Relative Wages of Immigrant Men and the Great Recession

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Abstract

Using CPS data from 2007 to 2012, we examine the contemporaneous effect of the Great Recession on the relative wages of immigrant men. Compared to pre-recession period, immigrants see a modest decline in their relative wages during the recession regardless of model specification. After the recession, immigrants' relative wages largely recover from the recession-induced decline, but the wage disadvantage does not completely revert back to its pre-recession level. Selective in- and out-migration by immigrants or selection of natives into employment do not seem to drive the results. It appears that, during the recession, immigrants may have traded higher employment with lower wages and employers might have been willing to hire them as a cost-saving measure. The results could have implications for how relative wages of immigrants respond to the ongoing COVID-19 Pandemic Recession.

Keywords Immigrants · Relative wages · Recession · Reservation wage

JEL Classification J1 · J3 · J6

Introduction

Previous work has documented how business cycles affect the evolution of immigrants' wages at the time of entry (Nakamura and Nakamura, 1992; Chiswick and Miller, 2002; Bratsberg et al., 2006). However, little attention has been given to the potential effect of the business cycle on immigrants' contemporaneous wages, especially on a severe downturn such as the Great Recession. The Great Recession (2007–2009) was the longest and deepest recession in the USA since World War II. Approximately, 8.8 million jobs disappeared, and the unemployment rate rose to a peak of 9.5% in October 2009 (Bureau of Labor Statistics (United States Bureau of Labor Statistics, 2012).

The downturn has affected labor market outcomes of some demographic groups more than others. Orrenius and Zavodny (2010b) find that immigrant men's (un) employment is more strongly tied to the business cycle than those of native workers because immigrants are overrepresented among workers with low levels of education and in occupations that are sensitive to changes in economic conditions. Given the fact that immigrants have a different wage profile than natives, it is possible that the recession could have affected their wages differently. The considerably severe and prolonged nature of the downturn provides an excellent opportunity to examine how immigrants' wages fare, relative to the wages of natives, over the business cycle. Knowing the extent of the wage gap between immigrants and natives could shed light on the dynamics of the wage differential between the two groups in the short run. It also could inform on how relative wages of immigrants might respond to the current COVID-19 Pandemic Recession.

To the best of our knowledge, there is no study that has analyzed the potential changes in relative wages of immigrants in the USA over the business cycle. Our paper therefore contributes to the literature by examining how downturns in the economy could immediately affect the wages of immigrants, especially in the context of a severe downturn like the Great Recession. Immigrant wages could differ from those of natives, especially if immigrants have a different education

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profile and/or ability to transfer skills into the labor market, and if those differences lead to differences in occupational sorting between groups. Even after adjusting for these factors, however, a wage differential between immigrants and natives could still persist in the recession period if unobservable factors, such as reservation wage and worker flexibility that are correlated with unemployment, affect wages of immigrants and natives differently.

Our analysis, which is based on data from the Annual Social and Economic Supplement (ASEC) of the Current Population Survey (CPS), shows that immigrant men's pre-recession wage disadvantage is slightly larger during the recession period, regardless of model specification. In the post-recession period, immigrants' relative wages largely recover from the recession-induced decline, but the wage disadvantage does not completely return to its pre-recession level. When we break down the sample into various educational groups and re-estimate the main model for these subsamples, we find a similar modest relative wage decline in the recession period, except for college graduate immigrants, whose relative wages see a larger decline.

It is possible that changes in the immigration flow over the business cycle could contaminate our estimates. To avoid this potential contamination from immigration changes, we exclude Mexican dropouts and recently arrived immigrants from the sample. A similar issue could arise if natives become more selected during the recession because of more generous unemployment insurance benefits. To check for potential native self-selection, we compare changes in wages of natives in the recession and post-recession periods. The results remain similar in both cases, so changes in worker composition such as selective in- and-out-migration by immigrants or differential selection of natives into employment do not seem to drive the results. Given the higher growth in immigrants' unemployment rate and their shorter unemployment spell in the recession period, it is possible that immigrants may have traded higher employment with lower wages and that employers might have been willing to hire them as a cost-saving measure.

These results are consistent with the findings of the literature on how wages respond to economic downturns in general. During past recessions, employers responded to the shock by primarily adjusting the employment margin rather than the wage margin as they were reluctant to cut wages. Cutting wages could negatively affect morale among workers and could therefore lower employee productivity. Using data from 1970s to early 1990s to analyze differences in labor market responses to economic downturns between immigrants and natives in Germany and the UK, Dustmann et al. (2010) show that there is a significantly larger employment response to economic shocks for immigrants than for natives, but they find only a small difference in wage responses for the two groups. Similar to previous recessions, the Great Recession is characterized by substantial

employment declines and much smaller wage cuts (Eslby et al., 2016; Cadena and Kovak, 2016).

These results could inform the potential question of how wages of immigrants would fare during the COVID-19 Pandemic Recession, relative to the wages of natives. We speculate that the COVID-19 Pandemic Recession will cause a larger decline in immigrants' relative wages, as compared to past recessions, including the Great Recession. Workers are twice more likely to face pay cuts during the COVID-19 downturn than they were during the Great Recession a decade ago (Cajner et al., 2020). However, given the unique nature of the currently ongoing recession, employers anticipate that the economy will rebound faster than it would under typical recession times.

The remainder of the paper is organized as follows: the “[Related Literature](#)” section discusses related literature; the “[Data](#)” section details the data; the “[Empirical Model and Results](#)” section outlines the empirical model and presents the results; the “[Discussion of Results](#)” section discusses the results; and the “[Summary](#)” section provides a summary.

