Changes in returns to education in India, 1983–94: by gender, age-cohort and location

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Abstract

There is hardly any estimate of the monetary returns to schooling in the labor market in India based on national level representative data for the recent period. This paper provides estimates of the returns to education in wage employment in India by gender, age cohort and location (rural–urban) for the most recent period 1993/4, and also evaluates the changes in returns over a period of time from 1983–94 using data from a large national level household survey. The estimates show that the returns to education increase up to the secondary level and decline thereafter. There is evidence of substantial gender and rural–urban differences in the returns to schooling. Investment in women's education, particularly at the middle, lower secondary and higher secondary levels, is more profitable than that for men in 1983 and also in 1993/4. The returns to women's primary and middle levels of education have declined while those to secondary and college levels have increased during the decade 1983–94. © 2002 Elsevier Science Ltd. All rights reserved.

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1. Introduction

Low levels of literacy and educational attainment, large gender disparity in enrolment, completed education, and labor market participation are important features of the Indian economy. Large-scale unemployment among the educated population has led to the widely held belief that there is a surplus of education in the economy and the productivity of the labor force is low. Accordingly it has been questioned whether investment in education in India is profitable.

National level estimates of private rate of return to education in the labor market made for urban India in 1960 by Blaug, Layard, and Woodhall (1969) convinc-

ingly show that investing in education is profitable. Their estimate of the private returns to education varies from 9–17% across different levels and the returns to most levels were higher than the expected Government of India returns of 12% from investment in physical capital (industry). A comprehensive summary of this and other early studies on monetary returns to education in the labor market is given in Psacharopoulos and Hinchliffe (1973) and Heyneman (1980).[1] Although these earlier studies have made important contributions to the literature on the returns to education in India their estimates are based on an urban sample and are now dated. Since then some attempts have been made to estimate the

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[1] These studies adopted the 'full' or 'elaborate' method to compute the internal rate of return to levels of education and these returns may be compared with the returns to other types of investment such as in physical capital.

returns to education using small sample surveys (Malathy, 1983; Tilak, 1987; Divakaran, 1996; Kingdon, 1997). More recently, Duraisamy and Duraisamy (1993, 1995) estimated the returns to higher education and also to scientific and technical education using the national level Degree Holders and Technical Personnel survey data of 1981. A limitation in these later works is that persons with higher education constitute only a small fraction of the labor force and hence are not representative of the Indian labor market. These shortcomings notwithstanding, the existing studies in general provide evidence that the private returns to education in India or specific regions in the country confirm the stylized facts observed for several countries (Psacharopoulos, 1994). It is, however, difficult to discern any time trend from these returns as the studies are not comparable.

Besides the monetary returns to education in the form of higher wages/earnings in the labor market, education confers other benefits on which there is only limited evidence in the Indian context. One such benefit of education is its effect on productivity in self-employed occupations such as farming, own-account enterprises and the like (see Jamison & Lau, 1982). Duraisamy (1992) shows that farmers' education (4 years and above) increases the gross value of farm output by 4% in India and also found that the educated farmers are more technically and allocatively efficient than their uneducated counterparts.

Education also bestows several non-monetary or consumption benefits (see Schultz (1988) and McMahon (1995) among others for a review of studies on non-market benefits of education) such as reduced family size, better health status, efficiency in home production, child care, political awareness etc.[2] Additionally, there are external benefits of education which are rarely accounted for due to conceptual and measurement problems. In a recent work, McMahon (1999) develops a comprehensive framework to measure the monetary and non-monetary benefits of education, including the externalities of education, and applies this framework to estimate the total impact of education using country level aggregate data for East Asian, Latin American, African and industrialized nations.[3] Ideally, for policy purposes, a measure of the total effect of education is relevant (market and non-market benefits). However the available household level data are inadequate for such comprehensive returns

estimation. Hence the present study, like most studies on educational returns, focuses on the reward for education in wage employment for which the wage data are much cleaner.[4] Such estimates would be useful indicators of the reward for education in the labor market and also guide public and private investment in education. How these returns vary by gender and regions at a point in time and the variation in these over a period of time will help understand the nature and functioning of labor markets and guide region specific educational investment policies.

The purpose of this paper is to estimate the returns to education for workers in wage employment, by gender, age cohort and location (by rural–urban), for the most recent period 1993/4, and also to evaluate the changes in returns over a period of time from 1983–94. This is perhaps the first attempt in the Indian context using national level representative survey data. The study provides a set of estimates on returns that may be compared with similar estimates for other countries. The large-scale employment and unemployment survey data from two rounds of the National Sample Surveys (NSS) for the years 1983 and 1993/4 are used for the purpose. It is interesting to note that these are the only national level surveys in India that provide information on wages and some labor market characteristics of the individuals and recently these data have been made available to researchers. The present work also seeks to address a few issues in estimating the returns such as functional form of the earnings function and sample selection bias.

The rest of the paper is organized as follows: In Section 2, the structure of education and the labor market in India are briefly discussed. Section 3 describes the database and outlines the earnings function framework that is used here to estimate the returns to education. The specification and estimation issues are also discussed in this section. Section 4 presents and compares the estimates of the returns to schooling based on ordinary least squares (OLS) and joint maximum likelihood (JML) methods. The time trend in the returns to education in India is the subject matter of Section 5. Last, the major findings are summarized in Section 6.

2. Structure of education and the labor market in India

The school education system in India comprising primary, middle and secondary levels varies considerably

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[2] There is now some evidence on the non-market benefits of education in the Indian context. Duraisamy and Malathy (1990) report that adult female education significantly reduces family size and adult male and female education increase child schooling. Malathy (1994) shows that women's education has a significant positive effect on time allocation to teaching children.

