NBER WORKING PAPER SERIES

DID TRADE LIBERALIZATION HELP WOMEN? THE CASE OF MEXICO IN THE 1990S

Ernesto Aguayo-Tellez
Jim Airola
Chinhui Juhn

Working Paper 16195
http://www.nber.org/papers/w16195

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
July 2010

We would like to thank Carolina Villegas-Sanchez for helping us with the programs and we would also like to thank INEGI officials for granting on-site access to the establishment level data used in this study under the commitment of complying with the confidentiality requirements set by the Mexican Laws and in particular, to Maria Luisa Meza Leon, Lizi Ivette Gonzalez Jimenez and Gabriel Romero Velasco. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

Did Trade Liberalization Help Women? The Case of Mexico in the 1990s
Ernesto Aguayo-Tellez, Jim Airola, and Chinhui Juhn
NBER Working Paper No. 16195
July 2010
JEL No. J16,J21,J31,O19,O24,O54

ABSTRACT

Using household and establishment level data which span the 1990s, we examine the impact of trade liberalization policies on women's labor market outcomes in Mexico. We find that that women's relative wage remained stable while employment increased, leading to an increase in women's wage bill share. Between-industry shifts, consistent with trade-based explanations, account for up to 40 percent of the growth in women's wage bill share between 1990 and 2000. Comparing across industries, we find tariff cuts and exports are positively related to industry growth and women benefited since some of the fastest growing industries were female-intensive industries. We use establishment level data for the manufacturing sector to examine within-industry shifts in women's wage bill share. Even controlling for detailed industry and maquiladora status, women's wage bill share is positively related to exports by foreign firms, suggesting that trade liberalization further encouraged outsourcing and assembly-type activity. Finally, we find suggestive evidence that household bargaining power shifted in favor of women. Expenditures shifted from goods associated with male preference, such as men's clothing and tobacco and alcohol, to those associated with female preference such as women's clothing and education.

Ernesto Aguayo-Tellez
Facultad de Economia
Universidad Autonoma de Nuevo Leon
Monterrey, Nuevo Leon C.P. 64930
ernestoaguayo@gmail.com

Jim Airola
DRMI
Naval Postgraduate School
Monterey, CA 93943
jsairola@nps.edu

Chinhui Juhn
Department of Economics
University of Houston
Houston, TX 77204-5882
and NBER
cjuhn@uh.edu

I. Introduction

A large literature examines the impact of trade liberalization on wage structure in both developed and developing economies. The findings have been surprising. Contrary to the Heckscher-Ohlin model which predicts that wage inequality should rise in skilled labor abundant (developed) economies but fall in less skilled labor abundant (developing) economies, most researchers have found that trade liberalization increased wage inequality in both developed *and* developing economies.[2] A related literature also examines how trade liberalization impacts poverty rates and has found mixed results.[3] Compared to the number of studies that examine the distributional impacts across skill and income groups, there is relatively little work examining consequences across gender.[4] This is surprising given that gender equality, along with ending hunger and poverty, is one of the eight stated goals in the U.N. Millennium Development Goals Report (UN, 2009). Given that many developing countries have already or are now in the process of adopting liberalization policies, an important question is whether this will move them closer to the goal of gender equality without explicit policy interventions. Aside of equity concerns, the effect of liberalization policies on gender outcomes may also be of interest from a long-run growth perspective since there is now growing evidence that empowering women promotes education and better children's outcomes (Thomas (1990), Duflo (2000), Qian (2008)).

[2] Among others, Robbins (1996), Wood (1997), Behrman, Birdsall, Szekely (2000) cover multiple countries. Cragg and Eppelbaum (1996), Revenga (1997), Hanson and Harrison (1999), Melendez (2001), Feliciano (2001), Airola and Juhn (2008) examine Mexico. Currie and Harrison (1997), Pavcnik (2002), and Attanasio, Goldberg, Pavcnik (2004) examine trade and wages in Morroco, Chile, and Colombia respectively.

[3] While Goldberg and Pavnik (2007) find little systematic relationship between tariff changes and poverty in Colombia, Topalova (2007) finds a positive relationship between tariff reductions and poverty rates across Indian states. Using a measure called "globalization" which also includes FDI flows, Hanson (2007) finds that in Mexico, states more exposed to globalization had reductions in poverty rates relative to states that were less exposed.

[4] Oostendorp (2004) presents cross-country analysis relating the gender gap to measures of trade and FDI. The paper finds that trade and FDI inflows reduce the gender gap among low skilled occupations while results are mixed for high skilled occupations. A recent volume, Bussolo and De Hoyos (2009) also examine the link between trade liberalization and poverty through the channel of women's labor market outcomes.

In this paper we examine the distributional impact of trade liberalization policies across gender using data from Mexico. In doing so we have three main goals. Our first goal is to provide a comprehensive picture of women's relative labor market outcomes during the period of reform. While most papers focus on the gender wage gap, we examine employment changes in conjunction with wage changes.[5] We use household surveys to examine the entire economy rather than focusing on tradeables or the manufacturing sector. Since employment rates are still low for women in Mexico (44 percent in 2004), we also examine whether changing selection may be biasing our story. Our second goal is to link women's labor market outcomes to trade liberalization policies. We conduct industry level analysis relating changes in relative labor market outcomes of women and the industry level changes in tariffs and trade flows. We also use establishment-level data from the manufacturing sector to examine within-industry shifts. Finally, our third goal is to move in the direction of examining women's well-being. We examine household expenditures to see whether women's bargaining power within the household improved along with their relative earnings.

To summarize our findings, we find that women's relative wage remained stable over this period while employment increased, suggesting relative demand for female labor increased. Between-industry shifts account for up to 40 percent of the increase in wage bill share of women from 1990 to 2000. Our conclusion is that trade-based explanations can potentially explain a large amount of the total change—particularly when one compares to similar studies conducted

[5] Papers which examine the gender wage gap include Brown, Pagan, and Rodriguez-Oreggia (1999) which decomposes the gap into the component due to differences in characteristics between men and women and the component due to discrimination. Pagan and Ullibarri (2000) find that the gender gap is larger for older workers, larger in smaller firms, large in the informal sector, and larger at the border. Sanchez and Pagan (2001) find a large earnings gap between female and male-owned micro-enterprises which is partly explained by lower levels of education and experience of female owners although surprisingly, not much is explained by differences in sectoral composition of female and male-owned businesses. An exception in this literature is Melendez (2001) which examines employment changes as well as wage changes and uses a labor demand framework similar to ours. Compared to his analysis, we use the larger Census samples and specifically focus on gender.

in the U.S. (Berman, Bound and Griliches (1994) and Mexico in an earlier period (Revenga (1997) and Hanson and Harrison (1999)). Comparing across industries, we find tariff cuts and exports are positively related to industry growth. Women benefited since some of the fastest growing industries were female-intensive industries. Trade variables, however, cannot explain the large decline in agricultural employment, suggesting the importance of other farm-related policies such as the elimination of price subsidies and land reform. We also use establishment level data for the manufacturing sector to examine within-industry shifts in women's wage bill share. We find that even controlling for detailed industry and maquiladora status, women's wage bill share is positively related to exports by foreign establishments, suggesting that trade liberalization further encouraged outsourcing and assembly-type activity.

Women's relative earnings increased but are they necessarily better off? We end with suggestive evidence that women's bargaining power within the household improved along with their relative earnings. Household expenditures shifted from goods associated with male preference, such as men's clothing and tobacco and alcohol, to those associated with female preference such as education and women's clothing.

This paper is organized as follows. Section II briefly summarizes the tariff reductions resulting from the signing of NAFTA. Section III documents the changes in the gender gap and relative supply of female workers. Section IV examines between and within-industry shifts in female wage bill share and links these changes to trade liberalization policies. Section V reports the results on household expenditure patterns. Section VI concludes.

II. Mexico's Trade Liberalization in the 1990s

Mexico implemented unilateral tariff reductions in the 1980s to join the GATT in 1986. By 1987, the highest tariff was reduced to 20% and the tariff structure was simplified to include only 5 different rates: 0%, 5%, 10%, 15%, 20%. Starting in 1990, Mexico's opening strategy switched to pursuing bilateral free trade agreements, with the most important being the North American Free Trade Agreement (NAFTA) with U.S. and Canada which took effect in 1994. NAFTA reduced tariff rates with the U.S. from a maximum of 20% to zero in 15 years and many of the reductions to zero took immediate effect (Zabludovsky, 2005). Figure 1 shows trends in effective tariff rates separately for U.S. and other non-NAFTA countries. Table 1 reports tariff changes by industry. Columns (1) and (2) show Mexican import tariffs in 1993 before NAFTA as well as the change in tariffs from 1993-2000. Columns (3) and (4) report U.S. tariff levels in 1993 and the change from 1993-2000.[6] The table illustrates the bilateral nature of the agreement where reductions in Mexican tariffs were accompanied by corresponding reduction in U.S. tariffs. "Textiles" and "Clothing" are especially notable in that NAFTA abolished relatively high tariffs in these industries on both sides of the border.[7] Since more than 80% of the trade occurs with the U.S., the decline in effective tariffs resulted in dramatic increases in trade flows. Figure 2 shows the trends in exports and imports as fractions of GDP. The figure shows that while the unilateral tariff reductions had some impact in the 1980s, trade flows accelerated in the 1990s. Interestingly, trade flows appear to have stagnated again in the 2000s mostly likely due to a recession in the U.S. and China's entry into the WTO.

[6] The Mexican tariff data are from the volume published by Ministry of the Economy (formerly SeCOFI), Fracciones Arancelarias y Plazos de Desgravacion, Tratado de Libre Comericio de America del Norte (1994). The U.S. tariff data are from Romalis (2002). For both Mexican and U.S tariffs, we begin with 8-digit harmonized tariff system categories and aggregate up to 3-digit SCIAN97 (NAICS) categories using initial import and export shares. Details of the construction of the tariff data are in the data appendix.

[7] The correlation of Mexican and U.S. tariffs changes reported in the table is approximately 0.3.

In addition to NAFTA, Mexico also engaged in other important reforms during the 1990s which most likely amplified the effects of trade liberalization policies. One of the most important changes was the easing of restrictions on foreign ownership of assets in 1989 with further consolidation and extension upon the signing of NAFTA (Hanson (2007)). Before this change, foreign direct investment occurred exclusively through the "maquiladoras," the export assembly establishments which were largely foreign-owned. The "maquiladoras" were created in the 1960s as an exception to the import-substitution policies that prevailed during the period. Firms were allowed to import duty-free inputs and machinery as long as the final output was exported abroad. The maquiladoras were allowed to be a hundred percent foreign-owned and thus became a vehicle for FDI (Hanson, 2004). With the signing of NAFTA, not only did these firms continue to grow but foreign firms engaged in similar export assembly activity also increased. For example, the share of establishments without the official "maquiladora" designation who report being engaged in export activity and being at least 10 percent foreign-owned increased from 10 to 12 percent from 1991 to 2000.[8] Overall, the stock of foreign direct investment in 1990 U.S. dollars increased over 300 percent from 1990 to 2000.[9]

NAFTA impacted the agricultural sector by reducing tariffs on staples such as corn. While the tariff reductions were phased in gradually with the last of the tariffs being eliminated in 2008, other important reforms which impacted the agricultural sector took place in conjunction with the tariff reductions. Price supports were eliminated in favor of direct income transfers with the final programs being phased out by 2008. In addition, the Mexican Constitution was amended in 1991 to allow the "ejidatarios," peasants who had benefited from land reform, to gain property rights and be able to sell their land (McMillan, Zwane, Ashraf

[8] Based on our calculations using establishment level data, ENESTyC.
[9] These numbers are based on Lane and Milesi-Feretti (2007) which reports the stock of FDI investment in 1990 U.S. dollars. They also make adjustments for depreciation and changes in the real exchange rate.

(2007)). While it is difficult to separate out the contribution of each policy change, the outcome was a steep decline in employment in the agricultural sector.

