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First fired, first hired? Business cycles and immigrant labor market transitions

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Abstract

Using individual-level Current Population Survey (CPS) data matched across adjacent months from 1996 to 2013, this paper examines immigrant-native differentials in labor market transitions to changes in the business cycle. The paper captures economic fluctuations by measuring deviations in local demand from national economic circumstances and examines monthly transitions among employment, unemployment, and nonparticipation. Immigrants are found to be first fired and first hired over the business cycle, and the aggregate unemployment gap is caused by immigrants' higher rates in the unemployment entry flow. Although to some extent the gap can be explained by variation in the immigrant-native's exposure to cycles across industry and occupation, the first fired and first hired pattern still holds. Tests for heterogeneity show that low-skilled immigrants are more vulnerable to the business cycle. Tests of the structural changes from the 2007–2009 Great Recession show that since its start, there was a secular shift in the transition probabilities that would affect all workers negatively, but cyclical volatility was mitigated for immigrants in the post-Great Recession period.
JEL Classification: J15, J21, J23, J61, J63, J64

Keywords: Labor market transitions, Labor force dynamics, Unemployment, Business cycle, Immigrant workers

1 Introduction

The share of foreign-born workers in the US labor force has grown since 1996. In the 1996 to 2012 period, more than half of the increase in the total labor force was among the foreign born. In 2012, there were 25 million foreign-born persons age 16 years and older in the US labor force, representing 16.1% of the total.[1] The economic adjustment of immigrant labor is important for understanding the economic well-being of immigrants and the host population, and immigrants' impact on native workers. Previous studies on the economic assimilation of immigrants largely focused on immigrants' adjustment on earnings, but little is known about immigrants' labor market performance in terms of their employment and unemployment dynamics through changing macro-economic conditions.

In previous studies of wage assimilation, immigrants have been found to be more responsive to changes in local labor market conditions than natives were. Does a similar pattern of immigrants being more sensitive to cyclical changes also hold in terms of their employment and unemployment dynamics? What is the driving force of

the overall immigrant-native unemployment gap over cycles? In examining the sensitivity of the immigrant labor market to the fluctuations in the business cycle, most previous studies use business cycle conditions at the time of arrival in the receiving country as a source of economic fluctuations. Such studies have found that arriving in different phases of the business cycle has a very weak effect on immigrant cohorts' subsequent employment and unemployment experiences (Aydemir 2003; Chiswick et al. 1997; Chiswick and Hurst 2000). When focusing on contemporary macroeconomic conditions as a measure of cyclical changes, how would such conditions affect the sensitivities of immigrant labor market dynamics? This paper provides insight into these unanswered questions in the US immigration literature.

This paper uses individual-level Current Population Survey (CPS) data matched across adjacent months from 1996 to 2013 to investigate differences in immigrant-native cyclical sensitivity in monthly transitions between employment, unemployment, and nonparticipation. Using a locally exogenous measure of the business cycle to gauge the sensitivity of labor market dynamics to aggregate demand, the paper provides a detailed examination of the dynamic flows into and out of unemployment and further explains the driving force of immigrant-native unemployment gaps over the cycle.

Prior studies in the literature have established that immigrants are more strongly tied to the business cycle than natives are by comparing their grouped average employment rates (Hoynes 2000; Hoynes et al. 2012; Orrenius and Zavodny 2009). These prior studies have focused on the relationship of movement of labor force aggregates to cyclical changes in demand. The limit of this type of approach is a static description of movements in the stock level of labor force aggregates without being able to reveal the dynamic sources of underlying fluctuations. In considering the level of unemployment, rising unemployment can be caused by either rising rates of entry into unemployment or falling rates of hiring from among the employed. Thus, a better understanding of immigrant-native unemployment gaps and a comparison of immigrant-native labor market performance over the cycle require a dynamic examination of the transition flows into and out of the labor force statuses over the business cycle. This paper contributes to the literature by applying high frequency monthly data to empirically examine the cyclical variations in immigrant-native labor market transitions and to further explain the driving force of the overall unemployment gap.

This paper examines the underlying transitions because they determine the stocks of the aggregates that are observed. This dynamic approach of relating differences in transition rates to movements of steady-state stocks of labor force aggregates over time was developed by Badgett (1994), Blanchard et al. (1990), and Abraham and Shimer (2001) and was employed to study the unemployment gap between black and white workers by Couch and Fairlie (2010). Decomposing the sample into different race groups, blacks were found to be the first fired when the economy sours but also the first hired when business cycle conditions are favorable.[2] These findings stand in contrast to conventional predictions based on labor force aggregates that the less-skilled groups were the first fired as business cycle conditions worsen but are the last hired as the economy improves. The findings also demonstrate the importance of examining underlying transitions rather than aggregated data when the interest is in learning about labor market dynamics. This paper contributes to the US immigration literature by applying this dynamic approach of relating underlying monthly transition flows to aggregate unemployment gaps in the immigrant labor market.

This paper starts from a baseline two-way transition model (transitions between employment and unemployment) to investigate how immigrants respond differently to the business cycle relative to natives. It then expands the analysis to a three-way transition model (transitions among employment, unemployment, and nonparticipation) to provide a more comprehensive explanation of how transition flows would drive the cyclicality of the immigrant-native unemployment gap. The results are then examined through a number of robustness checks. Following the baseline transition model, the paper tests for heterogeneity by decomposing the sample into different demographic groups by gender, age, race, country of origin, education, region, industry, and occupational sector. Furthermore, the paper specifically tests the cyclical influence of being of certain skill and employment types on the underlying transition patterns. Finally, because the Great Recession in the USA was associated with a slow employment recovery that extended beyond the official NBER dating of the cycle, the paper explores the labor market structural changes caused by the Great Recession that might affect the immigrant-native transition differential over the examined sample period.

The main findings conclude that immigrants are the first fired as business cycle conditions worsen and are the first hired as business cycle conditions improve. This pattern remains unchanged after controlling for the cyclical influence of education, industry, and occupational sector, and is robust to changes in the business cycle measure and the selectivity of the sample. Potential discrimination and lack of USA-specific human capital likely underlie the remaining gaps in transitions into unemployment, and the gaps in transitions into employment might be attributable to the lack of additional source of income and unfavorable policies toward immigrants. Several categories of immigrant workers appear to have a higher chance of losing jobs as the business cycle worsens, thus driving the first-fired pattern. They are immigrants below age 50, or with Hispanic ethnicity, or holding less than a college degree, or those working in construction, trade, and transportation industries. Immigrant workers with the following characteristics are found to have a greater probability of being rehired when local business cycle conditions start to improve, thus driving the first-hired pattern. These characteristics include ages 31–40 years, or with a master's and above educational attainment, or residing in the western USA, or working in the private sector related to the agricultural and financial industries. Combining both the unemployment entry and exit transitions, immigrant workers' greater likelihood of losing a job is most important in accounting for their higher unemployment rates. Examining movement across three labor force states reinforces immigrants' first-fired first-hired pattern and further reveals that when local demand is slacker, immigrants are less likely to quit the labor force. Moreover, they have a greater chance of transitioning from being out of the labor force to resuming a job search as an unemployed person. This point can be explained by the fact that immigrants are ineligible for or are reluctant to apply for most public supporting programs intended to help low-income families during recessions. The Great Recession brought an upward shift in the baseline probability of losing a job and a downward shift in the odds of finding a job that would affect all workers negatively. However, immigrants' cyclical volatility in transitioning into unemployment dampened in the post-Great Recession period.

The paper proceeds as follows. Section 2 provides a theoretical framework and a review of the literature. Section 3 introduces the data, the construction of transition

probabilities, and the business cycle measurement. Section 4 presents descriptive statistics and the underlying monthly transition rates and trends. Section 5 discusses the methodological framework. Empirical results and robustness checks are offered in Section 6. Section 7 contains tests for heterogeneity and other tests. Section 8 concludes the paper.

2 Theoretical framework and literature review

2.1 Theoretical framework

Immigrant workers might have different responses to cyclical changes in economic conditions for several reasons. First, the observable characteristics of the foreign-born population might be different from the native-born population in ways that relate to the cyclical sensitivity of their employment outcomes. These variations might include differences in educational attainment, skill level, school quality, language, race, industry, and occupation. Recent studies have shown that demographic groups involving minority racial or ethnic groups, nonwhites, low-education workers, and those involved with cyclical sectors are affected most by the business cycle (Hoynes 2000; Hoynes et al. 2012; Orrenius and Zavodny 2009). Second, foreign-born workers might have different labor market patterns than observably identical native-born workers due to cultural or social differences, such as different levels of access to networks and public programs. Many immigrants lack access to various public social benefits such as Unemployment Insurance, non-emergency Medicaid, food stamps, Supplemental Security Income, and Temporary Assistance for Needy Families. Considering how public programs affect labor market transitions, such programs can create transitional gaps between the two groups of workers in the cycle. For example, an immigrant worker who does not qualify for safety net programs might have a more-active job search compared with an observably identical native worker who could instead rely on the safety net. Third, the legal status of immigrants is another important factor in accounting for the differences across native and immigrant workers. There has been an increasing presence of undocumented Mexican workers in service occupations and unskilled industrial employment in which domestic unskilled workers are in short supply or refuse to perform the work required in the field (Rivera-Batiz 1999; Jenkins 1978). In an attempt to understand the immigrant-native differential responses to cyclical changes, the paper will provide detailed empirical analyses of labor market transitions across different labor market statuses when controlling for observable personal and job characteristics. It will furthermore provide heterogeneous tests by different demographic characteristics and tests of the cyclical influences of the industry and occupational sector.

In addition to the abovementioned labor supply factors, demand side factors could also drive the underlying differential in immigrant-native labor market transitions. For example, potential discrimination would bias employers' lay-off decisions and thus affect immigrant workers' chance of leaving employment (unemployment entry transition). Moreover, such discrimination would be an obstacle for immigrant workers to enter employment such that their unemployment exit transition would be encumbered. Demand for labor could also differ by immigrants' inhabitant regions. Immigrants tend to cluster in certain geographic areas. For example, 32.5% of the immigrant population (versus 11.6% of the natives) lived in three metropolitan areas in the 1990s—Los Angeles, New York, and Miami (Borjas 2003). Additionally, the west coast is home to

many of the world's largest technology firms, at which highly skilled immigrant workers in the field are in high demand.

Based on the theoretical framework, this paper hopes to gain insight into the potential mechanisms driving any immigrant-native differences in cyclicality of employment. A simultaneous increase in unemployment entry and exit flows could result in unchanged stock level of unemployment. Rising unemployment (for example) can be driven by either increased firing, reduced hiring, or both. Built on a dynamic transition model, the paper provides a close empirical examination of immigrant-native differentials in hiring and firing patterns over the business cycle.

2.2 Review of previous research

Current studies on the labor market performance of immigrants have examined immigrants' wage assimilation (Borjas 1985, 1994, 1995; Bratsberg et al. 2006; Chiswick 1978; LaLonde and Topel 1992; Schoeni 1997) and the labor market impact of immigration on natives in the host country (Altonji and Card 1991; Borjas 2003; Card 2001; Peri and Sparber 2011a, 2011b). Immigrants have been documented as being more affected by changes in local labor market conditions than are natives in the studies of wage assimilation, but there has not been much attention given to their employment and unemployment dynamics associated with economic fluctuations. To date, most research has focused on using the macroeconomic conditions at the time of arrival as a measure of the business cycle, and analyzed its impact on immigrant cohorts' subsequent employment and unemployment experiences, as in the work of Aydemir (2003), Chiswick et al. (1997), and Chiswick and Hurst (2000), in which the authors hoped to discover to what extent macroeconomic conditions at the time of arrival would lead to a long-term gap between immigrants and natives. These studies primarily find little evidence that the employment status of immigrant workers is more sensitive to changing demand than that of natives.

