

# COMPARATIVE STUDY OF EMPLOYABILITY BETWEEN SPANISH AND FRENCH STUDENTS IN CIVIL ENGINEERING

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## Abstract

Recent reforms undertaken in the higher education system of the European countries through the Bologna process have ensured comparability of undergraduate degrees. One advantage of this process is an easier mobility of young professionals among European countries. This is particularly important in the current economic scenario, in which young professionals encounter difficulties to start their professional career. In light of this scenario, the authors of this paper aim to identify and compare the difficulties perceived by undergraduate students in civil engineering to enter the labor market. Data for this study were collected by a questionnaire survey completed by 469 Spanish and French students enrolled in undergraduate degrees in civil engineering. Based on this data, statistical analyses based on principal components, as well as analysis of variance, were undertaken. In this analysis, 21 possible barriers perceived by students to enter the job market were analyzed and reduced to six principal components: government's economic policy, graduate intrinsic barriers, excess of graduates, structure and characteristics of the labor market, globalization of work and training gaps. The analysis of variance found statistically significant differences in the perception of these barriers between Spanish and French students. The former gave more importance to extrinsic and global barriers such as the government's policies and the structure of the labor market. On the other hand, French students focused on specific barriers such as training gaps and intrinsic internal barriers related, among others, to their preference for only well-paid jobs.

Keywords: Employment, Undergraduate Degree, Labor Market.

## 1 INTRODUCTION

One of the main objectives of higher education is to provide adequate training and skills to ensure the employability of young professionals [1]. However, the current economic scenario poses difficulties to young professionals for entering the job market. In the last four years, the overall employment rates for young people fell three times as much as for adults [2].

One of the measures proposed by the European Commission to tackle this problem is to increase labor mobility among countries in the European Union [2]. This measure would help to cover the differences among unemployment rates among countries in the EU. Indeed, there is a gap of over 50 percentage points between the member state with the lowest rate of youth unemployment (Germany at 7.7% in December 2013) and the member state with the highest rate, Greece (58.3% in December 2013) [2]. Recent reforms undertaken in the higher education system of the European countries through the Bologna process have ensured a system of academic degrees that are easy to recognize and compare [3]. One advantage of this process is an easier mobility of young professionals among European countries.

Previous studies have analyzed the employability of graduates in construction in different countries, such as the United States, the United Kingdom, Spain and countries in the European Union [4–7]. However, these studies are focused on the perspective of employers. On the other hand, a previous study developed by the authors have analyzed the problem from the point of view of students [8]. Nevertheless, the case study developed by the authors only considered the opinion of Spanish students [8]. In order to gain an overall perspective of the problem, the objective of this study is to identify and compare the difficulties perceived by undergraduate students in civil engineering to enter the labor market. In order to achieve this objective, a comparative study of employability between Spanish and French students in civil engineering is proposed.

## 2 MATERIALS AND METHODS

In order to collect students' opinion, the investigation was based on a questionnaire developed by the authors, which had already been used to analyze the perception of Spanish graduates in construction management [8]. In order to undertake the comparative analysis, French and Spanish undergraduates in construction sector were questioned. The Spanish population consisted of 677 students of the School of Civil Engineering at the Universitat Politècnica de València (UPV) from four different academic degrees in civil engineering. In May 2013, they were distributed a questionnaire in their classes and handed it after completing. The French population was composed of 309 students from eight engineering schools or universities: École Nationale des Ponts et Chaussées, Ecole Nationale d'Ingénieurs de Saint-Etienne, Institut National des Sciences Appliquées Toulouse et Rouen, École Nationale Supérieure d'Électronique, d'Électrotechnique, d'Informatique, d'Hydraulique, et des Télécommunications, École des Ingénieurs de la Ville de Paris, Ecole d'Ingénieurs and Université Pierre et Marie Curie in Paris. They fulfilled an online questionnaire that they received by email, also during the month of May 2013.

The questionnaire consisted of two parts. The first part was to collect general information on respondents. In the second part, respondents were asked to give their opinion on the cause of high unemployment rate among graduates in construction. For this purpose, 21 possible reasons were listed and respondents had to weigh them with a 5-point Likert scale, with 1 being completely disagree and 5 completely agree.