III. Relative Wage and Employment Trends 1990-2000

A. Women's Relative Wage

Figure 3 documents changes in relative wage of women during the period 1984-2004. We use the multiple rounds of a representative household survey, Household Income and Expenditure Surveys (ENIGH) and the 10% samples of the Mexican Population Census of 1990 and 2000 available from the Census IPUMS. Our wage sample consists of men and women who are 15-64 years old, who reported working full-time (30 hours or more), and who either did not have self-employment earnings or reported that they were not self-employed. Additionally, since we are calculating means in figure 3, we are wary of outlier observations and proceed by deleting the top and bottom 1 percent of observations by gender.[10] Details of the data construction and sample selection statements are in the data appendix.

Figure 3a graphs the mean female-male wage ratio. The figure shows that women's relative wage fell from 1984 to 1989, but there is no clear trend since that period. In the census data, the wage ratio rose slightly from .81 in 1990 to .84 in 2000. Figure 3b shows mean wage ratios holding fixed the composition of workers across age and education categories.[11] Figure 3b illustrates that correcting for compositional changes makes little difference. In figure 3c we examine whether deleting self-employed workers substantially biases our results. We include self-employed workers in figure 3c and find similar trends. Finally, in figure 3d we examine the

[10] We experimented with various alternative cutoffs and other measures such as medians and log wage differences and found similar trends in relative wages.

[11] In order to hold composition across education and age constant, we first calculated average wages by single-year age and education categories and aggregated over these groups using a fixed distribution across all years.

most inclusive sample by including self-employed workers and part-time workers. We report hourly wages by dividing weekly wage by hours worked per week. We find that women are paid slightly better than men on an hourly basis (the ratio is often greater than 1) and moreover, at least according to the Census samples, hourly wages of women increased relative to wages of men during the 1990s. This suggests that we may be slightly understating wage gains of women by focusing on full-time wage and salary workers. The basic message we take away from the figure is that the gender wage ratio was relatively constant during the period of reform, 1990 to 2000.

B. Employment and Female Share of the Labor Force

We next examine changes in employment to population ratios of women and changes in the female share of the labor force. Table 2 reports the employment to population ratios of all women who are 15-64 years old, as well as employment to population ratios disaggregated by education category. Employment rates are much lower in Mexico than that observed in developed countries—for example, the ratio for comparable women in the U.S. during this period would be .60 and higher. Over the 1990s, employment-population ratios increased between 12.3 (ENIGH) and 13.4 (Census) percentage points.

Table 3 describes the changes in female share of the labor force. Top panel reports shares based on the ENIGH while the bottom panel refers to data from the Census. Panel A reports female share of total hours worked. Panel B reports labor shares in efficiency units. Focusing on the Census-based results in the bottom panel, the table shows that both measures of

female labor share increased by approximately 5 percentage points with the change in hours shares being slightly larger.

The decline in the female/male wage ratio from 1984 to 1989 is consistent with the increase in the relative supply of women where rapid entry of women led to a decline in own wage. Since 1989, however, relative wage of women have remained relatively constant while the relative supply of women have increased. Taken together, the evidence on the gender wage gap and relative supplies suggest that relative demand for women must have increased since 1989. In the special case of Cobb-Douglas production where the elasticity of substitution between male and female labor equals one, one can interpret changes in female wage bill share as an increase in relative demand for female labor (see Autor and Katz (1999)). Wage bill shares are reported in Panel C and the table shows that wage bill shares of women also increased by approximately 5 percentage points.[12] Taking wage changes together with employment changes, the aggregate evidence suggests that women's labor market outcomes improved over the period of trade liberalization.

One possible issue is that selection of working women may have changed during this period. For our purposes, if the selection of working women improved over time, we would be overstating their underlying wage gains. We addressed this issue somewhat by holding the composition of observable characteristics such as age and education fixed in figure 3b. We extend these results further by looking at married women and their spouses' characteristics in

[12] In calculating wage bill shares, we also allow group specific wages to vary by year. More specifically, we define 10 five-year age groups and 5 education groups. We use our wage sample to calculate average wage of group j in year t in the following manner: $W_{jt} = \frac{\sum_{i \in j} Wageinc_{it}}{\sum_{i \in j} Hours_{it}}$ and use our quantity sample to sum total hours by group j in year t as $H_{jt} = \sum_{i \in j} Hours_{it}$. Wage bill share of women in year t is calculated as follows: $WB_t^f = \frac{\sum_j \left(W_{jt}^f * H_{jt}^f\right)}{\sum_j \left(W_{jt} * H_{jt}\right)}$.

table 2 of the appendix. The top panel of appendix table 2 refers to all women. The table shows that 21 percent were working in 1990 and 35 percent were working in 2000. The average difference in years of schooling between workers and non-workers decreased from 3.1 to 2.1 years. For the wage sample, 16 percent of women were in our wage sample in 1990 and 23 percent in 2000. The gap in schooling between women in the wage sample and not in the wage sample also declined from 3.1 to 2.4. The bottom panel examines married women with spouse which consists of approximately 60 percent of women in the 15-64 age range. Among married women the table shows that not only did own education gap fall between working and non-working women, the education and wage gap of their spouses also fell. Given the strong positive assortative mating patterns, husbands' characteristics can be viewed as another indication of wife's quality. The comparison of working and non-working women over time suggests that working women have become less positively selected over time and that we may in fact be understating the rise in return to female labor.

IV. Are Women's Labor Market Outcomes Linked to Trade Liberalization?

A. Theoretical Link between Trade Liberalization and Gender Outcomes

The previous section showed that women's labor market outcomes improved during the 1990s. Our goal in this section is to explicitly link these changes to trade liberalization policies. Before making our arguments, however, it is first useful to review the theoretical channels that link trade liberalization policies to gender outcomes. Trade liberalization can impact relative wages and employment if men and women are imperfect substitutes in production and different industries utilize male and female labor in different intensities. Qian (2008) discusses how the

tenderness of the tea leaves requires careful plucking, giving women comparative advantage while men's height and stature give them comparative advantage in orchard crops. Similarly, women may have comparative advantage in light assembly manufacturing while men have advantage in heavy manufacturing that requires strength. Assuming men and women are imperfect substitutes in production, the labor demand framework that has been used for skill demand can be applied to discuss and quantify relative demand for female workers.[13] In this framework, factor intensities vary by industry, and trade liberalization, by affecting the growth of different industries, will generate relative demand shifts by gender.[14]

Another channel through which trade liberalization policies can affect gender outcomes is through technology. Trade liberalization can lead to the expansion of the export sector and the presence of foreign-owned exporting firms. These foreign firms may be more capital-intensive and/or bring more advanced technologies (Javorcik (2004), Arnold and Javorcik (2009)). These technologies may be more complementary with female than male labor. Galor and Weil (1996) and Welch (2000) explore the notion that women have advantage in cognitive vs. physical skills and that advances in technology increase the relative demand for women over time. Using U.S. data, Weinberg (2000) shows that female employment growth is positively related to computer-use across industries and occupations.

A third channel is through the reduction in discrimination brought about by foreign competition. Consistent with the original insight of Becker (1957), Black and Brainerd (2002)

[13] See for example, Katz and Murphy (1992), Bound and Johnson (1992), Berman, Bound, and Griliches (1994). This framework is adopted by Acemoglu, Autor, and Lyle (2004) who examine the impact of WWII mobilization rates on female labor supply and consequently on their relative wage. Their estimates of the elasticity of substitution between men and women suggest that "men and women are close but far from perfect substitutes."

[14] Alternatively, men and women may be perfect substitutes in production but may differ only in terms of the skill levels they embody (Bussolo and De Hoyos (2009)). In this case, to the extent that trade liberalization policies positively impact less skilled workers as predicted by Heckscher-Ohlin, women who are the less skilled workers should benefit. There are two problems with this. First, there is little evidence that trade liberalization benefited less skilled workers. Second, as we show, hourly wages of women are no lower than hourly wages of men suggesting that most of the gender gap is generated by hours differences.

report that U.S. industries which were subject to more competition through trade experienced greater reductions in earnings and employment disparities between men and women.[15] A recent paper by Levine, Levkov and Rubinstein (2009) exploits cross-state variation in bank deregulation to show that entry of new firms leads to reductions in racial wage discrimination.

In the following analysis, we focus mainly on the first channel where trade liberalization impacts the growth of different industries. We also examine whether women are complementary with technology or capital in our establishment-level analysis. The important question of whether trade liberalization induces competition and reduces discrimination we reserve for future work.

B. Between-Industry Shifts in Female Wage Bill Share

Table 4 reports labor shares across broad industry classes using Census data. The most significant change reported in the table is the declining share of agricultural employment throughout the period. According to the Census, agriculture's share fell from 12.5 percent in 1990 to 7.7 percent in 2000. As indicated in column (3) female labor share in agriculture in 1990 was only 2.9 percent. Since predominantly men work in agriculture in Mexico, we would expect this to negatively impact men relative to women. Somewhat surprisingly, the manufacturing sector also decreased modestly. Instead, several services sectors registered large growth, such as retail, professional services, education, hotel and restaurants, and other services.

Table 5 disaggregates the manufacturing sector further and shows that while manufacturing employment was flat overall, there have been winners and losers within manufacturing. Female-intensive sectors such as "clothing" and "computers and electronics"

[15] Artecona and Cunningham (2002) employ the same methods for Mexico but do not find a significant relationship between tariff changes and reductions in the gender wage gap across industries.

grew while predominantly male-intensive sectors such as “petroleum and coal products,” “chemicals” and “primary metal” declined. “Transportation equipment” which includes car assembly, on the other hand, grew over this period.

One method of summarizing these changes is to calculate within and between-industry changes in employment and wage bill shares of female workers. Between-industry changes in women’s wage bill share would be consistent with trade based explanations. For example, tariff reductions in the advent of NAFTA may have increased the relative size of the manufacturing export sector which more intensively utilizes female labor. These types of changes would be captured by between-industry shifts and we view gauging the importance of between-industry shifts as the first step towards assessing the role of trade liberalization policies.

We decompose the change in the female share into two components according to the following formula:

$$\Delta Female\_share_t = \sum_i \frac{N_{it-1}^f}{N_{it-1}} * \left(\Delta \frac{N_{it}}{N_t} \right) + \sum_i \left(\Delta \frac{N_{it}^f}{N_{it}} \right) * \frac{N_{it}}{N_t} \qquad (1)$$

The term $\frac{N_{it-1}^f}{N_{it-1}}$ is the share of women in industry *i* and $\Delta \frac{N_{it}}{N_t}$ is total employment growth of industry *i*. The first term corresponds to the “between” component and captures the extent to which growth in share of women was due to differential growth across industries. The second term reflects within-industry changes in female share. This type of decomposition analysis is most commonly conducted using detailed industry-level data from the manufacturing sector (Berman, Bound, and Griliches (1994), Berman, Bound, and Machin (1998)). We use household survey data similar to Autor, Katz, and Krueger (1998) and Attanasio, Goldberg and Pavcnik (2004)). An advantage of using household data is that we can examine economy-wide changes,

including agriculture and services. The disadvantage is that we lack detailed industry-level data and may misclassify between-industry movements as within-industry movements. We use 69 industry classifications which we can consistently match across the 1990 and 2000 Census.

Table 6 reports changes in employment shares (in efficiency units) as well as changes in wage bill shares. We distinguish 4 different groups, less educated (<12 years of schooling) males and females, and more educated (>=12 years of schooling) males and females. We also report all women's wage bill share in the last row. The table shows that the wage bill share of women increased 5.3 percentage points overall between 1990 and 2000. Between-industry shifts account for 40 percent (2.1/5.25) of the total change. Between-industry shifts account for a smaller (32 percent) but still substantial share of the change in employment share suggesting that employment shifts across industries were important. This is in contrast to Attanasio, Goldberg, and Pavcnik (2004) who find stable employment patterns across industries in Colombia and also Revenga (1997) and Hanson and Harrison (1999) who examine an earlier period in Mexico. These authors conclude that trade liberalization impacted industry wage premiums rather than reallocated labor across sectors. Our finding here is that labor reallocation is an important part of the story in Mexico during the 1990s. It is also important to keep in mind that our aggregate industry categories are likely to under-estimate the true shift in employment across industries thus giving us a lower bound of the importance of between-industry shifts.

The disaggregation by education group also points to which type of women gained the most in a relative sense. Since the wage bill share of less educated men dropped so dramatically (14.5 percentage points), less educated women especially had large gains (in a relative sense) vis a vis their male counter-parts. The four groups are not equally sized and the less educated

groups are much larger in number so that the aggregate change is largely driven by the relative outcomes of less educated women vs. less educated men.

