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CASTE DISCRIMINATION IN THE INDIAN URBAN LABOUR MARKET: AN ECONOMETRIC ANALYSIS

by
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Abstract: *This paper uses Degree Holders and Technical Personnel Survey of India to examine the wage gap between Non-Scheduled Castes/Tribes(NSC) and Scheduled Castes/Tribes(SC/ST). Separate wage equations, corrected for selection bias, are estimated for NSC and SC/ST. The parameter estimates of the wage equations were decomposed into 'endowment' and 'treatment' components using the familiar Oaxaca Decomposition Method. A separate account was also made to analyze the interaction between occupational attainment and the wage differential using the extended decomposition method. The main conclusion from the econometric results are: (a) the endowment difference is higher and discrimination causes 15 per cent lower wages for SC/ST as compared to NSC; (b) the discrimination coefficient is negative in the public sector whereas it is positive in the private sector; (c) intra-occupational wage effects dominate. The higher endowment difference in developing countries like India implies that the pre-market discriminatory practice with respect to education, health and nutrition are more crucial than labour market discrimination.* (JEL: *J3*)

Keywords: *scheduled and non-scheduled castes, decomposition of earnings differentials*

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1. *Introduction*

Caste is an important characteristic of the Indian social structure which denotes a ritual hierarchical placement of social groups. These social groups are usually defined as endogamous groupings with traditional occupational specialization. The ritual hierarchy of caste very often overlaps with the occupational hierarchy with the lowest castes frequently occupying the bottom rung in the occupation structure. The social system of castes tended to impose significant barriers to occupational choices, exit and entry, though these barriers to mobility have been considerably lowered under the impact of modernization.

The occupational and ritual placements of caste groups display a great deal of variations across regions in India. However a common feature of the social structure in India is the sharp contrast in status between the so-called untouchable castes (here and further on termed Scheduled Castes-SC and Scheduled Tribes-ST) and other caste groups. Though untouchability has been recognized as a social evil and declared a criminal offence under the Indian constitution, the social inequalities marking the untouchable groups in terms of access to public goods still persists. Immediately after independence the government of India sought to alleviate these inequalities by a programme of affirmative action in terms of political representation and in government and public sector employment. These usually took the form of reservation of seats in local and national legislature and jobs in the government and public sector for the former untouchable castes and tribal groups. Despite these efforts there is considerable evidence that skill and educational endowments of the scheduled castes lag behind the general population, the overwhelming bulk of these groups still being placed in the low productive and low paying jobs. This persistent feature of the labour market in India where social inequalities limit access to economic advancement has led scholars to posit the existence of a systematic discrimination based on caste in the labour market. Observed differences in earnings between individuals can arise from differences in education, experience and gender. They may also arise from belonging to socially disadvantaged groups such as the scheduled castes and tribes.

There is some empirical evidence that suggests the presence of systematic caste discrimination in the labour market. Banerjee and Knight (1985) for example, observe that in India "an effect of caste prejudice in the labour market, more generally, is to promote the economic interests of some groups and to harm those of others. The caste system is thus functional to the generation and maintenance of economic inequalities. Job discrimination produces caste differences in the price of labour and therefore in incomes. It can be expected that these economic interests contribute to the preservation of the caste system"(p. 278). They argue that differential access to jobs is potentially an important cause of earning differentials across castes. Their study shows that discrimination is greatest in operative jobs, where employees are recruited by means of informal contracts and is relatively less in white-collar jobs where recruitments involve formal methods. However, contrary to what they observe, caste discrimination in India is prevalent also in white-collar jobs. For example, the census figures in India reveal that the Scheduled Castes are still greatly under represented in middle and senior levels of public service employment.

Caste discrimination among the highly qualified personnel is an area still unexplored which calls for intriguing research and poses policy questions. It is important to note that in the labour market for the highly skilled and professionals where recruitment takes place through formal methods, the caste of the applicant may not be known and hence caste is less likely to play a role in earning determinations. Thus, it may not be possible to exercise discrimination based on any objective criteria. This in turn raises the question of how the Scheduled Castes are discriminated against in the highly qualified manpower sector. Unlike race or sex, which are readily identifiable, caste status is unidentifiable by the use of any objective criterion.

In view of the above, an attempt has been made to investigate some aspects of possible caste discrimination among science graduates in the Indian labour market. In this context, the following issues are discussed in this paper: (i) whether caste discrimination exists in the highly qualified labour market; (ii) whether it exists in the form of job/wage discrimination and (iii) to what extent it exists among science graduates.

This paper has been organized as follows: while Section 1 gives the background of the subject matter, Section 2 spells out the sources of data, Section 3 describes the methodology. Empirical results are discussed in Section 4 followed by a conclusion.

2. *Sources of Data*

The Government of India has been conducting periodical surveys of degree holders and technical personnel (DHTP) since 1961 along with the Census, on behalf of the Division of Scientific and Technical Personnel of the Council for Science and Industrial Research (CSIR). This Census is considered to be of national importance for the purpose of estimating the stock of scientific and technical personnel (STP) and their utilization patterns.

The present study utilizes data collected in the DHTP survey of 1981. The 1981 database is the most recent one, since 1991 data set is still not available for researchers. DHTP survey is the only survey which provides information about the earnings of the public and private sectors in India.

Data was collected on a 20 per cent sample basis for 12 states and on a complete Census basis in other states and union territories. For the 20 per cent sample, the systematic sampling method was adopted. The total number of schedules received for the STP were 0.7 million. The present study has used the data available on science graduates only. They constitute 41 per cent in the total sample of about 0.7 million scientific and technical personnel. To make an all India analysis, a 20 per cent sample has been drawn from the states where a complete Census was done and it has been added to the data from states where 20 per cent of the sample had already been collected. The final sample size used in the earnings function analysis is 78,068 after deleting all those samples who failed to provide all the necessary information. The survey draws out vital information on various human capital variables such as: (a) educational level attained, subjects studied, class obtained, university of study, year of obtaining the degree and country where the degree was obtained; (b) activity status like employed, self-employed, student, trainee, apprentice, retired, unemployed seeking a job, and unemployed and not seeking a job; (c) demographic information like age, sex, caste and marital status; and (d) employment history of graduates like year of entering the first job, occupation, sector, organization of employment, salary in the survey year and at the beginning and end of each job held.