[3] Another non-market benefit of education is its effect on poverty and inequality (see McMahon, 1999).

[4] Some studies have estimated the returns to education for self employed workers. A difficulty is that it is hard to separate the income from self-employment by the contribution due to physical capital, human capital and the reward for risk and uncertainty bearing.

across the states, since education is primarily the responsibility of the state governments, although recently it has been brought under the concurrent list (state plus federal subject). Most states follow 5 years of primary, 3 years of middle and 2 years each of secondary and higher secondary levels. In the public schools, the lessons are taught mostly in the regional languages and English is learned as a second language, whereas in the private schools most of the subjects are taught in English. The system of higher education is however more or less uniform across the country and taught mostly in English. The first level degree in non-technical subjects usually requires about 3 years while the technical degree courses span 4 years.

The work participation rates of the population and the distribution of workers over different sectors in the economy will provide an overview of the structure of the Indian labor markets. Although the population censuses and the national sample survey organization have been collecting data on work force participation rates over a long period of time, the trends in work participation cannot be meaningfully discerned from these data because of changes in the definition of work (gainful activity) over time. Since 1972/3 the NSS has adopted a more or less uniform, hence comparable, definition of work participation in its employment and unemployment surveys.

The work participation rates of men and women, and the structure and composition of the labor force by gender and employment, compiled from the NSS quinquennial (once in 5 years) surveys (1972/3 to 1993/4), are given in Table 1. The data reveal some interesting and rather distinctive features of the labor market. First, the work participation rate in India is rather low (54 and

28% for adult men and women in 1993/4) and the work participation of women is about one half that of men in 1993/4. Further, in the two decades 1973–94, the participation rates have not increased very much (a rise of 1.5% for men and 0.5% for women). Second, over 50% of the workers are in the self-employed sector. The regular wage/salaried sector accounts for only 16.7% of men and 6.2% of women workers. Data also indicate that 29.6% of men and 37% of women are casual laborers. Also, over the years, the percentage of self employed workers and those in salaried/regular wage employment have registered a decline while the proportion of casual laborers has increased by 10 percentage points for men and about 6 percentage points for women.[5]

3. Data, model and estimation issues

The data used in this study come from a large national level 'Employment and Unemployment' surveys of the NSS for the years 1983 and 1993/4.[6] These survey data are used to derive national level estimates of labor force participation, occupational distribution and wages. The sample households are drawn based on a two-stage stratified random sampling procedure. The first stage units are the census villages and urban blocks and the second stage comprises the households in these villages and urban blocks. The first stage units are selected circular systematically with probability proportional to the population, and the villages and urban blocks are selected in the form of two or more independent sub-samples. In the second stage, the households are arranged by means of livelihood (main occupation), and area of landholding in rural areas, and monthly per-capita consumption expenditure in urban areas. The samples are selected circular systematically with a random start.[7] The survey is divided into four sub-rounds of 3 months duration and equal numbers of sample villages and urban blocks are allocated to each sub-round. Thus the survey covered about 69,230 rural and 46,179 urban households in 7284 villages and 4792 urban blocks in the year 1993/4 and about the same number of households were surveyed in

Table 1
Work participation and structure of the Indian labor force,[a] 1972/3–1993/4[b]

	1972/3	1978/9	1983	1987/8	1993/4
Work participation:					
Men	52.9	53.6	53.8	53.1	54.4
Women	27.8	29.0	29.5	28.1	28.3
Structure of the work force:					
Self-employed:					
Men	60.1	58.0	55.9	54.5	53.7
Women	63.1	60.8	60.0	59.0	56.8
Regular wage/salaried workers:					
Men	19.8	18.3	18.1	18.2	16.7
Women	6.3	5.3	5.4	6.8	6.2
Casual laborer:					
Men	19.7	23.7	26.0	27.3	29.6
Women	30.6	33.9	34.6	34.2	37.0

[a] Age 15–59 years.
[b] Source: Compiled from NSS survey reports.

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[5] The published NSS reports do not provide an average daily wage rate for all wage workers (regular and casual workers) and so changes in real wages during 1973–94 cannot be examined.

[6] The NSS 1986/7 employment and unemployment survey data were also analyzed but the data on wages were found to be missing for most of the wage workers in the rural areas in that data set and hence not used in this study.

[7] In order to get an adequate number of sample households from the affluent sections of the society, the NSS 1993/4 survey stratified the households into affluent and others, based on the asset holding and monthly consumption expenditure. Two households from the affluent and 8 households from 'others' were selected circular systematically with a random start.

the 1983 survey.[8] The survey details and the aggregate estimates are given in Government of India (1997).

Information on the activity status, age, educational level, region of residence, etc. are available for all individuals. For workers, data are gathered on the number of days worked in the reference period while wage/salary is collected only for regular wage/salaried workers and casual laborers. Household level data on the area of landholding and ownership of homestead are also provided. Information on whether or not the household received income from different sources such as cultivation, wage/salary, interest and dividend, etc., were collected in a companion survey on consumer expenditure in 1993/4. However the amount of such incomes received is not known.

The returns to education estimated here are only for those in wage employment. For the sample of self-employed workers, wage or income particulars are not collected in the NSS surveys and hence it is not possible to estimate the returns to education for them.

