

Changes in the wage return to tertiary education in Spain: evidence from matched employer-employee data

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Abstract

This paper analyses the recent evolution of the wage return to tertiary education in Spain, distinguishing between advanced vocational training and university education. Using data from the Spanish Structure of Earnings Survey, the study estimates wage equations which, in addition to considering the human capital and the personal and employment characteristics of individuals as causal factors, includes a measure of the excess labour supply of university graduates by region. The results show that the wage differential of the graduate population fell, in general, in the period 1995-2006, and that a relatively high supply of graduates in the regional labour market negatively affects wages in such regions, and that these effects increase over time.

Keywords: wages, university graduates, advanced vocational training, excess graduate labour supply.

JEL Codes: J30, J31

1. Introduction and objectives

Spain has notably increased its human capital in recent decades, gradually reducing the weight of the population with only primary education and significantly increasing the proportion of the most highly educated. However, it remains below the OECD average in terms of the average number of years in education. Furthermore, the national structure of human capital displays important differences in comparison to other developed countries; the percentage of the population in Spain with only

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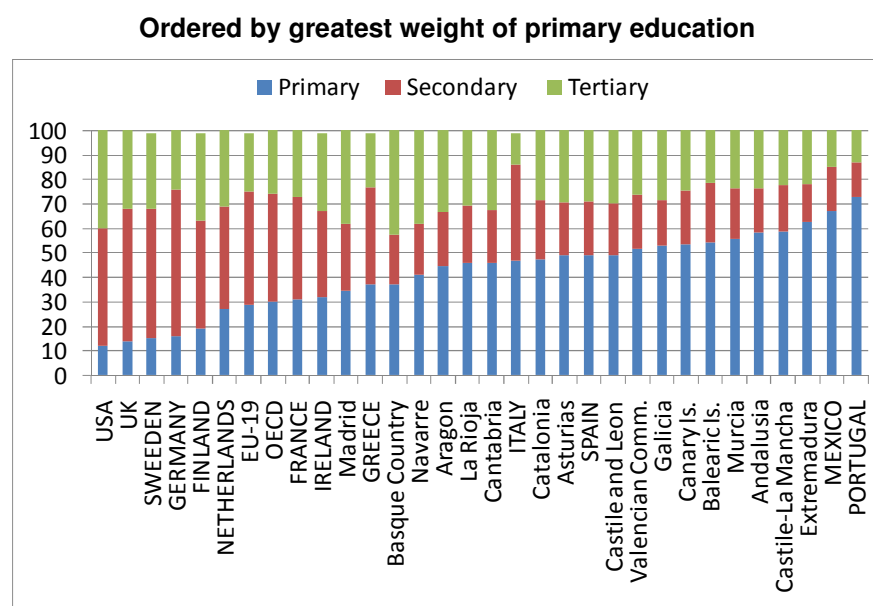
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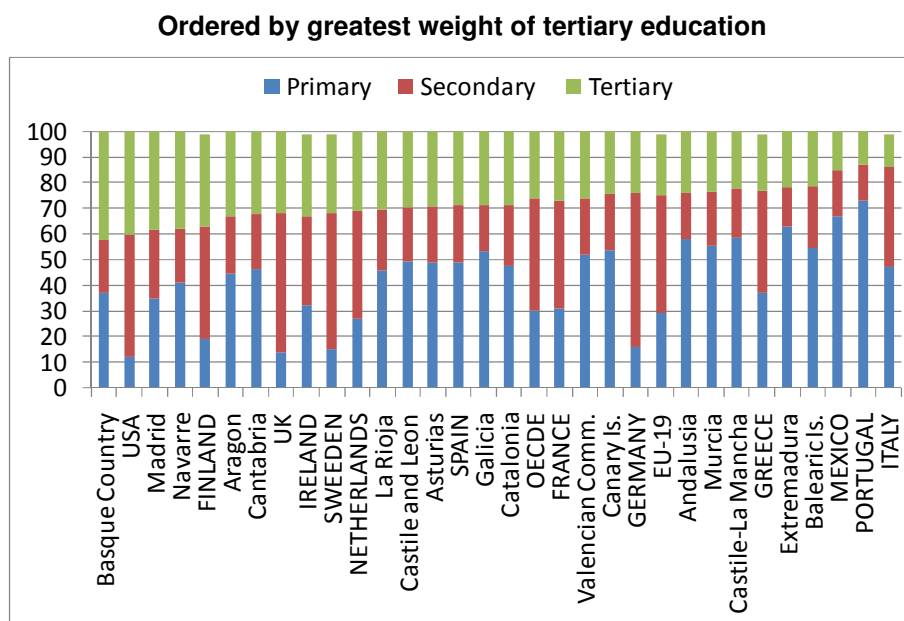
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primary education is still very high (20 points above the OECD average), the weight of the population with secondary education is markedly lower (22 percent compared to 44), while the ratio of the population with tertiary education is higher (29 percent compared to 27).

