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Juan Blyde
Matías Busso
Kyunglin Park
Dario Romero

Inter-American Development Bank
Department of Research and Chief Economist

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Juan Blyde*
Matías Busso*
Kyunglin Park*
Dario Romero**

* Inter-American Development Bank
** New York University - Abu Dhabi

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Abstract

By exploiting spatial variation in import exposure arising from initial differences in industry specialization, we analyze how local labor markets in Mexico adjusted to increased Chinese-import competition over different time horizons. The initial adjustment to the shock took various forms: a decline in the number of wage employees, a substitution of wage employees with piece-rate or outsourced workers, and a substitution of formal employees with informal employees. The negative effects on employment were mainly associated with job destruction from exiting firms, particularly those that were small and medium-sized. During periods in which employment fell, the population that actively participated in the labor force fell. The negative short- and medium-run effects mostly disappeared after 20 years.

JEL classifications: F14, F16, J23
Keywords: Import competition, Local labor markets, Employment, Mexico

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Author emails: Blyde (corresponding author), juanbl@iadb.org; Busso, mbusso@iadb.org; Park, kyungp@iadb.org; Romero (corresponding author), drf312@nyu.edu.

1 Introduction

Firms in developing countries routinely experience episodes of substantially increased competition in their domestic markets. Direct competition faced by local producers has intensified since at least 1990 with the liberalization of trade (World Bank 2017) and with the influx of large multinational firms (Atkin et al. 2018). These changes can trigger large reallocations of labor across the economy, and it can take many years for the adjustment to be complete. This paper studies the short- and long-run effects of adjustment in domestic labor markets in the manufacturing sector to the so-called China shock—the entry of China into the World Trade Organization (WTO), which transformed it into the largest world producer of manufacturing goods, whose exports have increased sixfold since 2001 (see Autor et al. 2013, Branstetter et al. 2019).

We rely on a shift-share methodology that relates the change in local labor market outcomes with the supply-driven change in Mexican firms' exposure to Chinese competition. Our analysis relies on the Population and Economic Censuses of Mexico for the 1998–2018 period. We first design and implement an algorithm to define commuting zones(CZ) in Mexico. These local labor markets are determined geographically by the boundaries of work and residence (Tolbert & Sizer 1996). We measure the change of import exposure in each local labor market as the change in an imports-per-worker measure, which combines the change in the value of imported goods from China in each (narrowly defined) industry with that industry's share of employment in the local labor market before the shock. In order to isolate the supply-side component of the shock, we instrument the change in Mexican imports from China with the change in imports to Latin American countries (LAC) that share a similar economic structure to Mexico's.

We find that the increased exposure to Chinese imports reduced Mexican manufacturing employment in the short run: an additional \$1,000 in import exposure per worker induced a reduction in manufacturing employment per working-age person of 1.8 percentage points. In the following years, the overall negative effect on employment persisted but declined. Our results show that almost 20 years after the initial shock, a \$1,000 rise in a commuting zone's imports per worker led to a (statistically insignificant) increase in its manufacturing employment per working-age population of 0.114 percentage points. We break down the effect by type of employee. We find that in both the short and medium runs, wage, blue-collar, and formal employees were more harmed by the shock than other types. Wage employees were partially substituted with piece-rate or outsourced (contract-based) employees and formal employees with informal ones. The impact of the competition shock decreased significantly in the long run, although the effect on informal workers continued to persist. On the extensive margin, the reduction in employment was met by an increase in the population that exited the labor force. Wages earned by the different types of workers fell greatly in the short run but quickly recovered. Finally, we find that the increased competition faced by manufacturing firms seems to have had a negative spillover effect on employment in the services sector, although that effect was much smaller than the effect on manufacturing firms. In related papers, Dix-Carneiro & Kovak (2015, 2019) study the effects of trade liberalization in Brazil. Similarly, we find changes in the extensive margin (between sectors and between employment statuses) and in the intensive margin (between formality and informality).

We also break down these changes in the labor force by firm characteristics. We find that job destruction in both exiting and surviving firms was counterbalanced by job creation in both. However, informal employment continues to increase, which is explained by the exceeding number of informal job creation in both surviving and entering firms relative to the number of informal job destruction. Last, along the lines of Branstetter et al. (2019), we find that an important mechanism of adjusting to trade shocks was firm exit. We also explore the characteristics of the most affected firms. We find that the increase in exit of manufacturing firms due to the increased competition was not evenly distributed among all kinds of firms. Small firms and those operating in competitive markets responded proportionately more. We also find that job destruction (creation) due to firm exit (entry) declined substantially over time, consistent with our previous findings that the negative short- and medium-run effects tended to disappear in the long term.

We estimate the full impact on employment at the national level by taking into account the effects of increased competition in Mexican local labor markets, the effects of increased competition in US markets, and the potential positive effects of Mexican firms' increased access to Chinese markets. We find that had competition from China remained unchanged between 1998 and 2013 -before the estimated impact substantially declined-, employment in the manufacturing sector in Mexico nationwide would have been about 7.6 percent higher in 2013 than in reality.

We assess the validity of our research design by estimating a placebo experiment that relates the import-exposure measure with outcomes in the previous decade. We find no effects. To understand the variation of effects across industries, we follow Goldsmith-Pinkham et al. (2020) and find that the adverse effects were concentrated in a few representative industries, especially those producing electronics. We also present a measure of competition in external markets (i.e., in the United States). When we model the US market as an indirect channel of increased competition, with Mexican firms competing with Chinese firms, our results do not change, which implies that competition in the external market did not intensify the employment effect. Another potential indirect effect of China joining the WTO is that Mexican firms may have increased their exports to China. We find this effect to be very small.

Our study contributes to a growing literature that examines the impact of the heightened competition from China. One strand of the literature identifies the effects by exploiting variation in Chinese-import competition at the industry level (Bernard et al. 2006, Mion & Zhu 2013), an approach that has been applied to Latin American countries by Alvarez & Claro (2008), Iacovone et al. (2013), and Caamal-Olvera & Rangel-González (2015). Similar to a recent study evaluating the long-run effects of the China shock (Autor et al. 2021), a number of papers examine the impact of Chinese competition by exploiting variation in import exposure across local labor markets (Autor et al. 2013, Acemoglu et al. 2016, Feler & Mine 2017, Rothwell 2017), with applications to Latin America (Costa et al. 2016). Mendez (2015) and Chiquiar et al. (2017) look at the impact of the China shock on Mexican labor markets. Our study differs from these in several respects. First, we cover a longer period (20 years), and we analyze the dynamic over the time of this reaction. Second, we analyze the impacts across different types of workers according to their characteristics. Finally, we explore how the effect on firm exit varies with firm characteristics.

The rest of the paper is organized as follows. Section 2 describes the Mexican economy before and during the China shock. Section 3 describes the empirical strategy. Section 4 analyzes the impact of the shock on employment. Section 5 presents robustness checks we conducted to validate our scope of study. Section 6 concludes with a discussion of the overall impacts of the shock.

2 The Spatial Distribution of Import Competition

One important import-competition shock in the last 20 years is the China shock of 2001. China's share of Mexican manufacturing imports rose from 1.3 percent in 1998 to nearly 20 percent 20 years later.[1] This shock was particularly important for Mexico because, since the birth of the North American Free Trade Agreement (NAFTA) in 1994, the country had been specializing in industries in which China would later show increased productivity and, therefore, increased ability to compete with Mexican firms in their domestic market (Amoroso et al. 2011, Chiquiar et al. 2017). The magnitude of this shock was large and unequally distributed across local labor markets (which we approximate using commuting zones described in Appendix A.1).

[1]Based on the United Nations Comtrade Database.

