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Trade Policy Liberalization and Gender Equality in the Labor Market: New Evidence for India*

Yana van der Meulen Rodgers, Rutgers University

Nidhiya Menon, Brandeis University

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* Corresponding author: Yana van der Meulen Rodgers, Women's and Gender Studies Department, Rutgers University, New Brunswick, NJ 08901. Tel 732-932-1151 x641, fax 732-932-1335, email yrodgers@rci.rutgers.edu. Contact information for co-author: Nidhiya Menon, Department of Economics & IBS, MS 021, Brandeis University, Waltham, MA 02454-9110. Tel 781-736-2230, fax 781-736-2269, email nmenon@brandeis.edu. We are indebted to Narayanan Subramanian, Elizabeth Brainerd, Puja Dutta, Ira Gang, Subhashis Gangopadhyay, Rachel McCulloch, and participants in the University of Pennsylvania Family Macro workshop and the UNDP-Fordham University gender and poverty series for their helpful suggestions. Funding from Brandeis University's Theodore and Jane Norman research grant is gratefully acknowledged. The usual caveat applies.

Introduction

India adopted several waves of trade and fiscal reforms in 1991, in response to a balance of payments crisis. The reforms included de-regulation, sharp reductions in the number of goods subject to licensing and other non-tariff barriers, reductions in export restrictions, and tariff cuts across all industries. As a consequence of these reforms, firms operating in the Indian economy have faced new pressures to remain competitive by reducing costs. In this research, we address the question of how the increased competition that resulted from trade liberalization has affected the compensation of male and female workers.

With reduced government protection and with increased exposure to competition from abroad, employment and pay patterns in Indian manufacturing industries changed markedly following liberalization. These industries experienced large variation in the timing and extent of tariff and non-tariff reductions during and after the 1991 reforms. The varying rates of liberalization across different industries provide an excellent opportunity for examining the impact of increasing exposure to international trade on gender wage differentials.

Neoclassical theory implies that with competition, discrimination against female workers should diminish over time (Becker 1971). This diminishing occurs because employers are less able to indulge their (costly) tastes for discrimination as competitive forces reduce profit margins. We incorporate this idea into a theoretical model of trade competition, industry concentration, and discrimination. Our theoretical model demonstrates that the implied outcome of a reduction in the wage gap from increased trade competition need not always result.

The theoretical model we develop is then tested on repeated cross sections of India's National Sample Survey Organization data, merged with trade and production data from 1983 to 2004. We employ ordinary least squares and fixed effects techniques at the industry level to

estimate the relationship between the male-female residual wage gap and measures of domestic concentration and international trade competition. Our identification strategy hinges on comparing India's relatively more concentrated and relatively less concentrated manufacturing industries. Since concentrated industries are less sensitive to competition from domestic forces, firms in concentrated industries are likely to enjoy rents, and could thus afford to indulge their taste for discrimination. Discrimination is not as likely to occur in less concentrated industries where rents are negligible due to greater domestic competition. Hence any effect on gender wage differentials in concentrated industries following trade liberalization is likely to result as a consequence of increased competition from abroad rather than from domestic forces.

Results of our empirical specifications indicate that increasing trade openness in India's more concentrated manufacturing industries is associated with growing residual wage gaps between male and female employees. This finding suggests that with declining rents in the concentrated sector post-liberalization, women appear to have borne the brunt of cost-cutting practices in firms' compensation decisions. By analyzing the effects of the Indian trade liberalization on relative pay in manufacturing industries, and by providing empirical evidence that female employees appear to have fared less well as compared to their male counterparts, this study demonstrates that not everyone benefited equally as a consequence of the reforms.

Trade Liberalization and Gender

Trade liberalization has brought a number of opportunities and challenges for male and female workers. Although the literature on international trade and gendered impacts has grown in recent years, little consensus has emerged as to the linkages between trade flows and gender differentials in employment, wages, and other dimensions of human capital. Numerous studies have documented the increasing representation of women in developing country workforces, and

especially in their manufactured export industries. Elson and Pearson (1981) were among the first to show women's growing participation in manufactured export industries. Subsequent work has documented the feminization of the workforce in export-oriented industries, especially in semi-industrialized countries (e.g. Wood 1991, Cagatay and Ozler 1995, Joekes 1995, Ozler 2000). More recently, Nordas (2003) finds a positive and statistically significant relationship between exports and female employment shares in Mauritius, Mexico, Peru, the Philippines and Sri Lanka. Because export-producing industries in these countries tend to hire women, trade policies that promote exports are likely to promote employment opportunities for female workers.

