



# Effects of Trade Liberalization on the Gender Wage Gap in Mexico

Raquel Artecona  
Wendy Cunningham

May 2002  
The World Bank  
Development Research Group/  
Poverty Reduction and Economic Management Network

## **Policy Research Report on Gender and Development**

Over the last several decades, gender issues have attained increased prominence in the debates over development policy. There is a growing body of evidence and experience linking gender awareness in policy and projects to equitable, efficient, and sustainable outcomes in development. However, these links are still not widely understood nor have these lessons been fully integrated by donors or national policy makers.

In mid 1998, work began on the Policy Research Report (PRR) on Gender and Development. The objectives of the report will be to strengthen the analytical and empirical underpinnings of these links and, in doing so, to clarify the value added of bringing a gender perspective to the analysis and design of development policies and projects.

In pursuit of these objectives, the PRR will draw on interdisciplinary perspectives, from research and project and policy experience. The report will incorporate extensive consultation with

Bank staff, researchers and academics outside the Bank, other donor agencies, and groups from civil society. In addition to the consultation process, a series of background papers on selected topics has been commissioned. These papers have been selected to fill some of the gaps in the existing literature as well as to augment knowledge in selected areas.

The Policy Research Report on Gender and Development Working Paper Series is intended to encourage early discussion of the findings of these papers in advance of the expected publication of the PRR. An objective of the series is to get the findings out quickly, even if the presentation is less than fully polished. The papers are preliminary and carry the names of the authors and should be cited accordingly.

The findings, interpretations, and conclusions are the author's own and do not necessarily reflect the view of the World Bank, its Board of Directors, or any of its member countries.

This paper is part of a series of papers on selected topics commissioned for the forthcoming Policy Research Report on Gender and Development. The PRR is being carried out by Elizabeth King and Andrew Mason and co-sponsored by the World Bank's Development Economics Research Group and the Gender and Development Group of the Poverty Reduction and Economic Management Network. Comments are welcome and should be sent directly to the author(s) at: [rartecona@eclac.org](mailto:rartecona@eclac.org) and [wcunningham@worldbank.org](mailto:wcunningham@worldbank.org). Copies can be found online at <http://www.worldbank.org/gender/prr>. For paper copies, please send your request to [Gender\\_PRR@worldbank.org](mailto:Gender_PRR@worldbank.org).

## **I. Introduction**

The assumption that open markets will lead to higher growth that benefit all members of a country is not fully shared by the gender community. Many women's organizations are calling for a halt to the trade reform process until there is a better understanding of its effect on women and on the relationships between men and women (IWGGT 2000, IDS 2000). These concerns are partially based on studies that show that globalization has led to an increase in subcontracting of women (Hale 1998), a decrease in the prices of agricultural goods produced by women (Fontana 1998), and a "masculinization" of typically female employment, such as textiles (UNIFEM 1999). Other studies have shown that trade is beneficial to certain groups of women, though, since it leads to less employer discrimination (Black and Brainerd 1999), a feminization of the highly paid manufacturing sector, and an increased demand for services (which tend to be dominated by women, especially in Latin America) (Fontana 1998). These mixed results indicate that the effect of free trade on women is dependent on the industrial composition of liberalizing countries, the liberalization process, and initial conditions, among other factors (Fontana 1998), so the impacts of open markets on women's or men's welfare cannot be generalized across countries or even across industries within a country. Instead, conclusions of the impacts of trade should be made on a case by case level.

This paper examines the change in the gender wage gap in the manufacturing sector in urban Mexico over the trade liberalization period (1987-1993).<sup>1</sup> Mexico rapidly opened its markets to international trade in the mid-1980s in an effort to align its trade policy with

---

<sup>1</sup> The analysis is limited to the manufacturing sector due to data limitations.

GATT guidelines. The sudden exposure of protected Mexican firms to international competition lead to cost saving adjustments in the composition of the labor force and remuneration. This paper focuses on the gender aspects of the latter question, namely 1) whether or not the gender wage gap in the manufacturing sector did change due to trade liberalization and 2) whether or not this can be attributed to a decrease in discrimination due to the increased competition that was generated by international competition. A difference-in-differences approach is used where the conditional gender wage gap in firms that were competitive before the trade reforms (and thus their level of competition could not have been affected by trade reforms) is compared to the conditional gender wage gap in firms that were protected from internal (via non-competitive markets) and external (via trade barriers) competition in the pre-reform period, but opened to competition in the post-reform period by lower trade barriers that also lowered the level of internal protection.

## **II. Conceptual Framework**

The theoretical literature concludes that trade liberalization leads to a decrease in the gender wage gap. The main theoretical underpinnings come from the Heckscher-Ohlin/Stolper-Samuelson (HO/SS) theory or on Becker's theory of discrimination. Neither of these theories will be selected a priori, but regardless of the model that underlies the econometric tests, the expected outcome is the same: trade liberalization leads to a decline in the gender wage gap.

