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Not All University Degrees Yield the Same Return: Private and Social Returns to Higher Education for Males in Spain*

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Abstract: In this paper we use micro data from the Spanish Family Expenditure Survey for 1990 to estimate, for the first time, the private and social rates of return of different university degrees in Spain. We compute internal rates of return and include investment on higher education financed by the public purse to estimate social rates of return. Our main finding is that, as presumed, there is large heterogeneity in rates of return amongst different university degrees. [*JEL* I21, J31]

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1. Introduction

The abundant empirical literature on rates of return to education has, so far, focused on the estimation of the *private* rates of return to primary secondary and higher education as a whole. That is, as far as higher education is concerned, researchers have bundled all university degrees into a single category and, therefore, have concealed the important heterogeneity within this group. In this paper we combine micro data from the Spanish Family Expenditure Survey for 1990 (*Encuesta de Presupuestos Familiares*) and data from one of the main Spanish universities to estimate, for the first time in Spain, the rates of return of a set of university degrees.

We estimate two types of rates of return: the so-called *private* rate of return which only takes into account costs of and benefits from investment in education borne by individuals, and a second rate of return that results form adding to the private costs the investment financed by the public purse. In a slight abuse of conventional terminology we term the latter the *social* rate of return.[1]

Our findings suggest that, as presumed, there is a large heterogeneity in the rates of return amongst university degrees.

The paper proceeds as follows. Section 2 discusses some methodological issues relevant for estimation. Section 3 presents the data employed and comments on their main shortcomings. Section 4 presents the empirical results, and finally section 5 concludes.

2. Some Methodological Aspects

Since Mincer's (1974) seminal study on the relationship between schooling, experience and earnings, rates of return to education are usually estimated using the education coefficient of a more or less sophisticated earnings function specification whereby earnings are modelled as a function of education and a quadratic in experience.[2] As Psacharopoulos (1981) points

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[1] Of course, a 'proper' social rate of return should include a wider range of benefits than labour market outcomes. Already Marshall in his *Principles of Economics* acknowledged that public and private spending on education has spill-over effects such as greater social cohesion, lower criminality or improved health. Arguably, our definition of social return is strongly guided by what is possible to measure, rather than by what ought to be measured. Yet, we believe our study provides a step forward towards the measurement of 'full' social rates of return in Spain. For an empirical study on social rates of return that employs a more comprehensive definition of costs and benefits, see Mingat and Tan (1996).

[2] Education is usually specified either in years or in levels, using dichotomous variables, and experience is often measured as potential experience —*i.e.* age - years in education -6.

out, one of the problems with this 'earnings function approach' is that it assumes that the only cost of schooling is the foregone earnings of individuals. In other words, this method cannot incorporate cost data in order to estimate social rates of return. Since this is one of the main aims of the present paper, we estimate internal rates of return to education, instead. That is, we compute the discount rate (r) that equates the present value of a stream of benefits which derive from additional educational attainments (B_t) to the present value of the stream of costs of the additional education qualifications acquired (C_t),

$$\sum_{t=1}^{s} C_t (1+r)^{-t} = \sum_{t=s+1}^{n} B_t (1+r)^{-t}$$

For all the rates of return that we estimate, the benefits of completing additional levels of education are measured by the present value of an estimated future stream of additional labour earnings that result from having acquired higher levels of education over the working lifetime —*i.e.* from age 16 to 64.[3]

When estimating *private* rates of return, the main cost of education borne by individuals is the opportunity cost of staying on in education. Such an indirect cost is measured by the labour earnings the individual would have obtained during the period of additional schooling had he entered the labour market with lower education qualifications. Other costs directly borne by individuals such as tuition, educational material, transport or student living costs are also taken into account.[4] In order to estimate *social* rates of return, the direct cost of schooling borne by the public sector is added to the private costs.

Therefore, to estimate private rates of return to education we only need information on age-earnings profiles by educational level, whereas the estimation of social rates of return requires additional information on resource cost of primary, secondary and higher education.

