The Impact of Recent Immigration in Spain:
A Comparison of the Immigration Surplus Across Regions

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MOTIVATION

- Immigration has become one of the most important issues to be addressed by Spanish policy makers in this new century. According to the last CIS questionnaire (september 2006), almost 60% of Spanish Citizens consider that immigration is their main social concern (before unemployment, housing and terrorism).

- Indeed, the pace that the Immigration phenomenon has taken in Spain is impressive. In 1991, only 1.2% of the Spanish adult population (around 300,000 individuals) were immigrants. This inflow rose to 4.0% by 2001 (around 1,370,000 individuals) and by 2005, the percentage has risen to 8,0 % (3,100,000 individuals).

Table 1: Percentage of Immigrants in Population and Employment (1991-2005)

	% Immigrants over Adult Population (older 16)			% Employed Immigrants over Adult Employed Population		
	1991 (Census)	2001 (Census)	2005 (Padrón)	1991 (Census)	2001 (Census)	2005 (Padrón)
Average	1.2	4.0	8.5	1.1	4.6	10.9
Andalusia	1.0	2.5	5.6	0.8	2.9	7.2
Aragón	0.5	3.0	7.2	0.5	4.1	10.0
Asturias	0.8	1.3	2.7	0.7	1.6	3.1
Balears	2.9	8.4	16.3	2.3	8.4	18.9
Canary I.	2.6	6.1	11.5	0.3	6.2	14.0
Cantabria	0.7	1.3	3.8	0.4	1.5	4.9
C. León	0.5	1.5	3.5	0.5	1.9	5.0
C. La Mancha	0.2	2.9	6.1	0.2	3.4	8.6
Catalonia	1.6	4.6	11.3	1.4	5.2	12.9
C. Valenciana	1.6	5.6	12.6	0.8	5.3	15.4
Extremadura	0.3	1.2	1.9	0.3	1.5	2.4
Galicia	1.1	1.2	2.6	0.9	1.3	2.9
Madrid	1.9	6.6	13.2	1.7	8.4	17.0
Murcia	0.4	5.9	12.5	0.4	8.8	16.3
Navarra	0.6	4.1	7.8	0.6	5.1	10.0
P.Vasco	0.6	1.5	3.5	0.5	1.6	4.5
Rioja	0.6	4.5	10.4	0.7	5.5	13.1
C. y Melilla	0.3	7.8		2.7	5.4	

Adult Population (1991 Census): 30,665,000
Adult Population (2001 Census): 34,223,000
Adult Population (2005 Padrón): 36,415,975

- However, geographical distribution of immigrants is concentrated in a few regions. Andalusia, Balears, Canary Islands, Catalonia, Valencia, Madrid and Murcia are by far the high-immigration regions. More precisely, these regions absorb 83.5% of the whole immigration stock, whereas the percentage of natives residing in such regions only reach 65% of the total adult population.

Table 2: Distribution of Natives and Immigrants across Regions (Adults)

	Immigrants Census 1991	Natives Census 1991	Immigrants Census 2001	Natives Census 2001	Immigrants Padron 2005
Andalusia	14.1	17.5	11.4	17.6	11.3
Aragón	1.2	3.0	2.4	3.0	2.6
Asturias	1.8	2.9	0.9	2.8	0.7
Balears	1.2	1.7	4.5	1.9	4.2
Canary I.	8.3	3.9	6.4	3.9	6.0
Cantabria	0.7	1.4	0.5	1.4	0.6
C. León	2.8	6.5	2.4	6.3	2.4
C. La Mancha	0.9	4.1	2.6	4.3	3.1
Catalonia	21.1	16.0	19.0	15.6	21.4
C. Valenciana	12.4	9.7	14.6	10.0	15.6
Extremadura	0.7	2.6	0.8	2.6	0.7
Galicia	6.3	6.9	2.2	7.0	1.9
Madrid	19.7	12.9	23.1	12.9	20.9
Murcia	0.9	2.7	4.4	2.8	4.4
Navarra	0.7	1.4	1.5	1.3	1.3
P.Vasco	2.9	5.9	2.0	5.4	2.0
Rioja	0.4	0.7	0.8	0.7	0.8
C. y Melilla	0.9	0.3	0.6	0.3	

Regions Attracting Immigrants: Andalusia, Balears, Canary Islands, Catalonia, C. Valenciana, Madrid and Murcia.
These attract: Census 1991: 77.7% of all immigrants vs 64.4% of natives.
Census 2001: 83.4% of all immigrants vs 64.7% of natives.
Padrón 2005: 83.8% of all immigrants.