## 2.1 *Hecksher-Ohlin and Stolper-Samuelson*

Under the Hecksher-Ohlin theory, production will relocate to those sectors that intensively use the relatively abundant factor of production. Since semi- and unskilled labor in Mexico is abundant relative to skilled labor, the demand for the relatively abundant factor should increase and, according to the Stolper-Samuelson theory, the relative price of that factor will increase. This may result in a decrease in the gender wage gap since women tend to have fewer observable job skills than men.<sup>2</sup>

## 2.2 *Discrimination*<sup>3</sup>

Becker (1971) presents an alternative theory for a positive correlation between trade openness and lower gender wage gaps is that international competition should eliminate excess profits that give Mexican firms the resources to pay different wages to men and women with the same skills. Discrimination in the workplace may be caused by employer and/or employee prejudices; both of which impose an additional cost on the firm.<sup>4</sup> Employers or workers who are prejudiced against certain types of workers based on *non-productivity* related characteristics are said to have a “taste for discrimination”, which may raise costs for the firms. If an employer prefers male workers over female workers, he/she will pay men a wage that is higher than their marginal productivity such that the total

---

<sup>2</sup> The education differential between women and men of working age is converging since females in the current generation have equal or higher levels of educational attainment than males. However, there is still a productivity difference due to experience; nearly 93 percent of adult Mexican men are in the labor force while only 40 percent of women are, reflecting women’s frequent entry and exit from the labor force.

<sup>3</sup> This discussion focuses on sex discrimination, but the arguments are robust to all types of discrimination (Becker 1971).

<sup>4</sup> Becker (1971) also discusses consumer discrimination where consumers dislike certain types of people, so they will not purchase goods that are made by or sold by workers who have the offending characteristics. This discrimination in the product market may influence the labor market since employers may be unwilling to hire workers who decrease product demand. Since only the urban manufacturing sector is considered in this analysis, it is unlikely that consumers will be able to identify the individual characteristics of those who created the product. Thus, this type of discrimination will not be considered here.

“cost” to the employer is the same for all workers: men receive  $w+d$  and women receive only  $w$ , where  $d$  is the value of the employer’s distaste for hiring women. The extra  $d$  paid to the men could also be interpreted as a compensating wage differential for men who have a distaste for working with women.<sup>5</sup> Alternatively, if the firm is the only employer in the geographic area or if there is a market-wide distaste for women, women may actually be paid below their marginal product (Becker 1971). This may force the most productive female workers out of the labor force, leading to a less productive labor force overall.

In non-competitive markets, firms will have the excess profits that may be used to “purchase discrimination”, i.e. pay men more than women simply because they prefer men. On the other hand, firms in competitive markets have zero profits so if they buy discrimination, they will have negative profits and go out of business (Becker 1971, Ashenfelter and Hannan 1986). This theory is supported by empirical work in the United States that finds smaller wage differentials between men and women who work in more competitive industries than in those where market concentration is higher (Hellerstein et. al. 1997, Black and Strahan 1999).

Since trade liberalization increases competition, it should decrease excess profits and eliminate those resources that may be used to create the wedge between male and female wages. As economies open, foreign producers will enter profitable national markets. Domestic producers in the (formerly concentrated) trade-impacted industries will

---

<sup>5</sup> Gender identity may be a basis for sex discrimination in the workplace (Akerlof 1999). Individuals belong to groups, whether by nature (sex, age, race, etc.) or by choice (university affiliation, profession, geographical location, for example). Identifying oneself with a group gives an individual pleasure. If an individual attempts to integrate into another group, this may impose a cost of the individuals in the target group. An example presented by Akerlof (1999), argues that men tend to be construction workers. If a woman joins the team, this may be a threat to the men on the team since construction work is a “male” job and forms part of their gender identity. The presence of a woman brings into question this identity, thus causing unhappiness among the male workers. To compensate for this cost, the workers may demand a higher wage, thus leading to a sex-based wage gap.

have to lower their costs and increase their productivity to stay in business, so they will no longer be able to afford the luxury of discrimination. Thus, gender wage discrimination should decrease in those industries. However, the gender wage gap should not change in the highly concentrated non-trade-impacted industries, especially those that have monopsony power, since those firms still earn profits that may be used to discriminate.<sup>6</sup>

### **III. Historical Background**

Although Mexico's trade reform process began in 1985, an import boom did not occur until 1988. In July 1985, Mexico's licensing requirements were decreased from 92.2% (of tariff lines) to 47.1% by the end of 1985, but these were slightly offset by an increase in tariff rates from an average of 23.5% to 28.5%. An import boom did not follow for three primary reasons. First, many of the tariff lines for which the licenses were removed were goods that were already produced more cheaply in Mexico than abroad. Second, licenses were still required in many industries and tariffs were raised on those goods for which there was potential international competition (Tybout 1994). Third, the nominal depreciation rate was kept above the rate of inflation, leading to a real depreciation of the peso (Ten Kate 1992). In 1987, trade protections were substantially reduced (Table 1) to align Mexico with GATT's requirements to reduce official import prices to zero. Furthermore, the depreciation of the peso slowed as the exchange rate of devaluation was

---

<sup>6</sup> Alternatively, technologies that are used in export-industries may be more suited to women's skills. For example, employers often characterize women as being flexible, dexterous, docile, and more amenable to discipline (Chant 1991), which are skills that are more suited to "just in time" organization or total quality control (Fontana 1998). The demand for these skills would increase the demand for females thereby increasing their wage, relative to men. Two studies on the maquiladora industry show contradictory results, though. First, a study on the effects of NAFTA on gender in Mexico showed that the new technologies were more suited to men's skills (UNIFEM 1998). Second a study on the maquiladora industry in Mexico notes that women's share of the labor force has been decreasing relative to men's in the 1990s while technology has been increasing (Fleck 2000).

slowed relative to the rate of inflation. However, inflation and periodic devaluations continued to hinder import growth (Ten Kate 1992).

