**Chinese Trade Competition and Rural Mexican Migration**

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# Chinese Trade Competition and Rural Mexican Migration

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**Abstract**

This study provides empirical estimates of the impact of the decline in Mexican manufacturing labor demand on the migration and employment decisions of rural Mexicans. Our empirical analysis utilizes a long-difference approach with employment data from an individual-level panel taken from the National Rural Mexican Household Survey (Spanish acronym ENHRUM) between 1998 and 2008. To address concerns about omitted variables bias that may arise from unobserved labor demand shocks in the United States that could influence the Mexican manufacturing labor supply, we use a measure of Chinese trade competition as an instrument for the manufacturing employment variable. Our results indicate that a 10 percentage point decline in Mexico's manufacturing labor demand (in terms of the share of total non-agricultural employment) increased the probability of migrating to the US by 23 percentage points and to the US non-agricultural sector by 17 percentage points. The results for agricultural employment (either in Mexico or the US) are smaller in magnitude and are not statistically significant, suggesting that the decline in manufacturing labor demand did not generate significant movement into farm work.

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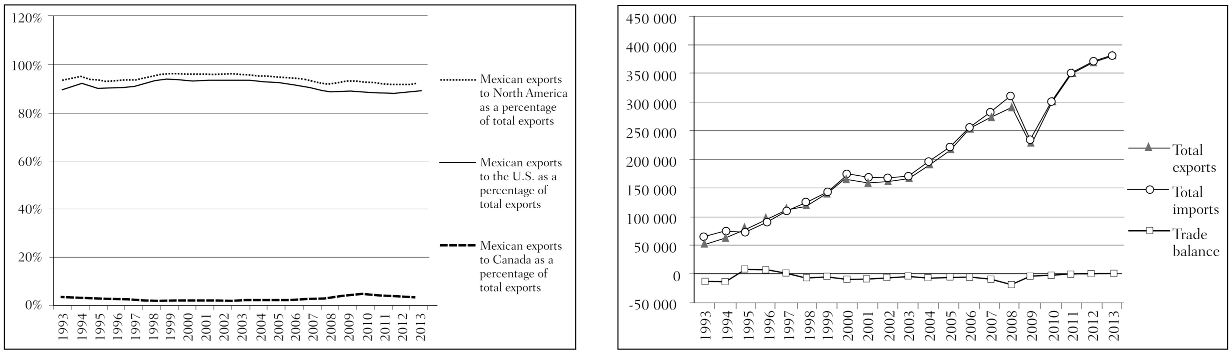
The rise of Chinese manufacturing after the country's accession to the World Trade Organization (WTO) in 2001 created ripple effects across the global economy, with Mexico lying in its wake. Despite an unfolding agricultural transformation taking place in the country, Mexico's manufacturing sector has been hit hard by trade competition with China, which has reduced manufacturing employment. Reduced demand for manufacturing labor in Mexico likely impacted the migration and employment decisions of Mexican workers, but to what extent and how? Gaining insight into this issue has important implications as it may have negatively impacted Mexico's economic development process while at the same time producing new labor supply pressures in both Mexico and the United States (US). For example, if the decline in manufacturing employment induced migration into American agriculture, this may have helped relieve labor supply constraints facing the US. On the other hand, if there were new migration flows into non-farm sectors of the US economy, it may have negatively impacted the labor market outcomes of low-skilled American workers. In this paper, we empirically examine which of these scenarios most likely occurred by quantifying the extent to which Chinese trade competition-induced decreases in Mexican manufacturing employment impacted the sectoral and geographic employment decisions of rural Mexicans.

In 1994, the North American Free Trade Agreement (NAFTA) was ratified, stimulating a significant increase in the production of manufactured goods in Mexico. As can be seen in Figures 1A and 1B, most of these goods were destined for US markets, and the value of Mexican manufacturing exports to the US more than doubled between 1994 and 1998 (Cota, 2015). However, China's accession to the WTO in 2001 created significant competitive pressures for Mexico, as global markets were flooded with inexpensive Chinese goods, which placed a damper on US demand for Mexico's manufactured goods. Between 2000 and 2003, Mexican exports remained flat, while China gained an increasing share of the US market for imported manufactured goods.

Recent estimates indicate that roughly five million undocumented Mexican immigrants reside in the US (Migration Policy Institute, 2022). Mexicans tend to be among the low-

Figure 1: Mexican Exports




(a) Percent of Mexican Exports to US

(b) Total Mexican Exports ($ US Millions)

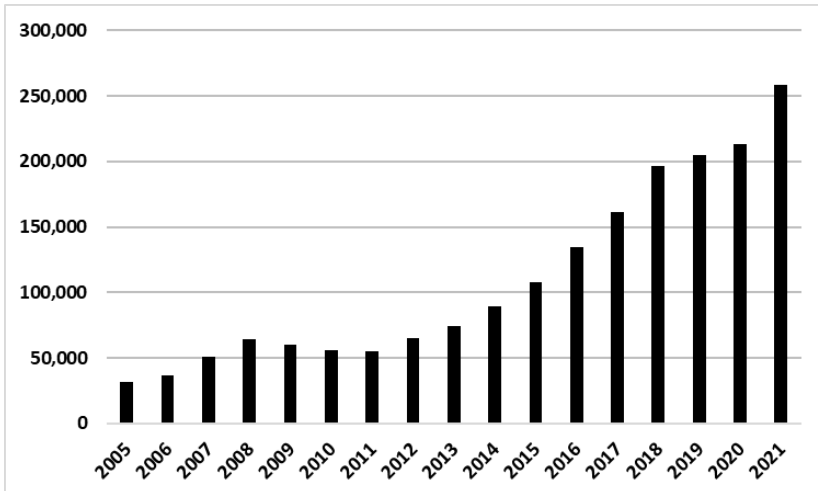
Note: These figures were obtained from
`https://www.sciencedirect.com/science/article/pii/S1870355016300210`.

est educated immigrants and are prevalent in low-skilled, manual-intensive jobs, such as construction, manufacturing, and agriculture. The extent to which low-skilled immigration impacts the American workforce has been a topic of debate for decades. While some studies have found significant negative impacts of immigration on the earnings and employment of domestic workers (e.g., Borjas, 2003; Mérel and Rutledge, 2021), others have failed to find such impacts (e.g., Card, 1990; Peri and Sparber, 2009; Ottaviano and Peri, 2012).

