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THE EFFECT OF IMMIGRATION ON THE EMPLOYMENT OPPORTUNITIES OF NATIVE-BORN WORKERS: SOME EVIDENCE FOR SPAIN(*)

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Abstract

Spain is one of the European countries where immigration flows during the last decade have increased noticeably. The Spanish labor market institutions and the Spanish immigration policy exhibit some peculiarities which may be relevant when analyzing the impact of immigration. This paper provides a first approximation to the labor market effects of immigrants in Spain during the second half of the 1990s, the period in which immigration flows to Spain have accelerated. By using alternative datasets, we estimate both the impact of legal and total immigration flows on the employment rates of native workers, accounting for the possible occupational and geographical mobility of immigrants and native-born workers. Using different samples and estimation procedures, we have not found a significant negative effect of immigration on the employment rates of native workers. The corresponding estimated elasticity is low, around -0.1, when considering only legal immigrants, and is not significant when considering both legal and illegal immigrants.

***JEL Codes**: J21, J11*
***Keywords**:* immigration, employment rates

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1. **Introduction**

The literature that seeks to evaluate the impact of immigration on the labor market of the host country is by now very large and well-surveyed.[4] Two main conclusions can be drawn from this literature:

First, it has proven very difficult to find support for the implications of the standard-textbook model in which an increase in labor supply due to immigration ought to reduce the wages of native workers in flexible labor markets in which relative wages adjust to demand and supply factors, or to reduce their employment rates in labor market where rigidities prevent adjustments of relative wages.

Secondly, empirical results seem to be time-dependent, with a variety of studies finding different estimates of the labor market impact of immigration depending on the episode under consideration.

In a recent influential paper, Borjas (2003) claims that this unsatisfactory state of affairs might arise from a somewhat misguided methodology. Most of the empirical studies in this strand of the literature use the so-called "area-analysis" approach which correlates wages and employment rates, on the one hand, and the fraction of immigrants, on the other hand, across local labor markets. These spatial correlations suggest that, at most, a 10 percent increase in the fraction of immigrants reduces the wages of native workers by about 1 percent. The small-sized estimates could be explained by the fact that immigrants tend to cluster in localities with thriving economies and therefore tend to cause a spurious positive correlation between immigration and local outcomes which biases downwards the parameter of interest. In order to correct for this bias, a number of studies have focused on the analysis of "natural experiments" where the increase in immigration can be considered as exogenously determined. This is the case of Card (1990) on the Mariel boatlift from Cuba to Miami, or Hunt (1992) on the repatriation from Algeria to France. However, they still get no significant effects.

Thus, as long as production factors, either capital or labor, are mobile across local labor markets, spatial correlations will fail to capture the parameter of interest,[5] namely, the degree of substitution between immigrants and native-born workers, as native workers move from those cities affected by the labor supply shock to other localities unaffected by the immigration influx, and firms may want to move into those cities where wages have fallen. Thus, Borjas (2003) advocates to replace spatial correlations by correlations across skill groups (using education and labor market experience as indicators of skills), on the grounds that these are categories from which, in the short run, it is impossible for workers to move away and therefore the degree of substitution between natives and immigrants is bound to be much better gauged. Using this approach, Borjas (2003) finds that an increase in the size of a skill group by 10 percent lowers the wage of workers in that group by about 2 to 3 percent and reduces working weeks by 2 percent. Nonetheless, Card (2001) and Card and Di Nardo (2001) find that in the US cities that have received flows of relatively unskilled immigrant, the

[4] See, for instance, Borjas (1994, 1999) and Friedberg and Hunt (1995).
[5] For a formal proof, see Borjas (1999).

relative size of their unskilled populations has also increased, which somewhat challenges the interpretation relying on the mobility of native workers as an explanation of the lack of spatial correlations between immigrant flows and local labor market outcomes.

Most of the empirical studies trying to assess the impact of immigrant flows on the labor market outcomes of native workers use US data.[6] Wealth of data and the long experience with the effects of large waves of immigration since the 1840s justify this focus of attention on the US experience. However, during the last decade many European countries have become recipients of immigrants, and, thus, the demand for informed analysis of the impact of immigration into Europe has notably increased.[7] In a recent contribution, Angrist and Kugler (2003), using a panel of European countries, find that the immigration slightly reduced the employment rate of native-born workers, although this effect is larger in countries with "rigid" institutions, in particular in countries where product market competition is restricted. This finding suggests that the link between immigration and labor market outcomes of native-born workers may be more subtle than just the insight provided by the static labor demand/labor supply model of the labor market. [8]

These premises lead us to the main motivation of this paper. Spain is one of the European countries where immigration flows during the last decade have increased noticeably. As seen in Figures 1a and 1b, during the second half of the nineties the net immigration rate to Spain has reached values close to 1,5% of the population, while immigration accounts for more than 90% of total population growth. Moreover, the Spanish labor market institutions and the immigration policy exhibit some peculiarities which may be relevant when analyzing the impact of immigration. And there are very few empirical studies trying to measure this impact.[9] This makes Spain an interesting case of study of the labor market effects of an immigration boom.

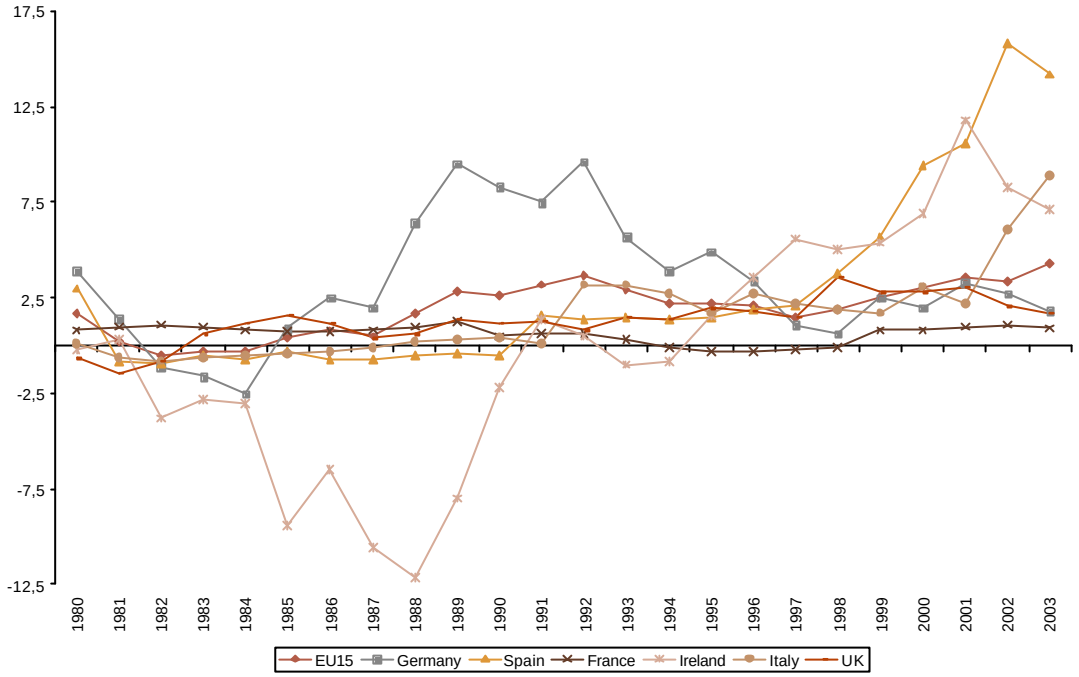
[6] There are, however, some studies which apply the "spatial correlations" approach to other host countries such as Hunt (1992) to France, Pischke and Velling (1997) to Germany, Friedberg (2001) to Israel, and Dolado et al. (1997) to Spain.

[7] For recent immigration trends in some European countries, see Coppel et. al (2001) and Boeri et al. (2000).

[8] The labor market impact of immigration also depends on the technological complementarities between capital and labor of each type in the production function, how wages are determined and what kind of labour market frictions are considered. For a discussion of these issues, see Section 2 in Carrasco, Jimeno and Ortega (2004).