By late 1988, under the Economic Solidarity Pact, inflation was brought under control, official and free exchange rates were aligned, and tariffs were further reduced, finally leading to a boom in imports (Table 1). Monthly imports increased from \$800 million in early 1987 to \$2 billion by the end of 1988. By the end of 1993, trade reform was largely complete and Mexican firms entered the internationally competitive market (Ten Kate 1992).

### 3.2 *Stylized Facts*

Both men's and women's wages and the gender wage gap increased after the trade liberalization period. Table 2 summarizes the unconditional log mean real wages of men and women before and after the trade reforms. The table is divided into four cells where firms may be classified as concentrated (a proxy for competitiveness) or non-concentrated and as trade impacted (trade barriers in that industry did lower with the reforms) or not trade impacted. By Becker's theory of discrimination, the gender wage gap should be higher in the concentrated industries than in the non-concentrated industries in the pre-reform period. The wage gap should decrease the most in concentrated industries that were exposed to competition through lower trade barriers, i.e. those firms in concentrated, trade impacted industries. Regardless of the degree of concentration (i.e. absence of competition) or openness to trade, real log wages increased for both men and women.<sup>7</sup>

---

<sup>7</sup> The exception is women in non-trade impacted concentrated industries where the mean real log wage did not change

Despite the overall increase in real wages, the gender wage gap became worse in three of the four groups. It only improved in the non-concentrated non-trade impacted industries, an industry that should not have felt the effects of trade and should have had low gender wage gaps to begin with. Among the group that should have benefited from trade - those in the trade impacted concentrated industries - the gender wage gap became even more in favor of men, thus supporting the view that trade is less beneficial to women than men.

These statistics may suggest that women do not reap the full benefits of trade, however the analysis does not take into account that men and women have different productivity-related characteristics. Table 3 shows that working men have more years of experience than do working women but that working women are slightly more educated. If productivity is more highly correlated with experience than education, men will have higher wages simply because they are more productive. Thus, to correctly compare men's and women's wages, the productivity characteristics should be controlled and only the unexplainable portion of the wage gap – where differences in preferences, unobservable productivity characteristics, unmeasured productivity characteristics, and discrimination are captured – should be considered.

#### **IV. Methodology and Data**

A two step process is used to identify whether or not the conditional gender wage gap changed as Mexico opened its economy to international competition. First, a Mincer earnings equation is estimated to explain the log wages of men and women and the residuals are preserved. The difference between the average male and female *residual* log wages in each industry in the sample is calculated, thereby omitting observable

productivity characteristics. Second, this residual is used as the dependent variable in an OLS equation that controls for changes over time, industry concentration, and exposure to trade openness.

#### 4.1 *Log Wage Residual*

The difference in men's and women's wages can partly be explained by differential levels of observable human capital, i.e. education and work experience. The average returns to human capital can be estimated using a typical Mincerian wage equation that regresses the log hourly wage on observable productivity characteristics.

However, earnings equations typically explain less than 25% of the variation in wages, as estimated by  $R^2$ , indicating that most of the factors that contribute to the wage are in the residual. The exact composition of the residual is controversial. It is likely to be a mixture of demand-side non-productivity related characteristics (discrimination), unobservable supply side characteristics (natural ability, self-selection into lower paying jobs, preferences, gender roles), and observable but unmeasured supply side characteristics (real experience, quality of education, occupation-specific training); all of which lead to differential wages among people with the same observable skills. We assume that natural ability, preferences, gender roles, and occupation-specific training stay constant over the six year period and that preferences in real experiences and quality of education change in the same way for both men and women.

To remove the differences in the observed productivity characteristics, the log of real hourly wages is regressed on a set of education dummy variables (vector  $e_1$ ), potential experience ( $e_2$ ) and potential experience squared ( $e_3$ )<sup>8</sup>:

---

<sup>8</sup> Potential experience is defined as: age minus 6 minus years of education. For men, this is an adequate estimate of experience since their labor force participation tends to be uninterrupted, but for women, it is very

$$\ln(w)_j = \alpha + \beta_1 e_{1j} + \beta_2 e_{2j} + \beta_3 e_{3j} + \mu_j \quad (1)$$

for  $j=1, 2, 3, \dots, J$  individuals. This regression is estimated for the pooled sample of male and female full-time employees in the private sector in the pre-reform period (four quarters of 1987 and the first quarter of 1988) and for a similar sample in the post-reform period (the fourth quarter of 1992 and the four quarters in 1993).<sup>9</sup>

The error terms are used to calculate the residual gender wage gap. First, average residual by sex for each industry is given by the mean of the residuals within each sex-industry group for each period. Next the residual gender wage gap for each industry in each period is calculated as the difference in the average residual for men and women in each industry in a single period.