Interestingly, the topic of labor market competition between unauthorized Mexican immigrants and domestic agricultural workers is rarely, if ever, a part of the US political debate. This general lack of concern about immigrant competition in the agricultural sector can be attributed to the fact that domestic workers are unwilling to engage in hired agricultural labor, and the current policy discussion revolves around how to secure an adequate number of foreign-born farmworkers, as opposed to whether immigrant farmworkers take American jobs. To highlight this fact, data from the US Department of State (2021) indicate that the number of H-2A visas issued to agricultural employers experiencing domestic labor shortages increased from 55,384 to 258,143 between FY2011 and FY2021, revealing that the domestic farm labor supply is insufficient to meet ongoing demand at current wage rates (see Figure

2).[1] Thus, it is useful to investigate whether reduced demand for Mexican exports stimulated new migration flows from Mexico.

Figure 2: H-2A Visas Issued, FY 2005 - 2021




Recent studies have found that Mexico's manufacturing export competition with China has impacted a number of different outcomes, including Mexican crime related to drug-trafficking (Dell et al., 2019), internal (i.e., within Mexico) migration (Majlesi and Narciso, 2018), and Mexican service sector employment (Mendez, 2015). However, the literature has failed to uncover a link between trade-induced job loss in Mexico and the supply of immigrant labor to the US at the sectoral level (i.e., agriculture or non-agriculture). Our study aims to fill a gap in the literature by examining whether trade pressures from China have had any influence on the migration of rural Mexican workers, while providing new insights into their sectoral employment decisions.

Our empirical analysis links work history data from a nationally-representative panel of rural Mexican workers to Mexican manufacturing employment data to estimate the impact of manufacturing job loss on the employment decisions of rural Mexicans. Our sample periods (1998-2003 and 1998-2008) are chosen to coincide with the period of time during which China

[1]The H-2A visa program allows US agricultural employers to legally hire foreign-born workers on a temporary basis. More than 90% of H-2A workers are from Mexico. In order to utilize the H-2A program, farm employers must provide evidence that "there are not sufficient able, willing, and qualified U.S. workers available to perform the temporary and seasonal agricultural employment for which nonimmigrant foreign workers are being requested" (DOL, 2021).

gained access to the WTO, which allowed the country to access key international markets, including the US. Since we use a long-difference approach,[2] we analyze the impacts over two time periods (a five-year period and a ten-year period) to gain insight into the shorter- and longer-run impacts, as we would expect heterogeneous impacts to be felt over different lengths of time.

Since our main regressor provides a measure of manufacturing employment, as opposed to a direct measure of labor demand, the primary identification challenge is the potential for unobserved labor demand shocks in the US that pull workers from the Mexican manufacturing labor supply to confound our empirical estimates. To mitigate this source of bias, we deploy an instrumental variable based on the work of Dell et al. (2019) that uses a measure of Chinese trade competition as a predictor of Mexican manufacturing employment. The measure of Chinese trade competition is highly correlated with Mexican manufacturing employment due to its impact on US demand for Mexican manufactured goods (and thus the demand for Mexican manufacturing labor) but arguably satisfies the exclusion restriction because this form of competition is driven by an exogenous shock to the supply of manufactured goods available to the US, as opposed to a shift in US labor demand that might draw workers out of Mexico. Thus, we argue that the Chinese trade competition instrument produces exogenous variation in the demand for Mexican manufacturing labor, thus driving unemployed Mexican manufacturing workers to seek employment in other sectors or geographic locations (i.e., the US).

Our preliminary findings suggest that trade competition-induced Mexican manufacturing job loss did not significantly impact the supply of labor to the agricultural sector, either in Mexico or the US, but it did increase the probability of migration to US, particularly for work in non-farm sectors of the economy. Thus, our analysis indicates that the surge in supply of Chinese manufactured goods triggered new migration flows that may have created competitive labor market pressures for low-skilled American workers, yet failed to relieve

[2]Our use of the long-difference approach, as opposed to a traditional multi-year panel model, is due to data limitations that prevent us from obtaining annual data for key variables in our model.

labor supply constraints in the agricultural sector.

Our study contributes to the literature in three ways. First, to the best of our knowledge, we are the first to uncover evidence of Chinese trade competition-induced migration from Mexico to the United States, particularly into non-agricultural jobs. Majlesi and Narciso (2018), on the other hand, find that Chinese trade competition has decreased migration to the United States, by reducing the amount of savings required to engage in migration, so our findings stand in sharp contrast to theirs. It is possible that the results we find differ from those of Majlesi and Narciso (2018) because the types of individuals sampled in the two sets of analyses are distinct, as Majlesi and Narciso (2018) include individuals who are from urban areas, while we do not. Nevertheless, our analysis provides evidence that China's accession to the WTO caused new labor market pressures for the US, which, to the best of our knowledge, have not been noted in the literature to date.

Second, we extend the recent farm labor literature, which has found empirical evidence of farm labor shortages (Hertz and Zahniser, 2012; Richards, 2018) and a long run negative trend in the farm labor supply (Taylor et al., 2012; Charlton and Taylor, 2016). Our analysis, which is based on the same data used in Charlton and Taylor (2016), suggests that shocks to Mexican labor markets that push rural Mexican workers to the US are not likely going to help resolve the American farm labor crisis. As a result, long run solutions to the farm labor supply problem should consider alternatives to the use of low-skilled labor from rural Mexico.

Third, we contribute to the development literature by examining the impact of export competition on a key development outcome in Mexico: migration. Despite the agricultural transformation of the Mexican economy, and a shift towards better and more plentiful non-farm jobs in the country, our research suggests that disruptions to the development process, such as those that reduce employment in non-farm sectors of the economy (Christiaensen et al., 2021; Charlton et al., 2021), can create new migration pressures that not only impact the earnings and employment opportunities in the home country, but also have consequences for destination countries that receive migrant workers.

The paper is structured as follows: Section 1 presents details about the empirical methodology and data, Section 2 presents the results, and Section 3 concludes.

