THE IMPACT OF IMMIGRATION ON OCCUPATIONAL SPECIALISATION AMONG NATIVES IN SPAIN: DOES THE BUSINESS CYCLE MATTER?*

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We test whether the impact of immigration on native workers differs depending on the business cycle. We divide the Spanish Labour Force Survey (2001-2012) into two periods: 2001-2007, when Spain was in a clear expansionary period, and 2008-2012, a period of deep economic recession. For the expansionary years, we find a sizable relocation of native workers to occupations with more interactive rather than manual content as a response to immigration. However, the pattern changes completely in the recession period of 2008-2012. There is no evidence of any relocation of natives to different occupations as a response to an immigration shock and we find a sizable negative impact on the employment levels of earlier immigrants.

Key words: Immigration, Task specialisation, Gender segregation, Occupational mobility, Business Cycle.

JEL Classification: J15, J24.

he impact of immigration on the host country's labour market is a topic of major concern for many immigrant-receiving nations. There is a large and growing body of literature on the consequences of migration on the employment and wages of native workers in the United States [see Borjas (1994, 1995, 1999, 2003, 2005), Borjas and Katz (2007), Card (1990, 2001, 2005), Card and Di Nardo (2000), Card and Lewis (2007), Lewis (2003), Ottaviano and Peri (2005, 2006), among others]. In general, this literature finds that immigration appears to have small wage effects but does not affect the employment rate of natives.

As noted by Ottaviano and Peri (2006), this is not surprising, given that the effect of immigration depends on the degree of substitution between native and immigrant workers *within* educational groups. If native and immigrant workers of similar educational attainment levels possess skills that lead them to specialise in different

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occupations, it is reasonable to find a null to small impact of immigration on the employment and wages of natives. After all, immigrants and natives are not competing for the same jobs. In this vein, Peri and Sparber (2009) and Amuedo and De la Rica (2011) have recently shown, for the United States and Spain, respectively, that less-educated natives adjust to an increase in less-educated immigrant workers by changing their task specialisation. In particular, less-educated natives appear to shift to occupations with a lower manual, as opposed to interactive, task content.

However, this empirical evidence refers to the years prior to 2008, a clear expansionary period. Given that most developed economies have entered a deep economic recession since 2008, it is worth considering whether the impact of immigration on natives found in the previous period has persisted in more recent years.

Peri (2010) studies the impact of immigrants on the US economy during recession and economic expansion. He finds that the short-run effect of immigrants depends on the state of the economy. In an expansionary period, immigration creates jobs and natives are not displaced from the labour market. However, during a recession, the economy does not absorb immigration so quickly and there seems to be a small negative impact on native unemployment in the short run (but not in the long run). It is not surprising that there is a change in the way in which the labour market reacts to immigration with respect to the state of the economy.

Our study extends the previous paper by Amuedo and De la Rica (2011) (hereafter AR) to account for the impact of immigration in Spain in the recent recession years of 2008-2012. A comparison between the impact of immigration in Spain in this period and the previous one is pertinent because the phenomenon of immigration in Spain very quickly took on huge proportions from 2000 to 2008: immigrants rose from 4 to 13 percent of the population, giving Spain one of the highest immigration rates of any country in the world. In those years, immigrants found jobs in low-skilled occupations –essentially construction, hotels and restaurants, agriculture and household services. However, since 2008, Spain has been going through a very deep recession with unemployment rocketing from 10% in 2008 to 25% by the end of 2012, leaving a great many immigrants and natives without jobs.

These economic changes provide a unique opportunity to test whether the displacement effect found in an expansionary period in AR –with natives moving from occupations with more manual to less manual and more interactive content as a result of an increase in immigration– persists in the current recession period. Moreover, our empirical approach extends the work of AR by using a more precise definition of "tasks" for both the expansionary and recession periods. In particular, we use a 3-digit task classification instead of a 2-digit one, which should define occupations much more accurately in terms of required tasks.

Given that jobs are scarcer in a recession than in an expansionary period, the labour market cannot be expected to absorb the increase in immigration as quickly as in expansionary periods. As a result, the occupational mobility exhibited by natives in the former period is likely to be smaller or even to disappear. In such circumstances, an increase in immigration may entail negative employment effects not only for natives, but also for earlier immigrants, as new and earlier immigrants may be close substitutes in terms of the labour force. We seek to provide evidence here of all these possible economic effects. The rest of the paper is organised as follows: Section 1 briefly sketches the theoretical framework used later for the empirical analysis. Section 2 describes the datasets used and discusses some changes in the Spanish labour market between the expansionary and recession periods. Section 3 presents the task variables used to measure the manual and interactive task components of jobs. Section 4 explains the methodology. The results of the empirical analysis are shown in Section 5. Conclusions are presented in Section 6.

1. THE THEORETICAL FRAMEWORK

The paper is based on a simple general equilibrium model developed by Peri and Sparber (2009) to illustrate the effects of immigration on specialisation and wages. In their model, immigrants have a comparative advantage in performing manual¹, as opposed to interactive², tasks owing to their limited language proficiency and their frequent lack of host-country-specific human capital skills. The theoretical model assumes a final tradable consumption good Y that is produced using two non-tradable intermediate services Y_H and Y_L . Y_H is the supply of highly-educated workers and Y_L is that of less-educated workers. The model is developed for less-educated workers – it is implicitly assumed that highly-educated natives and immigrants are perfect substitutes. However, less-educated native and immigrant workers may differ from one another in their relative task productivity. A CES production function of less-educated workers combines two tasks –manual (M) and interactive (I)– to produce a final consumption good Y_L :

$$Y_{L} = [\beta_{L}M^{\frac{\lambda-1}{\lambda}} + (1-\beta_{L})I^{\frac{\lambda-1}{\lambda}}]^{\frac{\lambda}{\lambda-1}}$$

where:

- β_L is the productivity in manual versus interactive tasks of less-educated workers,
- λ is the elasticity of substitution between manual and interactive tasks.

