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Did NAFTA Increase Labor Market Integration between the United States and Mexico?

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Abstract: This paper examines absolute and conditional wage convergence between the United States and Mexico using data from Mexican and United States household surveys. Although Mexican wages are rising relative to U.S. wages, household surveys provide little evidence of faster wage convergence following the North American Free Trade Agreement. Wages of more educated Mexicans demonstrate faster conditional convergence following NAFTA. Migration seems to play a more significant role than trade and foreign investment in conditional convergence.

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Did NAFTA increase labor market integration between Mexico and the United States? Labor market integration has been one of the primary hopes and fears of the North American Free Trade Agreement (NAFTA). This paper uses household-level surveys to evaluate labor market integration before and after NAFTA. To evaluate labor market integration, we consider both absolute and conditional wage convergence. Absolute convergence would occur if U.S. and Mexican wages equalized. Conditional convergence considers the return to a constant differential that may occur if a transitory shock temporarily caused wages to diverge.

The results suggest that Mexican wages were converging to U.S. wages before NAFTA and the Peso Crisis (1994). The crisis caused wages to fall significantly in Mexico until about 1998, when they began to recover. The rate of absolute convergence during the recovery period is not significantly higher than the rate of convergence before 1994. Evidence from the household surveys does suggest, however, that, controlling for the long-run trend in absolute convergence, the rate of conditional convergence is higher for more educated workers in the recovery period.

While the question of integration is interesting on its own, this paper also contributes to the debate about the mechanisms that integrate labor markets. The relative contributions of trade, migration, and capital flows in integrating labor markets have created significant debate in economic literature.[1] Williamson (1996) uses real wages, GDP per worker-hour and GDP per capita as indicators of wage, and he finds that the

[1] See, for example, O'Rourke and Williamson (1994), O'Rourke, Taylor, Williamson (1996), Saint-Paul, Gilles (1997, 1999), and Mokhtari and Rassekh (1989).

main cause of convergence is migration.[2] Mokhtari and Rassekh (1989) employ the coefficient of variation of wages (CVW). They use the mean and standard deviation of the ratio of nominal manufacturing wages to the Consumer Price Index to construct the CVW. They find that commodity-price convergence (using openness as a proxy) shows a strong impact on factor price equalization for the period (1961-1984) observed. Robertson (2000) examines conditional convergence between Mexico and the U.S. because the difference between average wage levels is large[3] and finds that migration may be the most important factor integrating markets because conditional convergence is stronger in the Mexican border region than in the Mexican interior.

In this paper, we consider the effects of FDI, migration, and trade by comparing the degree of conditional convergence between regions and economic sectors. Rogers and Hayden (2001) find that prices do not exhibit the same kinds of regional heterogeneity that characterizes labor markets. Therefore, if trade is considered to affect prices, then we should not expect to see strong regional differences in convergence if trade is the primary factor. FDI and migration tends to be concentrated along the Mexican border region and concentrates in manufacturing. If FDI increases economic integration, then we should expect to see faster conditional convergence in industries in which foreign investment concentrates.

Not surprisingly, the results suggest that all three factors affect conditional convergence. In the interior, traded sectors exhibit more rapid convergence than non-traded sectors. The border exhibits much higher rates of conditional convergence in all

[2] The correlation is weaker when capital is allowed to "chase" labor in the computable general equilibrium (CGE) models.
[3] In 2001, the United States GDP per capita was US$36,200 and the Mexican GDP per capita was $9,100.

sectors than the interior, suggesting that migration and foreign investment may play a larger role. Within the border, convergence is highest where migration is highest (Tijuana). In Ciudad Juarez, convergence is slower in industries with relatively high maquiladora investment than in nontraded goods industries.

In the sections that follow, we first examine convergence in the long run by looking at long run absolute wage trends. We discuss some of the problems comparing U.S. and Mexican wages, describe the economic and theoretical rationale for using absolute wage convergence as a measure of integration, and present some empirical results. We contrast both the trends in absolute wage convergence and test for unit roots, allowing for breaks in the series. We then present preliminary results that give some evidence of the speed of the convergence of the distribution of the differentials. Initial results suggest that the distributions converge more rapidly in the border region, but the change in the rate of convergence after NAFTA depends on the measure of wages used. The next section evaluates conditional convergence by looking at how the responsiveness to short-run wage shocks from the U.S. affect Mexican wages, including robustness checks and alternative wage comparisons. We conclude in the final section.

II. The Long Run: Absolute Wage Convergence

A. Theory and Motivation

Markets are generally considered to be integrated when prices converge. Thus, the most intuitive measure of labor market integration is the equalization of wages. This approach has been used widely in the literature. This metric is effective when discussing the removal of barriers to migration (such as the fall of the Berlin Wall) or in areas in

which barriers to migration are relatively small (Boyer and Hatton 1994, Moazzami 1997, Collins 1999).

Reynolds (1992) summarizes the expectation for wage convergence in the context of NAFTA. Trade theory suggests that wages, which are determined by supply, demand, productivity, government policies, and other factors, could equalize as a result of trade liberalization. The main reasons for this are well known to trade economists and therefore will only be briefly described here. The first reason is that differences in wages give rise to trade. In a two-factor, two-country, two-good model, wages will differ across countries when relative factor supplies differ. Wages are high in the labor-scarce country and low in labor-abundant countries. The increase in the demand for the (cheaper) labor-intensive goods from the labor-abundant country should increase the demand for labor and, therefore, increase wages. The reverse should happen in the labor-scarce country, generating a trend towards convergence in absolute levels.

In the context of the United States and Mexico, it seems unlikely that trade with Mexico would have a significant effect on U.S. wages because Mexico is just one of many trading partners[4] and many of these other trading partners have much lower wages than Mexico (e.g. China). Mexico, on the other hand, could have much larger effects from trade liberalization because 77.1% of Mexico's total trade is with the United States[5] and, therefore, tariff liberalization could affect a much wider range of production in Mexico. To the extent that trade liberalization results in production shifts that increase the demand for labor, we should expect to see production shifting into labor-intensive activities.

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[4] Mexico's share of total U.S. goods trade in March 2002 was 12.7%. In that same month, the top ten trading partners together made up about 70% of total U.S. goods trade.

[5] Based on March 2002 statistics. See http://dgcnesyp.inegi.gob.mx/bdine/bancos.htm .

Figure 1 shows the evolution of Mexico's manufacturing exports between 1991 and 2002. Exports rise throughout the sample period, but increase at a higher rate following NAFTA's implementation (even before the peso crisis). This increase in exports need not correspond to an increase in the share of workers working in manufacturing, however, because exports could increase if goods formally sold domestically were simply shifted abroad.

To briefly consider the shift in production before and after NAFTA, we draw upon data from the quarterly *Encuesta Nacional de Empleo Urbano* (National Urban Employment Survey, or *ENEU*). These data are available from the first quarter of 1987 to the last quarter of 2001. The surveys are conducted in municipalities throughout Mexico and are used to construct unemployment statistics. From these data, I constructed the share of urban employment in manufacturing in each quarter. To begin, I restrict the sample to workers between 16 and 70 years who are not self-employed, working in the public sector, or have missing earnings. I also focus on five urban areas: Central Mexico (Mexico City, Mexico State, and Guadalajara) and four border cities (Tijuana, Ciudad Juarez, Nuevo Laredo, and Matamoros).[6] Both males and females are included.

The share of these workers employed in manufacturing over time is found in Figure 2. The fraction of workers employed in manufacturing falls steadily between 1989 and 1994, when NAFTA went into effect. In contrast, between January 1, 1994 (when NAFTA first became effective) and the peso crisis (December 1994), the share of manufacturing employment rose. It falls somewhat during 1995 (the worst period of the

[6] In the analysis that follows, I test the robustness of including Monterrey. Including Monterrey does not significantly affect the results and the results for Monterrey are more similar to the results for the interior than for the border cities.

crisis) but continues to climb until 1999, when it again begins to fall. Overall, however, the share of employment in manufacturing rose in Mexico following NAFTA.

Shifting into manufacturing only increases the demand for labor if manufacturing is labor intensive. Of course, manufactured goods are produced with a wide range of labor-intensive techniques. Textiles is one of the most labor-intensive industries within Mexico. Figure 3 shows the evolution of the share of urban employment in the textile industry. As with manufacturing, the share employed in textiles falls until NAFTA. The peso crisis reverses the fall until the beginning of the recovery in 1998. The share of employment in textiles increases following NAFTA when the entire period (1994-2001) is considered, although the share seems to fall near the end of the sample.

Metal products, Machinery, and Equipment is also an important manufacturing industry in Mexico and has been the primary sector receiving maquiladora investment. The total number of maquiladora workers and plants is shown in Figure 4a. This figure shows that employment rose sharply until about 1988, when the rate of increase slowed. The rate of increase rose again in 1995 and remained high until falling in 2002. The number of establishments rises sharply until the 1992-1994 period and then resumes its rise until 2000. The relative distribution of maquilas also changed over the period. Figure 4b illustrates the change in log employment for three of the metropolitan areas described above: Central Mexico, Tijuana, and Ciudad Juarez. In Baja California (the state in which Tijuana is found), 54% of maquiladora employment was in this industry in 1998. In Chihuahua (the state in which Ciudad Juarez is located), this figure was 68% in the same year. Over the 1990-2002 period, employment in Ciudad Juarez is the highest, but Central Mexico gains employment relative to the border cities following NAFTA.

Figures 1-4 provide some circumstantial evidence that NAFTA did indeed lead to the kind of changes that theory suggests may lead to absolute wage convergence. Industrial employment shifted towards manufacturing in general and textiles in particular following NAFTA. Do Mexican wages show evidence of convergence towards United States wages following NAFTA?

B. Real vs Dollar Wages in Mexico

Figure 5 illustrates the real U.S. manufacturing wage (1982 dollars)[7] and the Mexican manufacturing wage in dollars using the nominal exchange rate to convert peso wages into dollars from 1963 to 1999.[8] Wages for U.S. manufacturing workers fall during the early 1980s and, in dollar terms, the Mexican wages seem to exhibit a slightly steeper positive trend. The scale makes the variation in the trends difficult to see, so panel B of Figure 5 rescales the two series. Wages in Mexico fall sharply during the "Lost Decade" of the 1980s, but begin to recover in 1987, just one year after Mexico implemented both dramatic inflation controls (the *pactos*) and joined the General Agreement of Tariffs and Trade. Dollar wages continue to rise until the peso crisis, but begin to recover relatively quickly in 1996. Over the entire period, Mexico's dollar wage seems to converge towards the U.S. real wage, as shown by the time path of the log difference in the two wage series in panel C.

When comparing wages across countries with very different monetary and exchange rate policies, it is important to address the problem of exchange rates. With

[7] The hourly wage in manufacturing including overtime was downloaded from the Bureau of Labor Statistics website.
[8] Wilkie et. al, eds. *Statistical Abstract of Latin America*.

freely floating exchange rates, wages in different currencies are easily compared using the nominal exchange rate because the nominal exchange rate accounts for inflation differences between the two countries. The Mexican exchange rate, however, has only been freely floating since the peso crisis in December 1994. Figure 7 illustrates the time path of the same U.S. wage series and the peso wages deflated for domestic inflation.[9] In panel A, the two series are rescaled to facilitate a more direct comparison. Two main results emerge. First, the dollar value of wages and the inflation adjusted Mexican wage both rise during the 1970s and fall during the 1980s. Inflation-adjusted wages fall more relative to earlier wages than the dollar-adjusted wages. This is especially evident in panel B, in which both the U.S. wage and the Mexican real wage are indexed such that 1963=1. The second main difference is that, starting in the middle of the 1980s, the inflation adjusted series and the dollar adjusted series diverge. In dollar terms, Mexican wages relative to U.S. wages trend upwards over the sample. In real terms, Mexican wages do not recover their lost purchasing power and therefore relative wages seem to exhibit a downward trend since the 1980s.