Though the data provides a wealth of information on the respondent's education and job history, it misses out certain vital information that is needed for labour market study such as: (i) information on the hours of work so that earnings are not calculated for hours of work. Moreover, the salary figures have been recorded in hundreds, thereby greatly reducing the variance in earnings; (ii) information on the family background of the respondents which plays a very important role in the labour force participation and earnings; and (iii) information on unionization and the tenure of job (which was not sought in the survey). In spite of these limitations, attempts have been made to use the data to estimate the earnings functions.

3. *Methodology*

There are three different approaches to study *discrimination* in the empirical literature. The first approach involves regressing earnings on the characteristics of all workers and including caste as one of the regressors (single-equation technique). However, this approach yields a biased result because it assumes that the wage structure is the same for both NSC (Non Scheduled castes and Tribes) and SC/ST (Scheduled castes and Tribes)[1]. This approach also constrains the values of the coefficients on the other explanatory variables, such as education and experience, to be the same for Scheduled and Non-Scheduled Castes (Gunderson 1989; Madheswaran, 1996). The second approach is the 'decomposition technique' using which it is possible to partition the observed wage gap between an 'endowment' component and a 'coefficient' component. The latter is derived as an unexplained residual and is termed as the "discrimination coefficient". This method was first developed by Blinder (1973) and Oaxaca (1973) and later extended to incorporate selectivity bias (Reimers, 1985) and the index number problem (Cotton, 1988 and Neumark, 1988). The third approach is the 'expanded approach', which incorporates occupational distribution in the earnings estimation and was proposed by Brown et al. (1980). Using this method, both wage discrimination and job discrimination can be calculated. For the analysis, the decomposition technique and the expanded approach have been employed. Although these techniques are well established, a brief discussion of these is presented in the following paragraphs.

3.1. *The standard decomposition method*. - The decomposition method enables one to separate the wage differential into differences that can be explained by differences in characteristics and those that cannot be explained by differences in characteristics. The gross wage differential can be defined as

(1) $$G = \frac{Y_{nsc} - Y_{sc}}{Y_{sc}} = \frac{Y_{nsc}}{Y_{sc}} - 1$$

where Y_{nsc} and Y_{sc} represent the wages of NSC individuals and individuals belonging to the SC/ST categories respectively. In the absence of labour market discrimination, the NSC and SC/ST wage differential would reflect pure productivity differences:

(2) $$Q = \frac{Y^o_{nsc}}{Y^o_{sc}} - 1$$

[1] Technically we allow only the intercept changes but not the slope. In order to overcome this problem, one can estimate earnings functions separately.

where the superscript denotes the absence of market discrimination. The *market discrimination coefficient (D)* is then defined as the proportionate difference between G+1 and Q+1

$$D = \frac{(Y_{nsc} / Y_{sc}) - (Y^o_{nsc} / Y^o_{sc})}{(Y^o_{nsc} / Y^o_{sc})} \tag{3}$$

Equations (1)-(3) imply the following logarithmic decomposition of the gross earnings differential

$$\ln(G + 1) = \ln(D + 1) + \ln(Q + 1) \tag{4}$$

This decomposition can be further applied within the framework of semi-logarithmic earnings equations (Mincer,1974) and estimated via OLS[2] such that

$$\ln \bar{Y}_{nsc} = \sum \hat{\beta}_{nsc} \bar{X}_{nsc} + \varepsilon_{nsc} \qquad \text{(Non-SC/ST wage equation)} \tag{5}$$

$$\ln \bar{Y}_{sc} = \sum \hat{\beta}_{sc} \bar{X}_{sc} + \varepsilon_{sc} \qquad \text{(SC/ST wage equation)} \tag{6}$$

where $\ln \bar{Y}$ denotes the geometric mean of earnings, $\bar{X}$ the vector of mean values of the regressors, $\hat{\beta}$ the vector of coefficients and ε is the error term with zero mean and constant variance. Within this framework, the gross differential in logarithmic term is given by

$$\ln(G+1) = \ln(\bar{Y}_{nsc} / \bar{Y}_{sc}) = \ln(\bar{Y}_{nsc} / \bar{Y}_{sc}) = \sum \hat{\beta}_{nsc} \bar{X}_{nsc} - \sum \hat{\beta}_{sc} \bar{X}_{sc} \tag{7}$$

The Oaxaca Decomposition simply shows that equation (7) can be

[2] The argument has been raised in the literature that working SC/ST and NSC are not a randomly selected samples of all SC/ST and NSC in the population. This is the familiar 'Selectivity Bias Problem'. In this context, we have used Heckman (1979) two-step procedure to overcome this problem. In the first step the labour force participation equation for SC/ST and NSC was estimated using the probit method and the 'Inverse Mills Ratio' has been calculated. In the second step, the Inverse Mills Ratio has been added as an additional explanatory variable in the earnings function. This variable has seldom been employed in the computation of earnings differentials by caste. Following Heckman and Polacheck (1974), the data was subject to Box-Cox transformation and the result strongly supports the semi-logarithmic functional for the earnings function.

expanded. In other words, the difference of the coefficients of the two earnings functions is taken as *a priori* evidence of discrimination. If, for the given endowment, SC and ST individuals are paid according to the NSC wage structure in the absence of discrimination, then the hypothetical SC/ST earnings function can be given as

$$\ln \bar{Y}_{sc} = \sum \hat{\beta}_{nsc} \bar{X}_{sc} \tag{8}$$

Subtracting equation (8) from equation (7) we get

$$\ln \bar{Y}_{nsc} - \ln \bar{Y}_{sc} = \sum \hat{\beta}_{nsc} (\bar{X}_{nsc} - \bar{X}_{sc}) + \sum \bar{X}_{sc} (\hat{\beta}_{nsc} - \hat{\beta}_{sc}) \tag{9}$$

Alternatively, the decomposition can also be done as

$$\ln \bar{Y}_{nsc} - \ln \bar{Y}_{sc} = \sum \hat{\beta}_{sc} (\bar{X}_{nsc} - \bar{X}_{sc}) + \sum \bar{X}_{nsc} (\hat{\beta}_{nsc} - \hat{\beta}_{sc}) \tag{10}$$

In equations (9) and (10) above, on the right hand side, the first term can be interpreted as endowment differences. The second term in these equations has been regarded in the literature as the *discrimination component*. This study basically focuses on the discrimination component. Studies use either of these alternative decomposition forms (equation 9 or 10) based on their assumptions about the wage structure that would prevail in the absence of discrimination. Some authors take the average of the estimates of the two equations (Greenhalgh, 1980). This kind of problem is called "the index number problem".