The model assumes two types of workers: less-educated native-born workers and less-educated immigrant workers, who may differ in their comparative advantages. Denoting by $e_{mn}(e_{mi})$ the relative manual to interactive efficiency in tasks of natives (immigrants), the assumed difference in comparative advantage implies that, on average, the relative efficiency of immigrants in manual versus interactive tasks is higher than that of natives, i.e. $(e_m)_n < (e_m)_i$. This leads immigrants to occupy jobs with more manual than interactive or non-manual content.

Peri and Sparber (2009) solve the equilibrium provision of relative manual tasks by natives, which is given by:

$$m_n^* = \left(\frac{\beta_L}{1 - \beta_L}\right)^{\frac{\alpha\lambda}{(1 - \alpha)\lambda + \alpha}} \left[f(\overline{e_m})_i^{\frac{1}{1 - \alpha}} + (1 - f)(\overline{e_m})_n^{\frac{1}{1 - \alpha}} \right]^{\frac{-\alpha}{(1 - \alpha)\lambda + \alpha}} \left[(\overline{e_m})_n^{\frac{1}{1 - \alpha}} \right]^{\frac{1}{1 - \alpha}}$$
[1]

⁽¹⁾ Examples of manual tasks include body coordination and physical strength.

⁽²⁾ Interactive tasks require good communication skills, such as being able to converse easily with other people, working in a team or supervising the work of others.

where f is the share of foreign-born workers³.

It is immediately apparent that $\frac{\partial(m)_n^*}{\partial f} < 0$ under the assumption that $(e_m)_n < 0$

 $(e_m)_i$, which is precisely the empirical implication that we test in our empirical analysis of the expansionary and the recession periods in Spain. For the empirical implementation, we use a log-linearisation and a reduced form of the equilibrium equation.

The interpretation of this implication is simple: immigration increases the supply of manual tasks because immigrants, making use of their comparative advantage, concentrate on jobs with more manual content. The increase in supply reduces the remuneration for jobs with more manual content and increases the remuneration for jobs with less manual or more interactive skills. Natives respond rationally and, using their comparative advantage, relocate to non-manual positions where wages are higher. In the new equilibrium, natives and immigrants do not compete for the same jobs and native wages are, therefore, not affected by immigration.

2. The Data – Descriptive Statistics

Three different datasets are used in the paper. The first is the Spanish Labour Force Survey, which contains individual data covering the period from 2001 to 2012. We use 2001-2007 to represent the "expansionary period" and 2008-2012 to represent the "recession period". The second dataset comprises population registers (*Padrón*), which are used to create instrumental variables for the share of foreignborn workers. The third is the ONET Survey, which provides information on the task intensity of each of the 3-digit occupational classifications. This survey is provided by the US Department of Labor and is described in detail in the next section.

In our definition, "immigrants" refers to individuals who were born outside Spain and were not citizens at birth. We exclude those with double nationality (less than 5% of the whole immigrant population) and consider only recent immigrants (those with a residency of 5 years or less), presuming that they are still lacking the language proficiency and other Spanish-specific human capital skills of natives.

Our sample considers non-college-educated workers between 15 and 65 since most immigrants in Spain do not have a college degree, are employed in unskilled jobs and compete with less-educated Spanish workers. We should highlight that our sample covers only workers: given that there has been a net destruction of around 3 million jobs as a result of the recession, the composition of workers is expected to have changed substantially from the first period to the second.

Tables 1A and 1B present descriptive statistics of natives and immigrants for the two periods. Table 1A presents the demographic characteristics and Table 1B focuses on the job characteristics of both natives and immigrants. From the former, we can see that immigrant workers are, on average, 7 years younger and more educated. The proportion of women among them is higher than among natives in both

⁽³⁾ A detailed derivation of this optimal provision can be found in Amuedo and De la Rica (2011) – Appendix A.

Table 1A: Nor	N-UNIVERSITY	–Educated Nati	ves and Immig	RANTS
	Demograph	nic Characteristics	(%)	
2001 - 2007	Natives	Native women	Native men	Immigrants
Average age	39.6	39.3	39.8	32.7
Age categories (%)				
Below 30	24	23	23	43
31-35	26	26	26	34.5
36-40	26	28	20	17
41-45	19	18	26	5
Over 46	5	4	5	0.5
Women (%)	35			43
Education (%)				
primary or less	28	29	25	28
secondary	72	71	75	72
2008 - 2012	Natives	Native women	Native men	Immigrants
Average age	41.9	41.9	41.9	33.2
Age categories (%)				
Below 30	18	17	17	40
31-35	24	23	26	36
36-40	28	30	23	17
41-45	24	23	28	6
Over 46	6	6	6	1
Women (%)	40			49
Education (%)				
primary or less	18	17	19	24
secondary	81	83	81	76

Notes: Non-university-educated individuals in work, aged between 16 and 65. "Immigrants" refers only to those with, at most, five years of residence in Spain, i.e. recent immigrants.

Source: 2001-2007 and 2008-2012 Spanish Labour Force Surveys.

periods. The average age of native workers is 40 in the first period and 42 in the second, while the average age of recent immigrant workers is 33 in both periods. The proportion of women increases from 35% to 40% among native workers and from 43% to 49% among immigrant workers in the second period. There is an increase in the number of women in the labour market from one period to the other.