The literature has raised the importance of a detailed examination of immigrants' labor market transitions in response to contemporary short-term economic fluctuations. For example, Bratsberg et al. (2006) found that the immigrant-native wage gap widens in economic downturns and contracts when the labor market strengthens. Additionally, in the analysis of the employment and unemployment experiences of immigrants in comparison with natives, Chiswick and Hurst (2000) concluded that the unemployment problems associated with foreign-born men appear to be short-term and merely transitional adjustments.

Building on previous studies, this paper contributes to the literature by examining the immigrant-native employment and unemployment dynamics in response to monthly changes in contemporary cyclical demand. Using variations generated by the monthly state-level unemployment rate for a 215-month time span, this paper investigates how immigrants differ from natives in their labor market transitions in relation to contemporary fluctuations in local demand, and how these transitional differences would lead to immigrant-native gaps in the aggregate level of unemployment.

In considering economic outcomes in terms of earnings and grouped average employment rates, immigrants have been documented as being more sensitive to the business cycle than are natives. For example, Orrenius and Zavodny (2009) found that the 2007 recession had hit the immigrants hard due to the fact that they are more likely

to work in cyclical sectors and to belong to minority racial or ethnic groups with less education. Hoynes (2000) found a similar pattern that across different demographic groups those with lower education levels and nonwhites were more affected by cycles over a sample period of 1975 to 1997. In the study of the Great Recession by Hoynes et al. (2012), the authors showed again that the impacts of the recession were felt most by the group of young, nonwhite, and low-education workers. This paper adopts a dynamic approach to compare the immigrant-native employment and unemployment transitions and relates the monthly transitions to the stead state level of unemployment to explain the cyclical gap.

This paper contributes to the literature by adopting a dynamic approach to investigate the immigrant-native gap in labor market transitions between employment, unemployment, and nonparticipation. This dynamic approach was initially developed in the work of Badgett (1994), and Blanchard et al. (1990). Badgett (1994) estimated workers' net flows into and out of unemployment, tracked the different experiences of blacks and whites, and compared the effects of the changing flows on the stock of unemployed workers across months. In studying the rates of job creation and destruction, Blanchard et al. (1990) explored disaggregated worker flows between different labor market statuses by various age-sex groups and interpreted their findings with a model of two types of workers, primary and secondary workers, who differ in their attachments to the labor market. Couch and Fairlie's (2010) study provided an empirical examination of black-white unemployment differentials in response to changes in cyclical demand from 1989 to 2004. Their finding stands in contrast to the conventional prediction that less-skilled workers are first fired and last hired. By applying high-frequency, individual-level data and building monthly transition probabilities across labor force states, this paper extends the literature by providing a close examination of immigrant-native labor market dynamics and by providing insights into the underlying driving forces affecting the aggregate immigrant-native unemployment gap over the cycle.

3 Data

3.1 Sample

This paper uses individual-level Current Population Survey (CPS) data. The observations are matched across adjacent months from January of 1996 to December of 2013, encompassing a 215-month time span. The matching algorithm for the data is based on the work of Madrian and Lefgren (2000), as implemented by Couch and Fairlie (2010). Instead of surveying a completely new set of housing units each month, the CPS re-samples households on a rotating basis. The sample is divided into eight representative subsamples called rotation groups; each month, a new rotation group is added to the overall sample. Housing units in each rotation group are interviewed for four consecutive months. There is an 8-month break, and the units are then interviewed again for four more months before exiting the survey. This rotation pattern of the CPS survey makes it possible to match information on individuals across adjacent months by linking surveys. Individuals present in the sample in adjacent months have their data matched so that their labor market transitions can be directly observed. As the CPS data are the basis for calculating the official US unemployment rates, this matching

procedure allows the labor market transitions of survey respondents to be related to aggregate unemployment at a monthly frequency.

3.2 Indicator for labor market transition

To examine underlying transition probabilities, this paper initially employs a two-way transition model and then expands the analysis to a three-way transition model. The two-way transition model focuses on transitions between employment and unemployment by restricting the analytical sample to individuals who are in the labor force for any two consecutive months and excluding those who are not in the labor force. To better relate the underlying transitions to the aggregate stock level of unemployment, the sample is further expanded to include transitions into and out of the labor force in the three-way transition model. Indicators for labor market transitions from 1 month to the next are created by linking the data across months. The transition rate is a discrete-time Markov probability that represents the likelihood that a person, being in a labor force state in the current month, will be in another labor force state the following month.

3.3 Business cycle measure

To capture local labor market conditions, a monthly state-level variable is constructed to measure local business cycle conditions that deviate from the national economy. This state-level business cycle measure gauges the deviation of the state-level unemployment rate from the national natural rate of unemployment (NRU). The measure captures shocks in local demand relative to a national measure of full employment and potential GDP. Variations in labor market transitions are driven in response to these different business cycle conditions across states. To the extent that these local deviations are exogenous to the overall national economic circumstances, the paper uses a locally exogenous measure of the business cycle to gauge the sensitivity of labor market transitions to aggregate demand. Data for the monthly state unemployment rate are retrieved from the Bureau of Labor Statistics (BLS). The NRU applied in this analysis is 5.28 and was drawn from separate estimates of an expectations-augmented Philips curve.[3] A practical reason for using deviations of state-level unemployment from a national NRU as a measure of local demand is to better incorporate the high-frequency feature of the data in this analysis. Other measures of the business cycle such as GDP or GNP are not available at a monthly frequency.

4 Descriptive statistics and transition trends

4.1 Descriptive statistics

The demographic composition of immigrant versus native workers is provided in Table 1. By age, the proportion of immigrant workers consisting of 20 to 40 years old is higher (53%) than of the native workers (45.4%). There is no significant difference in the composition by gender between the two groups, but more immigrants are married, 68.1% of the total, compared with 59.9% of the natives. In the sample, nearly 90% (86.3) of the native workers are white, and almost 10% (9.9) are black, whereas the two largest ethnic groups of immigrants are white (65.1%) and Asian (24.4%). Among the immigrant labor force, a larger proportion concentrates along the east and west coast (60.6%) compared with the

Table 1 Sample composition by immigrant status, CPS data, 1996–2013

		Native (%)	Immigrant (%)	Total (%)
Age	20–30	22.4	24.0	22.6
	31–40	23.0	29.0	23.7
	41–50	25.8	25.1	25.7
	51–60	22.1	17.0	21.4
	> 61	6.8	4.9	6.5
Gender	Male	48.0	48.6	48.1
	Female	52.0	51.4	51.9
Marital status	Single	40.1	31.9	39.1
	Married	59.9	68.1	60.9
Race	White only	86.3	65.1	83.6
	Black only	9.9	8.5	9.7
	Alaskan Native	1.2	0.8	1.2
	Asian	1.3	24.4	4.3
	Hawaiian/Pacific Islander	0.2	0.6	0.2
	2 race combinations	1.0	0.6	1.0
	More than 2 races	0.1	0.0	0.1
Country of birth	USA and its territories	99.0	0.0	86.4
	Mexico	0.1	28.2	3.7
	Canada	0.1	2.3	0.4
	Other Americas	0.1	22.9	3.0
	Europe	0.4	12.9	2.0
	Asia	0.3	27.7	3.8
	Pacific region	0.0	2.5	0.3
	Africa	0.0	3.6	0.5
Region	Northeast	20.5	23.2	20.9
	Midwest	25.6	12.6	24.0
	South	31.0	26.8	30.5
	West	22.9	37.4	24.7
Education	High school or less	40.3	54.1	42.1
	Some college but no degree	30.9	18.0	29.3
	Bachelor's degree	19.5	17.4	19.3
	Master's degree	6.7	6.9	6.7
	Professional school degree	1.4	1.6	1.4
	Doctorate degree	1.1	2.0	1.2
Industry	Agriculture	1.8	2.1	1.9
	Mining	0.7	0.3	0.7
	Construction	7.2	9.1	7.4
	Manufacturing	12.1	15.3	12.5
	Wholesale and retail trade	14.1	12.6	13.9
	Transportation and utilities	5.4	4.6	5.3
	Information	2.5	1.6	2.4
	Financial activities	7.1	5.4	6.9
	Professional and business services	10.1	11.6	10.3
	Educational and health services	22.3	16.9	21.7

Table 1 Sample composition by immigrant status, CPS data, 1996–2013 *(Continued)*

		Native (%)	Immigrant (%)	Total (%)
	Leisure and hospitality	6.7	12.0	7.3
	Other services	4.4	6.3	4.6
	Public administration	5.4	2.2	5.0
Occupational sector	Government-federal	3.0	1.7	2.8
	Government-state	5.0	2.7	4.7
	Government-local	8.4	3.7	7.9
	Private, for profit	65.8	77.3	67.2
	Private, nonprofit	6.6	4.0	6.3
	Self-employed, incorporated	3.6	3.5	3.6
	Self-employed, not incorporated	7.5	7.0	7.4
	Without pay	0.1	0.1	0.1
	Observations	10,217,419	1,486,801	11,704,220

Notes: The sample consists of people aged 20–64. All estimates are calculated using sample weights provided by the CPS

natives (43.4%). The immigrant workers are more likely than are the native born to have a degree below college—54.1 versus 40.3%. They are also more likely than are the native born to have a master's degree or higher, at 10.5 and 9.2%, respectively. When comparing the two groups, immigrants have a higher share working in agriculture, construction, manufacturing, leisure and hospitality, and other service fields. They are also more concentrated in the for-profit private sector. The question of whether immigrants with characteristics such as holding a lower-level degree or being in a more cyclically affected industry have a differential sensitivity to the business cycle is addressed in Section 7.

4.2 Transition trends

Table 2 shows the unemployment rates and transition probabilities between employment and unemployment by immigrant status for the entire sample period.[4] Panel A summarizes the statistics over the entire sample years from 1996 to 2013. Generally, immigrants have a higher unemployment rate (5.03%) than do natives (4.47%) over the years, represented by a difference of 0.56 percentage points. Immigrants are also 0.43 percentage points more likely to enter unemployment in the following month, and 4.36 percentage points more likely to transfer from unemployment to employment.

The sample period is then divided into two parts, the pre-Great Recession period from 1996 to 2007 shown by Panel B and the post-Great Recession period of 2008 to 2013 in Panel C. Comparing patterns before and after the Great Recession, the unemployment rates were much higher in the second period, 6.72% for immigrants and 6.39% for natives, nearly double those in the first period (3.96 and 3.50%). However, the unemployment gap between immigrants and natives narrowed to 0.33 percentage points after the Great Recession.

Immigrants continued to have a higher probability of both unemployment entry and exit rates in the two sub-periods. There appears to be noticeable within-group changes in the period after the Great Recession relative to its start. For example, the rate of losing jobs increased approximately 0.43 percentage points for immigrants, from 1.49

Table 2 Unemployment and transition rates, matched CPS data

	Immigrants (%)	*N*	Natives (%)	*N*	Immigrant-Native difference (%)
Panel A. 1996–2013					
Unemployment rate	5.03	1,094,181	4.47	7,916,965	0.56
Unemployment entry rate	1.65	1,041,193	1.22	7,590,294	0.43
Unemployment exit rate	33.24	52,988	28.88	326,671	4.36
Panel B. 1996–2007					
Unemployment rate	3.96	687,546	3.50	5,352,555	0.46
Unemployment entry rate	1.49	661,004	1.13	5,174,972	0.36
Unemployment exit rate	39.43	26,542	35.11	177,583	4.32
Panel C. 2008–2013					
Unemployment rate	6.72	406,635	6.39	2,564,410	0.33
Unemployment entry rate	1.92	380,189	1.39	2,415,322	0.53
Unemployment exit rate	27.46	26,446	22.13	149,088	5.33

Notes: The sample consists of people aged 20–64 who are in the labor force for any two consecutive months. All estimates are calculated using sample weights provided by the CPS

to 1.92%. The rate of finding jobs dropped markedly for immigrants and natives, from 39.43 to 27.46% and from 35.11 to 22.13%, respectively.

