Gender Inequality in the Labor Market During Economic Transition: Changes in India's Manufacturing Sector [*]

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Abstract: This paper uses household survey data from India's *National Sample Survey Organization* to examine why a structural overhaul in trade policies after the early 1990s has not been accompanied by greater improvements in women's relative wages. Despite a relative improvement in women's educational attainment, the mean gender wage ratio in manufacturing between 1987 and 2004 barely changed, remaining constant at about 49 percent. Results from two decomposition analyses offer compelling evidence that unmeasured gender-specific factors have become more important determinants of gender wage differentials across education groups and have offset female gains due to education and observed productivity characteristics. Furthermore, industry-level regressions suggest that growing competitive forces from international trade in concentrated industries are a plausible explanation for the increasing residual wage differential between men and women after 1987.

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Introduction

In 1990 and early 1991, a series of international and domestic shocks—including an oil price hike, a reduction in remittances from Indians working in the Middle East, a weakening in investor confidence following the assassination of Rajiv Gandhi, and expanding fiscal and trade deficits—precipitated a financial crisis in India. In return for receiving stand-by assistance from the International Monetary Fund in August 1991, the Indian government agreed to a standard policy prescription of stabilization and structural adjustment policies. Prominent among the policy reforms were substantial reductions in tariff levels on a wide range of imported products. Several new waves of reforms occurred in 1994 and 1997, with a slowdown in the pace of trade liberalization after 1997 as pressures from international agencies and creditors subsided.

During this period of liberalization, the gender wage differential remained unchanged, with women in manufacturing earning 49 percent of what men earned. This paper analyzes why women's relative wages in manufacturing stagnated during the reform period. Understanding why trade liberalization in India did not contribute to an increase in women's relative wages adds depth to the growing literature on wage structures and women's labor market performance in developing and transition economies. Relatively few studies have gone beyond descriptive analyses of changes in women's relative wages in periods of trade liberalization and increasing trade openness. The few studies that do employ econometric techniques to identify the impact of international trade on gender wage gaps have found conflicting results. In particular, Berik *et al.* (2004) find evidence that increasing trade openness is associated with higher residual wage gaps between men and women in two East Asian economies, a sign the authors interpret as increased wage discrimination.[1] Yet Black and Brainerd (2004) reach the opposite conclusion for the United States, with shrinking residual wage gaps associated with greater openness to imports.

Hazarika and Otero (2004) also find that increased trade (in this case Mexico) is associated with lower gender earnings differentials. Finally, Oostendorp (2004) uses data for more than 80 lower- and higher-income economies to show that except for highly-skilled workers in lower-income economies, increased trade is associated with reduced wage gaps.

This paper provides a detailed assessment of India's gender wage differential using four cross sections of data collected by the National Sample Survey Organization (NSSO). The data include the years 1983, 1987-1988, 1999-2000, and 2004, providing us with data coverage before, during, and after the macroeconomic liberalization. We use these data to conduct two decomposition procedures. The first decomposes the wage gap in individual years into a portion explained by measured, gender-specific skill differences, and a residual portion. The second procedure measures the contribution of changes over time in measured and unmeasured gender-specific factors, and in market returns to measured and unmeasured skills.

Results offer detailed evidence that unmeasured gender-specific factors have become more important determinants of gender wage differentials across education groups. Female workers gained relative to their male counterparts in education and experience, and the dispersion in the residual male wage distribution narrowed, which caused average male wages to fall relative to female wages. However, these relative gains for women were offset by a greater importance of unmeasured gender-specific factors, resulting in a stagnation of the aggregate gender earnings differential. These unmeasured factors could encompass growing gender differences in the unobserved skills of new labor market entrants, widening gender disparities in labor force commitment due to intermittency, and increasing wage discrimination by gender. We test this last assertion with industry-level regressions and find support for the hypothesis that increased competition from India's trade liberalization is associated with a widening in the residual gender wage gap in concentrated manufacturing industries.

Our study contributes new results that show the gender-specific repercussions of trade reforms, thus yielding useful evidence for policy makers in other countries that are moving toward less restrictive trade policies. This work will help to justify policy measures that build women's human capital and strengthen the social safety net. In addition, improved enforcement of equal pay and equal opportunity legislation will help to reduce unfair labor market practices that may contribute to observed gender differences.

Data Description

To explore the labor market impacts of trade policy reforms, we use four cross sections of data collected by the National Sample Survey Organization (NSSO). The data include the years 1983 (38^{th} round), 1987-1988 (43^{rd} round), 1999-2000 (55^{th} round), and 2004 (60^{th} round), providing us with coverage that precede and span years following trade and fiscal reforms. For each round, we utilize the Employment and Unemployment module - Household Schedule 10. To construct our labor force sample, we retain all individuals of prime working age (ages 15-60) who are employed in the manufacturing sector and who have positive weekly cash wages.[2] Industry-level variables are constructed using India's National Industrial Classification (NIC) system, which is based on international standards. The two earlier rounds of NSSO data use the 1970 NIC codes, while the two later rounds of data use the 1998 NIC codes. There are major differences at all levels of disaggregation beyond the one-digit level between the 1970 and 1998 NIC codes; these are incorporated in our empirical analysis.

Our analysis includes tests involving trade indicators. Data on export and import values across manufacturing industries, from 1980 to 2004, are constructed using the World Bank's Trade, Production and Protection Database (Nicita and Olarreaga 2006). We construct three measures of trade openness: exports/output, imports/output, and (exports+imports)/output. Although the data source also has information on tariff rates, we used trade shares because the tariff data are plagued with missing values. Data on output across manufacturing industries are obtained from India's Annual Survey of Industries (ASI).[3] Because the domestic output data are in rupees and the trade series are in dollars, we use average annual rupee/US$ exchange rates to convert output into dollars. Finally, ASI data are used to construct an index of domestic concentration across manufacturing industries. This index is based on the number of enterprises relative to output, by industry. All data sources are summarized in Appendix Table 1.

For the industry-level tests of competition and residual wage gaps, the various data series need to be aggregated to the same sets of industries using the same industry codes. We adopted the categorization in the World Bank Trade, Production and Protection series, which uses the ISIC (revision 2) classification at the three digit level and contains 28 industry categories per year. The NSSO labor data and the ASI production data are converted to this classification scheme using a concordance schedule we created based on information in Sivadasan and Slemrod (2006) and Central Statistical Organization (1970, 1998). The concordance schedule is reported in Appendix Table 2.

