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EFFECTS OF SOCIODEMOGRAPHIC CHANGES ON THE LABOUR MARKET OF GALICIA IN SPAIN

Recently, important societal changes have affected the labour market: declining birth rates, aging population, the delayed independence of young people, an increase in the number of households, new household structures (increases in small households and single-parent households), and an increase in female workers. As a consequence, any model of the Galician labour market should include the following explanatory variables: gender, marital status, household size, age, and education level. Using binary logistic regression, we analyze the effect of each variable on probability of job activity in several years (2003, 2007 and 2013); in Galicia (the northwest region of Spain). We show that the probability of job activity increases especially in women during the economic crisis (2013). In addition, men decide to reduce their retirement age during economic growth, whereas they prolong their retirement age during economic crises. Hence sociodemographic changes and economic cycle affect the probability of job activity.

Keywords: labour market, demographic change, gender, activity, logit

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1. INTRODUCTION

The aim of this paper is to show the influence of sociodemographic changes on the labour market (especially on the activity) in the first and second decade of the twenty-first century, including gender shifts, an aging population, evolving family structures, low birth rate, and the delayed independence for the nation's youth (III Quarterly Report of Labour Market, project of Social-Labour Guidance for employees by Trade Union Organization of CCOO for FOREM, 2010). For this purpose we have studied the labour market in Galicia (Spain). These population changes have occurred so quickly and on such a large scale that they have created a quasi-revolution (Carabaña-Morales, 2003). Their potential consequences for education, pension systems, immigration policy and family structure have

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made these changes the subject of analysis by politicians, academics, and other professionals.

This paper is organized as follows. Section 2 evaluates the influence of gender on the labour market. Section 3 analyzes changes in Spanish society related to the family structure during recent years. In addition, this section shows the implications of sociodemographic changes for the labour market. Section 4 presents a binary logistic regression analysis of the effects of each variable in order to explain the effects on the labour market. The paper ends with some concluding remarks.

2. INFLUENCE OF GENDER ON THE LABOUR MARKET

Women in the Spanish labour market are more educated in recent years, yet they have fewer job opportunities and earn less than men. This is more pronounced for unskilled female workers. Four principal characteristics make this especially interesting: 1) gender disparities are shrinking, 2) college-educated workers have an easier time finding jobs, 3) higher education reduces the social problems associated with an aging population, 4) men and women in the labour market tend to behave similarly because the education level is rising for both genders. Mendes *et al.* (2012) show that the number of years of schooling is the most relevant variable to explain the human capital.

Employed workers dedicate 9.86 years on average to education, but this value is 10.52 years for employed women and 9.49 years for employed men. That is, women spend in education one year more than men do (Instituto Valenciano de Investigaciones Económicas, IVIE, 2008a). These educated women do get jobs, but they tend to have fewer opportunities than men. In addition, men are more likely than women to be in management, despite women having higher qualifications than men, and women earn less money than men. They also have worse labour conditions. It is clear that discrimination against women exists in the labour market, but women constitute more than half the population, making discrimination a substantial waste of human capital (Barreiro-García and Martínez-Seijas, 2006). In addition, Mendes *et al.* (2012) study the effect of human capital on business performance.

Sex is a biological term; *gender* is a cultural one (Sanchez-Moreno and Delicado-Losa, 2007). The labour market highlights these differences, and there are a lot of studies about gender-based labour inequalities in recent decades that find that women work better than men but earn less (Martin and Ceridwen, 1984; Hartmann, 1994).

In fact, on the whole, older women earn less than older men. Salaries for women older than 54 are 38 per cent lower than salaries for men in the same age category (IVIE 2008b). The gender inequality is smaller for younger workers, however.

The discrimination against women in the labour market is based on two types of labour segregation: horizontal (jobs "just for women" or "just for men") and vertical (jobs with less responsibility). This is one cause for the salary differences between men and women (Saez-Lara, 1994). There are also other types of discrimination:

− Direct discrimination in which the person's treatment is based on gender.
− Indirect discrimination in which neutral but formal decisions negatively affect employees of a specific gender. Often these decisions cause gender discrimination.

Currently politicians are introducing anti-discrimination laws, and the International Labour Organization (ILO) is developing legal rules about gender equality and sensitivity. Many countries have formally adopted the ILO rules.

We expect that participation in the labour market depends on marital status, age and education level. Research already found that men are more likely to get a job at graduation and are overall less likely to be unemployed (Albert et al., 2003). Nowadays, however, young women are more educated than young men. Although many studies indicate that women are still concentrated in specific jobs and activity sectors that do not pay well and offer little professional advancement.

The evolution of gender participation in the Spanish labour market shows shrinking differences between women and men. Female unemployment is still higher than male unemployment, however, and the unemployment rate is higher for women at all education levels (Frutos-Balibrea and Titos-Gil, 2001).

Internal and external factors also determine how women integrate into the labour market. Family obligations are a common external factor. Women continue to do housework, for example, even when working outside the home. Looking after children, sick family members, or aging family members also falls largely to women and often damages their professional development. Young women, however, report fewer family obligations; their birth rates are also lower than in the past in Spain. Internal determinants are largely cultural, but rising education levels among women could raise the proportion of women in management.