- In a neoclassical setup, immigration to a local area will raise total income in that area, and will also shift the distribution of incomes across groups of workers. This income redistribution has lead to a growing concern that the concentration of immigrants in particular areas may be harming certain native groups in these areas. [Some examples: Borjas (1995, 2003, 2006), Ottaviano and Peri (2005, 2006), Peri (2006), Altonji and Card (2001), Card (2001, 2004)]

- As in an Hecksher Olin Model, where opening up trade always raises income if the factor shares in the trading partner differ from those in the home country, immigration will increase total income inasmuch as *the skill shares of the inflow of immigrants differ from those of natives*. Moreover, the higher the difference between the skill shares, the higher the increase in income that takes place.

- To date, most studies concerning the effects of immigration on wages that take into account that the skill share of immigrants differ to that of natives (most of them cited above), have focused on the effects on the national economy as a whole. Peri (2006) is an exception as he focuses on the effect of immigrants on Native Wages in California.

- Our purpose in this paper is to take into account that Spanish Immigration is unevenly distributed across the Spanish regions. Given that the positive effect of local immigration will be bigger if immigrants help "balance out" supply skill differences across regions, we want to measure the extent to which immigrants are distributing themselves in different regions so as to balance out these skill differences.

- The tool we are going to use to look at whether immigrants help "balance out" supply skill differences across regions is the Net Immigration Surplus, taking account of regional variation in native skills and the effect of heterogeneous immigrants on the local skill shares.
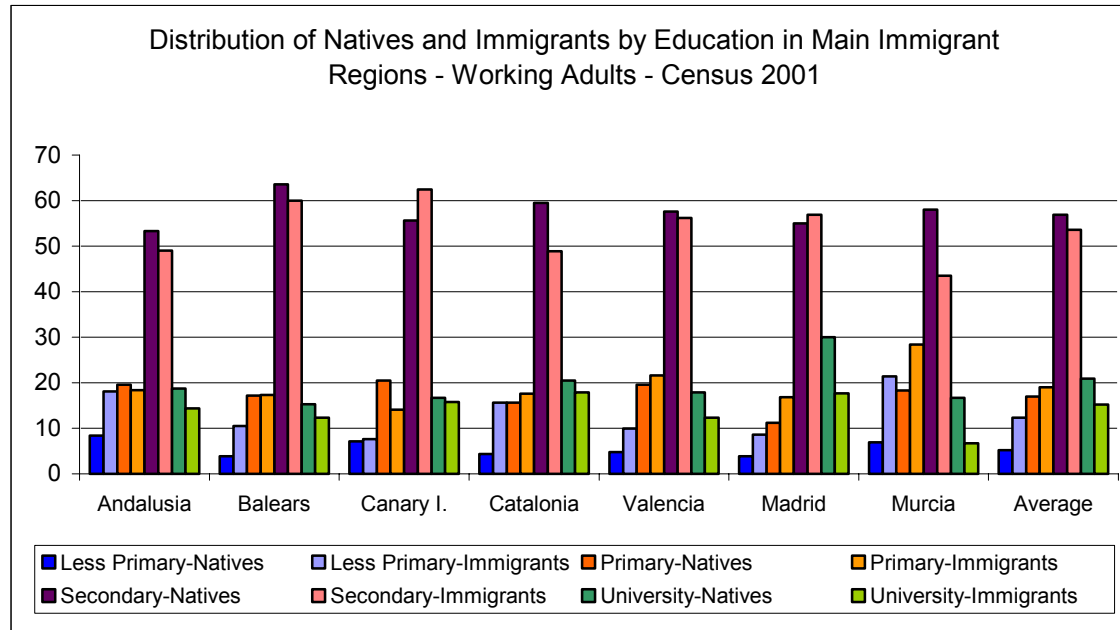
2. Data and Descriptives

2.1. Data

The basic datasets will be the 2001 and the 1991 Census microdata. We may also use the microdata of the 1995 and 2002 EES.