# 1 Empirical Methodology

## 1.1 Derivation of Empirical Framework

In order to model the decision process that Mexican workers engage in when they choose their sector and location of employment, we develop a simple mover-stayer framework to fit our empirical setting. The model describes a simple decision process that Mexican workers might engage in when they decide where to live and what sector to work in. We assume that individuals in the economy are heterogeneous and that they choose their sector of employment and physical location to maximize their utility, which is defined as the expected net income as follows:

$$U_i^* = \max_{j,k} U_i^{j,k} = \max_{j,k} [Y_i^{j,k} - C_i^{j,k}], \tag{1}$$

where individual $i$ works in sector $j \in$ {agriculture, non-agriculture} (denoted by $A$ and $N$, respectively) at location $k \in$ {home locality in Mexico, elsewhere in Mexico, United States} (denoted by $Mex^h$, $Mex^e$, and $US$, respectively). The expected gross income of the individual is denoted by $Y_i^{j,k}$, and $C_i^{j,k}$ identifies the monetarized cost associated with an individual working in a particular sector and location.[3]

We assume that the expected gross income of an individual working in a particular sector and location is a function of observed individual characteristics $\mathbf{X}_i$, unobservable factors $\epsilon_i^{j,k}$, and the probability of being employed in the location and sector, which is denoted

[3]Note that when there are non-pecuniary costs associated with working in a location and/or sector, our model implicitly assumes that the individual can place a monetary value on it.

by the variable $L^{j,k}$. Our primary concern has to do with understanding the impact of the declining Mexican manufacturing sector, so we simplify our model by assuming that Mexican workers can always find agricultural work in any location, as well as in the non-agricultural sector of the US, provided that they can cross the US-Mexico border legally or enter the US illegally without being apprehended. These simplifying assumptions imply that $L^{A,Mex^h} = L^{A,Mex^e} = L^{A,US} = L^{N,US} = 1$. Thus, the only relevant employment rate is that of the Mexican manufacturing sector (i.e., $L^{N,Mex} \leq 1$ and $\triangle L^{N,Mex} \neq 0$), where we drop the superscripts $h$ and $e$ on the $Mex$ identifier to define Mexican manufacturing employment in a general context. For a given location, the expected gross income for the individual working in a particular sector is defined as a function of observable individual characteristics and the probability of finding employment in the sector:

$$Y_i^{j,k} = f_i^{j,k}(\mathbf{X_i}, L^{j,k}) + \epsilon_i^{j,k}. \tag{2}$$

We define the cost associated with working in a given sector and location as a function of observable individual characteristics and the cost of physically relocating to a new location, which we assume is identified by the physical distance between the individual's initial location and the new location $PD_i^k$, as follows:

$$C_i^{j,k} = g_i^{j,k}(\mathbf{X_i}, PD_i^k), \tag{3}$$

where $PD_i^k = 0$ if an individual does not move to a new physical location. The individual's decision to work in a particular sector $j$ and location $k$ is represented by the following set of binary variables:

$$D_i^{j,k} = \begin{cases} 1 & \text{if} \quad Y_i^{j,k} - C_i^{j,k} + \epsilon_i^{j,k} > Y_i^{J,K} - C_i^{J,K} + \epsilon_i^{J,K} \\ 0 & \text{if} \quad Y_i^{j,k} - C_i^{j,k} + \epsilon_i^{j,k} \leq Y_i^{J,K} - C_i^{J,K} + \epsilon_i^{J,K} \end{cases} \tag{4}$$

$\forall\{j,k\} \neq \{J,K\}$. We can further describe the decision defined by (4) as follows:

$$\begin{aligned}
\mathrm{PR}[D_i^{j,k}=1] &= \mathrm{PR}[f_i^{j,k} - g_i^{j,k} + \epsilon_i^{j,k} > f_i^{J,K} - g^{J,K} + \epsilon_i^{J,K} > 0] \iff \\
\mathrm{PR}[D_i^{j,k}=1] &= \mathrm{PR}[\underbrace{f_i^{j,k} - f_i^{J,K} + g_i^{J,K} - g_i^{j,k}}_{h_i} + \underbrace{\epsilon_i^{j,k} - \epsilon_i^{J,K}}_{\epsilon_i} > 0] \iff \\
\mathrm{PR}[D_i^{j,k}=1] &= \mathrm{PR}[h_i + \epsilon_i > 0]. \qquad (5)
\end{aligned}$$

Empirically, we can estimate the set of discrete choice models described by (5) using a set of linear probability regressions, which we describe in more detail in Section 1. We are particularly interested in estimating the set of parameters $\beta^{j,k}$, which are defined as follows:

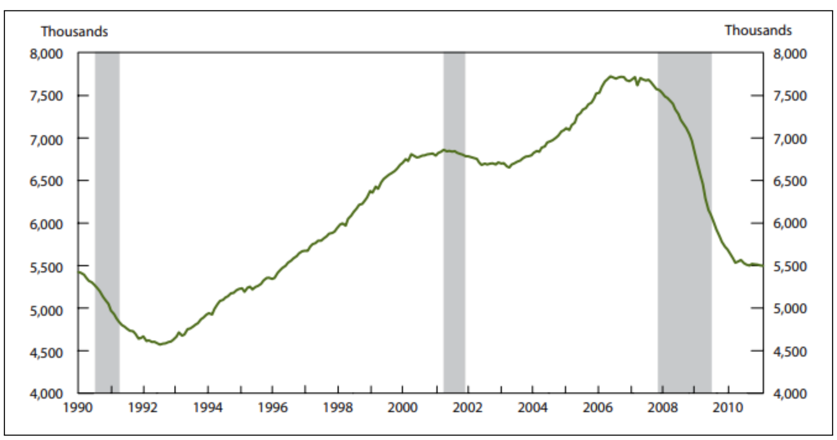
$$\beta^{j,k} = \frac{\partial \mathrm{PR}[D_i^{j,k}=1]}{\partial L^{N,Mex}} = \frac{\partial \mathrm{PR}[h^{j,k} > 0]}{\partial L^{N,Mex}}. \qquad (6)$$

The coefficients $\beta^{j,k}$ identify the percentage point change in the probability of being employed in a given location and sector as a result of a one percentage point change in the Mexican manufacturing employment rate.