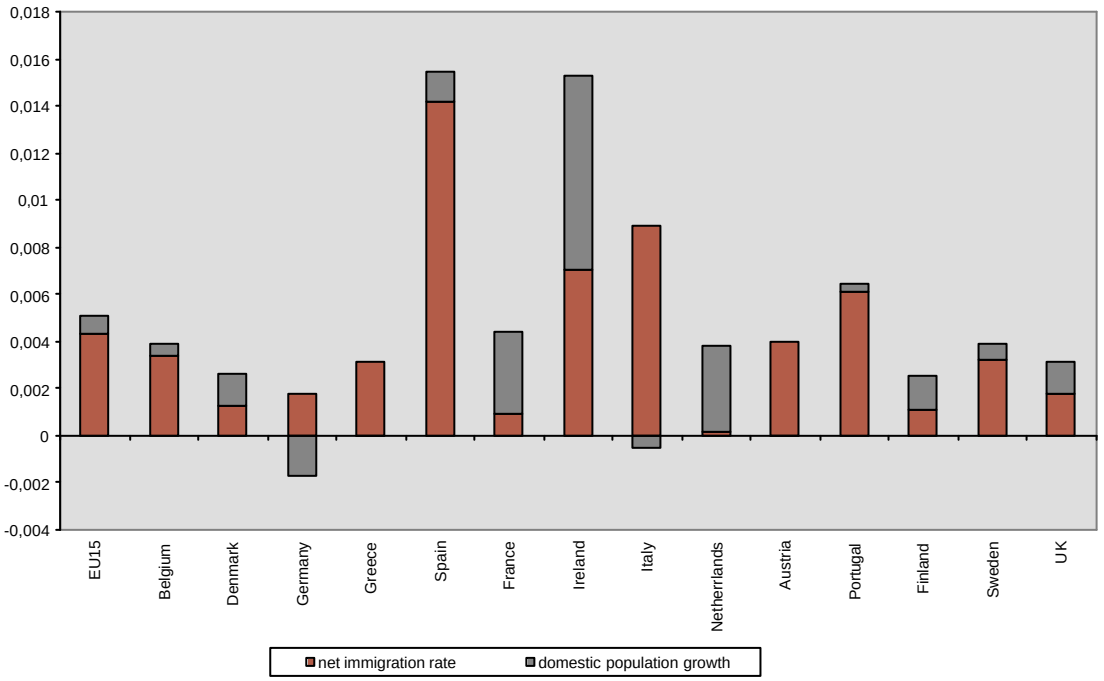
[9] Most of the research of immigration to Spain is of sociological/qualitative nature (see, for instance, Carrasco, 2002, and Izquierdo, 2002). Within the economic literature, there are some previous studies. Dolado et al. (1997) analyze the effects of an amnesty of illegal immigrants on the wages and unemployment rates of native-born workers in the late 1980s/early 1990s, while Dolado (2002) surveys the available literature related to the design of migration policies in order to shed light on the Spanish case. Collado et al. (2002) perform a generational accounting exercise to measure the impact of immigration on public budgets.

Figure 1a. Net immigration to Spain
(per thousands of inhabitants)



Source: EUROSTAT (NEWCRONOS Database).

Figure 1b. Population growth and its components in EU15 countries
(2003)



Source: EUROSTAT (NEWCRONOS Database)

Thus, the main goal of this paper is to provide a first approximation to the labor market effects of immigrants in Spain during the second half of the 1990s, the period in which immigration flows to Spain have accelerated. For this analysis, we rely on data from the register of work permits to foreigners, from the Labor Force Survey and from the last two waves of the Census of Population for the years 1991 and 2001. While the register of work permits provides an accurate measure of the incidence of legal immigration and offers information about the sector of activity and the region where the immigrants work, the Census of Population, in principle, covers both legal and illegal immigration and offers information on the educational level and potential work experience of the immigrants. Hence, by using alternative datasets, we estimate both the impact of legal and total immigration flows on the employment rates of native workers, accounting for the possible occupational and geographical mobility of immigrants and native-born workers.[10]

The paper is organized as follows. In Section 2 we provide a brief description of the evolution of immigration to Spain. In Section 3 we describe the data to be used, and in Section 4 we discuss the empirical implementation and comment on the main results. Finally, Section 5 concludes.

2. Immigration to Spain: A summary of the main trends

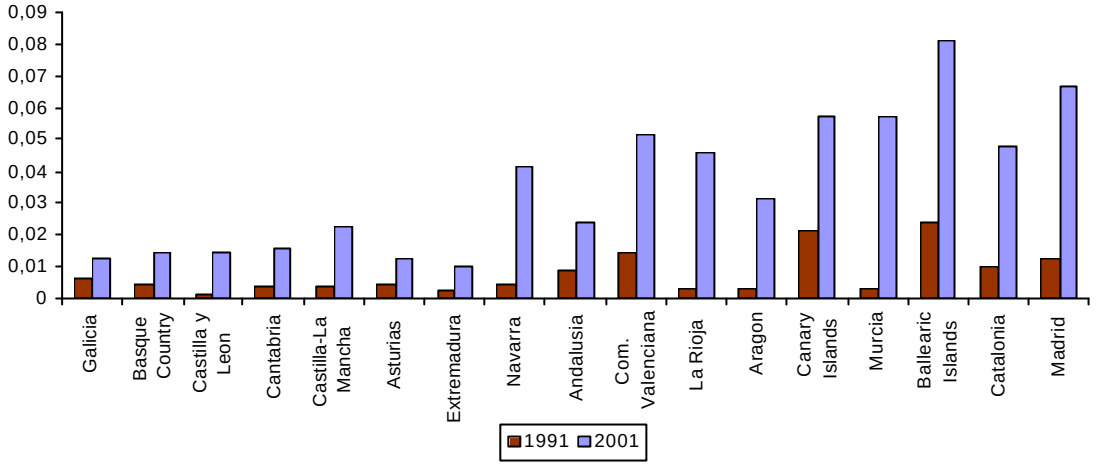
During the last decade, foreign population in Spain has surged from 0.35 million in 1991 to almost 2.7 million in 2003, that is, from about 1% to 6.25% of total population.[11] As shown in Figure 2, there is a clear regional concentration of the foreign population in Madrid and the Eastern part of Spain. South America and Africa are the main areas of origin of the immigrants (with weights of about 30% and 20%, respectively). About 50% of the immigrants have secondary studies, while around 15% have tertiary studies and almost 60% of them arrived after 1995. Finally, the foreign population is relatively young with about 60% of the immigrants in the 20-44 age group, and men of 25-34 years of age being overrepresented.[12]

[10] A recent paper with a similar approach to ours is Cohen-Goldner and Paserman (2004), who study the Israeli case.

[11] Not all available data sources (Census of Population, Labor Force Survey, administrative registers of residence and work permits, etc.) coincide in their measurement of the stock of foreign population in Spain. There are also some methodological problems caused by changing regulations (like the exemption of residence and work permits for non-Spanish EU citizens since 1992, special amnesties processes, the estimation of the stock work permits without precise knowledge of return migration, the incidence of illegal immigration, etc.) which sometimes blurred the exact incidence and distribution across sectors and regions of immigrants flows to Spain.

[12] For more details on the characteristics of immigrants in Spain, see Carrasco, Jimeno and Ortega (2004).