In the following section we will systematically relate these between-industry shifts to trade-related policies such as tariff reductions and increases in imports and exports. This entails focusing on the tradeables sector. Table 3 of the appendix shows that the results for the tradeables sector look similar to the overall decomposition with 40 percent of the rise in female wage bill share being due to between-industry shifts.

C. Are Tariff Changes Linked to Between-Industry Shifts?

The previous section established that a substantial portion of the rise in female wage bill share can be attributed to shifts in industry composition. In this section we go further to examine whether these between-industry shifts were related to trade liberalization. We ask the following two questions: 1) are tariff changes and trade flows systematically related to growth and decline of industries and 2) are the growing industries those that intensively employed women? We investigate the first of these questions in figures 4-7.

Figure 4 relates the change in total industry wage bill share, $\left(\Delta \frac{N_{it}}{N_t} \right)$ from 1990 to 2000 to the change in effective tariff rates at the industry level from 1993-2000 for the 29 industries in the tradeables sector for which we are able to match both across Census years and also to the tariff data using the Sistema de Clasificacion Industrial de America del Norte 1997 (SCIAN97). Figure 4 illustrates that the agricultural sector is a major outlier. Tariff changes in agriculture were relatively slowly implemented with the last of the reductions scheduled to go into effect in 2008. In preparation, however, the government implemented land reforms and began to dismantle price supports and subsidies which resulted in a steep decline in agricultural

employment well before the tariff reductions. For this reason we delete agriculture from subsequent figures and regressions below. Figure 5 shows the same relationship as illustrated in figure 4 but without agriculture. We see from the figure that tariff changes are negatively related to industry growth, meaning that a steep decline in tariffs is associated with growth of the industry.

It is interesting to note that these results are opposite of the standard Stolper-Samuelson effects. For example both Revenga (1997) and Hanson and Harrison (1999) in analyzing the 1980s find that less skilled workers were located in industries which were the most protected. Tariff reductions led to price reductions in sectors which adversely impacted workers who were over-represented in those sectors. We find that tariff reductions from 1993-2000 are actually positively related to industry growth. One important difference between the earlier and later periods of trade liberalization is the pursuit of bilateral trade agreements as opposed to unilateral tariff reductions. Within a broadly defined industry category, tariff reductions in Mexico were accompanied by tariff reductions in the U.S. For example, in the "clothing" industry which experienced a large tariff reduction, intermediate inputs are imported into Mexico at a reduced tariff rate and the output goods are exported to the U.S. also at a reduced tariff rate. This process may describe a sizeable part of the export manufacturing sector.

While tariff changes are arguably more directly related to policy changes compared to trade flows, we also examine the impact of trade flows on industry growth. Figure 6 shows the relationship between the change in industry wage bill share and trade as share of value added defined as (imports+exports)/value added. In figure 7, we use net exports share. Both total trade and net exports are positively related to industry growth. Net exports exhibit a stronger positive relationship, suggesting that exports were important source of growth during the 1990s.

The next question is whether the growing industries intensively employed women thereby increasing the relative demand for women. To answer this question we define the predicted "between-industry" wage bill share of group *j* in industry *i* as the following:

$$\Delta \text{Predicted Female\_share}_{it} = \left(\frac{N_{it}^f}{N_{it}} - \frac{N_t^f}{N_t} \right) * \Delta \frac{N_{it}}{N_t} * 100 \qquad (2)$$

where *i* refers to industry and $\frac{N_{it}^f}{N_{it}}$ refers to women's wage bill in industry *i*, $\frac{N_t^f}{N_t}$ refers to women's share in the economy, and $\Delta \frac{N_{it}}{N_t}$ represents the growth of industry *i*. The above predicted wage bill share is positive if women are over-represented (relative to aggregate share) in industry *i* and if industry *i* is growing over time. The predicted share is negative if either women are under-represented in growing sectors or over-represented in shrinking sectors. Regression of the above change in predicted wage bill share on the change in tariff changes across 28 industries (excluding agriculture) yielded coefficient of -.035 with standard error of .017. Industries predicted to have faster than average increase in female wage bill share had larger tariff declines.[16]

D. What Explains the Within-Industry Shifts?

Table 6 showed that up to 40 percent of the increase in female wage bill share was due to between-industry shifts. In this section we examine what may account for the rise in female wage bill share even *within* industries. To examine this question, we use establishment level data, Encuesta Nacional de Empleo, Salarios, Tecnologia y Capacion (ENESTyC). ENESTyC is

[16] Running similar regressions we find a positive and insignificant relationship between predicted female wage bill share and trade flows, and a significant positive relationship between predicted wage bill share and net exports. We weighted the regressions by industry wage bill shares. A handful of industries which are outliers in terms of female share such as clothing manufacture and computer assembly are important for our results. When we do not weight by industry size and run robust regressions, only net exports remain statistically significant.

a survey of establishments in the manufacturing sector and was carried out in 1992, 1998, and 2001. We use the 1992 and 2001 samples in our analysis which refer to the years 1991 and 2000. We drop micro establishments (those with 15 employees or less) from the analysis since these smaller establishments were oversampled in 2001 but we do not have clear details of the oversampling.[17] Table 7 provides a summary of the main variables. The table shows that exports and foreign ownership increased. The fraction of establishments who export (exports>0) increased from 43 to 55 percent. The fraction of establishments who are at least 10 percent foreign owned increased from 23 to 24 percent. Establishments who are both, "foreign exporter" increased from 17 to 21 percent. Establishments with "maquiladora" status also increased from 9 to 10 percent. The bottom panel which weights by employment shows even more dramatic increases in foreign ownership and exports.

To investigate what accounted for the within-industry shifts in female wage bill share, we run the following regression at the establishment level:

$$Female\_Share_{jist} = \alpha + \beta_1 \frac{\ln(K_{jist})}{\ln(Y_{jist})} + \beta_2 \ln(Y_{jist}) + \delta Foreign_{jist} + \phi Exports_{jist} + \gamma Foreign_{jist} * Exports_{jist} + \eta_t + \lambda_i + \pi_s + \varepsilon_{jist} \quad (3)$$

where $Female\_Share_{jist}$ represents the female wage bill share in establishment *j* in industry *i* in state *s* in year *t*, *K* represents capital, *Y* represents value-added, "Foreign" refers to share of assets that are foreign-owned, and "Exports" refers to share of sales that are exported. The interaction of "Foreign" and "Exports" refers to exports by foreign owned establishments. Year dummies, state dummies, and detailed industry dummies at the 6 digit level of the Mexican Classification

[17] We would like to thank Carolina Villegas-Sanchez for helping us with the programs and we would also like to thank INEGI officials for granting on-site access to the establishment level data used in this study under the commitment of complying with the confidentiality requirements set by the Mexican Laws and in particular, to Maria Luisa Meza Leon, Lizi Ivette Gonzalez Jimenez and Gabriel Romero Velasco.

of Activities and Products system (CMAP) were also included. Equation (3) is a reduced form relationship which under certain restrictive assumptions can be related to the cost function (see for example, Berman, Bound, and Griliches (1994), and Pavcnik (2003)). Results are reported in table 8. Column (1) pools the two years 1991 and 2000 while columns (2) and (3) report results for the two years separately.

Table 8 shows that women's wage bill share is negatively related to size, capital intensity, and R&D investment at the establishment level, giving little credence to the notion that women complement capital or technology. The one caveat is that our data only refer to establishments in the manufacturing sector. It is still possible that computers and technology complement female labor in the non-manufacturing and services sector. "Exports" has a strong positive effect on women's wage bill share. While "Foreign" by itself has a negative effect, "Foreign" interacted with "Exports" has a large positive effect. Since approximately 90 percent of foreign establishments are exporters in the sample, the average foreign effect is positive. Note that the positive impact of foreign exporters on women's wage bill share remains even after controlling for "maquiladora" status. Finally, there appears to be little evidence that maquildoras have become less "female-intensive" over time in that the size of the coefficient has increased from .034 in 1991 to .069 in 2000. Table 8 suggests that the reduction of tariffs on both sides of the border encouraged outsourcing and assembly-type activity which increased female wage bill share even *within* industries.

V. Household Expenditures and Shifts in Household Bargaining

We have shown that during the period of trade liberalization women's wage remained stable while they worked more (at least in the non-household sector). This brings us to the question of whether women's well-being improved as a result. Recent papers on household bargaining have rejected the common preference model of the household. Using a policy change in Britain where child allowance was transferred from the husband to the wife as a natural experiment, Lundberg, Pollack and Wales (1996) show that an exogenous shock to wife's income altered household expenditures towards "women's clothing" and "children's clothing" at the expense of "men's clothing" and "tobacco and alcohol." The exogenous shift in relative incomes altered the bargaining position of the wife and shifted household expenditures towards goods reflecting her preferences. Bobonis (2009) also finds that cash transfers to the wife in the Mexican Progressa program shifted expenditures towards children's goods. In this section, we examine changes in household expenditure patterns to see if bargaining position of married women increased to reflect the increase in their relative earnings.

We use two rounds of the Mexican Household Income and Expenditure Survey (ENIGH), 1992 and 2000. Our sample consists of married households with children where the husband and the wife are between 18 and 54 years old. Different households are interviewed in each round, thus we are unable to follow the same household over time. Households report total expenditures as well as expenditures in various categories covering the third quarter of the year previous to the survey. We deflate expenditures by the national consumer price index published by the Bank of Mexico with 2000 as the base year. We construct expenditure shares by dividing by total expenditures and run the following OLS regression:

$$Share_{it}^{j} = \alpha + \beta_1 Kids\_Young_{it} + \beta_2 Kids\_Old_{it} + \beta_3 Kids_{it} + \beta_4 Tot\exp_{it} + \delta_t + u_{it} \quad (4)$$

where $Share_{it}^{j}$ refers to expenditure share of good *j* in total expenditures for household *i* in year *t*. We also control for total expenditures, number of children younger than 3, number of children aged 3-5 and total number of children. The year dummies in the above regression indicate whether expenditure share of good *j* increased in 2000 relative to 1992.

Results are reported in table 9. The coefficients on the 2000 year dummy indicate that expenditures on male clothing fell over time while expenditures on female clothing increased. The survey only reports expenditures on "infant and toddler clothing." Expenditures in this category fell over time. "Education" expenditures which are typically associated with female preference increased while "alcohol and tobacco," associated with male preference, fell over time. The bottom three rows investigate the change in the ratio of expenditures. Children's clothing fell relative to male clothing if we include families with older children where clothing may be handed down from older siblings. When we look at families with young children only, we find no significant change in the ratio of children's to male clothing. The ratio of female to male clothing, however, increased from 1992 to 2000. The table offers suggestive evidence that women's bargaining power within the household improved along with their relative earnings over the 1990s. Household expenditures shifted from goods associated with male preference, such as men's clothing and tobacco and alcohol, to those associated with female preference such as education and women's clothing.

VI. Conclusion

Some view rising wage and income inequality in Latin America as an unacceptable consequence of following more efficient market-oriented policies. The impact of trade liberalization and foreign direct investment on domestic wage structure, therefore, is of central policy concern. The evidence in this paper suggests that rather than immiserizing women, trade liberalization improved women's labor market outcomes. Particularly during the reform period, 1990 to 2000, the gender wage ratio remained stable while employment of women increased. This suggests that the relative demand for women must have increased over this period. We find that labor reallocation across sectors was important during the reform period and sectoral shifts can account for up to 40 percent of the rise in wage bill share of women. Bilateral trade agreements such as NAFTA which cut tariffs also spurred exports and led to industry growth. Women benefited since some of the fastest growing industries were female-intensive industries. While tariff cuts alone cannot explain the rapid decline of the agricultural sector, pointing to the importance of land reform and abolition of agricultural subsidies, women also benefited, in a relative sense, from the declining agricultural sector. Within industries and across establishments we find a strong positive relationship between women's wage bill share and foreign exports, suggesting that NAFTA further spurred outsourcing and assembly-type activity. Examining household expenditure data, we find suggestive evidence that household bargaining power shifted in favor of women. Expenditures shifted from "male" goods such as male clothing and tobacco and alcohol to "female" goods such as women's clothing and children's education.