Comparison of the two periods is important because there might be a change in the composition of workers between the expansionary and the recession period which might affect the results of the empirical exercise. From Table 1A, we can

Table 1B: Non-U	University	–Educated Nati	ves and Immig	RANTS
	Job Cl	naracteristics (%)		
2001 - 2007	Natives	Native women	Native men	Immigrants
Distribution across Occu	pations			
Managers and Prof.	9	8	9	1
Technicians and Prof.	8	9	8	2
Clerks	7	11	5	2
Service and Sales	19	33	11	21
Agriculture and Fishery	4	3	5	2
Craft and Related Trade	23	5	32	21
Plant and Machine Op.	12	5	16	5
Elementary Occupat.	18	26	14	46
Distribution across Secto	ors			
Agriculture	7	5	8	10
Industry	20	14	24	11
Construction	15	1	22	23
Services	58	80	46	56
% Indefinite Contract	63	63	63	37
2008 - 2012	Natives	Native women	Native men	Immigrants
Distribution across Occu	pations			
Managers and Prof.	7	6	8	1
Technicians and Prof.	8	7	9	2
Clerks	11	17	7	3
Service and Sales	22	36	12	26
Agriculture and Fishery	4	2	5	4
Craft and Related Trade	18	4	27	18
Plant and Machine Op.	13	4	20	5
Elementary Occupat.	17	23	12	41
Distribution across Secto	ors			
Agriculture	6	4	8	8
Industry	18	12	22	9
Construction	12	1	17	20
Services	64	83	53	63
% Indefinite Contract	78	77	78	48

Notes: Non-university-educated individuals in work, aged between 16 and 65. "Immigrants" refers only to those with, at most, five years of residence in Spain, i.e. recent immigrants.

Source: 2001-2007 and 2008-2012 Spanish Labour Force Surveys.

see a noticeable change in the age structure of natives. In the expansionary period, 24% of native workers were younger than 30 while, in the second period, the figure drops to 18 %. By contrast, 45% of native workers were aged between 36 and 45 in the expansion period compared to 52% in the recession period. The change is significantly less pronounced among immigrants. This is a consequence of the dual contract system in Spain –a large number of older native workers have indefinite contracts with high severance payments and, hence, are far less likely to be laid off. Almost all job adjustments affect workers with fixed-term contracts, which are particularly prevalent among younger people. This age-composition change is not observed among immigrants as most of them held fixed-term contracts in the expansionary and in the recession period.

The second interesting feature concerns the educational attainment of the samples of workers for the two periods. There is a significant increase in the proportion of workers with secondary education and a corresponding decrease in the percentage of less-educated workers (with only primary education or less) in the second period. The proportion of native (immigrant) workers with secondary education increases from 72 to 81% (72 to 76%). This suggests that the workers who have been hardest hit by the recession are those with lower levels of education. As mentioned above, many unskilled workers have been laid off during the recession, and this pushes the educational composition of the sample of workers towards more skilled workers. As with age, the compositional change is clearly stronger among natives than among immigrants.

Table 1B presents the distribution of natives and immigrants across occupations and sectors as well as the % of workers with indefinite contracts for the two periods of analysis. Regarding job characteristics, the changes between the two periods are smaller, if any, an increase of around 11-12 percentage points in the proportion of workers with an indefinite contract, which again is a consequence of the massive layoffs of workers with temporary contracts. But the changes are about the same for natives and immigrants.

In summary, whereas native workers look a little bit older and more educated in the recession than in the expansion period, the change is much less pronounced for immigrants. It is not likely, therefore, that a strong change in the composition of immigrants might bias the results we obtain in the empirical analysis.

Table 2 presents a breakdown of immigrants by region of origin in the two periods, focusing on recent immigrant workers. Between 2001 and 2007, more than half of all immigrants were Latin Americans. The second largest group (23%) comprises immigrants from the non EU-15 countries of Europe, while African immigrants account for 12%. A comparison with the second period reveals a decrease in the proportion of Latin Americans and African immigrants and a corresponding increase in the proportion of non EU-15 immigrants. This is mainly driven by the large increase in Romanian immigrants which followed the EU enlargement of 2007. Through the Schengen Agreement, the entry of Romania into the European Union (EU) has allowed its citizens free access to work in any European country since 2007. The fact that entry visas were no longer required significantly decreased the costs of migration for Romanian, who headed mainly for Spain, Italy and the UK. More than 700,000 Romanian immigrants have entered Spain since 2007.

Table 2: BREAKDO	wn of Immigrants by Rec	GIONS OF ORIGIN (%)
2001 - 2007	All immigrants	Recent immigrants
Latin America	44	58
Africa	18	12
EU15	14	4
EU other than EU15	16	23
Other	8	3
Total	33507	8808
2008 - 2012	All immigrants	Recent immigrants
Latin America	40	53
Africa	17	11
EU15	10	4
EU other than EU15	21	28
Other	12	4
Total	38389	6145

Notes: All immigrants and employed recent immigrants aged from 16 to 65 in Spain. Individuals are weighted by their personal survey weight.

Source: 2001-2007 and 2008-2012 Spanish Labour Force Surveys.

3. MANUAL AND NON-MANUAL TASK MEASURES

To test the hypothesis that native workers relocate to jobs with relatively less manual content as the share of immigrants increases, we need to identify the manual and interactive tasks required in each occupation.

We use the task requirements for each occupational classification provided by the U.S. Department of Labor through its O*Net occupation classification⁴. The dataset assigns numerical values (from 1 to 10) to describe the importance of 52 abilities required by each occupation⁵. A representative sample of individuals from the 2000 US Census are asked two questions about each ability indicator: "How important is the ability to your current job?" and "What level of the ability is needed to perform your current job?".

Through the development of careful crosswalks with the International Standard Classification of Occupations (ISCO88), *O*Net* data has come to be used increasingly by a large number of researchers and institutions outside the United

⁽⁴⁾ For more details of the O*NET data set, visit http://www.onetcenter.org/.