Figure 2. Foreign population as a proportion of total population by region



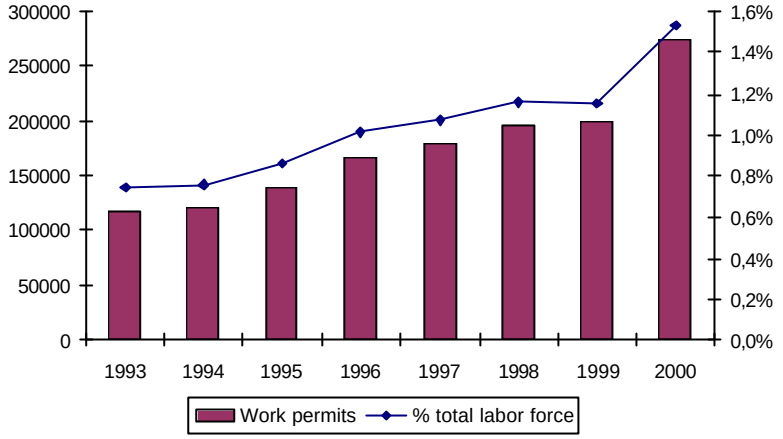
Source: Census of Population, 1991 and 2001

As for institutional details, foreigners are required to obtain a work permit if they pretend to be either employed or self-employed. There are several types of work with different duration and restrictions regarding the sectoral and geographical scopes where the immigrant is allowed to work.[13] Since 1992 EU citizens are exempted from this requirement (citizens from Luxembourg since 1993, citizens from Austria, Finland, Iceland, Norway and Sweden since 1994). By comparison between the Census data and the register data, it can be concluded that about one third of the immigrants are in an "irregular situation", that is, without a residence or a work permit. According to estimates from the Spanish Ministry of Employment, shown in Figure 3, the number of work permits has increased from around 120 thousands (0.7% of the labor force) in 1993 to around 270 thousands (1.5% of the labor force) in 2000.[14] The large increase in this last year was caused by a special amnesty process which took place over 2000 and 2001. Most work permits are awarded to immigrants in the service sectors.

[13] See Appendix 1 for a summary of this regulation.

[14] More recent data for 2000-2002 have not yet been made available by the Spanish Ministry of Employment. In 2000-2001 there was a special amnesty procedure, and in 2002 new immigration laws were approved after intense political discussions, which seem to be the reasons for the delay in the publication of these data.

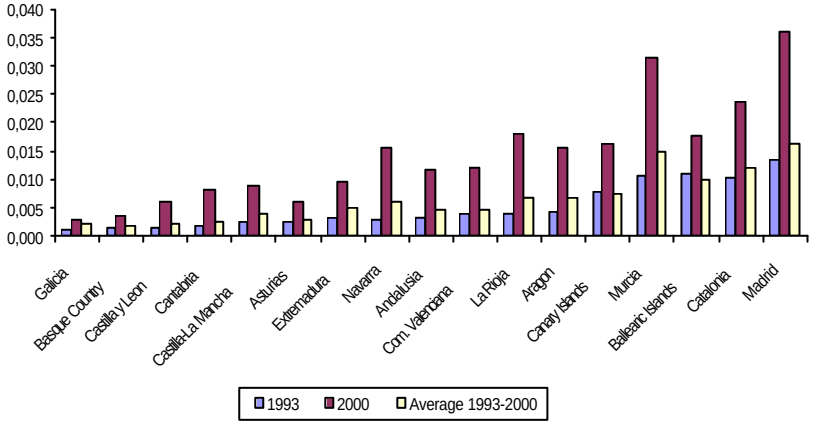
Figure 3. Work permits (stock)



Source: Ministry of Employment and Social Affairs

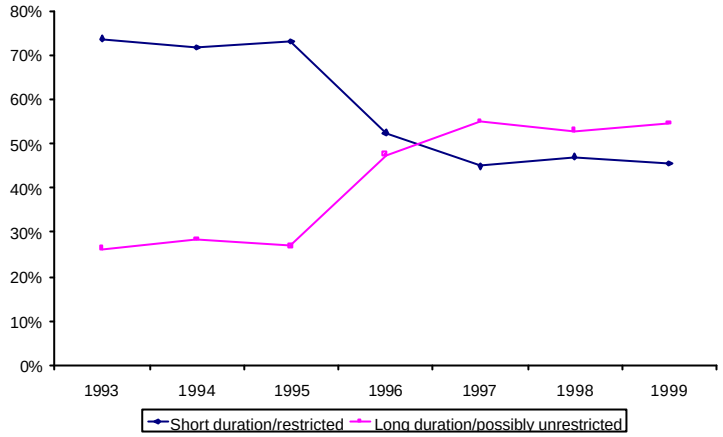
Figures 4a and 4b present the distributions of new work permits awarded each year by region and type. Immigrants with work permits represent a high proportion of the labor force in Madrid, Catalonia, Ballearic Islands, and Murcia. As for the distribution by type, we group work permits in two classes, those of short duration and restricted to a certain sector of activity and province of residence and those of long duration without restrictions on the sector of activity and province of residence. Figure 4b shows that while in 1993 around 75% of the work permits were short duration/restricted, in 1999 the proportion of work permits of long duration/unrestricted had risen to almost 55%.

Figure 4a. Work permits awarded by regions (% labor force)



Source: Ministry of Employment and Social Affairs

Figure 4b. Distribution of work permits by types



Source: Ministry of Employment and Social Affairs

3. Data

For the estimation of the labor market effects of immigration in Spain we first use detailed data on work permits for the period 1993-1999 from the register of the Spanish Ministry of Employment and Social Affairs. This source provides some individual characteristics of active legal immigrants in the Spanish labor market together with the region and the sector where they work, but neither their education nor their labor market experience. Alternatively, the Census of Population (available for 1991 and 2001) gives some information on the individual characteristics, including education, labor market experience, region of residence and the sector of work of all immigrants, either legal or illegal. The employment status of native-born workers is observed from both the Labor Force Survey and the Census of Population. In what follows we describe the construction of the variables to be used in our empirical analysis.

3.1. Legal immigration

Following Borjas (2003), our analysis relies on the correlation of the immigration supply shock and some local labor-market outcomes for native workers across cells, defined as explained above. We classify immigrants in several categories distinguishing: (i) age groups (20-34, 35-44, 45-54, over 55), (ii) gender, and (iii) 44 sectors of activity.[15] Ideally, we would like to use cells from which immigrants cannot relocate themselves as, for example, is the case of education (for individuals who participate in the labor force and are not enrolled in school) instead of sector of activity. Unfortunately, the register of work permits does not contain information on the educational attainment of the immigrant population.[16]

Insofar as skills are sector-specific, using correlations across sectors yield consistent estimates of the impact of immigration on the employment probabilities of native-born workers. However if workers, either native-born or immigrants, can move

[15] The list of sectors is in Appendix 2.

[16] Unfortunately, data availability restricts the definition of population groups for this exercise and prevents the analysis of wage effects.

across sectors in response to sector-specific labor market conditions, our estimates will be inconsistent and subject to the same criticism as the estimates based on "spatial correlations". In this regard, it is important to notice that in Spain the degree of sectoral mobility of native-born workers is not high. In any case, we will deal with the bias from sectoral mobility by, first, by conditioning on sectoral, time, age, and gender fixed effects, and secondly, by using a restricted sample of immigrants where sectoral mobility is restricted.

In order to identify an exogenous effect of the immigration supply shock on the local labor market outcomes, one possibility is to focus the analysis only on those work permits which are restricted to a certain sector of activity, and are a proportion of the total *wp* for each cell. Since those work permits are awarded by the immigration authorities and are not completely under the choice of the applicants, we could think that in this way some of the exogenous variation in immigration can be retrieved.[17]

Our definition of the immigration supply shock is

$$x_{agst} = \frac{wp_{agst}}{(n_{agst} + wp_{agst})}$$

where *wp* stands for the number of work permits, *n* for native employment, *a* for the age group, *g* for gender, *s* for sector of activity, and *t* for time. This variable measures the foreign-born share of the labor force in a particular skill group.

To capture labor market outcomes of native-born workers, we compute, for each cell, the employment rate of native workers, *y*, defined as:

$$y_{agst} = \frac{n_{agst}}{p_{agt}}$$

where *p* stands for the native-born population[18] For this purpose, we use the information provided by the Labor Force Survey (LFS). Notice that since the population cannot be defined by sector, the denominator of y_{agst} does not have sectoral variation, so that the employment rate of a group defined by age and gender in each year of the sample can just be recovered by simply adding y_{agst} across sectors.