The obvious explanation for the difference in the two series is that the peso/dollar exchange rate does not move enough to fully offset relative inflation. The difference between the relative price series and the exchange rate are shown in Figure 7, in which both the nominal exchange rate and the ratio of the Mexican and U.S. consumer price indices are normalized to equal 1 in 1986. While the series follow closely during the early part of the 1980s, the series begin to diverge in 1987. They continue to diverge

[9] The Mexican Índice Nacional de Precios al Consumidor (INPC) is used to measure inflation amd is available at http://www.banxico.org.mx .

until the peso crisis (which allowed the peso to adjust to offset the relative price differences), but they diverge again until the end of the sample.

The divergence between relative price levels and the nominal exchange rate creates a problem when comparing relative wages before and after NAFTA. Figures 5 and 6 illustrate that recovery from the 1980s crisis began in about 1987. To abstract from the effects of the debt crisis, I begin my formal analysis in 1987. To formally compare wages between Mexico and the U.S., I turn again to the *ENEU* surveys. The survey design is much like the U.S. Current Population Surveys (CPS). These surveys allow me to extend the analysis to all economic sectors and to differentiate by geographic region. I compare wages in the ENEU with U.S. wages calculated from the U.S. CPS.

The ENEU and CPS are similar in many respects, but one important difference is that the ENEU follows households for five quarters before dropping them from the sample. While matching individuals across periods may seem desirable, in practice it is very difficult because households, and not individuals, are revisited. To approximate the panel effect, I instead employ the pseudo panel approach described by Deaton (1985). This approach generates wage averages for different groups in the population and tracks the wages of these groups over time. This approach has the advantage of allowing us to follow "individuals" over the entire sample period.

To implement the pseudo-panel technique, I classify workers into 40 groups that are identified with five education levels and eight age groupings. The education levels are based on the continuous years of education variable, which is then sorted into the following categories: 0 to 6 years, 7 to 9 years, 10 years, 11-12 years, and more than 12 years. The age groups are 5 years apart starting at 15, except for the last group. The last

group includes workers between 50 and 65 in the first year.[10] As is customary in the pseudo-panel technique, the age group boundaries advance through time so that we follow cohorts. Using the United States CPS, I calculate the average wages for the same age-education groups in the United States and then pair these cohorts with their demographic counterparts in Mexico.

Figure 8a contains the evolution of the average ratio of log dollar wages of these groups (weighted by sample size) for Tijuana, Matamoros, and Central Mexico relative to their United States counterparts. These cities are chosen because they contrast in ways that help us understand integration. Tijuana and Matamoros are border cities that are more closely integrated with the United States labor markets than Mexican interior cities are (Robertson 2000). Tijuana has a larger number of *maquiladora* plants than Matamoros, and also is closer to a major United States city. Not surprisingly, the United States border patrol apprehends many more people trying to enter the United States illegally in Tijuana than in other parts of the border (Hanson, Robertson, and Spilimbergo 2002).

At first glance, figure 8a shows two important features. First, prior to the NAFTA and the peso crisis, the ratio of Mexican wages to United States wages was increasing, suggesting absolute wage convergence. It is important to mention at this point that the Mexican real exchange rate was also appreciating at this time: the nominal exchange rate was not adjusting to offset Mexican inflation. Thus, wages increased in dollar terms even if they did not increase relative to Mexican inflation. This changed dramatically when the peso crashed in December 1994. The adjustment in the nominal value of the peso

[10] I also performed the analysis with 6 education groups for a total of 48 categories. The results are very similar.

resulted in a sharp drop in the dollar value of Mexican wages. Following NAFTA, a very similar phenomenon has occurred with the Mexican exchange rate: the nominal value of the exchange rate has not adjusted to offset the differences in inflation between Mexico and the United States so that the dollar value of Mexican wages has been increasing relative to United States wages.

The second main feature evident in figure 8 is the difference in both the absolute and relative wage changes between regions within Mexico. The Mexican border region has higher wages than the Mexican interior, and the wages in Tijuana are higher, on average, than the wages in Matamoros. Furthermore, during the peso crisis, the wages in the border region in general, and most evident in Tijuana in particular, did not fall as much as wages in the interior. Wages in Tijuana also recover more quickly from the crisis than wages in the interior.

The lack of adjustment in the nominal exchange rate makes wage comparisons using the nominal exchange rate difficult. An alternative approach is demonstrated in figures 8b. Rather than changing Mexican wages to dollars using the nominal exchange rate, I calculate real wages in the United States and Mexico using the consumer price index of each country (using 1992 as the base year).[11] I then divide each series by the average of the 1992 values. This creates a wage index for each country that is in the same units and therefore can be compared directly. Figure 8b shows the evolution of the ratio of the Mexican (normalized) wages (for Tijuana and Central Mexico) to United States (normalized) wages. As suggested by the time path of manufacturing wages in Figures 5 and 6, the wage series exhibit much different time path. Two main features emerge.

[11] Although the city-specific price indices are available, I used the national price index values to deflate all wages. The correlation coefficient of the city-specific price indices for the cities used here is above 0.999 for each city pair.

First, wages in Central Mexico are more volatile. They rise more prior to the crisis and fall more during the crisis, raising the possibility that proximity to the U.S. economy mitigates domestic economic fluctuations much like living next to the ocean mitigates domestic temperature fluctuations. Second, wages exhibit more recovery in dollar terms than in peso terms, again suggesting that perhaps the peso is not fully adjusting to offset domestic inflation.

Figure 9a, which separates these trends by industry, suggests that the differences in the relative wage are not large across industries, although wages may have fallen more in the nontraded industries. In the Tijuana, wages begin to fall as early as 1991 while wages in the interior are still rising. Figure 9b differentiates the wage series by education level. These series illustrate the documented rise in the relative wage of more skilled workers (Hanson and Harrison 1999, Revenga 1997) between 1987 and 1994. It is interesting, however, that the wages of the less educated workers begin to recover from the crisis earlier than skilled workers in both regions, perhaps due to changes in relative skill demand following NAFTA (Robertson, forthcoming).

Prior to NAFTA, the wages in the interior (Central Mexico) rose more quickly than in the border region. As shown before, the drop in wages is larger due to the peso crisis in the interior. The recovery, or wage growth following NAFTA, seems more rapid in Tijuana. The relevant question for this section is essentially whether the rate of growth in wages is more rapid following NAFTA. We now test this observation formally.

C. Trends, Trend Breaks, and Unit Roots

Figures 8a and 8b suggest similar movements in the Mexican-U.S. wage ratio. One may wonder if these series have a trend and/or a unit root characterizing growth in the relative wage over time. One problem in this kind of analysis is determining the actual trend breaks. One could, of course, guess at the breaks based on the graphical analysis of the series as shown in Figure 8. Vogelsang and Peron (1998) [VP] propose a more formal approach that relates the trends directly to unit root tests. They describe eight approaches (four for the additive outlier (AO) model and four for the innovative outlier (IO) model) and suggest that AO models should be used if large slope shifts are expected because the power of the tests is higher. The basic intuition of the tests is to evaluate the statistical significance of successive t-statistics on trend break terms that are moved through the sample using the following equation (VP eq. 2.2)

$$\begin{aligned} y_t &= \mu + \beta t + \theta DU_t + \gamma DT_t + \tilde{y}_t^2 \\ \tilde{y}_t^2 &= \sum_{i=0}^{k} \omega_i D(T_b)_{t-i} + \alpha \tilde{y}_{t-1}^2 + \sum_{i=0}^{k} c_i \Delta \tilde{y}_{t-i}^2 + u_t \end{aligned} \quad (1)$$

In this equation, $DU = 1(t > T_b)$, $DT = 1(t > T_b)(t - T_b)$, and $D(T_b) = 1(t=T_b+1)$.

Figure 8 suggests that the wage series may actually exhibit two trend breaks: a decline in the middle of the sample and a recovery. Formal tests using the test described above support this idea. Figure 10 shows the test statistic from the above test (the t-statistic on the trend break term) for the Central Mexico and Tijuana dollar wage ratios. The local extrema suggest trend breaks. In this case, the test statistic roughly fits our intuition about where the breaks in the series occur. The breaks in both the dollar-value wage ratios and the index wage ratios for the Mexican cities described above are found in to top half of Table 1.

When measured in dollars, wages in most cities experience breaks at similar times. Wages drop beginning around 1993 (pre crisis) and recover beginning around 1998. When indexed for domestic inflation, the first break periods differ. In particular, wages in Tijuana begin falling in 1990, and most of the breaks occur closer to the crisis date (1994:4). The next question that naturally arises is whether the recovery trend is steeper than the pre-NAFTA trend. The next two columns test the slope before NAFTA with the slope after NAFTA by testing the difference of the trend coefficients before and after the first trend break.[12] A positive value suggests that the trend coefficient was larger during the recovery. The results suggest that the recovery trend is weakly greater than before NAFTA and the crisis, but the difference is very small. When measured in dollars, wages generally do not exhibit a statistically steeper trend in the NAFTA/recovery period. It is also interesting to note that for Tijuana and Ciudad Juarez, the recovery trend is less steep during the NAFTA/recovery period. Central Mexico exhibits the steepest trend, but it is difficult to determine whether this is due to the subsequent appreciation of the peso or the relative rise in maquiladora investment. Overall, however, the recovery trends for every city are positive, suggesting that Mexican and U.S. wages are converging (due to increases in Mexican wages rather than falling U.S. wages), but there is little evidence that the rate of this convergence was affected by trade. Regional heterogeneity weighs against the hypothesis that trade has contributed to convergence in average wages.

The next question is, once the trends have been accounted for, whether the series exhibit a unit root. To test for the unit roots I take the residuals from the OLS regressions

[12] Each series was regressed with three linear trend terms. The first is a linear trend increasing from 1 at the beginning of the sample, the second starting at 1 (and 0 earlier) at the first trend break, and the third starting at 1 (and 0 earlier) at the second trend break.

on the trend terms described above and then apply the Kwiatkowski, Phillips, Schmidt, Shin (KPSS, 1992) stationarity test on each series. This test has a null hypothesis of stationarity, and was conducted under the null of level stationarity. The test's denominator was calculated using the Bartlett kernel, as employed by KPSS. The maximum lag order was derived from Stata's automatic bandwidth selection routine, to avoid evaluating a range of test statistics for various lags (the maximum lag order was 5 in every case).

The test results (and approximate 5% critical value) are shown in the final column of Table 1. The detrended data show no support for rejecting the null hypothesis of level stationarity. Therefore, there is little evidence suggesting that relative wages between Mexico and the U.S. exhibit a unit root over the relatively short period examined here. The relative wages, therefore, may be converging back to an equilibrium differential. In the next two sections we consider two approaches to measure this kind of convergence.

III. The Medium Run: Distributional Convergence

The discussion in the previous section suggested that there is little evidence of accelerated convergence in absolute wage levels after NAFTA: Mexican wages do trend towards U.S. wages, but this trend is not steeper after NAFTA. Another way to think about integration, however, follows from trade theory that suggests that factor prices may differ both due to incomplete specialization and productivity differences. Once these productivity differences are accounted for, factor prices seem to be much more equal.

In this section we introduce an approach that addresses three concerns in the literature. First, labor is heterogeneous. Average wages may mask differences in

convergence if the returns to some factors do equalize. For example, skilled and unskilled worker's wages may converge at different rates. Furthermore, most studies that do take account of productivity differences assume there is a constant country-specific effect. It is possible, however, that different factors may have different productivity differences and that productivity differences may be distributed across factors.

Second, international differences in wages may be due to incomplete integration, differences in cones, or productivity differences. It may be possible that, given a change in prices that follows from trade liberalization, wages may converge to a differential that is explained, for example, by productivity. Third, we know little about the rates of convergence following trade liberalization.

These three concerns may be addressed using a Markov chain approach to a distribution of factor price differences. Webber (2002) employs an approach described by Shorrocks (1978) to measure wage convergence in the European Union. Here we employ this approach in a slightly different context. To begin with, assume that we have some number of factors N that can be matched across countries (in this case, Mexico and the United States). Furthermore, assume that in the perfectly integrated equilibrium the difference in factor prices can be represented with a factor-specific parameter k_j (for j = 1…N) such that

$$w_j^{us} = k_j w_j^{mx}. \tag{2}$$

In this case, relative wages for each factor j will depend on the distribution of k. If we assume that trade liberalization changes relative prices, and hence relative wages, in wages that move factors towards convergence, then the observed relative wage ratios would converge towards their integrated equilibrium values.

