Trade Reforms and Gender Wage gap in India *

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Abstract

This paper examines the gender wage differential in India from 1983 to 2004-05. We use Oaxaca-Blinder method of decomposition to study the gender wage gap. Moreover, we investigate whether trade liberalisation has any impact on gender wage gap. To be specific, we investigate whether state level trade exposure has an impact on a) female labour force participation, b) gender wage gap. We estimate the probability of work force participation for female using binary choice model controlling for individual level characteristics and policy variable (region level trade exposure). We also estimate the gender wage gap using various decomposition methods and determine the significance of policy variable (trade exposure). We use household survey data of Indian National Sample Survey (NSS) for wage, employment and other socio-economic information. The tariff data is extracted from UNCTAD - TRAINS (Trade Analysis and Information System) data base.

Keywords: Tariff Reforms; Gender; Wages; Discrimination

JEL Classification: F14; F16; J3; J4; J7.

1 Introduction

Indian economy witnessed a colossal change in the last three decades. External reform measures were adopted during mid 80's followed by the comprehensive economic liberalisation in 1991. The budget in July, 1991 was a clear shift towards outward-oriented, market-based economy. The nominal GDP growth rate leaped up to 8-10%. We observed declining dependence on the traditional agricultural sector along with a structural change. After liberalisation, the employment growth in India has increased from one percent per annum to nearly 3 percent and industrial employment growth increased from 2.9 percent to 4.2 percent between 1993-94 to 1999-2000 and 1999-2000 to 2004-05 (Unni and Raveendran, 2007). These remarkable changes may have impact on economically and socially disadvantaged groups, especially, women. Our paper examines the impact of Indian economic transformation in terms of trade liberalisation on women in the past 25-30 years.

Oppression to women has a long history in India. Gender inequality is one of the most deep rooted forms of inequalities in the traditional structure of society. Though the Indian constitution focuses on economic and social equality, it has not been realised even after sixty years of independence. Economic deprivation against women takes various forms and shapes. It is prevalent in every segment of society. Low economic value of women is considered as one of the determinants of gender bias. One of the major indicators of economic inequality across gender is the wage gap. There are many reasons why women in general, earn less than men. The first one follows theory of equalising differences. Women may have a tendency to choose less stressful occupation or they may opt for different career path than men. They may invest less to acquire human capital since they face more disruptions in the labor market. The second explanation addresses that women are more discriminated against men and earn less for same characteristics. Both types of wage differentials exist in the work force in India. It encourages us to perform an in-depth analysis of convergence in male-female educational attainment, occupational choices and wage gap during the period of economic transformation. We are also interested to study the impact of trade liberalisation on gender wage gap. National Sample Survey data published by National Sample Survey Organisation (NSSO) provides detail wage and demographic information of individuals. In the present study, we use this

dataset which covers entire India spatially for rural as well as urban Indian adults participating in the labor force during 1983-2004-05.

In this paper, we examine gender wage differential and its convergence in India during 1983 to 2005. We measure raw wage gap across major occupation categories, different groups following educational attainment and rural-urban sectors. We also estimate conditional wage gap at state and sector level. We follow Oaxaca (1973) method of decomposition to explain the wage gap. Following this approach, the fraction of male-female earnings differentials might result from "difference in productive characteristics" and the other fraction is the result of "discrimination". We also examine the wage gap using birth and age cohort analysis. Using the raw wage gap, we find that wage gap in urban areas decreased during 1983 and 1999-00. It stopped changing after 1999-00. However, rural wage inequality decreased from 1983 to 1993-94 and then there was a upward trend till 1999-00. It started falling after 1999-00. At the next step, we impose control and estimate conditional wage gap. It falls in urban districts during 1983-1999-00. However, the trend reversed after 2000 while the rural wage differential followed the same pattern as observed in the unconditional wage gap trend. Decomposing the gender wage gap following **?**, the difference in predicted average male-female wage decreased over time. The explained variation reflected a downward trend from 1983 to 2004-05. The variation from "discrimination" marginally fell during 1983-2000. It is interesting to note that gender wage "discrimination" increased after 1999. The other important contribution of our paper is to investigate whether trade liberalisation has any impact on female labour force participation and gender wage gap. We use National Sample Survey data published by National Sample Survey Organisation (NSSO) for our analysis. To be specific, we make use of the five rounds of employment-unemployment schedules of NSS data; 38th, 43rd, 50th, 55th and 61st round.

To the best of our knowledge, our study examine the gender discrimination from the perspective of educational attainment and wage inequality in a single study capturing time series evolution in gender discrimination for India as a whole. As we have mentioned before, we use NSS data to do this which has the widest coverage for India both spatially and over the time.

A number of studies examines gender discrimination in terms of educational attainment and wage inequality in India. Kingdon (2002) has studied the gender gap in educational attainment by examining the data from urban Uttar Pradesh while Duraiswami and Duraiswami (1999) has talked about the inequality in enrolment and educational attainment among the women in professional and technical education. On the other hand, Deshpande and Deshpande (1999) has studied the wage inequality in urban labor market while Madheswaran and Lakshmanasamy (1996) has studied it among the nationwide science graduates in India. Chakroborty and Chakroborty (2009) estimated education and wage differential in West-Bengal. Our study is different from all these since it considers the data across all the states covering rural and urban areas. We have controlled for occupation effects on wage outcomes. Moreover, our study is endowed with a time series perspective by considering five different rounds of NSS data in analysing the pattern of gender wage gap during the past three decades. To be specific, this particular aspect was not addressed by other studies.

The remainder of the paper is organised as follows: We give a brief description of data in section 2. Section 3 discusses the convergence of wage differential using the unadjusted and conditional wage gap. We also derive the Oaxaca-Blinder method of wage decomposition in this section. We address impact of tariff reforms on female labour force participation and gender wage gap in section 4. Section 5 concludes.

2 Data

This study uses latest five quinquennial rounds (1983, 1987-88, 1993-94, 1999-2000 and 2004-05) of National Sample Survey data published by National Sample Survey Organisation(NSSO), set up by the Government of India. NSSO conducts large quinquennial rounds of survey on a regular interval to collect socio-economic data at household level for the entire country. The employment & unemployment schedule collects individual information on education and wage. These surveys include whole geographical area of India except some areas of Jammu & Kashmir and Andaman Nicobar Islands. NSSO uses complex stratified sampling design to select ultimate stage

unit(households) in both urban and rural areas. We would like to mention that our sample is a pooled cross section data. We focus on the earnings of the prime aged adults (16-65 years) living in rural and urban areas. We analyse the earnings from organised as well as unorganised sector. We consider two sample sets. The first one is the overall sample where the individuals not enrolled in educational institutions are taken into account. In the wage sample, we consider the individuals for whom "usual occupation" is same as "weekly occupation" along with the regular occupation categories and for whom wage information is non-missing.

We measure wages as average daily wage earned from the main occupation. The sum of wages, salary earnings, bonus and prerequisites evaluated at retail prices along with the cash value of the in kind payments received in the reference week from main activity gives us the total earnings on the main job. Daily wage is expressed as the total wage earned in the last week divided by days worked in that week. Then, it is converted to real rupees. Consumer Price Index for rural Maharashtra in the year 1983 published by Reserve Bank of India is used as wage deflator. The wages throughout the paper are expressed in real rupees using the above-mentioned wage deflator.

The occupation information covers formal as well as informal sector. The broad categories of occupations are mapped from three-digit to one-digit level following National Occupational Classification Code of the year 1968. We use three major classification of occupations: white collar job (Occu 1), blue collar job (Occu 2) and agriculture and agriculture related work (Occu 3).

Individuals was asked about the highest level of education successfully completed. We use five categories of education for our analysis: illiterate, below primary, primary, middle and secondary and above. A person who cannot read or write a simple message with understanding in at least one language is considered illiterate. Individuals who are literate by definitions through formal schooling, however are yet to pass primary standard education, are considered in the category of "below primary". Similar definition would follow for higher categories that have passed the appropriate levels. We have clubbed individuals who have passed higher secondary, graduation and post

graduation along with individuals passed diploma/certificate courses in the category of "secondary and above".