3.2. *Cotton's decomposition approach.* - To solve the index number problem, i.e., whether equation (9) or equation (10) should be used to calculate the discrimination coefficient, Cotton (1988) and Neumark (1988) have proposed an alternative decomposition. When applied to our scenario, it can be interpreted as implying that discrimination not only lowers the salaries of SC/ST individuals, but also raises the salaries of NSC individuals. Equations (9) and (10) reveal only the relative pay effects of labour market discrimination and Cotton suggests that they mask overpayment relatively to NSC individuals and underpayment to SC/ST individuals, as compared to the non-discriminatory wage. Therefore, the discrimination component (unexplained) should comprise two parts – one, representing the amount by which NSC characteristics are overcompensated relatively to their marginal product and the other representing the amount by which SC/ST characteristics are under compensated (SC/ST disadvantage, i.e., the cost of belonging to the SC/ST group).

The true non-discriminatory wage would lie somewhere between the NSC and SC/ST wage structure. The Cotton logarithmic wage differential is written as

$$(11)\ \ln \bar{Y}_{nsc} - \ln \bar{Y}_{sc} = \sum \beta^{*}(\bar{X}_{nsc} - \bar{X}_{sc}) + \sum \bar{X}_{nsc}(\hat{\beta}_{nsc} - \beta^{*}) + \sum \bar{X}_{sc}(\beta^{*} - \hat{\beta}_{sc})$$

where β* is the reward structure that would have occurred in the absence of discrimination. The first term on the RHS of equation (11) above is skill differences between SC/ST and NSC, while the second term represents the overpayment relatively to NSCs due to favoritism, and the third term the underpayment to SC/STs due to discrimination. The decomposition specified in equation (11) above cannot be made operational without some assumption about the salary structures for SC/ST and NSC in the absence of discrimination. The theory of discrimination provides some guidance in the choice of the non-discriminatory wage structure. The assumption is operationalised by weighting the NSC and SC/ST wage structures by respective proportions of NSC and SC/ST in the labour force. Thus, the estimator β* used above is defined as

$$(12)\qquad \beta^{*} = P_{nsc}\hat{\beta}_{sc} + P_{sc}\hat{\beta}_{sc}$$

where P_{nsc} and P_{sc} are the sample proportions of NSC and SC/ST populations and $\hat{\beta}_{nsc}$ and $\hat{\beta}_{sc}$ the NSC and SC/ST pay structures respectively.

3.3.*The expanded decomposition method*. - Oaxaca (1973) and Cotton and Neumark (1988) methods are criticized on the grounds that they do not distinguish adequately between wage discrimination and job discrimination or even occupational segregation. If the same characteristics that determine wages also determined the choice of occupation, then these methods would be sufficient to calculate the discrimination coefficient. But there are other factors that influence occupational attainment such as childhood influences, influences due to personal characteristics and some from discriminatory constraints on occupational choice or entry. Persons with similar characteristics, but who have attained different occupational levels, often earn differing wages implying that there are other additional factors that influence occupational attainments.

Brown et al. (1980) incorporate a separate model of occupational attainment into their analysis of wage differentials. The mean wage differentials are decomposed into explained and unexplained intra and inter occupational differences. Following their modelling, the occupation specific earnings functions for NSC and SC can be written as :

$$\ln Y_j^{nsc} = \Sigma\beta^{nsc}{}_j X^{nsc} + \varepsilon_j^{nsc} \tag{13}$$

$$\ln Y_j^{sc} = \Sigma\beta^{sc}{}_j X^{sc} + \varepsilon_j^{sc} \tag{14}$$

where *'j'* denotes occupations, and ε denotes the error term. The choice of occupation can influence the wages that a worker receives either because of institutional factors which influence the institutional wages or because the wages represent human capital acquired in the job. When this is the case, it is possible to distinguish between wage and job discrimination. If the sample proportion of NSCs and SCs in each occupational sector is denoted by P^{nsc} and P^{sc} respectively, then the overall mean wage differential may be calculated from eqs. (13) and (14) as

$$\begin{aligned}\ln \overline{Y}^{nsc} - \ln \overline{Y}^{sc} &= \sum_{j=1}^{k} (P_j^{nsc}\overline{Y}_j^{nsc} - P_j^{sc}\overline{Y}_j^{sc}) \\ &= \sum_{j=1}^{k} [P_j^{nsc}\hat{\beta}_j^{nsc}(\overline{X}_j^{nsc}) - P_j^{sc}\hat{\beta}_j^{sc}(\overline{X}_j^{sc})]\end{aligned}$$

adding and subtracting $P_j^{sc}(\overline{X}_j^{nsc}\hat{\beta}_j^{nsc})$ on the right hand side gives

$$= \sum_{j=1}^{k} P_j^{sc}(\hat{\beta}_j^{nsc}\overline{X}_j^{sc} - \hat{\beta}_j^{sc}\overline{X}_j^{nsc}) + \sum_{j=1}^{k} \hat{\beta}_j^{nsc}\overline{X}_j^{nsc}(P_j^{nsc} - P_j^{sc})$$

$$G = W + J \tag{15}$$

where *W* represents that part of the gross difference in wages which is due to wage differences within an occupation, and *J* represents that part which is due to differences in occupational composition.

Let $\hat{P}_j^{SC}$ be the proportion of Scheduled Caste workers in the sample who would be in occupation *'j'* if SCs faced the same occupational structure as the NSCs. The *G* can be further decomposed as follows:

$$(\ln \overline{Y}_j^{nsc} - \ln \overline{Y}_j^{sc}) = \sum_{j=1}^{k} P_j^{sc} [\hat{\beta}_j^{nsc} (\overline{X}_j^{nsc} - \overline{X}_j^{sc})] + \sum_{j=1}^{k} P_j^{sc} [\hat{\beta}_j^{nsc} \overline{X}_j^{sc} - \hat{\beta}_j^{sc} \overline{X}_j^{sc}] +$$

$$+ \sum_{j=1}^{k} \ln \overline{Y}_j^{nsc} (P_j^{nsc} - \hat{P}_j^{sc}) + \sum_{j=1}^{k} \ln \overline{Y}_j^{nsc} (\hat{P}_j^{sc} - P_j^{sc})$$

(16) $$G = WE + WD + JE + JD$$

where *WE* is that part of earnings differential explained by differences in personal characteristics since both the wage structure and job proportions are being held constant. *WD* represents wage discrimination since it isolates the effect of caste differences on the wage structure within occupations. *JE* is the explained part of differences in occupational attainment due to differences in endowments. And *JD* is the job discrimination since it isolates the effect of caste differences in occupational attainment, which cannot be explained by group differences in endowments. Thus, the two components, wage and job discrimination, put together constitute the extent of caste discrimination in the labour market.