Life cycle labour earnings are estimated using Heckman's (1979) two stage estimation procedure to take due account of the sample selection bias

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[3] Of course, there are other benefits steaming form education investment (see footnote 1). These benefits should also be considered in education policy design.

[4] Since the EPF does not provide itemised information on direct individual costs of education we have used the overall education related expenditure reported by families.

that arises from the fact that labour earnings are only observed for those individuals who are occupied.[5] This way we obtain predicted life cycle labour earnings conditional on the fact that individuals are employed. Finally, expected life cycle labour earnings are computed by multiplying this prediction by the probability of being employed. Employment probabilities by education level are estimated from probit models (see Section 4 for specifications of the employment and the earnings equations).

3. The Data

We use the sample of males[6] aged 16 to 64 in 1990 from the *Encuesta de Presupuestos Familiares* (Spanish Family Expenditure Survey) for 1990 — EPF. See Sanz (1992) for a detailed description of the EPF. Table A1 reports summary statistics of the data, and Figure A1 displays Kernel density estimates of log earnings by education level.[7] Earnings are defined as labour market income accruing from (dependent) employment as well as self-employment. Mean earnings increase with the education level and the university degrees groups with higher mean earnings are engineering, law & economics, heath related sciences and technical 'medium level' ones, in this order—see Table A1. Full-time workers represent 90% of the sample.

One of the main problems of this data set is the under-reporting of earnings. As in most family expenditure surveys the magnitude of such under-reporting is not homogeneous across earnings sources but it is greater for the self-employed. In order to solve this problem individual earnings have been adjusted, so that EPF earnings figures match the Spanish national accounts.[8]

The EPF does not contain information on the university degree undertaken by individuals. It only reports whether individuals completed a higher education degree and if so it distinguishes between 'grado medio' and

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[5] See Heckman (1976, 1979) for further econometric details. See also Green (1997) for a general introduction on sample selection problems and its possible solutions.

[6] Women are excluded from the analysis due to their low labour market participation rate, and especially for older cohorts. Since the no participation is in many cases voluntary the inclusion of women in a joint analysis would certainly lead to misleading estimates of the private rates of return to education.

[7] We have used a Gaussian kernel and window width of 0.7.

[8] For a detailed description of the correction factors used to match EPF to National accounts figures, see Oliver (1997).

'grado superior' degrees.[9] We have imputed the type of degree completed by each individual on the basis of the occupation and the economic sector the individual is working in. Such imputation assigns a probability of having completed a given university degree.[10] Therefore, we use two sets of weights for the subsample of individuals with a higher degree: sample weights, provided by the EPF, and the probability of having completed a given degree.

Despite its relevance for policy making, social returns to education are rarely estimated due to the lack of information on resource cost of education, and especially of higher education.[11]

Resource costs for primary and secondary education were derived from official figures on public spending on education of all public administration bodies with competence in this area.[12] As far as resource costs for university degrees are concerned, we have employed information from one of the largest Spanish universities: the *Universitat Autònoma de Barcelona*. Table 1 reports mean individual public costs and mean individual actual duration by education level. Due to small sample sizes we have grouped higher education related degrees into 4 'medium level' degree categories and 5 'superior level' degree categories —see Appendix Table A2.

4. Returns to Education

As outlined in Section 2, in order to estimate internal rates of return one first has to estimate life cycle earnings and employment probabilities. In order to do so, we fit separate employment and earnings equations for each education level and employ very parsiomonious specifications.

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[9] For non-Spanish readers, 'grado medio' (medium level) degrees are 3 year degrees and rather more specialised than 'grado superior' (superior level) degrees, which are designed as 5 year degrees. Both degrees are considered higher education in Spain.

[10] For most cases, imputation was straightforward. For instance, those working as economists or lawyers were assigned a probability of one of having completed economics or law degrees, respectively. However, other cases were not that clear-cut. School teachers and university professors surely come from different degrees. In this case probabilities were assigned using information on staff composition in both Spanish schools and universities. More detailed information on the imputation process is available from the authors on request.

