The Impact of NAFTA on U.S. Local Labor Market Employment

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Abstract

This paper studies the impact of the North American Free Trade Agreement on U.S. local labor markets, based on cross-regional variation in exposure to the U.S. and Mexico's tariff liberalization. Lower U.S. tariffs led to a relative decline in the share of the working-age population employed in manufacturing (especially among low-skilled workers) in more exposed regions, and increases in unemployment and in the share of the population employed in certain low-pay nonmanufacturing industries. Employment losses due to U.S. tariff liberalization were much larger among female and nonwhite workers. U.S. tariff cuts also induced changes in the task composition of employment, leading to a decline in employment in production-related routine occupations and an increase in abstract occupations. The contraction in manufacturing employment and in production-related routine employment and the rise in unemployment as a result of U.S. tariff liberalization were concentrated in parts of the South and Midwest with relatively lower human capital. Mexico's tariff cuts, in contrast, did not have a discernible impact on most U.S. local labor market employment outcomes.

Keywords: NAFTA, Trade policy, Tariffs, Employment, Unemployment, Local Labor Markets

JEL classification: F1, J2

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1. Introduction

The consequences of the North American Free Trade Agreement (NAFTA) for the U.S. economy, and especially for U.S. workers, have been hotly debated since its enactment. Key to this debate is the geographic dimension of NAFTA's impact, given that regions across the U.S. were differentially exposed to tariff liberalization. Prior work by Hakobyan and McLaren [2016] has examined the impact of regional exposure to U.S. tariff cuts toward Mexico on U.S. wages. Despite the prominence of NAFTA in the public debate, however, empirical evidence on its consequences is still limited. This paper studies the impact of NAFTA on local employment outcomes, showing that U.S. tariff liberalization has led to a significant decline in manufacturing employment in more exposed regions. This has been especially the case among low-skill workers, and has been coupled with an increase in employment in certain low-pay nonmanufacturing industries, in unemployment and in labor force nonparticipation. Female and nonwhite workers have faced much larger employment losses due to U.S. tariff liberalization relative to other groups. In addition, NAFTA has led to a transformation in the task composition of employment, away from routine and toward abstract occupations.

Starting January 1st 1994, the U.S. and Mexico swiftly liberalized tariffs toward each other. Local labor markets across the U.S. were exposed to this liberalization to different extents, depending on their initial industrial composition. Textile and apparel industries were among those facing the largest tariff reductions by the U.S. Consequently, among the most exposed regions by U.S. tariff liberalization were areas in North and South Carolina with a large textile sector, such as Greensboro and Fayetteville. Following the cross-regional empirical approach of Autor et al. [2013] and Hakobyan and McLaren [2016], I relate measures of regional exposure to tariff cuts to changes in local labor market outcomes. Like Hakobyan and McLaren [2016], I focus on the period 1990-2000.

Mexican tariff cuts toward the U.S. were on average larger than U.S. tariff cuts, and U.S. local labor markets were also differentially exposed to them. In addition, there is a high correlation ($\rho = 0.72$) across U.S. regions in exposure to U.S. and Mexico's tariff cuts, as a result of the substantial overlap in the industries receiving the largest tariff reductions by the U.S. and Mexico. However, the impact of Mexican tariff liberalization on U.S. regional outcomes has not been analyzed in prior work, and is thus part of the contribution of this paper, bringing newly digitized data on Mexican tariff schedules to the fore.

A concurrent trade shock to U.S. local labor markets during this period, which has received much attention, comes from rising imports from China, driven by China's productivity growth. The consequences of this shock during 1990-2007 have been documented extensively by Autor et al. [2013]. Much work has followed [Acemoglu et al., 2016, Autor et al., 2015, 2016] given the quantitatively large implications of this "China shock" to local labor markets and the flexibility of the cross-regional empirical strategy to analyze a variety of outcomes. I follow Autor et al. [2013]'s empirical approach closely, and find that NAFTA has had important consequences for local labor market employment outcomes beyond the impact of Chinese import competition.

To measure regional exposure to tariff liberalization I build on, but substantially extend, prior work. As in the literature [Hakobyan and McLaren, 2016], local labor market exposure to tariff cuts is defined as a weighted average of industry-level tariff changes, with weights given by initial employment shares in each region. A first difference is that I develop a measure of exposure to U.S. tariff cuts based on much more industry variation than in previous work, thus sharpening identification. While Hakobyan and McLaren [2016] exploit variation across 89 different industries using employment weights from the 1990 Census, I follow Autor et al. [2013] in computing weights based on the significantly more detailed County Business Patterns data, which results in variation across 417 tradable industries (including 397 manufacturing industries). Second, there are differences in the literature in the exact definition of regional exposure to tariffs, including whether to weigh tariffs by the exporter's revealed comparative advantage (as in Hakobyan and McLaren [2016]) or not, or how to treat the nontradable sector. I take a pragmatic approach and show that the baseline results are robust to all the different measures of regional exposure to tariff cuts developed in the literature. The last contribution in terms of measuring exposure to tariff liberalization is that I use, for the first time, data on Mexico's tariff schedule of tariff preferences toward the U.S. under NAFTA, obtained from the Mexican government's official gazette. This schedule is digitized and results in a dataset of tariffs on more than 12 thousand different HS 8-digit product categories. It is worth noting that while the U.S. and Mexico's tariff schedules provided a timeline of gradual liberalization, I show that, in practice, both countries liberalized most goods either immediately in January 1$^{\text{st}}$, 1994 or shortly thereafter. This justifies focusing on the period 1990-2000.

The results found indicate a substantial impact of NAFTA on local labor market outcomes. I start by documenting the effect of U.S. and Mexico's tariff liberalization on manufacturing employment. Regions at the 75th percentile of exposure to U.S. tariff cuts experienced a 0.15 percentage point decline in the share of manufacturing employment in the working-age population relative to regions at the 25th percentile of exposure. This magnitude implies that the reduction in U.S. tariffs toward Mexico can be associated to a 0.25 percentage point decline in the manufacturing employment to population ratio over 1990-2000. This is equal to 12% of the decline in this ratio during the decade.[1]

[1] The share of manufacturing employment in the working-age population evolved from 12.7% in 1990 to 10.5% in 2000. As discussed in detail in Section 3, this calculation uses relative effects obtained from the cross-regional empirical analysis to infer absolute effects, as in Autor et al. [2013]. An alternative is to use a general equilibrium model to infer the impact of NAFTA. For example, Caliendo and Parro [2015] develop a general equilibrium model to infer the welfare consequences

This overall impact did not affect all workers in a region equally. The effect is not statistically significant among workers with college education. In contrast, among those with no college education, regions at the 75th percentile of exposure experience a 0.20 percentage point decline in the share of manufacturing employment relative to those at the 25th percentile. The impact of U.S. tariff liberalization also differs markedly by gender. While the effect is not statistically different from zero among men, it is negative and very large among women, driving them out of the manufacturing sector in more exposed regions.[2] Differences across age groups, in contrast, are smaller than differences across genders, with a larger impact of U.S. tariff liberalization among those aged 35-49.

The decline in the share of population employed in manufacturing in response to U.S. tariff cuts leads to the question of where those workers relocate. First, like with other shocks to U.S. local labor markets, I find no adjustment in population, implying that the decline in the manufacturing employment share of the population must lead to changes in employment in nonmanufacturing industries, unemployment, or nonparticipation in the labor force.[3] For the population as a whole, I find U.S. tariff cuts do not lead to statistically significant changes in nonmanufacturing employment, nor in labor force participation, but they do lead to a statistically significant increase in unemployment.[4] Regions at the 75th percentile of exposure experienced a 0.05 percentage point in the unemployment to population ratio relative to regions at the 25th percentile.

The lack of adjustment in nonmanufacturing employment hides substantial heterogeneity. Nonmanufacturing industries – from retail and wholesale trade to utilities to government – are quite different from each other. For example, in 1990 the average wage in retail and wholesale trade was only three quarters of the mean pay across all service industries. Looking at the impact on these subsectors separately, I find that U.S. tariff liberalization leads to large increases in employment in both retail and wholesale trade and in construction, which are both among the lowest-paying service subsectors.

I also find clear differences between college and noncollege workers in the response of nonmanufacturing employment, unemployment, and labor force nonparticipation to U.S. tariff cuts. Specifically,

of NAFTA. Kim and Vogel [2020a] develop a model to study the effect of trade shocks on welfare allowing for margins of adjustment such as unemployment and labor force nonparticipation, and use it to infer the consequences of the U.S. granting of permanent normal trade relations to China on relative welfare across commuting zones between 2000-2007.

[2]Note that Autor et al. [2013] report small differences across genders on the impact of rising Chinese imports on manufacturing employment over their entire sample 1990-2007, which consists of stacked differences for 1990-2000 and 2000-2007. However, considering only 1990-2000, growth in Chinese imports did have a much larger effect on female employment, just as U.S. tariff cuts under NAFTA did.

[3]The lack of response in local population to tariff liberalization is consistent with similar findings in other contexts, such as rising import competition from China [Autor et al., 2013]. Yagan [2019] and Molloy et al. [2011] document little impact of the 2007-2008 recession on migration.

[4]The finding that regional exposure to U.S. tariff liberalization under NAFTA led to an increase in unemployment adds to the evidence showing this is an important adjustment margin provided by [Autor et al., 2013] and Erten et al. [2019] based on other contexts, and lends support to models incorporating this margin including Helpman et al. [2010], Helpman and Itskhoki [2010], Davidson et al. [1999], Davis and Harrigan [2011] and Kim and Vogel [2020a].

I report large and statistically significant increases in unemployment and labor force nonparticipation among noncollege individuals. For those with college education, in contrast, U.S. tariff liberalization does not have a statistically significant effect. The response in nonmanufacturing employment also differs across genders. Only among women does the nonmanufacturing employment to population ratio grow. In the case of unemployment, U.S. tariff cuts lead to an increase among both genders. Finally, the response of labor force participation has opposite signs; tariff liberalization increases participation among women and reduces it among men. Understanding the mechanisms behind this differential response in terms of labor force participation merits further exploration and could perhaps be clarified with longitudinal data. Last, I also find differences in the adjustment across age groups. While for younger workers aged 16-34 there is a relevant increase in nonmanufacturing employment, for older workers aged 35-49 and 50-65 there is an increase in unemployment and in labor force nonparticipation.

While the literature has emphasized the differential impact of trade liberalization across groups by educational attainment or by gender, it has been silent regarding race. It is interesting to study differential effects by race in the context of NAFTA, because sectors facing large tariff cuts, such as textiles and apparel, were concentrated in regions with a large black population, such as certain areas in North and South Carolina. I find that while the impact of U.S. tariff cuts on manufacturing employment (as a fraction of the working-age population) was similar for white and black workers, the impact on total employment was very different, and specifically, very negative for nonwhite workers. Among nonwhites, U.S. tariff liberalization leads to a 0.22 percentage point decline in employment as a share of the working-age popuation in regions at the 75th percentile of exposure relative to regions at the 25th percentile. This coefficient is smaller (0.07 p.p.) and statistically insignificant for white individuals. In line with this, nonwhite workers face a larger increase in unemployment than white workers, while changes in labor force participation are not statistically significant. This pattern also holds when focusing on noncollege individuals, with larger declines in employment and increases in unemployment for nonwhite workers. In this case, however, white workers are more likely to exit the labor force.

In contrast to U.S. tariff liberalization, Mexico's tariff cuts do not have a statistically significant impact on practically any of the U.S. local labor market outcomes discussed so far.[5] What could be the reasons behind this asymmetry? A first possiblity is that Mexico's tariff cuts did not lead to an increase in U.S. exports to Mexico. I show, however, that this is not the case. Using data on trade flows, I find a significant increase in exports to Mexico in industries facing larger tariff cuts.[6] A second option is that

[5]Note that the impact of Mexican tariff liberalization on manufacturing employment as a share of the working-age population is not estimated to be precisely zero. The coefficient has, intuitively, the opposite sign to that of U.S. tariff liberalization, but the confidence interval is very wide.

[6]Specifically, I find a 24% increase in U.S. exports to Mexico relative to the rest of the world in industries with above-

increases in the demand for U.S. exports have little impact on employment, at least in the industries receiving larger tariff cuts. One could speculate that export opportunities could lead to expanding output through technological upgrading rather than hiring labor [Bustos, 2011]. These hypotheses could be explored in future work using plant-level data. Feenstra et al. [2019], however, do find employment gains in regions exposed to increased demand for U.S. exports during 1991-2001. In any case, the impact of Mexico's tariff liberalization on U.S. manufacturing employment, while not statistically significant, has a magnitude that is similar (and an opposite sign) to that of U.S. tariff liberalization. It could be possible that this impact is indeed large but, given the width of the confidence intervals, this is uncertain.

Next, I study the impact of NAFTA on the task composition of employment. Following Autor et al. [2015], I classify occupations into those with a primarily abstract, routine or manual task content.[7] I find that U.S. tariff liberalization has led to an increase in employment in abstract occupations and a decline in routine occupations. Regions at the 75th percentile of exposure experienced a 0.08 percentage point in employment in abstract occupations (as a share of the working-age population) relative to regions at the 25th percentile. This increase in employment in abstract occupations is larger among men and among those with college education. It is seen in both the manufacturing and nonmanufacturing sectors, being somewhat larger in the latter. Routine occupations can be separated into two quite distinct groups [Autor and Dorn, 2013, Autor et al., 2015]: those related to clerical activities and retail sales, and those linked to production. U.S. tariff liberalization reduced employment only among production-related routine occupations. Regions at the 75th percentile of exposure faced a 0.18 p.p. larger decline in employment in these occupations compared to regions at the 25th percentile.[8] This decline in routine production-related employment is widely uneven among subgroups of the population. The effect is very large among women, and not statistically different from zero among men. It is present among both college and noncollege workers, but more than three times larger among the latter. Intuitively, it is only found to be present in the manufacturing sector. Finally, U.S. tariff cuts led to much less change in employment in manual occupations, although I do find a decline in manual employment in manufacturing coupled with an increase in nonmanufacturing, and a combined effect not statistically different than zero.

median initial tariff levels relative to other industries between 1990 and 2000.

[7] Autor et al. [2015] constrast the response of local labor market employment by task to both trade (captured by rising Chinese imports) and technology. Given that routine occupations are codifiable and thus subject to replacement by aumotation, they measure technology as the initial routine employment share in each labor market, and isolate the long-run component of this routine employment share by constructing an instrument based on the historical (1950) local industry mix. My results for the impact of NAFTA tariff liberalization on the task composition of employment are based on regressions controlling for the commuting zone share of routine employment in 1990 and are similar with or without Autor et al. [2015]'s instrument for this share.

[8] The decline in employment in routine occupations as a consequence of U.S. tariff liberalization is also found when combining the two subgroups of primarily routine occupations (clerical activities and retail sales and production occupations).

While previous outcomes were found to be unresponsive to Mexico's tariff liberalization, these tariff cuts did lead to changes in the task composition of U.S. employment. Specifically, opposite to U.S. tariff cuts, they led to lower employment in abstract occupations, among men and among college individuals. They did not, however, have an impact on employment in routine or manual occupations.

In the last section of the paper, I document a large difference in the impact of U.S. tariff liberalization across high and low human capital commuting zones.[9] In low human capital commuting zones, which are located mostly in the South and parts of the Midwest, U.S. tariff cuts have had a large negative effect on manufacturing employment and in total employment, and increases in unemployment and in labor force nonparticipation. In high human capital regions, in contrast, the effects on all these outcomes are small and not statistically significant. Regarding the task composition of employment, the increase in employment in abstract occupations is found evenly across high and low human capital regions, but the decline in production-related routine occupations is much larger among the latter. Specifically, commuting zones at the 75th percentile of exposure to U.S. tariff cuts experienced a 0.68 percentage point decline in the share of the working-age population employed production-related routine occupations relative to commuting zones at the 25th percentile of exposure. As a point of comparison, between 1990 and 2000 the share of the working-age population employed in routine occupations in the low human capital commuting zones fell by 1.3 percentage points. Overall, these results imply a widening in regional disparities across the U.S.

The results in the paper are robust to a number of alternative forms of measurement. As stated earlier, I use various measures of regional exposure to liberalization found in the literature. Second, I control for rising import competition from China. To this end, I estimate Autor et al. [2013]'s regressions with the growth in imports competition from China instrumented by growth in Chinese exports to other developed countries, adding to this equation my measures of tariff liberalization. In additon, also following Autor et al. [2013], I document that tariff cuts are not correlated with changes in the share of manufacturing employment in the population during the 1980s or 1970s. Finally, I control for a rich set of initial commuting zone characteristics used by Autor et al. [2013].

One potential concern regarding the empirical strategy is that Mexico experienced a large devaluation in December 1994 in the context of a currency crisis and a deep recession in 1995. This devaluation and crisis were temporary, given that while Mexico's GDP fell sharply by 6.3% in 1995, it grew by 6.8% in 1996 and growth rates remained high during the rest of the decade.[10] The empirical identification

[9] I interpret the impact of human capital endowments on the adjustment to tariff liberalization as descriptive rather than causal, given that there are other differences across commuting zones in addition to human capital endowments (such as their economic structure), and these other factors could be in turn determined by human capital endowments.

[10] Burfisher et al. [2001] argue that trade between the U.S. and Mexico recovered promptly following Mexico's currency crisis.

of the effect of NAFTA is based on variation in tariff cuts across manufacturing industries, which interacts with commuting zones' initial industrial composition. All regressions control for the initial share of manufacturing employment. A devaluation would affect the manufacturing sector as a whole, and should not interfere with the identification strategy. In addition, while Mexico's recession and devaluation might have temporarily impeded imports from the U.S., I show that Mexico's tariff liberalization boosted U.S. exports between 1990 and 2000, to a similar extent than the increase in U.S. imports due to U.S. tariff liberalization.

Contribution to the Literature This paper contributes to a literature studying the local impact of trade shocks in the U.S. [Hakobyan and McLaren, 2016, Autor et al., 2013, 2015, Dorn et al., 2019, Kim and Vogel, 2020b, Pierce and Schott, 2020].[11] The main contribution to this literature is measuring the employment effects of NAFTA. NAFTA is the most prominent free trade agreement signed by the U.S. in recent decades, yet there has been no analysis of the regional employment outcomes studied here. This paper complements the work of Hakobyan and McLaren [2016], who have documented a relative decline in blue-collar wages in regions more exposed to U.S. tariff liberalization under NAFTA.[12] This paper also shows that many of the margins of adjustment to rising Chinese imports uncovered by Autor et al. [2013] and Autor et al. [2015] were also at work in the case of NAFTA.

An important question in the literature is whether trade shocks, and particularly import competition from China, has led to the decline in U.S. manufacturing employment in recent decades. Autor et al. [2013] establishes that commuting zones facing a larger increase in Chinese import competition during 1990-2007 have seen a relative decline in manufacturing employment. Pierce and Schott [2016] show that following China's WTO entry, U.S. industries facing larger declines in U.S. tariff threats toward China see larger declines in employment. My findings indicate that U.S. tariff liberalization under NAFTA has also played a role in the decline in manufacturing employment, accounting for 12% of the decline in manufacturing employment as a share of the working-age population during 1990-2000.

A second contribution lies in this paper's focus and findings on the differential impact that tariff liberalization under NAFTA has had across the population, based on gender, race, educational attainment and geography.[13] The results indicate that the decline in both manufacturing and total employment due to U.S. tariff liberalization is concentrated among women. This finding complements the results

[11] There has also been important work studying the impact of trade shocks on local labor market outcomes in various other countries including India [Topalova, 2010], Brazil, [Kovak, 2013, Dix-Carneiro and Kovak, 2017], Germany [Dauth et al., 2014], and South Africa [Erten et al., 2019].

[12] This paper also complements Caliendo et al. [2015]'s analysis of the trade and welfare effects of NAFTA.

[13] See the survey by Harrison et al. [2011] regarding the differential impact of trade liberalization across groups by educational attainment and the work by Hakobyan and McLaren, 2018, Aguayo-Tellez et al., 2010, Black and Brainerd, 2004, Gaddis and Pieters, 2017, Benguria and Ederington, 2017, Juhn et al., 2014 and Sauré and Zoabi, 2014, among others regarding the differential impact of trade liberalization by gender.

of Hakobyan and McLaren [2018] who study gender differences in the impact of NAFTA on wages and find lower wage growth among blue-collar women.[14] In addition, this is the first paper to examine the differential impact of trade shocks by race in the U.S., finding that U.S. tariff liberalization led to a larger decline in employment and a larger increase in unemployment among nonwhite workers.[15,16] The larger impact of U.S. tariff liberalization on low-skill workers is similar to Autor et al. [2013]'s findings in the context of Chinese import competition. Finally, the larger decline in manufacturing employment in low human capital commuting zones across the U.S. is consistent with Bloom et al. [2019]'s analysis of the effects of Chinese import competition on U.S. firms.

