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

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This paper demonstrates that low-skilled Mexican-born immigrants' location choices respond strongly to changes in local labor demand, which helps equalize spatial differences in employment outcomes for low-skilled native workers. We leverage the substantial geographic variation in labor demand during the Great Recession to identify migration responses to local shocks and find that low-skilled Mexican-born immigrants respond much more strongly than low-skilled natives. Further, Mexican mobility reduced the incidence of local demand shocks on natives, such that those living in metro areas with a substantial Mexican-born population experienced a roughly 50 percent weaker relationship between local shocks and local employment probabilities. (*JEL* E32, J15, J23, J24, J61, R23)

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

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job losses during downturns (Hoynes 2002; Hoynes, Miller, and Schaller 2012), but a prominent 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; and 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 changes. 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 living in the United States 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 more than 50 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, as in previous downturns, the primary employer response to declining product demand was to cut employment rather than to reduce wages. This feature makes it possible to determine which metro areas faced larger and smaller demand shocks by observing relative changes in employment across those locations. We also instrument for local labor demand using the standard Bartik (1991) measure that relies on the pre-Recession industrial composition of local employment. 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 4.6 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 5.7 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 United States, 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]

[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.

[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)

Having established that less-skilled Mexicans are highly geographically responsive to 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 relatively 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, even among the less mobile native population.

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 consider differences in observable demographic characteristics such as age, education, family structure, and home ownership, but find that these do not account for the differential responsiveness. Instead, we conclude that a likely contributing factor is the fact that the Mexican-born are a self-selected group of people with high levels of labor force attachment and a greater willingness to move long distances to encounter more favorable labor market conditions. 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).

These findings have important implications for multiple literatures. First, as mentioned above, various papers find that the mobility of workers reduces 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. We further demonstrate an even larger difference in responsiveness *within* the less-skilled market, between immigrants and natives. This distinction between less-skilled immigrants and natives likely explains why we find an important role for equalizing migration, while other recent work focusing on citizens (Yagan 2014) or total population (Mian and Sufi 2014) finds a more limited role for migration during the Great Recession. We show that 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

show that migration flows between the United States and Mexico respond as expected to changes in real wages in each country, and McKenzie, Theoharides, and Yang (2014) similarly find that migration rates from the Philippines responds to demand conditions. 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; and Böckerman and Haapanen 2013).

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, demand-driven location choices by immigrants represent a central challenge in the literature measuring immigrants' effects on natives' labor market outcomes. To address this challenge, researchers have used instrumental variables based on the existing locations of immigrant enclaves (Card 2001, for example) or relied on 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, and we show that during the Great Recession more than 75 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. Moreover, the fact that immigrants' mobility reduces variability in labor market outcomes faced by natives is an important effect of immigration on the host country, and a complete welfare accounting should take it into consideration.[5]

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 arrived immigrants. Finally, we introduce a 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 for similar jobs. 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.

[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 United States between 1975 and 1980. Similarly, a few demographic studies discuss immigrants' internal migration patterns (Belanger and Rogers 1992, Kritz and Nogle 1994, and Gurak and Kritz 2000). More recently, Maré, Morten, and Stillman (2007) study initial and subsequent location choices of immigrants to New Zealand.

[5] In a similar vein, di Giovanni, Levchenko, and Ortega (2015) expand the traditional welfare analysis to include effects of immigration on consumption varieties.

The remainder of the paper is organized as follows: the next section provides context for examining demand-sensitive location choices during the Great Recession. Section II provides the main results and multiple robustness checks of the Mexican/native-born differences in geographic responsiveness. Section III demonstrates that Mexican immigrants' mobility smooths labor market outcomes for natives. Section IV shows that similar mobility and smoothing results apply during the pre-Recession period. Section V decomposes 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 VI concludes.

I. Background and Conceptual Framework

A. *Measuring Demand Shocks*

Like many previous recessions, the Great Recession was characterized by large employment declines and much smaller wage cuts.[6] Our initial identification strategy exploits the fact that employers adjusted primarily on the employment margin rather than the wage margin, which makes it possible to observe the relative size of demand declines across metro areas directly through employment changes. Note that for our purposes, it is unimportant *why* employers responded this way; rather, this approach simply requires the descriptive fact that the bulk of the response occurred through employment.[7] We therefore initially measure each metro area's demand shock as the proportional decline in observed payroll employment, and then examine how local labor supply responded to this measure of the degree to which local conditions deteriorated. It is important to emphasize that this approach 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 low rates of unemployment, when employment changes are more likely to reflect shifts in both supply and demand.

Although the recessionary environment makes it plausible that changes in employment reflect only changes in demand, changes in the size of the local population may affect local labor demand through the consumer demand channel, creating a reverse causality problem. As we discuss in more detail in Section IIB, it is unlikely that the resulting bias will vary substantially across demographic groups, implying that the *relative* supply responses across groups remain informative. However, we further support this interpretation by conducting IV analysis using the Bartik (1991) measure as an instrument for changes in local employment. These results are very similar to those using OLS, and in most specifications, we fail to reject the null

[6] Online Appendix Section A.1 presents our own calculations and evidence from Rothstein (2012) that changes in average wages were relatively small compared to substantial changes in employment.

[7] 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, Hobijn, and Lucking (2012), 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. However, Elsby, Shin, and Solon (forthcoming) find little evidence that employers faced a larger wage rigidity constraint during the Great Recession than in previous recessions, despite lower rates of inflation.

hypothesis that the two sets of estimates are equal, which supports the interpretation that measured employment changes reflect demand shocks.

B. *Geographic Variation in Employment Changes*

There was considerable geographic variation in the depth of the Recession. The hardest hit locations (e.g., Nevada, Michigan, Florida) lost more than 10 percent of employment from 2006–2010, while a few places (including North and South Dakota and Texas) experienced modest employment growth over the same period.[8] Our empirical specifications define a local labor market as a metropolitan area (we will use the word "city" interchangeably for ease of exposition), and there was even greater variation in employment changes at this level of geography.[9]

Several recent papers examine the sources of these differences. Mian and Sufi (2014) show that counties with higher average household debt-to-income ratios in 2006 experienced larger declines in household expenditure and hence larger employment declines, particularly in nontraded industries that depend on local consumer demand. Greenstone, Mas, and Nguyen (2014) show that counties whose small businesses borrowed primarily from banks that cut lending following the financial crisis experienced larger employment declines, and Chodorow-Reich (2014) provides direct evidence that firms with greater exposure to such banks experienced greater employment losses. Fort et al. (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. We leverage the resulting geographic variation in the local depth of the Recession to identify the effects of labor market strength on individuals' location choices.

C. *Geographic Mobility 2006–2010*

Throughout our analysis, we consider locational supply responses separately by sex, skill, and nativity.[10] 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.[11] Notably, every demographic and skill group experienced substantial mobility over this time period, which suggests that there is scope for

[8] See online Appendix Section A.2 for details. The few employment increases were sufficiently small relative to population growth that it is reasonable to treat them as very mild declines.

[9] Online Appendix Figure A-4 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.

[10] 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).

[11] Although geographic mobility has been declining in the United States since around 1980, there is little evidence that the Recession reduced rates further than a continuation of the trend would predict (Molloy, Smith, and Wozniak 2011).

Table 1—Average Yearly Mobility (*Percentages*)

	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	7.7	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

Notes: Numbers report the percent of individuals who have made the relevant long distance move over the previous year. Sample includes 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 one-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 United States 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 United States to Mexico between June 2005 and June 2010)/(individuals living in the United States in 2005), divided by five for the average yearly rate. The values for this calculation are approximately zero for all groups except the Mexican-born.

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 United States, while the foreign-born are more likely to have moved from an international location.[12] As expected, emigration to Mexico is an important channel for Mexican-born population adjustment during this time period.[13] 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.

[12] 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.

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

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 VB, we discuss multiple pieces evidence that the Mexican-born are especially likely to move 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.

II. Population Responses to Demand Shocks

A. *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 by changes in payroll employment. Our dependent variable is the change in the natural log of the relevant demographic group's population from 2006–2010, calculated from the American Community Survey (ACS).[14] Note that the ACS sample includes both authorized and unauthorized immigrants.[15] 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 group) in the 2006 or 2010 ACS. These city-level restrictions are imposed uniformly, resulting in a sample of 95 cities in each regression.[16]

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.[17] Note that with only small changes in wages, the percentage change in expected earnings that a labor market offers (prior to any mobility) will be approximately equal to the percentage change in the number of jobs. We therefore use changes in the natural log of employment as our primary measure of local demand shocks, which we calculate using employment information from County Business Patterns (CBP) data.[18] Throughout the discussion we use the notation $\dot{x}$ to signify changes in logs: $\dot{x} \equiv \log(x_1) - \log(x_0)$. Unless

[14] We obtained the data from the Integrated Public Use Microdata Series (IPUMS) (Ruggles et al. 2010).