In the hope of assessing whether the entry or the exit rate contributes more to a higher unemployment of immigrants, the steady-state level of unemployment is decomposed into portions due to differences in unemployment entry rate and unemployment exit rate using the formula stock = (entry/[entry + exit])[5] (Abraham and Shimer 2001). Applying the observed transition rates in Panel A of Table 2, the calculated steady-state level of unemployment rate is 4.73% for immigrants and 4.05% for natives. If immigrants entered unemployment at the same rate as natives, their predicted unemployment rate in the steady-state level would fall to 3.54%. If immigrants were assigned the same rate of leaving unemployment as natives, their predicted unemployment rate would be raised to 5.4%. Contrasting the predicted and observed rates for immigrants suggests that the relatively high unemployment is primarily due to their greater chance of becoming unemployed. To evaluate whether the unemployment entry or exit flow drives a higher unemployment rate of immigrants, the paper will empirically examine the transitions in detail using a linear probability model.

Figures 1, 2, and 3 visually provide the movement of the seasonally adjusted rates through the sample period. Figure 1 shows the unemployment rates for immigrants and natives over the years 1996 to 2013. Although the unemployment rate for immigrants was consistently higher than for natives for most of the sample years, the gap between the two series was not large. It appeared to be disappearing before the Great Recession occurred and became wider again in the following years. At the end of the sample period, the two groups appeared to approach a similar level of unemployment.

Figure 2 shows the seasonally adjusted movements of employment-to-unemployment transitions from 1996 to 2013. The gap between the two series narrowed before the two economic peaks, March 2001 and December 2007,[6] and was most pronounced starting from the Great Recession. For the monthly unemployment exit rates shown by Fig. 3, the two series overlapped in the 1990s, and then immigrants started to display a visibly higher rate of moving into employment in the rest of the sample period. A close

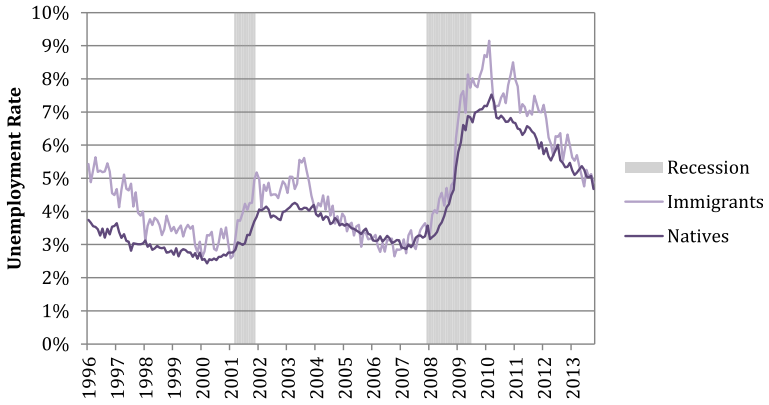

Fig. 1 Seasonally adjusted monthly unemployment rates: Matched CPS data, 1996–2013. *Notes:* Monthly unemployment rates are calculated by author using the matched CPS data. All data are seasonally adjusted. The sample consists of people aged 20–64 who are in the labor force for any two consecutive months. Shaded area represents recessions as reported by the National Bureau of Economic Research (NBER)

examination of the structural change from before to after the Great Recession will be discussed in Section 7.

5 Methodology

To examine the differences in immigrant-native cyclical sensitivities with respect to business cycle conditions, a linear probability model (LPM) that controls for personal and job characteristics is used. The empirical analysis will be evaluated first through a two-way transition model, in which only transitions between employment and unemployment are considered. The unemployment entry rate represents the probability that a worker employed in 1 month will become unemployed the following month. The unemployment exit rate represents the probability that a worker unemployed in 1 month will become employed the following month. The study is then extended to a three-way transition model. In addition to the unemployment entry and exit rate, transitions into and out of the labor force are considered. The three-way transition model

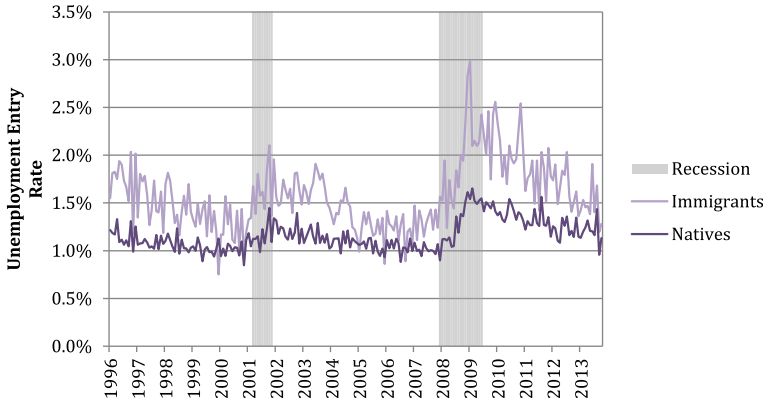

Fig. 2 Seasonally adjusted monthly unemployment entry rates: matched CPS data, 1996–2013. *Notes:* Monthly unemployment entry rates are calculated by author using the matched CPS data. All data are seasonally adjusted. The sample consists of people aged 20–64 who are in the labor force for any two consecutive months. Shaded area represents recessions as reported by the National Bureau of Economic Research (NBER)

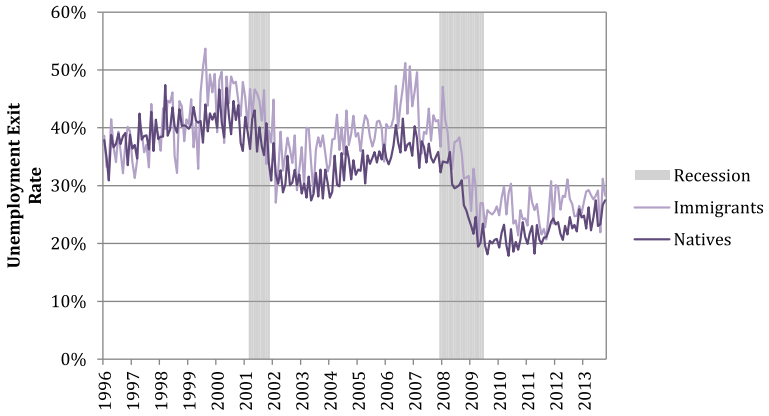

Fig. 3 Seasonally adjusted monthly unemployment exit rates: matched CPS data, 1996–2013. *Notes:* Monthly unemployment exit rates are calculated by author using the matched CPS data. All data are seasonally adjusted. The sample consists of people aged 20–64 who are in the labor force for any two consecutive months. Shaded area represents recessions as reported by the National Bureau of Economic Research (NBER)

includes transitions across all of the labor force states: *Employed to Unemployed*, *Employed to Not in the Labor Force (NILF)*, *Unemployed to Employed*, *Unemployed to NILF*, *NILF to Employed*, and *NILF to Unemployed*.

The corresponding results are reported from ordinary least square (OLS) estimates of linear probability models. The regression framework in the empirical model starts from a baseline specification and then adds interactions to evaluate how immigrants respond differently to the business cycle.

$$\begin{aligned} T_{pqist} = {} & \beta_0 + \beta_1 \mathrm{Imm}_{ist} + \beta_2 \mathrm{Unemployment}_{st} + \beta_3 \mathrm{Unemployment}_{st} \times \mathrm{Imm}_{ist} \\ & + \beta_4 (\mathrm{Rising}, \mathrm{Falling})_{st} + \beta_5 \mathrm{Unemployment}_{st} \times (\mathrm{Rising}, \mathrm{Falling})_{st} \\ & + \beta_6 \mathrm{Imm}_{ist} \times (\mathrm{Rising}, \mathrm{Falling})_{st} + \beta_7 \mathrm{Unemployment}_{st} \\ & \times (\mathrm{Rising}, \mathrm{Falling})_{st} \times \mathrm{Imm}_{ist} + \boldsymbol{\chi}_{ist} \boldsymbol{\delta} + \alpha_s + \gamma_t + \epsilon_{ist} \end{aligned} \quad (1)$$

The dependent variable T (transition probability) is a binary variable representing the probability that a person in state p (Unemployed, Employed, or NILF) in 1 month will be in state q (Unemployed, Employed, or NILF) in the following month. The transition is a stochastic process following a discrete-time Markov chain. Imm is a dummy variable indicating whether an individual is an immigrant[7] (1 for immigrants and 0 for natives), where i references the individual, s their state, and t the month. *Unemployment* is the business cycle control variable measuring the deviation of the state demand relative to a national measure of full employment, which is equal to the state-level aggregate unemployment rate minus the national natural rate of unemployment. *Rising* and *Falling* are two dummy variables to indicate whether the period is of rising (or falling) aggregate unemployment and are included to examine whether transitions are symmetric over periods of contraction and expansion.[8] $\boldsymbol{X}$ is a set of control variables including age, age-squared, gender, marital status, race, education, occupational sector, and industry.[9] α and γ represent state and month fixed effects, respectively. ε is the error term. All estimates are calculated using sample weights provided by the CPS. Standard errors are clustered to adjust for multiple observations per individual.

The key parameters in the equation are β_1, β_2, β_3, and β_7. β_1 measures whether the immigrant workers have an increased probability of making a transition. The estimate of β_2 indicates the extent to which the transition is influenced by the business cycle. The estimate of β_3 indicates whether the influence of the business cycle is greater for immigrants relative to native workers. The estimate of β_7 shows whether immigrant workers would respond even more strongly to weakening (strengthening) demand in periods of rising (falling) unemployment.

In order to provide a further look of what types of immigrant workers are more responsive to the business cycle, a heterogeneous test is performed according to Eq. (2). The empirical analysis is conducted on sub-samples (g represents an individual i belonging to a group g) by gender, age, race, educational level, region, industry and occupational sector to test for heterogeneity:

$$T^{g}_{pqist} = \beta_0 + \beta_1 \mathrm{Imm}^{g}_{ist} + \beta_2 \mathrm{Undiff}_{st} + \beta_3 \mathrm{Undiff}_{st} \times \mathrm{Imm}^{g}_{ist} + \boldsymbol{\chi}^{g}_{ist}\boldsymbol{\delta} + \alpha_s + \gamma_t + \epsilon^{g}_{ist} \tag{2}$$

Two additional tests are performed to study the change in the magnitude of parameters of interest. To test the structural change brought by the Great Recession, a dummy variable *Recession* (1 for the sample period of 1996–2007, 0 for the sample period of 2008–2013) is constructed and interacted with the other regressors from the transition model. The interacted terms will then report the structural change in corresponding estimation parameters brought by the Great Recession.