⁽⁵⁾ Some examples of ability: (i) finger dexterity, (ii) body coordination, (iii) oral comprehension

States⁶. The O*Net data are transformed using crosswalks with the International Standard Classification of Occupations (ISCO88). Occupations in Spanish data are classified according to the National Classification of Occupations (CNO) 94⁷ and CNO 11⁸. Like previous authors, we merge the data under the assumption that occupations in the United States and in Spain are not that different in terms of their manual and interactive task content.

Given that the scale of measurement in the O*Net survey for the tasks is rather arbitrary, each skill is rescaled to obtain a percentage score that represents the relative importance of each ability in the context of the whole distribution of occupations. The measure of manual abilities contains job task requirements such as finger dexterity, body coordination and strength. By contrast, the measure of interactive skills includes, for example, the importance of oral and written comprehension and expression⁹.

The manual-to-interactive relative task ratio for each occupation is created as the weighted average manual task content divided by the average interactive task content¹⁰. Table 1 in the Appendix shows the average manual and interactive task values and their ratios for each of the 3-digit occupational classifications. It can be observed that skilled non-manual occupations in broad categories such as managers, professionals and clerks are the ones with the highest (lowest) interactive (manual) skills. At the other extreme, occupations in broad categories such as assemblers and craft workers are the ones with the highest (lowest) manual (interactive) skill requirements.

The average manual and interactive tasks intensities for our sample of native workers [the figures are in the interval (0,1)] and for recent immigrants for both periods are shown in Table 3. The following interesting issues emerge. First, the intensity of immigrants in interactive tasks is lower than that of natives among both men and women and in both the expansionary and recession periods. Second, recent immigrants display a similar manual task intensity to native men but less than native women in the expansionary period. But, when the expansionary period is compared to the recession period, the intensity of immigrants in manual tasks is observed to have increased to a point where it is higher than for native men and women. Finally, a comparison of manual task intensity among natives in the first and second periods reveals increases among both men and women, which means that the proportion of workers in more manual-task-intensive occupations has increased from one period to the other.

⁽⁶⁾ See http://www.onetcenter.org/dl_files/paw/Products_at_Work.pdf for a summary of its many applications outside the United States.

⁽⁷⁾ Clasificación Nacional de Ocupaciones 1994.

⁽⁸⁾ Clasificación Nacional de Ocupaciones 2011.

⁽⁹⁾ We did some robustness checks to test whether the inclusion of different ability indicators in the definition of manual and interactive tasks changed the results, but they did not, so we finally decided to include the same ability indicators as previous studies for comparability reasons.

⁽¹⁰⁾ More precisely, the relative manual-to-interactive ratio supply of each year and each group of workers is constructed as the weighted average of the manual-to-interactive skill ratio supplied by individual workers from each group in each particular year, weighted by the number of hours worked and personal survey weight. Workers aged between 16 and 65 and recent immigrants are considered.

Table 3: AVERA	GE RELATIVE I	ASK SUPPLY OF	LESS-EDUCATE	D WORKERS
		2001-2007		
Average		Natives		Immigrants
Average	All	Men	Women	All
Manual tasks	0.59	0.63	0.52	0.62
Interactive tasks	0.35	0.34	0.39	0.23
Ratio M/I	3.07	3.17	2.84	4.55
		2008-2012		
Average		Natives		Immigrants
Average	All	Men	Women	All
Manual tasks	0.63	0.66	0.57	0.7
Interactive tasks	0.37	0.35	0.39	0.25
Ratio M/I	3.12	3.24	3.06	5.41

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Notes: Non-university-educated individuals in work aged between 16 and 65. "Immigrants" refers only to those with, at most, five years of residence in Spain, i.e. recent immigrants. Each individual is weighted by his/her personal survey weight and by the number of hours per week usually worked. Source: 2001-2007 and 2008-2012 Spanish Labour Force Surveys.





Source: Own elaboration.

The time trend in the manual-to-interactive task ratio for our samples of natives and immigrants for the whole period (2001-2012) can be seen in Figure 1.

It can be observed that natives, on average, work in occupations with significantly lower manual-to-interactive task ratios than immigrants in both the expansionary and recession periods. Moreover, the ratio for natives is more or less constant throughout the two periods while, for immigrants, there is a sharp increase in the ratio after 2007, when the expansionary period comes to an end, followed by a decrease in 2011 and 2012. This decrease may be a result of our selecting immigrants who enter employment from 2010 onwards. Given the high rate of destruction of unskilled jobs since 2009, which has affected immigrants to a large extent, it is likely that only the most qualified immigrants remain in work.

4. IMPLEMENTATION

Our methodology closely follows that used in AR. It is based on the spatial correlation approach. Individual-level data from 2001 to 2012 are collapsed into cells (province-year) and the hypothesis to be tested is whether the increase in the share of foreign-born workers per cell leads to a decrease in the average manual-to-interactive intensity per cell. For the first period there are 364 observations (52x7) and for the second there are 260 $(52x5)^{11}$.

This type of analysis assumes that labour markets are local and, therefore, requires there to be no outmigration of natives in response to increases in immigration inflows. This assumption is not likely to be very strong for Spain given that internal mobility of natives has been shown to be rather low [e.g. Bentolila, 2011].

We weight each individual by his/her personal Census weight, multiplied by the number of hours that he/she usually works in a week. This allows us to create variables which reflect the individual labour supply on an hourly basis. Each cell is also weighted by the number of individuals that belong to it.

A log-linearisation of equation [1] is used to examine the effects of immigration on task specialisation among natives:

$$Ln(M/I)_{n,p,t} = \mu_n(share_{foreign})_{pt} + X_{pt}\beta + \alpha_p + \delta_t + \varepsilon_{pt},$$
[2]

- $Ln(M/I)_{n,p,t}$ is the average manual-to-interactive task ratio of natives in each cell;
- *t* represents time, in our case 2001-2007 in the first data set and 2008-2011 in the second;
- *p* represents region (i.e. province in the case of Spain);
- *n* represents natives;
- δ_t represents year fixed-effects intended to account for common time-varying technological parameters;

⁽¹¹⁾ The fact that we only have 260 observations for the recession period prevents us from conducting any empirical checks on the impact of immigrants according to their place of origin. Standard errors increase greatly when immigrants are separated according to their places of origin – e.g. Latinos versus non-Latinos.