The feminization of the workforce, however, has less relevance in high-income economies where women are often displaced from low-wage jobs in import-competing sectors. Evidence in Anker (1998) indicates that in the manufacturing sectors of middle- and higher-income economies, women are concentrated in industries that have begun to upgrade, shed their workforce, and move abroad to lower-wage countries. In the U.S., Kongar (2006) argues that the U.S. gender wage gap declined largely due to women's job losses in low-wage manufacturing industries that competed with rising imports. Similarly, Berik (2000) finds that greater export orientation in Taiwan after 1980 was associated with a greater reduction in employment opportunities for women compared to men.

Although production for world markets has generated new paid employment opportunities for women in developing countries, these opportunities have not translated into more secure jobs as firms have faced pressures in international markets to keep costs low. Employment is often casual, temporary, and flexible in nature, with poor working conditions and little easing of domestic workloads (Barrientos, Kabeer, and Hossain 2004). Men are more

likely to obtain formal sector jobs while women are more likely to enter the informal sector, contributing to gender inequality. This result was also observed in a case study for India: according to Bhaumik (2003), the growth in the workforce share classified as casual accelerated after 1993 as a result of India's trade liberalization policies, with larger increases for female workers compared to their male counterparts in both rural and urban areas. More generally, the increasing trend of final-goods producers to subcontract towards smaller-scale, often home-based operations, helps to explain some of the casualization of the workforce. Employers find these smaller-scale operations effective because they help to reduce labor costs. Home-based workers are predominantly female, work for lower pay (often on a piece-rate basis), remain uncovered by labor standards that raise the cost of labor, get few benefits, often pay their own utility costs, and work long hours. Such workers are often new labor-market entrants or women who have lost their formal-sector jobs who need to work and care for their children at the same time (Balakrishnan, 2002).

A small but growing number of studies are using Computable General Equilibrium (CGE) analysis to show that new paid employment opportunities generated by trade liberalization have not necessarily helped women because the increase in time use for market work has not been accompanied by a similar reduction in time allocated toward domestic work. The net effect is an increase in women's total work burdens - so trade liberalization has not been accompanied by a reduction in women's share of unpaid domestic work. Arndt and Tarp (2000) and Fontana and Wood (2000) are the first published studies of CGE models that incorporate gender features by distinguishing between men and women in the labor market. Arndt and Tarp (2000) use the gendered CGE approach to analyze the gender effects of technological innovation in agriculture in Mozambique. Simulation results indicate that technological innovation increases

overall production and reduces risk, leading to higher female participation in market-oriented crops as well as higher female wages. However, this positive result may not occur if constraints such as household workloads or limited access to farming inputs prevent women from responding to the new market opportunities. Subsequent work with the Mozambique model by the authors, together with Sherman Robinson, builds in trade policy reforms and finds that the reforms did very little to reduce the gender wage gap, leading the authors to conclude that new reforms ought to focus on skill upgrading and generating employment opportunities across sectors (Arndt, Robinson, and Tarp 2006).

The CGE modeling approach in Fontana and Wood (2000) goes a step further by directly including time spent on unpaid household work and leisure, separately for men and women. Simulations for Bangladesh and Zambia indicate that trade liberalization appears to have a more positive effect for women in Bangladesh than in Zambia because of the higher female intensity in Bangladesh's export-oriented sector. The simulations showed the importance of including household work and leisure directly in the model, thus allowing for the analysis of welfare across dimensions separate from income gains. For example, while tariff liberalization in Bangladesh raises women's labor-market participation and wages, it also causes a reduction in their leisure time. A similar result is found using a gendered CGE analysis for Nepal: trade liberalization raises women's participation in market work and their relative wages, but the impact on domestic work and leisure is ambiguous (Fofana, Cockburn, and Decaluwe 2005). Whenever men participate more in domestic work, women are more responsive to the market and engage in greater amounts of market work. However, women's domestic workloads are not reduced at the same rate.

Trade liberalization can also affect gender equality through the reduction in tariff revenues, which can cause a reduction or a reallocation of government expenditures that affect various dimensions of men's and women's human capital and well-being. Grown (2005) builds this sort of pathway into a framework for understanding the linkages between trade liberalization and access to reproductive health services. Such linkages include direct channels through changes in government expenditures on reproductive health services, as well as trade agreements that include provisions on health care services. Indirect channels include changes in labor market conditions that affect income, mobility, health, and decisions about marriage and fertility. More broadly, Schultz (2006) examines cross-country variation in schooling and health as a basis for gender inequality and finds that trade liberalization is associated with increased trade and with higher levels of education and health, especially for women.