To distinguish equations (15) and (16), the determinants of occupational attainment have been estimated. The choice of occupation in the market sector is generally made simultaneously with the labour force participation decision. The access to occupation may influence the wage a worker receives. The observed wage differentials can arise due to differences between castes in the access to their jobs. Hence, we analyze the occupational attainment (using multinomial logit) of a worker first and then incorporate that in the earnings analysis. The worker compares the levels of utility obtainable from various labour force statuses and chooses the participation status that maximizes his utility. In other words, occupational attainment is determined by the interaction of demand factors (e.g. employer's preference) and supply factors (e.g. individual preferences). These interactions can be summarized in terms of a reduced form model where the probability of occupational attainment is determined by the vector *Z*. The estimated multinomial logit model is expressed as follows:

(17) $$P_{ij} = \frac{\exp(\gamma_j Z_i)}{\sum_{j=1}^{k} \exp(\gamma_j Z_i)}$$

where P_{ij} is the probability that the *i*th individual is attached to the *j*th occupation and γ is a vector of h coefficients corresponding to the *k*th occupational group. The total number of parameters to be estimated is $h(j-1)$, since the coefficients for each element of Z are determined only up to an arbitrary normalization. In our estimating model, we set the coefficients for construction workers to zero for the purpose of normalization. The parameters of the model are estimated by the ML (Maximum Likelihood) method. The information so obtained in equation (17) is used to correct the occupational wage equations for the potential effects of selection bias.

In the empirical analysis, the estimation is carried out in two steps. In the first step, estimates of the occupational attainment equations, γ have been obtained through the ML estimation of equation (17) and Inverse Mills Ratio (Lambda) has also been calculated. In the second step, Lambda has been inserted in the occupational wage equation as follows:

$$\ln Y_j = \beta_j Z_j + \hat{\lambda}_j \Theta_j + \varepsilon_j \tag{18}$$

where $\Theta = \sigma_j \rho_j$, $\hat{\lambda}_j = \dfrac{\phi[\tau(\hat{\gamma}_j Z_j)]}{F(\hat{\gamma}_j Z_j)}$, and ε is the error term. Consistent estimates for the *j*th sector wage equation can then be obtained by the application of Ordinary Least Squares (OLS) to equation (18). The role of the predicted $\hat{\lambda}$ term is to control for the effects of selectivity bias. The standard errors are corrected using the heteroscedasticity consistent procedure outlined by White (1980). The estimated results on wage differentials, using the outlined methodology are presented and discussed in the ensuing section.

4. *Empirical Results*

4.1.*Earnings functions for NSC and SC/ST*. - The average monthly earnings of NSC and SC/ST are Rs.1,041.76 and Rs.892.72 respectively. The difference of Rs.149 per month can be attributed to differences between the two groups of workers in several characteristics that are associated with earnings (Appendix, Table A1). The earnings ratio between SC and NSC by age, experience and occupation show that in almost all variables, age, experience and occupational groups, NSC workers earn more than their SC counterparts (Appendix, Table A2). To estimate the earnings differences attributed to discrimination, we estimated the earnings function separately for both males and females with selectivity corrected and uncorrected, which is reported in Table 1. The logarithm of monthly earnings is used as the dependent variable and level of education, class obtained in examinations, degree obtained from abroad, marital status, sex, and sector of employment are used as the independent variables.

Table1. Earnings functions for NSC and SC/ST
Dependent variable = log (monthly earnings)

Variables	Uncorrected		Corrected	
	NSC	SC/ST	NSC	SC/ST
Experience	0.06953 (20.03)	0.05089 (1.60)	0.06844 (98.29)	0.04944 (16.66)
Exp.Square	–0.00110 (–10.34)	–0.00065 (–4.41)	–0.00108 (53.09)	–0.00060 (6.04)
Ph.D	0.22360 (27.60)	0.81221 (3.43)	0.20960 (4.43)	0.80242 (3.56)
PG	0.18254 (39.95)	0.51915 (9.56)	0.17229 (3.97)	0.51001 (3.34)
UG	0.06014 (15.09)	0.36842 (4.46)	0.05292 (1.98)	0.36527 (2.40)
Foreign	0.34283 (45.18)	0.42024 (9.04)	0.34069 (41.13)	0.41045 (8.32)
Married	0.10102 (13.15)	–0.03338 (7.20)	0.01727 (4.42)	–0.02884 (1.98)
First	0.25120 (33.36)	0.23578 (7.18)	0.24624 (56.38)	0.23155 (12.42)
Second	0.16085 (21.57)	0.16096 (9.34)	0.15753 (44.85)	0.16326 (12.34)
Sex	0.10605 (51.75)	0.05900 (10.62)	0.05314 (9.59)	0.03029 (1.23)
Public	–0.09444 (24.25)	0.02311 (14.58)	–0.14201 (34.75)	–0.04943 (2.15)
Lambda	-	-	–0.17151 (20.88)	–0.16414 (3.47)
Constant	1.5116	1.2573	1.6204	1.3659
R–Square	0.4048	0.3232	0.4181	0.3380
N	74,065	4,003	74,065	4,003

Note: Figures in parentheses indicate absolute *t*-values.

The parameter estimates are consistent with the expectations based on human capital theory and confirm the plausibility of the human capital model. All the educational level variables are positive and significant. The rates of return to education for SC/ST are higher compared to NSC even after correction for selectivity bias. This may be due to under-investment in SC/ST education. Experience is positive and its square term is negative and significant. It implies that as experience increases, income also increases but at a diminishing rate. The coefficients of first class and second class are positive and the results confirm that class is a better proxy for ability and motivation. Foreign degree (proxy for quality of education) rather than Indian degree has a positive and significant impact on earnings. The higher returns to a foreign degree may be explained in terms of better quality of education given in those countries *vis-à-vis* an Indian degree. The estimated coefficient of marital status is positive and negative in NSC and SC/ST equations respectively. Irrespective of caste, males are earning more compared to females, which is reflected in the result that the coefficient of sex is positive and significant. The interesting result is that the coefficient of public sector is negative and positive in NSC and SC/ST equations respectively. This implies that the reserved quota policy of the Indian protective legislation seems to be in operation[3]. The earnings function fits well for the sample of NSC compared to SC/ST as indicated by the higher R^2 value. The Chow test has been carried out and the calculated F-value is 22.08, which is highly significant at 1 per cent level and it shows that the earnings function differs significantly between castes. Hence, it is necessary to decompose the earnings differential into explained and unexplained portions, which is carried out in the next section.