2.2. Descriptives

Differences in the skill shares between natives and immigrants in the most high-immigration regions

Distribution of Natives and Immigrants by Education in Main Immigrant Regions - Working Adults - Census 2001

Legend:
- Less Primary-Natives
- Less Primary-Immigrants
- Primary-Natives
- Primary-Immigrants
- Secondary-Natives
- Secondary-Immigrants
- University-Natives
- University-Immigrants

Distribution of Natives and Immigrants by Age
in Main Immigrant Regions - Working Population - Census 2001

Legend:
- 16-24 Natives
- 16-24 Immigrants
- 25-34 Natives
- 25-34 Immigrants
- 35-44 Natives
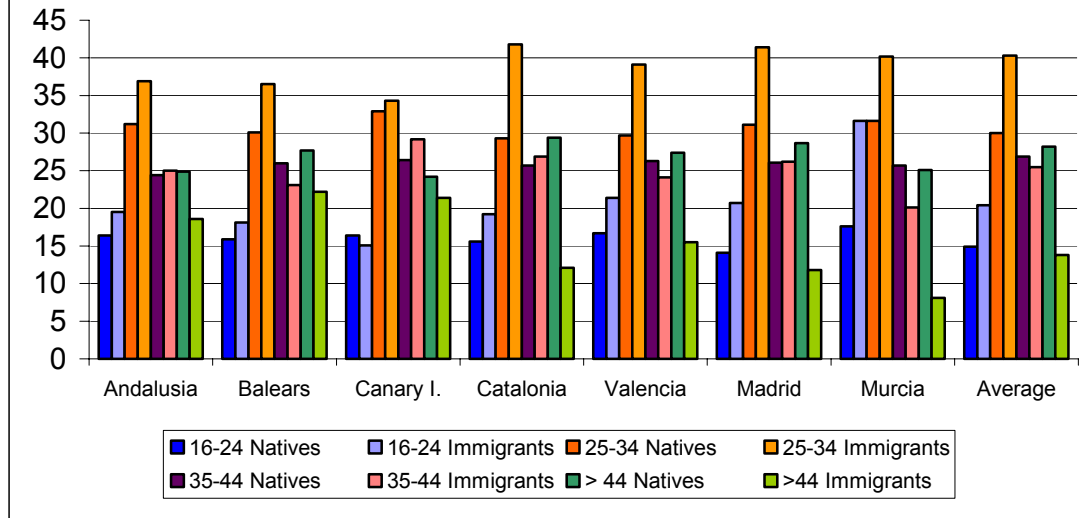- 35-44 Immigrants
- > 44 Natives
- >44 Immigrants

Table 3: Differences in the skill shares of Natives and Immigrants - $(\beta_i - b_i)^2$

Skills	Average	Andalusia	Balears	C.Islands	Catalonia	Valencia	Madrid	Murcia
1	4.32	15.28	3.09	0.38	4.45	3.31	1.25	36.84
2	17.62	38.31	16.64	2.89	32.03	11.90	6.76	58.21
3	6.55	6.45	2.59	0.37	19.27	2.37	4.04	14.66
4	3.09	8.82	0.77	6.05	0.94	3.06	3.92	9
5	4.75	1.25	2.56	0.94	3.57	6.70	1.10	34.33
6	19.53	6.45	6.40	0.26	20.43	24.70	8.76	65.28
7	0.16	2.04	0.17	3.27	1.02	0.04	0.24	0.70
8	25.60	11.69	13.17	9.61	29.81	29.05	40.57	22.46
9	3.45	2.75	0.51	0.25	0.12	0.98	3.20	5.71
10	10.30	0.68	2.22	0.57	1.79	10.11	28.40	12.60
11	7.72	5.38	9.73	14.51	12.39	4.08	3.13	44.35
12	30.91	0.39	1.58	7.84	76.91	12.39	36.24	44.89
13	0.33	0.07	0.20	0.23	0.65	0.57	0.00	0.11
14	2.37	5.01	3.49	0.32	1	4.97	0.65	12.67
15	2.46	1.44	0.96	0.02	0.40	2.19	0.01	12.60
16	4.24	0.36	0.08	0.00	4.57	1.41	1.51	6.76
Sum	164.85	117.77	77.32	57.15	234.64	145.51	178.89	396.94

Skills:

1=(Less than primary - 16-24; 2=(Less than primary - 25-34); 3=(Less than primary - 35-44); 4=(Less than primary - > 44); 5=(Primary - 16-24);6=(Primary - 25-34); 7=(Primary - 35-44);8=(Primary - > 44 ; 9=(Secondary - 16-24);10=(Secondary - 25-34); 11=(Secondary - 35-44); 12=(Secondary - > 44); 13=(University - 16-24); 14=(University - 25-34); 15=(University - 35-44); 16=(University - > 44);

3. The Framework:

The goal of the paper is to estimate the regional immigration surplus, paying particular attention to the high-immigration regions. The starting point will be the following:

- Assume that capital is infinitely elastically supplied at a constant rate, r.
- We allow for $i=1...n$ skill levels for immigrant and native workers, where skill will be defined in terms of education (4 levels) and age (4 level). The supply of immigrants is perfectly inelastic.
- There is a national aggregate production function (the same for all regions) that exhibits constant returns to scale.
- Immigrants are assumed to bring in only labour to the host country (they do not increase the host's country capital stock).
- Immigration does not produce external returns in the aggregate economy.

In this context, following Borjas (1995), we define the immigration surplus (IS) generated by the entry of M immigrants (i.e. the increase in national income per unit of output accruing to natives) as:

$$\frac{\Delta Q_N}{Q} = (K\frac{\partial r}{\partial M} + b_1 N\frac{\partial w_1}{\partial M} + b_2 N\frac{\partial w_2}{\partial M} + ... + b_n N\frac{\partial w_n}{\partial M})\frac{M}{Q} \qquad (1)$$

where b_i is the share of natives with skill i.
- For each skill i, only the following fraction of immigrants: $(\beta_i - b_i)M$ generate a positive IS. Given that the rate of return of capital is constant, we can approximate the IS by:

$$\frac{\Delta Q_N}{Q} = \frac{1}{2}\left[b_1 N(\beta_1 - b_1)M\frac{\partial w_1}{\partial M} + b_2 N(\beta_2 - b_2)M\frac{\partial w_2}{\partial M} + ... + b_n N(\beta_N - b_N)M\frac{\partial w_n}{\partial M} \right] \qquad (2)$$

After some manipulation, we reach the following expression:

$$\frac{\Delta Q_N}{Q} = \frac{1}{2}(1-m)m\sum_{i=1}^{n}\frac{(\beta_i - b_i)^2 s_i}{p_i}\sum_{j=1}^{n} e_{ij} \qquad (3)$$

where $L=N+M$, $m = \dfrac{M}{L}$, $s_i = \dfrac{w_i L_i}{Q}$, $p_i = \dfrac{L_i}{L}$, and e_{ij} stands for the inverse of factor price elasticity of inputs i and j.

This is the expression of the immigration surplus at a national level assuming i different skill levels.

What would be the IS for natives in a particular region c? Assuming that the production function is equal across regions, i.e. e_{ij} is the same across regions, the IS(c) could be written as:

$$IS(c) = \frac{1}{2}\left[1 - m(c)\right] m(c) \sum_{i=1}^{n} \frac{\left(\beta_i(c) - b_i(c)\right)^2 s_i(c)}{p_i(c)} \sum_{j=1}^{n} e_{ij} \qquad (3)$$

(All data but the factor price elasticities and labor income shares can be taken from 2001 Census Data - I discuss below the data to be used to calculate these two magnitudes).

4. Computing the factor price elasticities

1) First Step: Follow Borjas (2003) to serve as a comparative reference:

Estimate the elasticities of substitution between inputs and then relate them to the factor price elasticities for a given production function:

- Assume that output is produced by physical capital and different types of labour. Labour types are grouped according to education and age combined in a CES aggregate.
- Age groups are nested within educational groups, that are in turn nested into the labor composite Lt.
- At this stage, we assume that natives and immigrants within the same education-age group are perfect substitutes.
- More precisely, suppose that the aggregate production function for the whole economy at time t is given by:

$$Q_t = [\lambda_{kt} K_t^{\nu} + \lambda_{Lt} L_t^{\nu}]^{\frac{1}{\nu}}$$

where $v = 1 - 1/\sigma_{KL}$, with σ_{KL} being the elasticity of substitution between capital and labour. (Besides, the vector lambdas gives technology parameters and satisfy that $\lambda_{kt} + \lambda_{Lt} = 1$).