In the analysis of gender wage gaps, one can use a Heckscher-Ohlin framework in the context of skilled and unskilled labor as the two main factor inputs to predict the wage effects of an expansion in trade for a developing country. The demand in this country for relatively abundant, lower-skilled labor will increase, thus leading to a narrowing in the wage gap between higher- and lower-skilled workers. Because women tend to cluster in lower-skilled jobs and men cluster in higher-skilled jobs, these changes in skill demand arising from trade expansion should reduce the gender pay gap in developing economies. Yet a number of studies have documented persistent gender wage gaps in the face of growing trade openness and trade policy reforms. Some view gender wage gaps as a determinant of comparative advantage. For example, in South Korea, gender wage gaps in manufacturing are found to support continued export competitiveness (Seguino 1997). In this case, large gender wage gaps persisted or grew worse in the face of rapid export growth that depended on female labor. Women's real wages failed to

catch up to those of men's, despite favorable market conditions, due to a combination of public and private sector hiring practices, differential training opportunities by gender, and promotion discrepancies that left women in a comparatively weak position to bargain for wage increases that matched productivity increases. The South Korean case is not unique. Busse and Spielmann (2006) find that in a sample of 92 industrialized and developing countries, gender wage gaps are positively linked with comparative advantage in the trade of labor-intensive goods.

Others take the view that gender wage gaps are an outcome of competitive pressures associated with greater international trade. Several studies that have employed econometric techniques to identify the impact of international trade on gender wage gaps have found conflicting results. In particular, Berik, Rodgers, and Zveglich (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. They find that manufacturing industries that were relatively less competitive domestically but exposed to greater competition from imported goods experienced a decline in residual wage gaps.

Several other studies have strengthened the generality of these results to examine trade and gender wage differentials in other open economies. In particular, Hazarika and Otero (2004) find that in Mexico, trade-induced competition in product markets is associated with lower gender earnings differentials.[2] Using a sample of sixteen countries, Behrman and King (2002) similarly find that competitive pressures from international trade are a source of narrowing gender wage inequality. Yet mixed evidence is found in a cross-country study that uses data for more than 80 lower- and higher-income economies. Oostendorp (2004) shows that increased trade is associated with reduced wage gaps, but the opposite result is obtained for the case of

highly-skilled workers in lower-income economies. Hence the impact of trade liberalization on the gender wage gap remains an empirical issue, one that we address in this analysis.

Theoretical Underpinnings

In a neoclassical framework, discrimination is costly to employers and will not persist in a competitive market environment (Becker 1971). This hypothesis can be restated in an open economy context, whereby firms operating in industries that face international competition will experience greater pressure to cut costs, including costs associated with discrimination. In the longer term, discrimination is then expected to lessen in industries that are more open to trade. One can hypothesize that firms in concentrated industries face less competition from other domestic firms, and therefore experience less domestic pressure to cut costs (Borjas and Ramey 1995). If discrimination is costly, then we would expect any observed reduction in wage discrimination against female workers in concentrated industries to be caused by the competitive forces from international trade rather than other domestic firms (Black and Brainerd 2004). In the exposition that follows, Borjas and Ramey (1995) is used as the foundation to obtain an expression for equilibrium wages received by workers employed in the concentrated sector. We build on Becker's (1971) "taste for discrimination" coefficient by introducing a discrimination parameter which may be thought of as a wage premium that is paid to male workers. We then model the distribution of equilibrium wages between male and female employees in the concentrated sector. Our objective is to derive an expression for gender wage differentials in the non-competitive sector.

Neoclassical theory, as espoused in Borjas and Ramey (1995) and others, implies that an increase in trade should reduce the male-female wage gap. Alternative theories imply that an increase in trade can actually increase gender wage gaps in countries where female workers have

lower bargaining power and where women are segregated into lower-paying, lower-status jobs.[3] The model we develop is a combination of these effects.[4]

Following Borjas and Ramey (1995), the domestic economy consists of two sectors, the less-concentrated sector and the concentrated sector.[5] The concentrated sector is composed of n firms, each of whom behaves as a Cournot oligopolist. Total output of the concentrated sector in the domestic economy is composed of the sum of the output of all firms and the volume of net trade. For each firm, domestic production of the consumption good is directly proportional to the total number of workers. Each firm is associated with a union, and together they jointly maximize rents in a Nash bargaining framework. The union receives a proportion of the equilibrium level of rents to distribute among workers. Given the rent maximizing level of output, we can show that wages in the concentrated sector differ from wages in the competitive sector by a mark-up which is often positive. In the case of the data for India, average real wages for workers in the concentrated sector are indeed higher than the average real wages for workers in the less-concentrated sector. Also, since average real wages in the concentrated sector are higher, women may still want to be employed there even though they receive relatively lower pay compared to male workers in this sector.