3.1. Model

Returns to different levels of education may be estimated using two alternative approaches namely the elaborate method and the extended earnings function method (Psacharopoulos, 1994). The elaborate method provides internal rate of return to education but requires information on the cost of education, which is rarely available and hence the earnings function method is the one that is widely used. Both the methods, in theory, should give very similar results (Psacharopoulos, 1994). However, the earnings function method rests on a number of assumptions, which makes it difficult to interpret the estimated returns as the true internal rate of return that can be compared with the returns estimated using the elaborate method. The assumptions underlying the earnings function methodology are: First, private direct costs of education (tuition and fees paid, expenditure on books, transportation, uniform and other schooling inputs) are negligible or are offset by a student's part-time and summer earnings (Dougherty & Jimenez, 1991). Second, the cost of education is assumed to be the foregone earnings and this method automatically imputes foregone earnings to the rate of return calculation for the full length of one's schooling cycle. As Psacharopoulos (1994) points out, it is inappropriate to assign 6 years of foregone earnings to primary school children, mostly aged 6–12 years, as they may not have had any earnings foregone in early ages. As a result the returns to schooling for the primary level is underestimated. Third, the

earnings profiles are isomorphic (Dougherty & Jimenez). That is, the slope of the earnings function is the same for all levels of education and only the intercept varies by educational level. Fourth, there is no credit market constraint, that is, funds are available to all individuals to invest in their human capital at the same interest rate (Schultz, 1988). Despite these limitations the earnings function method remains popular in view of its simplicity and ease of estimation.

Under the earnings function framework, the wage of an individual is assumed to depend upon level of schooling and on-the-job training measured by job experience (and usually approximated in the literature by potential experience). The semi-logarithmic earnings function, also known as the Mincerian earnings function (Mincer, 1974), is the commonly accepted functional form for the earnings function and seldom has this form been subjected to empirical testing. The empirical justification for this is provided later in the paper.

The earnings equation is specified as follows:

$$\ln W_i = \alpha + \Sigma_k \beta_{ik} S_{ik} + \gamma_1 E_i + \gamma_2 E_i^2 + \delta L_i + u_i, \quad i=1,...,N \quad (1)$$

where W is the wage rate, S refers to schooling, E stands for experience and L denotes the location, α, β, γ and δ are the parameters to be estimated and u is the random disturbance term.

The dependent variable in the wage function is the logarithm of the daily wage rate (W) which is obtained by dividing the total wages and salaries (in cash and in kind) receivable for work done in the reference week by the total number of days reported working in wage work in that week.[9]

The schooling variable is measured here as k level dummies (S_k) as the years of schooling of the individuals is not available. The levels of education considered are primary, middle, secondary, higher secondary and graduate and above. Illiterates and persons below primary belong to the reference group. A dummy variable indicating whether the person had any additional technical diploma or certificate is also included as one of the education variables. The average rate of return per year of schooling for the kth level (r_k) can be measured as

$$r_k = (\beta_j - \beta_{j-1})/Y_k \quad (2)$$

where Y_k is the number of years of schooling at the kth

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[9] Daily wages may be affected by variation in hours of work. The NSS surveys do not collect data on hours of work but collect detailed information on the intensity of work (half or full day) for each activity in a day and for all the seven days of the reference period. The intensity is recorded as 0.5 if a person spent 1–4 hours in an activity and 1.0 if the intensity of work exceeds 4 hours. The days worked in each activity in the survey reference week is the sum of the product of participation and intensity of work. The wages receivable for the work done in an activity includes wages in cash as well as in-kind.

level. It is assumed that an individual spends 5, 3, 2, 2 and 3 additional years, over the previous level of schooling, to complete primary, middle, secondary, higher secondary and college levels of education in India.

Labor market experience (E) is defined as potential experience and is equal to age minus years of schooling minus 5. A squared term in potential experience is included to capture the non-linearity in the experience–earnings profiles. A dummy variable for residence in rural areas (L) is also included in the set of explanatory variables to capture the rural–urban difference.

3.2. Estimation issues

The returns to education based on the OLS estimates of the wage Eq. (1) are subject to various sources of bias and the recent literature provides alternative estimation strategies to tackle such issues (see Harmon & Walker (1995) and Ashenfelter, Harmon & Oosterbeek (1999)) for a discussion on this issue). The instrumental variables method has been proposed and used to account for the endogeneity of schooling. Owing to lack of information on the parental characteristics such as education, occupation etc., or ability measures or twins information in the data set, the sensitivity of OLS estimates to these sources of bias cannot be examined in this study. However, other estimation issues, namely functional form of the wage equation, sample selection bias, and the effects of cohort and place of residence on the returns to schooling are given due attention.

3.2.1. Functional form

The Mincerian semi-logarithmic specification is the most commonly used form of the wage function. Some studies have explicitly tested for the empirical appropriateness of this form (Heckman & Polachek, 1974; Dougherty & Jimenez, 1991; Duraisamy & Duraisamy, 1997). The Box–Cox transformation is applied to test for the appropriate functional form of the earnings functions — linear vs the semi-logarithmic. The general form of the Box–Cox transformation is given as follows:

$$W^i(\lambda) = \begin{cases} (W_{i\lambda}-1)/\lambda & \text{for } \lambda \neq 0 \\ \ln(W_i) & \text{for } \lambda = 0 \end{cases} \tag{3}$$

The interesting feature of the transformation is that the functional form depends on the parameter (λ). If the estimated $\lambda=1$, the dependent variable is linear. Alternatively, if $\lambda=0$, then the semi-log specification of the dependent variable in the wage function is appropriate.

The log-likelihood values obtained by maximization of the log-linear function are plotted in Fig. 1 for males and females. The log-likelihood value is minimum when the Box–Cox parameter λ takes the value of 0.321 and 0.220 for men and women respectively which is statisti-

cally different from zero and also from one at the 5% level. Heckman and Polachek (1974) using 1960 and 1970 US census data, and Dougherty and Jimenez (1991) with 1980 Brazilian census data obtained similar results and they preferred the semi-logarithmic transformation as the linear specification was rejected at a much higher significance level than the semi-logarithmic form. Using this rationale the semi-logarithmic form is taken here as the preferred functional form for the earnings function.