Stylized Facts: Trade Liberalization and Structural Changes in the Labor Market

Like many developing countries in the post-WWII era, India based its economic development and trade policies on an import substitution industrialization strategy. The country had some of the highest tariff rates and most restrictive non-tariff barriers in the region (Krishna and Mitra 1998, Topalova 2005). However, in 1990 and early 1991, a series of external, political, and macroeconomic shocks—including an oil price hike spurred by the Gulf War, a reduction in remittances from Indians employed in the Middle East, a shake-up in investor confidence following the assassination of Rajiv Gandhi, and growing fiscal and trade deficits—precipitated a financial crisis (Edmonds *et al.* 2005). The Indian government requested stand-by assistance from the International Monetary Fund in August 1991, and in return, agreed to what had become a fairly standard policy prescription of stabilization and structural adjustment policies. The government aimed to reduce tariff levels on a wide range of imported products, lower the variation across sectors in tariff rates, simplify the tariff structure, and remove many of the exemptions (Krishna and Mitra 1998, Topalova 2005). Several new waves of reforms occurred in 1994 and 1997, with a slowdown in the pace of trade liberalization after 1997.

Previous studies on India have found negative social impacts resulting from the introduction of trade policy reforms. In particular, evidence from a difference-in-difference approach in Topalova (2005) indicates that in districts that were more exposed to trade liberalization, both the incidence and depth of poverty decreased by less than the reductions observed in other districts that had fewer industries exposed to trade liberalization. India's trade liberalization also appears to have had negative impacts on child well-being. Findings in Edmonds *et al.* (2005) suggest that adjustment costs associated with trade liberalization were responsible for smaller declines in child labor and smaller improvements in school attendance in districts exposed to tariff cuts, compared to districts less exposed to the tariff reductions.[4] Trade liberalization also had differential effects on male and female employment. According to Bhaumik (2003), the growth in the workforce share classified as casual accelerated after 1993 as a result of the liberalization policies, with larger increases for female workers compared to their male counterparts in both rural and urban areas. However, not all studies have found negative social impacts for India. In particular, Mishra and Kumar (2005) argue that higher wage premiums in sectors that disproportionately employ unskilled workers led to an increase in their relative income and a decline in overall wage inequality.

Manufacturing industries across the board experienced some degree of tariff reductions during and after the initial sweeping 1991 reform package, and India's imports and exports grew dramatically as a result. Figure 1, which reports trends in exports and imports as a share of production, shows that both the aggregate export share and import share jumped sharply after 1991 and continued to rise steadily until the late 1990s. With a slowing in the pace of trade liberalization, the growth in trade ratios eased during the early 2000s, especially for exports. Superimposed onto this diagram are women's relative wages, with results suggesting that in the midst of India's comprehensive trade liberalization, women's relative wages stagnated at about 49 percent from 1987 through 2004.

During this reform period, male and female employment distributions changed dramatically. Table 1, which reports population-weighted employment shares for all individuals of working age, shows a very large shift out of agriculture for female workers. In 1983, almost 90 percent of female workers were employed in agriculture, and by 2004 this proportion had dropped to 53 percent. Women shifted into manufacturing as well as the various service industries. Although male workers also moved out of agriculture, the changes were less dramatic (from 61 to 51 percent during the period), with the gain absorbed entirely in services but not in manufacturing. Within manufacturing, India's employment distribution resembles that of many developing countries, with relatively high female representation in low-skilled intensive industries such as garments, food products, beverages, and tobacco, and relatively high male representation in higher-skilled and capital intensive industries such as industrial chemicals, glass, iron and steel, fabricated metals, and machinery.

Trends in the Female-Male Wage Ratio and Explanations

The analysis of trade liberalization and trends in the gender wage differential continues with a more detailed examination of the evolution of the female-male wage ratio in India's manufacturing sector. Table 2 reports results for unadjusted wage ratios by education groups. The top row reports the same (stagnant) aggregate wage ratio series that is illustrated in Figure 1. With disaggregation into education groups, the wage ratios rise on average from 1983 to 1987-88 for three of the four groups (those with middle school being the exception). From 1987-88 to 1999-2000 (the post liberalization era), ratios rise for all groups except those with the highest levels of education (high school and above). However, wage ratios in the 1999-2000 to 2004 time-frame increase only for those with high school and above; ratios for women in the remaining groups experience a decline. The most dramatic fall in the 1999-2000 to 2004 years is experienced by women with primary school education. Hence, the relatively constant female-male wage ratio from 1983 to 2004 hides wide fluctuations which become evident when the analysis is segregated by differing levels of human capital.

The determinants of trends in India's gender wage differential can be divided into four categories: changes in men's and women's observed characteristics, changes in the market returns to observed characteristics, changes in men's and women's unobserved characteristics, and changes in the market returns to unobserved characteristics. We examine each of these possible sources with a battery of descriptive statistics in the remainder of this section, and decomposition analyses in the subsequent section. The first category, observed characteristics, encompasses gender differences in education, experience, employment characteristics, and personal characteristics. In terms of education, sample means in Appendix Table 3 show that in 1983, 72 percent of female workers and 37 percent of male workers in manufacturing were illiterate or had less than a primary school education. By 2004, these proportions had fallen to 49 percent for females and 27 percent for males. Women also made substantial gains relative to men in attaining secondary school and graduate school educations. Also, women's average level of experience rose slightly during the period while that of men dropped. Hence the sample means point to an improvement in the educational attainment and experience of women relative to men, which contributes to an increase in women's relative wages.

The second explanation for trends in India's overall gender wage differential is changes in the market returns to observed characteristics. To provide evidence of such changes, we use ordinary least squares estimates of a standard human capital equation for male wages. For a given year *t*, we regress the natural logarithm of real weekly cash wages *(w)* for male workers on a set of worker characteristics *X* as follows:

$$w_t = X_t \beta_t + \varepsilon_t . \qquad (1)$$

Within *X*, we use a set of dummy variables for education level attained; an indicator variable for whether the individual has any technical education; years of potential experience and its square; number of pre-school children in the household; and binary variables for regional location, rural status, marital status, low-caste status, self-employed status, religion, and household headship. The notation ε is a random error term assumed to be normally distributed with variance σ^2. Appendix Table 4 reports coefficient estimates from the male wage regressions for all four survey years. In this table, the excluded education level is no schooling (illiterate), and the excluded regional dummy is the western region of India. The regressions are weighted using sample weights provided in the NSSO data for the relevant years. The weights correct for the fact that the proportion of individuals and households in each sample differs from the proportion in the true population. Use of these weights thus adjusts the coefficients to make them nationally representative. As evident in the table, general education, technical education and experience have positive effects on wages. Wages are lower for self-employed individuals, for individuals belonging to castes that are perceived as inferior, and for individuals employed in rural areas of India. Furthermore, on average, wages tend to be higher in the western regions as compared to other locations in India.