Related Literature

Economic downturns adversely affect the evolution of immigrants' entry wages in the long run (i.e., secular effects), but downturns could similarly affect wages of immigrants contemporaneously in the short run (i.e., cyclical effects). The past work that examines how the phase of the business cycle at the time of labor market entry differentially affects subsequent wages of immigrants, finds that immigrant earnings are lower among those who enter in a period of high unemployment (Nakamura and Nakamura, 1992; Chiswick and Miller, 2002; Bratsberg et al., 2006). For example, Nakamura and Nakamura (1992) document that although a higher national unemployment rate in the year of entry into the labor market is significantly associated with lower hourly wages afterwards for both immigrants and natives in the U.S.A, the effect is stronger for immigrants. Using the 1990 US Census, Chiswick and Miller (2002) also find that earnings are lower for immigrants who enter the US labor market in a period of high unemployment. Using CPS data from 1979 to 2003 and relating immigrant and native period effects to local labor market unemployment, Bratsberg et al. (2006) further document that the process of immigrant wage assimilation varies with labor market conditions and that the wage gap between immigrants and natives widens in economic downturns but contracts when the labor market improves.

Economic shocks could also influence wages of immigrants in the short run, but little attention has been given to the immediate effect of economic downturns on wages of immigrants, especially by an economic downturn as severe as the Great Recession. The Great Recession of 2007–2009

was the longest and deepest recession in the USA since World War II. Total employment fell by more than 8 million jobs, and the national unemployment rate rose from 5% in December of 2007, to reach a peak of 9.5% in October 2009 (Bureau of Labor Statistics (United States Bureau of Labor Statistics, 2012).

It has been documented that the Great Recession affects employment outcomes of immigrants differently than those of natives. For example, analyzing the relative labor market experiences of immigrant men during the Great Recession, Orrenius and Zavodny (2010b) find that immigrants' (un) employment is more sensitive to changes in economic conditions than among male natives. They attribute this sensitivity to immigrants' low levels of educational attainment and their concentration in pro-cyclical occupations.

A natural follow-up question is whether relative wages of immigrants would follow suit and would therefore be more responsive to the Great Recession in a similar fashion. To the best of our knowledge, there is no study in the literature that has studied the potential changes in relative wages of immigrants in the USA over the Great Recession. Our study aims to address this question and thus contributes to the literature by analyzing differences in the cyclical pattern of wages between immigrants and natives in the short run. Immigrants make up a sizable share of the labor force and their share has been steadily increasing over time; they now constitute about 17.4% of the labor force, up from 13.3% in 2000 (Bureau of Labor Statistics (BLS), 2012). The analysis could provide insights into how immigrants' relative wages fare in downturns and the nature of any potential wage differential between immigrants and natives in the short run.

We specifically examine the dynamics of the relative wages of immigrants over the Great Recession by allowing for different responses during periods of economic expansion and contraction. Assuming that the Great Recession produces a cyclical effect like any other recession, we predict that, due to unobservable factors such as reservation wage and worker flexibility that are correlated with the unemployment rate, the wage gap between immigrants and natives would increase as the unemployment rate rises.

Data

The study uses the ASEC of the CPS from the Minnesota Population Center (Flood et al., 2019) for the years 2007–2012, which correspond to 2006–2011 wages.¹ The data provides large nationally representative samples that contain

information on economic, demographic, and education characteristics of the populations of interest to us, i.e., immigrants and natives. While the CPS gathers information on country of origin for each respondent, it does not ask immigrants' legal status, which is defined as a person admitted for permanent residence in the USA (Department of Homeland Security (DHS) 2018). But, throughout this analysis, immigrants refer to those who were born outside the USA with no citizenship at birth, regardless of whether they are documented (i.e., permanent resident or naturalized²) or not.

Another advantage of the CPS data, which is particularly relevant to our study, is that it considerably reduces composition bias issues that could arise from using aggregate data (Solon et al. (1994). To further mitigate any other potential effects, we winsorize the hourly wage data (i.e., roll extreme values back) and estimate college-educated and non-college immigrants separately. Besides, we tackle any potential work-er composition issues later in the sensitivity analysis section.

Our sample includes immigrant and native men who are over 19 and below 66 years of age, work for wages or salary income, and are not enrolled in school at the time of survey. To account for the asymmetries in economic downturns and upturns, we divide up the time³ into three phases, namely, pre-recession period (2006), recession period (2008–2009), and post-recession period (2010–2011). The sample restrictions leave a total sample of 169,754 individuals (132,546 native observations and 37,208 immigrant observations). Pre-recession sample includes 34,561 individuals (27,050 native observations and 7,511 immigrant observations). Recession sample includes 69,171 individuals (54,265 native observations and 14,906 immigrant observations). Post-recession period sample includes 66,022 individuals (51,231 native observations and 14,791 immigrant observations).

We first report some demographic and human capital characteristics for immigrants and natives across various educational groups (i.e., high school dropouts, intermediate, or college degree) in Tables 1 and 2, respectively, and then similarly present summary statistics for the sample in Table 3. High school dropouts are those with less than 12 years of schooling, those with intermediate education have between 12 and 15 years of schooling, and college degree holders are those with 16 years of schooling or more. We characterize individuals with a bachelor's degree or above as high-skilled workers, those with intermediate education as middle-skilled workers, and those without a high school diploma as low-skilled workers.

Table 1 shows the distribution of educational attainment for both native and immigrant workers across the business

¹ Wages reported in CPS in a given year refer to those received in the preceding year.

² Excluding naturalized immigrants from the sample does not affect the results.

³ 2007 wages are excluded from the sample since it represents the year that leads to the recession.

