Immigrants Equilibrate Local Labor Markets: Evidence from the Great Recession*

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Abstract

This paper demonstrates that low-skilled Mexican-born immigrants' location choices in the U.S. respond strongly to changes in local labor demand, and that this geographic elasticity helps equalize spatial differences in labor market outcomes for low-skilled native workers, who are much less responsive. We leverage the wage rigidity that occurred during Great Recession to identify the severity of local downturns, and our results confirm the standard finding that high-skilled populations are quite geographically responsive to employment opportunities while low-skilled populations are much less so. However, low-skilled immigrants, especially those from Mexico, respond even more strongly than high-skilled native-born workers. These results are robust to a wide variety of controls, a pre-recession falsification test, and two instrumental variables strategies. A novel empirical test reveals that natives living in metro areas with a substantial Mexican-born population are insulated from the effects of local labor demand shocks compared to those in places with few Mexicans. The reallocation of the Mexican-born workforce reduced the incidence of local demand shocks on low-skilled natives' employment outcomes by more than 40 percent.

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1 Introduction

Over the past two decades, the labor market in the United States has shown signs of becoming less dynamic in a number of important ways. Job creation, job destruction, and job-to-job transitions have all fallen markedly (Davis, Faberman and Haltiwanger 2012, Hyatt and Spletzer 2013). Additionally, fewer people are making long-distance moves (Molloy, Smith and Wozniak 2011), which is concerning because geographic labor mobility is a primary means of equilibrating differences across local labor markets (Blanchard and Katz 1992). This declining dynamism is of particular concern for low-skilled workers during periods like the Great Recession, which featured mass unemployment and sharp differences across local markets. Not only are less educated workers disproportionately affected by job losses during downturns (Hoynes 2002, Hoynes, Miller and Schaller 2012), but a substantial literature finds that they are the least likely to move from depressed areas toward markets with better earnings prospects (Topel 1986, Bound and Holzer 2000, Wozniak 2010). The substantial geographic variation in labor market conditions during the Great Recession, combined with low levels of geographic mobility, created the potential for sharply disparate labor market outcomes across space, especially among workers without a college education.

In this paper, we examine mobility responses to geographic variation in the depth of the Great Recession, with the goal of determining how such mobility affects the incidence of local demand shocks. The analysis reveals an important and novel finding: in sharp contrast to their native-born counterparts, low-skilled Mexican-born workers were quite likely to make earnings-sensitive location choices, and this population shifted markedly away from the hardest hit metro areas toward more favorable markets.[1] Importantly, this mobility occurred not only among new arrivals, but also among immigrants who were already living in the US prior to the recession. Moreover, demand-sensitive migration by Mexican-born immigrants dramatically reduced the geographic variability of labor market outcomes faced by less-skilled *natives*. Natives in metro areas with a substantial Mexican-born population experienced a 40 percent weaker relationship between local demand shocks and local employment rates, compared to metro areas with relatively small Mexican-born populations.

Conducting this type of analysis requires identifiable changes in labor demand. During the Great Recession, the labor market exhibited downward-rigid nominal wages in a near zero-inflation environment, with employers responding to declining demand for their output

[1] As discussed below, we focus on the mobility of Mexican-born immigrants not because we find strong evidence against mobility of other immigrant groups, but rather because Mexicans exhibit the strongest and most precisely estimated mobility responses among the foreign-born.

by cutting the quantity of labor they employed. Our empirical strategy leverages this insight and the fact that changes in employment are measurable with a high level of precision at the local level to find the effect of demand shocks on local labor supplies. The results confirm the previous literature's finding of a strong education gradient in geographic responsiveness to labor market conditions. For example, among highly skilled (some college or more) native men, a 10 percentage point larger decline in local employment from 2006 to 2010 led to a 5.3 percentage point relative decline in the local population, compared with no measurable supply response among less skilled (high school degree or less) natives. In sharp contrast, less skilled Mexican-born men responded even more strongly than highly skilled natives, with a 10 percentage point larger employment decline driving a 7.6 percentage point larger decline in population. Immigrants thus play a crucial and understudied role in increasing the overall geographic responsiveness of less skilled laborers in the U.S., and this result adds a new dimension to the existing literature that focuses on workers' responsiveness to demand shocks based on education and demographics.[2]

To reinforce the interpretation that the reallocation of Mexican-born labor was caused by demand changes, we implement a wide array of robustness checks, all of which support the central results. The strong labor supply elasticities among the Mexican-born are unaffected by controlling for diffusion of Mexican immigrants away from traditional enclaves (Card and Lewis 2007), new anti-immigrant employment legislation, and new immigration enforcement policies (Bohn and Santillano 2012, Watson 2013). We further show in a pre-Recession false experiment that the observed differences in mobility between low skilled natives and Mexicans were not part of an ongoing pre-Recession trend. As a complement to our main identification strategy, we instrument for local labor demand using (i) the standard Bartik (1991) measure that predicts shifts in local labor demand based on the pre-Recession industrial composition of local employment and (ii) pre-Recession household leverage, following Mian and Sufi (2012). Both sets of IV results confirm the sharp differences in responsiveness between less skilled Mexican-born and native-born workers, which reinforces interpreting the observed population shifts as the result of changes in demand.

Having established that less skilled Mexicans are highly geographically responsive to

[2]Bartik (1991), and Blanchard and Katz (1992) show that workers generally respond to declines in labor demand by migrating toward stronger labor markets. In the immigration context, Hanson and Spilimbergo (1999) show that migration flows between the U.S. and Mexico respond as expected to changes in real wages in each country. Topel (1986), Bound and Holzer (2000), and Wozniak (2010) demonstrate substantial differences in geographic responsiveness across education and demographic groups, while a more recent literature argues that educational attainment itself increases individuals' geographic elasticity (Hickman 2009, Malamud and Wozniak 2012, Machin, Salvanes and Pelkonen 2012, Böckerman and Haapanen 2013).

changes in labor market conditions while less skilled natives are not, we examine the implications of Mexican mobility for natives' employment outcomes. We find that in metro areas where the Mexican-born comprised a substantial share of the low-skilled workforce prior to the recession, there was a much weaker relationship between labor demand shocks and *native* employment probabilities than in areas with comparatively few Mexican workers. Natives living in metro areas with many similarly skilled Mexicans were thus insulated from local shocks, as the departure (arrival) of Mexican workers absorbed part of the relative demand decline (increase). Therefore, Mexican mobility serves to equalize labor market outcomes across the country and partially obviates the need for natives to move.

Finally, we consider possible explanations for why the Mexican-born are more likely to make demand-sensitive long-distance moves. We begin by noting that a portion of the difference can be explained by larger overall mobility rates when including international migration. The remainder reflects differential sensitivity to changing labor market conditions, and we thus examine a number of reasons why the location decisions of the Mexican-born are more responsive. We first consider differences in observable demographic characteristics such as age, education, family structure, and home ownership, but we find that these do not account for the differential responsiveness. Instead, we conclude that a likely contributing factor is the greater labor market attachment among the Mexican-born, which derives in part from lower access to unemployment insurance programs and from relatively short intended stays within the US labor market. In addition, Mexican-born workers have access to a particularly robust network that reduces both the costs of acquiring information about distant labor markets and the financial costs of moving (Munshi 2003). Thus, Mexican workers have particularly high costs of extended periods of unemployment and the ability to identify and move toward parts of the country with better re-employment prospects.

These findings have important implications for multiple literatures. First, as mentioned above, a number of papers find that the mobility of workers is a key means of reducing geographic inequality (Bartik 1991, Blanchard and Katz 1992) and that differences in responsiveness across worker types determine the degree to which local shocks are realized in local outcomes for particular worker groups (Topel 1986, Bound and Holzer 2000). Prior work has focused on differences across education groups, and we confirm that native-born less skilled workers respond much less strongly to local market conditions than their higher skilled counterparts do. This paper further demonstrates an even larger difference in responsiveness *within* the less skilled market, between immigrants and natives. Thus, the presence of highly responsive immigrants increases the overall geographic elasticity of the

less skilled labor force, and immigrants' mobility serves as a form of labor market insurance by transferring employment probability from relatively strong markets to relatively weak ones. Importantly, immigrants' mobility mitigates the very negative outcomes that natives otherwise would have faced in the most depressed local markets, which had been the primary concern of the earlier literature.

Second, endogenous location choices by immigrants represent a central challenge in the literature measuring immigrants' effects on natives' labor market outcomes. The potential response of immigrants' location choices to local economic conditions has led researchers to use instrumental variables based on the existing locations of immigrant enclaves (Card (2001), for example) or to use national time-series identification rather than cross-geography comparisons (Borjas 2003).[3] Our results confirm the hypothesis that immigrants' location choices respond strongly to local economic conditions. However, while much of the prior literature focuses on endogenous location choices of newly arriving immigrants, we show that during the Great Recession more than 80 percent of Mexican immigrants' geographic response occurred through return migration or internal migration by previous immigrants, channels that are largely neglected in prior work.[4] This finding demonstrates that geographic arbitrage can occur even without much new immigration, as long as the labor market has a large stock of immigrants whose location choices are highly sensitive to employment opportunities.

Third, the most closely related prior work is Borjas's (2001) seminal paper, which introduced the possibility of spatial arbitrage through the arrival of new immigrants to states with high wage levels and simulated the potential geographic smoothing effect on natives' wages. Although similar in examining geographic smoothing resulting from immigrants' location choices, the current paper differs in important ways. Our unit of analysis is the metropolitan area rather than the state, allowing us to more closely approximate local labor markets. Importantly, we focus on responses to plausibly exogenous labor demand shocks rather than to unconditional wage levels or wage growth. As just mentioned, we examine the importance of return migration and internal migration rather than focusing only on newly

[3]While most of the literature seeks to mitigate the effects of endogenous location choices, a few papers focus directly on immigrants' location choices in response to demand shocks, including Borjas (2001), Jaeger (2007), Cadena (2013), and Cadena (2014).

[4]Bartel (1989) and Bartel and Koch (1991) show that immigrants' educational attainment and the presence of enclaves influenced immigrants' internal migration in the U.S. between 1975 and 1980. Similarly, a few demographic studies discuss immigrants' internal migration patterns (Belanger and Rogers 1992, Kritz and Nogle 1994, Gurak and Kritz 2000). More recently, Maré, Morten and Stillman (2007), study initial and subsequent location choices of immigrants to New Zealand.

arrived immigrants. Finally, we introduce a novel test to demonstrate empirically the geographic smoothing that Borjas investigated through simulation. Rather than assuming a particular degree of substitutability between immigrants and natives, we uncover a relationship in the data that would not exist if immigrants and natives did not compete in the labor market. In this sense, our work provides strong empirical support for his hypothesis that immigration "greases the wheels of the labor market," while expanding the finding to show that immigrants continue to fulfill this role even after arrival.

The remainder of the paper is organized as follows: the next section provides context for examining labor supply elasticities during the Great Recession, including descriptive evidence supporting our primary identification strategy. Section 3 provides the main results and multiple robustness checks of the Mexican/native-born differences in geographic responsiveness. Section 4 measures the degree to which Mexican immigrants' mobility smooths labor market outcomes for natives and demonstrates substantial smoothing in practice. Section 5 presents a decomposition of the supply responses into various channels and discusses potential reasons why Mexican-born immigrants may be uniquely positioned to serve as an equilibrating force in the low-skilled labor market. Section 6 concludes.

2 Background and Conceptual Framework

2.1 Identifying Demand Shocks

Like many previous recessions, the Great Recession was characterized by large employment declines and the absence of substantial wage cuts. In fact, as several authors have documented, inflation over this time period was minimal, and nominal wages continued to grow, albeit at a relatively slow rate (Daly, Hobijn and Lucking 2012a, Daly, Hobijn and Wiles 2012b, Rothstein 2012). Bewley (1999) details multiple potential explanations for the empirical regularity that employers prefer to reduce employment rather than cut wages in response to low product demand. As discussed by Daly et al. (2012a), one possibility is that employers may face a fairness constraint in bargaining with employees, wherein cuts to the nominal wage in response to demand changes are considered exploitative.[5] Alternatively,

[5]Kahneman, Knetsch and Thaler (1986) provide survey results with direct support for this hypothesis. Respondents perceive real wage cuts in response to product demand declines as "unfair" in a low inflation environment (when nominal wages must be cut) but "fair" in a high inflation environment (when nominal wages are increased but at a rate lower than inflation). Consistent with this idea, Card and Hyslop (1997) provide empirical evidence that in previous recessions, inflation likely "greased the wheels" of the labor market by allowing firms to cut real wages without reducing nominal compensation below workers' reference

inputs may be relatively difficult to substitute in the short run, such that if employers cut wages rather than employment, they "... would have lots of people with nothing to do" (p. 185, Bewley 1999). For the purpose of identifying demand shocks, however, it is not necessary to understand the precise reason why employers adjusted on the quantity rather than the price margin. Instead, the only requirement is that employers are acting as if they are unable to cut wages.

Figure 1 shows the national employment to population ratio among prime age workers (25-54) from 1979 to 2013. This ratio fell sharply between late 2007 and late 2009, declining by five percentage points. Compared to the pre-recession trend, it is clear that employment growth stalled by 2007, so we consider 2006 as the pre-recession baseline period and 2010 as the post-recession period throughout our analysis.

Figure 2 compares employment and wage changes over this time period. This figure combines the employment to population ratio from Figure 1 with calculations from Rothstein (2012) of changes in wage rates over the same time period.[6] All values represent proportional changes compared to the same month in the previous year. Average wages are roughly constant over this time period, although they rise in real terms in 2008, which reflects a combination of approximately flat nominal wages and price deflation. Additionally, the lack of downward wage changes was not due to compositional effects. Using the panel dimension of the CPS, the "Within-Worker Wages" series exhibits mildly rising wages for workers observed in the reference month and in the preceding year. As a whole, these results show no evidence of falling wages, even when employment was falling by more than four percent per year in mid-2009.

Our identification strategy exploits this downward wage rigidity and the fact that nearly every local market experienced declining labor demand in order to construct a measure of the relative magnitude of local demand shocks. The simple diagram in Figure 3, shows that, under these conditions, demand shocks are observable directly from changes in local employment. Initially, the market wage w and employment L^0 are determined by the intersection of labor demand, D^0, and labor supply, S. The market then faces a decline in labor demand, represented by a leftward shift in the labor demand curve to D^1. Given downward rigid wages, employment falls to L^1 with the magnitude of the employment change determined entirely by the difference between $D^1(w)$ and $D^0(w)$, i.e. by the size of the horizontal shift

point. In contrast, Elsby, Shin and Solon (2013) find little evidence that employers faced a larger wage rigidity constraint during the Great Recession than in previous recessions.

[6] We are grateful to Jesse Rothstein for making this series available to us.

in the demand curve.

Thus, with a negative labor demand shock and downward rigid wages, one can directly observe the size of the demand decline simply by comparing the quantity of employment before and after the shock. Because the wage floor is binding, this measure of declining labor demand does not depend in any way on the shape of the labor demand or labor supply curve. Moreover, even if the supply curve moves left following the shock as a result of labor migration, the demand decline will still be directly observable in employment as long as supply does not decline by more than demand does. Widespread unemployment suggests that the supply of workers continued to exceed demand.

As a result, in the remainder of the paper we measure each metro area's demand shock as the proportional decline in observed payroll employment, and we then examine how local labor supply responded to the depth of these observable decreases in labor demand. It is important to emphasize that this approach to identifying demand shocks is appropriate only because of the particular features of the labor market during the Great Recession and would likely not be applicable in periods with increasing labor demand or substantial wage flexibility. We also complement this method with the more traditional strategy of using an instrument to isolate the portion of employment changes driven by demand, and the results of these two approaches lead to very similar conclusions about supply responses among native-born and Mexican-born low-skilled workers.