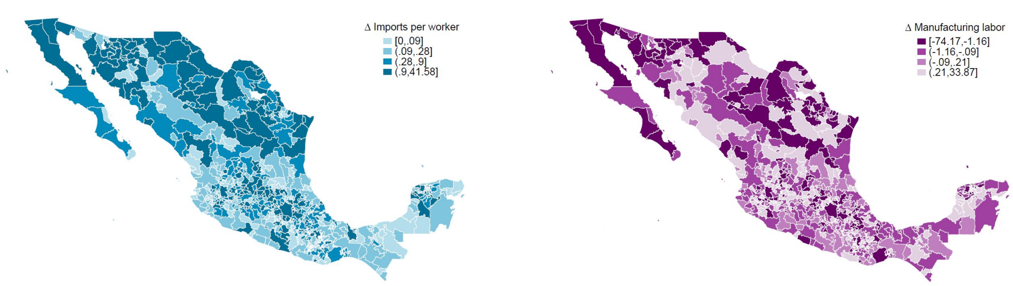
Table 1: Summary Statistics

	1998	Change 1998-2003	Change 1998-2008	Change 1998-2013	Change 1998-2018
Imports from China to Mexico/ workers in 1998 (in 1000US$)	0.055 (0.104)	0.169 (0.521)	0.703 (1.884)	1.194 (3.392)	1.485 (3.877)
Percentile of change in import penetration					
90		0.200	0.880	1.410	1.882
75		0.062	0.300	0.512	0.665
50		0.019	0.089	0.168	0.207

Notes: Authors' calculations based on United Nations Comtrade Database and Mexican Economic Census. This table shows the summary statistics for our main variables. It shows the mean and standard deviation for the initial period (1998) and end period (2018) in our analyses and some chosen percentiles for the change between these two periods. Panel A shows statistics by locality (a commuting zone) of import penetration, while Panel B shows employment rates by percentiles of manufacturing penetration.

Table 1 presents descriptive statistics of our measure of exposure to Chinese imports. In 1998 the value of imports from China, measured in constant 1998 US dollars per worker in Mexico, was about \$55. By 2003 the per-worker value increased by \$169, and by 2018 it increased nearly threefold by \$1,485. There was, however, significant heterogeneity across localities. For example, in the local labor market that corresponds to the 90th percentile of the change in exposure, the value of Chinese imports per worker grew by \$1,882, while in the local labor market that corresponds to the 50th percentile the value grew by only \$207. This reflects geographic variation in industry specialization, with some localities more specialized in industries that compete directly with imports than others.

Figure 1: Spatial Heterogeneity of the Import-Competition Shock



Panel A: Change in imports from China to Mexico per worker by local labor market, 1998–2018

Panel B: Change in manufacturing employment rate by local labor market, 1998–2018

Figure 1 depicts the geographic impact of the import-competition shock. Historically the Mexico City metropolitan area had the largest share of national manufacturing employment (46 percent in 1980). However, after the birth of NAFTA in 1994, that share underwent a rapid decline in favor of other regions, particularly the states that were well connected to the United States. Meanwhile, the southern regions saw virtually no change (Hanson 1998). Panel A of Figure 1 shows that zones in the North and in the center of the country experienced the largest increases in import exposure because they were relatively specialized in industries that compete most directly with the imports from China. These same areas also experienced some of the largest decreases (or smallest increases) in manufacturing employment (Panel B).

3 Empirical Strategy

3.1 Data

We use data on international trade produced by the United Nations Comtrade Database, a repository of official international trade information. These data are converted from six-digit Harmonized System codes to five-digit North American Industry Classification System codes using the concordance developed by Pierce & Schott (2012). The primary source of information on labor outcomes is the Mexican Economic Censuses of 1988, 1998, 2003, 2008, 2013, and 2018, from which we extract information on employment and wages by municipality, industry, establishment's characteristics, and worker's characteristics[2].

The Economic Census also allows us to longitudinally link individual establishments[3]. This database allows us to identify firms that entered, exited, or survived during the different census waves and to assess job flows from each of those groups of establishments. We supplemented the Economic Census information with information from the Population Censuses[4], which provides data by municipality on working-age population and on specific population characteristics (such as educational levels) that we use as control variables.

The trade data by industry are combined with employment data by industry and locality to construct a measure of exposure to Chinese imports at the local labor market level. A local labor market is defined by a commuting zone: an area within which most people live and work. Each area consists of a group of municipalities that exhibit a high degree of

[2]The industry classifications in the census using the six-digit NAICS codes, which we aggregate to five digits to match the trade data. The various Economic Censuses are originally reported in different versions of the NAICS classifications (2002, 2007, and 2012). We employ concordance tables, provided by the Mexican Statistical Agency (INEGI), to express all of them in the NAICS classification version 2002.

[3]While the most recent versions of the Economic Census include unique identifiers that link establishments over time, this is not true for the oldest versions of the census. To overcome this challenge, Busso et al. (2018) designed an algorithm that matched establishments over time based on location, names, and other unique identifiers provided by INEGI to create a longitudinal database from 1998 to 2013

[4]The years of the Economic Census and Population Census do not overlap exactly. Thus, the data from the Mexican Economic Census for the years 1988, 1998, 2003, 2008, and 2013 are matched with the data from the Population Census for the years 1990, 2000, 2005, 2010, and 2015, respectively.

socioeconomic interaction, commuting between the residence and the workplace. Details on constructing commuting zones are in Appendix A.2.

We study five sets of outcomes, all aggregated at the commuting zone level. First, our main outcomes of interest are the changes in manufacturing employment captured by the Economic Census. Our dependent variable is total employment in manufacturing in the local labor market divided by the working-age population (defined as people between 15 and 64 years of age). Second, we look at outcomes from the Population Census. As a way of validating the main results, we estimate the effect on manufacturing employment and non-manufacture employment. We also study the effect of the China shock on unemployment and percent of people out of the labor force. Third, to further investigate the mechanisms behind changes in net employment observed, we analyze the impact of the import competition shock on measures of job creation and job destruction. Fourth, an important outcome of interest is the change in log wages. The Economic Census reports the total payroll for each type of worker. We compute the average wages as the total payroll for each type of worker by all establishments in the locality divided by the number of employees in that category. Finally, we study how the import competition shock affected the population of establishments in the economy by studying the effect of the shock on the share of firms that populated the economy in 1998 that exited the market by 2003, 2008, 2013, and 2018. Similarly, we also measure for each of those years the share of new firms that have entered in the previous five years. Appendix Table A.1 describes all the variables used in the paper.

3.2 Methodology

We estimate the effect of import competition on local labor market outcomes using the following model:

$$\Delta Y_{it} = \theta \Delta IPW_{it} + X_{it}^{'}\gamma + e_{it} \tag{1}$$

Here, ΔY_{it} is the change in an outcome of interest in locality i in year t, $X_{it}^{'}$ is a vector of control variables measured before the China shock, and ΔIPW_{it} is a measure of the change in Chinese imports per worker in each locality i between 1998 and year t. Following Autor et al. (2013) we define that measure as follows:

$$\Delta IPW_{it}^{c} = \frac{1}{L_{i,t_0}} \sum_{j} \frac{L_{ij,t_0}}{L_{j,t_0}} \Delta M_{jt}^{c} \tag{2}$$

ΔM_{jt}^{c} is the change in the value of imported goods from China in industry j between year $t_0 = 1998$ and year t. While the baseline model is estimated for a 20-year change (between $t_0 = 1998$ and $t = 2018$), we also present results for three subperiods ($t = 2003$, $t = 2008$, and

$t = 2013$), which allows us to capture shorter-term effects. $L_{ij,t_0}/L_{j,t_0}$ is the share of industry j's employment in local labor market i in 1998, before China entered the WTO. We take this share to be fixed. The expression inside the summation apportions the aggregate increase in Chinese imports in each industry according to the spatial distribution of employment in 1998. We then divide it by L_{i,t_0}, the total employment in locality i in 1998, to obtain a per-worker measure of change in import competition from China faced by that locality. The expression is derived from a trade model with monopolistic competition in which each region is treated as a small open economy.[5] The intuition is straightforward: if, before the import-competition shock (that is, at time t_0), locality i's employment was concentrated in industries that manufacture goods that would later compete directly with imports from China, the import-competition exposure of that locality was high. In estimating the model, we also include different sets of fixed effects (for example, broad regions) in some specifications, which we discuss further in Section 5.