#### 4.2 *Difference-in-Differences*

A difference-in-differences methodology is employed to control for changes over the period that were not a result of the trade liberalization process and changes in wage due to trade liberalization that had nothing to do with the change in competitiveness of certain industries. The goal of the analysis is to determine if gender wage gaps decreased in firms that were directly affected by trade liberalization and if the effect was due to lower economic rents (and thus fewer resources to discriminate). Simply comparing gender wage gaps before and after the trade liberalization period is not sufficient since other factors in

---

imprecise due to their frequent entry and exit from the labor market. Actual experience data is rarely collected, so the derived experience variable is the best estimate available.

the economy that are unrelated to trade may have been responsible for relative changes in men's and women's wages, such as the privatization process, the removal of many barriers to foreign investment, or gender roles. Instead, the model that is estimated should control for any systemic shocks that are not caused by the trade liberalization and for those changes that cannot be attributed to increased competition (and thus decreased wage discrimination by sex). The difference-in-difference methodology (Heckman 1999, Gruber 1994) is simply a conditional estimate that controls for the general economy-wide effects and treatment group effects. Presenting the conditional estimate in a difference-in-difference framework more clearly outlines the role of the various control variables.

A change in the wage gap can occur because of general changes in the economy, changes due to trade, or changes due to the influence of trade on concentrated industries. The differencing eliminates those time-invariant characteristics that drive a wedge between male and female wages. It is more difficult to sort out the other two effects since a trade dummy will pick up both changes due to trade and those due to trade working through concentrated (less competitive) industries. Thus, a change in the conditional wage differential between competitive trade impacted industries and competitive non-trade impacted industries serves as the control variable - any change is solely due to lower trade barriers: since both were competitive industries before the liberalization period, the competition through trade did not make them competitive. A change in the wage differential between non-competitive industries that were affected by trade (trade impacted industries) and non-competitive industries that were not affected by trade (non-trade impacted industries) serves as the treatment variable since the former would become

---

<sup>9</sup> Estimating separate models for men and women would omit the information about the gender wage gap that is due to discrimination and other unexplained differences between women and men. Thus, a pooled sample

competitive through the liberalization period while the latter would remain non-competitive (and maintain their profits that allow them to wage discriminate). Thus, a change in the wage differential between these two types of industries is due to both changes caused directly by lower trade barriers and indirectly through increased competition created by lower trade barriers. Differencing the differences from each pair will give us the change due to trade working through concentrated industries alone:

$$\begin{aligned}
 & (\Delta \text{ wage gap in non-trade impacted} - \Delta \text{ wage gap in trade impacted})_{\text{competitive}} \\
 & - (\Delta \text{ wage gap in non-trade impacted} - \Delta \text{ wage gap in trade impacted})_{\text{non-competitive}} \\
 & = \Delta \text{ wage gap in competitive trade impacted industries due only to liberalization}
 \end{aligned}$$

Where the first term captures changes in the wage gap due to trade only (but not due to a change in competitiveness), the second term captures both the change in the wage gap due to trade and to becoming competitive, and the difference is the change in the wage gap that is solely due to becoming competitive.<sup>10</sup> This can be restated in a regression framework:

$$(res_{mi} - res_{fi})_{t+1} - (res_{mi} - res_{fi})_t = \alpha + \beta_1(\text{concentration})_i + \beta_2(\Delta \text{tariff level})_i + \beta_3(\text{concentration} * \Delta \text{tariff level})_i \quad (2)$$

where  $(res_{mi})_{t+1}$  is the average male wage residual in industry  $i$  in period  $t+1$  (the post-reform period),  $(res_{fi})_{t+1}$  is the average female wage residual in industry  $i$  in period  $t+1$ , and similarly for  $(res_{mi})_t$  and  $(res_{fi})_t$ . Thus, the left hand side is the change in the conditional

---

is estimated where men and women are treated as identical agents.

<sup>10</sup> In other words, the equation may be represented as: (change in wage gap due to trade) – (change in wage gap due to trade and change in wage gap due to increased competitiveness) = change in wage gap due to increased competitiveness.

wage differential over the reform period. The “*concentration*” variable is a dummy generated from the Herfindahl index in 1987; it should be positive since more concentrated industries have positive profits and thus may pay male workers higher wages. The “*Δtariff level*” variable is the difference in tariff levels in each industry between the pre- and post-reform period. Under the H-O/S-S, it should lead to a lower wage gap as trade should increase demand in the manufacturing sector for women. However, if the abundant factor is more skilled workers, then it will take a negative value since women tend to have less observable productivity characteristics. The third term is an interaction between competition and trade openness. If trade does require concentrated (non-competitive) industries to eliminate discriminatory practices in order to compete in the world market, this variable would take a negative sign. The industries in each concentration and trade openness category are listed in the Appendix.