3. SOCIODEMOGRAPHIC CHANGES

We review the sociodemographic changes in Spanish society that relate to the evolution of the family structure in recent years. These changes affect the economic environment and the labour market which makes them necessary to study. After all, employment determines lifestyles and broader social systems; it may be considered a psychosocial phenomenon in constant evolution due to social, cultural, and economic determinants, including the opinions of workers (Gonzalez and Rodriguez, 2010).

One of the biggest changes is the decreasing household size, 75% of which is due to declining birth rate (Requena, 1999). This is happening despite the increasing tendency of young people to live with their parents longer. Becker and Tomes (1976) study the trade-offs between quantity and quality in childbearing. They find that people who choose to have small families often cite lower expenses and better quality of life as reasons. Mcfalls (2007), Lee and Mather (2008), Carlson (2009), Jacobsen and Mather (2011), and Randall *et al*. (2011) study these factors.

The 2001 census indicates that one-person households are increasingly common, the number of couples with four or more children is decreasing, the number of couples without children is increasing, and households occupied by unrelated people increased fivefold. The census also indicates that young people leave home later, more old people live alone, and Spanish households have fewer members. This trend continued in 2011 (see Table 1).

Table 1

Census 2001 and 2011

Indicators	Census 2001	Census 2011	% variation 2001-2011
Number of households	14,187,169	18,083,692	27.5
One-person households	2,876,572	4,193,319	45.8
Median size of households (persons)	2.86	2.58	-10.0
Single young people aged 25-34 years who live alone	443,675	607,806	37.0
Number of couples	9,510,817	11,473,534	20.6
Couples without children	3,042,409	4,413,304	45.1
Couples with 3 or more children	994,665	631,186	-36.5
De jure couples	8,947,032	9,806,022	9.6
De facto couples	563,785	1,667,512	195.8
'Rebuilt' families	235,385	496,135	110.8
People aged 65 or older	6,796,936	7,933,773	16.7
People aged 65 or older who live alone	1,358,937	1,709,186	25.8

Source: (INE, 2011) and own elaboration

Another sociodemographic change that is a subject of concern for national and international institutions such as INSHT (2001) is population aging. The explanations for this trend include lower birth rates among European women in the 1960s (in Spain, the 1970s) and improvements in health and living conditions. These changes affect the labour market through their influence on job rules, productivity, retirement age, and organizational structure.

This aging population has four interesting characteristics when it comes to the labour market.
− The number of workers over the age of 50 has increased remarkably.
− Young people enter the labour market later, which raises their eventual retirement age.
− The ratio of retirees to workers is so high that the current pension system is unsustainable. For this reason, delays in the full retirement age are prolonging workers' careers (full retirement age increased from 65 to 67 in 2011).
− Sociodemographic changes are changing the distribution of job time (work days, flexibility, length of work days, etc.)

Key changes in sociodemographics and household structures during last decades include (Brändle-Señan, 2008):
− Falling marriage rates and increases in the number of unmarried couples.
− Increases in the divorce rate and the number of single-parent households (usually led by mothers).
− Increasing age of first-time married couples.
− Falling fertility rates; Spain has one of the lowest rates, despite higher fertility among immigrants.
− Increases in the number of working married women.
− Reduction in the number of households.
− Fewer large households and more one-person households (singles, widowers, widows, divorced and elderly people).

The research also finds that young people leave home later and live with their parents even when they find jobs. This situation is due to:
− Higher unemployment rates and higher housing costs.
− Lengthening of the time needed to obtain a degree and thus later career starts.
− Comfort with living at home and a desire to avoid a "step down" in lifestyle by leaving.

Campo and Rodríguez-Brioso (2002) study the Spanish family in the second half of the twentieth century. They show that the transition from

extended to nuclear families in Spain occurred before the 1950s. In addition, they find a lower birth rate, average family size and distant relatives in households during the 1960s. Since the 1980s, the Spanish nuclear family seems to have been similar to other Mediterranean and European countries. Hence the new characteristics of household are greater numbers of extramarital children, single parent families and family conflicts due to the new role of women in society.

The European birth rate has decreased in recent decades, although a slight recovery has been observed in recent years, but it is still below the generational replacement rate of 2.1 children per woman. The indicator of fertility level in a year (total fertility rate or TFR) reflects the interaction between time and fertility level. Many European countries are experiencing a postponement of births, which is also reflected in the higher average age of motherhood. As a result, the number of births in the current year and TFR has decreased, even if the number of children that women have throughout their life does not change. A better indicator of the average number of children per woman is the "adjusted TFR". This is a measure of the fertility level in a year which has no time effects. The Spanish situation in recent years shows a stabilization in the increase in the average age of motherhood. Therefore the difference between the two measures of fertility has almost disappeared, showing a slight increase in TFR combined with a continuing decline of fertility level represented by the adjusted TFR. This decrease can be largely caused by the incorporation of women into the labour market.

Previous papers recognize that sociodemographic changes affect the labour market. Almarcha et al. (2001) find that migration and population age are determinants of labour market changes. We add the following variables such as Sánchez-Sellero (2010) propose and justify (see Figure 1):

− *Gender*. The increase in women's participation in the workplace may be reducing the birth rate, among other factors. Consequently, we believe gender changes influence the labour market.
− *Household size*. Fewer household members and more one-person households affect the labour market.
− *Age*. Delayed independence among young people due to longer studies increases the age at which they get their first jobs. This translates into increased retirement age, which affects the labour market.
− *Education level*. The Spanish education level is higher than ever. The percentage of the population with a medium education level or more increased from 6.3% in 1964 to 69% in 2010 (IVIE, 2011).
− *Civil status*. Fewer weddings, higher celibacy rates, and more divorces have changed the family structure and the labour market.