- The labour aggregate Lt is defined as:

$$L_t = \left[\sum_{i=1}^{4} \theta_{it} L_{it}^{\rho} \right]^{\frac{1}{\rho}}$$

where *i* are each of the four educational categories (less than primary, primary, secondary and university). The parameter $\rho = 1 - 1/\sigma_E$, where σ_E is the elasticity of substitution across education groups. However, within each educational group i, we allow that workers with different experience levels to be imperfect substitutes. In particular;

$$L_{it} = \left[\sum_{j=1}^{4} \alpha_{ij} L_{ijt}^{\eta} \right]^{\frac{1}{\eta}}$$

where j are age intervals (spans of 10 years). The parameter $\eta = 1 - 1/\sigma_j$, where σ_j measures the elasticity of substitution between workers with different experience levels but within the same educational group.

   - As in Borjas, we will assume by now that σ_{KL}=1. Regarding the other two elasticities, given the CES production function stated below, and following Card and Lemieux (2001), the marginal productivity condition derived from this production function can be written as:

$$\log\left(w_{ijt}\right) = \delta_t + \delta_{it} + \delta_{ij} - \left(\frac{1}{\sigma_j}\right)\log L_{ijt} \quad (11)$$

$$\log\left(w_{it}\right) = \delta_t + trend_i - \left(\frac{1}{\sigma_E}\right)\log L_{it} \quad (12)$$

Once σ_E and σ_j were estimated, then from Hamermesh (1993) and the use of this three-level CES technology, we can obtain the factor price elasticities in the following way:

$$e_{ij,ij} = -\frac{1}{\sigma_j} + \left(\frac{1}{\sigma_j} - \frac{1}{\sigma_E}\right)\frac{s_{ij}}{s_i} + \left(\frac{1}{\sigma_E}\right)\frac{s_{ij}}{s_L}$$

where $e_{ij,ij}$ are the own factor price elasticities, and the s's are the different share of income accruing to each of the groups.

Regarding the cross-factor price elasticities:

$$e_{ij,ij'} = \left(\frac{1}{\sigma_j} - \frac{1}{\sigma_E} \right) \frac{s_{ij'}}{s_i} + \left(\frac{1}{\sigma_E} \right) \frac{s_{ij'}}{s_L}$$

and:

$$e_{ij,i'j'} = \left(\frac{1}{\sigma_E} \right) \frac{s_{i'j'}}{s_L}$$

5. Some Problems with these calculations

1. Data to compute these calculations:

1.A) Time Series Data:

- I am looking for macro data (annual) on wages for a span of around least ten years (1987-2001) for the different education groups and the different education-age groups. I might try to buy it from INE if possible. (More ideas?)
- Employment data: No problem. EPA
- Labour income shares for all skills: Once I have data on wages, if we assume that labour income is around 0.7 of total income, we can easily impute the labour shares of each skill.

1.B) 2001 EES Data

- Possibility: Compute the average earnings by skill groups taking establishments as units (all weighted by size).

- Problem: There is no total employment in each establishment - Only sample size. Enough?

2. Econometric problems:

2.1. Natives from a local region may "vote with their feet", so that the supply-shock is not properly accounted for.

Peri (2006) looks at the possible outflow of natives from the region. We can try the same for the high-immigration regions and see whether we see native outflow or not:

In particular, we could look at the response of Native Employment to Immigration (1991-2001) with the two census and see how the increase in immigration has lead to outflow of natives or not. If we do not see much response, we can forget about this potential problem.

2.2. - The $\beta_i(c)$ may be endogenous if immigrants select themselves into the most favourable regions for their skills.

Solution: Instrument this parameter with average shares of immigrants at a national level.

2.3. When estimating elasticities of substitution, employment is endogenous to wages. We need to find instruments - Following Card (2001), some studies have used the number of immigrants as instruments.

Other possibilities for Spain: Use total population (or total number of women) in each i or ij group

2) Next Steps:

Try to relax the assumption that natives and immigrants within each occupation-age group are imperfect substitutes (like in Peri (2006)). When doing so, we need to estimate the elasticity of substitution between natives and immigrants. We need relative wages and relative employment of each group.

Perhaps we could estimate it from the 2002 EES. Then all factor-price elasticities should be re-evaluated and the IS re-estimated.