### 4.3 *Data*

Several data sources are used to create the following variables:

1. Wage equations. The residual wages for men and women are generated from the Mexican *Encuesta Nacional de Empleo Urbano (National Urban Employment Survey)*. The pre-reform data are drawn from the data sets collected in all four quarters of 1987 and in the first quarter of 1988 while the data for the post-reform period are from all four quarters of 1992 and the first quarter of 1993. The survey includes demographic, labor supply, and remuneration information for approximately 1,250,000 individuals, of which more than 85,000 (in 1987 and 1988) and 150,000 (in 1992 and 1993) are adults working in

the manufacturing sector who are ages 16-65.<sup>11</sup> The industrial codes are disaggregated to the 4 digit level. The categories are not identical to the Standard Industrial Coding (SIC), but a codebook makes conversion relatively simple.

2. Import Penetration. Industries are classified as trade-impacted if the import share increased by at least 10% between 1987 and 1995. The import share is defined as the value of imports as a percentage of the value of domestic shipments. Data from the Annual Summary of *Comercio Exterior (International Business)* gives the value of imports by industry (6 digit SIC level) in millions of dollars for 1987<sup>12</sup> (the pre-reform period) and for 1995 (the post-reform period). The data on the value of domestic shipments is calculated by INEGI (National Statistical and Geographic Institute) from the *Encuesta Industrial Mensual (Monthly Industrial Survey)*.

3. Industrial concentration. The Herfindahl index, a proxy for industrial concentration,<sup>13</sup> is calculated using data on the value of sales at the firm and industry level in the 1985 *Encuesta Nacional de Empleo, Salarios, Tecnología y Capacitación en el Sector Manufacturero (National Survey of Employment, Salaries, Technology and Training in the Manufacturing Sector)*.<sup>14</sup>

---

<sup>11</sup> The sample size is larger in the latter period due to a larger sample collected. Although additional municipalities were added to the sample by INEGI (National Institute of Statistics and Geography) in the latter period, these observations were dropped from the sample used in this analysis.

<sup>12</sup> Missing values in the 1987 data are supplemented by data from the 1990 *Comercio Exterior*.

<sup>13</sup> Ashenfelter (1986) did a similar exercise for the US banking industry but tested whether the best proxy for competitiveness was the firm concentration ratio, the Herfindahl index, or a dichotomous measure of concentration. The coefficient estimates for all three were of the similar magnitude and significance level. Therefore, we will assume that the Herfindahl is a good proxy for the level of industrial competition, where

$$H = \sum_{i=1}^I m_i^2 \text{ and } m_i \text{ is the share that each firm in industry } i=1, \dots, I \text{ has in the total production of industry } i.$$

<sup>14</sup> It is not necessary to have information on the competitiveness of a firm in the post trade period. The firm only needs to be classified in its initial state since we assume that if an industry is exposed to trade liberalization, the firms in that industry will face higher competition than they did in the protected period. Thus, a firm is identified as competitive in the post-reform period if it was competitive in the pre-reform period or if it was non-competitive in the pre-reform period but was liberalized under the new trade regime.

4. Tariff and Quota Rates. The tariff and import- license data used are from unpublished records of SECOFI.<sup>15</sup> They correspond to the production weighted-average tariffs and import-license coverage by four-digit industry for the period 1984-1990.<sup>16</sup>

## **V. Results**

### *5.1 General results*

In 1987, protected industries paid higher wages to men than women. Table 4 establishes the pre-trade reform situation by estimating the relationship between the gender wage gap and measures of market power in 1987. Industries that are more protected in the domestic sphere (proxied by the concentration ratio), in the international sphere (proxied by the tariff rate ) or both (the interactive term) have higher gender wage gaps, though the coefficients on the total market power variable is not significant at the 10% level. Since these industries are protected and thus are likely to have excess profits, the gender wage gap may be partly explained by their ability to use their excess profits to pay men higher wages than women.

Table 5 reports the estimation of equation (2). The dependent variable is the change in the residual gender log wage gap from 1988 to 1993, so a decline in this variable indicates an improvement in female relative wages over the period. The dependent variable is regressed on the change in the trade openness, the concentration ratio in the base year, and the interactive term. Three indicators for trade openness are used in three separate estimates: change in tariff rates at the industry level, change in industrial import penetration rates, and change in industry-level quotas.

---

<sup>15</sup> These data were made available by Ann Harrison and Gordon Hanson.

<sup>16</sup> Since most of the effects of trade openness occurred by 1990, it is not necessary to use 1993 data.

The positive coefficient on the concentrated industry dummy in the first and third column of Table 5 indicates that the residual gender wage gap increased in concentrated, (non-competitive) industries relative to competitive industries, but the coefficient is not significant for any regression. The positive sign does not necessarily contradict the theory, though, since all concentrated industries were not necessarily opened by trade liberalization. The negative sign in the second column may be due to the smaller sample size such that those industries that dropped from the sample, due to missing import penetration data, were concentrated and experienced an increase in the wage gap. However, since the coefficients are not significantly different from zero, there may not be any change in the wage gap across industries with different concentration levels, on average.