Coefficient estimates in this appendix table also provide strong evidence of a widening over time in market payoffs to observed skills. The coefficient on the dummy variables for individuals with secondary school and graduate school both rose over time, from 0.46 and 0.82 in 1983 to 0.72 and 1.25 in 2004. Returns to individuals with all other levels of schooling also rose over time compared to individuals who are illiterate. This result is consistent with findings in Kijima (2006) of a widening in the dispersion of returns to observed skills during the period. Because men on average have higher education levels than women in most years, this increase in the premium for higher levels of schooling after 1983 contributes to higher average male wages relative to average female wages. Also acting against women's interests, the wage penalty for self-employment grew more severe during the period, with a coefficient that changed from -0.14 to -0.28. Because women were more likely to be self-employed, this worsening in the wage penalty serves to dampen women's relative overall wages. However, some changes in market returns were in women's favor, especially the increase in the premium for years of experience (from 0.04 to 0.06). With women on average having slightly more experience compared to men during the period, this premium increase boosts women's relative wages.

Gender differences in unobserved characteristics could also influence trends in the female-male wage ratio. This category could encompass unobserved skills of male and female workers, changes in the labor force commitment of female workers due to longer intermittency from the workforce, and wage discrimination by gender. Unobserved factors affect women's relative wages, after accounting for gender differences attributed to observed characteristics. To provide a better sense of the magnitude of this category of wage gap determinants, we calculated the mean female position in the male residual wage distribution, where residual wages measure the portion of wages that cannot be explained by observed productivity attributes. Results, which are found in Table 3, can be interpreted as the average woman's ranking in the male wage distribution after controlling for gender differences in observed qualifications. For example, the first entry under the column titled '1983' indicates that the mean female position is 27 percent of the way up the male residual wage distribution. That is, controlling for gender differences in observed characteristics, a woman with average wages for a female worker earns an amount that is just at the 27^{th} percentile of the male wage distribution.

As evident from Table 3, the average female position in the male residual wage distribution improved from 1983 through 1987-88, and then declined to reach a level in 2004 that was lower than the level in 1983. The increase in the mean female position through 1987-88 was true for all educational categories, except for women with middle school. The erosion from 1987-88 to 2004 was experienced by all educational groups, and was particularly marked for women with primary school and for women with high school and above. The analysis was also performed for women at different points in the male distribution (10^{th} percentile, 90^{th} percentile). For most educational groups, the position of women in the male residual wage distribution deteriorated over time.

In addition to gender differences in unobserved characteristics, differences in labor market returns to unobserved qualifications may also affect female-male wage ratios. To depict changes in returns to unobservable skills, Table 4 reports trends in the dispersion of residual male wages. A narrowing in the dispersion indicates decreasing returns to unobserved skills. Such declines should help to close the gender wage gap because more women have wages that rank toward the lower end of the male distribution. Therefore, when the male residual dispersion narrows, the average woman receives a relatively higher wage for a given position in the male distribution. The first row of estimates in Table 4 shows the difference in log wages between men in the 90th and 10th percentiles of the male residual wage distribution. It is clear that from 1983 to 2004, this difference decreased. Results indicate that the 90th-10th differential declined by 0.45 log points between 1983 and 2004. The decline in the 75-25 spread of 0.53 log points between 1983 and 2004 suggests that the broad trend of decreasing inequality cannot be attributed to changes that were occurring only in the tails of the distribution. Hence, from 1983 to 2004, the narrowing residual wage dispersion occurred throughout the male distribution and should have, in principle, raised women's overall relative wages.

Formal Decomposition Analyses of India's Gender Wage Gap.

The previous section lay the groundwork in presenting descriptive evidence showing changes in India's wage structure that often worked in opposing directions to influence the net male-female wage differential. This section uses two decomposition procedures to examine the various explanations more formally. The first technique uses individual cross-sections to examine the degree to which the overall wage gap can be explained by observed productivity characteristics between men and women (Oaxaca 1973; Blinder 1973). This procedure decomposes the wage gap in a particular year into a portion explained by average group differences in productivity characteristics and a residual portion that is commonly attributed to discrimination. For a given year t, the gender wage gap may be decomposed by expressing the natural logarithm of real wages *(w)* for male workers *(i=m)* and female workers *(i=f)* as follows:

$$w_{it} = X_{it}\,\beta_{it} + \sigma_{it}\,\theta_{it}\,. \qquad (2)$$

The notation X denotes a set of worker characteristics that affect wages (which we measure with the same variables noted above), and $\sigma_{it}\ \theta_{it}$ is a standardized error term. The standardized residual θ_{it} is distributed normally with a mean of zero and a variance of one for all years. The female wage equation can then be described using only the male coefficients and standard deviations as follows:

$$w_{ft} = X_{ft}\,\beta_{mt} + \sigma_{mt}\,\theta_{ft}\,. \qquad (3)$$

In Equation (3), we are using the market returns for male workers to predict the average wage that women would receive, given their observed characteristics, if they were paid the male rates. The gender gap can then be written as

$$w_{mt} - w_{ft} = (X_{mt} - X_{ft})\beta_{mt} + \sigma_{mt}\,(\theta_{mt} - \theta_{ft}). \qquad (4)$$

The left-hand side of Equation (4) is the total log-wage differential. On the right-hand side, the first term is the explained gap (the portion of the gap attributed to gender differences in measured productivity characteristics) and the second term is the residual gap (the portion attributed to unobserved returns and the error terms). When this equation is evaluated at the means, the residual gap represents the dispersion in the male residual wage distribution (σ_{mt}) and the average woman's position in the male residual wage distribution (θ_{ft}). In performing the decomposition, the convention in the literature is to use the male coefficients since it is presumed that male wages better reflect the market payoffs for productivity characteristics than do female wages. The male wage regression coefficients are then applied to female worker characteristics to construct measures of the residual wage gap.

Results from the Oaxaca-Blinder decomposition are reported in Table 5. The table shows that in 1983, the total male-female wage gap (in log points) for all education groups stood at 0.767. This gap can be converted to a ratio of geometric means by exponentiating its negative, yielding a female to male wage ratio of only 46.4 percent. Even though the total wage gap narrowed slightly over time to 0.710 log points in 2004, this end point is equivalent to a relative female wage of 49.2 percent, which is extremely low by international standards. Table 5 also shows that most of the total gender wage gap in India across all education groups remains unexplained by variations in education, experience, and other human capital characteristics. In 1983, 68.2 percent of the wage gap remained unexplained, and after a slight dip in the mid-1980s, the portion of the wage gap that cannot be explained grew to 78.0 percent by 2004. After 1987-1988, the explained gap steadily fell as women gained relatively more education and experience. However, acting against this improvement was a steady widening in the residual gap between men and women.

The Oaxaca-Blinder decomposition results in Table 5 indicate that the increase in the residual wage gap between men and women from 1983 to 2004 occurred across all educational categories in the sample. The largest increases were experienced by those with primary and middle school education. Women with high school and above also experienced an increase in the proportion of the wage gap that is unexplained from 1983 to 2004; however, this increase was more modest in magnitude (and slightly lower than the increase across all education groups) as compared to those experienced by groups with lower levels of education.

