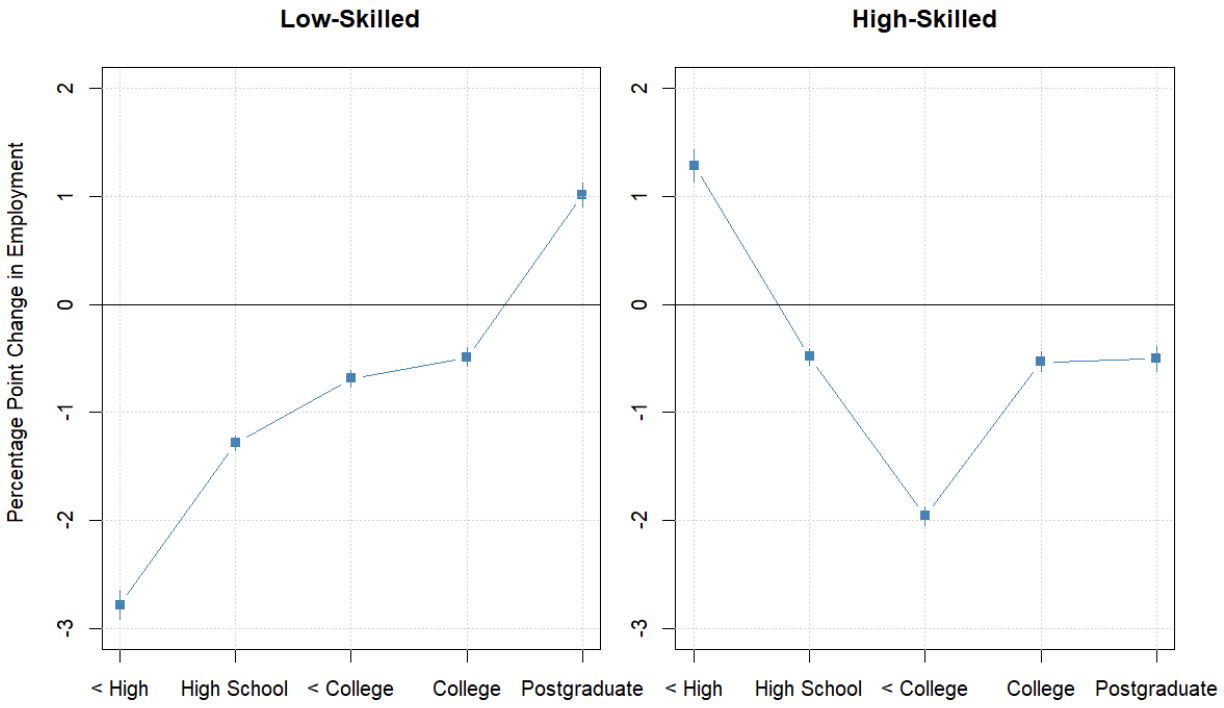
Technical Appendix

A. Selection into Employment

Our main analysis examines the impacts of immigration on wage distribution, which restricts our sample to those who were employed full-year during the period of analysis. Since immigration could reduce the employment of natives (Borjas, Grogger, and Hanson 2010) and therefore artificially increase native wages, it is necessary to consider our main findings alongside employment outcomes. In this appendix we expand our sample to all native residents, in and out of the labor force, aged 25–65 in the lower 48 states to gauge whether our wage results are driven by the selection into employment. Due to the extremely large sample size, we draw 50 percent of our observations and estimate Model (2) with a logit link function.

Figure A presents the average marginal effects of a 10-percentage-point increase of low- or high-skilled immigration by the education level of native workers, which approximates their location in the labor market. The results show that low-skilled immigration has an adverse effect on natives with less than high school education, but the effect attenuates for native workers with higher level of education and turn positive for those with postgraduate education. This indicates that the positive effect of low-skilled immigration on the wage of high-skilled natives is not due to the selection of latter group into employment. Similarly, high-skilled immigration appears to have positive effect for native workers with less than high school education and a small negative effect (≈ -0.5 percentage point) on workers with college or postgraduate degrees, which suggests that selection into employment does not explain the immigration bonus received by these groups.

FIGURE A. AVERAGE MARGINAL EFFECTS ON EMPLOYMENT OF A 10-PERCENTAGE-POINT INCREASE IN IMMIGRATION



B. Statistical Confounders

At the individual level, we control for the level of education, age and its squared term, race and ethnicity, part-time status, and the three-way interaction among sex, martial, and parental status, acknowledging that the effects of marriage and parenthood vary between men and women. The level of education is classified into five categories: less than high school, high school, some college, college, and postgraduate. Race and ethnicity is classified into five groups: non-Hispanic white, non-Hispanic black, Hispanic, non-Hispanic Asian, and others.