Departing from Borjas and Ramey (1995), we next model the distribution of wages between male and female workers in the concentrated sector, beginning with the assumption that that the total equilibrium wage in the concentrated industry is the weighted average of the wages paid to male and female workers where weights are the shares of male and female employees. Assume that male and female workers are substitutes in production, but each firm has a distaste for hiring female workers. Using Becker's (1971) idea that the firm must be willing to pay to indulge its distaste, this means that male workers are employed at a relatively higher wage. The

male wage premium can be represented by the parameter d, which can vary between zero and positive infinity, and which we refer to as the discrimination parameter. If $d = 0$ (no discrimination), then there is no wage premium paid to male workers. If $d > 0$, then male workers do receive a wage premium relative to female workers. We postulate that the relationship between d and the volume of net trade is positive. Our justifications include the fact that with trade, rents in the concentrated sector fall. If firms in the concentrated sector have a distaste for women, they may want to maintain male wages at the expense of female wages. With smaller rents, this means that female wages fall more, that is, d increases. Furthermore, following reasoning in Rosen (2003), as a consequence of competition from trade, firms with a lower d exit the market since they have relatively larger wage bills and are thus less profitable. Firms with a higher d remain in the market and protect male workers at the expense of female workers with high wage payments and more favorable employment decisions.

One can then derive an expression for the relative gender wage differential in the concentrated sector that is a function of the various parameters in the model. To examine the net effect of growing trade on the gender wage gap, we take the partial derivative of the gap with respect to net trade and demonstrate that this derivative is positive. That is, the relative wage gap increases with trade competition.

Data Description

To explore the labor market impacts of trade policy reforms, we use five 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), 1993-1994 (50^{th} round), 1999-2000 (55^{th} round), and 2004 (60^{th} round), providing us with data coverage before, during, and after the trade liberalization. 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. The wage variables are aggregated to the industry level using India's National Industrial Classification (NIC) system, which is based on international standards. There are major differences at all levels of disaggregation beyond the one-digit level between the NIC codes; these are incorporated in our empirical analysis.

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). This database is a compilation of data from various sources, including the United Nations Industrial Development Organization (UNIDO), the United Nations Statistics Division (UNSD), and the United Nations Conference on Trade and Development (UNCTAD). We construct three measures of industry-level trade openness: exports/output, imports/output, and (exports+imports)/output. Data on output across manufacturing industries are obtained from India's Annual Survey of Industries (ASI). 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. We also used ASI data to construct an index of domestic concentration across manufacturing industries. This index is based on the number of enterprises relative to output, by industry.

Because the test of the theoretical model is conducted at the industry level, all data series need to be aggregated to the same sets of industries using the same industry codes. We adopted the same categorization as 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 the concordance schedule we created based on information in Sivadasan and Slemrod (2006) and Central Statistical Organization (1970, 1998).

Descriptive Analysis: Trade Liberalization and Gender Wage Differentials

Like many developing countries in the post-WWII era, India based its economic development and trade policies on an import substitution 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). Yet 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, Pavcnik, and Topalova 2007). 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 as pressures from international agencies and creditors subsided.

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. However, individual firms in India faced not only competition from abroad but also from other domestic firms in the same industry. One way to measure domestic competition is firm concentration, and a commonly-used indicator is the number of industry-specific establishments divided by an industry-specific measure of scale. We construct the index of domestic concentration as (1 − #establishments/output), so that higher values correspond with greater concentration (that is, fewer establishments). Results indicate that petroleum refinery, industrial chemicals, and iron and steel rank as the most concentrated industries in India, while wood products, furniture, tobacco, and pottery rank as the least concentrated industries.

To better understand changing trade patterns across industries, we grouped industries into two groups, "more concentrated" and "less concentrated," and constructed average export ratios and average import ratios according to these classifications. As shown in Figure 1, industries that experienced more domestic competition (that is, the less concentrated group) also opened more to international trade after the reforms. Both imports/output and exports/output in less concentrated industries grew more than the corresponding trade ratios in concentrated industries. The figure also shows that imports dominate exports in more concentrated industries, while exports dominate imports in less concentrated industries.

Although trade activity differs considerably across these two classifications of industries, both groups experienced substantial cuts in tariff rates.[6] As shown in Figure 1, tariff rates have fallen drastically since 1983 across industries. On average, the cuts were slightly bigger in more-concentrated industries, falling by 85.5 percentage points from 115.6 percent in 1983 to 30.1 percent in 2004. In less-concentrated industries, average tariff rates fell by 84.0 percentage points, from 112.6 percent to 28.6 percent in the same period. Within these aggregate measures,

the tariff data indicate that the beverages industry (a more-concentrated industry) stands out for exceptionally high tariffs that took a relatively long time to be reduced, while most other industries went through drastic tariff cuts during the reform period. Petroleum and food products (both more concentrated) and plastic products and tobacco (both less concentrated) saw particularly large reductions in tariff rates.

Our theoretical model posits that workers in concentrated industries earn a wage premium compared to those in less-concentrated industries. Table 1 shows that this prediction holds for men and women in both 1983 and 2004. On average, male workers in more concentrated industries reported real wage levels of 4.05 log points, compared to just 3.77 log points in less concentrated industries. The comparable figures for women in 1983 were 3.40 and 3.16 log points. Industries that paid particularly high wages to men and women include petroleum refinery, industrial chemicals, transport equipment, and electric machinery. In contrast, relatively low wage levels were found in tobacco, professional equipment, and leather products. Also, in both years, the wage gap between men and women was higher in more concentrated industries compared to less concentrated industries (0.66 log points compared to 0.62 log points in 1983, and 0.69 log points compared to 0.62 log points in 2004). These descriptive results suggest that women are willing to work in concentrated industries with higher wage gaps because they are earning relatively higher wage levels.