3) Try different possible elasticities (others found in the literature) and simulate the IS for each case.

6. Final aim with these computations:

- See whether we find consistent differences on the different IS computed for the different high-immigration regions.

- Show to what extent these differences depend on the differences between the skill shares of natives and immigrants in each region.

- If these differences amount to be a very important final determinant, we might be able to give some advices regarding immigration policy in each region.
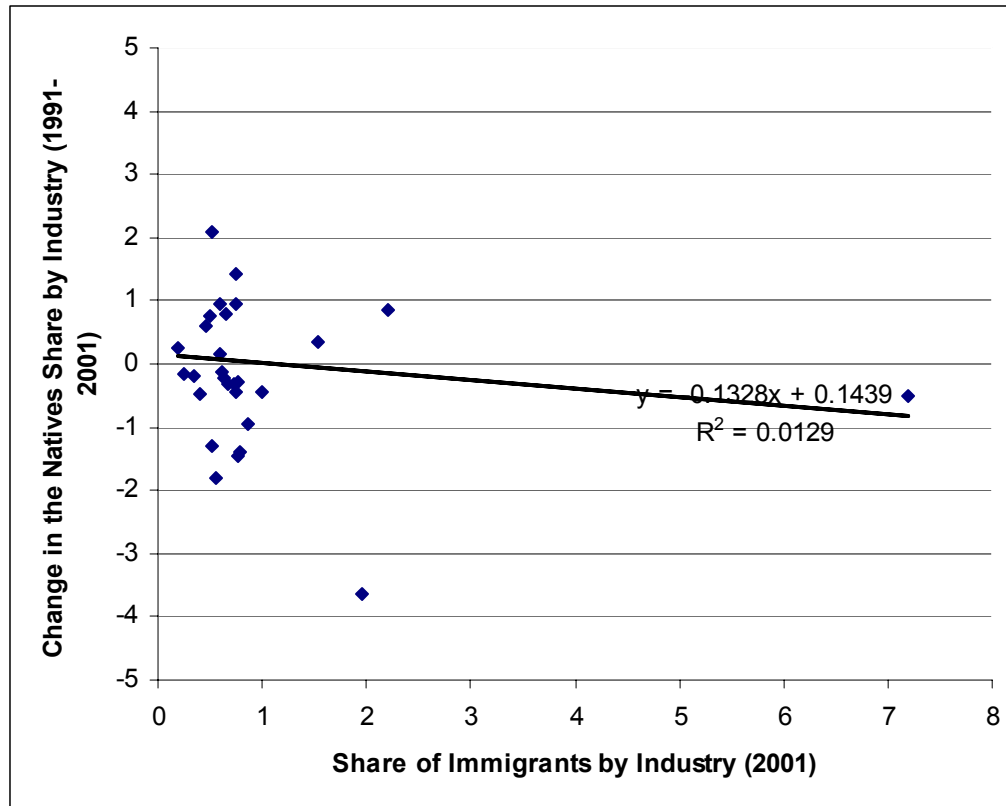
(End of the presentation)

Other figures (do not show in the presentation)

Distribution of Natives and Immigrants by Age in
Main Immigrant Regions - All Adults - Census 2001
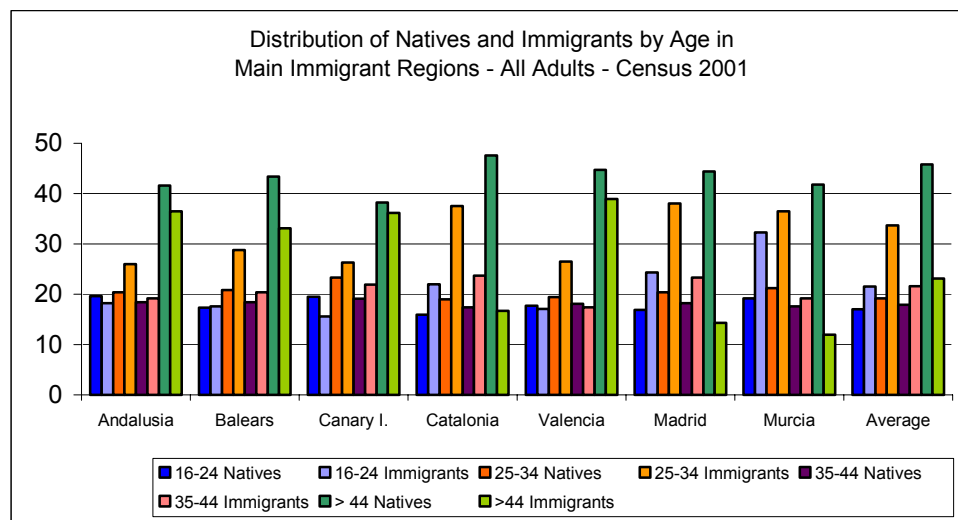
Figures 5-7

