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Research Article

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The Cyclicality of Immigrant Wages and Labour **Market Flows: Evidence from Spain**

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Abstract: This article studies the responses of real wages and labour market flows of immigrants in Spain for the period between 1999 and 2019. By using Labour Force Survey microdata, I examine the cyclicality of job-finding and job-separation rates for immigrants and natives over the long Spanish economic expansion and the sharp contraction. During the expansion, 1999-2007, the jobfinding rate was higher for immigrants than for natives, but both rates converged to a lower level after the Great Recession took place in 2008. I also find that the impact of the crisis on the job-separation rate was more than three times as high for immigrants than for natives. By using longitudinal social security data, I find that wage cyclicality is higher for immigrants than for natives: a one percentage point increase in the unemployment rate is associated with a 0.61 and 0.85% drop in real wages for natives and immigrants, respectively. However, these differences only occur among low-tenure workers. This study provides novel empirical evidence to enrich macroeconomic theories on the interaction of economic cycles and the impact of immigration.

Keywords: immigration, labour market, job-finding rate, job-separation rate, wage cyclicality

JEL classification: E24, J21, J31, J60, J61

1 Introduction

Foreign-born workers account for a large share of the labour force of many countries. In the United States or the United Kingdom, the share of foreign-born workers in the labour force increased from 9.3 and 4.3% in 1990 to 15.3 and 8.3% in 2010, respectively. A more striking example is Spain, where the share rose from 2.9% in 2000 to 11.3 and 15.0% in 2005 and 2010.

The literature has shown that there are significant differences between immigrants and natives regarding both their employment probabilities and prospective wages (Clark & Drinkwater, 2008; Gathmann & Keller, 2018). Work on immigrants' assimilation has reached similar conclusions (Borjas, 2015; Izquierdo, Lacuesta, & Vegas, 2009). A related question that remains open is whether those differences are amplified or mitigated over recessions and expansions. In other words, are immigrants more vulnerable to the economic cvcle?

This article studies how the natives-immigrants' labour market outcome gaps depend on the economic cycle. In particular, by using data from the Spanish Labour Force Survey (2005–2019), I first examine the cyclicality of the job-finding and job-separation rates for immigrants and natives. I compute the labour market flows for immigrants and natives, for all workers and workers within specific groups (same education/experience/sector/type of contract). To account for composition effects, I estimate a linear probability model to compute the labour market flows by nationality, conditional on observables. I also quantify the differential impact of the crisis on the jobfinding and job-loss probabilities for comparable immigrants and natives. Second, by using administrative data (Muestra Continua de Vidas Laborales), I examine differences in real wage cyclicality between immigrants and natives. I start by documenting the evolution of real monthly wages from 1999 to 2019 for all workers and fixing some job/worker characteristics. I then follow De la Roca (2014) to study wage cyclicality by estimating a wage equation in a two-steps procedure.

The Spanish economy is an interesting case of study for the purpose of the article for two main reasons. First, Spain experienced large foreign inflows in a very short period. As Figure 1 shows, immigration to Spain was close to zero before 1998. After that, immigrant inflows increased dramatically, reaching their maximum in 2007, where they made up to more than 2% of the total Spanish population. This increase is even more extraordinary when compared to other developed countries (Figure 1).

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Figure 1: Immigrant inflows. Source: OECD international migration database.

As a consequence, the share of immigrants in the labour force surged from 2.9% in 2000 to more than 15% ten years later. Second, Spain experienced sizeable job destruction in the Great Recession. As Figure 3 shows, the increase in the unemployment rate was more pronounced for immigrants, suggesting that the crisis hit harder the latter than natives.

I find that before the crisis (from 2005 to mid-2008) job-finding rates were higher for immigrants than for natives. This gap remains after controlling for composition effects. After the crisis, the gap vanished and both rates converged to a lower level. In contrast, job-separation rates are higher for immigrants than for natives through the full period (2005–2019), but the gap dramatically increased after the Great Recession took place in 2008. These findings also remain after controlling for observables.

The linear probability estimation shows that the impact of the crisis on the job-loss probability was more than three times as high for immigrants than for natives. Ceteris paribus, the crisis is associated with a 1.5 p.p. increase in the job-separation rate for natives, while for immigrants, that increase is 5.2 p.p. My estimates also suggest that the impact of the crisis on the job-finding probability was twice as high for immigrants than for natives. These results are consistent with those of the study by Dustmann, Glitz, and Vogel (2010) for the United Kingdom and Germany and Carrasco and García-Pérez (2015) for Spain. I find that wage cyclicality is higher for immigrants than for natives: a one percentage point increase in the unemployment rate is associated with a 0.61% drop in native real wages, while for immigrants, the decrease is 0.85%. My estimates are slightly higher than those reported by De la Roca (2014) and Font,

Izquierdo, and Puente (2015). However, overall they suggest a low degree of real wage sensitivity compared to other developed countries (Pissarides, 2009), as expected given the well-known labour market duality and high rigidity of the Spanish labour market (Bentolila, Cahuc, Dolado, & Le Barbanchon, 2012, Bentolila, Dolado, & Jimeno, 2012). Importantly, I find that the wage cyclicality gap between immigrants and natives only occur among low-tenured workers (less than 2 years of tenure in the establishment). Finally, real wages were more responsive during the expansion (1999–2008Q2) than during the recession (2008Q3–2013), with higher wage cyclicality among immigrants in both phases of the business cycle.

My results confirm that the Great Recession came along with a dramatic increase in job separations (and hence in unemployment), while wages were less sensitive. This apparent dichotomy is specially striking among immigrants. To the extent that a major goal of policymakers is minimising workers' unemployment risk, promoting wage flexibility or providing firms with an effective tool for adjusting production to economic downturns (which could prevent them from resorting to employment reductions) could be adequate before a new crisis occurs.

2 Literature Review and Contribution

This article relates to the extensive literature on the economic assimilation of immigrants (Abramitzky, Boustan, & Eriksson, 2014; Borjas, 2015; Monras, 2020 for the United States or Clark & Lindley, 2009; Dustmann & Fabbri, 2003 for the United Kingdom). Regarding the Spanish economy, Amuedo-Dorantes and De la Rica (2007) use a single cross-section for 2002 and show that immigrants face a higher unemployment rate. Izquierdo et al. (2009) show that at the time of arrival, immigrants' wages are significantly lower than natives', but the gap is reduced to half in the following 5 years. Monras, Vázquez-Grenno, and Elias (2020) find that the legalisation implemented in 2004 in Spain significantly reduced the labour market gaps between immigrants and natives. Other related works are studies by Fernández and Ortega (2008) and Rodríguez-Planas and Nollenberger (2016). By using data from 2000 through 2011, Rodríguez-Planas and Nollenberger (2016) find that immigrants who arrived before the 2008 recession had little trouble finding work immediately, but those who arrived after 2008 struggled to find work as Spanish unemployment rates increased. For the period 1996-2006, Fernández and



Figure 2: Immigrant share and composition by the region of country. Note: Share of foreign-born workers who are actively participating in the labour market. Source: Spanish Labour Force Survey.

Ortega (2008) find that immigrants face initially both a higher unemployment and temporary employment rate. A notable difference with these papers is that they use cross-sectional data, abstracting from exploiting the panel data dimension of the Spanish Labour Force Survey. Moreover, my data covers a longer post-crisis period. I add to this literature by focusing on differences between immigrants and natives regarding their labour market flows. In particular, my contribution is to show that a key source for the higher immigrants' unemployment rate is that their job-separation rate is higher regardless of the macroeconomic conditions.

This article is most closely related to the strand of the literature studying how immigrants respond to the economic cycle compared to natives. Dustmann et al. (2010) study unemployment and wage responses to economic shocks for immigrants relative to natives in Germany and the United Kingdom. Lessem and Nakajima (2019) show that undocumented Mexican immigrants in the United States experience larger wage drops during recessions than legal immigrants. Both papers show that there are significant differences in unemployment responses between immigrants and natives. A close work to my study is that of Carrasco and García-Pérez (2015), which investigate whether unemployment and employment durations for immigrants and natives respond differently to changes in the economic conditions. They find that the effect of the crisis on these durations is higher for immigrants than for natives. I contribute to their work in two dimensions. First, I focus on transition flows (i.e., job-separation

and job-finding rates) and how those changed with the cycle. Second, I cover a longer recessionary period, which is very relevant given the high persistence of the unemployment rates during the Great Recession.

My article is also related to the literature estimating worker flows. Some of the most influential papers on this topic are as follows: Blanchard, Diamond, Hall, and Murphy (1990), Elsby, Michaels, and Solon (2009), Fujita and Ramey (2009), or Shimer (2012), all for the United States economy. Several studies focus on European



Figure 3: Unemployment rate by nationality. Note: The unemployment rate differential (plotted in the right *y*-axis) is computed as the difference between the natives' and immigrants' unemployment rate. Source: Spanish Labour Force Survey.

labour markets, for instance Gomes (2012) for the United Kingdom, Fontaine (2016) for France, or Hertweck and Sigrist (2015) for Germany. By using Spanish data, Fontaine, Galvez-Iniesta, Gomes, and Vila-Martin (2020) or Silva and Vázquez-Grenno (2013) focus on the flows between permanent-temporary jobs and public-private employment, respectively. While all these articles stress the relevance of accounting for the evolution of labour market flows to understand unemployment determination, they have ignored the potential differences between immigrants and natives. Therefore, I add to this literature by computing labour market dynamics by nationality. The closest work in this regard is the study by Silva and Vázquez-Grenno (2011). They use the cross-sectional dimension of the Spanish Labour Force Survey to compute job-finding and job-exit rates of immigrants for the period 2000-2006. Some relevant traits differentiate my study from theirs. First, for computing flows, the panel data dimension of the survey should not be used (since before 2005, the SLFS-flows did not report nationality or country of birth). As a consequence, they need to impose several assumptions regarding the duration of unemployment and the frequency of the unemployment-inactivity flows. My contribution is, therefore, to use a richer and more suitable dataset for computing labour market transitions. Second, the scope of the analysis is also different. My main goal is to study the cyclical behaviour of the labour market flows and explain how much of the observed gap is due to composition effects. In contrast, Silva and Vázquez-Grenno (2011) focus on migrants' assimilation and study how the gap evolved with migrants' years of residence.