3.2.2. Sample selection bias

The wage functions are estimated using a sub-sample of wage workers. This restriction may lead to the familiar sample selection bias. The workers constitute about 36 and 12% of adult males and adult females aged 15–65 in our sample for 1983 and 1993/4. Heckman (1974) developed the joint maximum likelihood procedure to correct for this source of selection bias in wage estimates. This procedure involves estimating participation in wage work (WWP) and wage equations in a simultaneous equation framework, which requires the wage equation to be identified. Although the functional form restriction provides a statistical basis for identifying the wage equation, it is empirically evident that variable exclusion restrictions are required. The appropriate identifying variable, as suggested by labor supply theory, is an exogenous source of non-labor income of the individuals or households. For the recent period (1993/4), information on whether the household received interest and dividend income is available and hence the non-labor income variable is introduced as a dummy variable. It is not uncommon to use dummy variables as identifiers in simultaneous equation estimates (Harmon & Walker, 1995).

3.2.3. Cohort, and location effects

Availability and quality of schooling vary over a period of time and hence different cohorts of the sample may have gone through schooling of different quality. To account for this differential effect of quality, the returns to schooling are estimated separately for three age groups: 15–29, 30–44 and 45–65. The quality and availability of schooling infrastructure also differ markedly between rural and urban areas in India. To examine the influence of rural–urban differences in school availability and quality, the returns may be estimated by separating the sample by the place of schooling or place of birth as suggested in Schultz (1988). As such information is not available in the data set used in the study, the place of current residence of the individual is used to reflect the influence of rural–urban difference on returns. The rural–urban differential in returns, in this study, should not be interpreted as indicating the differences due to schooling infrastructure between the rural and urban areas owing to rural–urban migration. That is, most migrants in the urban areas might have had schooling in
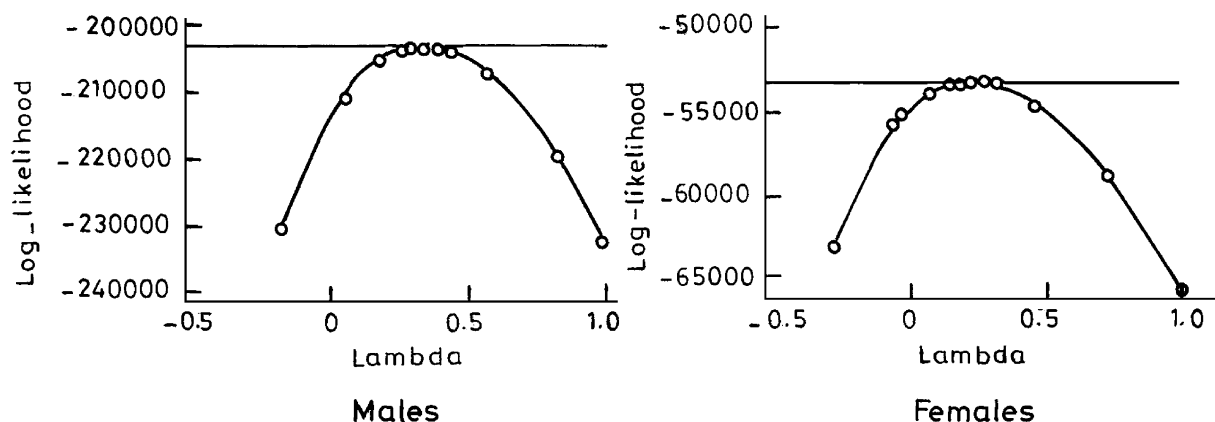
Fig. 1.   Box–Cox transformation: log-likelihood values by lambda.

rural areas and the urban estimates would reflect not only the urban school quality but also, to some extent, the school quality in rural areas. The rural–urban difference in returns would reflect the prevailing labor market situation in these areas.

The variable means and standard deviations for workers in wage employment and all persons by gender for the two years are given in Table 2. For the year 1983, the higher secondary level is clubbed with the secondary level in the data set.

4. Empirical results

4.1. Returns to education by gender

The estimates of the wage and wage work participation equations for males, females and for both sexes by OLS and JML methods for the whole sample (all age cohorts and in both rural and urban areas) are reported in Table 3.

The estimates of the wage work participation equation show that the effects of all educational levels, except higher secondary for women, experience and its quadratic, dummy variables for rural residence and non-labor income are statistically significant (at the 1% level) in all the three equations. It is interesting to note that the higher levels of education, namely higher secondary and above for men, and graduate and above for women, increase the probability of entering into wage work. This implies that education enables one to enter into regular salaried government or private wage work. Potential experience increases at a decreasing rate the chance of being in wage work. Residing in rural areas reduces the probability of being in wage work for men but increases the likelihood of participating in wage work for women. The wage identifier, namely a dummy variable for non-labor income, is negative and also statistically significant in all the equations at the 1% level.

The estimates of the wage equations by the OLS and JML methods confirm the conventional wisdom. That is, the coefficients of the educational level dummy variables are positive and also statistically significant at the 1% level in all equations. The effect of potential experience is positive and that of experience squared term is negative exhibiting the non-linear pattern of the experience–earnings profile. An additional year of experience increases wages by 6 and 4%, respectively, for men and women. The dummy variable for rural residence is negative and statistically significant at the 1% level suggesting that the daily wages are significantly lower (about 2–3%) in rural areas compared to urban areas.

The 'rho' term which denotes the correlation between the error terms of wage work participation and wage equations, is positive and statistically significant at the 1% level in all equations. This implies that the less productive men are more likely to be in wage work than others and the sample selection bias in the estimates of wage equation is important.