At time period t, the distribution of the relative wage ratios can be described by d_t. If the distribution evolves according to a Markov process characterized by the transition matrix φ, the distribution in period $t+1$ will simply be

$$d_{t+1} = \varphi d_t . \tag{3}$$

The second eigenvalue of the transition matrix provides Information about the evolution speed and steady state of the distribution d. Specifically, if the second eigenvalue is between zero and one, the distribution is converging towards the steady state. A second eigenvalue equal to one suggests that the steady state does not exist, and if it is equal to zero the steady state has already been reached.

As a first pass, I divided both the relative dollar wages and relative indexed wages into ten equal categories based on deciles of the entire distribution of each ratio for each quarter. I then calculated the Markov transition matrix for Tijuana and Central Mexico for the 1989-1994 period and the 1996-2001 periods for both relative wage series. The second eigenvalues of each transition matrix are shown in Table 2. All of the eigenvalues are between zero and one, suggesting that all of the distributions are converging towards a steady state. Shorrocks (1978) derives a formula used to describe the half-life h for the convergence to the steady state based on the eigenvalue λ_2:

$$h = \frac{-\log(2)}{\log|\lambda_2|} \tag{4}$$

Using this formula, I derive the estimated half-life for reaching the steady state for each of my four cases (Tijuana and Central Mexico before and after NAFTA).

Although preliminary, the results in Table 2 are provocative. First, in every case, Tijuana exhibits a more rapid convergence than Central Mexico, and, in the second period, Tijuana has a half-life that is less than half of Central Mexico. The second main

result is that the dollar wages and indexed wages offer very different results. The dollar wages exhibit slower convergence than the indexed wages. In addition, when comparing the pre- and post-NAFTA periods, the dollar wages and indexed wage offer contrasting results. Convergence in dollar wages slows down, while convergence in indexed wages speeds up. It is important to remember that this measure does not capture convergence to equal wages, or necessarily an equilibrium differential, but most likely is capturing the rate at which the distribution of differentials across factors converges to a steady state.

IV. The Short Run: Returning to the Equilibrium Differential

A. Theory and Motivation

One problem with using absolute wage convergence as a metric of integration between the United States and Mexico is that the United States government dedicates considerable resources to preventing migration from Mexico.[13] One reason often given for patrolling the border is that such border enforcement is necessary to maintain the wage differential. If the observed differential is constant, or is trend stationary, then an third approach generates two alternative measures of integration.

The basic estimation equation summarizing this approach is

$$\Delta w_{jt}^{mex} = \beta_0 + \beta_1 \Delta w_{jt}^{us} + \beta_2 (w^{mex} - w^{us})_{jt-1} + e_t . \qquad (5)$$

[13] According to the 2000 INS Statistical Yearbook, the INS apprehended 1,814,729 aliens in fiscal year 2000. Of these, approximately 96 percent were Mexicans.

This equation is derived from a supply and demand framework more completely described by Robertson (2000).[14] The equation describes the relationship between the change in the Mexican log wage for group j (defined here as an age-education group) at time t, the change in the log wage in the United States, and the difference between the U.S. and Mexican log wage levels.

In this approach, the β_1 term captures the effect of the U.S. wage shock on Mexican wages, and β_2 measures the rate of convergence back to the equilibrium differential. Larger differences between the two suggest a faster rate of return to the equilibrium differential. These two coefficients are measures of integration. More integrated labor markets should have larger coefficients (in absolute value). Robertson (2000), for example, shows that wages in Tijuana are more responsive to shocks and have a faster rate of convergence to the equilibrium differential than wages in the interior of Mexico, suggesting that the Tijuana (and the rest of the Mexican border region in general) is more integrated with the United States labor market than the Mexican interior is. This evidence is consistent with migration being a major factor integrating these labor markets.

The framework described in (5) can be modified to formally test the differences in the estimated coefficient values across regions and industries. The significance and sign of coefficients estimated from interacting region and industry dummy variables with the relevant variables reveals whether there are statistically significant differences across regions and industries as well as whether certain regions or industries are more integrated with United States labor markets.

[14] Including a lagged difference in the change in the Mexican wage to account for possible serial correlation generates very similar results.

This framework can also be used to provide information about the relative importance of the different channels of integration (trade, foreign direct investment, and migration). Trade theory generally considers effects of trade that occur through price changes. Rogers and Hayden (2001) find that prices in Mexico do not exhibit strong regional differences, which is consistent with the idea that domestic product markets are well-integrated enough so that price changes that occur as a result of trade would affect various regions in a similar way. Therefore, we would not expect to see large regional differences in the rates of convergence of wages if trade plays a dominant role. Furthermore, if NAFTA changed prices in Mexico, then we would expect to see more evidence of integration following NAFTA (during the recovery period).

Labor markets, on the other hand, seem to exhibit regional differences. This may be due to migration, since most migration from Mexico to the U.S. occurs over land, or foreign direct investment, since the maquiladora industry has historically located in the border region. Foreign investment tends to concentrated in manufacturing industries – primarily Metal Products, Machinery, and Equipment (which includes transportation equipment and the automobile industry). If foreign investment is the primary channel, then we should expect to see evidence of integration to be strongest in the manufacturing industries that have the most investment. Furthermore, maquiladora investment increased greatly following NAFTA. Therefore, if foreign direct investment is a primary force, then we would expect to see this influence increasing following NAFTA. Finally, if migration is the main channel, then we would expect to see little difference across industries and the largest degree of integration in Tijuana, where most INS apprehensions occur. In addition, since migration was not liberalized in NAFTA, a primary role for

migration in integrating markets would be suggested by little change in the degree of integration following NAFTA.

B. Empirical Results: Regional Differences before and after NAFTA

The data used to estimate (5) and its variants are the same log wage means for matched U.S.-Mexican age-education cells. The data are quarterly and run from 1987 to 2001. All of the regressions that follow also include three trend terms that capture the three segments of the relative wage trend as described in the previous section. Table 3 provides the results from the basic model in which we include regional effects for the entire sample period. This table extends Robertson (2000) by adding four post-NAFTA years of data and controlling for the different trend segments. The four border cities (Tijuana, Ciudad Juarez, Matamoros, and Nuevo Laredo) are included as interaction effects, leaving the main effects to reflect Central Mexico.[15] Three estimations are presented: all workers, workers with more than 12 years of education (more ed), and workers with 12 or fewer years of education (less ed). The results are consistent with the basic findings of the earlier paper. The shock term is positive and significant for Central Mexico for more educated workers, and the estimated effects of U.S. wage shocks are generally larger (although not significantly so) in the border cities. The convergence term is negative and significant, as expected, and the rate of convergence is larger for the border cities. The cities with the highest rates of migration and largest number of

[15] Central Mexico includes Mexico City, Mexico State, and Guadalajara. Monterrey was also included in these regressions as a separate city but was not reported because the results are very similar to those of Central Mexico.

maquiladoras have the fastest rates of convergence back to the equilibrium differential. Table 4 also shows that these results are weakest for less educated workers.

The effects of NAFTA are estimated by modifying the basic equation used in Table 4 by including a dummy variable equal to 1 for the post NAFTA years (1994 and on) and excluding the years with large exchange rate movements (1987 and 1995). The peso crisis in 1995 and the devaluation in 1987 may affect the results because the nominal value of the peso is used to calculate the dollar value of Mexican wages. In addition, the extreme movements of the peso may affect wages in ways that could be mistaken for the effects of trade liberalization because the peso crisis occurs in the first year of NAFTA. In addition to the main effect, the NAFTA dummy variable is interacted with the shock and convergence terms found in Table 4. These results are found in Table 5. The main effects are qualitatively very similar to those found in Table 4. The interactions with the NAFTA effects, however, are only significant and the convergence terms generally indicate faster conditional convergence following NAFTA for the more educated workers.[16] The results without 1987 and 1995 seem to be stronger in the sense that now the main shock term is positive and significant in column 2. The border effects are also somewhat larger in all three columns. Thus, it seems as if removing the periods with large movements in the peso improves the estimation results.

C. Empirical Results: Industry Differences before and after NAFTA

[16] The sign of the interaction coefficients on the shock terms are often negative and are generally positive on the convergence coefficients.

Rather than regions, one may think that wages in industries are closely linked across countries. Since trade and investment are generally focused in manufacturing, it may be the case that wages in manufacturing industries are more closely linked than wages in other industries. There are, however, some reservations about this approach. If workers are mobile across industries, then it is not clear that there should be systematic wage differences across industries that would be transmitted across countries.[17] Robertson and Dutkowsky (2002) find that labor market adjustment costs at the 2-digit level of Mexican manufacturing are small – about an order of magnitude smaller than in developed countries.

Another problem is that even narrowly defined industries may be very heterogeneous. The most relevant example of this case would be the kind of vertical specialization implied by Feenstra and Hanson (1997). They describe a kind of production fragmentation in which the final production of a good is broken into stages, and each stage may have a different production factor intensity. They suggest that capital flows into Mexico may be within a very narrowly defined industry, but the kinds of tasks performed (e.g. design versus assembly) may be very different. These different stages may therefore be subject to different shocks that may or may not be transmitted clearly across borders.

Even with these problems, however, focusing on industries is intuitive and helpful if industries are linked through investment or product prices. A shock to the demand for textiles in the United States, for example, may affect the demand for textile labor in

[17] The phenomenon of inter-industry wage differentials has spawned a very large literature, and significant differences in industry wages persist in Latin America. These differentials are also highly correlated across developed countries. There is relatively little research on these differentials in developing countries.

Mexico if foreign investment and trade link labor markets. Services, such as construction and commerce, may be less integrated under these mechanisms. If there are no systematic differences across industries, then it may be that shocks are not transmitted though industry-specific channels (increasing support for the migration hypothesis), or that shocks that are transmitted by industry-specific channels are quickly diffused throughout the economy.

To estimate the effects of industry-specific shocks, I change the definition of the age-education categories to accommodate industries. I defined 48 cells defined by 2 education groups (less than 12 years of education, 12 or more years), 4 age groups, and 6 industry groups. The industry groups include construction (the base industry), textiles, machinery and transport equipment, other manufacturing, commerce (wholesale and retail trade), and other services. The manufacturing industries were divided into these groups because the majority of the maquiladora investment is in the first two industries, regardless of where in the country the maquiladoras are located. The trend terms described earlier were included in these regressions but regional controls were not.

Table 6 contains the estimation results for the base equation and the industry dummy variables and interaction terms. The first main result from the table is that none of the shock terms are significant. The second main result is that the convergence terms for construction are significant and have the expected sign. The textile industry has a statistically significant higher rate of convergence to the U.S.-Mexican wage differential than construction, and the other services sector has a statistically significant lower rate of convergence than construction. None of the other industries have significantly significant marginal effects.

At this point we can begin to form some comparisons about the relative importance of the different channels of integration. If trade is the main factor, then we would expect little heterogeneity in the industry estimates and the tradable industries would perhaps exhibit more responsiveness to U.S. shocks and converge more quickly. Generally, however, the results in Table 6 (and other results that break down the estimation by gender and were included in an earlier version of the paper) are generally insignificant and just as often show less integration after NAFTA than more integration. Very little evidence supporting a large role for trade emerges.

Alternatively, strong regional patterns emerge in tables 3-5. Thus, this seems to suggest that either foreign direct investment or migration is the primary factor integrating markets. The next step is therefore to consider industries within regions. If FDI is more important, then we expect that, within the border region, industries with more foreign investment will exhibit more responsiveness to shocks and faster conditional convergence, with increasing effects evident after NAFTA. Tables 7 and 8 contain estimates of the base industry regression by city (Table 7) and when NAFTA effects are included (Table 8).

