The Effects of Trade-Induced Worker Displacement on Health and Mortality in Mexico

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Abstract

Recent research in the U.S. links trade-induced job displacement to deaths of despair. Should we expect the same mortality response in developing countries? This paper analyzes the effect of a trade-induced negative shock to manufacturing employment on leading causes of mortality in Mexico between 1998 and 2013. I exploit cross-municipality variation in trade exposure based on differences in industry specialization before China's accession to the WTO in 2001 to instrument for changes in local manufacturing employment. I find trade-induced job loss increased mortality from diabetes, raised obesity rates, reduced physical activity, and lowered access to health insurance. These deaths were offset by declines in mortality from alcohol-related liver disease and ischemic heart disease. These findings highlight that negative employment shocks have heterogeneous impacts on mortality in developing countries, where falling incomes lead to less access to health care and nutritious food, but also reduce alcohol and tobacco use.

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1 Introduction

Over the last several decades, the relationship between trade liberalization and individuals' well-being has become a central topic of discussion for economic policy. Many developing countries experienced increased economic growth stemming from a rapid export-led industrialization and integration into the world economy. With improved living standards and access to health care, mortality from infectious diseases considerably declined, whereas mortality from chronic diseases, such as diabetes and cardiovascular disease, is increasing at alarming rates (WHO, 2018). The rise in these "lifestyle" diseases is associated with tobacco use, physical inactivity, excessive use of alcohol, and unhealthy diets. To the extent that globalization promotes economic growth, it is possible that a population's health benefits from integration. However, understanding the distributional effects of trade liberalization remains a challenge.

This paper investigates the effect of a trade-induced negative shock to manufacturing employment on leading causes of mortality—diabetes, ischemic heart disease, and alcohol-related liver disease—in Mexican municipalities between 1998 and 2013. The country experienced a rapid export-led expansion of its manufacturing sector, an important source of formal employment creation, that started with its entry into GATT in 1986 and culminated with the signing of NAFTA in 1994. China's accession to the World Trade Organization (WTO) in 2001 generates plausibly exogenous variation in international competition affecting Mexican local labor markets and allows for exploring differential mortality responses to changes in local employment opportunities and income. I exploit cross-municipality variation in trade exposure given the differences in industry specialization before China's accession to the WTO in 2001, and I instrument manufacturing employment constructing measures of exposure to both import competition in Mexico's domestic market and export competition in the U.S. market.

A priori, it is unclear how a negative economic shock may affect these "lifestyle" diseases morbidity and mortality. On the one hand, falls in income may limit households' access to nutritious food and health care (Allcott et al., 2019; Barham and Rowberry, 2013; Behrman and Parker, 2011). On the other hand, a negative income shock could improve health to the extent alcohol, tobacco, and other drugs are normal goods (Lang et al., 2018; Ruhm et al., 2002; Ruhm, 2005) . While job loss could improve the physical health of individuals employed in industries imposing strenuous physical activity or prone to work-place injuries (Hummels et al., 2016; Mcmanus and Schaur, 2016), it could also deteriorate mental health because of increased stress, anxiety levels, and overall sense of "despair" (Pierce and Schott, 2018). Finding sources of exogenous variation in income and health behaviors is challenging. In the first part of the paper, I combine data from economic and population censuses with international trade flows to estimate the effect of trade-induced changes in local labor opportunities on mortality. I focus on three leading causes of death, which explain about one third of overall mortality in Mexico, with the aim to provide an insight into channels that affect the prevalence of chronic disease, such as the relationship between income and nutrition, access to health care, and health behaviors.

Diabetes, a chronic disease associated with high blood glucose levels, affects 14 percent of Mexican adults and is the leading cause of death over the period of my analysis (PAHO, 2012). Type 2 diabetes is the most common type and is largely the result of excess body weight and physical inactivity. I find that the trade-induced loss in manufacturing employment opportunities at the municipality level is associated with a significant increase in the type 2 diabetes age-adjusted mortality rate. This result is not driven by pre-existing trends in diabetes mortality rate, and it is robust to the inclusion of a rich set of municipality level controls. A one standard deviation decrease in the manufacturing employment rate is associated with an increase of over 2 deaths per 100,000 from type 2 diabetes between 1998-2013, representing approximately a 13 percent increase of the average age-adjusted diabetes mortality rate at baseline.[1]

[1] I calculate age-adjusted mortality rates to ensure that the differences in mortality are independent of age differences. This is relevant in the context of an epidemiological and demographic transition taking place in middle-income countries like Mexico. See section 3.1 for a detailed explanation.

I also examine whether two other leading causes of mortality, ischemic heart disease (i.e., heart attacks) and alcohol-related liver disease, were affected by the labor market disruption. I find that a one standard deviation decrease in the manufacturing employment rate is associated with a 4 percent decrease (2 deaths per 100,000) in ischemic heart disease age-adjusted mortality rates and a 6 percent decrease in alcohol-related liver disease age-adjusted mortality rates (1 death per 100,000) with respect to the baseline mortality rate. Moreover, while the increase in type 2 diabetes mortality associated with the negative employment shock affects both men and women, the decrease in mortality rates for ischemic heart disease and alcohol-related liver disease are concentrated in men. These results suggest that the factors driving these deaths are affected differently by the negative employment shock; my complementary evaluation of health surveys links each of the above results to specific health behaviors.

My identification strategy highlights the importance of labor market opportunities and income as determinants of health outcomes. In the second part of the paper, I provide additional supporting evidence on the relationship between income and households' investment in health inputs. First, using data from individual health surveys, I show that trade exposure is associated with increased state-level prevalence of obesity (measured using body mass index) and decreased physical activity, which are risk factors for type 2 diabetes. Results also point to significantly less access to preventive health check-ups, which might affect information availability through delayed diagnosis of type 2 diabetes. Declines in alcohol and tobacco consumption are possible mechanisms explaining ischemic heart disease and alcohol-related mortality declines.

Second, I provide reduced-form evidence of the effect of trade exposure on the local labor market. International competition is associated with wage reductions and increased levels of informality at the local level. I show that differential wage reductions are concentrated in the manufacturing sector in the short-term and expand to the overall economy in the long-term, implying some sectoral adjustment takes place over time. Additionally, more-exposed municipalities have fewer individuals with health insurance, which is explained by a differential reduction in the share of beneficiaries enrolled in social security through formal employment. Given that I find overall declines in formal employment at the local level, this result implies the loss of access to health care was not limited to manufacturing workers.

This paper makes two main contributions. First, I identify the impact of trade liberalization on chronic disease mortality through its influence on income and employment opportunities. Thus, I provide evidence of a new dimension of the relationship between globalization and inequality in developing countries (Braga, 2018; Pavcnik, 2017; Dix-Carneiro and Kovak, 2017; Topalova, 2010). Distinct from recent work, which focuses on the trade in foods and prices (Giuntella et al., 2019; Gracner, 2017) as determinants of state-level chronic disease prevalence, my empirical strategy allows me to analyze income effects of trade exposure as a channel affecting health outcomes. Using mortality data from national registries allows me to identify these effects at a smaller spatial unit (i.e., municipality level).[2]

Second, I take advantage of the level of disaggregation and geographical coverage of my data to explore whether the effects of trade-induced worker displacement on mortality are different depending on the source of international competition. Previous research studying the impact of Chinese international competition in Mexican labor market outcomes focuses either on the direct effect via a rise in import competition in the domestic market (Majlesi and Narciso, 2018; Blyde et al., 2017; Mendez, 2015) or the indirect effect via a reduction of exports to the United States (Dell et al., 2019; Utar and Torres Ruiz, 2013; Gallagher and Porzecanski, 2007; Gallagher et al., 2008; Hanson et al., 2008). Examining exposure to both types of international competition and using countrywide data is relevant for drawing conclusions regarding distributional implications of trade liberalization. I find that the effects of trade-induced job loss on mortality are similar using either measure of exposure to international competition. Furthermore, the results are robust to a rich set of municipality-level controls —migration pre-trends, employment pre-trends, gender composition, educational

[2] I provide estimates using 2,382 municipalities as opposed to 32 states. For a discussion on the implications of geographic aggregation for the analysis of health outcomes, see Lindo (2015).

distribution, and rural/urban status).

More broadly, my analysis relates to several important literatures. An extensive literature has investigated the health and mortality consequences of unemployment. Following the seminal contribution by Ruhm (2000), which reports a pro-cyclical fluctuation of mortality in the United States, a series of influential papers study the effect of economic conditions on mortality (Sullivan and Wachter, 2009; Ruhm, 2015; Autor et al., 2018), workplace injuries (Boone et al., 2011; Mcmanus and Schaur, 2016) and self-reported health outcomes (Hummels et al., 2016; Lang et al., 2018). Additionally, a recent strand of literature focuses on the deaths of despair—drug overdoses, suicides, and alcohol-related liver mortality—as the main driver of the overall increase in all-cause mortality in the U.S. in the last two decades (Pierce and Schott, 2018; Hollingsworth et al., 2017; Case and Deaton, 2015, 2017). I exploit exogenous variation in trade exposure at the local level for identification and to shed light into the mechanisms behind this relationship in a middle-income country like Mexico.

Finally, my analysis also relates to an extensive literature examining the effect of Chinese international competition on labor market outcomes in the last two decades (Autor et al., 2013, 2014; Acemoglu et al., 2016; Pierce and Schott, 2016a; Utar, 2018), as well as an array of socio-economic outcomes such as marriage and fertility (Autor et al., 2015, 2018), internal migration (Majlesi and Narciso, 2018; Greenland et al., 2019), women's decision making power (Majlesi, 2016) and opportunity cost of criminal employment (Dell et al., 2019). Here, using a similar identification strategy, my results contribute to a better understanding of the implications of international trade exposure on mortality in a developing country.

This paper proceeds as follows. In the next section, I provide background on Mexico's leading causes of mortality and manufacturing employment trends. Section 3 describes the data. In Section 4, I describe my empirical strategy. Section 5 presents the main results. In Section 6, I discuss the key mechanisms behind the mortality response I find and provide additional supporting evidence on the effects of international competition on health and labor market outcomes. Section 7 concludes.

2 Background

How do local changes in manufacturing employment opportunities affect mortality? The primary objective of this paper is to analyze the effects of trade-induced changes in the labor market on mortality, morbidity and health behaviors. In this section, I provide some background Mexican population's health and manufacturing employment overall trends.

2.1 Health and Mortality Trends

As other middle-income countries, Mexico has experienced an epidemiological transition, characterized by a decrease in mortality caused by communicable diseases. Overall mortality declined by nearly 30 percent from 1980 through 1996, associated with this epidemiological transition (Cutler et al., 2002).[3] However, the country has also experienced an alarming increase in the prevalence of chronic diseases, such as diabetes and ischemic heart disease, as shown in Figure 1.

The prevalence of these chronic diseases is a major public health problem in both developed and developing countries.[4] Each year, about 15 million adults aged 30 to 69 years old die from chronic diseases; 85 percent of these premature deaths occur in low- and middle-income countries (WHO, 2018). Over the period of 15 years analyzed in this paper, diabetes and ischemic heart disease are the leading causes of death in Mexico accounting for 15 and 13 percent of total deaths in 2013, respectively. They are followed by mortality from alcohol-related liver disease (6 percent).[5] In this paper, I focus on these three leading causes of death,

[3]The epidemiological transition has not been homogeneous across all the country. Deaths related to undernutrition and infectious, maternal and perinatal diseases are still very relevant in the poorest regions (Gonzalez and Quast, 2010).

[4]Bommer et al. (2017) estimates that the economic burden of diabetes represents 1.8 percent of global GDP in 2015. Moreover, OECD countries spend about 8.4 percent of their total health budget on treating obesity-related diseases. This is equivalent to about USD PPP 311 billion per year (or USD PPP 209 per capita per year) (OECD, 2019).

[5]Other main internal causes of death are cerebrovascular disease (5 percent) and chronic lower respiratory disease (4 percent). Regarding external causes of death, homicides and road accidents explained about 3-4 percent each of total mortality in 2013. The increase in the homicide rate has been documented in the recent literature (Velásquez, 2019; Dell et al., 2019; Basu and Pearlman, 2017; Dell, 2015). However, it is worth noting that even over the worst years on the homicide spike (2006-2010), homicides represented about a

which explain about one third of overall mortality in Mexico over the period, with the aim to provide an insight into channels that affect the prevalence of chronic disease, such as the relationship between nutrition and income, access to health care, and health behaviors (i.e., physical activity, alcohol and tobacco consumption).

Type 2 diabetes, which accounts for 90 percent of all diabetes cases, is a preventable disease but approaching levels of a global epidemic. The worldwide prevalence of diabetes among adults over 18 years of age rose from 4.7 percent (108 million people) in 1980 to 8.5 percent in 2014 (422 million people) (WHO, 2018). The key factors driving this alarming rise are overweight and obesity. In 34 out of 36 OECD member countries, more than half of the population is now overweight (OECD, 2019). In Mexico, the prevalence of overweight and obesity increased 15.4 percent between the years 2000 and 2012 (Barquera et al., 2013). Figure A-1 shows the body mass index (BMI) distribution of a national representative sample of adults from the Mexican National Survey on Health and Nutrition (ENSANUT).[6] The prevalence of obesity rose from 27 to 35 percent of the adult population between years 2000 and 2012, while the share of adults with overweight is about 38 percent for both years.

Cardiovascular diseases are the main cause of death globally, accounting for 31 percent of deaths (17.9 million people) per year. Over three quarters of these deaths occur in low- and middle-income countries. In Mexico, smoking is the main risk factor for cardiovascular disease (Acosta and Escobedo, 2010). According to the ENSANUT, nearly 18 percent of Mexican adults smoke. The main causes of smoking-related cardiovascular mortality are ischemic heart disease (i.e., heart attacks) and cerebrovascular disease (i.e., strokes).

Alcohol-related liver disease is the leading cause of death in young people and the third cause of overall mortality in Mexico. It is estimated that nearly 27 million Mexicans drink infrequently, but in excessive quantities (PAHO, 2012). Alcohol-related liver disease is usu-

fourth of the number of deaths that diabetes caused.

[6] I use objective measures of height and weight to calculate individuals' BMI, which is a person's weight in kilograms divided by the square of height in meters. A high BMI can be an indicator of high body fatness. If a person's BMI is 25.0 to <30, it falls within the overweight range; if the BMI is 30.0 or higher, it falls within the obese range.

ally referred to as one of the contributors of "deaths of despair" (together with overdose and suicide), which have been extensively discussed in the U.S. in the recent years (Case and Deaton, 2015, 2017; Pierce and Schott, 2018; Ruhm, 2019; Dow et al., 2019). Unlike the U.S., where deaths of despair are driven by mortality from overdose in the context of the opioid epidemic taking place in the country, alcohol-related liver disease mortality is the main driver in Mexico.

The leading causes of mortality in Mexico over the period of my analysis are associated with changes in lifestyle patterns including changes in food consumption, decline in physical activity, and health behaviors (such as alcohol and tobacco use). Changes in income may contribute to differences in the prevalence of these diseases.[7] First, a reduction in household income may force households to adjust their consumption patterns. For example, financially constrained households may face limited access to food variety and quality. On the other hand, to the extent alcohol and tobacco are normal goods, a negative income shock could benefit health by reducing their consumption. Finding sources of exogenous variation in income and health behaviors is challenging. In this paper, I use a trade-induced negative economic shock to estimate the effect of changes in local labor opportunities on mortality, morbidity and risk factors. In the next section, I provide some background on the Mexican manufacturing sector to motivate my empirical strategy.