Observed changes in the import-penetration measure might not be entirely driven by the supply side (by Chinese imports); they might be partly the outcome of internal shocks that affect Mexican import demand within Mexican industries. Because we are interested only in the supply-driven component, we estimate a 2SLS model in which ΔIPW_{it} in equation (2) is instrumented with the change in imports from China to other countries in Latin America:

$$\Delta IPW_{it}^{o} = \frac{1}{L_{i,t_0-10}} \sum_{j} \frac{L_{ij,t_0-10}}{L_{j,t_0-10}} \Delta M_{jt}^{o} \tag{3}$$

Here, ΔM_{jt}^{o} is the change in the value of imports from China in industry j in 17 Latin American countries between 1998 and year t.[6] There are two main potential threats to identification. First, changes in imports from China to the other Latin American countries might be correlated with demand shocks to Mexico that affect Mexico's imports of Chinese goods. While this is possible, in practice this should not be a major concern given that the transmission of Mexican trade shocks to the rest of Latin America is likely to be minimal because of the weak trade ties between the two areas. The shares of the rest of Latin America in Mexican imports and exports are 4 and 6 percent, respectively. The second threat to identification is that the measures of employment shares by locality used in equation (2) might be affected by the anticipation of the China shock. To address this, we rely on 10-year lagged values of the employment variables that are used as weights in equation (2)—that is, employment in 1988 (2 years earlier than the NAFTA negotiations began). Our empirical strategy is valid if the industry-share measure in 1988 is exogenous to changes in employment

[5] For a complete derivation, see Autor et al. (2013).

[6] The 17 Latin American countries are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Jamaica, Nicaragua, Panama, Peru, Paraguay, Uruguay, and Venezuela.

after controlling for observables.

4 Effect of Import Competition on Local Labor Markets

Import competition from China reduced the number of manufacturing jobs in Mexican local labor markets in the short and medium runs, though the effect diminished in the long run. We explore the different margins of adjustment to the China shock and the timing of the effects. Table 2, Panel A reports the main results, including the effects by type of employee contract, type of production, and firms' legal status in different periods.[7] We also examine the effects on wages, job creation, and other sectors and present the results in Panels B–D. To ease comparison, the first column presents the results for all the employees. Note that the regressions for worker type and firms' legal status are for wage workers only.

Margin of adjustment: type of worker. Column (2) shows the effect on contract workers who do not depend on a fixed salary defined in their contract. In the medium run, the effect on contract workers was positive.[8] While we do not observe significant impacts in the long run, the shock clearly persisted in that firms continued to rely less on wage employees. This column shows that part of this decline was compensated by an increase in the use of contract workers.

Wage employees can be separated into production workers (blue-collar jobs) and non-production workers (white-collar jobs). In the short and medium runs, the impact of the shock was three times larger for production workers (Column (4)) than for non-production workers (Column (5)). Even though we do not observe the same level of significance in the long run, we can infer that lower-skill workers were more severely affected.

Wage employees can also be divided into formal and informal workers. Even though a firm is legally required to pay social security taxes for its wage employees, compliance with the law is not universal. In other words, some firms that hire wage employees might not pay social security taxes for them. We assume the workers in these firms as informal. Given this situation, we conjecture that faced with a negative trade shock, some firms stop paying social security taxes on some of their wage employees by employing informal rather than formal workers. We test this hypothesis by separating the wage employees into these two

[7] According to the Economic Census, the owners and the family members working for the firm are also non-paid employees. To simplify matters, we exclude these people from the entire analysis because it is likely that they behave differently from salaried workers.

[8] The sum of the coefficients for wage employees and contract workers is equal to the coefficient for all workers. Likewise, the sum of the coefficients for production and non-production workers is equal to the coefficient for wage employees.

groups and then examining the effects of the shock. To create these two groups, first, we count all the wage workers employed by all the firms in the commuting zone for which the ratio of total social security taxes paid in each firm to total wages paid is less than 0.09. These are the informal wage employees. We consider the rest of the wage employees to be formal. Workers in firms that partially pay their social security taxes are considered formal.[9]

Columns (6) and (7) show the results for firms' legal status. The coefficient for formal workers is negative, while the coefficient for informal workers is positive and statistically significant (at the 1 percent level). Accordingly, we suggest that the decline we observe in the number of employees overall can be attributed to a decline in the number of formal employees. Similar to the literature on the Brazilian labor market adjustments (Dix-Carneiro & Kovak 2019), our results also show that trade-induced import competition is likely to displace formal workers and stimulate the replacement of informal ones.

Margin of adjustment: wage. We find that the shock also reduced wages, although the magnitudes are modest. Table 2, Panel B presents the findings. The dependent variable is expressed as the log change in wages. Comparing the impact on the wages of production and non-production workers, we see that only non-production workers' wages fell; a $1,000-per-worker increase in a commuting zone's exposure to Chinese imports reduced the annual wages of non-production workers by 0.04 log points. Comparing the impact on the earnings of formal and informal employees, we see a small negative effect on the wages of the formal employees; a $1,000-per-worker increase in a zone's exposure to Chinese imports reduced the annual wages of formal workers by 0.016 log points. We combine information from the Economic Census on the annual wage bill and the number of paid employees to obtain a measure of the average wage within a given commuting zone.[10] Because we do not see individual wages, we cannot say whether the observed changes in the average wage are due to changes in wages for individual workers or changes in the composition of workers. Not being able to keep the composition of workers constant might introduce a bias in the estimation.[11] Accordingly, the results should be viewed with some caution.

[9] Total social security taxes on wage employees in Mexico are approximately 32 percent of the wage. However, because the census data exclude some contributions (such as the housing fund and subnational taxes), a firm included in the census would fully comply with the labor regulations, paying 18 percent of wages as social security taxes. (Busso et al. 2013) use the ratio of total social security taxes paid to total wages paid to classify firms based on whether they hire paid employees legally. They define three groups: legal (the ratio is at least 18 percent), semi-legal (greater than 0 percent and lower than 18 percent), and illegal (0 percent). For simplicity, we create only two groups: formal and informal.

[10] We express wages in constant terms by using the GDP deflator.

[11] As mentioned in Autor et al. (2013), if workers with lower wages are more likely to lose their jobs, then the observed changes in the average wage will understate the changes in wages relative to the case in which the composition is kept constant.