Even though the residual gap is commonly attributed to wage discrimination by gender, it may incorporate other economic factors that have little to do with discrimination. The Juhn-Murphy-Pierce (1991) technique provides a more detailed description of the residual wage gap, and the determinants of the total wage differential between men and women. This procedure continues from Equation (4) by expressing the rate of change between year *t* and year *u*, and by using the notation Δ for the male-female difference in the variable that follows. The difference in the gender wage gap between two years is then

$$\Delta w_t - \Delta w_u = (\Delta X_t \beta_{mt} - \Delta X_u \beta_{mu}) + (\sigma_{mt} \Delta\theta_t - \sigma_{mu} \Delta\theta_u). \qquad (5)$$

The final step is to choose year *u* as the base year by adding and subtracting the terms $\Delta X_t \beta_{mu}$ and $\sigma_{mu} \Delta\theta_t$. This algebraic manipulation yields the Juhn-Murphy-Pierce decomposition equation, which is as follows:

$$\Delta w_t - \Delta w_u = (\Delta X_t - \Delta X_u)\beta_{mu} + \Delta X_t (\beta_{mt} - \beta_{mu})$$

$$+ \sigma_{mu} (\Delta\theta_t - \Delta\theta_u) + (\sigma_{mt} - \sigma_{mu})\Delta\theta_t. \qquad (6)$$

On the right-hand side, the first term represents the change in the gender wage gap due to observed worker characteristics, while the second term shows the change due to market returns to these observed characteristics. The third term captures changes in the gender wage gap due to unobserved characteristics. This term is interpreted as changes in the position of women in the male residual wage distribution. The last term represents changes in the gender wage gap due to returns to unobserved characteristics, as reflected in a narrowing or widening in the dispersion of men's residual wages. For each education group, we perform this decomposition for every year of available NSSO data. To avoid possible bias from choosing a particular year to represent the base year *u*, we use the average across the four years of data to measure year *u*. This procedure results in four observations for each term of the equation, which are then regressed on a linear spline with a break point in 1987. We chose 1987 as a plausible break point given that many of the results in the stylized facts section point to 1987 as a pivotal year for structural changes in the labor market.

Coefficients on the time trend variables from these spline regressions represent annual rates of change in the decomposition terms. These results are reported in Table 6. The table shows results for the entire 1983-2004 period as well as the 1983-87 and 1987-2004 sub-periods. A negative sign indicates that the male-female gap has become smaller, and a positive number means the male-female gap has grown larger. In each column and for each education group, the total change in the wage gap must sum to the changes due to the four components (observed characteristics, observed returns, unobserved characteristics, and unobserved returns).

The top row of Table 6 indicates that the overall gender wage gap narrowed slightly during the period of analysis, with forces in opposing directions preventing large changes in either direction. Central among these forces for the aggregate wage gap is a strong widening in the wage gap due to unobserved characteristics after 1987 (that is, some combination of increasing gender differences in unobserved abilities, increasing female intermittency, and growing wage discrimination by gender. On average, changes in unobserved gender-specific characteristics caused the wage gap to widen by 2.8 percent per year between 1987 and 2004. Also contributing to wider wage gaps is the growing dispersion in the returns to education and returns to other observed skills, which caused the total wage gap between men and women to widen by 1.1 percent per year between 1987 and 2004. Helping women overall is the relative improvement in their educational attainment and in other observed skills. This relative improvement contributed to a narrowing in the total wage gap of about 0.5 percent per year after

1987. The narrowing in residual male returns had an even larger contribution (about 1.9 percent annually) in helping to reduce the overall disparity between men's and women's wages.

The remaining results in Table 6 for the disaggregated education groups consistently indicate that changes in unobserved gender-specific characteristics are a sizeable share of the divergence in (total) male-female wage gaps across all four education groups. This component grows by as much as 8.6 percent per year for individuals with primary school attainment, far outweighing any other component for that education group. The other common conclusion across all education groups is a narrowing in the wage gap due to women's relative gains in observed characteristics after 1987, and for the entire period as a whole. However, for high-school and college-educated women, this gain in observed skills is not enough to offset the losses in unobserved characteristics, and the total wage gap for the most highly-educated women increases for the period as a whole.

Forces Behind the Growing Gap in Unobserved Characteristics

An important and interesting question is why the gender gap in unobserved characteristics widens for all education groups after 1987. One explanation is growing gender differences in the unmeasured abilities of new entrants into the labor market. One could argue that an influx of lower-skilled women into the manufacturing labor force during the period may have reduced the average wages of all working women. Under such a scenario, the decomposition analysis would attribute the growing gender wage gap to a widening gap between men and women in unobserved characteristics. Since the NSSO surveys do not follow the same workers over time, we cannot control for changes in unobserved ability as new workers enter the manufacturing sector. Hence, the hypothesis regarding the low ability of new labor market entrants is difficult to test in our data. However, evidence reported in Table 2 shows that the large shift for women workers out of agriculture was redirected more toward services than manufacturing. Coupled with large gains across India in women's literacy rates during the period, these broad changes suggest that an influx of lower-skilled women into manufacturing is unlikely to be the main reason behind the growing gap in unobserved characteristics.

A second explanation is growing differences between male and female workers in unmeasured skills as they age. This argument is particularly relevant if women spend time out of the labor force following childbirth. If labor force commitment by men and women diverged during the period of analysis due to women's increasing intermittency, our measure of potential experience would not be able to capture this change. As a consequence, the expanding gap in unobserved characteristics calculated by the decomposition may reflect women's increasing intermittency. However, demographic evidence from the World Bank (2005) suggests that this is unlikely to be the case. The total fertility rate (births per woman) in India decreased from 3.8 in 1990 to 2.9 in 2003. Moreover, the female labor force participation rate for ages 15-64 increased from 42.4 percent in 1990 to 45.2 percent in 2003. Finally, the proportion of the labor force that is female increased slightly from 31.2 percent in 1990 to 32.6 percent in 2003 (World Bank 2005).