## 1.2 Empirical Model

The main identification challenge to identifying the impact of trade-induced manufacturing employment decline on the migration and employment decisions of Mexican workers is omitted variables bias resulting from labor demand shocks in Mexico's northern neighbor, the United States. If demand for labor in the US is correlated with manufacturing employment in Mexico, then our estimates would be biased, as US labor demand could draw workers from across the border, thus affecting their locational and sectoral labor decisions. For example, one could imagine a scenario where an increase in the demand for US construction labor could be correlated with Mexican manufacturing employment, thus confounding our estimates. While there was a decline in construction employment during and after the 2001 recession, there were also significant increases over our sample period, raising concern about bias (see Figure 3). The direction of this source of bias depends upon (i) the sign of the correlation between US construction labor demand and the regional Mexican manufacturing employment share and (ii) the sign of the correlation between US labor demand and the employment decisions of rural Mexican workers. It turns out that, without additional information, the sign of the bias is ambiguous because our main regressor includes Mexican manufacturing workers in the numerator and the denominator. As a result, even if one can reasonably assume that the demand for low-skilled labor in the US is positively (resp. negatively) correlated with the probability of choosing employment in the US (resp. Mexico), the sign of the bias depends on the relative magnitude of the US labor demand induced change in manufacturing employment in Mexico states (the numerator of the main explanatory variable) and the change in the number of workers in the non-agricultural workforce (the denominator of the main explanatory variable). As such, our approach resolves this issue by exploiting changes in the manufacturing employment share that are driven by the exogenous shock to Chinese export supply, which impacted the demand for manufacturing labor in Mexico but not the demand for low-skilled migrant labor in the US.

Figure 3: US Construction Employment: 1990 - 2010




In an ideal empirical setting, we would examine two Mexican municipalities, one with a manufacturing sector that produces goods intended for export to the US, which are the same types goods that China exports to the US (call it municipality A), and one that has a manufacturing sector that produces export goods intended for the US market but are not produced by China (call in municipality B). Then we would generate an exogenous shock to municipality A's manufacturing employment rate by inducing an exogenous shock to China's export sector, while municipality B would receive no such shock. A comparison of the change in geographic and sectoral employment decisions of the workers in municipality A to those in municipality B could be used to determine the impact that the decline in manufacturing labor demand had on Mexican workers. Unfortunately, this hypothetical scenario is unrealistic and these types of natural experiments rarely occur in practice. Therefore, we rely upon an instrumental variables approach based on the work of Dell et al. (2019) to empirically estimate the effect of trade competition-induced Mexican manufacturing employment decline on the labor decisions of Mexican workers using the following set of linear probability models separately for each location and sector of employment:

$$D^{j,k}_{isrt} = \beta^{j,k} \Delta L^{N,Mex}_{st} + \mathbf{\Gamma} \mathbf{X}_{ist} + \phi_r + \varepsilon_{isrt}, \tag{7}$$

where $D^{j,k}_{ist}$ are a set of binary variables equal to 100 if individual $i$ from state $s$ in region $r$ works in location $j \in \{\text{home locality in Mexico, elsewhere in Mexico, US}\}$ and sector $k \in \{\text{agriculture, non-agriculture}\}$ in year $t$ and zero otherwise. The variable $\Delta L^{N,Mex}_{st}$ identifies percentage point change in the Mexican manufacturing share of the non-agricultural labor force between the initial year (1998) and year $t \in \{2003, 2008\}$ in Mexican state $s$.[4] The vector $\mathbf{X}_{ist}$ is a set of individual, municipal, and state-level control variables, $\phi_r$ is a set of Mexican region (i.e., multi-state) fixed effects, and $\varepsilon_{isrt}$ is the error term. The coefficients of interest are $\beta^{j,k}$, which quantify the impact of a one percentage point change in the Mexican manufacturing employment share on the probability of being employed in each sector and location.

Following the trade literature, we instrument $\Delta L^{N,Mex}_{st}$ with a measure of trade exposure

[4]More specifically, $\Delta L^{N,Mex}_{st}$ is the change in manufacturing's share of non-agricultural employment multiplied by 100.

proposed by Dell et al. (2019):

$$\begin{aligned} \Delta ICW_{st} &= \sum_{g} \frac{L_{gs,0}}{L_{Mg,0}} \frac{\Delta UC_{gt}}{L_{s,0}} \\ \Delta UC_{gt} &= \frac{Exp_{g,0}}{Exp_0} \Delta Exp_t \end{aligned} \tag{8}$$

where $\Delta ICW_{it}$ is the change in international competition per worker faced by Mexican municipality $i$ between the initial year 1998 (denoted by 0) and year $t$; $L_{gs,0}$ represents employment of industry $g$ in state $s$ in the initial year; $L_{Mg,0}$ is the total initial Mexican employment for industry $g$; $L_{s,0}$ is the total initial non-agricultural employment in state $s$; $\Delta UC_{gt}$ is the predicted change in Chinese exports to the US in industry $g$ between 1998 and year $t$, where $Exp_{g,0}/Exp_0$ is the value of Chinese exports to the US of industry $g$ goods as a share of total Chinese exports to the US in the initial year, and $\Delta Exp_t$ is the change in the total value of exports from China to the US between 1998 and year $t$. The trade exposure variable for state $s$ is proportional to expected industry $g$ exports to the US, the share of industry $g$'s state employment relative to the total Mexican employment in that sector, and the number of workers working in the state in the initial year, 1998.