2.2 Manufacturing Employment

The Mexican manufacturing sector experienced a rapid export-led expansion between the years 1986 and 2000, which started with the country's entry into the General Agreement on Tariffs and Trade (GATT) in 1986 and culminated with the signing of North American Free Trade Agreement (NAFTA) in 1994 and its implementation. The export to GDP ratio rose from 14 percent in 1986 to 25 percent in 2000, as Mexico became integrated into the world economy. Moreover, the relative relevance of manufacturing exports grew considerably over

[7] Across OECD countries, there are higher rates of overweight are obesity among the bottom 20 percent of income-earners compared to the top 20 percent (OECD, 2019).

this period. Manufacturing exports represented 10 percent of merchandise exports over the 1980s, 43.5 percent in 1990, and 85 percent in 2000.[8]

Nearly 60 percent of Mexican workers have informal jobs (ILO, 2014). The manufacturing sector is an important source of formal and informal employment. Data from the Mexican Social Security Institute (IMSS), which covers formal private-sector sector establishments, shows that employment in export manufacturing rose from 900,000 jobs in 1986 to over 2.7 million jobs in 2000 (Atkin, 2016). The importance of manufacturing employment is even larger when including the informal sector. According to the 1998 Mexican Economic Census, 30 percent (i.e., 4.1 million) of the workers in the labor force were employed in the manufacturing sector, with an average male to female ratio of 2.[9]

Unlike the in U.S., where the effects China's import competition has been more extensively studied, Mexico's manufacturing share of total employment was still following an upward trend in 2001. The majority of these jobs were low skill; 78 percent of manufacturing workers had no complete high school education according to the 2000 Population Census.

Mexico provides an interesting setting to study the impact of Chinese international competition on local labor markets for several reasons. First, while other middle-income countries benefited from China's entry to the WTO by exporting products in which China increased demand, the Mexican-Chinese trade relationship cannot be characterized as a mutual trade expansion. China's share of Mexican imports grew from 0.5 percent in 1994 to 8 percent in 2004, while Chinese imports from Mexico increased from 1.9 to 2.8 percent (Iacovone et al., 2013). Second, within NAFTA Mexico had developed a comparative advantage in the production of labor-intensive goods (Chiquiar et al., 2017; Feenstra and Kee, 2007; Gallagher et al., 2008; Hanson and Robertson, 2008). Consequently, China's sharp increase in exports to the U.S. following its accession to the WTO in 2001 is particularly relevant for Mexican

[8] A cross-country comparison of the relative importance of manufacturing on merchandise exports shows the same pattern. Over 2000-2005, manufacturing accounted for 85% of exports in Mexico, but only 54% in Brazil, 24% in Colombia, 20% in Peru, and 16% in Chile (Hanson, 2010).

[9] Appendix Table A-1 presents summary statistics from the 1998 Mexican Economic Census, which includes formal and informal employment.

manufacturing firms, given that nearly half of the manufacturing exports are produced by *maquiladoras*, or export assembly plants, with the U.S. as their export main destination (Utar and Torres Ruiz, 2013).[10]

3 Data

This section describes the data I use to investigate the relationship between decreased manufacturing employment opportunities and mortality at municipality level.

3.1 Mortality Rates across Municipalities

I calculate the number of deaths by municipality using administrative registers from the Mexican National Institute of Statistics and Geography (INEGI). This data provides information from all deaths certificates filed in Mexico. Observable demographics include age, gender, education level, marital status, occupation, condition of economic activity, and place of residence. Causes of death are classified using the International Classification of Diseases (ICD-10) (NCHS, 2018). I match year by municipality by age by gender death counts to corresponding population estimates from the 1990, 2000 and 2010 Mexican Censuses of Population and Housing Units, as well as the 1995, 2005 and 2015 Intercensal Population and Housing Count collected by INEGI. I use the population estimates to compute "age-adjusted" mortality rates, expressed per 100,000 population.[11]

The age-adjusted mortality rate for a municipality is the weighted average of the crude death rate across age categories within a municipality, using the Mexican population shares

[10] Appendix Figure A-3 shows some visual evidence by plotting Mexico's and China's export values in millions USD to the U.S. from 1990 to 2018, by product disaggregated at 2-digit Harmonized System (HS). The vertical lines show the year NAFTA was implemented (1994) and the year in which the U.S. granted Permanent Normal Trade Relations to China (October 2000). The plots show the increase in Mexican exports to the U.S. after NAFTA between 1994-2000, and the increase in China's exports after 2001. The most affected manufacturing sectors (textiles, electronic and mechanical machinery, wood and paper products, leather, footwear and transportation) in Mexico experienced a decrease (or at least a deceleration) in exports to the U.S..

[11] I interpolate the population (total, by gender, and by age group) for years between 1990, 1995, 2000, 2005, 2010 and 2015.

in those age categories in 2000 as weights. By assigning a standard age distribution to the populations being compared, I compute hypothetical summary rates indicating how the overall rates would have compared if the populations had had the same age distribution between periods. This method allows to obtain the differences in mortality that are independent of age difference, particularly important to in the context of a demographic transition characterized for aging population (Gelman and Auerbach, 2016).[12] The difference in age-adjusted mortality rates between two relevant periods is then:

$$\Delta AgeAdjDeathRate_{i,t,t-1} = 100,000 * \sum_{b=1}^{16} Share_{b,w} * (\frac{Deaths_{i,t,b}}{Population_{i,t,b}} - \frac{Deaths_{i,t-1,b}}{Population_{i,t-1,b}}) \quad (1)$$

I use the following 16 age categories, b: 0 to 4 years, 5 to 9 years...,70 to 75 years..., and greater than 75 years. The population weights, w, associated with these categories are provided in Appendix Table A-2.

3.2 Local Labor Markets and Trade

To examine the changes in manufacturing employment by industry and to measure the initial labor force size, I use the Mexican Economic Census. It was conducted in 1994, 1999, 2004, 2009 and 2014, with 1993, 1998, 2003, 2008 and 2013 reference periods. I do not use the 2008/2009 round because it was conducted during the Great Recession, period in which employment fluctuated significantly for causes other that exposure to Chinese trade competition.[13] Given these data restrictions, I look at the relationship between manufacturing

[12] I follow the same approach as Pierce and Schott (2018) to calculate age-adjusted mortality rates. In the U.S., age-adjusted death rates calculated by National Vital Statistics Reports are based on the 2000 U.S. standard population. This population standard was adopted by the National Center of Health Statistics (NCHS) in 1999, and replaced the 1940 standard population that had been used for more than 50 years. To the best of my knowledge, Mexico has not designated any particular year as population standard. Gelman and Auerbach (2016) show that age-adjusted mortality trends are not sensitive to the age distribution used to normalize the mortality rates.

[13] As pointed out by Dell et al. (2019), the fact that the constant reference period might not have been fully understood by respondents, significant measurement error could arise from variation in the timing of the survey. Additionally, the negative demand shock in the U.S. lead to exports from both China and Mexico to move together (decrease), weakening the negative relationship used for identification in this paper.

employment and mortality in the short run, 1998-2003, and in the longer run, 1998-2013.

Data on international competition is from UN Comtrade. This data is matched to 4-digit time-consistent manufacturing industries in the Mexican Economic Census using the concordance in Pierce and Schott (2009, 2016a) between Comtrade 4-digit Harmonized System (HS) and 4-digit North American Industry Classification System (NAICS, or SCIAN in Spanish). I use the dataset provided by the authors to create 4-digit industry (time-invariant) family level dataset containing 84 constant manufacturing industries.

I use three additional sources of data to examine the main channels through which trade exposure affected mortality. First, I examine the effect on wages using data from the National Survey of Occupations and Employment (ENOE). Second, I combine data from the Economic Census and the Mexican Social Security Institute (IMSS), which covers the universe of formal sector employment, to assess whether more-exposed municipalities exhibit increases in informal employment. Third, I use data from the Mexican National Survey on Health and Nutrition (ENSANUT) to explore differential changes in obesity prevalence (objectively measured using weights and height to calculate individuals' body mass index) and self-reported health behaviors. Each of these data sources is described in Section 6.2.

4 Empirical Strategy

The basis of my empirical analysis is to examine whether changes in local labor market opportunities have an effect on the population's health over time. I use an instrumental variable approach, following Autor et al. (2013) and Dell et al. (2019). I start by assuming that:

$$Y_{i,t} = \alpha_i + \delta_t + \beta L^m_{i,t} + t.X'_i\gamma + u_{i,t} \tag{2}$$

where $Y_{i,t}$ is the age-adjusted mortality rate at municipality level. $L^m_{i,t}$ is the manufacturing employment rate. α_i and δ_t are unobserved municipality and time effects, respectively, X_i is a trend for municipality i, and $u_{i,t}$ is the error term.

Municipalities more- or less-exposed to international competition differ in level and trend before the trade-shock, meaning that any direct comparison of exposed and non-exposed municipalities could be biased. To address pre-existing differences and to be able to explore the within-municipality variation in mortality, I difference the equation above and obtain the regression model I will use throughout the analysis:

$$\Delta Y_{i,t} = \beta_0 + \beta_1 \Delta L_{i,t}^m + X_i' \gamma + \Delta u_{i,t} \tag{3}$$

where $\Delta Y_{i,t}$ is the change in age-adjusted mortality rates between the initial year and year t in municipality i. $\Delta L_{i,t}^m$ is the change in the manufacturing employment rate (i.e. the number of workers in the manufacturing sector divided by the labor force size) between the initial year and year t in municipality i. X_i' includes baseline municipality-level controls and state fixed effects.

Although Equation 3 differences out unobservable municipality and time effects, changes in local manufacturing employment could be driven by changes in labor supply rather than labor demand, which would provide biased estimates of the effect of changes in employment opportunities on mortality. In order to address this potential identification threat, I exploit China's entry to the WTO as source of variation in local manufacturing labor demand that is uncorrelated with local labor supply.

Using a 2SLS specification, I examine whether municipalities with higher exposure to international competition per worker experience differential changes in mortality as a consequence of the negative shock to manufacturing employment. In section 4.1, I discuss how I construct the measures of municipality exposure to international competition that I use to instrument for changes in manufacturing employment. Section 4.2 discusses the 2SLS estimation.

4.1 Measures of Exposure to International Competition

China's accession to the WTO affected Mexico both directly via import competition in its domestic market and indirectly via export competition in the U.S. market. The increase in Chinese exports was not uniform across industries, allowing to exploit cross-municipality variation in exposure to international competition depending on municipalities' initial sector specialization. Following Autor et al. (2013) and Dell et al. (2019), I construct the following measure of municipality level exposure to trade:

$$\Delta ICW_{it}^{D} = \sum_{j} \frac{L_{ij,0}}{L_{j,0}} \frac{\Delta CE_{jt}^{D}}{L_{i0}} \tag{4}$$

where $\Delta ICW_{i,t}^{D}$ is the predicted change in International Competition per Worker faced by Mexican municipality i between the initial year and year. $L_{i,j,0}$ is the manufacturing employment of industry j in municipality i in the initial year, $L_{j,0}$ is the total initial manufacturing employment for industry j, and $L_{i,0}$ is the initial size of the labor force in municipality i. $\Delta CE_{j,t}^{D}$ is the change in Chinese manufacturing exports (CE) to destination D in industry j between the initial year and year t.

$$\Delta CE_{jt}^{D} = \frac{Exports_{j,0}^{D}}{Exports_{0}^{D}} \Delta Exports_{t}^{D} \tag{5}$$

where $Exports_{j,0}^{D}/Exports_{0}^{D}$ is the value of Chinese manufacturing exports to destination D of industry j goods as a share of the total Chinese manufacturing exports to destination D in the initial year. $\Delta Exports_{t}^{D}$ is the change in the total value of manufacturing exports from China to destination D between the initial year and year t. Different export destinations, D, allow me to construct two measures that capture of exposure to direct and indirect international competition. I'll refer to these two instruments in the following way:

(a) Export Competition: ΔICW_{it}^{Export} (equivalent to $\Delta ICW_{it}^{U.S.}$) when CE_{jt}^{D} is predicted change in Chinese manufacturing exports to the U.S. The intuition behind this measure of

exposure is that employment in Mexican manufacturing industries in which China experienced a higher growth in its import share in the U.S. market was affected more negatively. Figure A-4 shows histograms of the distribution of the measure of exposure to export competition for periods 1998-2003 and 1998-2013, respectively.

(b) Import competition: ΔICW_{it}^{Import} (equivalent to $\Delta ICW_{it}^{middle-income}$) when CE_{jt}^{D} is predicted change in Chinese manufacturing exports to a group of middle-income countries similar to Mexico. The idea is that because of similarities in the economic structure and income, these group of countries and Mexico are similarly exposed to increased import penetration from China.[14] Figure A-5 shows histograms of the distribution of the measure of exposure to import competition for both periods.

Table 1 presents summary statistics of the measures of exposure and the change in the manufacturing employment rate over the period of analysis. It is worth noting that the magnitudes of the measures of trade exposure in units of 1,000 USD are different because export values from China to the U.S. are much larger than export values from China to middle-income countries. Figure 8 shows a map of the cross-municipality exposure to international competition.

4.2 2SLS Estimation

My identification strategy aims at investigating labor market outcomes as a mechanism behind the relatioship between trade exposure and mortality. In order to isolate the trade shock

[14]The results presented in this paper, follow Mendez (2015)'s the selection of countries included in the sample are Argentina, Brazil, Chile Colombia, Costa Rica, Greece, Panama, and Portugal. Nevertheless, as robustness checks for my main specification I did three things. First, I checked that the results of the effect of import competition on manufacturing employment are robust to using different groups of middle-income countries to which China increased its exports. In particular, I constructed the instruments used by the previous literature changing CE_{t}^{D} in Equation 5 (Blyde et al., 2017; Majlesi and Narciso, 2018). Second, the second stage results for mortality are consistent with the 2SLS conventional specification (Autor et al., 2013) for import competition. Third, I also used Pierce and Schott (2016a) measure of U.S. industry exposure to China receiving PNTR to construct an alternative measure of exposure to export competition. The intuition behind the latter specification is that municipalities with industries that benefited from NAFTA, developing a comparative advantage and increasing exports to U.S. over 1994-2000, were more negatively affected by the trade agreement between China and the U.S. The results are consistent to these alternative specifications.

driven by supply-side changes in international trade that affect labor demand, I instrument changes in manufacturing employment by municipality using the measures of exposure to international competition that I define in the previous section. Chinese exports to the U.S. and to middle-income countries similar to Mexico are reasonably independent of Mexican health outcomes, but had a strong impact in the country's local labor markets.

4.2.1 International Competition and Manufacturing Employment - First Stage

First, I estimate the first stage using instruments for import and export competition separately.

$$\Delta L_{i,t}^{m} = \beta_0 + \beta_1 \Delta ICW_{i,t}^{D} + X_i'\gamma + \epsilon_{i,t} \tag{6}$$

where D is either the U.S. or middle-income countries. Second, I also estimate the first stage using both instruments together:

$$\Delta L_{it}^{m} = \beta_0 + \beta_1 \Delta ICW_{it}^{Export} + \beta_2 \Delta ICW_{it}^{Import} + X_i'\gamma + \epsilon_{it} \tag{7}$$

$\Delta ICW_{i,t}^{D}$ is divided by 1,000 to be in units of 1,000 USD. The sample includes 2,383 Mexican municipalities. The regressions are weighted by the initial working-age population size. In my baseline results, X_i' only include state fixed effects. I show that the results are robust to a rich set of baseline controls and pre-trends in the appendix. Given the municipality-industry level data on manufacturing employment available in the Mexican Economic Census, I look at the relationship between changes in manufacturing employment and mortality over a 5-year period, 1998-2003, and over a 15-year period, 1998-2013. The initial period is always 1998, which is the latest year with available industry-municipality level data in Mexico before China's entry to the WTO in 2001. I use the standardized change in the manufacturing employment rate as endogenous variable to interpret the second stage results on age-adjusted mortality rates as the effect of a one standard deviation change in manufacturing employment.

I start by presenting the first stage estimates of the effect of exposure to international competition on manufacturing employment in Table 2. The point estimates reported in Panel A show the effect a 1,000 USD increase in predicted international competition on changes in the manufacturing employment rate. To make these estimates more interpretable, I also report the effect of going from the 25th to the 75th percentile of municipality exposure in Panel B. Columns 1-3 show the first stage results from the period 1998-2003, while Columns 4-6 present the results for the period 1998-2013.