2.2 Geographic Variation in Labor Demand Shocks

There was considerable geographic variation in the depth of the recession. The hardest-hit states (e.g. Nevada, Michigan, Florida) lost more than ten percent of employment from 2006-2010, while a few states (including North and South Dakota and Texas) experienced modest employment growth over the same period.[7] Our empirical specifications define a local labor market as a metropolitan area (we will use the word "city" interchangeably for ease of exposition), and Appendix Figure A-2 provides time series information on employment for the metro areas with the largest decline, largest increase, and the median change in employment over this same time period, showing substantial variation across cities.

Uncovering the sources of theses differences is an objective of ongoing research. Mian and Sufi (2012) show that counties with higher average household debt-to-income ratios in 2006 experienced larger declines in household expenditure and hence larger employment declines,

[7]See Appendix Section A.1 for details. The few employment increases were sufficiently small relative to population growth that it is reasonable to treat them as very mild declines.

particularly in non-traded industries that depend on local consumer demand. Greenstone and Mas (2012) show that counties whose small businesses borrowed primarily from banks that cut lending following the financial crisis experienced larger employment declines, and Chodorow-Reich (2013) provides direct evidence that firms with greater exposure to troubled lending institutions experienced greater employment losses. Fort, Haltiwanger, Jarmin and Miranda (2013) show that states facing larger housing price declines experienced declining employment among young small businesses who often rely on home equity financing. Further, certain industries (notably construction and manufacturing) experienced especially large losses in employment, and these industries comprised different shares of local demand for labor across cities.

Our empirical strategy leverages the resulting geographic variation in the depth of the recession from these and other sources to identify effects of labor market strength on individuals' location choices. We therefore rely on the assumption that the severity of the local employment decline is uncorrelated with other *changes* in the value of living in particular labor markets that might influence location choices. We address this assumption directly by including a number of controls for changes in amenities and by subjecting the results to a pre-recession falsification test. As previously mentioned, we also conduct instrumental variables analysis relying on only an identified portion of the variation using either pre-recession local household leverage, following Mian and Sufi (2012), or an industry shift-share approach based on Bartik (1991).

2.3 Geographic Mobility 2006-2010

Throughout our analysis, we consider locational supply responses separately by sex, skill, and nativity. Table 1 reports long-distance (cross-city or international) mobility rates for these demographic groups. Immigration and internal migration are measured using the ACS, while emigration to Mexico is measured in the 2010 Mexican Decennial Census. In all cases, the numbers reflect average annual mobility rates throughout our study period.[8] Notably, every demographic and skill group experienced substantial mobility over this time period, which suggests that there is scope for the reallocation of labor across markets in response to local shocks. In nearly all cases the more educated portion of each demographic group exhibits a higher mobility rate. Natives are generally more likely to have moved within the

[8]Although geographic mobility has been declining in the US since around 1980, there is little evidence that the recession reduced rates further than a continuation of the trend would predict (Molloy et al. 2011).

U.S., while the foreign-born are more likely to have moved from an international location.[9] As expected, emigration to Mexico is an important channel for Mexican-born population adjustment during this time period.[10] Overall, less skilled Mexican-born individuals are substantially more likely to have moved during our sample period than are similarly skilled natives. For example, less skilled Mexican men's yearly migration rate was 7.0 percent, while the same rate for natives was 4.0 percent.

We stratify our analysis by nativity not only because immigrants are more mobile in general, but also because they are likely more motivated by labor market conditions when selecting a location; in section 5.2, we provide direct evidence that immigrants, and the Mexican-born in particular, are more likely to report moving for economic rather than personal reasons. Thus, the differences across groups in supply responses that we document below reflect both differences in the unconditional probability of moving and differences in responsiveness to economic conditions among those who migrate.

3 Population Responses to Demand Shocks

3.1 Data Sources and Specifications

Our empirical strategy examines changes in a city's working age population (separately by sex, skill level, and nativity) as a function of the relevant demand shock as reflected in changes to payroll employment. Our dependent variable is the proportional change in the population of the relevant demographic group from 2006-2010, calculated from the American Community Survey (ACS).[11] Note that the ACS sample includes both authorized and unauthorized immigrants.[12] Our sample includes individuals ages 18-64, not currently enrolled in school, and not living in group quarters. Because we will examine tightly defined groups of workers, we limit our analysis to cities with a population of at least 100,000 adults meeting these sampling criteria. Additionally, we drop cities with fewer than 60 sampled Mexican-born individuals in 2006 and cities with any empty sample population cells (for any demographic

[9] Moves that begin or end in an area that is not identifiable or not in an MSA are counted in these averages unless both the current and previous location are not in a valid MSA.

[10] Similar emigration may occur for other immigrant groups, but measuring return migration for all source countries is beyond the scope of this study.

[11] We obtained the data from IPUMS (Ruggles, Alexander, Genadek, Goeken, Schroeder and Sobek 2010).

[12] Official Department of Homeland Security estimates of the unauthorized immigrant population of the U.S. are based on the discrepancy between ACS estimates of the immigrant population and records from ICE (Hoefer, Rytina and Baker 2012). In addition, using proportional changes as the dependent variable eliminates the influence of any consistent undercount among unauthorized migrants.

group) in the 2006 or 2010 ACS. These city-level restrictions are imposed uniformly, resulting in a sample of 97 cities in every regression.[13]

Although we do not estimate a formal location choice model, both Borjas (2001) and Cadena (2013) provide theoretical (discrete-choice-based) justifications for using linear models to examine proportional changes in supply as a function of changes in expected earnings.[14] Note that with rigid wages, the proportional change in expected earnings that a labor market offers (prior to any mobility) will be approximately equal to the proportional change in the number of jobs. We therefore use proportional changes in employment as our primary measure of local demand shocks, which we calculate using employment information from County Business Patterns (CBP) data.[15] Throughout the discussion we use the notation $\dot{x}$ to signify proportional changes: $\dot{x} \equiv \frac{x^{t_1} - x^{t_0}}{x^{t_0}}$. Unless otherwise noted, this proportional change refers to the 2006 to 2010 long difference. Our primary specification is thus

$$\dot{N}_c = \beta_0 + \beta_1 \dot{L}_c + \epsilon_c, \tag{1}$$

where c indexes metro areas, $\dot{N}_c$ is the proportional change in working-age population, and $\dot{L}_c$ is the proportional change in employment from 2006-2010.

One concern with this basic specification is that overall employment changes understate the change in expected earnings for low-skilled and foreign-born workers, who were disproportionately represented in the hardest-hit industries.[16] As shown in Appendix section A.1, there was considerable variation in employment declines across industries, and Mexican-born workers (the largest single group among the low-skilled foreign-born) were more concentrated in the types of jobs that experienced the largest declines. We therefore construct group-specific employment changes that account for these differing industrial compositions.[17] Note

[13] We experimented with various city sample criteria including a restriction based only on overall population without any qualitative change in results.

[14] The linearity assumption allows for the value of fixed amenities to be differenced out, which avoids the incidental parameters problem.

[15] The metropolitan area definitions used in the ACS and the CBP are not entirely consistent, so we aggregate county-level employment information in the CBP data to match the definitions used in the ACS. Further, the MSAs in Connecticut do not coincide well with counties. We therefore treat the entire state of Connecticut as a single metropolitan area.

[16] Orrenius and Zavodny (2010) find that Mexican-born workers are especially hard-hit by recessions due with likely explanations including their comparatively low levels of education and concentration within more cyclical industries.

[17] As expected, the results using employment declines that are not specific to nativity groups show even larger differences in responsiveness between natives and the foreign-born. Results using shocks that are calculated at the the (city x skill group) level are available in the online appendix.

that the proportional change in city c's overall employment can be expressed as a weighted average of industry-specific (i) employment changes, with weights equal to the industry's share of total employment in the initial period.

$$\dot{L}_c = \sum_i \varphi_{ic}^{t_0} \dot{L}_{ic} \tag{2}$$

with

$$\varphi_{ic}^{t_0} \equiv \frac{L_{ic}^{t_0}}{L_c^{t_0}}$$

We then calculate the relevant change in employment for a given education and/or demographic group, g, using industry employment shares that are specific to each group, $\varphi_{ic}^{gt_0}$, rather than shares for the local economy as a whole, such that $\dot{L}_c^g \equiv \sum_i \varphi_{ic}^{gt_0} \dot{L}_{ic}$.[18]

The primary advantage of the CBP is that it obtains data from the universe of establishments in covered industries. Unfortunately, the CBP data do not cover employment in agricultural production, private household services, or the government. In our preferred specifications, therefore, we fill in the missing changes in employment using (city x industry) calculations from the ACS.[19] The only remaining concern, therefore, is the informal sector. If the employment losses in the informal sector are similar (in proportional terms) to losses in the formal sector, the results will be unaffected. It is nevertheless possible that foreign-born workers face larger employment declines than our measure indicates. Given the substantial difference in the responsiveness of native and foreign-born individuals, however, this issue seems unlikely to drive the results.

Our preferred specification also weights each city to account for the heteroskedasticity inherent in measuring proportional population changes across labor markets of various sizes. We construct efficient weights based on the sampling distribution of population counts,

[18] We estimate these shares at the group × city level by running a multinomial logit predicting a worker's industry based on his/her location and demographic group using data from the 2005 and 2006 ACS. This approach addresses the relatively small cell sizes for some demographic groups. Details of this estimation, which also accounts for the racial and ethnic composition of native-born workers, are available in section A.2 in the appendix. Note that ignoring small cell sizes using simple shares from the ACS yields similar results. The 2000 Census would provide a larger sample size, but there were substantial changes in the industry distribution of employment between 2000 and 2006, particularly for foreign-born workers, so we did not pursue this approach.

[19] The results are qualitatively similar (although somewhat attenuated) when we instead treat these employment changes as missing. Additionally, we obtain similar results when using only the ACS to calculate employment changes at the city-industry level. Details of these alternative demand shock measures are available in the online appendix.

accounting for individuals' ACS sampling weights.[20] In practice, nearly all of the cross-city variation in the optimal weights derives from differences in the 2006 population, and results from population-weighted specifications are quite similar.[21] Additionally, unweighted specifications produce qualitatively similar results in most specifications, particularly for the native-born and Mexican-born low-skilled workers that we focus on.[22]

A final potentially important interpretation issue stems from the assumption that changes in labor demand are reflected in changes in employment rather than in changes to wages. While the data largely support this assumption, as discussed above, there is a small positive correlation between wage changes and employment changes across metro areas.[23] Thus the elasticity of population with respect to payroll employment slightly overstates the supply elasticity with respect to expected earnings. However, our primary interest is the *difference in elasticities across demographic groups* rather than the *level* of the effect per se, and we do not expect wages to adjust differently across nativity groups. In fact, we have examined the time series of wages separately for native-born and Mexican-born workers (similar to Figure 2), and we find no appreciable difference in the degree to which wages were downward rigid.

3.2 Geographic Labor Supply Elasticities by Demographic Group

Table 2 reports estimated elasticities based on Equation 1 for groups defined by skill, sex, and nativity.[24] Each coefficient in the table comes from a separate regression, with the change in employment constructed separately for each worker type. The first column shows results for groups defined only by sex and education. The second and third columns report estimated elasticities separately for native-born and foreign-born populations. The first notable result is the distinct skill gradient in responsiveness. Within each nativity group, workers with at least some college education are much more responsive than are workers with at most a high school degree. As an example, for native-born men or women with at least some

[20] Further details of this procedure are available in the appendix in section A.4

[21] These results are available in the online appendix.

[22] For demographic and skill groups with some very small cells (e.g. high-skilled Mexican-born workers and low-skilled non-Mexican immigrants), the weighted and unweighted results differ. In each of these cases, the efficiency-motivated weighting reduces the estimated standard errors, which suggests that the weighted estimates are preferable. A complete set of unweighted results is available in the online appendix.

[23] As discussed in more detail in Appendix section A.6, wage changes range from roughly zero nominal growth in the hardest hit cities to growth in line with inflation in the cities with the mildest changes in employment.

[24] Throughout the analysis, we group together workers without a high school degree and high school graduates. Evidence suggests that these two groups are nearly perfect substitutes, although workers with a degree represent more effective units of labor (Card 2009).

college, a ten percentage point larger decline in employment leads to between a four and six percentage point larger decline in the size of a city's local population with that education level. In contrast, the results for natives with at most a high school degree exhibit much smaller point estimates that cannot be statistically distinguished from zero.

There are also substantial differences among skill groups by nativity, with the foreign-born consistently more responsive than the native-born. Most notably, the results for less skilled foreign-born workers are in stark contrast to those for native-born workers; these elasticities for low-skilled immigrants are of a similar magnitude to those of high-skilled natives and are strongly statistically significant.

The fourth and fifth columns of Table 2 show the results of estimating our primary specification using population and employment changes calculated separately for Mexican-born immigrants and for those from all other source countries. These estimates demonstrate a large positive and statistically significant response by less skilled immigrants from Mexico. In fact, this elasticity exceeds that of high-skilled native men and women.[25] Additional testing reveals that the less skilled Mexican-born elasticities are statistically significantly larger than those of natives (p=0.008) in the male subsample. As we will show below, this sharp difference between native and Mexican population responses is very robust to changes in specification and estimation strategy.

The surprising negative point estimate for other foreign-born less-skilled men is less robust. Evidence presented below shows that this coefficient's sign and significance vary depending upon the specification and estimation strategy, and may partly reflect the continuation of a pre-existing trend. Additional analyses, presented in the online appendix, show that results for subgroups of the other foreign-born are similarly inconsistent across specifications. Hence, we focus on the contrast between Mexican-born and native-born mobility, both of which are consistent across estimation strategies and precisely estimated.

These results confirm the well-established empirical regularity that highly-skilled natives respond much more strongly to geographic variation in local labor demand than do less-skilled individuals. The fact that less-skilled Mexican-born immigrants respond so strongly to labor demand shocks is, to our knowledge, a novel finding. We therefore spend the remainder of the paper examining this result and its implications in detail.

[25]The elasticity for highly skilled Mexican immigrants is large but imprecisely estimated because of the small share (only one in six) of Mexican immigrants with some college or more.

3.3 Robustness of the Mexican-Native Elasticity Difference

Figure 4 shows the data underlying the results for low-skilled men, both native-born and Mexican-born. These scatter plots show that the relationships summarized in the regression results are not driven by any particular set of cities and appear to hold broadly throughout the country. In addition, the value of the optimal weighting scheme is readily apparent, as outlier cities in the figures are those with *ex ante* higher sampling variance of estimated population changes. Finally, this figure provides a reminder that the positive elasticity is identified primarily by *less negative* changes to employment, with the Mexican-born population shifting from the hardest-hit cities to those with relatively milder downturns.

In order to interpret these results as evidence that geographic variation in employment losses *caused* the reallocation of less skilled Mexican-born population within the U.S., we consider a variety of robustness tests. First, we rule out other determinants of location choice that may be correlated with local changes in demand. Column (1) of Table 3 reproduces the baseline response of low-skilled Mexican-born men. In Column (2) we control for the Mexican-born share of each city's population in 2000 to account for the potential decline in the value of traditional enclaves discussed by Card and Lewis (2007).[26] Columns (3) and (4) add indicators for cities in states that enacted anti-immigrant employment legislation or new 287(g) agreements allowing local officials to enforce federal immigration law, based on the immigration policy database in Bohn and Santillano (2012).[27] In Column (4), all of these controls enter with a negative sign, as expected. Also, while the addition of the controls reduces the magnitude of the geographic elasticity slightly, it increases the estimate's precision as well. Table 4 provides results analogous to column (4) of Table 3 for all nativity, skill, and gender groups. The results show that the pattern of elasticities identified in Table 2 remains, and the difference in response between low-skilled natives and Mexicans is still statistically significant (p-value of 0.013).[28]

Although the Mexican-born elasticity is robust to the controls just mentioned, it remains

[26]Recall that the dependent variable is measured as the within-city change, which implies that this control allows for differential growth trends based on a city's traditional enclave status.