We have reported the characteristics of the sample and summary statistics of the main variables of interest in Table 1 and Table 10. Around 50% of the surveyed adults are female out of which 80% (approximately) are married. Average age of a respondent is 35 years. A representative household comprises of 7 members on an average. Approximately, 75% of the total households is from rural India.

3 How has women performed? Is the glass half empty or half full?

We study the pattern of convergence in education attainment, occupational choices and wages across gender. We start our analysis by comparing female as against male for the entire sample belonging in the age group of 16-65. Then, we contrast female vs. male using cohort analysis. We use two types of cohort analysis. A cohort is defined by age as well as birth. For age cohort analysis, the total sample is divided into five age groups with 10 years interval starting from sixteen years of age; 16-25, 26-35, 36-45, 46-55, 56-65. Five birth cohorts are constructed using year of birth at the interval of 10 years from 1928 to 1977, *viz*, 1928-1937, 1938-1947, 1948-1957, 1958-1967 and 1968-1977.

3.1 Convergence in educational attainment

We have reported the levels of attainment in education in Table 1 while Table 2 describes the relative gap in educational attainment. Relative education gap is estimated at the average level of education attainment. In each round, the mean education level for male and female increased. However, men are consistently more educated than women in rural as well as urban areas.

In other words, average level of education among women in our sample is lower than that of male (Table 1). In 1983, it was 2.37 for male and 1.62

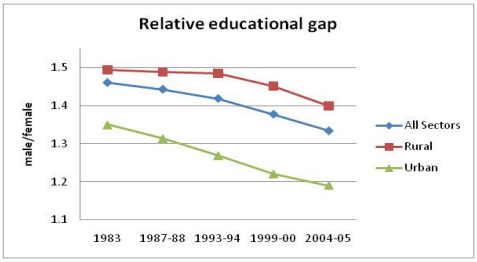


Figure 1: Relative Educational Gap (All Sectors)

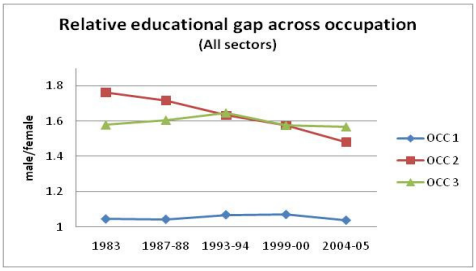
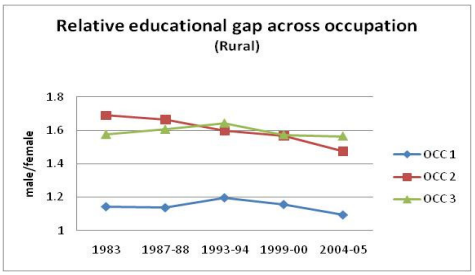


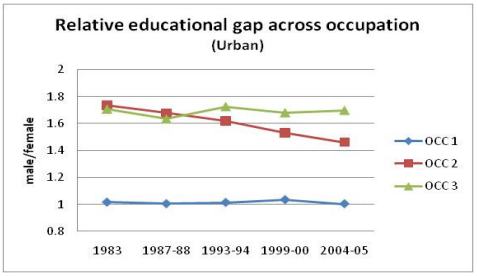
Figure 2: Relative Educational Gap across Occupation (All Sectors)

for female respectively. The relative educational gap across gender decreased during the study period in rural as well as in urban districts (Figure 1). However, the fall in the educational differential from 1983-2004-05 was higher in urban (13%) area compared to its rural (7%) counterpart. It is obvious that urban women have more exposures to education.

We would like to study whether the convergence in educational attainment is followed across different age cohorts. All the age cohorts witnessed compression in the education differential except the oldest age group (Fig 4). Gap in education attainment has widened marginally for this particular group. The volatility was caused by the small sample size. The gap in average educational attainment has declined by 11-13% for all the age cohorts except the two oldest ones. The fall in the ratio of male to female average educational attainment observed a secular decrease for each of the age cohort in urban areas which followed the trend observed from the aggregate pattern of convergence in urban districts during the study period. The middle age cohort, 36-45, here, observed the sharpest decline in the gap during 1983 to 2004-05. In contrast to the urban districts, the convergence in the



(a) Relative Educational Gap across Occupation (Rural)



(b) Relative Educational Gap across Occupation (Urban)

Figure 3: Relative Educational Gap across Occupation

educational differential was tepid in the rural areas and varies in the range of 5% to 13%. The youngest age cohort experienced the highest level of convergence here (13%). It is discernible that the differential in educational attainment (Fig 5) for the youngest age group remains almost same between 1983 and 1993-94, it started falling after 1993-94. Surprisingly, the male-female inequality in education became wider over the years in rural areas for two oldest age cohorts, *viz* 46-55 and 56-65 years.

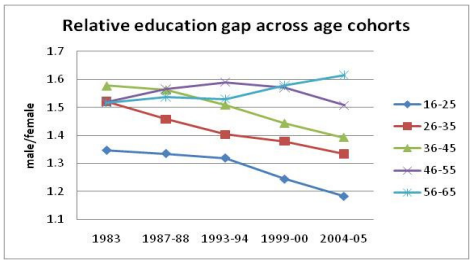
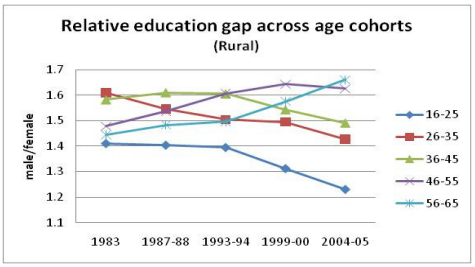
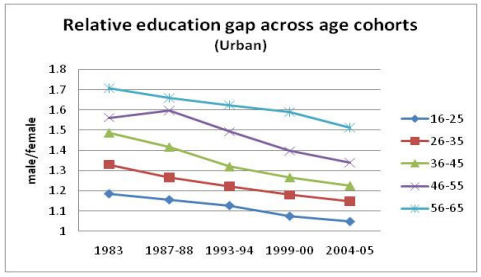


Figure 4: Relative Educational Gap across Age Cohorts (All Sectors)

What would be the pattern of education distribution in the labor force? How does it vary among female labor force compared to its male counterpart? In 1983, 75% of the total female labour force was either illiterate or had education below primary level. While the corresponding figure for male was 54%. It decreased to 54% for women and 33% for men by 2004-05 (Table 3). In contrast, proportion of secondary or higher level of education increased sharply for both the groups during the study period. In 1983, only 7% of the



(a) Relative Educational Gap across Age Cohorts (Rural)



(b) Relative Educational Gap across Age Cohorts (Urban)

Figure 5: Relative Rural-Urban Educational Gap across Age Cohorts

total female labor force accomplished higher education (edu5) while there was 16% of male in the same category. It increased by 97% and 171% for men and women respectively by 2004-05. It was the most significant change observed in the educational attainment amongst all the categories.

3.2 Occupational distribution

Another question which haunts our mind is how occupational choices differ across male and female? As we have mentioned in the data section, we have clubbed 10 categories [1] into three broad groups of occupation; white collar job (Occ1), blue collar job (Occ2) and agriculture (occ3). Our grouping, though it is subjective in nature, combine occupations with similar skill requirements. The first group (Occ1) considers professional and technical related workers, administrative, executive and managerial workers, clerical and related workers while sales workers, service workers, production and related workers, transport equipment operators and labourers are included in the second category (Occ2). Farmers, fishermen, hunters, loggers and related workers are clubbed together under Occ3. The differences in the returns to scale in the Indian economy are reflected through the grouping, *viz*, Occ1 in our sample has the highest mean wage followed by Occ2 and Occ3.

