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Wage Disparities and education: a recent study

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Abstract
The central theme of the paper is to capture the impact of choice of different subject streams , gender and socio-economic caste on earnings. Despite It's importance , however , very few studies have attempted to estimate the returns to education particularly at the tertiary level. Studies indicate a lot of variability in returns to different subject streams of education. Apart from the differencesacross subject streams of education , returns can be different across gender and caste , as indicated by some studies. Thus there is need to study the returns to education in the case of India and bring out the factors explaining the variability.
The present studyfocuses on demographic , human capital variables and socioeconomic factors that influence an individual's decision to invest in tertiary education. The study attempts to capture the unequal returns across gender and caste particularly. The study is based on the basic "Mincerian" earnings function (Mincer, 1974) to capture the relationship between earnings, education and experience. To take into account the sample selection bias the "Heckman two step " procedure is used.
The study has used primary data of Delhi University students, collecting information on demographic characteristics , socioeconomic variables , gender , family income, age cohorts and experience.
The study showcases that the above variables have an impact on returns to education. These variables form an important aspect of the individuals social status and also have a bearing on finding employment. The study has shown gender wage disparities highlighting gender inequalities and discrimination . The gender wage gap is to the extent of 10% to 14% . The study also looks at interplay of the caste system. Thus an attempt is made to unfold the modalities of earnings across gender, choice of subjects, and social caste system.
Keywords: disparities, gender, social classes, discrimination

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I. INTRODUCTION

Education plays an important role in the modern labourmarket. In human capital theory education is an investment of current resources in exchange for future returns. A large amount of literature has confirmed the relationship between education and earnings. Education is important for social change and equitable economic development and its outreach to marginalised sections is important in order to reduce inequalities.

The basis of a positive relation between education and earnings is based on " Mincerian earnings function ". This function is a single equation model that explains wage income as a function of schooling and experience. An important determinant of the demand for education are its expected benefits, which in turn depend upon human capital acquired during education. This is captured by the education wage relationship, which can be used to measure the returns to education.

II. REVIEW OF EXISTING LITERATURE

Several studies have attempted to estimate the returns to education using sample surveys for India. Notable are Tilak (1987), Kingdon (1999), T. Aggarwal (2011), and S. Madheswaran (2016). The studies have indicated that rates of return to education are not diminishing and there is an incentive to acquire higher levels of education. Despite this very few studies are capturing the inequalities in returns to education. Studies indicate that returns can be different for different social economic classes, gender, different quintiles and locational characteristics.

Rates of return across gender:

The study by S. Singhari&Madheswaran found significant inequality in rates of return to education between male and female workers. In the regular labour market rates of return were higher for males. The study also looked at rates of return across different quintiles of wage distribution by gender and came to the conclusion that it was not uniform across different quintiles, it was higher at higher quintiles. Another study by

AnuneetaMitra (2016), found a 'u' shaped relationship between education and earnings and came to the conclusion that wages for regular workers were higher for males but lower for casual workers. The reasons could be both explained and unexplained factors.

Rate of Return across socio economic clasess:

When educational opportunities and attachment are unequally distributed, they lead to unequal returns to education and become an important Source of inequalities. Since rates of return have an important bearing on income and wages, fostering equality in access to education is a powerful fool for aiming to reduce variations in rates of return and hence income inequality. Historically the access policy in higher education was dominated by three principles, namely inherited merit, equality of rights and equality of opportunity. This approach needs to replaced by affirmative action and sometimes equal inputs may not lead to equal outcomes as a result of different socio economic backgrounds may hamper ability to compete. These coming from 'advantaged' classes may have an edge due to both by providing a better learning environment and through better social contacts.

T. Aggarwal (2011) has used the IHDS (2005) data set and used information on household characteristics, age, education and caste. The study found that socio economic variables were statistically significant and there was a wage differential among the social groups. The estimates yield that the 'SC's 'ST's and 'OBC's were having a lower wage to the extent of 14% to 70% in both rural and urban sectors. Another study by S Singhari and Madheswaran used NSS data and found lower rates of return for these social classes. A study by P. Geeta Rani (NUEPA) had also found that family endowments and connections influenced returns to education and caste networks were important. Inspite of policies of reservation they experience lower rates of return even for higher education.

Thus we can see considerable inequality in rates of return to education across gender and socio economic categories.

Data Base :

The study has used primary data of about 600 students who have done a post graduate degree from Delhi University across different subject streams from 2012 to 2017. Data on their age, experience, family background and other demographic characteristics and earnings from all sources have been captured. Both qualitative and quantitative aspects have been covered.

III. METHODOLOGY

A variant of the Mincerian equation is used to estimate the returns to education for different subject streams. This equation is also known as human capital earnings function. The modification of the equation is to capture differential rates of return for different subject streams as taken by student of University of Delhi.

The different subject streams are divided into four categories:

(1) MBA – Covering MBA
(2) Social Sciences capturing economics and related fields.
(3) Humanities covering History, English, Political Science.
(4) Technical subjects, covering M.C.A and Nursing.