To test the cyclical influence of different education, occupational sector, and industry characteristics on the immigrant-native transition sensitivities, the model is evaluated as in Eq. (3). This approach tests the extent to which the magnitude of β_3 would fall or rise as the new interaction terms are added.

$$\begin{aligned} T_{pqist} = {} & \beta_0 + \beta_1 \mathrm{Imm}_{ist} + \beta_2 \mathrm{Undiff}_{st} + \beta_3 \mathrm{Undiff}_{st} \times \mathrm{Imm}_{ist} + \beta_4 \mathrm{Undiff}_{st} \times \mathrm{Edu}_{ist} \\ & + \beta_5 \mathrm{Undiff}_{st} \times \mathrm{Ind}_{ist} + \beta_6 \mathrm{Undiff}_{st} \times \mathrm{Occ}_{ist} + \boldsymbol{\chi}_{ist}\boldsymbol{\delta} + \alpha_s + \gamma_t + \epsilon_{ist} \end{aligned} \tag{3}$$

6 Empirical results and robustness checks

6.1 Transitions between employment and unemployment

Table 3 reports the two-way transition linear regression results for the sample period 1996 to 2013.[10] Only people who are in the labor force for two consecutive months are included in this model. Panel A shows the estimates for employment to unemployment transitions. Specification 1 starts from a base model in which a dummy variable for the immigrant and a business cycle control variable are included. The model also controls for age and its square, gender, race, marital status, education, occupational sector, and industry and includes a state and month fixed effect. Standard errors are adjusted for clustering multiple observations per individual. The dummy variable shows that on average, employed immigrants have 0.29 percentage points higher probability of entering unemployment than employed natives have the following month. All people are significantly affected by business cycle conditions; the monthly unemployment entry rate rises by 0.11 percentage points when there is a 1 percentage point increase in the state-level unemployment.

Table 3 Two-way transitions between employment and unemployment: matched CPS data, 1996–2013

	Specification			
	(1)	(2)	(3)	(4)
Panel A. Transition from employment to unemployment				
Immigrant	0.00291***	0.00236***	0.00342***	0.00222***
	(0.000179)	(0.000180)	(0.000161)	(0.000210)
Unemployment	0.00107***	0.000985***	0.000891***	0.000925***
	(0.0000267)	(0.0000280)	(0.0000279)	(0.0000327)
Unemployment*Immigrant		0.000503***	0.000464***	0.000415***
		(0.0000740)	(0.0000746)	(0.0000874)
Unemployment*Rising*Immigrant				0.00000653
				(0.000161)
Constant	0.0549***	0.0551***	0.0121***	0.0548***
	(0.000934)	(0.000934)	(0.000161)	(0.000935)
Personal and job controls	Yes	Yes	No	Yes
Observations	8,622,334	8,622,334	8,622,334	8,622,334
Mean of dependent variable	0.0128	0.0128	0.0128	0.0128
Panel B. Transition from unemployment to employment				
Immigrant	0.0655***	0.0602***	0.0542***	0.0586***
	(0.00297)	(0.00370)	(0.00361)	(0.00441)
Unemployment	− 0.0324***	− 0.0329***	− 0.0334***	− 0.0320***
	(0.000412)	(0.000438)	(0.000440)	(0.000517)
Unemployment* Immigrant		0.00262**	0.00266**	0.00245*
		(0.00102)	(0.00104)	(0.00125)
Unemployment*Falling*Immigrant				− 0.00108
				(0.00201)
Constant	0.592***	0.594***	0.334***	0.590***
	(0.0147)	(0.0147)	(0.00286)	(0.0147)
Personal and job controls	Yes	Yes	No	Yes
Observations	370,144	370,144	370,144	370,144
Mean of dependent variable	0.2976	0.2976	0.2976	0.2976

Notes: The sample consists of people aged 20–64 who are in the labor force for any two consecutive months. All estimates are calculated using sample weights provided by the CPS. Standard errors are adjusted for multiple observations per individual. All specifications also included a constant, age, age squared, gender, marital status, race, education, occupation and industry, and state and month fixed effects except Specification 3, which excludes personal and job controls. Unemployment = the state-level unemployment rate −the national natural rate of unemployment
*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

Specification 2 adds an interaction term between the immigrant dummy and the business cycle control to the first model. Immigrants continue to have a higher base probability of moving from employment to unemployment the following month, and all workers are more likely to enter unemployment when there is an increase in the local unemployment rate. The interaction term shows that immigrants have a stronger cyclical response to business cycle conditions; they are 0.05 percentage points more likely to enter unemployment than are their native counterparts for each percentage-point increase in state-level unemployment.

Specification 3 follows the same model as in Specification 2 but without controlling for personal and job characteristics. Excluding the personal and job controls yields a

similar pattern in the immigrant-native cyclical sensitivities.[11] A detailed examination of the cyclical influence of education, occupational sector, and industry on labor market transitions is studied in Section 7.

In Specification 4, interaction terms between the immigrant dummy, the business cycle measure, and a dummy variable indicating period of rising unemployment are added. This specification is to test whether immigrant workers are more likely to lose jobs in periods of rising unemployment. The result shows that in these periods, immigrants do not respond more strongly to weakening demand.

Panel B reports the set of estimates from the linear probability model for unemployment-to-employment transitions from 1996 to 2013. Specification 1 only includes the dummy for immigrants and the business cycle measure, together with the other controlling regressors. This base model shows that immigrants have a higher monthly probability of being re-employed when local demand is poor. Out of all unemployed workers, immigrants are 6.55 percentage points more likely than are natives to become rehired the following month. All people are 3.24 percentage points less likely to enter employment when there is a 1 percentage point increase in the state unemployment rate.

Adding the interaction term associated with the immigrant dummy and the business cycle control variable in Specifications 2 and 3 does not alter the basic pattern as provided by Specification 1. Immigrants show a greater responsiveness to changes in business cycle conditions, as indicated by the *Unemployment*Immigrant* coefficients. For each percentage point increase in the business cycle measure, immigrants are approximately 0.26 percentage points more likely than native workers are to leave unemployment the following month.[12] Together with Specification 2 in Panel A, these results present a first-in first-out pattern for immigrant workers in response to a negative shock. Specification 4 tests whether the unemployment-to-employment flow would be stronger for immigrant workers in expansionary periods (falling unemployment periods). There is no evidence suggesting a strong pattern of differential responsiveness to the business cycle measure when the economy is growing.

Combining the evidence from the two-way transition model, immigrants have a greater probability of making both transitions, indicating a higher unemployment entry and exit rate. In response to adverse business cycle conditions, they also appear to have a greater likelihood of losing a job and becoming rehired from the rank of unemployed in the following month. This pattern of results is consistent with the idea that there is a first-fired, first-hired cyclical pattern in the immigrant employment and unemployment dynamics. In Section 7, the paper will examine to what extent this gap in firing and hiring patterns might be attributed to workers' variations in exposure to industry and occupational sector over the cycle. The paper will also examine the driving forces of the first-fired, first-hired pattern separately by workers' personal and job characteristics.

6.2 Robustness checks

Following the preferred baseline transition model (Specification 2, Table 3), several robustness checks are performed in this section. The first-fired, first-hired pattern is checked against a manipulation of the sample selection and the business cycle measurement, respectively. First, a test of sample composition over contractionary periods

versus normal economic periods is implemented. As cautioned by Cadena and Kovak's (2016) study, low-skilled Mexican-born immigrants' location choices respond much more strongly to local shocks during the Great Recession than do the location choices of low-skilled natives. The conclusion that immigrants have a higher unemployment entry and exit rate in response to cyclical changes might be biased if workers have significantly different characteristics, potentially due to mobility, in contractionary periods when the sample was collected. Thus, Table 4 provides a test of statistically significant differences between average observed characteristics in the sample over different economic cycles. Although it is not possible here to directly track workers' mobility, this test serves as a check of the consistency of the sample through the business cycle. As shown in Table 4, average observed characteristics such as immigrant status, gender, age, race, and educational attainment are compared to ascertain whether they are different in economic downturns and in normal periods in the sample.[13] Only two (married and above college)[14] out of the 16 characteristics are significantly different, which indicates that the selectivity of the sample is not problematic in downturns. Because married people are supposed to be less mobile, the 0.23 percentage points higher presence of married observations in downturns would only bias downward the first-fired, first-hired pattern, if at all. Workers in the sample are observed to be 0.05 percentage points less likely to hold an above-college degree in downturns. To explore the cyclical influence of education on the immigrant-native transition differential, the paper will provide a detailed investigation in Section 7.[15]

To further ensure that the estimated results are not skewed by location movement, the sample is restricted to observations reporting consistent MSAs and excludes people with unidentified MSAs (potentially due to movement). The two-way transition model

Table 4 Test of average observed characteristics over contractionary periods, CPS data, 1996–2013

	(1)	(2)	Mean (1) − Mean (2)
	Normal periods	Downturns	Difference
Immigrant	0.1271	0.1270	0.0001
Age	41.7489	41.7305	0.0185
Female	0.5196	0.5191	0.0006
Married	0.6084	0.6107	− 0.0023‡
High school or less	0.4208	0.4214	− 0.0006
Some college but no degree	0.2928	0.2930	− 0.0002
College	0.1926	0.1923	0.0003
Above college	0.0938	0.0933	0.0005‡
White	0.7529	0.7532	− 0.0003
Black	0.0942	0.0940	0.0003
Hispanic	0.1076	0.1071	0.0005
Asian	0.0420	0.0417	0.0003
Americas	0.9340	0.9342	− 0.0002
Europe	0.0201	0.0202	− 0.0001
Asian Pacific	0.0411	0.0408	0.0003
Africa	0.0048	0.0047	0.0001
Observations	7,700,001	4,004,219	

Notes: The sample consists of people aged 20–64. All estimates are calculated using sample weights provided by the CPS
‡$p < 0.01$

is estimated again according to the preferred specification (Specification 2, Table 3), and results are presented in column 1 of Table 5. The key coefficients of interest (*Unemployment*Immigrant* in Panel A and B) fall in magnitude from 0.05 to 0.04 percentage points for unemployment entry transition and from 0.26 to 0.24 percentage points for unemployment exit transition, but they remain statistically significant, which indicates a first-fired, first-hired pattern. Another concern of the selectivity of the sample might come from the inaccuracy in the reported employment statuses from the self-employed[16] workers. In column 2 of Table 5, the self-employed workers are dropped from the sample. Indeed, the inclusion of self-employed workers magnifies the immigrant-native transition gaps slightly; however, the first-fired, first-hired pattern remains unchanged with the exclusion of these workers.

In columns 3 and 4 of Table 5, the previously estimated results in Table 3 are checked against the use of a different measurement of the business cycle. Although the procedure of constructing the business cycle control variable in this analysis has been implemented in a number of studies,[17] it is prudent to check whether the results are

Table 5 Robustness checks: matched CPS data, 1996–2013

	Specification			
	(1)	(2)	(3)	(4)
	Consistent MSA	Exclude self-employed	Time-varying NAIRU	Lead unemployment rate
Panel A. Transition from employment to unemployment				
Immigrant	0.00251***	0.00184***	0.00221***	0.00233***
	(0.000189)	(0.000190)	(0.000186)	(0.000180)
Unemployment	0.00100***	0.000874***	0.00100***	0.00101***
	(0.0000309)	(0.0000293)	(0.0000282)	(0.0000280)
Unemployment*Immigrant	0.000426***	0.000463***	0.000513***	0.000518***
	(0.0000766)	(0.0000774)	(0.0000749)	(0.0000742)
Personal and job controls	Yes	Yes	Yes	Yes
Observations	6,287,529	7,652,210	8,622,334	8,622,334
Mean of dependent variable	0.0127	0.0129	0.0128	0.0128
Panel B. Transition from unemployment to employment				
Immigrant	0.0597***	0.0644***	0.0596***	0.0600***
	(0.00389)	(0.00379)	(0.00386)	(0.00370)
Unemployment	− 0.0326***	− 0.0329***	− 0.0333***	− 0.0331***
	(0.000487)	(0.000445)	(0.000442)	(0.000438)
Unemployment*Immigrant	0.00243**	0.00247**	0.00269***	0.00275***
	(0.00106)	(0.00104)	(0.00103)	(0.00102)
Personal and job controls	Yes	Yes	Yes	Yes
Observations	275,109	352,498	370,144	370,144
Mean of dependent variable	0.2935	0.2920	0.2976	0.2976

Notes: The sample consists of people aged 20–64 who are in the labor force for any two consecutive months. All estimates are calculated using sample weights provided by the CPS. Standard errors are adjusted for multiple observations per individual. All specifications also included a constant, age, age squared, gender, marital status, race, education, occupation and industry, and state and month fixed effects. In Specification 1, observations with not identified MSA are dropped from the sample. Specification 2 excludes self-employed workers. In Specification 3, Unemployment = the state-level unemployment rate − the time-varying national natural rate of unemployment. In Specification 4, Unemployment = the lead period ($t + 1$) state-level unemployment rate − the national natural rate of unemployment

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

robust to the use of a time-varying national natural rate of unemployment. Column 3[18] in Table 5 adopts such an exercise. The key coefficients of interest (*Unemployment*Immigrant*) are all statistically significant ($p < 0.01$) and increase slightly in magnitude, suggesting a strongly robust first-fired, first-hired pattern to this alternative measure. In column 4[19] of Table 5, the business cycle control variable is substituted by using a one-period lead state-level unemployment rate instead to take into account the fact that the unemployment rate is considered a lagged cyclical variable. All other model specifications remain the same as in the preferred baseline model (Specification 2, Table 3). Again, the key coefficients yield similar estimated results and reinforce that the first-fired, first-hired is a robust pattern.