The final explanation for the growing residual wage gap is an increase in wage discrimination against female workers. This result would counter the implications of neoclassical theory on discrimination. Neoclassical theory of labor market discrimination implies that increased competition from international trade will reduce the wage gap. In a market economy where discrimination is costly, employers are less able to indulge their tastes for discrimination as competitive forces drive down profit margins (Becker 1971). To test this idea, we perform industry-level regressions to test the theoretical model of the gender wage gap and foreign trade competition. The empirics examine the relationship between the male-female wage gap and variations across industry and time in the exposure to competition from international trade, while controlling for changes in worker characteristics and domestic concentration. Our identification strategy centers on comparing India's more concentrated manufacturing industries, where firms enjoyed rents and could indulge in their taste for discrimination, with India's less concentrated manufacturing industries, where firms experienced greater domestic competition and were less able to discriminate.[5]

The residual wage series for male and female workers are constructed following the Oaxaca-Blinder decomposition procedure. We aggregate the residual wages by industry and year, and then estimate the determinants of residual wage gaps between men and women at the industry level as follows:

$$w_{imt} - w_{ift} = \beta_0 + C_{it}\,\beta_1 + T_{it}\,\beta_2 + Y\,\beta_3 + C_{it}\,T_{it}\,\beta_4 + C_{it}\,Y\beta_5 + T_{it}\,Y\beta_6 + C_{it}\,T_{it}\,Y\,\beta_7 + \varepsilon_{it.} \quad (7)$$

The notation w_{imt} denotes total male residual wages in industry *i* and year *t*, w_{ift} denotes total female residual wages in industry *i* and year *t*; C_{it} measures domestic concentration by industry and year; T_{it} represents competition from international trade by industry and year; and *Y* represents the year. The final term contains the interaction between domestic concentration and international competition and year ($C_{it}T_{it}Y$). We focus on this term's coefficient as it represents the impact of international trade competition in concentrated industries over time. All regressions are weighted with industry-level employment shares, and year and concentration are included as continuous variables. We use 28 industry classifications, as shown in Appendix Table 2.

Equation (7) is estimated using a panel dataset of industry-level observations over time. These results are reported in Table 7 for six different models. The first three models use ordinary least squares, while models four through six use fixed effects to control for time-invariant characteristics that are specific to each of the industries. The models differ according to the measurement of trade shares: models 1 and 4 use export shares, models 2 and 5 use import shares, and models 3 and 6 use total trade (exports plus imports) shares. To help guide the reader's eye, the coefficients on the key interaction term are highlighted in bold.

Results on the interaction term for concentration, trade, and year in Table 7 indicate that across model specifications, increasing trade openness in more concentrated industries is associated with higher wage gaps between men and women. The coefficient on this interaction term is positive and statistically significant in all six models. The observed changes in the gender pay differentials are likely to have arisen due to pressures from international trade since, as noted above, more concentrated industries are exposed to less domestic competition.

Discussion and Conclusion

If women are bearing a disproportionately large share of the costs of trade liberalization, then a number of policy measures that build women's human capital and strengthen the social safety net may help ease the burden. A policy priority is to achieve gender equality at all education levels so that women have access to the same range of occupational choices as men. Improved educational opportunities also include greater access for working-age women to vocational education; this may be especially useful for women who are displaced as a consequence of increased competition from abroad. Closely related, access to firm-specific training and new programs for accreditation for workers' skills can help to close the gender gap. By building and up-grading skills, vocational education programs and improved opportunities for on-the-job training can help improve women's ability to obtain a wider range of jobs, which, in turn, can help boost women's relative pay. Additionally, stronger enforcement of India's equal pay and equal opportunity legislation, which dates back to the late 1950s, may reduce discriminatory pay practices that appear to contribute to rising residual wage gaps in the manufacturing sector.

To the extent that productivity enhancing policies are not enough to safeguard women who are adversely affected by trade, improved social safety nets can help to reduce the burden that many low-wage women face. For example, greater public provision of day-care services for very young children and after-school services for school-age children can help to decrease the time and budgetary constraints that India's factory workers experience. Furthermore, women employed in export-producing factories often remit high shares of their income to families in the rural sector, at potentially great personal cost. Poor social safety nets in the rural sector contribute to this reliance on remittances from these women. Policy reforms that create a viable infrastructure in the rural sector, including social security, may help reduce the dependence on remittances, and so ease the pressure on such workers. By analyzing the effects of India's liberalization on women's compensation, and by highlighting the fact that female employees in manufacturing industries appear to fare less well as compared to their male counterparts, this study makes an important contribution to the literature by demonstrating that not everyone benefited equally as a consequence of the reforms.

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Table 1. Employment Structure in India by Gender, 1983-2004 (in Percent)

	1983	*1987-1988*	*1999-2000*	*2004*
Male				
Agriculture	60.9%	60.1%	54.7%	50.8%
Mining	0.8%	0.9%	0.7%	0.1%
Manufacturing	11.7%	11.3%	11.0%	11.8%
Utilities & construction	4.1%	5.4%	6.9%	8.5%
Wholesale & retail trade	7.6%	8.0%	12.4%	11.5%
Transport, storage, & communication	3.9%	3.8%	4.8%	5.8%
Business & social services	11.1%	10.5%	9.6%	10.6%
Sample Size	395,829	433,461	185,416	121,890
Female				
Agriculture	86.8%	85.6%	76.7%	53.2%
Mining	0.3%	0.3%	0.3%	0.9%
Manufacturing	5.4%	5.4%	9.0%	11.1%
Utilities & construction	1.2%	2.4%	1.9%	7.3%
Wholesale & retail trade	1.9%	1.8%	4.3%	11.0%
Transport, storage, & communication	0.2%	0.1%	0.3%	5.4%
Business & social services	4.3%	4.3%	7.5%	11.1%
Sample Size	245,344	270,502	80,998	106,199

Note: The results are population-weighted employment shares for all workers aged 15 to 60 who report a defined industry category.
Source: Authors' calculations based on NSSO data.

Table 2. Female-Male Wage Ratios in India's Manufacturing Sector, 1983-2004 (in %)

	1983	*1987-1988*	*1999-2000*	*2004*
Unadjusted Wage Ratios				
All Education Levels	46.4	48.6	48.4	49.2
Illiterate & Some Primary	50.9	52.4	53.2	51.9
Primary School	44.0	54.1	54.4	44.8
Middle School	53.9	44.0	54.8	52.2
High School & Above	59.2	73.2	57.3	64.4

Note: Wage ratios are the ratio of the geometric means of female and male weekly cash wages.
Source: Authors' calculations based on NSSO data.

Table 3. Mean Female Position in the Male Residual Wage Distribution, 1983-2004 (in %)

	1983	*1987-1988*	*1999-2000*	*2004*
Female Position in Male Distribution				
All education levels	27.0	31.1	28.7	24.9
Illiterate & Some Primary	24.3	24.7	22.8	20.8
Primary School	23.2	32.6	31.8	16.8
Middle School	35.1	31.2	27.5	24.5
High School & Above	42.1	48.2	36.4	34.0

Source: Authors' calculations based on NSSO data.

Table 4. Residual Wage Dispersion for Men, 1983-2004 (in Log Points)

	1983	*1987-1988*	*1999-2000*	*2004*
Residual Wage Differential:				
90-10 spread	2.279	2.398	2.295	1.826
90-50 spread	0.851	0.842	0.817	0.714
50-10 spread	1.428	1.556	1.478	1.112
75-25 spread	1.352	1.457	1.084	0.826
75-50 spread	0.515	0.499	0.444	0.382
50-25 spread	0.838	0.958	0.640	0.444

Note: Male residual wages are the portion of wages which cannot be explained by observed characteristics. Each result represents the difference in log wages between men in the indicated percentiles of the residual distribution.
Source: Authors' calculations based on NSSO data.