Moreover, within Spain considerable differences between regions are observable. For the ratio of the population having only primary education, no Autonomous Community achieves a position above the EU19 or OECD average. However, with regard to the weight of the population with tertiary education, the relative position of Spain improves significantly; the Basque Country, the Community of Madrid and Navarre occupy leading positions within the EU19, while only the Balearic Islands, Extremadura, Castile-La Mancha, Murcia and Andalusia are below the average.

Figure 1. Educational level of the adult population (25-64) in 2007





Source: OECD (2009) and EPA (Spanish Labour Force Survey)

Not only is the structure of human capital in Spain imbalanced, but also, as the OECD (2009) shows, the wage return to tertiary education (the wage skill premium rewarding tertiary education), is lower than that in other developed countries. Furthermore, according to data from the Structure of Earnings Survey, the wage skill premium for university graduates has fallen, in favour of those with advanced vocational training. Thus, between 1995 and 2006, private sector wages for university graduates in Spain increased by a nominal rate of only 15%, compared to 31% for the population with advanced vocational training. The wage growth of workers with primary and secondary education was also greater than that of graduates, by 39% and 26% respectively.

This lower wage growth for university-educated workers may be related to an excess labour supply in this segment, i.e. an imbalance between the number of graduates and the number of jobs available for which a degree is required. This excess supply produces situations of overeducation and, consequently, lower wages; see, among others, Alba-Ramírez (1993), Groot (1993) and Blázquez (2005).

Given the above, the objective of this paper is to analyse the evolution of wages for workers with tertiary education, distinguishing advanced vocational training from university education. In addition to contributing new empirical evidence to the

analysis of regional earnings differentials in Spain, already demonstrated by various authors (García and Molina 2002, Serrano 2002, Villaverde and Maza 2002, Simón et al. 2006, Izquierdo and Lacuesta 2006, El-Attar and Lopez-Bazo 2006, among others), a novel aspect of the study performed is the inclusion, as an explanatory variable of wages, the possible excess supply of university graduates in certain regional labour markets.

The paper is organized as follow. Section 2 explains the database, section 3 presents the econometric methodology strategy and section 4 discusses the results of the estimations. Section 5 presents the main conclusions.

2. Data

The analysis performed is based on microdata from the Spanish Structure of Earnings Survey (SES), corresponding to the independent cross-sections for 1995 and 2006. The SES is a quadrennial survey, undertaken by the National Statistics Institute (INE), of a representative sample of firms with 10 or more employees¹ in the industry, construction and service sectors². Its objective is to provide comparable information regarding earnings distribution in Spain, on the basis of a considerable number of sociodemographic and economic variables. The survey supplies data at the level of the firm (work centre), and individual information for a random sample of workers in each firm. Thus, they are matched employer-employee data, markedly enriching the analysis of earnings determination, since it is possible to consider as explanatory variables the characteristics of the company in which the individual works, such as its size, sector of activity or level of collective bargaining.

Given that the samples of the SES for the 1995 and 2006 waves are not identical, since the 1995 wave only includes establishments with 10 or more employees and, furthermore, does not include Education, Health activities and Other social activities. The data used in the present study are extracted from comparable samples, from which are excluded enterprises with fewer than 10 employees for

¹ The 2006 wave includes for the first time enterprises with fewer than 10 employees. To obtain results comparable with 1995, these have been excluded from the econometric analysis performed.

² Within the services sector, the 2006 SES includes Education, Health activities and Other social activities, which are not included in the 1995 wave.

2006 and the three sectors mentioned above. As the SES cross-sections are independent, it is unfortunately impossible to identify either the employees or the firms surveyed in 1995 with those for 2006.