The third contribution of the paper lies in the analysis of the impact of tariff liberalization on the task composition of employment. In this regard, my findings give further support to Autor et al. [2015]'s observation that trade liberalization reduces employment in routine tasks. In addition, I find an increase in employment in abstract occupations. This partially compensates the decline in routine employment and perhaps implies a potential for transformation in commuting zones experiencing manufacturing decline due to trade liberalization. These findings speak to the literature that examines the causes of job polarization in advanced economies [Autor et al., 2006, Goos et al., 2009, Dustmann et al., 2009].

Organization In Section 2, I describe the empirical approach, data sources, and measurement. In Section 3, I discuss the impact of NAFTA on manufacturing employment. In Section 4, I present results on outcomes beyond the manufacturing sector. Section 5 concludes.

2. Empirical Approach and Data

2.1. Empirical Approach

The empirical strategy exploits regional variation in exposure to NAFTA tariff cuts that originates in commuting zones' initial industrial composition. I construct regional measures of tariff changes between 1990 and 2000 weighing industry-level tariffs with industry employment shares in each region. These weights are computed in the initial year, 1990. This approach has been used in the case of NAFTA by Hakobyan and McLaren [2016] and in other contexts by Topalova [2010], Kovak [2013], Dix-Carneiro

[14] Sauré and Zoabi [2014] examine the effect of U.S. exports to Mexico during the 1990-2007 on differences between female and male labor force participation. However, their exercise is conceptually very different, as they measure the association between the change in state-level labor force participation and the change in aggregate state-level exports to Mexico. In addition, the ability to infer these relationships is limited in a regression with 51 observations.

[15] The only work analyzing the differential effect of trade liberalization by race is Hirata and Soares [2020], who study Brazil's unilateral trade liberalization and show a compression in the wage gap between black and white workers that is not explained by differences in observables.

[16] These findings are consistent with Gould [2018], which finds that deindustrialization in the U.S. during 1960-2010 has had a negative impact on black relative to white individuals.

and Kovak [2017], Erten et al. [2019], and Kis-Katos and Sparrow [2015] among others. Other work has constructed similar measures of regional exposure to trade flows instead of tariffs [Autor et al., 2013]. Specifically, a first measure of tariff liberalization for region i is the following sum across tradable industries $j \epsilon T$:

$$\Delta\tau_i^{U.S.} = \sum_{j \epsilon T} \frac{L_{ij}\Delta\tau_j^{U.S.}}{L_i} . \tag{1}$$

In this expression L_{ij} is employment in industry j in region i in 1990, L_i is total employment in region i in 1990, and $\Delta\tau_j^{U.S.} = \tau_{j\,2000}^{U.S.} - \tau_{j\,1990}^{U.S.}$ is the change in the U.S. tariff toward Mexico in industry j between 1990 and 2000. Variation in this measure of regional exposure to tariff liberalization stems from differences across regions in their initial industrial mix within the tradable sector, as well as from differences in the size of the tradable sector. The regressions I estimate will control for the initial share of manufacturing employment, so the identification will be due to differences in the industrial mix within manufacturing. Following Autor et al. [2013], the denominator in equation (1) is total regional employment, which implies that (1) is equivalent to a weighted average across all industries assigning zero tariffs to nontraded industries. Others [Kovak, 2013, Hakobyan and McLaren, 2016] normalize by total regional employment in traded industries, under the assumption that nontraded prices move with the prices of traded goods, and Hakobyan and McLaren [2016] argue this is a debatable issue.[17] In Appendix A.6, I define an alternative tariff measure based only on variation in tariffs within the tradable sector, and show that the results found using it are essentially the same as those found using the measure of exposure defined in (1).[18,19]

Hakobyan and McLaren [2016] point out that U.S. tariff cuts on Mexico should have a larger effect on trade flows in industries in which Mexico has comparative advantage, and define a measure of exposure to tariff liberalization that takes this into account. They define the following measure of Mexico's revealed comparative advantage in each industry j following Balassa [1965] and use it as an additional weight for industry-level tariffs:

$$\mathrm{RCA}_j^{\mathrm{MEX}} = \frac{x_{j\,1990}^{\mathrm{MEX}} \Big/ x_{j\,1990}^{\mathrm{ROW}}}{\sum_k x_{k\,1990}^{\mathrm{MEX}} \Big/ \sum_k x_{k\,1990}^{\mathrm{ROW}}} . \tag{2}$$

[17] Kovak [2013] develops a model including the nontraded sector, showing nontraded prices move with traded prices. Kovak [2013]'s framework is designed to measure the impact of trade liberalization on wages, and Kovak [2013] states that his model does not have a message in the case of studying nonwage outcomes (see his footnote 4). Given that this paper studies nonwage outcomes, I show that the results are robust to the various approaches to measuring weighted tariffs used in the literature.

[18] Because regressions control for the initial share of employment in manufacturing, identification is based only on variation across regions in the composition across traded industries, so both tariff measures yield very close results.

[19] I choose to report results using a measure of exposure that implicitly assigns zero tariffs to nontraded industries in the main text because I am interested in comparing the effects of NAFTA tariff liberalization to that of rising Chinese import competition in Autor et al. [2013], who treat nontraded industries in the same way.

In this expression, $x^{\text{MEX}}_{j\,1990}$ stands for exports from Mexico to the rest of the world (i.e. all countries excluding Mexico and the U.S.) in industry j in 1990. $x^{\text{ROW}}_{j\,1990}$ stands for exports between all countries excluding the U.S. and Mexico. This measure of revealed comparative advantage captures Mexico's share of rest of the world trade in industry j relative to all industries. The alternative measure of regional exposure to U.S. tariff liberalization is then the following:

$$\Delta\tau_i^{U.S.} = \frac{L_i^T}{L_i}\sum_{j\,\epsilon\,T}\frac{L_{ij}\text{RCA}_j^{\text{MEX}}\Delta\tau_j^{\text{U.S.}}}{L_{ij}\text{RCA}_j^{\text{MEX}}}\,. \tag{3}$$

In this expression, the denominator in the term $\sum_{j\,\epsilon\,T}\frac{L_{ij}\text{RCA}_j^{\text{MEX}}\Delta\tau_j^{\text{U.S.}}}{L_{ij}\text{RCA}_j^{\text{MEX}}}$ corresponds to the sum of employment across tradable industries weighted by Mexico's revealed comparative advantage. To be consistent with the previous tariff measure defined in equation (1), I multiply this term by the ratio of total regional employment in tradable industries over total regional employment $\frac{L_i^T}{L_i}$.[20] In the analysis below, I use both measures of regional exposure to U.S. tariff cuts (with and without revealed comparative advantage weights), finding very similar results.

I also construct equivalent measures of regional exposure to reductions in Mexican tariffs granted to the U.S. First, the equivalent to equation (1) is:

$$\Delta\tau_i^{\text{MEX}} = \sum_{j\,\epsilon\,T}\frac{L_{ij}\Delta\tau_j^{\text{MEX}}}{L_i}\,. \tag{4}$$

Second, accounting for U.S. revealed comparative advantage the measure of regional exposure is the following.[21]

$$\Delta\tau_i^{MEX} = \frac{L_i^T}{L_i}\sum_{j\,\epsilon T}\frac{L_{ij}\text{RCA}_j^{\text{US}}\Delta\tau_j^{\text{MEX}}}{L_{ij}\text{RCA}_j^{\text{US}}}\,. \tag{5}$$

In this expression, U.S. revealed comparative advantage is defined as:

$$\text{RCA}_j^{\text{US}} = \frac{x^{\text{US}}_{j\,1990}\Big/x^{\text{ROW}}_{j\,1990}}{\sum_k x^{\text{US}}_{k\,1990}\Big/\sum_k x^{\text{ROW}}_{k\,1990}}\,, \tag{6}$$

where $x^{\text{US}}_{j\,1990}$ stands for exports from the U.S. to the rest of the world (i.e. all countries excluding Mexico

[20] An alternative measure of exposure to tariff liberalization in which the denominator is based on employment in tradable industries only is the following: $\Delta\tau_i^{U.S.} = \sum_{j\,\epsilon\,T}\frac{L_{ij}\text{RCA}_j^{\text{MEX}}\Delta\tau_j^{\text{U.S.}}}{\text{RCA}_j^{\text{MEX}}L_i}$. This is exactly Hakobyan and McLaren [2016]'s measure. In Appendix A.6 I describe this measure in detail, and discuss how the baseline results in the paper are robust to using this measure of exposure.

[21] Just as before, the assumption behind this measure is that Mexico's tariff cuts toward the U.S. should have a larger effect on U.S. exports in industries in which the U.S. has comparative advantage.

and the U.S.) in industry j in 1990.[22]

2.2. Data Sources and Measurement

Local labor market outcomes I measure employment outcomes using the 1970, 1980, 1990, and 2000 5% samples of the Decennial Census [Ruggles et al., 2019]. As in Autor et al. [2013], I restrict the sample to individuals aged 16 to 64.[23]

Recent work studying U.S. local labor markets has defined these using the concept of commuting zone. These geographical units were defined by Tolbert and Sizer [1996] based on commuting patterns. I use the approach developed by Dorn [2009] and used by Autor and Dorn [2013] and Autor et al. [2013] to assign individuals to commuting zones based on the geographical information observed in the census data.[24] The analysis is restricted to 722 commuting zones in the continental U.S.

I also construct measures of the task composition of local labor market employment. Following Autor et al. [2015] I classify occupations into those performing primarily abstract, routine, or manual tasks. Abstract occupations perform problem-solving and organizational tasks. Routine occupations perform codifiable tasks and can thus be potentially automated, while manual occupations require physical dexterity or interpersonnal communication and are difficult to codify. The abstract category includes managerial, professional and technical occupations. The routine category consists of two quite distinct groups: clerical activities and retail sales occupations, and production-related occupations. Finally, mechanic, craft, agricultural and service occupations consist primarily of manual tasks. Autor and Dorn [2013] provide evidence in favor of this classification based on measures of job task intensity using the 1977 Dictionary of Occupational Titles.

Appendix Table A.4 reports summary statistics for all local labor market outcomes in 1990 and 2000, and for their change during 1990-2000.

Tariffs I construct measures of regional exposure to U.S. tariffs imposed on Mexico as well as Mexican tariffs imposed on the U.S. Previous work by Hakobyan and McLaren [2016] has analyzed the effect of U.S. tariff cuts on U.S. local labor markets (for wage outcomes), but not their response to Mexico's tariff reductions.

U.S. tariffs imposed on Mexico are obtained from Romalis [2007] at the 8-digit level of the U.S. tar-

[22] In Appendix A.6 I define a measure of regional exposure to Mexico's tariff liberalization in which the denominator is based on regional employment in traded industries only. In the Appendix, I show that this alternative measure is highly correlated with the measures defined by equations (4) and (5) and that using this alternative measure, the results I find are very similar to the baseline results in the main text.

[23] Further details on the sample selection are provided in Appendix A.2.

[24] The Census and ACS report individuals' Puma (Public Use Microdata Area) of residence.

iff schedule. These are aggregated to HS 6-digit codes using U.S. HS 8-digit imports as weights.[25] I then construct industry-level tariffs for 417 4-digit SIC tradable industries (including 397 manufacturing industries) using the concordance provided by Autor et al. [2013].[26] The method used to construct industry-level U.S. tariffs has the advantage of resulting in much more detailed variation than in Hakobyan and McLaren [2016]. Hakobyan and McLaren [2016] define tariffs for 89 industries, given that they use the set of industries detailed in the 1990 Census of Population. The further disaggregtion in this paper aids with the identification.

To construct the regional measures of exposure to tariff changes defined in equations (1) and (3), I compute weights using commuting zone by industry employment in 1990 from the Census Bureau's County Business Patterns (CBP). I follow Autor et al. [2013]'s procedure to impute missing employment and to aggregate the county-level data to commuting zones and to the industry classification described in the previous paragraph.[27] To construct Mexico's revealed comparative advantage in each industry, as defined in equation (2) I use trade flows obtained from COMTRADE. These are initially obtained by SITC revision 2 industries. Appendix A.1 provides further details regarding the translation of these trade flows to SIC industry codes. The correlation between these two measures of exposure to U.S. tariff liberalization, one which weighs tariffs by revealed comparative advantage (eq. 3) and one which doesn't (eq. 1), is extremely high ($\rho = 0.93$).

I also assemble new data on Mexico's tariff preferences toward the U.S. under NAFTA. These data are obtained directly from Mexico's *Diario Oficial* (the official daily publication of the Mexican government, equivalent to the U.S. Federal Register) and then digitized. These data have not been used in previous work. Appendix A.3 describes the processing procedure for this novel dataset. Mexico's tariffs are reported by 8-digit codes of the Mexican tariff schedule. I first construct average tariffs at the HS 6-digit level, which I then translate into SIC industries using the same concordance described earlier.[28]

Measures of regional exposure to Mexican tariff cuts, defined in equations (4) and (5), are constructed with the same CBP employment weights used for U.S. tariffs. The correlation between these two measures, one which does not weigh tariffs by revealed comparative advantage and one which does, is again extremely high ($\rho = 0.98$), just like in the case for U.S. tariffs.

It is worth noting that there is a substantial spatial correlation in regional exposure to U.S. and

[25] Data on U.S. imports used to construct weights are a product of the U.S. Census Bureau and obtained from Schott [2008].

[26] I use the classification of industries developed by Autor et al. [2013], which introduces a minor modification to the SIC 1987 classification. The goal of this modification is to avoid situations in which tradable SIC industries are not the main industry for any HS code and thus report zero trade.

[27] In some cases the CBP data reports ranges instead of precise employment values for some industry-county pairs in the interest of confidentiality. Autor et al. [2013]'s develop a procedure to impute employment to these cells.

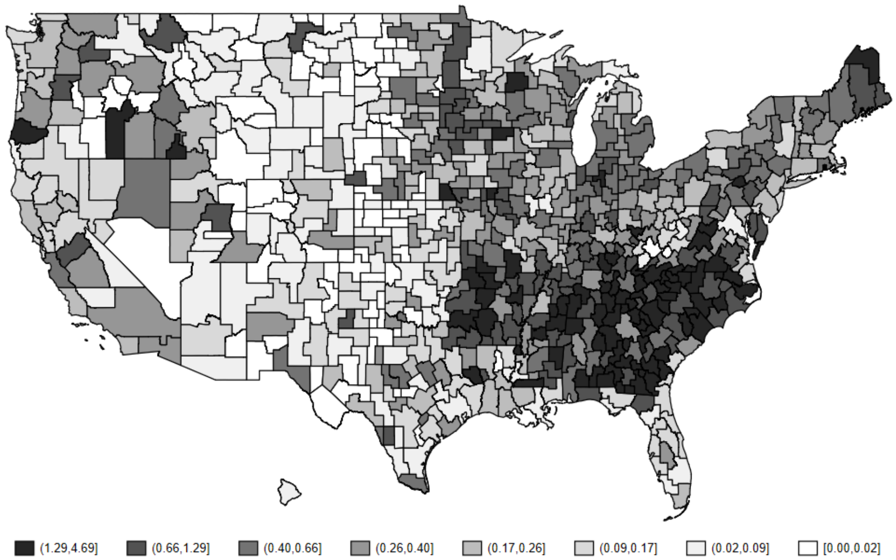
[28] I construct HS 6 -digit tariffs for Mexico to then match these to SIC codes. Note that HS codes are not internationally equivalent at any level more disaggregated than HS6. No weights are used to average tariffs by HS6 codes, given that Mexico's trade flows by HS8 (according to the Mexican HS classification) are not available for 1990.

Mexican tariff cuts. The correlation coefficient between these two measures is 0.72. This high correlation underscores the importance of including in the analysis both Mexico's and the U.S.' tariff cuts.

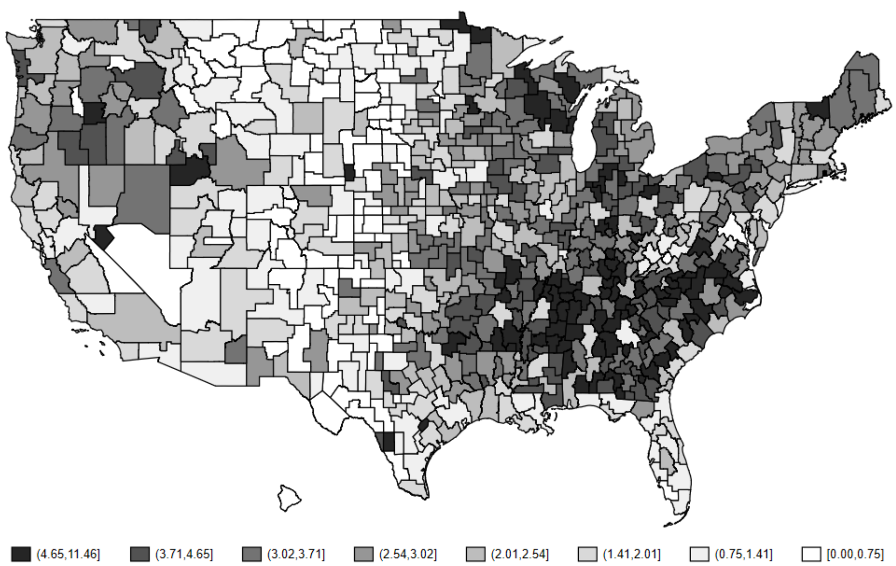
Panel A in Figure 1 maps the measure of regional exposure to U.S. tariff cuts. The largest reductions in U.S. tariffs impact commuting zones in the South Atlantic region and to a lesser extent in the North Atlantic and the Midwest. Panel B shows the regional variation in exposure to Mexico's tariff cuts and reflects the high correlation in regional exposure to U.S. and Mexico's tariff liberalization. While the analysis in the paper only uses measures of regional exposure to tariffs in 1990 and 2000, Appendix Table A.6 gives a sense of the evolution of tariffs over time. It tabulates the mean and various percentiles of the distribution of commuting zone exposure over time. Panels A and B refer to U.S. tariffs, with the difference that panel A implicitly assigns zero tariffs to the nontradable sector, while panel B is based on a weighted average within the traded sector only, as shown by equations (14) and (15) below that table. Both panels indicate that the largest decline in tariffs occurs as soon as the agreement is enacted in January 1st, 1994, and that further tariff cuts lead to almost zero tariffs by 1999. In addition, these panels show the skewness in the distribution of tariff exposure across regions. Panels C and D refer to Mexico's tariffs. While the initial level of tariffs is much higher in Mexico, the largest decline occurs immediately in 1994 and liberalization is almost complete by the late 1990s, as in the case of U.S. tariffs. In addition, Appendix Table A.5 reports summary statistics for the measures of regional exposure to 1990-2000 *changes* in tariffs and Appendix Figure A.1 plots an histogram of the distribution of these tariff cuts. The histograms again emphasize that the distribution of 1990-2000 changes in U.S. tariffs is left-skewed, with a large number of small tariff cuts and a long tail of larger tariff reductions.

Figure 1: Regional Exposure to Changes in Tariffs

Panel A: Commuting Zone Exposure to Change in U.S. Tariffs, 1990-2000



Panel B: Commuting Zone Exposure to Change in Mexico's Tariffs, 1990-2000



Notes: Panel A illustrates differences across commuting zones in exposure to U.S. tariff liberalization (defined in equation (3)) between 1990 and 2000. Panel B (in the next page) illustrates differences across commuting zones in exposure to Mexico's tariff liberalization (defined in equation (5)) between 1990 and 2000. Darker shades indicate larger tariff reductions.

Appendix Table A.7 lists the commuting zones most and least exposed to U.S. and Mexico's tariff liberalization, among the 100 with the largest population in 1990. The most exposed are mostly concentrated among North and South Carolina, a region with a large textile and apparel sector in 1990.[29,30]

[29]Some commuting zones cross state lines, and are assigned to the state in which they have the largest employment.

[30]South Carolina and North Carolina are the two states with the largest share of employment in textile and apparel industries in 1990, with 8.9% and 8.6% respectively.

Specifically, Fayetteville and Greensboro, in North Carolina, are the top two and face a substantially larger shock than the following ones. This is consistent with the map of exposure described earlier. The regions that are most exposed to Mexico's tariff liberalization are more spread out throughout the U.S. However, Greensboro and Fayetteville are also the two most exposed to this shock. The reason is that in 1990 these two commuting zones had a large textile sector and both the U.S. and Mexico reduced textile tariffs substantially. Washington DC, in contrast, is among the least exposed to both U.S. and Mexico's tariff cuts.

I also examine the variation across industries that generates the variation in regional exposure described earlier. Panel A in Appendix Table A.8 lists the 20 SIC 4-digit manufacturing industries most exposed to U.S. tariff cuts. Most of these industries belong to the textile sector, and received tariff cuts of between 34 and 11 percentage points. Panel B lists the 20 industries most exposed to Mexico's tariff liberalization. In this case there is more variety across sectors, with industries related to tobacco and cigar manufacturing being 4 out of the top 5 with the largest tariff cuts. Some industries related to wood and paper manufacturing and textiles were also among the most exposed to Mexico's tariff liberalization. Note that some of the industries in the textile sector appear in both lists, facing large tariff cuts from both the U.S. and Mexico.