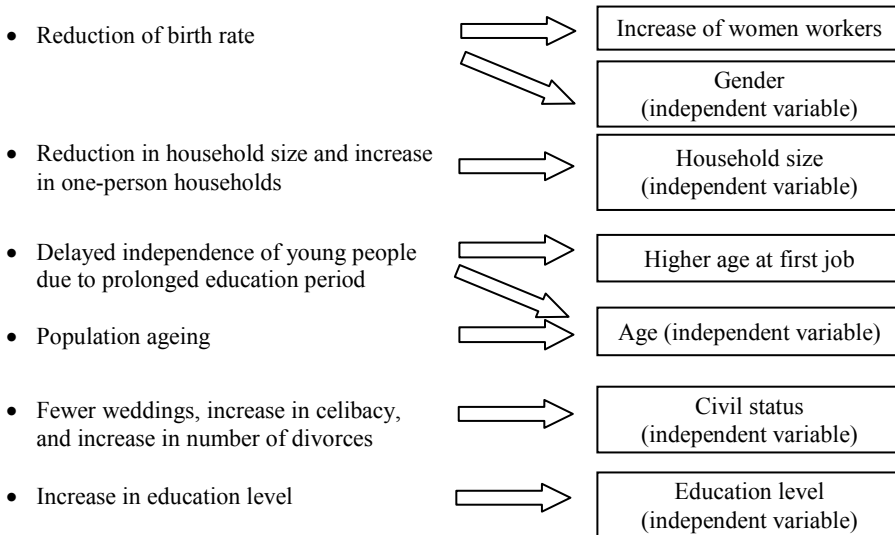|	
• Reduction of birth rate	Increase of women workers
	Gender (independent variable)
• Reduction in household size and increase in one-person households	Household size (independent variable)
• Delayed independence of young people due to prolonged education period	Higher age at first job
• Population ageing	Age (independent variable)
• Fewer weddings, increase in celibacy, and increase in number of divorces	Civil status (independent variable)
• Increase in education level	Education level (independent variable)

Figure 1. Repercussions of sociodemographic changes on the labour market and variables justification

Source: own elaboration

We show the impact of demographic factors in the occupation figures in Galicia in relation to Spain. Galicia has lower population pressure than Spain due to their greater regional aging, lower pressure of the active population in the labour market, lower growth in the number of employed, higher generation of industrial employment, lower generation of services employment, and higher agricultural impact in employment and unemployment. Ares and Rey (2008) compare the labour market in Galicia with Spain. They describe the characteristics of Galician labour market that represents the progressive convergence of the sectoral employment structure between Galicia and Spain (Fernández and López, 2000).

4. MODEL, METHODOLOGY, AND EMPIRICAL RESULTS

We propose an activity model to understand what drives a person to apply for a job. We consider the same methodology and geographic area as Sánchez-Sellero (2013). We use a binary logistic regression model (Agresti, 1996; Amemiya, 1981; Cox and Snell, 1989; Hosmer and Lemeshow, 1989) to analyze how *gender*, *household size*, *age*, *civil status*, and *education level* (see Figure 1) influence the probability of that activity.

Our data is from the "Survey of family life conditions" by Instituto Galego de Estatística (IGE). Because we are interested in the sociodemographic changes and their effects on the labour market during a stable economic cycle, we used data from 2003, 2007 and 2013. The sample includes 18,572, 17,619 and 23,684 residents of Galicia who represent a population of 2,701,425, 2,712,520 and 2,696,221 Galician residents in 2003, 2007 and 2013. The Galician labour market is similar to the Spanish labour market, allowing us to generalize the results to the Spanish labour market; we propose this following our previous analysis of the differences between the Galician and Spanish labour market.

In this activity model, the dependent variable equals 0 if the person is inactive in the job market and 1 if the person is active. This is a Bernoulli variable, its average is the probability of the event 1. Activity is different between men and women, so *gender* is an independent variable in our model. Because gender influences age, civil status, education level, etc., the rest of the independent variables are the interactions between gender and other characteristics. Accordingly, we include six categorical independent variables and two quantitative independent variables. The categorical independent variables are:

− *Gender*
− *Age group*gender*
− *Civil status*gender*
− *Education level*gender*
− *Nationality*gender*
− *City population*gender*
    The quantitative independent variables are:
− *Household size*gender*
− *Adjusted household income*gender*

Nationality, city population, and adjusted household income do not interact with *gender*.

Our objective is to study the influence of the independent variables on labour market activity and learn which personal characteristics are more likely to lead to a job. We are most interested in people aged between 16-65 − the traditional span of working life. If people are 16 years old, then the study of marital status or studies does not make sense. For this reason, we only take in consideration people aged 20-64 (see Table 2).

Tables 3.1. and 3.2. show the relative frequencies and activity percentages of each categorical variable. For example 53.7% of men were married and their participation rate was 86.4% in 2013. We present these data in each of the three years 2003, 2007 and 2013.