4.2. *Decomposition Results*

The Oaxaca decomposition. - The percentage gap in earnings, which can be attributed to differences in endowments and rewards are presented in Table 2. The discrimination coefficients were calculated using both ways using SC/ST and NSC means as weight (see equations (9) and (10) above). The table also presents both the selectivity uncorrected and corrected results.

The empirical results in Table 2 indicate that the endowment difference is higher and discrimination causes 15 per cent lower wages for SC as compared to NSC. The higher endowment difference in the developing countries like India implies that the pre-market discriminatory practice with respect to education, health and nutrition is more crucial than labour market discrimination. Correcting for selectivity bias reduces the discrimination coefficient to 12.5 per cent. It needs to be explained that the reason why

[3] In response to the burden of social stigma and economic backwardness borne by persons belonging to some of India's castes, the Constitution of India allows for special provisions for members of these castes. Articles 341 and 342 include a list of castes and tribes entitled to such provisions and all those groups included in the list are referred to as Scheduled Castes (SC) and Scheduled Tribes (ST). The Mandal Commission (1980) recommended 15 per cent and 7.5 per cent of the government jobs to be reserved for the SC and ST in public sector jobs, whereas there is no job reserved quotas in the private sector.

selectivity correction reduces the unexplained part of the wage gap lies in the negative coefficient for the 'Lambda'. The negative sign can be interpreted to mean that differences in the wage offer are larger than the differences in actual wages.

Table 2. Decomposition results by caste – Oaxaca decomposition (in percentages)

Selectivity correction	Pay advantage due to	Evaluated at	
		SC/ST means	NSC means
NO	Endowments	84.95	69.76
	Rewards	15.05	30.24
YES	Endowments	87.41	78.11
	Rewards	12.59	21.89

When transformed into absolute rupee values (Table 3), the above decomposition shows that the average earning of a NSC worker is Rs 1,041.76 and that of a SC/ST worker is Rs. 892.72. Of the gross earning differential of Rs. 149.04, Rs. 101.61 is attributable to the difference in endowments between NSC and SC/ST workers and Rs. 47.43 is attributable to discrimination against SC/ST workers. After selectivity correction, Rs 12.81 increases in the endowment part and reduces in the rewards part.

Table 3. Oaxaca decomposition of earnings differential by caste – Monetary values (in Rupees)

Equation	Selectivity correction	Pay advantage due to	Evaluated at	
			SC/ST means	NSC means
Including level of education	NO	Endowments	101.61	21.04
		Rewards	47.43	128.00
Including level of education	YES	Endowments	114.42	11.59
		Rewards	34.62	137.45

Note: The gross difference is approximately Rs. 149. Due to rounding off, it may not add up to the gross difference.

If the SC/ST workers are paid according to the earnings structure of NSC workers in the absence of discrimination ($\ln \bar{Y}_{sc} = \sum \hat{\beta}_{nsc} \bar{X}_{sc}$), the earnings of SC/ST workers will be Rs. 994.33 (Rs. 1001.61 in the corrected equation) implying that their earnings will increase by Rs. 101.61 (Rs. 108.89 in the corrected equation). Even when the SC/ST workers are paid like NSC workers, in the absence of discrimination, they earn less compared to NSC workers implying that *caste discrimination does exist among science graduates in India*. This calls for a closer look at the factors that underlie such results (Table 4).

Table 4. Relative contribution of specific variables to the decomposition – NSC - SC/ST earnings differentials (in percentages)

Variables	Uncorrected earnings function			Corrected earnings function		
	Endowment difference	Discrimination	Total differentials	Endowment difference	Discrimination	Total differentials
Experience	101.1	108.86	209.96	99.34	109.44	208.78
Experience square	–48.59	–36.65	–85.04	–47.32	–37.22	–85.04
Ph.D	0.79	–0.48	0.31	0.68	–0.48	0.2
PG	2.9	–50.58	–47.68	2.79	–50.81	–48.02
UG	–1.11	–153.99	–155.1	–1.02	–154.73	–155.75
Foreign	4.63	–0.73	3.9	4.6	–0.68	3.92
Married	–0.15	20.37	20.22	–0.25	22.28	22.03
First	13.27	1.44	14.71	13.04	1.26	14.3
Second	5.32	–1.16	4.16	5.23	–1.5	3.73
Sex (male)	–2.63	30.45	27.82	–1.32	13.79	12.47
Public	9.5	–68.05	–58.55	14.24	–53.34	–39.1
Lambda	–	–	–	–2.59	–0.23	–2.82
Constant	–	165.57	165.57	–	164.82	164.82
Total	**84.95**	**15.05**	**100.00**	**87.41**	**12.59**	**100.00**

It is observed that (i) experience contributes about 123.74 per cent of the earnings difference among the caste groups in favour of NSC groups. This may be because SC/ST workers have lesser work experience compared to NSC workers; (ii) the education variable on the whole contributes about 203.57 per cent earnings advantage with respect to SC/ST workers. This may be due to the reservation policy followed by the government in favour of SC/ST individuals. However, the large positive effect of the education variable is offset by the equally large effect of the constant term working in favor of the NSC workers; (iii) the other variables such as foreign degree, first class, second class, sex and marital status all contribute toward an earnings advantage (nearly 56.45 per cent) with respect to NSC workers; (iv) the public sector is seen to treat SC/ST workers favorably. On the whole, the large effect of education, public sector and the selectivity variable making things go in favour of SC/STs is largely offset by the intercept term and other variables that work in favour of the NSCs.

The earnings functions are also decomposed separately for both public and private sectors and the results are presented in Table 5. It shows that SC workers are discriminated against in the private sector, but in the public sector they are favored, as indicated by the coefficient of discrimination. As is expected, the government policy of protective legislation seems to be in operation.