[27]Bohn, Lofstrom and Raphael (forthcoming) show that the Legal Arizona Workers' Act, which required employers to participate in the federal E-Verify program, led to a decline in the foreign-born population of Arizona relative to other states. Bohn and Santillano (2012) and Watson (2013) show that local 287(g) policies also affected immigrants' location choices. Note that these policy controls account for the possibility that unauthorized immigrant under-count rates in the ACS changed in response to anti-immigrant legislation.

[28]We may be overcontrolling by including the policy indicators, since a deep local recession may increase anti-immigrant sentiment. If so, we conservatively bias the results away from finding the observed differences between natives and Mexicans.

possible that unobserved factors other than local demand changes contributed to the observed relationship. We use a false experiment approach to rule out persistent unobserved factors by regressing pre-recession (2000-2006) population changes on the demand shocks from 2006-2010. Other than the change in the timing for the dependent variable, these specifications are identical to the main analysis. Figure 5 shows this falsification test for low-skilled Mexican-born and native-born men.[29] For both groups, we find a negative relationship. Thus, if anything, the large population responses among the Mexican-born in the latter half of the decade represent a reversal of pre-recession trends. These findings rule out the hypothesis that low-skilled Mexican-born workers were coincidentally leaving the cities that would be hardest-hit during the recession even before it began, and further emphasize the stark differences in mobility between low-skilled Mexican-born and native-born workers.[30]

A final possibility is reverse causality, in which unmeasured factors drive population changes and these population changes result in changes in employment, either through decreasing product demand or by mechanically reducing the number of workers. We address this issue in two ways. First, we note that this mechanism would apply to all demographic and nativity groups. Thus, this alternative interpretation cannot explain the lack of a relationship between *native* population changes and employment changes, which exists despite substantial cross-city mobility (see Table 1). Moreover, since Mexicans often remit a substantial portion of their income rather than spending it locally, reverse causality through the demand channel would be stronger for natives and would bias the difference in elasticities in the opposite direction of the observed gap.

Second, we use two separate instrumental variables for employment changes that are plausibly exogenous to counterfactual population growth and that strongly relate to changes in local employment through well-understood economic mechanisms. The first instrument is the standard "Bartik instrument" (Bartik 1991), which predicts changes in local labor demand by assuming that national employment changes in each industry are allocated proportionately across cities, based on each city's initial industry composition of employment.[31]

[29]The full sets of falsification results with and without controls are available in Appendix Table A-1.

[30]Note that cities facing larger employment *declines* during the Great Recession on average experienced larger employment *increases* during the pre-recession period. Thus, the negative relationship for Mexicans in Figure 5 is consistent with the idea that Mexican workers respond to local labor market conditions during expansions as well. Monras (2013) documents similar responses before and after the Great Recession, taking the pre-Recession trends as the counterfactual in the post-Recession period (though without separating the sample by education).

[31]Other examples of the Bartik instrument appear in Bound and Holzer (2000), Blanchard and Katz (1992),

We calculate the instrument as

$$\psi_c = \sum_i \varphi_{ic}^{t_0} \dot{L}_i, \tag{3}$$

where $\varphi_{ic}^{t_0}$ is the fraction of city c employment in industry i in 2006, and $\dot{L}_i$ is the proportional change in national employment in industry i.

The results when using ψ_c as an instrument for the local employment decline are presented in Table 5; these specifications also include the controls introduced in Table 3. We report first-stage coefficients on the instrument and partial F Statistics along with the IV elasticity estimates. Although the instrument is identical in all cases, the first-stage coefficients differ based on how the Bartik measure relates to each group-specific employment decline. With the exception of highly skilled native women, we do not appear to face a weak instrument problem, and the first stage coefficients are similar in magnitude to those in the prior literature.[32] The IV elasticity estimates for men are quite similar to the OLS results and exhibit an even larger difference in responsiveness between less skilled natives and Mexicans, though the estimates are less precise. In spite of a few negative point estimates for other immigrants and highly skilled workers, our conclusions regarding strong responsiveness of less skilled Mexican immigrants and essentially no response among less skilled natives are supported when using this standard method of isolating demand shocks.[33]

The second instrument is based on Mian and Sufi's (2012) finding that counties with more highly leveraged households experienced larger employment losses during the Great Recession. Importantly, they find that these employment losses were concentrated in industries providing goods and services locally, suggesting that the tightening of credit during the financial crisis led to a decline in consumer demand and that this decline was largest among households that were more indebted.[34] This variable therefore isolates a portion of

Autor and Duggan (2003), Wozniak (2010), Notowidigdo (2013), and Charles, Hurst and Notowidigdo (2013).

[32]Stock and Yogo (2005) report that a first-stage F statistic greater than 8.96 is sufficient to reject the null hypothesis that the actual size of a 5 percent test is greater than 15 percent.

[33]The significant negative result for non-Mexican immigrants is puzzling, but we note that this result reflects an ongoing trend in the pre-recession period, as shown in Appendix Table A-1, and is reversed under alternate weighting schemes. Hence, we avoid making strong conclusions regarding non-Mexican immigrants. A few estimates for highly skilled workers are negative using this IV approach, though none are significant.

[34]Mian and Sufi (2011) identify several mechanisms through which household leverage drove declining demand. Indebted households became less able to roll over their debt and were thus forced to spend a greater share of their incomes on debt service rather than consumption. Households in cities with higher average leverage had a large share of their debts in mortgages, and many may have treated the annual increase in home value as "income," which disappeared during the crisis. Finally, some households may have decided that their previous levels of consumption were unsustainable and decided to find a new equilibrium spending path.

the geographic variation in employment changes that occurred as a result of changes in local demand through identifiable economic mechanisms related to the financial and housing crises.

Note that the Mian and Sufi measure may fail to satisfy the IV exclusion restriction by influencing migration through channels orthogonal to employment. For example, places with more indebted households may suffer neighborhood blight resulting from foreclosures, which in turn may drive out-migration. Alternately, foreclosures may induce former homeowners to enter the rental market, thereby increasing prices for rental housing and driving net out-migration.[35] While these concerns suggest that the IV estimates may be positively biased, we see no reason to think there would be a differential bias for Mexicans compared to natives, and comparisons across groups remain informative.

We construct the household leverage ratio analogously to Mian and Sufi (2012), aggregating MSA-level variables from county-level information provided by Equifax (total household debt) and the Internal Revenue Service (total income).[36] Table 6 presents the results of these specifications, which also include the controls introduced in Table 3. On the whole, the results are quite consistent with the OLS results in Table 4. The pattern of elasticities continues to show strong differences by skill level, and among the low-skilled, only the Mexican-born population responds significantly to changes in local labor demand.[37]

The consistency of the OLS results with the IV results using each instrument suggests that the OLS specifications are unlikely to be contaminated by remaining omitted variables or simultaneity. In fact, they provide strong support to the interpretation that employment declines are an effective measure of demand shocks in this time period. Overall, the wide variety of robustness tests presented in this section confirm the sharp differences in the responsiveness of less skilled natives and Mexican immigrants to local labor demand shocks.

[35] Note that the native mobility results are essentially unchanged when restricting the sample to renters.

[36] Mian and Sufi (2012) provide more detail on the data sources. The Equifax data are available through the Federal Reserve Bank of New York. Our restriction to large MSAs avoids the concern that only a portion of the counties used in the original paper are publicly available, as the restricted data are for counties with small populations.

[37] One potential caveat to keep in mind is that the exclusion restriction may not hold if pre-recession indebtedness led to foreclosures and neighborhood blight that was orthogonal to resulting declines in labor demand and this resulted in out-migration. While this phenomenon could bias the IV estimates positively, it does not seem likely to be a quantitatively important effect. Moreover, we see no reason why this consideration should apply differently across nativity groups.

4 Mexican Mobility Smooths Employment Outcomes

The previous section provides robust evidence that Mexican-born workers leave labor markets experiencing larger labor demand declines in favor of markets facing smaller declines. Here we show that natives living in cities with substantial Mexican populations are insulated from the employment effects of local labor demand shocks. This result is robust to changes in specification and appears to be driven by the combination of Mexican mobility and labor market competition between Mexicans and natives.

4.1 Approach to Measuring Smoothing

We define smoothing as the degree to which workers' expected earnings are equalized across space rather than tied to local demand. Given approximately rigid wages, the proportional change in expected earnings is primarily captured by the proportional change in the probability of being employed. Assuming that the employment probability is given by ratio of employment to working-age population, L_c/N_c, one can measure the degree of smoothing based on the observed relationship between local changes in the employment to population ratio ($d\ln(L_c/N_c)$) and the local demand shock ($d\ln L_c$). In the absence of any equalizing migration response, the labor demand decline in each city would be proportional to the local change in employment probability. In contrast, if earnings-sensitive migration was sufficient to equilibrate employment probabilities across cities, then the local change in employment probability would be uncorrelated with the local demand shock.

To formalize this intuition, one can quantify the degree to which local labor markets are integrated across space by examining the relationship between local changes in employment probability and the local demand shock:

$$\frac{d\ln(L_c/N_c)}{d\ln L_c} = 1 - \frac{d\ln N_c}{d\ln L_c}. \tag{4}$$

This expression makes clear that labor demand shocks have a proportional direct effect on local changes in employment probability but that the observed effect may be mitigated by equalizing migration reflected in a positive relationship between $d\ln L_c$ and $d\ln N_c$. We therefore quantify smoothing by running the following regression:

$$\dot{(L_c/N_c)} = \gamma_0 + \gamma_1 \dot{L}_c + \varepsilon_c \tag{5}$$

The dependent variable is the proportional change in the employment to working-age population ratio in a city's low-skilled working age population, calculated from ACS data. The independent variable is the proportional change in payroll employment, calculated from CBP data. Recall from Section 3.1 that we calculate proportional changes in payroll employment using a weighted average of proportional changes in industry employment. Initially we use weights based on the pre-recession industry shares among all low-skilled workers.

A slope coefficient of one in this regression would imply that local employment changes depend entirely on local shocks, whereas a coefficient of zero would indicate that local shocks are unrelated to local outcomes, with only the aggregate national shock determining the realized change in employment rates. Because we observe only industry-level employment changes, however, we can only approximate the local employment losses incident on low-skilled workers. This measurement error will tend to attenuate the estimated coefficient, so we focus on relative differences in coefficients across different cities rather than their absolute levels when evaluating the degree of smoothing.[38]

In particular, we measure the smoothing influence of Mexican mobility by dividing our sample of cities into those above and below the median Mexican-born share of the low-skilled population.[39] Cities with few Mexican immigrants have little scope for outmigration in response to a larger-than-average demand decline. Further, when selecting a new location, Mexican movers (including new arrivals from abroad) tend to choose cities with higher Mexican-born populations, either because these populations themselves are a direct amenity or because they proxy for unobserved amenities especially valued by the Mexican-born. As a result, less-skilled workers' employment probabilities in cities with many Mexicans should be less strongly related to local labor demand shocks than are those in cities with few Mexicans, which do not have access to equalizing Mexican mobility. We therefore estimate versions of (5) separately for cities with above- and below-median Mexican-born population shares, expecting to observe weaker relationships between employment probabilities and labor demand shocks in cities with many Mexican-born workers.[40]

[38] If $\dot{L}_c$ is measured with additive classical error given by ν_c, then the observed slope will be the true influence of local shocks on local employment multiplied by a factor of $\frac{\text{var}\left(\dot{L}_c\right)_c}{\text{var}\left(\dot{L}_c\right)_c + \text{var}(\nu_c)} \in (0, 1)$.

[39] Among the 97 cities in our sample, there is a great deal of variation in the share of the low-skilled population that is Mexican-born. Values range from just over one percent in cities like St. Louis and Miami to more than 40 percent in parts of Texas and California.

[40] Given our focus on less-skilled men, we measure Mexican-born population shares for that demographic group. The median Mexican-born share is roughly 15 percent. Sacramento has the highest share below the median and Omaha has the lowest share above.

4.2 Smoothing in the Overall Less-Skilled Market

We first examine the smoothing effects of Mexican mobility for the low-skilled labor force as a whole. Figure 6 provides a visual representation of the results, also reported in Panel (a) of Table 7. As expected, there is a much weaker relationship between employment probabilities and demand shocks in cities with large Mexican populations than in cities with smaller Mexican populations.[41] In fact, the relationship is 45 percent weaker in cities with high concentrations of Mexican-born workers. By increasing the average mobility of the less-skilled population, Mexicans smooth average employment probabilities across space for less-skilled workers.

This finding is a direct consequence of the mobility results in Section 3. Consider the following decomposition of the change in the less-skilled employment to population ratio (L_c/N_c) in a particular city.

$$\frac{d\ln(L_c/N_c)}{d\ln L_c} = 1 - \left((1-\eta_c)\frac{d\ln N_c^n}{d\ln L_c} + \eta_c \frac{d\ln N_c^m}{d\ln L_c}\right), \tag{6}$$

where superscripts m and n refer to Mexicans and natives respectively, and η_c is the Mexican population share. Section 3 reveals that Mexican populations are more responsive to changes in demand than are native populations ($\frac{d\ln N_c^m}{d\ln L_c} > \frac{d\ln N_c^n}{d\ln L_c}$), so cities with larger Mexican population shares exhibit a weaker (less positive) relationship between local shocks and local employment probabilities. Hence, the mobility results directly imply that Mexican mobility smooths average employment probabilities for the aggregate low-skilled workforce.

4.3 Smoothing in the Native Less-Skilled Market

The results presented thus far leave open the possibility that Mexican mobility equalizes overall less-skilled employment probabilities simply by equalizing employment rates among Mexicans without having any effect on the employment rates for less-mobile natives. We now determine whether *native* labor market outcomes are less related to local shocks in locations with larger Mexican population shares.

[41] In this and subsequent smoothing analyses we were concerned that the relatively small sample size (49 cities in each subsample) may lead to influential outliers. To address this problem, we estimated the relationships using local linear regressions, and the estimated slopes were quite similar to those shown in the figures. We were also concerned that the above-/below-median cut was too coarse, so we estimated this relationship separately by quartiles of pre-recession Mexican share. The pattern of results showed negligible differences between the first and second quartiles and between the third and fourth quartiles, supporting the median split.

4.3.1 Mexican Population Insulates Natives

To do so, we estimate versions of Equation (5) in which the dependent variable is calculated using employment to population ratios for low-skilled native men (L_c^n/N_c^n). Importantly, results using this approach are *not* mechanically driven by the preceding mobility results because changes in Mexican population do not appear in the denominator, as they did in the overall less-skilled employment to population ratio. Instead, Mexican mobility can affect the native employment to population ratio only by affecting native employment in the numerator.

Panel (b) of Table 7 shows the results of this modified analysis (the scatter plot is very similar to Figure 6). Changes in employment probabilities for natives living in cities with large Mexican populations are much less related to local demand conditions than are changes in cities with few Mexicans. The degree of smoothing between high and low Mexican share cities is nearly identical for less skilled native men as for the overall less skilled male population; the relationship in above-median cities is 46 percent weaker than in below-median cities. Thus, native employment probabilities were insulated from local shocks in the presence of substantial numbers of Mexican-born workers, with improved native outcomes in the hardest hit cities and diminished ones in more favorable markets. We also ran parallel analyses instrumenting for the employment changes using each of the instruments described in section 3.3; these specifications reveal similar differences between high and low Mexican-share cities.

This finding is precisely what one would expect if the presence of Mexicans in a local market mitigated the effects of a given decline in labor demand on natives' employment probabilities. However, there are two potential alternative explanations that we consider. In both cases the evidence supports interpreting the differential slopes as resulting from larger Mexican population shares.