Table 1 Educational Attainment of Immigrants and Natives Across the Recession

Period	Pre-recession period		Recession period		Post-recession period	
	Natives	Immigrants	Natives	Immigrants	Natives	Immigrants
Educational attainment (years)						
All individuals	13.55 (2.35)	11.74 (4.03)	13.61 (2.32)	12.02 (4.01)	13.69 (2.33)	12.08 (3.98)
College degree or higher	16.77 (1.31)	17.09 (1.50)	16.75 (1.28)	17.11 (1.51)	16.75 (1.30)	17.07 (1.49)
High school but less than college	12.59 (0.73)	12.49 (0.70)	12.59 (0.74)	12.48 (0.70)	12.62 (0.75)	12.47 (0.69)
High school dropouts	9.98 (1.49)	7.58 (2.65)	10.03 (1.50)	7.63 (2.63)	10.07 (1.43)	7.55 (2.66)
Educational attainment (% of degree holders)						
College degree or higher	0.280 (0.449)	0.226 (0.418)	0.288 (0.453)	0.249 (0.432)	0.301 (0.457)	0.253 (0.434)
High school but less than college	0.639 (0.480)	0.410 (0.491)	0.639 (0.480)	0.417 (0.493)	0.631 (0.482)	0.431 (0.495)
High school dropouts	0.081 (0.273)	0.363 (0.481)	0.073 (0.260)	0.333 (0.471)	0.068 (0.251)	0.316 (0.465)

Source: Authors' calculations

cycle. Overall, we find that natives have a higher number of years of schooling than immigrants before, during, and after the recession. However, when we break down the sample into various educational groups, a different picture emerges. Compared to natives, immigrants have more years of schooling in the college-educated group, but natives have more years of schooling in the high school dropout group. On the other hand, natives and immigrants have similar years of schooling

in the intermediate education group. When we look at the share of immigrants and natives who hold various educational groups, we find that, over the business cycle, educational levels of natives are concentrated at the middle and high end of the education distribution, while immigrants tend to be clustered in the high school dropout group.

We next turn to the occupational distribution of natives and immigrants. Table 2 illustrates distribution of immigrants and

Table 2 Occupational skill distribution of immigrants and natives across the recession by educational attainment

Period	Pre-recession period		Recession period		Post-recession period	
	Natives	Immigrants	Natives	Immigrants	Natives	Immigrants
High-skill occupational category						
All individuals	0.305 (0.460)	0.206 (0.404)	0.312 (0.463)	0.225 (0.418)	0.316 (0.465)	0.227 (0.419)
College degree or higher	0.689 (0.462)	0.667 (0.467)	0.684 (0.464)	0.679 (0.467)	0.686 (0.464)	0.676 (0.468)
High school but less than college	0.169 (0.375)	0.112 (0.315)	0.174 (0.379)	0.116 (0.320)	0.168 (0.374)	0.114 (0.318)
High school dropouts	0.053 (0.224)	0.020 (0.138)	0.042 (0.200)	0.022 (0.147)	0.049 (0.217)	0.022 (0.148)
Middle-skill occupational category						
All individuals	0.622 (0.485)	0.627 (0.483)	0.607 (0.489)	0.588 (0.492)	0.594 (0.491)	0.572 (0.495)
College degree or higher	0.289 (0.453)	0.273 (0.445)	0.287 (0.452)	0.261 (0.439)	0.285 (0.451)	0.272 (0.445)
High school but less than college	0.747 (0.434)	0.729 (0.444)	0.729 (0.444)	0.696 (0.459)	0.722 (0.448)	0.687 (0.467)
High school dropouts	0.782 (0.413)	0.733 (0.442)	0.790 (0.407)	0.699 (0.459)	0.768 (0.422)	0.668 (0.471)
Low-skill occupational category						
All individuals	0.072 (0.260)	0.166 (0.372)	0.081 (0.273)	0.186 (0.390)	0.090 (0.286)	0.200 (0.400)
College degree or higher	0.022 (0.146)	0.049 (0.217)	0.028 (0.165)	0.060 (0.237)	0.029 (0.168)	0.052 (0.222)
High school but less than college	0.083 (0.276)	0.159 (0.366)	0.096 (0.294)	0.188 (0.390)	0.109 (0.312)	0.208 (0.406)
High school dropouts	0.164 (0.370)	0.248 (0.432)	0.168 (0.374)	0.279 (0.448)	0.182 (0.386)	0.309 (0.462)

Source: Authors' calculations

Table 3 Mean unemployment rate and spell and hourly wages of immigrants and natives by educational attainment

Period	Pre-recession period		Recession period		Post-recession period	
	Natives	Immigrants	Natives	Immigrants	Natives	Immigrants
Unemployment rate						
All individuals	0.052 (0.22)	0.043 (0.202)	0.121 (0.326)	0.108 (0.310)	0.100 (0.300)	0.092 (0.289)
College degree or higher	0.021 (0.142)	0.020 (0.143)	0.051 (0.219)	0.059 (0.235)	0.044 (0.205)	0.053 (0.225)
High school but less than college	0.056 (0.231)	0.039 (0.193)	0.139 (0.346)	0.111 (0.314)	0.114 (0.318)	0.096 (0.295)
High school dropouts	0.128 (0.335)	0.061 (0.239)	0.248 (0.432)	0.140 (0.347)	0.225 (0.427)	0.117 (0.322)
Continuous weeks unemployed						
All individuals	17.97 (21.46)	17.84 (23.54)	26.65 (25.75)	23.86 (24.51)	34.91 (32.63)	34.49 (33.03)
College degree or higher	14.17 (16.90)	21.38 (26.13)	27.23 (25.54)	30.49 (26.45)	34.55 (31.82)	38.81 (32.78)
High school but less than college	18.48 (22.31)	21.15 (25.18)	26.20 (25.60)	25.67 (26.20)	35.16 (32.59)	36.59 (34.12)
High school dropouts	18.34 (20.52)	14.71 (21.36)	28.38 (26.56)	19.97 (21.31)	34.00 (32.64)	30.59 (31.50)
Mean log hourly wage						
All individuals	2.727 (0.691)	2.486 (0.689)	2.728 (0.696)	2.497 (0.719)	2.715 (0.703)	2.492 (0.717)
College degree or higher	3.145 (0.674)	3.092 (0.698)	3.149 (0.655)	3.063 (0.711)	3.117 (0.666)	3.065 (0.705)
High school but less than college	2.597 (0.615)	2.437 (0.589)	2.585 (0.623)	2.421 (0.634)	2.564 (0.630)	2.391 (0.623)
High school dropouts	2.277 (0.630)	2.168 (0.535)	2.263 (0.67)	2.166 (0.559)	2.255 (0.681)	2.172 (0.567)