[1] See farther detail in the appendix

Table 10 reports the distribution of workforce across occupation in our sample. We note three salient features in the evolution of the occupational choices. The proportion of Occ3 (farming/pastoral activities) in the labor force witnessed a steady decline from 1983 to 2004-05. The magnitude of fall was 27% for male and 17% for female respectively. Structural transformation in India is evident from these characteristics clarifying the fact that output and employment share in the agricultural sector decreased over time. Secondly, there was huge expansion for male as well as female workers in Occu2 which is mainly a combination of low skill blue collar and service sector jobs. The proportion of increase in this category is significantly higher for men/women in rural areas compared to its urban counterparts. It establishes the switching from agricultural jobs to the blue collar ones over the time. The share of Occ2 increased by 77% for men while it increased by 49% for female in the rural districts. Thirdly, the over-all increase in the ratio of Occ1, comprising of white-collar/high skill jobs, increased significantly higher for women compared to men. In 1983, the share was 12% for male while it was 5% for female. The proportion jumped by 115% for female and 43% for male by 2004-05. This is possibly an indicator of changing norms of traditional developing society over the time for women. It is encouraging to notice that the occupational distributions for men and women have been converging over the time.

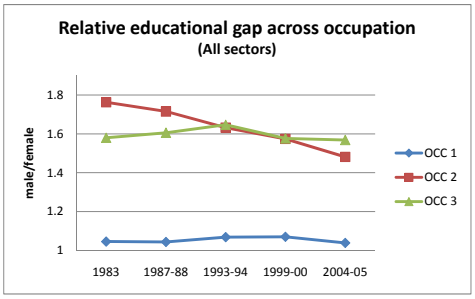
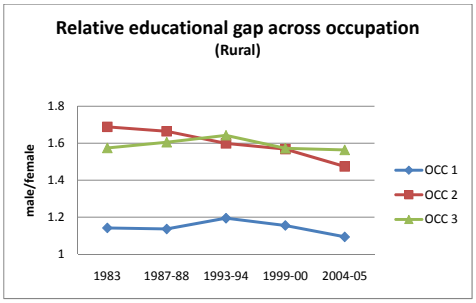
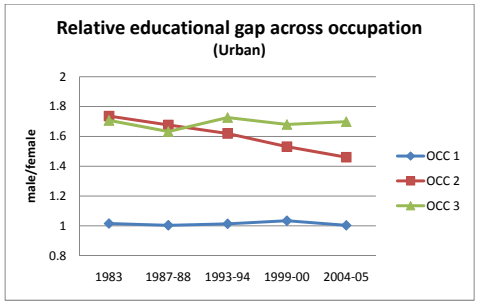


Figure 6: Relative Educational Gap across across Occupations (All Sectors)

The sharp change in occupational choices motivates us to study whether there is convergence in educational attainment across different categories of occupations. Table 4 reports the average level of education across three different occupational categories. Average level of education has risen for



(a) Relative Educational Gap across Occupation (Rural)



(b) Relative Educational Gap across Occupation (Urban)

Figure 7: Relative Rural-Urban Educational Gap across Occupation

all the occupation groups while the sharpest increase is observed in farming/agricultural jobs (33%) and blue collar/low skill jobs (24%). Occ1 experienced the highest average level of education followed by Occ2 and Occ3 for both male and female. Male are more educated than women consistently on an average for each of the occupational category. Table 5 and Figure 6 present the relative gap in average education levels for men and women within the same occupation. The gap in white collar job is lowest among the three groups. The convergence in the relative educational gap is highest in the blue collar jobs (Occ2) during the study period. The gap within this occupational group decreased by 12% in rural districts and 16% in urban districts respectively (Fig 7). The ratio of male to female average educational attainment level remained almost same in the agriculture category (Occu3). These results are almost in line with our previous findings that educational attainment levels are converging among male and female.

3.3 Convergence in wages

One of the key issues of our interest is to study how the pattern of wages between male and female in our sample varies over the time. To be specific, we attempt to explore whether the increase in educational attainment rate and changing occupational pattern of women through the opening of scopes to the higher skilled jobs have been reflected in the gender wage gap. We would like to note that our wage sample is smaller than the over-all working

sample due to the large number of missing wage observations. It arises since a significant proportion of the sample is from rural areas and self employed with positive land holding.

We start wage analysis by comparing the wage distribution of male and female in first round (1983) and in the latest round (2004-05) of the sample considered. Figure 8 presents the kernel density plots for male and female separately in two rounds mentioned above. We noticed that the wage density function for male and female shifted to the right from 1983 to 2004-05. This finding follows the economic transformation in India over the past two decades. Over-all wage dispersion within group during that time has been increased for both male and female. Panel (a) of figure 9 shows the wage inequality in rural areas while panel (b) reflects the same in the urban districts. The over-all variation in wage experienced a jump in urban areas (107%) compared to its rural counterpart (67%) from 1983 to 2004-05. Inequality among rural male workers fell marginally, however, inequality among urban workers increased from 1983 to 1993-94. Between 1993-94 and 1999-00, wage-disparity among male workers in both the sectors faced a sharp increase. It increased at decreasing rate after that. Conversely, rate of increase in female wage discrimination in rural areas was lower than the rate of increase in urban areas all through 1983 to 1999-00. The sharpest change in the wage dispersion was observed for urban male (111%).

We examine unadjusted ("raw") as well as conditional wage gap to study the pattern of wage differential over the years. The raw wage gap is defined as male wage over female wage per day; conditional wage gap is the regression adjusted gap using the covariates. Table 11 reports the average wage and the relative wage gap in different NSS rounds. Average wage for male increased by more than two folds. While the increase in female wage was almost three folds from 1983 to 2004-05. Average daily real wage for male and female turned out to be Rs. 30 and Rs. 17 by 2004-05.

Unadjusted wage gap decreased by 13% during the study period. In rural areas, the gap shrank by 5% between 1983 and 1993-94 (Table 11) . It increased marginally till 1999-00 and started falling again after 1999 (Fig 10). What would be the pattern of convergence in urban districts? In 1983,

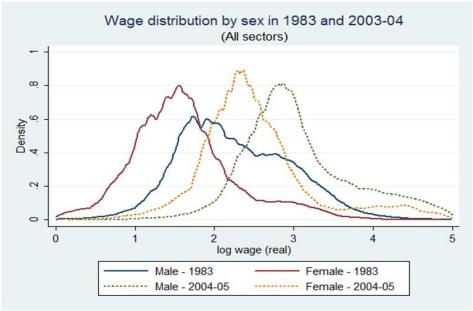
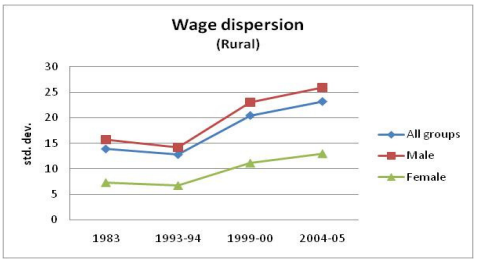
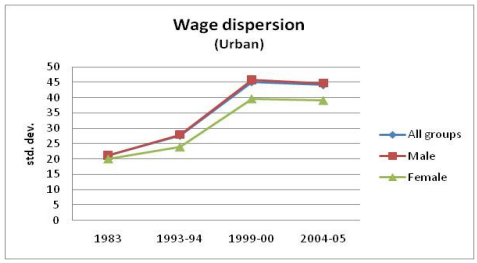


Figure 8: Wage Distribution (All Sectors)



(a) Wage Dispersion (Rural)



(b) Wage Dispersion (Urban)

Figure 9: Wage Dispersion

urban male earned 70% higher than urban female. The gap decreased sharply till 1999-00. However, it remained same during 1999 and 2004-05. Average daily wage for urban women increases by 170%. The magnitude of hike for rural female workers is 121%. The over-all wage inequality in rural as well as urban districts decreased. Does aggregate wage gap between male and female reflect similar convergence across different age and birth cohorts as well?