This table of absolute real wage levels and gaps also shows that both men and women experienced real wage gains over time across more and less concentrated industries. However, the wage gains of men exceeded those of women in more concentrated industries, contributing to an average wage gap that grew slightly, while it remained stagnant in less concentrated industries. Thus, the descriptive analysis does not support the prediction that growing

competition from international trade in concentrated industries would cause the wage gap to fall as it becomes more costly for employers to indulge their taste for discrimination.

The employment distribution has also changed substantially over time with trade liberalization and structural change in the overall economy. As reported at the bottom of Table 2, women's representation in the manufacturing labor force has increased, from 15.9% in 1983 to 17.2% in 2004. This increasing feminization of the manufacturing labor force is coming entirely from more concentrated industries, and especially from beverages, rubber products, electric machinery, and footwear. On average, 40 percent of all female workers were employed in more concentrated industries in 1983, and this proportion rose to 44 percent in 2004. Although the higher wage levels in concentrated industries would explain the continued shift of female workers into this sector, male employment shifted toward less concentrated industries despite lower wage levels there. The most noticeable change for men was a movement out of textiles, a more concentrated industry, into a variety of less concentrated industries. For women, an extremely large shift out of the tobacco industry is one of the main forces behind women's increased employment in other industries. In 1983, 42 percent of all female manufacturing workers were employed in tobacco, and by 2004 this share had fallen sharply to 12 percent. The other large employer of women in 1983, textiles, also saw a relative decrease in the distribution of female workers, while apparel and non-metallic mineral products experienced fairly large increases in their shares of the female workforce.

To complete the descriptive analysis, we perform a wage gap decomposition to understand the extent 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. Within the set of worker characteristics that affect wages, we use 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.

Results from the Oaxaca-Blinder decomposition show that a large proportion of the total gender wage gap in India remains unexplained by education, experience, and other human capital characteristics. In 1983, 56.5 percent of the wage gap remained unexplained, and after a dip in the mid-1980s, the portion of the wage gap that cannot be explained grew to 77.7 percent by 2004. During the 1980s, the explained wage gap actually grew, a result that is consistent with findings in Kijima (2006) of a widening in the overall distribution of observed skills during that period. After 1993-1994, the explained gap steadily fell as women gained relatively more education and experience. However, working against this improvement was a steady widening in the residual gap between men and women. Between 1987-1988 and 2004, the residual gap widened from 0.33 log points to 0.53 log points.

Testing the Theoretical Model with Industry-Level Regressions

Next, we perform industry-level regressions to test the theoretical model of the gender wage gap and foreign trade competition. The residual wage series for male and female workers, which can be interpreted as the portion of wages that remain unexplained by observed skill characteristics, 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:

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

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.

To estimate the industry-level wage gap equation, we used two alternative methods that varied in the treatment of the underlying dynamics of specific industry effects. In the first approach, we used ordinary least squares applied to the panel dataset of industry-level observations over time. Our second approach is based on a fixed effects strategy to control for time-invariant, industry-specific characteristics that may impact wage gap determinants. For each approach, six specifications are estimated that vary by measurement of the trade variable (export share, import share, and total trade share) and time (time trend, and a dummy for the post-liberalization years).

Detailed results, which are reported in Menon and Rodgers (2008), indicate that across most model specifications, increasing trade openness in more concentrated industries is associated with higher wage gaps between men and women. The coefficient on the interaction between concentration, trade, and year is positive and statistically significant in four of the six models estimated by Ordinary Least Squares. Furthermore, these observed changes in the

gender pay differentials are likely to have arisen due to pressures from international trade since more concentrated industries experience less domestic competition.

In the fixed effects estimations, the key interaction term for concentration, trade, and year has a positive coefficient in all six models, and this term is statistically significant in three of the six specifications. Hence, trade competition exacerbates gender wage gaps in concentrated manufacturing industries even after controlling for industry-specific effects that are constant over time.

Discussion and Conclusion

This study has found that increasing trade openness in more concentrated industries is associated with growing residual wage gaps between men and women employed in India's manufacturing industries. According to this study's identification strategy, competition from international trade rather than domestic pressures or changes in worker characteristics caused an increase in wage discrepancies between men and women. These results are consistent with the prediction of our theoretical model that with discrimination, international trade can lead to wider wage gaps between men and women. In a scenario with declining rents in the concentrated sector, firms appear to have maintained men's real wage gains at the expense of commensurate wage gains for women, leading to an overall increase in the gender pay differential.