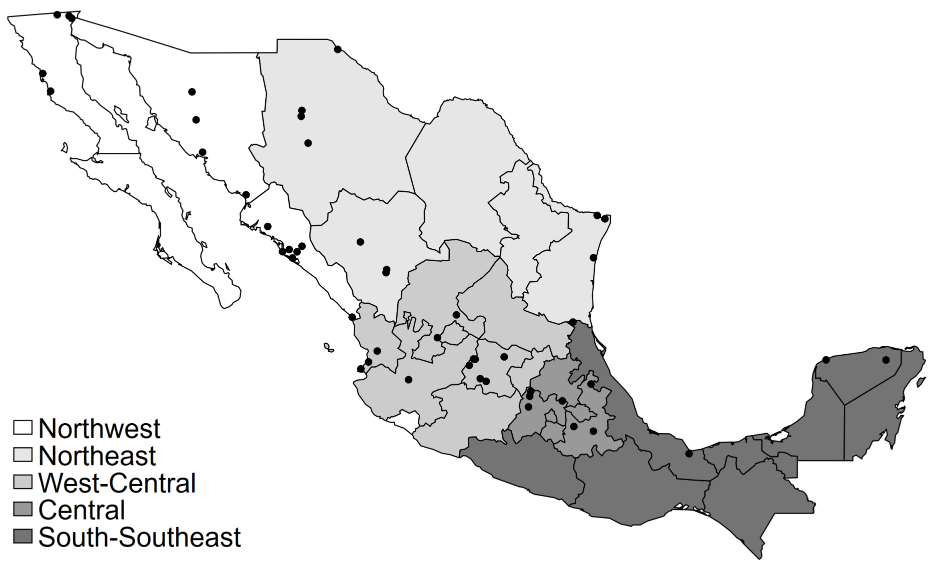
## 1.3 Data

The individual-level employment data come from the National Rural Mexican Households Survey (ENHRUM, by its initials in Spanish). The ENHRUM is a representative sample of rural Mexicans that contains a retrospective panel of data on individuals' work histories covering the 1980 to 2010 period. We restrict our sample to the set of individuals who were of working-age (i.e., 15 to 65) in 1998.[5] The ENHRUM sampling process consists of three phases. First, a random sample of Mexican states is selected (14 of the 32 states). Second, a sample of localities are selected from within the selected states (see Figure 4 for a map of

[5] Our conclusions remain unchanged if we, instead, use the entire sample of individuals, sampled individuals who were employed in 1998, or sampled rural Mexicans who were between 15 and 65 years of age and had a job in 1998.

the ENHRUM villages (localities) used in our analysis). Last, a sample of households are randomly selected from the locality. The data were collected in three rounds: 2002, 2007, and 2010.[6] Our sample focuses on the years 1998, 2003, and 2008 so that we can match the ENHRUM data to manufacturing labor and export competition measures we construct with data from INEGI's Mexican Economic Censuses and COMTRADE, as well as municipal- and state-level characteristics information from CONEVAL, Google Maps, and Dell et al. (2019).

Figure 4: Map of ENHRUM Villages Used in Our Analysis




To construct the export competition measure, we use data obtained from Dell et al. (2019).[7] The Mexican manufacturing and Chinese export data used by Dell et al. (2019) were originally compiled from the 1998 Mexican Economic Census and the United Nations' COMTRADE databases, respectively. The authors also standardized industry codes at the 4-digit ISIC level. The Mexican Economic Census covers all economic establishments in Mexico with a fixed location and is produced by the National Institute of Statistics and Geography (INEGI, by its initials in Spanish) every five years. We also utilize data from INEGI's Mexican Economic Census to construct our main regressor of interest, the change

[6]The ENHRUM database was provided by Dr. Jesus Arellano Gonzalez, a former Ph.D. student in the Agricultural and Resource Economics Department at UC Davis currently employed at Banco de México.

[7]These data are available online at `https://www.aeaweb.org/articles?id=10.1257/aeri.20180063`.

in the manufacturing share of the workforce at the state level.

To obtain the municipal or state level controls, we rely upon several data sources. First, we use state-level measures of the 2000 poverty rate from the National Council to Evaluate Social Development Policies (CONEVAL, by its initials in Spanish). We also construct measures of the distance from each Mexican municipality to the US border according to Google Maps.[8]

Table 1 provides a sample of summary statistics. As can be seen in the table, about half of the sampled individuals are females, and almost two-thirds are married. The average age of workers is greater than the average age of the general population in the sample. More than half of the workers originally come from rural municipalities.[9] The average sampled individual lives in a state where manufacturing labor as a share of the nonfarm labor force decreased by 1.5% between 1998 and 2003. The average worker in the sample comes from a federal entity where the average nonfarm worker faced about eighty thousand US dollars worth of Chinese trade competition in the 1998-2003 period. Among those employed in 1998, 55% worked in agriculture, but only 48% were farm laborers in 2003. In 1998, almost four out of every five workers worked in their home locality, 13% worked elsewhere in Mexico, and 10% worked in the US. About a quarter of the rural Mexican workers in the US worked in agriculture in 1998 and 2003.

The average state's manufacturing labor force declined by 0.63%, but manufacturing labor decreased in some states and slightly increased in others. Some federal entities experienced manufacturing labor declines representing over 4% of the 1998 nonfarm labor force. Each worker in the state facing the least trade competition dealt with four thousand or less US dollars worth of Chinese export competition. In contrast, each worker from the most trade-exposed states faced over a hundred and fifty thousand dollars of Chinese manufacturing trade competition.

[8]We also use the distance measures taken from Dell et al. (2019) as a robustness check. The results are qualitatively and quantitatively similar.

[9]A rural municipality is defined as one without urban centers with 2500 or more inhabitants.