The rate of return per year of education is computed using the estimates of wage equation by OLS and JML methods and reported in Table 4. In general, wage returns increase with the level of schooling up to the secondary level. The wage premium for an additional year of higher secondary and college education is lower compared to secondary level but higher than primary and middle levels. The private returns per year of schooling in India in 1993/4 for the primary, middle, secondary, higher secondary and college levels of education based on OLS wage estimates are, 7.9, 7.4, 17.3, 9.3 and 11.7% respectively. Interestingly the labor market returns is the highest for (junior) secondary education suggesting that expansion of this level of education would be more rewarding. A recent study by McMahon (1999) based on cross-country data points out that expansion of junior secondary education is most relevant in India for export oriented growth. The reward for an additional technical diploma or certificate is higher than that to college edu-

Table 2
Means and standard deviations of variables by gender and work status, India, 1983 and 1993/4[a]

Variables	1983				1993/4			
	All adults		Wage workers		All adults		Wage workers	
	Men	Women	Men	Women	Men	Women	Men	Women
Log daily wage	2.443	1.716	2.443	1.716	3.593	2.979	3.593	2.979
	(0.787)	(0.767)	(0.787)	(0.767)	(0.973)	(0.956)	(0.973)	(0.956)
Wage work participation Dummy	0.361	0.120	1.0	1.0	0.355	0.120	1.0	1.0
	(0.480)	(0.325)			(0.479)	(0.325)		
Education level dummy:								
Literate below primary	0.494	0.720	0.513	0.809	0.378	0.598	0.425	0.701
	(0.500)	(0.449)	(0.500)	(0.392)	(0.485)	(0.490)	(0.494)	(0.458)
Primary	0.162	0.105	0.145	0.060	0.135	0.110	0.127	0.062
	(0.369)	(0.307)	(0.352)	(0.237)	(0.342)	(0.313)	(0.333)	(0.240)
Middle	0.161	0.083	0.128	0.029	0.182	0.122	0.142	0.050
	(0.368)	(0.276)	(0.334)	(0.169)	(0.386)	(0.327)	(0.349)	(0.218)
Secondary[b]	0.136	0.063	0.140	0.061	0.141	0.087	0.119	0.059
	(0.342)	(0.244)	(0.347)	(0.240)	(0.348)	(0.282)	(0.324)	(0.236)
Higher secondary	—	—	—	—	0.081	0.043	0.067	0.039
					(0.272)	(0.203)	(0.251)	(0.194)
Graduate & above	0.046	0.019	0.073	0.040	0.083	0.041	0.120	0.089
	(0.208)	(0.135)	(0.260)	(0.195)	(0.277)	(0.198)	(0.325)	(0.284)
Technical diploma/certificate	0.026	0.009	0.046	0.033	0.038	0.014	0.059	0.042
	(0.158)	(0.096)	(0.209)	(0.179)	(0.192)	(0.117)	(0.236)	(0.201)
Potential experience (in years)	23.550	25.844	23.643	26.105	22.328	24.852	23.813	25.901
	(15.303)	(15.175)	(12.663)	(13.165)	(15.30)	(15.568)	(12.48)	(13.20)
Potential experience square	788.793	898.161	719.343	854.80	732.595	860.018	722.744	845.527
	(871.76)	(913.46)	(716.84)	(784.55)	(843.79)	(911.41)	(696.78)	(776.04)
Rural dummy	0.636	0.659	0.551	0.711	0.606	0.621	0.522	0.645
	(0.481)	(0.474)	(0.497)	(0.453)	(0.489)	(0.485)	(0.500)	(0.478)
Non-labor income (dummy)	—	—	—	—	0.064	0.065	0.058	0.049
					(0.244)	(0.246)	(0.233)	(0.215)
# of observations	184,458	178,373	66,651	21,444	178,896	178,896	63,507	20,393

[a] Source: Computed using NSS 1983 and 1993/4 survey data.
[b] Includes higher secondary for the year 1983.

Table 3
OLS and JML estimates of the wage and wage work participation (WWP) equations by gender, all age (15–65), India, 1993/4[a]

	Both sexes			Men			Women		
	OLS	JML		OLS	JML		OLS	JML	
	Wage	Wage	WWP	Wage	Wage	WWP	Wage	Wage	WWP
Educational level:									
Primary	0.395 (41.75)	0.388 (40.74)	−0.0826 (10.53)	0.313 (30.46)	0.302 (28.66)	−0.224 (22.16)	0.192 (8.42)	0.155 (6.27)	−0.389 (25.24)
Middle	0.617 (65.17)	0.610 (64.02)	−0.0728 (9.26)	0.506 (49.66)	0.491 (46.15)	−0.286 (28.95)	0.502 (19.59)	0.460 (16.41)	−0.442 (26.24)
Secondary	0.963 (95.27)	0.963 (95.05)	0.0247 (2.79)	0.820 (74.76)	0.808 (71.29)	−0.250 (22.78)	1.176 (48.28)	1.157 (46.37)	−0.184 (10.23)
Higher secondary	1.149 (90.04)	1.156 (90.15)	0.120 (10.47)	0.999 (72.19)	0.988 (70.16)	−0.225 (16.27)	1.411 (47.17)	1.419 (47.09)	0.0302 (1.30)
Graduate & above	1.500 (142.78)	1.537 (132.28)	0.571 (53.22)	1.372 (118.33)	1.378 (117.96)	0.180 (13.62)	1.684 (73.97)	1.730 (66.95)	0.589 (28.62)
Technical diploma/certificate	0.291 (22.41)	0.332 (23.53)	0.618 (42.95)	0.305 (21.51)	0.323 (21.82)	0.470 (27.68)	0.241 (8.40)	0.310 (9.07)	0.852 (29.71)
Experience	0.0559 (66.69)	0.0617 (54.11)	0.0756 (117.56)	0.0589 (61.53)	0.0633 (45.77)	0.0924 (112.45)	0.0413 (25.46)	0.0457 (22.68)	0.0505 (43.13)
Experience square ($\times 10^{-2}$)	−0.0783 (53.55)	−0.0883 (44.68)	−0.129 (116.02)	−0.0814 (47.78)	−0.0892 (36.24)	−0.163 (111.40)	−0.0599 (22.49)	−0.0675 (20.12)	−0.0855 (45.00)
Rural dummy	−0.285 (46.95)	−0.297 (47.25)	−0.161 (31.07)	−0.299 (44.20)	−0.316 (40.66)	−0.370 (54.33)	−0.164 (13.29)	−0.159 (12.70)	0.0605 (6.55)
Non-labor Income	—	—	−0.271 (25.28)	—	—	−0.192 (73.62)	—	—	−0.249 (12.85)
Constant	2.358	2.168	−1.435	2.476	2.376	−0.949	2.200	1.969	−1.706
Rho	—	0.128 (7.67)		—	0.0852 (4.43)		—	0.146 (3.82)	
Adjusted *R*-square/log likelihood	0.359	−281199		0.337	−180661		0.380	−82153	
# of observations	83,900	348,546		63,507	178,896		20,393	169,650	