Table 5. Sector-wise results by caste – Oaxaca method (in percentages)

Equation	Pay advantage due to	Evaluated at SC/ST Means	Evaluated at NSC Means
PUBLIC SECTOR	Endowments	110.25	100.73
	Rewards	–10.25	–0.73
PRIVATE SECTOR	Endowments	52.22	59.85
	Rewards	47.80	40.15

Table 6. Decomposition of earnings differentials by caste – Cotton approach (in percentages)

Components	Corrected for selectivity bias	Uncorrected for selectivity bias
Due to skill difference	87.41 (130.38)	84.95 (126.72)
Due to NSC treatment advantage	1.28 (1.97)	1.51 (2.35)
Due to SC/ST treatment advantage	11.31(16.69)	13.54 (19.97)
Total	100.00	100.00

Note: Figures in parentheses indicate values in Rupees

Table 7. Sector-wise results by caste – Cotton approach

Components	Percentage
PUBLIC SECTOR	
Due to skill difference	109.68
Due to NSC treatment advantage	–0.04
Due to SC/ST treatment disadvantage	–9.64
PRIVATE SECTOR	
Due to skill difference	52.67
Due to NSC treatment advantage	2.41
Due to SC/ST treatment disadvantage	44.92

Using the Cotton (1988) approach, the estimations reveal that the difference due to skill is 84.95 per cent (Table 6). The NSC treatment advantage is 1.51 per cent and the SC treatment disadvantage is about 13.54 per cent in the uncorrected equation. The corresponding figures in the corrected equation are 87.41 per cent, and 1.28 per cent and 11.31 per cent for NSCs and SCs respectively. In the same manner, we have also calculated these values for public and private sectors (Table 7). The results show that SC workers are more disadvantaged in the private sector compared to the public sector, which is consistent with the Oaxaca decomposition result.

4.3. *Wage and job discrimination*. - This section is devoted first to an analysis of occupational attainment within the framework of the multinomial logit model. We set the coefficient for construction workers to zero for the purpose of normalisation. Table 8 below presents the results of the estimations.

Table 8. Multinomial logit estimates of occupational attainment for NSC

Variables	Teaching	Production	Service	Administration
Exp	–0.0433 (2.95)	–0.0035 (2.22)	–0.0201 (2.35)	–0.0875 (5.64)
Exp^2	0.0010 (2.28)	0.0005 (2.10)	0.0001 (2.01)	0.0022 (6.08)
PhD	3.6025 (5.85)	1.2074 (2.53)	0.2879 (2.45)	–0.0803 (0.13)
PG	2.3484 (4.69)	0.1234 (2.25)	0.5056 (2.06)	0.8579 (2.19)
UG	1.3658 (2.73)	1.4092 (2.87)	1.4794 (3.11)	1.9563 (4.37)
Foreign	–0.8393 (7.12)	–0.5620 (4.37)	–0.5755 (4.75)	–0.6882 (5.94)
Married	0.2776 (3.29)	0.2292 (2.64)	0.1625 (1.92)	0.1435 (1.74)
First	–0.2057 (2.35)	0.1952 (2.16)	–0.3187 (3.62)	0.3010 (3.53)
Second	0.0277 (0.35)	–0.1002 (1.28)	0.0994 (1.29)	–0.0258 (0.34)
Male	1.4068 (9.27)	0.1190 (0.73)	0.4405 (2.85)	1.1049 (7.32)
Public	–0.1103 (1.77)	–0.2682 (3.81)	–0.9503 (13.89)	0.8432 (12.41)
Constant	2.2761	0.9670	2.4211	2.7138

Figures in parentheses indicate t-values
Log Likelihood = –84,918.26
Restricted (slopes=0) Log-L= –95,583.45
Chi-square Value = 21,330.39
Rho-square = 0.37
LR = 21,330
Wald Test = 987.89

The specification adopted reflects a compromise in the trade-off between included regressors and the number of distinct occupational groups analysed. The reported specification is arrived at *via* a sequence of nested tests. The likelihood ratio test (LR) is constructed for testing the parameter restriction. The value of the LR is 21330, which is larger than the critical value of the Chi-square with 11 degrees of freedom. The other method to test for the validity of choice is a Wald test, where only the slope coefficients are tested and not the intercept. The calculated value is 0.987, which rejects the null hypothesis that the parameters are equal. The likelihood ratio index or coefficient of determination is also calculated which is analogous to the least squares multiple correlation coefficient. The likelihood function is converged and most of the coefficients are significant at 1 per cent level. The sign of the coefficient for experience and its square terms are positive and negative respectively. This implies that as experience increases the probability of being a worker observed in all occupations decreases at increasing rate relative to the construction category. This suggests that there is a tendency for workers to move up the hierarchy towards a professional status as they get older. In terms of education, the pattern of significance is much stronger. The influence of higher education significantly increases the likelihood of being engaged in almost all occupations, except in the administration sector. Married persons are more likely to find a job. The coefficient of first class is positive and significant in the administration sector. The result suggests that the first class holders of a degree have a preference for a job in the administrative sector rather than for a teaching job. This result may be useful for the policy implication that the meritorious students should be encouraged to engage in the teaching profession so as to improve the quality of teaching. Another interesting result is that the coefficient of public sector is negative which implies that Non-Scheduled Castes are more likely to work in the private sector and Scheduled Castes in the public sector.

Using occupation attainment results, the predicted distribution for Scheduled Castes $(\hat{P}^{SC})$, and non-Scheduled Castes $(\hat{P}^{Nsc})$ is obtained. Except for construction workers, the residual accounts for the major part of the observed differences are given in Table 10. The proportion of production and administration workers is higher for the Scheduled Castes compared to non Scheduled Castes. For the services sector, the residual difference (0.10) is actually greater than the observed difference (0.04). If there were differential access to occupation by castes, one would expect the proportion of Scheduled Caste workers in the service sector to be higher in comparison to the proportion of non-Scheduled Caste workers. Our estimations show that the Scheduled Caste workers are at a disadvantage in terms of entry into the service sector.

The earnings functions of occupation are needed to complete the decomposition based on the full model**.** Table 9 below reports the estimated occupation-wise earnings function. The results of the estimation show that *returns to education and experience vary substantially amongst the different occupational groups*. For each occupational group we decompose the actual earnings difference into its explained (E) and unexplained (U) components, assuming that the earnings function for Non-Scheduled Castes also applies to the Scheduled Castes (columns 8-10 in Table 10). The final calculation of the decomposition exercise implies the use of figures for the explained and unexplained components of differences in earnings within each occupation (columns 11-14 in Table 10).