References

Acemoglu, D. Autor, D. and D. Lyle (2004) "Women, War, and Wages: The Effect of Female Labor Supply on the Wage Structure at Midcentury," Journal of Political Economy, 112(3): 495-551.

Airola, Jim, and Chinhui Juhn (2008), "Wage Inequality in Post-Reform Mexico," Journal of Income Distribution, 17(1): 110-135.

Arnold, Jens M. and Beata Javorcik (2009), "Gifted Kids or Pushy Parents? Foreign Direct Investment and Plant Productivity in Indonesia," Journal of International Economics, forthcoming.

Artecona, Raquel, and Wendy Cunningham (2002), "Effects of Trade Liberalization on the Gender Wage Gap in Mexico," Working Paper, The World Bank.

Attanasio, O., Pinelopi Goldberg, and Nina Pavcnik (2004), "Trade Reforms and Wage Inequality in Colombia," Journal of Development Economics, 74:331-366.

Autor, D., Katz, L. and A. Krueger (1998), "Computing Inequality: Have Computers Changed the Labor Market?" Quarterly Journal of Economics, 108(4): 1169-1214.

Autor, D., Katz, L. (1999), "Changes in the Wage Structure and Earnings Inequality," Ashenfelter, Orley; Card,David, eds. Handbook of Labor Economics, Volume 3A New York: North-Holland.

Becker, Gary (1957), The Economics of Discrimination. Chicago: The University of Chicago Press.

Behrman, J., Birdsall, N., and M. Szekely (2000), "Economic Reform and Wage Differentials in Latin America," Inter American Development Bank Working Paper No. 435.

Berman, E., Bound, J., and Z.Griliches (1994) "Changes in the Demand for Skilled Labor Within U.S. Manufacturing: Evidence from the Annual Survey of Manufacturers," Quarterly Journal of Economics, 109: 367-398.

Berman,Eli; Bound,John, and Stephen Machin (1998), "Implications of Skill-Biased Technological Change: International Evidence," Quarterly Journal of Economics, 113(4): 1245-79.

Berman, Eli, and Stephen Machin (2000), "Skill-Biased Technology Transfer: Evidence of Factor Biased Technological Change in Developing Countries," Working paper, January 2000.

Black, Sandra, and Elizabeth Brainerd (2002), "Importing Equality? The Impact of Globalization on Gender Discrimination," NBER Working Paper 9110.

Bobonis, Gustavo (2009), "Is Allocation of Resources within the Household Efficient? New Evidence from a Randomized Experiment," Journal of Political Economy, 117: 453-503.

Bound, J. and G. Johnson (1992), "Changes in the Structure of Wages in the 1980s: An Evaluation of Alternative Explanations," American Economic Review, 82: 271-392.

Brown, C., Pagan, Jose, and E. Rodriguez-Oreggia (1999), "Occupational Attainment and Gender Earnings Differentials in Mexico," Industrial and Labor Relations Review, Vol. 53, No.1, pp.123-135.

Bussolo, Maurizio, R. De Hoyos. (2009), "Introduction and Overview." Bussolo, M. and R. De Hoyoy, ed. Gender Aspects of the trade and Poverty Nexus. Washington, DC: World Bank Press.

Cragg, Michael and Mario Epelbaum (1996), "Why has Wage Dispersion Grown in Mexico? Is it the Incidence of Reforms or the Growing Demands for Skills?" Journal of Development Economics, 59: 99-116.

Currie, Janet and Ann Harrison (1997), "Trade Reform and Labor Market Adjustment in Morocco," Journal of Labor Economics, 15:S44-S71.

Duflo, Esther (2000), "Grandmothers and Granddaughters: Old Age Pension and Intra-Household Allocation in South Africa," NBER Working Paper, No. 8061.

Feenstra, Robert, and Gordon Hanson (1997), "Foreign Direct Investment and Relative Wages: Evidence from Mexico's Maquiladoras," Journal of International Economics, 42(3): 371-94.

Feenstra, Robert, John Romalis, and Peter Schott (2002), "U.S. Imports, Exports, and Tariff Data, 1989-2001," NBER Working Paper, No. 9387.

Feliciano, Zadia (1994), "Workers and Trade Liberalization: The Impact of Trade Reforms in Mexico on Wages and Employment," Dissertation, Harvard University.

Galor, Oded and David N. Weil (1996). "The Gender Gap, Fertility, and Growth." American Economic Review, vol. 86, No. 3, pp.374-387.

Goldberg, P. and N. Pavcnik (2007), "The Effects of the Colombian Trade Liberalization on Urban Poverty," Ann Harrison, ed. Globalization and Poverty, Chicago: University of Chicago Press.

Hanson, Gordon (2004), "What Has Happened to Wages in Mexico Since NAFTA?" Toni Estevadeordal, Dani Rodrik, Alan Taylor, and Andres Velasco, ed., FTAA and Beyond: Prospects for Integration in the Americas, Cambridge, MA: Harvard University Press.

Hanson, Gordon, and Ann Harrison (1999), "Trade and Wage Inequality in Mexico," Industrial Labor Relations Review, 52(2): 271-288.

Hanson, Gordon (2007), "Globalization, Labor Income, and Poverty in Mexico," Ann Harrison, ed. Globalization and Poverty, Chicago: University of Chicago Press.

Javorcik, Beata (2004), "Does foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers through Backward Linkages," American Economic Review, 94(3): 605-627.

Katz, Lawrence, and Kevin M. Murphy (1992), "Changes in Relative Wages, 1963-1987: Supply and Demand Factors," Quarterly Journal of Economics, 107(1): 35-78.

Lane, P. and G. Milesi-Ferretti (2007) "The External Wealth of Nations: Measurement of Foreign Assets and Liabilities in Industrial and Developing Countries," Journal of International Economics, Vol 55, No.2.

Levine, R., A. Levkov, and Y. Rubinstein, "Racial Discrimination and Competition," Working paper, Brown University, July 2009.

Lundberg, Shelly, R. Pollak and T. Wales (1997). "Do Husbands and Wives Pool Resources? Evidence from the UK Child Beneft," Journal of Human Resources, 32: 463-479.

McMillan, M., A. Awane, and N. Ashraf (2007), "My Policies or Yours: Does OECD Support for Agriculture Increase Poverty in Developing Countries?" Ann Harrison, ed. Globalization and Poverty, Chicago: University of Chicago Press.

Melendez, Jorge. (2001) "The Structure of Wages under Trade Liberalization: Mexico from 1984 to 1998," Ph..D. Dissertation, University of Chicago.

Murphy,K, and F. Welch (1992), "The Structure of Wages," Quarterly Journal of Economics, 107(1): 285-326.

Oostendorp, Remco (2004), "Globalization and the Gender Wage Gap," Working Paper, Free University, Amsterdam.

Pagan, Jose A. and Miren Ullibarri (2000), "Group Heterogeneity and the Gender Earnings Gap in Mexico", Economia Mexicana. Nueva Epoca. Vol. IX, No. 1

Pavcnik, Nina (2003), "What Explains Skill Upgrading in Less Developed Countries?" Journal of Development Economics, 71: 311-328.

Qian, Nancy (2008) "Missing Women and the Price of Tea in China: The Effect of Sex-Specific Earnings on Sex Imbalance," Quarterly Journal of Economics, 123(3): 1251-1285.

Revenga, Ana L. (1997), "Employment and Wage Effects of Trade Liberalization: The Case of Mexican Manufacturing," Journal of Labor Economics; 15(3): S20-43.

Robbins, Donald J. (1996), "HOS Hits Facts: Facts Win; Evidence on Trade and Wages in the Developing World," Development Discussion Paper No. 557, H.I.I.D.

Sanchez, Susana M. and Jose A. Pagan (2001), "Explaining Gender Differences in Earnings in the Microenterprise Sector", ," in Maria Correia and Elizabeth Katz (eds.) The Economics of Gender in Mexico: Work, Family, State and Market.

Szekely, Miguel (1998), The Economics of Poverty, Inequality and Wealth Accumulation in Mexico. St Martin's Press.

Thomas, Duncan (2000) "Intra-Household Resource Allocation: An Inferential Approach," Journal of Human Resources, 35: 635-654.

Topalova, Petia (2007), "Trade Liberalization, Poverty, and Inequality: Evidence from Indian Districts," Ann Harrison, ed. Globalization and Poverty, Chicago: University of Chicago Press.

United Nations (2009), UN Millennium Development Goals Report 2009, New York: United Nations.

Weinberg, Bruce (2000), "Computer Use and the Demand for Female Workers," Industrial and Labor Relations Review,Vol. 53, No.2, pp.290-307.

Welch, Finis (2000), "Growth in Women's Relative Wages and in Inequality Among Men: One Phenomenon or Two?" American Economic Review, Vol. 90, No.2, pp. 444-449.

Wood, Adrian (1997), "Openness and Wage Inequality in Developing Countries: The Latin American Challenge to East Asian Conventional Wisdom," World Bank Economic Review, 11(1): 33-57.

Zabludovsky, J. (2005), "El Tlcan y La Politica de Comercio Exterior en Mexico: Una Agenda Inconclusa," Informacion Comercial Espanola (821): 59-70.

Data Appendix

A. Household Surveys (Census, ENIGH)

We use data from 9 rounds of the Household Income and Expenditure Surveys (ENIGH), a nationally representative survey which spans the period 1984-2004. We also use data from the 10% samples of the Mexican Population Census of 1990 and 2000 available from the Census IPUMS. Unlike the ENIGH, statistical inferences using the larger Census samples are significant at the two-digit industry level (92 categories) and at the state level (32 states). Appendix Table 1 provides summary statistics of the data.

For calculating wages we construct a wage sample consisting of men and women who are 15-64 years old, who worked at least 30 hours during the survey week and reported no self-employment income. Wages are reported wage and salary earnings last month converted to a weekly wage by dividing by 4.33. Earnings were deflated by the national consumer price index published by the Bank of Mexico with 2000 as the base year.

For reporting quantities of labor by education and by industry, we construct a sample of 15-64 year olds who report positive hours during the survey week, including the self-employed. We report hours-weighted employment shares and employment shares in efficiency units of labor. To calculate efficiency units of labor, we first calculate average wages (fixed across all years) by 2 gender, 10 age and 6 education categories. We weight hours by these average wages to calculate efficiency units of labor. All our calculations are weighted by the household weights to make the sample nationally representative.

B. Data on Tariffs, Exports, and Imports

We match industry classifications available in the 1990 and 2000 Census samples to the Sistema de Clasificacion Industrial de America del Norte 1997 (SCIAN97 and also called the NAICS in the U.S.). Tariff, export, and import data for 1993-2000 were obtained from the Ministry of the Economy (formerly SECOFI), international trade statistics (www.economia.gob.mx). Tariffs, exports and imports are reported in "facciones arancelarias" which is a classification system for products. There are more than 34,000 products. For tariff schedules we used the book Fracciones Arancelarias y Plazos de Desgravación, Tratado de Libre Comercio de América del Norte (1994), published by the Ministry of Economy. The book publishes each product with the 1993 tariff rates (0,5,10,15,20%) along with a code, A, B, C, D or B6 which describes the rate at which the tariff is reduced to zero. For example, Code A corresponds to a tariff which is reduced to zero in 1994. We aggregated products and tariff schedules up to the SCIAN97 industry codes using the 1993 import shares as weights. U.S tariff data come from John Romalis (http://faculty.chicagobooth.edu/john.romalis/more/) with the description and documentation available in the NBER Working paper 9387. We aggregate the 6 digit harmonized tariff schedules available in the Romalis data up to the 3-digit SCIAN97 categories using the 1993 shares of Mexican exports to the U.S.