[11] As far as we are aware of, there are only two other studies on social returns to education for Spain Quintás and Sanmartín (1978) use data from 1971 and report only returns to primary (17.2%), secondary (8.6%) and higher education as a whole (12.8%). Oliver *et al*. (1998) use the same data set for 1990 and report rates of return to primary, secondary and higher education to be 20.2%, 17.9% and 19.3% respectively. The difference in the estimates arises partly because they use the whole population and partly due to methodological differences such as different specifications of the employment and earnings equations.

4.1 Employment equation

In the employment regression the dependent dichotomous variable takes the value of one if the individual is employed, and zero otherwise. The set of regressors comprise only a quadratic in age and regional (autonomous community) dummy variables. Probit estimates of the employment equation for each education level are given in Appendix Table A3. For technical, teaching and business degrees nearly all sample members were employed. Hence, for those education levels the employment equation could not be estimated.[13]

As outlined in Section 2, this equation serves two purposes. On the one hand, the probit estimates have been used to compute life cycle employment probabilities by education level. As Weale (1993) points out, ignoring employment probability differentials may lead to a bias when assessing the benefits form investments in education. We take due account of employment probability differentials and adjust the estimated age-earnings profiles accordingly. On the other hand, the probit estimates have also been used to compute the inverse Mills' ratio, that is, to control for sample selection bias.

Estimated life cycle employment probabilities are shown in Figure 1.[14] As expected, employment probabilities are lower for individuals without studies and higher for university graduates. Amongst the latter group, those studying engineering and law & economics display the highest employment probabilities whereas those studying "other social sciences and humanities" degrees and "other 'medium level'" degrees display the lowest ones.

4.2 Earnings equation

Earnings are defined as yearly gross earnings. In the earnings equation the logarithm of gross earnings is regressed on the same set of variables as in the employment equation plus a dummy variable to control for full-time employment and the inverse Mills' ratio to take due account of the sample selection bias. OLS estimates by education level are shown in Appendix Table

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[12] For official aggregate data on education public spending, see Ministerio de Economía y Hacienda, *Cuentas de las Administraciones Públicas* (1990).

[13] In particular, only 1% of males with a technical degree, and 2% of those with a business degree were unemployed. Everybody holding a teaching degree was employed.

[14] Life cycle employment probabilities and earnings in Figures 1 and 2, respectively, are computed taking a population weighted mean of the regional coefficients.

A4, and estimated life cycle earnings for full-time male earners (adjusted for employment probabilities) are given in Figure 2.

Figure 2 contains some interesting findings already. First, according to the estimated life cycle earnings, three big groups of education levels emerge. A first group of high life cycle earnings including engineering, health related sciences, law & economics, technical 'medium level' degrees and business; a second one, with "medium" life cycle earnings, including "other social sciences & humanities", teaching, other 'medium level' degrees and secondary education; and a third one, with much lower life cycle earnings, including primary education and no education. It is worth noting that the degrees belonging to the first group display higher starting earnings level and a steeper slope than any of the other education categories. Note also that age-earnings profiles of business and technical 'medium level' degrees are considerably flatter than most age-earnings profiles in Figure 2. This is certainly due to the fact that age-earnings profiles could not be adjusted by employment probabilities. Notwithstanding this, however, the age-earnings profile for teaching displays a rather pronounced U-shaped form.[15]

Moreover, the age-earnings profile turning point, that is, the age at which earnings cease to increase and start decreasing, occurs on average at a latter age for the first group and at the earliest age of the three groups for the third one. Natural science degrees display a surprisingly symmetric U-shaped profile centred at age 45, the earliest turning point of all education levels.

4.3 Private and social returns to education

Table 2 shows the internal rates of return that obtain from the discounted flow of costs and benefits analysed above. In general, these estimates confirm some popular conceptions and are consistent to rates of return to university degrees found in other countries (see Psacharopoulos, 1994).