Data collected were analyzed using IBM SPSS Statistics software (version 21). First, correlations between variables were analyzed. Then, a principal-component analyses (PCA) was carried out to reduce the number of variables [9]. Finally, an ANOVA was applied to the principal factors resulting from the PCA, to show possible differences in answers among the respondents depending on their nationality [10].

## 3 RESULTS

### 3.1 Statistical characterization

From the 986 delivered surveys, a total of 469 were successfully fulfilled and considered in the analysis. This accounts for a response rate of 47.56%, which seems high but reasonable if we take into consideration that Spanish questionnaires were distributed and returned to the facilitator by hand during classes. According to the responses collected, a profile of the students can be established. There are 69% of Spanish and 31% of French, and both are profiled as 22 years-old or younger (Spanish: 79%, French: 68%) male (Spanish: 70%, French: 64%).

Table 1 presents the variables considered to analyze the possible causes of unemployment, the codes used to perform the analysis and a basic statistical description (mean and standard deviation) of the collected answers.

**Table 1.** Statistical description and codes of the 21 possible reasons for unemployment

Code	Variable	Mean	S.D.
V 01	Current economic crisis	4.20	0.89
V 02	Real estate "bubble"	3.93	1.12
V 03	Significant public debt	3.90	1.16
V 04	Government's employment policy	3.60	1.17
V 05	Government's public infrastructure policy	3.55	1.12
V 06	Globalization in the construction sector	3.30	1.12
V 07	Lack of government funding for housing	3.23	1.15
V 08	Too many professionals for current market demands	3.20	1.13
V 09	Socially unbalanced job distribution	3.16	1.13
V 10	III-advised managerial decisions	3.16	1.04
V 11	Inadequate design of university programs	3.02	1.09
V 12	Unemployed professionals lack initiative to work in other countries	2.91	1.13

Code	Variable	Mean	S.D.
V 13	Too many universities offering similar undergraduate degrees	2.91	1.20
V 14	Unemployed graduates only seeking good jobs	2.88	1.24
V 15	Unemployed professionals lack foreign language skills	2.87	1.10
V 16	Inadequate master degrees to fulfill market demands	2.77	1.02
V 17	Too many universities offering similar graduate degrees	2.69	1.05
V 18	Many people with simultaneous jobs	2.64	1.07
V 19	Lack of job search know-how	2.61	1.15
V 20	No eagerness to work	2.52	1.30
V 21	Lack of training of university graduates	2.09	1.07

### 3.2 Correlation between variables

An analysis of the correlation between variables is used to determinate the level of linear relation existing among variables. A relation exists if the Pearson correlation coefficient  $R$  is different from 0, which is equivalent to a bilateral signification lower than 0.05 [11].

Figure 1 represents the correlations among unemployment causes. In order to show only the strongest relations, it was decided to keep correlations with the highest coefficient in absolute value ( $R > 0.30$ ), except for some variables which did not show any correlation higher than 0.30 (i.e. V 09). This graphical representation helps to identify, in a preliminary analysis, the relation among variables [12].