Table 2

Sample and population

	2003	**2007**	**2013**
Sample: people aged 20-64	Actives: 7,352 people	Actives: 7,209 people	Actives: 10,637 people
	Inactives: 3,494 people	Inactives: 3,178 people	Inactives: 3,272 people
	Total: 10,846 people	Total: 10,387 people	Total: 13,909 people
Population: people aged 20-64	Actives: 1,153,178 people	Actives: 1,207,667 people	Actives: 1,310,476 people
	Inactives: 512,969 people	Inactives: 487,480 people	Inactives: 348,618 people
	Total: 1,666,147 people	Total: 1,695,147 people	Total: 1,659,094 people

Source: (IGE, 2003, 2007, 2013) and own elaboration

Table 3.1

Descriptive statistics (relative frequencies and activity percentages)
of categorical variables in the activity model

Variables	**2003**	**2007**	**2013**
Gender			
Men	49.4 (80.3%)	49.5 (80.2%)	49.7 (83.2%)
Women	50.6 (58.4%)	50.5 (62.4%)	50.3 (74.8%)
Age groups * gender			
From 20 to 24 years, men	12.3 (63.8%)	9.5 (63.1%)	7.7 (56.1%)
From 20 to 24 years, women	11.7 (46.9%)	9 (52.6%)	7.3 (52.2%)
From 25 to 29 years, men	13.4 (82.2%)	12.5 (85.2%)	9.5 (88.9%)
From 25 to 29 years, women	13 (77%)	12.1 (78.5%)	9.2 (86.8%)
From 30 to 34 years, men	12.4 (93.1%)	13 (91.8%)	12.7 (94.8%)
From 30 to 34 years, women	12.3 (71.1%)	12.7 (76.4%)	12.1 (90.9%)
From 35 to 39 years, men	11.7 (93%)	12.3 (95.2%)	13.9 (95.7%)
From 35 to 39 years, women	11.9 (72.1%)	12.2 (73.2%)	13.5 (87.8%)
From 40 to 44 years, men	11.6 (93%)	11.6 (91.1%)	12.9 (92.8%)
From 40 to 44 years, women	11.6 (64.5%)	11.9 (70.7%)	12.8 (83.1%)
From 45 to 49 years, men	10.7 (87%)	11.5 (89.6%)	12 (93.1%)
From 45 to 49 years, women	10.7 (62.1%)	11.6 (67.1%)	12.3 (81.6%)
From 50 to 54 years, men	10.3 (84.9%)	10.3 (82.5%)	11.4 (86.6%)
From 50 to 54 years, women	10.3 (50.8%)	10.5 (59.7%)	11.8 (73.9%)
From 55 to 59 years, men	9.8 (68.1%)	9.9 (66.7%)	10.4 (74.4%)
From 55 to 59 years, women	10.2 (40.3%)	10.1 (44.9%)	10.9 (64.3%)
From 60 to 64 years, men	7.7 (44.2%)	9.4 (42.1%)	9.5 (45.8%)
From 60 to 64 years, women	8.4 (25.8%)	9.9 (25.8%)	10.1 (37.7%)
Marital status * gender			
Married, men	57.2 (85.4%)	56.3 (84%)	53.7 (86.4%)
Married, women	60.4 (56.7%)	59.8 (58.7%)	57.4 (74.2%)
Separate or divorced, men	2.8 (77%)	3.5 (76%)	4.9 (80.6%)
Separate or divorced, women	4.5 (74.2%)	5.6 (77.3%)	7.2 (83.8%)
Single, men	38.7 (74%)	39 (75.9%)	40.8 (79.8%)
Single, women	30.1 (64.1%)	30.1 (69.9%)	31.4 (78%)
Widower or widow, men	1.3 (48.2%)	1.1 (53%)	0.6 (51.5%)
Widower or widow, women	5.1 (31%)	4.5 (42.3%)	3.9 (43.2%)

Source: (IGE, 2003, 2007, 2013) and own elaboration

Table 3.2

Descriptive statistics (relative frequencies and activity percentages)
of categorical variables in the activity model

Variables	2003	2007	2013
Formation level * gender			
First period of secondary studies, men	54 (82.9%)	51.3 (80.3%)	43.9 (81.6%)
First period of secondary studies, women	48.5 (51.8%)	46.9 (54.8%)	37.8 (66.9%)
Second period of secondary studies, men	17.3 (74.8%)	18 (79.6%)	23.5 (80.7%)
Second period of secondary studies, women	17.6 (60.8%)	17.9 (65.1%)	22.8 (74.2%)
Illiterate and primary education, men	5.8 (49%)	4.3 (40.3%)	3 (49.8%)
Illiterate and primary education, women	7.9 (29.8%)	5.5 (29.6%)	3.7 (39.8%)
Advanced vocational training, men	9.9 (90.2%)	11.5 (91.4%)	11.7 (92.3%)
Advanced vocational training, women	8.4 (78.7%)	8.5 (81.7%)	11.6 (88.4%)
University studies, men	13 (83%)	14.9 (83.7%)	17.8 (90.1%)
University studies, women	17.6 (77.2%)	21.2 (77.8%)	24.1 (86.8%)
Nationality * gender			
Spanish, men	98.5 (80.2%)	97.9 (80%)	96.9 (82.9%)
Spanish, women	98.8 (58.2%)	97 (62.2%)	96 (74.4%)
Foreign, men	1.5 (87.2%)	2.1 (92.2%)	3.1 (92%)
Foreign, women	1.2 (70.5%)	3 (68.5%)	4 (85.3%)
Size of the municipality * gender			
Big: more than 20.000 habitants, men	46.9 (80.3%)	51 (81%)	52.4 (84%)
Big: more than 20.000 habitants, women	49.6 (60.2%)	52.9 (64.7%)	54.5 (77%)
Small: fewer than 20.000 habitants, men	53.1 (80.3%)	49 (79.4%)	47.6 (82.3%)
Small: fewer than 20.000 habitants, women	50.4 (56.7%)	47.1 (59.8%)	45.5 (72.2%)

Source: (IGE, 2003, 2007, 2013) and own elaboration

Tables 4.1. and 4.2. show the logit estimation results of the activity model. We obtain all the estimations from the R statistical package (R Core Team, 2012) and all the graphics from the Lattice package (Sarkar, 2008).