Table B1 presents the means and standard deviations of individual-level variables by immigrant status. As one would expect, immigrants on average earn lower but more dispersed wages than natives. Immigrants also have more polarized distribution of skills. A quarter of immigrants have less than high education, compared to 6 percent of natives. In the meantime, 12 percent of immigrant workers have a postgraduate degree, compared to about 9 percent of natives. Regarding race and ethnicity, almost half of immigrants identify as Hispanic, compared to 7 percent of natives. A fourth of immigrants identify as Asian, compared to about 1 percent in the native population.

We incorporate a series of state-level measures in an attempt to isolate the influence of immigration on the labor-market dynamics from concurrent developments, particularly those associated with labor demand. Table B2 details the state-level variables. As suggested in Figure 1, Immigrants tend to concentrate in the states with higher economic development, more-educated workforce, and the largest cities. Specifically, we include logged GDP per capita from the Bureau of Economic Analysis, the proportion of workers that are college-educated, logged population size, and the metropolitan share of population from the Census in our models. To further gauge the demand for labor, we also consider state-wide unemployment rate, which is expected to depress wages. To account for the economic consequences of de-industrialization and trade deficit (Autor,

Dorn, and Hanson 2013; Kollmeyer and Pichler 2013; Lee 2005), we control for the manufacturing share of employment.

In addition to these economic factors, we take into account labor market institutions that affect wage distribution, including union density (Card 1996; Rosenfeld 2014; Western and Rosenfeld 2011) and inflation-adjusted minimum wage (Autor, Manning, and Smith 2010; Dube, Naidu, and Reich 2007; Lee 1999). Since some of these state-level factors such as population size, economic development (Aubry, Burzyński, and Docquier 2016), the metropolitan share of population, and union density (Rosenfeld and Kleykamp 2009) may be on the causal pathways between immigration and labor-market outcomes, our estimates are likely to capture only part of the immigration effects. Lastly, we incorporate state and year fixed effects to address time invariant state factors and national trends.

Figure B1 presents the correlation matrix at the state level in both numeric (lower triangle) and graphic ways (upper triangle, in which the widths of the ellipses indicate the strength of correlation). It shows that the states with higher immigration density tend to have higher average wage but larger wage dispersion, which provides some support to our hypothesis. However, these states also have higher GDP per capita, more educated workforce, larger population, more population residing in metropolitan areas, higher unemployment, less manufacturing workers, higher union density, and higher state minimum wage. We untangle these structural factors in our regression analysis.

Table B1 Weighted Means and Standard Deviations, Individual-level Variables, 1980-2015

Variables	Native	Immigrant
Dependent Variables		
Logged Wage	3.014	2.835
(S.D.)	0.653	0.710
Education		
(REF: Less than High School)	0.059	0.254
High School	0.376	0.296
Some College	0.267	0.159
College	0.208	0.171
Postgraduate	0.090	0.120
Age	42.528	41.419
(S.D.)	10.777	10.215
Race and Ethnicity		
(REF: White)	0.798	0.175
Black	0.107	0.081
Hispanic	0.069	0.486
Asian	0.010	0.242
Other	0.016	0.016
Part-Time	0.102	0.096
Family		
(REF: Men*Unmarried*Childless)	0.155	0.144
Men*Unmarried*Parent	0.033	0.038
Men*Married*Childless	0.124	0.110
Men*Married*Parent	0.228	0.310
Women*Unmarried*Childless	0.122	0.081
Women*Unmarried*Parent	0.080	0.074
Women*Married*Childless	0.106	0.070
Women*Married*Parent	0.151	0.173
N	14466992	2038939