The concept of wage used here is that of gross hourly wages, expressed in 1995 euros. Account is taken of distinct components for the survey reference month (October), adding to the basic wage for that month all supplements paid (for shift work, night shift, seniority, productivity, etc.) and bonuses, not including payment for overtime. The calculation of the hours worked monthly is based on the agreed working week, correcting downwards the hours worked in the month for those cases in which the earnings for the reference month were affected by maternity or temporary incapacity for work. In the 1995 sample, the distinct wage items were originally expressed in pesetas, and have been converted to euros. For 2006, in order to reflect the distinct evolution of prices in the Autonomous Communities (regions), their values have been deflated by the annual averages of the general CPI, divided by region and published by the INE, and taking 1995 wages as base³.

Further adjustments have been made: those enterprises with under four observations of employees were eliminated, in order to correctly identify fixed effects by firm; the observations of Ceuta and Melilla were eliminated, as they were insufficiently representative, as were workers over 64; finally, given the different behaviour of the private and public sectors, the samples selected only include firms in the former.

2. Methodology

The methodology employed consists of estimating wage equations using ordinary least squares, where the logarithm of the hourly earnings of each individual i depends on his human capital (H_{ki}), measured by the education level completed and experience in the enterprise; on demographic characteristics such as gender and age (X_{ki}); on characteristics of the specific job (O_{ki}), such as contract type, working day or

³ Taking as base 1995=100, for each region the accumulated growth of the general CPI between 1995 and 2006 is calculated. All the data from the 2006 wave are deflated by this price index, which for Spain as a whole is 138.4, ranging from a minimum of 132.5 in the Canary Islands to a maximum of 145.0 in La Rioja (145,0).

occupation; on characteristics of the enterprise (E_{ki}), for example its size (measured by a binary variable indicating whether there are 50 or more employees⁴), the type of collective bargaining or the percentage of employees with tertiary education⁵.

In addition to the abovementioned variables, the present study examines the regional influence on wage determination, focusing on the possible existence of an excess labour supply of university graduates in each region (Autonomous Community). This variable is represented by the University Graduate Ratio (R_{CCAA}), calculated for each region. This ratio is the quotient between the number of persons aged 16 and over who have completed any type of university education (diplomas, degree courses, postgraduate and doctoral studies) and the number of persons employed in the region in jobs which, according to the descriptions employed in the National Classification of Occupations (CNO-1994), must be filled by individuals with university education. Specifically, the study considers individuals in the following occupations: Legislators and senior officials; Managers (firms with 10 or more employees); Science and engineering professionals; Social and cultural professionals; and Science and engineering associate professionals⁶. The ratio has been calculated using data from the Spanish Labour Force Survey (EPA).

⁴ The number of employees in the enterprise, calculated using the sample data, is also included.

⁵ The percentage of employees with tertiary education in the enterprise has been calculated using the sample data.

⁶ CNO94 Codes: 10, 11, 20, 21, 22, 23, 24, 26, 27, 28 and 29.

Table 1. University graduate ratio in relation to educational requirements, by region ^(a) (1996-2006)

Value of ratio	Regions	1996	Value of ratio	Regions	2006
Low	Catalonia	1,68	Low	Catalonia	1,79
	Extremadura	1,78		Extremadura	1,88
	Murcia	1,84		Murcia	1,94
	Navarre	1,87		Navarre	1,95
	Canary Islands	1,87		Canary Islands	1,95
	La Rioja	1,88		La Rioja	2,03
Inter-mediate	Castile-La Mancha	1,92	Inter-mediate	Castile-La Mancha	2,04
	Valencia	1,93		Valencia	2,09
	Galicia	1,95		Galicia	2,09
	Basque Country	2,01		Basque Country	2,09
	Balearic Islands	2,02		Balearic Islands	2,11
	Asturias	2,04		Asturias	2,13
	Andalusia	2,04		Andalusia	2,14
High	Madrid	2,11	High	Madrid	2,15
	Aragon	2,13		Aragon	2,16
	Cantabria	2,16		Cantabria	2,26
	Castile and León	2,41		Castile and León	2,41
	Spain	1,96		Spain	2,05

(a) Eurostat NUTS 2 Level

Source: Authors' elaboration, from the Spanish Labour Force Survey (EPA, INE)

Table 1 presents the university graduate ratio in each region, dividing them into three groups, High, Intermediate and Low⁷. A high value indicates a greater labour supply of university graduates, which in theory leads to lower earnings for graduates in such regions. The national graduate ratio increased by 4% between 1996 and 2006, due to the population with university education growing faster than the number of jobs in the economy requiring such studies. While this increase affected the majority of regions, the ratio fell in the Community of Madrid, Cantabria and the Balearic Islands, where qualified employment has outgrown the number of graduates available. Certain regions such as Catalonia, Navarre, and Murcia maintain their leading positions (i.e. low ratio values), while Castile and León and Aragon display high ratio values.