These tables show the coefficients for three years, their significance degrees, McFadden's R^2 and percentages correctly classified. The model in 2013 is better than in 2007, and this, in turn, is better than in 2003. Therefore, the percentage of people correctly classified by the model is 80.7% in 2013, whereas in 2003 this is 73.8%.

All the coefficients are significant for 2003. The coefficients referred to men and women who live in municipalities with a population greater than 20,000 and foreign women are not significant for 2007. On the other hand, the coefficients of men who live in municipalities with a population greater than 20,000 and single women are not significant.

Table 4.1.

Logit estimation results of the activity model

Variables	$\beta_j(2003)$	$\beta_j(2007)$	$\beta_j(2013)$
Gender			
Women	-2.737 ***	-2.285 ***	-1.361 ***
Age groups * gender			
From 20 to 24 years, men	-1.564 ***	-1.432 ***	-2.446 ***
From 25 to 29 years, men	-0.824 ***	-0.337 ***	-0.64 ***
From 35 to 39 years, men	-0.566 ***	0.078 ***	-0.231 ***
From 40 to 44 years, men	-0.734 ***	-0.759 ***	-1.073 ***
From 45 to 49 years, men	-1.315 ***	-0.921 ***	-0.99 ***
From 50 to 54 years, men	-1.503 ***	-1.443 ***	-1.672 ***
From 55 to 59 years, men	-2.412 ***	-2.335 ***	-2.425 ***
From 60 to 64 years, men	-3.293 ***	-3.186 ***	-3.518 ***
From 20 to 24 years, women	-1.111 ***	-1.095 ***	-2.035 ***
From 25 to 29 years, women	0.144 ***	0.055 ***	-0.375 ***
From 35 to 39 years, women	0.118 ***	-0.079 ***	-0.327 ***
From 40 to 44 years, women	-0.1 ***	-0.092 ***	-0.614 ***
From 45 to 49 years, women	-0.099 ***	-0.087 ***	-0.523 ***
From 50 to 54 years, women	-0.443 ***	-0.291 ***	-0.819 ***
From 55 to 59 years, women	-0.744 ***	-0.764 ***	-1.149 ***
From 60 to 64 years, women	-1.309 ***	-1.603 ***	-2.133 ***
Marital status * gender			
Separate or divorced, men	-0.755 ***	-0.821 ***	-0.441 ***
Separate or divorced, women	0.617 ***	0.626 ***	0.293 ***
Single, men	-1.227 ***	-1.204 ***	-0.935 ***
Single, women	0.135 ***	0.314 ***	0.007
Widowers	-0.692 ***	-0.758 ***	-1.044 ***
Widows	-0.476 ***	-0.136 ***	-0.726 ***

Dependent variable: ACTIVE PEOPLE
Method: Binary logit estimated by maximum likelihood

Source: (IGE, 2003, 2007, 2013) and own elaboration

Table 4.2.

Logit estimation results of the activity model

Variables	β_j(2003)	β_j(2007)	β_j(2013)
Formation level * gender			
Second period of secondary studies, men	-0.411 ***	-0.079 ***	0.111 ***
Second period of secondary studies, women	0.342 ***	0.244 ***	0.294 ***
Illiterate and primary education, men	-1.001 ***	-1.18 ***	-1.265 ***
Illiterate and primary education, women	-0.439 ***	-0.687 ***	-0.899 ***
Advanced vocational training, men	0.755 ***	0.796 ***	0.809 ***
Advanced vocational training, women	1.1 ***	1.071 ***	1.014 ***
University studies, men	0.148 ***	0.392 ***	1.01 ***
University studies, women	1.034 ***	0.937 ***	1.199 ***
Nationality * gender			
Foreign, men	0.29 ***	0.776 ***	0.287 ***
Foreign, women	0.428 ***	0.03	0.369 ***
Size of the municipality * gender			
Small: fewer than 20,000 habitants, men	0.085 ***	0.012	-0.005
Small: fewer than 20,000 habitants, women	0.03 ***	-0.006	-0.099 ***
Size of the family * gender			
Size of the family, men	0.211 ***	0.325 ***	0.365 ***
Size of the family, women	0.023 ***	0.069 ***	0.087 ***
Adjusted household income * gender			
Adjusted household income, men	-0.353 ***	-0.461 ***	-0.59 ***
Adjusted household income, women	-0.136 ***	-0.202 ***	-0.351 ***
Constant	3.285 ***	3.044 ***	3.501 ***
Observations with dependent variable = 0	3494	3178	3272
Observations with dependent variable = 1	7352	7209	10637
Total number of observations	10846	10387	13909
Chi-square	370,008.986 ***	392,823.792 ***	390,329.298 ***
-2 log likelihood	1,674,410.6	1,628,712.9	1,307,811.1
MacFadden R^2	0.186	0.199	0.233
Correct classifications	73.8%	75.7%	80.7%

Figures with *, ** and *** indicate a level of significance of 10%, 5% and 1%, respectively.