Tariff liberalization and trade flows A pertinent question is whether U.S. tariff cuts increased U.S. imports from Mexico, and whether Mexico's tariff cuts increased U.S. exports to Mexico. In Appendix A.7, I show that this is indeed the case. Using product by country level data, I show that between 1990 and 2000 there was a 33% increase in U.S. imports from Mexico relative to the rest of the world in industries with initial high (i.e., above-median) tariff levels relative to other industries.[31] I also report a 24% increase in U.S. exports to Mexico relative to the rest of the world in industries with initial high tariff levels relative to other industries between 1990 and 2000.

Initial commuting zone characteristics The analysis includes a set of initial commuting zone variables measured in 1990, drawn from Autor et al. [2013] and used as control variables. These are the share of population employed in manufacturing, the share of college-educated population, the fraction of foreign born population, the share of the female population that is employed, the share of routine employment, and an index of the offshorability of the occupations in each commuting zone.

Growth in Chinese import competition During the time period under study, the U.S. labor market also faced rising import competition from China. I include in the analysis Autor et al. [2013]'s measure

[31] This is consistent with the analysis in Romalis [2007].

of commuting zone exposure to this shock during 1990-2000:

$$\Delta \text{IPW}_{ui} = \sum_j \frac{L_{ij}}{L_{uj}} \frac{\Delta M_{ucj}}{L_i}. \tag{7}$$

In this expression, ΔM_{ucj} stands for the change in industry-level imports between 1990 and 2000, L_{ij} stands for employment in industry j in region i in 1990, L_{uj} stands for total employment in industry j in 1990, and L_i stands for total employment in region i in 1990. Unobserved shocks could have an impact on both U.S. local labor market outcomes and on imports, so following Autor et al. [2013] I use the following instrument to isolate the component due to supply shocks, stemming from China's rising productivity and transition to a market-oriented economy. This instrument is defined as a weighted average of 1990-2000 growth in industry-level imports from China by eight developed countries other than the U.S., ΔM_{ocj}.[32]

$$\Delta \text{IPW}_{oi} = \sum_j \frac{L_{ij,1980}}{L_{uj,1980}} \frac{\Delta M_{ocj}}{L_{i,1980}}. \tag{8}$$

Differently than in equation (7), employment is computed for 1980, to prevent a simultaneity bias resulting from commuting zone employment potentially being a function of anticipated Chinese imports. These variables are described by Autor et al. [2013] in detail.[33] Appendix Table A.9 reports summary statistics for these variables.

3. NAFTA and Manufacturing Employment

To assess the impact of NAFTA on manufacturing employment in U.S. local labor markets, I estimate regressions of the following form using OLS:

$$\Delta L_i^m = \beta_1 \Delta \tau_i^{U.S.} + \beta_2 \Delta \tau_i^{MEX} + X_i' \beta_3 + \epsilon_i. \tag{9}$$

The dependent variable is the change between 1990 and 2000 in the share of manufacturing employment in the working-age population in commuting zone i. $\Delta \tau_i^{U.S.}$ stands for the regional exposure to changes in U.S. tariffs toward Mexico between 1990 and 2000, with alternative defintions in equations (1) and (3). $\Delta \tau_i^{MEX}$ represents exposure to changes in Mexican tariffs toward the U.S. during the same period, as defined in (4) or (5). The term X_i' contains a set of controls capturing the economic charac-

[32] Specifically, this measure considers Chinese imports by Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland, based on data availability.

[33] These measures are constructed using HS 6-digit trade flows from UN Comtrade for 1990 and 2000, which are then translated to 4-digit SIC codes. Employment weights are computed using the CBP data described earlier, assigning counties to commuting zones.

teristics of each commuting zone in 1990, as well as dummy variables for nine census divisions. The sample consists of the 722 commuting zones in the continental U.S. Observations are weighted by each commuting zone's initial population in 1990. Standard errors are clustered at the state level. This regression resembles the main specification in Autor et al. [2013] but with measures of exposure to tariff liberalization as the regressors of interest.[34]

Table 1 reports the baseline results. Columns 1 and 2 include only a measure of exposure to U.S. tariff cuts, $\Delta\tau_i^{U.S.}$. In column 1, this measure weighs industry tariffs by Mexico's revealed comparative advantage (as defined in equation (3)). The measure of exposure in column 2 does not include this adjustment (see equation (1)). Both columns show that regions with higher exposure to tariff cuts see a relative decline in the share of manufacturing employment in the working-age population. The magnitude is similar in both cases. The coefficient in column 1 indicates that commuting zones at the 75th percentile of exposure experience a decline of 0.15 percentage points in the manufacturing employment share of the population relative to commuting zones at the 25th percentile.[35] The coefficient in the second column implies a 0.16 p.p. relative decline.

Columns 3 and 4 add the commuting zone exposure to Mexican tariff changes, $\Delta\tau_i^{MEX}$. The measure of exposure to Mexico's tariff liberalization is weighted by U.S. revealed comparative advantage in column 3 but not in column 4. The coefficient on the exposure to U.S. tariff cuts changes very little in comparison to columns 1 and 2. In both columns 3 and 4, reductions in Mexico's tariffs toward the U.S. show no statistically significant impact on the share of manufacturing employment in the working-age population.

Next, columns 5 and 6 add Autor et al. [2013]'s measure of rising import competition from China, defined in equation (7). In this case, I estimate equation (9) using two-stage least squares. I use the same instrument as Autor et al. [2013], regional exposure to rising imports from China by other non-U.S. developed countries, defined in equation (8). This is essentially the same specification used in Autor et al. [2013]. The only difference, other than the inclusion of exposure to NAFTA tariff cuts, is that Autor et al. [2013] stack differences between 1990-2000 and 2000-2007. Here, I focus on the period 1990-2000. The first stage estimates are shown in Appendix Table A.11 and indicate that U.S.

[34]Consistent with most of the literature, I do not include a measure of regional exposure to the initial 1990 tariff level in the regression. First, it would be redundant, since the correlation between a measure of regional exposure to the initial 1990 tariff level and the measure of regional exposure to the 1990-2000 change in tariffs is -0.998 for the U.S. and -0.997 for Mexico. A possible reason to include a measure of exposure to the initial 1990 tariff level would be to control for anticipation effects in industries not fully liberalized by 2000. This is not a concern since liberalization was practically complete by 2000. In year 2000, the average (employment-weighted) tariff across tradable industries was 0.13% for U.S. tariffs and 1.3% for Mexican tariffs. Note, however, that I find similar results when including a measure of regional exposure to the initial 1990 tariff level.

[35]The 75th and 25th percentiles of the distribution of the measure of regional exposure to U.S. tariff cuts are -0.167 and -0.419, as shown in the first row in Appendix Table A.5. The difference between these two numbers, times the regression coefficient 0.597, is 0.15.

imports from China are highly correlated to Chinese imports by the set of other developed countries. Back to the 2SLS second-stage estimates in Table 1, in column 5 the measures of exposure to tariff liberalization weigh industry-level tariffs by revealed comparative advantage, while in column 6 they do not. The results show that the negative impact of U.S. tariff cuts on the manufacturing employment to population ratio persists after controlling for rising import competition from China. The magnitude of this effect is very close to that found in columns 1 through 4. Note also that, as Autor et al. [2013] found, rising import competition has a negative effect on commuting zone manufacturing employment. This effect, however, is not statistically significant at conventional levels during the period 1990-2000. This is not a result of controlling for tariff liberalization. Panel A in Appendix Table A.12 replicates Autor et al. [2013]'s main specification focusing exclusively on the period 1990-2000, without including measures of exposure to NAFTA tariff liberalization, finding a similar result.[36] In other words, Autor et al. [2013]'s result is driven primarily by the 2000-2007 period, even though in both the 1990-2000 and 2000-2007 periods there is substantial evidence of an impact of Chinese import competition on manufacturing employment.

The first three colums in Appendix Table A.13 report results using an alternative definition of regional exposure to tariff cuts based only on variation in tariffs within the tradable sector (see equations (11) and (12) in Appendix A.6). The results are extremely similar to the baseline results discussed above; the coefficient in column 3 indicates that commuting zones at the 75th percentile of exposure experience a decline of 0.13 percentage points in the manufacturing employment share of the population relative to commuting zones at the 25th percentile. This is comparable to the 0.15 p.p. relative decline based on column 5 in Table 1 under the baseline tariff liberalization exposure measure.

How can these estimates of the impact of NAFTA on U.S. manufacturing employment be benchmarked? During the period 1990-2000 the mean tariff change across commuting zones based on the baseline definition in equation (3) was -0.41. Using the coefficient of 0.59 of column 5 in Table 1, this implies a decline of 0.25 percentage points in the share of manufacturing employment in the population. Over this period, this share went from 12.7 to 10.5 (a decline of 2.2 percentage points). This implies that U.S. tariff cuts toward Mexico account for 12% of the decline in the manufacturing employment to population ratio. This approach, however, uses relative effects obtained from the cross-regional empirical strategy to infer absolute effects. An alternative is to use a general equilibrium model to infer the impact of NAFTA, such as in Caliendo and Parro [2015].

Appendix Table A.14 examines the stability of the previous estimates to different sets of control

[36] The difference with Table 2 in Autor et al. [2013] in which they break down results by decade is that here all the control variables are included.

Table 1: NAFTA Tariff Liberalization and Change in Share of Manufacturing Employment in the Working-Age Population

Dependent Variable: Change in manufacturing emp/working-age pop (in % pts)						
	OLS (RCA-weighted)	OLS	OLS (RCA-weighted)	OLS	2SLS (RCA-weighted)	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\tau^{US}$	0.597**	0.755**	0.582**	0.748**	0.591**	0.756**
	(0.261)	(0.315)	(0.254)	(0.316)	(0.242)	(0.306)
$\Delta\tau^{MEX}$			0.107	0.022	0.088	0.003
			(0.177)	(0.140)	(0.172)	(0.137)
ΔIPW					-0.169	-0.129
					(0.169)	(0.173)
Percentage of employment in manufacturing$_{1990}$	-0.053***	-0.048**	-0.040	-0.045	-0.031	-0.039
	(0.018)	(0.021)	(0.028)	(0.027)	(0.029)	(0.028)
Percentage of college-educated population$_{1990}$	0.000	-0.005	-0.001	-0.006	0.001	-0.004
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Percentage of foreign-born population$_{1990}$	-0.008	-0.005	-0.008	-0.005	-0.004	-0.003
	(0.013)	(0.014)	(0.013)	(0.014)	(0.013)	(0.013)
Percentage of employment among women$_{1990}$	0.025	0.020	0.027	0.020	0.030	0.023
	(0.028)	(0.028)	(0.027)	(0.028)	(0.025)	(0.026)
Percentage of employment in routine occupations$_{1990}$	-0.176***	-0.186***	-0.177***	-0.186***	-0.186***	-0.193***
	(0.056)	(0.055)	(0.056)	(0.055)	(0.056)	(0.054)
Average offshorability index of occupations$_{1990}$	-0.686*	-0.578	-0.701*	-0.581	-0.706**	-0.585
	(0.370)	(0.375)	(0.370)	(0.378)	(0.360)	(0.366)
Census division dummies	Yes	Yes	Yes	Yes	Yes	Yes

Notes: $N = 722$. This table reports the results of the estimation of equation (9). The dependent variable is the change in manufacturing employent as a share of the working-age population. In columns 1, 3 and 5, the measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). In columns 2, 4 and 6, the measures of exposure to tariff liberalization do not weigh tariffs by revealed comparative advantage, as defined by equations (1) and (4). Columns 1 through 4 are estimated by OLS. In columns 5 and 6, estimated by 2SLS, growth in Chinese imports (ΔIPW_{ui}, defined in equation (7)) is instrumented by growth in Chinese exports to non-U.S. high-income markets (defined in equation (8)). Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

variables.[37] The first column excludes all the control variables in X_i'. These are introduced sequentially in columns 2 through 5. Column 2 adds the fraction of the population employed in manufacturing in 1990. This is a first step toward adressing the concern that the coefficient on the measure of exposure to tariff cuts might be capturing long-run trends in manufacturing employment (issue which is addressed further below). The negative coefficient on this control variable implies a decline in manufacturing employment in commuting zones with a higher initial level. Column 3 adds the percentage of college-educated population, the percentage of foreign born population, and the percentage of employment among women, all measured in 1990. Column 4 adds the fraction of initial employment in routine occupations and the average offshorability of occupations. The share of routine occupations captures the possibility that the decline in manufacturing employment is driven by technological change, given that routine occupations are more susceptible to be substituted by automation. Finally, column 5 adds census division dummies and is equivalent to column 5 in Table 1. Throughout all columns, the magnitude of the impact of exposure to U.S. tariff cuts is fairly stable and statistically significant. The inclusion of census division dummies, which further control for trends in manufacturing employment, reduces the estimated coefficients compared to the previous columns.

One concern with this estimation strategy is that the estimates could be the result of omitted trends, given the long-run decline in manufacturing employment in the U.S. While the census division dummies in this regression in first differences do control for trends, there could be trends varying at a more local level, by state or commuting zone. Following Autor et al. [2013], to verify that the results are not driven by omitted trends, I estimate regression (9) with *past* changes in manufacturing employment as the dependent variable. The results in Appendix Table A.15 rule out the concern of omitted trends, as they indicate that NAFTA tariff cuts are not correlated to changes in the lagged change in the share of manufacturing employment in the population during either 1980-1990, 1970-1980, or 1970-1990.[38]

Having established a negative impact of U.S. tariff cuts in manufacturing employment overall, I now turn to exploring these effects for different subgroups of the population based on education, gender and age. In Table 2, the dependent variables are the change in the share of manufacturing employment over the working-age population among either those with or without college education. For noncollege individuals, the negative impact of tariff cuts on manufacturing employment is larger than that previously reported for the entire population. Commuting zones at the 75th percentile of exposure experience a decline of 0.20 percentage points in the manufacturing employment share of the working-age popula-

[37] Appendix Table A.14 uses the measures of exposure to tariff liberalization that weigh industry-level tariffs by revealed comparative advantage (see equations (3) and (5)).

[38] Appendix Table A.15 uses the measures of exposure to tariff liberalization that weigh industry-level tariffs by revealed comparative advantage (see equations (3) and (5)).

Table 2: NAFTA Tariff Liberalization and Change in Share of Manufacturing Employment in the Working-Age Population by Education Level

Dependent Variable: Change in manufacturing emp/working-age pop (in % pts)

	Noncollege				College			
	OLS		2SLS		OLS		2SLS	
	(RCA-weighted) (1)	(2)	(RCA-weighted) (3)	(4)	(RCA-weighted) (5)	(6)	(RCA-weighted) (7)	(8)
$\Delta\tau^{US}$	0.801***	1.058***	0.811***	1.065***	-0.041	-0.125	-0.040	-0.123
	(0.289)	(0.338)	(0.274)	(0.327)	(0.259)	(0.329)	(0.251)	(0.318)
$\Delta\tau^{MEX}$	0.189	0.076	0.167	0.057	-0.094	-0.218	-0.095	-0.224
	(0.190)	(0.139)	(0.187)	(0.138)	(0.195)	(0.169)	(0.184)	(0.159)
ΔIPW			-0.189	-0.126			-0.011	-0.042
			(0.162)	(0.160)			(0.222)	(0.223)

Notes: $N = 722$. This table reports the results of the estimation of equation (9). The dependent variables are the change in manufacturing employent as a share of the working-age population among individuals with no college education (columns 1-4) or with college education (columns 5-8). In columns 1, 3, 5, and 7 the measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). In columns 2, 4, 6, and 8 the measures of exposure to tariff liberalization do not weigh tariffs by revealed comparative advantage, as defined by equations (1) and (4). Columns 1-2 and 5-6 are estimated by OLS. In columns 3-4 and 7-8, estimated by 2SLS, growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

tion relative to commuting zones at the 25th percentile.[39] In contrast, the impact for college individuals has the opposite sign, but is smaller and not statistically significant. The results also indicate that, as in the overall case, Mexican tariff cuts do not have a large nor statistically significant impact on U.S. manufacturing employment for these subgroups.[40] Finally, the fact that the impact of U.S. tariff cuts on manufacturing employment is larger for those with lower educational attainment is similar to the response observed for rising import competition from China.

Next, the first four columns in Table 3 display impacts by gender.[41] The results are striking. The effect of U.S. tariff liberalization on the manufacturing employment to population ratio is negative, large and statistically significant for women, and much smaller and not statistically significant among

[39] This magnitude is based on column 3, which uses measures of exposure to tariff liberalization that weigh industry-level tariffs by revealed comparative advantage (see equations (3) and (5)), and which controls for rising import competition from China.

[40] Columns 4 through 9 in Appendix Table A.13 report the results for those with or without college education using the alternative definition of regional exposure to tariff cuts based only on variation in tariffs within the tradable sector (see equations (11) and (12) in Appendix A.6). This yields very similar results. For example, the impact of U.S. tariff liberalization for noncollege individuals is such that commuting zones at the 75th percentile of exposure face a decline of 0.21 percentage points in the manufacturing employment share of the working-age population relative to commuting zones at the 25th percentile. This is comparable to the 0.20 p.p. relative decline found under the baseline measure of exposure to U.S. tariff liberalization.

[41] Table 3 uses the measures of exposure to tariff liberalization that weigh industry-level tariffs by revealed comparative advantage (see equations (3) and (5)).

men. For women, commuting zones at the 75th percentile of exposure experience a decline of 0.34 percentage points in this outcome relative to commuting zones at the 25th percentile. In this regard, there is a similarity with exposure to increasing Chinese import competition, which also impacts women much more than men during 1990-2000. Note that Autor et al. [2013] show that stacking 1990-2000 and 2000-2007 the disproportionate impact of the "China shock" on women disappears; this pattern is only found in the 1990-2000 period and also holds after removing measures of tariff exposure from the regression. This is seen in columns 4 and 5 in panel A in Appendix Table A.12, which replicates Autor et al. [2013]'s analysis restricted to the 1990-2000 period. Finally note that Mexican tariff cuts did not impact women and men differently.

In the next six columns in Table 3 the results are displayed separately by age groups. I divide the population into those aged 16-34, 35-49, and 50-64. The impact of U.S. tariff cuts on the manufacturing employment to population ratio is negative among all age groups and statistically siginificant for the older two (35-49 and 50-64). The estimated coefficient is larger among those aged 35-49, for which commuting zones at the 75th percentile of exposure experience a 0.15 percentage point decline in the manufacturing employment to population ratio relative to commuting zones at the 25th percentile of exposure. This interquartile difference is 0.12 percentage points for the 50-64 group. In contrast, Mexico's tariff cuts did not have a statistically significant impact on any age group, nor did rising imports from China during this period.

4. The Impact of NAFTA Beyond Manufacturing

This section examines a set of additional outcomes to shed light on the adjustment of commuting zones to tariff liberalization beyond the decline in the manufacturing employment share of the working-age population documented earlier. The first outcome is population. Table 4 shows the results of estimating equation (9) with the log change in working-age population in each commuting zone as the dependent variable.[42] Clearly, the exposure to both U.S. and Mexico's tariffs did not have a statistically significant impact on commuting zone population. The coefficients are similar between columns 1 (with exposure measures weighted by revealed comparative advantage) and column 2 (without these weights). Columns 3 and 4 add the change in Chinese import competition. The coefficients on the measures of exposure to tariff cuts remain stable. These columns also show that rising Chinese import competition does not lead to significant changes in commuting zone population, as discussed by Autor et al. [2013]. This finding echoes a number of studies, which, in different contexts, have found that migration is fairly

[42]The working-age population consists of individuals aged 16-64.