Closely related to my work are the studies by De la Roca (2014) and Font et al. (2015) that also use administrative data from the Spanish Social Security to examine real wage cyclicality. For the period 1988-2011, De la Roca (2014) finds evidence of weak real wage cyclicality, with a baseline estimate of a 0.4% increase in wages in response to a one percentage point decline in the unemployment rate. Font et al. (2015) finds that the wage cyclicality largely differs in expansions and recessions, with a lower sensitivity of wages after negative shocks. The distinction with respect to my work is twofold. First, I focus on the differences in the wage cyclicality between immigrants and natives. Second, I use data from a more recent period, which allows me to consider a longer post-crisis period. This is very relevant since, as stated earlier, the crisis affected more immigrants than natives in terms of iob destruction.

The rest of this article is organised as follows. Section 3 provides an overview of the Spanish immigration process. Section 4 examines the cyclicality of job-separation and job-finding rates for immigrants and natives. Section 5 studies the real wage cyclicality, and Section 6 concludes this study.

3 Background: Migration in Spain

Immigration to Spain is a recent process. Throughout most of the 20th century, Spain was a country of emigration, mainly to Europe (France, Germany, and Switzerland).¹ From the late '90s, Spain experienced the largest inflow of immigrants among all developed countries. As Figure 1 shows, from 1998 to 2008, on average foreign inflows made up 1.1% of the total population per year. As a consequence, the number of immigrants² in the labour force went up from 0.27 million (1.6% of the total population) in 1998, to 3.4 million (15.0% of the total labour force) in 2010, as displayed in Figure 2. This notable immigration boom can be explained by a combination of factors. Bertoli, Fernández-Huertas Moraga, and Ortega (2011) argues that the Latin American crisis had a lot to do with the Spanish immigration boom. Similarly, Bertoli and Moraga (2013) shows that Spanish migration policies also played an important role, in particular a special migration arrangement with former colonies. Furthermore, the Eastern European expansion of the European Union can be also made responsible for a large part of the immigration flows over this period. Finally, it has been argued that the Spanish economic boom enhanced the process.

The right panel of Figure 2 displays the composition of immigrant workers by region of origin.³ As we can see, the main regions of origin are South America (mainly Ecuador and Colombia), Africa (Morocco), and Europe (mostly Romania). Regarding the trend: (1) during the immigration boom (1999–2007), Romania and the South American countries concentrated most of the increase in immigration, while the share of Africa remained quite constant; (2) South American immigrants' flows were more sensitive to the crisis, as their share dropped from 2013 to 2019, due to both a decrease in inflows and an increase in South American immigrants' outflows, that

¹ See Izquierdo, Jimeno, and Lacuesta (2015) for a more exhaustive description of the historical migration process.

² Through this article, I use the terms immigrant and foreigner indistinctively. See Section 4.1 for a discussion on the definition of migration status in the data.

³ Results are constructed from the Spanish Labour Force Survey, and I am restricting my sample for immigrants that are actively participating the labour market.

Recaño, & Quintero-Lesmes, 2018).⁴

4 Cyclicality of Labour Market Flows: Immigrants versus Natives

4.1 Data

I use data from the Spanish Labour Force Survey-Flows (SLFS, Estadística de Flujos de la Población Activa), a quarterly representative survey of about 65,000 households, which is equivalent to around 180,000 individuals. The sample is divided into six waves (rotation groups), and every quarter one wave is replaced by a new one. The longitudinal structure of the SLFS allows us to match observations belonging to two consecutive surveys. Also, due to the structure of the database, we can track each individual for five successive quarters (1 year and a half). Although the quarterly survey starts in 1999, I restrict my analysis to the period between 2005Q1 and 2019Q4, as the longitudinal dimension of the survey did not provide information about nationality before 2005. The survey asks respondents about their labour market status and job characteristics (occupation, sector, or type of contract) as well as personal characteristics (age, education, or nationality). Unfortunately, it only reports the respondent' citizenship and not her country of birth. Consequently, I define immigrants as individuals with foreign citizenship. Finally, the survey does not distinguish between natives and workers with double nationality. Therefore, in my definition of immigrants, I restrict to foreigner workers without double nationality.

4.1.1 Descriptive statistics

Table 1 displays the descriptive statistics by differentiating three phases: pre-crisis (from 2005Q1 to 2008Q2), crisis (2008Q3–2013Q2), and post-crisis (2013Q3–2019Q4).⁵ Female workers account for a higher share among immigrants than

	crisis		crisis	crisis		crisis
Male	58.4	55.6	53.7	55.1	52.9	51.7
Age						
16-19	2.2	1.5	1.0	2.9	2.3	1.7
20-24	8.5	6.8	5.3	10.5	8.4	6.5
25-30	14.1	11.7	9.4	19.3	15.7	11.7
30-34	14.9	14.4	11.5	21.7	20.9	16.7
35-39	11.0	14.7	14.1	17.1	18.5	19.9
40-44	13.3	13.9	15.1	12.0	14.2	16.1
45-49	11.9	13.0	14.2	7.8	9.3	12.1
50-54	9.4	11.0	12.9	5.1	6.0	8.2
55-59	7.1	8.2	10.3	2.4	3.1	4.6
60-64	3.9	4.4	5.4	1.0	1.3	2.4
Education						
HS drop-outs	14.0	12.4	6.5	22.2	21.6	18.7
Secondary	51.8	52.0	52.9	56.5	57.2	56.5
Tertiary	33.2	35.6	40.6	21.3	21.2	24.8
Sector						
Agriculture	4.3	3.7	3.7	5.6	6.7	7.8
Construction	11.5	7.9	5.8	22.4	12.5	8.1
Industry	17.5	15.3	14.6	11.8	9.6	9.4
Services	66.8	73.1	75.9	60.2	71.3	74.7
White collar	58.8	63.6	66.6	35.5	40.0	46.2
Temporary rate	28.9	22.3	24.2	55.6	41.7	38.2
Unemployment	8.3	19.1	17.8	11.7	31.0	26.4
rate						

Notes: Pre-crisis: 2005Q1-2008Q2; Crisis: 2008Q3-2013Q2; Postcrisis: 2013Q3-2019Q4. Source: Spanish Labour Force Survey.

natives, although differences decreased over time. Immigrants are also younger than natives (32% are younger than 30, while for natives this fraction is 25%). The share of workers with tertiary education (or college graduates) is lower among immigrants than natives, while the share of high school drop-outs is higher. The share of workers with secondary education is very similar for immigrants and natives.⁶

I divide employed workers between blue and white-collar workers (Llull, 2018), depending on their job occupation (see Table A1 in Appendix E for details on the occupations included in each group). Natives are more concentrated among white-collar occupations than immigrants. Also, the

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Immigrants

Crisis Post-

Table 1: Immigrants and natives characteristics

Pre-

Natives

Crisis

Post-

Pre-

⁴ Figure A14 in Appendix E plots the evolution of the stock of immigrant workers by region of origin.

⁵ I chose this period since 2008Q3 and 2013Q2 are, respectively, first and last quarter with a negative quarterly growth rate of real GDP (ignoring two quarters in 2010 with slightly and temporarily positive rates). This is consistent with the definition of recession by the Spanish Business Cycle Dating Committee.

⁶ Similar to the study by Borjas (2003), I classify individuals into four education groups: high-school drop-outs or less (i.e., primary studies or less), lower secondary education, higher secondary education and a college degree. For the descriptive statistics, I pool the two secondary education categories, as there are no big differences in those two educational levels between immigrants and natives.

share of white-collar workers has increased for both groups after the Great Recession, since many blue-collar occupations became unemployed with the crisis. Immigrants also work more as temporary than natives (in the pre-crisis period, the temporary rate was 29% for natives and 56% for immigrants). As expected, the temporary rate decreased for both groups with the arrival of the crisis, as most of the job destruction was concentrated among workers with temporary contracts.

Most workers, natives and immigrants, are employed in the service sector. We can also see that during the precrisis period, immigrants were more concentrated in the construction sector than natives (23% of immigrants versus 11% of natives), but the difference is lower expected. The plunge in the construction sector employment with the Great Recession is salient: the share of immigrants employed in that sector dropped by 12 percentage points, while for natives the drop was 5 percentage points.

The unemployment rate is higher for immigrants than for natives for the full period. Nonetheless, the unemployment gap skyrocketed after the Great Recession took place. Figure 3 displays natives' and immigrants' unemployment rates, as well as the difference between the two rates. We can observe that from 2005 to 2008 the unemployment rate gap fluctuated around 2–4 p.p. However, after the Great Recession, it raised from 4.7 in 2008Q2 to more than 13 p.p. in 2013. Sectoral composition and differences in observables (education or age) can partially explain immigrants' higher unemployment rate.

In the next section, I disentangle the source of the unemployment rate gap between immigrants and natives from differences in job-finding and job-separation rates: are immigrants more time unemployed because they have a harder time finding jobs or because they lose their jobs more easily? In addition, I examine whether the heterogeneity in the transition flows between the two groups still exists among comparable workers: Is the unemployment gap and the differences in the labour market flow only due to composition effects? Finally, I study if there are differences regarding cyclicality of job-finding and job-separation rates for immigrants and natives.

4.2 Evolution of labour market flows

The longitudinal nature of the data allows us to examine labour market dynamics for immigrants and natives by using the transition rates approach (Elsby et al., 2009, Shimer, 2012, or Silva & Vázquez-Grenno, 2013 for Spain). In particular, I compute the job-finding and job-separation rates from 2005Q1 to 2019Q1. In Appendix A, I also display

the evolution of job-to-job transitions with a change in employer. As my goal is to understand differences in the probability of finding and losing jobs between immigrants and natives, I consider a three-state environment (employment, unemployment, and inactivity). However, given the important role of employment duality in the Spanish labour market, I will also compute job-separation rates by nationality and type of job (temporary versus permanent). Denote by $j = \{N, M\}$ the labour market dynamics of natives and immigrants, respectively. Using the fundamental equations that describe the evolution of the stock of employed, unemployed and inactive workers (denoted as E_i , U_i and I_i , respectively, see Appendix A), the transition rate from unemployment to employment (job-finding rate) and from employment to unemployment (job-separation rate) are computed as follows:

Job-finding rate :
$$\lambda_{j,t}^{UE} = \frac{N_{j,t}^{UE}}{U_{j,t-1}} = \frac{N_{j,t}^{UE}}{N_{j,t}^{UE} + N_{j,t}^{UU} + N_{j,t}^{UI}}$$
, (1)

Job-separation rate:
$$\lambda_{j,t}^{EU} = \frac{N_{j,t}^{EU}}{E_{j,t-1}} = \frac{N_{j,t}^{EU}}{N_{j,t}^{EU} + N_{j,t}^{EE} + N_{j,t}^{EI}}$$
, (2)

where $N_{j,t}^{XY}$ is the number of workers transitioning from state *X* to state *Y* at period *t*.