Note: The reference category is men, aged 30-34, married, Spanish, with first period of secondary studies and living in a city with more than 20,000 habitants.

Dependent variable: ACTIVE PEOPLE

Method: Binary logit estimated by maximum likelihood

Source: (IGE, 2003, 2007, 2013) and own elaboration

This model provides the probability that $Y = 1$ when the values of variables X are given. The equation with a single variable X is the following:

$$E\left[\frac{Y}{X}\right] = P\left[Y = \frac{1}{X}\right] = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots + \beta_k X_{ki}. \qquad (1)$$

The β_j parameter represents the variation in the probability that $Y = 1$ (be active) conditioned to one-unit variation of X_j:

$$\beta_j = \frac{\partial P\left[Y = \dfrac{1}{X}\right]}{\partial X_{ji}}. \qquad (2)$$

However, logit model parameters are not particularly informative, and for this reason these parameters are not interesting. This model proposes a *non-linear* relationship between explanatory and *P(Y=1)* explained variables. For example, the effect of the probability caused by the *X* variable depends on the starting point of this *X* variable.

The next step is to calculate the probabilities under certain assumptions. We use *nationality* and *city population* to analyze how the categorical independent variables affect the probability of job activity. *Gender*, *civil status*, *education level*, and *age* are not fixed. We consider only Spanish people in cities with more than 20,000 people (big cities).

We obtain the probabilities by replacing the estimated coefficients values (Tables 4.1. and 4.2.) in the following logit model:

$$p = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_1 + \ldots + \beta_k X_k)}} \qquad (3)$$

The exception is that we multiply the quantitative variables of each coefficient by the average:
− *Coefficient of correct income men/women * average of correct income men/women*
− *Coefficient of household size men/women * average household size men/women*

Therefore Table 5 provides descriptive statistics (mean, SD, minimum and maximum) for the quantitative variables in the activity model.

Table 5

Descriptive statistics for the quantitative variables in the activity model

Variables	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
	2003				2007				2013			
Number of men	3.84	1.41	1	11	3.59	1.37	1	10	3.27	1.26	1	10
Number of women	3.78	1.45	1	11	3.52	1.40	1	10	3.24	1.26	1	10
Adjusted income men	1,910	1,435	0	28,849	2,225	1,537	0	13,681	1,948	1,336	0	11,180
Adjusted income women	1,528	1,323	0	19,094	1,845	1,530	0	14,291	1,677	1,375	0	11,180

Source: (IGE, 2003, 2007, 2013) and own elaboration

To analyze the effect of each quantitative variable on the probability of job activity, we must fix the categorical variables. So, we limit the sample to Spanish people who are married, aged 40-44, with a second period of secondary studies, and live in big cities. We chose these categories because they concentrate the majority of people and are thus the most representative. To analyze the effect of sample size on the probability of job activity, we do the following:

− *Coefficient of correct income men/women * average of correct income men/women*
− *Coefficient of household size men/women * value of household size men/women (no fixed)*

4.1. Main Effects of Personal Characteristics on the Probability of Job Activity

In this section we show the main results of the different probabilities of activity, as well as some graphical representations of these conclusions. In addition, all the graphics (except Figure 4) are based on different probabilities of the dichotomy between men and women. We focus on the effect of the sociodemographic changes variables.

First, we look at the *effect of formation level* on the probability of job activity. We find that, in general terms, the greater the formation level, the more likely a person is to work. But we should add that the probability of job activity of men and women reaches a maximum when the worker completed advanced vocational training in 2003 and 2007. However, in the economic

crisis of 2013, this probability reached a maximum when the worker completed university studies and this does not occur due to a reduction in the mentioned probability when the worker finished advanced vocational training. We show these ideas, for example, when people are married at the age of 40-44 (see Figure 2).
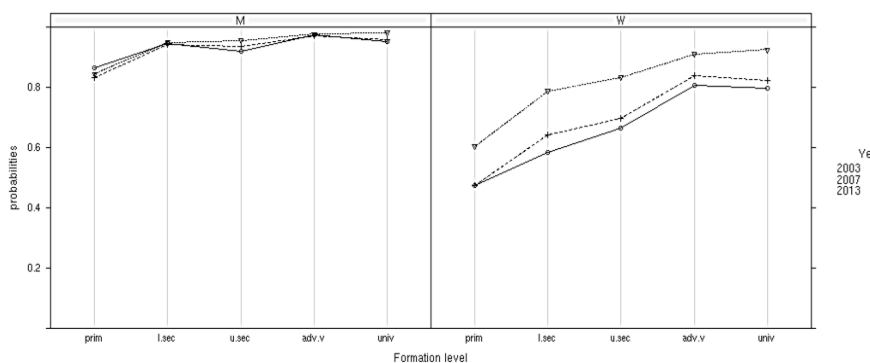

Figure 2. Effect of formation level on probability of job activity: Spanish, big cities, married, aged 40-44

Note: M: men, W: women, prim: illiterate and primary education, l.sec: first period of secondary studies, u.sec: second period of secondary studies, adv.v: advanced vocational training, univ: university studies.

Source: (IGE, 2003, 2007, 2013) and own elaboration

We highlight that the greater increase on the probability of job activity occurred in 2013, especially for women as a result of a period of the economic crisis.