Summary statistics of the variables for both samples (all work permits, and restricted sample of work permits) are presented in Table 1. The initial number of cells is 2,464 (4x2x44x7), but after dropping 69 cells in which there were no observations, we end up with a sample of 2,395 cells. In both samples, the immigration rate, *x*, is

[17] Again, we acknowledge that immigrants plausibly ask for permits in those sectors where they think there are better conditions. Appendix 3 presents probit estimates of the approval rate of work permits conditioning by region, sector and some immigrants' characteristics. The results show that the probability of awarding a work permit increases with age, is about half a percentage point lower for males, was higher during the 1995-1996 period (close to the only amnesty episode included in our sample), and shows some variation across sectors and, even more, across provinces. The sectors in which the probability of awarding a work permit is lowest are Extraction of minerals, Apparel and Textiles, Construction, Wholesale Trade, Retail Trade, Transports, Real State, Other entrepreneurship activities, Education, and Personal Services. The sectors in which the probability of awarding a work permit is highest are Refineries, Precision Equipment, Other transportation equipment, and Air Transports.

[18] Given that the number of cells we are using is rather high, the LFS estimates of employment and population may be not be as accurate as, for instance, data from the Census of Population. As a result, in some cells the employment of native-born workers is underestimated.

similar albeit slightly larger for the whole sample of work permits (0.91% *vs*. 0.89%). The average value of the employment rate is about 52%.[19]

Table 1: Summary statistics of the sample of work permits

Variable	Obs.	Mean	Std. Dev.	Min	Max
		All work permits			
wp	2,395	413.1543	1701.986	0	26842.61
n	2,395	34986.82	54082.26	59.48	576896.3
p	2,395	2872971	920442.5	1962557	4576883
x	2,395	.0089141	.0285298	0	.5235348
y	2,395	.5196545	.2146994	.1677236	.8712901
		Restricted set of work permits			
wp	2,395	264.1124	1106.548	0.036	17663.21
n	2,395	34986.82	54082.26	59.48	576896.3
p	2,395	2872971	920442.5	1962557	4576883
x	2,395	.00911	.041425	0	.7077917
y	2,395	.5196545	.2146994	.1677236	.8712901

Notice that this measure of the incidence of immigration excludes illegal immigration. In fact, anecdotal evidence suggests that most immigrants enter Spain "illegally" and, after some period, apply for and, eventually, achieve a work permit. Hence, our measure of the incidence of immigration is the result of the "supply of immigrants" combined with the administrative decision to award a work permit, which shows some variation across demographic groups, provinces, and sectors of activity (see Appendix 3). The results obtained from this sample will be compared to those obtained with a sample extracted from the Census of Population which, in principle, covers both legal and illegal immigrants and that we construct as explain below.

3.2.Total immigration

To measure total immigration we make use of the information provided by the Census of Population for 1991 and 2001. This source has the advantage that we can classify immigrants in groups defined by education and work experience, as in Borjas (2003). Thus, in this case our measure of immigration shocks is

$$x_{ewgt} = \frac{m_{ewgt}}{(n_{ewgt} + m_{ewgt})}$$

where *m* stands for the number of total immigrant workers, *e* for the educational level (without studies, primary, secondary or tertiary education), *w* for potential work experience (in groups of five years from 0 to 40) and *g* for gender, so that we have 64 cells observed in 1991 and 2001. Similarly, from the information in the Census of Population, we also compute the employment rates of the native-born population of similar characteristics as:

$$y_{ewgt} = \frac{n_{ewgt}}{p_{ewgt}}$$

[19] This figure has been obtained by adding y_{agst} across sectors. The average value of the employment rate as it was constructed is around 1.2%.

Table 2 presents the descriptive statistics of the variables to be used in the empirical analysis in Section 4. The immigration supply shock, x, takes an average value of 4.90%, ranging from 0.24% (men with no formal studies and 36 to 40 years of work experience in 1991) to 37.5% (men without studies and 11 to 15 years of work experience in 2001). The mean of the dependent variable is about 0.59. The increase in the proportion of immigrants in the labor force has been the highest in the low education-low potential work experience groups, while the employment rates of native-born workers are increasing in potential work experience and educational levels, and higher for men than for women.[20]

Table 2: Summary statistics of the sample from the Census of Population

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
m	128	6443.594	9422.634	80	49518
n	128	192595.3	199036	4035	889824
p	128	317401.2	282223.9	22811	1167184
x	128	0.0490229	0.0714003	0.0023942	0.3749789
y	128	0.5860545	0.2575048	0.0832516	0.9578755

4. Empirical approach and main results

To compute the effect of the immigration rates, x, on the native employment rates, y, we estimate the following two equations:

$$\log\left(\frac{y_{agst}}{1-y_{agst}}\right) = b\,x_{agst} + a_a + j_g + s_s + t_t + e_{agst} \quad (1)$$

$$\log\left(\frac{y_{egwt}}{1-y_{egwt}}\right) = b\,x_{egwt} + a_e + j_g + s_w + t_t + e_{egwt} \quad (2)$$

where α, φ, τ, and σ are vectors of unobservable fixed effects reflecting, respectively, either age or education, gender, year and either sector of activity or potential work experience. Since the dependent variable is within the (0,1) interval, we impose a logistic transformation, rather than estimating linear regressions.[21] In addition to these specifications with fixed effects, we also include some interactions among them. The standard errors are clustered by cells to adjust for possible serial correlation. All the regressions are weighted by the sample size used to calculate either y_{agst} or y_{egwt}. We present the estimates of the coefficient ß. Nonetheless, given that our measure of the employment rate, the dependent variable, is significantly different in our samples of legal and total immigrants, it is easier to interpret this coefficient by converting it into an elasticity. Following Borjas (2003) we define alternative measures of the immigration shock: $x'_{agst}=wp_{agst}/n_{agst}$ and $x'_{egwt}=m_{egwt}/n_{egwt,}$ so that the corresponding

[20] See Figures A.1 and A.2 in Appendix 4.

[21] Results from linear regressions are similar to those reported in the text.

elasticities of employment rates with respect to the ratio of immigrants to native workers are

$$\left(\frac{\partial y_{agst}}{\partial x'_{agst}}\right)\left(\frac{x'_{agst}}{y_{agst}}\right)=\frac{1}{\left(1+x'_{agst}\right)^2}\frac{\partial y_{agst}}{\partial x_{agst}}\left(\frac{x'_{agst}}{y_{agst}}\right)$$

$$\left(\frac{\partial y_{egwt}}{\partial x'_{egwt}}\right)\left(\frac{x'_{egwt}}{y_{egwt}}\right)=\frac{1}{\left(1+x'_{egwt}\right)^2}\frac{\partial y_{egwt}}{\partial x_{egwt}}\left(\frac{x'_{egwt}}{y_{egwt}}\right)$$

where

$$\frac{dy_{agst}}{dx_{agst}}=b\,\frac{\exp(b\,x_{agst}+a_a+j_g+t_t+s_s)}{\left[1+\exp(b\,x_{agst}+a_a+j_g+t_t+s_s)\right]^2}$$

$$\frac{dy_{egwt}}{dx_{egwt}}=b\,\frac{\exp(b\,x_{egwt}+a_e+j_g+t_t+s_w)}{\left[1+\exp(b\,x_{egwt}+a_e+j_g+t_t+s_w)\right]^2}$$

are the marginal effects. We evaluate these magnitudes at each observation and then calculate the mean.

Under the assumption of no selection bias (that is to say, if there is no correlation between the unobservable fixed effects and the variable x), consistent estimates of the parameter of interest, β, in equations (1) and (2) can be obtained by ordinary least squares (OLS). Nevertheless, if we think that selectivity effects are present, the fixed effects can be treated as additional parameters to be estimated, which therefore allows for correlation between them and the explanatory variable, x. If we assume that no selection bias is present after controlling for fixed effects, then consistent estimates of the parameters can be obtained by OLS regression on the fixed effects model. On the other hand, if selectivity effects still remain even after controlling for fixed effects, we should use an alternative strategy in order to obtain the true causal effect of x on y (i.e instrumental variables or cuasi-natural experiments). These selectivity effects are more likely in the specification in which cells are defined using sectors of activity (equation 1) than in the specification which defines cells using education (equation 2).