These results are consistent with the story that female workers have relatively weak bargaining power and lower workplace status than men, so they are in a weaker position to negotiate for favorable working conditions and higher pay. This lack of power in the workplace places women in a vulnerable position as firms try to compete on a cost basis in world markets. Outside sources offer numerous examples of how women may end up in positions with less bargaining power and limited wage gains compared to men. For example, a survey of female

workers in India's manufacturing sector indicates that women are segregated into lower-paying jobs, and in cases when they do hold the same job as men, they are still paid a lower wage (South Asian Research and Development Initiative 1999). This source also finds that women are less likely to receive overtime pay when they do work overtime, and they also have inequitable access to training and promotion. These survey results also indicate that union leadership and membership is dominated by men, with explanations including intimidation tactics that make women afraid to join, as well as union meetings held at night when women are caring for their children. These examples, which point to the lack of enforcement of legislation that prohibits sex-based discrimination as well as employer and union practices that favor male workers, provide some context within which to understand why discrimination might persist or worsen in the case of growing competitive pressures from trade liberalization.

Policy reforms that strengthen women's human capital, eliminate discriminatory labor market practices, and develop the social safety net can counteract the forces associated with trade that are undermining women's economic status. Gender equality at all education levels will help women gain access to the same range of occupations as men. Education reforms also include greater access to vocational education for working-age women, especially those who lose their jobs due to increased competition from abroad. Access to firm-specific training and new programs for accreditation for workers' skills can also help women upgrade their skills and increase their chances of obtaining higher-paying jobs that have traditionally been male-dominated or are newly created as a result of trade-induced technological change. A report by the Self Employed Women's Association describes a number of cases in which increasing mechanization in India is associated with job displacement for women (Jhabvala and Sinha 2002). New rice mills in the food processing industry utilizing new husking equipment caused

job losses for women who used traditional husking methods, and similar job displacement patterns were observed for women in textiles and garments as firms adopted new technologies.

Additionally, stronger enforcement of India's equal pay and equal opportunity legislation, which dates back to the late 1950s, will boost women's job security and reduce discriminatory pay practices that appear to be contributing to rising residual wage gaps in the manufacturing sector. Note, however, that policies aiming to raise women's relative pay may be counterproductive if firms relocate in order to avoid paying higher wages. Raising the likelihood that higher wages will stimulate productivity gains and prioritizing gender equality in an open economy may require measures that slow the speed with which firms can leave a country in response to higher wage legislations (Seguino and Grown 2006).

Improved social safety nets can help to ease 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 serve to free up time and financial resources for female factory workers. Also, women employed in export-producing factories often remit high shares of their income back to families in the rural sector. Weak social safety nets in the rural sector contribute to the reliance on remittances from these women. Policy reforms that create a viable social infrastructure in the rural sector, including social security, will lessen the dependence on remittances and ease the pressure on such workers.

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Table 1. Absolute Real Wage Levels and Gender Gaps, by Industry and Sex, 1983-2004 (in log points)

	1983			*2004*		
	Male	*Female*	*Gap*	*Male*	*Female*	*Gap*
More Concentrated Total	**4.05**	**3.40**	**0.66**	**4.76**	**4.07**	**0.69**
Petroleum refinery	4.80	4.55	0.24	5.58	6.31	-0.73
Industrial chemicals	4.28	3.94	0.33	5.30	5.33	-0.03
Iron and steel	4.16	3.73	0.43	5.05	3.72	1.33
Misc. petroleum and coal products	4.00	3.49	0.51	5.76	4.71	1.05
Transport equipment	4.17	4.28	-0.11	5.04	4.56	0.48
Other chemicals	4.15	3.07	1.08	4.87	4.41	0.46
Beverages	3.87	3.70	0.17	4.98	3.92	1.06
Rubber products	3.98	4.19	-0.21	4.78	4.55	0.23
Machinery (electric)	4.24	3.94	0.30	5.35	4.73	0.62
Non-ferrous metals	4.06	3.55	0.51	4.59	3.66	0.93
Footwear (except rubber or plastic)	3.99	2.50	1.49	4.44	3.28	1.16
Textiles	4.04	3.09	0.94	4.56	3.73	0.83
Paper and products	4.01	3.27	0.74	4.86	3.76	1.10
Food products	3.84	3.26	0.59	4.53	4.08	0.45
Machinery (except electrical)	4.06	3.72	0.34	4.99	4.43	0.56
Less Concentrated Total	**3.77**	**3.16**	**0.62**	**4.50**	**3.88**	**0.62**
Glass and products	3.86	3.35	0.51	4.81	4.28	0.53
Leather products	3.78	2.13	1.65	4.52	4.65	-0.13
Professional and scientific equipment	3.76	2.81	0.95	5.00	5.18	-0.19
Plastic products	3.94	3.02	0.93	4.71	4.47	0.24
Wearing apparel (except footwear)	3.83	3.41	0.42	4.50	3.83	0.67
Other manufactured products	3.99	3.04	0.95	4.64	3.88	0.77
Other non-metallic mineral products	3.94	3.42	0.52	4.63	3.99	0.65
Printing and publishing	3.78	3.31	0.47	4.54	4.39	0.15
Fabricated metal products	3.86	3.13	0.73	4.56	3.71	0.85
Pottery, china, earthenware	3.79	4.00	-0.21	4.10	3.39	0.71
Tobacco	3.49	3.19	0.30	4.01	3.52	0.49
Furniture (except metal)	4.06	2.56	1.50	4.47	3.86	0.61
Wood products (except furniture)	3.86	2.61	1.25	4.32	3.47	0.85