As expected, the results are more consistent with the basic model when the estimation is done separately for each city. The main shock effects (in construction) are positive, although only significant in Nuevo Laredo. It is interesting that the effects of shocks in the United States are strongest in the textile sector in Tijuana. The rest of the marginal effects are generally not significant. The convergence terms, on the other hand, are all negative and significant for construction. All of the marginal effects are significant in Central Mexico, with the largest being in textiles and electric machinery and transportation equipment. A similar result emerges in Tijuana, in which the marginal

effects are negative and significant in textiles and other manufacturing. Textiles again has a very large (in absolute value) coefficient, suggesting that the textile industry in Tijuana, rather than the textile industry nation wide, is closely integrated with the United States labor markets. It is interesting that the effects of electric and transport equipment are positive and significant in Ciudad Juarez, and positive in Matamoros and Nuevo Laredo. More than 50% of maquiladora employment is in this sector. This result weighs against the FDI hypothesis. Interestingly, the additional effect of the textile industry is in the reverse order of the percent of maquiladora employment in textiles.[18]

Table 8 contains the effects of the NAFTA on these estimates. When the NAFTA (1997-2001) dummy is included, the shock terms are still generally insignificant. The effect of NAFTA is relatively large and positive in textiles in Tijuana and Ciudad Juarez, and large and negative in Matamoros. The main convergence terms remain negative and significant across all cities, but the rate of convergence is only higher for construction in Tijuana and Ciudad Juarez. With the exception of Nuevo Laredo, which experiences faster convergence in the tradable industries and slower convergence in the non-tradable industries, there is little evidence of a significant increase in integration that would be due to trade or foreign investment. On the other hand, the two largest INS apprehension cities – Tijuana and Ciudad Juarez - both experience faster convergence rates in the NAFTA period, which is most consistent with the immigration hypothesis.

IV. Conclusions and Policy Implications

[18] In 1998, the share of maquiladora employment in textiles was 6.7%, 15.6%, and 10.7% in Baja California (Tijuana's state), Chihuahua (Juarez's state), and Tamaulipas (Matamoros and Nuevo Laredo's state) respectively.

While there has been a significant increase in trade and foreign direct investment in Mexico following NAFTA, this paper finds surprisingly little evidence of increased integration of labor markets. Wages are converging in absolute levels following NAFTA, but the rate of absolute convergence is not higher than it was before NAFTA. Using indexed wages, the rate of convergence seems to be slower in the border region.

Using an alternative approach that controls for the rising trend in the relative wage, the paper estimates the responsiveness to shocks and the short-run rate of convergence back to the equilibrium differential. This approach reveals very limited evidence of increased labor market integration following NAFTA. The Mexican border region remains more integrated with the United States than the Mexican interior, but there is little change in this pattern following NAFTA. Furthermore, neither the border nor the interior seems more integrated.

These results may contribute to the debate about what factors integrate labor markets in North America. Theory tells us that trade, capital flows, and migration can all integrate labor markets. NAFTA liberalized trade and capital flows, but did not relax restrictions on migration. The lack of evidence that integration increased uniformly or in traded sectors (as expected from a dominating effect of trade) as well as the lack of evidence of increased integration in FDI-intensive industries suggest less of a role for these two channels. Alternatively, integration is strongest in the two most significant departure points for migrants. Together, these findings suggest that migration probably plays the most significant role in integrating labor markets.

What are we to conclude from these varied and diverse results? There is a active debate in the economics literature about the effects of economic integration on living standards. Frankel and Romer (1999) suggest that countries that trade more experience

more growth. Since that paper, several others have suggested that trade is not a sufficient condition for growth. Institutions, education, and other factors also play a role. NAFTA successfully increased trade and investment flows, but the results in this paper suggest that, while important and possibly necessary for integration-related growth, trade and foreign investment may not be enough.

Of course, one may also draw the conclusion that trade and investment have not increased enough to have the expected effects. There is very little, if any, significant evidence that the increases in trade and investment have had adverse effects. Thus, it is possible that further investments in infrastructure (that would promote trade), institutions (that reduce economic risk), and measures to facilitate investment may yet yield positive effects. It is also possible that the time frame studied here is too brief to detect the kinds of changes implied by trade and investment. The overall trend in Mexican wages – measured either in dollars or real pesos – is positive and therefore, in the long run, we can confidently conclude that Mexico is catching up to the U.S. in terms of wages.

The strongest implications, however, seem to come from migration. Migration seems to play a critical role in integrating labor markets and raising wages. At the very least, it seems clear that additional measures by the U.S. to further restrict Mexican migration will have detectable negative effects on Mexican wages – both in terms of absolute and conditional convergence. Therefore, those concerned with increasing Mexican wages should not support such measures.

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Figure 1: Mexican Manufacturing Exports