Figure 4 displays the evolution of immigrants and natives quarterly job-finding and job-separation rates. Before the crisis (from 2005 to mid-2008), the job-finding rate was higher for immigrants than for natives (45 and 35%, respectively). However, after the crisis, both rates converged quickly to a lower level of around 20%. Regarding the evolution of job-separation rate, for all the period, those rates are higher for immigrants than for natives. However, the gap between the two increased significantly after the Great Recession took place in 2008. In particular, the immigrant job-separation rate more than doubled from 208 to 2009 (from 4.5 to 11%). For natives, the rate jumped from 2.3 to 3.8%. These two figures suggest a disruptive change in the job-finding and job-separation rate gap between immigrants and natives with the arrival of the Great Recession.

4.3 Conditional labour market flows

These figures should be viewed with caution as these differences could just be due to differences in experience, sector composition, or type of contract. Since immigrants are younger, work more in temporary jobs, and were more concentrated in the construction sector, the result that the job-separation rate is higher for immigrants than for natives is far from being surprising. Similarly, pre-



Figure 4: Labour market transitions by nationality. Note: The transitions are seasonally adjusted using a 4-quarters moving average, constructed from the Spanish Labour Force Survey-Flows.

crisis differences in the job-finding rate might be also due, in part, to composition effects.

As a first attempt to disentangle how much of the observed differences in transition rates are due to differences in observables, Appendix B provides an exhaustive analysis of the evolution of job-finding and job-separation rates keeping constant some individual characteristics (education, experience, and sex) or job features (occupation, sector, and type of contract). I find that the pattern observed in Figure 4 is regularly repeated within almost all sectors, education categories, experience, occupation, or type of contract.

I compute the evolution of the job-finding and jobseparation rates of immigrants and natives conditional on observable characteristics. For that, I estimate the following linear probability model:

$$UE_{i,t} = \alpha_1 + \alpha_1^m \operatorname{imm}_i + \alpha_1^{my} \operatorname{imm}_i * \operatorname{year}_t + \boldsymbol{\delta} X_{i,t}^1 + \varepsilon_{i,t}^1, \quad (3)$$

$$EU_{i,t} = \alpha_2 + \alpha_2^m \operatorname{imm}_i + \alpha_2^{my} \operatorname{imm}_i * \operatorname{year} + \boldsymbol{\delta} X_{i,t}^2 + \varepsilon_{i,t}^2, \quad (4)$$

where $UE_{i,t}$ ($EU_{i,t}$) is a dummy variable defined only for the unemployed (employed) and takes value 1 if a job is found (lost) at quarter *t* and 0 otherwise; imm_i is a dummy variable that takes the value 1 if the worker is an immigrant and 0 otherwise;⁷ year_t is a dummy variable for the year when the transition took place;⁸ $X_{i,t}^{1}$ is a vector of control variables that includes dummies for education, potential experience, marital status, age, gender, region of residence, occupation, sector of activity,⁹ and year dummies; $X_{i,t}^2$ includes all variables in $X_{i,t}^1$ and it further adds as controls the type of contract (permanent or temporary), type of job (full or partial time) and tenure; $\varepsilon_{i,t}$ is the idiosyncratic error term. The model allows us to compute the evolution of the job-finding and job-separation rates for an immigrant and native worker with the average characteristics of the sample.¹⁰

Figure 5 plots the predicted job-finding (left panel) and job-separation rates (right panel) for an immigrants. One can see that the differences in the job-finding rate between immigrants and natives are unaffected by the inclusion of observables. That is, even for comparable workers, the estimates suggest that before 2008, the job-finding rate was higher for immigrants than for natives, while that positive gap for immigrants vanished after the arrival of the Great Recession. As we can see in the left panel of Figure 5, after 2008, the confidence intervals of the estimation overlap, suggesting that there are no significant differences in the evolution of the job-finding rate of the two groups after that year. As we can see in the right panel of Figure 5, there are also large differences in the probability of moving to unemployment between immigrants and

⁷ The survey does not provide the worker's country of birth, so we define immigrants as workers with foreign nationality.

⁸ I interact the nationality with year dummies instead of quarter dummies to reduce the noise in the estimation due to the small number of unemployment to employment transitions in a given

quarter. The results of the estimation when interacting the nationality and quarter dummies can be found in the Figure in Appendix E.9 In case of unemployment, the sector of activity and occupation is that when the worker was last employed.

¹⁰ Results are robust to estimate the probabilities using a multinomial logit model.

Job-finding Rate

Job-separation Rate



Figure 5: Conditional labour market transitions by nationality. Note: The figure plots the residuals (evaluated at the average at means of other covariates) obtained from the estimation of equations (3) and (4) using a linear probability model. Both regressions include controls for education, potential experience, marital status, age, gender, region of residence, sector of activity, occupation, type of contract (permanent or temporary), type of job (full or partial time), tenure and year dummies. Equations (3) and (4) are estimated using 263,938 and 2,057,896 observations, respectively. The dashes lines report the 95 percent confidence interval on the prediction. Source: Spanish Labour Force Survey-Flows (2005–2019).

natives, even controlling for observable characteristics. However, the figure shows that during the pre-crisis period (2005 and 2006), the differences are smaller than suggested by the unconditional figures. This was expected, given that, as we discussed earlier, immigrants are more concentrated among the low-educated groups or they work more in temporary jobs. Still, the conditional job-separation rate gap between immigrants and natives is found to be large, especially after the crisis. In fact, Figure 5 shows even more clearly that the increase in the job-separation rate was higher for immigrants than for natives after 2007. The estimates suggest that *ceteris paribus*, in 2006, the jobseparation rate was 2% for natives and 3.5% for immigrants, while in 2008, those rates jumped to 4 and 10%, respectively. That is, although the probability of losing jobs doubled for natives, it almost tripled for immigrants. After that, the relative change is very similar for the two groups: from 2008 to 2012, ceteris paribus, the job-separation rate went up from 10 to 12% for immigrants and from 4 to 5.5% for natives.

4.4 Testing the cyclicality of labour market flows

The previous section suggests that the immigrants' transition flows were more sensitive to the outset of the Great Recession, even when controlling for composition effects. In this section, I estimate the following linear probability model to quantify the differential impact of the crisis on the employment transitions of immigrants and natives:

$$UE_{i,t} = \beta_1 + \beta_1^{m} \operatorname{imm}_i + \beta_1^{c} \operatorname{crisis}_t + \beta_1^{mc} \operatorname{imm}_i * \operatorname{crisis}_t + \boldsymbol{\delta}_1 \boldsymbol{X}_{i,t}^1 + \varepsilon_{i,t}^1,$$
(5)

$$EU_{i,t} = \beta_2 + \beta_2^m \operatorname{imm}_i + \beta_2^c \operatorname{crisis}_t + \beta_2^m \operatorname{crisis}_t + \boldsymbol{\delta}_2 \boldsymbol{X}_{i,t}^2 + \varepsilon_{i,t}^2,$$
(6)

where the dummies $UE_{i,t}$, $EU_{i,t}$ and imm_i are defined as earlier; crisis_t is a dummy variable that takes the value 1 for the time interval 2008Q3–2013Q2¹¹ and 0 otherwise; the vectors $X_{i,t}^1$ and $X_{i,t}^2$ includes the same control variables as mentioned earlier; and $\varepsilon_{i,t}$ is the idiosyncratic error term. The coefficients of interest are β_1^{mc} , β_2^{mc} , which are associated with the interaction term of the variables imm_i and crisis_t. Their signs and magnitudes will be used to quantify the differential impact of the crisis on the probability of finding (losing) a job between immigrant and native workers.

The results of the estimation are organised as follows: (a) Tables 2 and 4 displays the coefficients of equations (5) and (6), respectively; (b) using those coefficients, in this table, I computed the predicted job-finding and job-

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¹¹ I chose this period since 2008Q3 and 2013Q2 are the first and the last quarter with a negative quarterly growth rate of real GDP, respectively (ignoring two quarters in 2010 with slightly and temporarily positive rates). The results are robust to move the quarter from which the dummy for crisis starts to take the value 1. Results are also very similar when defining the dummy crisis as taking value 1 for all periods after 2008Q3 and 0 otherwise.

	(1) Imm	(2) (1) + others	(3) (2) + Crisis	(4) (3) + Educ	(5) (4) + Age/Exp	(6) (5) + Sector	(7) (6) + Occ
β_1^m	0.023***	0.021***	0.100***	0.102***	0.100***	0.071***	0.071***
-	(0.002)	(0.002)	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)
β_1^{mc}			-0.088***	-0.088***	-0.087***	-0.074***	-0.073***
			(0.009)	(0.009)	(0.009)	(0.011)	(0.010)
β_1^c			-0.067***	-0.067***	-0.068***	-0.080***	-0.079***
-			(0.008)	(0.008)	(0.008)	(0.010)	(0.010)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Crisis dummy	No	No	Yes	Yes	Yes	Yes	Yes
${\rm Crisis}\times {\rm imm}$	No	No	Yes	Yes	Yes	Yes	Yes
Education	No	No	No	Yes	Yes	Yes	Yes
Age	No	No	No	No	Yes	Yes	Yes
Sector FE	No	No	No	No	No	Yes	Yes
Occupation FE	No	No	No	No	No	No	Yes
Other controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	440,931	440,931	440,931	440,928	440,928	265,117	263,938

Table 2: Estimation results: UE

Note: Regressions of a dummy variable for the transition from unemployment to employment (UE) on dummies for the migration status, crisis and the interaction term of the last two. Column (2) adds as controls gender, marital status, and region dummies. Column (3) add the crisis dummy and the interaction term between crisis and immigrant status. Column (4) adds education controls, while column (5) adds age dummies and potential experience. Column (6) adds sector fixed effects, and column (7) adds occupation fixed effects. The sector of activity and occupation is that when the worker was last employed. Standard errors in parentheses. Significance levels: *p < 0.05, **p < 0.01, ***p < 0.001. Source: Spanish Labour Force Survey-Flows (2005–2019).

separation rates when the dummy crisis equals 0 or 1 alongside with the marginal effect of the dummy crisis.