First, suppose that less skilled Mexican immigrants and natives worked in completely different types of jobs, i.e. that the labor market were perfectly segmented by nativity. In this case, a general measure of the local decline in low skilled employment would not necessarily capture the demand declines facing the native portion of the job market. The weaker relationship between shocks and employment rates could derive, in part, from measuring the relevant decline in demand for native workers more accurately in cities with fewer Mexican-born workers.[42] To address this possibility, in panel (c) of Table 7 we adjust the

[42]Measurement error resulting from segmented labor markets may result in upward or downward bias in

independent variable and calculate proportional job losses using the industry distribution of *native* less skilled workers rather than the industry distribution of all less skilled workers as in panel (b). The gap between high and low Mexican share cities decreases only slightly; the shock-outcome relationship is still 41 percent weaker in below-median cities and the difference remains statistically significant at conventional levels (p=0.015). While this adjustment does not rule out labor market segmentation by occupation within industry, the very modest change in observed smoothing when accounting for the substantial differences in natives' and Mexicans' industry distributions (see Appendix Figure A-4) suggests that labor market segmentation is an unlikely explanation for the differences between these two sets of cities.

As a second alternative, we consider the possibility that some other unobserved factor causes some local labor markets to adjust to shocks more easily and that this other factor is correlated with the Mexican share of the low-skilled population. Perhaps Mexicans are attracted to the most "dynamic" local economies that are more flexible on a number of other dimensions including differences in local regulations and capital flexibility. Under this alternative, natives' outcomes would have been smoother in these cities even in the absence of a large Mexican population. We address this hypothesis by repeating the smoothing analysis for highly skilled native-born men. Because we do not expect low-skilled Mexican mobility to affect outcomes for higher skilled workers, any differential incidence of local shocks among this skill group would suggest the presence of such an unobserved factor.

Panel (d) of Table 7 reports the relationship between changes in highly skilled native employment rates and labor demand shocks, calculated using highly skilled native men's industry employment distribution. We maintain the same classification of cities into above- and below-median Mexican population share (among low-skilled workers) used in the previous panels. There is no evidence that the incidence of employment shocks is any different for highly skilled workers in the two groups of cities. Thus, there is no support for the hypothesis that the labor markets with higher Mexican population share are more able to absorb labor demand shocks in general.[43]

cities with larger Mexican share. The multiplicative bias is given by

$$\frac{(1-\phi)\ \text{var}(\dot{L}^n) + \phi\ \text{cov}(\dot{L}^n, \dot{L}^m)}{(1-\phi)^2\text{var}(\dot{L}^n) + \phi^2\ \text{var}(\dot{L}^m) + 2(1-\phi)\phi\ \text{cov}(\dot{L}^n, \dot{L}^m)},$$

where ϕ is the Mexican share of employment, $\text{var}(\dot{L}^n)$ and $\text{var}(\dot{L}^m)$ are the variance in labor demand shocks in the native and Mexican segments of the labor market, and $\text{cov}(\dot{L}^n, \dot{L}^m)$ is their covariance.

[43] Alternatively, cities with higher Mexican population shares could have more flexible wage structures and the smoother employment results could reflect stronger wage adjustment in response to demand shocks in these cities. In Appendix section A.6, we explore and reject this hypothesis, finding instead that native wage

This set of results therefore implies that the presence of substantial Mexican-born population insulates less skilled natives from the effects of local labor demand shocks. This is an important finding, as it indicates very different outcomes for natives living in cities facing similar labor demand shocks but with different Mexican population shares. Note that the smoothing result applies both to relatively positive and relatively negative shocks, with the presence of Mexicans improving outcomes for natives in the hardest hit markets and depressing outcomes for natives in the most positively affected locations.

4.3.2 Migration as the Smoothing Mechanism

The preceding results show that cities with a large Mexican population experienced smoother labor market outcomes among native low-skilled workers. We now discuss whether it is appropriate to interpret this smoothing as the consequence of equalizing migration or whether larger Mexican populations affect the incidence of labor demand shocks and native employment through some other mechanism. Consider the following identity demonstrating how the Mexican employment share, ϕ_c, influences the relationship between native employment probability, L_c^n/N_c^n, and the local employment shock.

$$\frac{d\ln(L_c^n/N_c^n)}{d\ln L_c} = 1 + \phi_c\left(\frac{d\ln L_c^n}{d\ln L_c} - \frac{d\ln L_c^m}{d\ln L_c}\right) - \frac{d\ln N_c^n}{d\ln L_c} \tag{7}$$

The last term on the right hand side is the native population response, which the results in Section 3 show is approximately zero on average. Further, this population response does not differ between above- and below-median Mexican share cities, so the term in parentheses is the sole driver of differences across the two groups of cities.[44] This term captures the differential equilibrium incidence of local job losses on native and Mexican workers, and it must be negative in order to rationalize the observation of a weaker relationship between changes in natives' employment probabilities and local employment shocks in cities with larger Mexican shares. Thus, in equilibrium, following job losses, turnover, and any migration responses, local employment declines are disproportionately reflected in declining local employment of Mexican-born workers.

This is precisely what one would expect if Mexican mobility had a direct effect on natives' employment probability. By leaving the most depressed local markets, Mexican workers

changes are slightly *less* positively correlated with employment changes in cities with larger Mexican share.

[44] In cities with above- and below-median Mexican population shares, native population responses yield nearly identical point estimates that are statistically indistinguishable.

absorb a disproportionate share of the local employment decline, and natives' share of employment rises as a result. To reinforce this interpretation, we show that it implies a degree of smoothing that is very similar to that observed in the data. Suppose that less skilled natives and Mexicans are perfect substitutes, in the sense that they are indistinguishable to employers. In this case, a given decline in overall employment will decrease equilibrium employment probabilities identically for both nativity groups, and differential employment changes will be driven by differential population changes.

$$\frac{d\ln(L_c^n/N_c^n)}{d\ln L_c} = \frac{d\ln(L_c^m/N_c^m)}{d\ln L_c} \Rightarrow \frac{d\ln L_c^n}{d\ln L_c} - \frac{d\ln L_c^m}{d\ln L_c} = \frac{d\ln N_c^n}{d\ln L_c} - \frac{d\ln N_c^m}{d\ln L_c}. \tag{8}$$

Under this interpretation, one can predict the amount of smoothing using employment shares and mobility responses. Indexing cities with Mexican population share above and below the median by a and b respectively, plugging in the estimated mobility responses to (7), and differencing across the two groups of cities yields the following expression:

$$\left(\frac{d\ln(L_c^n/N_c^n)}{d\ln L_c}\right)^a - \left(\frac{d\ln(L_c^n/N_c^n)}{d\ln L_c}\right)^b = (\phi_c^a - \phi_c^b)\left(\frac{d\ln \hat{N}_c^n}{d\ln L_c} - \frac{d\ln \hat{N}_c^m}{d\ln L_c}\right) \tag{9}$$

Implementing this calculation yields a predicted gap of 0.20, which is very similar to the difference in slopes reported in panel (c) Table 7.[45] Thus, the observed *scale* of smoothing closely matches the prediction of a simple model of differential mobility and labor market competition between less skilled native-born and Mexican born workers.[46]

Taken as a whole, the results in the section imply that Mexican immigrants' willingness to move away from the hardest hit cities and toward the least affected cities substantially reduced geographic inequality during the Great Recession. Further, their mobility exerted an equilibrating influence on the employment rates of native-born workers in addition to

[45] This calculation requires the elasticity of Mexican population with respect to "native" shocks (averages employment declines using native industry weights). This elasticity, which has a descriptive rather than causal interpretation, is 0.923 (0.300).

[46] A closely related alternative interpretation is that employers choose to lay off Mexican workers before natives and hire natives first when filling vacancies. This could occur due to employer preferences or due to a seniority-based layoff policy (Ritter and Taylor 1998). In this case, Mexican workers insulate natives from job losses directly, by absorbing a portion of the employment decline and smoothing natives' outcomes even before the Mexican workers migrate. However, such a mechanism would be unlikely to persist in the absence of Mexican migration, as employers would have an incentive to deviate from their plans as a large pool of unemployed Mexican workers would create a source of cheaper labor, even if the two groups of workers were imperfect substitutes. Even in this alternative scenario, Mexicans' willingness to relocate in response to demand conditions likely still facilitates the smoothing of natives' outcomes.

smoothing outcomes among the Mexican low-skilled population. Mexican mobility therefore provides an implicit form of insurance to native workers by transferring native employment probability from cities with relatively strong demand to cities experiencing the largest negative shocks.

5 Extensions and Discussion

In this section we study the mechanisms through which the less skilled Mexican-born population adjusted to labor demand shocks and investigate some hypotheses for why Mexicans respond so much more strongly than similarly skilled natives.

5.1 Channels of Population Adjustment

A city's Mexican-born working-age population, N_c^m, can change between 2006 and 2010 through five channels: 1) arrivals from abroad after 2006, 2) migration between cities within the U.S., 3) departures from the U.S., 4) aging in or out of the sample, and 5) entering or leaving the sample due to changing schooling status. Here, we measure the importance of each channel in driving the strong population responses among less skilled Mexican-born men. Channels 1 and 4 are directly observable, as the ACS records immigrants' age and year of arrival. Channel 5 likely makes a very small contribution, particularly among the less skilled working-age immigrants in our sample. Channels 2 and 3 are more difficult to separate in the data; we return to this below.

We begin by examining changes in the number of Mexican-born individuals who arrived in the U.S. before and after 2007. Thus, we partition a city's change in Mexican population as (suppressing city subscripts):

$$N^{m,2010} - N^{m,2006} = N_{new}^{m,2010} + (N_{pre-2007}^{m,2010} - N_{pre-2007}^{m,2006}). \tag{10}$$

In words, the change in the Mexican-born population consists of the number of immigrants who arrived in 2007 or later (N_{new}^m) plus the change in the number of immigrants who arrived in the U.S. in 2006 or earlier ($N_{pre-2007}^m$). Notice that $N_{pre-2007}^{m,2006}$ is simply the resident Mexican population in 2006. Dividing both sides of (10) by $N^{m,2006}$, one can decompose the proportional change in Mexican population into components resulting from new arrivals (channel 1) and from reallocation of existing residents (channels 2-5).

We therefore estimate versions of (1) for less skilled Mexican men, using each component of the overall proportional population change as a dependent variable. The results are presented in Table 8. Column (1) reproduces the overall elasticity from column (1) of Table 3. The next two columns additively decompose that estimate into components coming from new arrivals and reallocation of existing residents. The coefficient in column (2) implies that 17 percent of the reallocation (0.13/0.76) occurred through differential inflows of new immigrants in response to differential demand shocks. Note that fewer than 17 percent of Mexican-born immigrants living in the US in 2010 arrived during the preceding five years; thus these new arrivals account for more than their "fair share" of the reallocation.[47] It is likely that during periods with larger immigration inflows, this channel would account for a larger share of overall adjustment, but net migration inflows approached zero by the end of the decade (Passel, Cohn and Gonzalez-Barrera 2012). The remaining 83 percent of the reallocation occurred among existing residents (channels 2-5), and this aggregate effect is reflected in the coefficient in column (3). The quantitatively large share of reallocation among existing immigrants is an important finding, as the majority of the previous literature focuses only on earnings maximizing location choices among newly arriving immigrants. Column (4) provides a direct estimate of the contribution of net aging in (channel 4); as expected the contribution of this channel is negligible.[48]

Most of the reallocation therefore occurred through migration by those already resident by 2006. There are, to our knowledge, no available data sources that allow reliable measurement of return migration flows to Mexico separately by US city during this time period.[49] In addition, the ACS asks respondents only about internal movement over the past year; the five year mobility question, standard in prior decennial censuses, does not appear in the ACS. Thus, it is not possible to precisely decompose the pre-2007 Mexican-born observations in the 2010 ACS into those who lived in the city in 2006 and those who lived in another US

[47]This clustering of low-skilled new arrivals in high demand areas complements Kerr's (2010) finding that U.S. cities with relative increases in innovation (measured by patenting rates) from 1995-2004 increase the immigrant share of their inventors while cities with declining relative innovation experience a disproportionate decline in immigrant invention.

[48]People between the ages of 18 and 21 in 2010 who arrived prior to 2007 are assumed to have aged in. Individuals 61-64 in 2006 are assumed to age out.

[49]The Mexican Decennial Census, intercensal counts, and the Mexican National Survey of Employment and Occupation (ENOE) do not include sub-national geographic information for return migration sources in the U.S. The National Survey of Demographic Dynamics (ENADID) only includes U.S. state information and does not allow one to isolate return migration between 2006 and 2010. Finally, the Northern Border Migration Survey (EMIF) uses non-standard sampling procedures that raise questions of representativeness and interpretation.

location. Nevertheless, one can construct an imperfect estimate of internal net migration by aggregating internal inflows and outflows from each successive annual ACS survey. The regression in column (5) is based on this technique, and it reveals that measured internal migration can explain 20.5 percent of the overall reallocation. Given the imprecise construction of the internal migration measure, however, this estimate is likely biased toward zero, so one likely cannot attribute the entire remainder to return migration. Nevertheless, it is clear that both migration internal to the US and return migration to Mexico contributed substantially to the overall local supply elasticity, consistent with the descriptive migration rates for Mexican-born individuals reported in Table 1.

5.2 Why are the Mexican-Born More Responsive?

We now consider potential explanations for the sharp differences in population elasticity between native-born and Mexican-born less skilled workers. Recall from Table 1 that, although the less skilled Mexican-born are less likely than similarly skilled natives to migrate within the U.S., their much higher rate of international mobility implies a substantially larger overall probability of migrating. This may simply reflect a process of self-selection in which, by virtue of having migrated internationally, immigrants reveal their willingness to move. Hence, the immigrant pool may consist primarily of highly mobile individuals.

Given a process of self-selection, immigrants' demographics and other observable characteristics may account for their increased responsiveness compared to natives. To investigate this possibility, we first estimate probit regressions in which we predict Mexican-born status based on either age, marital status, detailed educational attainment, home ownership, or all of these factors together.[50] We then use the resulting propensity score weights to calculate city-level populations and industry shares (to calculate the relevant employment changes) using native workers whose observable characteristics, on average, match those of the Mexican-born. We then repeat our main analysis for this reweighted group of natives. The results are shown in columns (1)-(5) of Table 9, with the baseline results for less skilled Mexican-born and native-born men provided for reference. Even after making these adjustments, we find no evidence that natives move toward cities with better job prospects. Thus, differences in these observable factors between natives and Mexicans do not account for the groups' differences in geographic responsiveness.

While observable characteristics do not account for the differences, Mexican immigrants

[50]The propensity score equation estimates are presented Appendix Section A.7.

may be more responsive to labor market conditions for a variety of other reasons. First, they are less likely to be eligible for Unemployment Insurance (UI) and other social safety net programs, the existence of which tends to reduce geographic differences in total income (Tatsiramos 2009). More than half of Mexican-born immigrants are in the US without authorization (Passel 2005) and thus are ineligible for UI benefits.[51] As a result, foreign-born individuals are substantially less likely to receive UI benefits than natives (see Appendix Section A.8), which implies that immigrants' total incomes are more dependent on their labor market earnings.

Moreover, many Mexican immigrants report moving to the U.S. intending a relatively short stay, often planning to work until having saved a particular amount of money to invest back in Mexico or with the objective of remitting a particular amount at regular intervals (Massey, Durand and Malone 2003).[52] Additionally, Massey et al. (2003) describe the decision for some individuals to migrate to the U.S. from Mexico as part of a larger household's diversification of human capital across labor markets. Workers with either of these types of motivations will find extended periods of unemployment especially costly and may therefore be more willing to relocate in order to find new employment more quickly.

These factors suggest that Mexican-born immigrants are especially likely to make an earnings-maximizing move because they have strong attachment to the labor market. As shown in Appendix Figure A-8, Mexican-born workers' unemployment durations were, on average, 33 percent shorter than than those of natives. Additionally, Appendix Table A-3 provides direct evidence that Mexicans are more likely than natives to move for reasons related to labor market conditions. The Mexican-born are especially likely to report moving to look for work or because they lost a previous job. In fact, among all possible answers, this category is the most common response among the Mexican-born (23.6 percent). This descriptive evidence is consistent with the idea that Mexican immigrants are more likely to consider the strength of a local labor market when making a location decision.