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

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

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

[18] 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.

otherwise noted, this 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.[19] 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 (see online Appendix Section A.2 for details). We therefore construct group-specific employment changes that account for these differing industrial compositions.[20] Note 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.

$$\dot{L}_c = \sum_i \varphi_{ic}^{t_0} \dot{L}_{ic}, \quad \text{where} \quad \varphi_{ic}^{t_0} \equiv \frac{L_{ic}^{t_0}}{L_c^{t_0}}. \tag{2}$$

Based on this insight, we 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 $\dot{L}_c^g \equiv \sum_i \varphi_{ic}^{gt_0} \dot{L}_{ic}$.[21]

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 $\times$ industry) calculations from the ACS.[22] 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

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

[20] 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 $\times$ skill group) level are available in online Appendix Section A.10.

[21] We estimate these shares at the group $\times$ 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.3 in the online Appendix. Note that ignoring small cell sizes using simple shares from the ACS yields similar results.

[22] 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 online Appendix Section A.10.

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, accounting for individuals' ACS sampling weights.[23] 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. 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.[24]

Finally, we note that although employment changes represent the bulk of employers' responses to demand changes, there is a small positive correlation between wage changes and employment changes across metro areas.[25] 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 workers and Mexican-born workers, and we find no appreciable difference in the degree to which wages adjusted rather than employment.

B. *Geographic Labor Supply Elasticities by Demographic Group*

Figure 1 shows scatter plots based on equation (1) for low-skilled native-born and Mexican-born men. Each circle represents a metro area, with its size proportional to the weight it receives in the regression.[26] The x-axis shows the change in log employment, constructed using industry shares specific to each worker type, and the y-axis shows the change in log population for the relevant group.[27] The figure clearly demonstrates our central finding regarding the labor supply responses of less-skilled workers: Mexican-born workers respond much more strongly to local labor demand shocks than do natives, with Mexican-born population shifting away from the hardest hit cities and toward those with relatively mild downturns, while native populations respond much less.

Table 2 reports similar elasticities for a variety of groups defined by skill, sex, and nativity, with each coefficient in the table coming from a separate regression. For example, the native-born and Mexican-born coefficients for less skilled men

[23] Further details of this procedure are available in the online Appendix in Section A.4.

[24] For demographic and skill groups with some very small cells (see online Appendix Table A-2), the weighted and unweighted results occasionally differ. In each of these cases, the efficiency-motivated weighting reduces the estimated standard errors, which suggests that the weighted estimates are preferable. The full set of results is available in online Appendix Section A.10.

[25] As discussed in more detail in online 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.

[26] The value of the optimal weighting scheme is readily apparent, as outlier cities in the figures are those with ex ante higher sampling variance for estimated population changes.

[27] Descriptive statistics for the variables in the analysis in this section can be found in online Appendix Ssection A.8.

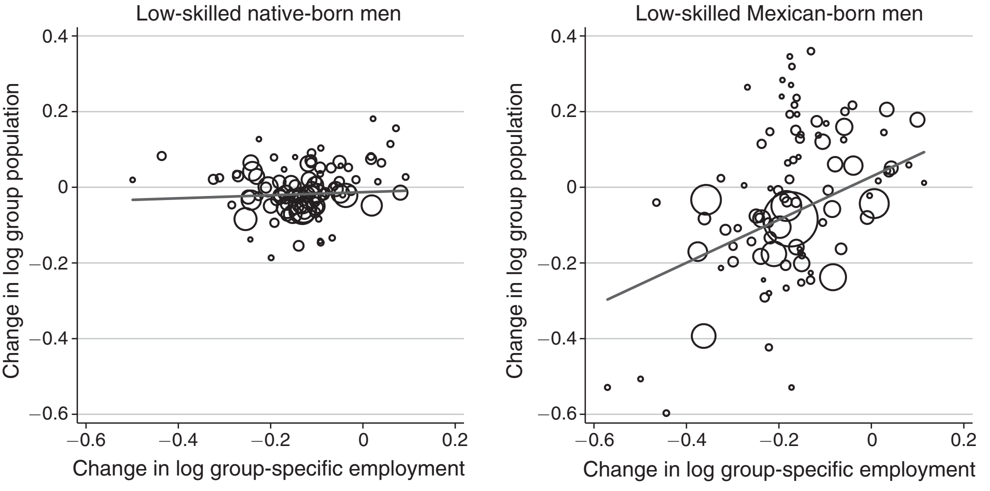

Figure 1. Population Responses to Employment Shocks: Native-Born and Mexican-Born Low-Skilled Men

Notes: Changes are calculated as the long difference in logs from 2006 to 2010. The individual sample, 95 city sample, and construction of group-specific employment changes are described in the text. Observations are weighted to account for heteroskedasticity (details are in online Appendix Section A.4). Two cities fall above the graph range: Amarillo, TX (−0.097, 0.694) and Birmingham, AL (−0.148, 0.754). The regression line is based on all observations.

Source: Authors' calculations are from American Community Survey and County Business Patterns.

Table 2—Population Response to Labor Demand Shocks

	Dependent variable: Change in log of population				
	All	Native-born	Foreign-born	Mexican-born	Other foreign-born
Panel A. Men, high school or less					
Change in log of group-specific employment	0.163***	0.041	0.388**	0.569***	−0.087
	(0.061)	(0.072)	(0.169)	(0.202)	(0.264)
Panel B. Men, some college or more					
Change in log of group-specific employment	0.498***	0.463***	0.605***	0.171	0.717***
	(0.090)	(0.092)	(0.206)	(0.316)	(0.209)
Panel C. Women, high school or less					
Change in log of group-specific employment	0.408***	0.196	0.616***	0.652***	0.505
	(0.115)	(0.156)	(0.186)	(0.192)	(0.332)
Panel D. Women, some college or more					
Change in log of group-specific employment	0.475***	0.440***	0.826***	0.218	0.898***
	(0.126)	(0.118)	(0.271)	(0.505)	(0.268)

Notes: Each listed coefficient represents a separate regression of the change in log(population) for the relevant group (from the American Community Survey) from 2006–2010 on the change in log(group-specific employment) from County Business Patterns data over the same time period, using the demographic group's industry mix. All regressions include an intercept term and 95 city observations. Observations are weighted by the inverse of the estimated sampling variance of the dependent variable (see Section A.4 in the online Appendix for details). Heteroskedasticity robust standard errors appear in parentheses.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

in panel A correspond to the scatter plots in Figure 1. Comparing panels A and C to B and D, respectively, we find the well-established empirical regularity that, in general, workers with at least some college education are much more responsive than are workers with at most a high school degree. There are also substantial differences among skill groups by nativity, with the foreign-born consistently more responsive than the native-born. For less-skilled workers, the strongest mobility responses appear among Mexican-born immigrants, in sharp contrast to the very small and statistically insignificant estimates for natives.[28] 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 economic implications.

To rule out the possibility that the Mexican mobility result is driven by changes in other determinants of location choice that may be correlated with local changes in demand, we introduce a variety of controls. We control for the Mexican-born share of each city's population in 2000, which accounts for the potential decline in the value of traditional enclaves discussed by Card and Lewis (2007). We also 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 Santillano and Bohn (2012). Table 3 presents population elasticities analogous to Table 2, with the addition of these controls.[29] The pattern of elasticities remains essentially unchanged.[30]

Although the pattern of elasticities is robust to the controls just mentioned, there remains the possibility of reverse causality, in which unmeasured factors drive population changes, and these population changes result in changes in employment, either through decreasing consumer 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 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

[28] Note that the split between Mexican-born and other immigrants is motivated primarily by the low-skilled labor market, wherein slightly more than half of all immigrants are from Mexico. We report results for higher skilled Mexican immigrants for completeness, but these cell sizes are quite small (see online Appendix Table A-2). Also, note that the surprising negative point estimate for other foreign-born less-skilled men is not robust to changes in specification (see online Appendix Section A.10).

[29] See online Appendix Table A-1 for coefficient estimates on the enclave and policy controls for less-skilled Mexican-born men.

[30] 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.