[a] Source: Computed from survey data. *t*-values in parentheses.

Table 4
Returns to education per year based on OLS and JML estimates by gender, India, 1993/4[a]

Educational level	OLS			JML		
	Both sexes	Men	Women	Both sexes	Men	Women
Primary	7.9	6.3	3.8	7.8	6.1	3.1
Middle	7.4	6.4	10.3	7.4	6.3	10.1
Secondary	17.3	15.7	33.7	17.7	15.8	34.9
Higher secondary	9.3	8.9	11.8	9.7	9.0	12.8
College/University	11.7	12.4	9.1	12.7	13.0	10.6
Technical diploma/certificate	14.6	15.2	12.0	16.6	16.2	15.5

[a] Source: Computed using the results reported in Table 3.

cation (14.6%). The corresponding returns based on JML wage estimates indicate that the OLS estimates are slightly lower than those of JML estimates for secondary and above levels of education.

Comparing the returns to men's and women's education, it is interesting to note that the returns to an additional year of women's education is higher than that to men at the middle, secondary and higher secondary levels, particularly so at the secondary level where the wage gains to women's education is more than twice that to men's. Men receive 6.4, 15.7 and 8.9% returns on middle, secondary and higher secondary levels compared to 10.3, 33.7 and 11.8% returns for the same levels to women.

The returns to education estimates for men, women and for both sexes indicate that the market reward to primary and upper primary (middle) levels are lower than those for secondary and higher levels of education. This is at odds with the conventional pattern observed worldwide that primary education fetches the highest returns in low-income countries as reported in Psacharopoulos (1994). But recent studies for many low-income countries, cited in Moll (1996, Table 4), show that the returns to primary education is lower compared to secondary level (also see Mwabu and Schultz (2000) for South Africa, Kingdon (1997) for India, Siphambe (2000) for Botswana, among others). Moll (1996) argues that decline in school quality and changes in the demand and supply factors largely account for the low returns to primary schooling. Mwabu and Schultz (2000) show that supply of graduates is a significant determinant of the market returns to education. In the Indian context, the massive expansion of schooling infrastructure after independence in 1947 led to a decline in quality and thus a negative trade-off between quantity and quality is observed (Duraisamy, James, Lane, & Tan, 1998).

The estimated low returns to primary education should be noted with caution for any policy purpose. First, the estimates are restricted to wage-earner occupations that constitute a small fraction of the labor force and cannot be generalized as returns to primary education for all

sectors. Second, the major benefits of education, especially for primary level, take the form of better health, low fertility, poverty reduction etc., and these non-market benefits are not captured in these estimates.

4.2. Returns by age cohorts

The OLS and JML estimates of the wage and participation equations for three age groups — 15–29, 30–44 and 45–65 — are estimated.[10] The estimates of the wage work participation equations indicate that the younger cohort of men with graduate and above levels of education are more likely to be in wage work than the older cohort of men. But in the case of women, those aged 30 and above with higher secondary levels of education are more likely to be in wage work than women below 29 years of age. The selection term, rho, is positive and statistically significant at the 5% level or above in all equations except for the women in the age group 15–29. The OLS and JML estimates of wage equations show that the set of education dummy variables have a positive sign in all the equations except technical diploma in the OLS results for the 45–65 cohort.

The implied returns per year of education are computed and shown in Table 5. The returns to education for different levels vary markedly across the age cohorts. It is interesting to note that the returns to primary, middle and secondary levels of education are lower for the younger cohorts, 15–29 and 30–44, than for the oldest cohort. However, the opposite is true for higher secondary, college and technical diploma. The returns to higher secondary level for the 45–65 age group are very low perhaps due to the small sample size in this category as a separate 'higher secondary' level did not exist before

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[10] Due to space constraint, the OLS and JML estimates of wage and wage work participation equations by gender for the three age groups and rural–urban residence are not reported here. These are available free of charge from the author upon request.