Source: Authors' calculations

natives across different occupational skill groups. In the spirit of Autor and Dorn (2013), we delineate occupational groups into three categories as follows: abstract non-routine cognitive occupational category, which is classified as the high-skill occupational category; routine cognitive and manual occupational group, which is classified as the middle-skill occupational category; and non-routine manual service occupational group, which is classified as the low-skill occupational category. Broadly speaking, managerial, professional, and technical occupations specialize in abstract, non-routine cognitive tasks, clerical, administrative, and sales occupations; and production and operative occupations specialize in routine cognitive and routine manual tasks, respectively, while service occupations such as food preparation and in-person health assistance specialize in non-routine manual tasks. We therefore do occupation distribution analysis for these three different subpopulations as follows: (1) those with high-skill occupations, often held by college degree holders; (2) those with middle-skill occupations, often held by those with high school degree or some college; (3) and those working in low-skill occupations, often held by high school dropouts.

Immigrants are underrepresented in the high-skill occupations category throughout the period of study, where the share is 20% for immigrants and 30% for natives. When we split the sample into college and non-college-educated groups, we find that the share of college-educated immigrants with high-skill occupations is slightly lower than that of college-educated natives in the high-skill occupations category (67 versus

69%), but immigrants significantly narrow the gap during the recession and the smaller gap carries over to the post-recession period. The share of non-college-educated immigrants with high-skill occupations is lower than the share of non-college-educated natives as well. For example, the share of immigrants with intermediate education is lower than the share of comparable natives (11 versus 17%), and the difference stays similar throughout the period of study. Similarly, the share of high school dropout immigrants with high-skill occupations is lower than that of high school dropout natives (2 versus 5%) throughout the period of study.

The share of immigrants who hold middle-skill occupations is similar to that of comparable natives in the pre-recession period and drops slightly for both groups, both recession and post-recession periods, although it drops marginally more for immigrants. The share of college-educated immigrants with middle-skill occupations is slightly lower than that of natives (27% for immigrants and 29% for natives) and it slightly decreases to 26% during recession but bounces back in the post-recession periods. The share of non-college-educated immigrants with middle-skill occupations is lower than the share of non-college-educated natives; more specifically, the share of immigrants with intermediate education who hold middle-skill occupations, is slightly lower than the share of comparable natives (73 versus 75%) and the difference stays similar throughout the period of study, despite the fact that the share falls slightly for both in the recession and post-recession periods. The share of high school dropout

immigrants with middle-skill occupations is also lower than that of high school dropout natives (73 versus 78%) in the pre-recession period and the difference stays similar despite the fact that the share falls slightly for immigrants during the recession and post-recession periods.

Unlike high-skill and middle-skill occupations, the share of immigrants with low-skill occupations is higher for immigrants (17 versus 7%). The share goes up slightly for both groups during recession and post-recession periods, but the difference stays similar throughout the period of study. Overrepresentation of immigrants in the low-skill category is more pronounced for the high school dropout immigrants. The share of high school dropout immigrants in the pre-recession period is 25%, but only 16% for high school dropout natives. The share grows slightly for both groups during the recession and post-recession periods. The share of college-educated immigrants with low-skill occupations is higher (5 versus 2%) in the pre-recession period and the share increases slightly for both groups during recession but falls back to its pre-recession level for immigrants in the post-recession period. Similarly, the share of immigrants with intermediate education who hold low-skill occupations is also higher for immigrants than for natives (16 versus 8%) in the pre-recession period. The share increases for both groups during and after the recession periods, but the difference stays similar.

Overall, the share of natives is higher in all the occupational categories except for the low-skill category, where immigrants' share is higher than that of native workers. There is also evidence that the share of workers in both high-skill and low-skill occupations grew during and after the recession, while it shrank a little for middle-skill occupations. So, immigrants are thus overrepresented in the low-skill occupation category and underrepresented in both high-skill and middle-skill occupation categories.

We next report in Table 3 the summary statistics for unemployment, unemployment spell, and hourly wages. For unemployment, we find that immigrants have lower unemployment rates than natives throughout the period of study. It is 5% for natives and 4% for immigrants in the pre-recession period. The rate more than doubles for both groups in the recession period (12% for natives and 11% for immigrants). It falls slightly for both groups in the post-recession period (10% for natives and 9% for immigrants).

However, breaking down the sample into various educational groups reveals a different pattern. College graduate workers have a similar unemployment rate of about 2% in the pre-recession period, regardless of nativity. College-educated immigrants see a higher unemployment uptick compared to their native counterparts in the recession period (6 versus 5%). The rate falls to 4.4% and 5.3% for natives and immigrants, respectively, in the post-recession period, albeit higher than its pre-recession level, and the rate still remains higher for immigrants. Non-college-educated immigrants

have lower unemployment rates than their native counterparts over the business cycle, but the rate increase is higher for immigrants in the recession period. Immigrants with intermediate education do have a lower unemployment rate than their native counterparts (4 versus 5.6%) in the pre-recession period, but this rate more than doubles for all workers during recession (11% for immigrants and 14% for natives). The rate falls similarly for both groups in the post-recession period (9.6% for immigrants and 11.4% for natives). High school dropout immigrants also have a lower unemployment rate than their native counterparts in the pre-recession period (6 versus 13%). The rate more than doubles for immigrants and almost doubles for natives (14% and 25%, respectively). However, the rate falls slightly to almost 12% for immigrants and 22.5% for natives in the post-recession period.