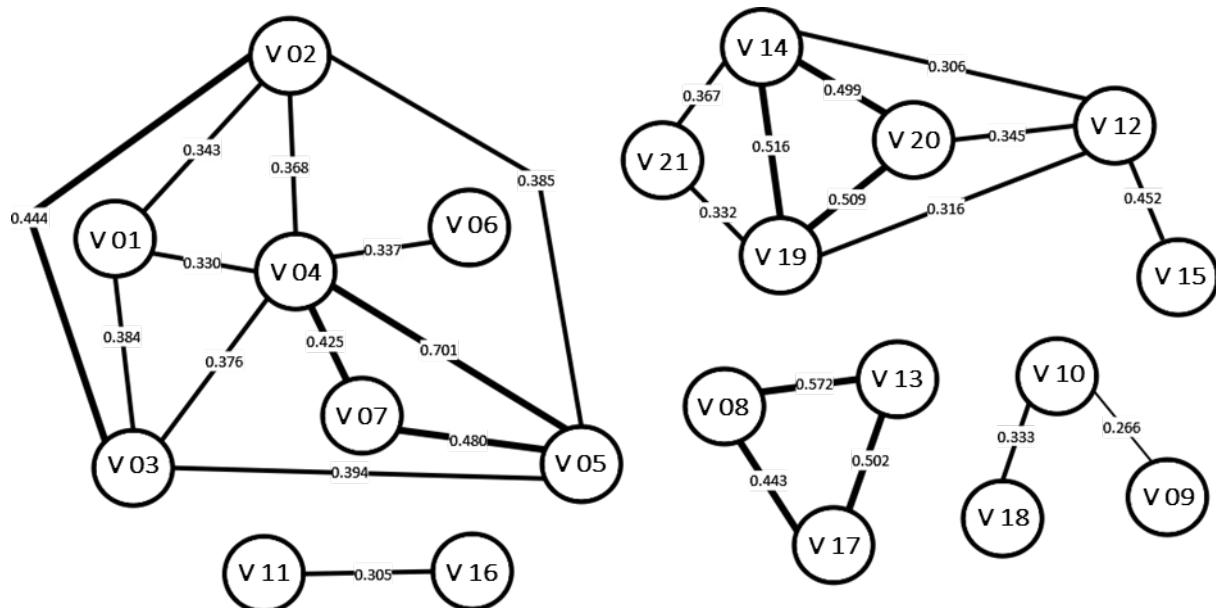


Figure 1. Grouping of variables with  $R > 0.300$  in absolute value at a bilateral signification level of 0.05

### 3.3 Principal component analysis

The PCA reduces the number of variables by building new variables that explain most of the variability of the input data. These new variables, the principal components, are built as linear combinations of the original variables. Before applying the PCA, the adequacy of the data set was assessed by Bartlett's spherical test ( $P < 0.001$ ) and Kaiser-Meyer-Olkin (KMO) measure ( $KMO = 0.823$ ). The criterion used to determinate the number of principal components was its eigenvalue being greater than 1.000. The PCA produced six principal factors from the 21 possible reasons for unemployment. These factors explain 58.68% of the input data variability (Table 2).

**Table 2.** Principal-Component analysis

Principal Component	Eigenvalues		
	Total	Variance (%)	Cumulative variance (%)
PC 1	4.057	19.317	19.317
PC 2	3.304	15.736	35.053
PC 3	1.740	8.287	43.339
PC 4	1.140	5.427	48.766
PC 5	1.077	5.126	53.892
PC 6	1.005	4.787	58.680
PC 7	0.898	4.277	62.957
PC 8	0.796	3.793	66.749
...	...	...	...
PC 20	0.394	1.876	98.710
PC 21	0.271	1.290	100.000

The Varimax method was used to determine the importance of the input variables in each principal component. This method is based on an orthogonal rotation that minimizes the number of variables having high saturations in each factor [13]. As a result of this analysis, the original variables grouped in each principal component are shown in Table 3, where the highest scores of each variable are marked in bold font. In order to undertake an easier interpretation of these results, Table 4 presents the groups of variables obtained with this analysis and their interpretation.