For the four subject streams, three dummy variables were created, to capture the essence of qualitative data. Quantitative after come in the form of "Binary Variables" or a zero one variable. In the model, "Technical Subjects" weretaken as the reference category serving the bench/ control variable. The three dummy variables were as follows:

i. MBA : Assuming the value 'I' of the student was in this category and value '0' if not.
ii. Humanities : Assuming the value 'I' if the student was in the category and value '0' if not.
iii. Social Science :Assuming the value 'I' if the student was in the category and value '0' if not.

The other variables work in the model were : gender, experience, fathers education, number of siblings, non labour of the correspondent, social marital status, class to capture the human capital; demographic and exclusion restrictions. These variables formed an important aspect of the individual's family background or social status. Ethnicity via social class too was an important variable in the human capital accumulation process, particularly in India, where caste was an important variable in influencing earnings and occupation.

Econometric Specification :

The data base contains individuals both employed and unemployed. Therefore the estimation of wage equation could suffer from the problem of ' sample selection bias ' . If the wage functions are estimated only using the individuals who work and therefore earn a wage. This might be a selective group and therefore not be a representative sample. To take into account for sample selection, we use a ' Heckman ' two step procedure. The procedure involves two stages, in first stage a participation (selection) equation captures the probability of having worked, and the second stage involves the estimation of wage (outcome) equation.

The identifying variables or exclusion restrictions that affect the selection equation must be found appropriately. These can be excluded from the wage equation as they don't necessarily have an impact on the wage equation. They may only have an impact on probability of being in the wage market. In the absence of exclusion restrictions the sample selection problem cannot be addressed properly and estimates may be biased and imprecise. The variables therefore in both equations need to be different.

1st Stage Model :

In the first stage estimation, the participation equation was given on the basis of human capital variables, demographic and identifying variables. From the estimation of this equation a selection variable 'I' known as the " Inverse Mills rate " was created. This was used as a regress end in 2nd stage equation. This equation was estimated for all observations. The equation was given the form as :**Yi= ZiØ+Ui**

where the dependent variable took the form of binary variable and had value '1' if the individual worked and '0' if not, 'z' was the set of exclusion restrictions, human capital and demographic variables. Variables like non labour income, number of siblings, marital status, father's education were used as identifying variables. They affect the probability of the person to enter the job market. We expect negative signs on variables like number of siblings and non-labour income whereas positive sign on fathers education.

2nd Stage Wage Equation :

This involved incorporating a set of dummy variables to capture differential rates of returns to different subject streams. The equation also includes the 'Inverse Mills rate' as an additional regressor obtained after estimating the first stage. We also include variables like experience, since an individual with higher experience in a job is likely to earn more, experience squared term is incorporated to capture the possibility of a non-linear relationship between earnings and experience. This equation was carried outonly for uncensored observations (only for these who worked). The dependent variable selected for the wage equation is the 'log' of the hourly wage. The logarithmic form was used as a regress and because the distribution of wages tends to highly skewed, most of the time it is right skewed and doesn't follow the normal distribution. Also in the log form, the problem of heteroscedasticity is usually less severe.

Two variants of the 'wage equation' were estimated. One variant had the specification as follows:

Log hourly wages = constant + D1+D2+D3+D4+ exp + exp2 where,

D1 was dummy variable for subject category MBA.

D2 was dummy variable for subject social science

D3 was dummy variable for subject humanities (technical subjects was taken as the base category)

D4 represented the dummy variable for gender.

The other two independent variables in the equation were labour market experience and square of experience.

The second variant of the wage equation also had social classes represented by dummy variables as independent variables as caste system in India could influence earnings and choice of occupations as borne by different empirical studies.

The specification of the wage equation for this variant was:

Log hourly wages = constant + D1 + D2 + D3 + D4 + D5 + D6 + D7 + Exp + Exp2

Where new D5 represented dummy variable for 'SC'

D6 represented dummy variable for 'ST'

D7 represented dummy variable for 'general'

(base category was social class 'OBC').

(other variables same as first variant of the wage equation)

Thus the model had both quantative and quantitative aspects captured in the data base. With two categories of dummy variables the benchmark or base category was essentially technical Subjects and OBC category of social classes.

Results and findings :

The model was a 'semilog model' implying the co efficient had to be dependent interpreted accordingly. In the model, variable was the wage rate (hourly) in log form (regressors) in linear form, the coefficient was to be interpreted as semi clasticities – that is relative or percentage change in the regressor, as approximations.

Main findings of 1st variant of wage equation :

It was seen that experience and experience squared were most significant variables in influencing earnings as borne by the 'Z' values. Over time, experience influenced earnings in a positive way, figures revealed that 50% of increase in earnings could be attributed to this factor. Experience square was another

significant variable, and the negative sign captured that earnings increased overtime at a diminishing rate capturing a nonlinear relation.