Table 2: Effects by Labor Type

		by type of contract		by type of worker		by firm's legal status	
	All employees [1]	Contract employees [2]	Wage employees [3]	Production workers [4]	Non-production workers [5]	Formal employees [6]	Informal employees [7]
Panel A: Effect on working-age population manufacturing shares							
Period 1998-2003	-1.827**	0.189	-2.016***	-1.548***	-0.467***	-2.076**	0.061
	(0.757)	(0.157)	(0.720)	(0.566)	(0.170)	(0.883)	(0.351)
Period 1998-2008	-0.581**	0.190**	-0.771***	-0.597**	-0.174***	-0.885***	0.114**
	(0.238)	(0.075)	(0.257)	(0.232)	(0.033)	(0.243)	(0.052)
Period 1998-2013	-0.258**	0.178*	-0.435***	-0.337**	-0.099***	-0.653***	0.218***
	(0.103)	(0.096)	(0.161)	(0.149)	(0.021)	(0.160)	(0.068)
Period 1998-2018	0.114	0.116	-0.002	0.029	-0.031	-0.099	0.097***
	(0.170)	(0.150)	(0.204)	(0.186)	(0.023)	(0.194)	(0.038)
Panel B: Effect on manufacturing wages							
Period 1998-2003			-0.166***	-0.190***	-0.199***	0.086	-0.429***
			(0.053)	(0.058)	(0.059)	(0.055)	(0.098)
Period 1998-2008			-0.008	-0.010	-0.037**	-0.023	0.053***
			(0.019)	(0.021)	(0.016)	(0.019)	(0.018)
Period 1998-2013			-0.010	-0.010	-0.030**	-0.013	0.024**
			(0.011)	(0.011)	(0.012)	(0.011)	(0.010)
Period 1998-2018			-0.011	-0.004	-0.040**	-0.016	0.024**
			(0.013)	(0.014)	(0.020)	(0.015)	(0.009)
Panel C: Manufacturing job flows							
JC Surv	0.125***	0.025	0.121***	0.127***	0.016***	0.115***	0.037*
	(0.038)	(0.036)	(0.039)	(0.039)	(0.006)	(0.038)	(0.022)
JC Entry	1.130***	0.137	0.993***	0.868***	0.125***	0.873***	0.120***
	(0.245)	(0.156)	(0.254)	(0.236)	(0.029)	(0.235)	(0.044)
JD Surv	0.184***	0.001	0.204***	0.181***	0.044**	0.226***	0.009*
	(0.066)	(0.017)	(0.076)	(0.095)	(0.020)	(0.076)	(0.006)
JD Exit	0.957***	0.045	0.912***	0.785***	0.127***	0.861***	0.051**
	(0.184)	(0.035)	(0.180)	(0.156)	(0.027)	(0.174)	(0.022)
Panel D: Effects on other sectors							
Wholesale & retail employment	-0.065** (0.030)	-0.033* (0.018)	-0.032 (0.033)	-0.024 (0.027)	-0.008 (0.009)	0.015 (0.023)	-0.047*** (0.017)
Services employment	-0.145 (0.120)	-0.054 (0.034)	-0.090 (0.108)	-0.082 (0.075)	-0.008 (0.039)	-0.066 (0.059)	-0.024 (0.072)
Wholesale & retail wages	-	-	-0.003 (0.007)	-0.004 (0.006)	0.005 (0.010)	-0.004 (0.008)	0.000 (0.009)
Services wages	-	-	0.002 (0.009)	0.002 (0.007)	-0.007 (0.016)	-0.001 (0.009)	0.009 (0.015)

Notes: Panels A, B, and C report results for the manufacturing sector. The dependent variable in Panel A is the change in manufacturing employment over working-age population in CZ, for all employees (1), for contract employees (2), for paid employees (3), for production workers (4), for non-production workers (5), for formal workers (6), and for informal workers (7); in Panel B it is the log change in wages for the corresponding population; in Panel C, the 20-year job flow in manufacturing employment. The main explanatory variable is the change in imports from China to Mexico per worker, in kUS$. The instrument is the change in imports from China to LAC per worker. The control variables are the percentage of employment in manufacturing before the shock (between 1988 and 1998), the percentage of population with secondary education, the level of routineness of the average occupation, and the change in imports from rest of the world countries (ROW) to Mexico per worker, in kUS$.

The total negative effect on manufacturing employment in the short and medium runs can mainly be explained by job destruction from exiting firms and to a lesser extent by job destruction at surviving firms. Table 2, Panel C reports the effect on job flows for the full 20-year period. A $1,000-per-worker increase in a commuting zone's exposure to Chinese imports reduced the number of jobs by 0.957 percentage points in exiting firms and 0.184 percentage points in surviving firms. This negative effect was not offset by job creation by entering firms or surviving firms; the same exposure to Chinese imports induced job creation of 1.130 percentage points by entering firms and 0.125 percentage points by surviving firms. The positive impact that contract workers experienced came mainly from the creation of jobs at new firms. The negative impact on wage employees can be attributed to the destruction of jobs at both surviving and exiting firms. This pattern of job destruction by exiting and surviving firms also captures the total reduction in the numbers of both production and non-production workers. Finally, the effect of the shock on the creation of informal jobs is confirmed by a reduction in the destruction percentage of those types of jobs at surviving firms. A commuting zone that experienced an increase in Chinese-import exposure of $1,000 per worker saw an increase in the number of informal jobs among newly entering firms of 0.12 percentage points. *Spillovers.* Similarly, we do not find any persistent significant effect in the wholesale-and-retail and services industries. Yet Table 2, Panel D (first two rows) reports our estimates for employment for the full 20-year period (1998 to 2018) and shows that the overall effect for both industries was negative. The effect on wholesale and retail faded in time. The shock induced a bigger decline in service-sector employment. Columns (2) and (3) indicate that Chinese competition drove a reduction in the number of both wage employees and contract workers. In the service sector, as in the manufacturing sector, the China shock produced a decline of formal employees without an accompanying increase in informal employment. Exploring the effects on wages, we find no spillover effects—either in services nor wholesale and retail. Altogether, these results constitute evidence that, because of economic links among sectors, the China shock had modest negative spillover effects on sectors other than manufacturing.

Firm exit and entry. Table 3 presents our estimates of the effect of the China shock on firm exit and entry, with time horizons noted in different columns. We also explore whether these effects are heterogeneous across different types of firms. Each panel describes a category: industry, firm size, productivity, or competitiveness index. Panel A shows, by industry, that manufacturing-firm destruction was not compensated by manufacturing-firm creation. A $1,000-per-worker increase in a commuting zone's exposure to Chinese imports increased (in the long run) the share of exiting firms by 0.258 percentage points, an effect not significantly counterbalanced by the share of entering firms. These effects are not present either in wholesale and retail or in services. In those industries, the trade shock increased the flow of firms, in turn increasing the shares of both exiting and entering firms.[12]

Table 3, Panel B presents the findings for different firm sizes. The coefficients indicate that the trade shock affected mostly small and medium-sized firms. Regarding exit, the shock did not affect big firms' share of exiting firms (where a big firm is defined as having more than 50 workers), but it increased smaller firms' share. Moreover, the shock induced an increase in the entry of firms of all sizes but especially bigger firms. While a $1,000-per-worker increase in a commuting zone's exposure to Chinese imports increased the share of entry of small firms (fewer than five workers) by 0.288 percentage points, it induced an

[12] We estimated these effects using firm microdata instead of local-labor-market aggregates.

increase in the share of entry of medium firms (20 to 50 workers) by 0.396 percentage points. Overall, for firms with fewer than 26 workers, the effect on exiting firms was bigger than the effect on the entry of new firms.