Table 3: NAFTA Tariff Liberalization and Change in Share of Manufacturing Employment in the Working-Age Population by Gender and by Age

Dependent Variable: Change in manufacturing emp/working-age pop (in % pts)

	By Gender				By Age					
	Female		Male		16-34		35-49		50-64	
	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	OLS (5)	2SLS (6)	OLS (7)	2SLS (8)	OLS (9)	2SLS (10)
$\Delta\tau^{US}$	1.313***	1.341***	-0.159	-0.169	0.468	0.476	0.597*	0.610**	0.467**	0.472**
	(0.223)	(0.203)	(0.319)	(0.312)	(0.341)	(0.325)	(0.320)	(0.303)	(0.222)	(0.220)
$\Delta\tau^{MEX}$	0.070	0.011	0.129	0.152	0.053	0.034	0.076	0.048	0.196	0.185
	(0.153)	(0.157)	(0.236)	(0.218)	(0.230)	(0.219)	(0.251)	(0.249)	(0.158)	(0.158)
ΔIPW		-0.509***		0.194		-0.155		-0.240		-0.096
		(0.136)		(0.261)		(0.234)		(0.171)		(0.164)

Notes: N = 722. This table reports the results of the estimation of equation (9). The dependent variable is the change in manufacturing employent as a share of the working-age population by gender (columns 1-4) or by age-groups (columns 5-10). The measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). Columns 1, 3, 5, 7 and 9 are estimated by OLS. In columns 2, 4, 6, 8 and 10, estimated by 2SLS, growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table 4: NAFTA Tariff Liberalization and Change in Working-Age Population

Dependent Variable: Change in log population counts (in log points)

	OLS (RCA-weighted) (1)	OLS (2)	2SLS (RCA-weighted) (3)	2SLS (4)
$\Delta\tau^{US}$	-0.647	-0.549	-0.703	-0.607
	(0.979)	(1.061)	(0.969)	(1.030)
$\Delta\tau^{MEX}$	0.619	-0.583	0.739	-0.441
	(0.819)	(0.775)	(0.788)	(0.727)
ΔIPW			1.031	0.965
			(0.768)	(0.752)

Notes: $N = 722$. This table reports the results of the estimation of equation (9). The dependent variable is the log change in the working-age population. In columns 1 and 3, the measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). In columns 2 and 4, the measures of exposure to tariff liberalization do not weigh tariffs by revealed comparative advantage, as defined by equations (1) and (4). Columns 1 and 3 are estimated by OLS. In columns 2 and 4, estimated by 2SLS, growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

unresponsive to economic shocks.[43]

The results in the previous section document a decline in the manufacturing employment to population ratio as a result of U.S. tariff liberalization. Because there is no statistically signicant change in commuting zone population, this must be compensated by an increase in employment in nonmanufacturing sectors, unemployment, and/or the share of individuals not in the labor force. Table 5 estimates equation (9) with the changes in each of these outcomes as dependent variables.[44] All these outcomes are expressed as a share of commuting zone population. Panel A refers to all types of workers. Columns 1 and 2 refer to the share of manufacturing employment and are equivalent to columns 3 and 5 in Table 1 discussed earlier. Columns 3 and 4 refer to nonmanufacturing employment as a share of working-age population. Column 3 is estimated by OLS and includes changes in exposure to both U.S. and Mexico's tariff cuts. Column 4 adds growth in Chinese imports and is estimated by 2SLS. The sign of the coefficients on regional exposure to changes in U.S. tariffs implies that tariff cuts lead to an increase in employment in nonmanufacturing industries, but the coefficients are not statistically significant. There is also no statistically significant association between nonmanufacturing employment and exposure to

[43] For example, Yagan [2019] and Molloy et al. [2011] document that geographic mobility was not a relevant adjustment mechanism in response to the 2007-2008 Great Recession.

[44] Table 5 uses the measures of exposure to tariff liberalization that weigh industry-level tariffs by revealed comparative advantage (see equations (3) and (5)). Appendix Table A.16 is equivalent but using measures of exposure to tariff liberalization without these weights (see equations (1) and (4)). Finally, Appendix Table A.17 is equivalent to Table 5 but using an alternative definition of regional exposure to tariff cuts based only on variation in tariffs within the tradable sector (see equations (11) and (12) in Appendix A.6). The results are quite similar, as I discuss in more detail in Appendix A.6.

Mexico's tariff cuts, nor to the growth in Chinese import competition. I will show later that while tariff liberalization does not have a meaningful effect on nonmanufacturing employment as a whole, there are very different underlying impacts on various industries within nonmanufacturing. Columns 5 and 6 report the results for total employment, so the coefficients are equal to the sum of those obtained for manufacturing and nonmanufacturing employment. These columns show that U.S. tariff liberalization leads to a statistically significant decline in employment. Commuting zones at the 75th percentile of exposure experience a relative loss of 0.1 percentage points in the employment to population ratio relative to regions at the 25th percentile of exposure.

Next, columns 7 (OLS) and 8 (2SLS) in Table 5 study unemployment (as a share of the working-age population). U.S. tariff cuts clearly lead to increases in unemployment. Regions at the 75th percentile of exposure see a rise in unemployment of 0.05 percentage points relative to regions at the 25th percentile of exposure. Note also that Mexico's tariff cuts do not have a statistically significant impact on U.S. unemployment, nor does the growth in Chinese import competition during this period.[45] Finally, in columns 9 (OLS) and 10 (2SLS) the dependent variable is the change in the number of individuals not in the labor force as a fraction of the working-age population. There is no statistically significant impact of U.S. tariffs on this outcome. There is some evidence, however, that Mexico's tariff cuts are associated to an increase in the share of U.S. population out of the labor force. These coefficients, however, are barely statistically significant (p-value 0.96) and are not robust to other tariff measures, as shown in Appendix Table A.16 which replicates Table 5 without weighing tariff exposure by revealed comparative advantage.

Panels B and C in Table 5 divide each of these categories by educational attainment, showing important differences in the adjustment to tariff liberalization. Consider first noncollege individuals in panel B. First, the decline in the share of manufacturing employment in the population in response to U.S. tariffs, in columns 1 and 2, already discussed in the previous section, is stronger than among the entire population. For this group, again I do not observe a statistically significant change in employment in nomanufacturing industries (columns 3 and 4). Adding up, the total effect on employment is statistically significant and indicates a relative decline of 0.19 percentage points in employment as a fraction of the working-age population for commuting zones in the 75th relative to the 25th percentile of exposure. This magnitude is twice as large than the 0.1 p.p. found for in the overall sample earlier. The increase in unemployment for noncollege workers as a result of U.S. tariff liberalization is also larger than for the population as a whole (columns 5 and 6). Regions at the 75th percentile of exposure see a rise in unemployment of 0.07 percentage points relative to regions at the 25th percentile of exposure. Finally,

[45] Growth in Chinese imports did raise local labor market unemployment over the longer 1990-2007 period [Autor et al., 2013].

U.S. tariff cuts lead to a large increase in the share of noncollege individuals out of the labor force, with a 0.12 percentage point difference between regions at the 75th and 25th percentiles of exposure. There is no significant impact of Mexican tariff cuts on most of these outcomes.[46] In contrast, for college workers (panel C) all results point to a lack of a significant response to both U.S. and Mexico's tariff cuts. This portraits a very uneven impact of NAFTA across the college vs. noncollege population.

The next set of results breaks down impacts by gender. Among women, in panel A in Table 6, the decline in the manufacturing employment to working-age population ratio is coupled with a large and statistically significant increase in the share of the population employed in nonmanufacturing industries, unemployed, and out of the labor force.[47] Column 4 indicates that the share of nonmanufacturing employment to population ratio increases by 0.1 percentage points in a region at the 75th relative to the 25th percentiles of exposure. This increase in nonmanufacturing employment is not enough to compensate for the losses in manufacturing, so total employment as a share of the population falls by a very large 0.24 percentage points at the 75th relative to the 25th percentiles of exposure. Among male workers (see panel B in Table 6), there is an increase in unemployment due to U.S. tariff cuts, similar in magnitude to that for women, but no siginificant changes in employment. In addition, among men, U.S. tariff cuts cause a fall in the share of the population out of the labor force, which is the opposite that was found for women. An analysis using longitudinal data could perhaps shed more light on this difference.

Appendix Table A.18 shows interesting differences in the adjustment to U.S. tariff liberalization across age groups.[48] Among individuals aged 16-34, the only statistically significant effect is an increase in employment in nonmanufacturing industries as a share of the working-age population. Those aged 35-49 and 50-64 see a similar decline in manufacturing employment, and no increase in nonmanufacturing employment. The oldest group faces the largest decline in total employment, such that the employment to working-age population ratio falls by 0.26 p.p. at the 75th relative to the 25th percentile of exposure to U.S. tariff liberalization. While the increase in unemployment is larger among the middle-aged (those in the 35-49 group), older workers see a larger increase in labor force nonparticipation.

An understudied aspect in the literature is the differential impact of trade shocks by race. As I discussed in the introduction, while in other contexts the literature has examined differential effects by skill or gender, this is the first paper to look at differential effects by race in the U.S. To this end, I split the

[46] The exception is the finding that lower Mexican tariffs are associated to an increase in labor force nonparticipation, which is unintuitive.

[47] Table 6 uses the measures of exposure to tariff liberalization that weigh industry-level tariffs by revealed comparative advantage (see equations (3) and (5)).

[48] Appendix Table A.18 uses the measures of exposure to tariff liberalization that weigh industry-level tariffs by revealed comparative advantage (see equations (3) and (5)).

Table 5: NAFTA Tariff Liberalization and Change in Employment Status in the Working-Age Population

Dependent Variable: Change in population shares by employment status (in % pts)

	Manufacturing		Nonmanufacturing		Employment		Unemployment		Not in the Labor Force	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: All education levels										
$\Delta\tau^{US}$	0.582**	0.591**	-0.196	-0.205	0.386*	0.386*	-0.190**	-0.187**	-0.196	-0.199
	(0.254)	(0.242)	(0.188)	(0.178)	(0.196)	(0.199)	(0.076)	(0.078)	(0.162)	(0.163)
$\Delta\tau^{MEX}$	0.107	0.088	0.094	0.115	0.201	0.202	0.046	0.038	-0.247*	-0.240*
	(0.177)	(0.172)	(0.193)	(0.189)	(0.166)	(0.158)	(0.076)	(0.069)	(0.147)	(0.144)
ΔIPW		-0.169		0.179		0.010		-0.068		0.058
		(0.169)		(0.207)		(0.198)		(0.086)		(0.146)
Panel B: No college education										
$\Delta\tau^{US}$	0.801***	0.811***	-0.043	-0.051	0.757***	0.760***	-0.290***	-0.284***	-0.467**	-0.476**
	(0.289)	(0.274)	(0.206)	(0.195)	(0.264)	(0.265)	(0.101)	(0.104)	(0.217)	(0.219)
$\Delta\tau^{MEX}$	0.189	0.167	0.140	0.156	0.328	0.323	0.056	0.043	-0.384*	-0.366*
	(0.190)	(0.187)	(0.269)	(0.261)	(0.223)	(0.213)	(0.081)	(0.073)	(0.194)	(0.192)
ΔIPW		-0.189		0.142		-0.047		-0.111		0.158
		(0.162)		(0.233)		(0.250)		(0.111)		(0.176)
Panel C: College education										
$\Delta\tau^{US}$	-0.041	-0.040	-0.097	-0.107	-0.138	-0.147	-0.056	-0.055	0.193	0.202
	(0.259)	(0.251)	(0.248)	(0.244)	(0.218)	(0.215)	(0.085)	(0.083)	(0.222)	(0.216)
$\Delta\tau^{MEX}$	-0.094	-0.095	0.043	0.066	-0.051	-0.030	0.024	0.023	0.026	0.007
	(0.195)	(0.184)	(0.176)	(0.163)	(0.156)	(0.149)	(0.082)	(0.076)	(0.168)	(0.162)
ΔIPW		-0.011		0.191		0.179		-0.010		-0.169
		(0.222)		(0.184)		(0.152)		(0.063)		(0.143)

Notes: $N = 722$. This table reports the results of the estimation of equation (9). The dependent variables are the change in the share in the working-age population of manufacturing employent (columns 1-2), of nonmanufacturing employent (columns 3-4), of total employment (columns 5-6), of unemployment (columns 7-8) and of the number of individuals not in the labor force (columns 9-10). The measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). Columns 1, 3, 5, 7 and 9 are estimated by OLS. In columns 2, 4, 6, 8 and 10, estimated by 2SLS, growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table 6: NAFTA Tariff Liberalization and Change in Employment Status in the Working-Age Population by Gender

Dependent Variable: Change in manufacturing emp/working-age pop (in % pts)

	Manufacturing		Nonmanufacturing		Employment		Unemployment		Not in the Labor Force	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Female										
$\Delta\tau^{\text{US}}$	1.313***	1.341***	-0.392**	-0.398**	0.921***	0.943***	-0.169***	-0.165**	-0.752***	-0.778***
	(0.223)	(0.203)	(0.192)	(0.180)	(0.190)	(0.193)	(0.062)	(0.065)	(0.174)	(0.183)
$\Delta\tau^{\text{MEX}}$	0.070	0.011	0.025	0.036	0.095	0.047	0.004	-0.005	-0.099	-0.042
	(0.153)	(0.157)	(0.204)	(0.203)	(0.151)	(0.160)	(0.068)	(0.063)	(0.147)	(0.164)
ΔIPW		-0.509***		0.095		-0.414**		-0.074		0.488***
		(0.136)		(0.192)		(0.180)		(0.068)		(0.169)
Panel B: Male										
$\Delta\tau^{\text{US}}$	-0.159	-0.169	0.019	0.005	-0.140	-0.164	-0.208*	-0.205*	0.348*	0.369*
	(0.319)	(0.312)	(0.228)	(0.222)	(0.237)	(0.255)	(0.113)	(0.113)	(0.202)	(0.211)
$\Delta\tau^{\text{MEX}}$	0.129	0.152	0.163	0.191	0.292	0.343	0.088	0.081	-0.380	-0.424**
	(0.236)	(0.218)	(0.222)	(0.217)	(0.243)	(0.224)	(0.097)	(0.089)	(0.227)	(0.212)
ΔIPW		0.194		0.241		0.435		-0.058		-0.377
		(0.261)		(0.263)		(0.297)		(0.121)		(0.229)

Notes: $N = 722$. This table reports the results of the estimation of equation (9). The dependent variables are the change in the share in the working-age population of manufacturing employent (columns 1-2), of nonmanufacturing employent (columns 3-4), of total employment (columns 5-6), of unemployment (columns 7-8) and of the number of individuals not in the labor force (columns 9-10) by gender. The measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). Columns 1, 3, 5, 7 and 9 are estimated by OLS. In columns 2, 4, 6, 8 and 10, estimated by 2SLS, growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

population into white and nonwhite individuals.[49] Table 7 shows these results.[50] Columns 1 and 2 in panel A indicate that the effect of U.S. tariff liberalization on the decline in manufacturing employment between white and nonwhite workers is similar.[51] The impact of U.S. tariff cuts on nonmanufacturing employment (in columns 3 and 4), however, is radically different across racial groups, although the coefficients are not statistically significant in both cases. The sign of the coefficients indicate U.S. tariff cuts lead to an increase in nonmanufacturing employment among whites, and a decline among nonwhites. Columns 5 and 6 report the impact on total employment for each group. These coefficients are the sum of those for the manufacturing and nonmanufacturing population shares. Among nonwhites, U.S. tariff liberalization leads to a large decline in employment, such that regions at the 75th percentile of exposure experience a 0.22 percentage point decline relative to regions at the 25th percentile. In contrast, the effect is negative but smaller (0.07 p.p.) and statistically insignificant for white individuals.

This difference in the effect of NAFTA on employment across racial wage groups translates into large differences in the impact on unemployment (see columns 7 and 8). The increase in unemployment as a share of the population is four times larger for nonwhites than for whites. During 1990-2000, exposure to rising Chinese imports also has differential impacts by race, and leads to an increase in unemployment among nonwhite workers only, while the effects are not statistically significant for employment outcomes. Finally, the impact of U.S. tariff liberalization on labor force nonparticipation is not statistically significant among either group.

It is worthwhile to separate these effects by educational attainment, given that there are important differences in attainment by race.[52] These results are shown in panels B and C in Table 7. In the noncollege sample (see panel B), the decline in the manufacturing employment to population ratio in response to U.S. tariff cuts is larger among white workers, and statistically significant only for this group. In contrast, the decline in the total employment to population ratio is statistically significant for both groups and 28% larger for nonwhite workers, given a (not statistically significant) decline in nonmanufacturing employment in this group. In line with this, there is also a much larger increase in unemployment rates for nonwhite workers. Regions at the 75th percentile of exposure face a 0.17 percentage point decline in the unemployment to population ratio for nonwhite workers relative to regions at the 25th percentile, compared to a 0.06 p.p. relative decline for white individuals. Differently

[49] I group all nonwhite individuals in a single category because some races have a very small population. At a national level, in the 1990 Census 80% of individuals are classified as white, 12% as black or african american, 3% are asian or pacific islander and 5% belong to other groups. Note that being hispanic is an ethnicity rather than a race.

[50] Table 7 uses the measures of exposure to tariff liberalization that weigh industry-level tariffs by revealed comparative advantage (see equations (3) and (5)).

[51] This effect is statistically significant among white workers, while the p-value is 0.16 among nonwhite individuals. The magnitude is similar in both groups, with a relative decline in manufacturing employment as a share of the population of 0.14 p.p. (for whites) and 0.13 p.p. (for nonwhites) between the 75th and 25th percentiles of exposure.

[52] For instance, 28% of white workers and 20% of nonwhite workers have at least some college education in the 1990 Census.

than with employment and unemployment, U.S. tariff liberalization leads to a statistically significant decline in labor force participation only among white individuals. Last, the results in panel C show that tariff cuts by the U.S. and Mexico do not lead to significant effects on all the outcomes analyzed among college individuals.

Which nonmanufacturing industries expand? The earlier results documented that the U.S. tariff liberalization led to increases in nonmanufacturing employment among women and among young workers. This effect was not statistically significant for the population as a whole, nor in the subsamples of noncollege and college individuals. Nonmanufacturing industries, however, can be quite different between them in terms of skill and pay. Here, I examine further the reallocation of employment toward nonmanufacturing by breaking this sector into five narrower industries. These are construction, transportation and utilities, wholesale and retail trade, other services, and government.

Table 8 reports the results of estimating equation (9) with the change in employment in each of these industries (as a share of the working-age population) as the dependent variable.[53] U.S. tariff liberalization leads to a statistically significant increase in employment in construction and in wholesale and retail trade. Commuting zones at the 75th percentile of exposure experience an increase of 0.042 percentage points in the construction employment share of the working-age population relative to commuting zones at the 25th percentile. This magnitude is 0.038 percentage points for wholesale and retail trade. These coefficients are close to zero and not statistically significant for other nonmanufacturing industries.

Panels B and C in the same table focus on noncollege and college individuals respectively. The case of noncollege workers is similar to that of the overall population, with an increase in employment shares in construction and commerce. Among college workers, U.S. tariff liberalization leads to a statistically significant increase in employment only in the construction industry. Next, Table 9 splits these results by gender.[54] Both among female and male workers, U.S. tariff liberalization is associated to an increase in the construction employment to population ratio. Only among women there is also an increase in employment in wholesale and retail trade.

Overall, these results indicate that displacement from manufacturing leads workers to relocate to the lowest paying service-sector industries.[55]

[53]Table 8 uses the measures of exposure to tariff liberalization that weigh industry-level tariffs by revealed comparative advantage (see equations (3) and (5)).

[54]Table 9 uses the measures of exposure to tariff liberalization that weigh industry-level tariffs by revealed comparative advantage (see equations (3) and (5)).

[55]In the 1990 census, the nonmanufacturing industries with the lowest average wage were wholesale and retail trade, personal services and construction. The average wage in wholesale and retail trade was only 75% of the average in all nonmanufacturing industries.