Let us start with the marginal private rates of return which measure the return to investment in higher education made only by individuals, *i.e.* costs comprise the opportunity cost of education —in terms of forgone earnings— plus direct costs directly borne by individuals. Due to lack of information, most previous studies bundle all university degrees into one category and

[15] Recall that the age-earnings profile for teaching is not adjusted either by employment probabilities.

estimate the average rate of return to higher education as a whole. The fourth column in Table 2 shows that the marginal private rate of return differs substantially across higher education degrees: from 67.7% for technical 'medium level' degrees to a negative return (-5%) for "other social sciences and humanities" degrees. Nearly half of university degree groups —technical, business, engineering, law & economics, and health related sciences, in this order— obtain double digit rate of returns, whereas the rate of return to the rest of university degrees range from 6.4 to 8.2 per cent, with the notable exception of "other social sciences & humanities". Such differences in rates of return are especially relevant for in the case of private marginal return rates the investment undertaken by individuals with different degrees —mainly in terms of foregone earnings— is roughly the same.

When direct costs of higher education are also taken into account to assess the profitability of higher education degrees, the relevant rate of return is the social marginal one.

Social marginal rates of return to higher education degrees are about half the private ones. Social marginal rates of return only differ from private ones in that direct costs of higher education are added to the flow of private costs considered when computing the latter rate of return. Thus, the large reduction in profitability is only accounted for by direct resource costs of higher education —shown in Table 1.[16] Now, investment in those degrees with a lower private marginal return rate yields a small return (between 3 and 4%), but investment in those degrees with a higher private marginal return rate is still paying large returns.

Note, however, that taking the private/social rate of return differential at face value could lead to misleading policy recommendations. From the above evidence one should, by no means, conclude that there is over-investment in higher education relative to some socially optimum amount, for our estimates of benefits are solely based on the additional individual earnings that result from additional educational attainments. That is, we omit social benefits such as greater community and social participation, higher social

[16] Even though social rates of return should be computed using *before* tax earnings, and private rates of return should be computed using *after* tax earnings, we have employed before tax earnings in both cases due to lack of information. Notwithstanding this, the post- versus pre-tax treatment of earnings does not make a big difference in a rate of return calculation (Psacharopoulos, 1981).

cohesion, lower criminality, improved health, etc. Therefore, we provide lower bound estimates of social rates of return.

As outlined above, marginal rates of return are important to assess the relative profitability of investments in higher education. However, one should also bear in mind that the above are not returns to projects of the same size, but that (resource) costs differ across university degree categories.[17] For instance, the large return to technical 'medium level' degrees refers to a smaller project than the lower return to health related degrees.

As far as secondary education is concerned, the private marginal rate of return (12.1%) is slightly higher than previous estimates for Spain,[18] and, due to the relatively small resource cost borne by the public sector, the social marginal rate of return is only a bit lower than the private one.

Let us now turn to absolute rates of return. We find both private and social absolute rates of return to be larger than their corresponding marginal ones for most university degrees groups. In the case of private returns such a difference basically reflects the difference in post-secondary school earnings between individuals with primary education alone and those with secondary education.

Although schooling in Spain is compulsory until the age of 16 it is interesting to know how much lower social rates of return are when private opportunity costs between ages 12 to 16 are also taken into account. The first column in Table 2 shows that absolute social rates of return drop between half to one percentage point for most university degrees.

The rates of return shown in Table 2 have to be interpreted with caution. In particular on should bear in mind that:

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[17] After all, few people would prefer a 100 per cent return to a 1 euro project to a 5 per cent return to a 100 euro project.

[18] Note that this is the only rate of return that can be compared to those found in other studies. Recent studies find lower private marginal rates of return to secondary education. In particular, Vila and Ginés (1998) and Lassibille and Navarro (1998) find similar rates of return, 5.26% and 5.50% respectively. However, the first one refers to males only whereas the second one refers to both males and women. Even though these two studies use the same data set than ours the samples they use differ from ours in some crucial aspects that might explain the differences found in rates of return. Both studies work only with household heads and drop self-employed and part-time workers. As Alba and San Segundo (1995) show, self-employed obtain higher rates of return than employees. These last authors use a different data set (Spanish Labour Survey, 1990) and obtain a higher rate of return, 7.3%. This estimate, though, is not too reliable due to small sample size, 1107 male workers. Moreover, all previous studies employ the 'earnings equation' approach but none of them controls for sample selection bias. Finally, we obtain higher rates of return estimates because we take due account of the effect of education on the employment probability —see Oliver *et al.* (1998) for a more detailed discussion on this.