The male-female earnings differential using the age cohort is depicted in the figure 11 while panel (a) of the figure 12 presents relative wage gap across age cohorts in the rural areas and panel (b) considers the same in the urban districts. The over-all wage gap decreased for all the younger age cohorts except the oldest one during the study period. There was a sharp widening of the gap even in the rural areas for the oldest people. This finding is in line with what we have observed in the convergence of the educational

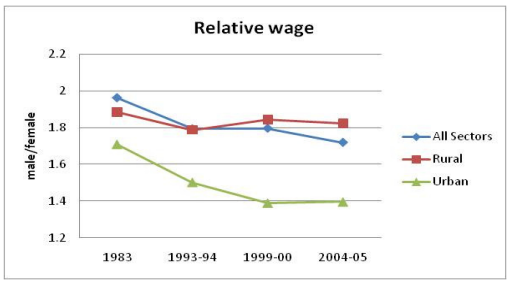


Figure 10: Relative wage gaps

attainment due to the small sample size. Rural districts have experienced fall in wage gap in the range of 5% to 15% for three younger cohorts during the period under study while the wage premium of men compared to women for the two oldest age cohorts have increased by 4% and 32% respectively. In urban areas, each of the five age cohorts has experienced a moderate level of convergence. The ratio of male to female wage has witnessed sharpest decline (24%) here for the following age cohort, 46-55.

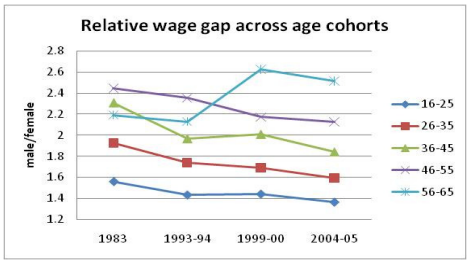
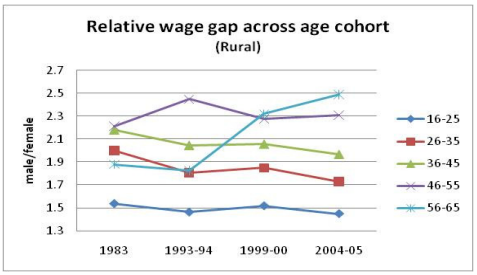
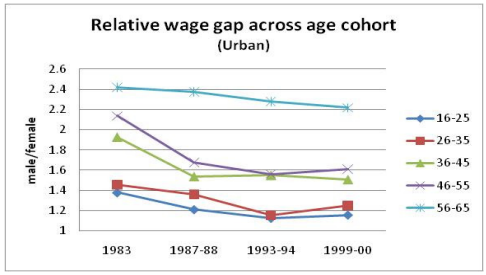


Figure 11: Relative Wage Gap across Age Cohorts (All Sectors)

We also examine the behaviour of relative wages of male and female using birth cohorts. Fig 13 depicts over-all convergence in wage gap using five birth cohorts. Panel (a) and panel (b) of Fig 14 report gender wage gap using birth cohorts for rural and urban areas respectively. The wage inequality has been increased for each of the birth cohorts except for the oldest cohort. Does it follow similar trend in rural-urban framework? An opposite trend is observed in the wage inequality for the youngest and oldest birth cohort



(a) Relative Wage Gap across Age Cohorts (Rural)



(b) Relative Wage Gap across Age Cohorts (Urban)

Figure 12: Relative Rural-Urban Wage Gap across Age Cohorts

in rural and urban districts. The youngest cohort has witnessed an increase in the gender wage gap by 3% in the rural areas while decrease by 10% in the urban districts. Urban male experienced a decline in wage premium compared to female by 76% while the hike was 20% in the rural areas. The increase in ratio of male to female wage for the second oldest birth cohort was significantly higher in the urban areas compared to its rural counterpart. The magnitude of increase was 44% in urban districts while it was 12% in the rural areas. The ratio of male to female wage differential observed similar increasing trend in both the sectors for three other medium birth cohorts.

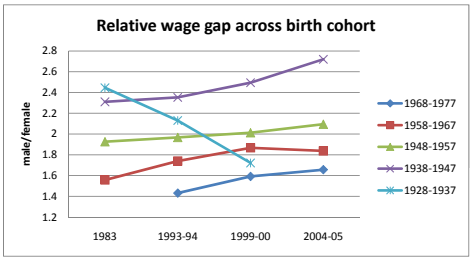
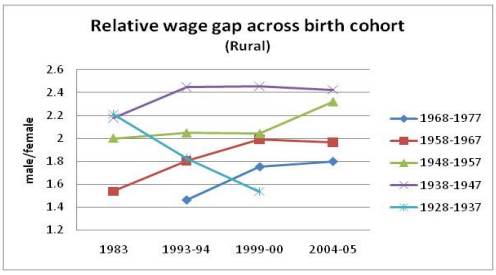


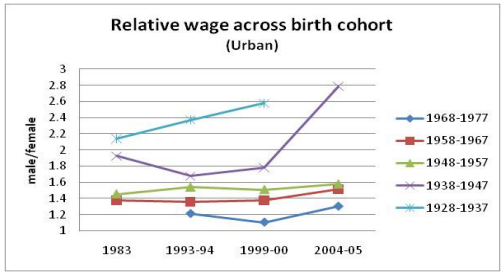
Figure 13: Relative Wage Gap across Birth Cohorts (All Sectors)

Next, we examine whether the decrease in inequality is concentrated among workers in any particular occupation or education group.

Figure 15 presents trends in the raw wage gap between the average earnings of men and women by five groups following different educational attainment. Panel (a) and panel (b) of figure 16 show the wage convergence in



(a) Relative Wage Gap across Birth Cohorts (Rural)



(b) Relative Wage Gap across Birth Cohorts (Urban)

Figure 14: Relative Rural-Urban Wage Gap across Birth Cohorts

rural and urban areas respectively. It is discernible that the over-all unadjusted wage differential for uneducated (Edu1), below primary (Edu2) and primary (Edu3) educated respondents converged over time. However, the wage inequality for middle education (Edu4) group jumped by 20% while the gap remained almost same for higher education (Edu5) category during the study period. Middle education group has observed steady increase in the wage differential in both urban and rural areas. We note that there is a opposite trend in wage inequality in rural and urban areas for Edu1, Edu2 and Edu5. The proportion of decrease (27%) in the wage premium of male over female in the urban sector outweighs the proportion of increase (18%) in the gap in rural sector for primary education. Wage gap for the higher educated with more than ten years of schooling declined steadily from 1.20 (in 1983) to 1.14 (in 2004-05) in urban areas while in rural districts, the gap increased by 14% during the same period.

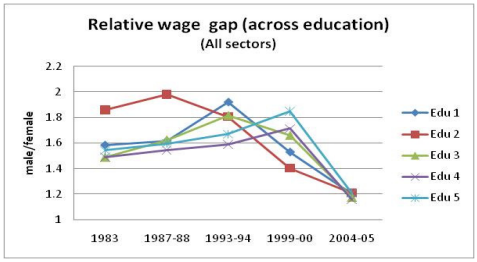
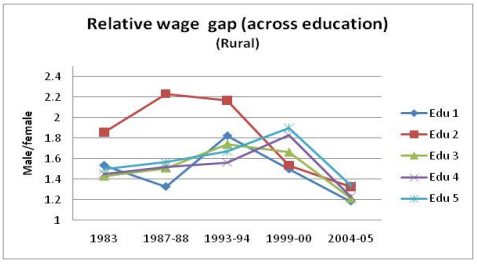
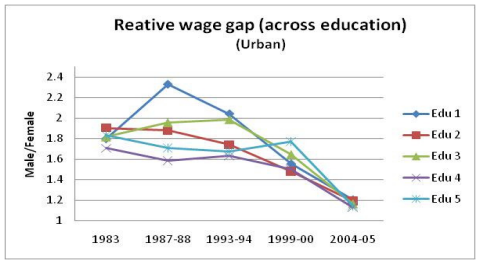