For each period, I estimate the first stage in Equation 6 using the measures of exposure to import and export competition separately and using both instruments in the same specification as in Equation 7. Estimates in Columns 1 and 4 imply that moving a municipality from the 25th to the 75th percentile of exposure to export competition is associated with a decline of 0.3 standard deviations in the manufacturing employment rate. The effect when using import competition alone as instrument is similar in magnitude and sign (see Columns 2 and 5).

The baseline estimates of Equation 7 presented in Column 3 suggest that an interquartile shift in a municipality's predicted exposure to export competition over 1998-2003 is associated with 0.16 standard deviation (-0.0872 x (1.98-0.18)) decline in the manufacturing employment rate, as well as a 0.16 standard deviation decline due to import competition (-1.158 x (0.1431-0.01)). Over 1998-2013, Column 6 shows a 0.12 standard deviation decline in the manufacturing employment rate associated with moving a municipality from the 25th to the 75th percentile of exposure to export competition (-0.0116 x (11.35-1.08)), and a 0.24 standard deviation decline associated with import competition (-0.0793 x (3.14-0.11)).[15]

The main takeaway from Table 2 is that using both predicted Chinese competition in the U.S. and direct import competition as an instrument generates a strong first stage. The

[15]First stage estimates using log manufacturing employment as endogenous variable show that moving a municipality from the 25th to the 75th percentile of exposure to international competition are associated with a -0.02 log points change in manufacturing employment over 1998-2003 and -0.09 log points change over 1998-2013.

relationship between international competition and manufacturing employment has been well-documented in Mexico (Blyde et al., 2017; Chiquiar et al., 2017; Mendez, 2015; Utar and Torres Ruiz, 2013; Iacovone et al., 2013) and hence it is not the main focus of this paper. I built on the previous literature findings to examine how the impact of international competition affected health outcomes through local labor markets. In the next section, I discuss potential threats to my identification assumptions.

4.2.2 Threats to identification

Identification would be threatened if predicted international competition affected changes in mortality through channels other than the labor market. It is possible that areas with increased exposure to import competition per worker, have different supply of healthful or unhealthful products (food, alcohol, tobacco). However, all the exogenous variation I exploit is driven by the initial municipalities' industrial composition, hence predicted exposure to non-manufacturing imports is not captured by the instruments. Regarding the exclusion restriction for export competition, it is hard to think how Chinese competition in the U.S. market could affect Mexico through channels other than decline in employment in the manufacturing sector. Furthermore, my empirical specification differences out any municipality level unobservable characteristics, allowing me to explore within-municipality variation in mortality. Another concern is that municipalities with higher exposure to international competition were already experiencing differential trends in mortality, but I show using pre-period data that this is not the case.

Moreover, recent work shows that estimations using the shift-share instrumental variables proposed by Autor et al. (2013) might suffer an overrejection problem affecting robust standard errors. This issue is caused by cross-regional correlation in residuals across observations with very similar shares (Adão et al., 2019). However, the inclusion of controls improves the performance of these specifications because they absorb most of the cross-regional correlation in the residuals.[16] My first stage is robust to the inclusion of a rich set of baseline controls, which allays concerns about cross-regional correlation in residuals. Results are reported in Table A-4. Column 1 presents the baseline specification, which only includes state fixed effects. Column 2 includes geographic controls for urban/rural municipalities and the log distance to U.S. that absorb region-specific trends in manufacturing employment. Column 3 additionally controls for the share of population older than 15 years old with no primary education and the share of working-age men. Column 4 controls for pre-period working-age population growth (1990-1998)to account for the possibility of differential working-age population growth between areas more- and less- exposed to trade international competition (Greenland et al., 2019).[17] In the same spirit, I add controls for the pre-period change in manufacturing employment (1993-1998) in Column 5, and the pre-period interstate and returned migration rates (1995-2000) in Columnn 6.[18] Overall, the estimates remain statistically significant and the magnitudes are similar.

Finally, Goldsmith-Pinkham et al. (2019) also discuss Autor et al. (2013)'s identifying assumptions in terms of shift-shares, and argue that weighting the shares by growth rates in Chinese exports is an imperfect way of isolating the variation in industries where China experienced rapid productivity gains (low-skill and labor-intensive). However, this does not imply that the identification assumption is implausible in terms of shares. For example, the authors mention Pierce and Schott (2016a) measure industry-level of exposure to China receiving Permanent Normal Trade Relations (PNTR) as a case in which the argument is not that a trade policy is random, but that the change in a trade policy is

[16] Adão et al. (2019) show that accounting for controls used by Autor et al. (2013) in the first-stage regression of reduces the overrejection rate by about 20% with respect to their placebo exercise with no controls.

[17] Recent work by Greenland et al. (2019) find that local labor markets in the U.S. with higher exposure to Chinese import competition (using the Permanent Normal Trade Relations agreement with China as policy change as Pierce and Schott (2016a)) experienced a relative reduction in population growth, driven by young, males and low-educated groups. The authors also replicate Autor et al. (2013) identification strategy and, contrary to them, find evidence of population adjustments. The key difference in their results lies upon controlling for pre-existing trends in population growth at the local level.

[18] Return migrants are individuals living in Mexico in 2000, but who lived in another country (or state) five years before. The return migration rate is the number of returned migrants divided by the source's population in year 1995.

not correlated with pre-existing trends in outcomes at the local level.[19] Following Pierce and Schott (2018), I construct a measure of Mexican municipalities (indirect) exposure to the PNTR as the employment-share weighted average of NTR gaps across manufacturing industries that are subject to tariffs. Figure A-6 in the appendix shows the employment share-weighted-average NTR gaps across 4-digit NAICS industries in Mexico. The intuition behind using this alternative instrument is that Mexican municipalities with industries that benefited from NAFTA, developing a comparative advantage and increasing exports to U.S. over 1994-2000, were more negatively affected by the trade agreement between China and the United States. The change in trade policy between China and the U.S. was not correlated with Mexican pre-existing outcomes at the local level, while the industry-municipality shares predict changes in employment through the changes in the trade policy between third countries. My first stage results are robust to using Pierce and Schott (2016a) measure of exposure to trade competition as shown in Table A-5. Columns 1 and 2 show that moving a Mexican municipality from the 25th to the 75th percentile of exposure to PNTR, decreased the manufacturing employment rate by about a 0.5 standard deviation. Columns 3 and 4 include the measure of exposure to import competition as instrument; an interquartile shift in municipalities exposure in international competition decreases the manufacturing employment rate by 0.21 standard deviations due to export competition (using PNTR) and 0.26-0.30 standard deviation due to import competition (using ICW-Import).

5 Effects of Trade-induced Job Loss on Mortality

This section examines whether changes in manufacturing employment, instrumented by international competition, influence changes in leading causes of mortality in Mexico during two periods: 1998-2003 and 1998-2013.

[19] In October, 2000, the United States Congress passed a bill granting Permanent Normal Trade Relations (PNTR) to China.Pierce and Schott (2016a) measure the impact of NTR as the rise in US tariffs on Chinese goods that would have occurred in the event of a failed annual renewal of China's NTR status. The refer to this difference as the NTR gap. Pierce and Schott (2018) compute county-level exposure to the PNTR as the employment-share-weighted-average of NTR gap across the 4-digit SIC industries active in the county.

I start by showing 2SLS estimation results of the effect of a change in the manufacturing employment rate, instrumented by exposure to import and export competition, on leading causes of mortality —type 2 diabetes, ischemic heart disease and alcohol-related liver disease. Given that the coefficients of the first stage are negative, to interpret the second stage point estimates as the effect of a decrease in manufacturing employment on leading causes of mortality, the sign of coefficients needs to be reversed.

Panel A in Table 3 presents the estimation results using my preferred specification (i.e., estimating Equation 7 as first stage). Column 1 shows that one standard deviation decrease in the manufacturing employment rate between 1998 and 2003 is associated with an increase of 2.367 and 2.183 deaths per 100,000 caused by type 2 diabetes between 1998-2003 and 1998-2013, respectively. These changes represent 14 and 13 percent of the average age-adjusted diabetes mortality rates across municipalities in the year 1998 which is 17.47, as reported in the second to last row of the table. Coefficients in Column 2 imply a 4 percent decrease (2.018 deaths per 100,000) in ischemic heart disease age-adjusted mortality rate over 1998-2013. The result is statistically significant at conventional levels only for 1998-2003. Column 3 shows that a one standard deviation decrease in a municipality manufacturing employment rate is associated with a 6 percent decrease in alcohol-related liver disease age-adjusted mortality rates (1 death per 100,000) with respect to the baseline mortality rate of 17.24 deaths per 100,000. For these baseline results, I also show second stage estimates using exposure to export competition (Panel B) and exposure to import competition (Panel C) separately (i.e., estimating Equation 6 as first stage). Looking at Panels B and C, it seems that all the effect on alcohol-related liver disease originates in regions exposed to export competition, while the effect on ischemic heart disease is present in areas with more exposure to import competition. However, I cannot reject that the coefficients are equal.

In Table A-3, I show that municipalities more exposed to international competition were not experiencing differential trends in these causes of mortality, using data extending 8 years prior to my sample period. The dependent variable in the second stage is the change in age-adjusted mortality rates between 1990 and 1997. The endogenous variable remains the change in manufacturing employment between 1998-2003 and 1998-2013, instrumented by my two measures of exposure to international competition. All the coefficients are statistically insignificant, alleviating concerns over the identification assumptions.[20]

In Table 4, I explore whether there are different effects by gender using my preferred specification. The statistically significant increase in type 2 diabetes associated with the negative shock affects both men and women, while the decrease in mortality rates caused by ischemic heart disease and alcohol-related liver disease are driven by men. Over a 15 year period, type 2 diabetes age-adjusted mortality rates increased about 2 per 100,000 with respect to a baseline rate of 15.84 for men and 18.58 for women. These point estimates represent a 13 percent (=2.063/15.84) increase for men and a 12 percent (=2.225/19.12) for women. Moreover, a one percent decrease in the manufacturing employment rate is associated with a 5 percent (=2.727/53.98) decrease in ischemic heart disease mortality and 6 percent (=1.84/29.66) decrease in alcohol-related liver disease for men *vis a vis* their 1998 levels. The results are not statistically significant at conventional levels for women.

I also present the results described above in Figure 3 (type 2 diabetes), Figure 4 (ischemic heart disease), and Figure 5 (alcohol-related liver disease). The figures directly show the effect of a decrease in the manufacturing employment rate (i.e., with the sign of the second stage reversed).

In Table 5, I show results for other types of cardiovascular disease, such as cerebrovascular disease (i.e., strokes) and hypertensive disease, and chronic lower respiratory disease. These diseases follow in the ranking of leading causes of death in Mexico (PAHO, 2012). Estimates are statistically insignificant at conventional levels, with the exception of chronic

[20]The caveat of using pre-period mortality data is that the International Classification of Deaths (ICD) changed in 1998. In the main analysis, causes of death are classify using ICD-10, which has been used in Mexican mortality records since 1998. In order to conduct the placebo exercise to check for differential pre-trends in the years previous to my analysis, I have to classify deaths using ICD-9. There are some comparability issues between the two. For example, diabetes is only reported at aggregate level in ICD-9, so I cannot calculate the pre-trend for type 2 diabetes. This results in a baseline rate for 1990 that is higher than the baseline rate reported in the main analysis. Other causes of death have similar issues.

lower respiratory disease. However, this is plausibly arising by chance given the number of outcomes examined.

Although there are theoretical reasons to explore these outcomes separately, given that these are the leading causes of mortality in Mexico over this period, I also correct for the potential issue of simultaneous inference using multiple hypothesis testing. I calculate q-values using the Benjamini-Hochberg step-up method to control for the false discovery rate (Benjamini and Hochberg, 1995). The effect found on type 2 diabetes is statistically significant after the corrections in every specification (sometimes at 5 percent instead of 1 percent). However, for some of the specifications, the effects of the economic shock on cardiovascular disease and alcohol-related liver disease are no longer significant after p-value the correction. This is not surprising given that the evidence on cardiovascular disease and alcohol-related mortality is weaker before the p-value correction.

The main takeaway from the evidence presented in this section is that trade-induced job displacement increased the type 2 diabetes mortality rate by about 13% with respect to its baseline value, and that this effect is not driven by pre-trends in diabetes mortality rate. My identification strategy allows me to identify the impact of globalization on diet-related chronic disease mortality through income effects. In the next section, I provide reduced-form evidence on the effect of international exposure on health outcomes and additional labor market outcomes (wages and formality) that help highlight income as the main mechanism behind the mortality response to the trade shock.

6 Discussion and Additional Supporting Evidence

I find that the decline in manufacturing employment, induced by higher international competition, is associated with increases in age-adjusted mortality due to type 2 diabetes. Some evidence also points to a decrease in age-adjusted mortality due to ischemic heart disease and alcohol-related liver disease. The identification strategy highlights the importance of labor market opportunities and income as determinants of health outcomes. In this section, I further examine the mechanisms behind the mortality response observed. First, I discuss previous findings in the literature. Second, I present additional supporting evidence on the relationship between international competition and health outcomes. Third, I show reduced-form evidence that trade exposure is negatively associated with two additional labor market outcomes: wages and formal sector employment. I discuss the implications of the latter regarding access to health insurance.

6.1 Discussion on Mechanisms

The main difficulty to interpret the effects of a negative labor market shock on mortality, presented in the previous section, is that I find increases in some types of mortality, but decreases in other causes of death. Given that mortality is commonly used as an indicator of the population health, the results indicate that the drivers of chronic disease might be different or differently affected by an employment shock. In this section, I discuss possible explanations for the results, based on previous evidence in the literature.

First, the prevalence of type 2 diabetes is associated with poor nutrition and lack of physical activity. Therefore, a plausible reason for the increase in type 2 diabetes might be linked to limited access to food variety and quality in financially constraint households. Allcott et al. (2019) provide evidence of a meaningful nutrition-income relationship in the U.S.; the authors find that households in the top income quartile buy groceries that are 0.56 more healthful than the bottom quartile. In Mexico, Barham and Rowberry (2013) find that Progresa/Oportunidades, a conditional cash transfer (CCT) program that started in the late 1990s, significantly reduced elderly municipal-level mortality from diabetes by 12%.[21] Behrman and Parker (2011) also find self-reported reductions in the overall prevalence of diabetes among the elderly members in households that were beneficiaries of Progresa.[22]

[21] The authors find that the program reduced mortality cause by infectious disease, but it had little effect on mortality caused by respiratory infections or heart disease, stroke and hypertension.

[22] Hoddinott et al. (2000) report an improvement of dietary quality, as measured by the number of different

Given that Progresa's main target were households with children in school age, these studies suggest that increased income in the entire household improve the overall households' access to nutritious food and other health inputs.[23]

Second, to the extent we consider cigarettes, alcohol, and other drugs as normal goods, falls in income will tend to improve health by reducing their consumption. Ruhm et al. (2002) reports a procyclical variation in overall drinking using aggregate U.S. sales data from 1987 to 1999, and Ruhm (2005) also finds a procyclical variation in tobacco use over the same period. However, Ruhm (2019) finds that U.S. counties experiencing economic decline over 1999-2015 had larger increases in alcohol mortality. Lang et al. (2018) do not find significant differences in smoking and drinking in CZ with higher exposure to import competition in the U.S. All in all, the previous evidence on this mechanism seems to be mixed.

Third, job loss for those individuals employed in industries imposing strenuous physical activity could imply improvements in the general health production function. Pierce and Schott (2016b) and Ruhm (2000) find a negative association between economic shocks and heart attacks, Hummels et al. (2016) report that increased effort in manufacturing jobs resulting from positive export shocks is associated with increased rates of hospitalizations due to heart attacks. Mcmanus and Schaur (2016) find increased injury rates in industries with higher exposure to import competition in the U.S.; Boone et al. (2011) find workers are less likely to report accidents during recessions.

Fourth, changes in the opportunity cost of time will also affect individuals' health production function. While individuals might have more time to do physical activity during recessions (Ruhm, 2005), bad economic conditions could also force less healthy individuals to enter the labor force or primary caregivers to join the workforce (Cutler et al., 2016).[24]

In the next sections, I show reduced-form evidence of the effect of international compe-

foods consumed, and the increase in the value of consumption of fruits and vegetables and animal products.