Overall, immigrants have lower unemployment rates than their native counterparts over the business cycle. Although both groups see higher unemployment rates in the recession period, the rate increase is higher for immigrants, regardless of education level. The unemployment rate goes down for both groups similarly in the post-recession period. Non-college-educated immigrants tend to substantially outperform native counterparts in terms of unemployment, but that is not the case for college-educated immigrants, who tend to have slightly higher unemployment rates than college-educated natives.

The second metric reported in Table 3 is the unemployment spell, which is measured by the number of consecutive weeks workers stay unemployed. Immigrants and natives start at similar unemployment spell rates in the pre-recession period (about 18 weeks each), but natives see a higher spell growth in the recession period (27 versus 24 weeks) and that spell growth increases at a similar rate for both groups in the post-recession period (about 35 weeks each). So, the unemployment spell trends upward for all workers, both during and after the recession. College-educated immigrants have a higher spell in the pre-recession period than their native counterparts (21 versus 14 weeks) but spell rate goes up for both groups in the recession and post-recession periods.

Immigrants with intermediate education have a higher unemployment spell than their native counterparts in the pre-recession period (21 versus 18 weeks), but the spell rate grows faster for natives and catches up with that of immigrants with intermediate education in the recession period (26 weeks each). The spell goes up similarly for both groups in the post-recession period (around 36 weeks each). High school dropout immigrants have lower unemployment spells than native dropouts in all periods of the study, i.e., 15 weeks for immigrants and 18 for natives in the pre-recession period, 20 for immigrants and 28 for natives in the recession period, 31 weeks for immigrants and 34 weeks for natives in the post-recession period. The spell goes up faster for natives in the recession period, but the opposite occurs in the post-

recession period, where it instead grows faster for high school dropout immigrants. So, immigrants have lower unemployment spells than natives over the business cycle in general. But this is mostly driven by high school dropout immigrants, who have a lower unemployment spell than their native counterparts throughout the period of study. However, immigrants with college and intermediate education have higher unemployment spells relative to native counterparts and the difference persists throughout the period of the study although the spell rate grows faster for natives in the recession period.

The third and final metric reported in Table 3 is the hourly wage of the two groups. Natives have a higher average log hourly wage than immigrants throughout the period of study. The gap is the largest for those with intermediate education (log of 0.16), second largest (log of 0.10) for high school dropouts, and smallest for the college-educated group (log of 0.08) in the recession period. The gap almost closes for college-educated immigrants in the post-recession period as natives' average wage sees some decline, but the gap stays similar to its recession levels for non-college-educated immigrants.

Empirical Model and Results

Empirical Model

We employ the standard Mincer regression to examine the relative wages of immigrants over the business cycle. We use the basic regression (1) and its variants below to separately estimate the relative wages of immigrants for the three time periods of pre-recession (2006), recession (2008–2009), and the post-recession period (2010–2011).

$$\text{Log } \omega_i = \alpha + \beta D_i + \theta X_i + \varepsilon_i \quad (1)$$

Log ω is the log real⁴ hourly⁵ wages,⁶ and i is an index for individuals. D , the explanatory variable of interest, is a dummy for immigration status (= 1 if immigrant and zero if native).

Vector X has a set of controls that include (1) demographic variables such as race, marital status, and Hispanic origin; (2) job-related characteristics such as full-time status and number of employers; and (3) geographic and temporal variables such as state and year fixed effects. ε_i is the error term. The coefficient, β , above can be interpreted as the composite wage differential between immigrants and natives, that is unadjusted for labor market factors such as potential experience,

education, and occupational sorting. To explore how these factors could independently and collectively affect relative wages of immigrants, we first introduce them alternately and then jointly later in model (5). Introducing these factors alternately allows us to see how each factor affects relative wages of immigrants. Wages between immigrants and natives could differ if immigrants have a different education profile than natives, or if immigrants cannot fully transfer their skills (i.e., potential experience) to the host country or lack host country-specific skills, or if immigrants are overrepresented in occupations that are susceptible to cyclical fluctuations.

We first introduce experience,⁷ E , and its square into model (1) and produce model (2) as shown below.

$$\text{Log } \omega_i = \alpha + \beta D_i + \gamma E_i + \theta X_i + \varepsilon_i \quad (2)$$

We next introduce schooling, S , into model (1) and produce model (3) as shown below. Schooling contains a set of three dummies, i.e., less than high school, high school graduate and some college, and bachelor's degree and beyond.

$$\text{Log } \omega_i = \alpha + \beta D_i + \gamma S_i + \theta X_i + \varepsilon_i \quad (3)$$

To investigate how sorting into different occupational categories could affect relative wages, we next introduce a set of occupational group dummies and produce model (4) as shown below.

$$\text{Log } \omega_i = \alpha + \beta D_i + \theta X_i + \delta O_i + \varepsilon_i \quad (4)$$

We now incorporate potential experience, schooling, and occupational categories into model (1) and produce model (5), (the main model hereafter).

$$\text{Log } \omega_i = \alpha + \beta D_i + \gamma E_i + \theta X_i + \gamma S_i + \delta O_i + \varepsilon_i \quad (5)$$

Even after controlling for all these variables, unobservable factors (i.e., reservation wage and worker flexibility) that are correlated with unemployment could still influence the relative wages of immigrants during the recession period.

Main Regression Results

By first looking at panel 1 of Table 4, which describes the basic⁸ estimates of relative wages of immigrants based on model (1), we find immigrants have a wage disadvantage of over 11 log points in the pre-recession period. This disadvantage increases to 12 log points during the recession before it returns to its pre-recession level in the post-recession period.

⁴ We convert all nominal wages to real wages using 1999 as the base year.