4.1. The impact of legal immigration

Tables 3a and 3b present the OLS estimates of β from equation (1), using both the *whole* and the *restricted* samples of work permits. The first row in Table 3a reports the results from the pooled data without including any type of fixed effects in the regression, together with the corresponding elasticities of employment rates with respect to the immigration supply shock. For this specification, we find an insignificant effect of the immigration shock on the employment rates of native-born workers. Row (2) presents the estimates when including specific gender, age, sector, and time effects, while Row (3) presents the results when including also interactions among them. In both cases, the estimated coefficient is negative, increases in absolute value, and becomes statistically significant. In particular, when interactions are included as additional regressors, the estimated elasticity is around -0.18, so that an increase of 10% in the ratio of immigrant to native workers, say, from 5% to 5.5%, would decrease the

employment rate of native-born workers by 1.8%, that is from 52% (the average value in our sample) to 51.06%.

Rows (4) to (9), in turn, report the coefficients estimated for men and women separately. These estimates yield even smaller elasticities in absolute values than the ones obtained at the aggregate level (-0.035 for men and -0.088 for women), and the estimated coefficients are statistically significant at the standard significance levels.

These results, however, could still be biased if we think that, even after controlling for sector, age, and gender fixed effects, immigrants tend to move towards those segments in the labor market where the employment rates of native-born workers are lower (or higher) or, alternatively, if native-born workers tend to move out of those segments where immigrants flow in. Table 3b reports the estimates using as measure of immigration only those immigrants with short duration/restricted work permits. With this sample, in which mobility of immigrants is restricted, while the estimated coefficients remain negative and statistically significant, the corresponding elasticities are noticeably smaller than those found in the sample with all work permits.[22] These results suggest that immigrants tend to concentrate on those cells where the native employment is lower.

[22] It is still plausible that, even after conditioning on age, gender, time, and sectoral fixed effects, and restricting the sample to a subset of foreign workers with some restrictions concerning geographical and sectoral mobility, these estimates should not be interpreted as the causal effect of immigration on the employment rate of native-born workers, since they would be biased upwards, if a rise of employment in a particular cell attracts immigrants of those characteristics, and downwards in the case in which immigrants of some demographic characteristics arrive following a fall of employment of a particular population group with the same characteristics. The problem can be addressed by using an instrument given by the ratio of work permits newly awarded each year to employment of native-born workers within each particular group. This instrument should be valid under the assumption that the decision to award work permits is not reacting to labor market conditions of particular population groups. The results from IV estimation using this instrument are qualitatively similar to those obtained with OLS estimation.

Table 3a: OLS estimates using the whole sample of work permits. Dependent variable transformed: log(y/(1-y))

	Coefficient β	Std. Err.	Marginal Effects*	Elast.*	Fixed effects	Interactions	Obs.
(1)	0.1125	2.3744	0.0005	0.0057	NO	NO	2,395
(2)	-9.7442	1.6585	-0.1071	-0.1364	YES	NO	2,395
(3)	-15.0422	2.3176	-0.1687	-0.1823	YES	YES	2,395
			ESTIMATES BY GENDER				
			Males				
(4)	-3.4443	0.9333	-0.0268	-0.1261	NO	NO	1,231
(5)	-3.8672	1.0398	-0.0577	-0.0451	YES	NO	1,231
(6)	-3.6505	1.2259	-0.0551	-0.0349	YES	YES	1,231
			Females				
(7)	8.9504	5.5090	0.0208	0.4765	NO	NO	1,164
(8)	-12.9204	3.2577	-0.1033	-0.0995	YES	NO	1,164
(9)	-13.1792	4.9524	-0.1060	-0.0882	YES	YES	1,164

*Mean values of the marginal effects and elasticities. Sample period: 1993-99.

Table 3b: OLS estimates using the sub-sample of restricted work permits. Dependent variable transformed: log(y/(1-y))

	Coefficient β	Std. Err.	Marginal Effects*	Elast.*	Fixed effects	Interactions	Obs.
(1)	-3.4864	1.4529	-0.0150	-0.2033	NO	NO	2,395
(2)	-7.8515	1.3161	-0.0867	-0.1107	YES	NO	2,395
(3)	-9.5513	1.2722	-0.1080	-0.1109	YES	YES	2,395
			ESTIMATES BY GENDER				
			Males				
(4)	-2.5331	0.2853	-0.0197	-0.0287	NO	NO	1,231
(5)	-2.6433	0.5762	-0.0393	-0.0169	YES	NO	1,231
(6)	-2.6401	0.8584	-0.0398	-0.0150	YES	YES	1,231
			Females				
(7)	-7.6830	3.7139	-0.0181	-0.3898	NO	NO	1,164
(8)	-6.9083	1.8464	-0.0547	-0.0784	YES	NO	1,164
(9)	-5.7124	1.9625	-0.0458	-0.0554	YES	YES	1,164

*Mean values of the marginal effects and elasticities. Sample period: 1993-99.

4.2. The impact of total immigration

In the pervious estimations, since the immigration supply shock is given by the number of work permits awarded, the impact of illegal immigration is disregarded. Nevertheless, under the assumption that there is a positive correlation between legal and illegal immigration across the cells considered, our estimates of the corresponding elasticity is biased upwards, in absolute value, so that the impact of immigration on the employment opportunities of native-born workers would be even smaller than that reported in the previous section.

We now perform a similar estimation procedure defining immigration shocks and employment rates by gender, educational level and potential work experience. The data are from the Census of Population for 1991 and 2001, which is the recent period when immigration to Spain surged. These data could, in principle, provide a good measure of the total immigration to Spain, both legal and illegal, while the definition of labor market segments by education and potential work experience ameliorates the endogenity problem created by mobility of immigrants and native-born workers. However, the number of cells used in the estimation (64 per year) is significantly lower than that used in the previous estimation with the sample of work permits, so that the precision of the estimates is bound to be lower.

Table 4 presents these results. Overall, we do not find statistically significant estimates in any specification, neither at the aggregate nor at the separate estimations by gender.[23] To get some feeling about the importance of geographical mobility when performing this kind of estimation, we also exploit the variability across 17 Spanish regions defining labor market segments as above for each of these regions. The resulting estimates are in the first panel of Table 5. When using the geographical variation the estimated elasticities tend to become negative and larger in absolute value than the ones obtained when the region is not used to define the cells. This discrepancy suggests that part of the negative partial correlation between immigration and employment rates of native-born workers found when we use geographical variation is produced by worker mobility rather than by a causal effect from immigration to employment opportunities. One possible interpretation of this result is that immigrants tend to move to those regions of Spain where the employment rate of native-born workers is lower.

This result is confirmed by the estimations presented in the last panel of Table 5, where, as in the previous section, we use sectors of activity to classify workers into different groups.[24] The results from these estimates provide elasticities that, although not statistically significant, are larger in absolute value than those obtained when defining labor market segments by educational levels, gender and potential work experience.

[23] One could think that the labor force participation decision may introduce some endogeneity in the variable x_{ewgt}, in which case we should use an instrument. Following Borjas (2003), we use the proportion of immigrants in the total population as an instrument. The results from the IV estimations provide an elasticity that is either not statistically significant or positive when the interactions of the fixed effects are included as additional regressors.

[24] We use 29 sectors of activity. The list of sectors is in Appendix 3.

Table 4. OLS estimates using education-gender-experience groups
Dependent variable transformed: log(y/(1-y))

	Coefficient ß	Std Err.	Marginal Effects*	Elast.*	Fixed Effects	Interactions	Nº of obs.
(1)	-0.8851	1.6755	-0.2049	-0.0217	NO	NO	128
(2)	-1.3741	1.1512	-0.2509	-0.0266	YES	NO	128
(3)	-0.9936	2.2581	-0.1816	-0.0186	YES	YES	128
			ESTIMATES BY SEX				
			Males				
(4)	-2.9967	1.0943	-0.4884	-0.0586	NO	NO	64
(5)	-1.1420	0.9803	-0.1720	-0.0224	YES	NO	64
(6)	0.8989	1.7123	0.1397	0.0179	YES	YES	64
			Females				
(7)	3.2229	2.3557	0.7838	0.0815	NO	NO	64
(8)	-0.3964	1.0385	-0.0798	-0.0082	YES	NO	64
(9)	3.1526	4.1907	0.6235	0.0629	YES	YES	64

* Mean values of the marginal effects and elasticities.
Regression models include interactions between education and experience fixed effects, education and period fixed effects, and experience and period fixed effects.