I start commenting on the results in Table 2. Moving from column (1) to (7), I sequentially add different controls, as displayed in the bottom panel of the Table. I will refer to the last column (column (7)) as the baseline estimation, as it includes all controls referred in the previous section. The baseline estimation delivers an estimated value β_1^{mc} of -0.0079. This value can be interpreted as follows: among comparable workers, during the crisis (2008Q3–2013Q2), the drop in the probability of finding a job was 7.9 p.p. higher for immigrants than for natives. In other words, *ceteris paribus*, the crisis is associated

with a 7.9 p.p. decrease in the job-finding rate for natives (captured by the coefficient β_1^c), while for immigrants, the decrease is 15.2 p.p. (captured by the sum of the coefficients β_1^c and β_1^{mc}). This suggests that the impact of the crisis on the probability of finding a job was more than twice as high for immigrants than for natives.

As we can see in columns (1) and (2), if we do not interact the crisis dummy with the migration status, we would underestimate the job-finding gap between immigrants and natives (2 p.p. in vs 7 p.p in the baseline estimation). The reason is that in this case, the coefficient β_1^m would capture the differences in the probability of finding a job between immigrants and natives both before

	Probability finding a job (UE)			Probability losing a job (EU)		
	Crisis 0	Crisis 1	Marginal effect	Crisis 0	Crisis 1	Marginal effect
Native Immigrant	44.02 48.37	36.11 33.18	-7.91*** -15.18***	3.61 2.59	5.08 7.76	1.47*** 5.18***

Table 3: Adjusted predictions and marginal effect

Note: Adjusted predicted probabilities and marginal effects computed by the linear probability model of equations (5) and (6), estimated with all the control variables (i.e., using the estimation results displayed in column (7) and column (9) of Tables 2 and 4, respectively). The left panel (UE) uses 263,938 observations. The right panel (EU) uses 2,057,896 observations. Significance level: *p < 0.1, *p < 0.05, and ***p < 0.01.

	(1) Imm	(2) (1) + Other	(3) (2) + Crisis	(4) (3) + Educ	(5) (4) + Age/Exp	(6) (5) + Sector	(7) (6) + Occc	(8) (7) + Contr	(9) (8) + Tenure
β_2^m	0.043***	0.044***	0.030***	0.028***	0.022***	0.017***	0.005***	-0.017***	-0.019***
_	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
β_2^{mc}			0.023***	0.028***	0.028***	0.029***	0.030***	0.038***	0.037***
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
β_2^c			0.011***	0.012***	0.013***	0.013***	0.013***	0.015***	0.015***
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Crisis dummy	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
${\sf Crisis}\times{\sf imm}$	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Education	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Age	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Occupation FE	No	No	No	No	No	No	Yes	Yes	Yes
Type contract	No	No	No	No	No	No	No	Yes	Yes
Tenure	No	No	No	No	No	No	No	No	Yes
Other controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,547,652	2,547,652	2,547,652	2,547,651	2,547,651	2,547,535	2,520,966	2,057,896	2,057,896

Table 4: Estimation results: EU

Note: Regressions of a dummy variable for the transition from employment to unemployment (EU) on dummies for the migration status, crisis and the interaction term of the last two. For a description of the controls in columns (1)–(7), see the footnote in Table 2. Column (8) adds the type of contract (temporary or permanent). Column (9) adds tenure and a dummy for part-time. Standard errors in parentheses. Significance levels: *p < 0.05, **p < 0.01, ***p < 0.001. Source: Spanish Labour Force Survey-Flows (2005–2019).

and after the crisis. Therefore, the estimation value would be an average over the period. However, as Figure 4 shows, it is reasonable to think that those differences are not the same before and after 2008. These results provide additional support to the finding of previous sections: (1) before the crisis, immigrants were finding jobs at a higher rate than natives; (2) the impact of the crisis on this rate was more negative for them than for natives.

When comparing the estimated coefficients in columns (1) to those in column (7), one can see that composition effects do not play a big role in explaining the jobfinding rate gap between immigrants and natives. My estimates suggest that the inclusion of sector fixed effects is the only control that significantly changes the value of β_1^m (which is reduced from 0.100 in column (5) to 0.071 in column (6)). The other controls have a very minor impact on the estimation value of both β_1^m , β_1^{mc} and β_1^c .

For a cleaner interpretation of the magnitude of the coefficients, the left panel of Table 3 displays the estimated predicted job-finding probabilities (evaluated at the means of all covariates) for both immigrants and natives before and after the crisis and the marginal effect of the crisis dummy for each group. The estimation suggests that, for an average worker, the pre-crisis predicted value of the job-finding rate was 48.4 and 44.0% for immigrants and natives, respectively. After the crisis,

those rates went down to 36.1 and 33.2%, which implies that the drop in the job-finding rate during the crisis was sizeable: around 45% for immigrants and 22% for natives.

Now I move to the results regarding the job-separation rate, in Table 4. As mentioned earlier, in each column, I sequentially add new controls, with the last column (in this case, column (9)) displaying the coefficients after adding all controls (baseline estimation). The coefficient obtained on β_2^{mc} can be read as follows: for comparable workers, during the crisis (2008Q3-2013Q2), the increase in the probability of losing a job was 3.7 p.p. higher for immigrants than for natives. In other words, ceteris paribus, the crisis is associated with a 1.5 p.p. increase in the job-separation rate for natives (captured by the coefficient β_2^c), while for immigrants, that increase is 5.2 p.p (captured by the sum of the coefficients β_2^c and β_2^{mc}). This suggests that the impact of the crisis on the probability of losing a job was more than three times as high for immigrants than for natives. Comparing columns (3)-(7), one can see that education, experience, sector, and occupational fixed effects barely affect the estimated coefficient of β_2^{mc} . When adding the type of contract as a control variable (column (8)), the coefficient of interest β_2^{mc} becomes higher.

Interestingly, the estimation results suggest that the pre-crisis job-separation rate gap by nationality disappears

after controlling for observables. As shown in columns (1)–(5), after controlling for education, age, sex and experience, the coefficient β_2^m , which captures the pre-crisis jobseparation gap, is reduced by half (from 0.047 to 0.022). The value of β_2^m in columns (6) and (7) shows that the inclusion of sector and occupation fixed effects additional reduce the gap to close to zero (0.005), with the occupation fixed effect driving most of the change. Finally, once we control for the type of contract (column (8)), the unconditional pre-crisis job-separation gap becomes negative, suggesting that the pre-2008 observed job-separation gap was fully explained by composition effects.

As mentioned earlier, for a better interpretation of the results, I move to the right panel of Table 3. I find that the increase in the job-loss probability after the crisis was very large for both groups but much higher for immigrants: everything else equal, it tripled for immigrants (from 2.6 to 7.8), while it was multiplied by 1.4 among natives (from 3.6 to 5.1).

In a robustness check, I run the same regression as in equation (6) but adding an interaction term between the dummy for the crisis and the type of contract, allowing for a different impact of the crisis on the probability of losing a job for temporary and permanent workers. There are good reasons to suspect that this is the case, as workers employed in temporary jobs are less protected and have a higher risk of turnover, specially during an economic downturn (see Figure A7). The column (2) of Table A2 (in Appendix E) displays the results. As expected, the coefficient associated with the interaction term between the temporary contract and the crisis dummy is positive (0.04) and significant. Also, allowing for this interaction reduces the magnitude of the coefficient β_2^{mc} (0.025 vs 0.037 in the baseline). In other words, the baseline estimation of β_2^{mc} (in column (9) of Table 4) may suffer from a slight upward bias if we do not allow for the possibility of a higher impact of the crisis on the job-separation probability for temporary workers. This result is reasonable, as immigrants worked more in temporary jobs than natives.¹² Still,

with these new estimates, the analysis on the adjusted predicted probabilities shows that *ceteris paribus*, the impact of the crisis on the job-separation probability was 2.8 times as high for immigrants than for natives (see Table A3 in Appendix E).

5 Real wage cyclicality: immigrants versus natives

5.1 Data

Since the Spanish Labour Force Survey does not provide information on wages, in this section, I use Spanish administrative data from the Continuous Sample of Working Histories (Muestra Continua de Vidas Laborales, MCVL hereinafter) on earnings and working histories of workers. The MCVL consists of a 4% representative random sample of all workers affiliated (working, receiving a public pension, or being registered as unemployed) with the social security administration in the year of the publication of the dataset. The data were released in 2004, and after that year, it follows the same sample of individuals over time, adding new observations each year to replace exiting workers while keeping the sample representative of the population. Furthermore, the data provides retroactive information on the workers' entire labour market history. That is, as long as an individual registers one day of activity with social security in any year between 2005-2019 (which is the last year that I include in the analysis), her complete working life history can be recovered up to 1981.

Along with the job history, for each individual, a large amount of information is available, including personal and demographic characteristics (age, gender, education, nationality, region of residence), firm information at the establishment level (location, size), and labour market information (industry, occupation, type of contract). The unit of observation in the data is any change in the individual's labour market status or any modification in job characteristics. Importantly, it also provides earnings data, in nominal terms. As explained in the study by De la Roca (2014), wages are available for all workers, but some observations are censored. I deflate wages using the consumer price index (base year 2015) provided by the Spanish Statistical Office (INE).

¹² Similarly, I also add an interaction term between the dummy for the crisis and the sector of activity dummies (column (3) in Table A2), which allows for heterogeneous effects of the crisis on the job-separation probability by sector. This is a reasonable assumption given the nature of the Spanish crisis and, in particular, given the key role played by the construction sector in driving the increase in the unemployment rate. As expected, the coefficient associated with the interaction term between the construction sector and the crisis dummy is positive (0.020) and highly significant. Also, allowing for this interaction additionally reduces the magnitude of the coefficient β_2^{mc} (0.025 vs 0.037 in the baseline), as immigrants were more

concentrated among the construction sector, specially before the Great Recession.