Finally, the Mexican-born have access to particularly robust networks and a diffuse set of enclaves. There are nontrivial Mexican-born populations in many more of the nation's labor markets than there are for any other immigrant source country. Mexican immigrants

[51] A worker who was using false documentation rather than being paid under the table may be able to make a claim by continuing to claim the previous identity as long as there are not other workers continuing to receive covered wages under the same social security number. This type of fraudulent claim, however, is certainly more difficult than the claiming process for a former employee who had legal authorization.

[52] Nekoei (2013) uses temporal variation in exchange rates to provide evidence consistent with this phenomenon.

comprise at least one percent of the population of more than half of US metro areas, whereas no other source country is similarly represented in more than ten percent of cities.[53] Several studies have found that immigrants tend to locate in markets with previous migrants from the same source country, and the Mexican-born population has continued to spread out geographically over the previous two decades.[54] Further, networks lower moving costs and increase the probability that a move across labor markets will result in a favorable employment outcome (Munshi 2003).

A natural remaining question is what factors motivate less skilled natives' cross-city moves and why labor market conditions are of relatively little importance. One prime candidate is the substantial home bias that has been identified in prior work (Diamond 2012, Kennan and Walker 2011). In fact, over our study period, 47 percent of all cross-city moves by low-skilled natives had the mover's state of birth as the destination. This substantial likelihood of selecting a city in one's home state does not simply reflect a generally higher prevalence of within state moves; of those beginning in a state other than their state of birth, only one third moved to a different city within the same state. Among those beginning from a city in their home state, in contrast, roughly two thirds chose another city in the same state.[55] Although not conclusive, these calculations suggest that much of the substantial cross-city mobility occurs for reasons related to family or other amenities of one's home state rather than for employment conditions.

In sum, while we are unable to explain with certainty the sources of the higher responsiveness among the less skilled Mexican-born, the available evidence suggests that they are so responsive because they are a self-selected group of highly mobile individuals, they have particularly strong labor market motivations, and they have the informational and informal financial resources necessary to make earnings-maximizing location decisions. Relative to natives, they also have less access to other programs such as unemployment insurance that make remaining in a weak labor market less costly.

[53]Calculations based on the 2000 Census. Mexicans comprise at least one percent of the population of working age adults in 54 percent of metropolitan areas; the next closest source country is the Philippines, with at least a one percent population share in 9.6 percent of cities.

[54]The importance of ethnic enclaves was first shown by Bartel (1989). Card and Lewis (2007), among others, document the recent diffusion beginning in the 1990s.

[55]All of the calculations mentioned in this paragraph are based on the same sample used for Table 1.

6 Conclusion

This paper has demonstrated that low-skilled Mexican-born workers' location choices responded very strongly to geographic variation in labor demand during the Great Recession. This behavior is in sharp contrast to low-skilled native-born workers who show little response. Further, the reallocation of Mexican immigrants reduced spatial variation in employment outcomes for natives living in cities with substantial Mexican-born share. This novel empirical finding represents economically significant behavior, and it is quite robust to a number of alternative interpretations.

The high degree of mobility among low-skilled Mexican-born individuals has a number of important implications. First, Mexican immigrants comprise an increasing share of the less skilled labor force, and their growing presence has raised this group's average geographic supply elasticity substantially. The rising share of the Mexican-born among the low-skilled therefore partially mitigates concerns that the relative lack of mobility among less skilled workers leads to large disparities in these workers' earnings across local labor markets (Bound and Holzer 2000). As U.S. policy makers seek ways to normalize the status of unauthorized workers and put in place legal channels for less skilled temporary migrant workers, they should consider the geographic flexibility immigrants provide labor markets when they are free to change locations and employers in response to changing demand conditions.

Second, this paper provides evidence that immigration inflows respond to demand conditions, and it further shows that immigrants continue to alter their locations in response to labor demand after residing in the country for some time. Although precisely disentangling the contributions of internal migration and return migration to Mexico is difficult, the evidence shows that both channels are important and that a substantial share of the geographic reallocation occurred among previously resident immigrants. This additional layer of responsiveness is an understudied phenomenon, and it deserves continued research.

Finally, these findings support previous evidence showing that immigrants' location choices respond to exogenous changes in labor market conditions (Cadena 2013, Cadena 2014). This endogenous supply response potentially confounds research designs relying on geographic variation in immigration inflows to identify immigrants' effects on natives. A further examination of the methods used to overcome this empirical challenge is likely warranted given the growing body of evidence favoring endogenous immigrant inflows.

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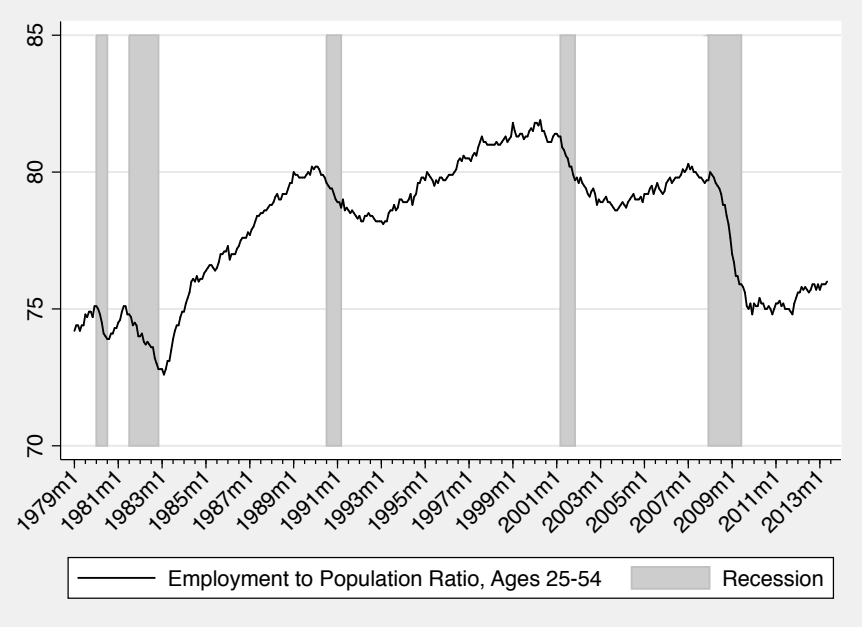
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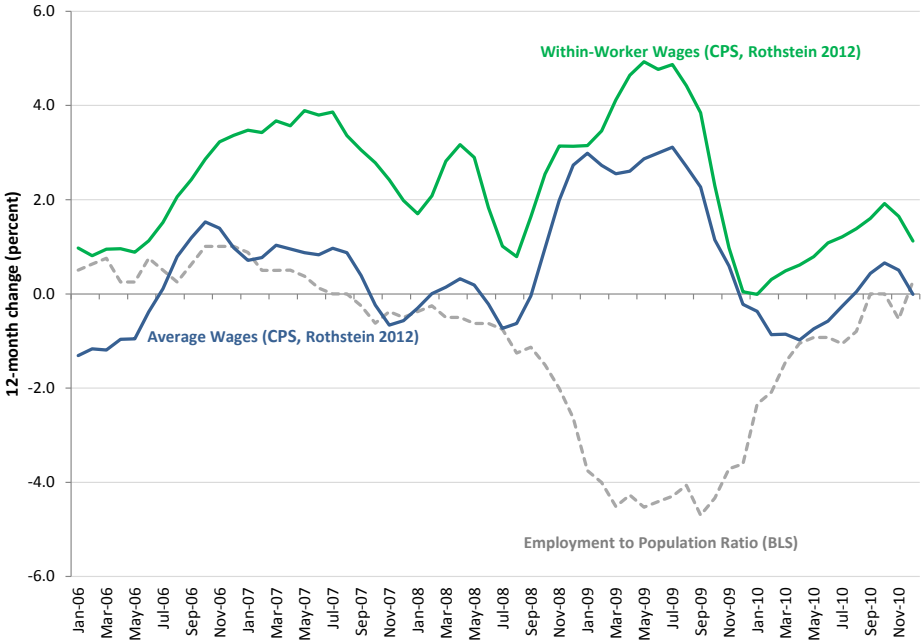
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Figure 1: Time Series of National Employment to Population Ratio, Ages 25-54, 1979-2013



Sources: Bureau of Labor Statistics and National Bureau of Economic Research.

Figure 2: Time Series of Wages and Employment, 2006-2010



Sources: Authors' calculations from Bureau of Labor Statistics data; Rothstein (2012).

Figure 3: Demand Shocks with Rigid Wages

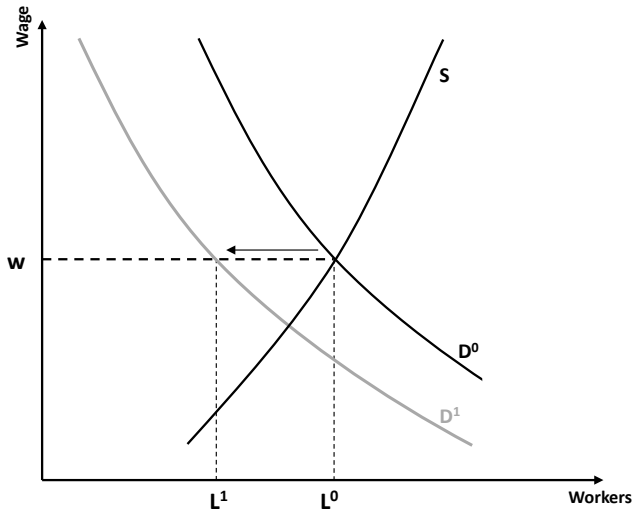
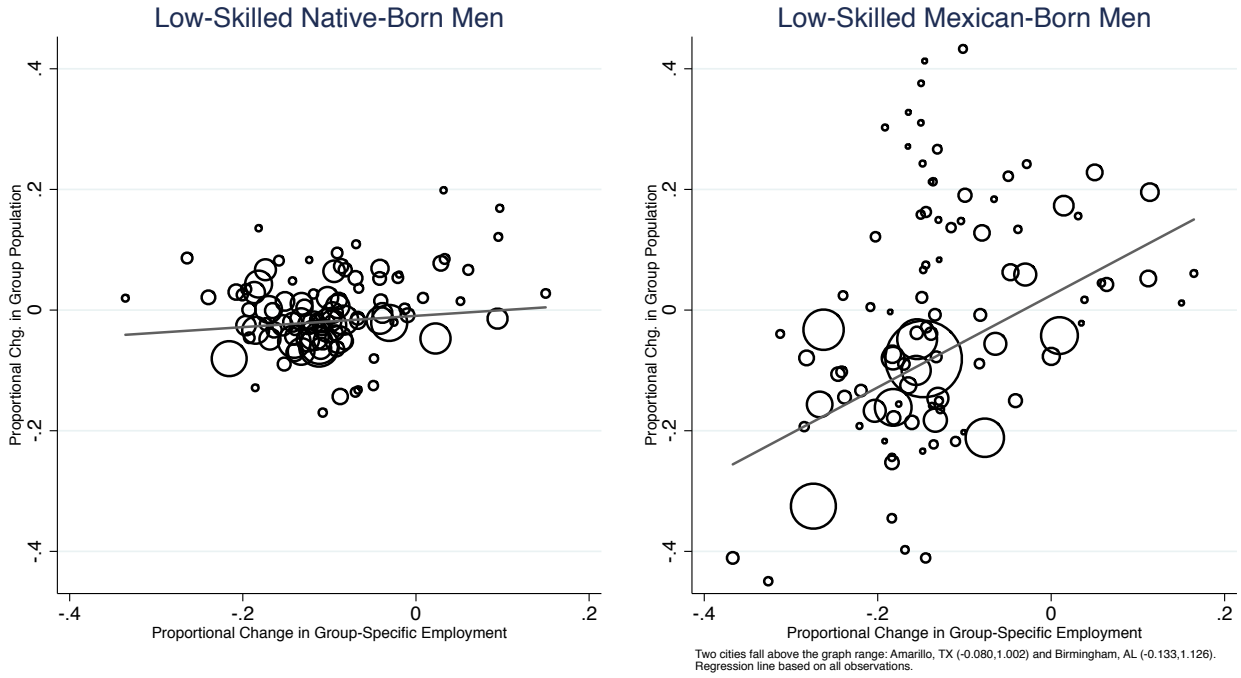
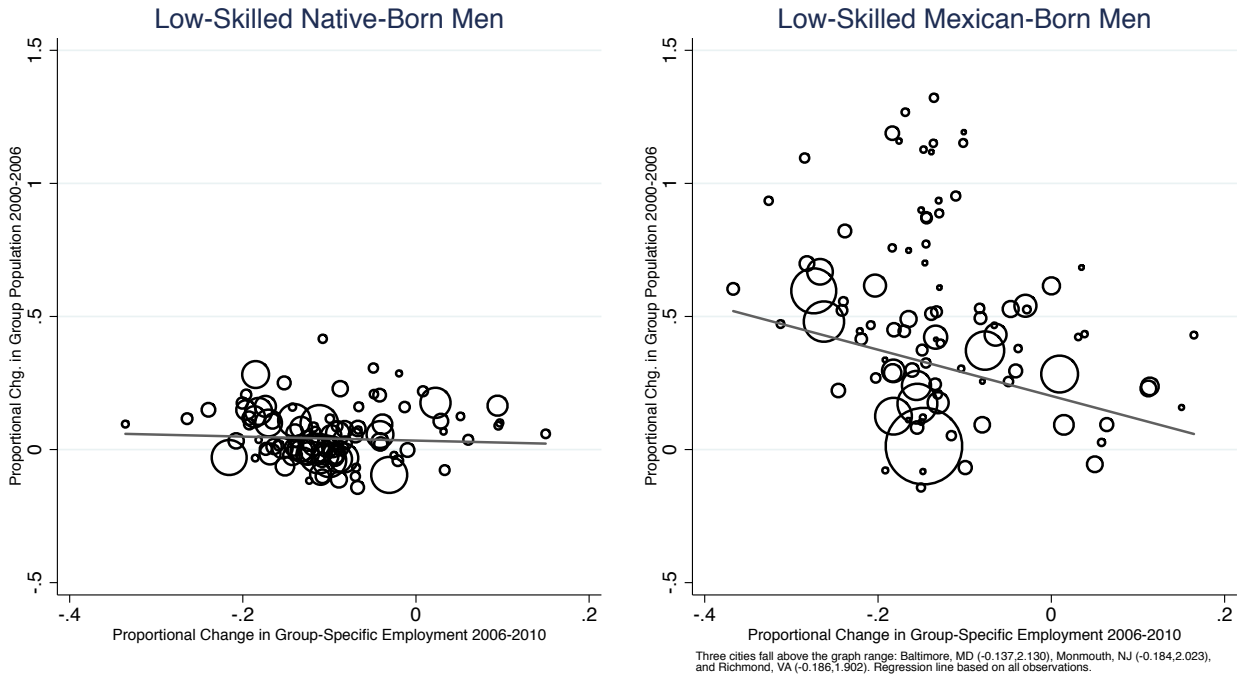


Figure 4: Population Responses to Employment Shocks:
Native-born and Mexican-born Low-Skilled Men