Expressions (1) to (4) summarise the distinct specifications of the wage equations estimated:

⁷ High: those regions whose average ratio exceeds the national average by over 4%. Low: those regions whose average ratio is lower than the national average by over 4%. The differences between the three groups are statistically significant at 95%.

$$\log(wage_i) = f(H_{ki}, X_{ki}, O_{ki}, E_{ki}, CCAA) \quad (1)$$

$$\log(wage_i) = f(H_{ki}, X_{ki}, O_{ki}, E_{ki}, R_{CCAA}) \quad (2)$$

$$\log(wage_i) = f(H_{ki}, X_{ki}, O_{ki}, E_{ki}, R_{Low}, R_{Intermediate}, R_{High}) \quad (3)$$

$$\log(wage_i) = f(X_{ki}, O_{ki}, E_{ki}, H_{ki} * R_{L,I,H}) \quad (4)$$

Specification (1) is a standard wage equation, where regional factors which affect salaries are accounted for by including in the estimation dummy variables for each region. Specification (2) includes, as an explanatory variable of wages, the university graduates ratio in each region. Specification (3) contains, in place of the specific values of the ratio, three dummies for the three groups of regions, according to the low, intermediate or high value of the university graduates ratio shown in Table 1. The final specification of the model (model 4) takes as explanatory variables the interactions between the educational level of individuals and the regional group to which they belong. This fourth specification permits the wage differences for graduates compared to other collectives to be established, depending on whether graduates are in excess supply in the region in question.

Table 2 presents the main descriptive characteristics of the sample, analysed for the SES waves of 1995 and 2006. As can be seen, men account for over 75% of the sample, and workers aged 25-44 for 60%. Concerning educational level, 60% of the sample have primary education; in both waves, approximately 8% have advanced vocational training; and university graduates are more strongly represented in the 2006 wave than in 1995.

Table 2. Characteristics of the sample analysed and average hourly wage

	Sample characteristics		Gross hourly wage		
	1995	2006	1995 (euros)	2006 (euros)	2006 (1995 euros)
Total (n cases)	152.533	115.602	6,85	9,68	6,99
Men	76,7%	65,2%	7,29	10,53	7,60
Women	23,3%	34,8%	5,41	8,08	5,83
16 to 24 ages	9,5%	7,4%	4,07	6,70	4,85
25 to 44 ages	59,9%	63,5%	6,80	9,27	6,70
45 and older	30,6%	29,2%	8,74	11,30	8,15
Primary	65,4%	58,1%	5,74	8,14	5,88
Secondary	16,0%	17,1%	7,71	10,24	7,39
Advanced Vocational Training	8,1%	8,8%	7,38	10,36	7,46
University	10,4%	16,0%	12,12	14,28	10,32
Seniority in the firm: less than 1 year	10,5%	24,8%	4,54	7,50	5,43
1 to 3 years	18,2%	21,3%	5,29	8,51	6,15
3 to 5 years	10,1%	11,0%	6,33	9,10	6,57
5 to 10 years	20,0%	18,4%	7,28	10,25	7,40
10 years and more	41,3%	24,5%	8,85	13,57	9,79
Fixed-term contract	26,3%	26,7%	4,59	7,56	5,48
Indefinite duration contract	73,7%	73,3%	7,66	10,45	7,54
Part-time	3,5%	13,2%	5,49	7,69	5,55
Full-time	96,5%	86,8%	6,90	9,98	7,21
Firm size: 50 and more employees	54,8%	56,5%	7,76	10,63	7,68
10 to 49 employees	45,2%	43,5%	5,75	8,44	6,09
Sector-level collective bargaining	34,3%	39,3%	6,85	10,14	7,32
Local level collective bargaining	40,9%	50,3%	5,83	8,66	6,26
Firm-level collective bargaining	24,8%	10,4%	8,54	12,84	9,29
C Mining and quarrying	1,4%	1,0%	6,75	9,49	6,85
D Manufacturing	58,8%	38,5%	6,72	9,81	7,06
E. Electricity, gas and water supply	1,6%	1,2%	9,24	15,27	11,07
F. Construction	6,7%	11,7%	6,09	9,06	6,56
G. Wholesale and retail trade	9,7%	13,5%	5,92	8,66	6,26
H. Hotels and restaurants	5,4%	7,5%	5,16	7,76	5,62
I. Transport, storage and communication	5,2%	5,8%	6,97	10,14	7,34
J. Financial intermediation	6,2%	5,8%	11,30	16,83	12,18
K. Real estate, renting and business activities	5,0%	15,0%	6,66	8,31	6,01