The exposure of non-competitive industries to international trade does not seem to affect the gender wage gap in those industries. Contrary to H-O/SS, following the trade reform, the ratio of skilled to unskilled wages increased dramatically in Mexico (Hanson and Harrison 1999, Feenstra and Hanson 1997). Since female workers comprise a large share of the less skilled workers in Mexico, trade will also increase the relative wage of men to women so an increase in the gender wage gap should be observed in trade-impacted industries, regardless of the initial level of concentration. The negative coefficient in the change on tariff and quota variables (positive in the “change in import share”) variables suggests that the gender wage gap grew more in industries that experienced greater increases in foreign competition relative to industries that experienced little or no competition from increased trade. However, again, the coefficients are not significant,

except in the third regression where the coefficient on the quota variable is marginally significant at the 20% level.

The key variable of interest for this paper, however, is the interaction between the concentrated industry dummy variable and the change in import share variable. A positive (negative) coefficient on the interactive term for regressions 1 and 3 (2) would indicate that the gender wage gap has declined more in concentrated industries that experienced a trade shock relative to competitive industries that were also affected by trade. This is exactly what is weakly observed in all three models estimated. The results are insensitive to the choice of trade impacted indicator. Although all three coefficients have the sign predicted by Becker's theory of discrimination, only the coefficient on the interactive term in the third regression is significant, and then only at the 20% level. Thus, the results weakly suggest that lower trade barriers indirectly improve women's remuneration, relative to men's, by increasing competition and lowering excess rents that may have been used to create a wedge between male and female wages.

### 5.3 *Sensitivity Tests*

The weak coefficient estimates may be due to outliers that are affecting the means estimates. A DFITS sensitivity test is performed for each regression, to identify those observations with very large differences between the observed value and the fitted value. The industries that are identified as outliers are dropped and the estimated regression coefficients are reported in Table 6.

The results are similar to those in the complete regressions, but the coefficient estimate on the interactive term in column 1 is more significant than while the estimate for

column 3 is no longer significant. Thus, we conclude that the results are not driven by outliers but the significance of the coefficients is sensitive to them. This may be a result of the reduction in the degrees of freedom of an already small sample.

## **VI. Conclusions**

Trade liberalization was found to be associated with higher gender wage gaps in the Mexican manufacturing sector, but this is likely due to an increased premium to men's higher (experience) skills; the discrimination component of wage differentials seems to fall with competition that is brought about by international competition. A comparison of men's and women's wages before and after Mexico's trade liberalization period shows that the wage gap in the manufacturing industry increased. However, the increase in the wage gap appeared to be due to general movements in the economy over the period and an increased premium to skills, as found by Hanson and Harrison (1999). When purging the sample of these two effects, we find suggestive evidence (significant at the 20 percent level) that trade liberalization leads to a decrease in wage discrimination. In particular, in those industries that were forced to become competitive due to trade liberalization, the gender wage gap *fell*. This may be attributed to discrimination since, as discussed by Becker in his classic 1971 dissertation, firms that are competitive (and are not monopsonies) do not have the profits to wage discriminate. These findings indicate that trade may be beneficial to women by decreasing wage discrimination, but an improvement in women's relative wages will depend on improving women's skills to better compete in the newly competitive markets.

## VII. Tables

TABLE 1: Trade and exchange rate statistics

	1985*	1986	1987	1988	1989	1990
Annual inflation rate <sup>1</sup>	56.7	73.6	139.7	112.7	26.5	28.1
Official exchange rate <sup>2</sup>	96.6	142.9	125.5	98.6	100.1	---
Free exchange rate <sup>2</sup>	104.3	144.7	135.5	100.4	101.5	---
Licenses(as % of domestic production) <sup>2</sup>	92.2	57.6	42.2	42.4	38.4	11.2
Tariff (mean) <sup>2</sup>	23.5	24.5	11.8	10.2	12.5	---
Official import prices <sup>2</sup>	18.7	18.7	0.6	0	0	---
% change in import volume from previous year (in 1995 US\$) <sup>1</sup>	10.9	-7.6	5.1	36.7	18.0	19.7

\* June 1985, all other years are December.

<sup>1</sup> *International Financial Statistics*, IMF

<sup>2</sup> Ten Kate (1992) and Tybout (1994)

TABLE 2: Mean Real Hourly Wages (in natural logs)

		Concentrated Industries			Non-concentrated Industries		
		Male	Female	Male/Female	Male	Female	Male/Female
<b>Trade Impacted</b>	Pre-reform	0.11	0.10	1.10	0.15	0.13	1.20
	Post-reform	0.17	0.12	1.43	0.18	0.14	1.29
<b>Not Trade Impacted</b>	<b>Pre-reform</b>	0.14	0.11	1.33	0.14	0.10	1.33
	Post-reform	0.17	0.11	1.59	0.16	0.14	1.19

TABLE 3: Mean characteristics of the labor force, by gender

	Pre-reform		Post-reform	
	Male	Female	Male	Female
education	8.17	8.53	9.35	9.88
experience	20.7	16.42	17.9	14.52

TABLE 4: Conditional gender wage gap in the pre-reform period\*

Concentration ratio	0.212 (1.97)
Tariff rate	0.0013 (0.871)
Concentration ratio * tariff rate	0.0044 (1.79)
Constant	0.000271 (0.00)
Sample size	103
Adjusted R <sup>2</sup>	0.0093