⁵ Hourly wage is defined as wage and salary income divided by the product of (weeks and weekly usual hours worked in the past year).

⁶ To account for any potential outliers, we winsorize the hourly wage by resetting the observations in the bottom and upper 1% tails of the distribution to the 1st percentile and 99th percentile values, respectively, while retaining all the observations.

⁷ Measured as age minus years of education minus six.

⁸ Controls for demographic, job characteristics, geographic and temporal factors. The coefficients of these and other controls are reported in Table 5.

Panel 2, which reports the estimates of model (2), introduces potential experience of workers into the basic model. The addition of experience increases immigrants' wage disadvantage proportionally across the business cycle. Immigrants have a wage disadvantage of a little over 12 log points in the pre-recession period. This disadvantage increases to 13.4 log points during the recession and stays the same in the post-recession period. Panel 3, which reports the estimates of model (3), introduces the schooling of workers into the basic model. Immigrants' wage disadvantage shrinks to 8.5 log points in the pre-recession period. This disadvantage increases to 10 log points during the recession, before it falls to 9 log points in the post-recession period, which is similar to what it was in the pre-recession period. Panel 4 reports the estimates of model (4), which adds different occupational categories to the basic model. Similar to panel 3, immigrants' wage disadvantage in the pre-recession period is 8.2 log points. This disadvantage does not change that much during the recession (8.6 log points) but it decreases to 7.5 log points in the post-recession period, which is little less than what it was in the pre-recession period.

Panel 5 shows the estimation results of model (5), the main model, which controls for worker productivity characteristics such as experience and schooling as well as different occupational categories. Similar to previous specifications, immigrants see a wage disadvantage of 7.6 log points in the pre-recession period. This disadvantage grows to 9.3 log points during the recession. The gap shrinks to 8.6 log points in the post-recession period, which is still higher than what it was in the pre-recession period.

To check if the trends in the relative wages of immigrants differ among immigrants with different levels of education, we next break the sample of the main model (5) into subsamples of individuals who (1) have a college degree or higher, (2) have high school degree or some college but not a college degree, and (3) are high school dropouts. Panel 6 reports the estimates of relative wages of college-educated immigrants relative to native counterparts. The results show that college-educated immigrants experience a wage disadvantage of 3.2 log points in the pre-recession period. The wage disadvantage grows to 8 log points in the recession period, but the gap decreases to 5 log points in the post-recession period. Panel 7 shows the estimates of relative wages of immigrants who have intermediate education (i.e., high school degree or some college). Immigrants have 10.4 log point wage disadvantage in the pre-recession period. The disadvantage grows to 11 and 12 log points in the recession and post-recession periods, respectively. Panel 8 shows the estimates of high school dropout workers. High school dropout immigrants see a 9.7 log point wage disadvantage in the pre-recession period. This disadvantage goes up to 11.4 log points in the recession period before it falls to 8.7 log points in the post-recession period.

Table 4 Relative log hourly wages of immigrant men

Period	Pre-recession (<i>S</i> = 34,561)	Recession (<i>S</i> = 69,171)	Post-Recession (<i>S</i> = 66,022)
Panel 1: basic model	−0.112*** (0.011)	−0.120*** (0.010)	−0.113*** (0.010)
Panel 2: basic model + experience	−0.121*** (0.011)	−0.134*** (0.011)	−0.133*** (0.011)
Panel 3: basic model + schooling	−0.086*** (0.010)	−0.102*** (0.010)	0.091*** (0.010)
Panel 4: basic model + occupation	−0.082*** (0.010)	−0.086*** (0.010)	−0.075*** (0.010)
Panel 5: main model (= experience + schooling + occupation)	−0.076*** (0.010)	−0.093*** (0.010)	−0.086*** (0.010)
Panel 6: main model (restricting sample to those with college degree or higher)	−0.032* (0.019)	−0.080*** (0.014)	−0.050*** (0.014)
Panel 7: main model (restricting sample to those with high school diploma or some college)	−0.104*** (0.013)	−0.111*** (0.010)	−0.120*** (0.010)
Panel 8: main model (restricting sample to high school dropouts)	−0.097*** (0.024)	0.114*** (0.020)	0.087*** (0.020)
Panel 9: main model (excluding Mexican high school dropouts from main model)	−0.074*** (0.010)	0.091*** (0.010)	−0.086*** (0.010)

Only the coefficient of nativity status is shown. Dependent variable is log hourly wages

***, **, and * indicate significance at 1%, 5%, and 10%, respectively. Robust standard errors are reported in parentheses. Omitted schooling group is intermediate education, and omitted occupational group is middle-skill occupational category

Robustness Test Analysis

The cyclical nature of the relative wages of immigrants reported above could be contaminated if immigrant flows are more sensitive to the business cycle, or if there are compositional changes in the unobservable characteristics of natives. First, the supply of immigrant workers could change during the recession, so the observed relative wage difference could be partly driven by changes in the flow of immigrants either through an inflow slowdown or higher return migration. Second, natives' self-selection in to or out of employment could alternatively affect their wages during the recession and consequently overstate the wage gap between the two groups.