Table 1: Descriptive Statistics

| | (1) 1998-2003 & 2003-2008 | (2) 1998-2003 | (3) 2003-2008 | (4) 1998-2008 |
|---|---|---|---|---|
| | *Demographics* | | | |
| Age | 29.07 | 28.61 | 29.94 | 28.05 |
| | (12.55) | (12.54) | (12.51) | (12.45) |
| Education | 6.56 | 6.51 | 6.65 | 6.25 |
| | (3.69) | (3.72) | (3.61) | (3.60) |
| Female | 0.51 | 0.51 | 0.51 | 0.51 |
| | (0.50) | (0.50) | (0.50) | (0.50) |
| Married | 0.59 | 0.62 | 0.53 | 0.60 |
| | (0.49) | (0.49) | (0.50) | (0.49) |
| Child/Adult Ratio | 0.15 | 0.15 | 0.16 | 0.15 |
| | (0.17) | (0.17) | (0.17) | (0.16) |
| Distance to US (km) | 636.83 | 611.29 | 684.22 | 680.65 |
| | (365.07) | (363.01) | (364.22) | (360.58) |
| Rural | 0.20 | 0.20 | 0.20 | 0.21 |
| | (0.40) | (0.40) | (0.40) | (0.40) |
| Poverty rate | 20.89 | 20.26 | 22.06 | 21.89 |
| | (10.05) | (9.70) | (10.57) | (10.48) |
| | *Work Location* | | | |
| Locality | 0.39 | 0.39 | 0.40 | 0.40 |
| | (0.49) | (0.49) | (0.49) | (0.49) |
| Mexico | 0.06 | 0.06 | 0.06 | 0.06 |
| | (0.24) | (0.24) | (0.24) | (0.25) |
| US | 0.08 | 0.07 | 0.09 | 0.07 |
| | (0.27) | (0.25) | (0.29) | (0.25) |
| | *Employment* | | | |
| $\Delta L_{st}$ | -3.22 | -3.81 | -2.13 | -4.89 |
| | (2.45) | (2.57) | (1.74) | (2.33) |
| Farm | 0.23 | 0.24 | 0.22 | 0.24 |
| | (0.42) | (0.43) | (0.41) | (0.42) |
| Nonfarm | 0.29 | 0.27 | 0.33 | 0.29 |
| | (0.45) | (0.44) | (0.47) | (0.45) |
| | *Trade Competition* | | | |
| $\Delta ICW_{st}$ | 0.06 | 0.04 | 0.10 | 0.04 |
| | (0.07) | (0.03) | (0.09) | (0.03) |
| Observations | 7,075 | 4,597 | 2,478 | 2,277 |

mean coefficients; sd in parentheses

$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

# 2 Empirical Results

## 2.1 Employment by Location and Sector

### 2.1.1 1998-2003

We start out by presenting our estimates for the 1998-2003 sample in Table 2. We highlight the importance of this period of time because it allows us to focus on the impacts of the initial trade shock. The basic migration results can be found in the top panel of the table titled "Work at Location." This panel provides estimates of the effects of trade competition-induced changes in the share of Mexican manufacturing employment on the geographic employment decisions irrespective of sector. For reference, the odd numbered columns display the coefficients from models that do not control for demographic characteristics while the even numbered columns include demographic controls.

For the sake of parsimony, we focus our attention on the estimates in the even columns because they control for various forms of human capital accumulation that, if not controlled for, would likely lead to omitted variable bias. For this set of results, none of the OLS coefficients are statistically significant, but the IV results are significant when we examine the probability of migrating to another location in Mexico or the United States. The IV results indicate that a labor demand induced 10 percentage point reduction in the manufacturing employment share causes an 11.3 percentage point reduction in the probability of living elsewhere in Mexico and a 23.4 percentage point increase in the probability of migrating to the US. The IV coefficient for the probability of staying in the same Mexican locality is insignificant but suggests that manufacturing decline likely caused workers to exit their home locality over the relevant period of time (-16.7 pp for each 10 pp reduction in the manufacturing employment share). These results stand in contrast to those of Majlesi and Narciso (2018) who analyze a representative sample of Mexican individuals in urban and rural municipalities and find that manufacturing import competition increased internal migration while decreasing migration to the US. Our findings may differ from theirs due to differences

Table 2: Probability of Working in Location/Sector at the End of the Period: 1998 - 2003

| | (1) Home Locality | (2) Home Locality | (3) Elsewhere in Mexico | (4) Elsewhere in Mexico | (5) US | (6) US |
|---|---|---|---|---|---|---|
| | **Work at Location** | | | | | |
| **OLS** | 0.280 | -0.287 | 0.117 | -0.0867 | -0.952 | -0.546 |
| | (1.147) | (0.645) | (0.487) | (0.202) | (0.942) | (0.441) |
| **IV** | 4.491* | 1.670 | 3.509*** | 1.128* | -0.468 | -2.341** |
| | (2.708) | (1.202) | (1.037) | (0.616) | (1.951) | (1.082) |
| | **Agricultural Work at Location** | | | | | |
| **OLS** | 1.416 | 0.315 | 0.262*** | 0.164*** | -0.333 | -0.210 |
| | (1.284) | (0.672) | (0.0742) | (0.0495) | (0.416) | (0.204) |
| **IV** | 3.953* | 0.876 | 0.513*** | 0.205 | -0.813 | -0.636 |
| | (2.321) | (0.900) | (0.174) | (0.141) | (0.901) | (0.500) |
| | **Non-Agricultural Work at Location** | | | | | |
| **OLS** | -1.136 | -0.602 | -0.146 | -0.251 | -0.619 | -0.336 |
| | (1.478) | (0.544) | (0.457) | (0.192) | (0.652) | (0.289) |
| **IV** | 0.538 | 0.794 | 2.996*** | 0.923 | 0.345 | -1.705** |
| | (3.286) | (1.272) | (0.949) | (0.572) | (1.279) | (0.714) |
| N | 4,597 | 4,597 | 4,597 | 4,597 | 4,597 | 4,597 |
| Region F.E. | Yes | Yes | Yes | Yes | Yes | Yes |
| Demographic Controls | | Yes | | Yes | | Yes |
| First Stage F-stat | 20.89 | 18.90 | 20.89 | 18.90 | 20.89 | 18.90 |

**Note:** Standard errors in parentheses are clustered at the locality level. $^{*}p < .1$, $^{**}p < .05$, $^{***}p < .01$.

in the opportunities that urban Mexican workers have relative to rural respondents, as our sample is comprised entirely of individuals who are from rural villages.

When we focus on the probability of working in the agricultural sector of each location, which can be found in the middle panel titled "Agricultural Work at Location," the IV results are significant when we look at the probability of working in Mexican agriculture outside the individuals' home locality without the demographic controls, but adding the demographic controls leads to estimates that are smaller in magnitude and not statistically significant. None of the other IV results for agriculture are statistically significant, although the negative coefficient in column (6) for agricultural work in the US suggests that manufacturing decline in Mexico may have caused a small number of workers to seek employment in US agriculture.

The bottom panel of Table 2 indicates that the decline in Mexican manufacturing share of employment increased the probability of moving to the US to perform non-agricultural work. Column (6) reveals that a 10 percentage point decline in the Mexican manufacturing share of employment is associated with a 17.1 percentage point increase in the probability of working in the US non-agricultural sector. None of the other IV results that control for demographic characteristics are statistically significant, although the coefficients suggest that Mexican workers were less likley to become employed in non-farm work in Mexico between 1998 and 2003.