I construct a panel with monthly observations for the period 1999-2019. I start with the most updated version of the sample, which is the 2019 edition. After processing the social security and census records of individuals contained in the 2019 edition of the MCVL, we turn to the 2018 edition and extract the social security and census records of the individuals contained in this edition but absent from the 2019 edition. I do the same for the subsequent editions (2017–2005). The initial sample is a monthly data set of individuals who have worked at any time between January 1999 and December 2019. I restrict this sample to workers aged 20-60 during that period. I focus on salaried employment, dropping from the sample unemployment spells and self-employed. Finally, I restrict to workers who had worked the full month with the same establishment. These restrictions reduce the sample to 683,624 individuals and 75,060,205 monthly observations.

5.1.2 Descriptive statistics

This section summarizes the main characteristics of the sample included in the MCVL, presenting the results for immigrants and natives. Again, I identify immigrants as workers of foreign nationality. In the sample, immigrants account for 20.34% of individuals, and 9.37% of the monthly observations.13 As mentioned earlier, all statistics are displayed in Table A4 (in Appendix E) dividing the sample period into three phases: pre-crisis (1999Q1-2008Q2), crisis (2008Q3-2013Q2), and post-crisis (20013Q3-2019Q4).14

In the MCVL, I split workers into three education groups: low secondary education or less (i.e., primary education and lower secondary education), high secondary education, and college education.¹⁵ Immigrants are more concentrated among the low educated groups,

and they are more time employed as temporary. Workers' sectoral composition is very similar to the sample of the Spanish Labour Force Survey, with most of the workers employed in the service sector, and a higher share of immigrants working in construction, especially during the pre-crisis period (see Table A4 in Appendix E for details on the numbers).

I construct a variable specifying the number of days that a worker has been employed for a given establishment.¹⁶ Similar to the studies by De la Roca (2014) and Font et al. (2015), I classify employed workers into six tenure categories: (1) workers employed less than 1 year who came from unemployment or inactivity (newly hired); (2) workers employed less than 1 year who came from an employment spell (job movers); (3) workers 1-2 years of tenure; (4) 2-4 years; (5) 4-6 years; and (6) more than 6 years of tenure. As we can see in Table 5, immigrant workers are more concentrated among the lowtenure groups than natives. During the pre-crisis period, 60% of employed immigrants were working in firms with less than 1 year of tenure, while that share was around 30% among natives. Similarly, natives are overrepresented in the highest group of tenure: during the whole sample period, 30% of natives are working in establishments with more than 6 years of tenure, for only 5% among immigrants.

5.2 Monthly average wage

The left panel of Figure 6 plots the evolution of the monthly wage for immigrants and natives, while the right panel displays the wage premium.¹⁷ First, the monthly average wage is higher for natives than immigrants. Second, the average wage of immigrants grew at a slower rate throughout the full period. In particular, in 1999, the average native wage was around 20% higher than for

¹³ The discrepancy is explained by the fact that immigrants have shorter labour market career than natives (since they arrive late to Spain), and hence, the sum of employment and unemployment spell must be lower.

¹⁴ Notice that the pre-crisis period here is larger, as for the Spanish Labour Force Survey-Flows, I had to restrict my analysis to the period 2005Q1, see Section 4.1.

¹⁵ Unfortunately, these educational groups can not be directly compared with those of the Spanish Labour Force Survey, as the administrative data do not distinguish between primary graduates and low secondary education. Also this is the reason why the lower educational level is overestimated compared to Table 1.

¹⁶ This variable counts the number of days accumulated in an establishment throughout a worker's career. That is, if he leaves the establishment and then returns, the tenure starts from its former level. De la Roca (2014) also considers the alternative of counting every return as a new spell, and he founds very similar results. That is why I abstract from that case.

¹⁷ Throughout the article, I indistinctively use the term wage premium and wage gap to refer to the wage differential between immigrants and natives. It is computed as $(\bar{w}_{N,t}/\bar{w}_{M,t} - 1)$, where $\bar{w}_{j,t}$ is the monthly average wage for natives j = N and immigrants j = M at month *t*.

	Natives			Immigrants		
	Pre-crisis	Crisis	Post-crisis	Pre-crisis	Crisis	Post-crisis
Tenure group						
Newly hired	11.1	9.1	8.6	13.4	14.4	13.9
Job movers	21.5	12.1	11.8	46.3	26.0	22.4
1–2 years	18.1	14.3	12.6	21.3	21.0	18.9
2-4 years	19.9	20.5	16.2	13.7	22.7	19.6
4–6 years	10.7	14.2	11.0	3.6	9.9	10.2
>6 years	18.6	29.8	39.9	1.8	6.0	14.9

Table 5: Job tenure categories by nationality

Note: The newly hired group includes workers employed with less than 1 year of tenure that came from unemployment or inactivity. The job movers group includes workers employed with less than 1 year of tenure and who came from an employment spell. Pre-crisis: 1999Q1–2008Q2; Crisis: 2008Q3–2013Q2; Post-crisis: 2013Q3–2019Q4. Source: MCVL.



Figure 6: Monthly real wage by nationality. Note: The wage premium is computed as $(\bar{w}_{N,t}/\bar{w}_{M,t} - 1)$, where $\bar{w}_{j,t}$ is the monthly average wage for natives j = N and immigrants j = M at month t. Wages are seasonally adjusted by taking out the coefficient of the monthly dummies from an OLS regression. Source: MCVL.

immigrants, while that difference increased to 30% in 2008 and more than 50% in 2015. Afterwards, the gap has been reduced to around 40% at the end of 2019 (right panel of Figure 6). Figure 6 also shows that with the arrival of the crisis (mid-2008), the average wage of immigrants stopped growing, while that of natives was less affected. As a consequence, the wage premium increased by 20 p.p. from 2008 to 2015.

Real wage heterogeneity by nationality could be partially explained by differences in observables between immigrants and natives, as immigrants are more concentrated among low-educated and low-tenure groups, work more as temporary and were more concentrated in the construction section (see Table 5 and Table A4 in Appendix E). In particular, the literature has shown that tenure is a very important determinant of wage cyclicality (De la Roca, 2014).¹⁸ Thus, the higher wage sensitivity among immigrant workers could be explained by the fact that immigrants are more concentrated among low-tenure categories (newly hired and job movers). In Appendix C, I try to provide empirical support for this hypothesis by comparing natives-immigrants monthly average real wage among workers who stayed employed

¹⁸ As stated in the study by De la Roca (2014), wages among newly hired workers are more sensitive to changes in the aggregate economic conditions, as they are not as subject to re-negotiation agreements and other forms of wage-bargaining rigidities. Similarly, from an employer point of view, it seems easier to implement wage cuts among less-tenure employers.



Figure 7: Monthly average wage by nationality and sector. Note: The wage premium is computed as $(\bar{w}_{N,t}/\bar{w}_{M,t} - 1)$, where $\bar{w}_{j,t}$ is the monthly average wage for natives j = N and immigrants j = M at month t. Wage premium is normalised to 100 at 2008Q1. Wages are seasonally adjusted by taking out the coefficient of the monthly dummies from an OLS regression. Source: MCVL.

in the same establishment from January 2007 to December 2012 (without any unemployment spell or change in employer). I find almost no differences in the cyclicality of wages between immigrants and natives (Figure A9 in Appendix C), suggesting that a significant part of the drop in the average wage of immigrants may be due to job changers or newly formed jobs.

As an alternative attempt to disentangle how important are differences in observables to explain differences in the overall wage cyclicality, in Appendix D, I examine the evolution of real wages keeping constant some individual or job characteristics (education, sector, type of contract, and gender). Overall, the figures suggest that wage sensitivity during the Great Recession (from 2007 to 2012), is not very different among natives and immigrants once you control for differences in observables. For illustrative purposes, I focus on the results for the sectoral composition. As shown in Figure 7, the evolution of wages follows a similar pattern in all sectors: higher wages for natives than immigrants, with the gap growing during the expansion. After the Great Recession, the wage gap remained constant in both the industry and services sectors (where it dropped), and there was a small increase in the construction, where the decrease in immigrant wages was higher than for natives, especially in the period 2009–2013 (bottom panel of Figure 7).

5.2.1 Tenure

Given the key role played by the work tenure in shaping wage cyclicality, in this section, I look at the evolution of wages by nationality within each tenure group. Figure 8 plots the time series of real wages for each tenure category defined in Section 5.1.2 and wage premium between immigrants and natives. As expected, wage sensitivity is higher among the low-tenure groups, especially during the Great Recession. For all the tenure categories, we find that the average wage gap between immigrants and natives was close to zero in 1999, but it widens over the expansionary period (1999-2007). Finally, Figure 8 also suggests that during the Great Recession, differences regarding average wage drop between immigrants and natives are higher among the low-tenure groups. This can be seen by looking at the evolution of the wage premium: we see a significant acceleration of this indicator from 2007 among the low-tenure groups, especially for job movers (top right panel) and workers with 1-2 years of tenure (middle left panel). On the opposite, among the high-tenure groups (bottom panel), we observe fewer differences between immigrants and natives after the Great Recession. Somehow striking is the evolution of the wage premium for workers with 2-4 work tenure, as it remained almost constant from 2007 to 2013, and it suddenly increased by around 20% in only 1 year.

5.3 Regression approach

The previous section suggests that wage cyclicality is not much different among immigrant and native workers once one takes into account differences in observables (education, sector of work, type of contract, and job tenure). To test this hypothesis, I estimate a monthly wage equation of the following form:

$$\ln w_{i,t} = \alpha_i + \boldsymbol{\delta}_1 \boldsymbol{X}_{i,t}^1 + \gamma_1 \boldsymbol{U}_t + \gamma_2 T + \varepsilon_{i,t}, \quad (7)$$

where ln $w_{i,t}$ is the log real monthly wage of worker *i* in period *t* (where *t* is a year-month pair); α_i is a worker fixed effect; $X_{i,t}^1$ are worker and job characteristics; U_t is the cyclical variable (which is the unemployment rate); *T* is a linear time trend; and $\varepsilon_{i,t}$ is the error term with zero mean and constant variance. Worker fixed effects are introduced to address the workforce composition bias that originates along the different phases of the business cycle (Solon, Barsky, & Parker, 1994). As discussed by De la Roca (2014), the most standard approach to overcome the composition bias is to estimate the wage equation in first differences (Bils, 1985; Devereux & Hart, 2006; Gertler,

Huckfeldt, & Trigari, 2016; Solon et al., 1994). However, I follow De la Roca (2014) and run the model in levels to include in the regression also workers who just moved from unemployment to employment in a given month.