Source: Sample taken from the SES, 1995 and 2006

Twenty-five percent of individuals have a fixed-term contract and the rest have permanent contracts. While part-time workers were scarcely represented in the 1995 wave (3%), in 2006 this figure was 13%. Slightly over 55% of individuals work in enterprises of 50 employees or more and the rest in firms having 10 to 50 employees. Finally, by sector, manufacturing industries are more strongly represented in the 1995 wave than in 2006, while construction and services have greater weight in 2006.

With regard to average hourly earnings, it is first of all striking that these increased by a nominal 41% between 1995 and 2006, and by 2% in real terms. By

collectives, earnings growth has not been homogenous, having increased more among women and the younger (16-24) population. By educational level, the greatest increases have been for the population with primary education and that with advanced vocational training; in fact, real growth has only taken place for these two groups, while the real earnings of the population with secondary and university education have fallen since 1995. The table also shows greater wage growth for employees with fixed-term contracts, while at the same time the real earnings of workers with permanent contracts have fallen. By sectors, the most notable growth is in energy, while real estate activities and personal services are least favoured.

4. Results

The results of the estimations of the four specifications considered are presented in Table 3. In each, women's average hourly wages are approximately 19% lower than men's (for the remaining explanatory variables given); this differential persisted virtually unaltered in the period analysed. The effect of age is positive, indicating that the longer individuals are in the labour market (taking this measure as an approximation of the human capital accumulated), the greater are their earnings.

However, the estimations for 2006 show that the effect of age on wages, while maintaining its positive sign, loses intensity. By contrast, employment experience within the enterprise itself, measured by seniority, increased its positive effect on wages, practically doubling: a further year of seniority in the firm increased earnings by 1% in 1995, but by 1.8% in 2006. This confirms the continuation in 2006 of the trend pointed out by Simón (2009) for the period 1995-2002, concerning this increased effect of experience on earnings.

With regard to contract type and working day, the estimations show that employees with permanent contracts receive higher hourly wages than fixed-term employees, although the return to earnings associated with contract type has fallen notably; in 1995 this differential was 9%, but 4% by 2006. Full-time workers, who in 1995 earned approximately 1.5% less than part-time employees, had inverted their position by 2006; other variables being constant, their hourly earnings exceeded those of part-time workers by 1.7%.

In relation to company characteristics, employees in firms with under 50 employees were paid less than those in larger companies; furthermore, this differential widened between 1995 and 2006. With regard to the collective bargaining level, the wages of those workers included in a sectoral or local agreement are lower than those whose collective agreement is negotiated within the firm. Lastly, the fixed effects of the enterprise included in the four estimations (number of employees in the sample and percentage of employees with tertiary education) show that a higher proportion of workers with tertiary education in the company increases the hourly wage paid, although this effect on earnings has declined since 1995.

Against this background, how does the educational level of individuals affect their earnings from employment? All the estimations performed in the present study include as explanatory variables four categories of educational levels: primary education, including those who have only completed compulsory education and also those with no education; secondary education i.e. intermediate post-compulsory education (high school and intermediate vocational training); and tertiary education. This last category has been further divided in two, to test whether an exchange has been produced in the wages of employees with university education and those with advanced vocational training, the latter being taken as reference in the estimations performed.