[23]For an comprehensive literature review of the research on the effects of Progresa, see Parker and Todd (2017).

[24]Cutler et al. (2016) discuss the latter as a potential mechanism linking of economic crisis and mortality in Mexico over the 1980s and 1990s. However, the authors do not find evidence of this mechanism; they highlight reduced income and reduced public sector funds for health system as the main mechanisms.

tition on health outcomes and two additional labor market outcomes with the aim to pin down some of the channels discussed here.

6.2 Reduced-Form Evidence

6.2.1 International Competition and Health Outcomes

In this section, I explore risk factors driving the mortality response to the negative economic shock described in the main part of the analysis. I use the Mexican National Health and Nutrition Survey to explore whether regions with higher exposure to international competition exhibit differential change in the shares of population that report healthy behaviors (i.e., exercising) or unhealthy behaviors (i.e., drinking or smoking), and the change in the share of population with obesity.[25]

There are several caveats of using these health surveys to explore the mechanisms behind the mortality response at municipality level. First, the number of municipalities in the sample reduces significantly (covering roughly 15% of the municipalities used in the main analysis). Second, it has been representative at state-level (there are 32 states in Mexico) only since 2006 (ENSANUT, 2012). Third, it includes richer questions on physical activity behavior for the periods 2006 and 2012 that are not available in year 2000 (which is only representative at urban/rural national level). Fourth, the years when the health survey took place (i.e., 2006 and 2012) do not match the Economic Census years (i.e., 1998, 2003, 2013), which is my source of manufacturing employment data.

Despite all the data limitations mentioned, to the best of my knowledge, the Mexican National Health and Nutrition Survey is the best source of health data in Mexico, with a large geographical coverage.[26] Therefore, there is value is exploring this data in a descriptive

[25] These cross-sectional surveys provide information about around 40,000 adults (20-70 years old) in each round (i.e., ENSA 2000, ENSANUT 2006, and 2012).

[26] The Mexican Family Life Survey, which is a longitudinal survey that took place in 2002, 2005 and 2009, is a potentially good source of data to explore health behaviors as well. There are two main reasons why I do not use it for this analysis. Firstly, it only covers around 100 municipalities (oversampling rural areas). Second, the first year it took place (i.e., 2002) is already after China's entry to the WTO (i.e., 2001) so I would not have a pre-shock baseline for the analysis.

way in order to try to pin down the mechanisms that might explain the change in mortality rates observed. However, given all these caveats, I do not attach causal interpretation to the results in this section. I'll interpret them as conditional correlations and suggestive evidence of the mechanisms behind the mortality response.

Table 6 presents the reduced-form results at state level. Each coefficient results from a different regression of the outcome variables in the table rows on a state level measure that summarizes exposure to manufacturing import and export competition.[27] The survey has information on households' income that allows me to explore changes in health behaviors along the income distribution. However, the mortality data used in the main part of the analysis is not available by income level. Consequently, I cannot draw conclusions on mortality outcomes based on the differences by income level found in this section. Column 1 presents overall shares, Columns 2 and 3 split the sample in low and high income households, Columns 4 and 5 present results by gender.

The results suggest a negative relationship between trade exposure and some factors driving diet-related chronic disease. First, higher exposure to international competition is positively associated with higher overall obesity prevalence, and especially among low-income households. Second, individuals living in more-exposed states are less likely to have done physical activity (either intense, moderate or walking at least 10 minutes) in the previous weeks. All the estimates have a negative sign, with the exception moderate exercise for high income households, which is positive but not statistically significant. Third, access to health care is also negatively associated with international competition. The share of individuals with health insurance and who report getting any preventive screening decrease in high-exposure areas for all subgroups.

However, I do not find any statistically significant differences in self-reported physical and

[27] Since the survey is representative at state level only for years 2006 and 2012, I constructed the exposure measures for this period at state level, but I kept the industry pre-shock employment shares. Results using the two measures of international competition are similar. Given the reduced number of observations in the state-level analysis, I add the two measures to avoid collinearity issues arising from the measure being too similar at state level.

mental health. Finally, the share of individuals that report smoking and drinking daily is negatively associated with exposure to international competition for low-income households and positively associated for high income households.

The suggestive evidence presented in this section is consistent with income as an important factor affecting health outcomes. Next, I present reduced-form evidence on additional labor market outcomes that help highlight income as the main mechanism explaining my results.

6.2.2 International Competition and Wages

The Mexican Economic Census, which I use as main source of employment data, only has data on the annual wage bill and the annual number of paid employees by industry and municipality. However, it does not have information on individual wages and hours worked. Consequently, it does not allow me to observe whether the changes in wages are due to changes for individual workers or the result of changes in the composition of workers. Therefore, I complement this part of the analysis using data from the National Employment Survey (Encuesta Nacional de Empleo ENE) and the National Survey of Occupations and Employment (Encuesta Nacional de Ocupaciones y Empleo - ENOE) to examine the effect of trade exposure on wages.[28] This survey tracks the Mexican labor force and provides information on characteristics of employment, but it is only available for a subsample of municipalities.

Table 7 shows reduced-form results of the effect of international competition on the change in log change of wages of full-time workers (i.e., individuals who report working at least 30 hours). The results suggest that higher exposure to international competition was associated with a statistically significant decrease in wages in the manufacturing sector in the short run and overall decreases in wages in the long run. Moving a municipality from the 25th to the 75th percentile of exposure to international competition decreased average wages in the manufacturing sector by 5-6 percent between 1998-2003 and by 4-5 percent between 1998-

[28] National Survey of Occupation and Employment (ENOE), which started in 2005, is the consolidation and merger of the National Urban Employment Survey (ENEU) and the National Employment Survey (ENE).

2013. The point estimates in the non-manufacturing sector are negative in both periods, but statistically significant in the long term, implying certain sectoral adjustment takes place over time.

Previous studies on the impact of Chinese import competition in Mexican labor markets find mixed effects on wages. Chiquiar et al. (2017) documents an increase in wages associated with exposure to NAFTA in the pre-period, followed by a decrease in wages after China's entry to the WTO in 59 Mexican metropolizan zones (which group about 300 municipalities). Mendez (2015) does not find a negative effect on wages within formal private-sector employment during the period 2000-2010. However, examining the effects on wages within the formal sector does not allow to capture changes in earning due to transitions from formal to informal employment. The results in the next section show that there were significant changes in the levels of informality at the local level. Therefore, changes in the composition of informal and formal workers are a relevant dimension to consider when analyzing local level changes in wages.

6.2.3 International Competition and Formal Employment

In this section, I take two approaches to examine whether municipalities with higher exposure to international competition experienced differential adjustments in the formal labor force.

First, using data from the Mexican Economic Census for the full sample of municipalities, I examine whether there was a change in the composition of workers within the manufacturing sector. In particular, I divide the manufacturing labor force in paid employees and contract workers. The distinction is relevant because paid employees have more rights in terms of severance payments, social security contributions, minimum salary and unionizing than contract workers, who are paid by the hour and are not covered by labor regulations. Consistent with Blyde et al. (2017), I find that exposure to international competition is associated with an overall decrease in manufacturing employment as well as a change in the composition of workers within the sector. Table 8 shows that higher trade exposure is associated with a decrease in paid employees paired with an increase in contract workers.

Second, I combine data from the Mexican Economic Census and the Mexican Social Security Institute (IMSS) to estimate effects on the gap between formal an informal employment. Employment data from the IMSS covers the universe of formal private-sector establishments, and all employees must enroll.[29] I take this difference as a proxy of a "gap" between formal and informal employment.

Table 9 shows that moving a municipality from the 25th to the 75th percentile in international competition decreased the share of formal jobs in the manufacturing sector by 1-1.5 percentage points. Furthermore, the overall share of formal employment (i.e., the ratio IMSS to Economic Census number of total workers) decreases by 1-2 percentage points over 1998-2003, and by about 3 percentage points over 1998-2013. This implies an increase in informality of about 8% in the manufacturing sector and 2% to 6% in all sectors.[30]

6.2.4 International Competition and Access to Health Insurance

In this section, I examine whether municipalities with higher exposure to international competition experienced a differential decrease in the share of population with access to health care through employment.[31]

In Mexico, formal sector workers (and their families) have health insurance through employment, provided by the Mexican Institute of Social Security (Instituto Mexicano de Seguro Social or IMSS) and the Institute of Social Security and Services for Civil Servants (Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado or ISSSTE). In 2000, around 40% of the Mexican population was covered by IMSS, 7% was covered by ISSSTE, 3% was covered by private insurance, and the rest did not have health insurance. Regarding the population employed in the manufacturing sector in particular, according to

[29] The data available from the IMSS covers 1,439 municipalities.

[30] The initial ratio of workers enrolled in the IMSS to workers count form the economic census is 0.124 in the manufacturing sector and 0.47 in all sectors.

[31] I use data from the Population Census for the years 2000, 2005 and 2010. The caveat is that the years of the Economic Census I use for the main part of the analysis do not overlap exactly with the Population Census years.

the 2000 Population Census, 53% of manufacturing workers report affiliation to IMSS while 1% were affiliated to ISSSTE, and 45% were uninsured.[32]

Table 10 presents reduced-form results on the relationship between trade exposure and access to health insurance. Moving a municipality from the 25th to the 75th percentile of international competition is associated with a reduction in the share of the population with access to any type of health insurance of 1 percentage point over 2000-2005 and 2.5 percentage points over 2000-2010. This decrease is partially explained by the decrease in the share of beneficiaries enrolled in the IMSS. The estimates are negative for both periods, but statistically significant only over 2000-2010. Moving a municipality from the 25th to the 75th percentile of international competition decreased the share of population with access to health insurance thorough the IMSS by 0.4 percentage points over this period.[33]

7 Conclusion

This paper investigates the extent to which changes in local manufacturing employment opportunities affected leading causes of mortality in Mexico. I use cross-municipality variation in trade exposure given differences in industry specialization before China's accession to the WTO in 2001, and I instrument the change in manufacturing employment with two forms of predicted international competition per worker. In addition to direct import competition, I exploit the increased export competition that Mexico faced in the U.S. market.

I show that trade-induced job displacement led to a 13 percent increase in type 2 diabetes age-adjusted mortality rates. This result is robust to instrumenting changes in manufactur-

[32] Data from 10.6 percent subsample of the 2000 Mexican census collected by INEGI and available from IPUMSI (Minnesota Population Center). The 10.1 million records cover 2,443 municipalities.

[33] It is worth noting that in 2002, the Mexican government launched a free health insurance program known as "Seguro Popular" (or popular health insurance) to provide health insurance to around 50 million uninsured people (around 50% of the population). The roll-out was time-staggered across municipalities (non-random), starting as a pilot in five states in 2002, and extending to every municipality country-wide by 2007 (Bosch and Campos-Vazquez, 2014). The main objective of "Seguro Popular" was to cover the population with no access to health care through work, i.e., informal workers and their families. The expansion of "universal" health care might have mitigated the negative effects on health outcomes if displaced workers did not lose health care access, instead switching to "Seguro Popular". Given that the expansion was non-random, I cannot draw casual conclusions regarding the effect of the program because its roll-out is potentially endogenous.

ing employment with import and export competition, including a rich set of municipality level controls, as well as correcting estimation p-values for multiple hypothesis testing. Additionally, some evidence points to decreases in alcohol-related liver disease and ischemic heart disease, especially among men, although somewhat noisily estimated in some of the specifications.

While recent research has focused on supply-side analysis of the consequences of globalization on food prices and households' welfare, this paper provides evidence on demand-side factors that are central to the health-income relationship. My identification strategy highlights the importance of labor market opportunities and income as determinants of health outcomes. Additionally, I explore the main mechanisms linking decreased employment opportunities and mortality. Exposure to international competition is associated with lower wages, less formal employment, less access to health care, higher rates of obesity and reduced physical activity.

This paper contributes to examining the effects of trade shocks on health and mortality through the income channel. Other relevant factors are changes in food prices, tastes, information and individuals' reluctance to invest in costly healthy behaviors, such as keeping a health diet and exercising. The key question for future research is to evaluate how to address the prevalence of "lifestyle" diseases such as type 2 diabetes along the income distribution. It is likely that the drivers of obesity in developed and developing countries are differently affected by policy. Consequently, providing information and incentives aiming at behavioral change might be more effective in contexts where households are not financially constrained, while safety nets might be necessary to alleviate nutritional inequality.

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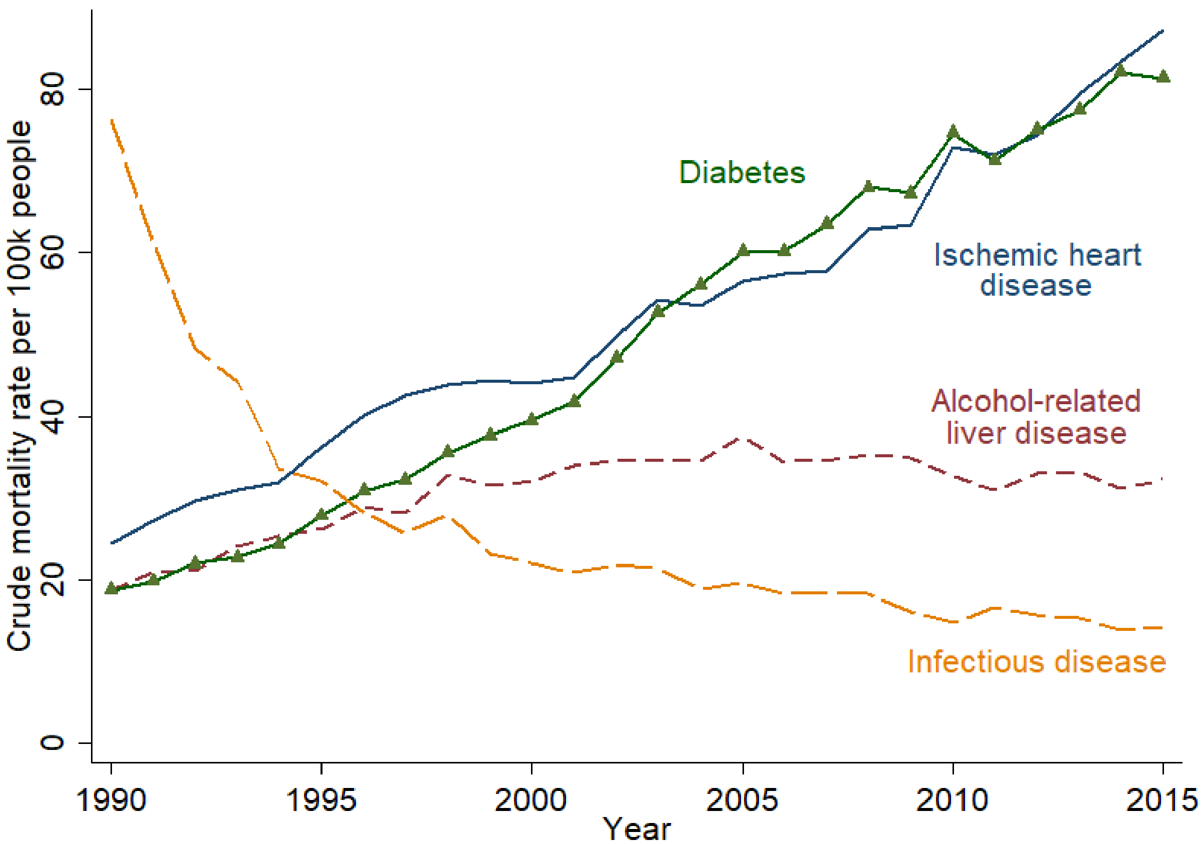
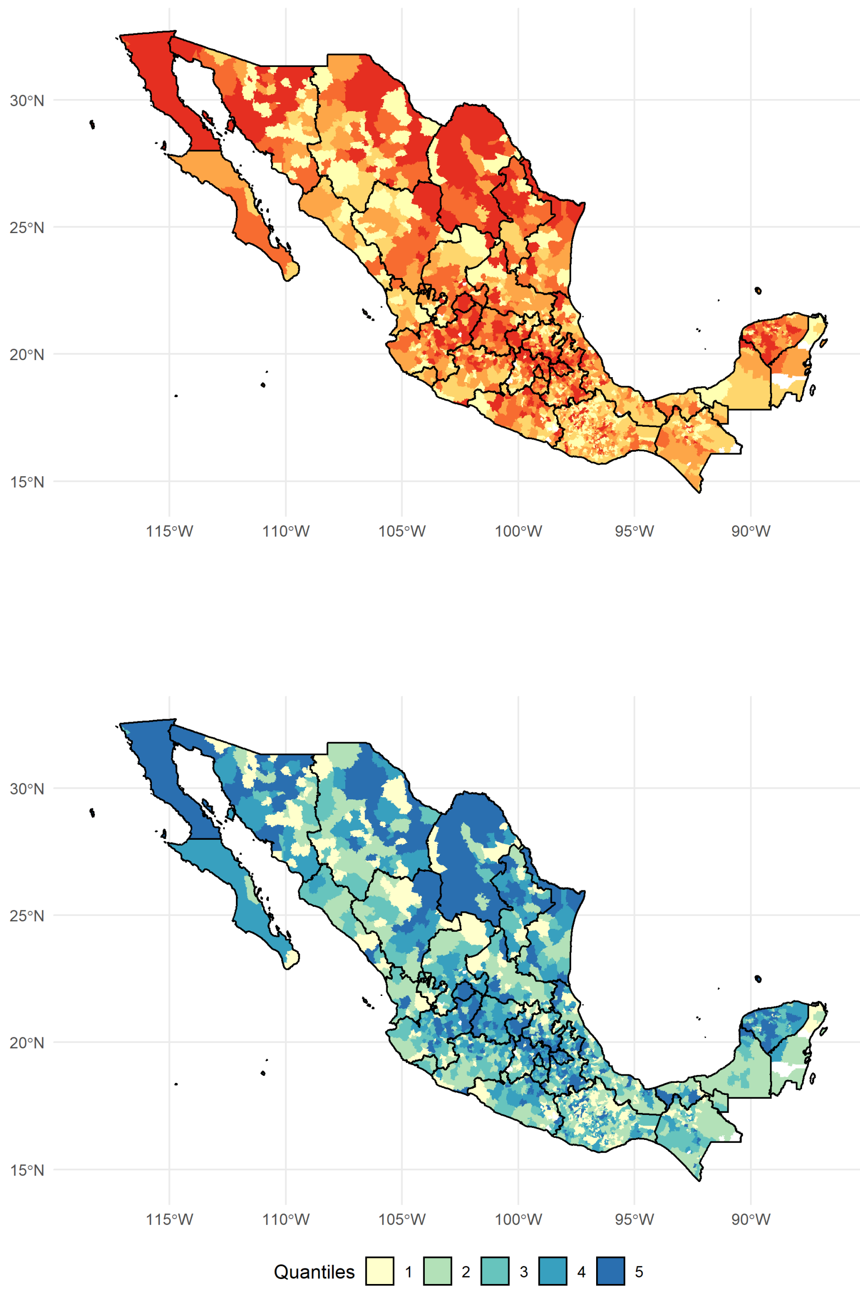
8 Figures