C. Establishment Surveys (ENESTyC)

The establishment-level data come from Encuesta Nacional de Empleo, Salarios, Tecnologia y Capacion (ENESTyC). The samples in ENESTyC are representative cross sections of establishments in the manufacturing sector for the years 1992, 1998, and 2001. We use the 1992

and 2001 samples in our analysis which refer to the years 1991 and 2000. We drop micro establishments (those with 15 employees or less) from the analysis since these smaller establishments were oversampled in 2001 but we do not have clear details of the oversampling. "Value added" is defined as the value of output minus materials. We deflate output by the producer price index (PPI) at the industry level and materials by the materials price index (MPI) provided by the Central Bank of Mexico. Wage bills are deflated by the consumer price index (CPI). "Capital" is value of total assets deflated by PPI. "R&D Share" refers to share of income devoted to research and development. To construct female wage bill share, we first aggregate wage bills of workers in different white and blue collar categories, supervisors, clerical workers, special production workers, and general production workers, all of which are reported separately by gender. Some categories have missing values in which case we replace with zeros before adding. The wage bill shares refer to basic salary for full time workers and exclude payment for extra hours or contributions to social security. We also exclude part time workers, hourly employees, and subcontractors from wage bill calculations. "Foreign" refers to establishments where 10 percent or more of the assets are foreign-owned. "Exporter" refers to establishments with positive exports. "Foreign exporter" refers to establishments which fulfill both conditions.

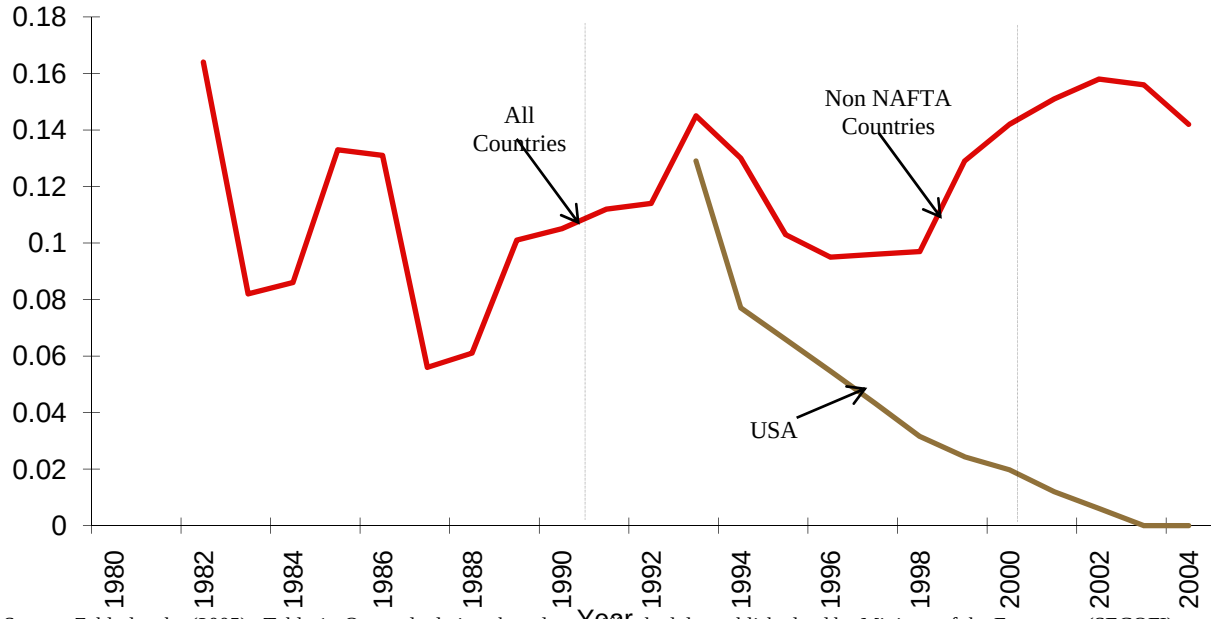
Table 1

Tariff Rates Pre and Post-NAFTA

	Mexico		U.S.	
Industry	1993 Rate % (1)	Change 93-00 (2)	1993 Rate % (3)	Change 93-00 (4)
Agriculture	4.5	-3.8	4.1	-3.6
Livestock	4.5	-3.2	0.0	0.0
Fish	0.0	0.0	0.0	0.0
Oil and Gas	10.0	-7.0	0.5	-0.5
Minerals	6.1	-5.9	0.3	-0.3
Food	12.4	-9.1	3.6	-2.0
Beverage and Tobacco	18.9	-14.4	3.7	-3.2
Textiles and Fabrics	12.9	-10.0	13.2	-13.1
Textile Mill Products	19.3	-14.4	6.1	-6.0
Clothing	20.0	-17.1	13.2	-12.9
Leather	9.3	-7.6	11.6	-8.8
Wood	17.5	-14.4	1.2	-1.1
Paper	8.3	-6.2	0.0	0.0
Printed Matters	9.0	-8.1	0.0	0.0
Petroleum and Coal Products	1.9	-1.4	1.5	-1.1
Chemicals	9.4	-7.8	1.8	-1.6
Plastics and Rubber	15.2	-11.5	1.2	-1.0
Nonmetallic Mineral Products	14.9	-12.5	4.7	-1.8
Primary Metal	8.8	-6.5	3.2	-2.6
Fabricated Metal	13.8	-12.1	0.5	-0.5
Machinery, Except Electrical	14.6	-13.9	0.0	0.0
Computers and Electronics	12.8	-12.0	1.7	-1.7
Electrical Equip & Appliances	14.0	-10.9	0.2	-0.2
Transportation Equip	11.4	-8.9	1.3	-1.3
Furniture	16.1	-11.9	0.0	0.0
Miscellaneous	15.3	-14.0	0.8	-0.8

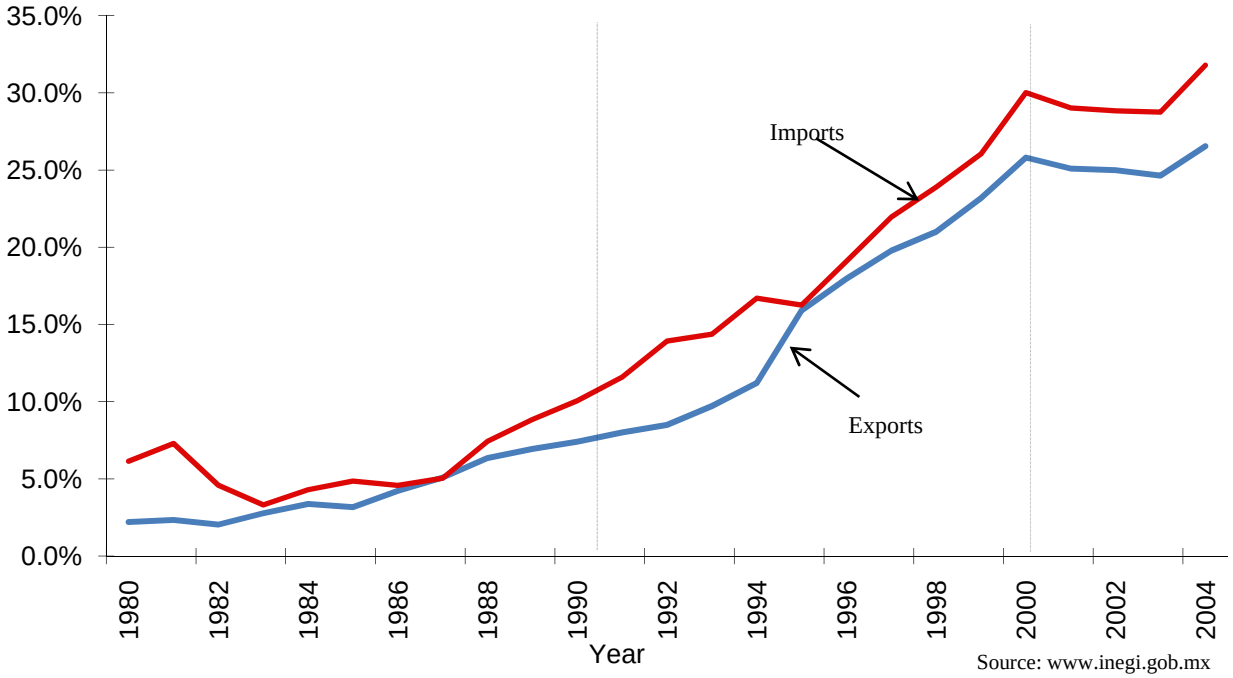
Source: Mexican tariff data, Fracciones Arancelarias y Plazos de Desgravacion, Tratado de Libre Comericio de America del Norte, 1994. U.S. tariff data, from Romalis (2002). For both U.S. and Mexican tariff data we begin with 8-digit harmonized tariff system categories and aggregate up to 3-digit SCIAN97 (NAICS) categories using initial import and export shares as weights. Details of the data construction are in the data appendix.

Figure 1
Effective Tariffs,1980-2004



Source: Zabludovsky (2005) , Table 1. Own calculations based on tariff schedules publishedand by Ministry of the Economy, (SECOFI).