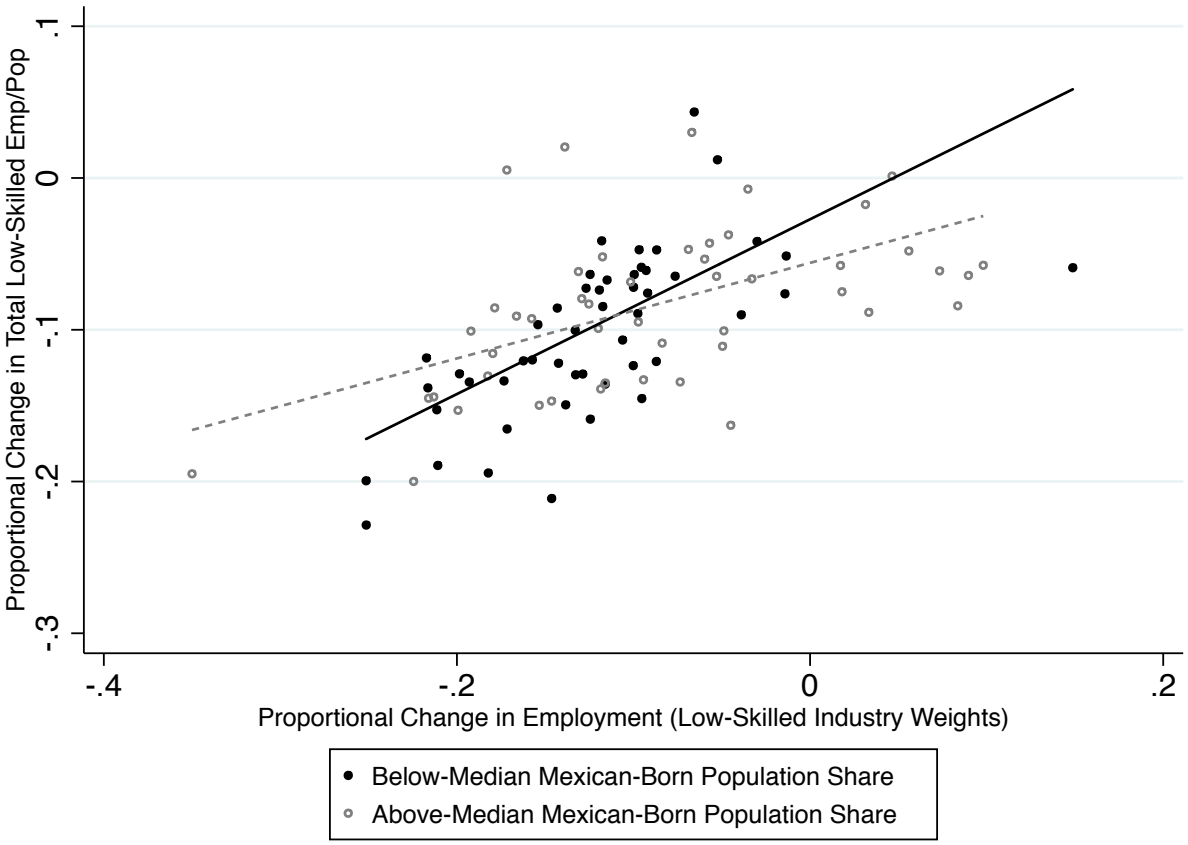
Source: Authors' calculations from American Community Survey and County Business Patterns. Proportional changes from 2006 to 2010. Individual sample, 97 city sample, and construction of group-specific employment changes described in the text. Weighted to account for heteroskedasticity (details in appendix).

Figure 5: Falsification Test:
Population Change 2000-06 vs. Group-Specific Employment Change 2006-10



Source: Authors' calculations from American Community Survey and County Business Patterns. Falsification test with proportional population changes from 2000 to 2006 and proportional employment changes from 2006 to 2010. Individual sample, 97 city sample, and construction of group-specific employment changes described in the text. Weighted to account for heteroskedasticity (details in appendix).

Figure 6: Mexican Mobility Smooths Employment Outcomes:
Change in Male Low-Skilled Emp/Pop Ratio vs. Change in Low-Skilled Employment



Source: Authors' calculations from 2006-2010 American Community Survey and County Business Patterns. Changes in employment and employment to population ratios are calculated for low-skilled men (without regard to nativity). Construction of group-specific employment changes and weights described in the text and the appendix. Fitted lines are from a weighted regression using efficiency weights based on the entire low-skilled male population in each city. See Table 7 for estimates.

Table 1: Average Yearly Mobility Rates

	Native-Born	Foreign-Born	Mexican-Born	Other Foreign-Born
Panel A: Men, High-school or less				
Immigration	0.2%	1.9%	1.8%	2.1%
Internal Migration	3.8%	3.3%	3.0%	3.6%
Emigration to Mexico		1.2%	2.3%	
Total	4.0%	6.4%	7.0%	5.7%
Panel B: Men, Some college or more				
Immigration	0.3%	2.8%	1.9%	2.9%
Internal Migration	4.6%	4.7%	3.3%	4.9%
Emigration to Mexico		0.1%	1.0%	
Total	4.8%	7.6%	6.2%	7.8%
Panel C: Women, High-school or less				
Immigration	0.1%	1.8%	1.2%	2.4%
Internal Migration	3.6%	2.9%	2.4%	3.2%
Emigration to Mexico		0.4%	1.0%	
Total	3.7%	5.1%	4.5%	5.6%
Panel D: Women, Some college or more				
Immigration	0.2%	2.8%	1.7%	2.9%
Internal Migration	4.4%	4.3%	3.1%	4.4%
Emigration to Mexico		0.1%	0.8%	
Total	4.5%	7.2%	5.6%	7.3%

Sample: individuals aged 18-64, not enrolled in school, and not in group quarters at the time of the survey. "Immigration" and "Internal Migration" are calculated using the 1-year mobility question in the 2006-2010 ACS. "Immigration" reports (individuals arriving in MSAs from abroad) / (individuals living in an MSA in the survey year or prior year). "Internal Migration" reports (individuals moving across MSA boundaries within the U.S. who arrived in or left an MSA) / (individuals living in an MSA in the survey year or prior year). These are calculated for each ACS year and averaged across years. "Emigration to Mexico" is calculated using the 2010 Mexican Census and the 2005 ACS, and reports (individuals moving from the U.S. to Mexico between June 2005 and June 2010) / (individuals living in the U.S. in 2005), divided by 5 for the average yearly rate. The values are approximately zero for all but the Mexican-born.

Table 2: Population Response to Labor Demand Shocks

	Dependent Variable: Proportional Population Change				
	All	Native-Born	Foreign-Born	Mexican-Born	Other Foreign-Born
Panel A: Men, High-school or less					
Proportional Change in	0.227***	0.094	0.553**	0.764***	-0.194
Group-Specific Employment	(0.072)	(0.085)	(0.232)	(0.235)	(0.336)
Panel B: Men, Some college or more					
Proportional Change in	0.591***	0.532***	0.830***	0.953	0.907***
Group-Specific Employment	(0.097)	(0.099)	(0.227)	(0.840)	(0.221)
Panel C: Women, High-school or less					
Proportional Change in	0.470***	0.248	0.681***	0.694***	0.605*
Group-Specific Employment	(0.117)	(0.151)	(0.204)	(0.204)	(0.359)
Panel D: Women, Some college or more					
Proportional Change in	0.496***	0.446***	0.989***	1.726	1.070***
Group-Specific Employment	(0.143)	(0.132)	(0.328)	(1.396)	(0.327)

Each listed coefficient represents a separate regression of the proportional population change for the relevant group (from the American Community Survey) on the proportional change in group-specific employment (from County Business Patterns data, using the demographic group's industry mix). All regressions include an intercept term and 97 city observations. Observations are weighted by the inverse of the estimated sampling variance of the dependent variable (see appendix for details). Heteroskedasticity-robust standard errors in parentheses - *** significant at the 1% level, ** 5%, * 10%.

Table 3: Population Response to Labor Demand Shocks: Low-Skilled Mexican-Born Men With Enclave and Policy Controls

	Dependent Variable: Proportional Population Change - Mexican-born Men, High-school or less			
	(1)	(2)	(3)	(4)
Proportional Change in Employment	0.764***	0.753***	0.664***	0.612***
	(0.235)	(0.239)	(0.206)	(0.190)
Enclave Measure		0.079	0.021	-0.022
(Mexican-born Share of City Population)		(0.135)	(0.139)	(0.142)
New State Immigrant Employment Legislation			-0.059	-0.012
			(0.056)	(0.033)
New State 287g Policy				-0.105**
				(0.041)
Constant	0.025	0.011	0.018	0.022
	(0.032)	(0.044)	(0.044)	(0.042)
R-squared	0.264	0.266	0.289	0.329

Each column represents a separate regression of the proportional population change for Mexican-born men with a high school degree or less (from the American Community Survey) on the proportional change in group-specific employment (from County Business Patterns data, using the demographic group's industry mix). All regressions include an intercept term and 97 city observations. Observations are weighted by the inverse of the estimated sampling variance of the dependent variable (see appendix for details). Heteroskedasticity-robust standard errors in parentheses - *** significant at the 1% level, ** 5%, * 10%.

Table 4: Population Response to Labor Demand Shocks - With Enclave and Policy Controls

	All	Native-Born	Foreign-Born	Mexican-Born	Other Foreign-Born
Panel A: Men, High-school or less					
Proportional Change in	0.217***	0.095	0.378**	0.612***	-0.203
Group-Specific Employment	(0.077)	(0.084)	(0.173)	(0.190)	(0.364)
Panel B: Men, Some college or more					
Proportional Change in	0.560***	0.491***	0.847***	0.766	0.929***
Group-Specific Employment	(0.083)	(0.092)	(0.205)	(0.958)	(0.216)
Panel C: Women, High-school or less					
Proportional Change in	0.459***	0.224	0.685***	0.776***	0.533
Group-Specific Employment	(0.121)	(0.150)	(0.188)	(0.196)	(0.371)
Panel D: Women, Some college or more					
Proportional Change in	0.492***	0.426***	1.012***	1.565	1.118***
Group-Specific Employment	(0.116)	(0.117)	(0.297)	(1.310)	(0.309)

Each listed coefficient represents a separate regression of the proportional population change for the relevant group (from the American Community Survey) on the proportional change in group-specific employment (from County Business Patterns data, using the demographic group's industry mix), with the enclave and policy controls in Column (4) of Table 3. All regressions include an intercept term and 97 city observations. Observations are weighted by the inverse of the estimated sampling variance of the dependent variable (see appendix for details). Heteroskedasticity-robust standard errors in parentheses - *** significant at the 1% level, ** 5%, * 10%.

Table 5: Population Response to Labor Demand Shocks:
Bartik (1991) IV Estimates

	Dependent Variable: Proportional Population Change				
	All	Native-Born	Foreign-Born	Mexican-Born	Other Foreign-Born
Panel A: Men, High-school or less					
IV Estimate					
Proportional Change in	0.271	0.016	0.480	1.289**	-0.878***
Group-Specific Employment	(0.072)	(0.111)	(0.498)	(0.572)	(0.301)
First Stage					
Predicted Employment Change	3.407***	3.214***	3.901***	4.293***	4.140***
	(0.603)	(0.602)	(0.709)	(1.165)	(0.569)
Partial F Statistic	31.93	28.49	30.25	13.57	52.995
Panel B: Men, Some college or more					
Proportional Change in	0.291	0.486*	-0.309	-0.774	-0.230
Group-Specific Employment	(0.214)	(0.261)	(0.336)	(1.082)	(0.392)
First Stage					
Predicted Employment Change	2.225***	2.220***	2.691***	4.860***	2.406***
	(0.557)	(0.601)	(0.461)	(0.832)	(0.449)
Partial F Statistic	15.94	13.66	34.13	34.12	28.65
Panel C: Women, High-school or less					
Proportional Change in	0.164	-0.449	0.278	1.706**	-0.904
Group-Specific Employment	(0.187)	(0.335)	(0.499)	(0.680)	(0.581)
First Stage					
Predicted Employment Change	1.890***	1.775***	2.269***	2.829***	2.020***
	(0.452)	(0.495)	(0.474)	(0.785)	(0.329)
Partial F Statistic	17.47	12.85	22.87	12.996	37.64
Panel D: Women, Some college or more					
Proportional Change in	-0.387	-0.316	-1.284	0.123	-1.577
Group-Specific Employment	(0.776)	(0.835)	(1.021)	(1.107)	(1.058)
First Stage					
Predicted Employment Change	0.738	0.719	1.341***	2.864***	1.139***
	(0.469)	(0.490)	(0.419)	(0.596)	(0.361)
Partial F Statistic	2.477	2.151	10.27	23.08	9.952

Each listed coefficient represents a separate instrumental variables regression of the proportional population change for the relevant group (from the American Community Survey) on the proportional change in group-specific employment (from County Business Patterns data, using the demographic group's industry mix). All regressions include an intercept term, 97 city observations, and the enclave and policy controls in Column (4) of Table 3. Observations are weighted by the inverse of the estimated sampling variance of the dependent variable (see appendix for details). Heteroskedasticity-robust standard errors in parentheses - *** significant at the 1% level, ** 5%, * 10%. We use the predicted employment change (based on Bartik (1991) and described in the text) as an instrument for the proportional change in group-specific employment. The first-stage coefficient on the instrument and the partial F statistic are reported below the corresponding IV estimate.

Table 6: Population Response to Labor Demand Shocks:
Household Leverage IV Estimates

	Dependent Variable: Proportional Population Change				
	All	Native-Born	Foreign-Born	Mexican-Born	Other Foreign-Born
Panel A: Men, High-school or less					
IV Estimate					
Proportional Change in	0.074	-0.128	0.323	0.550*	-0.389
Group-Specific Employment	(0.120)	(0.124)	(0.254)	(0.292)	(0.469)
First Stage					
Household Leverage	-0.095***	-0.086***	-0.106***	-0.114***	-0.090***
	(0.014)	(0.014)	(0.015)	(0.016)	(0.020)
Partial F Statistic	47.76	37.41	52.04	50.32	21.26
Panel B: Men, Some college or more					
Proportional Change in	0.620***	0.609**	0.653	-0.142	1.028*
Group-Specific Employment	(0.214)	(0.246)	(0.449)	(0.478)	(0.562)
First Stage					
Household Leverage	-0.051***	-0.049***	-0.053***	-0.105***	-0.045***
	(0.015)	(0.016)	(0.014)	(0.011)	(0.016)
Partial F Statistic	10.76	8.950	15.09	84.68	8.171
Panel C: Women, High-school or less					
Proportional Change in	0.120	0.054	0.753**	1.179***	-0.242
Group-Specific Employment	(0.176)	(0.223)	(0.499)	(0.322)	(0.889)
First Stage					
Household Leverage	-0.057***	-0.057***	-0.058***	-0.070	-0.039***
	(0.010)	(0.011)	(0.011)	(0.011)	(0.014)
Partial F Statistic	31.05	29.40	29.54	38.14	7.347
Panel D: Women, Some college or more					
Proportional Change in	0.659***	0.828***	0.587	0.242	0.257
Group-Specific Employment	(0.776)	(0.280)	(0.678)	(1.461)	(0.903)
First Stage					
Household Leverage	-0.042***	-0.041***	-0.039***	-0.059***	-0.033***
	(0.011)	(0.012)	(0.010)	(0.012)	(0.012)
Partial F Statistic	13.64	12.11	13.89	22.85	8.363

Each listed coefficient represents a separate instrumental variables regression of the proportional population change for the relevant group (from the American Community Survey) on the proportional change in group-specific employment (from County Business Patterns data, using the demographic group's industry mix). All regressions include an intercept term, 97 city observations, and the enclave and policy controls in Column (4) of Table 3. Observations are weighted by the inverse of the estimated sampling variance of the dependent variable (see appendix for details). Heteroskedasticity-robust standard errors in parentheses - *** significant at the 1% level, ** 5%, * 10%. We use average household leverage, calculated using household debt data from Equifax and household income data from the IRS (see text for details), as an instrument for the proportional change in group-specific employment. The first-stage coefficient on the instrument and the partial F statistic are reported below the corresponding IV estimate.