Table 9. Occupation specific earnings function with multinomial selection for NSC-ST and SC/ST

Variables	Teaching		Construction		Production	
	NSC	SC/ST	NSC	SC/ST	NSC	SC/ST
Exp	0.0595 (45.56)	0.0341 (5.11)	0.0660 (12.08)	0.0392 (1.23)	0.0728 (36.22)	0.0557 (5.11)
Exp ^{2}	–0.0009 (23.73)	–0.0002 (0.98)	–0.0009 (5.38)	–0.0003 (0.23)	–0.0011 (18.53)	–0.0006 (1.28)
PG	0.1690 (1.96)	0.1746 (0.86)	0.3348 (2.27)	0.4338 (1.32)	0.0488 (0.58)	1.3761 (4.14)
UG	–0.1522 (1.76)	–0.2515 (1.24)	0.0898 (0.61)	0.2135 (0.69)	–0.0973 (1.17)	1.2360 (3.76)
Foreign	0.2187 (15.88)	0.3284 (3.72)	0.2439 (5.74)	–0.3731 (0.96)	0.3469 (14.82)	0.0923 (0.62)
Married	0.0334 (4.21)	0.0252 (0.77)	0.0043 (0.14)	0.1597 (1.31)	–0.0031 (0.28)	–0.0572 (1.43)
First	0.3305 (36.13)	0.2658 (6.90)	0.2561 (7.89)	0.3321 (2.03)	0.1497 (12.57)	0.1515 (3.45)
Second	0.2235 (27.44)	0.1843 (5.97)	0.1397 (4.79)	0.2158 (2.06)	0.1150 (12.47)	0.1311 (3.94)
Sex (Male)	0.0542 (5.41)	0.0248 (0.54)	–0.0136 (0.20)	–5.5844 (2.80)	0.0694 (2.84)	0.1258 (1.50)
Public	–0.0284 (3.72)	0.0496 (1.14)	–0.2693 (8.34)	–1.2044 (2.21)	–0.2202 (19.74)	–0.1407 (1.55)
Lambda	–0.1552 (11.84)	–0.0692 (0.97)	–0.2033 (1.83)	–4.6997 (2.71)	–0.1399 (3.99)	–0.2682 (1.43)
Constant	1.5111	1.7082	1.7285	8.1204	1.7971	0.4758
R-Square	0.56	0.53	0.52	0.75	0.47	0.36
F-value	1778.37	83.14	112.23	8.74	642.34	24.29
N	15.392	834	1161	43	7987	482

(continues)

Table 9. (*continued*) Occupation specific earnings function with multinomial selection for NSC-ST and SC/ST

Variables	Service		Administration	
	NSC	SC/ST	NSC	SC/ST
Exp	0.0667 (37.15)	0.0555 (9.10)	0.0724 (71.84)	0.0520 (11.86)
Exp ^{2}	–0.0010 (19.07)	–0.0007	–0.0012 (41.13)	–0.0007 (4.95)
PG	0.1627 (1.70)	0.3899 (1.17)	0.2424 (3.90)	0.2795 (1.46)
UG	0.0200 (0.21)	0.2405 (0.72)	0.1156 (1.86)	0.2353 (1.23)
Foreign	0.4150 (20.74)	0.0653 (0.33)	0.3844 (29.25)	0.5173 (7.67)
Married	0.0413 (4.16)	0.0091 (0.24)	0.0117 (2.17)	–0.0408 (2.02)
First	0.1914 (16.98)	0.1895 (3.75)	0.2565 (41.92)	0.2267 (8.40)
Second	0.1266 (14.98)	0.1481 (4.76)	0.1576 (32.50)	0.1510 (8.20)
Sex (Male)	0.0692 (3.60)	0.1496 (2.01)	0.0475 (6.73)	0.0120 (0.36)
Public	–0.1597 (17.50)	–0.0790 (1.39)	–0.1500 (20.41)	–0.1474 (2.46)
Lambda	–0.0918 (4.13)	0.0215 (0.21)	–0.1195 (8.57)	–0.2964 (3.09)
Constant	1.6770	1.3735	1.5827	1.6621
R–Square	0.38	0.38	0.41	0.31
F–value	739.83	29.48	2299.68	86.61
N	13342	534	36183	2110

Note: 1.Figures in parentheses indicate absolute t–values
2. The results were corrected for hetereoskedasticity; the calculated Chi–square values are greater than the tabulated values. Because of less cell frequencies in the PhD variable, the latter was combined with the PG variable.

Of the gross difference of 15 per cent, the explained wage difference (*WE*) accounts for 2 percentage points; the explained occupational difference (*JE*) for 1.09 percentage points (in favor of the Scheduled Castes); wage discrimination (*WD*) for 13 percentage points and occupational discrimination (*JD*) for 1.43 percentage points. Thus, *discrimination accounts for a large part of the gross earnings difference, with wage discrimination being considerably more important than job discrimination.* This result is consistent with an earlier study about India by Banerjee and Knight (1985).

Table 10. Full decomposition of gross earnings differential by caste – Brown, Moon and Zoloth approach

Occupation	Observed distribution		Predicted distribution		Observed difference	Explained difference	Residual difference
	P_{nsc}	P_{sc}	$\hat{P}_{nsc}$	$\hat{P}_{sc}$	$P_{nsc} - P_{sc}$	$P_{nsc} - \hat{P}_{sc}$	$\hat{P}_{sc} - P_{sc}$
	1	2	3	4	5	6	7
Teaching	0.2078	0.2083	0.2078	0.2328	0.0005	–0.0250	0.2449
Construction	0.0156	0.0107	0.2078	0.0100	0.0049	0.0057	–0.0007
Production	0.1078	0.1204	0.0157	0.1841	–0.0126	–0.0763	0.0637
Service	0.1801	0.1334	0.1078	0.2425	0.0467	–0.0623	0.1091
Admin.	0.4885	0.5271	0.1801	0.3341	–0.0386	0.1544	–0.1930

Occupation	Gross difference	Explained difference	Unexplained difference	Wage explained
	8	9	10	11
Teaching	0.1584	–0.0159	0.17444	0.00333
Construction	0.2887	0.0652	0.22347	0.00070
Production	0.1667	0.0128	0.15396	0.00154
Service	0.1581	0.0640	0.09406	0.00854
Admin.	0.1391	0.0136	0.12548	0.00720

Occupation	Wage discrimination	Job explained	Job discrimination
	12	13	14
Teaching	0.03634	–0.05778	0.05657
Construction	0.00240	0.01420	–0.00185
Production	0.01854	–0.17780	0.14851
Service	0.01255	–0.14902	0.26073
Admin.	0.06614	0.35975	–0.44962

Wage Explained = 0.02132
Wage Discrimination = 0.13596
Job Explained = –0.0109
Job Discrimination = 0.01434