Figure 2
Non-oil Exports and Imports as share of GDP,



Source: www.inegi.gob.mx

Figure 3a. Female/Male Mean Weekly Wage Ratio

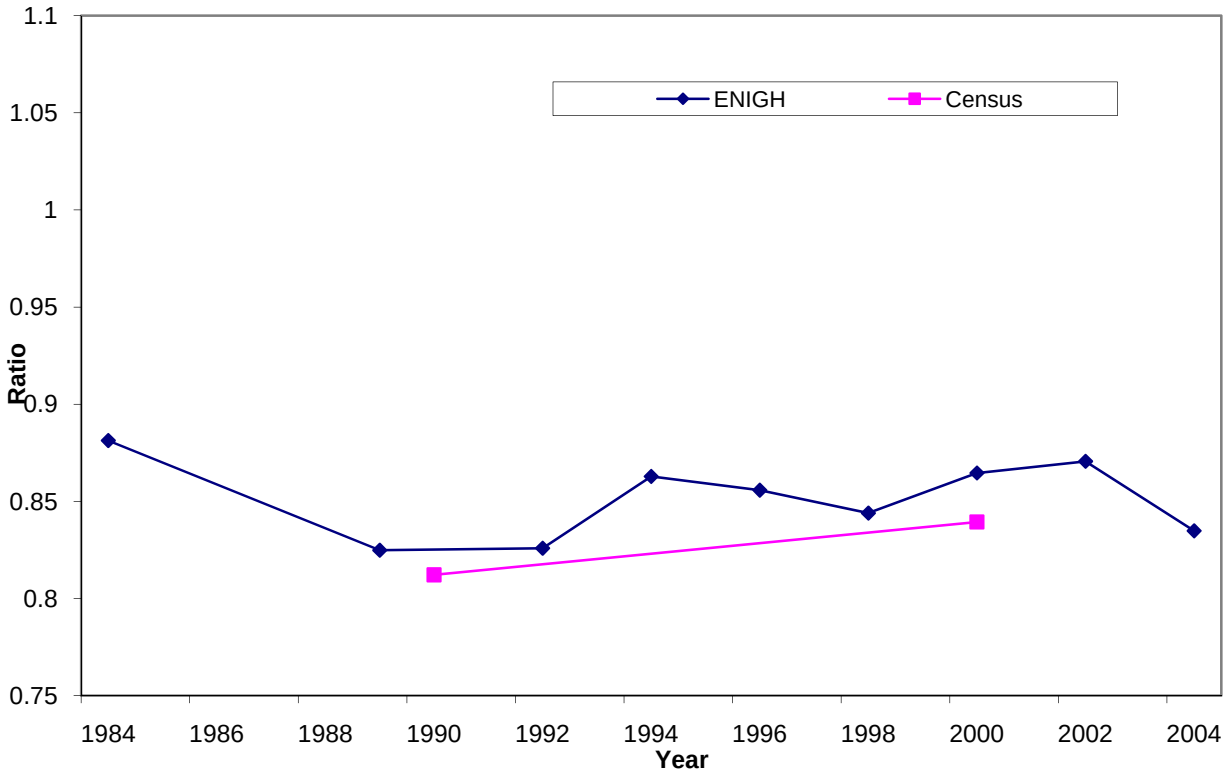


Figure 3b. Female/Male Mean Weekly Wage Ratio
Composition Fixed

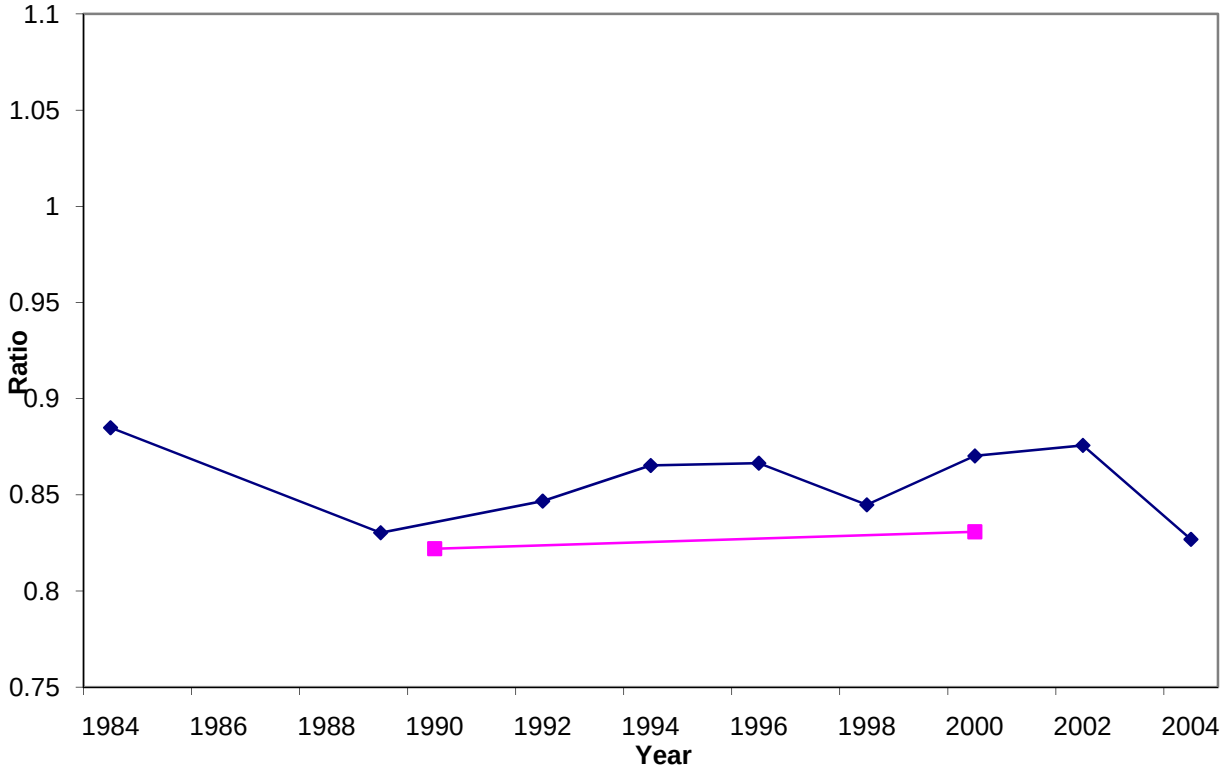


Figure 3c. Female/Male Mean Weekly Wage Ratio
Including Self-Employed

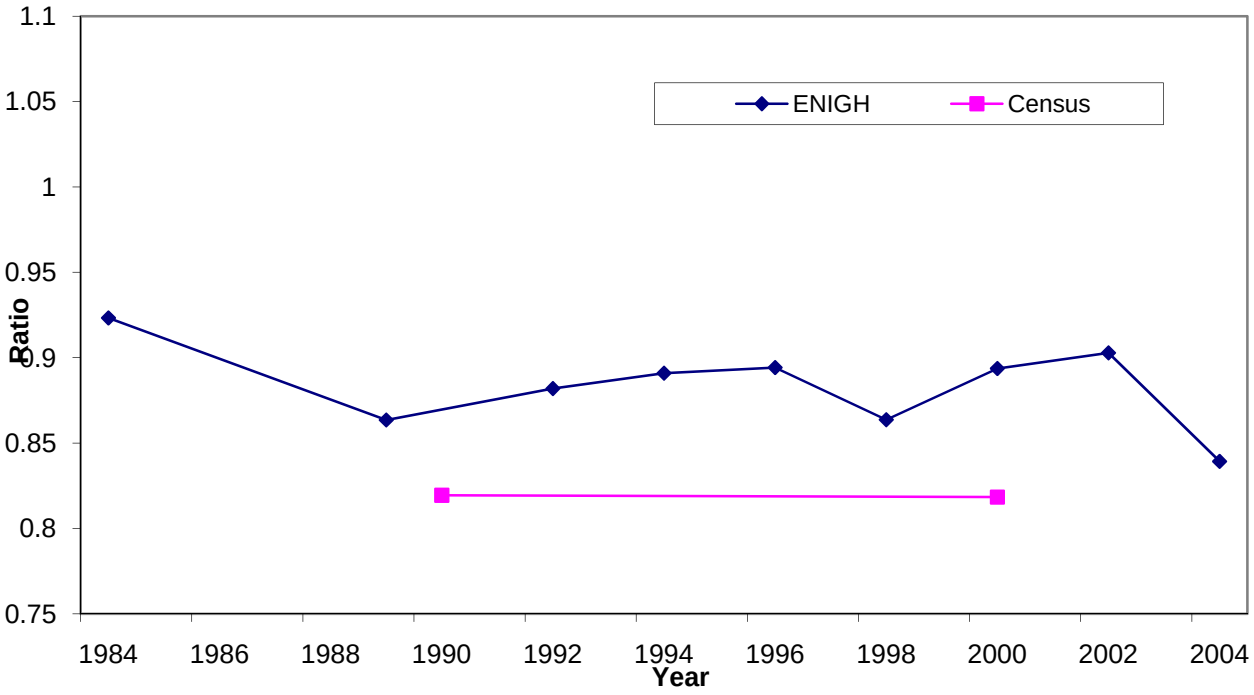


Figure 3d. Female/Male Mean Hourly Wage Ratio
Including Self-Employed

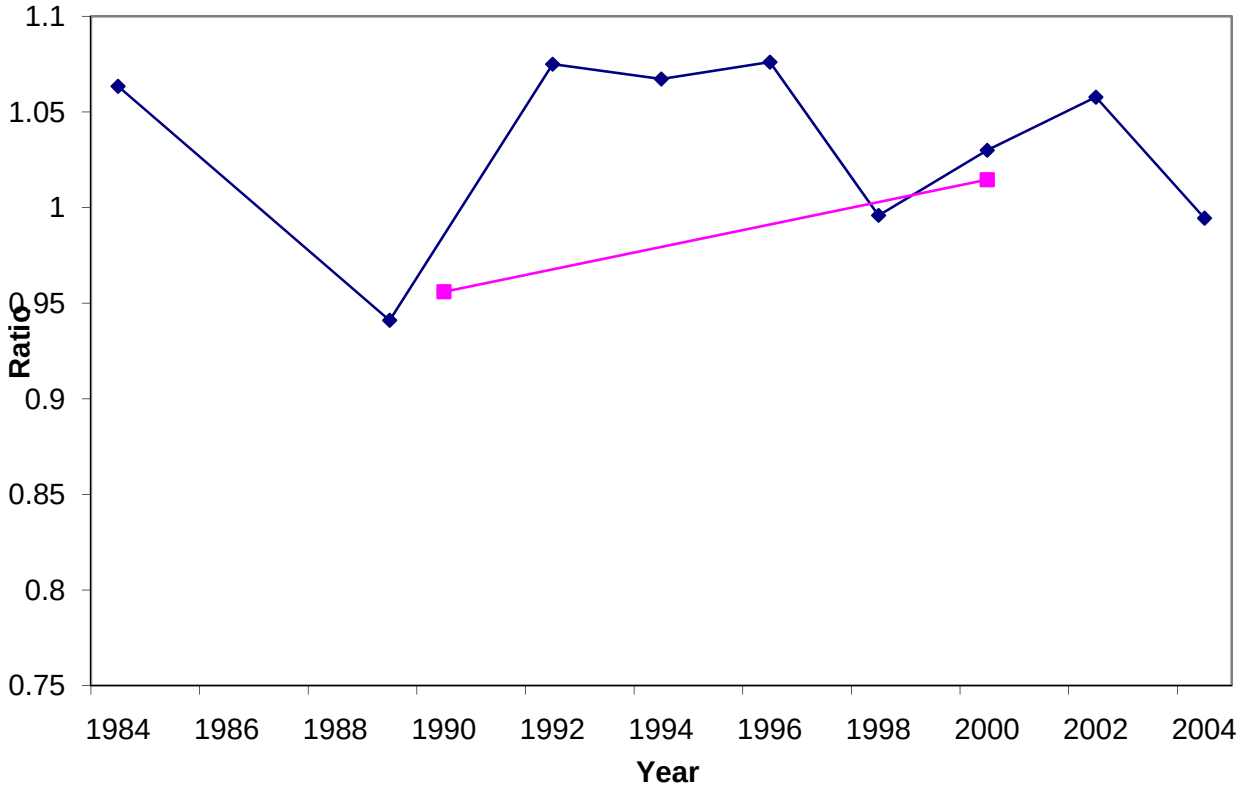


Table 2

ENIGH - Employment-Population Ratio of Women 15-64 Years Old

	Year								
Education	1984	1989	1992	1994	1996	1998	2000	2002	2004
0 Years	0.225	0.207	0.247	0.310	0.361	0.340	0.299	0.346	0.311
1-5 Years	0.232	0.228	0.278	0.336	0.385	0.409	0.381	0.422	0.386
6-8 Years	0.308	0.293	0.282	0.325	0.377	0.402	0.397	0.412	0.421
9-11 Years	0.332	0.337	0.361	0.394	0.410	0.436	0.444	0.452	0.421
12-15 Years	0.432	0.511	0.455	0.493	0.507	0.491	0.474	0.505	0.536
16+ Years	0.577	0.696	0.698	0.754	0.756	0.745	0.746	0.722	0.746
All	0.267	0.289	0.315	0.363	0.402	0.419	0.412	0.440	0.441

Source: ENIGH 1984-2004. Sample includes 15-64 year old males and females. Employment is defined as those with positive hours of work during the survey week.

Census - Employment-Population Ratio of Women 15-64 Years Old

	Year	
Education	1990	2000
0 Years	0.094	0.229
1-5 Years	0.115	0.243
6-8 Years	0.188	0.296
9-11 Years	0.301	0.343
12-15 Years	0.378	0.470
16+ Years	0.601	0.700
All	0.214	0.348

Source: Census, 1990,1995,2000. Sample includes 15-64 year old males and females. Employment is defined as those with positive hours of work during the survey week.

Table 3

ENIGH - Female Labor as a Share of Total Labor

	1984	1989	1992	1994	1996	1998	2000	2002	2004
A. Hours									
<12 Years	0.215	0.238	0.247	0.269	0.293	0.300	0.303	0.310	0.312
>=12 Years	0.232	0.273	0.275	0.301	0.316	0.321	0.316	0.349	0.387
All	0.217	0.244	0.252	0.274	0.298	0.304	0.306	0.319	0.333
B. Efficiency Units									
<12 Years	0.195	0.223	0.229	0.251	0.270	0.278	0.289	0.295	0.291
>=12 Years	0.177	0.211	0.219	0.240	0.262	0.261	0.247	0.285	0.321
All	0.190	0.219	0.225	0.246	0.266	0.271	0.270	0.290	0.306
C.Wage Bill Shares									
<12 Years	0.209	0.221	0.230	0.249	0.266	0.282	0.285	0.292	0.279
>=12 Years	0.174	0.211	0.223	0.233	0.267	0.254	0.241	0.311	0.327
All	0.201	0.218	0.227	0.242	0.266	0.270	0.265	0.301	0.303

Sample includes 15-64 year old males and females. The table reports the female shares of total labor measured in hours, in efficiency units of labor, and in wage bill shares. To calculate shares in efficiency units, we weight hours by the group specific average wage, fixed over years. With wage bill shares, average wages by group vary by year.

Census - Female Labor as a Share of Total Labor

	A. Hours		B. Efficiency Units		C. Wage Bill Shares	
	1990	2000	1990	2000	1990	2000
<12 Years	0.215	0.254	0.207	0.238	0.212	0.232
>=12 Years	0.280	0.356	0.230	0.301	0.228	0.309
All	0.226	0.281	0.215	0.267	0.217	0.270

Sample includes 15-64 year old males and females. The table reports the female shares of total labor measured in hours, in efficiency units of labor, and in wage bill shares. To calculate shares in efficiency units, we weight hours by the group specific average wage, fixed over years. With wage bill shares, average wages by group vary by year.