Table 5. OLS estimates using different groups
Dependent variable transformed: log(y/(1-y))

	Coefficient ß	Std. Err.	Marginal Effects*	Elast. *	Fixed effects	Interactions	Obs.
ESTIMATES FOR EDUCATION-GENDER-EXPERIENCE-REGIONS GROUPS							
(1)	0.9852	0.6820	0.2254	0.0217	NO	NO	2,168
(2)	-1.0797	0.3766	-0.1958	-0.0200	YES	NO	2,168
(3)	-2.7802	0.4890	-0.5035	-0.0510	YES	(Region x Year), (Education x Year), (Experience x Year)	2,168
(4)	-1.0663	0.4218	-0.1934	-0.0187	YES	(Region x Year), (Education x Year), (Experience x Year), (Education x Experience)	2,168
ESTIMATES FOR SECTOR-GENDER-AGE GROUPS							
(5)	4.4081	2.0927	0.0260	1.5246	NO	NO	464
(6)	-5.3112	2.7149	-0.0845	-0.0871	YES	NO	464
(7)	-3.7908	3.6896	-0.0611	-0.0491	YES	YES	464

* Mean values of the marginal effects and elasticities.
In the estimates for regions, we have dropped eight cases, out of 2,176 observations, in which the employment rate of native-born workers was zero or one.
Regression models include interactions between sector and age fixed effects, sector and period fixed effects, and age and period fixed effects.

5. Concluding remarks

The economic analysis of immigration has devoted much attention to the identification of its impact on the labor market outcomes of native-born workers. However, the empirical evidence on this matter is not totally conclusive and, to a large extent, refers to the US case, where relative wages adjust to the relative supply and demand of workers of different characteristics to a larger extent than in the "rigid" European labor markets.

In this paper we have searched for some effects of immigration on the Spanish labor market. Although still a country with a relatively low proportion of foreign population, during the period 1993-1999 the number of foreign workers with work permits increased by about 70%, and the proportion of immigrants in the total population increased by more than 5 percentage points between 1991 and 2003. This strong rise has spurred some concerns about a possible fall in the employment rates of native-born workers. To address this issue, we estimate the impact of immigrants with work permits on the employment rates of native-born workers using information on employment rates and incidence of immigration for workers of different groups of age, gender, and sectors of activity. We also use an alternative sample including illegal immigrants and searching for correlation between immigration and employment rates across workers groups defined by educational levels, gender and potential work experience.

We have found some negative effect of immigration on the employment rates of native-born workers only when considering immigrants with work permits and employment rates are defined over sectors of activity. In this case the corresponding elasticity estimated by OLS is around -0.1. In the sample with restricted work permits, where occupational mobility is less than a problem, we also found that legal immigration has a quite small effect on the employment rate of native workers. On the contrary, when considering total immigration we have found negative, but not statistically significant, effects of immigration on the employment rate of native workers.

This result has some interesting policy implications for the debate about the effects of an amnesty for illegal immigrants. Such a measure, which may cover about 500,000 illegal immigrants, is currently being discussed in Spain. This would yield a rise in the proportion of legal immigrants of about 30%. Assuming that the elasticity of the employment rates of the native-born population to legal immigration is -0.05, the amnesty would result in a fall of the employment rate of native-born workers of about 1.5%, that, from the current level of 62%, amounts to less than one percentage point.

Our results ought to be complemented by further analyses. First, given the short period span in our samples, we can only observe the short-run impact of immigration, which is conceivably very different to its long-run impact. Moreover, we have tried to measure the causal effect of immigration on the employment rates of the native-born workers. The fact that we have been unable to find any sizeable effect does not mean that the impact of immigration on the labor market outcomes of native-born workers is small, since that impact could have taken place through wages or through the total number of hours worked. Whether that happened or not remains to be investigated once adequate data on these variables are available.

Appendix 1

The regulation of work permits

There are 10 different types of work permits that can be awarded. For employees, they are:

Permit A. Awarded for seasonal jobs. Its duration coincides with the duration of the job but cannot exceed 9 months. It cannot be renewed.

Permit b (new). It is awarded for jobs within determined geographical area (province), occupation, and sector of activity. Its duration coincides with the duration of the employment contract but cannot exceed 1 year.

Permit B (renewal). It allows to be employed in several sectors of activity and occupations during a maximum of 2 years. It can be restricted to a determined geographical area. It is awarded to foreign workers who previously hold a permit b (new).

Permit C. It allows to be employed in any sector of activity throughout all the Spanish territory for a maximum of 3 years. It is awarded to foreign workers who previously hold a permit B (renewed).

For self-employees, the types of work permits are:

Permit d (new). It is awarded for jobs within a determined sector of activity. Its duration cannot exceed 1 year. Its geographical scope may be restricted.

Permit D (renewal). It allows to be employed in several sectors of activity during a maximum of 2 years. It can be restricted to a determined geographical area. It is awarded to foreign workers who previously hold a permit b (new).

Permit E. It allows to be employed in any sector of activity throughout all the Spanish territory for a maximum of 3 years. It is awarded to foreign workers who previously hold a permit B (renewed).

For both employees and self-employees, there are also:

Permit F. Awarded to foreign workers commuting between Spain and a neighbor country. Its maximum duration is 5 years and can be renewed.

Permanent permit. It allows to be employed in any sector of activity throughout all the Spanish territory without any restrictions. It is awarded only since 1996.

Exceptional permit. Awarded for exceptional contributions to the cultural and economic progress of Spain. It allows to be employed in any sector of activity throughout all the Spanish territory without any restrictions. It is awarded only since 1996.

Appendix 2: Sectoral classification

Work permits

1. Agriculture, cattle raising, and hunting
2. Fishing
3. Coal mining
4. Oil and gas extraction
5. Extraction of minerals (non-energy)
6. Food, beverages, and tobacco
7. Apparel and textiles
8. Leather products
9. Wood and cork products
10. Paper and printing
11. Refineries
12. Chemical products
13. Rubber and plastics
14. Fabricated Non-metallic minerals
15. Metal manufacturing
16. Fabricated metal products (excluding machinery)
17. Mechanical equipment
18. Office equipment
19. Electrical equipment
20. Precision instruments
21. Automobiles
22. Other transportation equipment
23. Furniture and other manufacturing
24. Production and distribution of electric energy, water and gas
25. Construction
26. Vehicles. Sales and repair
27. Wholesale trade
28. Retail trade
29. Hotels and restaurants
30. Transports
31. Sea transports
32. Air transports
33. Other transports and communications
34. Financial activities
35. Real estate
36. Research and Development
37. Other entrepreneurship activities
38. Public Administration
39. Education
40. Health and social services
41. Public sewerage
42. Cultural and leisure activities
43. Personal services
44. Domestic care

Census of Population

1. Agriculture, cattle raising, and hunting
2. Fishing
3. Extraction of fuels
4. Extraction of minerals (non-energy)
5. Food, beverages, and tobacco
6. Textile industry
7. Wood and cork products
8. Paper and printing
9. Refineries
10. Fabricated chemical products
11. Metal manufacturing
12. Fabricated metal products (excluding machinery)
13. Electronic, electrical and optical equipment
14. Transport equipment
15. Furniture and other manufacturing
16. Production and distribution of electric energy, water and gas
17. Construction
18. Vehicles. Sales and repair
19. Wholesale trade
20. Retail trade
21. Hotels and restaurants
22. Transports and communications
23. Financial activities
24. Entrepreneurship activities
25. Public Administration
26. Education
27. Health and social services
28. Domestic care
29. Other services