#### 2.1.2 1998-2008

We also estimated a set of models that use the long difference between 1998 and 2008. These results can be found in Table 3. These results suggest that longer-run (i.e., over a decade) impacts of trade competition between Mexico and China were still present, with some Mexican migration to non-farm sectors of the US, but the impacts are less pronounced than the initial trade shock and adjustment. Between 1998 and 2008, we find that a 10 percentage point decrease in the Mexican manufacturing share of employment caused a 9.5 percentage point increase in work in US non-farm sectors, as opposed to a 17.1 percentage point increase between 1998 and 2003. In terms of the internal geographic and sectoral migration of Mexicans, the results suggest that the decline in Manufacturing employment caused a shift out of work away from home locality, both in agriculture and in non-agricultural work. For each 10 percentage point decline in the Mexican manufacturing share of employment, workers were about 6.0 percentage points less likely to work in agriculture away from their home locality and about 16.2 percentage points less likely to work in non-farm activities away from their home locality.

### 2.2 Demographic Characteristics

To highlight other relevant findings from our analysis, we present the full set of IV regression coefficients (excluding the region fixed effects) for the base migration model for the 1998-2003

Table 3: Probability of Working in Location/Sector at the End of the Period: 1998 - 2008

| | (1) Locality | (2) Locality | (3) Mexico | (4) Mexico | (5) US | (6) US |
|---|---|---|---|---|---|---|
| | **Work at Location** | | | | | |
| **OLS** | 0.322 | -0.343 | 2.350*** | 1.962*** | -1.313 | -0.788 |
| | (2.197) | (1.564) | (0.743) | (0.489) | (1.761) | (0.723) |
| **IV** | 0.501 | -0.549 | 2.886*** | 2.220*** | -0.675 | -0.794 |
| | (2.202) | (1.530) | (0.784) | (0.545) | (1.742) | (0.712) |
| | **Agricultural Work at Location** | | | | | |
| **OLS** | 1.898 | 0.557 | 0.479** | 0.426** | 0.246 | 0.298 |
| | (1.288) | (1.093) | (0.211) | (0.188) | (0.676) | (0.456) |
| **IV** | 2.070 | 0.252 | 0.598** | 0.600** | 0.0391 | 0.152 |
| | (1.397) | (1.240) | (0.242) | (0.239) | (0.632) | (0.409) |
| | **Non-Agricultural Work at Location** | | | | | |
| **OLS** | -1.576 | -0.899 | 1.871*** | 1.536*** | -1.559 | -1.086** |
| | (3.260) | (2.036) | (0.572) | (0.370) | (1.256) | (0.506) |
| **IV** | -1.569 | -0.801 | 2.288*** | 1.621*** | -0.714 | -0.946* |
| | (3.165) | (1.962) | (0.629) | (0.412) | (1.370) | (0.553) |
| N | 2,277 | 2,277 | 2,277 | 2,277 | 2,277 | 2,277 |
| Region F.E. | Yes | Yes | Yes | Yes | Yes | Yes |
| Demographic Controls | | Yes | | Yes | | Yes |
| First-Stage F-stat | 115.4 | 368.6 | 115.4 | 368.6 | 115.4 | 368.6 |

**Note:** Standard errors in parentheses are clustered at the locality level. $^{*}p < .1$, $^{**}p < .05$, $^{***}p < .01$.

sample in Table 4.[10] First, our results suggest that older rural Mexicans are less likely to be working in their home locality and elsewhere in Mexico, but there is no clear evidence that they are moving to the US. These findings suggest that older Mexicans are simply less likely to be working. We also find that educational attainment is a driver of employment migration from Mexico to the US. Holding constant all other observables, for each additional year of education, rural Mexicans are about 0.61 percentage points more likely to migrate to work in the US. These results imply that an individual with 9 years of education is 5.5 pp more likely to be working in the US relative to a similar worker with no formal education. Female Mexicans are less likely than their male counterparts to be working at each location, but the estimates suggest that this is more pronounced for women who have not left their home locality. Relative to men, women are about 9.3 pp less likely to be working in their home

[10]Similar results for the period 1998-2008 can be found in Appendix Table A.1.

locality, 1.7 pp less likely to be working elsewhere in Mexico, and 4.8 pp less likely to be working in the US. Individuals living in a rural municipality at the beginning of the period are about 3.8 percentage points more likely to be working in the US at the end of the period than Mexicans who were living in an urban municipality at the beginning of the period, suggesting that there are better employment opportunities for those living in Mexican cities. For each 10 percentage point increase in the poverty rate, rural Mexicans are about 2.5 pp less likely to be working in their home locality and about 3.5 pp more likely to be working elsewhere in Mexico. Children also have an important influence on the work location of Mexicans. For each 10 pp in the household's child to adult ratio, Mexicans are about 2.1 pp more likely to be working in their home locality, 0.9 pp less likely to be working elsewhere in Mexico, and 1.0 pp less likely to be working in the US. This result is similar to other research, which finds the ratio of children to adults in the household is positively associated with farm labor supply in Mexico but is negatively related to agricultural work in the US (Charlton and Taylor, 2016). Together, these results are consistent with a scenario where younger, more educated male workers who have fewer children living in their household are more likely to engage in migration to the US to work.