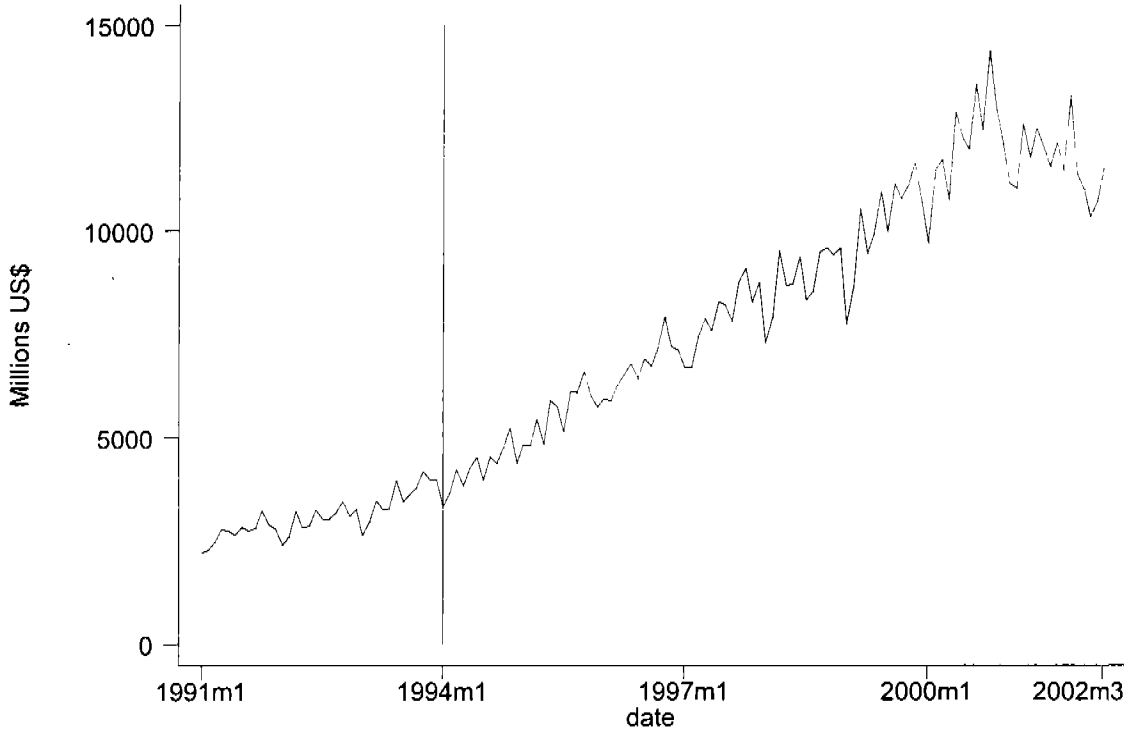


Figure 2: Share of Manufacturing in Urban Employment in Mexico

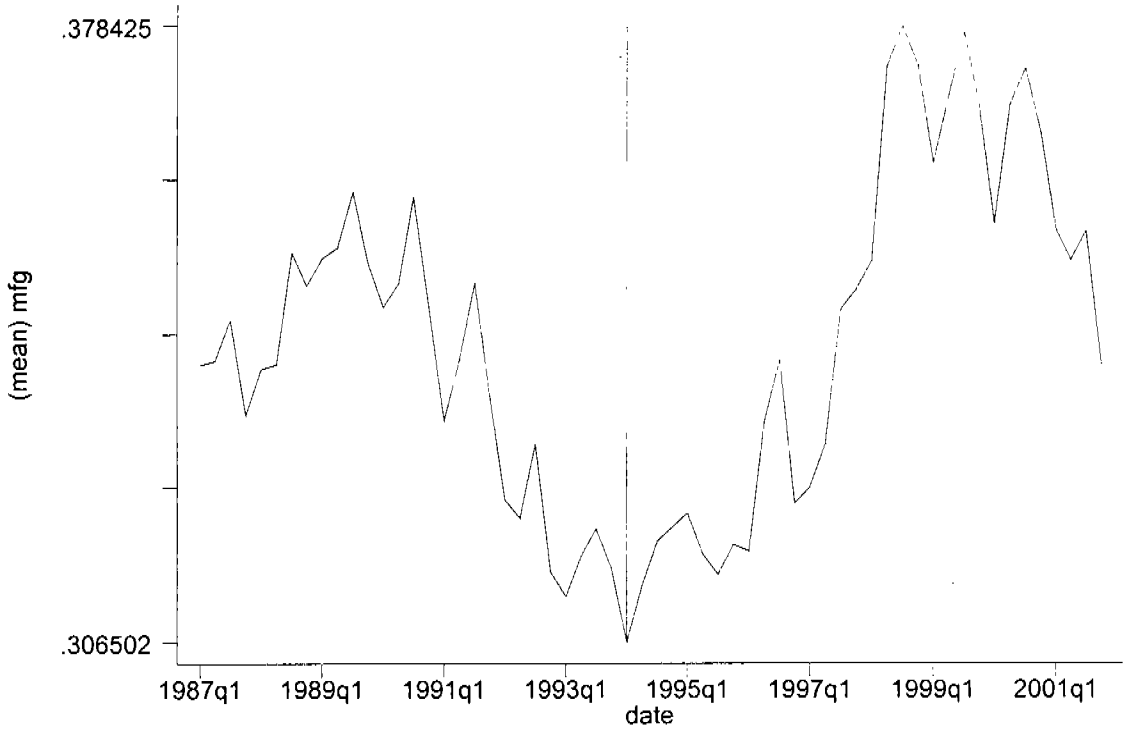


Figure 3: Textile Share of Total Urban Employment in Mexico

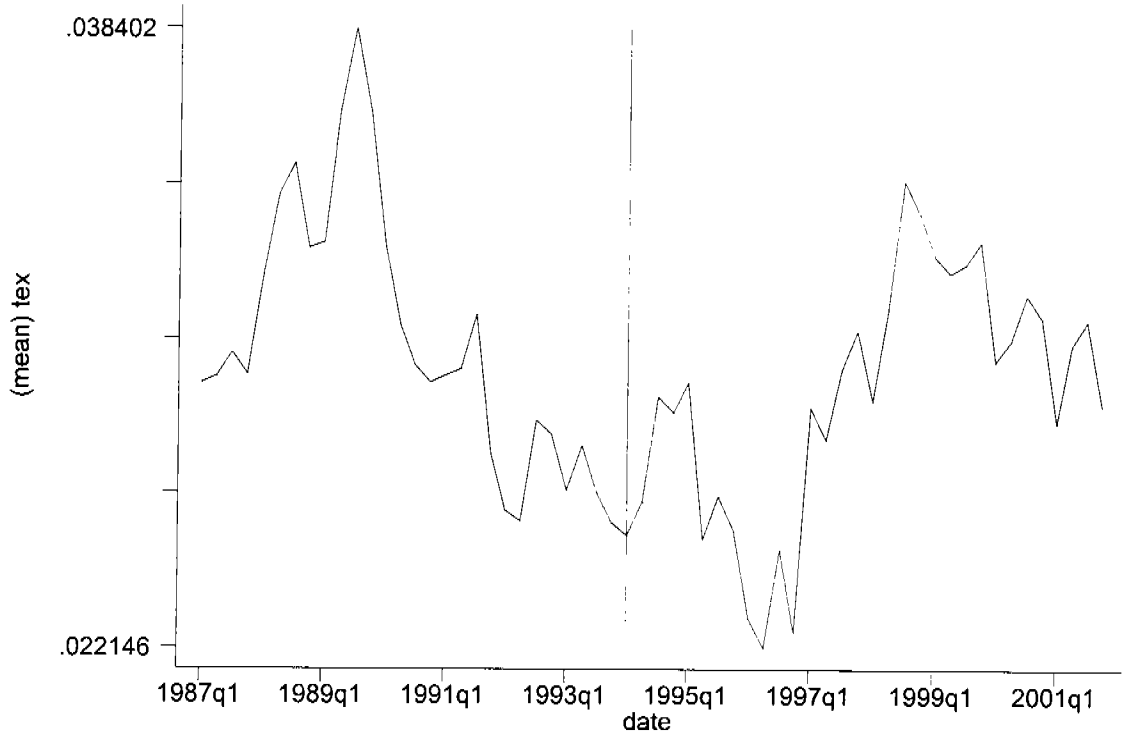


Figure 4a: Maquiladora Employment and Establishments

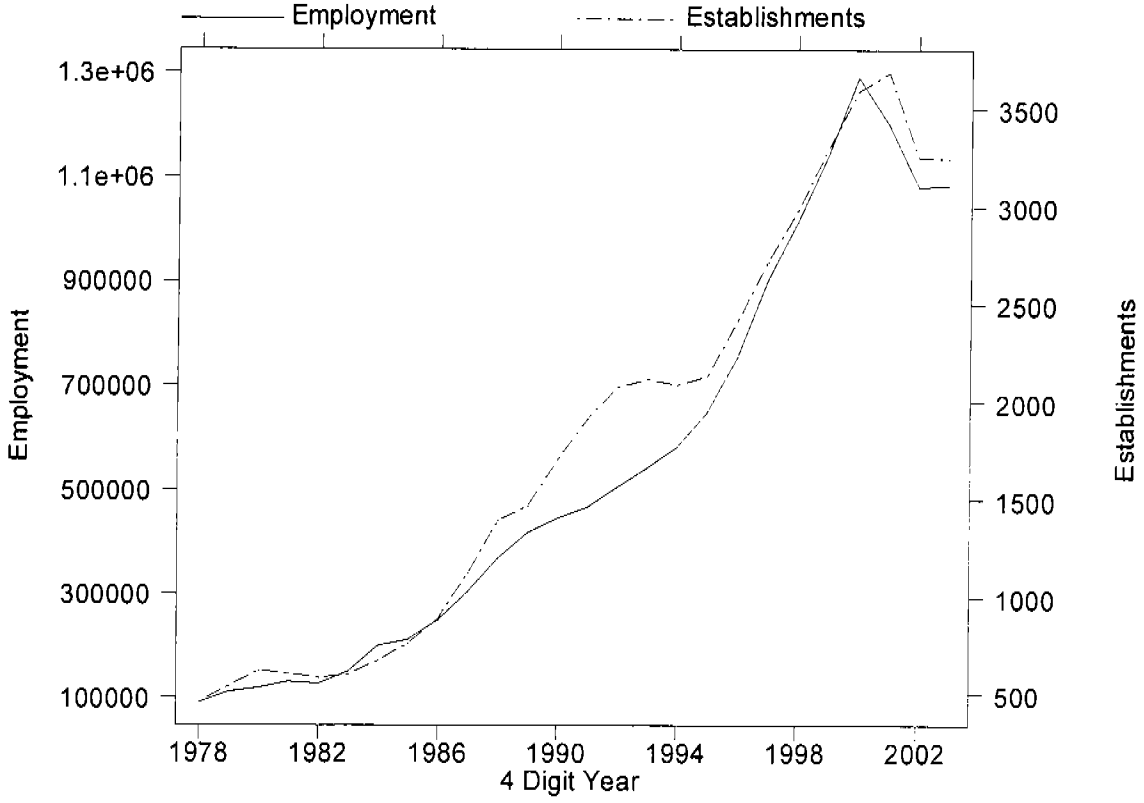


Figure 4b: Maquiladora Employment by City

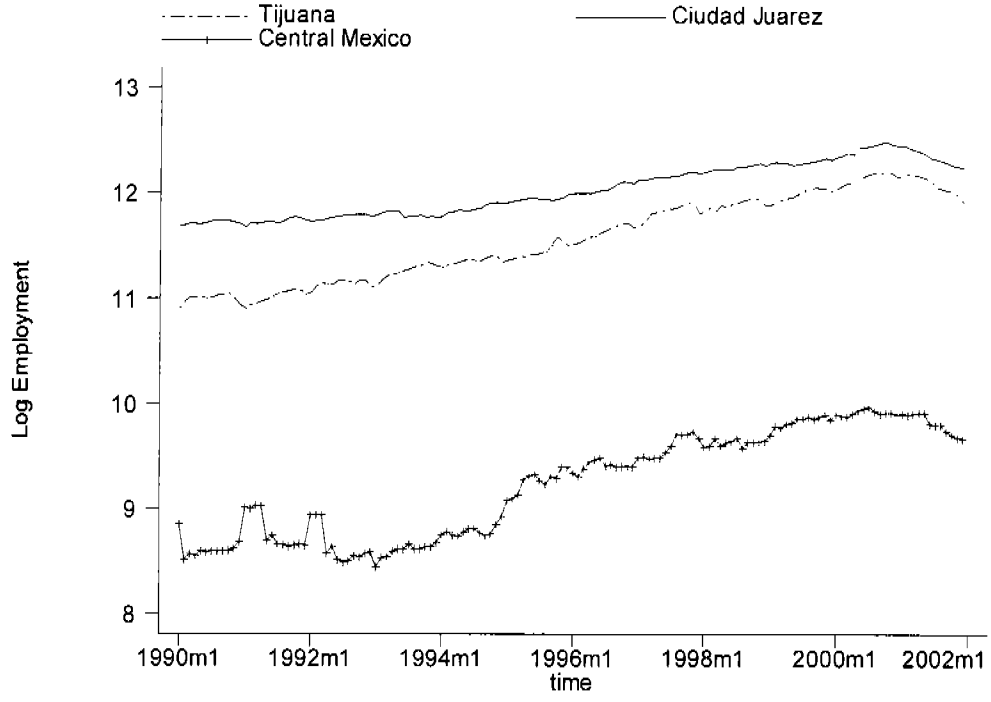
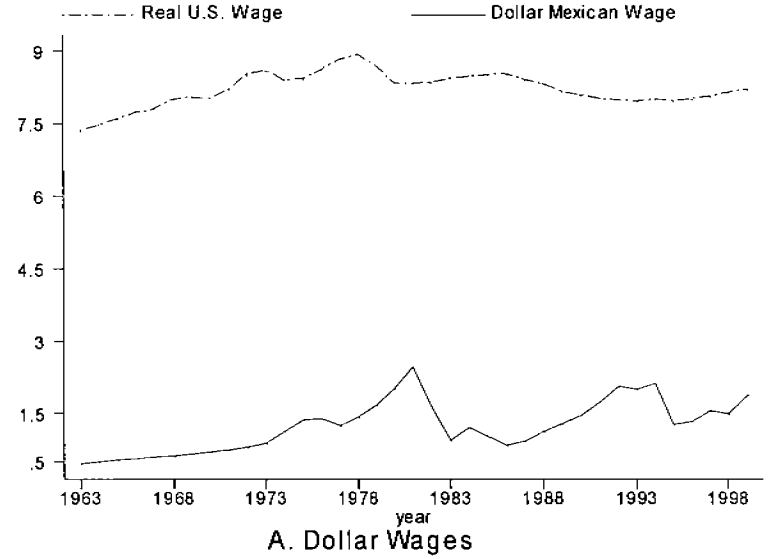
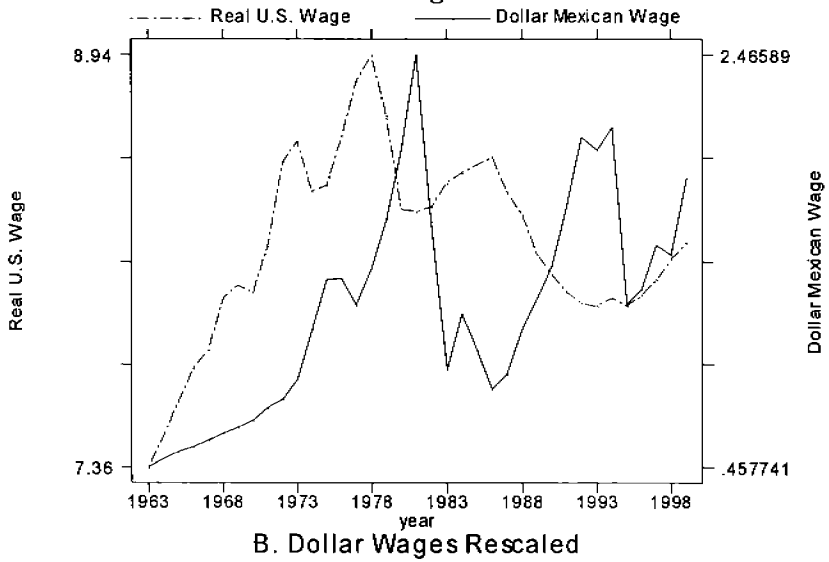


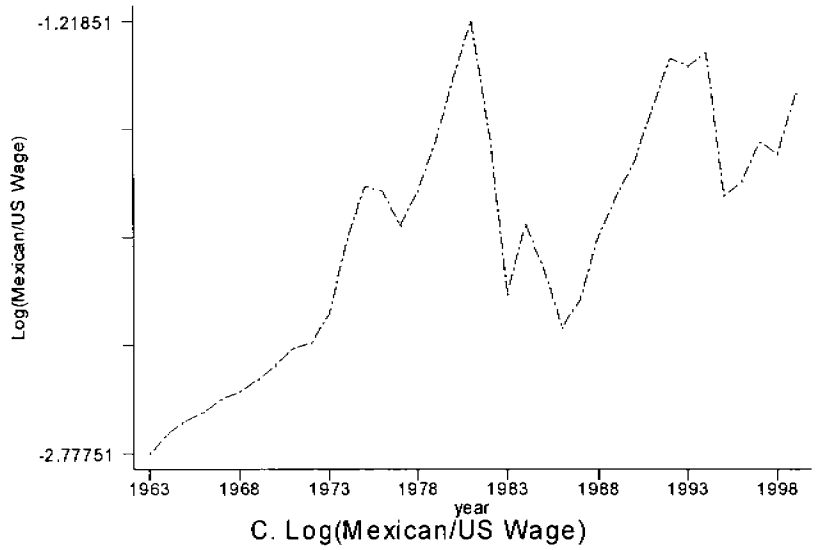
Figure 5: Comparing Dollar-Valued Mexican and U.S. Wages



A. Dollar Wages



B. Dollar Wages Rescaled



C. Log(Mexican/US Wage)

Figure 6: Comparing Inflation-Adjusted Mexican and U.S. Wage (Indxed from Local Currencies)