Appendix 3

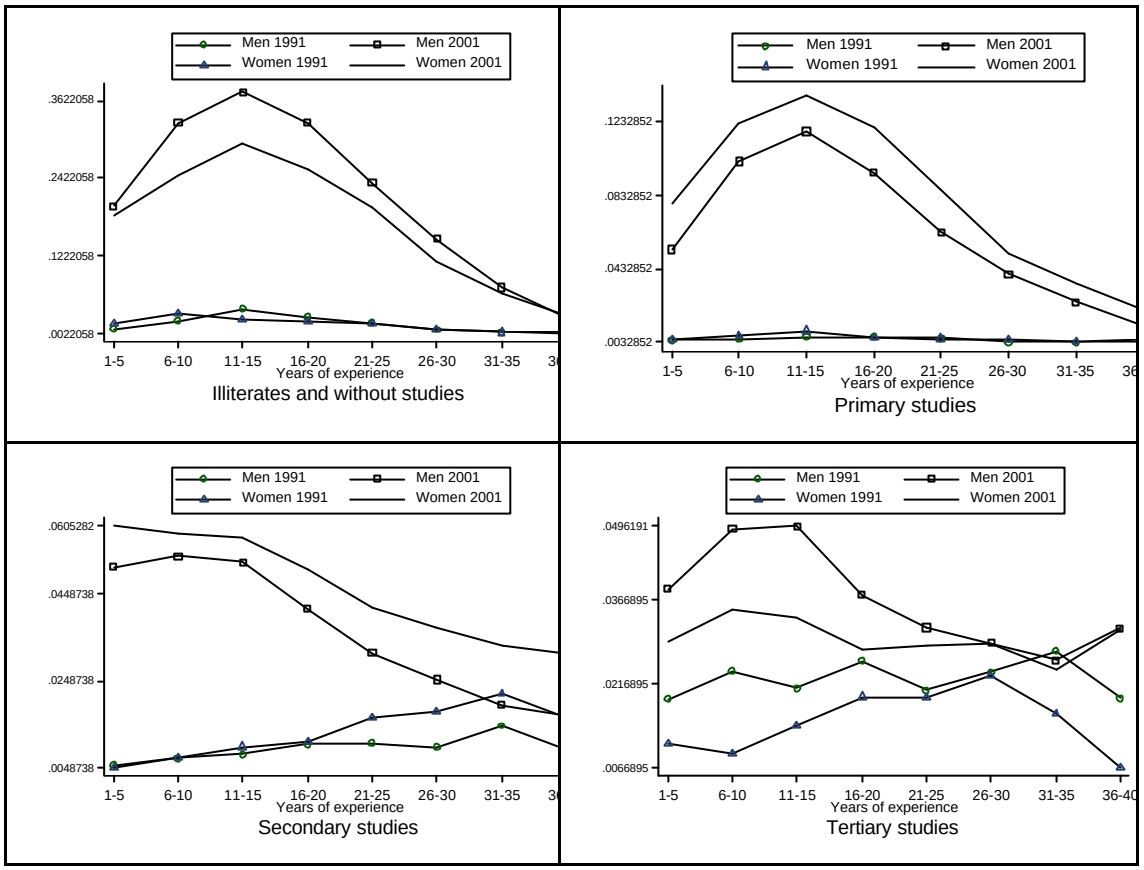
Table A3.1. Probit regression.
Dependent variable: Probability of awarding a work permit
Marginal effects

	Marginal effect (percentage points)	95% Confidence band (percentage points)			Marginal effect (percentage points)	95% Confidence band (percentage points)	
prov1	0.8155	2.686	-1.055	age	0.15983	0.1992	0.1205
prov2	2.91295	4.1127	1.7132	age squared	-0.00125	-7.00E-04	-0.0018
prov3	0.16595	2.1351	-1.8032	male	-0.54073	-0.4089	-0.6725
prov4	5.26568	5.68	4.8513	self-employee	-0.01914	0.2267	-0.265
prov5	-1.41934	1.5153	-4.354	Work permit: short-duration/restricted	-8.63123	-8.5126	-8.7499
prov6	-6.9435	-3.078	-10.809	year 1995	6.61997	6.7286	6.5114
prov7	-2.08456	0.4746	-4.6437	year 1996	6.10514	6.2214	5.9889
prov8	8.94721	9.5679	8.3265	year 1998	-0.79967	-0.6366	-0.9628
prov9	-7.61165	-3.4874	-11.7359	year 1999	3.27538	3.3977	3.1531
prov10	5.46368	5.6139	5.3134	sect1	-2.67131	0.429	-5.7716
prov11	-8.31871	-4.2122	-12.4252	sect2	-1.64638	1.6132	-4.9059
prov12	-0.20312	1.8843	-2.2905	sect3	2.49763	5.555	-0.5597
prov13	3.80837	4.6331	2.9836	sect4	0.78561	4.6162	-3.045
prov14	-4.18717	-0.9447	-7.4296	sect5	-6.28756	-0.8594	-11.7158
prov15	-1.27314	1.1913	-3.7375	sect6	-1.64692	1.5165	-4.8104
prov16	4.9597	5.3074	4.612	sect7	-7.10273	-2.2693	-11.9362
prov17	5.09424	5.5291	4.6594	sect8	-2.19406	1.5441	-5.9322
prov18	-7.47012	-3.5852	-11.3551	sect9	-3.07353	0.7064	-6.8535
prov19	2.3341	3.6975	0.9707	sect10	-3.28727	0.6791	-7.2536
prov20	-0.51846	1.8212	-2.8581	sect11	4.8737	6.1436	3.6038
prov21	4.63019	5.0948	4.1656	sect12	1.57534	3.749	-0.5983
prov22	5.36131	5.4917	5.231	sect13	-0.41301	2.7532	-3.5792
prov23	3.14394	4.1918	2.0961	sect14	0.83667	3.2353	-1.562
prov24	4.44939	5.0144	3.8844	sect15	-1.02053	2.0345	-4.0755
prov25	5.17967	5.4445	4.9148	sect16	-2.51454	1.1385	-6.1676
prov26	5.22237	5.4188	5.026	sect17	1.07874	3.6191	-1.4616
prov27	0.69628	2.7447	-1.3522	sect18	-0.22706	2.8262	-3.2803
prov28	0.3711	2.3275	-1.5853	sect19	2.20285	4.2418	0.1639
prov29	-7.13234	-3.4133	-10.8514	sect20	-8.79998	-0.4606	-17.1394
prov30	0.64441	2.4845	-1.1956	sect21	2.10949	4.3806	-0.1616
prov31	5.57344	5.6753	5.4715	sect22	2.31013	4.1871	0.4332
prov32	-0.51607	1.8686	-2.9008	sect23	-2.10832	1.3366	-5.5532
prov33	4.94941	5.2808	4.618	sect24	0.48448	3.4069	-2.438
prov34	-8.19105	-3.4647	-12.9174	sect25	-4.94014	-1.0363	-8.844
prov35	1.96508	3.4042	0.526	sect26	-3.59978	0.2647	-7.4643
prov36	3.98118	4.7154	3.2469	sect27	-4.9954	-0.834	-9.1569
prov37	4.97804	5.3183	4.6378	sect28	-4.61583	-0.7225	-8.5091
prov38	-2.02923	0.5582	-4.6167	sect29	-2.99873	0.3557	-6.3532
prov39	0.6335	2.5474	-1.2804	sect30	-5.27357	-0.9277	-9.6195
prov40	-2.96709	-0.0024	-5.9318	sect31	-1.06108	3.3022	-5.4244
prov41	-3.04391	-0.16	-5.9279	sect32	3.62119	4.9081	2.3343
prov42	3.36644	4.5306	2.2023	sect33	-0.9879	2.0029	-3.9787
prov43	4.31633	4.9414	3.6913	sect34	1.42721	3.588	-0.7336
prov44	2.82604	4.047	1.6051	sect35	-5.73453	-1.1877	-10.2814
prov45	0.40455	2.3292	-1.5201	sect36	-1.61269	1.7148	-4.9402
prov46	3.80742	4.6291	2.9858	sect37	-6.02754	-1.6454	-10.4097
prov47	2.65306	3.9433	1.3628	sect38	-2.52326	1.0081	-6.0546
prov48	-3.82193	-0.6986	-6.9453	sect39	-7.63236	-2.8714	-12.3933
prov50	-3.39028	-0.5014	-6.2791	sect40	-1.18303	1.8356	-4.2017
prov51	4.29847	5.2241	3.3728	sect41	-1.04708	2.0249	-4.119
prov52	-4.63093	-1.2707	-7.9912	sect42	-0.83468	2.0067	-3.6761
				sect43	-9.14214	-3.719	-14.5652
				sect44	-0.67546	1.9521	-3.303

