Measuring Sample Selection Corrected Gender Wage Gaps in India: 1993-94 to 2009-10

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This paper examines gender discrimination in wages in India using the observed effect of productivity differences between women and men as viewed within the human capital theory. For the purpose, the study utilises micro-level information from the 50th and 66th rounds of the National Sample Survey (NSS). The data show that women participation rate in the job market is lower than that for men. As labour market participation is not likely to be random, wage equations have been estimated by applying Heckman's selection model with two-step estimation techniques using pooled data of two independent samples taken from the two rounds. A substantial wage differential between men and women exists in the Indian labour market, both in rural and urban areas; but the difference has been declining during the post-reform period. The study observes substantial lower wage for women than for men at every educational standard and the wage gap increased significantly among women workers with higher level of education both in rural and urban areas during the period 1993-2010.

I. INTRODUCTION

Earning differences among workers largely depend on the sector of the economy in which they are absorbed (Lewis 1954, Kuznets 1955). In Lewis (1954) model, earnings in the subsistence sector set a floor to wages in the capitalist sector, and there is a gap of roughly 30 per cent between capitalist wages and subsistence earnings. In this model, a part of the gap is illusory because of the higher cost of living in the capitalist sector. Kuznets (1955) further

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developed a model of wage dualism by considering intersectoral shifts of workers and observed that income inequality exhibited an inverted-U pattern as more workers were absorbed in the high income sector.[1] Subsequent research examined inequality further (Fields 1979, Anand and Khanbur 1993) and also examined poverty in the Lewis-Kuznets process of intersectoral shifts.

Later on, wage differential has been grounded in human capital theory as developed by Schultz (1961, 1962), Becker (1964), and Mincer (1974). The existence of wage differential has also been a major concern in the job search theory, developed in the late 1960s and early 1970s, in which a wide variety of wages exist in the labour market, and workers are presumed to search among employers for the best possible opportunities. Empirical studies often show that workers with given measured human capital characteristics have systematically different wages or earnings depending on the type of employment in which they are working.

This paper concentrates on the specific issue of gender wage discrimination by addressing the observed effect of productivity differences between women and men on average wage differentials as viewed in the human capital theory. According to human capital theory, accumulation of human capital through education and training enhances workers' skill, productive capacities and their life-cycle earnings. The relationship between wage and experience, education and other attributes is well documented in the literature (Mincer 1958, 1974, Becker 1964). In this theoretical frame, wage rate reflects the productivity potential based on various human capital characteristics and wage differential between women and men workers can be decomposed into two parts: one component is explained by the observable human capital endowments and the other part is due to unobserved differences in human capital and other characteristics.

The recent rise in labour market flexibility, reducing or vanishing protective regulations, in the developing countries has been well connected with the process of neo-liberal reforms (Standing 2002). One of the likely outcomes of the ongoing process of post-reform structural adjustment and flexibility in the labour markets has been growing informalisation of work and feminisation of labour in a number of industries and services in the developing countries. In India, over 90 per cent of the total workforce is absorbed in the informal sector mostly in the form of casual wage-workers, contract labourers and piece-rated workers contributing less than 60 per cent of the GDP. Available studies indicate that an

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[1]Inequality measures used by Kuznets are the income share of the poorest quintile, the income share of the richest quintile, and the interquintile range.

increasing proportion of women workers have been denied social security to which they are legally entitled under the existing labour laws (Anker 1998, Standing 1999). This kind of deprivation suffered by the women workers was also found in the early 1970s in a number of developing countries, and with their increasing exposure to the global economy since the 1990s the incidence has grown enormously.

A few number of studies captured some aspects of wage inequality in India with data from the National Sample Survey (NSS). Using employment and unemployment surveys of NSS for 1993-94 and 1999-2000, Glinskaya and Lokshin (2005) investigated wage differentials between the public and private sectors in India, and found, by applying their own methodologies, that the public sector premium ranges between 62 per cent and 102 per cent over the private-formal sector. In our earlier attempt (Das, Dasgupta and Biswas 2009), by using macro-level information from NSS, we observed that there had been no improvement in the status of women in the Indian labour market almost for all age groups during the 1990s. The neo-liberal policy oriented development process failed to register socio-economic progress that could reduce gender discrimination in public and private spaces of work. Furthermore, average wage rates per day in both rural and urban locations were found heavily biased against female workers in almost all the states. Different dimensions of wage inequality, as observed in the Indian labour market, have also been examined by decomposing Gini inequality index by population subgroups in the shape of "within" and "between" components across sectors, gender and activity status in India with unit level 61st round NSS data in Das (2011). In analysing the structure of wage inequality, the study considered three major sectors, the public sector, private formal sector and informal sector. The study maintains that wage inequality in the private formal sector is higher than the inequality even in the informal sector. The wage differentials in India are higher in rural as compared to urban areas, and are higher among women than among men workers. The study also observed a considerable wage inequality by gender (Table 3 in Das 2011).