5. *Conclusions*

In this paper, an attempt has been made to analyze the earning differentials by caste in terms of education, employment and earnings. Labour market participation of SC/ST categories is quite low and the extent of unemployment among them is higher as compared to NSC. The estimated earnings function shows that the rates of return to SC/ST are higher compared to NSC. This may be due to under investment in SC/ST's education. Earnings differentials do exist between NSC and SC/ST and are greatest in the private sector. The decomposition analysis clearly shows that

85 per cent of the earnings differential is due to differences in human capital endowments and 15 per cent to discrimination in the market place. The higher endowment difference in the developing countries like India implies that the pre-market discriminatory practices with respect to education, health and nutrition are more crucial than labour market discrimination. Further, a separate analysis has been made to analyze the interaction between occupational attainment and the wage differential using the extended decomposition method. This analysis reveals that wage discrimination is more pronounced than job discrimination. This indicates that the demand side differences are the major causes for unequal pay. Our findings underscore the need for policy to aim at the distribution of household's resources for education, health, etc., and that SC/ST families should be encouraged to invest on their children. Another important implication is that the policy of job reservation seems to have had the desired effect (because public sector's recruitment is by formal method) but how it could be extended to private, informal and self-employed sectors needs deliberations. Radical changes in social behavior and social values regarding the weaker sections will be necessary before it is possible to level up the imbalances in earnings and the occupational structure of castes.

APPENDIX

Table A1. Measurement, definition and descriptive statistics of variables

Variables		Non-SC/ST	SC/ST
EXP^2	Experience square	11.136 (7.498)	8.894 (6.431)
EXP	Experience (in years)	187.98 (259.54)	120.47 (184.06)
PhD	1= worker with a PhD; 0 otherwise	0.0062 (0.0786)	0.0125 (0.0353)
PG	1= worker with a post graduate; 0 otherwise	0.2573 (0.4371)	0.23238 (0.4223)
UG	1= worker with an under graduate degree; 0 otherwise	0.7352 (0.4412)	0.7649 (0.4241)
Foreign	1= worker with a foreign degree; 0 otherwise	0.0358 (0.1858)	0.0149 (0.1215)
Married	1= worker is married; 0 otherwise	0.7231 (0.4474)	0.7459 (0.4353)
First	1= worker with a first class degree; 0 otherwise	0.2141 (0.4102)	0.1324 (0.3389)

(*continues*)

Table A1. (*continued*) Measurement, definition and descriptive statistics of variables

Variables		Non-SC/ST	SC/ST
Second	1= worker with a second class degree; 0 otherwise	0.4554 (0.4908)	0.4042 (0.4908)
Male	1= if the worker is a male; 0 otherwise	0.8935 (0.3083)	0.932 (0.2516)
Public	1= worker is working in public sector; 0 otherwise	0.7346 (0.4415)	0.8895 (0.3134)
North	1= worker is working in the Northern region of India; 0 otherwise	0.1468 (0.3539)	0.1124 (0.3159)
South	1= worker is working in the Southern region of India; 0 otherwise	0.1574 (0.3642)	0.1192 (0.324)
East	1= worker is working in the Eastern region of India; 0 otherwise	0.2359 (0.4245)	0.3609 (0.4803)
West	1= worker is working in the Western region of India; 0 otherwise	0.4056 (0.491)	0.3517 (0.4775)
Lambda	Inverse Mills ratio	0.0723 (0.2336)	0.0491 (0.1885)
In Y	Logarithm of monthly earnings	2.3435 (0.3887)	2.1891 (0.3701)
N	Number of observations	74,065	4,003

Note: Figures in parenthesis indicate standard deviation.

Table A2. Relative earnings of science graduates by age, experience and occupation – SC/ST - Non-SC/ST ratio

Age Group	Ratio	Experience Group	Ratio	Occupation	Ratio
18-22	0.99	1-2	0.97	Teaching	0.93
23-26	0.94	3-5	0.94	Construction	0.89
27-30	0.93	6-8	0.96	Production	0.93
31-34	0.84	9-11	0.88	Service	0.93
35-38	0.8	12-14	0.85	Administration	0.93
39-42	0.87	15-17	0.84		
43-46	0.85	18-20	0.9		
47-50	0.88	21-23	0.86		
51-54	0.82	24-30	0.83		
55-58	0.92	31+	0.88		
59-62	0.27				
All Years	0.82	All Years	0.83		

REFERENCES

BANERJEE B. and KNIGHT J.B., “Caste Discrimination in the Indian Urban Labour Market”, *Journal of Development Economics*, 1985, *17*, pp. 277-307.

BLINDER A.S., “Wage Discrimination: Reduced Form and Structural Estimates”, *Journal of Human Resources*, 1973, *8*, pp. 436-55.

BROWN R.S., MOON M., and ZOLOTH B.S., “Incorporating Occupational Attainment in Studies of Male/Female Earnings Differentials”, *Journal of Human Resources*, 1980, *15*, pp. 3-28.

COTTON J., “On the Decomposition of Wage Differentials”, *Review of Economics and Statistics*, 1988, *70*, pp. 236-43.

GREENHALG C., “Male-female Differentials in Great Britain: Is Marriage an Equal Opportunity?”, *Economic Journal*, 1980, *90*, pp.751-75.

GUNDERSON M., ”Male-Female Wage Differentials and Policy Responses”, *Journal of Economic Literature*, 1989, *27*, pp. 46-117.

HECKMAN J.J., “Sample Selection as a Specification Error”, *Econometrica*, 1979, *47*, pp. 153-61.

—— and POLACHECK.S., ”Empirical Evidence on the Functional Form of the Earnings Schooling Relationships”, *Journal of the American Statistical Association*, 1974, *69*, pp. 350-54.

MADHESWARAN S., “Econometric Analyses of Labour Market for Scientists in India”, Unpublished Ph.D. Thesis, University of Madras, 1996.

MINCER J., *Schooling, Experience and Earnings*, New York: Columbia University Press, 1974.

NEUMARK D., “Employers Discriminatory Behaviour and the Estimation of Wage Discrimination”, *Journal of Human Resources*, 1988, *23*, pp. 279-95.

OAXACA R.L.,”Male-Female Wage Differentials in Urban Labour Market”, *International Economic Review*, 1973, *14*, pp. 693-709.

REIMERS C.W., “A Comparative Analysis of the Wages of Hispanics, Blacks and Non-Hispanic Whites”, in G.J.Borjas and M.Tienda, eds., *Hispanic in the U.S. Economy*, New York: Academic Press, 1985.

WHITE H., “A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity”, *Econometrica,* 1980, *48*, pp. 817-38.