Table 3—Population Response to Labor Demand Shocks—With Enclave and Policy Controls

	Dependent variable: Change in log of population				
	All	Native-born	Foreign-born	Mexican-born	Other foreign-born
Panel A. Men, high school or less					
Change in log of group-specific employment	0.150**	0.040	0.292**	0.475***	−0.084
	(0.063)	(0.071)	(0.141)	(0.172)	(0.281)
Panel B. Men, some college or more					
Change in log of group-specific employment	0.479***	0.435***	0.631***	0.014	0.742***
	(0.074)	(0.082)	(0.187)	(0.285)	(0.204)
Panel C. Women, high school or less					
Change in log of group-specific employment	0.395***	0.166	0.631***	0.743***	0.444
	(0.121)	(0.157)	(0.179)	(0.202)	(0.348)
Panel D. Women, some college or more					
Change in log of group-specific employment	0.473***	0.423***	0.841***	0.315	0.939***
	(0.095)	(0.102)	(0.243)	(0.597)	(0.248)

Notes: Each listed coefficient represents a separate regression of the change in log(population) for the relevant group (2006–2010, using the American Community Survey) on the change in log (group-specific employment) from County Business Patterns data over the same time period, using the demographic group's industry mix. These specifications include the enclave and policy controls in column 4 of Table A-1. All regressions include an intercept term and 95 city observations. Observations are weighted by the inverse of the estimated sampling variance of the dependent variable (see Section A.4 in the online Appendix for details). Heteroskedasticity robust standard errors are in parentheses.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

industry composition of employment.[31] This measure is plausibly exogenous to counterfactual population growth and strongly relates to changes in local employment. We calculate the instrument as $\psi_c = \sum_i \varphi_{ic}^{t_0} \dot{L}_i$, 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 4; these specifications also include the controls introduced in Table 3.[32] For each specification, we report the IV elasticity estimates, the p-value of a test that the OLS and IV coefficients are equal, the first-stage coefficients on the instrument, and partial F-statistics for the instrument in the first stage.[33] 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

[31] Other examples of the Bartik instrument appear in Bound and Holzer (2000); Blanchard and Katz (1992); Autor and Duggan (2003); Wozniak (2010); Notowidigdo (2013); and Charles, Hurst, and Notowidigdo (2013). In online Appendix Section A.12, we provide an additional set of IV specifications that use pre-Recession household borrowing rates, following Mian and Sufi (2014).

[32] These specifications include only 94 of the 95 cities used in the OLS results. We drop Brazoria, Texas because it is a substantial outlier in both the first stage and reduced form. See online Appendix Section A.9 for details.

[33] We use Wooldridge's (1995) score test of instrument exogeneity because our specification includes heteroskedasticity-robust standard errors.

Table 4—Population Response to Labor Demand Shocks: Bartik (1991) IV Estimates

	Dependent variable: Change in log population				
	All	Native-born	Foreign-born	Mexican-born	Other foreign-born
Panel A. Men, high school or less					
IV estimate					
Change in log of group-specific employment	0.223	0.007	0.402	0.992**	−0.675**
	(0.166)	(0.090)	(0.409)	(0.468)	(0.278)
p-value testing shock exogeneity	0.541	0.764	0.606	0.029	0.072
First stage					
Predicted change in log employment	4.196***	4.038***	4.590***	5.108***	4.717***
	(0.702)	(0.672)	(0.912)	(1.478)	(0.699)
Partial F-statistic	35.74	36.13	25.31	11.94	45.60
Panel B. Men, some college or more					
IV estimate					
Change in log of group-specific employment	0.270*	0.411**	−0.237	−0.475	−0.161
	(0.157)	(0.192)	(0.264)	(0.387)	(0.329)
p-value testing shock exogeneity	0.316	0.935	0.017	0.331	0.081
First stage					
Predicted change in log employment	2.651***	2.662***	2.985***	5.337***	2.727***
	(0.542)	(0.569)	(0.486)	(0.947)	(0.449)
Partial F-statistic	23.89	21.91	37.76	31.79	36.89

(*Continued*)

in the prior literature.[34] The IV elasticity estimates for men are 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 the 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.[35] The coefficient estimate of 0.922 for low-skilled Mexican-born men implies that a city facing a 10 percentage point larger employment decline experienced a 9.92 percentage point larger decline in Mexican-born population. Compare this strong response to the very precisely estimated zero coefficient for low-skilled native men.

Finally, we use a false experiment approach to rule out the possibility that persistent unobserved factors drove the observed mobility responses. We regress 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 2 shows this falsification test for low-skilled Mexican-born and native-born men.[36] For both groups, we find a negative relationship. Thus, if anything, the large population responses among the

[34] 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.

[35] 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 online Appendix Table A-18, 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.

[36] The full sets of falsification results with and without controls are available in online Appendix Table A-18.

Table 4—Population Response to Labor Demand Shocks: Bartik (1991) IV Estimates (*Continued*)

	Dependent variable: Change in log population				
	All	Native-born	Foreign-born	Mexican-born	Other foreign-born
Panel C. Women, high school or less					
IV estimate					
Change in log of group-specific employment	0.145	−0.405	0.273	1.811***	−0.979*
	(0.168)	(0.287)	(0.504)	(0.665)	(0.556)
p-value testing shock exogeneity	0.169	0.040	0.315	0.047	0.022
First stage					
Predicted change in log employment	2.067***	2.068***	2.167***	2.502***	1.983***
	(0.387)	(0.405)	(0.419)	(0.675)	(0.317)
Partial F-statistic	28.59	26.09	26.76	13.73	39.17
Panel D. Women, some college or more					
IV estimate					
Change in log of group-specific employment	−0.066	−0.054	−0.754	0.438	−1.092
	(0.378)	(0.420)	(0.716)	(0.919)	(0.738)
p-value testing shock exogeneity	0.209	0.368	0.010	0.886	0.056
First stage					
Predicted change in log employment	1.081**	1.061**	1.580***	2.915***	1.364***
	(0.447)	(0.449)	(0.439)	(0.558)	(0.377)
Partial F-statistic	5.854	5.578	12.97	27.33	13.12

Notes: Each listed coefficient represents a separate instrumental variables regression of the change in log (population) for the relevant group (2006–2010, using the American Community Survey) on the change in log (group-specific employment) from County Business Patterns data over the same time period, using the demographic group's industry mix. All regressions include an intercept term, 94 city observations, and the enclave and policy controls in column 4 of Table A-1. These specifications omit Brazoria, Texas, which is a substantial outlier in the first stage; see Section A.9 in the online Appendix for details. Observations are weighted by the inverse of the estimated sampling variance of the dependent variable (see Section A.4 in the online Appendix for details). The excluded instrument is the predicted change in log (employment), based on Bartik (1991) and described in the text. The listed "p-value testing shock exogeneity" is from a test of the null hypothesis that the OLS and IV slope coefficients are equal to each other. The first-stage coefficient on the instrument and the partial F-statistic are reported below the corresponding IV estimate. Heteroskedasticity robust standard errors are in parentheses.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Mexican-born in the latter half of the decade represent a reversal of pre-Recession trends. Note that cities facing larger employment *declines* during the Great Recession on average experienced larger employment *increases* during the pre-Recession period, and additional analysis in Section IV directly supports the interpretation that population changes in the earlier period also reflect earnings-maximizing behavior.[37]

Overall, this section documents sharp differences in the responsiveness of less-skilled natives and Mexican immigrants to local labor demand shocks. This finding is robust to controlling for other determinants of immigrants' location choices and to alternative approaches for identifying local labor demand shocks, and it was not driven by preexisting migration patterns.[38]

[37] Monras (2015) documents similar responses before and after the Great Recession, although he treats the pre-Recession growth rates as the counterfactual in the Recession period.

[38] In online Appendix Section A.11, we also show that the results are robust to excluding cities in California, and that there is no statistically significant heterogeneity in elasticities for cities closer to the Mexican border or that have traditionally attracted large Mexican-born populations.