Table 5
Returns to education per year based on OLS and JML estimates by age cohort, India, 1993/4[a]

Age cohort/Educational level	OLS			JML		
	Both sexes	Men	Women	Both sexes	Men	Women
Age cohort 15–29:						
Education level:						
Primary	6.0	5.0	3.5	5.9	4.9	3.1
Middle	6.4	6.1	6.0	6.4	6.1	5.8
Secondary	10.9	9.4	24.2	10.8	9.3	24.4
Higher secondary	14.0	12.4	21.6	14.1	12.3	22.3
College/University	14.5	15.8	10.4	15.6	16.6	11.6
Technical diploma/Certificate	17.9	17.9	16.8	19.6	19.0	19.2
Age cohort 30–44:						
Education level:						
Primary	7.3	5.9	2.9	7.1	5.8	2.2
Middle	8.1	6.7	13.9	8.2	6.7	13.7
Secondary	18.9	17.8	33.9	19.5	18.0	35.6
Higher secondary	10.1	9.7	13.1	10.8	10.0	14.3
College/University	10.4	10.6	9.9	11.1	10.9	11.3
Technical diploma/Certificate	14.2	14.9	11.4	16.2	15.7	14.7
Age cohort 45–65:						
Education level:						
Primary	9.8	7.3	4.6	9.4	7.0	3.3
Middle	8.5	6.6	23.2	8.6	6.5	23.1
Secondary	19.8	18.8	36.5	21.0	19.3	39.7
Higher secondary	2.8	3.4	−0.9	3.3	3.5	0.4
College/University	10.7	11.6	5.7	10.9	11.7	6.3
Technical diploma/Certificate	11.5	12.8	4.3	13.2	13.4	8.8

[a] Source: Computed using the OLS and JML estimates of the wage equations.

the mid seventies in many Indian states. The decline in the returns to secondary and lower levels for the younger age cohorts may be due to an increase in the supply of persons with these educational levels following the massive expansion of education facilities since independence in 1947. The increase in the returns for higher secondary and above levels and to technical diploma may be attributed to the rapid industrialization in the country in the recent years which might have led to an increase in the demand for technical and highly qualified persons. The returns estimates from OLS and JML methods are close to each other and exhibit similar pattern.

4.3. Rural–urban differences in the returns to education

As discussed in the introductory section, most of the available estimates of the returns to education for India are based on urban samples (see Heyneman (1980) for a review of these studies). The returns to education may vary between rural and urban areas due to institutional and other constraints that create barriers to perfect mobility of labor between rural and urban areas. The

estimates based only on urban sample may be biased and hence of limited usefulness for educational planning and policies. The returns to education based on OLS and JML estimates of wage functions are given in Table 6.

A striking finding in the rural–urban estimates is that returns per year of schooling are higher in the rural than in the urban areas for primary and secondary levels and also for additional technical diploma. Especially, the returns to primary education in rural areas are 69 and 32%, higher for men and women than in urban areas. The reward for middle, higher secondary and college education are higher in the urban labor markets than those in the rural areas. Both rural and urban labor markets offer higher reward for women's (middle, lower and higher secondary) education compared to that of men's. These estimates clearly show that the returns to education based on the urban sample alone cannot be meaningfully used as representative estimates for India.

5. Changes in returns to education over time, 1983–94

It is important to examine how the returns to education vary over time within a country. This would be valuable

Table 6
Returns to education per year based on OLS and JML estimates by place of residence, India, 1993/4[a]

Place of residence/Educational level	OLS			JML		
	Both sexes	Men	Women	Both sexes	Men	Women
Rural wage workers:						
Education level:						
Primary	8.4	7.1	4.1	8.2	6.8	3.6
Middle	7.0	6.6	7.4	6.9	6.4	7.3
Secondary	19.7	17.9	34.1	20.1	18.0	34.6
Higher secondary	9.0	8.4	11.0	9.4	8.5	11.6
College/University	11.4	11.6	10.1	12.3	12.1	10.8
Technical diploma/certificate	19.1	19.3	19.3	20.9	20.2	21.0
Urban wage workers:						
Education level:						
Primary	6.3	4.2	3.1	6.3	4.1	2.4
Middle	8.0	6.6	13.6	8.0	6.6	13.2
Secondary	16.0	14.7	32.4	16.2	14.7	34.0
Higher secondary	10.5	10.1	12.9	10.7	10.1	14.1
College/University	12.3	13.2	9.3	13.2	13.5	11.3
Technical diploma/certificate	13.4	14.3	10.2	15.3	14.9	14.8

[a] Source: Computed using the OLS and JML estimates of wage equations.

for educational planning and also for testing the implications of important theories of the labor markets (Psacharopoulos, 1989). Available time-trend estimates for the US and other developing and developed countries suggest that returns tend to decline over time within a country (Psacharopoulos, 1994). Using two cross section employment and unemployment surveys of the NSS, the changes in the returns to education from 1983 to 1993/4 in India are examined. Due to data constraints in the 1983 survey, the specification and estimation methods adopted earlier need to be modified for comparing the returns in 1983 with those in 1993/4. First, the education level in the 1983 survey does not contain higher secondary level as a separate category but it is included with the secondary level.[11] To compare the time trend in the returns to schooling, the secondary and higher secondary levels of education in the 1993/4 survey are merged and denoted as secondary level. Second, the 1983 survey did not collect information on the sources of non-labor income and hence we could not use a dummy variable for interest and dividend income to serve as wage identifiers. Some studies use various forms of assets as proxy

for non-labor income (Mwabu & Schultz, 2000). Both the 1993/4 and 1983 surveys gathered information on assets such as whether the household owned the homestead, and the area of landholding. In India, most of the urban households do not own land but hold their assets in other forms, but neither of these surveys provides information on these. So area of landholding is not an adequate measure of assets. An attempt was made to apply the JML method by using homestead as an identifier of the wage equation. The function however turned out to be non-concave and for this reason the estimation could not be carried out. Hence I use only the OLS method to estimate the wage functions.