- α_p is a vector that contains region (province) fixed-effects that account for variations in unobserved population characteristics;
- *X_{pt}* is a vector that contains information on the average personal characteristics of workers in each cell (four age group dummies, a secondary education dummy);
- (*share*_{foreign})_{pt} represents the share of foreign-born workers (recent immigrants) in each cell, set as the number of recent immigrants in the cell divided by number of natives in the cell.

We use a Weighted Least Square estimation in which the weights are the number of individuals in each cell. Robust standard errors clustered by province are reported under the estimates.

The dependent variable is the (log) level of manual-to-interactive tasks of natives in each cell. The relevant parameter for our study is η_n . A negative, statistically significant value of η_n would confirm that natives specialise in occupations with lower manual content as the share of foreign born workers in the region increases.

However, immigrants do not settle randomly across regions and, hence, the endogeneity of the share of foreign-born workers must be accounted for. To correct for this, we use instrumental variables and assume, as previous studies do, that the main determinant for the decision of recent immigrants on where to locate is the settlement of previous immigrants [see Card (2001), Cortes (2006), Lewis (2003), Ottaviano and Peri (2006), Peri (2006), Saiz (2003), Dustman *et al.* (2008) among others for similar strategies]. This is also true in Spain (Sandell 2008)¹². We do this by using the ratio of immigrants to natives in each province four years before, which we construct using data from the Population Register (*Padrón*) which provides the most representative information about immigration in Spain given that almost all immigrants register in order to gain access to public medical care¹³.

As mentioned in the introduction, an increase in the inflow of immigrants is very likely, particularly in recession years when jobs are scarce, to have a negative impact on the employment rates of host-country workers. This may apply not only to natives, but also to earlier immigrants. Longhi *et al.* (2008), comparing 45 studies published between 1982 and 2007, find that there seems to be a negative effect of new immigrant inflows on the employment rate of earlier immigrants. A similar result was found by D'Amuri *et al.* (2010) for Germany.

We check whether an increase in immigration inflow crowds out less educated natives and/or non-recent immigrants from employment. To that end, we estimate the employment rate (ER) of (i) natives and (ii) non-recent immigrants as a proportion of the share of foreign-born workers, time and province dummies at cell level for both periods [equation 2].

$$ER_{i,p,t} = \mu_n \left(share_{foreign} \right)_{pt} + \alpha_p + \delta_t + \varepsilon_{pt},$$
[3]

⁽¹²⁾ Using data on immigrants obtained from Spanish population registers, Sandell (2008) shows that networks play a crucial role in the location choices of immigrants.

⁽¹³⁾ We have done some sensitivity analysis with the lags of the instrument. Very similar results emerge when four or fewer lags are considered. However, standard errors increase to a great extent when five or more lags are considered, presumably because the correlation between the % of foreign born workers in each region across time decreases when the time lag is big enough.

In this equation, *i* refers to either natives or non-recent immigrants. The analysis is carried out using OLS and IV methods. Each individual is weighted by his/her personal survey weight and cells are weighted by the number of individuals in them. The heteroskedasticity problem is solved by using robust standard errors where standard deviations are clustered by province.

5. Results

5.1. The Impact of Immigration on the Relative Task Supply of Natives – Expansion versus Recession

Table 4 displays the estimated effect of immigrants on the manual-to-interactive task content of native jobs for the two periods. We estimate the effects for all natives and, separately, for native men and women. Previous studies, such as AR, find that immigration has a stronger impact on native women than on native men. Estimations are carried out using OLS and IV methods.

For the expansionary period we find, as expected, the same results as AR. Very briefly, this means (i) an increase in the share of foreign-born workers has a strong, negative impact on the manual-to-interactive task content of native jobs. 2SLS results, based on the IV strategy, show a greater negative impact on the share of immigrants in general. That would imply that OLS is biased downwards. However, the standard errors of the IV estimation are much higher than those of the OLS estimation, so we should be cautious about the precision of this higher magnitude. (ii) Immigration has a greater impact on the task specialisation of native women than native men, independently of whether the OLS or IV estimation is used.

The results for the recession period are shown in the right-hand panel of Table 3. They indicate that, in 2008-2012, there is no significant effect of immigrants on the task specialisation of natives. The OLS estimates for the recession period are about one third the size of those for the expansionary period and none of them is significant. None of the IV estimates is significant although, in general, the magnitude of the coefficients is not negligible – they are even higher than those found for the expansionary period. However, the standard errors are very high and this prevents them from being significant. The instruments used for the recession period are the same as those used for the expansionary period. Although they pass the validity tests, they seem to be much less precise for the recession than for the expansionary period. However, the significant decrease in OLS estimates in recession compared to the expansionary period, together with the non-significant impact in the IV estimates, lead us to conclude that, in the recession years, we find no significant impact of immigrants on the relocation of manual versus non-manual tasks among natives.

If immigration does not relocate natives to other occupations, then the question of what specific effect immigration has on natives arises. Three possible labour market responses to an immigration shock can be posited, particularly in a recession period:

1. Native wages, particularly among those who are more likely to compete with immigrants for jobs, decrease in a recession to absorb the immigration shock.