Notes: N = 585,674. Pseudo R-squared = 0.2257

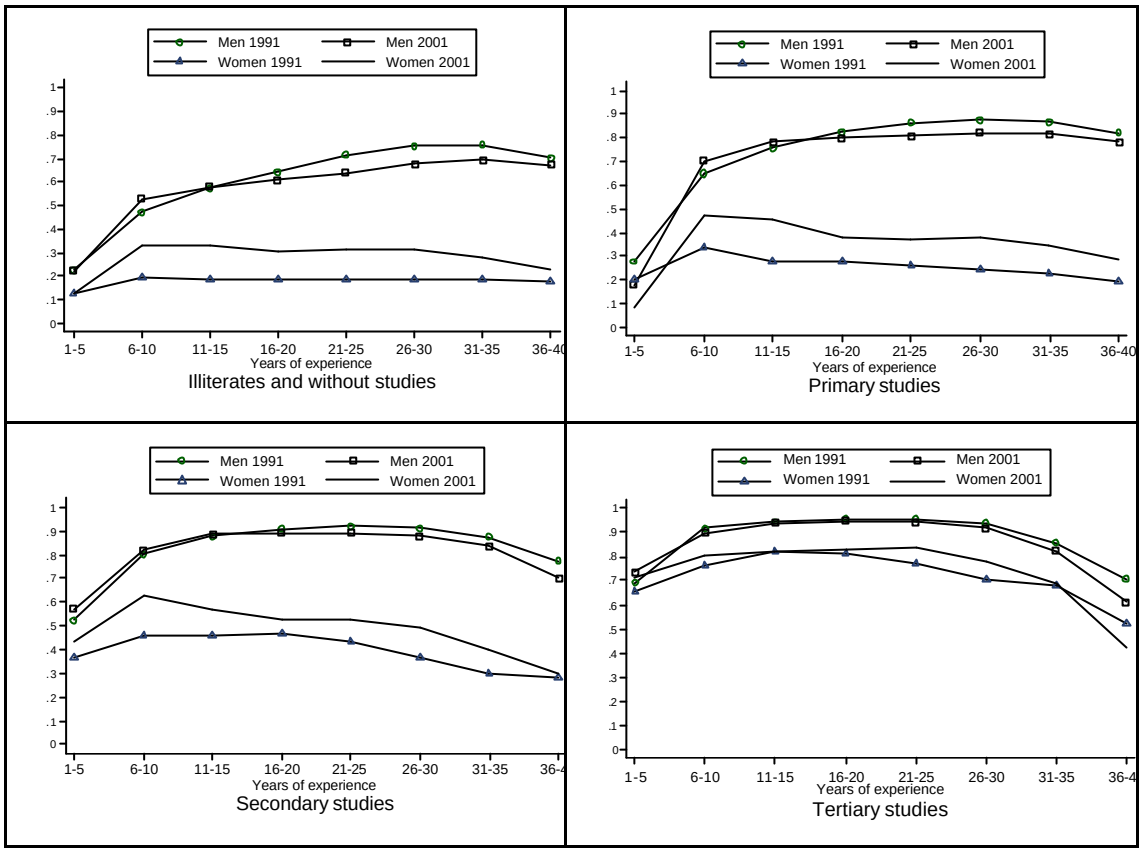
Appendix 4.

Figure A1. Incidence of immigration by educational level and years of experience



Source: Census of Population, 1991 and 2001

Figure A2. Employment rates of native-born workers by educational level and years of experience



Source: Census of Population, 1991 and 2001

References:

Angrist, J. and A. Kugler (2003): «Productive or Counter-Productive : Labour Market Institutions and the Effect of Immigration on EU natives », *Economic Journal* (forthcoming).

Boeri, T. et al. (2002): Who is Afraid of the Big Enlargement ?. CEPR Policy Paper No. 7. London.

Borjas, G. (1994): "The Economics of Immigration", Journal of Economic Literature, vol. XXXVII, December 1994, 1667-1717.

Borjas, G. (1999): "The economic analysis of immigration" in O. Ashenfelter and D. Card (eds.), *Handbook of Labour Economics*, vol. 3A. North Holland.

Borjas, G. (2001): "Does Immigration Grease the Wheels of the Labor Market?", *Brookings Papers on Economic Activity*, 1, 69-119,

Borjas, G. (2003): "The Labor Demand Curve *Is* Downward Sloping: Reexamining the Impact of Immigration on the Labor Market", *The Quarterly Journal of Economics*, vol 118, no. 4, pp. 1335-1378.

Card, D. (1990): "The Impact of the Mariel BoatLift on the Miami Labor Market". *Industrial and Labor Relations Review*, 43, 245-257.

Card, D. (2001): «Immigrants Inflows, Native Outflows, and the Local Labour Market Impacts of Higher Immigration », *Journal of Labour Economics*, 19, 22-64.

Card, D. and J.E. DiNardo (2001): "Do immigrant inflows lead to native outflows?", *American Economic Review*, vol. 90, no. 2 May, pp. 360-367.

Carrasco, C. (2002): "El Impacto Económico de la Inmigración: Incorporación al Mercado de Trabajo Formal e Informal" en *La Inmigración: Una Realidad en España*, Seminario de Investigación para la Paz.

Carrasco, R., J.F. Jimeno and A.C. Ortega (2004): "The Effect of Immigration on the Employment Opportunities of Native-Born Workers: Some Evidence for Spain" FEDEA, working paper no. 2004-17.

Cohen-Goldner, S. and M.D. Paserman (2004): "The Dynamic Impact of Immigration on Natives' Labor Market Outcomes: Evidence from Israel", IZA DP no. 1315.

Collado, D., I. Iturbe-Ormaetxe and G. Valera (2002): "Quantifying the Impact of Immigration in the Spanish Welfare State", Universidad de Alicante, mimeo.

Coppel, J., J.C. Dumont, and I. Visco (2001): "Trends in immigration and economic consequences" OECD Economics Department Working Papers, no. 284.

Dolado, J.J. (2002): “Los nuevos fenómenos migratorios: Retos y Políticas” en García-Milá, T (ed.), *Las nuevas Fronteras de la Política Económica en España, (2001*), CREI, Universidad Pompeu Fabra y Generalitat de Catalunya.

Dolado, J.J, J.F. Jimeno and R. Duce (1997): "Los efectos de la inmigración sobre la demanda relativa de trabajo cualificado vs. poco cualificado: Evidencia para España", *Cuadernos Economicos de ICE*, num. 63, 11-30.

Friedberg, R. and J. Hunt (1995): "The Impact of Immigration on Host Country Wages, Employment and Growth", *Journal of Economic Perspectives* 9, Spring, 23-44.

Friedberg, R. (2001): “The Impact of Mass Migration on the Israeli Labor Market”, *The Quarterly Journal of Economics*, CXVI(4), November 2001, pp.1373-1408.

Hanson, G., et al. (2001): “Immigration and the US Economy: Labor Market Impacts, Illegal Entry and Policy Choices”, in T. Boeri, B. McCormick and G. Hanson, eds., *Immigration Policy and the Welfare System*, Oxford University Press.

Hunt, J. (1992): “The impact of the 1962 repatriates from Algeria on the French Labor Market”, *Industrial and Labor Relations Review*, 45, 556-572.

Izquierdo, A. (2002): “Panorama de la Inmigración en España al Alba del Siglo XXI” en *La Inmigración: Una Realidad en España*, Seminario de Investigación para la Paz.

Pischke S. and J. Velling (1997): “Employment effects of Immigration to Germany: An Analysis Based on Local Labor Markets”, *Review of Economic and Statistics*, 79, November, pp. 594-604.