6.3 Transitions across all labor force statuses

For a more complete overall depiction of the labor market dynamics, the analysis is expanded to include transitions into and out of the labor force. Table 6 provides transition probabilities across all three labor force states over the sample period 1996 to 2013. All specifications follow the preferred baseline model (Specification 2, Table 3), which includes the immigrant dummy, the business cycle control variable, and their interactions, controlling for personal and job characteristics.

Columns 1 and 3 in Table 6 contain the results for transitions between employment and unemployment. The parameter estimates for the interaction between immigrant status and the business cycle indicate that immigrant workers are more likely to be fired and to regain employment later over the business cycle. Columns 2 and 4 consider the movements into nonparticipation from employment and unemployment, respectively. For

Table 6 Three-way transitions across all labor force states: matched CPS data, 1996–2013

	Transition					
	(1)	(2)	(3)	(4)	(5)	(6)
	Employed to unemployed	Employed to not in labor force	Unemployed to employed	Unemployed to not in labor force	Not in labor force to employed	Not in labor force to unemployed
Immigrant	0.00222***	0.00659***	0.0412***	0.0188***	0.0144***	0.00168***
	(0.000175)	(0.000239)	(0.00303)	(0.00265)	(0.000753)	(0.000509)
Unemployment	0.000965***	− 0.000103***	− 0.0254***	− 0.00543***	− 0.00296***	0.00347***
	(0.0000274)	(0.0000334)	(0.000366)	(0.000347)	(0.000103)	(0.0000908)
Unemployment* Immigrant	0.000494***	− 0.000480***	0.00350***	− 0.00223***	0.0000601	0.00104***
	(0.0000721)	(0.0000845)	(0.000846)	(0.000774)	(0.000251)	(0.000211)
Constant	0.0515***	0.139***	0.414***	0.414***	0.155***	0.100***
	(0.000899)	(0.00122)	(0.0120)	(0.0113)	(0.00244)	(0.00201)
Personal and job controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,805,216	8,805,216	457,460	457,460	2,416,885	2,416,885
Mean of dependent variable	0.0125	0.0215	0.2403	0.1927	0.0651	0.0379

Notes: The sample consists of people aged 20–64. All estimates are calculated using sample weights provided by the CPS. Standard errors are adjusted for multiple observations per individual. All specifications also included a constant, age, age squared, gender, marital status, race, education, occupation and industry, and state and month fixed effects except Specification 5 and 6, where occupation and industry are not available for workers not in the labor force.
Unemployment = the state-level unemployment rate – the national natural rate of unemployment
*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

both transitions, the interactions (*Unemployment*Immigrant*) are negative and statistically significant, indicating that immigrant workers are less likely to exit the labor force when the labor market is weakening. Column 6 examines the transition from being out of the labor force to resuming job search as an unemployed person, and immigrant workers have a greater probability of making this transition. Combining the evidence from Columns 2, 4, and 6, the results suggest that immigrants are driven by factors that discourage them from staying non-participated when the economy turns bad. The ineligibility for public support programs might be one contributor. The 1996 federal welfare and immigration laws excluded many immigrants from the eligibility for federal programs (Broder 2009), such as Unemployment Insurance (UI), non-emergency Medicaid, food stamps, Supplemental Security Income (SSI), and Temporary Assistance for Needy Families (TANF). The ineligibility for many social benefits caused hardship for these low-income immigrant families who lacked the support that is available to other native low-income households. Without additional sources of income, this group of immigrants would have a high probability of taking any job that is offered or of continuing a search for work instead of remaining unemployed or leaving the labor force.

In summary, findings in this section with the inclusion of transitions across all of the labor force states reaffirm the first-fired, first-hired pattern in the two-way transition model.

7 Heterogeneity and other additional tests

7.1 Test for heterogeneity

The paper has examined the overall difference in cyclical sensitivities to the business cycle between immigrants and natives. Because the immigrant population is vastly diverse, the paper then turns its focus to a narrower scope of classification to explore what types of immigrant workers would be affected most in economic downturns compared with their native counterparts. The analytical sample is again restricted to those in the labor force for any two consecutive months. Test results from a two-way transition model are presented in Tables 7 and 8, in which the immigrant dummy, the business cycle measure, their interactions, and all personal and job controls are included, comparable to the preferred baseline model in Table 3, Specification 2.

Table 7 reports estimates of the interaction terms associated with the business cycle measure and immigrant dummies by countries of origin. Immigrants from Mexico and other countries in the Americas are more likely to be laid off, whereas European and Asian immigrants are less likely to be laid off when business cycle conditions are poor. Mexican and Asian immigrants are the only two groups who are more likely to become re-employed when business cycle conditions are improving.

The reported estimation coefficient in Table 8 is *Unemployment*Immigrant*, which shows the differential impact of the business cycle on immigrant-native unemployment entry and exit rates.[20] In terms of the employment-to-unemployment transition, both male and female immigrant workers are found more affected by cycles than native workers are, and immigrant male workers appear to be the more responsive group. This difference between men and women might be due to their differences in labor market attachment. In a comparison of the unemployment-to-employment transition, female immigrants are more affected by cycles than are their native counterparts, but

Table 7 Two-way transitions by country of origin: matched CPS data, 1996–2013

	Employment to unemployment	Unemployment to employment
Unemployment*Mexico	0.00153***	0.00311*
	(0.000158)	(0.00166)
Unemployment*Canada	− 0.000482	− 0.000439
	(0.000340)	(0.00679)
Unemployment*Other Americas	0.000739***	− 0.000913
	(0.000154)	(0.00191)
Unemployment*Europe	− 0.000454***	0.00165
	(0.000138)	(0.00265)
Unemployment*Asia	− 0.000427***	0.00312*
	(9.01e−05)	(0.00177)
Unemployment*Pacific	0.000242	− 0.000780
	(0.000511)	(0.00713)
Unemployment*Africa	0.000346	0.00154
	(0.000368)	(0.00467)
Observations	8,622,334	370,144

Notes: The sample consists of people aged 20–64 who are in the labor force for any two consecutive months. All estimates are calculated using sample weights provided by the CPS. Standard errors are adjusted for multiple observations per individual. All specifications also included a constant, the immigrant dummy by country of origin, the business cycle control variable, relative personal and job controls, and state and month fixed effects, comparable to the baseline model in Table 3 Specification 2. Unemployment = the state-level unemployment rate – the national natural rate of unemployment

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

this cyclical sensitivity is not noticeable between immigrant and native male workers. This difference likely reflects the fact that women might act as secondary workers who actively seek to enter employment (from being unemployed) to make up for the recession-induced lost earnings of the principal earner.[21]

The unemployment entry coefficients for age groups below 50 are all positive and statistically significant, indicating that relatively young immigrants are more sensitive to business cycles in terms of the employment-to-unemployment transition. In rates of leaving unemployment, the immigrant group of aged 31–40 is more likely to find a job when business cycle conditions improve, whereas none of the other age groups responds differently from native workers.

The heterogeneous test by race is conducted by examining white, black, Hispanic, Asian, and other[22] ethnic workers. The white, black, Asian, and other ethnic groups are all non-Hispanic. Compared with other race groups, white immigrant workers are less likely to enter unemployment and more likely to leave unemployment compared with white native workers. Hispanic immigrant workers are found to have a larger chance of being fired, whereas black immigrant workers are found to have a smaller chance of becoming re-employed than are their native counterparts. A detailed examination of racial differences in labor market transitions can be found in Couch, Fairlie, and Xu's 2016 study, in which monthly transition probabilities were contrasted among Hispanic, African-American, and white workers. The analysis provided evidence that both blacks and Hispanics have a higher probability of being unemployed than do white workers as business conditions worsen, and that for some sample periods, minorities are more likely to be hired when business cycle conditions are weak.

Table 8 Test for heterogeneity based on two-way transitions: matched CPS data, 1996–2013

	Employment to unemployment	Unemployment to employment
	Reported coefficient: *Unemployment*Immigrant*	
Gender		
Male	0.000667***	0.000885
	(0.000106)	(0.00135)
Female	0.000176*	0.00426***
	(0.0000983)	(0.00153)
Age		
20–30	0.000795***	0.00104
	(0.000191)	(0.00218)
31–40	0.000532***	0.00694***
	(0.000140)	(0.00201)
41–50	0.000293**	0.00203
	(0.000127)	(0.00194)
51–60	0.000213	0.00152
	(0.000153)	(0.00228)
> 61	− 0.000179	0.00368
	(0.000321)	(0.00478)
Race		
White	− 0.000325***	0.00413*
	(0.000119)	(0.00219)
Black	0.000201	− 0.0108***
	(0.000306)	(0.00337)
Hispanic	0.00106***	− 0.000536
	(0.000166)	(0.00182)
Asian	0.0000391	− 0.00487
	(0.000191)	(0.00414)
Other	0.000433	0.0123
	(0.000649)	(0.0106)
Education		
No more than high school	0.000804***	0.00312**
	(0.000128)	(0.00135)
Some college but no degree	0.000187	0.00275
	(0.000151)	(0.00225)
Bachelor's degree	− 0.000073	− 0.00236
	(0.000123)	(0.00252)
Master's degree and above	− 0.000178	0.0110***
	(0.000119)	(0.00395)
Region		
Northeast	0.000290*	0.00455
	(0.000176)	(0.00307)
Midwest	0.0000285	− 0.000134
	(0.000184)	(0.00279)
South	0.000626***	0.00122
	(0.000146)	(0.00222)

Table 8 Test for heterogeneity based on two-way transitions: matched CPS data, 1996–2013 *(Continued)*