Recent immigrants	2001-	2007	2008-	-2012
Recent minigrants	OLS	IV	OLS	IV
All Natives	-0.742***	-1.237**	-0.256	-2.175
	(0.235)	(0.486)	(0.336)	(1.372)
Native men	-0.626 **	-1.038*	-0.208	-1.826
	(0.281)	(0.559)	(0.345)	(1.656)
Native women	-0.965 ***	-1.548**	-0.327	-2.505*
	(0.316)	(0.713)	(0.535)	(1.482)

Table 4: Impact of the Share of Foreign-Born Workers on theRelative M/I Task Supply of Natives – 2001-2007 versus 2008-2012

Notes:

(1) Non-university-educated individuals in work aged between 16 and 65 age. "Immigrants" refers only to those with, at most, five years of residence in Spain, i.e. recent immigrants. Each individual is weighted by his/her personal survey weight and by the number of hours per week usually worked.

(2) We estimate the manual-to-interactive ratio for natives in terms of the share of immigrants, year dummies and province dummies. In the estimation at cell level (year, province), each cell is weighted by the number of individuals in it. Robust standard errors are reported, clustered by province.

(3) *** significant at 1%, ** significant at 5%, * significant at 10%

Source: Our own estimations from the 2001-2007 and 2008-2012 Spanish Labour Force Surveys.

- 2. If new immigrants compete with natives for scarce jobs, natives might be displaced by new immigrants and this would decrease the employment rate among natives following the immigration shock.
- 3. If new immigrants compete with non-recent immigrants, the latter might be displaced by the immigration shock. Therefore, the employment rate among non-recent immigrants would decrease following the immigration shock.

Unfortunately, we cannot test hypothesis 1 because of a lack of adequate individual data. However, we can try to test the second and third hypotheses. With respect to the second, Peri (2010) shows that, in the US, immigration in periods of economic weakness seems to have some slight negative effect on native employment and income per worker in the short run but not in the long run. On the other hand, as mentioned above, Longhi *et al.* (2008) and D'Amuri *et al.* (2010) find sizable decreases in employment rates among earlier immigrants following new immigration shocks.

Below, we test the second and third hypotheses for Spain, for both the expansionary and recession periods.

5.2. The Impact of Immigration on the Employment Rate of Natives and Non-Recent Immigrants

Using the Spanish Labour Force Survey we estimate equation [3] where the dependent variable is the employment rate of natives or of non-recent immigrants

as a proportion of the share of recent immigrants. In addition to time and region dummies, we also include the unemployment rate for each province. Each individual is weighted by his/her survey weight. Equation [3] is estimated using OLS and IV methods. The 4-year lagged values of the immigrant-to-native ratio are used as instrumental variables, following the same logic as for the manual-to-interactive task ratio regression. As before, non-university-educated individuals between 16 and 65 are considered. Table 5 reports the results.

Table 5: IMPACT OF R	ecent Immigrants on Em	PLOYMENT
	2001 - 2	2007
	OLS	IV
Employment rate of natives	-0.00005 (0.0003)	-0.001 (0.0008)
Employment rate of Non-Recent Immigrants	1.0910 (0.7444)	5.961*** (1.961)
	2008 - 2	2012
	OLS	IV
Employment rate of natives	-0.0003 (0.0006)	-0.0031 (0.0024)
Employment rate of Non-Recent Immigrants	-0.4076*** (0.1498)	-1.2609** (0.543)

Notes:

Non-university-educated individuals in work aged between 16 and 65 age. "Immigrants" refers only to those with, at most, five years of residence in Spain, i.e. recent immigrants. Each individual is weighted by his/her personal survey weight and by the number of hours per week usually worked.
 In the estimation at cell level (year, province), each cell is weighted by the number of individuals in it. Robust standard errors are reported, clustered by province.

(3) *** significant at 1%, ** significant at 5%

Source: Our own estimations from the 2001-2007 and 2008-2012 Spanish Labour Force Surveys.

The employment rate of natives shows no response following the immigration shock for either the expansionary period or the recession, whichever estimation method is used. However, the impact of immigration seems to have completely different effects on the employment level of non-recent immigrants in the expansionary period and in the recession. In the former, we find either no impact (from OLS estimation) or a positive, significant impact (from the IV estimation), but the sign is clearly reversed in the latter. Independently of which estimation method is used, the employment level of non-recent immigrants decreases with the entry of new immigrants in the recession period. The magnitude of the IV coefficients is higher than that of the OLS estimates, but the important finding is that in the recession period new immigrants have displaced non-recent immigrants. The explanation is obvious: in a period of job scarcity, new immigrants, who are very close substitutes for nonrecent immigrants, compete with the latter for the few jobs available and that competition displaces some non-recent immigrants to an out-of-employment situation. As a result, the employment rate among this group of immigrants decreases.

6. CONCLUSIONS

Previous studies have analyzed the impact of immigration on task specialisation and employment rates among natives. Most of them conclude that native workers respond to immigration by relocating to occupations with more interactive, rather than manual, content. In addition, no impact whatsoever of immigration on the employment rate of natives is found. However, this empirical evidence refers to the years prior to 2008, a clear expansionary period. Given that most developed economies have entered a deep economic recession since 2008, it is worth wondering whether the impact of immigration on natives found in the previous period persists in these new circumstances. Indeed, given that jobs are scarcer in a recession than in an expansionary period, the labour market in the host country may be expected not to be able to absorb the increase in immigration in the short run. Hence, the occupational mobility exhibited by natives in the earlier period may be expected to decrease or even disappear. In such circumstances, an increase in immigration may entail negative employment effects not only on natives but also on earlier immigrants, as new immigrants may be competing for the same scarce jobs with workers in the host country.

Our study focuses on Spain, which has been going through a deep economic recession since 2008. Basically, it extends a previous paper by Amuedo and De la Rica (2011) in an attempt to account for the impact of immigration in Spain in the recent recession years, 2008-2012.