- t-values in parentheses

TABLE 5: Impact of Trade on Male-Female Wage Differentials in the Mexican Urban Manufacturing Sector<sup>\*+</sup>

	<b>Change in Tariffs</b>	<b>Import Penetration Ratio</b>	<b>Change in Quotas</b>
Concentration ratio (competitiveness)	.0067 (.051)	-.072 (-.471)	.2927 (1.017)
$\Delta$ Trade Openness	-0.000015 (-.007)	.0075 (.603)	-.2729 (-1.494)
$\Delta$ Trade Openness *Concentration ratio	.005167 (.915)	-.0062 (-.495)	.4068 (1.34)
Constant	-.0133 (-.197)	-.03019 (-.369)	-.2626 (-1.517)
Sample Size	71	38	71
Adjusted R <sup>2</sup>	-0.0178	-0.0621	0.005

\* t-values in parentheses

<sup>+</sup> Dependent variable: (male wage residual – female wage residual)<sub>post-reform</sub> – (male residual – female residual)<sub>pre-reform</sub>

TABLE 6: Regression Results after sensitivity tests

	Change in Tariffs	Import Penetration Ratio	Change in Quotas
Concentration	0.028 (0.25)	-0.089 (-0.67)	0.59 (0.21)
Change in openness	0.00043 (0.2)	0.0037 (0.28)	-0.039 (-0.21)
Interactive	0.0064 (1.27)	-0.0067 (-0.28)	0.17 (0.6)
Constant	0.016 (0.25)	-0.0014 (-0.02)	-0.029 (-0.16)
Industries dropped*	2021 2053 beer 3412	2053 3319 3321 3640	2053 2091
Adjusted R <sup>2</sup>	0.0038	-0.066	-0.015
Sample size	67	34	69

## VIII. References

- Akerlof, George (1999) "The Economics of Identity" *mimeo* (Brookings Institute, Washington, DC)
- Ashenfelter, Orley and Timothy Hannan (1986) Sex Discrimination and Product Market Competition: The Case of the Banking Industry" *Quarterly Journal of Economics* 51(1), 149-173.
- Becker, Gary (1971) *The Economics of Discrimination* (Univeristy of Chicago Press: Chicago, IL).
- Black, Sandra and Elizabeth Brainerd (1999) "Importing Equality? The Effects of Increased Competition on the Gender Wage Gap" *mimeo*.
- Black, Sandra and Philip Strahan (1999) "Rent-Sharing and Discrimination: The Effects of Deregulation on the Labor Market" *mimeo*.
- Chant, Sylvia (1991) *Women and Survival in Mexican Cities: Perspectives on Gender, Labor Markets and Low Income Households*.
- Feenstra, R.C., and G.H. Hanson. 1997. "Foreign Direct Investment and Relative Wages: Evidence from Mexico's Maquiladoras," *Journal of International Economics*, 42: 371-394.
- Fleck, Susan (2000) "A Gender Perspective on Maquila Employment and Wages in Mexico" in Maria Correia and Elizabeth Katz (eds.) *The Economics of Gender in Mexico: Work, Family, State and Market*, forthcoming.
- Fontana, Marzia, Susan Joeekes and Rachel Masika (1998) "Global Trade Expansion and Liberalization: Gender Issues and Impacts" BRIDGE Development and Gender, report #42.
- Gruber, Jonathan (1994) "The Incidence of Mandated Maternity Benefits" *AER* 84(3), 622-641.
- Hale, Angela (1998) *Trade Myths and Gender Reality: Trade Liberalisation and Women's Lives* (Global Publications Foundations, International Coalition for Development Action and Women Working Worldwide), 2nd edition.
- Hanson, Gordon and Ann Harrison (1999) "Trade Liberalization and Wage Inequality in Mexico" *Industrial and Labor Relations Review* 52(2), 271-287.
- Heckman, James, Robert J. Lalonde and Jeffrey A. Smith (1999) "The Economics and Econometrics of Active Labor Market Programs" in Orley Ashenfelter and David Card (eds.) *The Handbook of Labor Economics*, Volume 3A.

Hellerstein, Judith, David Neumark and Kenneth Troske (1997) "Market Forces and Sex Discrimination" *NBER Working Paper Series* #6321.

IWGGT (Informal Working Group on Gender and Trade) (2000), "Gender and Trade: Some Conceptual Links" <http://www.icftu.org/english/equality/eeqgenderandtrade.html>.

Ten Kate, Adriaan (1992) "Trade Liberalization and Economic Stabilization in Mexico: Lessons of Experience" *World Development* 20(5), 659-672.

Tybout, James and M. Daniel Westbrook (1994) "Trade Liberalization and the Dimensions of Efficiency Change in Mexican Manufacturing Industries" Georgetown University Working Paper #92-03.

UNIFEM (1998) *El Impacto del TLC en la Mano de Obra Femenina en Mexico* (UNIFEM: Mexico City, Mexico).