Table 7: NAFTA Tariff Liberalization and Change in Employment Status in the Working-Age Population by Race

Dependent Variable: Change in population shares by employment status (in % pts)

	Manufacturing		Nonmanufacturing		Employment		Unemployment		Not in the Labor Force	
	Nonwhite	White	Nonwhite	White	Nonwhite	White	Nonwhite	White	Nonwhite	White
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: All education levels										
$\Delta\tau^{US}$	0.508	0.545**	0.360	-0.251	0.868***	0.294	-0.526***	-0.141*	-0.342	-0.153
	(0.360)	(0.240)	(0.341)	(0.206)	(0.333)	(0.193)	(0.186)	(0.084)	(0.352)	(0.152)
$\Delta\tau^{MEX}$	0.285	0.019	-0.439	0.136	-0.154	0.155	-0.110	0.070	0.263	-0.225
	(0.291)	(0.178)	(0.348)	(0.185)	(0.413)	(0.159)	(0.181)	(0.063)	(0.325)	(0.149)
ΔIPW	-0.165	-0.218	-0.296	0.281	-0.460	0.063	0.267*	-0.102	0.193	0.039
	(0.377)	(0.182)	(0.622)	(0.207)	(0.495)	(0.181)	(0.151)	(0.083)	(0.430)	(0.131)
Panel B: No college education										
$\Delta\tau^{US}$	0.493	0.872***	0.554	-0.053	1.047**	0.819***	-0.668***	-0.232**	-0.379	-0.587***
	(0.517)	(0.253)	(0.459)	(0.202)	(0.434)	(0.242)	(0.231)	(0.098)	(0.421)	(0.197)
$\Delta\tau^{MEX}$	0.292	0.067	-0.561	0.274	-0.269	0.341	-0.176	0.085	0.445	-0.426**
	(0.347)	(0.197)	(0.426)	(0.245)	(0.494)	(0.213)	(0.206)	(0.068)	(0.383)	(0.201)
ΔIPW	-0.086	-0.239	-0.101	0.238	-0.187	-0.001	0.012	-0.128	0.175	0.129
	(0.423)	(0.158)	(0.446)	(0.232)	(0.475)	(0.230)	(0.208)	(0.113)	(0.430)	(0.157)
Panel C: College education										
$\Delta\tau^{US}$	0.143	-0.130	0.273	-0.130	0.416	-0.260	-0.354	-0.021	-0.062	0.281
	(0.420)	(0.261)	(0.441)	(0.284)	(0.466)	(0.231)	(0.281)	(0.088)	(0.395)	(0.231)
$\Delta\tau^{MEX}$	0.102	-0.112	-0.489	0.024	-0.388	-0.088	0.147	0.040	0.241	0.047
	(0.346)	(0.189)	(0.448)	(0.205)	(0.430)	(0.168)	(0.220)	(0.070)	(0.430)	(0.178)
ΔIPW	-0.120	-0.075	-0.279	0.304	-0.399	0.229	0.457**	-0.058	-0.059	-0.172
	(0.418)	(0.247)	(0.823)	(0.204)	(0.585)	(0.171)	(0.205)	(0.061)	(0.492)	(0.155)

Notes: $N = 722$. This table reports the results of the estimation of equation (9). The dependent variables are the change in the share in the working-age population of manufacturing employent (columns 1-2), of nonmanufacturing employent (columns 3-4), of total employment (columns 5-6), of unemployment (columns 7-8) and of the number of individuals not in the labor force (columns 9-10) by race. The measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). All regressions are estimated by 2SLS, and growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table 8: NAFTA Tariff Liberalization and Change in Share of Industry Employment in the Working-Age Population

Dependent Variable: Change in industry emp/working-age pop (in % pts)

	Construction (1)	Transportation and Utilities (2)	Wholesale and Retail Trade (3)	Other Services (4)	Government (5)
Panel A: All education levels					
$\Delta\tau^{US}$	-0.165**	0.072	-0.153**	0.019	0.051
	(0.066)	(0.065)	(0.076)	(0.169)	(0.086)
$\Delta\tau^{MEX}$	-0.063	0.021	0.005	0.101	0.011
	(0.056)	(0.054)	(0.077)	(0.180)	(0.080)
ΔIPW	-0.058	-0.017	0.046	-0.018	0.030
	(0.076)	(0.060)	(0.088)	(0.147)	(0.071)
Panel B: No college education					
$\Delta\tau^{US}$	-0.195**	0.059	-0.156*	0.069	0.070
	(0.087)	(0.073)	(0.085)	(0.147)	(0.069)
$\Delta\tau^{MEX}$	-0.025	0.020	0.095	-0.029	0.052
	(0.087)	(0.077)	(0.093)	(0.156)	(0.068)
ΔIPW	-0.055	-0.026	0.091	-0.099	0.008
	(0.114)	(0.056)	(0.106)	(0.129)	(0.062)
Panel C: College education					
$\Delta\tau^{US}$	-0.174**	0.114	-0.064	0.105	0.067
	(0.074)	(0.086)	(0.113)	(0.185)	(0.136)
$\Delta\tau^{MEX}$	-0.051	0.015	-0.058	0.132	-0.012
	(0.055)	(0.085)	(0.111)	(0.203)	(0.116)
ΔIPW	-0.023	-0.015	0.013	0.003	0.032
	(0.072)	(0.073)	(0.113)	(0.183)	(0.091)

Notes: $N = 722$. This table reports the results of the estimation of equation (9). The dependent variables are the change in the share in the working-age population of employent in construction, in transportation and utilities, in wholesale and retail trade, in other services, or in government. The measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). All regressions are estimated by 2SLS, and growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table 9: NAFTA Tariff Liberalization and Change in Share of Industry Employment in the Working-Age Population by Gender

Dependent Variable: Change in industry emp/working-age pop (in % pts)

	Construction	Transportation and Utilities	Wholesale and Retail Trade	Other Services	Government
	(1)	(2)	(3)	(4)	(5)
Panel A: Female					
$\Delta\tau^{US}$	-0.054***	0.040	-0.240***	-0.208	0.028
	(0.017)	(0.059)	(0.084)	(0.204)	(0.078)
$\Delta\tau^{MEX}$	0.020	0.067	-0.073	-0.001	0.006
	(0.028)	(0.041)	(0.083)	(0.222)	(0.079)
ΔIPW	0.013	0.012	0.047	-0.078	0.091
	(0.026)	(0.043)	(0.090)	(0.144)	(0.067)
Panel B: Male					
$\Delta\tau^{US}$	-0.244**	0.112	-0.100	0.135	0.076
	(0.110)	(0.084)	(0.096)	(0.173)	(0.104)
$\Delta\tau^{MEX}$	-0.138	-0.021	0.085	0.196	0.021
	(0.096)	(0.083)	(0.103)	(0.166)	(0.087)
ΔIPW	-0.107	-0.041	0.066	0.077	-0.015
	(0.126)	(0.084)	(0.105)	(0.158)	(0.086)

Notes: $N = 722$. This table reports the results of the estimation of equation (9). The dependent variables are the change in the share in the working-age population of employent in construction, in transportation and utilities, in wholesale and retail trade, in other services, or in government. The measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). All regressions are estimated by 2SLS, and growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Changes in the task composition of employment Next, I examine whether tariff liberalization under NAFTA induced a change in the task structure of U.S. local labor markets. The results here are related to Autor et al. [2015], who compare the impact of trade (captured by rising Chinese imports) and technology on the task composition of U.S. commuting zones.

To this end, I estimate equation (9) with the dependent variable defined as the change in the share of commuting zone working-age population employed in primarily abstract, routine, or manual occupations. The classification of occupations and the logic behind it were described in Section 2.2. Recall that managerial, professional and technical occupations perform primarily abstract tasks. Routine occupations are divided into two distinct groups: i) clerical activities and sales-related occupations, and ii) production-related occupations. Finally, mechanic, craft, agricultural and service occupations primarily consist of manual tasks.

In these regressions, I control for the potential effect of technological change on the task composition of employment. Given that routine occupations are codifiable and thus subject to replacement by automation, I follow Autor et al. [2015] and represent exposure to technological change as the share of each labor market's initial employment in routine occupations. To isolate the long-run component of this routine employment share, I use an instrument based on the historical (1950) local industry mix proposed by Autor et al. [2015].[56] Note that the 1990 routine employment share was also included as a control variable in all previous regressions, but here I use Autor et al. [2015]'s instrument for this routine employment share, in order to be able to compare my results with those in Autor et al. [2015] and to interpret the coefficient on the instrumented routine employment share as the effect of technological change.

Table 10 shows the results.[57] Panel A focuses on abstract occupations. U.S. tariff liberalization is associated to an increase in employment in abstract tasks (as a share of the working-age population). The coefficient is very similar when I use the instrument for the start-of-period routine employment share (column 1) or not (column 2).[58] The magnitude is such that regions at the 75th percentile of exposure experience a 0.08 percentage point increase in the abstract employment to population ratio relative to those at the 25th percentile. Columns 3 and 4 show that this increase in employment in abstract occupations is larger for males than for females. In turn, columns 5 and 6 indicate that the increase is five times larger among college workers. This increase in abstract employment is found both within manufacturing and nonmanufacturing.[59] These findings shed light on the transformation of

[56] The instrument for the employment share in routine occupations is described in Appendix A.5. Appendix Table A.10 provides summary statistics for the 1990 share of routine employment and for this instrument.

[57] Table 10 uses the measures of exposure to tariff liberalization that weigh industry-level tariffs by revealed comparative advantage (see equations (3) and (5)).

[58] Appendix Table A.20 reports the first stage for the 2SLS regression.

[59] In columns 7 and 8, for abstract employment in manufacturing and nonmanufacturing respectively, the measure of the

local economies in response to import competition, with an expansion in managerial, professional and technical jobs. Note that this expansion could be driven by various margins. It could occur due to a reallocation across industries, with a relative increase in employment in abstract-intensive industries, or across firms within each industry, with a relative gain in employment in abstract-intensive firms, or even within firms. An analysis using firm-level data could further dilucidate which of these margins is dominant.

While Mexican tariff cuts did not show statistically significant impacts on most of the outcomes analyzed earlier in the paper, I do find an impact on the share of the population employed in abstract occupations. This effect, intuitively, has the opposite effect than that of U.S. tariff cuts, and is concentrated among men, among those with college education, and in the nonmanufacturing sector. Rising import competition from China only has a statistically significant effect on abstract employment in nonmanufacturing, such that more exposed regions see an increase in this share. This is consistent with Autor et al. [2015] who find a larger impact of trade during the 2000s.[60] Finally, note that technological change, captured by the long-run component of the 1990 share of employment in routine occupations, led to an increase in employment in abstract occupations, especially among men and in the nonmanufacturing sector.

Panel B in Table 10 focuses on the set of routine occupations consisting of clerical activities and sales jobs. Overall and among all subgroups, U.S. tariff cuts had little impact on these type of routine occupations. Next, in panel C, the dependent variable is the change in employment in production-related routine occupations as a share of the working-age population. In this case, the situation is very different: U.S. tariff liberalization has a large and clear negative impact. Overall, regions at the 75th percentile of exposure experience a 0.18 percentage point decline in the production-related routine employment to population ratio relative to those at the 25th percentile. Notably, this effect is entirely driven by female employment, as shown in columns 3 and 4.[61] Among women, the magnitude of the effect is twice as large than for the overall sample. The impact of U.S. tariff cuts is also much larger among noncollege individuals (see columns 5 and 6). It is found only in the manufacturing sector, as shown in columns 7 and 8. Mexican tariff liberalization, in contrast, had no statistically significant impact on these outcomes. Growth in Chinese import competition does contribute to the decline in production-related routine employment among women. Technology has a negative sign on routine

initial share of routine employment (as well as the instrument) are constructed as shares of routine employment within each sector, in line with Autor et al. [2015].

[60] Appendix Table A.19 reports the results of these regressions excluding measures of exposure to tariff liberalization, finding similar results for the impact of rising Chinese imports during 1990-2000.

[61] This is consistent with the fact that the impact of U.S. tariff liberalization on manufacturing employment is also driven by female employment, as shown earlier in Table 3.

employment, but in most samples this is not statistically significant.[62]

Finally, panel D studies employment in manual occupations. In this case, U.S. tariff cuts do not appear to have statistically significant effects except when focusing on the manufacturing and nonmanufacturing sectors separately in columns 7 and 8. Lower tariffs lead to a decrease in employment in manual occupations in manufacturing, and an increase in nonmanufacturing. Technological change does appear to have a substrantial positive impact on employment in manual occupations, concentrated among noncollege workers and in the manufacturing sector.

Overall, the results indicate that U.S. tariff liberalization leads to a reshuffling of employment away from production-related routine occupations and toward abstract occupations.

Regional heterogeneity in the adjustment to tariff liberalization Finally, I study differences in the response of commuting zones to tariff liberalization based on initial human capital endowments. For this purpose, I define as high human capital commuting zones those with an above-median share of the population with college education in 1990, while the other half are defined as low human capital commuting zones. Appendix Figure A.2 maps high and low human capital commuting zones, showing that low human capital regions are concentrated in the South and parts of the Midwest, while high human capital regions are found in both coasts and in some northern and western parts of the interior. I will interpret the effects of human capital endowments on the response to NAFTA as descriptive, rather than causal, because there are other differences between these regions aside from human capital endowments (such as their economic structure), and these other differences could be in turn determined by human capital endowments.

I estimate equation (9) splitting the sample between high and low human capital areas. I include changes in manufacturing employment, nonmanufacturing employment, unemployment and the number of individuals out of the labor force as dependent variables, all expressed as a share of the working-age population. These results are shown in Table 11.[63] There is a very sharp contrast in the impact of NAFTA between these two types of commuting zones. Among high human capital regions, the impact of U.S. and Mexico's tariff liberalization is small and not statistically significant for all outcomes. In contrast, in low human capital regions, U.S. tariff liberalization has a large negative effect on manufacturing employment, a smaller positive impact on nonmanufacturing employment, and a negative impact on total employment. In addition, low human capital regions more exposed to U.S. tariff lib-

[62] The negative effect of technology on routine employment is consistent with the results by Autor et al. [2015] but the lack of statistical significance in my results compared to Autor et al. [2015]'s Table 5 is due to the larger set of control variables used here.

[63] Table 11 uses the measures of exposure to tariff liberalization that weigh industry-level tariffs by revealed comparative advantage (see equations (3) and (5)).

Table 10: NAFTA Tariff Liberalization and Change in Share of Task Employment in the Working-Age Population

Dependent Variable: Change in occupational emp/working-age pop (in % pts)

			By gender		By educ. attainment		By sector	
	All	All	Female	Male	Noncollege	College	Mfg.	Nonmfg.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Primarily abstract occupations.								
(Share of working-age population employed in managerial/professional/ technical occupations.)								
$\Delta\tau^{US}$	-0.303**	-0.288**	-0.203*	-0.395*	-0.117*	-0.502***	-0.140*	-0.188*
	(0.134)	(0.121)	(0.115)	(0.207)	(0.062)	(0.169)	(0.084)	(0.097)
$\Delta\tau^{MEX}$	0.247**	0.253**	0.111	0.387**	-0.028	0.254*	0.015	0.219**
	(0.116)	(0.106)	(0.098)	(0.173)	(0.053)	(0.137)	(0.064)	(0.107)
ΔIPW	0.205	0.071	0.022	0.388	0.049	0.204	-0.089	0.285*
	(0.179)	(0.125)	(0.116)	(0.273)	(0.068)	(0.131)	(0.073)	(0.148)
Share of 1990 Emp.	0.217*	-0.033	-0.035	0.472***	0.044	0.131	0.032	0.227**
in Routine Occs.	(0.114)	(0.040)	(0.096)	(0.159)	(0.042)	(0.106)	(0.028)	(0.095)
Panel B: Primarily routine occupations.								
(Share of working-age population employed in clerical/retail sales occupations.)								
$\Delta\tau^{US}$	0.026	0.032	-0.087	0.127	0.034	0.190	-0.031	0.072
	(0.121)	(0.103)	(0.121)	(0.126)	(0.149)	(0.157)	(0.049)	(0.114)
$\Delta\tau^{MEX}$	-0.032	-0.029	-0.102	0.044	0.022	-0.063	-0.033	-0.006
	(0.091)	(0.087)	(0.128)	(0.082)	(0.108)	(0.122)	(0.061)	(0.079)
ΔIPW	0.093	0.035	-0.011	0.133	0.255*	-0.061	0.001	0.069
	(0.119)	(0.096)	(0.149)	(0.097)	(0.154)	(0.118)	(0.033)	(0.104)
Share of 1990 Emp.	0.109	0.000	-0.004	0.145**	0.212**	0.006	0.036*	0.055
in Routine Occs.	(0.097)	(0.033)	(0.143)	(0.061)	(0.107)	(0.102)	(0.021)	(0.075)
Panel C: Primarily routine occupations.								
(Share of working-age population employed in production occupations.)								
$\Delta\tau^{US}$	0.718***	0.719***	1.338***	0.080	0.854***	0.256***	0.709***	0.021
	(0.146)	(0.145)	(0.160)	(0.176)	(0.214)	(0.084)	(0.175)	(0.022)
$\Delta\tau^{MEX}$	0.055	0.055	0.032	0.062	0.141	-0.037	0.050	-0.005
	(0.079)	(0.078)	(0.098)	(0.098)	(0.104)	(0.063)	(0.093)	(0.023)
ΔIPW	-0.009	-0.018	-0.274***	0.276	-0.082	0.131	0.029	0.017
	(0.117)	(0.109)	(0.095)	(0.192)	(0.142)	(0.146)	(0.083)	(0.023)
Share of 1990 Emp.	-0.063	-0.078***	0.037	-0.157	-0.057	-0.054	0.034	0.024
in Routine Occs.	(0.069)	(0.030)	(0.074)	(0.107)	(0.114)	(0.054)	(0.052)	(0.015)
Panel D: Primarily manual occupations.								
(Share of working-age population employed in craft/mechanics/agricultural/service occupations.)								
$\Delta\tau^{US}$	-0.088	-0.078	-0.115	-0.033	-0.048	-0.107	0.142*	-0.247**
	(0.098)	(0.096)	(0.108)	(0.189)	(0.168)	(0.100)	(0.079)	(0.119)
$\Delta\tau^{MEX}$	-0.082	-0.077	0.001	-0.177	0.171	-0.190**	0.021	-0.123
	(0.101)	(0.096)	(0.105)	(0.192)	(0.194)	(0.078)	(0.068)	(0.122)
ΔIPW	0.023	-0.078	-0.063	0.167	0.072	0.045	0.048	-0.046
	(0.102)	(0.094)	(0.082)	(0.176)	(0.203)	(0.095)	(0.035)	(0.106)
Share of 1990 Emp.	0.309***	0.121***	0.071	0.634***	0.573***	0.063	0.063***	0.288***
in Routine Occs.	(0.088)	(0.029)	(0.063)	(0.167)	(0.140)	(0.057)	(0.020)	(0.070)

Notes: $N = 722$. This table reports the results of the estimation of equation (9). The dependent variables are the change in the share in the working-age population of employent in primarily abstract occupations (panel A), primarily clerical and sales-related routine occupations (panel B), primarily production-related routine occupations (panel C) and primarily manual occupations (panel D). The measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). All regressions are estimated by 2SLS, and growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. In columns 1 and 3 through 8 the share of employment in routine occupations in 1990 is instrumented by the measure of commuting zone historical industry structure defined in equation (10) in Appendix A.5. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

eralization face increases in unemployment and in labor force nonparticipation. All these effects are statistically significant. The impact among low human capital regions is such that commuting zones at the 75th percentile of exposure to U.S. tariff cuts experienced a 0.81 percentage point decline in manufacturing employment and a 0.45 p.p. decline in total employment (both as a share of the working-age population) relative to commuting zones at the 25th percentile of exposure.[64] In addition, within the low human capital sample, regions at the 75th percentile of exposure face a 0.18 p.p. increase in unemployment and a 0.27 p.p. increase in labor force nonparticipation relative to regions at the 25th percentile.

I also revisit the effect of tariff liberalization on task employment distinguishing between high and low human capital commuting zones. Table 12 shows that, among both the high and low human capital samples, U.S. tariff liberalization has led to an increase in the share of the population employed in abstract occupations and a decline in employment in production-related occupations. These results are statistically significant for both samples. In the case of employment in abstract occupations, the increase is of similar magnitude, but the decline in production-related routine employment is much larger in the low human capital sample. Specifically, commuting zones at the 75th percentile of exposure to U.S. tariff cuts experienced a 0.16 percentage point increase in the share of the population employed in abstract tasks relative to commuting zones at the 25th percentile of exposure in the low human capital sample, and a 0.18 p.p. relative increase in the high human capital sample. For production-related routine employment, the relative decline comparing the 75th to 25th percentiles of exposure is 0.13 p.p. in the high human capital sample and 0.68 p.p. in the low human capital sample. For comparison, note that during this period, the share of the working age population employed in routine occupations in the low human capital commuting zones fell by 1.3 p.p. from 0.101 to 0.088. This implies a very large impact of U.S. tariff liberalization under NAFTA on the task composition of employment in low human capital areas of the country.

The results in this section are related to Bloom et al. [2019], who study the response of firm employment to Chinese import competition during 1992-2012 and find a larger decline in manufacturing employment in low human capital regions.[65]

Overall, these results imply a widening in regional disparities across the U.S. In 1990, low human capital regions had higher levels of unemployment and lower labor force participation than high human

[64] Summary statistics for the measures of exposure to tariff liberalization separated between high and low human capital commuting zones are found in panel B in Appendix Table A.5.

[65] My results in Table 11 for the period 1990-2000 indicate a larger negative impact of Chinese import competition in high human capital commuting zones. This suggests Bloom et al. [2019]'s findings in this regard might be driven by the post 2000 part of their sample, which is consistent with their statement about finding stronger effects of Chinese import competition after 2000.