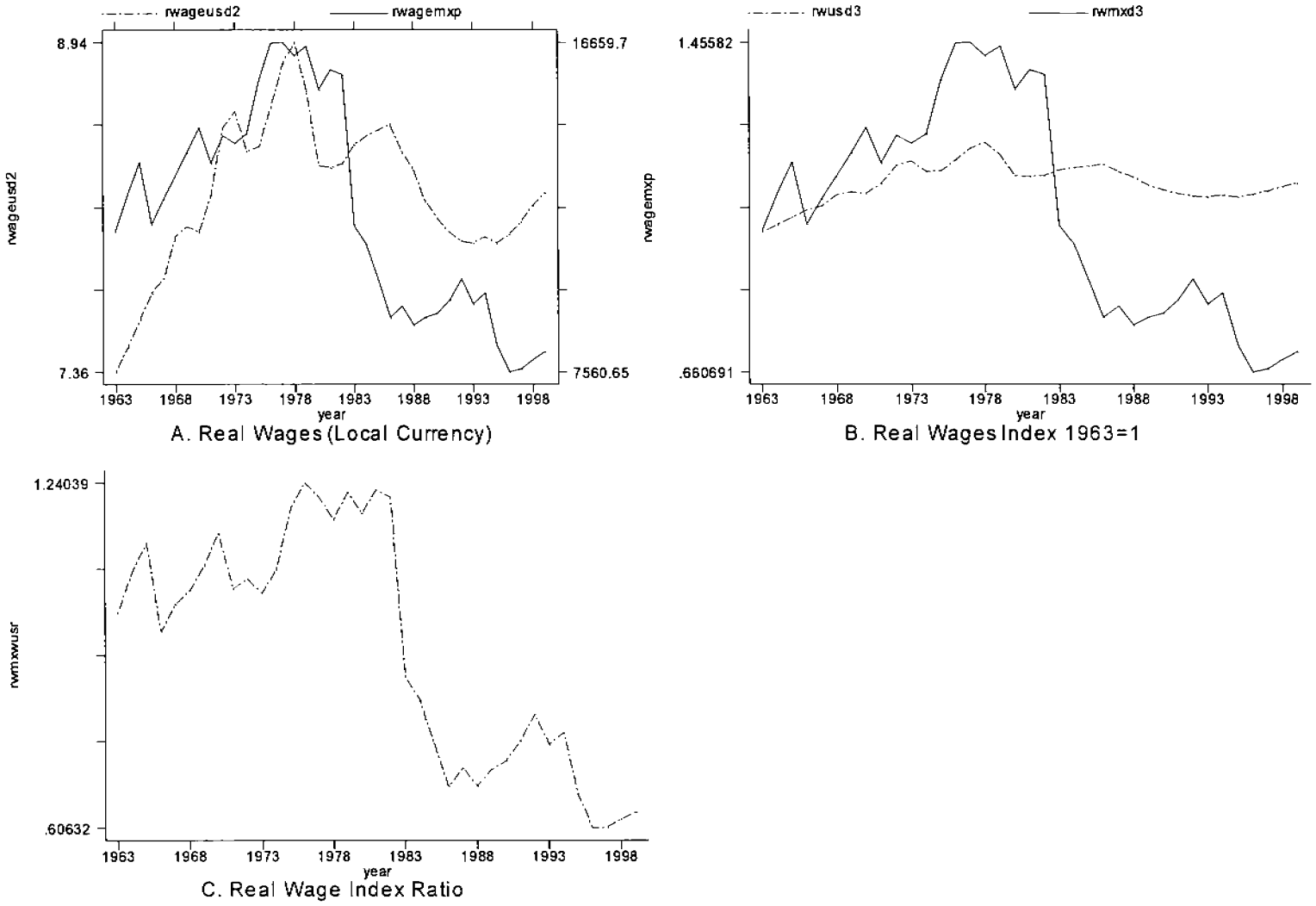
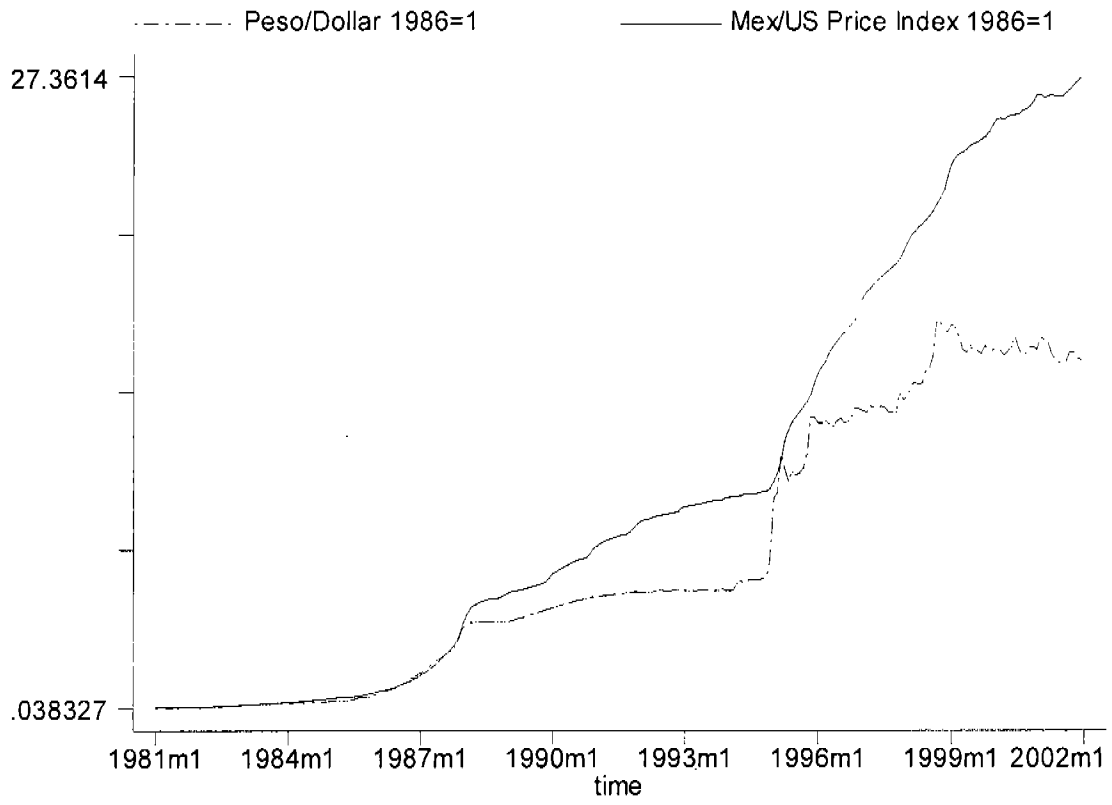
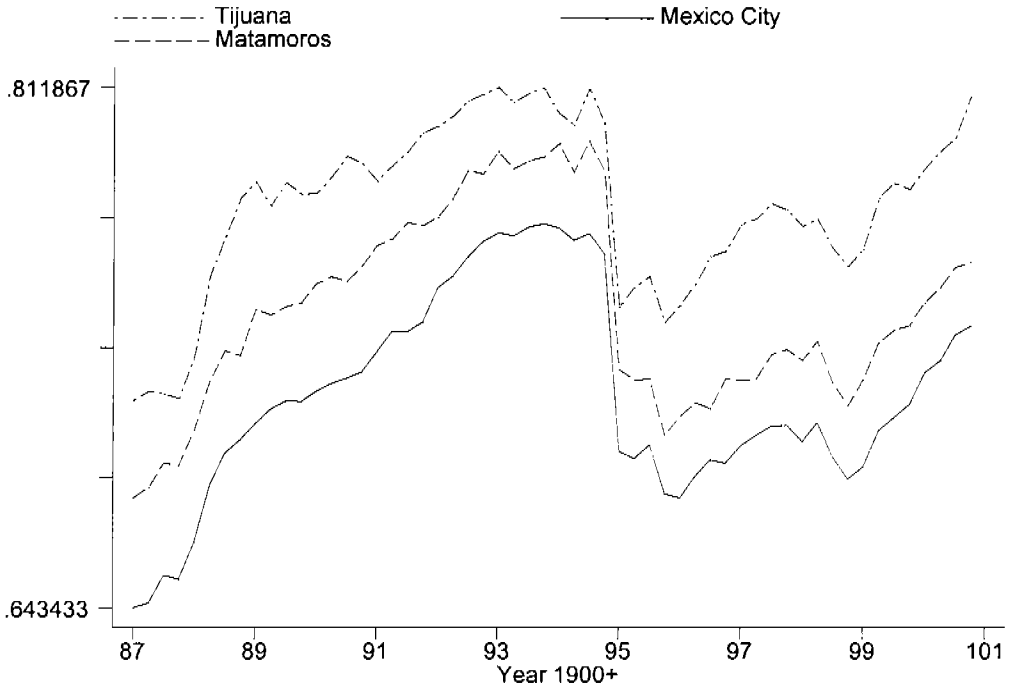


Figure 7: Mexican Exchange Rate and Relative Prices



Source: Banco de México and BLS. The Mexican inflation index is the nation-wide index normalized to 1 in 1986. The exchange rate is the nominal pesos per dollar exchange rate (in new pesos) divided by the average of the 1986 values. The U.S. inflation index is the CPI for all urban consumers as found on the BLS website, normalized to 1 in 1986.

Figure 8a: Mexican/United States Dollar Wage Ratios



Notes: These series are the ratio of Mexican to United States log monthly earnings, in which the log monthly earnings were first converted to dollars using the nominal exchange rate. These (log) dollar values were then arithmetically averaged across all age-education groups (using cell sizes as weights) and used to calculate the ratio of log wages.

Figure 8b: Mexican/United States Normalized Wage Ratios

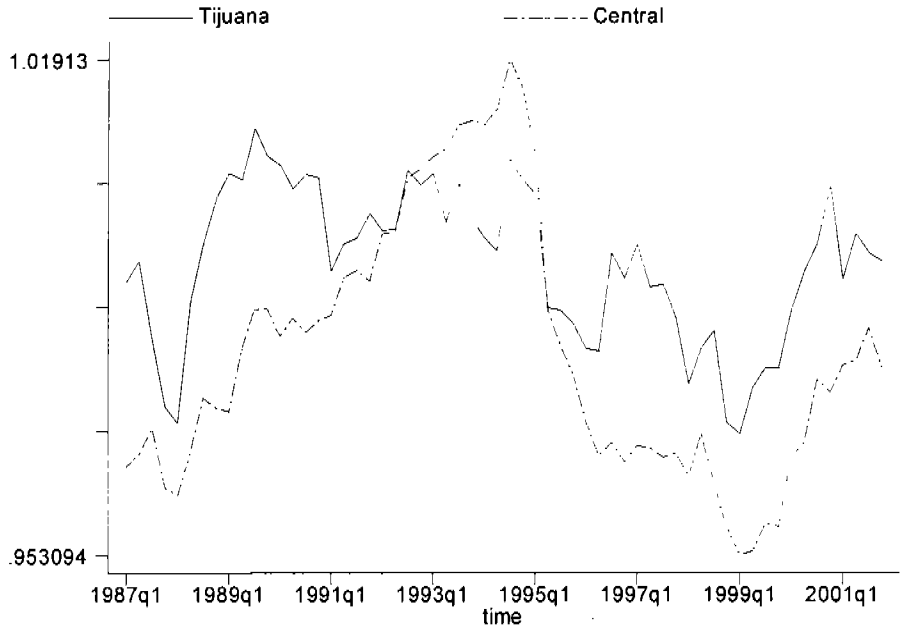
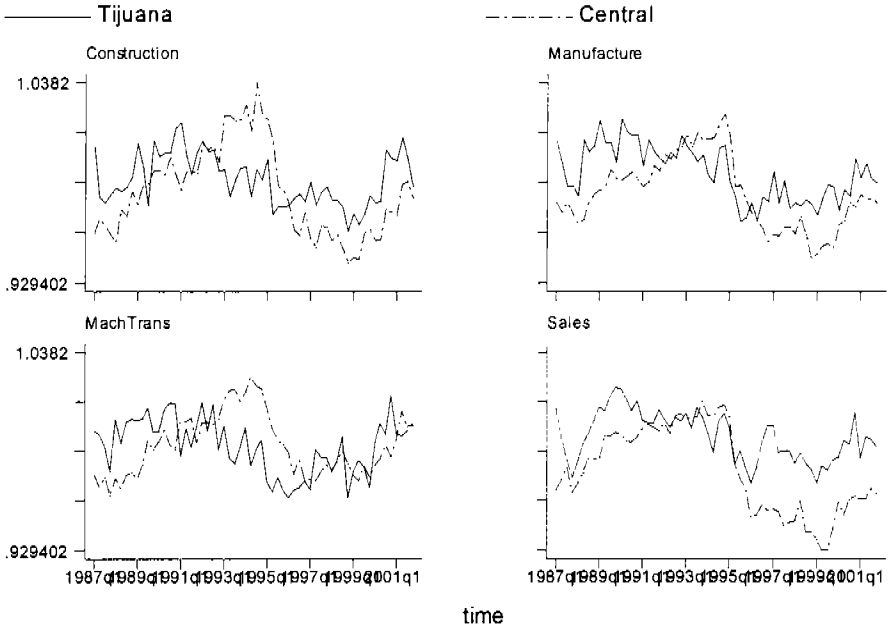


Figure 9a: Normalized Wage Ratios by Industry



Notes: This graph shows the ratio of the Mexican inflation-adjusted wage relative to the United States inflation-adjusted wage, when the wages in both countries are normalized to be equal to 1 for 1992. The real values are compared without using the nominal exchange rate.