**Appendix:** Industries in increasing order of tariff reduction and categorized by concentration level (H = Herfindahl index)

Not Concentrated (H < 0.12)	Concentrated (H >= 0.12)
1	Containers and products of tin
2 Cookies, crackers and tortillas	
3	Beer
4	Carpets, rugs and durable fabrics
5 Containers of paper and cardboard	
6 Sodas	
7	Perfumes and cosmetics
8	Food coloring and concentrate
9	Other glass products
10 Containers of paper and paperboard	
11	Glass of all kinds
12	Manufacturing of automobiles and trucks
13	Insulated fabrics
14	Forging, pressing, stamping and roll-forming of metal; metallurgy
15	Radios, televisions, etc.
16	Other fabricated metal products
17 Pulp, paper and cardboard	
18	Containers of glass
19	Metallurgic of lead, zinc, etc.
21 Non-metal furniture (preferably wooden furniture)	
22	Structural metal products, tanks, reservoirs and steam generators.
24 Fine materials (cashmere, etc.)	
25 Paints, varnish and lacquer	
26 Structural metal products, tanks, reservoirs and steam generators.	
27	Non-Refractory clay products
28 Woolen yarn	
29	Corrugated paper and paperboard
30 Man-made fibers	
31 Home appliances and parts	
32 Tripaly y fibracel	
33 Plastic materials and products	
34	Asbestos products
35 Concrete	
36 Preparation and packaging of fruits and legumes	
37	Coffee and tea
38	Chewing gum production
39	Beverages made from agave (except pulque)

---

40	Rum, vodka and gin
41	Wines and liquors
42	Beer
43	Cigarettes
44	Socks
45	Sweaters
46	Clothing, except shirts
47 Clothing, except shirts	
48 Clothing, except shirts	
49	Shirts
50 Clothing, except shirts	
51 Pillows, cushions and mattresses	
52	Ceramics
53 Paper, printing, etc.	
54 Metal furniture and accessories	
55	Refractory clay products
56	Tires and inner tubes
57	Discs
58	Repairs and accessories for trucks and automobiles
59	Candies and chocolates (including cocoa products)
60	Starch and yeast
61 Fish and Seafood	
62	Rum, vodka and gin
63	Shoes
64	Office machinery, calculators, etc.
66	Repairs and accessories for trucks and automobiles
67	Lace and ribbons
68	Industrial Gas
69 Thread and yarn from soft fibers	
70	Fiberglass
71	Accumulators, primary cells and primary batteries
72 Plastic Materials y products	
73 Preparation, preservation and packaging of meat	
74 Plastics in primary forms and synthetic rubber	
75	Metallurgic of copper
76 Basic Chemical Products	
77	Thread and materials from coarse fibers
78	Dyes and pigments
79 Other rubber articles	
80 Machinery and electrical industrial	

---

---

equipment	
81	Repairs and accessories for trucks and automobiles
82	Wire and products of wire
83	Agricultural tools without engine
84	Insulation
85	Bodies (coachwork) for motor vehicles; trailers and semi-trailers
86 Thread and yarn from soft fibers	
87	Detergents, soaps and tooth paste
88 Knotted and crocheted fabrics and articles	
89	Repairs and accessories for trucks and automobiles
90	Plastic and plastic products
91 Basic chemical products	
92	Shoes
93	Motorcycles, bicycles, etc.
94	Electric lamps and lighting equipment
95	Basic chemical products
96	Repairs and accessories for trucks and automobiles
97	Motors and its parts for trucks and automobiles
98	Electric Materials and accessories
99	Casting of iron and steel
100 Machinery for extractive industries and construction	
101	Lifting and handling equipment
102 Electric motors, energy generators, etc.	
103	Metallurgic of aluminum and soldering
104	Preparation and spinning of textile fibers; weaving of textiles
105 Plastic Materials and products	
106 Other machinery and equipment	
107	Parts and repairs for communication equipment
109 Medical products	
110 Matches	
111 Cement	
112 Manufacture of steam generators	
113	Construction and repair of train materials
114 Pumps, compressors, taps and valves	
115	Recycling of oils and additives
116	Manufacture of television and radio transmitters and apparatus for line

---

---

117	telecommunications
118 Wheat grinding	Casting of iron and steel
119 Grinding of corn and other cereals	
120	Insecticides and pesticides
121 Vegetable Oil	
122 Animal Food	
123	Evaporated, concentrated and dry milk
124	Manufacture of agricultural and forestry machinery
125 Forging, pressing, stamping and roll-forming of metal; powder metallurgy	
126 Fertilizers	
127 Casting of iron and steel	
128 Milk production	

---

\*Some industries appear more than once, with different levels of tariff reductions and in some cases industries with the same name appear as both concentrated and non-concentrated. This is because industries that were separated under the 1975 Census classification (used in the Herfindahl index calculation) were grouped in the National Accounts codification from where the industry names were drawn. The industries that appear more than once are: shoes; beer; containers of paper and cardboard containers; structural metal products, tanks, reservoirs and steam generators; thread and materials from soft fibers; forging, pressing, stamping and roll-forming of metal; metallurgy, plastic and products of plastic, basic chemical products, parts and repairs for automobiles and trucks, clothing (except shirts).