We use the Spanish Labour Force Survey (2001-2012) and, overall, our findings suggest that the impact of immigration on the labour market of a host country clearly depends on the business cycle. More specifically, we find a sizable relocation of native workers to occupations with more interactive rather than manual content as a response to immigration as well as a null impact on native employment levels for the expansionary years (2001-2007). Nor do we find any negative impact of immigration on the employment levels of earlier immigrants in that period. However, the pattern changes completely when we focus on the recession period. First, there is no evidence of any relocation of natives to different occupations as a response to an immigration shock. Second, we find no impact of immigration on the employment levels of earlier immigrants. Therefore, new immigrants in recession years displace earlier immigrants, for whom they are likely to be close substitutes in terms of jobs.

Table 1: The Skill Content of Each Occur	ATION		
Occupation	Interactive	Manual	Ratio
Major group 1: legislators, senior officials and managers			
12 Corporate managers			
121 Directors and chief executives	0.9067	0.2057	0.2269
122 Production and operations managers	0.7802	0.3937	0.5047
123 Other specialist managers	0.8208	0.3562	0.4340
13 Managers of small enterprises			
131 Managers of small enterprises	0.7542	0.2661	0.3528
Major group 2: professionals			
21 Physical, mathematical and engineering science professionals			
211 Physicists, chemists and related professionals	0.6728	0.3924	0.5832
212 Mathematicians, statisticians and related professionals	0.4594	0.1605	0.3493
213 Computing professionals	0.5619	0.5543	0.9864
214 Architects, engineers and related professionals	0.5909	0.5412	0.9159
22 Life science and health professionals			
221 Life science professionals	0.6078	0.3919	0.6448
222 Health professionals (except nursing)	0.7793	0.6677	0.8568
223 Nursing and midwifery professionals	0.8883	0.4671	0.5259
23 Teaching professionals			

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APPENDIX

manul		
nteractive	Manual	Ratio
0.6800	0.3993	0.5872
0.8267	0.2857	0.3456
0.4683	0.3686	0.7870
0.7820	0.2998	0.3834
0.8567	0.3079	0.3594
0.6492	0.5575	0.8588
0.7857	0.1297	0.1651
0.6746	0.3486	0.5167
0.8258	0.2936	0.3555
0.4239	0.6693	1.5789
0.5228	0.5762	1.1022
0.4042	0.8514	2.1066
0.4922	0.6981	1.4183
0.5450	0.6021	1.1048
0.5144	0.7005	1.3616
0.6363	0.5857	0.9205
0.7350	0.5657	0.7697
	teractive 0.6800 0.8267 0.4683 0.4683 0.4683 0.7820 0.8567 0.6492 0.6492 0.6492 0.6492 0.6492 0.6422 0.4042 0.4042 0.4042 0.5228 0.4042 0.4042 0.5228 0.4042 0.5228 0.4022 0.5450 0.5528 0.5450 0.5528 0.5528 0.5528 0.5528 0.5528 0.5528 0.5528 0.5528 0.5528 0.5558 0.5	teractive Manual (6800 0.3993 1.4683 0.3686 1.4683 0.3686 1.4683 0.3686 1.7820 0.2998 1.7827 0.3079 1.7857 0.3079 1.7857 0.3079 1.7857 0.3079 1.7857 0.3079 1.7857 0.2936 1.297 1.7857 0.1297 1.7857 0.1297 1.7857 0.1297 1.7857 0.2936 1.4239 0.5657 1.4042 0.8514 1.4042 0.8514 1.4022 0.6981 1.5450 0.6021 1.5450 0.6021 1.5450 0.5657 1.7350 0.56577 1.7350 0.56577 1.7350 0.56577 1.7350 0.56577 1.7350 0.56577 1.7550 0.56577 1.7550 0.56577 1.7550 0.56577 1.7550 0.56577 1.7550 0.56577 1.7550 0.56577 1.7550 0.56577 1.7550 0.56577 1.7550 0.55577 1.7550 0.555777 1.7550 0.55577 1.7550 0.55577 1.7550 0.55577 1.75500 0.55

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Table 1: The Skill Content of Each Occupation (cc	ontinuation)		
Occupation	Interactive	Manual	Ratio
33 Teaching associate professionals			
334 Other teaching associate professionals 34 Other associate professionals	0.5316667	0.26	0.4890
341 Finance and sales associate professionals	0.7014	0.2937	0.4187
342 Business services agents and trade brokers	0.7750	0.2129	0.2747
343 Administrative associate professionals	0.5317	0.2600	0.4890
344 Customs, tax and related government associate professionals	0.5638	0.3586	0.6360
345 Police inspectors and detectives	0.6558	0.5214	0.7951
346 Social work associate professionals	0.8217	0.2743	0.3338
247 Artistic, entertainment and sports associate professionals	0.4408	0.6114	1.3870
Major group 4: clerks			
41 Office clerks 1			
411 Secretaries and keyboard-operating clerks	0.5361	0.4781	0.8918
412 Numerical clerks	0.6157	0.3257	0.5290
413 Material-recording and transport clerks	0.4900	0.4590	0.9367
414 Library, mail and related clerks	0.4035	0.5255	1.3023
419 Other office clerks	0.4975	0.3571	0.7179
42 Customer services clerks			
421 Cashiers, tellers and related clerks	0.5400	0.4169	0.7720
422 Client information clerks	0.6663	0.4043	0.6067