The differences in the probability of job activity for both genders between 2003, 2007 and 2013 are smaller when the formation level is higher.

The estimation results are in accordance with raw data. So, for example, the probability of job activity moves around 0.90 in men with university studies (see Figure 2, Tables 3.1. and 3.2.). This probability is between 0.78 and 0.90 in women with university studies (see Figure 2, Tables 3.1. and 3.2.). We should take in consideration that we obtained the estimated probability of job activity in more specific situations than in the raw data.

In addition, we show the *effect of age* on the probability of job activity. So, in years of economic growth (2003 and 2007), the probability of job activity reaches the maximum for men aged 30-39 and for women aged 25-29. However, in the economic crisis of 2013 the probability of job

activity reached the maximum when people were aged 30-34. We extended our analysis through the effect of age on probability of job activity in married people with a second period of secondary studies (see Figure 3).
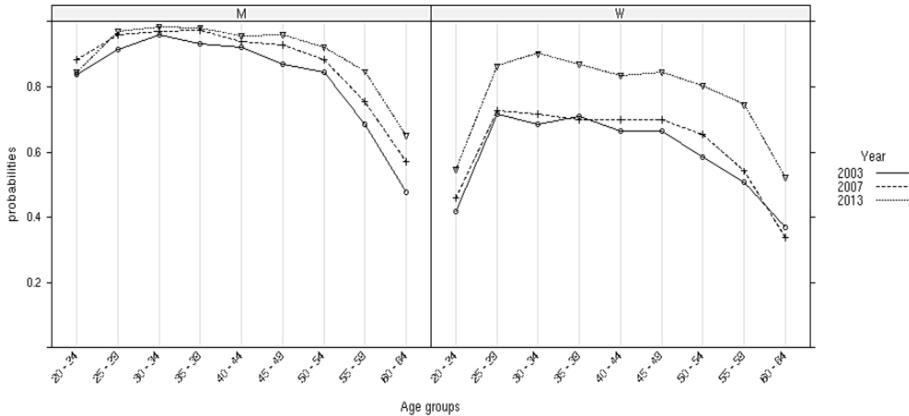

Figure 3. Effect of age on probability of job activity: Spanish, big cities, married, second period of secondary studies
Note: M: men, W: women.

Source: (IGE, 2003, 2007, 2013) and own elaboration

We continue to see in 2013 that the probability of job activity of women is significantly higher than in previous years.

The probability of job activity for men aged less than 44 (Figure 3) is similar every year (2003, 2007 and 2013), but the probability of job activity for men aged more than 45 in the economic crisis of 2013 is higher than during the economic growth of 2003 and 2007. In addition, men get the retirement at a younger age during the economic growth (2003 and 2007), whereas they extended the retirement age during the economic crisis of 2013.

Regarding the women, we show that the probability of job activity for women aged 30-34 is less than for women aged 25-29 during the economic growth (2003 and 2007). However, this reduction disappears in the economic crisis of 2013. Hence the probability of job activity in men and women reaches a maximum when their age is 30-34. When women are at fertile age, their children are born and need to be cared for. A greater reduction in the probability of job activity during women's fertile age is for women aged 30-34 in 2003, 35-39 in 2007 and 40-44 in 2013. They stay at home to take care of their children during economic growth whereas they look for a job to earn money during an economic crisis.

The probability of job activity is greatly reduced when the age is higher and the educational level is lower in 2003, 2007 and 2013 (Figure 4). In addition, when people are 30-34 years old, the probability of job activity was very similar in 2003, 2007 and 2013. However, when their age is 30-34, the probability of job activity in the economic crisis of 2013 was higher than during economic growth (2003 and 2007). When age increases, job activity decreases more if education levels are lower in the economic crisis of 2013 (see Figure 4).

Figure 4. Effect of formation level on probability of job activity: aged 30-34, 45-49 and 60-64:

Spanish men, big cities, married

Source: (IGE, 2003, 2007, 2013) and own elaboration

The larger the *household size*, the higher the probability of job activity (Figure 5). The probability of job activity among women rose considerably more than for men during the economic crisis of 2013. We considered married people aged 40-44 and with a second period of secondary studies.
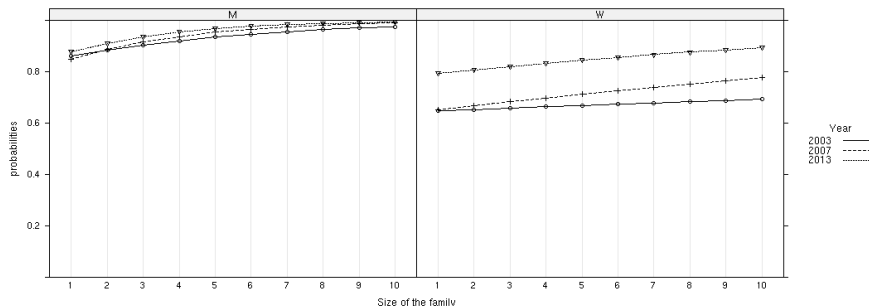

Figure 5. Effects of household size on probability of job activity: Spanish people, big cities, married, aged 40-44, second period of secondary studies

Note: M: men, W: women.

Source: (IGE, 2003, 2007, 2013) and own elaboration

Household size is a quantitative variable, thus we include the variations in the probability of activity for a unit increase in household size (see Table 6).