The OLS estimates of the wage functions by gender for 1983 and 1993/4 are reported in Table 7 and the derived estimates of the returns to schooling are given in Table 8. In general, there is evidence of a change in the reward for women's education during the decade 1983–94. The returns to middle level schooling have declined for both men and women but the change is particularly considerable (4%) for women. It should be noted that the absolute returns to women's education are higher than to men at the middle and secondary levels in both the periods. The secondary and college levels of education appear to be more rewarding for women in recent years. The returns to women's secondary and college levels of education have registered an increase of 1.7 and 0.8% respectively. However, for men the returns to secondary education has declined by 0.6% while there is no change in the reward for college education. Technical diploma fetches higher returns for men in the recent

[11] Prior to mid 1970s, most of the Indian states adopted a system of 11 years of school education followed by one year of college/junior college education, referred to as 'Pre-University Certificate', before entering into undergraduate programs (general or technical/professional courses). Since the mid-1970s, all the states have adopted a more or less uniform system of 10 years of secondary education followed by 2 years of higher secondary level education.

Table 7
OLS estimates of wage equation by gender, India, 1983 and 1993/4[a]

Variables	1983			1993/4		
	Both sexes	Men	Women	Both sexes	Men	Women
Education level:						
Primary	0.411	0.307	0.205	0.393	0.312	0.189
	(61.56)	(45.41)	(11.57)	(41.57)	(30.32)	(8.29)
Middle	0.664	0.519	0.635	0.615	0.504	0.497
	(89.58)	(70.60)	(25.69)	(64.89)	(49.44)	(19.41)
Secondary	1.076	0.914	1.349	1.028	0.882	1.264
	(144.31)	(122.03)	(65.91)	(116.65)	(91.46)	(61.06)
Graduate & above	1.542	1.401	1.731	1.496	1.368	1.678
	(159.71)	(143.68)	(71.53)	(142.30)	(117.93)	(73.65)
Technical	0.268	0.278	0.256	0.299	0.312	0.247
diploma/certificate	(24.56)	(24.93)	(9.85)	(22.99)	(22.04)	(8.61)
Experience	0.0477	0.0518	0.0274	0.0555	0.0586	0.0405
	(73.52)	(75.18)	(20.75)	(66.26)	(61.24)	(25.02)
Experience square ($\times 10^{-2}$)	−0.0685	−0.0729	−0.0427	−0.0779	−0.0812	−0.0589
	(61.64)	(60.63)	(16.69)	(53.26)	(47.63)	(22.12)
Rural dummy	−0.373	−0.399	−0.164	−0.287	−0.300	−0.167
	(79.92)	(81.89)	(16.69)	(47.19)	(44.37)	(13.53)
Constant	1.483	1.607	1.291	2.365	2.482	2.215
Adjusted *R*-square	0.471	0.480	0.413	0.357	0.335	0.378
# of observations	88,095	66,651	21,444	83,900	63,507	20,393

[a] Source: Computed from survey data. *t*-values in parentheses.

Table 8
Trends in the returns to education in India by gender, 1983–1994[a]

Educational level	1983			1993/4		
	Both sexes	Men	Women	Both sexes	Men	Women
Primary	8.2	6.1	4.1	7.9	6.2	3.8
Middle	8.4	7.1	14.3	7.4	6.4	10.3
Secondary[b]	13.7	13.2	23.8	13.8	12.6	25.5
College/University	11.6	12.2	9.5	11.7	12.2	10.3
Technical diploma/certificate	13.4	13.9	12.8	14.9	15.6	12.3

[a] Source: Computed using the results reported in Table 7.
[b] Includes Higher secondary level.

year, which may be due to an increase in the demand for technically skilled labor.

6. Conclusions

This paper estimates the private returns to education in India for persons in wage employment by gender, age-cohort and location using the Mincerian earnings function method. The changes in the returns over the period 1983 to 1993/4 are also examined using the national level NSS data. The major findings of this study are the following:

First, one of the benefits of education is that it enables one to enter into regular wage work. Our results show that higher levels of education, particularly a college degree, significantly increase the likelihood of entering into wage employment.

Second, for those in wage employment the private rate of return per year of education increases as the level of education increases up to the secondary level and then declines thereafter. Technical diploma/certificate fetches higher reward than college education. This implies that expansion of junior secondary education and technical institutions would be more rewarding. The low returns to primary education may be due to the declining quality

of primary education in India and this implies an urgent need to increase the quality of primary schooling. It should be noted that there are other major benefits of primary education such as the high returns to basic education of farmers in the rural areas and substantial gains in non-market activities especially for women that are not captured in our returns estimates.

Third, the returns to women's education exceed that to men's at the middle, secondary and higher secondary levels. Especially at the secondary level, the returns to additional schooling of women is over twice as large as the corresponding returns for men.

Four, the younger age cohorts (15–29 and 30–44) receive lower returns to additional year of education at the primary, middle and secondary levels than the older age cohorts. In the case of college degree and technical diploma, wage workers in the 15–29 age group obtain higher returns compared to the others.

Five, a striking finding on the variation in returns by rural–urban residence is the higher returns to education to those residing in rural than in urban areas for primary and secondary levels and for technical diploma. The rewards for higher secondary and college education are higher for the urban compared to the rural residents. Both the rural and the urban labor markets offer higher returns to women's middle, secondary and higher secondary education than that to men.

Lastly, there is evidence of considerable change in the reward for education, particularly for women, between 1983 and 1993/4. The returns to women's education for primary and middle levels have declined while those for secondary and college levels have increased during the decade 1983–94. The absolute returns to women's middle and secondary education are higher than to men in both the periods. The reward for men's technical diploma has increased in recent years.

Acknowledgements

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