The most important finding was that the 'dummy variable' for humanities was also nearly significant. This dummy variable captured the 'Interceptshift'. The constant term gave mean log hourly earnings. It essentially revealed that humanities subject stream had higher earnings by close to 30%. The findings also revealed that 'MBA' subject stream had a higher salary by nearly 3% and social sciences had a lower salary by 2% (not while statistically significant). Gender discrimination was also observed as males had a higher salary 10% (not very statistically significant).

The 'P' values (probability) values also gave a similar insight. 'P' values summarized the strength or weakness of the empirical evidence and smaller 'p' values for gender, humanities subject stream, experience and experience squared were obsessed highlighting their importance.

Main findings of selection equation :

The variables had expected signs like, father education, marital status, siblings, had a positive impact in probability of selection, as educated families were likely to be having contacts in finding jobs as well as a motive for higher education. Also married people and people with larger families were more flexible in finding jobs, therefore better chances of being employed. Non labour income meant that people with alternative sources of money were to be more choosy in finding jobs, a negative sign was expected. Significant variables were gender and marital status the other variables which were close to statistically significant were the social classes of 'SC' and 'ST' and this probably indicated the policy of reservation in the public sector. Therefore these variables were reasonable identifying variables.

The selectivity term – Inverse Mills Rate was somewhat, significant not very indicating sample selection could be problem and therefore it was reasonable to use the 'Heckman' model.

The sign of 'RHO' which captures the correlation between the error terms of 1st stage and 2nd stage regressions was positive, thus implying they were correlated but not highly. This also lead us to the conclusion of a selectivity bias if we had estimated regression on employed people only.

Table 1

Result for Variant 1

Heckman selection model—two step estimates

No. of observations = 600

Censored observations = 262

Uncensored observations = 338

Log hourly earnings	Coef.	Std. Err.	z	p>|z|
Gender	-.100	.143	.70	.483
MBA	.031	.156	.20	.840
Humanities	.296	.185	1.60	.109
Social sci.	-.021	.157	--.14	.892
Experience	.504	.124	4.06	.000
Exp. 2	-.055	.019	--2.83	.005
Constant	.012	.465	.03	.978
Employment gender	.180	.106	1.7	.090
ST	.306	.163	1.88	.060
SC	.296	1.83	.068	--.021
GEN	.112	.85	.394	--.145
FATHER EDU	.012	.12	.903	--.196
Sibling	.066	.91	.364	--.077
Marital status	.319	2.87	.004	.101 .537
Non labour income	.00	--.037	.714	--.00 .00
Constant	-.334	--2.07	.038	--.649 --.018

Finding for Variant IInd:

On looking at results of the variant IInd of the wage equation we find that while gender is not statistically significant females are earning slightly less and social classes not significant. Experience is very significant with earnings increasing at a decreasing rate. The selection equation also indicates gender and marital status are important in the probability of finding a job. Again the inverse mills ratio, was somewhat significant.

Variant-II

	Coef.	Std. Err.	z	P>|z|
Log hour 1yr				
Gender	–.1436526	.1611979	0.89	0.373
MBA	.0316854	.1775789	0.18	0.858
Humanities	.3399432	.2080483	1.63	0.102
Social sci.	.0555422	.1911545	0.29	0.771
Experience	.5124662	.1238177	4.14	0.000
ST	.1785552	.2345074	0.76	0.446
SC	–.0175431	.2193155	–0.08	0.936
GEN	–.2943411	.1744075	–1.69	0.091
EXP2	–.0597942	.0198153	–3.02	0.003
Cons	–.2206464	.6824037	–0.32	0.746
Employment				
Gender male	.1844997	.1068304	1.73	0.084
MBA	.1084743	.1387691	0.78	0.434
Humanities	.1537003	.1660777	0.93	0.355
Social sci.	.2134868	.1422013	1.50	0.133
ST	.3133372	.1640195	1.91	0.056
SC	.3036803	.1629866	1.86	0.062
GEN.	.1278997	.1396475	0.92	0.360
Father edu.	.0170494	.1070703	0.16	0.873
Siblings	.0652575	.0737534	0.88	0.376
Marital stat.	.3271647	.1123966	2.91	0.004
Non labour	–4.25e–06	.0000164	–0.26	0.795
Family income	3.27e–09	3.70e–06	0.00	0.999
Cons	–.4659807	.280639	–1.66	0.097
Mills				
Lambda	.8734297	.6883897	1.27	0.205
Rho	0.70671			
Sigma	1.2359157			

IV. CONCLUSION

Estimates of returns of education are after used to inform education policy decisions on the allocation of public investment. Inequalities in returns suggest more emphasis on female education and socio-economic backward classes is needed. Wage discrimiionis experienced not only gender wise but also social group wise. This speaks adversely about India's social fabric given the extremely unequal distribution of returns to higher education. The policy option suggested is for a differential fee in higher education. Though identification of the differential fee is a difficult task, still targeting should be tried. While there can be errors it is preferable to equal subsidies for all.

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