Although the observed difference in wages between men and women provides a gross idea about gender pay gap, it is worthwhile to analyse the factors affecting most the observed wage gap across gender. In many cases, men and women differ in their education and other human capital endowments. Women are more likely to stay away from gainful employment for biological as well as other reasons connected with religious, social and ethnic factors. Also, the segregation of men and women with respect to occupation or industry may explain a part of the gender wage gap. The aim of this study is to look into the difference in wages by gender explained by education, skill, work experiences

and other social factors, and how the incidence of the gender pay gap changed during the first decade of economic reforms in India. In analysing gender discrimination primarily in the context of post-reform development in India, the study uses micro-level information as available in the 50th and 66th round unit level NSS for 1993-94 and 2009-10 respectively. As labour market participation is not likely to be random, we have estimated wage equations by applying Heckman's (1979) selection model with two-step estimation (Heckit) techniques using pooled data of two independent samples taken from the two rounds.[2]

The paper is organised as follows. Section II describes the main features of labour market in India. Variation of the incidence of employment by levels of education is discussed in the dualistic frame of the labour market. Section III describes the data, construction of variables and the samples used in this study. Section IV deals with methodological issues in estimating wage equation after correcting sample selection bias. Empirical estimates are analysed in section V. Finally Section VI concludes the paper.

II. CHARACTERISTICS OF LABOUR MARKET IN INDIA

Wage in the labour market induces the way through which workers decide to provide their services. In the less developed world including India, labour market is not well developed and wages are determined not by the interaction of demand and supply but by the administrative or institutional process. Some workers are paid wages on daily basis, while some others performing similar kind of work on a tenure basis. Although workers in the formal sector are organised under trade unions, those in the informal sector are unorganised. Thus the demand-supply analysis in a competitive frame may not be appropriate in understanding how wages and employment are determined in the Indian labour market. Although, at least theoretically, an individual's choice of job is based on utility maximisation principle, the choices for a large section of the workforce are highly restricted by various social and economic factors in a third world economy and sometimes they are forced to sale their capacity to labour without following the norms of optimisation.

The workforce in India increased by one and a half times and even more during the period between 1977-78 and 2009-10. According to the official estimate as recorded in Census 2001, 61.6 per cent of all workers were engaged in agriculture, 17.2 per cent in industry and 21.12 per cent in services sectors. In

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[2]In estimating wage differential between public and private sectors, Glinskaya and Lokshin (2005) also used the same estimation technique, but for the two cross sections separately.

agriculture, the share of main workers declined while that of the marginal workers increased at a significant rate during the census period 1991 and 2001. While the share of agricultural output declined, its employment share did not decline proportionately causing marginalisation of workforce in agriculture. The income in services sector grew faster than those in manufacturing, but the share of services in employment has grown at a much slower rate. Within the services, fast growth is confined to communication and financial services that absorb less labour compared to labour intensive construction and transport sectors. One of the major outcomes of this kind of growth pattern in India is a growing informalisation with rising wage inequality in the labour market. Wage inequality has increased in India with real wages growing rapidly in the top two deciles since the NSS round in 1983.

In India, the employment rate is the highest among people without education or education level up to primary level and the lowest with higher secondary level in terms of usual status employment both in rural and urban economy irrespective of the gender division of labour (Statement 5.5, *NSS Report No. 537: Employment and Unemployment Situation in India, 2009-10*).   This is an indication of the dominance of informal activities and lack of formal sector jobs available for young people with higher education. As a part of labour market flexibility, firms are allowed to employ contract labour even in core activities and to outsource peripheral activities to make larger profits. The changes in labour laws[3] make it easy for employers to suit the hiring and firing practices to the needs of maximum profits. While the worker population ratio for both male and female with education level graduate and above declined during 1993-94 and 2009-10, the rate of decline was significantly high for female in rural India during this period.[4]

During 1993-94, about 44 per cent of the rural male workers were not literate while 13 per cent were educated with secondary and above educational standard. In 2009-10, the share of illiterate reduced to 28 per cent and the share with secondary or higher level of education among male workers in rural areas improved to 24 per cent. The respective figures for rural female workers were about 79 per cent and 3 per cent during 1993-94 and about 58 per cent and 9 per cent during 2009-2010. In urban India, an estimated 18 per cent of the employed males and about 48 per cent of the employed females were not literate during

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[3]For example, the Industrial Dispute Act (1947), Contract Labour Prohibitive and Regulation Act (1970).