The coefficient y_1 of equation (7) identifies changes in our cyclical variable (in this case the unemployment rate) with changes in wages. However, since in a given month all workers are exposed to the same level of unemployment, the standard error of the coefficient of y_1 would be underestimated in the presence of time-specific errors (Moulton, 1986). To overcome that issue, I follow De la Roca (2014) by taking a two-steps procedure to transform equation (7) into the following two equations:

$$\ln w_{i,t} = \alpha_i + \delta_1 X_{i,t}^1 + \sum_{t=1}^{I} \beta_t D_t + e_{i,t}, \qquad (8)$$

$$\hat{\beta}_t = \phi_0 + \phi_1 U_t + \phi_2 t + \eta_t. \tag{9}$$

In the first stage, I estimate equation (8), which includes a dummy for each year-quarter combination.¹⁹ As the goal is to track down differences in the wage cyclicality by worker nationality, this first stage equation is estimated separately for the sample of immigrants and native workers.²⁰ The estimated set of coefficients $\hat{\beta}_{t}$ captures variations in wages that are free from observed characteristics and time-invariant unobserved individual heterogeneity. In my estimations, the vector of time-varying worker and job characteristics $X_{i,t}^1$ includes the age, the square of the age, the type of contract, tenure, the square of tenure, and dummies for the sector. To account for heterogeneity in the wage sensitivity between immigrants and natives among different tenure groups, I also estimate equation (8) by including an interaction term between tenure groups and the year-quarter combinations.

In the second stage, equation (9), I regress the estimated year-quarter coefficients $\hat{\beta}_t$ on the cyclical variable, which is the yearly lagged quarterly unemployment rate,²¹ and linear trend *T*. Therefore, the standard error of the new coefficient of interest ϕ_1 is now free from the

¹⁹ Wages are observed monthly, but the unemployment rate is calculated quarterly.

²⁰ An alternative is to modify equation (8) by including an interaction term between the year-quarter combinations and a dummy for the worker nationality and estimate the equation for the entire pool of native and immigrant workers. Given the large size of the sample of both immigrants and natives, both approaches deliver very similar results (see Table A5 in Appendix E).

²¹ This is standard in the literature. As argued in Font et al. (2015), wages are usually not able to adjust contemporaneously to cyclical shocks as most wages are set 1 year in advance. This is particularly



Figure 8: Monthly average wage by nationality and tenure. Note: The wage premium is computed as $(\bar{w}_{N,t}/\bar{w}_{M,t} - 1)$, where $\bar{w}_{j,t}$ is the monthly average wage for natives j = N and immigrants j = M at month t. Wage premium is normalised to 100 at 2008Q1. Wages are seasonally adjusted by taking out the coefficient of the monthly dummies from an OLS regression. Source: MCVL.

aggregate bias present in equation (7) (De la Roca, 2014). The coefficient ϕ_1 captures the semi-elasticity of wages with respect to the unemployment rate: the higher and more negative it is, the more pro-cyclical real wages are. Conversely, a positive value would imply that real wages are counter cyclical.

5.3.1 Results

The first row of Table 6 displays the estimation results of the coefficient of interest ϕ_1 for immigrants and natives. Wage cyclicality is higher for immigrants than for natives:

a one percentage point increase in the unemployment rate is associated with a 0.62% decrease in native real wages, while for immigrants, the decrease is 0.85%. My results are slightly higher than those reported by De la Roca (2014) and Font et al. (2015). The main reason is that their sample is restricted to years before 2011 and 2013, respectively, and from Section 5.2, we show that much of the action in real wages is observed after 2012. Nevertheless, overall, my results suggest a very low degree of real wage cyclicality, especially compared to developed countries, where estimates tend to find semi-elasticities above 1 (see Pissarides, 2009 for a summary of most available studies for the United States, France, Germany, the United Kingdom, Portugal, or Italy).

I follow De la Roca (2014) and estimate wage sensitivity differences between immigrants and natives within tenure categories. For that, I modify equation (8) by

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relevant in Spain, where firm-level indexation is widespread (Bentolila et al., 2012; Babecky et al., 2010).

 Table 6: Wage cyclicality for selected samples

	Natives	Immigrants
All workers	-0.618***	-0.851***
Newly hired	-1.101***	-1.234***
Job movers	-0.947***	-1.139***
1–2	-0.845***	-1.016***
2-4	-0.591***	-0.785***
4-6	-0.396***	-0.420***
>6	-0.320***	-0.185***
Observations (first stage)	65,918,800	7,009,146

Note: Estimation results of the coefficient ϕ_1 in equation (9). Each coefficient is obtained from a different second-stage regression, where the dependent variable is the year-quarter coefficients obtained in the first-stage and the regressor is the yearly lagged quarterly unemployment rate. All second-stage regressions have 83 quarterly observations (1999:1 to 2019:4) and include a constant term, a linear time trend and quarter indicators. Significance levels: *p < 0.1, **p < 0.05, ***p < 0.01. Source: MCVL.

including an interaction term between the year-quarter combinations and a dummy for the tenure category. Now, the second stage equation (9) regresses the estimated year-quarter indicator coefficients β_t for each tenure group on the yearly lagged quarterly unemployment rate U_t and the linear time-trend *T*. Again, we run these two-steps procedures differently for our sample of immigrants and natives.

The lower panel of Table 6 shows the cyclicality of each tenure group for natives and immigrants. As expected, real wage cyclicality is higher among low-tenure groups. In particular, the newly hired workers is the group with the highest coefficient: for natives, a one percentage point increase in the unemployment rate is associated with a 1.10% decrease in the newly hired real wage. Regarding

Table 7: Wage cyclicality along the business cycle

Natives	Immigrants
-0.591***	-0.751***
-0.606***	-0.767***
-0.985***	-1.067***
-0.642***	-0.794***
65,918,800	7,009,146
	Natives -0.591*** -0.606*** -0.985*** -0.642*** 65,918,800

Note: Estimation results of the coefficient ϕ_1 in equation (9). Each coefficient is obtained from a different second-stage regression where the dependent variable is the year-quarter coefficients obtained in the first-stage and the regressor is the yearly lagged quarterly unemployment rate. All second-stage regressions have 83 quarterly observations (1999:1 to 2019:4) and include a constant term, a linear time trend and quarter indicators. Significance levels: *p < 0.1, **p < 0.05, ***p < 0.01. Source: MCVL.

differences by nationality, we see that wage cyclicality is higher for immigrants than for natives only in the lowtenure groups (newly hired, job movers, and workers with 1-2 years of tenure). Among workers with more than 2 years of work tenure in the establishment, wage cyclicality is roughly the same (or even higher in the case of more than 6 years) for natives than for immigrants.

Finally, I investigate the existence of wage sensitivity asymmetries along the business cycle. In particular, I want to test (1) whether the real wage is more sensitive to positive or negative changes in the unemployment rate; and (2) if we observe differences in real wage sensitivity before and after the Great Recession. To test for those two hypotheses, in the second stage of the estimation, I interact the yearly quarter unemployment rate with (1) a dummy that equals 1 if changes in the unemployment rate are positive and (2) a dummy that equals 1 if $t \ge 2008Q3$.

Table 7 shows the results for each of the specifications. I find small differences regarding the wage sensitivity to positive and negative changes in the unemployment rate (among natives, semi elasticity of -0.60 to negative changes and -0.61 to positive change, top-panel of Table 7). Moreover, as mentioned earlier, real wage sensitivity is higher among immigrants in both cases.

The bottom panel of Table 7 shows that real wages were more responsive during the expansion than after the Great Recession, for both immigrants and natives (bottom panel of Table 7), suggesting the existence of a certain degree of downward wage rigidity during the last recession.

6 Conclusion

This article examines the cyclicality of real wages, jobfinding, and job-separation rates for immigrants and natives, using data from Spain for the period 1999–2019. I find that before the Great Recession (pre-2008), job-finding rates were higher for immigrants than for natives, but after the crisis, both rates converged to a lower level. The unconditional jobseparation rate was always higher for immigrants than for natives, but the gap increased after the Great Recession. I show that these patterns are not explained by composition effects: *ceteris paribus* the impact of the Great Recession on the probability of losing (finding) a job was three times (twice) as high for immigrants than for natives. I find that wage cyclicality is also higher for immigrants: a one percentage point increase in the unemployment rate is associated with a 0.61% decrease in natives' real wages and with a 0.85% decrease for immigrants. However, differences only occur among low-tenure workers (less than 2 years of tenure in the firm). Overall my results suggest a low degree of real wage sensitivity compared to other developed countries.

The empirical literature studying labour market outcomes of immigrants has commonly highlighted the existence of a gap between immigrant and native workers in terms of employment probabilities and prospective wages. My results confirm these findings. However, they also reveal that the gap can be significantly amplified during a recession, especially regarding unemployment hazards. The literature has also overlooked the sources explaining the unemployment differential between immigrants and natives. Taking the transition rates' approach, I present new empirical evidence showing that the differential is mainly due to differences in the job-separation rate.

The empirical evidence provided in this article might be also useful for policymakers to design targeted policies aimed at mitigating the effect of the economic crisis on the unemployment prospect of immigrants, arguably one of the most vulnerable groups of workers. In particular, my results confirm that the last recession came along with a dramatic increase in job separations (and hence unemployment), while wages were less sensitive. This apparent dichotomy is especially striking among immigrants. To the extent that a major goal of policymakers is minimising workers' unemployment risk, promoting wage flexibility or providing firms with an effective tool for adjusting production to economic downturns (which could prevent them from resorting to employment reductions) could be adequate before a new crisis occurs.

This article is a step forward in understanding the interaction between economic cycles and the impact of immigration. The finding that immigrants were highly sensitive to the last recession may have implications on the overall labour market effect of immigrants. Further research is needed to assess and identify the underlying mechanisms explaining the heterogeneous impact of economic cycles on the labour market performance by nationality, and the implications of this heterogeneity on (1) the impact of the economic cycle on unemployment and other macroeconomic aggregates; (2) the overall impact of immigrant inflows on natives' labour market outcomes.