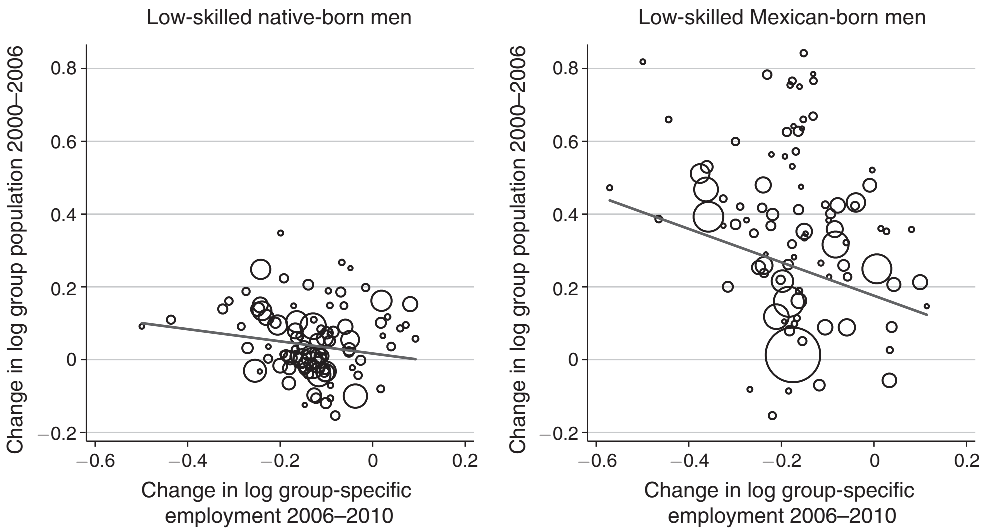

Figure 2. Falsification Test: Population Change 2000–2006 versus Group-Specific Employment Change 2006–2010

Notes: The figure presents a falsification test with changes in log (population) from 2000 to 2006 and changes in log (payroll employment) from 2006 to 2010. The individual sample, 95 city sample, and construction of group-specific employment changes are described in the text. Observations are weighted to account for heteroskedasticity (details are in online Appendix Section A.4). Three cities fall above the graph range: Baltimore, MD (−0.153, 1.141), Monmouth, NJ (−0.222, 1.106), and Richmond, VA (−0.219, 1.065). The regression line is based on all observations.

Source: Authors' calculations from American Community Survey and County Business Patterns

III. 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.

A. *Approach to Measuring Smoothing*

We define smoothing as the degree to which workers' employment probabilities are equalized across space rather than tied to local demand.[39] Assuming that the employment probability is given by the 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 rate $(d\ln(L_c/N_c))$ and the local demand shock $(d\ln L_c)$. In the absence of any equalizing migration response, the local change in employment probability would be proportional to the labor demand decline in each city. In contrast, if earnings-sensitive migration was sufficient to

[39] Given approximately constant wages, employment smoothing will be equivalent to smoothing expected earnings.

equilibrate employment probabilities across cities, then the local change in employment probability would be uncorrelated with the local demand shock.

To formalize this intuition, consider the relationship between the local change in the employment rate and the local demand shock:

$$(3) \qquad \frac{d\ln(L_c/N_c)}{d\ln L_c} = 1 - \frac{d\ln N_c}{d\ln L_c}.$$

Labor demand shocks have a proportional direct effect on local changes in employment probability, but 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:

$$(4) \qquad \dot{(L_c/N_c)} = \gamma_0 + \gamma_1 \dot{L}_c + \varepsilon_c.$$

The dependent variable is the change in the log of the employment to working-age population ratio calculated from ACS data.[40] The independent variable is the change in the log of payroll employment, calculated from CBP data. Recall from Section IIA that we calculate proportional changes in city level payroll employment using a weighted average of proportional changes in city level industry employment. For this smoothing analysis, we initially use weights based on the pre-Recession industry shares among all low-skilled workers in each city and calculate employment rates among the entire low-skilled population.

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 outcomes are unrelated to local shocks, with only the aggregate national shock determining the realized change in employment rates. Because we only approximate the employment losses incident on low-skilled workers, however, we expect some attenuation of the estimated coefficient due to measurement error. We therefore focus on relative differences in coefficients across different cities rather than their absolute levels when evaluating the degree of smoothing.[41]

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.[42] 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

[40] Descriptive statistics for this variable are available in online Appendix Table A-29.

[41] 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 $\frac{\mathrm{var}(\dot{L}_c)}{\mathrm{var}(\dot{L}_c) + \mathrm{var}(\nu_c)} \in (0, 1)$.

[42] Given our focus on less-skilled men, we measure Mexican-born population shares for that demographic group. Among the 95 cities in our sample, there is a great deal of variation in the share of the low-skilled population that is Mexican-born, with values ranging from just over 1 percent in cities like St. Louis and Miami to more than 40 percent in parts of Texas and California. The median Mexican-born share is roughly 15 percent, and Sacramento has the highest share below the median while Omaha has the lowest share above.

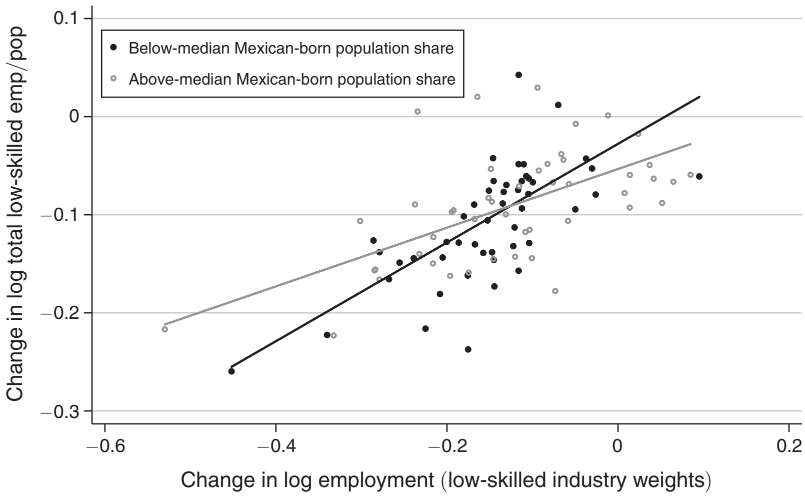

Figure 3. Mexican Mobility Smooths Employment Outcomes: Change in Male Low-Skilled Employment/Population Ratio versus Change in Low-Skilled Employment

Notes: Changes in log (employment) and log (employment to population ratio) are calculated from 2006 to 2010 for low-skilled men (without regard to nativity). Construction of group-specific employment changes and weights are described in the text and the online Appendix (Section A.4). Fitted lines are from a weighted regression using efficiency weights based on the entire low-skilled male population in each city. Table A.31 in the online Appendix has slope estimates.

Source: Authors' calculations are from 2006–2010 American Community Survey and County Business Patterns.

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 (4) separately for cities with above-median 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.

B. *Smoothing Results*

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 3 provides a visual representation of the results.[43] 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.[44]

[43] Panel (a) of online Appendix Table A-31 presents corresponding OLS regression results.

[44] In this and subsequent smoothing analyses we were concerned that the relatively small sample size may lead to influential outliers, so we estimated the relationships using local linear regressions, and the estimated slopes

TABLE 5—MEXICAN MOBILITY SMOOTHS EMPLOYMENT OUTCOMES: BARTIK (1991) IV ESTIMATES

Dependent variable: Change in log employment/population	City's Mexican population share		
	Below-median	Above-median	Difference
Panel A. Dependent variable sample: Less-skilled men			
Change in log employment for less-skilled men (CBP)	0.685***	0.305***	–0.380***
	(0.119)	(0.071)	(0.138)
Panel B. Dependent variable sample: Native less-skilled men			
Change in log employment for less-skilled men (CBP)	0.731***	0.283***	–0.448***
	(0.138)	(0.072)	(0.155)
Panel C. Dependent variable sample: Native less-skilled men			
Change in log employment for less-skilled native men (CBP)	0.736***	0.305***	–0.431***
	(0.131)	(0.077)	(0.152)
Panel D. Dependent variable sample: Native high-skilled men			
Change in log employment for high-skilled native men (CBP)	0.293***	0.214**	–0.079
	(0.112)	(0.102)	(0.151)

Notes: The table examines the relationship between labor market outcomes (changes in employment probability) and labor demand shocks (changes in payroll employment) separately for cities with above-median and below-median Mexican population share to demonstrate the smoothing effect of Mexican mobility. Smaller coefficients indicate more smoothing. We use the predicted change in log (employment), based on Bartik (1991) and described in the text, as an instrument for the change in log (group-specific employment). 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. Panel D examines the relationship between *high-skilled* native employment shocks and *high-skilled* native men's employment. These specifications omit Brazoria, Texas, which is a substantial outlier in the first stage; see Section A.9 in the online Appendix for details. Heteroskedasticity robust standard errors are in parentheses.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 5, panel A confirms this pattern using the Bartik (1991) instrument for local employment changes. In fact, the relationship is more than 50 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 II. Consider the following decomposition of the change in the less-skilled employment to population ratio (L_c/N_c) in a particular city.

$$(5) \qquad \frac{d\ln(L_c/N_c)}{d\ln L_c} = 1 - \left((1-\eta_c)\frac{d\ln N_c^n}{d\ln L_c} + \eta_c \frac{d\ln N_c^m}{d\ln L_c}\right),$$

were quite similar to those shown in the figures. We also estimated this relationship separately by quartiles of pre-Recession Mexican share. These results, which are available in online Appendix Table A-30, show decreasing coefficients from the first (lowest) quartile of Mexican share through the third quartile followed by a leveling off.

where superscripts m and n refer to Mexicans and natives respectively, and η_c is the Mexican population share. Section II reveals that Mexican populations are more responsive to changes in demand than are native populations $\left(\frac{d \ln N_c^m}{d \ln L_c} > \frac{d \ln N_c^n}{d \ln L_c}\right)$, 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.