[4]The rate of decline was 5 per cent for rural males and 19 per cent for rural females on the basis of NSS 50th and 66th round reports on *Employment and Unemployment Situation in India.*

1993-94. The respective figures improved to 11 per cent and 30 per cent in 2009-10. The estimate of the proportion of people educated with secondary and above educational standard was much higher in urban areas – while about 39 per cent of the employed males and about 23 per cent of the employed females were educated above secondary and above educational standard during 1993-94, the shares increased to 52 per cent for employed males and 43 per cent for employed females in 2009-10. Between 1993-94 and 2009-2010, there was an improvement in the share of educated workers both for males and females in rural and urban areas, but the rate of improvement was significantly higher for female workers in urban India during the period between 1993-94 and 2009-10.[5]

The national averages for usual status unemployment rates were higher for rural male workers compared to rural female workers, while the rates of unemployment by usual, weekly and daily statuses were much higher for urban female workers than for urban male workers (Das et al. 2009). A comparison of the NSS rounds on employment and unemployment brings out that in the late 1990s national averages for unemployment rates by usual, daily and weekly statuses increased for both male and female workers, particularly in rural areas. Variations in unemployment rates for male and female workers across the major states have been considerable. The NSS Report (Report No. 537) highlighted that the usual status unemployment rates for rural female workers in Assam, Jammu & Kashmir, Kerala, Punjab and West Bengal were much higher compared to the national averages.

III. POOLED DATA AND CONSTRUCTION OF VARIABLES

The unit data from the employment and unemployment survey in India (schedule 10) of 50th and 66th NSS quinquennial rounds for 1993-94 and 2009-10 respectively have been used in this study. The sample consists of over 42 per cent and over 48 per cent women in the 50th and 66th rounds respectively. The data set covers geographical areas all over India, excepting for few regions.[6] The cross-sectional survey is roughly representative of the national, state, and the so-called "NSS region" level. It gathers information about demographic characteristics of household members, weekly time disposition, and their main and secondary job activities. The principal job activities are defined for all household members as self-employed, regular salaried worker, casual wage labourer and so on.

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[5]Figures are taken from the calculation carried out by Dr. Anindita Sengupta with NSS 50th and 66th round reports on *Employment and Unemployment Situation in India.*
[6](i) Leh (Ladakh) and Kargil districts of Jammu & Kashmir, (ii) interior villages of Nagaland situated beyond five kilometres of the bus route and (iii) villages in Andaman and Nicobar Islands which remain inaccessible throughout the year.

The usual principal activity status is used to examine employment status of a person. Persons who operate their own farm or non-farm enterprises or are engaged independently in a profession or trade on own-account or with one or a few partners are self-employed in household enterprises. The self-employed workers operating their enterprises on their own account without hiring any labour are defined as own-account workers and those run by hiring labour are employers. Persons working in other farm or non-farm enterprises and getting in return salary or wages on a regular basis are the regular salaried or wage employees. A person casually engaged in others' farm or non-farm enterprises and getting in return wage according to the terms of the daily or periodic work contract is a casual wage labour.

We have constructed independently pooled cross section[7] from randomly sample households as in schedule 10 of NSS 50th and 66th rounds on employment and unemployment in India. From statistical standpoint, this kind of data set consists of independently sampled observations. By pooling random samples drawn from the same population, but at different points in time, we can get more precise estimators and test statistics with more power (Wooldridge 2009). To capture the change in sampling distributions of a single random sample over time, we allow the intercept to differ over periods by introducing year dummy variables in the estimating model. The year dummy can be interpreted as the change in the effect of control variables on the dependent variable. We can also interact a year dummy with key explanatory variables to see if the effect of those variables has changed over a certain time period. Total wages have been defined as the sum of weekly cash and in-kind wages in Rupees from the usual principal activity.[8] Different dummy variables are used to represent different levels of education among the workers. Workers' age is the proxy for experience. Skill dummy, 1 for workers with technical knowledge and 0 otherwise; gender dummy, 1 for women and 0 for men; and sector dummy, 1 for rural and 0 for urban areas have been constructed.