Figure 5: Share of immigrants in each industry relative to natives (29 industries)
Census 2001 versus Change in the natives share by industry (1991-2001)
All country

In X-axis: Share of immigrants by industry/share of natives in those industries.

Figure 6: Share of immigrants in each industry relative to natives (29 industries)
Census 2001 versus Change in the natives share by industry (1991-2001)
Catalonia

Shares of Immigrants and Natives by Industry - Catalonia

$y = -0.088x + 0.1042$

$R^2 = 0.0042$

Change in the Natives Share by Industry (1991-2001)

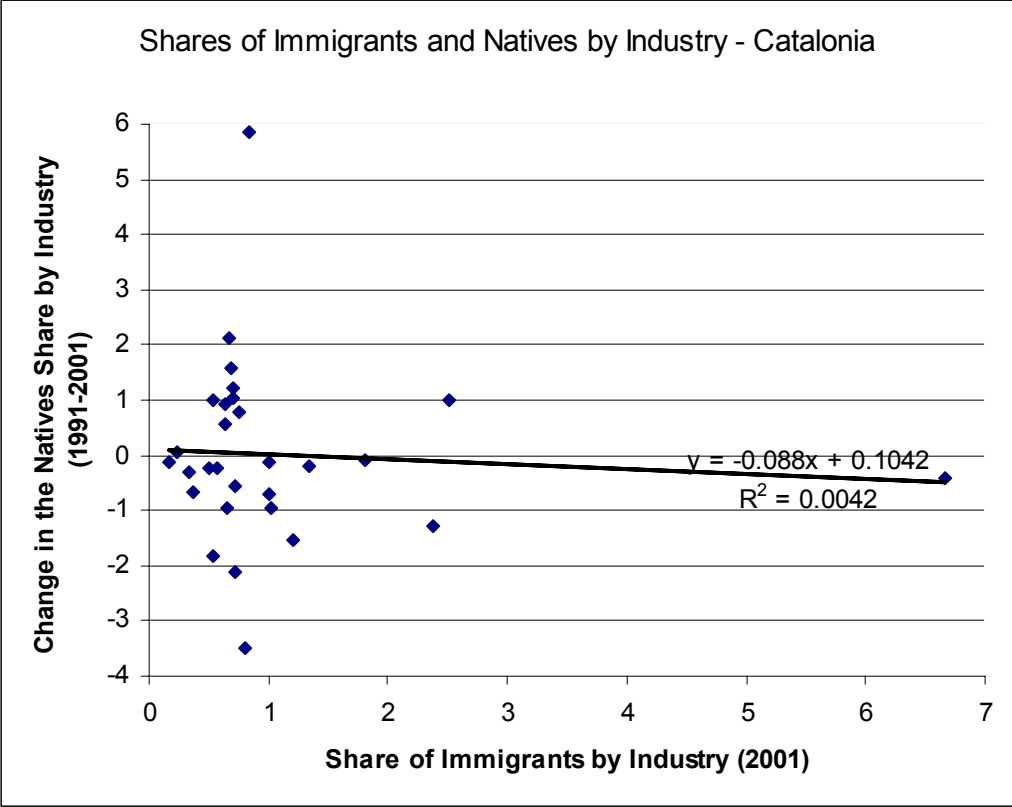Share of Immigrants by Industry (2001)

Figure 7: Share of immigrants in each industry relative to natives (29 industries)
Census 2001 versus Change in the natives share by industry (1991-2001)
Madrid

Shares of Immigrants and Natives by Industry - Madrid

Change in the Natives Share by Industry (1991-2001)

$y = -0.0876x + 0.1131$

$R^2 = 0.0069$

Share of Immigrants by Industry (2001)