	Employment to unemployment	Unemployment to employment
	Reported coefficient: *Unemployment*Immigrant*	
West	0.000549***	0.00256*
	(0.000120)	(0.00153)
Industry		
Agriculture	0.00139	0.0230***
	(0.000911)	(0.00578)
Mining	0.000408	− 0.0116
	(0.00151)	(0.0292)
Construction	0.00200***	− 0.00343
	(0.000404)	(0.00273)
Manufacturing	− 0.0000379	0.00167
	(0.000180)	(0.00233)
Wholesale and retail trade	0.000565***	0.0026
	(0.000185)	(0.00277)
Transportation and utilities	0.000586**	0.00124
	(0.000297)	(0.00514)
Information	0.000683	0.000421
	(0.000526)	(0.00635)
Financial activities	0.0000336	0.0126***
	(0.000212)	(0.00421)
Professional and business services	0.000165	− 0.000308
	(0.000222)	(0.00281)
Educational and health services	− 0.00000648	0.000738
	(0.000123)	(0.00308)
Leisure and hospitality	0.00000727	0.00332
	(0.000210)	(0.00328)
Other services	0.000171	0.00581
	(0.000306)	(0.00476)
Public administration	0.000392	0.00333
	(0.000283)	(0.00782)
Occupational sector		
Government	0.000322*	0.00663
	(0.000170)	(0.00440)
Private	0.000441***	0.00239**
	(0.0000842)	(0.00107)
Self-employed	0.000761***	0.00630
	(0.000237)	(0.00454)
Without pay	0.00186	− 0.0738
	(0.00315)	(0.170)

Notes: The sample consists of people aged 20–64 who are in the labor force for any two consecutive months. The reported estimate is *Unemployment*Immigrant*. All estimates are calculated using sample weights provided by the CPS. Standard errors are adjusted for multiple observations per individual. All specifications also included a constant, the immigrant dummy by country of origin, the business cycle control variable, relative personal and job controls, and state and month fixed effects, comparable to the baseline model in Table 3 Specification 2. The numbers of observations are provided in Appendix: Table 11. Unemployment = the state-level unemployment rate − the national natural rate of unemployment

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

The reported coefficients for immigrants with a high school degree or lower are positive and statistically significant in both transitions.[23] Workers with less education are apparently the first to be fired when the labor market is worsening. However, they also have a greater chance of re-entering employed status in bad economic times because they tend to hold fewer restrictions in the job searching process. Another immigrant group having a greater chance of finding jobs are those who hold a master's degree or higher. Although college-level immigrants do not have a different response to cyclical changes compared with native workers, a higher degree such as master's and above does let immigrants stand out in a slack labor market.

Immigrants from all parts of the USA other than the Midwest region have a higher probability of entering unemployment than do the natives when there is a rise in the local unemployment rate. This difference could be due to immigrants being more concentrated on the east and west coasts rather than in the Midwest region, as summarized by Table 1; thus, the heterogeneity would be less obvious in the Midwest region. West regional immigrants are the only group who are more likely to become re-employed than the natives are when demand is slacker.

Out of 13 types of industries, immigrants who have a higher risk of losing jobs than natives in a weakening labor market are those who work in more cyclically affected industries such as construction, wholesale and retail trade, and the transportation and utility industries. Immigrants who work in the agricultural and financial industries are more likely to leave unemployment when the economy starts to grow while local demand is still relatively poor. For most types of workers, including those working in the government sector, the private sector, and the self-employed, the probability of losing jobs is greater for immigrants than for natives, while private sector workers are the only category in which immigrants have a greater chance of being rehired than do natives when business cycle conditions improve.

In summary, immigrants below age 50, or those with no more than a high school degree, or working in the construction, trade, and transportation industries appear to have a higher chance of being fired as the business cycle worsens, thus leading to a first-fired pattern in the immigrant group. Immigrant workers aged 31 to 40, or those who obtain less than a college or obtain a master's degree or higher, or those residing in the western USA, or those working in the private sector related to agricultural and financial industries appear to have a greater probability of being hired as business cycle conditions start to improve, thus leading to a first-hired pattern in the immigrant group.

7.2 Test for structural changes brought by the great recession

Recorded as the longest contraction period since the Great Depression by the National Bureau of Economic Research (NBER), the 2007 to 2009 Great Recession was associated with a slow unemployment recovery and the deepest downturn in the labor market in the postwar era.[24] To investigate the impact of the Great Recession on immigrant cyclical sensitivities and to gain insight into patterns of labor market dynamics prior to the Great Recession in comparison to its aftermath, a test across the pre- and post-2007 period is performed to examine whether underlying labor market dynamics were structurally altered by the recession.

Specifically, the structural test asks whether the Great Recession initiated a pattern of labor market transitions different from the one that existed previously. The sample is divided into a pre-Great Recession period encompassing a number of years of growth and a mild recession (2001), and a post-2007 period that begins with the initiation of the Great Recession and then extends for a number of years of growth. The expansionary and contractionary business cycle movement in the two sub-sample periods is helpful in providing useful variation to estimate hiring and firing patterns prior to the Great Recession and how those patterns varied with the start of the Great Recession.

Following the baseline specifications, a categorical dummy variable indicating the sample period after the Great Recession is constructed and interacted with every other variable in the two-way transition model. The reported interaction terms in Table 9 measure the structural change of the estimation parameters brought by the Great Recession. *Pre-recession* is a dummy variable taking the value 1 for the period from January 1996 to December 2007 and 0 for January 2008 through December 2013. *Post-recession* is a dummy variable taking the value 1 for the sample months from January 2008 to December 2013 and 0 for the sample period from January 1996 to December 2007. A non-constant regression method is used. The estimates of *Pre-recession* and *Post-recession* dummy present the base probabilities of making a transition for all of the workers in the two sub-sample periods. Thus, the structural change in the base probability brought by the Great Recession is given by comparing the two estimates.

Estimation parameters in Panel A show the changes in unemployment entry transitions from before the Great Recession to afterwards. There is a significant increase in the base probability of the unemployment entry rate from around 0.057 in the 1996–2007 period to around 0.073 in the 2008–2013 period. This increase in the base probability of being fired affects all of the workers in the sample negatively. The cyclical effect of a 1-percentage increase in the business cycle measure on the employment-to-unemployment transition drops by 0.04–0.05 percentage points (shown by *Recession*Unemployment*) after the start of the Great Recession. The coefficient associated with the interactions among the recession dummy, the immigrant dummy, and the business cycle measure is negative, small, and statistically significant, indicating that the cyclical volatility of the immigrant-native unemployment entry gap is reduced in the post-2007 period. There is no significant change in the immigrant-native differential in their rates of being fired in periods of rising unemployment.

Panel B shows the test results for changes in unemployment exit rates from the two sub-sample periods. For all workers, the change in the base probability of moving from unemployment to employment is estimated to have declined (from 0.58 to approximately 0.46) in the post-2007 period, meaning that the adverse economic conditions experienced beyond the onset of the Great Recession dampened their chance of becoming rehired. The extent of the cyclicality of the unemployment exit transition becomes less pronounced after the start of the Great Recession. For both periods, parameter estimates show that people are less likely to become re-employed in response to a weak demand.[25] However, the magnitude of that response declines after the start of the Great Recession, accounting for the positive coefficient on the business cycle variable (shown by *Recession*Unemployment*). With the start of the Great Recession, however, immigrant-native responsiveness to the business cycle measure is not observed to be

Table 9 Test for structural changes brought about by the Great Recession: matched CPS data, 1996–2013

	Specification		
	(1)	(2)	(3)
Panel A. Transition from employment to unemployment			
Pre-recession	0.0575***	0.0574***	0.0573***
	(0.00114)	(0.00114)	(0.00114)
Post-recession	0.0731***	0.0733***	0.0780***
	(0.00621)	(0.00621)	(0.00771)
Recession*Immigrant	0.00117***	− 0.000424	− 0.00169**
	(0.000331)	(0.000487)	(0.000684)
Recession*Unemployment	− 0.000457***	− 0.000414***	− 0.000401***
	(0.0000692)	(0.0000720)	(0.0000849)
Recession*Unemployment*Immigrant		− 0.000502**	− 0.000246
		(0.000212)	(0.000256)
Recession*Unemployment*Rising*Immigrant			− 0.000223
			(0.000481)
Personal and job controls	Yes	Yes	Yes
Observations	8,622,334	8,622,334	8,622,334
Panel B. Transition from unemployment to employment			
Pre-recession	0.583***	0.583***	0.581***
	(0.0219)	(0.0219)	(0.0219)
Post-recession	0.457***	0.455***	0.566***
	(0.105)	(0.105)	(0.118)
Recession*Immigrant	0.00768	0.0162*	0.0257**
	(0.00541)	(0.00849)	(0.0102)
Recession*Unemployment	0.0226***	0.0232***	0.0229***
	(0.00141)	(0.00149)	(0.00177)
Recession*Unemployment*Immigrant		− 0.00384	− 0.00502
		(0.00403)	(0.00487)
Recession*Unemployment*Falling*Immigrant			0.00828
			(0.00815)
Personal and job controls	Yes	Yes	Yes
Observations	370,144	370,144	370,144

Notes: The sample period covers 1996–2013. All specifications use a non-constant regression method. *Pre-recession* is a dummy, 1 for January 1996 to December 2007, 0 for January 2008 to December 2013. *Post-recession* is a dummy, 1 for January 2008 to December 2013, 0 for January 1996 to December 2007. The sample consists of people aged 20–64 who are in the labor force for any two consecutive months. All estimates are calculated using sample weights provided by the CPS. Standard errors are adjusted for multiple observations per individual. All specifications also included age, age squared, gender, marital status, race, education, occupation and industry, and state and month fixed effects. Unemployment = the state-level unemployment rate – the national natural rate of unemployment
*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

structurally affected (shown by *Recession*Unemployment*Immigrant*). Nor do immigrant workers demonstrate a different cyclical sensitivity in periods of falling unemployment.

Of the changes associated with the Great Recession and its aftermath, the most important were a secular upward shift in the unemployment entry rate and a downward shift in the unemployment exit rate that negatively affected both immigrant and native workers, whereas the immigrant-native cyclical differential was mitigated in terms of the employment-to-unemployment transition.

7.3 Test for the cyclical influence of industry, occupational sector, and education

There have been arguments about immigrants being in more cyclically affected industries and occupational sectors or holding different educational levels that would make them more vulnerable to business cycle conditions. This section contains a discussion of estimates associated with the interactions among the business cycle measure and of the education, industry, and occupational sector controls to investigate their influence on the cyclical behavior between immigrants and natives. The models estimated in Table 10 follow the same structure as the preferred baseline two-way transition model (Specification 2, Table 3). Column 1 reports the same set of estimates as provided by Specification 2 of Table 3. Columns 2 through 5 compare whether the inclusion of the new interactions would affect the magnitude of the immigrant-native gap in their business cycle responsiveness. In the employment-to-unemployment transitions shown in Panel A, the inclusion of the education, industry, and occupational sector interaction terms reduces the corresponding coefficient (*Unemployment*Immigrant*) from 0.0005 to 0.0004, 0.00035, and 0.00044, respectively.