Table 3: Effects on Firm Entry and Exit

	Share Exit 98-03	Share Exit 98-08	Share Exit 98-13	Share Exit 98-18	Share Entry 98-03	Share Entry 98-08	Share Entry 98-13	Share Entry 98-18
Panel A: by Industry								
Manufacturing	4.318***	0.857**	0.441**	0.258*	1.539	0.619	0.292	0.200
	(1.286)	(0.366)	(0.183)	(0.143)	(1.315)	(0.390)	(0.190)	(0.152)
Wholesale & retail	2.863***	0.750***	0.320***	0.231*	3.624***	1.186***	0.540***	0.369***
	(0.842)	(0.190)	(0.096)	(0.131)	(1.230)	(0.206)	(0.123)	(0.113)
Services	3.535***	0.606**	0.353**	0.230**	2.769***	0.691***	0.365***	0.230*
	(0.982)	(0.256)	(0.141)	(0.106)	(0.969)	(0.210)	(0.113)	(0.118)
Panel B: Manufacturing by Size								
Less than 5	5.715***	1.147***	0.581***	0.377**	2.891**	0.922**	0.444**	0.288*
	(1.396)	(0.378)	(0.188)	(0.149)	(1.325)	(0.383)	(0.176)	(0.148)
6-10 workers	10.393***	2.504***	1.166**	0.879*	7.404***	1.263*	0.737*	0.763***
	(2.976)	(0.872)	(0.510)	(0.503)	(2.438)	(0.666)	(0.404)	(0.271)
11-25 workers	6.942***	1.908***	0.848**	0.432	7.932***	1.850***	0.993***	0.846*
	(2.596)	(0.713)	(0.333)	(0.297)	(2.297)	(0.631)	(0.321)	(0.446)
26-30 workers	2.864	1.367	0.482	0.285	5.692	3.708***	1.246**	0.769*
	(2.470)	(1.205)	(0.548)	(0.790)	(4.036)	(1.123)	(0.488)	(0.396)
More than 50 workers	3.171	2.153*	1.168**	0.901	2.532	2.959**	1.200**	1.295**
	(2.693)	(1.102)	(0.503)	(0.747)	(2.765)	(1.185)	(0.511)	(0.516)
Panel C: Manufacturing by Productivity Quartile								
Quartile 1	1.123**	0.380**	0.187*	0.187*	-0.087	0.157	0.018	0.172
	(0.455)	(0.157)	(0.104)	(0.096)	(0.771)	(0.158)	(0.099)	(0.230)
Quartile 2	1.062	0.354*	0.205	0.188	-0.291	-0.017	-0.234*	-0.046
	(0.711)	(0.213)	(0.129)	(0.123)	(0.878)	(0.157)	(0.138)	(0.201)
Quartile 3	0.166	0.014	-0.025	0.002	-1.203***	-0.045	-0.317**	-0.045
	(0.631)	(0.178)	(0.093)	(0.121)	(0.431)	(0.172)	(0.132)	(0.195)
Quartile 4	0.150	-0.053	-0.052	-0.015	-1.568	0.003	-0.168	-0.090
	(0.896)	(0.279)	(0.169)	(0.199)	(1.064)	(0.217)	(0.118)	(0.103)
Panel D: Manufacturing by HHI								
Less than 0.15	4.266***	0.858**	0.441**	0.253*	1.293	0.642*	0.288	0.198
	(1.259)	(0.352)	(0.184)	(0.138)	(1.371)	(0.385)	(0.192)	(0.155)
0.15-0.25	0.009	0.753	0.157	0.040	2.085	-0.175	-0.298	-0.284
	(3.204)	(0.835)	(0.327)	(0.644)	(2.020)	(0.866)	(0.353)	(0.392)
More than 0.25	7.056***	-2.834***	-0.987	-1.075	-7.877	-1.316	0.025	-0.125
	(2.722)	(0.959)	(0.601)	(0.666)	(5.465)	(1.287)	(0.732)	(0.378)

Notes: In the first three columns, the dependent variable is the share of exiting firms for the corresponding category in each period. In the last three, it is the share of entrant firms. The instrument is the change in imports from China to LAC per worker. All the regressions include the full set of control variables from Table B.1. Observations are weighted by start-of-period CZ share of national population. Robust standard errors in parentheses are clustered by state. *** , ** , and * indicate significance at the 1, 5, and 10 percent levels, respectively.

When we analyze the behavior of firms in different productivity quartiles (Table 3, Panel C), we find that the increase in exposure to Chinese imports induced greater exit by firms in the lowest quartile, as expected by the theory (Melitz 2003). Additionally, we explore the effects' heterogeneity by the level of competition that the firms faced. In Panel D, manufacturing firms in competitive markets (Herfindahl–Hirschman Index lower than 0.15) experienced an increase in the share of exiting firms in response to exposure to Chinese competition. Firms competing in unconcentrated markets adjusted less to meet the demands of increased import competition. The point estimate indicates that a $1,000-per-worker increase in Chinese-import exposure induced an increase of 0.253 percentage points in the share of exiting firms between 1998 and 2018.

We can also use our results to provide a back-of-the-envelope calculation of the job losses in Mexico due to increased competition. To do this, we first calculate the number of jobs lost because of Chinese competition in Mexico. We then calculate how much manufacturing employment would have grown between 1998 and 2013–before the estimated effects substantially declined–if import exposure from China had remained at 1998 levels, and we then compare the resulting counterfactual number of jobs created with the actual number of jobs created. The difference is the number of job losses due to the China shock.[13]

The overall job loss in the manufacturing sector, measured as the change in wage employees plus the change in contract workers, was approximately 333,000 workers in 2013, which is almost 14 percent greater than the approximately 292,000 workers in 2003. In other words, had import exposure from China in Mexico and the United States remained unchanged between 1998 and 2013, the total number of workers in the manufacturing sector would have been 333,000 larger (about 7.6 percent).[14]

5 Robustness Checks

To assess the validity of our identification assumptions, we included several measures above. We proceed to include a number of variables to control for various labor force and demographic factors. In Appendix Table B.1, we introduce geographic indicator variables for eight regions to control for region-specific trends in employment.[15] One concern is that the estimated effect is partly capturing the general downward trend of manufacturing employment observed in many countries. Not controlling for this trend might lead us to attribute a decline in manufacturing employment entirely to Chinese imports, even though independent factors may play a role.[16] Column (2) shows that the coefficient for the pre-trend control is not statistically significant in any period, and the coefficient for import exposure does not significantly change.

A second concern is that the evolution of employment in manufacturing might be driven

[13] Calculations are presented in Appendix C.

[14] The 2013 Economic Census mentions that 4.4 million workers were employed in the manufacturing sector. We exclude from the analysis owners and family members working for the firms. In 2013, these groups represented around 700,000 people.

[15] We follow the national statistical agency in grouping Mexico's 32 states into eight regions by shared cultural, economic, and geographical traits.

[16] In Mexico, between 1988 and 1998 the share of manufacturing employment among the working-age population increased from 5.1 to 6.8 percent, and then it hovered between 5.5 and 6 percent between 2003 and 2013. Our approach is similar to that used by (Dix-Carneiro & Kovak 2017), who examine the impact of Brazilian trade liberalization on employment growth by controlling for a pre-liberalization trend in employment to account for possible spurious correlations.

in part by the skills of the population in the local labor market. Therefore, in Column (3) we include the share of the commuting zone's population that had a secondary education before the China shock. For the short and medium runs, the coefficient is negative and significant at conventional levels.

Following Autor et al. (2013), we also control for the extent to which the occupations in the commuting zones have a high risk of being displaced by technology, a factor that could confound the effect of the China shock. We rely on work by Costinot et al. (2011), which characterizes the level of routineness of the tasks performed by workers in each occupation combined with information on the distribution of occupations in each (NAICS four-digit) sector to generate an index of routineness by sector. We use this index to construct an average level of occupational routineness at the local labor market level in 1998.[17] The results of including this control variable are reported in Column (4). The estimated coefficient for the routine-intensity variable is not significant.[18]

Finally, we test whether the increased import exposure to China reflected a more general exposure to imports. Our import-penetration variable might be capturing import exposure to countries other than China, possibly overstating the effect of imports from China. We construct a measure of exposure to imports from other countries by following equation (2) but replacing the change of imports from China with the change of imports from the rest of the world. The results in Column (5) show that the import exposure to the rest of the world is not statistically significant. While not shown in the table, the coefficient for import exposure to China does not significantly change with the above controls.

We then use an alternative set of countries to build the instrumental variable in equation (3). The rationale behind using Latin American countries to construct the instrument is that a shock in Mexico is likely to be uncorrelated with Chinese-import demand in Latin American countries because the trade linkages between Mexico and Latin America are relatively limited. We modify this instrument by building it from an alternative group of countries at similar levels of economic development to Mexico.[19] We argue that because their economic structure and levels of development are similar, these countries and Mexico were similarly exposed to growth in imports from China. Changing the set of countries used as instruments does not

[17]We assume that the distribution of occupations by sector in Mexico is similar to that observed in the United States.

[18]Another dimension that could confound the effect of the China shock is the degree of offshorability of the activities performed in different sectors. Unfortunately, we lack information to measure this for Mexico. However, Mexico participates in global value chains not by internationally fragmenting domestic production but by receiving bundles of fragmented production from the rest of the world, particularly from the United States Blyde et al. (2014). Therefore, controlling for offshorability is not likely to matter in our setting.