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[7]If a random sample is drawn at different time period, pooling of the random samples forms an independently pooled cross section.

[8]In NSS, the activity status determined on the basis of the reference period of 1 year is known as the usual activity status of a person, that determined on the basis of a reference period of 1 week is known as the current weekly status of the person and the activity status determined on the basis of a reference period of 1 day is known as the current daily status of the person. The activity status on which a person spent relatively longer time during the 365 days preceding the date of survey is considered the usual principal activity status of a person.

IV. ESTIMATING WAGE EQUATION: METHODOLOGICAL ISSUES

A simple way to look at the wage gap between women and men workers is to consider a sex dummy in a single wage regression. The underlying assumption is that wages differ between the groups by a fixed amount, while the individual and other characteristics have the same effect on their wages. A more flexible approach is to estimate Mincerian wage regression where education and work experience are treated as explanatory variables (Mincer 1974).[9] In estimating wage regression for Indian labour market, we have used human capital theory which calls for inclusion of skill variables such as education, training and experience into the model. By following Mincer (1974), the wage equation in the frame of pooled data from two independent random samples is specified as

$$\ln w = \alpha_0 + \alpha_1 D^{y09} + \alpha_2 D^f + \sum_{i=1}^{4} \beta_i D_i^{edu} + \phi D^{ts} + \theta_1 x + \theta_2 x^2$$

$$+ \eta_1 D^f D^{y09} + \sum_{i=1}^{4} \gamma_i D^{edu} D^f + \sum_{i=1}^{4} \delta_i D_i^{edu} D^{y09} D^f +$$

$$\eta_2 D^{ts} D^f + \eta_3 D^{ts} D^{y09} D^f + \varepsilon \qquad\qquad (1)$$

The variable D^{y09} is a dummy variable equal to 1 if the person comes from the 66th round (2009-10) and 0 if it comes from the 50th round (1993-94). The variable D^f is a gender dummy variable equal to 1 for women and 0 for men; D^{edu} is the education dummy, i=1 to 4 representing 4 levels of education; D^{ts} is the dummy variable for technical skill, x represents experience (age), ε is an i.i.d. idiosyncratic error term with mean zero and constant variance σ^2_ε measuring the effects of unobservable factors. The quadratic term in experience allows for the possible diminishing return to human capital accumulated through schooling. The intercept term measures the initial ability. The intercept for 1993-94 is α_0 for men and $(\alpha_0 + \alpha_2)$ for women and the intercept for 2009-10 is $(\alpha_0 + \alpha_1)$ for men and $(\alpha_0 + \alpha_2 + \eta_1)$ for women. The coefficients β_i's act as the effects of schooling at different levels for men and $(\beta_i + \gamma_i)$ for women in 1993-94 and the effects for women in 2009-10 is measured by $(\beta_i + \gamma_i + \delta_i)$; Φ measures the effect of technical know-how for men, $(\Phi + \eta_2)$ for women in 1993-94 and the effect for women in 2009-10 is $(\Phi + \eta_2 + \eta_3)$. The coefficients θ_1 and θ_2 are those that

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[9]The Mincerian wage regression, however, disregards the endogeneity of post-schooling human capital accumulation and treats schooling and training symmetrically. Griliches (1977) pointed out several econometric problems that arise in estimating the returns to schooling and, in particular, those pertaining to the measurement of both schooling and ability.

correspond to the return to experience and reflect concavity of the age earnings profile when θ_2 is negative. We assume that experience has the same effect on wage for both men and women workers in both time periods.

In estimating wage equation with household level unit data of NSS, some complicated problems arise because some households and some members within a household receive no wage. In the sample, wages are observed for those who work and if we ignore individuals with no wage earnings the sample becomes non-random or incidentally truncated and the problem of sample selection bias will arise.[10] Heckman (1976, 1979) proposed two estimation techniques to overcome the selection bias problem. One is the maximum likelihood (ML) estimation of a selection model assuming bivariate normality of the error terms in the wage and participation equations. Second is the two-step estimation (Heckit) procedure, ML probit estimation of the participation equation, and OLS (or GLS) estimation of the wage equation using participants only and the normal hazard (the inverse Mills ratio $\hat{\lambda}$) estimated from the first step as additional regressor. In this study, Heckit method is used in estimating gender gap in wage.