Source: Authors' population-weighted averages based on NSSO data.

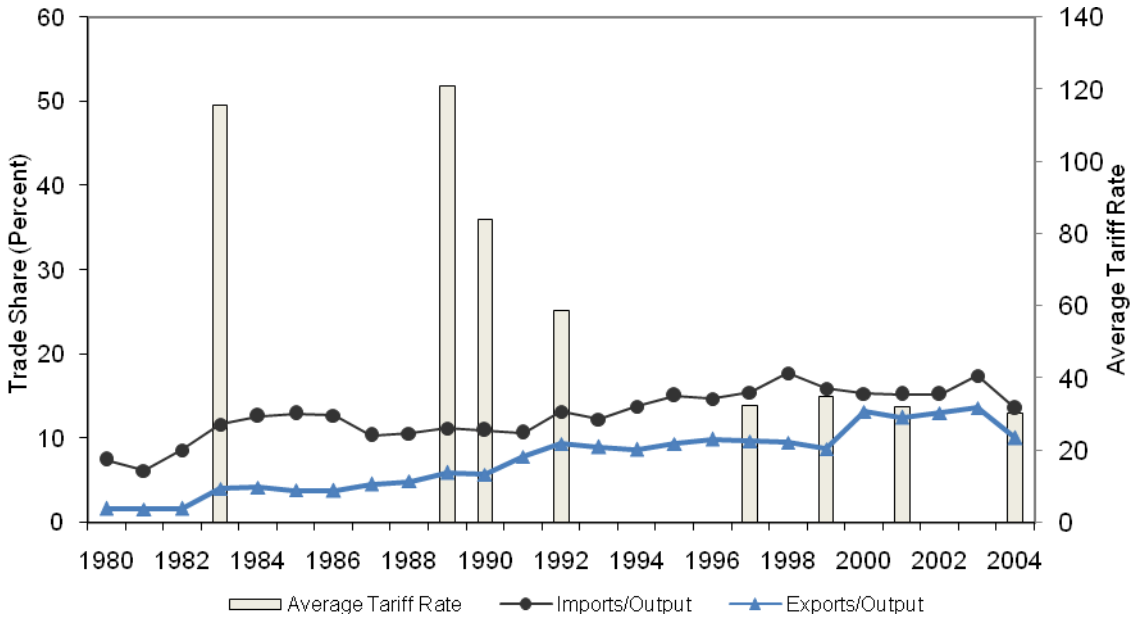
Table 2. Employment Distribution and Female Share of the Workforce, by Industry, 1983-2004 (in Percent)

	1983			*2004*		
	Male	*Female*	*% Female*	*Male*	*Female*	*% Female*
More Concentrated						
Petroleum refinery	0.1	0.1	14.7	0.5	0.1	5.4
Industrial chemicals	2.3	0.1	0.5	1.3	0.8	11.4
Iron and steel	6.5	1.5	4.1	3.4	1.9	10.5
Misc. petroleum and coal products	0.2	0.1	11.8	0.3	0.2	11.3
Transport equipment	4.5	0.5	2.2	4.1	2.7	12.0
Other chemicals	3.8	5.7	22.0	3.4	4.5	21.9
Beverages	0.7	0.2	5.2	0.7	0.8	19.8
Rubber products	0.8	0.1	1.1	1.5	1.6	18.1
Machinery (electric)	4.2	1.0	4.4	1.9	2.4	20.4
Non-ferrous metals	1.2	0.3	4.0	1.9	1.0	9.9
Footwear (except rubber or plastic)	0.7	0.3	6.6	1.3	1.3	16.8
Textiles	24.8	20.3	13.4	18.0	15.3	15.0
Paper and products	1.4	0.7	8.3	2.8	0.2	1.7
Food products	9.9	8.3	13.6	8.9	8.7	16.7
Machinery (except electrical)	4.8	0.5	1.8	4.5	2.7	11.3
Less Concentrated						
Glass and products	1.2	0.6	8.7	1.2	2.3	28.6
Leather products	0.6	0.3	7.7	1.1	0.7	11.5
Professional and scientific equipment	0.5	0.3	9.6	0.3	0.1	8.9
Plastic products	0.9	0.5	9.9	2.1	1.5	12.8
Wearing apparel (except footwear)	3.9	4.0	16.3	6.4	10.0	24.6
Other manufactured products	3.0	1.3	7.5	4.1	2.9	12.7
Other non-metallic mineral products	6.2	7.6	18.8	9.5	12.1	21.0
Printing and publishing	3.0	1.2	7.0	3.1	2.6	14.6
Fabricated metal products	4.9	0.8	2.9	6.1	3.6	11.0
Pottery, china, earthenware	0.2	0.3	20.0	0.3	0.4	20.8
Tobacco	4.8	42.2	62.6	3.0	11.9	45.1
Furniture (except metal)	1.0	0.1	1.7	2.2	2.0	15.7
Wood products (except furniture)	4.1	1.5	6.4	6.0	5.5	15.8
All Industries Total	**100.0**	**100.0**	**15.9**	**100.0**	**100.0**	**17.2**
More Concentrated Total	**65.8**	**39.5**	**10.2**	**54.6**	**44.4**	**14.4**
Less Concentrated Total	**34.2**	**60.5**	**25.0**	**45.4**	**55.6**	**20.2**