**Table 3.** Loading Matrix of the Factors in the Principal Components, Rotated

Code	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6
V 01	<b>0.494</b>	-0.170	0.273	0.115	0.015	-0.387
V 02	<b>0.597</b>	-0.019	0.181	0.193	-0.128	-0.161
V 03	<b>0.633</b>	0.027	0.223	0.116	-0.004	-0.206
V 04	<b>0.816</b>	-0.107	-0.022	0.016	0.046	0.116
V 05	<b>0.820</b>	-0.106	0.029	-0.003	0.056	0.179
V 06	<b>0.485</b>	0.097	0.117	0.294	-0.100	-0.082
V 07	<b>0.665</b>	0.006	-0.099	0.107	0.021	0.266
V 08	0.128	0.059	<b>0.810</b>	0.113	-0.014	-0.014
V 09	0.076	0.108	0.014	<b>0.631</b>	-0.023	0.261
V 10	0.296	0.084	0.014	<b>0.681</b>	0.016	-0.065
V 11	0.176	0.158	0.295	0.110	0.065	<b>0.606</b>
V 12	-0.102	0.310	0.093	-0.076	<b>0.759</b>	0.058
V 13	0.047	0.032	<b>0.829</b>	0.020	0.066	0.053
V 14	-0.017	<b>0.789</b>	0.034	0.085	0.107	0.131
V 15	0.070	0.190	0.027	0.168	<b>0.789</b>	0.010
V 16	-0.062	-0.008	0.258	0.175	0.444	<b>0.487</b>
V 17	0.111	0.039	<b>0.705</b>	0.060	0.132	0.232
V 18	0.088	0.086	0.173	<b>0.707</b>	0.197	0.042
V 19	-0.082	<b>0.763</b>	0.014	0.117	0.172	0.080
V 20	-0.022	<b>0.780</b>	0.074	0.039	0.203	-0.059
V 21	-0.055	<b>0.511</b>	0.024	0.135	-0.040	<b>0.470</b>

Note: PC = Principal Components. Variables with more weight in the PC are marked in bold font

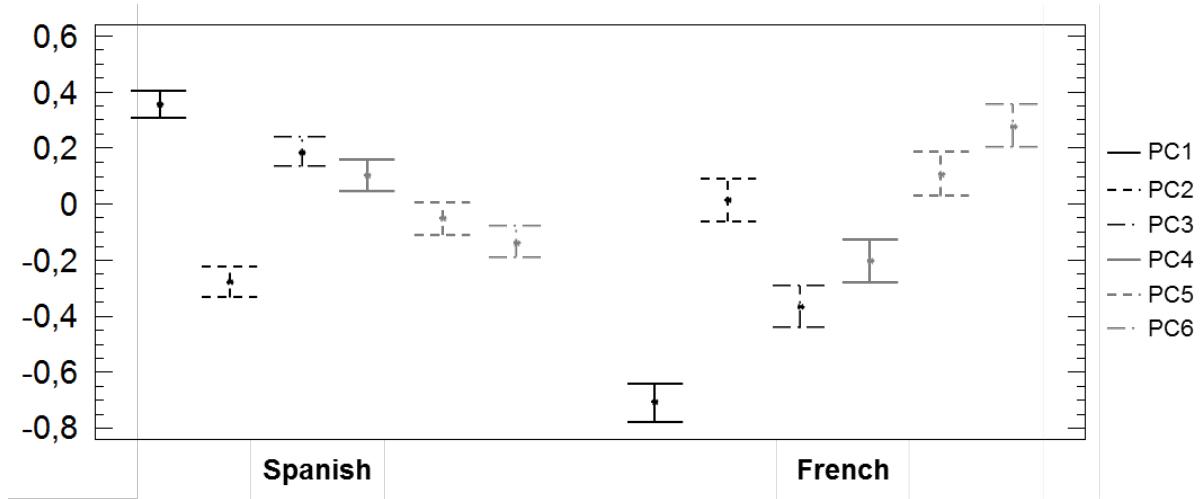
**Table 4.** Grouping of Variables into Principal Components

PC	Variable	Code	Interpretation
PC1	Current economic crisis	V 01	Current situation related to the government's economic policy and other economic factors
	Real estate "bubble"	V 02	
	Significant public debt	V 03	
	Government's employment policy	V 04	
	Government's public infrastructure policy	V 05	
	Globalization in the construction sector	V 06	
	Lack of government funding for housing	V 07	
PC2	Unemployed graduates only seeking good jobs	V 14	Graduate intrinsic reasons
	Lack of job search know-how	V 19	
	No eagerness to work	V 20	
	Lack of training of university graduates	V 21	
PC3	Too many professionals for current market demands	V 08	Excess of graduates/qualifications
	Too many universities offering similar undergraduate degrees	V 13	
	Too many universities offering similar graduate degrees	V 17	
PC4	Socially unbalanced job distribution	V 09	Structure and characteristics of the labor market
	Ill-advised managerial decisions	V 10	
	Many people with simultaneous jobs	V 18	
PC5	Unemployed professionals lack initiative to work in other countries kills	V 12	Globalization of work
	Unemployed professionals lack foreign language s	V 15	
PC6	Inadequate design of university programs	V 11	Training gaps
	Inadequate master degrees to fulfill market demands	V 16	
	Lack of training of university graduates	V 21	