By following Heckman (1979), we assume the equation for entering the labour market as

$$w_i^{j*} = z_i^j \gamma^j + u_i^j \tag{2}$$

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[10]The selection bias problem arises if the working individuals do not form a random subgroup of the sample population but differ systematically, in unobservable aspects of preferences, opportunities, and productivity, from those not employed. Greene (2003) provides the moments for an incidentally-truncated bivariate normal distribution. Suppose that y and z have a bivariate distribution with correlation ρ, and we are interested in the distribution of y given that z exceeds a particular value or truncation point τ.

$$E(y \mid z > \tau) = \mu_y + \rho \sigma_y \lambda(\alpha_z)$$

$$V(y \mid z > \tau) = \sigma_y^2 \left[1 - \rho^2 \delta(\alpha_z) \right]$$

Here,

$$\alpha_z = \frac{\tau - \mu_y}{\sigma_z}$$

$$\lambda(\alpha_z) = \frac{\phi(\alpha_z)}{1 - \pi(\alpha_z)}$$

$$\delta(\alpha_z) = \lambda(\alpha_z) \left[\lambda(\alpha_z) - \alpha_z \right]$$

$\Phi(\alpha_z)$ is the standard normal density and $\pi(\alpha_z)$ is the cumulative density; $\lambda(\alpha_z)$ is the inverse Mills ratio (IMR) for z.

w_i^{j*} is the difference between the market wage and the reservation wage. The reservation wage is the minimum wage at which the ith individual is prepared to work. If the wage is below that level nobody will choose to work. We do not actually observe w_i^{j*}. All we observe is a dichotomous variable w_i^{j} with a value of 1 if a person enters the labour market and 0 otherwise:

$$w_i^{j} = \begin{array}{ll} 1 & if \quad w_i^{j*} > 0 \\ 0 & if \quad w_i^{j*} \leq 0 \end{array}$$

The wage equation specified in (1) is appropriate only if w_i^{*} is positive.

The Heckit procedure is the maximum likelihood probit estimation of the participation equation shown in (2) to obtain estimates of γ by assuming $u_i \sim N(0; 1)$. For each observation in the selected sample, we have to compute

$$\hat{\lambda}(\alpha_u) = \frac{f(z_i\hat{\gamma})}{F(z_i\hat{\gamma})}$$

and

$$\hat{\eta}_i = \hat{\lambda}(\alpha_u)\left(\hat{\lambda}(\alpha_u) - z_i\hat{\gamma}\right)$$

V. CHANGES IN GENDER WAGE GAP: EMPIRICAL RESULTS

We have applied the sample selection correction to the data. We have 35,57,455 persons after excluding children up to age 15 and old-age above 60 years in the pooled sample[11] in which 29,15,671 data points are censored and the rest are uncensored. As the wage for nonworking people is unobserved, we need to estimate a probit model for labour force participation to test and correct for sample selection bias. The estimated results are shown in Table I. The inverse Mill's ratio, the estimated value of λ, as shown in the lower panel of Table I, is statistically significant. Thus there was selection bias in the sample and wage equation is to be estimated after correcting for sample selection bias. In addition to education and experience variables, we include household size, and dummy variables to capture the effects relating to religious and ethnic groups as explanatory variables in the selection equation but not in the wage equation. We

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[11]In the pooled sample 6,39,416 persons come from the 50th round (1993-94) and 29,18,039 persons come from the 66th round (2009-10).

assume that, given the productivity factors, the household size and social and religious factors have no effect on wage.

The intercept for 1993-94 is positive and statistically significant. The coefficients of year dummy and rural dummy are significantly negative. Household size has a negative coefficient, implying that higher the size, lower is the probability to participate in the labour market. Female dummy has a highly significant and negative coefficient, indicating that the participation rate in the labour market for women has been lower than men's participation. However, the participation rate improved significantly for women in 2009-10.