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, by estimating versions of equation (4) 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. Instead, Mexican mobility can affect the native employment to population ratio only by affecting native employment in the numerator.

Panel B of Table 5 shows the results. 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 relationship in above-median cities is 61 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.

To understand the scale of the smoothing result, consider a city that faced a relatively severe employment decline but that had few low-skilled Mexican-born workers, such as Orlando, Florida.[45] Orlando experienced a decline in the native employment to population ratio from 78.6 to 66.0 percent from 2006 to 2010. If the labor market were characterized by full smoothing, with all cities experiencing the average decline in employment rates, Orlando's rate would have declined to only 73.6 percent in 2010. The smoothing estimates in panel B of Table 5 imply that if Orlando had a larger Mexican-born population comparable to that of Phoenix, Arizona, which faced a similar employment shock, its native employment to population ratio would have fallen to 68.7, which is substantially closer to the full smoothing level than is 66.0.[46] Thus, the employment to population ratio in Orlando was 2.7 percentage points lower than it might have been had a substantial Mexican-born population been present to absorb some of the local shock through equalizing migration. It is important to emphasize that the same smoothing results imply opposite

[45] Orlando experienced a 23.9 log point employment decline between 2006 and 2010 (placing it at the 14th percentile of the shock distribution), and only 5.7 percent of the low-skilled population was Mexican-born in 2006.

[46] This calculation requires the intercept terms for the regressions in the first two columns of Table 5 panel B. For below-median cities the intercept is −0.012, and for above-median cities it is −0.080.

effects for cities experiencing relatively positive shocks. In that case, cities with low Mexican-born populations experienced more *positive* employment growth than would have occurred in the presence of equalizing migration.

The findings in panel B of Table 5 are precisely what one would expect if the presence of Mexicans in a local market weakened the effects of a 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 measure of the local decline in total low-skilled employment would not necessarily capture the demand declines facing the native portion of the 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.[47] To address this possibility, in panel C of Table 5 we adjust the independent variable and calculate proportional job losses using the city-specific industry distribution of *native* less-skilled workers rather than the industry distribution of all less-skilled workers in the city as in panel B. The gap between high and low Mexican share cities decreases only slightly; the shock-outcome relationship is still 59 percent weaker in below-median cities, and the difference remains statistically significant. While this adjustment does not rule out 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 online Appendix Figure A-6) 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 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.

[47] Measurement error resulting from segmented labor markets may result in upward or downward bias in cities with larger Mexican share. The multiplicative bias is given by

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

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

Panel D of Table 5 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-median 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.[48]

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. Importantly, 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.

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 this smoothing is likely 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.[49]

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

The last term on the right hand side is the native population response, which the results in Section II show is approximately zero on average.[50] The term in parentheses captures the differential equilibrium incidence of local job losses on native and Mexican workers, and it must be negative to be consistent with 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.

[48] In online Appendix Section A.14, we explore and reject additional alternative interpretations, including the possibility that the above-median cities had more flexible wage structures and the possibility that the results depend critically on the inclusion of California metro areas.

[49] Note that we have introduced the ϕ_c term as distinct from η_c to emphasize that this expression relates to the share of Mexican immigrants in *employment* rather than in the population. These are not necessarily equal in general, and Mexican immigrants tend to have higher employment rates empirically.

[50] Further, this population response does not differ between above-median and below-median Mexican share cities. See online Appendix Section A.11 for details.

This is precisely what one would expect if Mexican mobility had a direct effect on natives' employment probability. By leaving (or failing to enter) the most depressed local markets, Mexican workers 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 comparable 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.[51] Under this interpretation, one can predict the amount of smoothing using employment shares and mobility responses. Indexing cities with Mexican population shares above and below the median by a and b respectively, plugging the estimated mobility responses into (6), and differencing across the two groups of cities yields the following expression:

$$(7) \quad \left(\frac{d\ln\left(L_c^n/N_c^n\right)}{d\ln L_c}\right)^a - \left(\frac{d\ln\left(L_c^n/N_c^n\right)}{d\ln L_c}\right)^b = \left(\phi_c^a - \phi_c^b\right)\left(\widehat{\frac{d\ln N_c^n}{d\ln L_c}} - \widehat{\frac{d\ln N_c^m}{d\ln L_c}}\right).$$

Implementing this calculation yields a predicted gap of -0.29, which is similar in scale to the difference in slopes reported in panel C, Table 5.[52] Thus, the observed *scale* of smoothing is consistent with the prediction of a simple model of differential mobility and labor market competition between less-skilled native-born and Mexican-born workers.[53]

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 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.

[51] To see this, note the following: $\frac{d\ln\left(L_c^n/N_c^n\right)}{d\ln L_c} = \frac{d\ln\left(L_c^m/N_c^m\right)}{d\ln L_c} \Rightarrow \frac{d\ln L_c^n}{d\ln L_c} - \frac{d\ln L_c^m}{d\ln L_c} = \frac{d\ln N_c^n}{d\ln L_c} - \frac{d\ln N_c^m}{d\ln L_c}$.

[52] This calculation requires the elasticity of Mexican population with respect to "native" shocks (average employment declines using native industry weights). This elasticity, which has a descriptive rather than causal interpretation, is 1.206 (0.300).

[53] An 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 without any migration. Part of the difference between the calculations presented and the estimated difference may derive from this (or other forms of imperfect substitution. However, these employer choices in hiring and firing would be unlikely to persist without Mexican migration, as unemployed Mexican workers would create a profit-increasing 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.

TABLE 6—POPULATION RESPONSE TO LABOR DEMAND SHOCKS 2000–2006: BARTIK (1991) IV ESTIMATES

	Dependent variable: Change in log population				
	All	Native-born	Foreign-born	Mexican-born	Other foreign-born
Panel A. Men, high school or less					
IV estimate					
Change in log of group-specific employment	0.328**	0.130	0.050	0.842***	−0.141
	(0.149)	(0.143)	(0.582)	(0.206)	(0.763)
p-value testing shock exogeneity	0.017	0.027	0.004	0.848	0.004
First stage					
Predicted change in log employment	3.783***	3.889***	3.485***	4.355***	3.137**
	(0.957)	(0.829)	(1.235)	(1.088)	(1.428)
Partial F-statistic	15.63	21.99	7.957	16.01	4.827
Panel B. Men, some college or more					
IV estimate					
Change in log of group-specific employment	0.356***	0.295*	0.041	1.532**	−0.090
	(0.135)	(0.161)	(0.424)	(0.739)	(0.458)
p-value testing shock exogeneity	0.950	0.906	0.005	0.317	0.002
First stage					
Predicted change in log employment	3.481***	3.458***	3.742***	3.089***	3.845**
	(1.031)	(0.950)	(1.422)	(0.912)	(1.495)
Partial F-statistic	11.40	13.25	6.929	11.47	6.612

(*Continued*)

IV. Pre-Recession Analysis

In this section, we examine whether the differential population responses and associated smoothing that occurred during the Great Recession were similarly operative during the preceding boom (2000–2006). As discussed previously, OLS regressions of population changes on employment changes are likely appropriate only in an environment like the Great Recession, where adjustment to demand shocks occurred primarily through employment rather than wages. As this feature was not present during the boom, Table 6 presents Bartik IV specifications for 2000–2006, following Table 4.[54] In this earlier time period, high-skilled workers of both genders are more responsive than were low-skilled workers, at least among the native-born. There is not as clear of a pattern among other groups, and the elasticities are, on the whole, estimated less precisely. Importantly, however, the strong positive elasticity among low-skilled Mexican-born men remains. Recall that the set of cities that experienced large demand increases during the boom period tended to have larger declines in the bust. Thus, the reversal of trends among the Mexican-born between Figures 1 and 2 reflects a substantial and rapid population response to local demand conditions in both time periods.

Table 7 presents smoothing results for the pre-Recession period, splitting the city sample into those above and below median Mexican-born population share, as in Table 5. Again, we use the Bartik instrument to predict changes in local employment. In panels A–C, the results continue to show that less-skilled men's local outcomes

[54] Note that in this time period, unlike in the Recession, many of the instrument exogeneity tests return p-values below conventional significance levels, which supports the assertion that IV estimation is more appropriate than OLS specifications.