Table 10 Tests for the influence of education, occupation, and industry based on two-way transitions: matched CPS data, 1996–2013

	Specification				
	(1)	(2)	(3)	(4)	(5)
Panel A. Transitions from employment to unemployment					
Immigrant	0.00236***	0.00232***	0.00237***	0.00237***	0.00232***
	(0.00018)	(0.00018)	(0.00018)	(0.00018)	(0.00018)
Unemployment	0.000985***	0.000249**	0.000356***	0.00407***	0.00250**
	(0.000028)	(0.000105)	(0.0000635)	(0.00122)	(0.00122)
Unemployment*Immigrant	0.000503***	0.000397***	0.000352***	0.000436***	0.000308***
	(0.000074)	(0.000074)	(0.0000739)	(0.0000742)	(0.0000744)
Unemployment*Education indicators	No	Yes	No	No	Yes
Unemployment*Industry indicators	No	No	Yes	No	Yes
Unemployment*Occupation indicators	No	No	No	Yes	Yes
Observations	8,622,334	8,622,334	8,622,334	8,622,334	8,622,334
Mean of dependent variable	0.0128	0.0128	0.0128	0.0128	0.0128
Panel B. Transitions from unemployment to employment					
Immigrant	0.0602***	0.0613***	0.0607***	0.0601***	0.0616***
	(0.0037)	(0.0037)	(0.0037)	(0.0037)	(0.00371)
Unemployment	− 0.0329***	− 0.0192***	− 0.0323***	− 0.0525***	− 0.0391*
	(0.000438)	(0.00528)	(0.00588)	(0.0188)	(0.0206)
Unemployment*Immigrant	0.00262**	0.00208**	0.00240**	0.00268***	0.00184*
	(0.00102)	(0.00103)	(0.00102)	(0.00102)	(0.00103)
Unemployment*Education indicators	No	Yes	No	No	Yes
Unemployment*Industry indicators	No	No	Yes	No	Yes
Unemployment*Occupation indicators	No	No	No	Yes	Yes
Observations	370,144	370,144	370,144	370,144	370,144
Mean of dependent variable	0.2976	0.2976	0.2976	0.2976	0.2976

Notes: The sample consists of people aged 20–64 who are in the labor force for any two consecutive months. All estimates are calculated using sample weights provided by the CPS. Standard errors are adjusted for multiple observations per individual. All specifications also included a constant, age, age squared, gender, marital status, race, education, occupation and industry, and state and month fixed effects. Unemployment = the state-level unemployment rate – the national natural rate of unemployment

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

The coefficient falls to 0.00031 when all three interactions are included together. Thus, education, industry, and occupational sector contribute to a stronger cyclical responsiveness for immigrants as economic conditions worsen. The remaining immigrant-native gap in transition rates into unemployment might be attributed to the potential impact of discrimination. As stated in Couch and Fairlie's (2010) study of racial transition differential, a discriminating employer can lay off equally qualified black workers and not face economic costs for doing so in slack business conditions. Similarly, tastes for discrimination can be more readily exercised against immigrant workers without an employer bearing costs in a slack market. Unobserved unfamiliarity with the labor market that makes a worker less productive can also contribute to immigrants still being first-fired when the cyclical influence of education, industry, and occupational sector are controlled. The cause of this result can be immigrants having different family background and educational quality or their lack of USA-specific human capital,[26] including their proficiency in the English language, knowledge of social norms, and communication and cognitive skills.

In the unemployment-to-employment transitions in Panel B, the coefficient estimate on *Unemployment*Immigrant* falls from 0.0026 to 0.0021 and 0.0024 when controlling for the cyclical influence of education and industry, respectively. This decrease indicates that a relatively higher exit rate from unemployment for immigrant workers is partially due to their being concentrated in certain types of education and industry, which offers them a higher chance of becoming re-employed. Controlling for the influence of occupational sector in the business cycle slightly increases the coefficient estimate by 0.00006, meaning that without the cyclical influence of being in certain sectors, immigrant workers would have had higher rates of leaving unemployment. Adding all three types of control factors reduces the coefficient to 0.0018. Policy discrepancy and the lack of additional income sources, such as immigrants being ineligible for many federal support programs, help explain the remaining gap indicating that immigrants remain more likely to move into employment the following month. Low reservation wage might be another factor that accounts for the remaining gap indicating that immigrant workers have a greater likelihood of becoming rehired from the queue of unemployed.

Overall, the inclusion of the three new interactions contributes somewhat to the widening and narrowing of the immigrant-native transition gaps but does not alter the pattern of immigrants being first-fired and first-hired over the business cycle.[27]

8 Conclusions

Using individual-level CPS data matched across adjacent months from January 1996 to December 2013, this paper compares the differential patterns of monthly transitions in labor force status between immigrant and native workers in response to business cycle conditions. The paper starts by examining the transition flows between employment and unemployment in a two-way transition model and then expands the analysis to include transitions into and out of the labor force for a better overall depiction of labor market dynamics. The underlying transition pattern between employment and unemployment implies that immigrant workers are more likely to be fired as business cycle conditions worsen. Immigrants also have a higher probability of becoming re-employed in the following month when the economy starts to grow while business cycle conditions are poor. Thus, immigrant workers are found to have a first-fired, first-hired pattern over the business cycle in terms of the unemployment entry and exit

flows. This pattern is robust to changes in the business cycle measure and the selectivity of the sample. When adding the transitions across labor force in the three-way model, empirical findings confirm the above pattern from the two-way model that immigrants have a greater chance of losing a job but also have a greater likelihood of finding a new one over the business cycle. Relating the underlying transition flows to the stock level of aggregate unemployment rates shows that the relatively high rate of unemployment of immigrants is primarily due to their higher chance of entering unemployment. Evidence from the three-way transition model further reveals that immigrants are less likely to leave the labor force and are more likely to move from nonparticipation into the labor force to search for work when local demand conditions are relatively weak. This pattern might be driven by the fact that immigrants are either ineligible for or are reluctant to apply for most public support programs intended to help low-income families during recessions.

To investigate what types of immigrant groups would be affected most by cyclical changes and drive the first-fired, first-hired pattern, the paper decomposes the sample into different demographic groups by country of origin, gender, age, race, education, residential region, industry, and occupational sector. Considerable evidence suggests that immigrants who are more likely to become unemployed are those aged below 50, or with no more than a high school degree, or working in the construction, trade, or transportation fields. Several categories of immigrant workers appear to have a greater chance of leaving unemployment. These categories include immigrants from Mexico or Asia, those aged 31 to 40 years, those whose educational attainment is no more than a high school or having a master's degree or above, those residing in the western USA, those involved with the agricultural and financial industries, or those working in the private sector.

In contrasting the period after the beginning of the Great Recession with earlier years, the paper conducts a test of structural change brought by the severe 2007 Great Recession. The most noticeable change is an upward shift in the baseline probability of entering unemployment and a downward shift in the odds of finding jobs. However, the cyclical volatility of transitioning into unemployment declined for immigrant workers in the period marked by the start of the Great Recession, suggesting that the adverse economic conditions experienced beyond the onset of the Great Recession affected all workers negatively, whereas the differential responsiveness dampened for immigrant workers.

To provide a comprehensive explanation to the underlying transitions, the paper also tests for the cyclical influence of skill and employment characteristics on immigrant-native differential responsiveness in their labor market transitions. The first-fired, first-hired pattern for immigrant workers is robust to the control of cyclical influences of education, industry, and occupational sector. As the pattern remains unchanged, potential discrimination and lack of USA-specific human capital likely underlie the remaining immigrant-native gap in transitions into unemployment, and the gap in movement into employment might be attributable to the lack of additional sources of income and unfavorable policies toward immigrants.

Endnotes

[1]Statistics from the United States Department of Labor Bureau of Labor Statistics: http://www.bls.gov/spotlight/2013/foreign-born/home.htm.

[2]The "last in, first out" pattern was first proposed by Freeman et al. (1973) to describe the black employment pattern over the business cycle. He found the employment of

blacks is strongly cyclical, rising relative to other groups in expansions and falling in recessions, and is of greater sensitivity compared with whites.

[3]The NRU of 5.28 is taken from the prior research of Couch and Fairlie (2010). More detail on its estimation can be found there (p. 232). Additionally, Couch and Fairlie (2010) considered time-varying NRU as a possibility and found that estimations similar to those performed in this analysis were robust to that alternative procedure. A robustness check using the time-varying NRU is provided in Section 6.

[4]Only people who are in the labor force for any two consecutive months are considered.

[5]In Abraham and Shimer's (2001) three-state model, $u = \lambda_{eu} \times e + \lambda_{uu} \times u + \lambda_{nu} \times n$, where e denotes the fraction of the population that is employed, u the fraction that is unemployed, and n the fraction that is not in the labor force. λ_{eu}, λ_{uu}, and λ_{nu} are the transition rates of employment to unemployment, unemployment to unemployment, and not in the labor force to unemployment, respectively.

[6]Two peaks in the sample period are March 2001 and December 2007. For business cycle expansions as reported by the National Bureau of Economics (NBER), see http://www.nber.org/cycles.html.

[7]Immigrants are defined as foreign born who are not US citizens at birth. People from American Samoa, Guam, Northern Marianas, Puerto Rico, U.S. Virgin Islands, and other US Island Areas are treated as natives.

[8]The *Rising* dummy takes the value 1 for a month when the state-level unemployment rate in the following month is higher than the unemployment rate in the current month, and it takes the value 0 if the unemployment rate is falling or not changing. The *Falling* dummy takes the value 1 for a month when the state-level unemployment rate in the following month is lower than the unemployment rate in the current month, and it takes the value 0 if the unemployment rate is rising or not changing.

[9]Gender is a dummy variable, female = 1 and male = 0. Marital status is a dummy variable, married = 1, and 0 otherwise. Race, education, occupational sector, and industry are categorical variables.

[10]The two-way transition model was also estimated for two sub-periods in the sample, a pre-Great Recession period of 1996–2007 and a post-2007 period of 2008–2013. Immigrants were found more sensitive to business cycle conditions in making the unemployment entry transitions but showed no different responsiveness in the unemployment exit transitions. See Appendix: Tables 12 and 13 for more-detailed results. A close examination of the structural change brought by the Great Recession is provided in Section 7.

[11]A robustness check with a sample of individuals ages 25 and over is provided in Panel A of the Appendix: Table 14. The result that immigrant workers are more likely to make the employment-to-unemployment transition holds up with the sample of adults who are likely to have completed their education.

[12]A robustness check with a sample of individuals ages 25 and over is provided in Panel B of the Appendix: Table 14. The result that immigrant workers are more likely to make the unemployment-to-employment transition holds up with the sample of adults who are likely to have completed their education.

[13]Economic downturns are defined as the months when the national unemployment rate in the following month is higher than that in the current month. Normal periods are the months when the national unemployment rate in the following month is lower

than or at the same level as that in the current month. Inf the 215 months covered by the sample, there are 74 downturn months and 141 normal months.

[14]"Above college" includes master's degree, professional school degree, and doctorate degree.

[15]In Section 7, the paper shows that although the additional inclusion of the cyclical influences of industry, occupational sector, and education alter the magnitude of immigrant-native transition gaps, the first-fired, first-hired pattern remains unchanged over the business cycle.

[16]A self-employed worker in the sample is counted as unemployed in the next period if he/she reports becoming unemployed in the t + 1 period. The self-employed are not counted as both employed and unemployed at the same time.

[17]Section 3 shows that the business cycle control variable provides an indicator of excess demand (in growths) or lack of demand (in recessions) at the state level relative to NRU. This procedure has been implemented by Couch and Fairlie (2010), Xu and Couch (2017), and Couch et al. (2016).

[18]In this specification, the *Unemployment* variable equals the state-level unemployment rate minus the time-varying national natural rate of unemployment.

[19]In this specification, the *Unemployment* variable equals the lead period (t + 1) state-level unemployment rate minus the national natural rate of unemployment.

[20]The numbers of observations for Table 8 estimations are reported in Appendix: Table 11.

[21]Hoynes (2000) found that low-skill nonwhite women experience greater cyclical fluctuation than do high-skill white men, partly due to women's employment being more likely involved with manufacturing and laborer positions, which would lead to higher rates of cyclical fluctuation.

[22]Other race contains Alaskan Native, Hawaiian/Pacific Islander, two race combinations, and more than two races.

[23]Bratsberg et al.'s (2016) recent study about Norway show a similar finding that the most negative employment effects of job loss are among immigrants from developing countries without a high school degree.

[24]The National Bureau of Economic Research (NBER) dates the last recession as running from December 2007 to June 2009. At 18 months, it was the longest contraction period since the Great Depression. During this period, the labor market also experienced its deepest downturn in the postwar era. The national unemployment rate rose 5 percentage points in only a year and a half, reaching a peak of 10% in October 2009.