Table 3. OLS estimations of gross hourly wages, in 1995 euros

	Model 1		Model 2		Model 3		Model 4	
	1995 Coeff.	2006 Coeff.	1995 Coeff.	2006 Coeff.	1995 Coeff.	2006 Coeff.	1995 Coeff.	2006 Coeff.
(Constant)	0.762 ***	1.219 ***	0.801 ***	1.432 ***	0.739 ***	1.193 ***	0.895 ***	1.294 ***
Female	-0.195 ***	-0.194 ***	-0.192 ***	-0.193 ***	-0.192 ***	-0.193 ***	-0.192 ***	-0.192 ***
Age	0.032 ***	0.016 ***	0.031 ***	0.016 ***	0.032 ***	0.016 ***	0.032 ***	0.016 ***
Age*Age	0.000 ***	0.000 ***	0.000 ***	0.000 ***	0.000 ***	0.000 ***	0.000 ***	0.000 ***
Advanced Vocational Training	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.		
Primary	-0.067 ***	-0.040 ***	-0.066 ***	-0.042 ***	-0.068 ***	-0.041 ***	-	-
Secondary	0.033 ***	0.021 ***	0.039 ***	0.026 ***	0.037 ***	0.028 ***	-	-
University	0.147 ***	0.104 ***	0.148 ***	0.105 ***	0.146 ***	0.105 ***	-	-
Tenure	0.010 ***	0.018 ***	0.010 ***	0.018 ***	0.010 ***	0.018 ***	0.010 ***	0.018 ***
Tenure*Tenure	0.000 ***	0.000 ***	0.000 ***	0.000 ***	0.000 ***	0.000 ***	0.000 ***	0.000 ***
Permanent contract	0.084 ***	0.034 ***	0.091 ***	0.034 ***	0.090 ***	0.036 ***	0.090 ***	0.036 ***
Full-time	-0.010 *	0.020 ***	-0.014 **	0.017 ***	-0.015 **	0.017 ***	-0.015 **	0.017 ***
Firm size: 50 and more employees	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
10 to 49 employees	-0.034 ***	-0.044 ***	-0.037 ***	-0.040 ***	-0.038 ***	-0.039 ***	-0.038 ***	-0.039 ***
Firm-level collective bargaining	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Sector-level collective bargaining	-0.103 ***	-0.088 ***	-0.100 ***	-0.095 ***	-0.101 ***	-0.093 ***	-0.101 ***	-0.093 ***
Local-level collective bargaining	-0.094 ***	-0.088 ***	-0.094 ***	-0.094 ***	-0.094 ***	-0.092 ***	-0.094 ***	-0.092 ***
Workplace fixed effects								
Firm size (number of employees)	0.007 ***	0.005 ***	0.008 ***	0.006 ***	0.008 ***	0.007 ***	0.008 ***	0.007 ***
Share highly-educated workers	0.003 ***	0.002 ***	0.003 ***	0.002 ***	0.003 ***	0.002 ***	0.003 ***	0.002 ***
University Graduate Ratio	-	-	-0.031 ***	-0.120 ***	-	-	-	-
Regions with low University Graduate Ratio	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Regions with intermediate University Graduate Ratio (1)	-	-	-	-	-0.012 ***	-0.020 ***	-	-
Regions with high University Graduate Ratio (2)	-	-	-	-	0.017 ***	-0.020 ***	-	-
Graduates and low ratio	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Primary and low ratio (3)	-	-	-	-	-	-	-0.225 ***	-0.146 ***
Secondary and low ratio (3)	-	-	-	-	-	-	-0.106 ***	-0.063 ***
Tertiary (AVT) and low ratio (3)	-	-	-	-	-	-	-0.141 ***	-0.077 ***
Primary and low ratio (1)	-	-	-	-	-	-	-0.227 ***	-0.159 ***
Secondary and intermediate ratio (1)	-	-	-	-	-	-	-0.129 ***	-0.092 ***
Tertiary (AVT) and intermediate ratio (1)	-	-	-	-	-	-	-0.166 ***	-0.131 ***
Tertiary (univ.) and intermediate ratio (1)	-	-	-	-	-	-	-0.050 ***	-0.008 ***
Primary and high ratio (2)	-	-	-	-	-	-	-0.208 ***	-0.149 ***
Secondary and high ratio (2)	-	-	-	-	-	-	-0.107 ***	-0.101 ***
Tertiary (AVT) and high ratio (2)	-	-	-	-	-	-	-0.148 ***	-0.119 ***
Tertiary (univ.) and high ratio (2)	-	-	-	-	-	-	0.047 ***	-0.053 ***
Regional dummies (17 categories)	Yes	Yes	No	No	No	No	No	No
Occupational dummies (8 categories)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies (9 categories)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.71	0.72	0.70	0.71	0.70	0.71	0.70	0.71
Adjusted R ²	0.50	0.51	0.49	0.50	0.49	0.50	0.49	0.50
Number of observations	152,533	115,602	152,533	115,602	152,533	115,602	152,533	115,602

Source: Authors' estimations, using sample data from the SES, 1995 and 2006

*** Significant at 99%; ** Significant at 95%; * Significant at 90%

(1) Regions with intermediate university graduate ratio in 1995: Castile-La Mancha, Valencia, Galicia, Basque Country, Balearic Islands, Asturias, Andalusia; regions with intermediate university graduate ratio in 2006: Basque Country, Madrid, Extremadura, Valencia, Cantabria, Canary Islands, La Rioja, Galicia, Andalusia.