- due to lack of information the estimates do not separate the effect of education from other effects such as informal learning, on-the-job training, motivation or innate ability.[19]
- life cycle earnings across different age-groups at one point in time are not necessarily a reliable guide to the future earnings profile of a cohort graduating at a particular level of education today. Note, however, that this is an unavoidable problem with cross-section data.
- regarding social rates of return, recall that they take no account of broader social or economic benefits other than labour market outcomes.

Notwithstanding these cautions, we believe that our findings provide some new and interesting evidence on rates of return to investment in university degrees. Finally, considering that the social rates of return estimates omit some important benefits, some of they still compare favourably with rates of return to physical capital in Spain for 1990 which amounts to 20%.[20] This result is consistent with the evidence given for most OECD countries (see Healy, 1998 and McMahon, 1991).

We can draw some tentative policy implications from our analysis. On the one hand, high social returns —that, recall, are measured using a rather comprehensive definition of costs both privately and publicly financed, but only uses the benefits accruing to the individual through labour market outcomes— calls for a more equitable sharing of some university degrees' costs. On the other hand, the positive spill-overs or externalities referred to but not measured here constitute a clear case for public subsidy. These two results are not contradictory if public money goes either to those with a smaller likelihood for higher education attainment due to the usual economic drawbacks of lower socioeconomic class or to those degrees that have a lower private return but potentially a much higher social one.

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[19] For an excellent empirical analysis about on-the-job training for a sample of young Sweedish male white collar workers, see Hause (1980). For a survey and discussion on the endogeneity biases in the estimates of returns to schooling attributed to the omission of unobserved variables such as effort or ability and to measurement error, see Griliches (1977) and Card (1995). Recent evidence fom studies on identical twins by Ashenfelter and Krueger (1994) and Ashenfelter and Rouse (forthcoming), however, may lead to minimise such problems. Indeed, Healy (1998) conjectures that measurement error (through for example omission of quality of education) and the omission of control variables such as ability in less sophisticated estimation of returns to education may tend to roughly cancel each other. Finally, recent studies which use instrumental variables in the earnings equation to correct for the ability bias tend to find higher rather than lower returns to education —see Card (1995).

[20] The figure on average rate of return to physical capital in the business sector was obtained from Table 69, p. 159, of *OECD Economic Outlook*, no. 53, 1993.

5. Conclusions

In this paper we present estimates of returns to university degrees, primary and secondary education for male workers in Spain using the Spanish Family Expenditure Survey 1990. Rates of return to different university degrees have never been estimated in Spain. Therefore, we present new evidence for Spain on the old relationship between education and earnings.

We present estimates of private returns that take into account costs borne by the individual (mainly foregone earnings) and private gains in terms of higher pre-tax earnings, and social returns that include, in addition to the private costs, resource costs borne by the public sector. However, macroeconomic and wider social gains have not been considered.

Our findings suggest that rates of return differ substantially across university degrees. Technical 'medium level' degrees yield the highest rate of return whereas other social sciences and humanities degrees yield a negative rate of return.

The information required to estimate the social rates of return to university degrees is not contained in any of the data sets available in Spain. We have solved this problem by inferring the necessary information from other sources; namely, university degrees were assigned to individuals on the basis of their occupational classification and economic sector. Moreover, resource costs refer to one Spanish university.

Despite these and other shortcomings outlined in Section 4, our findings throw some new light on the old problem of assessing university degrees both at an individual and a more social level. Of course profitability, as defined and estimated in this paper, should not be the only element on which to evaluate university degrees, but should however be one of the many elements that ought to be employed to carry out such assessment. Thus far, this element was not quantified and thus could not be considered.