Selective Inflow and Outflow of Immigrants

Immigrants' labor force make-up could change during the recession and potentially become more selected if less immigrants

Table 5 Coefficients of main control variables, main model

Period/coefficients of control variables	Pre-recession ($S = 34,561$)	Recession ($S = 69,171$)	Post-recession ($S = 66,022$)
Experience			
Experience	0.031*** (0.001)	0.030*** (0.001)	0.032*** (0.001)
Experience squared	− 0.052*** (0.002)	− 0.052*** (0.001)	− 0.052*** (0.002)
Schooling			
Less than high school degree	− 0.220*** (0.010)	− 0.211*** (0.010)	− 0.201*** (0.011)
College degree or higher	0.343*** (0.010)	0.346*** (0.010)	0.333*** (0.010)
Occupational category			
Low-skill category	− 0.287*** (0.011)	− 0.273*** (0.010)	− 0.274*** (0.010)
High-skill category	0.272*** (0.010)	0.290*** (0.010)	0.310*** (0.010)
Race			
Black	− 0.153*** (0.011)	− 0.149*** (0.010)	− 0.143*** (0.012)
Mixed race	− 0.056*** (0.014)	− 0.050*** (0.010)	− 0.052*** (0.015)
Hispanic status	− 0.135*** (0.010)	− 0.107*** (0.010)	− 0.121*** (0.013)
Married	0.202*** (0.010)	0.197*** (0.010)	0.188*** (0.010)
Full-time status	0.123*** (0.022)	0.117*** (0.012)	0.133*** (0.015)
Number of employers	− 0.094*** (0.010)	− 0.072*** (0.010)	− 0.090*** (0.012)

Only the coefficient of nativity status is shown. Dependent variable is log hourly wages

***, ** and * indicate significance at 1%, 5%, and 10%, respectively. Robust standard errors are reported in parentheses. Omitted category for schooling is intermediate education; omitted occupational group is middle-skill occupational category; omitted category for race is white, and omitted citizenship category is being born in the USA

arrive, and/or some immigrants return migrate. There should be less concern over the inflow of authorized immigrants, as there is no documented strong correlation between business cycles and new authorized immigration. Most of these new authorized immigrants, who come through family reasons or the temporary visas (H-1B and H-2B), constitute a small portion of total migration to the USA and also face a fixed quota that is usually lower than the demand for these workers even in years of depressed labor demand (Chiswick et al., 1997).

The inflow and return migration of unauthorized immigrants could, however, pose an issue for our estimates. Return-migrating during the recession, especially by Mexican immigrants, could reduce the competition for available jobs and improve the employment prospects of remaining immigrants (Orrenius and Zavodny, 2010a). In that scenario, the coefficient of the relative wages of immigrants could underestimate the true magnitude of the immigrant wage gap in the recession period. However, the previous research on the scope of Mexican return migration during the Great Recession find no evidence that the demographic attributes of Mexican return-migrants in 2005–2010 shifted dramatically from previous periods (Masferrer and Roberts, 2012). Furthermore, any such bias should be minimized when we exclude Mexican high school dropouts from the sample. In fact, once we exclude the Mexican high school dropouts from the sample and compare the new estimates (reported in panel 9) to those of the main model (panel 5), we find no change in the relative wages of immigrants throughout the period of study.

Even if the return migration issue is mitigated with the exclusion of Mexican high school dropouts from the sample, the slowdown of new immigration could still pose a problem for our estimates. Immigrant inflows often slowdown during recessions, particularly among unauthorized Mexican immigrants. So, the Great Recession might have caused a decrease in the number of Mexican migrants who otherwise would have come to the USA (Fix et al., 2009; Villarreal, 2014). This could once again increase immigrant wages and potentially improve their relative wages. To avoid such potential contamination for our estimates, we exclude recently arrived immigrants (i.e., those who came during the period of the study) from the sample. This helps us rule out the possibility that recent immigrants' entry wages (i.e., effects of macro conditions at arrival) or their growth rate confound the estimates. By doing so, we are restricting the sample to more established immigrants, but the results⁹ stay very similar.

Differential Selection of Natives During Recession

Alternatively, the potential wage differential between natives and immigrants during the recession could partially reflect an increase in wages of natives. Unlike many immigrants, native workers qualify for safety net programs during economic downturns, which was particularly generous during the Great Recession. In the aftermath of the Great Recession,

⁹ Not reported here but available upon request.

the Congress extended benefits for unemployment insurance (UI) recipients by allowing recipients to receive up to 99 weeks of benefits. Having access to government assistance would, thus, reduce work incentives for natives, especially for those at the bottom of the labor market. Rothstein (2011), who studied the effects of differential UI extensions on lengths of unemployment spells, finds a small but significant impact of UI extensions on individuals prolonging their unemployment spells.

If generous unemployment insurance and other types of government assistance incentivize low-wage natives to disproportionately remain in the unemployment rolls, the remaining native workers would skew high-wage workers. As a result, wage estimates of natives will be biased upwards, which would, in turn, bias immigrants' relative wages by making them artificially lower than they should be. To check if natives become more selected during recession, we compare changes in wages of natives in the recession and post-recession periods.¹⁰ The estimates show that there is no within native wage change in both periods, which refutes the claim that natives are more self-selected during the recession. This is consistent with the findings of Borjas (2015), who notes that natives' differential selection into labor force does not drive the assimilation patterns of immigrants during the Great Recession.

Discussion of Results

Wages of immigrants and natives could differ if immigrants have a different education profile than natives. Indeed, the distribution of immigrants' education is more bifurcated than that of natives. Immigrants are relatively concentrated at the top and bottom of the education distribution, so they are more likely to either be high school dropouts or have advanced degrees (Borjas, 2007; Orrenius and Zavodny, 2009). Immigrant and native wages could also differ if immigrants cannot fully transfer their skills (i.e., potential experience) to the host country or do not possess host country-specific skills (Chiswick and Miller, 2009). Differences in education profiles and skill transferability between immigrants and natives could lead to differences in the occupational concentration for the two groups, which could, in turn, generate differences in wages. Evidence shows that immigrants are overrepresented in occupations that require relatively little to no education (Orrenius and Zavodny, 2010b) and those that are susceptible to cyclical fluctuations.

Even after adjusting for all these factors, a wage difference between immigrants and natives could still persist if,

unobservable factors such as reservation wage and worker flexibility that are correlated with unemployment during the downturn period, affect the wages of immigrants and natives differently. Because immigrants are more likely to be concentrated in occupations that are susceptible to the downturn, less favorable job opportunities could have a stronger effect on immigrants' bargained wages, especially given the fact that many immigrants do not qualify or are reluctant to apply for unemployment insurance benefits. The Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) sharply reduces immigrants' access to social programs and thus creates an incentive for immigrants to stay employed, particularly during downturns. So, while immigrants are willing to take lower-paying jobs after layoff, natives would be more likely to engage in a longer job search while being subsidized by unemployment insurance or other benefits.