(2) Regions with high university graduate ratio in 1995: Madrid, Aragon, Cantabria, Castile and León; regions with high university graduate ratio in 2006: Aragon, Asturias, Castile and León.

(3) Regions with low university graduate ratio in 1995: Catalonia, Extremadura, Murcia, Navarre, Canary Islands, La Rioja; regions with low university graduate ratio in 2006: Catalonia, Balearic Islands, Castile-La Mancha, Navarre.

Firstly, it must be underlined that the results always show that hourly wages for any group, except for those having primary education, are, *ceteris paribus*, higher than those of workers with advanced vocational training; this differential is greater in the case of the university-educated population. Confirming that the population with primary education and advanced vocational training benefited most from wage growth during the study period (in real terms growth was only positive for these two groups), evolution over time shows a reduction in the wage differential, compared with advanced vocational training, for both the secondary education group and the graduate group. Concretely, in 1995 individuals with a university degree, received an hourly wage 15% above that of those possessing advanced vocational training; eleven years later, this figure had fallen to 10.5%.

The inclusion in the model of the university graduate ratio as an explanatory variable (model 2) proves to be statistically significant and displays a negative sign, thereby indicating that the greater that ratio in a region (i.e. the greater is the relative labour market supply of university graduates), the lower are the wages received by graduates of similar characteristics within that region.

The specification of model 3 includes, in turn, the three groups of regions, according to their university graduate ratio. Its results show that workers in the regions with the greatest graduate labour supply in 2006 (Aragon, Asturias and Castile and León), receive hourly wages 2% lower than those in regions where this ratio is lowest (Catalonia, Murcia, Balearic Islands, Castile-La Mancha, and Navarre).

Lastly, the fourth specification includes as explanatory variables the interaction between human capital and the university graduate ratio, represented by twelve different collectives and formed jointly by the three groups of regions and the four categories of educational level. Here, the reference category is the group of individuals with university education working in regions where the graduate labour supply is low. The estimations reveal that the wages of any of the other groups are lower. Moreover, in regions with a higher graduate ratio, the wage differential increases to the disadvantage of all those working there.

Comparing the estimations for 1995 and 2006, it is also clear that for the majority of collectives wage differences have fallen. However, university graduates working in regions with a high graduate ratio receive wages lower than those employed in regions with no excess graduate labour supply; moreover, this wage differential widened over the study period. More concretely, graduates who work in Aragon, Asturias or Castile and León, which have a relatively high supply of graduates, earn hourly wages 5.3% lower than their peers in Catalonia, Murcia, the Balearic Islands, Castile-La Mancha or Navarre, and 4.5% lower than those in the Basque Country, Madrid, Extremadura, the Valencian Community, Cantabria, the Canary Islands, La Rioja, Galicia or Andalucía.

Finally, focusing on the collective with advanced vocational training, it is evident that wages for all the groups considered are effectively lower than those for any category with university education. However, as already observed, this gap has narrowed in all regions, which may be interpreted as an increase in the degree of substitution of the latter by the former for similar occupations.

5. Conclusions

This paper has analysed the recent evolution of the wage returns to tertiary education in Spain, distinguishing between advanced vocational training and university education. The analysis was performed through wage equation estimations, using matched employer-employee data from the Spanish Structure of Earnings Survey. The estimations take as reference the gross hourly wage, and include as explanatory variables human capital, the personal characteristics of individuals and characteristics of the job and the firm.

In addition to contributing new evidence to the study of the wage differences by level of human capital which exist in Spain, the novel feature of the present paper is its inclusion, as an explanatory variable of wages, of an approximate measure of the excess labour supply of graduates in certain Spanish regions. The results obtained show, firstly, that the wage skill premium for university education, compared with advanced vocational training, fell over the study period. This indicates that a

high graduate labour supply in a region, in relation to the volume of qualified jobs existing in that region, negatively affects wages in general and, furthermore, strongly influences graduate wages; this latter effect increased over time.

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