# 3 Conclusion

China's accession to the WTO created a number of new international markets for Chinese exports, including the United States. This export supply shock created significant competition for Mexico's export market in the US, leading to a decline in manufacturing employment in Mexico. We estimated the impacts of this trade competition-induced decline in employment on the geographic and sectoral migration decisions of rural Mexican workers. We find that in the first few years after the initial trade shock (up until 2003), there was a pronounced impact on the average rural Mexican worker's decision to migrate to the US to perform non-farm labor. However, during that period of time, we find no statistically significant

Table 4: IV results for 1998-2003

| | (1) Locality | (2) Mexico | (3) US |
|---|---|---|---|
| $\triangle L_{st}^{N,Mex}$ | 1.670 | 1.128* | -2.341** |
| | (1.202) | (0.616) | (1.082) |
| Unemployed | -71.12*** | 1.027 | 0.457 |
| | (2.314) | (0.696) | (1.022) |
| Locality - Farm | -2.557 | 0.747 | 3.899*** |
| | (2.327) | (1.098) | (1.429) |
| Mexico - Farm | -52.00*** | 56.01*** | -2.600 |
| | (9.709) | (10.56) | (1.755) |
| Mexico - Nonfarm | -71.88*** | 71.29*** | 0.694 |
| | (2.732) | (2.576) | (1.583) |
| US - Nonfarm | -68.56*** | -1.610 | 73.31*** |
| | (3.415) | (1.067) | (3.233) |
| US - Farm | -68.18*** | -0.938 | 71.22*** |
| | (5.085) | (1.348) | (5.269) |
| Age | -1.238*** | -0.180* | 0.127 |
| | (0.247) | (0.104) | (0.156) |
| Age$^2$ | 0.0172*** | 0.00204 | -0.00460** |
| | (0.00351) | (0.00143) | (0.00229) |
| Education | 0.163 | -0.0334 | 0.613*** |
| | (0.394) | (0.281) | (0.233) |
| Education$^2$ | -0.0178 | 0.0355* | -0.0195 |
| | (0.0223) | (0.0213) | (0.0151) |
| Female | -9.249*** | -1.743** | -4.799*** |
| | (1.686) | (0.757) | (0.968) |
| Married | -3.740*** | 0.616 | 0.530 |
| | (1.068) | (0.673) | (0.883) |
| Child/Adult Ratio | 21.11*** | -9.266*** | -10.38*** |
| | (4.255) | (2.309) | (2.557) |
| Distance to US | -0.00121 | -0.00460 | 0.00679* |
| | (0.00463) | (0.00367) | (0.00356) |
| Rural | -0.580 | 1.843 | 3.824** |
| | (2.552) | (1.303) | (1.858) |
| Poverty Rate | -0.248* | 0.354*** | 0.157 |
| | (0.141) | (0.119) | (0.130) |
| Constant | 121.8*** | 1.265 | -18.20** |
| | (10.22) | (7.715) | (8.811) |
| N | 4,597 | 4,597 | 4,597 |
| Region F.E. | Yes | Yes | Yes |
| First-Stage F-stat | 18.90 | 18.90 | 18.90 |

**Note:** Standard errors in parentheses are clustered at the locality level. Significance levels are indicated by $* < .1$, $** < .05$, $*** < .01$.

impact on the decision to supply labor to the agricultural sector, either in Mexico or in the US. Specifically, we find that a 10 percentage point decline in the Mexican manufacturing share of employment caused a 23.4 increase in the probability of migrating to the US with a 17.1 percentage point increase in the probability of performing non-farm work in the US. Once we focus on the longer-run effects, extended out to 2008, we find that impacts of migration to the US had dissipated to some extent, and there was a shift into work back at the individuals' home localities, both in agriculture and non-agriculture.

The results from our analysis suggest that China's accession to the WTO created new migration flows from Mexico to the United States, particularly for work in non-agricultural sectors of the economy. While we do not provide empirical evidence that indicates these labor supply shocks worsened the outcomes of native-born workers in the United States, we were unable to uncover convincing statistical evidence that these new migration flows helped relieve labor supply constraints in the agricultural sector. These results add to the mounting body of evidence that suggests reliance upon rural Mexican workers as long-run solution to sustain US agriculture should be viewed with caution and that the industry should consider developing new incentives to stimulate migration flows back into the agricultural sector or start developing feasible alternatives to the historically inexpensive supply of labor from Mexico.

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# Online Appendices

## A Full Regression Results 1998 - 2008

Table A.1: Full IV results for 1998-2008

| | (1) Locality | (2) Mexico | (3) US |
|---|---|---|---|
| $\triangle L_{st}^{N,Mex}$ | -1.972** | 0.330 | -0.909** |
| | (0.770) | (0.363) | (0.446) |
| Unemployed | -56.31*** | 0.898 | 0.554 |
| | (2.275) | (0.826) | (0.811) |
| Locality - Farm | 0.418 | 0.942 | 2.612** |
| | (2.330) | (0.965) | (1.139) |
| Mexico - Farm | -45.38*** | 53.18*** | -3.599*** |
| | (8.098) | (9.052) | (1.174) |
| Mexico - Nonfarm | -58.22*** | 57.16*** | 1.094 |
| | (3.030) | (3.294) | (1.421) |
| US - Nonfarm | -60.69*** | -3.292*** | 64.87*** |
| | (3.118) | (1.176) | (3.304) |
| US - Farm | -60.61*** | -2.695 | 61.22*** |
| | (3.870) | (1.896) | (4.981) |
| Age | -0.621*** | 0.150 | 0.0541 |
| | (0.216) | (0.103) | (0.0989) |
| Age$^2$ | 0.00986*** | -0.00284* | -0.00249* |
| | (0.00332) | (0.00158) | (0.00139) |
| Education | 0.377 | 0.0504 | 0.607*** |
| | (0.382) | (0.233) | (0.182) |
| Education$^2$ | -0.0168 | 0.0355** | -0.0182* |
| | (0.0226) | (0.0143) | (0.0109) |
| Female | -15.76*** | -2.038*** | -3.921*** |
| | (1.470) | (0.736) | (0.838) |
| Married | -3.818*** | 0.0587 | -0.288 |
| | (1.171) | (0.603) | (0.730) |
| Child/Adult Ratio | 18.45*** | -9.709*** | -8.620*** |
| | (4.306) | (1.823) | (2.127) |
| Distance to US | 0.00554 | -0.00117 | 0.00230 |
| | (0.00456) | (0.00256) | (0.00222) |
| Rural mun. | -3.729* | 1.314 | 4.245*** |
| | (2.134) | (1.452) | (1.341) |
| Poverty Rate | -0.0207 | 0.178 | 0.166* |
| | (0.152) | (0.122) | (0.0939) |
| N | 7075 | 7075 | 7075 |
| Region F.E. | Yes | Yes | Yes |
| Period F.E. | Yes | Yes | Yes |
| F-stat | 80.92 | 80.92 | 80.92 |

**Note:** Standard errors in parentheses are clustered at the locality level. Significance levels are indicated by $* < .1$, ** $< .05$, *** $< .01$.