Table 5. Oaxaca-Blinder Decomposition of Male-Female Wage Gap (in log points)

	1983	*1987-1988*	*1999-2000*	*2004*
All Education Groups				
Total M-F Wage Gap	0.767	0.721	0.725	0.710
Explained Gap	0.244	0.249	0.235	0.156
Unexplained (Residual) Gap	0.523	0.472	0.490	0.554
% Gap Unexplained	68.2%	65.5%	67.6%	78.0%
Illiterate & Some Primary				
Total M-F Wage Gap	0.676	0.646	0.631	0.656
Explained Gap	0.132	0.057	0.056	0.077
Unexplained (Residual) Gap	0.544	0.589	0.575	0.579
% Gap Unexplained	80.5%	91.2%	91.1%	88.3%
Primary School				
Total M-F Wage Gap	0.822	0.615	0.610	0.804
Explained Gap	0.266	0.192	0.167	0.104
Unexplained (Residual) Gap	0.556	0.423	0.443	0.700
% Gap Unexplained	67.6%	68.8%	72.6%	87.1%
Middle School				
Total M-F Wage Gap	0.618	0.822	0.602	0.650
Explained Gap	0.277	0.328	0.178	0.109
Unexplained (Residual) Gap	0.341	0.494	0.424	0.541
% Gap Unexplained	55.2%	60.1%	70.4%	83.2%
High School & Above				
Total M-F Wage Gap	0.524	0.312	0.557	0.440
Explained Gap	0.201	0.215	0.201	0.133
Unexplained (Residual) Gap	0.323	0.097	0.356	0.307
% Gap Unexplained	61.6%	31.1%	63.9%	69.8%

Note. The total wage gap is male wages – female wages; the explained wage gap is gender differences in observed characteristics weighted by male coefficients; and the residual wage gap is the portion that cannot be explained by differences in characteristics. All results are in log points, except the unexplained gap as a share of the total wage gap is in percentage points.

Table 6. Annual Rates of Change in the Male-Female Wage Gap (in %)

	1983-1987 Sub-Period	*1987-2004 Sub-Period*	*1983-2004 Total*
All education levels			
Total change in gap	-0.249	-0.452	-0.298
Change due to observed characteristics	0.148	-2.499	-0.487
Change due to observed returns	-0.080	1.063	0.194
Change due to unobserved characteristics	-0.416	2.845	0.366
Change due to unobserved returns	0.099	-1.860	-0.371
Illiterate & Some Primary			
Total change in gap	-0.539	0.391	-0.316
Change due to observed characteristics	-0.254	-0.556	-0.327
Change due to observed returns	-0.101	1.222	0.216
Change due to unobserved characteristics	0.027	2.072	0.518
Change due to unobserved returns	-0.211	-2.346	-0.723
Primary School			
Total change in gap	-2.007	4.020	-0.560
Change due to observed characteristics	-0.582	-0.727	-0.616
Change due to observed returns	0.092	-0.713	-0.101
Change due to unobserved characteristics	-1.694	8.593	0.775
Change due to unobserved returns	0.177	-3.134	-0.618
Middle School			
Total change in gap	-0.189	0.430	-0.041
Change due to observed characteristics	-0.641	-0.896	-0.702
Change due to observed returns	-0.298	0.224	-0.173
Change due to unobserved characteristics	0.839	2.695	1.284
Change due to unobserved returns	-0.089	-1.593	-0.450
High School & Above			
Total change in gap	1.845	-1.684	0.998
Change due to observed characteristics	0.482	-2.175	-0.156
Change due to observed returns	0.129	-0.135	0.065
Change due to unobserved characteristics	1.069	1.581	1.192
Change due to unobserved returns	0.166	-0.955	-0.103

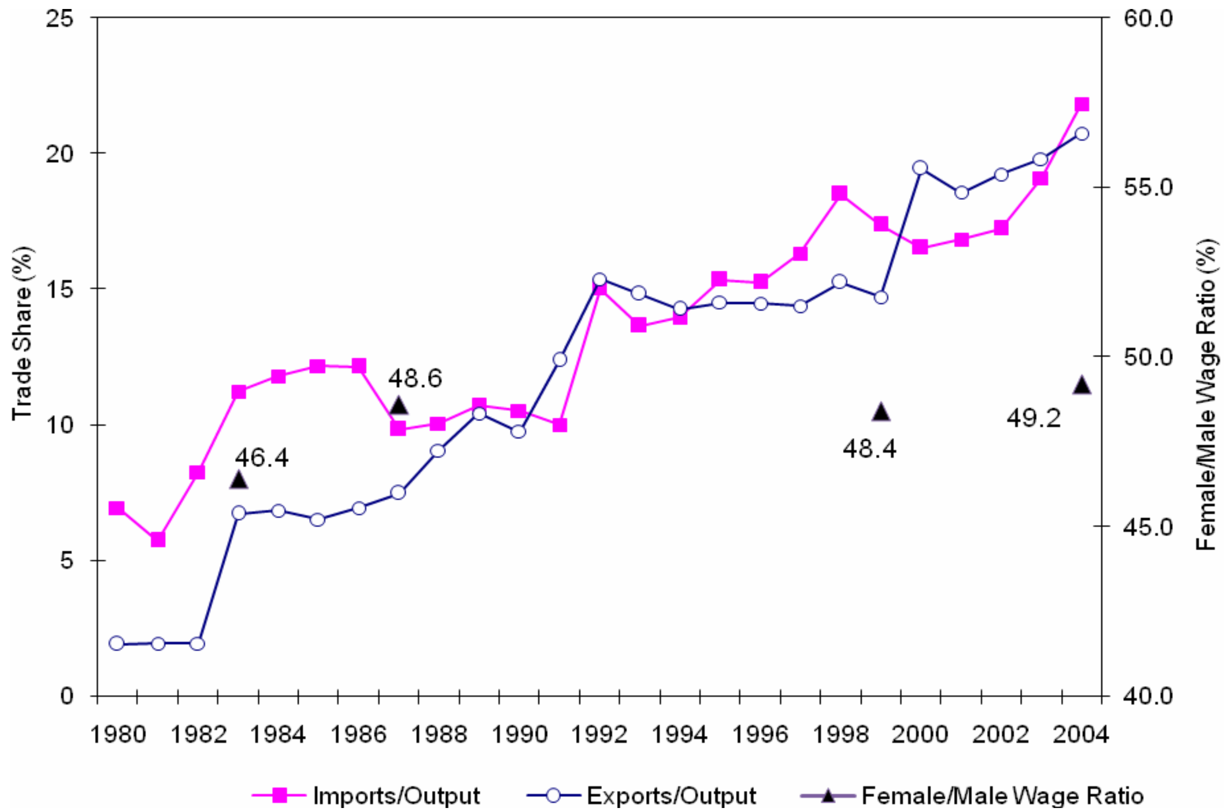
Note. For each education group, we perform the Juhn, Murphy, and Pierce decomposition for each year of available NSSO data. This procedure results in four observations for each term of the equation, which are then regressed on a linear spline with a break point in 1987. Coefficients on the time trend variables are reported above. A negative sign indicates that the male-female gap has become smaller, and a positive number means the male-female gap has grown larger.