[19]We identified the set of countries that are most similar to Mexico along five dimensions: GDP per capita, physical capital, human capital, population, and export-basket composition. The countries are Argentina, Brazil, Colombia, Costa Rica, Malaysia, Peru, Poland, and Romania.

alter the results in any meaningful way. If anything, as shown in Appendix Table B.2, the alternative instrument tends to strengthen the results. Therefore we continue to use 17 Latin American countries to build the instrumental variable.

We also assess the plausibility of the identification assumption by estimating a placebo model using the change in the share of the working-age population employed in manufacturing between 1988 and 1998, before the China shock as a dependent variable. We conduct this placebo test using the same set of controls included in the main results (shown in column (1) of Table 2). The estimated coefficients are very small, and we cannot reject the null hypothesis of no effect. Results are shown in Appendix Table B.3.

Next, we compute the Rotemberg weights of the estimator presented in the last column of Table B.4 as in Goldsmith-Pinkham et al. (2020). Bartik instruments (after Bartik (1991)), like the ones used in our analysis, can be decomposed into a weighted sum of the instrumental-variable estimators obtained by considering each of the industry shares in 1988 ($\frac{L_{ij,t-10}}{L_{i,t-10}}$ in equation (3)) as an instrument in a just-identified model. Analysis of these decomposition weights ("Rotemberg weights") provides insight into the mechanism behind our instrument and thus allows us to assess the plausibility of our identification assumptions.[20] We compute the Rotemberg weights of the estimator presented in the last column of Appendix B.4 as in Goldsmith-Pinkham et al. (2020). Similarly to Autor et al. (2013), we find that a small number of industries explain a large share of the variation of our instrument: the top 10 industries, presented in Table B.4, account for over 60 percent (0.73/1.076) of the positive weights in the estimation. Among them are relatively technologically stagnant industries (apparel, footwear, energy, wire, and cable) and relatively technologically innovative industries (electronic components, computers and peripheral equipment, household audio, video, and phones). For the first set of industries, it is likely that China's heightened comparative advantage was the main driver behind the supply shock, while for the second set of industries, the supply shock likely arose from a change in technology that led to mechanization. These high-skilled industries are similar to those with more weight in the United States, as shown in Goldsmith-Pinkham et al. (2020). We take this as indirect evidence that our instrument picks up variation from industries in which China experienced productivity gains and that the import-competition shock is operating in our estimation.

[20] That is, $\hat{\theta} = \sum_{k=1}^{K} \hat{\alpha_k}\hat{\beta}_k$. For a complete derivation, see Goldsmith-Pinkham et al. (2020). $\hat{\alpha_k} = \frac{g_k Z_k' X^{\perp}}{\sum_{k=1}^{K} g_k Z_k' X^{\perp}}$ and $\hat{\beta}_k = (Z_k' X^{\perp})^{-1} Z_k' Q^{\perp}$. Z are the industries' shares (initial 1988 shares of employment for each industry in each commuting zone $\frac{L_{ij,t_0-10}}{L_{i,t_0-10}}$), X is the endogenous regressor (exposure to Chinese imports ΔIPW_{it}), Q is the outcome (for example, the change in manufacturing employment, ΔY_{it}), g_k is the shock to industry k (for example, the change in imports from China to Latin America per worker in each industry $\frac{\Delta M_{jt}^{o}}{L_{j,t}}$), $X^{\perp}$ is the residuals of X on the controls, and $Q^{\perp}$ are the residuals of Q on the controls.

We also account for the increase in competition in external markets. The increase in competition experienced by Mexican firms came in part through an indirect channel: because about 90 percent of Mexican manufacturing exports go to the United States, Mexican firms might have also experienced an increase in competition from Chinese manufacturers in the US market. In Appendix B.5, we find that the gross import exposure, adding the import exposure in the domestic market to the import exposure through the US market, has fewer positive effects compared to the average import exposure.

6 Concluding Discussion

We examined the impact of China's emergence as a manufacturing powerhouse on Mexican manufacturing employment. To identify the effects of this trade shock on various labor-market outcomes, we exploited heterogeneity across local labor markets in terms of industry specialization and exposure to import competition. We strengthened our findings' plausibility by including a set of controls indicating different characteristics of the labor force, along with an alternative instrumental-variable test and a placebo model in which the dependent variable is lagged (1988–98) so that it pertains to a period before the China shock. To explore the underlying effects of the shock, we constructed Bartik instruments to estimate the share of different industries and to explore the impact of increased competition in the US market.

We found that in the most exposed zones, the adjustment in the labor market took various forms: a decline in the number of paid employees, a substitution of some wage employees by contract workers, and a substitution of some formal wage employees with informal wage employees. The adverse effects on employment were mainly associated with job destruction from exiting firms, particularly those that were small and medium-sized. We found that the shrinkage in the level of employment accompanied an increase in the population that exited the labor force. Our estimates account for the increased competition from Chinese products in the domestic market and the increased competition that Mexican exporters faced in the US (their main export market). The estimates also account for the small increase in employment due to increased access to the Chinese market. We provided evidence that the negative effects persisted for some time and were largest in the medium term but mostly disappeared after 20 years.

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ONLINE APPENDIX (Not for publication)

A Variables definitions and data construction

A.1 Variable definition

Table A.1: Variables description and data source

Variable	Description	Source
Share of working-age population in manufacturing	Employment in manufacturing divided by total employment at the CZ level	Based on Mexican Economic Census and Population Census from INEGI
Import penetration from country c in CZ i	Weighted average of Mexican imports from country c in industry i divided by total employment in CZ i. The weight is the share of the CZ i in industry j's employment.	Based on COMTRADE from UN and Mexican Economic Census from INEGI
Instrument for import penetration from country c in CZ i	Weighted average of the imports of 17 Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Jamaica, Nicaragua, Panama, Peru, Paraguay, Uruguay, and Venezuela) from country c in industry i divided by total employment in CZ i. The weight is the share of the CZ i in industry j.	Based on COMTRADE from UN and Mexican Economic Census from INEGI
Alternative import penetration from country c in CZ i	Weighted average of Mexican imports from country c in industry i divided by Mexican apparent consumption (output + imports - exports) in industry i. The weight is the share of the CZ i in industry j's employment.	Based on COMTRADE from UN and Mexican Economic Census from INEGI
Instrument for alternative import penetration from country c in CZ i	Weighted average of the imports of 17 Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Jamaica, Nicaragua, Panama, Peru, Paraguay, Uruguay, and Venezuela) from country c in industry i divided by Mexican apparent consumption (output + imports - exports) in industry i. The weight is the share of the CZ i in industry j's employment.	Based on COMTRADE from UN and Mexican Economic Census from INEGI
Import penetration from China through the US market	Weighted average of US imports from China in industry i divided by total employment in CZ i. The weight is the share of the CZ i in industry j's employment multiplied by the share of Mexico in US imports of industry j.	Based on COMTRADE from UN and Mexican Economic Census from INEGI
Percentage of employment in manufacturing pre-trend (88-98)	10-year change in the share of employment in manufacturing (1988–98) at the CZ level	Based on Mexican Economic Census from INEGI
Percentage of population with secondary education	Population with secondary education completed divided by total population at the CZ level	Based on Mexican Economic Census and Population Census from INEGI
Routine intensity level of occupations	Weighted average of the level of routineness of all the sectors that were active in the CZ in 1998. The weights are the shares of the CZ's employment in sector j. The sectoral level of routineness is taken from Costinot, Oldenski, and Rauch (2011).	Based on Mexican Economic Census from INEGI and Costinot, Oldenski and Rauch (2011)
Paid employee	A paid employee earns a predetermined amount of money, has the right to a severance payment when fired, and is entitled to social security benefits. Constructed at the firm level as *Staff depending on the company name* minus *Owners, family members and other unpaid workers*. Aggregated as share of total employment in the corresponding CZ.	Based on Mexican Economic Census from INEGI
Contract employee	A contract employee is paid hourly or by a project, there is no severance payment, and they are not entitled to social security benefits. Constructed at the firm level as *Staff supplied by another company name* plus *Staff for fees or commissions without basic salary*. Aggregated as share of total employment in the corresponding CZ.	Based on Mexican Economic Census from INEGI
Production employee	Blue-collar paid employees. Constructed at the firm level as the variable *Production, sales, and service staff*. Aggregated as share of total employment in the corresponding CZ.	Based on Mexican Economic Census from INEGI
Nonproduction employee	White-collar paid employees. Constructed at the firm level as the variable *Administrative, accounting, and management staff*. Aggregated as share of total employment in the corresponding CZ.	Based on Mexican Economic Census from INEGI
Formal employees	Paid employees in firms for which the ratio of total social security taxes paid to total wages is positive. Total security taxes paid is constructed as *Employer contributions to social security schemes* plus *Other social benefits*. Aggregated as share of total employment in the corresponding CZ.	Based on Mexican Economic Census from INEGI
Informal employees	Paid employees in firms for which the ratio of total social security taxes paid to total wages is equal to zero. Aggregated as share of total employment in the corresponding CZ.	Based on Mexican Economic Census from INEGI
Entering firm	A firm that was not present in the 1998 census but was present in the 2003, 2008, or 2013 census (depending on the case). Aggregated as share of total firms (in the corresponding category) in the corresponding CZ.	Based on Mexican Economic Census from INEGI and Busso et al. (2018)
Exiting firm	A firm that was present in the 1998 census but not in the 2003, 2008, or 2013 census (depending on the case). Aggregated as share of total firms (in the corresponding category) in the corresponding CZ.	Based on Mexican Economic Census from INEGI and Busso et al. (2018)
Surviving firm	A firm that was present in both the 1999 census and the 2004, 2009, or 2014 census (depending on the case).	Based on Mexican Economic Census from INEGI and Busso et al. (2018)