Table 4

Industrial Distribution (Census)

Industry (SCIAN97)	Year		
	1990	2000	Female Share in 1990 (%)
Agriculture	12.5	7.7	2.9
Fishing	2.5	1.8	3.6
Oil and Gas	1.3	0.8	9.0
Electricity and Water	1.0	0.7	9.7
Construction	5.8	7.9	1.8
Light Manufacturing	7.2	7.0	25.7
Medium Manufacturing	4.9	4.1	14.4
Heavy Manufacturing	6.6	7.1	14.4
Wholesale	2.2	1.6	13.8
Retail	13.8	14.6	28.4
Transportation and Storage	9.1	8.9	4.4
Communications	1.2	1.2	25.5
Financial Services	2.2	1.5	29.1
Real State Services	0.4	0.6	24.3
Professional Services	3.3	4.8	21.5
Education	7.7	8.1	46.9
Health Services	5.3	5.1	48.4
Recreation Services	0.7	0.8	21.1
Hotels and Restaurants	3.6	4.5	35.4
Other Services	3.3	5.2	62.0
Government	5.5	6.1	21.8
Total	100	100	21.7

Source: Mexican Census IPUMS, 1990 and 2000. The table reports shares of labor in efficiency units.

Table 5

Industrial Distribution: Manufacturing (Census)

Industry	Year		Female Share in 1990 (%)
	1990	2000	
Food	16.4	15.3	19.3
Beverages and Tobacco	4.8	3.8	7.7
Textiles and Fabrics	3.5	2.5	12.7
Textile Mill Products	0.9	1.4	30.3
Clothing	8.2	11.9	55.6
Leather	5.1	3.8	21.3
Wood	1.4	1.6	5.9
Paper	1.8	1.9	11.3
Printing	4.7	2.6	19.2
Petroleum and Coal Products	2.8	1.7	10.2
Chemicals	5.7	4.6	20.3
Plastic and Rubber	2.6	2.5	17.7
Nonmetallic Mineral Products	6.8	7.4	8.5
Primary Metal	3.7	2.6	6.4
Fabricated Metal	7.0	7.1	14.1
Machinery, Except Electrical	2.7	2.1	7.6
Computers and Electronics	2.7	4.5	30.2
Electrical Equip & Appliances	4.1	3.4	32.0
Transportation Equipment	5.9	8.4	12.9
Furniture	6.3	6.9	5.1
Miscellaneous	2.7	4.0	25.1
Total	100	100	18.7

Source: Mexican Census IPUMS, 1990 and 2000. The table reports shares of labor in efficiency units.

Table 6

Change in Share of Workers by Education and Gender, 1990-2000

Group	Employment Share			Wage Bill Share		
	Between	Within	Total	Between	Within	Total
Men <12	-2.39	-8.59	-10.98	-4.15	-10.38	-14.53
Women <12	1.42	-2.22	-0.80	1.05	-3.68	-2.63
Men >=12	0.73	5.04	5.77	2.04	7.23	9.28
Women >=12	0.24	5.78	6.01	1.05	6.83	7.88
Men	-1.66	-3.55	-5.21	-2.10	-3.15	-5.25
Women	1.66	3.55	5.21	2.10	3.15	5.25

Source: Mexican Census IPUMS 1990 and 2000. Decompositions are based on 69 industry categories. Employment shares are reported in efficiency units.

Figure 4. Industry Growth and Tariff Changes

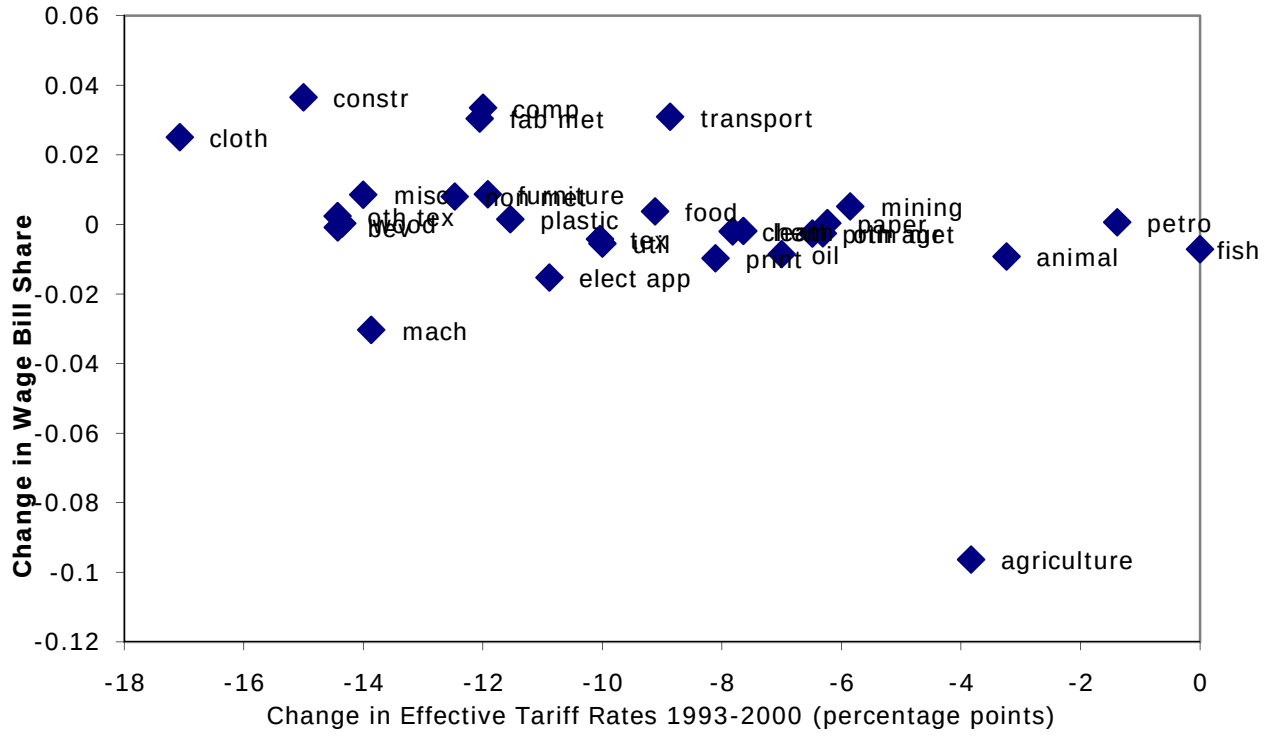


Figure 5. Industry Growth and Tariff Changes w/o Agriculture

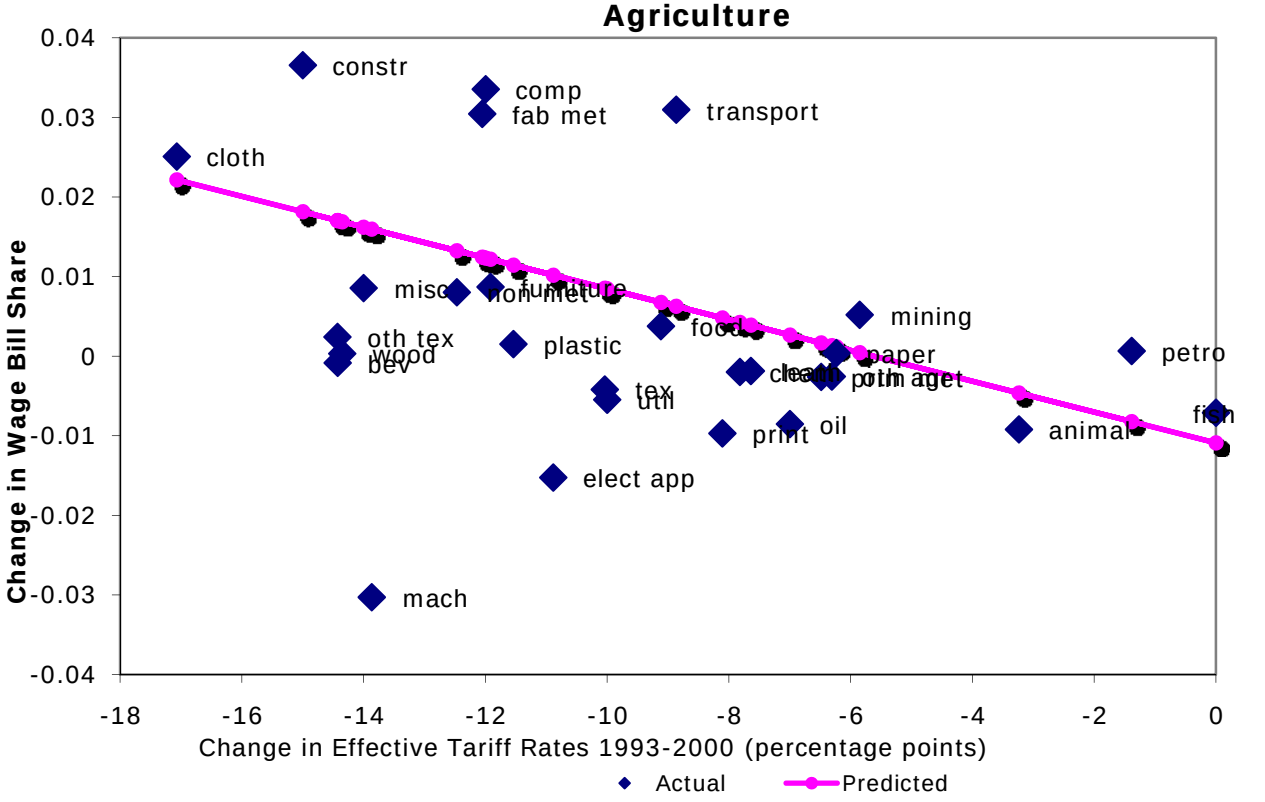


Figure 6. Industry Growth and Trade (Imp+Exp/Value-Added)