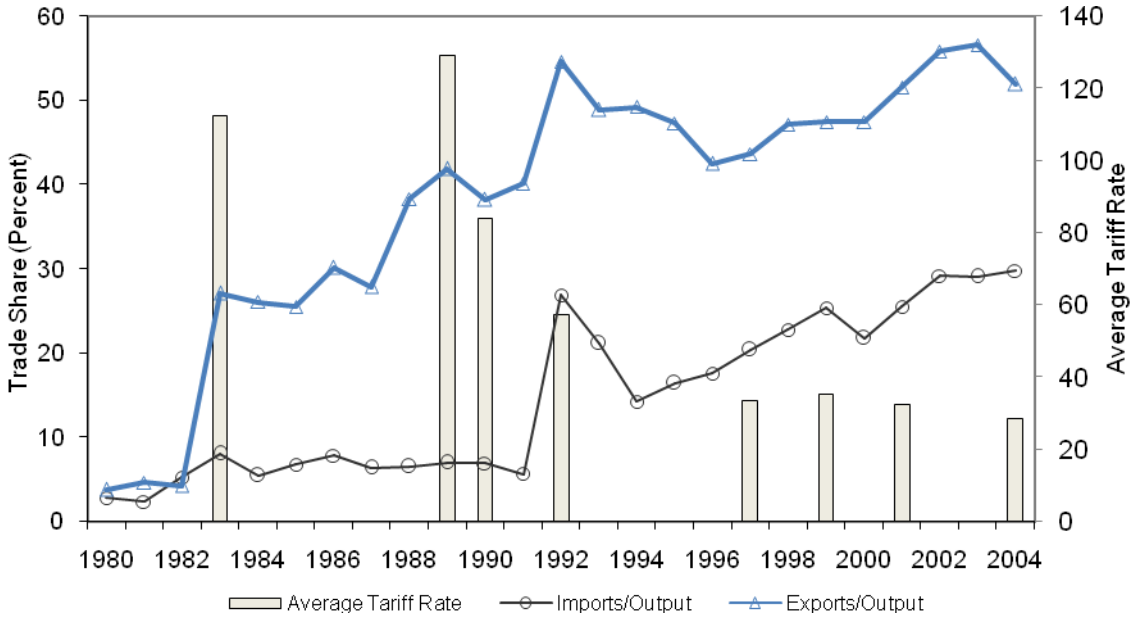
Source: Authors' population-weighted averages based on NSSO data.

Figure 1. Average Trade Ratios and Tariff Rates by Levels of Domestic Concentration

Panel A: More Concentrated Industries



Panel B: Less Concentrated Industries



Note: Industry-level tariffs are the average of tariff rates applied on good entering the country, and average tariffs by concentration are calculated by applying average employment shares to the industry-level tariffs.

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

Endnotes

[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] Artecona and Cunningham (2002) have a similar conclusion for Mexico but the key result not estimated with precision across specifications.

[3] These arguments draw on the implications of non-neoclassical theory in Darity and Williams (1985) and Williams (1987).

[4] The complete model, with corresponding equations, is found in Menon and Rodgers (2008).

[5] Development of the less-concentrated sector follows Borjas and Ramey (1995) and is not discussed in detail here.

[6] Comprehensive data sources on trade policies are less readily available compared to trade values; the tariff data we located in the World Bank's Trade, Production and Protection Database only covered the years 1990, 1992, 1997, 1999, 2001, and 2004. To construct tariff series for earlier years, we used tariff data by industry for the years 1983 and 1989 published in Gang and Pandey (1998a, 1998b) and a concordance table supplied by the authors for consolidating their data into the same 28 manufacturing categories as the World Bank's series.