Finally, the analysis could be extended to females and employment status —*e.g.* employee vs. self-employed, public vs. private sector employees. We have earmarked this for future research.

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Table 1. Average Individual Public Cost of Education and Actual Duration*

	Average Individual	*Mean*	*Average Individual*
No Education[a]	173,969	5.0	869,846
Primary Education[b]	173,969	3.0	521,907
Secondary Education[b]	207,835	4.0	831,342
Higher education: 'Grado Medio' (medium level) Degrees			
Technical[b]	423,405	3.0	1,270,215
Teaching	435,711	3.4	1,490,132
Business	237,190	5.1	1,216,785
Others[c]	423,405	3.0	1,270,215
Higher education: 'Grado Superior' (superior level) Degrees			
Engineering	466,985	5.3	2,485,519
Natural Sciences	646,686	5.4	3,483,177
Health Related Sciences	619,017	6.4	3,941,696
Law & Economics	213,751	5.9	1,269,086
Other Social Sciences and Humanities	324,303	5.0	1,628,283

* Costs are measured in pesetas, and duration in years.

[a] No Education refers to no degree completed —illiteracy or lack of any certification. We have assumed that these individuals studied for 5 years (first cycle of primary education).

[b] Due to lack of information duration is not actual but officially planned.

[c] Due to lack of information we assign to the 'Others' category public costs and duration of the 'Technical' category.

Table 2. Private and Social Returns to Education for Male Earners, Spain 1990/91 (in percentage)

	Social Rates of Return			*Private* Rates of Return	
	Absolute[a]	*Absolute*	*Marginal*	*Absolute*	*Marginal*
Primary Education[b]	23.5	29.9	29.9		
Secondary Education	15.8	17.3	10.2	28.8	12.1
'Medium level' Degrees					
Technical	20.5	22.2	38.5	39.3	67.7
Teaching	13.2	14.2	3.2	26.5	6.8
Business	16.3	17.3	15.8	29.2	29.8
Others	12.7	13.5	4.1	20.3	6.4
'Superior level' Degrees					
Engineering	16.6	17.5	17.3	28.3	27.7
Natural Sciences	11.0	11.5	3.9	18.7	8.2
Health Related Sciences	12.6	13.1	9.2	21.0	14.7
Law & Economics	15.6	16.5	14.8	24.6	19.9
Other Social Sciences & Humanities	9.8	10.3	-5.8	15.4	-5.0

[a] Unlike the other columns, these estimates assume a private opportunity cost of schooling between ages 12 to 16.

[b] Private rates of return for primary education are not computed since it is assumed that there is no opportunity cost of schooling before age 16.

APPENDIX

Table A1. Mean Earnings and Sample Summary Statistics

	Mean	Standard Deviation
EARNINGS (in Pesetas)		
No Education	2065439	2083236
Primary Education	2558806	2605779
Secondary Education	3048673	3684499
'Medium level' Degrees		
Technical	5080971	2874618
Teaching	3396431	1360252
Business	4653391	2496882
Others	4023963	2703335
'Superior level' Degrees		
Engineering	5701323	2804592
Natural Sciences	3668820	2078519
Health Related Sciences	5258853	2514954
Law & Economics	5360568	5358010
Other Social Sciences & Humanities	3808403	2103309
AGE	38.25	14.58
FULL-TIME	0.9	

Table A2. Composition of Degree Categories

Degree Category	*Degree*
'Grado Medio' (medium level) degrees	
Technical	Technical engineering & Computing
Teaching	Teaching
Business	Business
Others	All the rest
'Grado Suerior' (superior level) degrees	
Engineering	Engineering, Chemistry, Architecture
Natural Sciences	Biology, Physics, Geology, Mathematics.
Health Related Sciences	Medicine, Veterinary, Pharmacy
Law & Economics	Law, Economics, Business
Other Social Sciences and Humanities	Classical Philology, Hispanic Philology, Anglo-German Philology, Romanic Philology, Catalan Philology, Philosophy, Educational Sciences, Art, History, Geography, Journalism, Publicity, Political Sciences, Sociology, Psychology, Translation Studies.