Figure 9b: Normalized Wage Ratios by Education Group

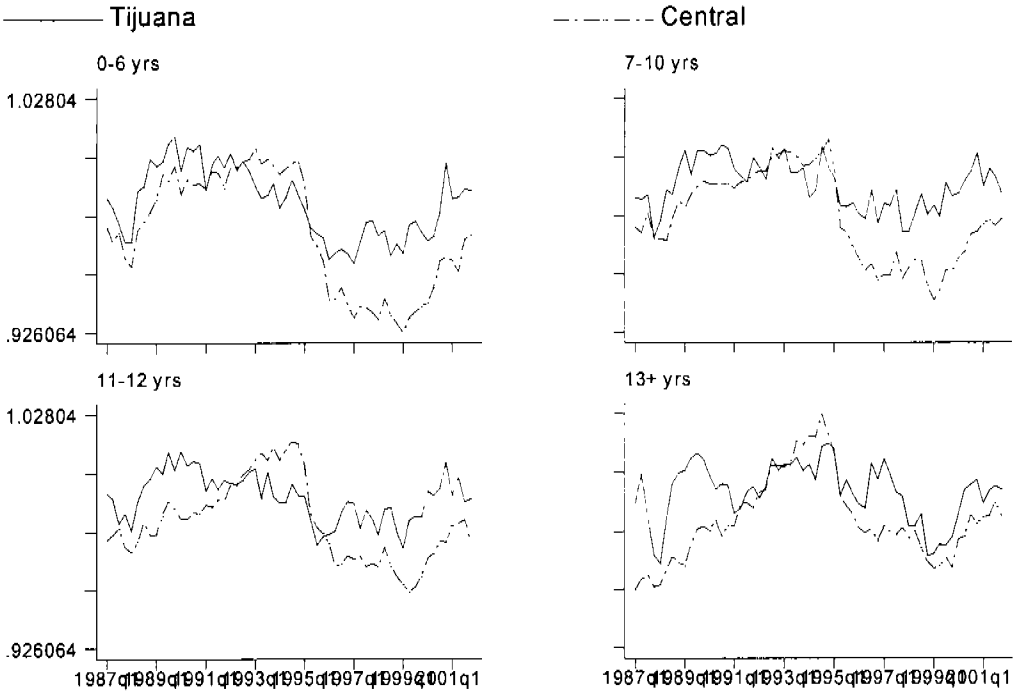


Figure 10a: Trend Break Test Statistic
Dollar Wages

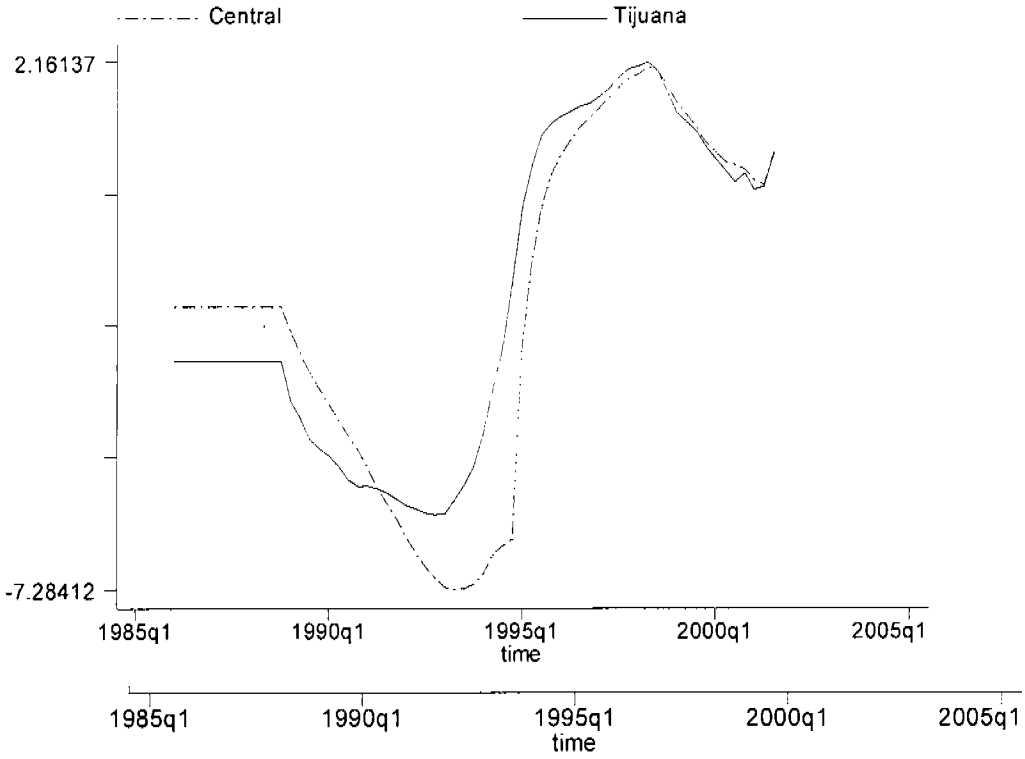


Figure 10b: Trend Break Test Statistic
Normalized Wages

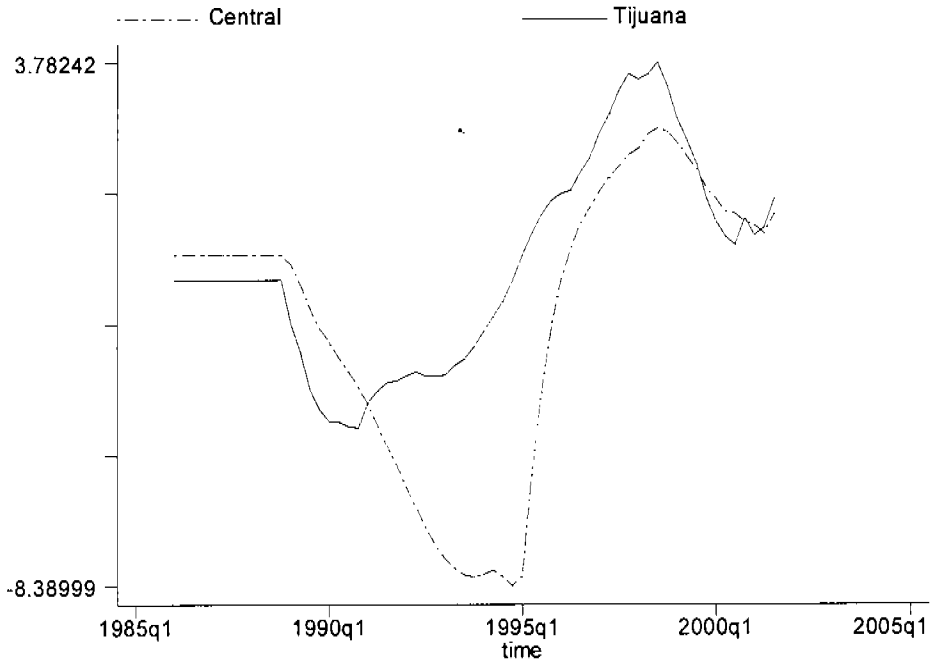


Table 1: Trends and Unit Roots

Using Dollar Value of Wages

	Break 1	Break 2	Net Recovery Trend	p-value	KPSS stat (5% crit val=0.46)
Central	93:3	98:2	0.0010	0.169	0.056
Monterrey	93:3	98:1	0.0006	0.406	0.057
Tijuana	93:1	98:2	0.0010	0.197	0.063
C Juarez	93:2	97:3	-0.0005	0.343	0.041
Matamoros	93:1	98:2	0.0010	0.188	0.055
N Laredo	94:4	98:2	0.0025	0.010	0.070

Using Real Wage (Index Ratios)

	Break 1	Break 2	Net Recovery Trend	p-value	KPSS stat (5% crit val=0.46)
Central	94:4	98:3	0.0013	0.003	0.057
Monterrey	95:1	98:3	0.0009	0.052	0.071
Tijuana	90:4	98:3	-0.0003	0.457	0.043
C Juarez	93:4	97:2	-0.0006	0.042	0.038
Matamoros	94:4	98:2	0.0010	0.008	0.055
N Laredo	94:2	98:2	0.0001	0.810	0.090

Table 2: Dynamic Distributional Convergence

Dollar Wages	1989-1994		1996-2001	
	Central Mexico	Tijuana	Central Mexico	Tijuana
lambda 2	0.8547	0.7496	0.9246	0.8436
Speed	26.49	14.43	53.05	24.45
Indexed Wages	1989-1994		1996-2001	
	Central Mexico	Tijuana	Central Mexico	Tijuana
lambda 2	0.5185	0.4709	0.6505	0.3989
Speed	6.33	5.52	9.67	4.53

Notes: The speed of convergence to the equilibrium distribution is the half-life in years calculated as –Tlog(2)/log(lambda) in which T is the time period and lambda is the second eigenvalue of the Markov transition matrix derived from dividing the relative wages into ten categories based on deciles of the distribution of relative wages. See Shorrocks (1978).

Table 3: Basic Results
Eneu 1987-2001

	(1) All Ed	(2) More Ed	(3) Less Ed
Tijuana	-0.062	-0.123	0.002
	(0.022)**	(0.023)**	(0.021)
C. Juarez	-0.050	-0.135	0.024
	(0.028)	(0.028)**	(0.034)
Matamoros	-0.046	-0.168	0.023
	(0.022)*	(0.036)**	(0.018)
N. Laredo	-0.087	-0.155	-0.030
	(0.021)**	(0.040)**	(0.025)
Shock (Central Mexico)	-0.005	0.476	-0.046
	(0.037)	(0.105)**	(0.036)
Tijuana	0.031	-0.019	0.060
	(0.078)	(0.167)	(0.083)
C. Juarez	0.035	0.224	0.046
	(0.054)	(0.146)	(0.059)
Matamoros	0.074	0.035	0.091
	(0.060)	(0.101)	(0.064)
N. Laredo	-0.063	-0.371	-0.022
	(0.047)	(0.118)**	(0.050)
Convergence (Central Mexi	-0.033	-0.211	-0.015
	(0.011)**	(0.027)**	(0.012)
Tijuana	-0.061	-0.161	-0.004
	(0.019)**	(0.021)**	(0.017)
C. Juarez	-0.037	-0.124	0.013
	(0.019)	(0.021)**	(0.022)
Matamoros	-0.032	-0.135	0.013
	(0.015)*	(0.025)**	(0.010)
N. Laredo	-0.056	-0.113	-0.020
	(0.013)**	(0.023)**	(0.014)
Constant	0.015	-0.433	0.057
	(0.024)	(0.068)**	(0.023)*
Observations	12829	5627	7202
R-squared	0.05	0.16	0.05

Notes: All equations include year effects. Robust standard errors in parentheses. * significant at 5%; ** significant at 1%. Monterrey was included but not reported. Monterrey exhibits less integration than the border cities. Three time trend terms were also included as described in the text.