Figure 1: Leading Causes of Mortality - Mexico 1990-2015



Notes: This figure shows national-level crude mortality rate per 100,000 for leading causes of mortality in Mexico over my main period of analysis and the decline in communicable disease mortality in the context of the epidemiological transition in Mexico. The regression analysis uses age-adjusted mortality rates to obtain differences in mortality that are independent of age differences, particularly relevant in the context of a demographic transition characterized for aging population.

Figure 2: Cross-municipality Exposure to International Competition per Worker - Mexico

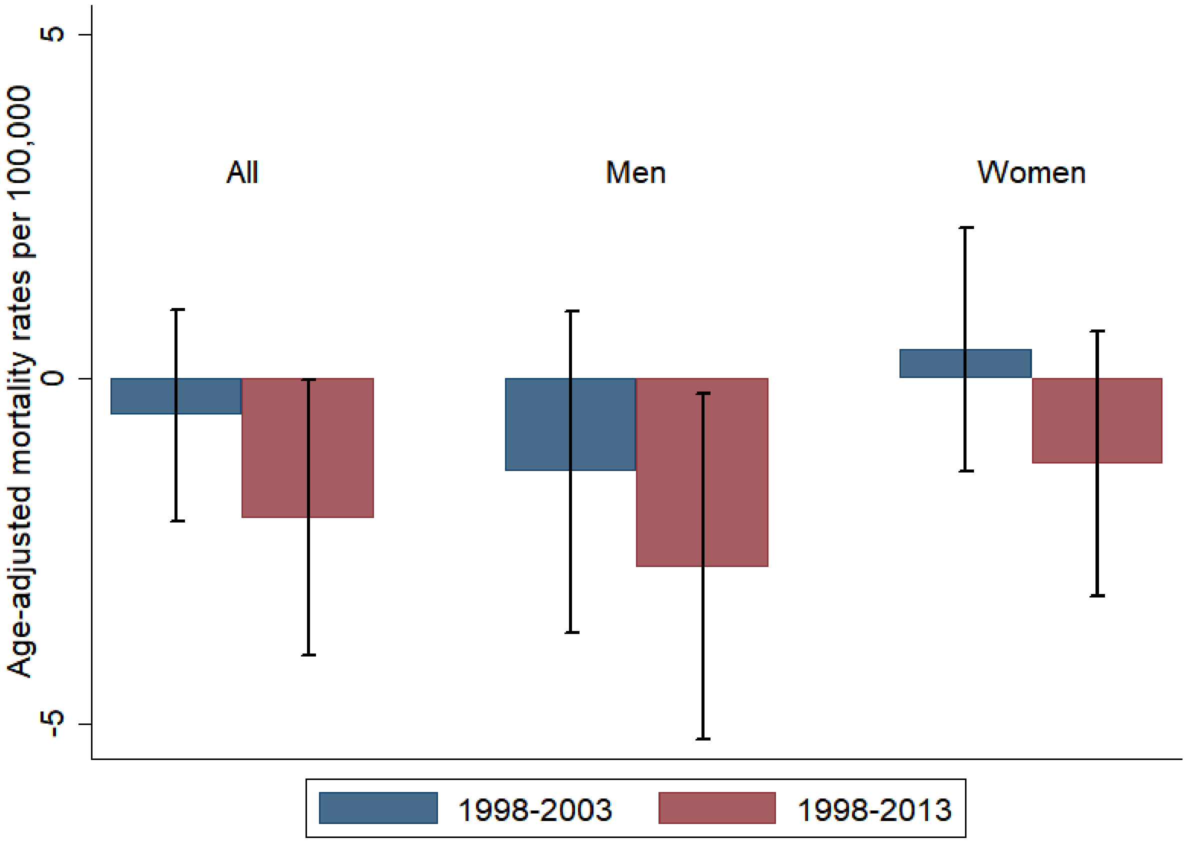


Notes: These maps of Mexico show the cross-municipality exposure to international competition per worker (ICW) between 1998-2013. The map on top shows predicted exposure to Chinese competition in the U.S. market and the bottom map shows predicted import competition in the domestic market.

Figure 3: Manufacturing Job Loss and Type 2 Diabetes Mortality

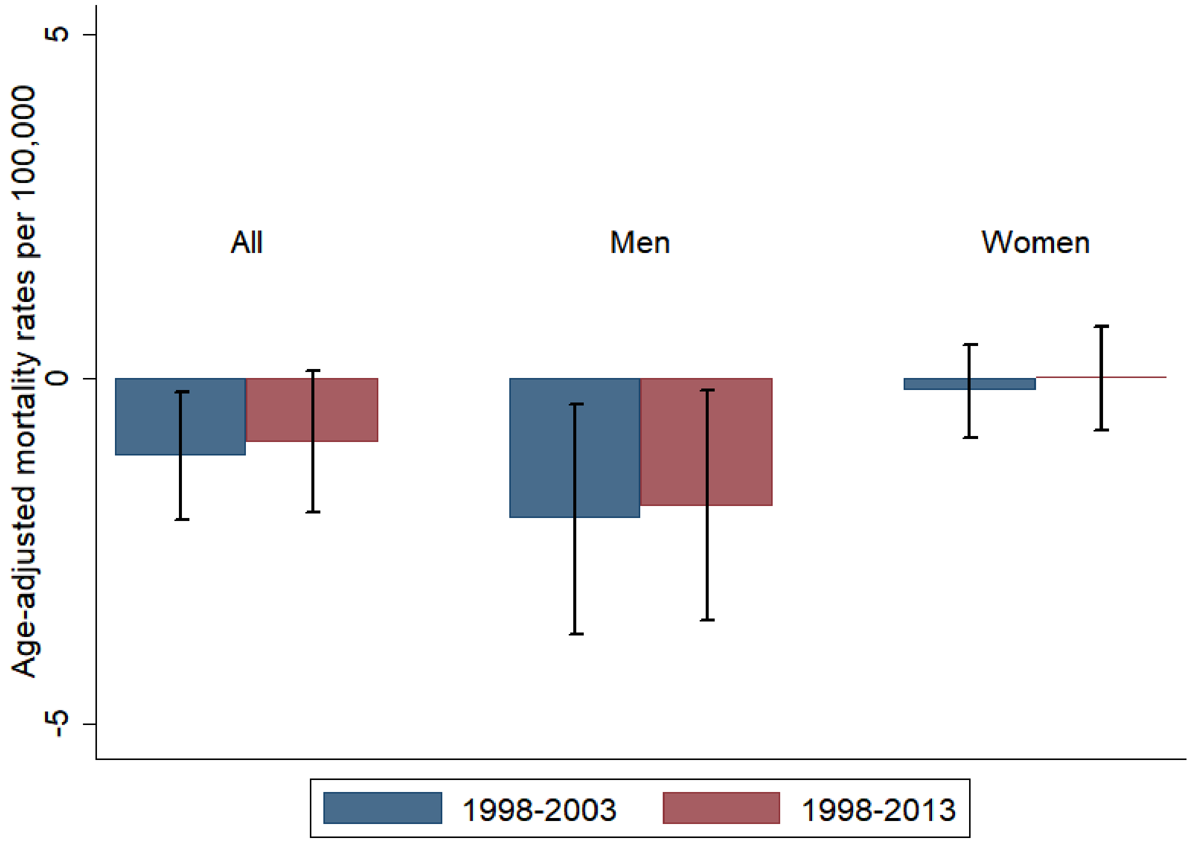
Notes: This Figure reports 2SLS estimates of Equation 3 for two time periods: 1998-2003 (blue bars) and 1998-2013 (red bars). Observations are municipalities weighted by the initial working age-population. The estimates presented in this figure are equivalent to those in Panel A of Table 3 (All) and Table 4 (by gender) using my preferred specification for the 2SLS estimation, i.e., using Equation 7 for the first stage estimation (Columns 3 and 6 in Table 2). Given that the First Stage coefficients reported in Table 2 are negative, in order to interpret the 2SLS estimates in tables 3 and 4 as the effect of a standard deviation *decrease* in manufacturing employment on age-adjusted mortality rates, the sign of the coefficient in this table needs to be reversed. To facilitate the interpretation of the second stage results, these figure directly shows the effect of a one standard deviation *decline* in manufacturing employment, instrumented by international competition, on the age-adjusted mortality rate (deaths per 100,000). The baseline mortality rate and sample mean change in the outcome variable for the two periods are reported in the tables. All regressions include state fixed effects. Robust standard errors. Figure shows 90% confidence intervals.

Figure 4: Manufacturing Job Loss and Ischemic Heart Disease Mortality



Notes: This Figure reports 2SLS estimates of Equation 3 for two time periods: 1998-2003 (blue bars) and 1998-2013 (red bars). Observations are municipalities weighted by the initial working age-population. The estimates presented in this figure are equivalent to those in Panel A of Table 3 (All) and Table 4 (by gender) using my preferred specification for the 2SLS estimation, i.e., using Equation 7 for the first stage estimation (columns 3 and 6 in Table 2). Given that the First Stage coefficients reported in Table 2 are negative, in order to interpret the 2SLS estimates in tables 3 and 4 as the effect of a standard deviation *decrease* in manufacturing employment on age-adjusted mortality rates, the sign of the coefficient in this table needs to be reversed. To facilitate the interpretation of the second stage results, these figure directly shows the effect of a one standard deviation *decline* in manufacturing employment, instrumented by international competition, on the age-adjusted mortality rate (deaths per 100,000). The baseline mortality rate and sample mean change in the outcome variable for the two periods are reported in the tables. All regressions include state fixed effects. Robust standard errors. Figure shows 90% confidence intervals.

Figure 5: Manufacturing Job Loss and Alcohol-Related Liver Disease Mortality



Notes: This Figure reports 2SLS estimates of Equation 3 for two time periods: 1998-2003 (blue bars) and 1998-2013 (red bars). Observations are municipalities weighted by the initial working age-population. The estimates presented in this figure are equivalent to those in Panel A of Table 3 (All) and Table 4 (by gender) using my preferred specification for the 2SLS estimation, i.e., using Equation 7 for the first stage estimation (columns 3 and 6 in Table 2). Given that the First Stage coefficients reported in Table 2 are negative, in order to interpret the 2SLS estimates in tables 3 and 4 as the effect of a standard deviation *decrease* in manufacturing employment on age-adjusted mortality rates, the sign of the coefficient in this table needs to be reversed. To facilitate the interpretation of the second stage results, these figure directly shows the effect of a one standard deviation *decline* in manufacturing employment, instrumented by international competition, on the age-adjusted mortality rate (deaths per 100,000). The baseline mortality rate and sample mean change in the outcome variable for the two periods are reported in the tables. All regressions include state fixed effects. Robust standard errors. Figure shows 90% confidence intervals.

9 Tables

Table 1: Summary Statistics ICW and Manufacturing Employment Rate

	Mean	**sd**	**25th**	**75th**
Δ International Competition per Worker in 1,000 USD				
Δ ICW Export 1998-2003	1.83	3.21	0.19	1.98
Δ ICW Export 1998-2013	10.50	18.38	1.08	11.35
Δ ICW Import 1998-2003	0.14	0.25	0.01	0.14
Δ ICW Import 1998-2013	3.03	5.41	0.11	3.14
Δ in Manufacturing Employment Rate				
ΔL_i^m 1998-2003	-0.05	0.08	-0.08	-0.01
ΔL_i^m 1998-2013	-0.07	0.10	-0.12	-0.02

Notes: This table reports summary statistics of measures of exposure to export and import competition for each period. ΔICW is the change in predicted International Competition reported in units of 1,000 USD per worker. $\Delta ICW_{i,t} Export$ represents the municipality level exposure to Chinese competition in the U.S. market, while $\Delta ICW_{i,t} Import$ is the municipality level exposure to import competition. The magnitudes of the instruments is different because exported values from China to the U.S. is much larger than the export values from China to middle-income countries similar to Mexico. $\Delta L_{i,t}^m$, is the change in the manufacturing employment rate.