Table 6

Variations in probability of job activity by unit increase in household size

Number of household members	Δ probability men (%)	Δ probability women (%)	Δ probability men (%)	Δ probability women (%)	Δ probability men (%)	Δ probability women (%)
	2003		2007		2013	
1						
2	2.33	0.52	3.70	1.55	3.41	1.39
3	1.98	0.51	2.88	1.51	2.53	1.32
4	1.67	0.51	2.20	1.47	1.84	1.24
5	1.40	0.51	1.66	1.43	1.32	1.17
6	1.16	0.50	1.23	1.39	0.94	1.10
7	0.96	0.50	0.91	1.35	0.66	1.04
8	0.80	0.50	0.67	1.31	0.46	0.97
9	0.65	0.49	0.49	1.26	0.32	0.91
10	0.54	0.49	0.36	1.22	0.23	0.85

Source: (IGE, 2003, 2007, 2013) and own elaboration

If household size increases from one to two, the probability of job activity increases by 3.41% among men and 1.39% among women in the economic crisis of 2013. The changes are always positive, though the greater the household size, the lower the increase in probability (see Table 6).

Finally, we studied the *effect of marital status* on the probability of job activity. The probability of job activity is higher among married men than
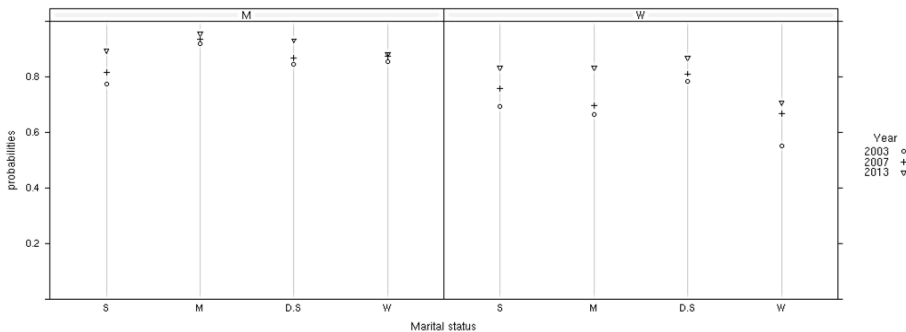

Figure 6: Effects of civil status on probability of job activity: Spanish people, big cities, aged 40-44, second period of secondary studies
Note: M: men, W: women, S: single, M: married, D-S: separate/divorced, W: widower.

Source: (IGE, 2003, 2007, 2013) and own elaboration

for singles, separated people, divorcees, or widows. The probability of job activity among married women is lower than for single women in the period of economic growth (2003 and 2007), but the opposite happened in the economic crisis of 2013. However, the probability of job activity is similar for both genders (80%) (see Figure 6). On the whole, we can say that separated/divorced women are more active than single, married and widowed women. The probability of job activity among married women rose considerably in the economic crisis of 2013. Thus, they achieve reduced differences in job activity among married men in that year. Men reach the highest job activity when they are married. We considered people 40-44 years old and with a second period of secondary studies (Figure 6).

CONCLUDING REMARKS

The population is ageing; households are smaller and more complex. These dynamics generate multiple effects for people, households, and families (Didimo-Castillo, 2004).

Nowadays, education levels are higher in women but they still have worse jobs overall than men. *Gender* can explain the labour market by highlighting that gender inequalities are being reduced over time, college education makes people more employable, and that inequality between men and women in the workplace shrinks as they ascend the education scale. The inequalities of employment chances resulting from gender variation tend to decrease, among other reasons, due to increased levels of education.

We also find that sociodemographic changes have increased the number of women workers, lowered the birth rate, created an ageing population, delayed independence for young people, increased the number of households, increased the number of one-person households, lowered household size, and increased the number of single-parent households. All of these changes justify the variables in our labour market model, including *gender*, *age*, *education level*, *household size*, and *civil status*. The trend of Spanish society's behaviour in 2001 is similar to 2011.

For this purpose we consider an activity model. Therefore we studied the sociodemographic changes during economic growth and economic crisis. In this sense, we analyzed 2003 and 2007 for the economic growth period and 2013 for the economic crisis period. The probabilities in 2007 are similar to 2003, however they are different in 2013. We conclude that the sociodemographic changes and the economic cycle are important to the study of the labour market.

We find that the probability of job activity increased especially among women during the economic crisis (2013). In addition, people reach retirement at a younger age especially for men during economic growth, whereas they postpone the retirement age during economic crisis.

The probability of job activity for women aged 20-24 during economic crisis is higher than during economic growth. This is because they stay at home to take care of their children during economic growth whereas they look for a job to earn money during economic crisis. The increase of the probability of job activity caused by the increase of family members is higher during economic crisis.

Our main results for Galician labour market are the same as for the Spanish market, such as the higher activity of women and the increase in the retirement age. The great sociodemographic changes and the difficulties in accessing the labour market can affect the Galician labour market.

The Spanish and Galician economies have been improving since 2014, but many people do not earn more money and they continue being worried by unemployment. We think that people do not get stable and quality jobs, especially during economic crisis. This is a bigger problem than the effects of sociodemographic changes on the labour market.

These results point to certain lines of research for the future. For example, the effect of sociodemographic changes in the labour market could be studied in different regions in order to make a comparative analysis among regions. The effect of the distances between labour markets may also provide valuable information.

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