Hindu women had a higher chance of entering into the labour market in 1993-94, but the rate declined in 2009-10. The coefficient of female dummy for Muslims is negative, implying that the probability of entering into the labour market is lower for them as compared to the position of women in other religious groups. The marginal effect, however, of Muslim females increased in 2009-10. The positive coefficients of female dummies for backward social groups in 1993-94 imply that the labour market participation for them was higher as compared with women in higher castes, and women workers in scheduled caste had larger marginal effect than the tribal women or women in other backward castes in the country. But the participation rate of women declined in all the socially backward groups of people in 2009-10.

The coefficients of dummy variables for females with primary education and with higher secondary level are negative, while those for females with graduate and post graduate levels of education are positive. Thus women's labour market participation was lower at lower levels of education and significantly higher at higher education level as compared with the participation rate of illiterate women as well as the men counterparts in 1993-94. But the rate of entering into the job market improved for women with lower education and deteriorated for highly educated women in 2009-10, implying, although grossly, the rising incidence of feminisation and informalisation of the labour market during the post-reform development in India. The women with technical knowledge had more access to enter into the job market, although declining over time, at least in probabilistic sense as compared with their men counterparts.

As the hypothesis of sample selection bias is accepted, the use of the censored sample model (OLS) would lead to incorrect estimates for the valuation of wage equation. The Wald chi^2 test[12] indicates the correlation is very significant

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[12] Wald chi^2(21) = 1240000 , Prob > chi^2 = 0.0000.

between error terms in the selection equation and the wage equation. Hence, Heckman's technique will provide better result. The estimated results of wage equation, specified in (1), by OLS using participants in the labour market only and the normal hazard (the inverse Mill's ratio) estimated from the first step as additional regressor are shown in Table II.

TABLE I
PROBIT ESTIMATES OF THE INCIDENCE OF
LABOUR FORCE PARTICIPATION

Variables	Coefficients	z-statistic	P>z
Intercept	0.08	28.26	0
Household size	-0.10	-273.07	0
Female	-0.79	-77.47	0
y09	-0.43	-183.83	0
y09_female	0.54	46.7	0
female_hindu	0.16	16.1	0
female_muslim	-0.04	-2.57	0.01
female_st	0.27	30.68	0
female_sc	0.40	53.97	0
female_obc	0.06	18.94	0
female_primary	-0.34	-32.92	0
female_HS	-0.19	-22.17	0
female_graduate	0.46	7.76	0
female_PG	0.65	46.5	0
female_technical	0.73	35.63	0
rural	-0.19	-115.04	0
female_hindu_y09	-0.08	-7.24	0
female_muslim_y09	0.07	4.49	0
female_st_y09	-0.05	-5.29	0
female_sc_y09	-0.10	-11.63	0
female_primary_y09	0.31	27.7	0
female_HS_y09	0.12	13.09	0
female_graduate_y09	-0.28	-4.7	0
female_PG_y09	-0.31	-17.8	0
female_technical_y09	-0.48	-20.87	0
Inverse Mill's ratio			
λ	0.09	15.19	0
ρ	0.102		
σ	0.901		

Note: Estimations have been made by using Stata software.
Source: Author's calculation based on unit data for NSS 50th and 66th rounds on *Employment and Unemployment Situation in India.*

In the wage equation, the intercept for 1993-94 is 9.86 and the intercept for 2009-10 is 6.74. The weekly wage used here is in nominal Rupees in logarithmic form. The negative coefficient on the year dummy, D^{y09}, indicates deflationary factor for nominal wage in 2009-10.[13] Wage differential between women and men was 62 per cent in 1993-94; the negative sign of the coefficient implies that wage was lower for women than for men workers in this period. The gender wage gap, however, reduced by 58 per cent in 2009-10. Rural urban wage gap was significant irrespective of the gender dimension of workers. In 1993-94, the average wage in rural areas was 40 per cent lower than urban wage. The marginal rates of return to education were 0.13, 0.46, 1.13 and 1.28 at primary, higher secondary, graduate and post graduate levels for men workers in 1993-94 respectively, whereas the respective rates for women were -0.02, 0.66, 1.7 and 1.45 during this period.

Thus women with primary level of education got lower return from education than men with the same level of education, whereas women with higher levels of education got higher returns than men with the same levels of education. The positive coefficients of $D^{edu\_P}D^{f}D^{y09}$ and $D^{edu\_PG}D^{f}D^{y09}$ indicate that the rates of return to education of primary and post-graduate levels for women increased, but the negative coefficients of $D^{edu\_HS}D^{f}D^{y09}$ and $D^{edu\_graduate}D^{f}D^{y09}$ are indicative of the fall in rate of return for women workers with higher secondary and graduate level of education during the post-reform period in India. Skill premium, on the other hand, was 26 per cent for men and 72 per cent for women in 1993-94. But the skill premium for women declined by 77 per cent in 2009-10.