TABLE 6—POPULATION RESPONSE TO LABOR DEMAND SHOCKS 2000–2006: BARTIK (1991) IV ESTIMATES (*Continued*)

	Dependent variable: Change in log population				
	All	Native-born	Foreign-born	Mexican-born	Other foreign-born
Panel C. Women, high school or less					
IV estimate					
Change in log of group-specific employment	0.387*	0.238	−0.281	0.562	−0.082
	(0.230)	(0.238)	(0.767)	(0.378)	(0.762)
p-value testing shock exogeneity	0.075	0.121	0.001	0.599	0.017
First stage					
Predicted change in log employment	2.618***	2.770***	2.806**	3.641***	2.459*
	(0.880)	(0.738)	(1.093)	(0.872)	(1.335)
Partial F-statistic	8.852	14.08	6.592	17.44	3.396
Panel D. Women, some college or more					
IV estimate					
Change in log of group-specific employment	0.484**	0.415*	−0.137	0.521	−0.227
	(0.230)	(0.233)	(0.641)	(0.961)	(0.654)
p-value testing shock exogeneity	0.504	0.705	0.025	0.801	0.022
First stage					
Predicted change in log employment	2.643**	2.705**	2.730*	1.814**	2.895*
	(1.279)	(1.256)	(1.419)	(0.895)	(1.496)
Partial F-statistic	4.272	4.641	3.703	4.109	3.743

Notes: Each listed coefficient represents a separate instrumental variables regression of the change in log(population) from 2000 to 2006 for the relevant group (from the American Community Survey) on the change in log(group-specific employment) from County Business Patterns data over the same period, using the demographic group's industry mix. All regressions include an intercept term, 95 city observations, and the enclave control listed in column 2 of Table A.1. Observations are weighted by the inverse of the estimated sampling variance of the dependent variable (see Section A.4 in the online Appendix for details). We use the predicted change in log(employment), based on Bartik (1991) and described in the text, as an instrument for the change in log(group-specific employment). The listed "p-value testing shock exogeneity" is from a test of the null hypothesis that the OLS and IV slope coefficients are equal to each other. The first-stage coefficient on the instrument and the partial F-statistic are reported below the corresponding IV estimate. Heteroskedasticity robust standard errors are in parentheses.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

are less tied to local shocks in cities with greater access to Mexican-born workers, although the differences are not statistically significantly different from zero in the latter two panels. Importantly, the results in panel D continue to show no substantial difference in smoothing in the high-skilled labor market based on Mexican-born population share. Thus, the phenomena of large population responses among the Mexican-born and the resulting smoothing occur to some extent regardless of whether the economy is growing or shrinking, although it is reasonable to conclude that the smoothing effect may be especially operative during downturns.

V. 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.

Table 7—Mexican Mobility Smooths Employment Outcomes 2000–2006: Bartik (1991) IV Estimates

Dependent variable: Change in log employment/population	City's Mexican population share		
	Below-median	Above-median	Difference
Panel A. Dependent variable sample: less-skilled men			
Change in log employment for less-skilled men (CBP)	0.542**	−0.110	−0.651**
	(0.250)	(0.218)	(0.331)
Panel B. Dependent variable sample: native less-skilled men			
Change in log employment for less-skilled men (CBP)	0.296***	0.178	−0.117
	(0.084)	(0.130)	(0.155)
Panel C. Dependent variable sample: native less-skilled men			
Change in log employment for less-skilled native men (CBP)	0.299***	0.201	−0.098
	(0.083)	(0.150)	(0.171)
Panel D. Dependent variable sample: native high-skilled men			
Change in log employment for high-skilled native men (CBP)	0.141**	0.103*	−0.038
	(0.060)	(0.061)	(0.085)

Notes: The table examines the relationship between labor market outcomes (changes in employment probability) and changes in payroll employment separately for cities with above-median and below-median Mexican population share to demonstrate the smoothing effect of Mexican mobility. This table reports the results of specifications run using data from 2000–2006 for both the dependent and independent variables. Smaller coefficients indicate more smoothing. We use the predicted change in log (employment), based on Bartik (1991) and described in the text, as an instrument for the change in log (group-specific employment). 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. Panel D examines the relationship between *high-skilled* native employment shocks and *high-skilled* native men's employment. Heteroskedasticity robust standard errors are in parentheses.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

A. *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 United States, (3) departures from the United States, (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 United States before and after 2007. Thus, we partition a city's change in Mexican population as (suppressing city subscripts):

$$N^{m,2010} - N^{m,2006} = N_{new}^{m,2010} + \left(N_{pre-2007}^{m,2010} - N_{pre-2007}^{m,2006}\right). \tag{8}$$

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

	Total elasticity (chg. in log pop.) (1)	Total elasticity (prop. chg. in pop.) (2)	New arrival sorting (3)	Change in pre-2007 arrivals (4)	Net aging in (5)	Internal inflows (6)	Internal outflows (7)
Change in log employment	0.569***	0.528***	0.115***	0.413**	−0.025	0.025	0.087**
	(0.202)	(0.177)	(0.024)	(0.174)	(0.019)	(0.060)	(0.034)
Constant	0.028	0.034	0.072***	−0.039	0.005	0.090***	−0.066***
	(0.035)	(0.033)	(0.007)	(0.031)	(0.007)	(0.018)	(0.007)
Share of total elasticity (percent)	N/A	100	21.8	78.2	−4.8	4.7	16.5
Share of pre-2007 elasticity (percent)	N/A	N/A		100	−6.1	6.1	21.1
R^2	0.203	0.178	0.132	0.142	0.013	0.001	0.055

Notes: Column 1 reproduces the corresponding estimate from Table 2. Column 2 replaces the change in log(population) with the proportional change in population. As described in the text, columns 3–7 decompose the overall response in column 2 into different migration components. All other specification details are identical to Table 2. The dependent variable in column 7 is the growth in the local population due to internal outflows, i.e., the negative of the proportional change in population due to outflows. A test of the null hypothesis that the sum of the coefficients in columns 6 and 7 is zero returns a p-value of 0.108. Heteroskedasticity robust standard errors are in parentheses.

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

In words, the change in the Mexican-born population consists of the number of immigrants who arrived in 2007 or later (N^m_{new}) plus the change in the number of immigrants who arrived in the United States in 2006 or earlier ($N^m_{pre-2007}$). Notice that $N^{m,2006}_{pre-2007}$ is simply the resident Mexican population in 2006. Dividing both sides of (8) 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 slightly modified versions of equation (1) for less-skilled Mexican men, using the proportional change in the population $\left(\frac{N^{m,2010} - N^{m,2006}}{N^{m,2006}}\right)$ and each component thereof as dependent variables, rather than the change in log population. The results are presented in Table 8. Column 1 reproduces the overall elasticity for low-skilled Mexican men shown in Figure 1; column 2 shows the slight change in the magnitude from the change in the dependent variable. The next two columns additively decompose that estimate into components coming from new arrivals and movement of existing residents. The coefficient in column 3 implies that 22 percent of the reallocation occurred through differential inflows of new immigrants in response to differential demand shocks. Note that fewer than 22 percent of Mexican-born immigrants living in the United States in 2010 arrived during the preceding five years; thus, these new arrivals account for more than their "fair share" of the reallocation.[55] It is likely that during periods with larger immigration

[55] This clustering of low-skilled new arrivals in high demand areas complements Kerr's (2010) finding that US cities with relative increases in innovation (measured by patenting rates) from 1995–2004 increase the immigrant

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 78 percent of the reallocation occurred among existing residents (channels 2–5), and this aggregate effect is reflected in the coefficient in column 4. Column 5 provides a direct estimate of the contribution of net aging in (channel 4); as expected the contribution of this channel is negligible.[56]

Most of the reallocation therefore occurred through migration by those already resident by 2006. The large share of reallocation among existing immigrants is an important finding, as the majority of the previous literature focuses only on location choices among newly arriving immigrants. Decomposing this channel further is difficult, however, because there are no available data sources that allow reliable measurement of return migration flows to Mexico separately by US city during this time period.[57] 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 pre-2007 arrivals observed in the 2010 ACS into those who lived in the same city in 2006 and those who lived in another US location. Nevertheless, one can construct imperfect estimates of internal migration by aggregating internal inflows and outflows from each successive annual ACS survey. The regressions in columns 6 and 7 are based on this technique, and they reveal that, together, measured internal migration can explain roughly 20 percent of the overall reallocation, with internal outflows relatively more important. Given the lack of a direct measure of return migration and the fairly wide confidence intervals on each of the other components, it is difficult to precisely estimate the relative contribution of return migration. It is clear, though, that both migration internal to the United States and return migration to Mexico were important components of the overall local supply elasticity, consistent with the descriptive migration rates for Mexican-born individuals reported in Table 1.