Figure 15: Relative Wage Gap across Education (All Sectors)



(a) Relative Wage Gap across Education (Rural)



(b) Relative Wage Gap across Education (Urban)

Figure 16: Relative Rural-Urban Wage Gap across Education

We examine how wage gap converged within each of the three broad occupation categories from 1983 to 2004-05. Figure 17 and Figure 18 present the results. Circles indicate wage gap in white-collar jobs, squares indicate wage inequality in blue-collar jobs and triangles indicate wage gap in agricultural jobs. Relative wage premium in white collar jobs (Occu1) has increased substantially (19%) while the wage inequality in agricultural jobs (Occu3) maintained a parity during 1983 and 2004-05. It can be seen that the relative wages has tended to converge for blue collar jobs (Occu2). Does over-all wage gap between male and female reflect significant differences between urban and rural areas? panel (a) and panel (b) of figure 18 show almost similar trend. In both urban and rural areas, wage inequality has converged for Occu2. In contrast, the ratio of male to female wage in Occu1 in urban areas has increased from 1.24 to 1.32 during the study period. This was caused by tremendous increase in average wage in this occupational category. An urban white collar male-professional earned 175% higher wages from 1983 to 2004-05 while the proportion of increase in urban female's wage was comparatively smaller (161%). In 2004-05, the average daily wage for urban male in this profession was 67 rupees per day while a female used to earn 51 rupees. Opening up of Indian economy may play a major role in it. The average wage gap in Occu3 muted in rural areas.

The gender wage differential compressed by 5% during 1983 and 1993-94 and remained almost same during 1993-94 to 2004-05. The relative wage premium increased from 1.43 to 1.45 between 1983 and 2004-05. The average daily-wage for a male and female agricultural worker happened to be 16 rupees and 11 rupees respectively by 2004-05.

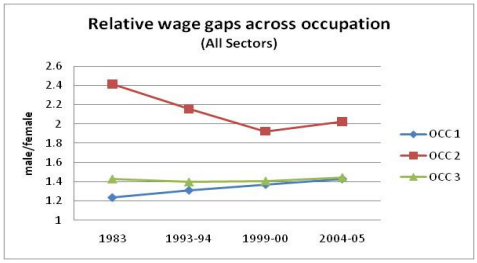
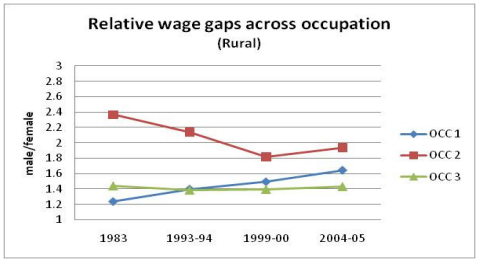
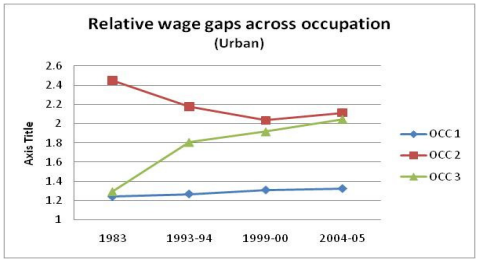


Figure 17: Relative Wage Gap across Occupation (All Sectors)



(a) Relative Wage Gap across Occupation (Rural)



(b) Relative Wage Gap across Occupation (Urban)

Figure 18: Relative Rural-Urban Wage Gap across Occupation

3.3.1 Conditional wage gap

We have found the declining trend in male-female wage gap so far for almost past three decades. We now examine it farther by estimating regression adjusted gender wage gap. We estimate the gender wage gap and analyse it's trend controlling for human capital variables alongside the other demographic correlates. We follow Mincerian earnings function approach. To be specific, we estimate a linear log wage regression for each of the five NSS rounds on the following characteristics: individual age, age squared, education (*education*) and squared education ($education^2$), rural/urban dummy, female dummy and state specific dummy. We consider the different returns to education in rural and urban areas by including the interaction terms between individual education attainment and education attainment squared and the rural/urban dummy ($educationXrural$ and $education^2Xrural$).

Table 12 reports the results. We find that the co-efficient of the female dummy is negative and significant in all the rounds except for the 1983 round. The negative estimates for the female dummy signifies that the conditional wages of female were lower compared to male with similar endowment. The striking feature of the analysis arises from the fact that the size of the negative effect of the female dummy has become smaller over the sample period except the round 55 corresponding to the year 1999-00. Rural concentration of female plays a significant role in lowering the wage in three rounds except round 1987-88 and 1999-00. Net return to education is positive in each round as expected.

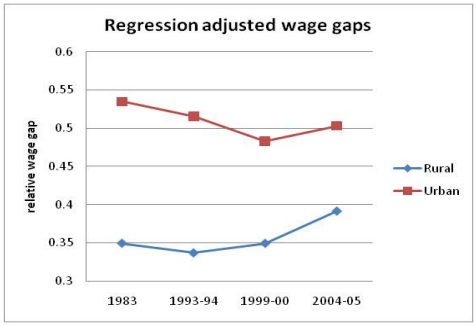


Figure 19: Conditional wage gaps

Though the conditional wage differential declined over time, an opposite trend is observed in rural and urban districts. Table 13 presents the results. It is higher in urban areas compared to its rural counterpart in each of the time period under study (Figure 19) except in 1987-88. In rural areas, the wage gap decreased marginally from 1983 to 1993-94. The trend reversed during 1993-94 and 1999-00. After 1999-00, we observed a sharp increase in the wage gap. It contradicts the unadjusted raw wage gap where earnings differential fell after 1999-00 (Figure 10). Looking at the urban wage gap in the presence of covariates, we notice that the gap decreased from .52 (1983) to .48 (1999-00). The trend became upward after 1999-00. If we go back to unadjusted wage gap for this time period, we notice, the gap remained same between 1999 and 2004-05. However, when we control for the different demographic variables, specially, human capital variables, the increasing trend is followed. It may arise from discrimination. We will study this in deeper detail using Oaxaca-Blinder decomposition method.

3.4 Decomposition of male-female wage gap

A most popular method of wage decomposition was introduced by Blinder (1973), it was modified by Oaxaca (1973) later. Following this approach, we take into account two co-efficient: the first one is from the log wage regression entirely on male sub-sample while the other one comes from log wage regression only on female sub-sample. The difference between the estimated co-efficient for men and women is termed as the, difference resulting from distinct "rewarding structure". When we multiply the difference with particular set of characteristics, we get wage differential due to difference in the "reward structure" with that particular set of characteristics.

Difference between male and female wage can be attributed either from observable or unobserved variations. If explanatory variables for men and women take different values, it may lead to gender wage gap. Such gap is due to the difference in the "observable characteristics". If the difference arises from product of vector difference from "observable characteristics" and either of the male or female regression co-efficient, then the difference is known as "unexplained /unobservable characteristics" or "discrimination". These two sources of differences add to aggregate differential in log wage between male and female.

Following the notations used by Oaxaca-Blinder and using the properties of Ordinary Least squares, we can state:

$$\overline{log(Wage_{male})} = \overline{Z_{male}}\hat{\beta}_{male} \tag{1}$$

$$\overline{log(Wage_{female})} = \overline{Z_{female}}\hat{\beta}_{female} \tag{2}$$

The over bar in equation 1 and equation 2 symbolise the sample mean of the variable. The sample mean is calculated over the logarithm of each worker's wage rate. The row vector in the difference in mean characteristics is given by;

$$\triangle\, \overline{Z} = \overline{Z_{male}} - \overline{Z_{female}} \tag{3}$$

$$\triangle \hat{\beta} = \hat{\beta}_{male} - \hat{\beta}_{female} \tag{4}$$

Therefore, the male-female logarithmic wage gap is given by (using above equations),

$$\overline{log(Wage_{male})} - \overline{log(Wage_{female})} = \triangle \overline{Z} \hat{\beta}_{female} + \overline{Z_{male}} \triangle \hat{\beta} = \triangle \overline{Z} \hat{\beta}_{male} + \overline{Z_{female}} \triangle \hat{\beta} \tag{5}$$

In equation 5, the term, $\triangle Z \beta_{female}$ denotes gender "difference due to the difference in the observed characteristics"(using female wage structure) while $Z_{male} \triangle \beta$ is the "gender difference due to the different treatments" or in other words, it gives the measure of "discrimination"(using male weights). Similarly, the term $\triangle Z \beta_{male}$ indicates gender "difference due to the difference in the observed characteristics"(using male wage structure) while $Z_{female} \triangle \beta$ captures the measure of "discrimination"(using female weights).