[25]As the local demand is weak, all workers are less likely to move from unemployment to employment. The influence of "*Unemployment*" variable on this transition is − 0.047 before the Great Recession and becomes − 0.021 in the post-2007 period. Detailed results for the two sample periods can be found in Panel B of the Appendix: Tables 12 and 13.

[26]In the studies of immigrant-native earning gaps, Chiswick (1978) found that being less productive leads to the earning gap in earlier years by using a basic human capital earnings function in a multiple regression analysis.

[27]Another set of estimates with restricting the sample to individuals ages 25 and over who have likely completed their education is provided in the Appendix: Table 15. Similar to the results in Table 10, seven out of eight tests in Table 15 (columns 2 through 5 in Panels A and B) indicate a stronger responsiveness in the underlying transitions for immigrant workers.

Appendix

Table 11 Sample size for the heterogeneous test (Table 8)

	Employment to unemployment	Unemployment to employment
	Number of observations	
Gender		
Male	4,518,334	208,658
Female	4,104,000	161,486
Age		
20–30	1,897,511	119,724
31–40	2,189,050	89,352
41–50	2,403,867	86,748
51–60	1,779,853	62,654
> 61	352,053	11,666
Race		
White	6,500,175	233,194
Black	715,698	58,526
Hispanic	860,870	52,887
Asian	352,314	11,985
Other	159,414	12,621
Education		
No more than high school	3,281,917	197,145
Some college but no degree	2,567,830	105,542
Bachelor's degree	1,838,989	49,652
Master's degree and above	933,598	17,805
Region		
Northeast	1,811,611	76,021
Midwest	2,154,460	85,826
South	2,549,079	108,192
West	2,107,184	100,105
Industry		
Agriculture	157,559	7024
Mining	58,226	2467
Construction	614,755	52,109
Manufacturing	1,082,244	51,698
Wholesale and retail trade	1,193,066	53,158
Transportation and utilities	467,142	16,317
Information	205,315	9022
Financial activities	610,264	17,869
Professional and business services	877,944	47,388
Educational and health services	1,902,948	47,721
Leisure and hospitality	607,460	40,012
Other services	397,613	15,451
Public administration	447,798	8544
Occupational Sector		

Table 11 Sample size for the heterogeneous test (Table 8) *(Continued)*

	Employment to unemployment	Unemployment to employment
	Number of observations	
Government	1,365,493	29,559
Private	6,280,986	322,772
Self-employed	970,124	17,646
Without pay	5731	167

Table 12 Estimated transitions between employment and unemployment: matched CPS data, 1996–2007

	Specification			
	(1)	(2)	(3)	(4)
Panel A. Linear regressions for probability of employment-to-unemployment transition				
Immigrant	0.00211***	0.00227***	0.00345***	0.00221***
	(0.000211)	(0.000218)	(0.000194)	(0.000237)
Unemployment	0.00144***	0.00132***	0.00124***	0.00131***
	(0.0000658)	(0.0000673)	(0.0000676)	(0.0000727)
Unemployment*Immigrant		0.000974***	0.00105***	0.00105***
		(0.000172)	(0.000173)	(0.000193)
Unemployment*Rising*Immigrant				− 0.000272
				(0.000408)
Constant	0.0556***	0.0555***	0.0124***	0.0553***
	(0.00111)	(0.00111)	(0.000192)	(0.00111)
Personal and job controls	Yes	Yes	No	Yes
Observations	5,826,823	5,826,823	5,826,823	5,826,823
Panel B. Linear regressions for probability of unemployment-to-employment transition				
Immigrant	0.0603***	0.0600***	0.0539***	0.0592***
	(0.00440)	(0.00441)	(0.00418)	(0.00509)
Unemployment	− 0.0466***	− 0.0470***	− 0.0490***	− 0.0473***
	(0.00158)	(0.00165)	(0.00168)	(0.00185)
Unemployment* Immigrant		0.00357	0.00329	0.00436
		(0.00372)	(0.00383)	(0.00448)
Unemployment*Falling* Immigrant				− 0.00375
				(0.00741)
Constant	0.601***	0.601***	0.340***	0.597***
	(0.0210)	(0.0210)	(0.00395)	(0.0210)
Personal and job controls	Yes	Yes	No	Yes
Observations	199,530	199,530	199,530	199,530

Notes: The sample consists of people aged 20–64 who are in the labor force for any two consecutive months. All estimates are calculated using sample weights provided by the CPS. Standard errors are adjusted for multiple observations per individual. All specifications also included a constant, age, age squared, gender, marital status, race, education, occupation and industry, and state and month fixed effects except Specification 3, which excludes personal and job controls. Unemployment = the state-level unemployment rate – the national natural rate of unemployment
*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

Table 13 Estimated transitions between employment and unemployment: matched CPS data, 2008–2013

	Specification			
	(1)	(2)	(3)	(4)
Panel A. Linear regressions for probability of employment-to-unemployment transition				
Immigrant	0.00391***	0.00247***	0.00406***	0.000683
	(0.000320)	(0.000473)	(0.000454)	(0.000646)
Unemployment	0.000875***	0.000796***	0.000749***	0.000911***
	(0.0000584)	(0.0000602)	(0.0000604)	(0.0000801)
Unemployment*Immigrant		0.000449***	0.000291**	0.000772***
		(0.000128)	(0.000129)	(0.000171)
Unemployment*Rising*Immigrant				− 0.000493*
				(0.000256)
Constant	0.0558***	0.0560***	0.0121***	0.0552***
	(0.00172)	(0.00172)	(0.000328)	(0.00173)
Personal and job controls	Yes	Yes	No	Yes
Observations	2,795,511	2,795,511	2,795,511	2,795,511
Panel B. Linear regressions for probability of unemployment-to-employment transition				
Immigrant	0.0719***	0.0798***	0.0737***	0.0882***
	(0.00400)	(0.00765)	(0.00767)	(0.00902)
Unemployment	− 0.0211***	− 0.0207***	− 0.0211***	− 0.0213***
	(0.000887)	(0.000920)	(0.000929)	(0.000992)
Unemployment* Immigrant		− 0.00209	− 0.00215	− 0.00298
		(0.00168)	(0.00170)	(0.00202)
Unemployment*Falling* Immigrant				0.00410
				(0.00340)
Constant	0.537***	0.536***	0.286***	0.536***
	(0.0205)	(0.0205)	(0.00499)	(0.0206)
Personal and job controls	Yes	Yes	No	Yes
Observations	170,614	170,614	170,614	170,614

Notes: The sample consists of people aged 20–64 who are in the labor force for any two consecutive months. All estimates are calculated using sample weights provided by the CPS. Standard errors are adjusted for multiple observations per individual. All specifications also included a constant, age, age squared, gender, marital status, race, education, occupation and industry, and state and month fixed effects except Specification 3, which excludes personal and job controls. Unemployment = the state-level unemployment rate – the national natural rate of unemployment

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

Table 14 Two-way transitions between employment and unemployment: matched CPS data, 1996–2013

	Specification			
	(1)	(2)	(3)	(4)
Panel A. Transition from employment to unemployment				
Immigrant	0.00365***	0.00318***	0.00408***	0.00304***
	(0.000181)	(0.000182)	(0.000162)	(0.000212)
Unemployment	0.00103***	0.000958***	0.000865***	0.000888***
	(0.0000265)	(0.0000276)	(0.0000275)	(0.0000322)
Unemployment*Immigrant		0.000428***	0.000472***	0.000362***
		(0.0000744)	(0.0000750)	(0.0000879)
Unemployment*Rising*Immigrant				0.000235
				(0.000153)
Constant	0.0357***	0.0359***	0.0106***	0.0357***
	(0.00105)	(0.00105)	(0.000158)	(0.00105)
Personal and job controls	Yes	Yes	No	Yes
Observations	7,860,821	7,860,821	7,860,821	7,860,821
Mean of dependent variable	0.0114	0.0114	0.0114	0.0114
Panel B. Transition from unemployment to employment				
Immigrant	0.0593***	0.0547***	0.0562***	0.0542***
	(0.00315)	(0.00394)	(0.00383)	(0.00469)
Unemployment	− 0.0314***	− 0.0319***	− 0.0322***	− 0.0310***
	(0.000444)	(0.000474)	(0.000476)	(0.000561)
Unemployment* Immigrant		0.00224**	0.00274**	0.00195
		(0.00107)	(0.00109)	(0.00131)
Unemployment*Falling* Immigrant				0.000843
				(0.00201)
Constant	0.525***	0.527***	0.324***	0.523***
	(0.0197)	(0.0197)	(0.00312)	(0.0198)
Personal and job controls	Yes	Yes	No	Yes
Observations	309,558	309,558	309,558	309,558
Mean of dependent variable	0.2851	0.2851	0.2851	0.2851

Notes: The sample consists of people aged 25–64 who are in the labor force for any two consecutive months. All estimates are calculated using sample weights provided by the CPS. Standard errors are adjusted for multiple observations per individual. All specifications also included a constant, age, age squared, gender, marital status, race, education, occupation and industry, and state and month fixed effects except Specification 3, which excludes personal and job controls. Unemployment = the state-level unemployment rate – the national natural rate of unemployment
$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 15 Tests for the influence of education, occupation, and industry based on two-way transitions: matched CPS data, 1996–2013

	Specification				
	(1)	(2)	(3)	(4)	(5)
Panel A. Transitions from employment to unemployment					
Immigrant	0.00318***	0.00314***	0.00318***	0.00319***	0.00313***
	(0.000182)	(0.000182)	(0.000182)	(0.000182)	(0.000182)
Unemployment	0.000958***	0.000301***	0.000359***	0.00377***	0.00241*
	(0.0000276)	(0.000105)	(0.0000626)	(0.00128)	(0.00128)
Unemployment*Immigrant	0.000428***	0.000315***	0.000294***	0.000362***	0.000241***
	(0.0000744)	(0.0000742)	(0.0000744)	(0.0000746)	(0.0000746)
Unemployment*Education indicators	No	Yes	No	No	Yes
Unemployment*Industry indicators	No	No	Yes	No	Yes
Unemployment*Occupation indicators	No	No	No	Yes	Yes
Observations	7,860,821	7,860,821	7,860,821	7,860,821	7,860,821
Mean of dependent variable	0.0114	0.0114	0.0114	0.0114	0.0114
Panel B. Transitions from unemployment to employment					
Immigrant	0.0547***	0.0554***	0.0552***	0.0546***	0.0560***
	(0.00394)	(0.00394)	(0.00394)	(0.00394)	(0.00395)
Unemployment	− 0.0319***	− 0.0188***	− 0.0236***	− 0.0523**	− 0.0298
	(0.000474)	(0.00531)	(0.00685)	(0.0249)	(0.0265)
Unemployment*Immigrant	0.00224**	0.00194*	0.00196*	0.00229**	0.00155
	(0.00107)	(0.00108)	(0.00107)	(0.00107)	(0.00108)
Unemployment*Education indicators	No	Yes	No	No	Yes
Unemployment*Industry indicators	No	No	Yes	No	Yes
Unemployment*Occupation indicators	No	No	No	Yes	Yes
Observations	309,558	309,558	309,558	309,558	309,558
Mean of dependent variable	0.2851	0.2851	0.2851	0.2851	0.2851

Notes: The sample consists of people aged 25–64 who are in the labor force for any two consecutive months. All estimates are calculated using sample weights provided by the CPS. Standard errors are adjusted for multiple observations per individual. All specifications also included a constant, age, age squared, gender, marital status, race, education, occupation and industry, and state and month fixed effects. Unemployment = the state-level unemployment rate – the national natural rate of unemployment

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

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