B. *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 United States, their much higher rate of international mobility implies a substantially larger overall probability of migrating. This difference may simply reflect a process of self-selection in which the immigrant pool consists primarily of highly mobile individuals.

share of their inventors while cities with declining relative innovation experience a disproportionate decline in immigrant invention.

[56] 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.

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

Table 9—Propensity Score Reweighting of Less-Skilled Native Men to Match Less-Skilled Mexican-Born Men's Observables

	Change in log of group-specific employment		Constant		R^2
Panel A. No reweighting					
(1) Mexican-born	0.569***	(0.202)	0.028	(0.035)	0.203
(2) Native-born	0.041	(0.072)	−0.013	(0.010)	0.005
Panel B. Reweighted natives based on listed covariates					
(3) Skill only	−0.028	(0.101)	−0.022	(0.015)	0.001
(4) Age only	0.119	(0.084)	−0.022**	(0.011)	0.028
(5) Rent versus own only	−0.047	(0.094)	0.010	(0.012)	0.004
(6) Family structure only	0.047	(0.067)	−0.017	(0.011)	0.005
(7) All prior covariates	0.014	(0.122)	−0.002	(0.022)	0.000
Panel C. Limit native sample to those outside birth state					
(8) Outside birth state only	0.211*	(0.119)	−0.026	(0.020)	0.031
(9) Outside birth state and reweighted for all other covariates	0.385	(0.282)	−0.018	(0.054)	0.023

Notes: Rows 1 and 2 in panel A reproduce corresponding estimates from Table 2 for Mexican-born and native-born less-skilled men. Rows 3–7 in panel B present population responses for natives, reweighted to match Mexican-born individuals' based on the listed characteristics. Row 8 in panel C provides population responses among natives living outside of their state of birth, and in row 9 these populations are further reweighted to match the same set of covariates as in row 7. All other specification details are identical to Table 2. See text and online Appendix (Section A.15) for details.

Thus, to some extent, 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.[58] 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 mobility analysis for this reweighted group of natives. The results are shown in panel B of Table 9, with the baseline results for less-skilled Mexican-born and native-born men provided for reference in panel A. Even after making these adjustments, we find no evidence that natives move toward cities with better job prospects.

We then consider the possibility that natives who have previously made long-distance moves may be similarly more responsive. Row 8 in panel C presents the results of a version of row 2, but with population changes and city-level employment changes calculated based on the subset of low-skilled natives who are living outside of their state of birth. The estimated elasticity in this group is substantially larger than the elasticity among all natives, and the coefficient is marginally statistically significant. In row 9, we further reweight the population used in row 8 to reflect all of the covariates included in row 7. This specification yields the largest point estimate among any native population, although it is imprecisely estimated. Thus, it appears that part of the strong mobility responses among the Mexican-born derives

[58] The propensity score equation estimates are presented in online Appendix Section A.15.

from self-selection, although the differences do not appear to be entirely driven by differences in demographics.

Additionally, Mexican immigrants 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 reduces geographic differences in total income (Tatsiramos 2009). More than half of Mexican-born immigrants are in the United States without authorization (Passel 2005) and are thus ineligible for UI benefits. Empirically, foreign-born individuals are substantially less likely to receive UI benefits compared to natives (see online Appendix Section A.16), which makes immigrants' total incomes more dependent on their labor market earnings.[59]

Moreover, many Mexican immigrants report moving to the United States intending a relatively short stay, often planning to save 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).[60] Additionally, Massey, Durand, and Malone (2003) report that some individuals migrate to the United States 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-improving move because they have strong attachment to the labor market. Mexican-born workers' unemployment durations are, on average, 33 percent shorter than than those of natives (see online Appendix Figure A-14), and among movers, the Mexican-born are especially likely to report moving to look for work or because they lost a previous job (see online Appendix Table A-36). In fact, among all possible answers, this category is the most common response among the Mexican-born (23.8 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 comprise at least 1 percent of the population of more than half of US metro areas, whereas no other source country is similarly represented in more than 10 percent of cities.[61] Several studies have found that immigrants tend to

[59] 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. Further, one could potentially examine the importance of this channel using data on natives who are also ineligible for UI, such as those who are paid as independent contractors, rather than as employees. Unfortunately, the ACS does not ask this information of survey respondents.

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

[61] Calculations are based on the 2000 census. Mexicans comprise at least 1 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 1 percent population share in 9.6 percent of cities.

locate in markets with previous migrants from the same source country, and that the Mexican-born population has continued to spread out geographically over the previous two decades.[62] Further, networks provide information about local labor market conditions and lower moving costs, thereby increasing 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 (Kennan and Walker 2011; Diamond 2015). 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.[63] 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 all of 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 demand-sensitive location choices. Relative to natives, they also have lower access to programs such as unemployment insurance that make remaining in a weak labor market less costly.

VI. 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 (and during the preceding boom). 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

[62] 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.

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

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 US policymakers 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, 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.

REFERENCES

Autor, David H., and Mark G. Duggan. 2003. "The Rise in the Disability Rolls and the Decline in Unemployment." *Quarterly Journal of Economics* 118 (1): 157–206.

Bartel, Ann P. 1989. "Where Do the New U.S. Immigrants Live?" *Journal of Labor Economics* 7 (4): 371–91.

Bartel, Ann P., and Marianne J. Koch. 1991. "Internal Migration of U.S. Immigrants." In *Immigration, Trade and the Labor Market*, edited by John M. Abowd and Richard B. Freeman, 121–34. Chicago: University of Chicago Press.

Bartik, Timothy J. 1991. *Who Benefits from State and Local Economic Development Policies?* Kalamazoo, MI: W. E. Upjohn Institute for Employment Research.

Belanger, Alain, and Andrei Rogers. 1992. "The Internal Migration and Spatial Redistribution of the Foreign-Born Population in the United States: 1965–70 and 1975–80." *International Migration Review* 26 (4): 1342–69.

Bewley, Truman F. 1999. *Why Wages don't Fall during a Recession.* Cambridge: Harvard University Press.

Blanchard, Olivier Jean, and Lawrence F. Katz. 1992. "Regional Evolutions." *Brookings Papers on Economic Activity* 1: 1–75.

Böckerman, Petri, and Mika Haapanen. 2013. "The Effect of Polytechnic Reform on Migration." *Journal of Population Economics* 26 (2): 593–617.

Borjas, George J. 2001. "Does Immigration Grease the Wheels of the Labor Market?" *Brookings Papers on Economic Activity* 1: 69–133.

Borjas, George J. 2003. "The Labor Demand Curve *is* Downward Sloping: Reexamining the Impact of Immigration on the Labor Market." *Quarterly Journal of Economics* 118 (4): 1335–74.

Bound, John, and Harry J. Holzer. 2000. "Demand Shifts, Population Adjustments, and Labor Market Outcomes during the 1980s." *Journal of Labor Economics* 18 (1): 20–54.

Cadena, Brian C. 2013. "Native Competition and Low-Skilled Immigrant Inflows." *Journal of Human Resources* 48 (4): 910–44.

Cadena, Brian C. 2014. "Recent Immigrants as Labor Market Arbitrageurs: Evidence from the Minimum Wage." *Journal of Urban Economics* 80: 1–12.

Cadena, Brian C., and Brian K. Kovak. 2016. "Immigrants Equilibrate Local Labor Markets: Evidence from the Great Recession: Dataset." *American Economic Journal: Applied Economics.* http://dx.doi.org/10.1257/app.20140095.

Card, David. 2001. "Immigrant Inflows, Native Outflows, and the Local Market Impacts of Higher Immigration." *Journal of Labor Economics* 19 (1): 22–64.

Card, David. 2009. "Immigration and Inequality." *American Economic Review* 99 (2): 1–21.

Card, David, and Ethan G. Lewis. 2007. "The Diffusion of Mexican Immigrants During the 1990s: Explanations and Impacts." In *Mexican Immigration to the United States,* edited by George J. Borjas, 193–227. Chicago: University of Chicago Press.

Charles, Kerwin Kofi, Erik Hurst, and Matthew J. Notowidigdo. 2013. "Manufacturing Decline, Housing Booms, and Non-Employment." National Bureau of Economic Reserach (NBER) Working Paper 18949.