Table 6 presents the decompositions of wages for each of the five rounds of NSS data under study. Average log wages of male and female are reported in second and third column. We have not presented the underlying regression estimates for space limitation. Third column represents the difference in predicted log wage for the two groups over the different survey rounds while the next columns report the size of the observable and discrimination (unobserved) part of the wage gap. The final column, seventh column, reports the fraction of the over-all log wage difference observed from educational attainment alone. From the table, we find that men earned 30% higher wages per day than women in 1983; it rose marginally to 31% in 1987-88 while it fell to 18% in 2004-05. The ratio of male to female wage decreased from .672 in 1983 to .564 in 2004-05. As we have mentioned earlier, the gender wage gap is composed of two parts: "observed difference" and "discrimination". In India, a significant proportion of wage gap remained unexplained. Sixty-three percent of the total gap in 1983 was from discrimination while in 2004-05, it rose to 76%. Though, the gender wage inequality has decreased, we observe a substantial increase in the "unobserved" part of the variation (Figure 20). To be specific, The gender wage differential due to discrimination increased steadily after 1999 which follows from the result we found in the previous

section using the conditional wage gap. It is surprising to note that even the differences in education accounted for 21% in 1983 which decreased to 13% in 2004-05. Does trade liberalisation as an exogenous measure explain gender wage gap in India? We discuss it in the following section.

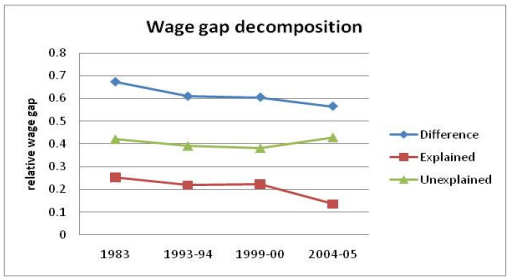


Figure 20: Oaxaca-Blinder decomposition

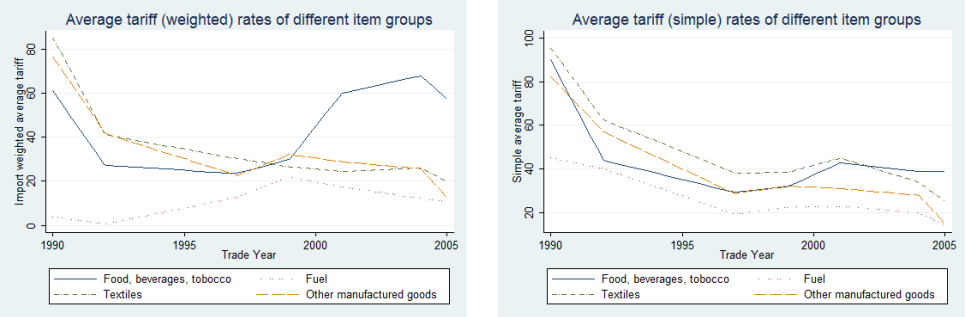
4 Tariff reforms and wage gap

In this section, we attempt to study whether trade liberalisation as an exogenous process by nature has any impact on female labour force participation and gender wage gap. As we have mentioned earlier, we consider gender wage gap and female labour force participation as the indicators of economic value of women.

4.1 Trade reform in India

In 1991, India initiated comprehensive measure of global economic integration. Tariff reduction and elimination of some non-tariff barriers were two important components of the liberalisation process in 1990s. The reform in India was unique in a sense that it was drastic and came as a surprise to policy makers. The exogenous nature of trade liberalisation measures in 1991 helps analysts to establish a causal relationship between reforms measures and economic outcomes (Topalova, 2007).

High import tariffs were effective source of trade protection before 1991. Before 1991, average tariff rate was 83.7% and maximum tariff rate was 521%(Table 7). It shows the significant change in MFN tariff rates during the early phase. The mean tariff rate fell from 83.7% in 1990 to 58.1 % in 1992. This rate again gradually reduced to 19.5% in 2005. The standard deviation of import weighted average tariff rates of 6 digit (HS code) item groups is only 16.9% in 2005 compared to a very high degree of dispersion in 1990.



(a) weighted (b) simple

Figure 21: Simple and weighted average tariff of different consumption item groups

Figure 21(a) shows weighted average tariff rates of different consumption item groups. During 1990 to 1992, both simple and weighted averages of food, textile and other manufactured goods fell sharply and then they followed a steady declining trend except for food, beverages and tobacco products. Simple average tariff rate of fuel and fuel products had a declining trend, but import weighted tariffs did not show uniform trend. It is clear from the plots that first part of 1990s witnessed sharpest drop in tariff rates. Though there are some reversals in later periods, the general direction of tariff reform is towards liberalisation. As a result, trade shares in GDP have increased at a much higher rate after 1991(fig. 4.1). The drastic change in tariff rates in 1991 and subsequent gradual changes have several general equilibrium effects on prices and wages. The next section outlines the empirical strategy to identify welfare effects of tariff change incorporating all these general equilibrium effects.

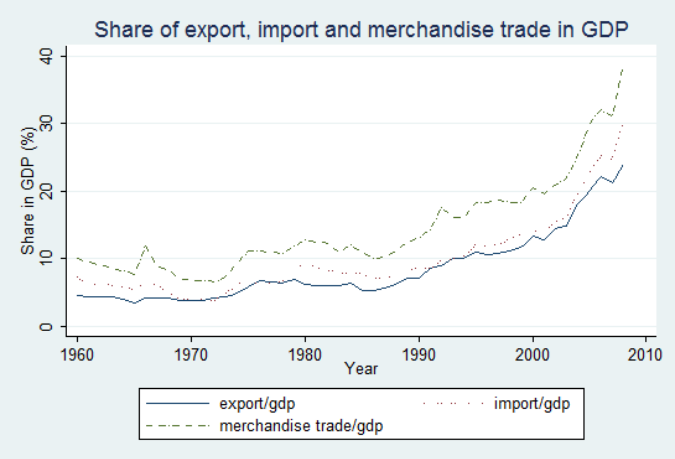


Figure 22: Share of export, import and merchandise trade in GDP

4.2 Estimation

Our focus is to measure the impact of tariff reforms on female labor force participation and gender wage inequality. To estimate these impacts, we initially regress labour force participation on trade exposure, individuals characteristics and gender dummy. Our main interest in this regression is the co-efficient of gender dummy along with the interaction of gender dummy and tariff exposure. We follow Topalova (2007) to estimate the regional level (NSS regions) trade exposure measures. Industry specific tariff rates are calculated for the five NSS rounds mapping from HS code to NIC 1987 (Debroy and Santhanam, 1993). The 43rd round corresponds to pre-liberalization period, and all other rounds are from post-liberalisation era. We have tariff data from 1990-2005. Thus, we can estimate regional level trade exposure measure in pre and post trade liberalisation period. [2] Pre-reform regional level industry specific employment weights are used to calculate the regional trade exposure. Three digit level industrial workforce distribution data from 1991 census is used to calculate pre-reform weights.

$$w_{i,r} = \frac{emp_{i,r}}{\sum_i emp_{i,r}} \tag{6}$$

[2]We use tariff data in 1990 for 43rd round (1987-88) since we do not have tariff data before 1990. There is no significant difference in tariff rates from 1987 to 1990.