Table 4: Effects of NAFTA on Shock and Convergence Estimates

	(1)		(2)		(3)	
	All Ed	(Nafta)	More Ed	(Nafta)	Less Ed	(Nafta)
Shock (Central Mexico)	-0.011	0.018	0.469	-0.040	-0.061	0.060
	(0.042)	(0.071)	(0.095)**	(0.349)	(0.042)	(0.071)
Tijuana	0.068	-0.126	0.001	-0.079	0.107	-0.168
	(0.064)	(0.147)	(0.163)	(0.493)	(0.067)	(0.154)
C. Juarez	0.079	-0.179	0.234	-0.043	0.095	-0.194
	(0.067)	(0.104)	(0.182)	(0.405)	(0.071)	(0.101)
Matamoros	0.110	-0.139	0.070	-0.287	0.128	-0.135
	(0.068)	(0.146)	(0.150)	(0.576)	(0.074)	(0.147)
N. Laredo	-0.070	0.027	-0.479	0.909	-0.013	-0.040
	(0.040)	(0.105)	(0.171)*	(0.515)	(0.037)	(0.105)
Convergence (Central Mexic	-0.037	0.003	-0.216	-0.069	-0.023	0.026
	(0.011)**	(0.013)	(0.026)**	(0.022)**	(0.013)	(0.013)*
Tijuana	-0.061	0.002	-0.155	-0.037	-0.010	0.016
	(0.018)**	(0.006)	(0.021)**	(0.008)**	(0.017)	(0.006)*
C. Juarez	-0.038	-0.001	-0.125	-0.014	0.010	0.006
	(0.019)*	(0.003)	(0.020)**	(0.007)	(0.021)	(0.002)*
Matamoros	-0.033	0.001	-0.144	0.006	0.011	0.007
	(0.015)*	(0.002)	(0.022)**	(0.005)	(0.010)	(0.003)*
N. Laredo	-0.055	-0.002	-0.111	-0.025	-0.021	0.005
	(0.013)**	(0.003)	(0.024)**	(0.006)**	(0.015)	(0.002)
Constant	0.005		-0.451		0.040	
	(0.024)		(0.066)**		(0.024)	
Observations	12829		5627		7202	
R-squared	0.05		0.18		0.18	

Notes: Robust standard errors in parentheses. * significant at 5%; ** significant at 1%. Monterrey was included but not reported. Monterrey exhibits less integration than the border cities. Three time trend terms were also included as described in the text. NAFTA and city main effects were included but are not reported.

Table 5: NAFTA Effects without 1987 and 1995

	(1)		(2)		(3)	
	All Ed	(Nafta)	More Ed	(Nafta)	Less Ed	(Nafta)
Shock (Central Mexic	0.036	-0.029	0.647	-0.220	-0.037	0.035
	(0.043)	(0.071)	(0.092)**	(0.311)	(0.030)	(0.066)
Tijuana	0.046	-0.104	0.060	-0.105	0.067	-0.128
	(0.060)	(0.158)	(0.186)	(0.544)	(0.063)	(0.167)
C. Juarez	0.039	-0.140	0.104	0.090	0.059	-0.159
	(0.074)	(0.116)	(0.209)	(0.429)	(0.079)	(0.114)
Matamoros	0.084	-0.113	0.091	-0.309	0.087	-0.095
	(0.070)	(0.151)	(0.186)	(0.624)	(0.076)	(0.152)
N. Laredo	-0.053	0.009	-0.504	0.935	0.008	-0.060
	(0.043)	(0.114)	(0.139)**	(0.481)	(0.038)	(0.115)
Convergence (DF)	-0.018	-0.012	-0.189	-0.084	-0.012	0.017
	(0.008)*	(0.013)	(0.028)**	(0.022)**	(0.008)	(0.012)
Tijuana	-0.071	-0.003	-0.208	-0.034	-0.011	0.011
	(0.022)**	(0.006)	(0.025)**	(0.009)**	(0.018)	(0.005)*
C. Juarez	-0.040	-0.005	-0.140	-0.014	0.009	0.001
	(0.019)*	(0.002)*	(0.022)**	(0.007)	(0.021)	(0.002)
Matamoros	-0.029	-0.001	-0.147	0.006	0.014	0.005
	(0.015)	(0.002)	(0.020)**	(0.006)	(0.012)	(0.002)
N. Laredo	-0.052	-0.004	-0.118	-0.026	-0.016	0.003
	(0.014)**	(0.002)	(0.024)**	(0.006)**	(0.015)	(0.002)
Constant	0.050		-0.397		0.074	
	(0.019)*		(0.071)**		(0.016)**	
Observations	11285		4955		6330	
R-squared	0.04		0.20		0.04	

Notes: All equations include year effects. Robust standard errors in parentheses. * significant at 5%; ** significant at 1%. Monterrey was included but not reported. Monterrey exhibits less integration than the border cities. Three time trend terms were also included as described in the text. NAFTA and city main effects were included but are not reported.

Table 6: Industry Estimates
Males and Females

	(1)	(2)	(3)
	All Ed	More Ed	Less Ed
Shock (Construction)	0.051	-0.037	0.039
	(0.049)	(0.273)	(0.054)
Textiles	-0.024	0.268	-0.069
	(0.067)	(0.303)	(0.062)
Electric & Transport	-0.034	0.188	-0.044
	(0.057)	(0.327)	(0.060)
Other Mfg.	0.087	-0.050	0.101
	(0.094)	(0.354)	(0.098)
Commerce	0.052	0.508	-0.011
	(0.093)	(0.348)	(0.081)
Other Services	-0.074	0.391	-0.109
	(0.075)	(0.297)	(0.075)
Convergence (Construction)	-0.122	-0.325	-0.070
	(0.019)**	(0.022)**	(0.007)**
Textiles	-0.100	-0.107	-0.058
	(0.044)*	(0.037)**	(0.024)*
Electric & Transport	-0.008	0.069	-0.014
	(0.025)	(0.038)	(0.010)
Other Mfg.	-0.020	0.059	-0.022
	(0.024)	(0.037)	(0.013)
Commerce	0.013	0.104	0.002
	(0.023)	(0.041)*	(0.006)
Other Services	0.049	0.177	0.027
	(0.019)*	(0.025)**	(0.006)**
Constant	-0.195	-0.529	-0.078
	(0.036)**	(0.043)**	(0.017)**
Observations	12811	5915	6896
R-squared	0.08	0.14	0.07

Notes: Robust Standard Errors in parentheses. * significant at 5%; ** significant at 1%.The main effects time trends are included in the estimation but are not reported here.

Table 7: Industry Estimation by City

	(1) Central Mexico	(2) Tijuana	(3) C. Juarez	(4) Matamoros	(5) N. Laredo
Shock (Construction)	0.027	0.060	0.137	-0.012	0.191
	(0.028)	(0.083)	(0.126)	(0.178)	(0.053)**
Textiles	-0.080	0.329	-0.046	0.356	0.229
	(0.058)	(0.119)**	(0.162)	(0.220)	(0.173)
Electric & Transport	0.096	0.035	-0.127	0.036	-0.128
	(0.076)	(0.117)	(0.126)	(0.180)	(0.058)*
Other Mfg.	0.140	0.009	0.011	0.341	-0.059
	(0.096)	(0.111)	(0.277)	(0.227)	(0.235)
Commerce	0.082	0.067	-0.008	0.222	0.243
	(0.103)	(0.102)	(0.272)	(0.216)	(0.078)**
Other Services	-0.008	-0.030	-0.028	-0.133	-0.179
	(0.069)	(0.106)	(0.148)	(0.206)	(0.104)
Convergence (Constr.)	-0.099	-0.218	-0.257	-0.216	-0.288
	(0.013)**	(0.029)**	(0.045)**	(0.026)**	(0.029)**
Textiles	-0.081	-0.412	-0.103	-0.112	-0.222
	(0.023)**	(0.084)**	(0.059)	(0.038)**	(0.052)**
Electric & Transport	-0.092	-0.057	0.102	0.018	0.051
	(0.018)**	(0.054)	(0.050)*	(0.030)	(0.030)
Other Mfg.	-0.034	-0.146	-0.033	-0.090	-0.093
	(0.014)*	(0.052)**	(0.057)	(0.041)*	(0.048)
Commerce	-0.032	-0.051	0.001	-0.043	-0.058
	(0.014)*	(0.035)	(0.056)	(0.048)	(0.044)
Other Services	-0.036	-0.008	0.040	-0.021	-0.004
	(0.015)*	(0.031)	(0.048)	(0.029)	(0.027)
Constant	-0.179	-0.366	-0.490	-0.419	-0.680
	(0.031)**	(0.047)**	(0.082)**	(0.054)**	(0.067)**
Observations	2787	2551	2557	2507	2409
R-squared	0.11	0.16	0.12	0.14	0.16

Notes: Robust Standard Errors in parentheses. * significant at 5%; ** significant at 1%.The main effects time trends are included in the estimation but are not reported here.

Table 8: Industry-City Estimation with NAFTA Effects

	(1) Central Mexico		(2) Tijuana		(3) C. Juarez		(4) Matamoros		(5) N. Laredo	
	Main	97-01	Main	97-01	Main	97-01	Main	97-01	Main	97-01
Shock (Construction)	0.043	-0.005	0.075	0.022	0.181	-0.024	0.125	-0.243	0.169	0.075
	(0.067)	(0.159)	(0.176)	(0.276)	(0.153)	(0.164)	(0.116)	(0.229)	(0.076)*	(0.109)
Textiles	-0.100	0.072	0.129	0.362	-0.080	0.038	0.619	-0.389	0.281	-0.110
	(0.083)	(0.192)	(0.232)	(0.372)	(0.206)	(0.262)	(0.191)**	(0.272)	(0.215)	(0.288)
Electric & Transport	0.059	0.134	0.024	0.020	-0.185	0.097	-0.096	0.291	-0.104	-0.018
	(0.103)	(0.175)	(0.204)	(0.289)	(0.154)	(0.168)	(0.118)	(0.236)	(0.079)	(0.158)
Other Mfg.	0.227	-0.158	0.084	-0.108	-0.204	0.581	0.445	-0.293	0.084	-0.191
	(0.085)*	(0.221)	(0.200)	(0.299)	(0.403)	(0.380)	(0.158)**	(0.383)	(0.298)	(0.424)
Commerce	0.075	0.026	-0.143	0.611	-0.086	0.174	0.111	0.184	0.227	0.048
	(0.118)	(0.173)	(0.204)	(0.310)	(0.322)	(0.220)	(0.209)	(0.339)	(0.104)*	(0.242)
Other Services	-0.039	0.069	-0.088	0.125	-0.071	0.049	-0.235	0.178	-0.194	0.046
	(0.105)	(0.202)	(0.192)	(0.302)	(0.169)	(0.208)	(0.184)	(0.281)	(0.162)	(0.281)
Convergence (Constr.)	-0.127	0.005	-0.232	-0.099	-0.265	-0.090	-0.231	-0.032	-0.319	-0.037
	(0.018)**	(0.017)	(0.030)**	(0.028)**	(0.043)**	(0.043)*	(0.025)**	(0.026)	(0.028)**	(0.034)
Textiles	-0.101	0.002	-0.404	0.014	-0.098	-0.008	-0.139	0.038	-0.223	-0.018
	(0.022)**	(0.005)	(0.082)**	(0.014)	(0.048)*	(0.015)	(0.040)**	(0.011)**	(0.049)**	(0.013)
Electric & Transport	-0.098	-0.011	-0.067	0.028	0.099	0.014	0.002	-0.001	0.051	-0.014
	(0.018)**	(0.004)*	(0.054)	(0.005)**	(0.049)*	(0.010)	(0.031)	(0.006)	(0.027)	(0.006)*
Other Mfg.	-0.049	-0.005	-0.170	0.009	-0.042	0.009	-0.097	-0.000	-0.098	-0.026
	(0.019)*	(0.004)	(0.047)**	(0.005)	(0.053)	(0.014)	(0.039)*	(0.007)	(0.042)*	(0.007)**
Commerce	-0.062	0.010	-0.072	-0.000	-0.014	0.001	-0.064	0.014	-0.061	0.016
	(0.019)**	(0.004)*	(0.036)	(0.009)	(0.051)	(0.014)	(0.047)	(0.009)	(0.043)	(0.005)**
Other Services	-0.064	-0.004	-0.029	-0.018	0.012	-0.007	-0.048	0.002	-0.007	0.006
	(0.022)**	(0.004)	(0.032)	(0.015)	(0.046)	(0.013)	(0.028)	(0.007)	(0.027)	(0.008)
Constant	-0.282		-0.425		-0.537		-0.487		-0.782	
	(0.049)**		(0.050)**		(0.081)**		(0.052)**		(0.061)**	
Observations	2787		2551		2557		2507		2409	
R-squared	0.17		0.20		0.16		0.18		0.21	

Notes: Robust Standard Errors in parentheses. * significant at 5%; ** significant at 1%.The main effects time trends are included in the estimation but are not reported here.