Table 11: NAFTA Tariff Liberalization and Change in Employment Status in the Working-Age Population in High and Low Human Capital Regions

Dependent Variable: Change in population shares by employment status (in % pts)

	Manufacturing		Nonmanufacturing		Employment		Unemployment		Not in the Labor Force	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Low human capital commuting zones										
$\Delta\tau^{US}$	0.863***	0.858***	-0.415*	-0.386*	0.448**	0.472***	-0.177**	-0.185***	-0.271*	-0.287**
	(0.237)	(0.217)	(0.215)	(0.203)	(0.186)	(0.173)	(0.078)	(0.069)	(0.145)	(0.142)
$\Delta\tau^{MEX}$	0.159	0.164	0.307	0.275	0.466**	0.439**	-0.051	-0.042	-0.415**	-0.397**
	(0.156)	(0.152)	(0.216)	(0.217)	(0.195)	(0.199)	(0.072)	(0.066)	(0.190)	(0.198)
ΔIPW		0.046		-0.257		-0.211		0.070		0.141
		(0.175)		(0.259)		(0.175)		(0.050)		(0.158)
Panel B: High human capital commuting zones										
$\Delta\tau^{US}$	0.102	0.014	-0.168	-0.053	-0.066	-0.039	-0.044	-0.066	0.109	0.104
	(0.475)	(0.487)	(0.461)	(0.467)	(0.433)	(0.370)	(0.179)	(0.165)	(0.390)	(0.356)
$\Delta\tau^{MEX}$	0.060	0.031	-0.080	-0.043	-0.021	-0.012	0.166	0.159	-0.146	-0.147
	(0.201)	(0.202)	(0.249)	(0.229)	(0.248)	(0.233)	(0.119)	(0.109)	(0.227)	(0.219)
ΔIPW		-0.351*		0.459*		0.108		-0.088		-0.020
		(0.193)		(0.237)		(0.265)		(0.123)		(0.208)

Notes: N = 361 in each panel. This table reports the results of the estimation of equation (9), splitting the sample between low and high human capital commuting zones. High (low) human capital commuting zones are those with an above (below) share of working-age population with college education in 1990. The dependent variables are the change in the share in the working-age population of manufacturing employent (columns 1-2), of nonmanufacturing employent (columns 3-4), of total employment (columns 5-6) of unemployment (columns 7-8) and of the number of individuals not in the labor force (columns 9-10). The measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). Columns 1, 3, 5, 7 and 9 are estimated by OLS. In columns 2, 4, 6, 8 and 10, estimated by 2SLS, growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

capital regions, and U.S. tariff liberalization extended that gap.[66]

5. Conclusions

This paper has provided a detailed portrait of the employment effects of U.S. and Mexican tariff liberalization under the North American Free Trade Agreement on U.S. local labor markets. A first key finding is that commuting zones with a higher exposure to U.S. tariff liberalization have seen a relative decline in the share of population employed in manufacturing. This has been coupled with increases in employment in certain low-pay service-sector industries, in unemployment, and in labor-force nonpar-

[66]In 1990, unemployment as a share of the working-age population was 0.052 in low human capital regions and 0.047 in high human capital regions. The number of individuals out of the labor force (also as a fraction of the working-age population) was 0.281 in low human capital regions and 0.238 in high human capital regions.

Table 12: NAFTA Tariff Liberalization and Change in Share of Task Employment in the Working-Age Population in High and Low Human Capital Regions

Dependent Variable: Change in occupational emp/working-age pop (in % pts)

	Abstract	Routine Clerical / Retail Sales	Routine Production	Manual
	(1)	(2)	(3)	(4)
Panel A: Low human capital commuting zones				
$\Delta\tau^{US}$	-0.164**	0.003	0.714***	-0.112
	(0.081)	(0.087)	(0.196)	(0.107)
$\Delta\tau^{MEX}$	0.146	-0.002	0.158	0.026
	(0.102)	(0.125)	(0.138)	(0.122)
ΔIPW	-0.018	-0.103	0.187	-0.053
	(0.122)	(0.232)	(0.163)	(0.146)
Share of 1990 Emp.	0.176	0.307	0.212	0.160
in Routine Occs.	(0.214)	(0.200)	(0.187)	(0.202)
Panel B: High human capital commuting zones				
$\Delta\tau^{US}$	-1.087**	-0.024	0.758***	-0.277
	(0.437)	(0.272)	(0.268)	(0.308)
$\Delta\tau^{MEX}$	0.552**	-0.078	-0.198*	-0.079
	(0.270)	(0.109)	(0.103)	(0.214)
ΔIPW	0.209	0.250**	-0.129	0.013
	(0.230)	(0.104)	(0.098)	(0.120)
Share of 1990 Emp.	0.322***	0.078	-0.215**	0.383***
in Routine Occs.	(0.108)	(0.111)	(0.093)	(0.106)

Notes: N = 361 in each panel. This table reports the results of the estimation of equation (9), splitting the sample between low and high human capital commuting zones. High (low) human capital commuting zones are those with an above (below) share of working-age population with college education in 1990. The dependent variables are the change in the share in the working-age population of employent in primarily abstract occupations (column 1), primarily clerical and sales-related routine occupations (column 2), primarily production-related routine occupations (column 3) and primarily manual occupations (column 4). The measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). All regressions are estimated by 2SLS, and growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets, and the share of employment in routine occupations in 1990 is instrumented by the measure of commuting zone historical industry structure defined in equation (10) in Appendix A.5. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

ticipation, and has not led to changes in population. At the same time, the impact of Mexican tariff cuts on U.S. local labor markets is not statistically significant across most of these outcomes.

These effects of U.S. tariff liberalization are very uneven across different groups of the population. The decline in manufacturing employment is concentrated among individuals with low educational attainment and among women. I also examine, for the first time, differences between races in the impact of trade shocks in the U.S., finding that the decline in employment due to U.S. tariff liberalization is substantially larger among nonwhite workers. In addition, the impact of U.S. tariff liberalization has had a very disparate effect across geography. While low human capital commuting zones (located mostly in the South and parts of the Midwest) have seen declines in manufacturing and total employment, and increases in unemployment and labor force nonparticipation, the impact of tariff cuts on high human capital commuting zones has been small and not statistically significant.

Finally, U.S. tariff liberalization under NAFTA has also led to changes in the task structure of local labor markets, with an increase in employment in abstract tasks which partially compensates a large decline in employment in production-related routine tasks. While the increase in employment in abstract tasks is larger among men and among college-educated workers, the decline in employment in production-related routine tasks is concentrated among women and noncollege workers, again highlighting the uneven effects of trade liberalization.

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A. Appendix

A.1. Construction of Revealed Comparative Advantage

The measures of revealed comparative advantage defined in equations (2) and (6) require industry-level trade flows in 1990. Specifically, I use exports from Mexico to the rest of the world excluding the U.S., exports from the U.S. to the rest of the world excluding Mexico, and exports among the rest of the world excluding the U.S. and Mexico. I use a concordance provided by Autor et al. [2013] to assign trade flows from the 1988/1992 version of the Harmonized System ("H0") to SIC industries. The trade data are obtained from the UN's Comtrade database through the World Bank's World Integrated Trade Solution (WITS). They are downloaded using the SITC revision 2 classification, given that in 1990 only some countries report trade using the Harmonized System. I then use a concordance between SITC Tier 4 codes and the 1988/1992 HS Classification 6-digit codes.

A.2. Sample Selection and Local Labor Market Outcomes

The sample selection follows Autor et al. [2013]. I restrict the sample to individuals aged 16 to 64. Unpaid family workers and those living in institutional group quarters are excluded. Labor supply weights are constructed multiplying usual hours worked times weeks worked in the year preceding each survey. All employment outcomes are constructed weighing by these labor supply weights and by the Census person sampling weight.

A.3. Mexico's NAFTA Tariff Schedule

I digitize and process the schedule of Mexico's NAFTA tariffs toward the U.S. These data are obtained from Mexico's *Diario Oficial* (the official publication of Mexico's government). Products, listed at the 8-digit level of Mexico's version of the Harmonized System, are classified into several different categories according to the timeline of liberalization. The main categories are the following. Tariffs on category A products are eliminated immediately and entirely on January 1st, 1994. Category B products are liberalized in five equal steps starting January 1st, 1994, and become duty free on January 1st, 1998. Tariffs on category B6 products (a subset of textile and apparel products) are eliminated first by a percentage equal to the base rate on January 1st, 1994 and then in five equal steps, becoming duty free by January 1st, 1999. Tariffs on category C products are liberalized in ten equal steps starting January 1st, 1994, and become duty free on January 1st, 2003. Tariffs on category C+ products are liberalized in fifteen equal steps starting January 1st, 1994, and become duty free on January 1st, 2008. Category D products are duty free before NAFTA and remain as such. These categories account for more than 98% HS 8-digit products. The rest follows various exceptions which I process on a case by case basis.

Table A.1 reports the number of HS8 products under each category. Consistent with the pattern shown in Appendix Table A.6, most products are liberalized entirely or substantially shortly after January 1st, 1994.

Table A.1: Tariff Liberalization Categories: Mexico's Schedule

Category	Number of Products	% of Products
A	5815	47.4%
B	1747	14.2%
B+	3	0.0%
B6	762	6.2%
C	3436	28%
C+	3	0.0%
D	277	2.3%
Other	220	1.8%

Notes: This table reports the number of HS 8-digit products under each category of tariff liberalization in Mexico's tariff schedule.

A.4. U.S. NAFTA Tariff Schedule

Table A.2 describes the number of productions under each category of U.S. tariff liberalization toward Mexico. While the tariff data in the analysis is obtained from Romalis [2007], here I use data from Besedes et al. [2020] to tabulate the liberalization categories.

The details are as follows. Tariffs on category A products are eliminated immediately and entirely on January 1st, 1994. Category B products are liberalized in five equal steps starting January 1st, 1994, and become duty free on January 1st, 1998. Tariffs on category B6 products (a subset of textile and apparel products) are eliminated first by a percentage equal to the base rate on January 1st, 1994 and then in five equal steps, becoming duty free by January 1st, 1999. Tariffs on category C products are liberalized in ten equal steps starting January 1st, 1994, and become duty free on January 1st, 2003. Tariffs on category C+ products are liberalized in fifteen equal steps starting January 1st, 1994, and become duty free on January 1st, 2008. Category D products are duty free before NAFTA and remain as such. Tariffs on category C10 fall to 80% of the original rate in January 1st, 1994 then to 70% in January 1st, 1996, and then in seven equal steps becoming duty free on January 1st, 2003. The rest of the products are labeled by Besedes et al. [2020] as mixed category products, such that within each HS8 product there are several subproducts indexed by letters (not by HS10 codes) that fall under different liberalization categories.

Overall, this table shows that at least 66.3% of HS8 products were duty free on January 1st 1994, at least 76.5% were duty free before January 1st, 1999, 10% were duty free beyond 2000 (but their tariff rates in most cases had fallen by two thirds by 2000) and 13.45% were under the mixed category situation which means I don't have the data to determine which fraction was duty free before 2000.

Table A.2: Tariff Liberalization Categories: U.S. Schedule

Category	Number of Products	% of Products
A	4526	50.7%
B	179	2.0%
B6	728	8.2%
C	752	8.4%
C+	74	0.8%
C10	71	0.8%
D	1402	15.7%
Other	1202	13.45%

Notes: This table reports the number of HS 8-digit products under each category of tariff liberalization in the U.S. tariff schedule. Source: Besedes et al. [2020].

A.5. Instrument for Routine Employment Share

Here I describe the instrument for the commuting zone share of employment in routine occupations in 1990, introduced by Autor et al. [2015] and used in columns 1 and 3 through 8 in Table 10. This instrument is a measure of commuting zone historical industry structure defined as a weighted average of industries' share of employment in routine occupations in 1950, with weights equal to employment shares. Define $E_{i,j,1950}$ as the employment share of industry j in region i in 1950 and $R_{-i,j,1950}$ as the share of employment in routine occupations in industry i in all U.S. states except the state that includes region i. Then this instrument is:

$$\widetilde{RSH}_i = \sum_j E_{i,j,1950} \times R_{-i,j,1950}. \tag{10}$$

A.6. Alternative Measure of Regional Exposure to Tariff Liberalization

This section describes measures of regional exposure to tariff liberalization based only on variation in tariffs within the tradable sector. I also summarize the results obtained using these alternative measures.

First, the following measure of exposure to U.S. tariff liberalization for region i is a sum across industries j that belong to the tradable sector T. It weighs tariffs by Mexico's revealed comparative advantage, as in Hakobyan and McLaren [2016]. In fact, this is the exact same measure used by Hakobyan and McLaren [2016]:

$$\Delta\tau_i^{US} = \frac{\sum_{j \epsilon T} L_{ij} \mathrm{RCA}_j^{\mathrm{MEX}} \Delta\tau_j^{\mathrm{US}}}{\sum_{j \epsilon T} \mathrm{RCA}_j^{\mathrm{MEX}} L_i}. \tag{11}$$

This measure is highly correlated with the one defined in equation (3) in the main text ($\rho = 0.90$). The correlation is also high with the measure in equation (1) which does not weigh tariffs by revealed comparative advantage ($\rho = 0.81$).

The following equation shows the equivalent to (11) but for exposure to Mexico's tariff liberalization, in which tariffs are weighted by U.S. revealed comparative advantage:

$$\Delta\tau_i^{MEX} = \frac{\sum_{j \epsilon T} L_{ij} \mathrm{RCA}_j^{\mathrm{US}} \Delta\tau_j^{\mathrm{MEX}}}{\sum_{j \epsilon T} L_{ij} \mathrm{RCA}_j^{\mathrm{US}}}. \tag{12}$$

Once again, the correlation between this measure and the alternative in equation (5) in the main text is high ($\rho = 0.58$). The correlation between (12) and the measure defined in equation (4), which does not weigh tariffs by revealed comparative advantage, is 0.49.

Appendix Tables A.13 and A.17 show that the two key sets of results in the paper are robust to using these alternative measures of regional exposure to tariff liberalization.

Appendix Table A.13 studies the effect of tariff liberalization on the share of manufacturing employment in the working-age population and corresponds to Tables 1 and 2 in the main text. The 0.591 coefficient in column 5 in Table 1 implies a 0.15 percentage point decline in manufacturing employment as a share of the working-age population in regions at the 75th percentile of exposure relative to regions at the 25th percentile. This is the equivalent to the 0.156 coefficient in column 3 in Appendix Table A.13 which implies a 0.13 percentage point decline in manufacturing employment as a share of the working-age population in regions at the 75th percentile of exposure relative to regions at the 25th percentile. The patterns are also similar among noncollege and college workers.

Appendix Table A.17 studies the effect of tariff liberalization not only on the share of the working-age population employed in manufacturing, but also employment in nonmanufacturing sectors, unemployment, and/or the share of individuals not in the labor force. It is equivalent to Table 5 in the main text. The results are quite similar. For example, the -0.065 coefficient for unemployment in column 8 in Appendix Table A.17 implies a 0.055 percentage point increase in unemployment as a share of the working-age population in regions at the 75th percentile of exposure relative to regions at the 25th percentile. This is the equivalent to the -0.187 coefficient in column 8 in Table 5 which implies a 0.047 percentage point increase in unemployment employment as a share of the working-age population in regions at the 75th percentile of exposure relative to regions at the 25th percentile.

The only differences are the following. First, while in both tables U.S. tariff liberalization leads to a statistically significant fall in manufacturing employment and a non statistically significant impact in nonmanufacturing employment, Table 5 shows a negative and statistically significant impact on total employment, while this is not statistically significant in Appendix Table A.17.[67] Second, Table 5 shows a positive and statistically significant impact on labor force nonparticipation among noncollege workers, while this effect has the same sign but is not statistically significant in Appendix Table A.17.

A.7. Did NAFTA Increase Trade Flows?

This section shows that both U.S. and Mexico's tariff liberalization under NAFTA led to increased trade. To assess the effect of U.S. tariff liberalization, I use data on U.S. imports by HS 6-digit product and source country in 1990 and 2000.[68] I estimate the following difference in differences regression with country-year, product-country and product-year fixed effects:

$$\log(\text{Value})_{pct} = \gamma_{pc} + \nu_{pt} + \eta_{ct} + \beta \cdot \text{Mexico}_c \cdot \text{High Tariff}_p \cdot \text{Post}_t + \epsilon_{pct}. \tag{13}$$

The effect of U.S. tariff liberalization is captured by the triple interaction between a dummy variable High Tariff$_p$ equal to one for products with above-median tariffs in 1990 and zero otherwise, a dummy Mexico$_c$ equal to one for imports sourced from Mexico and zero otherwise, and a dummy Post$_t$ equal to one for year 2000 and zero for 1990. The results are shown in column 1 in Table A.3 and the 0.286 coefficient implies a 33% increase between 1990 and 2000 in U.S. imports from Mexico relative to imports from the rest of the world in industries with high initial tariff levels relative to other industries.

Similarly, I estimate an equivalent regression using data on U.S. exports to Mexico and all other countries. In this case the High Tariff$_p$ dummy variable is equal to one for products with above-median Mexican tariffs in 1990 and zero otherwise, and Mexico$_c$ is equal to one for exports to Mexico. The coefficient in column 2 in Table A.3 implies a 24% increase between 1990 and 2000 in U.S. exports to Mexico relative to exports to the rest of the world in industries with high initial tariff levels relative to other industries.

[67] The magnitude of the effect on total employment is comparable, albeit somewhat smaller, to that found in Table 5. It implies a 0.06 percentage point decline in employment as a share of the working-age population in regions at the 75th percentile of exposure relative to regions at the 25th percentile. The equivalent relative decline was 0.1 p.p. in Table 5.

[68] These data on U.S. imports and exports are produced by the U.S. Census Bureau and obtained from Schott [2008].

Table A.3: NAFTA Tariff Liberalization and Trade Flows

Dependent Variable: (log) U.S. imports from Mexico or U.S. exports to Mexico

	US Imports	US Exports
	(1)	(2)
$1[\text{Mexico}_c] \cdot 1[\text{High Tariff}_p] \cdot 1[\text{Post}_t]$	0.286*	0.216*
	(0.038)	(0.028)
N	137352	277878

Notes: This table reports the results of the estimation of equation (13). Column 1 corresponds to U.S. imports and column 2 corresponds to U.S. exports. Standard errors are clustered by HS 6-digit product, year and origin (or destination) using multiway clustering. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

A.8. Descriptive Statistics

Table A.4: Summary Statistics for Local Labor Market Outcomes

Percentage of working-age population employed in manufacturing	1990	2000	1990-2000	Percentage of working-age population employed in nonmanufacturing	1990	2000	1990-2000
All	12.7	10.5	-2.1	All	57.8	59.2	1.3
	(4.8)	(4.5)	(1.6)		(5.9)	(5.2)	(2.4)
Noncollege	13.4	11.0	-2.3	Noncollege	48.9	49.1	0.0
	(5.4)	(5.1)	(1.9)		(5.8)	(5.3)	(2.7)
College	11.6	9.9	-1.7	College	67.9	68.5	0.5
	(4.2)	(4.0)	(1.6)		(4.5)	(4.0)	(2.0)
Female	8.3	6.7	-1.5	Female	55.4	57.7	2.3
	(3.7)	(3.0)	(1.6)		(5.9)	(5.4)	(2.8)
Male	17.3	14.5	-2.6	Male	60.2	60.7	0.2
	(6.4)	(6.1)	(2.0)		(6.8)	(6.1)	(2.6)
Nonwhite	13.3	11.2	-2.0	Nonwhite	47.9	49.9	1.8
	(6.2)	(5.6)	(3.1)		(8.2)	(6.5)	(4.1)
White	13.9	11.6	-2.1	White	58.6	60.7	2.0
	(5.2)	(4.9)	(1.7)		(6.2)	(5.5)	(2.2)

Percentage of working-age population employed	1990	2000	1990-2000	Percentage of working-age population unemployed	1990	2000	1990-2000
All	70.4	69.7	-0.8	All	4.8	4.3	-0.5
	(5.0)	(5.0)	(2.8)		(1.0)	(0.9)	(0.7)
Noncollege	62.3	60.1	-2.2	Noncollege	6.3	5.7	-0.6
	(5.4)	(5.9)	(3.3)		(1.2)	(1.2)	(0.9)
College	79.5	78.4	-1.1	College	3.1	3.0	-0.2
	(3.9)	(3.6)	(2.4)		(0.7)	(0.7)	(0.7)
Female	63.6	64.3	0.8	Female	4.2	4.0	-0.3
	(5.5)	(5.5)	(3.2)		(0.9)	(0.9)	(0.7)
Male	77.5	75.2	-2.4	Male	5.4	4.6	-0.8
	(4.9)	(4.9)	(2.8)		(1.3)	(1.1)	(0.9)
Nonwhite	61.1	61.1	-0.2	Nonwhite	8.4	6.9	-1.4
	(6.7)	(4.6)	(4.8)		(2.2)	(1.6)	(1.8)
White	72.4	72.3	-0.1	White	4.0	3.5	-0.5
	(4.8)	(4.7)	(2.5)		(0.9)	(0.8)	(0.7)

Percentage of working-age population not in the labor force	1990	2000	1990-2000
All	24.8	26.1	1.3
	(4.3)	(4.4)	(2.6)
Noncollege	31.4	34.2	2.8
	(4.6)	(5.2)	(3.0)
College	17.4	18.7	1.3
	(3.6)	(3.3)	(2.2)
Female	32.1	31.7	-0.5
	(4.9)	(4.9)	(3.0)
Male	17.1	20.2	3.2
	(4.5)	(4.3)	(2.6)
Nonwhite	30.5	31.9	1.6
	(5.6)	(3.9)	(4.4)
White	23.6	24.2	0.6
	(4.3)	(4.2)	(2.2)

Notes: This table reports the mean and standard deviation (in parenthesis under the mean) for local labor market outcomes studied throughout the paper. These statistics are weighted by 1990 population in each commuting zone.