Job creation	Defined at the firm level as either the number of employees for entering firms (JC Entry) or the difference in workers between 1998 and 2003, 2008, or 2013 (depending on the case) for surviving firms when the difference is non-negative. Aggregated as share of total employment in the corresponding CZ.	Based on Mexican Economic Census from INEGI and Busso et al. (2018)
Job destruction	Defined at the firm level as either the number of employees for exiting firms (JD Exit) or the difference in workers between 1998 and 2003, 2008, or 2013 (depending on the case) for surviving firms when the difference is negative. Aggregated as share of total employment in the corresponding CZ.	Based on Mexican Economic Census from INEGI and Busso et al. (2018)
Productivity	Defined at the firm level as log physical productivity as in Hsieh and Klenow (2009). It is a measure of deviation of the individual firm productivity from the corresponding six-digit-industry average productivity if marginal products of capital and labor were equalized across plants. Firm productivity is calculated as share of the output value over the cost of capital and wages.	Based on Mexican Economic Census from INEGI and Hsieh and Klenow (2009)
Competition	Herfindahl–Hirschman Index (HHI). Defined at the six-digit industry level as $\sum_{i=1}^{N} s_i^2$, with s_i being the share of value added by firm i in the corresponding industry. Value added is taken from the variable *Gross censal value added*.	Based on Mexican Economic Census from INEGI

A.2 Constructing commuting zones

The algorithm to construct commuting zones is as follows. First, we identified central localities. We considered a municipality to be central if it attracts population from other municipalities for employment purposes. These are places where economic activity tends to be concentrated. To identify them in the data, we created an index of urbanity at the municipality level that is the sum of the following standardized variables: municipality population, percent of urban population, urban density, percent of population working in nonprimary activities, and number of municipalities from which people come to work. We classified a municipality as central if it has an urban index score above the 25th percentile. The process identifies 599 central municipalities. We consider the rest of the municipalities to be peripheral.

Second, we assigned a peripheral municipality to a central municipality in multiple rounds, as follows. In round one, we found peripheral municipalities that satisfied three criteria: (i) its centroid is less than 100 kilometers from the centroid of a central municipality;[21] (ii) at least one person from the peripheral municipality worked in the central municipality; and (iii) there was a positive correlation in the urban employment rates between their census tracts.[22] At the end of this, an initial set of peripheral municipalities were adjoined to a central municipality.

Third, we repeated this procedure adding peripheral municipalities until no more municipalities could be assigned. After seven rounds, this procedure assigned 1,068 municipalities to central municipalities (73 percent of the municipalities in Mexico). Finally, to assign the residual municipalities, we continued the process of assignment by lifting criterion (iii). After five new rounds, 291 more municipalities were assigned. In the end, there was a small

[21] Two municipalities were so large that they did not have a neighboring municipality below the 100 km threshold. We treated these municipalities as independent commuting zones.

[22] We created the following measure of employment correlation between municipalities M and N: $\alpha_{M,N} = L'PW_L/L'PL$. Here, L_{mx1} is the vector of the employment rate for municipality M's census tracts. This measure is standardized by the state average and standard deviation. W_{mxn} is a weighting matrix for the census tracts of municipalities M and N, where the matrix is defined as the inverse of the distance from each census tract. The sum of all the values in each row is standardized to be equal to one. $W_L = W * L^n$ is the vector of the weighted average employment rate of municipality N's census tract. P is a diagonal matrix that weights the census tract of municipality M by the population share of each municipality M. Also, if one municipality was a neighbor of two or more central municipalities, we created an index that took into account the three assignment criteria described above. We assigned the peripheral municipality to the central municipality with the greatest index value.

residual of municipalities that were not assigned with this process. These were very rural,[23] and small[24] so we treated them as independent commuting zones. All in all, the algorithm assigned the whole universe of Mexican municipalities to 780 commuting zones or local labor markets.

B Additional Robustness Checks

Table B.1: Effects on Manufacturing Employment:
(Full controls)

	1998-2003	1998-2008	1998-2013	1998-2018
Change in imports from China	-1.827***	-0.581**	-0.258**	0.114
to Mexico/worker	(0.757)	(0.238)	(0.103)	0.170)
Percentage of employment in	0.019	-0.019	-0.025	-0.081
manufacturing in pre-change (88-98)	(0.017)	(0.014)	(0.018)	(0.069)
Percentage of population with	-0.215*	-0.136*	-0.158***	-0.173
secondary education	(0.098)	(0.070)	(0.053)	(0.203)
Routine intensity level	0.076	-0.067	0.016	-0.128
of occupants	(0.148)	(0.090)	(0.113)	(0.831)
Change in imports from ROW	0.621	0.003	0.009	-0.158
to Mexico/worker	(0.520)	(0.018)	(0.016)	(0.374)
Regional Fixed Effects	YES	YES	YES	YES
Number of observations	737	738	738	738

Notes: *** , ** , and * indicate significance at the 1, 5, and 10 percent levels, respectively.

[23] On average, 72 percent of the population in these municipalities work on primary activities, the urban area is less than 19 percent, and most of them (77) are located in Oaxaca.

[24] The population of these municipalities is always smaller than 19,000.