Flexibility in moving across regions, industries and occupations (Borjas 2001; Orrenius and Zavodny, 2009) should enable immigrants to adjust to changing labor market conditions more quickly than natives. Lower moving costs and immigrant networks that provide information about local labor market conditions increase the probability of immigrants' quest for jobs. Relatedly, employers have a greater incentive in retaining or hiring more immigrants during economic downturns. When demand is volatile, firms may seek to create a flexible workforce that can easily be laid off and re-hired. So, employers may use immigrant labor for cost reduction purposes or to make their labor force more flexible. By doing so, firms can gain a competitive edge by retaining immigrants since they would accept lower wages and are more flexible than natives.

The results of the basic model (which controls for individual characteristics, and temporal and geographic factors) show that there is indeed a wage gap between immigrant and native men in the pre-recession period. The wage differential expands a little in the recession period before it falls back to its pre-recession level in the post-recession period. The wage differential between the two groups slightly widens for all periods in a similar way when we introduce potential experience, suggesting that not accounting for the lack of immigrants' complete skill transferability masks a would-be larger wage gap between the groups. However, once we alternately add schooling and occupational sorting variables to the basic model, the wage differential between immigrants and natives shrinks, but a larger gap still exists in the recession period.

The main model, which incorporates experience, schooling and occupation groups, shows that there is an immigrant wage disadvantage of 7.6 log points in the pre-recession period. This wage disadvantage grows to 9.3 log points during the recession, which suggests that the downturn would depress wages of immigrants relative to natives through a lower bargained power since immigrants have lower reservation

¹⁰ We create a dummy that is equal to 1 for the recession (post-recession) period and 0 for the pre-recession (recession) period, and interpret the coefficient of this dummy as the change of wages between these two periods for natives.

wages (Chiswick 2005). In the post-recession period, immigrants' relative wages largely recover from the recession-induced decline, but the wage disadvantage does not completely revert back to its pre-recession level. When we break down the sample into various educational groups and re-estimate the main model, we find a similar pattern, but the relative wage decline is more pronounced for college-educated immigrants. Due to a shorter tenure and imperfect substitutability of immigrants and natives, high-skilled immigrants might accept lower pay during a recession, as minimum wage does not constrain wages of college-educated workers like it does at lower levels of education (Chiswick et al., 2006).

Immigrants have a higher growth in unemployment rate but are able to shorten their unemployment spells during the recession, which is consistent with the findings of Enchautegui (2012), who report that "The lowest employment point for immigrants was in February 2009, well within the Great Recession, while the lowest employment point for natives was on January 2011, 20 months after the official end of the recession." The fact that immigrants see a higher growth in the unemployment rate but register a shorter unemployment spell during the recession period indicates that immigrants may have traded higher employment with lower wages and that employers might have been willing to hire them as a cost-saving measure.

Summary

This paper examines the relative wages of immigrants in the pre-recession, recession, and post-recession periods. While a lot is known about the effect of economic downturns on wage assimilation of immigrants, little is understood about the immediate effect of economic shocks on immigrants' wages in the short run, especially one as deep as the Great Recession. Given the fact that immigrants have a different wage profile than natives, it is possible that the recession have affected their wages differently.

As predicted, immigrants see a modest decline in their relative wages during recession. This wage differential is independent of differences in education profiles, skill transferability, and degree of occupational segregation between immigrants and natives. Immigrants largely recover from this decline in the post-recession period. When we break down the sample into various educational groups and re-estimate the main model, we also find the relative wages of immigrants see a modest decline during the recession for all education groups, except for college graduate immigrants, whose relative wages see a larger decline.

It is possible that changes in immigrants' composition across the recession, due to return migration/slowdown in immigration or natives' differential labor market participation, might affect our estimates. The robustness checks we carry

out, however, show that they do not pose major threats to our results. So, we are confident that changes in worker composition such as lower immigration inflow and/or return migration by immigrants or differential selection of natives in to and out of employment do not seem to drive the results.

It appears that unobserved factors, such as reservation wage and worker flexibility that are correlated with unemployment, contribute to immigrants' wage decline. Given the fact that immigrants have a higher growth in unemployment rate but shorter unemployment spell in the recession period suggests that immigrants may have traded higher employment with lower wages and that employers might have been willing to hire them as a cost-saving measure.

The results are consistent with the findings of the literature on how economic downturns affect wages. During past recessions, employers responded to the shock mostly at the extensive margin rather than the intensive margin as they opted slashing employment instead of cutting wages. Studying immigrants' labor market responses to economic shocks relative to natives in Germany and the UK, Dustmann et al. (2010) show evidence of a considerably larger unemployment response to economic shocks for immigrants than for natives, but found only a small difference in wage responses for the two groups. Like many previous recessions, the Great Recession was also characterized by substantial employment declines and much smaller reduction in wages (Eslby et al., 2016; Cadena and Kovak, 2016).

The finding that immigrants' wages are more responsive to the Great Recession than those of natives implies that business cycles affect immigrants' relative wages both in the short run and in the long run. These results could also inform on how wages of immigrants would fare during the COVID-19 Pandemic Recession relative to wages of natives. We speculate that relative wages of immigrants will see a larger decline during COVID-19 Pandemic Recession than they did in the Great Recession and other past recessions. Workers are twice as likely to get a pay cut in the Pandemic Recession than they were during the Great Recession (Cajner et al., 2020). Given the unique nature of this recession, employers anticipate that the economy will rebound faster than it would under a typical recession.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

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