Table 7: Mexican Mobility Smooths Employment Outcomes:
Change in Low-Skilled Emp/Pop Ratio vs. Change in Payroll Employment

dependent variable: proportional change in employment/population (ACS)

	City's Mexican population share		
	below-median	above-median	difference
(a) dependent variable sample: less-skilled men			
proportional change in employment for less-skilled men (CBP)	0.576*** (0.061)	0.315*** (0.055)	-0.261*** (0.082)
(b) dependent variable sample: native less-skilled men			
proportional change in employment for less-skilled men (CBP)	0.584*** (0.073)	0.314*** (0.054)	-0.270*** (0.091)
(c) dependent variable sample: native less-skilled men			
proportional change in employment for less-skilled native men (CBP)	0.594*** (0.080)	0.351*** (0.057)	-0.243** (0.098)
(d) dependent variable sample: native high-skilled men			
proportional change in employment for high-skilled native men (CBP)	0.437*** (0.102)	0.510*** (0.144)	0.073 (0.177)

Examines the relationship between labor market outcomes (changes in employment probability) and labor demand shocks (changes in payroll employment) separately for cities with above- and below-median Mexican population share to demonstrate the smoothing effect of Mexican mobility. Smaller coefficients indicate more smoothing. Panel (a) examines the relationship between low-skilled employment shocks and low-skilled men's employment probability. Panel (b) examines the relationship between low-skilled employment shocks and low-skilled *native* men's employment probability. Panel (c) examines the relationship between low-skilled *native* employment shocks and low-skilled *native* men's employment.

Table 8: Channels of Population Response:
Male Low-Skilled Mexican-Born Population

	Dependent Variable: Proportional Population Change				
	(1)	(2)	(3)	(4)	(5)
	Total Elasticity	New Arrival Sorting	Change in Pre-2007 Arrivals	Net Aging In	Net Internal Inflows
Proportional Change in Employment	0.764***	0.133***	0.631***	-0.026	0.157**
	(0.235)	(0.028)	(0.232)	(0.024)	(0.073)
Constant	0.025	0.067***	0.957***	0.005	0.020
	(0.032)	(0.006)	(0.030)	(0.007)	(0.015)
Share of Total Elasticity	100.0%	17.4%	82.6%	-3.4%	20.5%
Share of Pre-2007 Elasticity	N/A	N/A	100%	-4.1%	25%
R-squared	0.264	0.160	0.222	0.010	0.022

Column (1) reproduces the corresponding estimate from Table 2. As described in the text, Columns (2)-(5) decompose this overall response into different migration components. All other specification details are identical to Table 2

Table 9: Propensity Score Reweighting of Less Skilled Natives to Match Mexican-Born Observables

	No Reweighting		(1)	(2)	(3)	(4)	(5)
			Reweighted Natives Based on Listed Covariates				
	Mexican-Born	Native-Born	Exact Education Only	Age Only	Rent vs. Own Only	Family Structure Only	All Covariates
Proportional Change in Group-Specific Employment	0.764***	0.094	0.065	0.180*	0.002	0.079	-0.058
	(0.235)	(0.085)	(0.128)	(0.102)	(0.109)	(0.093)	(0.211)
Constant	0.025	-0.010	-0.014	-0.018	0.016	-0.013	-0.012
	(0.032)	(0.009)	(0.015)	(0.011)	(0.011)	(0.013)	(0.030)
R-squared	0.264	0.018	0.003	0.047	0.000	0.008	0.002

Reproduces corresponding estimates from Table 2 for Mexican-born and native-born less skilled men. Columns (1)-(5) present population responses for natives, reweighted to match Mexican-born individuals' based on the listed characteristics. All other specification details are identical to Table 2. See text and appendix for details.

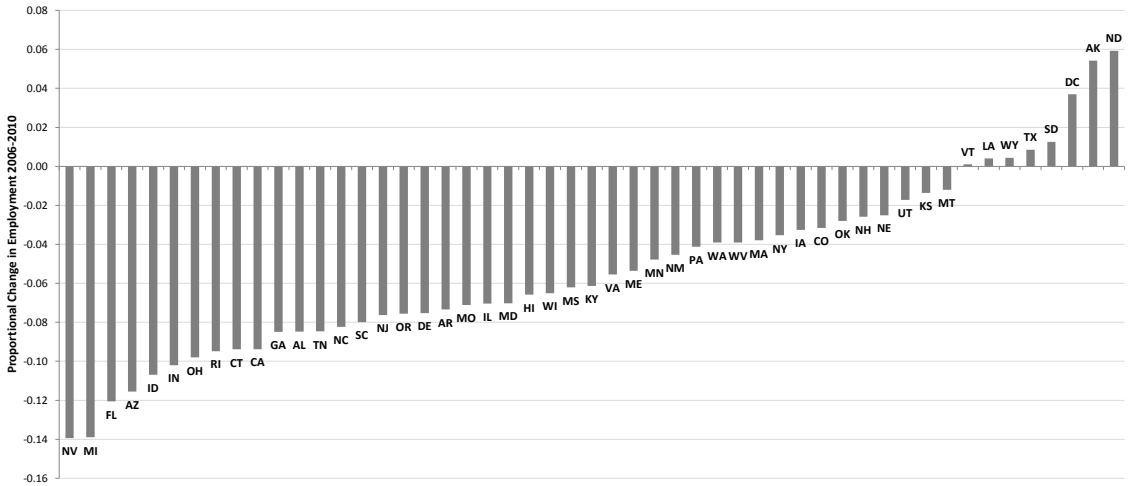
A Appendix

Additional results discussed in the text but not presented here are available in the online appendix, available at: `http://www.andrew.cmu.edu/user/bkovak/cadenakovak_greatrecession_online_appendix.pdf`

A.1 Employment Changes in the Great Recession

This section presents summary statistics on employment changes that occurred during the Great Recession. Figure A-1 shows proportional employment changes by state, as measured in County Business Patterns data.

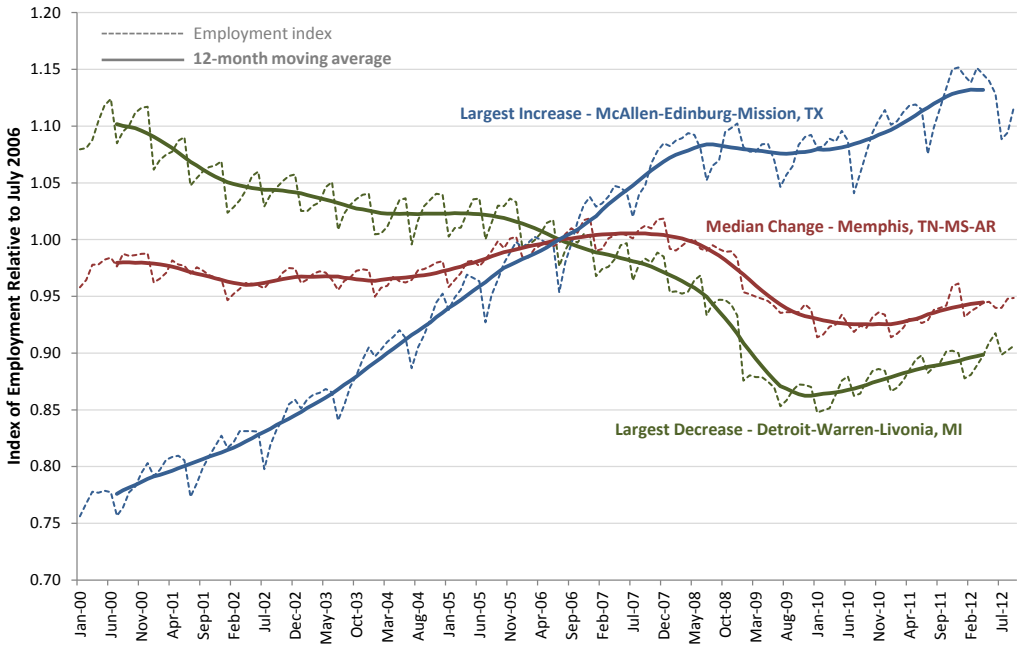
Figure A-1: Changes in Employment 2006-2010, US States



Source: County Business Patterns.

Figure A-2 provides time series information on employment for the metro areas with the largest decline, largest increase, and the median change in employment over this same time period, showing substantial variation across cities.

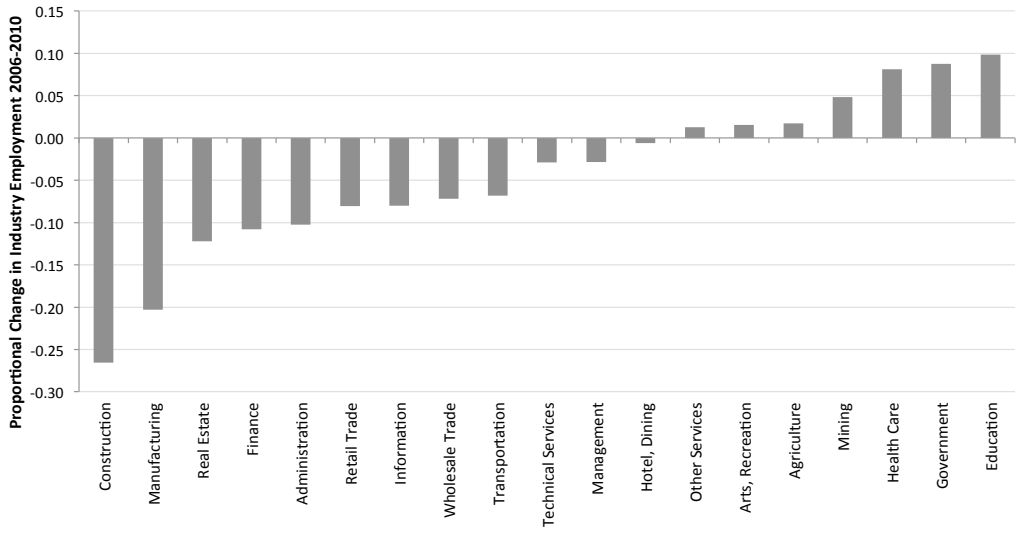
Figure A-2: Employment 2006-2010, Selected Metro Areas



Source: Authors' calculations from Current Employment Statistics, metro area total non-farm employment. Normalized to 1 in July 2006.

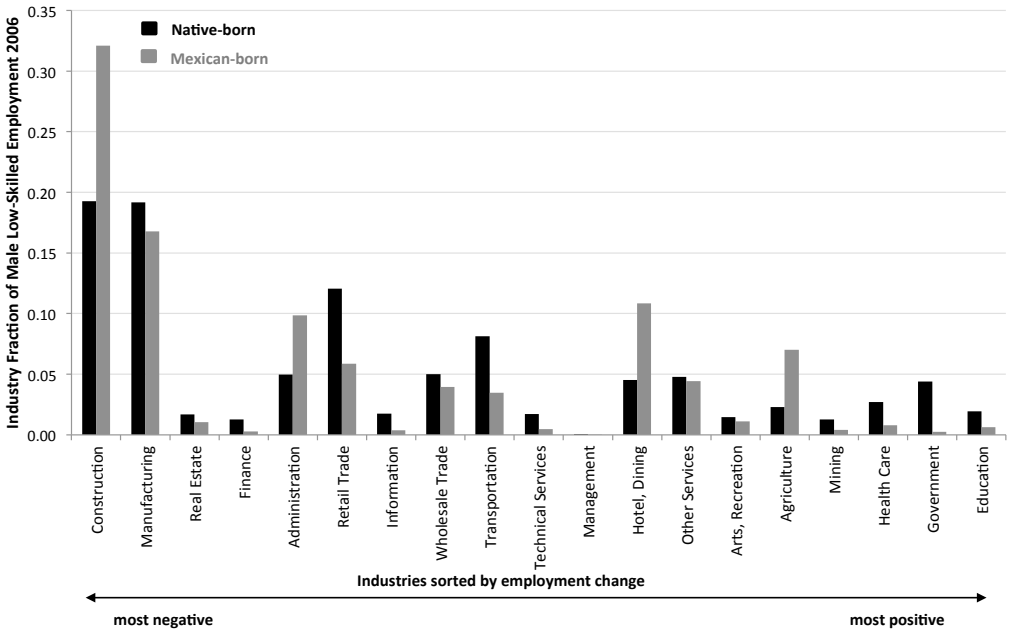
Figure A-3 shows that there was considerable variation in employment declines across industries, and Figure A-4 shows that Mexican-born workers (the largest single group among the low-skilled foreign-born) were more concentrated in the types of jobs that experienced the largest declines.

Figure A-3: Employment Changes by Industry 2006-2010



Sources: Authors' calculations from County Business Patterns (CBP) and the American Community Survey (ACS). CBP employment changes shown for all industries except those without without full coverage in the CBP: Agriculture, Other Services, and Government. ACS employment changes shown in those cases.

Figure A-4: Employment Shares by Industry Among Low-Skilled Men, Native- and Mexican-Born, 2006



Sources: Authors' calculations from the 2006 American Community Survey. See text for individual sample restrictions. This figure reports information for men with no more than a high school education. See Figure A-3 for industry employment changes used to sort categories.

A.2 Details of the Multinomial Logit Estimation of Industry Shares

In constructing employment declines faced by each (skill × sex × nativity) group in each city, we need information on each group's city-level industry shares. We calculate these shares based on multinomial logit estimates. In earlier versions, we calculated shares by directly measuring the within-city share of the group working in each industry in the ACS. This approach is potentially problematic because the cell sizes can be quite small for particular industries. The remainder of this section describes the implementation of the approach we use, although we emphasize that none of these decisions are pivotal. In fact, the results are remarkably similar to those obtained using the simpler sample-based shares approach.

We predict the probability that an individual of type j living in city c works in industry i as a function of his/her type and location. Our explanatory variables are a full set of worker type dummies and city dummies, and we run separate models for each (skill × sex) group. Note that if we included dummies at the (type × city) level, the predicted probabilities would simply be the sample shares. Our method therefore imposes the assumption that the influence of worker type and city on the industry distribution of employment are separable in determining an individual's likelihood of working in a given industry.[56]

[56]These factors can be considered as additively separable in a latent variable framework, although given

For further richness, we also account for the different composition of the native and foreign-born workforce across cities. For natives, we allow a worker's industry to depend on his/her racial and ethnic composition, with separate coefficients for non-Hispanic whites, non-Hispanic blacks, non-Hispanic Asians, native-born Hispanics, and other non-Hispanics. Among the "other immigrants" category, we allow for a separate industry mix based on groupings of source countries including Western Hemisphere immigrants, Asian immigrants, and other immigrants.

After running these models, we predict individual-level probabilities of working in each industry. We then aggregate these predicted probabilities to the city level for the broader groups considered in the regressions (native-born, foreign-born, Mexican-born, other foreign-born).[57] We use these shares to create the employment shocks based on CBP data at the city-industry level.

A.3 Specification Alternatives

We have conducted several specification checks for the main elasticity results as discussed in the main text. These include using employment declines that are not specific to each demographic group, various ways of addressing the CBP's non-covered industries, using the three-year samples of ACS data to calculate population changes, and alternative weighting schemes (including unweighted results). As mentioned in the text, each of these alternatives continues to support the central conclusions of the paper. For the interested reader, a complete set of the results of these specifications is available in the online appendix.

A.4 Heteroskedasticity Weights

The population growth measures we use as dependent variables are estimates derived from underlying micro data, and hence are likely to result in heteroskedasticity. Along with reporting heteroskecasticity-robust standard errors, we weight by the inverse of the sampling variance of the population growth estimates. This section describes how we construct these variance estimates.

For a particular city, c, our dependent variable is

$$\frac{\hat{p}_c^{2010} - \hat{p}_c^{2006}}{\hat{p}_c^{2006}} = \frac{\hat{p}_c^{2010}}{\hat{p}_c^{2006}} - 1,$$

where $\hat{p}_c^t$ is the estimated city population in year t. The variance of the dependent variable is thus

$$var\left(\frac{\hat{p}_c^{2010}}{\hat{p}_c^{2006}} - 1\right) = var\left(\frac{\hat{p}_c^{2010}}{\hat{p}_c^{2006}}\right)$$

the multinomial logit function form, they are multiplicatively separable in determining the probability.

[57] Note that this approach merely takes a weighted average of each of the finer groups within the more aggregate cells.