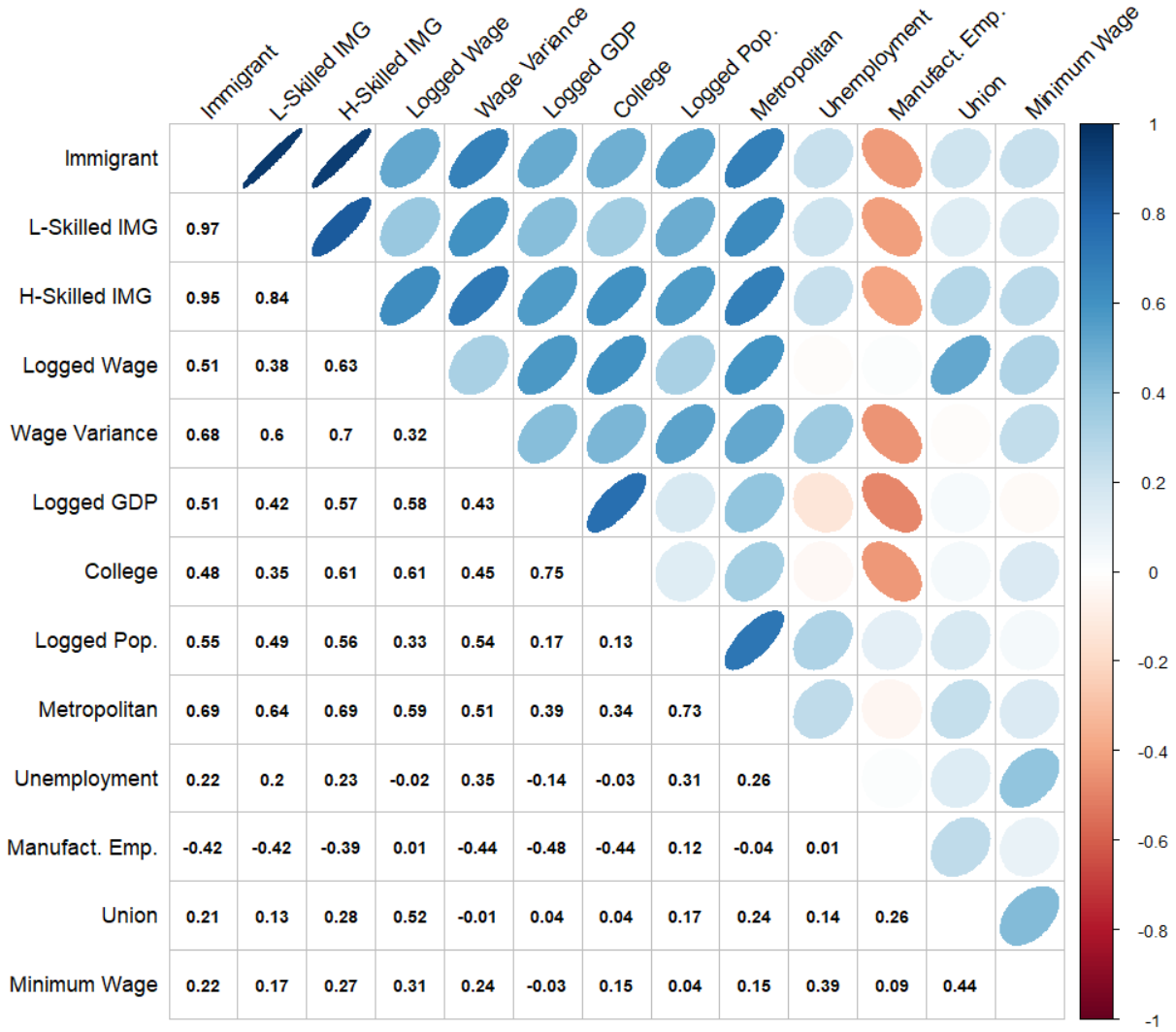
Note: The sample includes full-year private-sector employed workers in the lower 48 states who earned at least 5,000 (2016) dollars and aged 25-65. Observation with 0 weight are dropped from the sample.

Table B2 Means and Standard Deviations, State-level Variables, 1980-2015

Variables	Mean	SD
Immigrant	0.167	0.117
Low-Skilled IMG	0.075	0.053
High-Skilled IMG	0.092	0.067
Logged Wage	2.981	0.105
Logged GDP per capita€	10.717	0.192
College	0.185	0.039
Logged Population	16.044	0.881
Metropolitan	0.769	0.183
Unemployment (%)§	6.372	2.043
Manufacturing Emp.	0.189	0.070
Union	0.140	0.067
Minimum Wage¥	7.649	0.891
State-Year (N)	864	

Note: € Bureau of Economic Analysis. § Bureau of Labor Statistics. ¥ Tax Policy Center and Department of Labor. We take the higher value of federal and state minimum wage, deflated by national CPI.

FIGURE B1. CORRELATIONS MATRIX, STATE-LEVEL VARIABLES



	Immigrant	L-Skilled IMG	H-Skilled IMG	Logged Wage	Wage Variance	Logged GDP	College	Logged Pop.	Metropolitan	Unemployment	Manufact. Emp.	Union	Minimum Wage
Immigrant													
L-Skilled IMG	0.97												
H-Skilled IMG	0.95	0.84											
Logged Wage	0.51	0.38	0.63										
Wage Variance	0.68	0.6	0.7	0.32									
Logged GDP	0.51	0.42	0.57	0.58	0.43								
College	0.48	0.35	0.61	0.61	0.45	0.75							
Logged Pop.	0.55	0.49	0.56	0.33	0.54	0.17	0.13						
Metropolitan	0.69	0.64	0.69	0.59	0.51	0.39	0.34	0.73					
Unemployment	0.22	0.2	0.23	-0.02	0.35	-0.14	-0.03	0.31	0.26				
Manufact. Emp.	-0.42	-0.42	-0.39	0.01	-0.44	-0.48	-0.44	0.12	-0.04	0.01			
Union	0.21	0.13	0.28	0.52	-0.01	0.04	0.04	0.17	0.24	0.14	0.26		
Minimum Wage	0.22	0.17	0.27	0.31	0.24	-0.03	0.15	0.04	0.15	0.39	0.09	0.44	

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