Table 2: International Competition per Worker (ICW) and Manufacturing Employment - First Stage

	Δ Manufacturing Employment Rate (standardized)					
	1998-2003			**1998-2013**		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Effect of a $1,000 increase in predicted ICW (point estimates)						
Δ ICW - Export	-0.157***		-0.0872***	-0.0299***		-0.0116**
	(0.0178)		(0.0271)	(0.00319)		(0.00506)
Δ ICW - Import		-2.126***	-1.158***		-0.113***	-0.0793***
		(0.210)	(0.318)		(0.0104)	(0.0178)
Panel B: Effect of moving a municipality from 25th-75th percentile of exposure						
Δ ICW - Export	-0.2815***		-0.1564***	-0.3068***		-0.1188**
	(0.0319)		(0.0485)	(0.0328)		(0.0520)
Δ ICW - Import		-0.2937***	-0.1599***		-0.3417***	-0.2402***
		(0.0290)	(0.0439)		(0.0315)	(0.0539)
First Stage F-stat	**77.88**	**102.53**	**64.65**	**87.61**	**117.85**	**76.76**
International Competition	Export	Import	Both	Export	Import	Both
Observations	2,382	2,382	2,382	2,382	2,382	2,382

Notes: This Table reports First Stage estimates of Equations 6 and 7 for two time periods: 1998-2003 (columns 1-3) and 1998-2013 (columns 4-6). Observations are municipalities weighted by the initial working age-population. The dependent variable, $\Delta L^m_{i,t}$, is the change in the manufacturing employment rate (i.e., the change in the number of workers in the manufacturing sector normalized by the labor force size in municipality i); it is standardized to facilitate the interpretation of the second stage. ΔICW is the change in predicted International Competition per Worker (ICW) in 1,000 USD. Columns 1 and 4 present estimates of Equation 6 using municipality level exposure to Chinese competition in the U.S. market, $\Delta ICW_{i,t}Export$, as instrument. Columns 2 and 5 present estimates of Equation 6 using municipality level exposure to import competition, $\Delta ICW_{i,t}Import$. Columns 3 and 6 estimate Equation 7, using both instruments in the same specification. Panel A presents point estimates, which should be interpreted as the standard deviation change in the manufacturing employment rate associated with an increase of 1,000 USD in ICW. In Panel B, I rescale these point estimates to reflect the change in trade exposure for a Mexican municipality at the 75th percentile compared to the 25th percentile of exposure. All regressions include state fixed effects. Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1).

Table 3: Manufacturing Employment and Leading Causes of Mortality - 2SLS

	Δ Age-adjusted Mortality Rate					
	1998-2003			**1998-2013**		
	Type 2 Diabetes	**Ischemic Heart Disease**	**Alcohol Related Liver Disease**	**Type 2 Diabetes**	**Ischemic Heart Disease**	**Alcohol Related Liver**
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Import and Export Competition						
Δ Manuf. Employment	-2.367***	0.534	1.119**	-2.183***	2.018*	0.915
	(0.634)	(0.930)	(0.568)	(0.707)	(1.215)	(0.622)
Panel B: Export Competition						
Δ Manuf. Employment	-2.163***	-0.108	1.575***	-2.424***	1.429	1.037
	(0.670)	(0.778)	(0.578)	(0.856)	(1.221)	(0.664)
Panel C: Import Competition						
Δ Manuf. Employment	-2.575***	1.191	0.652	-2.065***	2.304*	0.857
	(0.656)	(1.359)	(0.601)	(0.688)	(1.366)	(0.628)
Mean of Dep. Var.	10.87	-0.32	-2.17	20.42	2.33	-5.02
Baseline rate	17.47	47.35	17.24	17.47	47.35	17.24
Observations	2,382	2,382	2,382	2,382	2,382	2,382

Notes: This Table reports 2SLS estimates of Equation 3 for two time periods: 1998-2003 (columns 1-3) and 1998-2013 (columns 4-6). Observations are municipalities weighted by the initial working age-population. The instrumented variable is the change in the manufacturing employment rate, which is standardized to facilitate the interpretation of the second stage. The 2SLS estimates show the effect of a standard deviation *change* in the manufacturing employment rate on the change in age-adjusted mortality rate (number of deaths per 100,000 people). Given that the First Stage coefficients reported in Table 2 are negative, in order to interpret the 2SLS estimates in this table as the effect of a standard deviation *decrease* in manufacturing employment on age-adjusted mortality rates, *the sign of the coefficient in this table needs to be reversed*. In Figures 3, 4 and 5, I directly show the effect of a decline in manufacturing employment, instrumented by international competition, using the specification in Panel A. The instrumental variables are described in Table 2 notes. Panel A instruments the change in the manufacturing employment rate using both import and export competition, while panels B and C use only export exposure and import exposure, respectively. The bottom rows show the sample mean change in mortality rate (mean dep. var.) and baseline mortality rate by cause. All regressions include state fixed effects. Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1).

Table 4: Manufacturing Employment and Leading Causes of Mortality by Gender

	Δ Age-adjusted Mortality Rate					
	1998-2003			**1998-2013**		
	Type 2 Diabetes	**Ischemic Heart Disease**	**Alcohol Related Liver Disease**	**Type 2 Diabetes**	**Ischemic Heart Disease**	**Alcohol Related Liver**
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Men						
Δ Manuf. Employment	-1.030	1.348	2.037**	-2.063***	2.727*	1.840*
	(0.758)	(1.419)	(1.017)	(0.777)	(1.521)	(1.014)
Mean of Dep. Var.	10.77	0.05	-3.59	22.61	4.44	-8.77
Baseline rate	15.84	53.98	29.66	15.84	53.98	29.66
Panel B: Women						
Δ Manuf. Employment	-3.687***	-0.427	0.177	-2.225***	1.232	-0.0117
	(0.878)	(1.072)	(0.410)	(0.859)	(1.163)	(0.455)
Mean of Dep. Var.	11.03	-0.70	-0.66	18.58	0.59	-1.21
Baseline rate	19.10	41.26	5.47	19.10	41.26	5.47
Observations	2,382	2,382	2,382	2,382	2,382	2,382

Notes: This Table reports 2SLS estimates of Equation 3, using Equation 7 as First Stage, for two time periods: 1998-2003 (columns 1-3) and 1998-2013 (columns 4-6). Observations are municipalities weighted by the initial working age-population for each gender. Panel A presents results for men and Panel B for women. The instrumented variable is the change in the manufacturing employment rate, which is standardized to facilitate the interpretation of the second stage. The 2SLS estimates show the effect of a standard deviation *change* in the manufacturing employment rate on the change in age-adjusted mortality rate (number of deaths per 100,000 people). Given that the First Stage coefficients reported in Table 2 (see columns 3 and 6 in Table 2) are negative, in order to interpret the 2SLS estimates in this table as the effect of a standard deviation *decrease* in manufacturing employment on age-adjusted mortality rates, *the sign of the coefficient in this table needs to be reversed*. In Figures 3, 4 and 5, I directly show the effect of a decline in manufacturing employment, instrumented by international competition (using the two measures of exposure: import and export competition). The bottom rows in each panel show the sample mean change in mortality rate (mean dep. var.) and baseline mortality rate by cause. All regressions include state fixed effects. Robust standard errors in parentheses (*** $p<0.01$, ** $p<0.05$, * $p<0.1$).

Table 5: Manufacturing Employment and Other Causes of Mortality - 2SLS

	Δ Age-adjusted Mortality Rate					
	1998-2003			**1998-2013**		
	Cerebro-vascular Disease	**Hyper-tensive Disease**	**Chronic Lower Respiratory Disease**	**Cerebro-vascular Disease**	**Hyper-tensive Disease**	**Chronic Lower Respiratory Disease**
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: All						
Δ Manuf. Employment	0.510	-0.604	-0.569	-0.110	-0.0689	0.764*
	(0.600)	(0.473)	(0.582)	(0.502)	(0.434)	(0.431)
Mean of Dep. Var.	-2.78	0.39	-0.69	-6.93	2.31	-3.44
Baseline rate	27.41	10.08	19.45	27.41	10.08	19.45
Panel B: Men						
Δ Manuf. Employment	0.431	-0.406	-1.549**	0.00920	-0.188	0.415
	(0.857)	(0.505)	(0.771)	(0.629)	(0.510)	(0.618)
Mean of Dep. Var.	-2.52	0.77	-0.66	-5.93	3.16	-4.47
Baseline rate	26.48	8.24	22.43	26.48	8.24	22.43
Panel C: Women						
Δ Manuf. Employment	0.540	-0.838	0.299	-0.205	-0.00797	1.122**
	(0.753)	(0.702)	(0.768)	(0.664)	(0.517)	(0.528)
Mean of Dep. Var.	-3.03	-0.00	-0.70	-7.85	1.49	-2.49
Baseline rate	28.32	11.85	16.79	28.32	11.85	16.79
Observations	2,382	2,382	2,382	2,382	2,382	2,382

Notes: This Table reports 2SLS estimates of Equation 3, using Equation 7 as First Stage, for two time periods: 1998-2003 (columns 1-3) and 1998-2013 (columns 4-6). Observations are municipalities weighted by the initial working age-population. Panel A presents results for everyone, Panel B for men and Panel C for women. The instrumented variable is the change in the manufacturing employment rate, which is standardized to facilitate the interpretation of the second stage. The 2SLS estimates show the effect of a standard deviation *change* in the manufacturing employment rate on the change in age-adjusted mortality rate (number of deaths per 100,000 people). Given that the First Stage coefficients reported in Table 2 (see columns 3 and 6 in Table 2) are negative, in order to interpret the 2SLS estimates in this table as the effect of a standard deviation *decrease* in manufacturing employment on age-adjusted mortality rates, *the sign of the coefficient in this table needs to be reversed*. The bottom rows in each panel show the sample mean change in mortality rate (mean dep. var.) and baseline mortality rate by cause. All regressions include state fixed effects. Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1).

Table 6: Exposure to International Competition and Health Outcomes - Reduced-Form Evidence

	All	**Household income**		**Gender**	
		Low	**High**	**Men**	**Women**
Prevalence					
Obesity (BMI>30)	0.012*	0.025***	-0.006	0.021**	0.007
	(0.006)	(0.007)	(0.019)	(0.008)	(0.006)
Risk factors					
Currently smokes	0.003	-0.016*	0.018*	0.006	-0.002
	(0.004)	(0.009)	(0.009)	(0.006)	(0.002)
Drinks daily	0.001	-0.001	0.004**	0.001	0.001*
	(0.001)	(0.001)	(0.002)	(0.002)	(0.0003)
Drunk last month	0.006	0.011	0.028***	0.016*	-0.002
	(0.004)	(0.007)	(0.010)	(0.008)	(0.003)
Physical activity					
Intense exercise last week	-0.014	-0.038**	-0.004	-0.011	-0.024*
	(0.011)	(0.016)	(0.016)	(0.012)	(0.014)
Moderate exercise last week	-0.008	-0.017	0.009	-0.029**	-0.002
	(0.014)	(0.015)	(0.018)	(0.011)	(0.020)
Walk 10 min last 10 days	-0.014	-0.021	-0.006	-0.020	-0.014
	(0.014)	(0.023)	(0.021)	(0.016)	(0.014)
Access to health care					
Health insurance	-0.046**	-0.039	-0.031*	-0.044*	-0.047**
	(0.022)	(0.030)	(0.018)	(0.023)	(0.021)
Preventive medicine in the last year	-0.018*	0.005	-0.038**	-0.016	-0.015
	(0.010)	(0.014)	(0.017)	(0.017)	(0.010)
Self-reported physical and mental health					
Bad health in last 2 weeks	0.005	0.012	-0.002	0.005	0.005
	(0.008)	(0.010)	(0.006)	(0.010)	(0.007)
Any depression symptoms	0.018	0.005	0.011	0.018	0.018
	(0.021)	(0.028)	(0.017)	(0.024)	(0.019)
Poor mental health	0.013	0.007	0.006	0.014	0.009
	(0.018)	(0.019)	(0.026)	(0.014)	(0.021)
States	32	32	32	32	32

Notes: This Table shows state-level reduced-form results of the effect of international competition on the change in health outcomes over 2006-2012. Data is from the Mexican National Health and Nutrition Survey (ENSANUT), which is representative at state level for 2006 and 2012. Each coefficient results from a different regression o the outcome variables in the table rows on a state-level measure that summarizes exposure to import and export competition. I calculated the measures of predicted exposure to international competition at state level for 2006-2012, with the industry pre-shock industry shares from 1998. ΔICW is the change in predicted International Competition reported in units of 1,000 USD per worker. $\Delta ICW_{i,t}Export$ is the predicted municipality level exposure to Chinese export competition in the U.S. market, while $\Delta ICW_{i,t}Import$ is the predicted municipality level exposure to Chinese import competition. Results using the two measure of exposure to Chinese competition separately generate similar results. Since there are only 32 states, I add the two measures to avoid collinearity issues arising from the measures being to similar at state level. Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)

Table 7: Exposure to International Competition and Wages - Reduced-Form Evidence

	Dependent variable: Δ Log Wages					
	1998-2003			**1998-2013**		
	Total (1)	**Manufacturing** (2)	**Non-Manuf.** (3)	**Total** (4)	**Manufacturing** (5)	**Non-Manuf.** (6)
Panel A: Reduced form - Export competition						
Δ ICW Export	-0.00430	-0.0161***	-0.00116	-0.00223**	-0.00250**	-0.00206*
	(0.00546)	(0.00608)	(0.00523)	(0.00108)	(0.00127)	(0.00108)
Rescaled 25th-75th pctile	-0.0138	-0.0545***	-0.0037	-0.0373**	-0.0451**	-0.0347*
	0.0175	0.0205	0.0168	0.0180	0.0229	0.0181
Panel B: Reduced form - Import competition						
Δ ICW Import	-0.0622*	-0.119***	-0.0478	-0.00611**	-0.00659**	-0.00612**
	(0.0325)	(0.0440)	(0.0335)	(0.00254)	(0.00317)	(0.00265)
Rescaled 25th-75th pctile	-0.0317*	-0.0624***	-0.0243	-0.0457**	-0.0534**	-0.0459**
	0.0165	0.0230	0.0171	0.0190	0.0257	0.0199
Observations	403	403	403	403	403	403

Notes: This Table shows reduced-form results of the effect of international competition on the change in log change of wages of full-time workers (i.e., individuals that report working at least 30 hours) for two time periods: 1998-2003 (columns 1-3) and 1998-2013 (columns 4-6). Observations are municipalities covered in Employment and Occupation Survey (ENE-ENOE) weighted by the initial working age-population. The overall change in wages is presented in columns 1 and 4. Columns 2 and 5 show the change in wages in the manufacturing sector, while columns 3 and 6 show the change in wages in the non-manufacturing sectors. ΔICW is the change in predicted International Competition reported in units of 1,000 USD per worker. $\Delta ICW_{i,t}Export$ is the predicted municipality level exposure to Chinese export competition in the U.S. market (Panel A), while $\Delta ICW_{i,t}Import$ is the predicted municipality level exposure to Chinese import competition (Panel B). In each sub-panel, the first two rows present point estimates, which should be interpreted as the log change in wages associated with an increase of 1,000 USD in ICW, while in the second two rows present rescaled estimates to reflect the change in log wages for a Mexican municipality at the 75th compared to the 25th percentile of exposure. All regressions include state fixed effects. Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)

Table 8: Exposure to International Competition and Formal Manufacturing Employment - Reduced-Form Evidence

	1998-2003			**1998-2013**		
	All Employees (1)	**Paid Employees** (2)	**Contract Workers** (3)	**All Employees** (4)	**Paid Employees** (5)	**Contract Workers** (6)
Panel A: Reduced form - Export competition						
Δ ICW - Export	-0.0249***	-0.0229***	0.0810***	-0.00614***	-0.00548***	0.0111***
	(0.00406)	(0.00445)	(0.0245)	(0.00106)	(0.00132)	(0.00395)
Rescaled 25th-75th pctile	-0.0447***	-0.0414***	0.1464***	-0.0631***	-0.0567***	0.1145***
	0.0073	0.0081	0.0443	0.0109	0.0136	0.0409
Panel B: Reduced form - Import competition						
Δ ICW - Import	-0.365***	-0.367***	0.681**	-0.0284***	-0.0270***	0.0144
	(0.0517)	(0.0632)	(0.305)	(0.00367)	(0.00458)	(0.0126)
Rescaled 25th-75th pctile	-0.0505***	-0.0524***	0.0974**	-0.0858***	-0.0845***	0.0451
	0.0071	0.0090	0.0436	0.0111	0.0143	0.0393
Observations	2382	2382	2382	2382	2382	2382