Table 7. Test of Male-Female Residual Wage Gaps and Trade Competition
(in log points; standard errors in parentheses).

	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*
Concentration	0.395	-0.690*	1.489*	0.357	-1.098**	0.896*
	(0.719)	(0.406)	(0.852)	(0.460)	(0.443)	(0.472)
Trade	0.573*	0.462***	0.883***	0.689**	0.425***	0.789***
	(0.321)	(0.110)	(0.240)	(0.289)	(0.152)	(0.267)
Year	0.424	-0.351**	0.263	0.071	-0.314***	0.037
	(0.378)	(0.166)	(0.373)	(0.196)	(0.104)	(0.216)
Concen x Trade	-0.574	-0.756***	-1.213***	-0.732**	-0.562***	-0.997***
	(0.386)	(0.151)	(0.336)	(0.327)	(0.171)	(0.309)
Concen x Year	-0.490	0.307	-0.488	-0.149	0.316***	-0.180
	(0.417)	(0.197)	(0.428)	(0.227)	(0.113)	(0.235)
Trade x Year	-0.305	-0.074	-0.237	-0.224	-0.076	-0.187
	(0.186)	(0.065)	(0.158)	(0.149)	(0.046)	(0.127)
Concen x Trade x Year	**0.337***	**0.151****	**0.343***	**0.270***	**0.122****	**0.263***
	(0.202)	**(0.074)**	**(0.174)**	**(0.164)**	**(0.055)**	**(0.138)**
Constant	-0.031	1.304***	-0.446			
	(0.641)	(0.316)	(0.587)			
No. observations	112	112	112	112	112	112
R^2	0.161	0.301	0.157	0.892	0.892	0.894

Note. The dependent variable in all models is the male-female residual wage gap. Models 1 – 3 estimate OLS regressions. Models 4 – 6 estimate Fixed Effects regressions, which include 28 industry dummies. In Models 1 and 4, trade is exports/output; in Models 2 and 5, trade is imports/output; and in Models 3 and 6, trade is (exports+imports)/output. All regressions are weighted with industry-level employment shares; year and concentration are both continuous variables. The notation *** denotes statistically significant at the 0.01 level; ** at the 0.05 level, and * at the 0.10 level.

Figure 1. Trade Ratios and Female/Male Wage Ratios, 1980-2004



Source: Authors' calculations based on data sources in Appendix Table 1.

Appendix Table 1. Descriptive and Regression Analyses: Variables and Data Sources

Variable	Description	Data Source
Gender Wage Gap	Male wages − female wages, by industry (unadjusted wages and residual wages)	National Sample Survey Organization (NSSO) 1983, 1987-88, 1999-2000, 2004
Wage Deflator	Wholesale price index for manufactured products	Ministry of Commerce and Industry, Government of India, 1980-81 – 2004-05
Export Value	Dollar value of India's exports, by industry	Trade, Production and Protection Database (Nicita & Olarreaga 2006), 1980 – 2004
Import Value	Dollar value of India's imports, by industry	Trade, Production and Protection Database (Nicita & Olarreaga 2006), 1980 – 2004
Tariffs	Average tariff rates, by industry	Trade, Production and Protection Database (Nicita & Olarreaga 2006), 1980 – 2004
Domestic Output	Total output, in rupees, by industry	Annual Survey of Industries (ASI), 1980-81 – 2003-04
Exchange Rate	Average annual rupee/US$ exchange rate	Reserve Bank of India, 1980-81 – 2004-05
Domestic Concentration	(1 – No. establishments/output), by industry	Annual Survey of Industries (ASI), 1980-81 – 2003-04

Appendix Table 2. Concordance Between ISIC Revision 2, NIC 1970, and NIC 1998 Codes

Labels	ISIC (rev 2)	NIC 1970	NIC 1998
Food products	311-312	200-219	1511-1549
Beverages	313	220-224	1551-1554
Tobacco	314	225-229	1600
Textiles	321	230-263, 266-269	1711-1730
Wearing apparel (except footwear)	322	264, 265	1810
Leather products	323	290, 292-293, 295-299	1820-1912
Footwear (except rubber or plastic)	324	291	1920
Wood products (except furniture)	331	270-275, 279	2010-2029
Furniture (except metal)	332	276-277	3610
Paper and products	341	280-283	2101-2109
Printing and publishing	342	284-289	2211-2230
Industrial chemicals	351	294, 310-311, 316	2411-2413, 2430
Other chemicals	352	312-315, 317-319	2421-2429
Petroleum refinery	353	304	2320
Miscellaneous petroleum and coal products	354	305-307	2310, 2330
Rubber products	355	300-302	2511-2519
Plastic products	356	303	2520
Pottery, china, earthenware	361	322, 323	2691
Glass and products	362	321	2610
Other non-metallic mineral products	369	320, 324-329	2692-2699
Iron and steel	371	330-332	2710
Non-ferrous metals	372	333-339, 344	2720-2732, 2891-2892
Fabricated metal products	381	340-343, 345-349	2811-2812, 2893-2899
Machinery (except electrical)	382	350-359	2813, 2911-2930, 3000
Machinery (electric)	383	360-369	3110-3230
Transport equipment	384	370-379	3410-3599
Professional and scientific equipment	385	380-382	3311-3330
Other manufactured products	390	383-389	3691-3699

Source: Created by authors, with reference to data in Sivadasan and Slemrod (2006) and Central Statistical Organization (1970, 1998).

Appendix Table 3. Means and Standard Deviations for Wage Earners in Manufacturing,1983-2004