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[13]Let P09 be the deflationary factor for nominal wage in 2009-10. Then, the log of the real wage for each person in the 2009-10 sample is log (wage/P09)=log(wage)–log(P09). While wage differs across people, P09 does not and log (P09) will be absorbed into the intercept for the year 2009-10. Thus the negative coefficient on the year dummy, y09, measures the deflationary effect on nominal wage in 2009-10.

TABLE II

**SAMPLE SELECTION BIAS CORRECTED OLS
ESTIMATES OF WAGE EQUATION**

Variables	Coefficients	z-statistic	P>z
Intercept	9.86	1066.19	0
age	-0.01	-39.86	0
Age^2	0.00	48.9	0
D^f	-0.62	-101.2	0
D^r	-0.40	-155.48	0
D^{y09}	-3.12	-893.55	0
$D^{y09}D^f$	0.58	85.67	0
D^{edu_p}	0.13	27.99	0
$D^{edu\_p}D^f$	-0.15	-8.12	0
$D^{edu\_p}D^fD^{y09}$	0.23	11.93	0
D^{edu_HS}	0.46	127.36	0
$D^{edu\_HS}D^f$	0.20	13.79	0
$D^{edu\_HS}D^fD^{y09}$	-0.03	-1.92	0.055
$D^{edu\_graduate}$	1.13	189.18	0
$D^{edu\_graduate}D^f$	0.57	8.88	0
$D^{edu\_graduate}D^fD^{y09}$	-0.52	-8.1	0
D^{edu_PG}	1.28	197.18	0
$D^{edu\_PG}D^f$	0.17	9.83	0
$D^{edu\_PG}D^fD^{y09}$	0.02	1.17	0.242
D^{ts}	0.26	37.44	0
$D^{ts}D^f$	0.46	19.41	0
$D^{ts}D^fD^{09}$	-0.77	-29.17	0

Note: Estimations have been made by using Stata software.
Source: As for Table I.

VI. CONCLUSIONS

India has a long history of wage determination through the administrative process even in the organised sector.[14] In the Indian labour market, labour productivity had not so far been a potent factor in the determination of wages. It is hardly possible to explain wage differences among workers of roughly homogeneous type not only in the unorganised sector but also in the organised sector in terms of demand-supply mechanism. In an economy where labour

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[14]For detail, see *Report of the National Commission on Labour* (2002), Government of India.

market is imperfect, and there is distress selling of labour, a multiplicity of wage rates may exist because of the lack of bargaining power of ordinary workers.

This study is an attempt to look at gender gap in wages by estimating wage regression as suggested in human capital theory. It examines possible determining factors of gender gap in wages both in rural and urban economy in India with the NSS 50th round (1993-94) and 66th round (2009-10) household level information on employment and unemployment in India, covering roughly two decades of economic reforms. As labour market participation is not likely to be random, we have estimated wage equations by applying Heckman's selection model with two-step estimation techniques using pooled data of two independent samples taken from the two rounds.

Women workers earn much lower wages than their men counterparts. The observed wage gap by gender has been substantial across groups with different education. Gender gap has widened among workers with higher education and skills during the post-reform period. The gender gap remained very high among workers without formal education and with lower educational standard. They are mostly unskilled workers absorbed in informal activities.

The effects of different factors in entering into labour market have been different. The women participation rate in the job market is lower than men. Among social groups, scheduled caste has a stronger effect, irrespective of gender, on chance of labour market participation. Scheduled tribes are lagging far behind even in basic entitlements and thus their chance of getting a job is much less than other groups. People with higher education and technical skills are in better position due to obvious reasons.

A substantial wage differential between men and women exists in the Indian labour market, but the difference has been reducing during the post-reform period. Public sector jobs with social securities have declined and the expansion of better paid jobs in the private sector has failed to compensate for the decline during the 1990s and thereafter. In many cases, women have to face some barriers in participation in the labour market with well paid activities, but bad working conditions, particularly in the private sector, due to social and ethnic reasons. Probably, the increasing insecurity in pay and other conditions of work, one of the major outcomes of neo-liberal reforms, could be the prime reason for widening gender gap in pay for workers with higher education and skill.

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