We use the delta method and assume that sampling is independent across years, so that $cov(\hat{p}_c^{2010}, \hat{p}_c^{2006}) = 0$. Plug in sample estimates for means and variances of the population estimates to yield the estimated sampling variance of population growth in city c.

$$\hat{var}\left(\frac{\hat{p}_c^{2010}}{\hat{p}_c^{2006}}\right) \approx \left(\frac{\hat{p}_c^{2010}}{\hat{p}_c^{2006}}\right)^2 \left(\frac{\hat{var}(\hat{p}_c^{2010})}{(\hat{p}_c^{2010})^2} + \frac{\hat{var}(\hat{p}_c^{2006})}{(\hat{p}_c^{2006})^2}\right).$$

To calculate $\hat{var}(\hat{p}_c^t)$ accounting for individual sampling probabilities we follow Deaton (1997) equation (1.24):

$$\hat{var}(\hat{p}_c^t) = \frac{n^t}{n^t - 1} \sum_{i=1}^{n^t} (z_i - \bar{z})^2,$$

where n^t is the sample size, $z_i \equiv w_i \iota_{ic}$, w_i is inverse of individual i's probability of appearing in the sample, and ι_{ic} is an indicator for whether individual i appears in city c.

Combining the previous two expressions yields our estimate for the sampling variance of population growth. We use three-year ACS samples to calculate these variance estimates to avoid wildly inaccurate estimates for demographic groups with only a few individuals in a given city (this only appreciably affected the weights in a few cities for the "other foreign-born" group). In practice, these weights turn out to be very closely related to the 2006 population, with a correlation coefficient of 0.9896 when considering observations for all demographic groups in all cities. For completeness, in the online appendix we present versions of Tables 2 and 4 weighting by 2006 population with no substantive changes to the main results.

A.5 Falsification Results for All Groups

Figure 5 provided the results for the pre-trend falsification test for low-skilled men (native- and Mexican-born). For reference, Table A-1 provides analogous results for all (sex x skill x nativity) groups.

Table A-1: Falsification Test: 2000-2006 Population Change vs. 2006-2010 Labor Demand Shocks

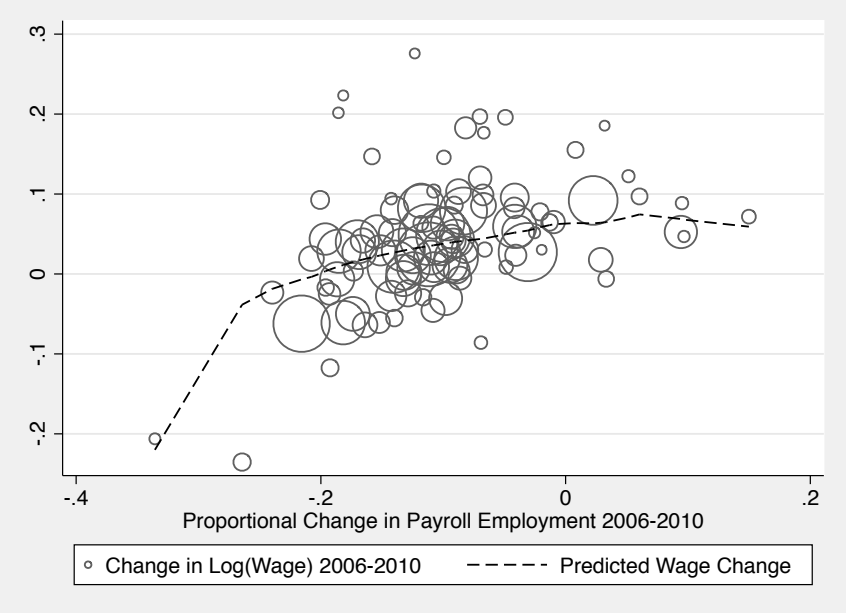
	Dependent Variable: Proportional Population Change				
	All	Native-Born	Foreign-Born	Mexican-Born	Other Foreign-Born
Panel A: Men, High-school or less					
Proportional Change in	-0.299	-0.076	-1.115***	-0.868***	-1.638***
Group-Specific Employment	(0.288)	(0.236)	(0.375)	(0.280)	(0.585)
Panel B: Men, Some college or more					
Proportional Change in	-0.035	0.035	-0.843	-0.618	-0.898
Group-Specific Employment	(0.154)	(0.133)	(0.558)	(0.609)	(0.570)
Panel A: Women, High-school or less					
Proportional Change in	0.246	0.266	-0.134	0.022	-0.372
Group-Specific Employment	(0.309)	(0.261)	(0.606)	(0.623)	(0.757)
Panel B: Women, Some college or more					
Proportional Change in	0.376**	0.465***	0.401	3.421**	-0.158
Group-Specific Employment	(0.179)	(0.162)	(0.553)	(1.588)	(0.535)

Identical specification to Table 2, with the exception that the proportional population changes are calculated for 2000-2006.

A.6 Wage and Employment Changes

As discussed, in section 3.1, the elasticity of population with respect to employment will overstate the supply elasticity with respect to expected earnings when wage changes and changes in the employment probability are positively correlated. Figure A-5 shows the relationship between *nominal* wage changes and payroll employment shocks for low-skilled native-born men from 2006-2010. The wage data come from the ACS questions on annual earnings, usual hours worked, and annual weeks worked. The figure reveals a positive relationship between wage changes and employment declines. With the exception of the outlier cities in the SW corner of the figure, however, the range of average wage changes is relatively narrow. The hardest hit cities experienced close to zero nominal wage growth while cities with relatively stronger labor demand changes saw wage growth in line with inflation. The change in CPI-U from 2006 to 2010 was roughly eight percent, which is slightly higher than the largest predicted value from the smoothed conditional expectation line. These results are consistent with the large body of literature showing that employers respond to demand decreases through layoffs and that workers often continue to receive small raises even when employers are cutting payrolls.

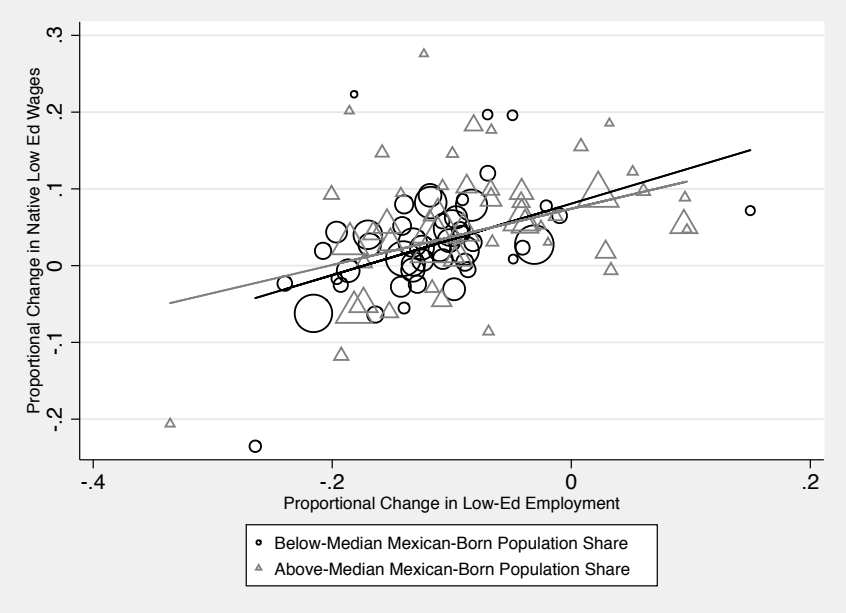
Figure A-5: Wage Changes and Employment Changes 2006-2010



Source: Authors' calculations from ACS and CBP data. The wage data are calculated as annual earnings divided by (usual weekly hours * annual weeks worked). The wage sample includes native men with a high school degree or less. The employment changes are calculated using the industry weights for this population. The fitted line is the fit from an epanechnikov kernwl (bw=0.04) calculated at each city's value of the employment shock. These conditional means are weighted using city weights. The outliers in the SW corner are Naples, FL and Fort Meyers-Cape Coral, FL.

As discussed in footnote 43, a potential concern with the smoothing analysis is that larger Mexican-born populations may have less rigid wage structures. Recall that under this hypothesis, wage changes should be more strongly correlated with employment changes in cities with greater Mexican concentrations. Figure A-6 shows that, in fact, the opposite is true. Instead, this figure is consistent with the interpretation that Mexican mobility smoothed both employment and wage outcomes for natives. Note, however, that the difference in slopes for the two sets of cities is not statistically significantly different from zero, which implies that the smoothing in employment rates documented in the main text is the primary effect.

Figure A-6: Wage Changes and Employment Changes by Mexican Share



Source: Authors' calculations from ACS and CBP data. The wage data are calculated as in Figure A-5. The wage sample includes native men with a high school degree or less. The employment changes are calculated using the industry weights for this population. The solid black line and solid black circles are for cities with below-median Mexican-born population shares. The gray triangles and line are for cities with above-median Mexican-born population shares.

A.7 Propensity Score Reweighting

Table A-2 provides the results of the probit specifications used to reweight the native population for the results described in section 5.2. The individual coefficients on each age are suppressed in column (3), but the log likelihood is included for reference.

Table A-2: Probit Regressions Predicting Mexican Nativity (2006)

	Dependent Variable: Mexican-born Indicator				
	(1)	(2)	(3)	(4)	(5)
High School Dropout	1.164***	1.195***			
	(0.0107)	(0.0100)			
Rents Home	0.423***			0.531***	
	(0.0108)			(0.00928)	
Married, Spouse Present	0.123***				-0.183***
	(0.0138)				(0.0112)
Any Children (1= yes)	-0.00228				-0.0286*
	(0.0193)				(0.0173)
Number of Children	0.197***				0.270***
	(0.00747)				(0.00682)
Age Dummies	YES	NO	YES	NO	NO
Observations	152,782	152,782	152,782	152,782	152,782
Log Likelihood	-7473000	-8175000	-9273000	-9262000	-9219000

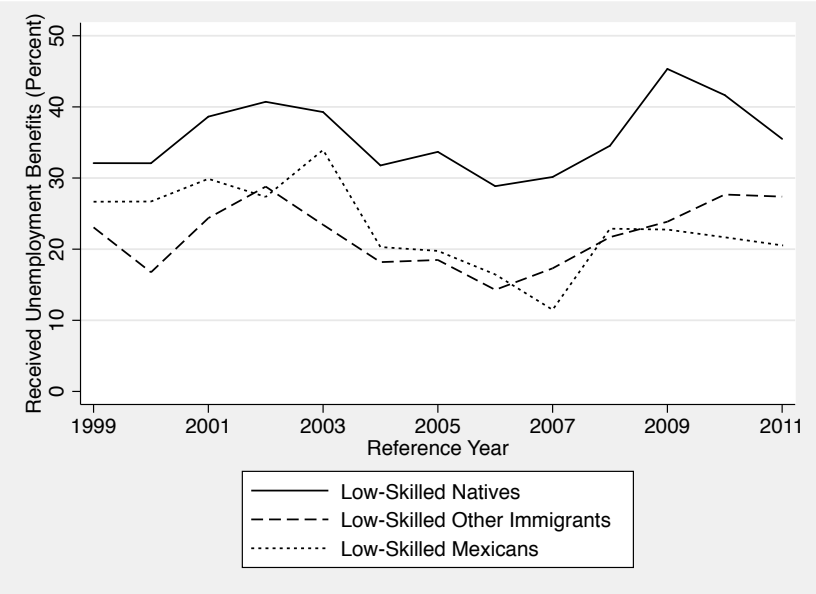
Sample includes native-born and Mexican-born men with at most a high school degree who meet individual sampling criteria and live in the 97 cities in our sample. Heteroskedasticity-robust standard errors in parentheses - *** significant at the 1% level, ** 5%, * 10%.

A.8 CPS descriptives

The following section uses Current Population Survey data we reference in Section 5 when examining why the less-skilled Mexican-born respond so much more strongly than similarly skilled natives.

Figure A-7 shows UI participation rates by nativity groups for low-skilled men among those who had a spell of unemployment in the previous year. The patterns across groups for high-skilled men are broadly similar, although the high-skilled are less likely to claim benefits in general.

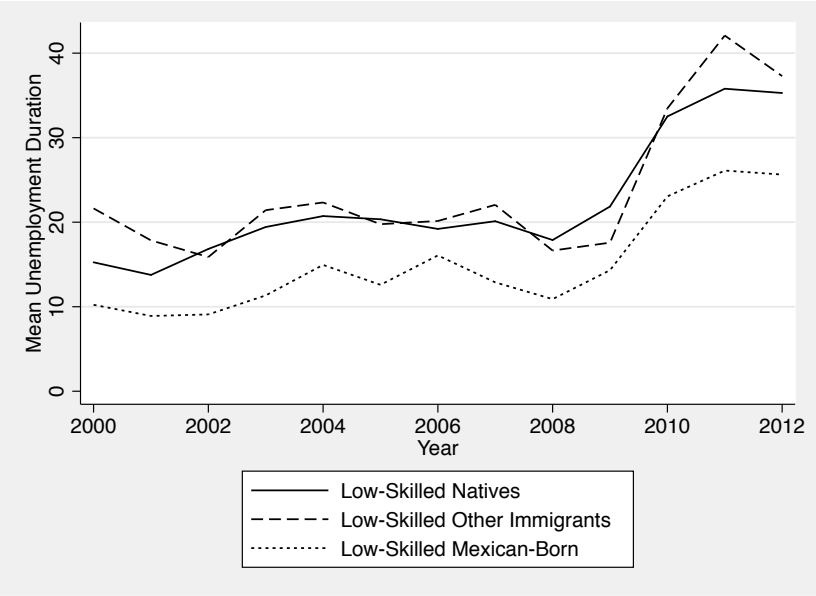
Figure A-7: Unemployment Benefit Receipt by Nativity 2000-2011



Source: Authors' calculations from Current Population Survey data. Sample includes men ages 18-64, not in school, not in group quarters, with at most a high school degree.

Figure A-8 shows average unemployment duration among those who are unemployed in the reference month, separately by nativity. The results show that Mexican-born workers have markedly shorter unemployment durations than natives.

Figure A-8: Unemployment Duration (Among Unemployed) by Nativity 2000-2012



Source: Authors' calculations from Current Population Survey data. Sample includes men ages 18-64, not in school, not in group quarters, with at most a high school degree. Average duration calculated among those who are unemployed in the reference month.

Table A-3 is based on a question from the March supplement to the Current Population Survey asking recent movers why they moved. We report summary statistics for less skilled men who moved across county lines or internationally in the past year. The Mexican-born are especially likely to report moving to look for work or because they lost a previous job. In fact, among all possible answers, this category is the most common response among the Mexican-born (23.6 percent). Note that these numbers include individuals arriving from abroad. Nearly two thirds of Mexican-born arrivals from abroad report one of the job related reasons. Among internal migrants, the Mexican-born are still twice as likely to report moving to look for work or because of a lost job as are natives or other immigrants.

Table A-3: Stated Reasons for Moving Among Cross-County Movers, 2001-2010

	Native-Born	Mexican-Born	Other Immigrant
Attend/leave college	1.7%	1.1%	1.7%
Change in marital status	6.6%	3.2%	5.1%
Change of climate	1.3%	0.2%	1.1%
For cheaper housing	5.2%	4.3%	4.0%
For easier commute	4.5%	4.3%	4.4%
Health reasons	1.9%	0.7%	0.4%
Natural disaster	0.3%	0.2%	0.1%
New job or job transfer	**16.3%**	**17.1%**	**15.1%**
Other family reason	16.7%	12.4%	16.3%
Other housing reason	6.9%	4.8%	6.5%
Other job-related reason	3.4%	4.7%	4.4%
Other reasons	4.5%	2.1%	8.0%
Retired	0.7%	0.0%	0.2%
To establish own household	7.0%	5.0%	5.0%
To look for work or lost job	**5.3%**	**23.8%**	**10.3%**
Wanted better neighborhood	3.3%	3.6%	2.9%
Wanted new or better housing	8.9%	9.6%	9.0%
Wanted to own home, not rent	5.7%	2.9%	5.5%

Source: Authors' calculations from March CPS data, 2000-2010. Sample includes men ages 18-64, not in school, not in group quarters, with at most a high school degree who are living in a different county in the survey year than in the previous year.