Table A.4: Summary Statistics for Local Labor Market Outcomes (*Continued*)

Percentage of working-age population employed in construction	1990	2000	1990-2000	Percentage of working-age population employed in transportation and utilities	1990	2000	1990-2000
All	4.6	5.0	0.4	All	5.5	5.5	0.0
	(0.9)	(1.0)	(0.8)		(1.1)	(1.1)	(0.5)
Noncollege	62.3	60.1	-2.2	Noncollege	62.3	60.1	-2.2
	(5.4)	(5.9)	(3.3)		(5.4)	(5.9)	(3.3)
College	79.5	78.4	-1.1	College	79.5	78.4	-1.1
	(3.9)	(3.6)	(2.4)		(3.9)	(3.6)	(2.4)
Female	0.9	1.0	0.1	Female	3.2	3.3	0.1
	(0.3)	(0.3)	(0.2)		(1.0)	(1.0)	(0.4)
Male	7.7	8.6	0.8	Male	7.6	7.6	-0.0
	(1.6)	(1.7)	(1.4)		(1.4)	(1.4)	(0.7)
Nonwhite	30.5	31.9	1.6	Nonwhite	30.5	31.9	1.6
	(5.6)	(3.9)	(4.4)		(5.6)	(3.9)	(4.4)
White	23.6	24.2	0.6	White	23.6	24.2	0.6
	(4.3)	(4.2)	(2.2)		(4.3)	(4.2)	(2.2)

Percentage of working-age population employed in wholesale and retail trade	1990	2000	1990-2000	Percentage of working-age population employed in other services	1990	2000	1990-2000
All	13.9	13.2	-0.8	All	26.5	29.0	2.4
	(1.5)	(1.4)	(0.9)		(4.5)	(4.5)	(1.4)
Noncollege	62.3	60.1	-2.2	Noncollege	62.3	60.1	-2.2
	(5.4)	(5.9)	(3.3)		(5.4)	(5.9)	(3.3)
College	79.5	78.4	-1.1	College	79.5	78.4	-1.1
	(3.9)	(3.6)	(2.4)		(3.9)	(3.6)	(2.4)
Female	12.5	12.0	-0.5	Female	33.7	36.6	3.0
	(1.6)	(1.6)	(0.9)		(4.3)	(4.2)	(1.9)
Male	15.4	14.4	-1.0	Male	20.9	22.7	1.8
	(2.0)	(1.7)	(1.0)		(4.9)	(5.3)	(1.5)
Nonwhite	30.5	31.9	1.6	Nonwhite	30.5	31.9	1.6
	(5.6)	(3.9)	(4.4)		(5.6)	(3.9)	(4.4)
White	23.6	24.2	0.6	White	23.6	24.2	0.6
	(4.3)	(4.2)	(2.2)		(4.3)	(4.2)	(2.2)

Percentage of working-age population employed in government	1990	2000	1990-2000
All	3.6	3.5	-0.1
	(1.9)	(1.6)	(0.7)
Noncollege	62.3	60.1	-2.2
	(5.4)	(5.9)	(3.3)
College	79.5	78.4	-1.1
	(3.9)	(3.6)	(2.4)
Female	3.1	3.3	0.1
	(1.9)	(1.6)	(0.7)
Male	4.1	3.8	-0.3
	(2.0)	(1.6)	(0.8)
Nonwhite	30.5	31.9	1.6
	(5.6)	(3.9)	(4.4)
White	23.6	24.2	0.6
	(4.3)	(4.2)	(2.2)

Notes: This table reports the mean and standard deviation (in parenthesis under the mean) for local labor market outcomes studied throughout the paper. These statistics are weighted by 1990 population in each commuting zone.

Table A.4: Summary Statistics for Local Labor Market Outcomes (*Continued*)

Percentage of working-age population employed in abstract occupations	1990	2000	1990-2000	Percentage of working-age population employed in routine (clerical and sales) occupations	1990	2000	1990-2000
All	25.0	26.0	0.9	All	16.7	16.4	-0.3
	(4.8)	(4.9)	(1.3)		(2.3)	(1.8)	(1.2)
Noncollege	8.9	7.7	-1.3	Noncollege	15.2	14.8	-0.4
	(1.4)	(1.1)	(0.7)		(2.9)	(2.4)	(1.4)
College	42.8	42.2	-0.6	College	18.5	18.0	-0.6
	(4.9)	(4.8)	(1.6)		(1.8)	(1.4)	(1.2)
Female	22.7	24.5	1.8	Female	23.3	22.3	-1.1
	(4.1)	(4.1)	(1.5)		(2.9)	(2.2)	(1.9)
Male	27.5	27.4	-0.1	Male	9.8	10.3	0.5
	(5.7)	(5.9)	(1.5)		(2.0)	(1.7)	(0.8)

Percentage of working-age population employed in routine (production) occupations	1990	2000	1990-2000	Percentage of working-age population employed in manual occupations	1990	2000	1990-2000
All	7.3	6.1	-1.1	All	21.4	21.2	-0.2
	(2.9)	(2.7)	(1.0)		(3.2)	(3.1)	(1.0)
Noncollege	9.8	8.5	-1.3	Noncollege	28.3	29.1	0.7
	(3.6)	(3.4)	(1.3)		(3.1)	(3.0)	(1.6)
College	4.3	3.9	-0.4	College	13.9	14.3	0.4
	(1.7)	(1.8)	(0.7)		(2.9)	(3.0)	(1.0)
Female	4.7	4.0	-0.7	Female	12.9	13.6	0.7
	(2.8)	(2.1)	(1.3)		(2.4)	(2.3)	(0.9)
Male	9.9	8.3	-1.5	Male	30.3	29.1	-1.2
	(3.5)	(3.5)	(1.0)		(4.3)	(4.1)	(1.6)

Notes: This table reports the mean and standard deviation (in parenthesis under the mean) for local labor market outcomes studied throughout the paper. These statistics are weighted by 1990 population in each commuting zone.

Table A.5: Summary Statistics for Measures of Regional Exposure to Tariff Liberalization

	Defined in equation	Mean	St. Dev.	p10	p25	p50	p75	p90
Panel A: Across all commuting zones								
$\Delta\tau^{\text{US}}$	3	-0.41	0.54	-0.85	-0.42	-0.23	-0.17	-0.1
$\Delta\tau^{\text{US}}$	1	-0.44	0.52	-0.9	-0.41	-0.3	-0.19	-0.13
$\Delta\tau^{\text{US}}$	11	-1.8	1.4	-3.36	-1.91	-1.45	-1.05	-0.66
$\Delta\tau^{\text{MEX}}$	5	-2.37	1.22	-3.92	-2.88	-2.2	-1.5	-1.14
$\Delta\tau^{\text{MEX}}$	4	-2.56	1.32	-4.28	-3	-2.29	-1.6	-1.37
$\Delta\tau^{\text{MEX}}$	12	-11.78	1.67	-13.19	-12.21	-11.62	-11.14	-9.98
Panel B: By human capital								
$\Delta\tau^{\text{US}}$ (low human capital)	3	-0.93	0.92	-2.36	-1.28	-0.59	-0.33	-0.14
$\Delta\tau^{\text{US}}$ (high human capital)	3	-0.27	0.22	-0.5	-0.32	-0.22	-0.16	-0.09
$\Delta\tau^{\text{MEX}}$ (low human capital)	5	-3.55	1.61	-5.69	-4.56	-3.39	-2.48	-1.74
$\Delta\tau^{\text{MEX}}$ (high human capital)	5	-2.04	0.82	-3.09	-2.46	-2.02	-1.4	-1.14

Notes: This table reports summary statistics of the distribution of the measures of exposure to NAFTA tariff liberalization between 1990 and 2000. High (low) human capital commuting zones are those with an above (below) share of working-age population with college education in 1990. These statistics are weighted by 1990 population in each commuting zone.

Table A.6: Regional Exposure to Tariff Liberalization Over Time

Year	Mean	St. Dev.	p10	p25	p50	p75	p90
Panel A: Regional Exposure to U.S. Tariffs (equation (14))							
1993	0.29	0.49	0.06	0.09	0.15	0.21	0.58
1994	0.18	0.33	0.04	0.06	0.10	0.13	0.34
1997	0.09	0.16	0.02	0.03	0.05	0.07	0.18
2000	0.02	0.04	0.00	0.01	0.01	0.02	0.04
Panel B: Regional Exposure to U.S. Tariffs (equation (15))							
1993	1.22	1.30	0.35	0.60	0.85	1.28	2.28
1994	0.78	0.89	0.21	0.37	0.50	0.78	1.35
1997	0.39	0.45	0.10	0.16	0.25	0.44	0.78
2000	0.11	0.14	0.02	0.04	0.07	0.12	0.21
Panel C: Regional Exposure to Mexico's Tariffs (equation (16))							
1993	2.59	1.37	1.23	1.65	2.37	3.16	4.38
1994	0.97	0.82	0.32	0.42	0.72	1.26	1.96
1997	0.51	0.48	0.16	0.21	0.37	0.62	1.03
2000	0.20	0.21	0.06	0.08	0.15	0.25	0.39
Panel D: Regional Exposure to Mexico's Tariffs (equation (17))							
1993	12.82	2.25	10.86	12.00	12.52	13.24	14.21
1994	4.62	2.65	2.05	2.81	4.58	5.72	6.74
1997	2.42	1.67	1.02	1.58	2.30	2.92	3.61
2000	0.95	0.79	0.38	0.59	0.87	1.15	1.47

Notes: Panels A and B tabulate the mean, standard deviation, and 10th, 25th, 50th, 75th and 90th percentiles of the distribution across commuting zones of the following measures of regional exposure to U.S. tariff liberalization, in which employment and revealed comparative advantage are computed in 1990 and tariffs vary by year. L_i stands for total employment in commuting zone i. L_{ij} stands for employment in commuting zone i in industry j. L_i^T stands for employment in all tradable industries in commuting zone i. $\tau_{tj}^{U.S.}$ is the U.S.' tariff toward Mexico in industry j in year t. $\text{RCA}_j^{\text{MEX}}$ is Mexico's revealed comparative advantage in industry j, defined in equation (2).

$$\tau_{it}^{U.S.} = \frac{L_i^T}{L_i} \sum_j \frac{L_{ij}\text{RCA}_j^{\text{MEX}} \tau_{tj}^{\text{U.S.}}}{L_{ij}\text{RCA}_j^{\text{MEX}}} . \tag{14}$$

$$\tau_{it}^{U.S.} = \sum_j \frac{L_{ij}\text{RCA}_j^{\text{MEX}} \tau_{tj}^{\text{U.S.}}}{L_{ij}\text{RCA}_j^{\text{MEX}}} . \tag{15}$$

Panels C and B tabulate equivalent summary statistics of the distribution across commuting zones of the following measures of regional exposure to Mexico's tariff liberalization. τ_{tj}^{MEX} is Mexico's tariff toward the U.S. in industry j in year t. $\text{RCA}_j^{\text{U.S.}}$ is the U.S.'s revealed comparative advantage in industry j, defined in equation (6).

$$\tau_{it}^{MEX} = \frac{L_i^T}{L_i} \sum_j \frac{L_{ij}\text{RCA}_j^{\text{U.S.}} \tau_{tj}^{\text{MEX}}}{L_{ij}\text{RCA}_j^{\text{U.S.}}} . \tag{16}$$

$$\tau_{it}^{MEX} = \sum_j \frac{L_{ij}\text{RCA}_j^{\text{U.S.}} \tau_{tj}^{\text{MEX}}}{L_{ij}\text{RCA}_j^{\text{U.S.}}} . \tag{17}$$

These summary statistics are weighted by commuting zone population in 1990.

Table A.7: Largest and Smallest Exposure to Tariff Liberalization Among 100 Largest Commuting Zones

Panel A: U.S. Tariffs

Rank	CZ Name	State	Change in Tariff	Rank	CZ Name	State	Change in Tariff
1	Fayetteville	NC	-3.071	91	Virginia Beach	VA	-0.101
2	Greensboro	NC	-2.716	92	Tulsa	OK	-0.097
3	Greenville	SC	-1.746	93	Port St. Lucie	FL	-0.083
4	Johnson City	TN	-1.424	94	Tucson	AZ	-0.081
5	Charlotte	NC	-1.288	95	New Orleans	LA	-0.075
6	Reading	PA	-0.878	96	Oklahoma City	OK	-0.072
7	Gary	IN	-0.865	97	Houston	TX	-0.064
8	Raleigh	NC	-0.849	98	Bakersfield	CA	-0.038
9	Columbia	SC	-0.810	99	Washington DC	MD	-0.027
10	Modesto	CA	-0.767	100	Las Vegas	NV	-0.021

Panel B: Mexico's Tariffs

Rank	CZ Name	State	Change in Tariff	Rank	CZ Name	State	Change in Tariff
1	Greensboro	NC	-6.496	91	Sarasota	FL	-1.153
2	Fayetteville	NC	-4.673	92	New York	NY	-1.142
3	Johnson City	TN	-4.605	93	Virginia Beach	VA	-1.141
4	Grand Rapids	MI	-4.110	94	Des Moines	IA	-1.103
5	Rockford	IL	-4.061	95	New Orleans	LA	-1.077
6	Greenville	SC	-4.035	96	Toms River	NJ	-1.041
7	Reading	PA	-4.009	97	Bakersfield	CA	-0.863
8	Canton	OH	-3.917	98	Port St. Lucie	FL	-0.853
9	Erie	PA	-3.907	99	Washington DC	MD	-0.467
10	Richmond	VA	-3.852	100	Las Vegas	NV	-0.389

Notes: This table reports the list of commuting zones facing the largest and smallest reductions in regional tariff exposure among the largest 100 commuting zones in terms of 1990 population. Panel A corresponds to exposure to U.S. tariff liberalization (defined in equation (3)). Panel B corresponds to exposure to Mexico's tariff liberalization (defined in equation (5)). States listed correspond to the state in which a commuting zone has the largest share of population. Commuting zone names are obtained from Chetty et al. [2014].

Table A.8: Industries with Largest Tariff Reductions

Panel A: U.S. Tariffs

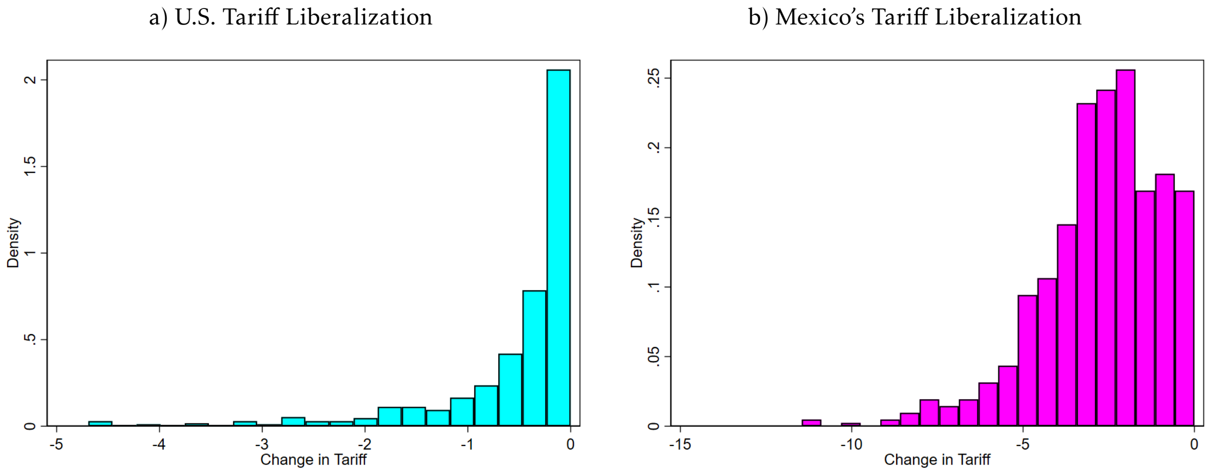
Rank	SIC code	Industry Name	Tariff Change	Rank	SIC code	Industry Name	Tariff Change
1	3262	Vitreous china table + kitchenware	-34.4	16	2339	Women's and misses' outerwear, nec	-14.4
2	2342	Bras, girdles, and allied garments	-23.3	17	3142	House slippers	-14.1
3	2024	Ice cream and frozen desserts	-20.0	18	2231	Broadwoven fabric mills, wool	-13.8
4	2325	Men's and boys' trousers and slacks	-17.1	19	2258	Lace + warp knit fabric mills	-13.3
5	2252	Hosiery	-16.3	20	2331	Women's + misses' blouses + shirts	-13.0
6	2385	Waterproof outerwear	-16.3	21	2391	Curtains and draperies	-12.4
7	2329	Men's and boys' clothing, nec	-16.2	22	2311	Men's and boys' suits and coats	-12.4
8	2369	Girls' and children's outerwear, nec	-15.8	23	2335	Women's, junior's, + misses' dresses	-12.4
9	2221	Broadwoven fabric mills, manmade	-15.4	24	2337	Women's and misses' suits and coats	-12.2
10	2321	Men's and boys' shirts	-15.4	25	2341	Women's and children's underwear	-12.2
11	3021	Rubber and plastics footwear	-15.2	26	2322	Men's + boys' underwear + nightwear	-12.2
12	2253	Knit outerwear mills	-15.0	27	2384	Robes and dressing gowns	-12.1
13	2087	Flavoring extracts and syrups, nec	-15.0	28	2297	Nonwoven fabrics	-11.8
14	3341	Secondary nonferrous metals	-14.6	29	3161	Luggage	-11.4
15	2257	Weft knit fabric mills	-14.5	30	2211	Broadwoven fabric mills, cotton	-11.0

Panel B: Mexico's Tariffs

Rank	SIC code	Industry Name	Tariff Change	Rank	SIC code	Industry Name	Tariff Change
1	2621	Paper and paperboard mills	-44.3	16	2393	Textile bags	-20.0
2	2131	Chewing and smoking tobacco	-35.0	17	2323	Men's and boys' neckwear	-20.0
3	2121	Cigars	-35.0	18	2448	Wood pallets and skids	-20.0
4	2111	Cigarettes	-35.0	19	2381	Fabric dress and work gloves	-20.0
5	2141	Tobacco stemming and redrying	-35.0	20	3263	Semivitreous table + kitchenware	-20.0
6	2429	Special product sawmills, nec	-20.0	21	2258	Lace + warp knit fabric mills	-20.0
7	2394	Canvas and related products	-20.0	22	3581	Automatic vending machines	-20.0
8	2342	Bras, girdles, and allied garments	-20.0	23	2396	Automotive and apparel trimmings	-20.0
9	2257	Weft knit fabric mills	-20.0	24	2325	Men's and boys' trousers and slacks	-20.0
10	2391	Curtains and draperies	-20.0	25	3262	Vitreous china table + kitchenware	-20.0
11	2449	Wood containers, nec	-20.0	26	3271	Concrete block and brick	-20.0
12	2371	Fur goods	-20.0	27	2252	Hosiery	-20.0
13	2322	Men's + boys' underwear + nightwear	-20.0	28	2451	Mobile homes	-20.0
14	2771	Greeting cards	-20.0	29	2329	Men's and boys' clothing, nec	-19.8
15	3251	Brick and structural clay tile	-20.0	30	3149	Footwear, except rubber, nec	-19.8

Notes: Panel A lists the 30 SIC 4-digit manufacturing industries facing the largest reductions in U.S. tariffs toward Mexico between 1990 and 2000. Panel B lists the 30 SIC 4-digit manufacturing industries facing the largest reductions in Mexico's tariffs toward the U.S. between 1990 and 2000.

Figure A.1: Distribution of Changes in Regional Exposure to Tariff Liberalization



Notes: These histograms show the distribution of the measures of regional exposure to tariff liberalization. Figure a) corresponds to exposure to U.S. tariff liberalization, defined in equation (3). Figure b) corresponds to exposure to Mexico's tariff liberalization, defined in equation (5).

Table A.9: Summary Statistics for Growth in Chinese Import Competition

	Defined in equation	Mean	St. Dev.	p10	p25	p50	p75	p90
ΔIPW_{ui}	7	1.14	0.99	0.38	0.62	0.89	1.32	2.05
ΔIPW_{oi}	8	1.00	0.70	0.33	0.53	0.92	1.26	1.87

Notes: This table reports summary statistics of the distribution of the measure of growth in Chinese imports between 1990 and 2000, ΔIPW_{ui} and the instrument used for it, growth in Chinese imports by other eight developed countries ΔIPW_{oi}. These statistics are weighted by 1990 population in each commuting zone.

Table A.10: Summary Statistics for Initial Routine Employment Share

	Mean	St. Dev.	p10	p25	p50	p75	p90
Share of 1990 Empl. in Routine Occs.	32.23	2.83	28.13	30.44	32.85	34.45	35.01
$\widetilde{RSH}_i$	24.11	4.76	17.28	21.47	25.04	26.96	28.19

Notes: The first row reports summary statistics for the distribution of the share of employment in routine occupations in 1990. The second row reports summary statistics for the instrument used for the initial routine employment share, which is defined in equation (10). These statistics are weighted by 1990 population in each commuting zone.