Table 1: THE SKILL CONTENT OF EACH OCCUPATION	(continuation)		
Occupation	Interactive	Manual	Ratio
Major group 5: service workers and shop and market sales workers			
51 Personal and protective services workers			
511 Travel attendants and related workers	0.4875	0.5100	1.0462
512 Housekeeping and restaurant services workers	0.4465	0.4742	1.0619
513 Personal care and related workers	0.5779	0.5118	0.8856
514 Other personal services workers	0.3542	0.6119	1.7277
516 Protective services workers	0.5615	0.5069	0.9027
52 Models, salespersons and demonstrators			
521 Fashion and other models	0.1950	0.2886	1.4799
522 Shop, stall and market salespersons and demonstrators1	0.4642	0.5579	1.2018
Major group 6: skilled agricultural and fishery workers			
61 Skilled agricultural and fishery workers 1			
611 Market gardeners and crop growers	0.2933	0.7271	2.4789
612 Animal producers and related workers	0.2013	0.6886	3.4215
613 Crop and animal producers	0.4000	0.6686	1.6714
614 Forestry and related workers	0.0683	0.6314	9.2404
Major group 7: craft and related trades workers 1			
71 Extraction and building trades workers			
711 Miners, shot firers, stone cutters and carvers	0.3467	0.9057	2.6126
712 Building frame and related trades workers	0.1959	0.7621	3.8895
713 Building finishers and related trades workers	0.1821	0.7302	4.0090
714 Painters, building structure cleaners and related trades workers	0.2450	0.7119	2.9057

Table 1: The Skill Content of Each Occupation (c	continuation)		
Occupation	Interactive	Manual	Ratio
MAJOR GROUP 5: SERVICE WORKERS AND SHOP AND MARKET SALES WORKERS			
72 Metal, machinery and related trades workers			
721 Metal molders, welders, sheet-metal workers, structural-metal preparers,	0.1356	0.8055	5.9394
722 Blacksmiths, tool-makers and related trades workers	0.1585	0.7979	5.0347
723 Machinery mechanics and fitters	0.2461	0.8506	3.4558
724 Electrical and electronic equipment mechanics and fitters	0.2550	0.8556	3.3553
73 Precision, handicraft, craft printing and related trades workers			
731 Precision workers in metal and related materials	0.1272	0.9271	7.2876
732 Potters, glass-makers and related trades workers	0.1358	0.8200	6.0368
734 Craft printing and related trades workers	0.0889	0.8290	9.3268
74 Other craft and related trades workers			
741 Food processing and related trades workers	0.1283	0.7462	5.8145
742 Wood theaters, cabinet-makers and related trades workers	0.1192	0.9150	7.6783
743 Textile, garment and related trades workers	0.0667	0.8707	13.0607
744 Pelt, leather and shoemaking trades workers	0.1633	0.9514	5.8251
Major group 8: plant and machine operators and assemblers			
81 Stationary plant and related operators 1			
811 Mining and mineral-processing-plant operators	0.1228	0.8357	6.8067
812 Metal-processing plant operators	0.1925	0.8829	4.5863
813 Glass, ceramics and related plant operators	0.1678	0.8576	5.1116
814 Wood-processing- and papermaking-plant operators	0.1800	0.6707	3.7262
815 Chemical-processing-plant operators	0.2511	0.6814	2.7137

Table 1: THE SKILL CONTENT OF EACH OCCUPATION (continuation)		
Occupation	Interactive	Manual	Ratio
82 Machine operators and assemblers			
822 Chemical-products machine operators	0.2150	0.8243	3.8339
823 Rubber- and plastic-products machine operators	0.1306	0.7845	6.0091
825 Printing-, binding- and paper-products machine operators	0.0683	0.8071	11.8119
826 Textile-, fur- and leather-products machine operators	0.1231	0.8411	6.8310
827 Food and related products machine operators	0.2233	0.6490	2.9062
828 Assemblers 1	0.1450	0.9314	6.4236
829 Other machine operators not elsewhere classified	0.3000	0.8186	2.7286
83 Drivers and mobile plant operators			
831 Locomotive engine drivers and related workers	0.2439	0.7648	3.1357
832 Motor vehicle drivers	0.3529	0.7143	2.0239
833 Agricultural and other mobile plant operators	0.2057	0.7782	3.7827
834 Ships' deck crews and related workers	0.1400	0.5557	3.9694
Major group 9: elementary occupations 1			
91 Sales and services elementary occupations			
911 Street vendors and related workers	0.3667	0.2529	0.6896
913 Domestic and related helpers, cleaners and launderers	0.0750	0.5500	7.3333
914 Building caretakers, window and related cleaners	0.1406	0.4348	3.0932
915 Messengers, porters, doorkeepers and related workers	0.3764	0.5494	1.4595
916 Garbage collectors and related laborers	0.2117	0.7871	3.7188
92 Agricultural, fishery and related laborers			
921 Agricultural, fishery and related laborers	0.1192	0.7293	6.1199
93 Laborers in mining, construction, manufacturing and transport			
931 Mining and construction laborers	0.0833	0.6597	7.9166
932 Manufacturing labourers 1	0.0994	0.5952	5.9856
933 Transport laborers and freight handlers	0.0925	0.6379	6.8958

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RESUMEN

En este trabajo contrastamos si el impacto de la inmigración sobre los trabajadores nativos depende del ciclo económico. Dividimos la Población Activa Española desde 2001 en dos períodos: 2001-2007, donde España disfrutaba de un periodo claramente expansivo, y 2008-2012, un período de recesión económica profunda. Para el periodo expansivo, encontramos que los trabajadores nativos responden ante el incremento de la inmigración mediante una recolocación hacia ocupaciones con más contenido interactivo que manual. Sin embargo, este patrón se modifica sustancialmente durante la época recesiva, 2008-2012. En primer lugar, no se observa ningún movimiento de recolocación de trabajadores nativos hacia otras ocupaciones como respuesta a un shock de entrada de inmigrantes. Además, encontramos un impacto significativo y negativo de la entrada de inmigrantes sobre los niveles de empleo de los inmigrantes establecidos en España hace más de cinco años.

Palabras clave: Inmigración, especialización en tareas, segregación ocupacional, ciclo económico.

Clasificación JEL: J15, J24.