Variable	*Male 1983*	*Female 1983*	*Male 2004*	*Female 2004*
Log real weekly cash wages in rupees	3.978	3.211	4.650	3.940
	(0.937)	(0.793)	(0.872)	(0.972)
Dummy for illiterate individual	0.215	0.603	0.180	0.432
	(0.411)	(0.489)	(0.384)	(0.496)
Dummy for individual with below primary years of schooling	0.151	0.115	0.085	0.060
	(0.358)	(0.319)	(0.279)	(0.237)
Dummy for individual with primary school	0.207	0.152	0.171	0.154
	(0.405)	(0.359)	(0.376)	(0.361)
Dummy for individual with middle school	0.185	0.061	0.256	0.124
	(0.388)	(0.240)	(0.436)	(0.330)
Dummy for individual with secondary school	0.182	0.057	0.192	0.108
	(0.386)	(0.232)	(0.394)	(0.310)
Dummy for individual with graduate school	0.059	0.012	0.117	0.123
	(0.236)	(0.109)	(0.321)	(0.328)
Years of potential experience for individual	20.546	21.371	19.200	21.792
	(12.016)	(12.512)	(11.679)	(12.881)
Years of potential experience for individual squared/100	5.665	6.132	5.050	6.406
	(6.011)	(6.508)	(5.563)	(6.317)
Dummy for individual with no technical education	0.935	0.979	0.912	0.937
	(0.246)	(0.142)	(0.283)	(0.243)
Dummy for individual who is currently married	0.724	0.595	0.701	0.699
	(0.447)	(0.491)	(0.458)	(0.459)
Dummy for scheduled-tribe/scheduled-caste individual	0.177	0.206	0.219	0.286
	(0.381)	(0.405)	(0.413)	(0.452)
Dummy for self-employed individual	0.112	0.206	0.098	0.159
	(0.315)	(0.405)	(0.298)	(0.366)
Dummy for individual of Hindu religion	0.825	0.768	0.844	0.859
	(0.380)	(0.422)	(0.363)	(0.348)
Dummy for households with male heads	0.962	0.785	0.940	0.812
	(0.192)	(0.411)	(0.238)	(0.391)
Dummy for rural areas	0.296	0.531	0.432	0.584
	(0.457)	(0.499)	(0.495)	(0.493)
Number of pre-school children in household	0.636	0.626	0.502	0.396
	(0.863)	(0.877)	(0.792)	(0.721)
Dummy for northern states of India	0.215	0.090	0.264	0.105
	(0.411)	(0.287)	(0.441)	(0.306)
Dummy for southern states of India	0.287	0.591	0.266	0.437
	(0.452)	(0.492)	(0.442)	(0.496)
Dummy for eastern states of India	0.167	0.093	0.110	0.100
	(0.373)	(0.290)	(0.313)	(0.300)
Dummy for western states of India	0.331	0.225	0.360	0.358
	(0.471)	(0.418)	(0.480)	(0.480)
Number of observations	14435	2517	5155	1004

Standard deviations in parentheses. Sample in each year consists of working age population (15-60 years of age) with positive cash wages employed in the manufacturing industry.

Appendix Table 4. Coefficient Estimates from Male Wage Regressions (in log points; standard errors in parentheses).

	1983	*1987-1988*	*1999-2000*	*2004*
Dummy for individual with below primary years of schooling	0.070***	0.054*	0.103***	0.141***
	(0.025)	(0.031)	(0.033)	(0.044)
Dummy for individual with primary school	0.147***	0.109***	0.068**	0.279***
	(0.024)	(0.029)	(0.032)	(0.037)
Dummy for individual with middle school	0.196***	0.248***	0.228***	0.355***
	(0.025)	(0.031)	(0.030)	(0.036)
Dummy for individual with secondary school	0.460***	0.501***	0.473***	0.715***
	(0.028)	(0.031)	(0.030)	(0.040)
Dummy for individual with graduate school	0.818***	0.949***	1.024***	1.246***
	(0.039)	(0.038)	(0.037)	(0.050)
Years of potential experience for individual	0.041***	0.047***	0.041***	0.059***
	(0.003)	(0.003)	(0.003)	(0.004)
Years of potential experience for individual squared/100	-0.056***	-0.061***	-0.059***	-0.092***
	(0.005)	(0.006)	(0.005)	(0.008)
Dummy for individual with no technical education	-0.186***	-0.274***	-0.327***	-0.315***
	(0.032)	(0.032)	(0.034)	(0.042)
Dummy for individual who is currently married	0.120***	0.140***	0.093***	-0.068**
	(0.022)	(0.027)	(0.023)	(0.034)
Dummy for scheduled-tribe/scheduled-caste individual	-0.091***	-0.035	-0.032*	-0.073***
	(0.020)	(0.025)	(0.018)	(0.027)
Dummy for self-employed individual	-0.135***	-0.180***	-0.045**	-0.278***
	(0.025)	(0.029)	(0.021)	(0.037)
Dummy for individual of Hindu religion	0.004	0.009	-0.051**	0.013
	(0.020)	(0.023)	(0.024)	(0.030)
Dummy for households with male heads	0.044	0.117***	0.147**	0.101**
	(0.039)	(0.043)	(0.067)	(0.045)
Dummy for rural areas	-0.105***	0.185***	-0.007	0.004
	(0.017)	(0.028)	(0.018)	(0.023)
Number of pre-school children in household	0.003	-0.003	0.003	0.009
	(0.009)	(0.011)	(0.012)	(0.014)
Dummy for northern states of India	-0.065***	0.043*	0.159***	0.135***
	(0.021)	(0.024)	(0.022)	(0.028)
Dummy for southern states of India	-0.238***	-0.192***	-0.029	-0.072***
	(0.019)	(0.022)	(0.021)	(0.027)
Dummy for eastern states of India	-0.203***	-0.047*	0.152***	-0.055
	(0.022)	(0.026)	(0.031)	(0.037)
Constant	3.461***	3.295***	3.754***	3.806***
	(0.062)	(0.067)	(0.085)	(0.081)
No. observations	14,426	12,028	11,150	5,155
Adjusted R^2	0.115	0.148	0.157	0.259

Note. All estimates are from weighted Ordinary Least Squares regressions. The notation *** indicates statistically significant at the 0.01 level; ** at the 0.05 level, and * at the 0.10 level.

Endnotes

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[1] Agesa and Hamilton (2004) apply a similar methodology to data from the United States in the context of the racial wage gap for men, and they also find little evidence that increasing competition from international trade reduces the racial wage gap.

[2] To prevent distortions from outliers in the mean regressions, individuals with implausibly high weekly cash wages are dropped from the sample. As the cut-off points, we use the rupee equivalent of US$4000 in real 1999 dollars. This cutoff amounts to 41,360 rupees for rural and urban samples in 1983; 66,101.45 rupees for the rural sample and 73,732.16 rupees for the urban sample in 1987-88; 614,757.20 rupees for the rural sample and 707,790.42 rupees for the urban sample in 1999; and 705,184.69 rupees for the rural sample and 876, 846.86 for the urban sample in 2004.

[3] The ASI cover the years 1980-81 through 2003-04, where 1980-81 represents April 1980 through March 1981, and so forth. Because the 2004-05 ASI have not yet been released, we applied the one-year historical average growth rate from 2002-03 to 2003-04 to the base values for 2003-04 in each industry in order to estimate industry-level output and number of establishments for 2004-05. In the regression estimates, we conducted robustness checks that included applying the two-year and three-year historical average growth rates, and the magnitudes, signs, and significance levels on the key interaction term of interest did not vary substantially.

[4] The idea that children bear some of the adjustment costs of trade reforms is consistent with findings in Menon (2007) which finds that states in India that are unionized have higher incidences of labor unrest, disruptions in household earnings, and child labor.

[5] This approach was originally developed in Borjas and Ramey (1995) in the context of overall U.S. wage inequality.