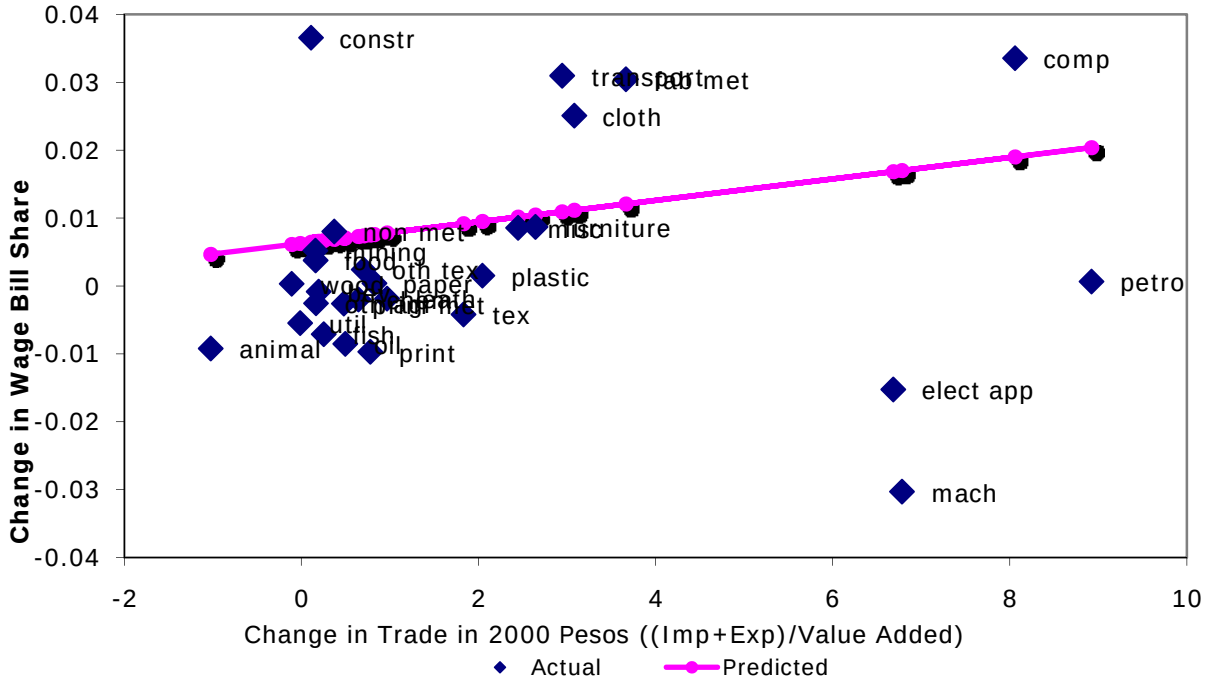


Figure 7. Industry Growth and Net Export Growth

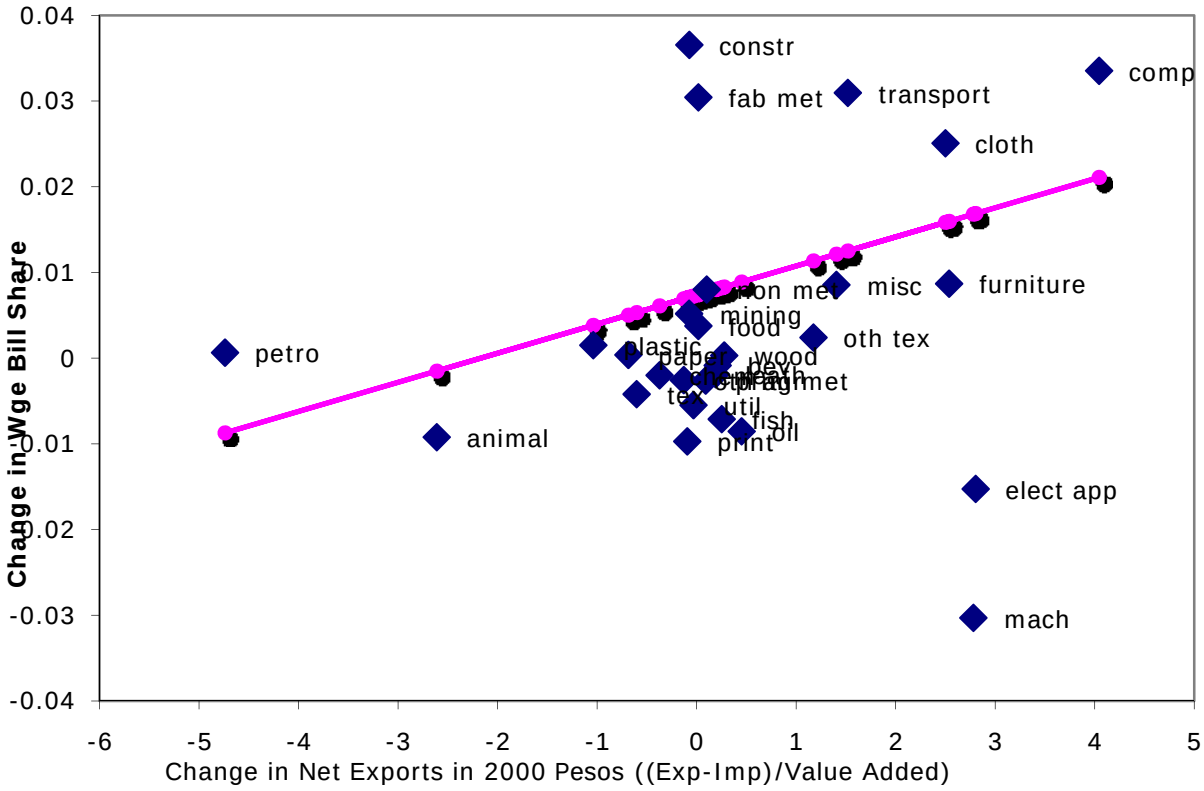


Table 7

Summary Statistics - Establishment Survey (ENESTyC)

A. Unweighted

		1991			2000	
Variable	N	Mean	Std	N	Mean	Std
Log (Capital/ Value Added)	4151	-0.38	1.41	5272	-0.52	1.68
Log Value Added	4151	10.61	1.70	5272	10.31	1.96
R&D/Income	4238	0.01	0.02	4848	0.00	0.01
Share of White Collar Workers	4238	0.29	0.17	5654	0.28	0.19
Foreign Ownership (>=10%)	4238	0.23	0.42	5037	0.24	0.43
Exports>0	4238	0.43	0.50	5570	0.55	0.50
Foreign Exporter	4238	0.17	0.38	4975	0.21	0.50
Share of Foreigned Owned Assets	4238	0.19	0.37	5037	0.21	0.39
Exports as Share of Sales	4238	0.20	0.36	5570	0.22	0.34
Export Share*Foreign Share	4238	0.09	0.27	4975	0.12	0.29
Maquildora	4238	0.09	0.29	5654	0.10	0.30

B. Weighted by Employment

		1991			2000	
Variable	N	Mean	Std	N	Mean	Std
Log (Capital/ Value Added)	4151	-0.04	1.34	5272	-1.07	1.97
Log Value Added	4151	11.98	1.70	5272	12.32	1.98
R&D/Income	4238	0.01	0.02	4848	0.00	0.01
Share of White Collar Workers	4238	0.27	0.16	5654	0.26	0.19
Foreign Ownership (>=10%)	4238	0.39	0.49	5037	0.51	0.50
Exports>0	4238	0.59	0.49	5570	0.75	0.43
Foreign Exporter	4238	0.33	0.47	4975	0.46	0.50
Share of Foreigned Owned Assets	4238	0.34	0.45	5037	0.47	0.48
Exports as Share of Sales	4238	0.28	0.40	5570	0.43	0.43
Export Share*Foreign Share	4238	0.19	0.37	4975	0.33	0.44
Maquildora	4238	0.13	0.29	5654	0.33	0.47

Source: Encuesta Nacional de Empleo, Salarios, Tecnologia y Capacitacion (ENESTyC) survey 1991 and 2001. The table reports means for establishments with more than 15 employees.

Table 8

Female Wage Bill Share and FDI - Firm-level Regressions

Dependent Variable = Female wage bill share in 1991,2000	(1) 1991 & 2000		(2) 1991		(3) 2000	
ln(capital/value added)	-0.010	**	-0.007	**	-0.011	**
	(0.000)		(0.00)		(0.00)	
ln(value added)	-0.016	**	-0.017	**	-0.013	**
	(0.000)		(0.00)		(0.00)	
R&D share	-0.067		-0.026		-0.221	
	(0.100)		(0.13)		(0.18)	
Share of white collar workers	-0.071	**	-0.103	**	-0.047	**
	(0.010)		(0.02)		(0.01)	
Foreign share	-0.028	**	-0.029	**	-0.024	**
	(0.010)		(0.01)		(0.01)	
Exports as percent of sales	0.033	**	0.051	**	0.008	**
	(0.010)		(0.01)		(0.01)	
Foreign*Exports	0.073	**	0.074	**	0.063	**
	(0.010)		(0.02)		(0.02)	
Maquila dummy	0.051	**	0.034	**	0.069	**
	(0.010)		(0.02)		(0.02)	
Number of Observations	8515		4151		4364	
R2	0.565		0.609		0.562	

Source: ENESTyC. Standard errors in parentheses; **significant at 1 percent level. The dependent variable is female wage bill share. Micro etablishments (those with 15 or less employees) are excluded. The regression also includes 6-digit industry year dummies, state and year dummies. The regression is unweighted.

Table 9
Expenditure Shares 1992 and 2000
Married Couples with Children

	1992	2000	2000 Dummy with Controls	
Total Expenditures (2000 Pesos)	4683.4	4470.3		
Male Clothing	0.0263	0.0244	-0.0014 (0.0006)	**
Female Clothing	0.0112	0.0141	0.0035 (0.0004)	**
Child Clothing (only young children)	0.0117	0.0039	-0.0038 (0.0011)	**
Education	0.0678	0.0770	0.0061 (0.0019)	**
Alcohol and Tobacco	0.0112	0.0058	-0.0049 (0.0005)	**
Child Clothing/Male Clothing (with older children)			-0.3629 (0.0466)	**
Child Clothing/Male Clothing (only young children)			-0.0228 (0.0973)	
Female Clothing/Male Clothing			0.1562 (0.0369)	**

Appendix Table 1

Summary Statistics (ENIGH)

individuals ages 15 and over	Year								
	1984	1989	1992	1994	1996	1998	2000	2002	2004
Number of Observations	12,841	32,491	28,483	34,623	37,677	28,140	25,471	43,617	57,077
% workers	51.24	52.87	55.07	58.05	59.74	61.53	61.34	61.89	61.73
Men	77.37	78.96	80.89	82.15	81.45	83.32	83.99	81.94	81.69
Women	26.72	28.88	31.48	36.29	40.19	41.94	41.22	44.03	44.14
% fulltime	80.47	82.63	80.32	78.09	77.08	76.55	78.98	77.10	81.98
Education	5.40	6.25	6.44	6.61	6.96	7.07	7.53	7.68	8.07
Men	5.90	6.73	6.84	6.97	7.39	7.48	7.95	8.07	8.32
Women	4.93	5.81	6.06	6.28	6.58	6.70	7.16	7.33	7.84
Average hourly wage	17.98	17.52	18.42	20.52	14.15	15.01	17.35	17.88	17.56
Men	18.37	18.23	19.10	21.41	14.65	15.62	18.26	18.21	18.07
Women	16.80	15.51	16.64	18.27	12.99	13.57	15.28	17.19	16.48

Summary Statistics (Census)

Individuals aged 15 to 64	Year	
	1990	2000
Number of observations	458,411	590,898
Urban share (%)	74.20	77.25
% workers	47.54	55.61
Men	74.74	78.07
Women	22.28	34.99
% fulltime	86.01	83.53
Education	6.69	7.90
Men	7.01	8.14
working men	6.88	8.16
Women	6.40	7.68
working women	8.76	9.02
Average hourly wage	21.44	18.25
Men	22.26	18.75
Women	19.16	17.14

Appendix Table 2

Characteristics of Workers and Non-workers - All Women

	1990 Census			2000 Census			1990 Census			2000 Census		
	Work	No work	Diff	Work	No Work	Diff	Sample	No Sample	Diff	Sample	No Sample	Diff
Relative Frequency	0.21	0.79	-	0.35	0.66	-	0.16	0.84	-	0.23	0.77	-
Avg Education	8.83	5.75	3.08	8.99	6.93	2.07	9.01	5.92	3.09	9.47	7.12	2.35

Characteristics of Workers and Non-workers - Married Women

	1990 Census			2000 Census			1990 Census			2000 Census		
	Work	No work	Diff	Work	No Work	Diff	Sample	No Sample	Diff	Sample	No Sample	Diff
Relative Frequency	0.12	0.88	-	0.27	0.73	-	0.08	0.92	-	0.15	0.85	-
Avg Education	9.58	5.13	4.45	9.05	6.49	2.56	9.83	5.31	4.52	9.80	6.72	3.08
Avg Education - Spouse	9.84	5.85	3.99	9.28	7.16	2.12	10.14	6.00	4.14	9.89	7.36	2.53
Avg Log Wage - Spouse	6.76	6.35	0.41	6.63	6.37	0.26	6.77	6.37	0.40	6.69	6.39	0.30
Number of Children <6	0.76	1.02	-0.26	0.62	0.79	-0.18	0.74	1.02	-0.28	0.59	0.77	-0.18

Sample includes wives aged 15 to 64

"Work" is defined as those with positive hours worked in the reference week.

"Wage Sample" are workers with positive hours who worked full-time and who were not self-employed.

Appendix Table 3

Change in Share of Workers by Education and Gender, 1990-2000, Tradeables Only

Group	Employment Share			Wage Bill Share		
	Between	Within	Total	Between	Within	Total
Men <12	-4.02	-7.07	-11.09	-4.85	-8.44	-13.29
Women <12	2.18	0.92	3.10	1.63	0.27	1.90
Men >=12	1.53	3.85	5.38	2.76	5.44	8.20
Women >=12	0.31	2.31	2.62	0.46	2.73	3.19
Men	-2.49	-3.22	-5.71	-2.09	-2.60	-5.09
Women	2.49	3.22	5.71	2.09	2.60	5.09

Source: Mexican Census IPUMS 1990 abd 2000. Decompositions are based on 69 industry categories. Employment shares are reported in efficiency units.