Chodorow-Reich, Gabriel. 2014. "The Employment Effects of Credit Market Disruptions: Firm-level Evidence from the 2008–09 Financial Crisis." *Quarterly Journal of Economics* 129 (1): 1–59.

Daly, Mary, Bart Hobijn, and Brian Lucking. 2012. "Why Has Wage Growth Stayed Strong?" *Federal Reserve Bank of San Francisco* (*FRBSF*) *Economic Letter.* April.

Davis, Steven J., R. Jason Faberman, and John Haltiwanger. 2012. "Labor Market Flows in the Cross Section and Over Time." *Journal of Monetary Economics* 59 (1): 1–18.

Diamond, Rebecca. 2015. "The Determinants and Welfare Implications of US Workers' Diverging Location Choices by Skill: 1980–2000." http://web.stanford.edu/~diamondr/jmp_final_all_files.pdf.

di Giovanni, Julian, Andrei A. Levchenko, and Francesc Ortega. 2015. "A Global View of Cross-Border Migration." *Journal of the European Economic Association* 13 (1): 168–202.

Elsby, Michael W. L., Donggyun Shin, and Gary Solon. Forthcoming. "Wage Adjustment in the Great Recession." *Journal of Labor Economics*.

Fort, Teresa, John Haltiwanger, Ron Jarmin, and Javier Miranda. 2013. "How Firms Respond to Business Cycles: The Role of Firm Sage and Firm Size." *International Monetary Fund Economic Review* 61 (3): 520–59.

Greenstone, Michael, Alexandre Mas, and Hoai-Luu Nguyen. 2014. "Do Credit Market Shocks Affect the Real Economy? Quasi-Experimental Evidence from the Great Recession and 'Normal' Economic Times." National Bureau of Economic Research (NBER) Working Paper 20704.

Gurak, Douglas T., and Mary M. Kritz. 2000. "The Interstate Migration of U.S. Immigrants: Individual and Contextual Determinants." *Social Forces* 78 (3): 1017–39.

Hanson, Gordon H., and Antonio Spilimbergo. 1999. "Illegal Immigration, Border Enforcement, and Relative Wages: Evidence from Apprehensions at the U.S.–Mexico Border." *American Economic Review* 89 (5): 1337–57.

Hickman, Daniel C. 2009. "The Effects of Higher Education Policy on the Location Decision of Individuals: Evidence from Florida's Bright Futures Scholarship Program." *Regional Science and Urban Economics* 39 (5): 553–62.

Hoefer, Michael, Nancy Rytina, and Bryan Baker. 2012. *Estimates of the Unauthorized Immigrant Population Residing in the United States: January 2011*. Department of Homeland Security Office of Immigration Statistics. Washington, DC, March.

Hoynes, Hilary W. 2002. "The Employment, Earnings, and Income of Less Skilled Workers over the Business Cycle." In *Finding Jobs: Work and Welfare Reform,* edited by David Card and Rebecca Blank, 23–71. New York: Russell Sage Foundation.

Hoynes, Hilary, Douglas L. Miller, and Jessamyn Schaller. 2012. "Who Suffers during Recessions?" *Journal of Economic Perspectives* 26 (3): 27–47.

Hyatt, Henry R., and James R. Spletzer. 2013. "The Recent Decline in Employment Dynamics." United States Census Bureau Center for Economic Studies (CES) Working Paper 13-03.

Jaeger, David A. 2007. "Green Cards and the Location Choices of Immigrants in the United States, 1971–2000." *Research in Labor Economics* 27: 131–83.

Kennan, John, and James R. Walker. 2011. "The Effect of Expected Income on Individual Migration Decisions." *Econometrica* 79 (1): 211–51.

Kerr, William R. 2010. "Breakthrough Inventions and Migrating Clusters of Innovation." *Journal of Urban Economics* 67 (1): 46–60.

Kritz, Mary M., and June Marie Nogle. 1994. "Nativity Concentration and Internal Migration among the Foreign-Born." *Demography* 31 (3): 509–24.

Machin, Stephen, Kjell G. Salvanes, and Panu Pelkonen. 2012. "Education and Mobility." *Journal of the European Economic Association* 10 (2): 417–50.

Malamud, Ofer, and Abigail Wozniak. 2012. "The Impact of College on Migration Evidence from the Vietnam Generation." *Journal of Human Resources* 47 (4): 913–50.

Maré, David C., Melanie Morten, and Steven Stillman. 2007. "Settlement Patterns and the Geographic Mobility of Recent Migrants to New Zealand." *New Zealand Economic Papers* 41 (2): 163–96.

Massey, Douglas S., Jorge Durand, and Nolan J. Malone. 2003. *Beyond Smoke and Mirrors: Mexican Immigration in an Era of Economic Integration.* New York: Russell Sage Foundation.

McKenzie, David, Caroline Theoharides, and Dean Yang. 2014. "Distortions in the International Migrant Labor Market: Evidence from Filipino Migration and Wage Responses to Destination Country Economic Shocks." *American Economic Journal: Applied Economics* 6 (2): 49–75.

Mian, Atif, and Amir Sufi. 2014. "What Explains the 2007–2009 Drop in Employment?" *Econometrica* 82 (6): 2197–2223.

Molloy, Raven, Christopher L. Smith, and Abigail Wozniak. 2011. "Internal Migration in the United States." *Journal of Economic Perspectives* 25 (3): 173–96.

Monras, Joan. 2015. "Economic Shocks and Internal Migration." Institute for the Study of Labor (IZA) Discussion Paper 8840.

Munshi, Kaivan. 2003. "Networks in the Modern Economy: Mexican Migrants in the U.S. Labor Market." *Quarterly Journal of Economics* 118 (2): 549–99.

Nekoei, Arash. 2013. "Immigrants' Labor Supply and Exchange Rate Volatility." *American Economic Journal: Applied Economics* 5 (4): 144–64.

Notowidigdo, Matthew J. 2013. "The Incidence of Local Labor Demand Shocks." http://faculty.wcas.northwestern.edu/noto/research/notowidigdo_JMP_20130329.pdf.

Orrenius, Pia M., and Madeline Zavodny. 2010. "Mexican Immigrant Employment Outcomes over the Business Cycle." *American Economic Review* 100 (2): 316–20.

Passel, Jeffrey S. 2005. *Unauthorized Migrants: Numbers and Characteristics.* Pew Hispanic Center. Washington, DC, June.

Passel, Jeffrey S., D'Vera Cohn, and Ana Gonzalez-Barrera. 2012. "Net Migration from Mexico Falls to Zero–and Perhaps Less." Pew Hispanic Center. Washington, DC, April.

Ritter, Joseph A., and Lowell J. Taylor. 1998. "Seniority-Based Layoffs as an Incentive Device." Federal Reserve Bank of St. Louis Working Paper 1998-006A.

Rothstein, Jesse. 2012. "The Labor Market Four Years into the Crisis: Assessing Structural Explanations." *Industrial and Labor Relations Review* 65 (3): 467–500.

Ruggles, Steven, J., Trent Alexander, Katie Genadek, Ronald Goeken, Matthew B. Schroeder, and Matthew Sobek. 2010. "Integrated Public Use Microdata Series: Version 5.0." Minnesota Population Center. Minneapolis: University of Minnesota.

Santillano, Robert, and Sarah Bohn. 2012. "Do Local Immigration Laws Impact Employment and Wages? Evidence from the 287(g) Program." Paper presented at the Population Association of America. May 3.

Stock, James H., and Motohiro Yogo. 2005. "Testing for Weak Instruments in Linear IV Regression." In *Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg,* edited by Donald W. K. Andrews and James H. Stock, 80–108. Cambridge: Cambridge University Press.

Tatsiramos, Konstantinos. 2009. "Geographic labour mobility and unemployment insurance in Europe." *Journal of Population Economics* 22 (2): 267–83.

Topel, Robert H. 1986. "Local Labor Markets." *Journal of Political Economy* 94 (3, Pt. 2): S111–43.

Wooldridge, Jeffrey M. 1995. "Score diagnostics for linear models estimated by two stage least squares." In *Advances in Econometrics and Quantitative Economics: Essays in Honor of Professor C. R. Rao,* edited by G. S. Maddala, P. C. B. Phillips, and T. N. Srinivasan, 66–87. Cambridge, MA: Blackwell Publishers.

Wozniak, Abigail. 2010. "Are College Graduates More Responsive to Distant Labor Market Opportunities?" *Journal of Human Resources* 45 (4): 944–70.

Yagan, Danny. 2014. "Moving to Opportunity? Migratory Insurance over the Great Recession." http://eml.berkeley.edu/~yagan/MigratoryInsurance.pdf.

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