Assuming that the order among the principal components reflects their relevance for students [9], the first and second components should receive special attention. This means that students perceive that the most important reason for unemployment is the current situation related to government's economic policy and other economic factors, which accounts for 19.3% of the variance. This factor is followed by graduates' intrinsic reasons, which explains 15.7% of the variability. This means that students also admit that an important reason for unemployment among young graduate is their own shortcomings. It is also worth noting that this factor is strongly related to PC6, as it includes reasons peculiar to graduates related to training gaps.

### 3.4 Analysis of variance

To complete the multivariate analysis that provides information about the general tendencies in the answers collected, an ANOVA was conducted to show the influence of the students' nationality in their perception of unemployment. From this analysis, it can be concluded that nationality (French or Spanish) is a key factor on the perception of students, as it is significant ( $P < 0.05$ ) in all the principal components (PC).



**Figure 2.** ANOVA principal components and nationality, 95% least significance difference (LSD)

The results shown in Figure 2 suggest that Spanish students are more concerned with the current situation related to government's economic policy and other economic factors (PC1), the excess of graduates and/or qualifications (PC3) and the structure and characteristics of the labor market (PC4). Whereas, French students put forward graduate intrinsic reasons (PC2), globalization of work (PC5) and training gaps (PC6). The different perception of these factors between Spanish and French students is analyzed in the following paragraphs.

In general terms, Spanish students are concerned with issues related to the economy and public policy. This concern may be related to the high unemployment rate affecting young professionals in Spain. Indeed, the unemployment rate is higher in Spain than in France (22% of the active population in Spain versus 9% in France). These figures are especially worrisome for young people, as the unemployment rate for active population between 20 and 24-years-old was 43%, while in France was 22% for people between 15 and 24 [14, 15]. These figures may explain the concern of Spanish students about PC1 and PC4. In relation to PC3 (excess of graduates and/or qualifications), the concern of Spanish students may be due to the higher amount of graduates in civil engineering. Actually, the number of students in engineering and architecture in Spain is higher than in France (47,000 in Spain versus 32,500 in France) [16–18].

On the other hand, as French students have been less affected by the economic crisis, they are not so much concerned about the economic situation, and they value more the reasons that depend on their own abilities: graduate intrinsic reasons (PC2), problems for working in a globalized labor market (PC5) and training gaps of university degrees (PC6). However, it is somewhat surprising that French students regard poor language skills as a cause of unemployment (PC5), as they seem to be more prepared than Spanish students. For example, in 2012, 3.2% of French students in higher education were studying abroad, while only 1.6% of Spanish students did [19]. Indeed, foreign languages are generally more valued in the French educational system. For instance, 91% of French students in secondary schools learn two languages, whereas only a 23 % of Spanish do [19]. In addition, French secondary school require, at least, a 20% of the class time dedicated to languages, while in Spain this requirement is of 10% [19]. French students, who have received a longer training in foreign languages than Spanish students, still feel that language skills are an important cause for unemployment.

## 4 CONCLUSIONS

Based on a questionnaire survey completed by 469 Spanish and French students enrolled in undergraduate degrees in civil engineering, this paper has identified and compared the barriers perceived by students to enter the labor market. From the statistical analysis of the collected data, the following conclusions may be derived:

- The 21 variables proposed in this study as possible barriers perceived by students to enter the job market can be reduced to six principal components: government's economic policy, graduate intrinsic barriers, excess of graduates, structure and characteristics of the labor market, globalization of work and training gaps.

- The analysis of variance found statistically significant differences in the perception of these barriers between Spanish and French students.
- The Spanish students gave more importance to extrinsic and global barriers such as the government's policies, the excess of graduates and/or qualifications and the structure and characteristics of the labor market.
- On the other hand, French students focused on specific and intrinsic barriers such as graduate intrinsic reasons, problems for working in a globalized labor market and training gaps of university degrees.

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