Table B.2: Change in Manufacturing Employment in CZs, 1998–2013 (2SLS Estimates)

	[1]	[2]	[3]	[4]	[5]	[6]
Change in imports from China	-0.317***	-0.306***	-0.323***	-0.262***	-0.264***	-0.266***
to Mexico/worker	(0.091)	(0.077)	(0.092)	(0.085)	(0.089)	(0.090)
Percentage of employment in		0.013	-0.020	-0.027*	-0.026	-0.024
manufacturing pre-trend (88-98)		(0.027)	(0.015)	(0.015)	(0.017)	(0.018)
Percentage of population with				-0.153***	-0.154**	-0.158***
secondary education				(0.055)	(0.056)	(0.057)
Routine intensity level					-0.005	0.011
of occupations					(0.087)	(0.096)
Change in imports from ROW						0.010
to Mexico/worker						(0.016)
Regional Fixed Effects	NO	NO	YES	YES	YES	YES
Number of observations	780	780	780	780	780	780
	2SLS first stage estimates					
Change in imports from China	0.219***	0.235***	0.207***	0.195***	0.175***	0.175***
to LAC/worker	(0.046)	(0.047)	(0.044)	(0.042)	(0.038)	(0.038)
Weak identification test F statistic	23.0	25.2	22.1	21.0	21.1	10.5

Notes: Each column reports results from regressions over the 1998–2013 period. The dependent variable is the 15-year change in manufacturing employment over the working-age population in CZ between 1998 and 2013 (in percentage points). The main explanatory variable is the change in imports from China to Mexico over Mexico's apparent consumption, in percentage points. The instrument is the change in imports from China to LAC over Mexico's apparent consumption. The control variables are the share of manufacturing in the country's total employment (2–6), the percentage of population with secondary education (3–6), the level of routineness of the average occupation (5–6), and the change in imports from the ROW to Mexico over Mexico's apparent consumption (6). A region fixed effect is an additional control (3–6). Observations are weighted by start-of-period CZ as share of national population. Robust standard errors in parentheses are clustered by the state. The weak identification test is the Kleibergen-Paap Wald F statistic. *** , ** , and * indicate significance at the 1, 5, and 10 percent levels, respectively.

Table B.3: Effects on Manufacturing Employment
(Placebo)

	1988-1998 (Placebo)				
	[1]	[2]	[3]	[4]	[5]
Change in imports from China	0.027	-0.046	-0.040	-0.004	0.033
to Mexico/worker	(0.181)	(0.172)	(0.183)	(0.205)	(0.203)
Percentage of population with			-0.011	0.012	0.050
secondary education			(0.083)	(0.064)	(0.066)
Routine intensity level				0.117	-0.039
of occupations				(0.153)	(0.174)
Change in imports from ROW					-0.085***
to Mexico/worker					(0.022)
Regional Fixed Effects	NO	YES	YES	YES	YES

Notes: Each column reports results from regressions over the 1988–98 period. The dependent variable is the change in manufacturing employment over the working-age population in CZ between years (in percentage points). The main explanatory variable is the change in imports from China to Mexico per worker, in kUS$. The instrument is the change in imports from China to LAC per worker. The percentage of population with secondary education (3–5), the level of routineness of the average occupation (4–5), and the change in imports from the ROW to Mexico per worker are given in kUS$ (5). A region fixed effect is an additional control (2–5). Observations are weighted by start-of-period CZ share of national population. Robust standard errors in parentheses are clustered at the state level. *** , ** , and * indicate significance at the 1, 5, and 10 percent levels, respectively.

Table B.4: Top 10 Rotemberg-Weights Industries

	$\hat{\alpha}_k$	g_k	$\hat{\beta}_k$	90 % CI	Ind Share
Electronic Components	0.263	149.582	-0.337	(-0.60,-0.10)	0.388
Audio and Video Equipment	0.132	70.473	-0.009	(-0.20,0.20)	0.305
Electronic Computers and Peripheral Equipment	0.083	415.628	-0.420	N/A	0.126
Radio and TV Broadcasting Equipment	0.072	948.964	0.757	N/A	0.052
Navigational and Measuring Instruments	0.041	158.341	-0.086	(-0.20,0.50)	0.080
Telephone Apparatus	0.037	753.975	0.765	N/A	0.034
Power and Electricity Distribution Equipment	0.029	44.102	-0.526	(-0.70,-0.40)	0.283
Apparel	0.027	21.804	-2.257	(-7.00,-1.20)	1.864
Footwear	0.025	16.920	-0.832	(-1.40,-0.50)	1.046
Energy Wire and Cable	0.021	24.373	-0.655	(-5.00,-0.40)	0.303

Notes: This table reports the 10 industries with the highest Rotemberg weights. g_k is national industry export growth per worker from China to Latin America. $\hat{\beta}_k$ is the coefficient from the just-identified regression. The 90 percent confidence interval is the weak instrument robust confidence interval using the method from Chernozhukov & Hansen (2008) over a range from -10 to 10. N/A indicates that it was not possible to define the confidence interval successfully. Ind Share is the industry share (multiplied by 100 for ease of interpretation).

Table B.5: Direct and Indirect Effects on Employment

	All [1]	Contract [2]	Wage [3]	Production [4]	Non-production [5]	Formal [6]	Informal [7]
Panel A:							
Change in imports from China (Mexico and USA)/worker	0.057	0.059	-0.001	0.014	-0.016	-0.050	0.049***
	(0.085)	(0.076)	(0.103)	(0.094)	(0.012)	(0.098)	(0.019)
Panel B:							
Change in net imports from China (Mexico)/worker	0.115	0.118	-0.002	0.029	-0.031	-0.101*	0.099**
	(0.174)	(0.156)	(0.208)	(0.190)	(0.023)	(0.199)	(0.038)
Panel C:							
Change in imports from China (Mexico)/worker	0.114	0.116	-0.002	0.029	-0.031	-0.099	0.097***
	(0.170)	(0.150)	(0.204)	(0.186)	(0.023)	(0.194)	(0.038)

Notes: In the first three columns, the dependent variable is the share of exiting firms for the corresponding category in each period. In the last three, it is the share of entrant firms. The instrument is the change in imports from China to LAC per worker. All the regressions include the full set of control variables from Table B.1. Observations are weighted by start-of-period CZ share of national population. Robust standard errors in parentheses are clustered by the state. *** , ** , and * indicate significance at the 1, 5, and 10 percent levels, respectively.

C Counterfactual Measures

Following Acemoglu et al. (2016), the counterfactual can be calculated as follows:

$$\Delta L_{i2013}^{CFactual} = -\hat{\beta}_1 \times \widetilde{\Delta IPW_i} \times WAP_{i2013} \tag{C.1}$$

Here, $\Delta L_{i2013}^{CFactual}$ is the number of additional jobs that commuting zone i would have had in 2013 if the import penetration from China had remained at the 1998 level; $\hat{\beta}_1$ is the 2SLS coefficient estimate from equation (1); WAP_{i2013} is the working-age population of commuting zone i in 2013, and $\widetilde{\Delta IPW_i}$ is the portion of the import penetration from China in commuting zone i that can be attributed to a Chinese-import shock.[25] The latter is calculated by multiplying the original import-penetration measure, ΔIPW_i, with the partial R-square from the first-stage regression of equation (1). The R-square gives the variation of ΔIPW_i that is explained by the instrument in expression (2). Thus $\widetilde{\Delta IPW_i}$ is a proxy of the supply-driven component of ΔIPW_i. We calculate a counterfactual for each commuting zone and then add the results across all zones. We can illustrate the calculation using one commuting zone, Valle de Mexico, which includes Mexico City. The 15-year supply-driven change of import exposure in Valle de Mexico is equal to 0.996 (kUS$), which arises from multiplying the import exposure in Valle de Mexico of 1.61 (kUS$) by the R-square from the first-stage regression of 0.6186 (0.996 = 1.61 x 0.6186). Given the point estimate for paid employees of -0.470, the share of paid employees per working-age population would have increased by 0.463 percentage points more than it did (0.996 x 0.470 = 0.468). The working-age population in Valle de Mexico in 2013 was 14.4 million people. Therefore, the estimates imply that in 2013 there would have been approximately 67,000 more paid employees in manufacturing (14,475,137 x 0.0046 = 66,585). The equivalent point estimate for contract workers is 0.1985. Accordingly, the share of contract workers per working-age population would have increased by 0.198 percentage points less than it did (-0.996 x 0.192 = -0.191). Therefore, the estimates imply that in 2013 there would have been approximately 29,000 fewer contract workers in manufacturing (14,475,137 x (-0.00192) = -28,792).

[25] Recall that the original ΔIPW_i, or the change in imports per worker from China, might reflect not only the China shock but also Mexican demand factors.