Where, i is the 3-digit level industry and r is the NSS region. We have 77 regions in all NSS rounds. Using these weights, we calculate region level trade exposure measure for year t as

$$TradeExposure_{r,t} = \sum_{i} w_{i,r} * Tariff_{i,t} \tag{7}$$

Our empirical specification is the following:

$$pr[y_i = 1] = \beta_0 + \beta_1 Tr_{r,t} + \beta_2 F_i + \beta_3 F_i * Tr_{r,t} + \gamma Z_i + \epsilon_i \tag{8}$$

Where, $y_i = 1$ if the individual participates in the labour force. If any individual is engaged in any gainful economic activity or looking for job in last seven days for at least half an hour, we classify this individual as in labour force. $Tr_{r,t}$ is the trade exposure measure for region r at time t, F_i is the female dummy, Z_i includes all other control variables. We would like to emphasize that this is not a panel data; we have repeated cross section over four years. We analyse it using the probit model. The co-efficient of trade liberalisation measure is positive (Table 8) in three specifications. Model1 and Model2 provide estimate of overall participation rate whereas, Model3 and Model4 give the gender gap in participation rate. We find that female participation rate is lower than the male participation rate. The co-efficient of interaction term between trade measure and female dummy implies that the gap between male and female participation in the labour force increases due to tariff reforms. It supports similar findings in school attendance rate in India. Our model controls for supply side variables of the labour market using education. To control for the demand side, we use state specific fixed effects and year effects. Trade effect becomes insignificant when we consider trade level fixed effects. However, the interaction term remains significant. Using these preliminary results, we cannot conclude any definite explanation.

We estimate the impact of trade liberalisation on wage gap;

$$lnwage_i = \beta_0 + \beta_1 Tr_{r,t} + \beta_2 F_i + \beta_3 F_i * Tr_{r,t} + \gamma Z_i + \epsilon_i \tag{9}$$

Where, $lnwage_i$ is the logarithmic wage of individual i. We find that trade liberalisation helps in reducing the wage gap (Table 9). Co-efficient of female

dummy is negative and significant in all three specification controlling for individual characteristics, sector dummies and interaction between sector and tariff interaction. Trade liberalisation has significant impact on relative wage gap even after controlling the individual characteristics, state fixed effects and year effects. The declining trend of over all wage gap over the years may be attributed to trade liberalisation.

5 Conclusion

In this paper, we have analysed the gender wage differential over the years. We measured the raw wage inequality and conditional wage inequality. We explain the gender wage gap using Oaxaca-Blinder method of decomposition. We have tried to find out whether trade liberalisation has any impact on labour force participation and gender wage gap. We find that the wage gap declines over the time using raw wage gap. When we condition it on human capital variable and other individual characteristics, we see, wage gap decreases in the urban areas while it increases in the rural sector. It is evident from Oaxaca-Blinder method of decomposition that wage difference decreases over time. However, there is a substantial unexplained part establishing the existence of gender discrimination. We have examined the earnings differential using birth and age cohort explanations as well. We find that trade liberalisation might have an impact in decreasing the wage gap over the years.

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Table 1: Sample Summary Statistics (All Sectors)

AVG	**age**	**edu**	**%female**	**%married**	**hh size**	**%rural**
1983	35.086	2.001	0.504	0.775	7.116	0.758
se	0.031	0.003	0.001	0.001	0.008	0.001
1987-88	35.132	2.082	0.506	0.779	6.908	0.771
se	0.028	0.003	0.001	0.001	0.007	0.001
1993-94	35.570	2.284	0.501	0.783	6.571	0.750
se	0.030	0.003	0.001	0.001	0.007	0.001
1999-00	35.872	2.489	0.502	0.782	6.949	0.738
se	0.033	0.004	0.001	0.001	0.009	0.001
2004-05	36.157	2.652	0.503	0.780	6.510	0.734
se	0.034	0.004	0.001	0.001	0.008	0.001
MALE						
1983	35.478	2.379		0.756	7.148	0.748
se	0.044	0.005		0.001	0.012	0.001
1987-88	35.549	2.464		0.760	6.939	0.762
se	0.040	0.005		0.001	0.010	0.001
1993-94	35.883	2.681		0.761	6.580	0.741
se	0.043	0.005		0.001	0.010	0.001
1999-00	36.133	2.885		0.758	6.964	0.730
se	0.047	0.006		0.002	0.012	0.002
2004-05	36.369	3.034		0.755	6.518	0.725
se	0.048	0.006		0.002	0.012	0.002
FEMALE						
1983	34.700	1.629		0.793	7.086	0.769
se	0.043	0.004		0.001	0.011	0.001
1987-88	34.723	1.708		0.797	6.878	0.779
se	0.040	0.003		0.001	0.010	0.001
1993-94	35.259	1.890		0.804	6.561	0.758
se	0.043	0.004		0.001	0.010	0.001
1999-00	35.613	2.095		0.807	6.934	0.747
se	0.046	0.005		0.001	0.012	0.001
2004-05	35.947	2.275		0.805	6.502	0.744
se	0.048	0.006		0.001	0.012	0.002

Table 2: Relative educational gaps

Year	**All Sector**	**Rural**	**Urban**
1983	1.46	1.49	1.35
1987-88	1.44	1.49	1.31
1993-94	1.42	1.48	1.27
1999-00	1.38	1.45	1.22
2004-05	1.33	1.40	1.19

Table 3: Distribution of education in the workforce

Male	**Edu 1**	**Edu 2**	**Edu 3**	**Edu 4**	**Edu 5**
1983	40.05	13.54	16.33	13.79	16.29
se	0.00	0.00	0.00	0.00	0.00
1987-88	34.85	13.43	16.26	14.18	21.29
se	0.00	0.00	0.00	0.00	0.00
1993-94	29.62	12.91	13.94	16.07	27.47
se	0.00	0.00	0.00	0.00	0.00
1999-00	26.32	11.59	12.93	17.75	31.41
se	0.00	0.00	0.00	0.00	0.00
2004-05	21.49	11.48	15.12	19.55	32.36
se	0.00	0.00	0.00	0.00	0.00
Female					
1983	67.41	8.38	10.37	6.96	6.88
se	0.00	0.00	0.00	0.00	0.00
1987-88	61.98	9.11	11.08	7.83	10.00
se	0.00	0.00	0.00	0.00	0.00
1993-94	54.76	9.73	10.97	10.35	14.19
se	0.00	0.00	0.00	0.00	0.00
1999-00	49.14	9.63	10.97	12.38	17.88
se	0.00	0.00	0.00	0.00	0.00
2004-05	43.64	10.33	13.04	14.29	18.70
se	0.00	0.00	0.00	0.00	0.00

Table 4: Education attainment by occupations

	OCC 1	**OCC 2**	**OCC 3**
1983	4.29	2.41	1.66
se	0.01	0.01	0.00
1987-88	4.32	2.45	1.74
se	0.01	0.01	0.00
1993-94	4.40	2.73	1.90
se	0.01	0.01	0.00
1999-00	4.36	2.89	2.02
se	0.01	0.01	0.01
2004-05	4.43	3.00	2.22
se	0.01	0.01	0.01
Male			
1983	4.32	2.62	1.90
se	0.01	0.01	0.01
1987-88	4.34	2.65	1.98
se	0.01	0.01	0.01
1993-94	4.45	2.92	2.17
se	0.01	0.01	0.01
1999-00	4.41	3.10	2.37
se	0.01	0.01	0.01
2004-05	4.46	3.18	2.55
se	0.01	0.01	0.01
Female			
1983	4.13	1.49	1.20
se	0.04	0.01	0.00
1987-88	4.16	1.55	1.23
se	0.03	0.01	0.00
1993-94	4.17	1.79	1.32
se	0.03	0.02	0.01
1999-00	4.12	1.97	1.50
se	0.03	0.02	0.01
2004-05	4.30	2.15	1.62
se	0.03	0.02	0.01