A.9. Additional Results

Table A.11: NAFTA Tariff Liberalization and Change in Share of Manufacturing Employment in the Working-Age Population: 2SLS First Stage Estimates

Dependent Variable: Change in Chinese import exposure per worker, ΔIPW_{ui}

	(RCA-weighted) (1)	(2)
ΔIPW_{oi}	0.836***	0.836***
	(0.181)	(0.181)

Notes: $N = 722$. This table reports the results of the first stage for the 2SLS estimation of equation (9). In column 1 the measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). In column 2 the measures of exposure to tariff liberalization do not weigh tariffs by revealed comparative advantage, as defined by equations (1) and (4). Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table A.12: Growth in Chinese Imports and Change in Employment Status in the Working-Age Population

Dependent Variable: Change in population shares by employment status (in % pts)

		By Education		By Gender		By Age		
	All	Noncollege	College	Female	Male	16-34	35-49	50-64
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Manufacturing								
ΔIPW	-0.222	-0.263	-0.006	-0.627***	0.206	-0.197	-0.295*	-0.141
	(0.169)	(0.167)	(0.220)	(0.156)	(0.259)	(0.227)	(0.173)	(0.170)
Panel B: Nonmanufacturing								
ΔIPW	0.195	0.144	0.199	0.130	0.237	0.290	0.119	0.048
	(0.202)	(0.232)	(0.185)	(0.186)	(0.259)	(0.242)	(0.197)	(0.294)
Panel C: Employment								
ΔIPW	-0.028	-0.119	0.193	-0.498***	0.443	0.093	-0.176	-0.093
	(0.211)	(0.269)	(0.158)	(0.193)	(0.310)	(0.254)	(0.212)	(0.254)
Panel D: Unemployment								
ΔIPW	-0.052	-0.087	-0.006	-0.060	-0.041	-0.061	-0.043	-0.050
	(0.088)	(0.112)	(0.064)	(0.070)	(0.122)	(0.123)	(0.082)	(0.051)
Panel E: Not in the labor force								
ΔIPW	0.080	0.206	-0.187	0.557***	-0.402*	-0.032	0.218	0.143
	(0.157)	(0.196)	(0.148)	(0.177)	(0.242)	(0.190)	(0.152)	(0.236)

Notes: $N = 722$. This table reports the results of the estimation of equation (9). The dependent variables are the change in the share in the working-age population of manufacturing employent (panel A), of nonmanufacturing employent (panel B), of total employment (panel C), of unemployment (panel D) and of the number of individuals not in the labor force (panel E) overall (column 1) or for the subgroups listed in each column between 2 and 8. All regressions are estimated by 2SLS, and growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table A.13: NAFTA Tariff Liberalization and Change in Share of Manufacturing Employment in the Working-Age Population: Alternative Treatment of Nontradable Sector in Measure of Regional Exposure to Tariff Liberalization

Dependent Variable: Change in manufacturing emp/working-age pop (in % pts)

	All			Noncollege			College		
	OLS	OLS	2SLS	OLS	OLS	2SLS	OLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\Delta\tau^{US}$	0.161*	0.155*	0.156*	0.260**	0.249**	0.250**	-0.046	-0.048	-0.048
	(0.092)	(0.089)	(0.085)	(0.111)	(0.107)	(0.102)	(0.084)	(0.081)	(0.079)
$\Delta\tau^{MEX}$		0.025	0.022		0.048	0.044		0.010	0.009
		(0.044)	(0.041)		(0.051)	(0.048)		(0.040)	(0.037)
ΔIPW			-0.182			-0.198			-0.019
			(0.173)			(0.166)			(0.221)

Notes: $N = 722$. This table reports the results of the estimation of equation (9). The dependent variables are the change in manufacturing employent as a share of the working-age population among all individuals (columns 1-3), among individuals with no college education (columns 4-6) or among individuals with college education (columns 7-9). The measures of exposure to tariff liberalization are based only on variation in tariffs within the tradable sector, as defined by equations (11) and (12) in Appendix A.6. Columns 1-2, 4-5, and 7-8 are estimated by OLS. In columns 3, 6 and 9, estimated by 2SLS, growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table A.14: NAFTA Tariff Liberalization and Change in Share of Manufacturing Employment in the Working-Age Population: Control Variables Introduced Sequentially

Dependent Variable: Change in manufacturing emp/working-age pop (in % pts)

	2SLS (1)	2SLS (2)	2SLS (3)	2SLS (4)	2SLS (5)
$\Delta\tau^{US}$	1.162*** (0.308)	1.161*** (0.318)	1.207*** (0.285)	1.212*** (0.271)	0.591** (0.242)
$\Delta\tau^{MEX}$	-0.391** (0.196)	-0.403 (0.301)	-0.002 (0.229)	0.186 (0.210)	0.088 (0.172)
ΔIPW	-0.807*** (0.284)	-0.805*** (0.282)	-0.427* (0.220)	-0.542** (0.224)	-0.169 (0.169)
Percentage of employment in manufacturing$_{1990}$		-0.002 (0.041)	-0.003 (0.032)	0.039 (0.035)	-0.031 (0.029)
Percentage of college-educated population$_{1990}$			-0.023 (0.028)	-0.010 (0.026)	0.001 (0.018)
Percentage of foreign-born population$_{1990}$			-0.061*** (0.008)	-0.031*** (0.009)	-0.004 (0.013)
Percentage of employment among women$_{1990}$			-0.036 (0.029)	0.013 (0.031)	0.030 (0.025)
Percentage of employment in routine occupations$_{1990}$				-0.139*** (0.052)	-0.186*** (0.056)
Average offshorability index of occupations$_{1990}$				-0.550* (0.326)	-0.706** (0.360)
Census division dummies	No	No	No	No	Yes

Notes: $N = 722$. This table reports the results of the estimation of equation (9). The dependent variable is the change in manufacturing employent as a share of the working-age population. The measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). Growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table A.15: NAFTA Tariff Liberalization and Change in Share of Manufacturing Employment in the Working-Age Population: 1970-1990

Dependent Variable: Change in manufacturing emp/working-age pop (in % pts)

	1970-1980		1980-1990		1970-1990	
	(RCA-weighted) (1)	(2)	(RCA-weighted) (3)	(4)	(RCA-weighted) (5)	(6)
$\Delta\tau^{\text{US}}$	-0.267	-0.288	-0.233	-0.148	-0.246	-0.214
	(0.267)	(0.361)	(0.276)	(0.347)	(0.203)	(0.281)
$\Delta\tau^{\text{MEX}}$	-0.222	-0.221	-0.009	-0.077	-0.117	-0.150
	(0.149)	(0.152)	(0.163)	(0.158)	(0.116)	(0.117)

Notes: $N = 722$. This table reports the results of the OLS estimation of equation (9). The dependent variables are the change in the share in manufacturing employment in the working-age population between 1970-1980 (columns 1 and 2), between 1980-1990 (columns 3 and 4) or between 1970-1990 (columns 5 and 6). In columns 1, 3, and 5 the measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). In columns 2, 4, and 6 the measures of exposure to tariff liberalization do not weigh tariffs by revealed comparative advantage, as defined by equations (1) and (4). Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table A.16: NAFTA Tariff Liberalization and Change in Employment Status in the Working-Age Population: Alternative Measure of Exposure not Weighing by Revealed Comparative Advantage

Dependent Variable: Change in population shares by employment status (in % pts)

	Manufacturing		Nonmanufacturing		Employment		Unemployment		Not in the Labor Force	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: All education levels										
$\Delta\tau^{US}$	0.748**	0.756**	-0.327	-0.337	0.421	0.419	-0.262***	-0.257***	-0.159	-0.162
	(0.316)	(0.306)	(0.246)	(0.235)	(0.258)	(0.259)	(0.088)	(0.092)	(0.225)	(0.226)
$\Delta\tau^{MEX}$	0.022	0.003	0.187	0.213	0.209	0.216	0.024	0.012	-0.233	-0.228
	(0.140)	(0.137)	(0.172)	(0.171)	(0.185)	(0.177)	(0.079)	(0.070)	(0.157)	(0.155)
ΔIPW		-0.129		0.173		0.044		-0.083		0.039
		(0.173)		(0.210)		(0.187)		(0.081)		(0.140)
Panel B: No college education										
$\Delta\tau^{US}$	1.058***	1.065***	-0.175	-0.184	0.882**	0.881**	-0.377***	-0.369***	-0.506	-0.512
	(0.338)	(0.327)	(0.298)	(0.286)	(0.363)	(0.362)	(0.107)	(0.112)	(0.331)	(0.333)
$\Delta\tau^{MEX}$	0.076	0.057	0.263	0.285	0.338	0.341	0.024	0.004	-0.362*	-0.346*
	(0.139)	(0.138)	(0.216)	(0.211)	(0.223)	(0.213)	(0.092)	(0.081)	(0.188)	(0.188)
ΔIPW		-0.126		0.148		0.021		-0.132		0.110
		(0.160)		(0.232)		(0.232)		(0.106)		(0.163)
Panel C: College education										
$\Delta\tau^{US}$	-0.125	-0.123	-0.133	-0.145	-0.258	-0.267	-0.099	-0.098	0.357*	0.365*
	(0.329)	(0.318)	(0.299)	(0.293)	(0.207)	(0.204)	(0.090)	(0.089)	(0.210)	(0.203)
$\Delta\tau^{MEX}$	-0.218	-0.224	0.097	0.126	-0.120	-0.098	0.018	0.015	0.103	0.083
	(0.169)	(0.159)	(0.178)	(0.170)	(0.165)	(0.161)	(0.082)	(0.076)	(0.175)	(0.171)
ΔIPW		-0.042		0.193		0.150		-0.016		-0.134
		(0.223)		(0.182)		(0.147)		(0.059)		(0.140)

Notes: $N = 722$. This table reports the results of the estimation of equation (9). The dependent variables are the change in the share in the working-age population of manufacturing employent (columns 1-2), of nonmanufacturing employent (columns 3-4), of total employment (columns 5-6), of unemployment (columns 7-8) and of the number of individuals not in the labor force (columns 9-10). The measures of exposure to tariff liberalization do not weigh tariffs by revealed comparative advantage, as defined by equations (1) and (4). Columns 1, 3, 5, 7 and 9 are estimated by OLS. In columns 2, 4, 6, 8 and 10, estimated by 2SLS, growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table A.17: NAFTA Tariff Liberalization and Change in Employment Status in the Working-Age Population: Alternative Treatment of Nontradable Sector in Measure of Regional Exposure to Tariff Liberalization

Dependent Variable: Change in population shares by employment status (in % pts)

	Manufacturing		Nonmanufacturing		Employment		Unemployment		Not in the Labor Force	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: All education levels										
$\Delta\tau^{US}$	0.155*	0.156*	-0.085	-0.086	0.070	0.070	-0.066***	-0.065***	-0.004	-0.005
	(0.089)	(0.085)	(0.060)	(0.056)	(0.072)	(0.071)	(0.023)	(0.023)	(0.066)	(0.066)
$\Delta\tau^{MEX}$	0.025	0.022	-0.062	-0.059	-0.037	-0.037	0.045***	0.044***	-0.008	-0.007
	(0.044)	(0.041)	(0.061)	(0.059)	(0.054)	(0.052)	(0.015)	(0.014)	(0.048)	(0.046)
ΔIPW		-0.182		0.174		-0.008		-0.071		0.079
		(0.173)		(0.206)		(0.200)		(0.087)		(0.147)
Panel B: No college education										
$\Delta\tau^{US}$	0.249**	0.250**	-0.063	-0.064	0.186*	0.186*	-0.099***	-0.098***	-0.087	-0.088
	(0.107)	(0.102)	(0.074)	(0.070)	(0.096)	(0.095)	(0.032)	(0.033)	(0.088)	(0.087)
$\Delta\tau^{MEX}$	0.048	0.044	-0.112	-0.110	-0.065	-0.066	0.053**	0.051**	0.012	0.015
	(0.051)	(0.048)	(0.093)	(0.090)	(0.072)	(0.070)	(0.021)	(0.020)	(0.066)	(0.066)
ΔIPW		-0.198		0.131		-0.067		-0.114		0.182
		(0.166)		(0.232)		(0.255)		(0.113)		(0.181)
Panel C: College education										
$\Delta\tau^{US}$	-0.048	-0.048	-0.034	-0.035	-0.082	-0.083	-0.022	-0.022	0.105	0.106
	(0.081)	(0.079)	(0.061)	(0.059)	(0.067)	(0.065)	(0.026)	(0.026)	(0.070)	(0.068)
$\Delta\tau^{MEX}$	0.010	0.009	-0.013	-0.010	-0.004	-0.001	0.032**	0.032**	-0.028	-0.031
	(0.040)	(0.037)	(0.032)	(0.032)	(0.040)	(0.039)	(0.016)	(0.015)	(0.034)	(0.033)
ΔIPW		-0.019		0.190		0.171		-0.013		-0.158
		(0.221)		(0.186)		(0.151)		(0.064)		(0.143)

Notes: $N = 722$. This table reports the results of the estimation of equation (9). The dependent variables are the share in the working-age population of manufacturing employent (columns 1-2), of nonmanufacturing employent (columns 3-4), of total employment (columns 5-6), of unemployment (columns 7-8) and of the number of individuals not in the labor force (columns 9-10). The measures of exposure to tariff liberalization are based only on variation in tariffs within the tradable sector, as defined by equations (11) and (12) in Appendix A.6. Columns 1, 3, 5, 7 and 9 are estimated by OLS. In columns 2, 4, 6, 8 and 10, estimated by 2SLS, growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table A.18: NAFTA Tariff Liberalization and Change in Employment Status in the Working-Age Population by Age

Dependent Variable: Change in manufacturing emp/working-age pop (in % pts)

	Manufacturing		Nonmanufacturing		Employment		Unemployment		Not in the Labor Force	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Age 16-34										
$\Delta\tau^{US}$	0.468	0.476	-0.591**	-0.604**	-0.123	-0.128	-0.172	-0.168	0.295	0.295
	(0.341)	(0.325)	(0.262)	(0.247)	(0.294)	(0.294)	(0.110)	(0.112)	(0.273)	(0.270)
$\Delta\tau^{MEX}$	0.053	0.034	-0.141	-0.113	-0.088	-0.079	0.053	0.044	0.036	0.035
	(0.230)	(0.219)	(0.275)	(0.263)	(0.272)	(0.258)	(0.115)	(0.107)	(0.241)	(0.234)
ΔIPW		-0.155		0.235		0.080		-0.075		-0.005
		(0.234)		(0.239)		(0.241)		(0.121)		(0.180)
Panel B: Age 35-49										
$\Delta\tau^{US}$	0.597*	0.610**	-0.026	-0.033	0.570***	0.577***	-0.187**	-0.184**	-0.383***	-0.393***
	(0.320)	(0.303)	(0.276)	(0.265)	(0.179)	(0.175)	(0.090)	(0.091)	(0.130)	(0.126)
$\Delta\tau^{MEX}$	0.076	0.048	0.304	0.318	0.380**	0.367**	-0.017	-0.024	-0.364***	-0.343***
	(0.251)	(0.249)	(0.284)	(0.279)	(0.152)	(0.152)	(0.063)	(0.059)	(0.130)	(0.132)
ΔIPW		-0.240		0.122		-0.119		-0.059		0.178
		(0.171)		(0.200)		(0.203)		(0.081)		(0.143)
Panel C: Age 50-64										
$\Delta\tau^{US}$	0.467**	0.472**	0.572	0.567	1.040**	1.039***	-0.128*	-0.125*	-0.912**	-0.915**
	(0.222)	(0.220)	(0.370)	(0.367)	(0.407)	(0.401)	(0.068)	(0.070)	(0.369)	(0.363)
$\Delta\tau^{MEX}$	0.196	0.185	0.089	0.101	0.285	0.285	0.041	0.033	-0.326	-0.319
	(0.158)	(0.158)	(0.242)	(0.245)	(0.222)	(0.220)	(0.059)	(0.054)	(0.211)	(0.212)
ΔIPW		-0.096		0.099		0.003		-0.061		0.058
		(0.164)		(0.292)		(0.239)		(0.050)		(0.220)

Notes: $N = 722$. This table reports the results of the estimation of equation (9). The dependent variables are the change in the share in the working-age population of manufacturing employent (columns 1-2), of nonmanufacturing employent (columns 3-4), of total employment (columns 5-6), of unemployment (columns 7-8) and of the number of individuals not in the labor force (columns 9-10) by age-groups. The measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). Columns 1, 3, 5, 7 and 9 are estimated by OLS. In columns 2, 4, 6, 8 and 10, estimated by 2SLS, growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table A.19: Growth in Chinese Imports and Change in Share of Task Employment in the Working-Age Population

Dependent Variable: Change in occupational emp/working-age pop (in % pts)

	Abstract	Routine: Clerical/Sales	Routine: Production	Manual
	(1)	(2)	(3)	(4)
ΔIPW	0.232	0.090	-0.069	0.029
	(0.191)	(0.120)	(0.118)	(0.100)
Share of 1990 Employment in Routine Occupations	0.229*	0.107	-0.056	0.304***
	(0.119)	(0.096)	(0.067)	(0.087)

Notes: $N = 722$. This table reports the results of the estimation of equation (9), excluding the measures of regional exposure to tariff liberalization. All regressions are estimated by 2SLS, and growth in Chinese imports (ΔIPW) is instrumented by growth in Chinese exports to non-U.S. high-income markets. The share of employment in routine occupations in 1990 is instrumented by the measure of commuting zone historical industry structure defined in in equation (10) in Appendix A.5. Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Table A.20: NAFTA Tariff Liberalization and Change in Share of Task Employment in the Working-Age Population: 2SLS First Stage Estimates.

Panel A: Dependent Variable: Change in Chinese import exposure per worker, ΔIPW_{ui}

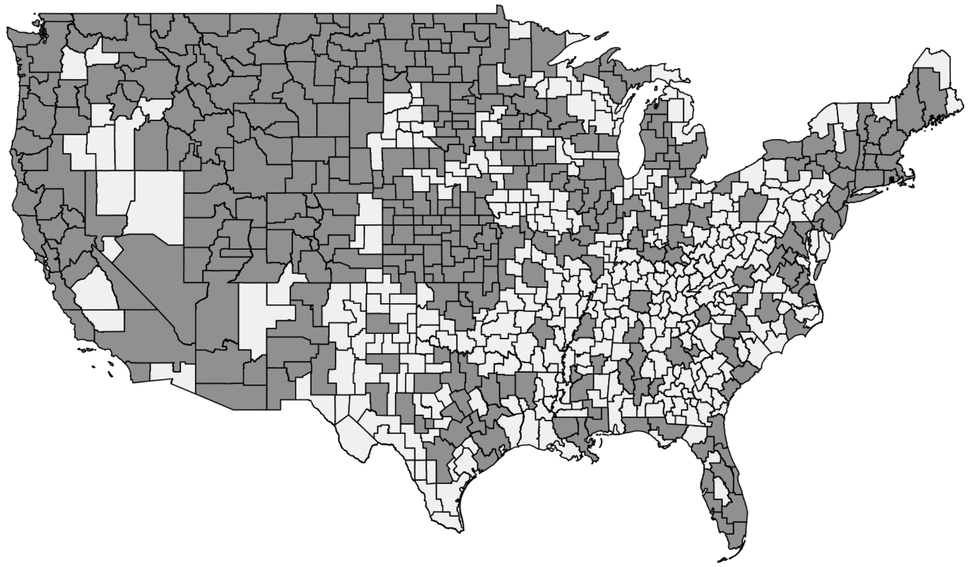
	(1)
ΔIPW_{oi}	0.828 ***
	(0.175)

Panel B: Dependent Variable: Share of 1990 employment in routine occupations

	(1)
$\widetilde{RSH}_i$	14.83***
	(2.12)

Notes: $N = 722$. This table reports the results of the first stage for the 2SLS estimation of equation (9) corresponding to column 1 in Table 10, which uses growth in Chinese imports by eight developed countries (ΔIPW_{oi}) as an instrument for growth in Chinese imports by the U.S. (ΔIPW_{ui}) and historical industry structure defined in equation (10) in Appendix A.5 as an instrument for the 1990 share of employment in routine occupations. In both panels, the measures of exposure to tariff liberalization weigh tariffs by revealed comparative advantage, as defined by equations (3) and (5). Standard errors are clustered by state and observations are weighted by 1990 population in each commuting zone. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level.

Figure A.2: High and Low Human Capital Commuting Zones



Notes: A darker (lighter) shade indicates high (low) human capital in 1990. High (low) human capital commuting zones are those with an above (below) median share of working-age population with college education in 1990.