Notes: This Table shows reduced-form results of the effect of international competition on the change in log number of workers within the manufacturing sector for two time periods: 1998-2003 (columns 1-3) and 1998-2013 (columns 4-6). Columns 1 and 4 show the overall change in log employment in the manufacturing sector, while the rest of the columns show changes in the composition of workers. Paid Employees (columns 2 and 3) have more rights in terms severance payment, social security contributions, minimum salary, and unionizing than contract workers (columns 3 and 6), who work by the hour and are not covered by labor regulations (Blyde et al., 2017). Observations are municipalities weighted by the initial working age-population. The dependent variable is the difference in log number of workers between two periods (not normalized by the total labor force size). ΔICW is the change in predicted International Competition reported in units of 1,000 USD per worker. $\Delta ICW_{i,t}Export$ is the predicted municipality level exposure to Chinese export competition in the U.S. market (Panel A), while $\Delta ICW_{i,t}Import$ is the predicted municipality level exposure to Chinese import competition (Panel B). In each sub-panel, the first two rows present point estimates, which should be interpreted as the log change in workers associated with an increase of 1,000 USD in ICW, while in the second two rows present rescaled estimates to reflect the change in log workers for a Mexican municipality at the 75th compared to the 25th percentile of exposure. All regressions include state fixed effects. Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)

Table 9: Exposure to International Competition and Formal Jobs - Reduced-Form Evidence

Dependent variable: Change in Share of Formal Jobs (ratio IMSS to Economic Census)				
	1998-2003		**1998-2013**	
	Manufacturing	**Total**	**Manufacturing**	**Total**
	(1)	(2)	(3)	(4)
Panel A: Reduced form - Export competition				
Δ ICW - Export	-0.00384*	-0.00478***	-0.00107***	-0.00208***
	(0.00217)	(0.00138)	(0.000413)	(0.000332)
Rescaled 25th-75th pctile	-0.0091*	-0.0113***	-0.0146***	-0.0282***
	0.0051	0.0033	0.0056	0.0045
Panel B: Reduced form - Import competition				
Δ ICW - Import	-0.0311*	-0.0521***	-0.00260**	-0.00591***
	(0.0159)	(0.0102)	(0.00113)	(0.00102)
Rescaled 25th-75th pctile	-0.011*	-0.0182***	-0.0150**	-0.0337***
	0.0056	0.0035	0.0065	0.0058
Observations	1439	1439	1439	1439

Notes: This Table shows reduced-form results of the effect of international competition on the change in the share of formal employment for two periods: 1998-2003 (columns 1-3) and 1998-2013 (columns 4-6). Observations are municipalities weighted by the initial working age-population. Employment data from the Mexican Social Security Institute (IMSS) covers the universe of formal private-sector establishments, and all employees must enroll (available for 1439 municipalities). The dependent variable represents the "gap" between formal an informal employment in each municipality. Columns 1 and 3 present results for the manufacturing sector, while columns 2 and 4 show results for all sectors. ΔICW is the change in predicted International Competition reported in units of 1,000 USD per worker. $\Delta ICW_{i,t}Export$ is the predicted municipality level exposure to Chinese export competition in the U.S. market (Panel A), while $\Delta ICW_{i,t}Import$ is the predicted municipality level exposure to Chinese import competition (Panel B). In each sub-panel, the first two rows present point estimates, which should be interpreted as the change in the share of formal workers (i.e., the ratio IMSS to Economic Census number of workers), while in the second two rows present rescaled estimates to reflect the change in the share of formal workers for a Mexican municipality at the 75th compared to the 25th percentile of exposure. All regressions include state fixed effects. Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)

Table 10: Exposure to International Competition and Health Insurance - Reduced-Form Evidence

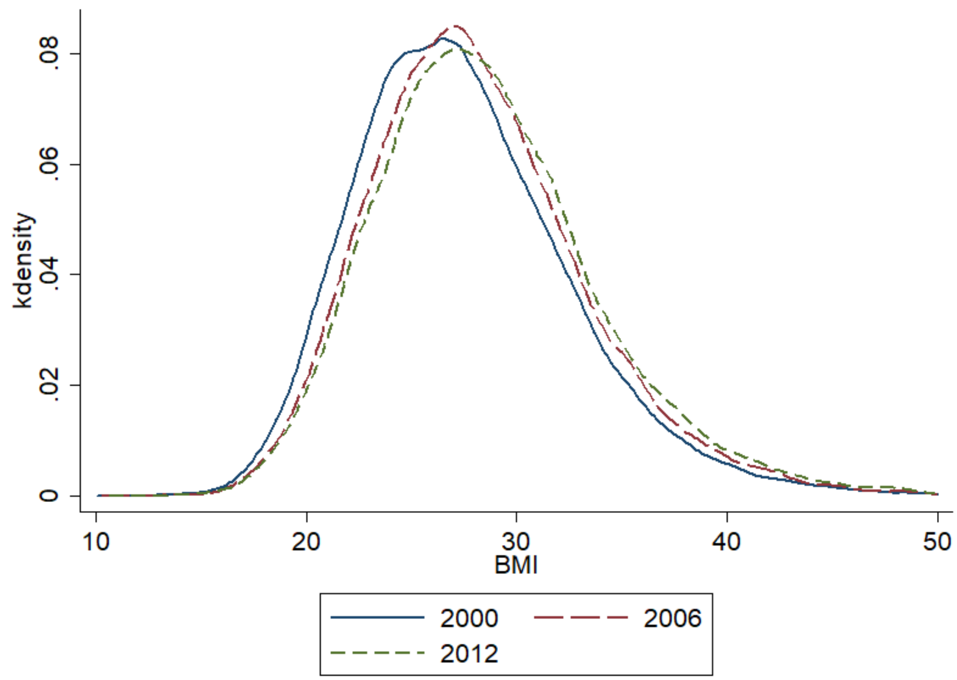
	2000-2005		**2000-2010**	
	Any insurance	**IMSS**	**Any insurance**	**IMSS**
	(1)	(2)	(3)	(4)
Panel A: Reduced form - Export competition				
Δ ICW Export	-0.00673***	-0.000381	-0.00229***	-0.000278**
	(0.00123)	(0.000429)	(0.000406)	(0.000119)
Rescaled 25th-75th pctile	-0.0139***	-0.0008	-0.0271***	-0.0033**
	0.0025	0.0009	0.0048	0.0014
Panel B: Reduced form - Import competition				
Δ ICW Import	-0.0714***	-0.00224	-0.00656***	-0.00114***
	(0.0157)	(0.00584)	(0.00134)	(0.000410)
Rescaled 25th-75th pctile	-0.0127***	-0.0004	-0.0255***	-0.0044***
	0.0028	0.0010	0.0052	0.0016
Observations	1,850	1,850	1,850	1,850

Notes: This Table shows reduced-form results of the effect of international competition on the change in the share the population that has health insurance for two periods: 2000-2005 (columns 1-3) and 2000-2010 (columns 4-6). Data is from the Mexican Population Census (2000, 2010) and Mexican Population Counts (2005). Observations are municipalities with information on insured population weighted by the initial working age-population. Columns 1 and 3 present results for the share of population with any type of health insurance (IMSS, ISSSTE, Seguro Popular, other), while columns 2 and 4 show the change in the share of population with access to health insurance through formal employment (IMSS). ΔICW is the change in predicted International Competition reported in units of 1,000 USD per worker. $\Delta ICW_{i,t}Export$ is the predicted municipality level exposure to Chinese export competition in the U.S. market (Panel A), while $\Delta ICW_{i,t}Import$ is the predicted municipality level exposure to Chinese import competition (Panel B). In each sub-panel, the first two rows present point estimates, which should be interpreted as the change in the share of population with health insurance, while in the second two rows present rescaled estimates to reflect the change in the share of insured population for a Mexican municipality at the 75th compared to the 25th percentile of exposure. All regressions include state fixed effects. Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)

A Appendix

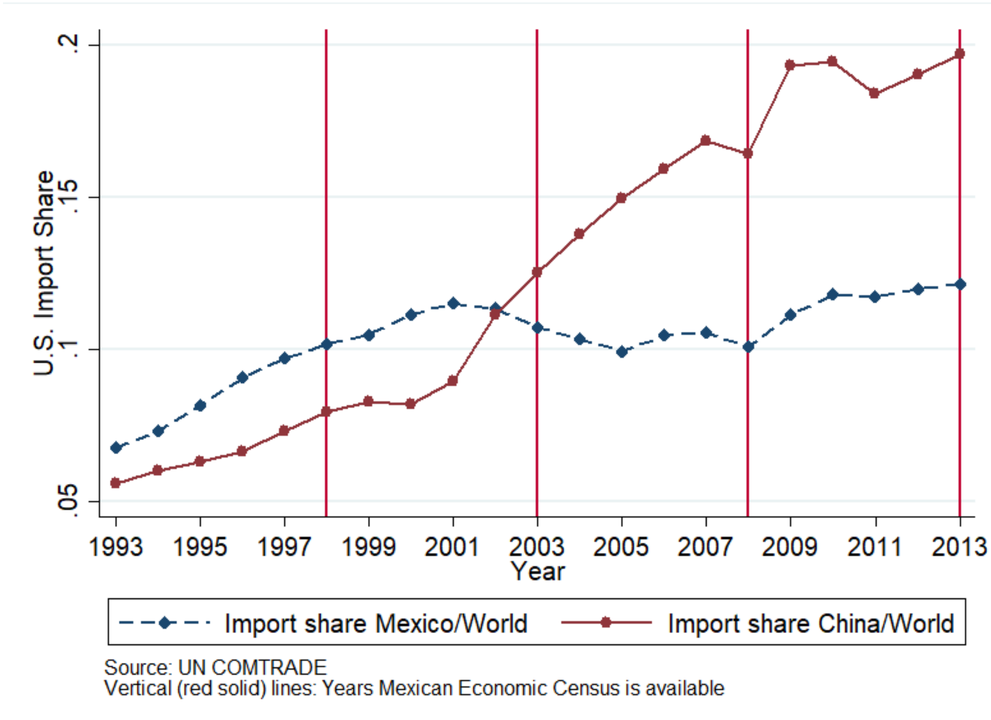
B Appendix Figures

Figure A-1: Body Mass Index (BMI)



This Figure shows the Body Mass Index (BMI) distribution of adults surveyed in the Mexican National Survey of Health and Nutrition (ENSA 2000; ENASUT 2006, 2012). I calculate individuals' BMI, which is a person's weight in kilograms divided by the square of height in meters. If a person's BMI is 25.0 to < 30, it falls within the overweight range; if the BMI is 30.0 or higher, it falls within the obese range.

Figure A-2: Share of China and Mexico in United States' imports



Notes: This figure shows that China surpasses Mexico's share of U.S. imports shortly after its accession to the WTO in 2001.

Figure A-3: Mexican and Chinese Exports to the U.S. (millions USD, 2-digit industries)

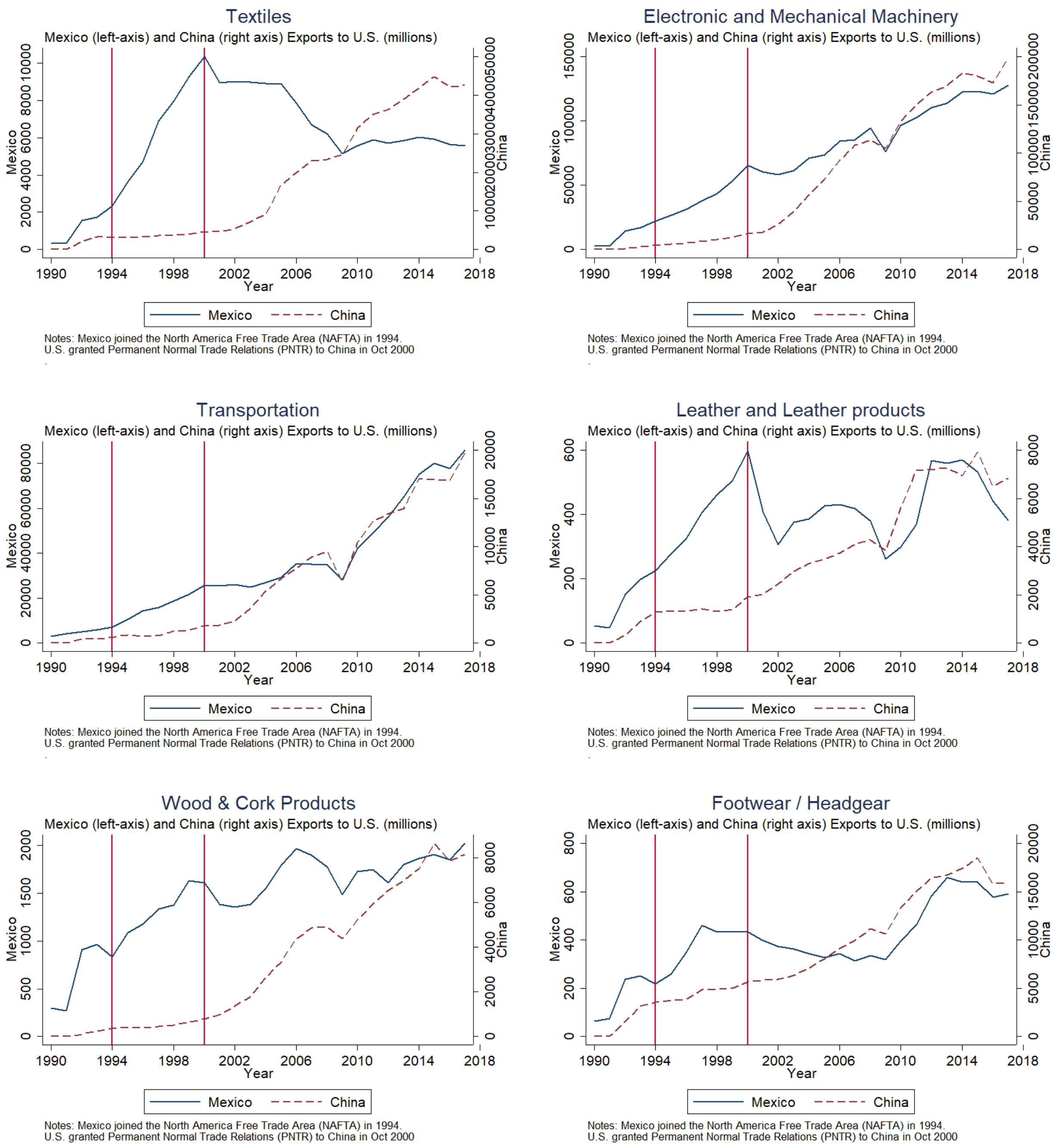
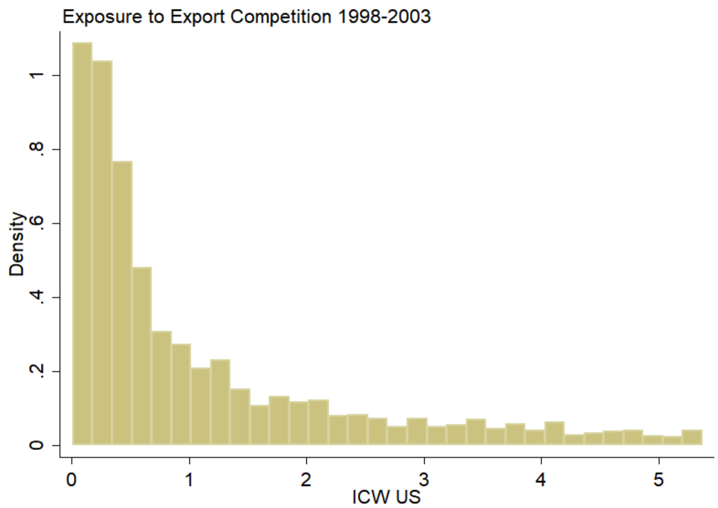
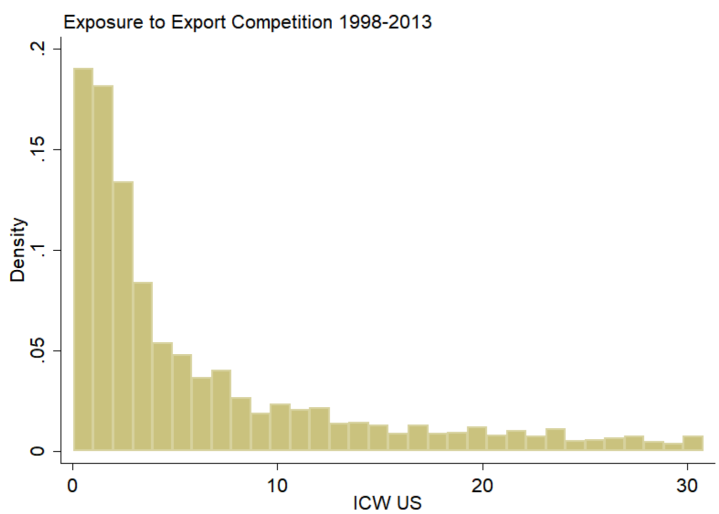