Table 5: Education gap across occupations

Year	**OCC 1**	**OCC 2**	**OCC 3**
1983	1.05	1.76	1.58
1987-88	1.04	1.72	1.61
1993-94	1.07	1.63	1.65
1999-00	1.07	1.57	1.58
2004-05	1.04	1.48	1.57

Table 6: Oaxaca-Blinder decomposition of log wage gaps

Year	**Male**	**Female**	**Difference**	**Explained**	**Unexplained**	**Explained by Education**
1983	2.245	1.573	0.672	0.252	0.421	0.208
1987-88	2.971	2.037	0.933	0.425	0.509	0.296
1993-94	2.727	2.118	0.609	0.218	0.391	0.161
1999-00	2.983	2.378	0.604	0.224	0.381	0.188
2004-05	3.081	2.516	0.565	0.135	0.429	0.148

Table 7: Tariff structure in India

Year	Mean	SD	Max
1990	83.7	51.99	520.93
1992	58.08	22.99	355
1997	30.63	14.63	260
1999	33.67	12.55	230
2001	34.87	26.54	586.91
2004	30.38	15.04	232.39
2005	19.45	16.85	232.39

All statistics are calculated using import weighted average
MFN tariff rates of 6 digit HS item group.
(source: Trade Analysis and Information System, UNCTAD)

Table 8: Regression of labour Force Participation

	Model 1 b/se	Model 2 b/se	Model 3 b/se	Model 4 b/se
$education$	0.221^{***}	0.140^{***}	0.074^{***}	-0.033^{*}
	(0.01)	(0.01)	(0.01)	(0.01)
$education^2$	-0.053^{***}	-0.043^{***}	-0.036^{***}	-0.024^{***}
	(0.00)	(0.00)	(0.00)	(0.00)
rural	0.276^{***}	0.307^{***}	0.272^{***}	0.310^{***}
	(0.02)	(0.02)	(0.02)	(0.02)
$ttariff_r$	0.013^{***}	0.004^{*}	0.012^{***}	0.002
	(0.00)	(0.00)	(0.00)	(0.00)
$ruralXttariff_r$	-0.007^{***}	-0.005^{***}	-0.009^{***}	-0.007^{***}
	(0.00)	(0.00)	(0.00)	(0.00)
age	0.018^{***}	0.016^{***}	0.016^{***}	0.014^{***}
	(0.00)	(0.00)	(0.00)	(0.00)
age^2	-0.000^{***}	-0.000^{***}	-0.000^{***}	-0.000^{***}
	(0.00)	(0.00)	(0.00)	(0.00)
female			-0.685^{***}	-0.778^{***}
			(0.01)	(0.02)
$femXttariff_r$			0.009^{***}	0.011^{***}
			(0.00)	(0.00)
Year effect	yes	yes	yes	yes
State effect	no	yes	no	yes
$PseudoR-sqr$	0.0234	0.0773	0.0654	0.1262
N	1288975	1288564	1288975	1288564

* p¡0.05, ** p¡0.01, *** p¡0.001

Table 9: Regression of Log Wage on Trade Exposure

	Model 1 b/se	Model 2 b/se	Model 3 b/se
female	-0.372^{***}	-0.373^{***}	-0.358^{***}
	(0.01)	(0.01)	(0.01)
rural	-0.086^{***}	-0.245^{***}	-0.120^{***}
	(0.01)	(0.03)	(0.03)
$ttariff_r$	0.007^{***}	0.007^{***}	0.018^{***}
	(0.00)	(0.00)	(0.00)
$femXttariff_r$	$-0.003**$	$-0.003**$	-0.004^{***}
	(0.00)	(0.00)	(0.00)
age	0.058^{***}	0.057^{***}	0.056^{***}
	(0.00)	(0.00)	(0.00)
age^2	-0.001^{***}	-0.001^{***}	-0.001^{***}
	(0.00)	(0.00)	(0.00)
$education$	-0.115^{***}	-0.226^{***}	-0.255^{***}
	(0.01)	(0.01)	(0.01)
$education^2$	0.059^{***}	0.078^{***}	0.082^{***}
	(0.00)	(0.00)	(0.00)
sector and tariff interaction	yes	yes	yes
education and sector interaction	no	yes	yes
Year effect	yes	yes	yes
State effect	no	no	yes
$R-sqr$	0.410	0.411	0.440
N	245501	245501	245501

Table 10: Distribution of Workforce (All Sectors)

Male	**Whitecollar**	**Bluecollar**	**Agriculture**
1983	11.56	34.56	53.89
se	0.00	0.00	0.00
1987-88	13.33	34.98	51.69
se	0.00	0.00	0.00
1993-94	14.53	36.73	48.75
se	0.00	0.00	0.00
1999-00	15.71	39.87	44.43
se	0.00	0.00	0.00
2004-05	16.46	44.35	39.19
se	0.00	0.00	0.00
Female			
1983	5.46	19.87	74.67
se	0.00	0.00	0.00
1987-88	7.91	20.49	71.61
se	0.00	0.00	0.00
1993-94	10.45	21.03	68.51
se	0.00	0.00	0.00
1999-00	9.75	20.94	69.31
se	0.00	0.00	0.00
2004-05	11.79	26.37	61.85
se	0.00	0.00	0.00

Table 11: Average wages and relative wage gap

	All Sectors			Rural			Urban		
	Male	**Female**	**Relative**	**Male**	**Female**	**Relative**	**Male**	**Female**	**Relative**
1983	12.799	6.520	1.963	10.488	5.571	1.883	16.781	9.832	1.707
se	0.104	0.092		0.144	0.066		0.133	0.333	
1987-88	25.197	11.088	2.272	25.932	8.883	2.919	25.010	15.914	1.572
se	0.160	0.164		0.467	0.175		0.162	0.341	
1993-94	21.494	11.991	1.792	18.250	10.210	1.787	27.469	18.301	1.501
se	0.103	0.101		0.116	0.089		0.190	0.311	
1999-00	27.978	15.581	1.796	23.583	12.789	1.844	36.049	25.963	1.388
se	0.305	0.197		0.370	0.174		0.534	0.630	
2004-05	30.017	17.470	1.718	25.935	14.238	1.822	37.157	26.634	1.395
se	0.247	0.224		0.302	0.164		0.417	0.674	

Table 12: Regression of log wage on individual characteristics and sex dummy

	1983 b/se	1987-88 b/se	1993-94 b/se	1999-00 b/se	2004-05 b/se
age	0.041^{***}	0.061^{***}	0.047^{***}	0.048^{***}	0.049^{***}
	0	0	0	0	0
age^2	-0.000^{***}	-0.001^{***}	-0.001^{***}	-0.000^{***}	-0.000^{***}
	0	0	0	0	0
education	-0.096^{***}	-0.043^{*}	-0.201^{***}	-0.161^{***}	-0.162^{***}
	-0.02	-0.02	-0.02	-0.02	-0.02
$education^2$	0.043^{***}	0.036^{***}	0.055^{***}	0.050^{***}	0.053^{***}
	0	0	0	0	0
female	0.277^{**}	-0.887	-0.378^{***}	-0.565^{***}	-0.237^{*}
	-0.09	-0.91	-0.1	-0.11	-0.1
rural	-0.096^{***}	0.089	-0.183^{***}	-0.037	0.135^{***}
	-0.03	-0.05	-0.03	-0.04	-0.03
R^sqr	0.551	0.575	0.39	0.537	0.513
N	60355	37151	67225	70460	71684

Table 13: Sector specific wage gaps

round	**Rural**	**Urban**
1983	0.35	0.53
se	0.01	0.02
1987-88	0.49	0.48
se	0.02	0.01
1993-94	0.34	0.52
se	0.01	0.02
1999-00	0.35	0.48
se	0.01	0.02
2004-05	0.39	0.50
se	0.01	0.02