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Appendix

A Methodology: Labour Market Flows

Consider a three-state environment (employment, unemployment, and inactivity). Denote by $j = \{N, M\}$ the labour market dynamics of natives and immigrants, respectively. To analyse labour market dynamics, I use the following fundamental equations that describe the evolution of the stock of employed, unemployed, and inactive workers (denoted as E_i , U_i and I_i , respectively):

$$\Delta E_{j,t} = \lambda_{j,t}^{UE} U_{j,t-1} + \lambda_{j,t}^{IE} I_{j,t-1} - (\lambda_{j,t}^{EU} + \lambda_{j,t}^{EI}) E_{j,t-1}, \quad (A.1)$$

$$\Delta U_{j,t} = \lambda_{j,t}^{EU} E_{j,t-1} + \lambda_{j,t}^{IU} I_{j,t-1} - (\lambda_{j,t}^{UE} + \lambda_{j,t}^{UI}) E_{j,t-1}, \quad (A.2)$$

$$\Delta I_{j,t} = \lambda_{j,t}^{UI} U_{j,t-1} + \lambda_{j,t}^{EI} E_{j,t-1} - (\lambda_{j,t}^{IE} + \lambda_{j,t}^{IU}) E_{j,t-1}, \quad (A.3)$$

where $\lambda_{j,t}^{XY}$ is the transition probability of moving from state *X* in quarter *t* – 1 to state *Y* in quarter *t*, for worker of nationality *j*, where *X*, *Y* = {*E*, *U*, *I*}.

These transition probabilities (transition rates) are calculated as a fraction of the flows from *X* to *Y* and the total number of workers in state *X* at quarter t - 1. I will focus my analysis on the evolution of the transition rate from unemployment to employment (job-finding rate) and from employment to unemployment (job-separation rate). Using the definition stated earlier, these rates are computed as follows:

Job-finding rate :
$$\lambda_{j,t}^{UE} = \frac{N_{j,t}^{UE}}{U_{j,t-1}} = \frac{N_{j,t}^{UE}}{N_{j,t}^{UE} + N_{j,t}^{UU} + N_{j,t}^{UI}}$$
, (A.4)

Job-separation rate: $\lambda_{j,t}^{EU} = \frac{N_{j,t}^{EU}}{E_{j,t-1}} = \frac{N_{j,t}^{EU}}{N_{j,t}^{EU} + N_{j,t}^{EE} + N_{j,t}^{EI}}$, (A.5)

where $N_{j,t}^{XY}$ is the number of workers transitioning from state *X* to state *Y* at period *t*.

A1 Job to Job Transitions

Equation (A.1), that describes the evolution of the stock of employed workers (E_j) , can also be written as follows:

$$E_{j,t} = \lambda_{j,t}^{UE} U_{j,t-1} + \lambda_{j,t}^{IE} I_{j,t-1} - \underbrace{(1 - \lambda_{j,t}^{EU} + \lambda_{j,t}^{EI})}_{\lambda_{j,t}^{EE}} E_{j,t-1},$$
(A.6)

where $\lambda_{j,t}^{EE}$ is the transition probability of moving from employment in quarter t - 1 to employment in quarter t, for worker of nationality j.

We can split this transition probability as follows:

$$\lambda_{j,t}^{EE} = \lambda_{j,t}^{EE_{sf}} + \lambda_{j,t}^{EE_{df}}, \qquad (A.7)$$



Figure A1: Job-to-Job transition rate, different employer. Notes: The transitions are seasonally adjusted using a 4-quarters moving average, constructed from the Spanish Labour Force Survey-Flows.

where $\lambda_{j,t}^{EE_{sf}}$ and $\lambda_{j,t}^{EE_{df}}$ are the transition probability of moving from employment in quarter t - 1 to employment in quarter t with the same employer, or different employer, respectively.

Similar to 2, these rates are computed as follows:

Job-to jo rate, different employer:

$$\lambda_{j,t}^{EE_{df}} = \frac{N_{j,t}^{EE_{df}}}{E_{j,t-1}} = \frac{N_{j,t}^{EE_{d}f}}{N_{j,t}^{EU} + N_{j,t}^{EE} + N_{j,t}^{IE}},$$
(A.8)

where $N_{j,t}^{XY}$ is the number of workers transitioning from state *X* to state *Y* at period *t*, and $N_{j,t}^{EE_{df}}$ is the number of workers transition from employment to employment but with a different in the employer (Figure A1).

B Cyclicality of Labour Market Flows by Worker/Job Characteristics

B1 Education

As the second row of Table 1 shows, the share of workers with at most primary education is higher among immigrants than natives, whereas the share of highly educated workers is lower among them. Arguably, less-educated workers are more vulnerable to the recession. Therefore, when comparing the impact of the crisis on the jobfinding and job-separation rates for the two subgroups,

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Figure A2: Labour market transitions by nationality and education attainment. (a) Job-finding rate. (b) Job-separation rate. Note: The transitions are seasonally adjusted using a 4-quarters moving average, constructed from the Spanish Labour Force Survey-Flows.

Table A1: Blue collar-white collar classification

A. Blue collar

Skilled agricultural and fishery workers Craftsmen Plant and machine operators and assemblers **Elementary occupations**

B. White collar

Legislators, senior officials, and managers Professionals Technicians and associate professionals Clerks Service workers and shop and market sales workers

Note: Groups are based on the International Standard Classification of Occupations (ISCO-88).

we should control for those differences in the educational attainment.

Figure A2 plots the job-finding and job-separation rates by education attainment. The evolution of the jobfinding rate (Panel A) for the lower qualification (primary educated and low-secondary graduates) displays a similar pattern as to when considering the entire pool of workers (in Figure 4). That is before the crisis low skilled immigrants found jobs faster than natives. However, job-finding rates converged very fast after 2008. Panel B shows that immigrants' job-separation rate increased more with the arrival of the Great Recession. The bottom panel of Figure A2 displays the results for tertiary-educated workers. In this case, the evolution of the job-finding rate is slightly different. In fact, we can see that when considering highly educated workers, the pre-crisis differences in the jobfinding rate between immigrants and natives disappear. However, the same pattern is found regarding the jobseparation rate: a large increase in immigrants' separations, steeper than for natives. Overall, differences persist within groups.

B2 Experience

Immigrants are younger and, therefore, have less work experience than natives, which could partially explain their labour market flows cyclical differences. To examine this hypothesis, I divide the sample into eight 5-year experience groups and show that within each experience group, we again observe the previous patterns. One limitation of the data, common in the literature, is that it does not provide any measure of work experience. Following Borjas (2003) and Ottaviano and Peri (2012), I approximate work experience by the difference between age and the age at which the individual finished her

	(1) Baseline	(2) (1) + Contract × Crisis	(3) (2) + Sector × Crisis	(4) (3) + Occ × Crisis
β_2^m	-0.019***	-0.016***	-0.014***	-0.014***
	(0.001)	(0.001)	(0.001)	(0.001)
β_2^{mc}	0.037***	0.029***	0.025***	0.025***
	(0.002)	(0.002)	(0.002)	(0.002)
β_2^c	0.015***	0.006***	0.019***	0.007*
-	(0.001)	(0.001)	(0.002)	(0.004)
Temporary $ imes$ Crisis		0.037***	0.034***	0.033***
$\textbf{Construction} \times \textbf{Crisis}$			0.025***	0.020***
Baseline Controls	Yes	Yes	Yes	Yes
Contract × Crisis	No	Yes	Yes	Yes
Sector × Crisis	No	No	Yes	Yes
Occupation × Crisis	No	No	No	Yes
Observations	2,057,896	2,057,896	2,057,896	2,057,896

Table A2: Estimation results: EU. Robustness checks

Note: Regressions of a dummy variable for the transition from employment to unemployment (EU) on dummies for the migration status, crisis, and the interaction term of the last two. The column (1) displays the result of the baseline estimation (i.e., the results presented in column (9) of Table 4). Standard errors in parentheses. Columns (2) adds to the baseline controls an interaction term between the type of contract and the crisis dummy. Column (3) adds as controls also an interaction term between the sector of activity and the crisis dummy; and column (4) additionally adds an interaction between the occupation and the crisis dummy. Significance levels: p < 0.05, p < 0.01, ***p < 0.001. Source: Spanish Labour Force Survey-Flows (2005–2019).

 Table A3:
 Adjusted predictions and marginal effect. Robustness check

	F	Probability losing a job (EU)				
	Crisis 0	Crisis 1	Marginal effect			
Native Immigrant	3.69 3.01	5.02 6.89	1.34*** 3.79***			

Note: Adjusted predicted probabilities and marginal effects computed by the linear probability model of equation (6), estimated with the control variables in the baseline estimation and adding interaction terms between the type of contract and the crisis dummy, the sector of activity and the crisis dummy, and the occupation and the crisis dummy (i.e., using the estimation results displayed in column (4) of Table A2). The estimation uses 2,057,896 observations. Significance level: *p < 0.1, **p < 0.05, ***p < 0.01.

studies. Figures A3 and A4 plot the evolution of the jobfinding and job-separation rates for four selected experience groups (the two lowest and the two highest), for immigrants and natives. Within each experience group, the job-finding rate (Figures A3) is higher for immigrants than for natives in the pre-crisis period. After 2008, we again observe that the job-finding rate gap between immigrants and natives vanished as both rates converge to a similar and low level during the recession.

Concerning the job-separation rate, again we find a similar pattern for all groups of potential experience: higher job-separation rates for immigrants than for natives before the crisis, with a hike in that job-separation gap after the Great Recession took place in 2008. However,

	Natives	Immigrants
All workers	-0.652***	-0.978***
Newly hired	-1.104***	-1.322***
Job movers	-0.952***	-1.242***
1–2	-0.851***	-1.054***
2-4	-0.562***	-0.752***
4-6	-0.397***	-0.421***
>6	-0.345***	-0.175***
Observations (first stage)	65,918,800	7,009,146

Note: Estimation results of the coefficient ϕ_1 in equation (9). Each coefficient is a separate second stage regression of the estimated year-quarter coefficients on the yearly lagged quarterly unemployment rate. All second stage regressions have 87 quarterly observations (1999:1 to 2019:4) and include a constant term, a linear time trend and quarter indicators. Significance levels: *p < 0.1, **p < 0.05, ***p < 0.01. Source: MCVL.

there are some differences among experience groups. Specifically, the right bottom panel of Figure A4 suggests that the largest differences regarding the impact of the crisis on job-separation rates between immigrants and natives are found among workers with more than 35 years of experience (right bottom panel). Conversely, data suggests that the impact of the crisis for groups with lower worker experience is more similar between immigrants and natives. That is, job-separation rates of low-experienced immigrants and natives did not diverge as much as the most experienced ones after the Great Recession took place.