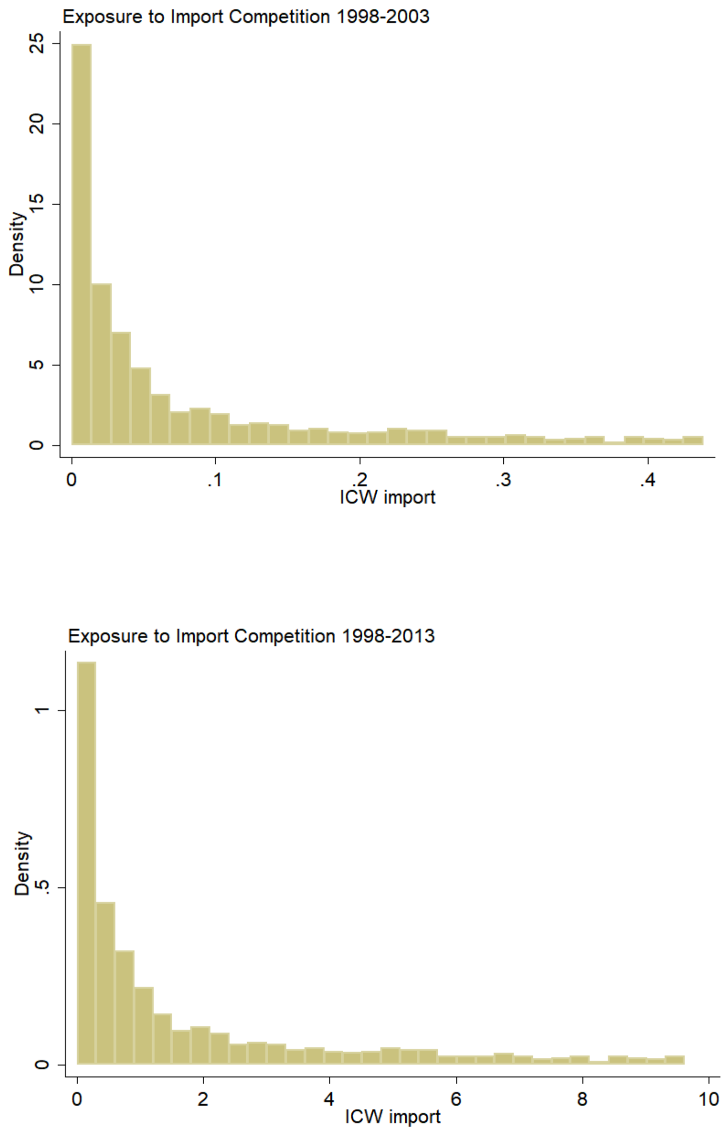
Figure A-4: Histogram - ICW Export Competition





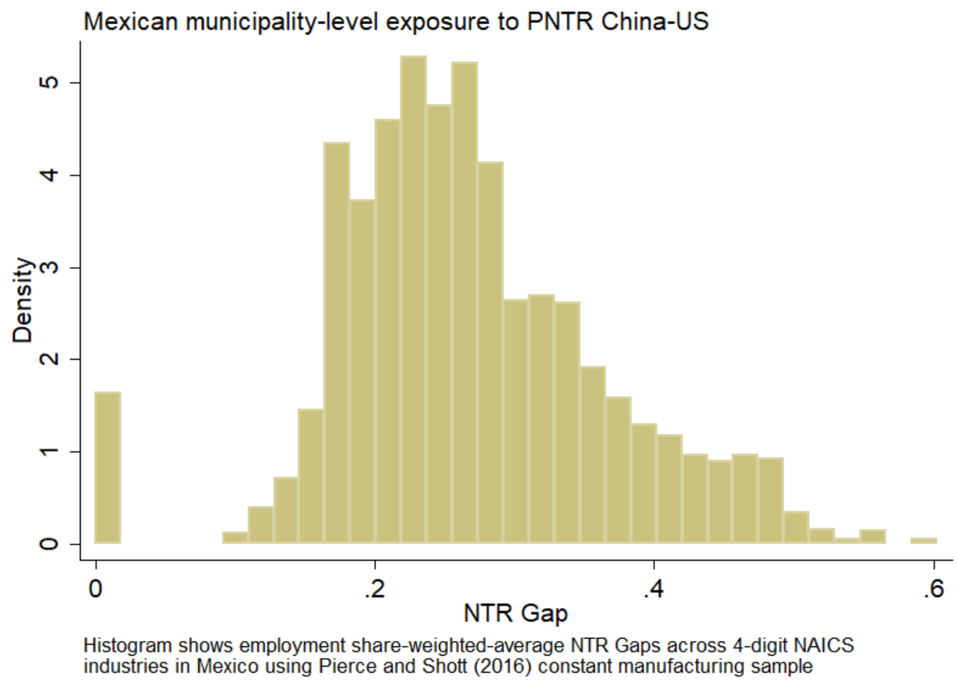
Notes: Figure shows the distribution of the measure of exposure to export competition across Mexican municipalities for two periods: 1998-2003 (top) and 1998-2013 (bottom). Summary statistics are presented in Table 1.

Figure A-5: Histogram - ICW Import Competition



Notes: Figure shows the distribution of the measure of exposure to import competition across Mexican municipalities for two periods: 1998-2003 (top) and 1998-2013 (bottom). Summary statistics are presented in Table 1.

Figure A-6: Histogram - Pierce and Schott (2016) measure of exposure



C Appendix Tables

Table A-1: Descriptive Statistics - Mexican Labor Force 1998

Industry (2-digits)	**Male-to-Female Ratio**	**Number of Workers**	**Share in Labor Force**
Agriculture, fishing, and forestry	15.6	174127	1%
Mining	11.1	113189	1%
Electric, water and gas supply	5.6	190033	1%
Construction	17.3	651411	5%
Manufacturing	**2.0**	**4175400**	**30%**
Wholesale Trade	3.2	851935	6%
Retail Trade	1.0	2940531	21%
Transportation and warehousing	6.9	596773	4%
Information	1.5	194116	1%
Financial services and insurance	1.3	241918	2%
Estate and rental services	1.8	113738	1%
Professional and business services	1.6	379021	3%
Management of companies	1.8	52010	0%
Administrative and support and waste management and remediation services	2.0	611097	4%
Educational Services	0.6	362015	3%
Leisure and hospitality	0.9	285326	2%
Arts, Entertainment and Recreation	2.1	107188	1%
Accommodation and food	1.0	940894	7%
Other services	3.6	846303	6%

Source: Mexican Economic Census 1998 - INEGI

Table A-2: **Distribution of Mexican Population Across Age Categories in 2000**

	Total	Women	Men
Ages 0-4	0.109	0.105	0.113
Ages 5-9	0.115	0.111	0.119
Ages 10-14	0.110	0.106	0.114
Ages 15-19	0.103	0.102	0.103
Ages 20-24	0.093	0.096	0.090
Ages 25-29	0.084	0.086	0.081
Ages 30-34	0.073	0.075	0.071
Ages 35-39	0.065	0.067	0.064
Ages 40-44	0.053	0.054	0.052
Ages 45-49	0.042	0.042	0.041
Ages 50-54	0.034	0.035	0.034
Ages 55-59	0.026	0.027	0.026
Ages 60-64	0.023	0.023	0.022
Ages 65-69	0.017	0.018	0.016
Ages 70-74	0.013	0.013	0.012
Ages 75 +	0.019	0.020	0.018

Note: Table reports the overall Mexican population weights used to construct the age-adjusted mortality rates. Data is from the 2000 Mexican Population Census.

Table A-3: Placebo - Pre-Trends Analysis - 2SLS

Dependent variable: Δ Age-adjusted mortality rate 1990-1997			
	Diabetes total*	**Ischemic Heart Disease**	**Alcohol Related Liver Disease**
Panel A: Import and Export Competition			
Δ Manuf. Employment 1998-2003	-0.567	1.485	0.623
	(0.963)	(1.157)	(0.788)
Δ Manuf. Employment 1998-2013	-0.590	1.349	0.413
	(0.846)	(0.998)	(0.696)
Panel B: Export Competition			
Δ Manuf. Employment 1998-2003	-0.215	1.363	1.187
	(1.061)	(1.372)	(0.828)
Δ Manuf. Employment 1998-2013	-0.198	1.258	1.096
	(0.980)	(1.267)	(0.753)
Panel C: Import Competition			
Δ Manuf. Employment 1998-2003	-0.884	1.596	0.114
	(0.958)	(1.101)	(0.809)
Δ Manuf. Employment 1998-2013	-0.770	1.390	0.0995
	(0.833)	(0.960)	(0.704)
Mean Dep.Var 1990-1997	10.02	12.24	7.95
Baseline rate 1990	18.89	23.24	19.97
Observations	2,382	2,382	2,382

Notes: This Table conducts a placebo exercise where the dependent variable is the change in age-adjusted mortality rate between 1990 and 1997. Table reports 2SLS estimates of Equation 3. The instrumented variable remains the change in the manufacturing employment rate (standardized) over 1998-2003 and 1998-2013. The 2SLS estimates show the effect of a standard deviation *change* in the manufacturing employment rate on the change in age-adjusted mortality rate (number of deaths per 100,000 people). The instrumental variables are described in Table 2 notes. Panel A instruments the change in the manufacturing employment rate using both import and export competition, while panels B and C use only export exposure and import exposure, respectively. The bottom rows show the sample mean change in mortality rate (mean dep. var.) and baseline mortality rate by cause. *The caveat of using pre-period mortality data is that the International Classification of Deaths (ICD) changed in 1998. The main analysis uses ICD-10, while for this table requires using ICD-9. There are some comparability issues between the two. For example, diabetes is only reported at aggregate level in ICD-9 so I cannot calculate the pre-trend for type 2 diabetes. This results in a baseline rate for 1990 that is higher than the baseline rate reported in the main analysis. Observations are municipalities weighted by the initial working age-population. All regressions include state fixed effects. Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1).

Table A-4: Varying Controls: First Stage

	Δ Change in manufacturing employment rate					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A			**1998-2003**			
Δ ICW - Export	-0.0872***	-0.0865***	-0.0821***	-0.0747***	-0.0805***	-0.0812***
	(0.0271)	(0.0284)	(0.0290)	(0.0287)	(0.0274)	(0.0275)
Δ ICW - Import	-1.158***	-1.089***	-1.133***	-1.183***	-0.996***	-0.978***
	(0.318)	(0.326)	(0.333)	(0.327)	(0.322)	(0.325)
First Stage F-stat	**64.65**	**52.71**	**50.13**	**48.18**	**44.11**	**43.69**
Δ ICW - Export (rescaled 25th to 75th pctile)	-0.1564***	-0.1551***	-0.1472***	-0.1340***	-0.1445***	-0.1456***
	(0.0485)	(0.0509)	(0.0521)	(0.0514)	(0.0491)	(0.0494)
Δ ICW - Import (rescaled 25th to 75th pctile)	-0.1599***	-0.1504***	-0.1564***	-0.1633***	-0.1376***	-0.1351***
	(0.0439)	(0.0450)	(0.0459)	(0.0452)	(0.0444)	(0.0448)
Panel B			**1998-2013**			
Δ ICW - Export	-0.0116**	-0.0138***	-0.0126**	-0.0118**	-0.0132**	-0.0130**
	(0.00506)	(0.00529)	(0.00545)	(0.00554)	(0.00519)	(0.00519)
Δ ICW - Import	-0.0793***	-0.0746***	-0.0773***	-0.0786***	-0.0673***	-0.0668***
	(0.0178)	(0.0181)	(0.0186)	(0.0187)	(0.0179)	(0.0182)
First Stage F-stat	**76.76**	**70.90**	**66.05**	**64.41**	**61.68**	**61.62**
Δ ICW - Export (rescaled 25th to 75th pctile)	-0.1188**	-0.1419***	-0.1294**	-0.1217**	-0.1356**	-0.1337**
	(0.0520)	(0.0544)	(0.0560)	(0.0569)	(0.0534)	(0.0533)
Δ ICW - Import (rescaled 25th to 75th pctile)	-0.2402***	-0.2257***	-0.2339***	-0.2380***	-0.2037***	-0.2021***
	(0.0539)	(0.0548)	(0.0563)	(0.0566)	(0.0541)	(0.0551)
Observations	2,382	2,382	2,382	2,382	2,382	2,382
Log(distance to U.S.); Rural dummy		Y	Y	Y	Y	Y
% Male in working age population			Y	Y	Y	Y
% Adult population with no primary education			Y	Y	Y	Y
Δ Log(population) 1990-1998				Y	Y	Y
Δ Log(manufacturing employment) 1993-1998					Y	Y
Δ Log (migration) 1995-2000						Y

Notes: This table shows that the first stage is robust to adding a rich set of municipality level controls. Column 1 is the baseline specification, which only includes state fixed effects. Columns 2 adds geographic controls for urban/rural municipalities and Log(distance to the U.S). Column 3 adds the percentage of population older than 15 years old with no primary education and the percentage of the municipality working age population that is male. Columns 4-6 add (log differences) for pre-period working-age population growth (1990-1998), pre-period change in manufacturing employment (1993-1998), the pre-period interstate and returned migration rates (1995-2000). The instruments and dependent variable are described in Table 2 notes.

Table A-5: Alternative Instrument for Export Competition

Dependent variable: Δ Manufacturing Employment Rate				
	1998-2003		**1998-2013**	
	(1)	(2)	(3)	(4)
$NTRGap_i$	-4.581***	-1.770**	-5.108***	-1.778**
	(0.618)	(0.688)	(0.626)	(0.738)
Δ ICW - Import		-1.884***		-0.102***
		(0.224)		(0.0119)
First Stage F-stat	**54.98**	**61.08**	**66.59**	**85.37**
$NTRGap_i$ (rescaled 25th to 75th pctile)	-0.5333***	-0.2061**	-0.5945***	-0.2070**
	(0.0719)	(0.0800)	(0.0729)	(0.0859)
Δ ICW - Import (rescaled 25th to 75th pctile)		-0.2602***		-0.3081***
		(0.0309)		(0.0361)
Observations	2,382	2,382	2,382	2,382

This table shows First Stage results using an alternative measure of exposure to Chinese competition in the U.S. market (i.e., "export" competition). I follow (Pierce and Schott, 2016a, 2018) in measuring the impact of Permanent Normal Trade Relations (PNTR) as the rise in US tariffs on Chinese goods that would have occurred in the event of failed annual renewal of China's NTR status prior to PNTR (i.e., NTR gap), and compute it for each industry j using ad valorem equivalent tariff rates provided by Feenstra et al. (2002) for 1999. Chinese exports to the U.S. increased in industries with higher NTR Gaps. Due to NAFTA, Mexico had increase its exports to the U.S., and developed a comparative advantage in some of the sectors in which China increased it exports to the U.S after 2000 (Hanson and Robertson, 2008). Then, I use the NTR Gap to instrument manufacturing employment changes in Mexico between 1998-2003 and 1998-2013. The PNTR provides exogenous variation to Mexico's export demand from the U.S. The first stage is: $\Delta L^m_{i,t} = \beta_0 + \beta_1 NTRGap_i + X_i'\gamma + \epsilon_{i,t}$. Where $NTRGap_i$ is the Mexican i municipalities (indirect) exposure to PNTR is the employment-share weighted average NTR gaps across industries j in which they are active: $NTRGap_i = \sum_j \frac{L_{ji,1998}}{L_{i,1998}} NTRGap_j$. Columns 1 and 3 show that municipalities with greater exposure to PNTR exhibit a decrease in the manufacturing employment rate over 1998-2003 and 1998-2013. Columns 2 and 4 add $\Delta ICW_{i,t} Import$ as instrument.