Table A4:	Immigrants and	natives	characteristics
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	Natives			Immigrants		
	Pre-crisis	Crisis	Post-crisis	Pre-crisis	Crisis	Post-crisis
Male	53.5	49.4	49.1	58.5	51.3	50,2
Average age	39.6	40.6	41.4	34.5	35.7	37.3
Education						
High-school drop-out	45.4	43.0	42.7	64.4	63.1	62.0
Secondary	31.3	29.7	28.9	24.9	23.2	21.3
Tertiary	23.4	27.4	28.4	10.7	13.7	16.7
Sector						
Agriculture	0.6	0.6	0.6	1.5	1.4	1.6
Construction	10.7	6.7	4.2	23.0	12.2	6.9
Industry	16.4	14.1	14.8	12.2	10.9	12.9
Services	72.3	78.5	80.4	63.2	75.5	78.5
Temporary rate	42.4	29.5	28.0	62.8	46.6	39.0
Monthly wage	1591.3	1725.0	1765.3	1222.4	1215.5	1237.2

Source: MCVL.

Less than 5 years

5-10 years



Figure A3: Job-finding rate by nationality and experience. Note: The transitions are seasonally adjusted using a 4-quarters moving average, constructed from the Spanish Labour Force Survey-Flows.

B3 Sector

As discussed in this Section 4.1.1, immigrants' employment was more concentrated than natives' in the construction sector during the expansionary period. Arguably, this sector was the most affected by the crisis, and hence, immigrants' concentration in construction could be a potential explanation for the steeper increase in the immigrants' job-separation relative to natives. Figures A5 and A6 display the evolution of the two transition flows for both immigrants and natives by sector of activity.

Figure A5 shows that in all sectors of activity the jobfinding rate was higher for immigrants than for natives in the pre-crisis period. Also, we find the same fast drop in the gap after 2008. That is, patterns are very similar to those for low skilled (Figure A2) or more experienced workers (Figure A3).

Regarding the cyclicality of the job-separation rate by sector of activity, Figure A6 shows that within the construction sector, for all periods, the job-separation rate has been higher for immigrants than natives. Moreover, we find the same pattern as to when pooling all workers: a large increase in the job-separation rate of immigrants, while for natives, it increased by a smaller magnitude. The same pattern is found for the other sectors. Results, therefore, suggest that the story that immigrants were more affected by the crisis only because they were more concentrated in the construction sector is not supported by the data: in all sectors of activity, with the Great Recession, the job-separation rate increased more for immigrants than for natives.

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Figure A4: Job-separation rate by nationality and experience. Note: The transitions are seasonally adjusted using a 4-quarters moving average, constructed from the Spanish Labour Force Survey-Flows.

B4 Type of Contract

The Spanish labour market is a well-known example of a dual labour market.²² The main feature of such markets is the coexistence of open-ended (permanent) contracts and fixed-term (temporary) contracts. This segmentation is very relevant for unemployment volatility as job security is much higher among workers with permanent contracts. Temporary contracts have a limited duration, and when they expire, the firm must decide whether to keep the worker or dismiss her at no cost.

As Table 1 shows, immigrants are more concentrated in temporary jobs. As those jobs have higher job-separation

rates, the fact that immigrants work more as temporary could partially explain the differences between immigrants and natives in the patterns of the overall job-separation rate. Figure A7 plots the evolution of the job-separation rate for immigrants and natives conditional on working as temporary or permanent.²³

As expected, job-separation rates are substantially higher among workers with temporary contracts. Regarding differences between natives and immigrants, the left panel of Figure A7 shows that before the crisis, the job-separation rate in temporary jobs was very similar for the two

²² See Bentolila, Dolado, and Jimeno (2020) for a recent survey on the topic.

²³ As mentioned earlier, a job-separation is computed as a transition from employment to unemployment. In the case of temporary contracts, if the contract is renewed or another temporary contract follows an ending one, we do not have a separation.







Figure A5: Job-finding rate by nationality and sector. Note: The transitions are seasonally adjusted using a 4-quarters moving average, constructed from the Spanish Labour Force Survey-Flows.

groups. After the crisis differences arise, as the increase in the job-separation rate is higher for immigrants than for natives. However, the figure suggests that those differences are smaller than after controlling for other observables. Regarding the job-separation rate for permanent workers, the right panel of Figure A7 shows that for these jobs the patterns are more similar to the previous figures: during the pre-crisis period job-separation rates were already higher for immigrants than for natives. But the impact of the crisis seems to be higher for immigrants. Specifically, while the job-separation rate for permanent immigrants roughly triples (from 2% in 2007 to almost 6% in 2008), natives job-separation rate doubles (from 0.8% in 2007 to 1.8% in 2008).

Gender

Figure A8.

C Wage Cyclicality: Job Stayers vs Rest

I compute the monthly average wage for workers who worked for the same establishment from January 2007 to December 2012, without any unemployment spell or change in employer. The idea is to check whether the

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Figure A6: Job-separation rate by nationality and sector. Note: The transitions are seasonally adjusted using a 4-quarters moving average, constructed from the Spanish Labour Force Survey-Flows.



Figure A7: Job-separation rate by nationality and type of contract. Note: The transitions are seasonally adjusted using a 4-quarters moving average, constructed from the Spanish Labour Force Survey-Flows.



Figure A8: Labour market transitions by nationality and gender. (a) Job-finding rate. (b) Job-separation rate. Note: The transitions are seasonally adjusted using a 4-quarters moving average, constructed from the Spanish Labour Force Survey-Flows.

drop in the aggregate average wage among immigrant workers also occurred among job stayers.

Figure A9 plots the evolution of the monthly average wage for all workers and for job stayers, from January 2007 to December 2012. For the sake of comparison, I normalize all-time series to 1,000 in January 2007. From the figure, we can see clearly that among job stayers, the average wage of immigrants and natives grew at a very similar rate during the period considered (first years of the Great Recession). In other words, it seems that the drop in the average wage of immigrants is mostly due to job changers or newly formed jobs.

D Wage Cyclicality by Worker/Job Characteristics

D1 Education

Figure A10 shows that the average real wage of natives is higher than for immigrants for all educational groups. Regarding cyclicality, the evolution of wages for the two lower educational levels is similar to the aggregate wage. However, differences arise among college graduates. First, wage premium is lower, around 30% for the period 2002–2015 (see Figure A16 in Appendix D). Second, wages

Monthly average wage, all workers

Monthly average wage, only job stayers



Figure A9: Normalised monthly real wage by nationality, aggregate vs job stayers (2007–2012). Note: The monthly wages are normalised to 100 at January 2007. Source: MCVL.



Figure A10: Monthly average wage by nationality and education attainment. Note: The wage premium is computed as $(\bar{w}_{N,t}/\bar{w}_{M,t} - 1)$, where $\bar{w}_{j,t}$ is the monthly average wage for natives j = N and immigrants j = M at month t. Wage premium is normalised to 100 at 2008Q1. Wages are seasonally adjusted by taking out the coefficient of the monthly dummies from an OLS regression. Source: MCVL.



Figure A11: Monthly average wage by nationality and tenure. Note: The wage premium is computed as $(\bar{w}_{N,t}/\bar{w}_{M,t} - 1)$, where $\bar{w}_{j,t}$ is the monthly average wage for natives j = N and immigrants j = M at month t. Wage premium is normalised to 100 at 2008Q1. Wages are seasonally adjusted by taking out the coefficient of the monthly dummies from an OLS regression. Source: MCVL.



Figure A12: Monthly average wage by nationality and type of contract. Note: The wage premium is computed as $(\bar{w}_{N,t}/\bar{w}_{M,t} - 1)$, where $\bar{w}_{j,t}$ is the monthly average wage for natives j = N and immigrants j = M at month t. Wage premium is normalised to 100 at 2008Q1. Wages are seasonally adjusted by taking out the coefficient of the monthly dummies from an OLS regression. Source: MCVL.

reacted less to the Great Recession than on aggregate, as both immigrant and native average wages continued growing after 2008. The bottom panel of A10 shows very clearly this pattern, as the wage premium remained almost constant (actually decreased slightly) after the arrival of the Great Recession (mid-2008 to 2015), while for the other education categories (top panel of Figure A10), it increased during the crisis.

D2 Tenure

Figure A11.

D3 Type of Contract

Figure A12.



Figure A13: Monthly average wage by nationality and gender. Note: The wage premium is computed as $(\bar{w}_{N,t}/\bar{w}_{M,t} - 1)$, where $\bar{w}_{j,t}$ is the monthly average wage for natives j = N and immigrants j = M at month t. Wage premium is normalised to 100 at 2008Q1. Wages are seasonally adjusted by taking out the coefficient of the monthly dummies from an OLS regression. Source: MCVL.



Figure A14: Stock of immigrant workers by region of country. Source: Spanish Labour Force Survey.

D4 Gender

Figure A13.

E Other Figures and Tables

Figures A14-A15, Tables A1-A5.



Figure A16: Wage premium by education attainment. Note: The wage premium is computed as $(\bar{w}_{N,t}/\bar{w}_{M,t} - 1)$, where $\bar{w}_{j,t}$ is the monthly average wage for natives j = N and immigrants j = M at month t. Source: MCVL.



Figure A15: Conditional labour market transitions by nationality using quarter dummies. Note: The figure plots the residuals (evaluated at the average at means of other covariates) obtained from the estimation of equations (3) and (4) using a linear probability model, but interacting the variable imm_i with quarter dummies instead of year dummies. Both regressions include controls for education, potential experience, marital status, age, gender, region of residence, sector of activity, occupation, type of contract (permanent or temporary), type of job (full or partial time), tenure, and quarter dummies. Equations (3) and (4) are estimated using 339,008 and 1,559,302 observations, respectively. Source: Spanish Labour Force Survey-Flows (2005–2015).



Figure A17: Wage premium by tenure group. Note: The wage premium is computed as $(\bar{w}_{N,t}/\bar{w}_{M,t} - 1)$, where $\bar{w}_{j,t}$ is the monthly average wage for natives j = N and immigrants j = M at month t. Source: MCVL.