Table A3. Employment Equation (by Education level)

Independent Variable	Without Education	Primary Education	Secondary Education	Higher Education: Others	Higher Education: Engineering	Higher Education: Natural Sciences	Higher Education: Health Related Sc.	Higher Education: Law & Economics	Higher Education: Other Social Sc. & Humanities
Constant	**-3.897**	**-4.81**	**-7.532**	**-11.184**	**-8.156**	**-9.911**	**-9.466**	**-6.806**	**-9.928**
	11.69	36.78	24.07	7.58	6.47	6.54	6.29	4.29	7.36
Age	**0.247**	**0.318**	**0.445**	**0.636**	**0.492**	**0.563**	**0.522**	**0.443**	**0.522**
	15.48	42.00	23.75	7.88	7.66	7.18	6.81	5.66	7.55
Age squared	**-0.003**	**-0.003**	**-0.005**	**-0.007**	**-0.005**	**-0.006**	**-0.005**	**-0.005**	**-0.005**
	16.81	41.66	21.98	7.79	7.28	7.10	6.62	5.94	7.24
REGIONAL DUMMIES[a]									
Aragón	**0.044**	**0.347**	**0.736**	**0.672**	**-0.058**	**0.340**	**0.004**	**0.627**	**0.007**
	0.25	4.28	4.56	1.65	0.17	0.66	0.01	1.48	0.02
Asturias	**-0.420**	**-0.043**	**0.034**	**0.308**	**-1.051**	**-0.406**	**-0.286**	**-1.406**	**-0.929**
	1.97	0.45	0.24	0.78	1.82	0.74	0.66	2.78	2.16
Canarias	**-0.469**	**0.053**	**-0.045**	**-0.667**	**-0.542**	**0.070**	**-0.175**	**-0.615**	**-0.423**
	3.36	0.69	0.34	1.91	1.42	0.16	0.49	1.32	1.04
Cantabria	**0.500**	**-0.052**	**0.109**	**-0.592**	**0.332**	**-0.074**	**-0.559**	**-1.408**	**-0.107**
	1.61	0.48	0.63	1.20	0.74	0.10	0.75	2.18	0.14
Castilla y León	**-0.338**	**0.096**	**0.038**	**-0.050**	**0.393**	**-0.185**	**-0.240**	**0.003**	**0.018**
	3.28	1.80	0.47	0.18	1.18	0.50	0.83	0.01	0.07
Castilla-La Mancha	**0.251**	**0.301**	**0.217**	**0.401**	**0.151**	**0.298**	**-0.170**	**0.088**	**0.344**
	2.65	4.36	1.74	1.17	0.47	0.71	0.56	0.30	1.03
Cataluña	**-0.234**	**0.431**	**0.491**	**-0.080**	**1.420**	**0.795**	**0.490**	**0.593**	**0.378**
	1.60	5.39	4.00	0.25	4.27	1.60	1.22	1.70	0.91
Comunidad Valenciana	**0.185**	**0.396**	**0.389**	**0.026**	**0.270**	**0.371**	**-0.164**	**0.212**	**0.608**
	1.94	5.98	3.64	0.06	0.88	0.77	0.45	0.69	1.53
Extremadura	**-0.013**	**0.070**	**-0.034**	**-0.230**	**0.013**	**0.236**	**-0.643**	**0.605**	**0.338**
	0.13	0.86	0.23	0.69	0.03	0.45	1.69	1.59	0.75
Galicia	**-0.144**	**0.015**	**0.004**	**-0.428**	**-0.813**	**-0.415**	**-0.385**	**-0.696**	**-0.088**
	1.52	0.25	0.04	1.35	1.60	1.46	1.24	1.53	0.32
Madrid	**0.030**	**0.341**	**0.277**	**0.209**	**0.524**	**0.132**	**-0.494**	**0.664**	**0.051**
	0.16	3.99	2.34	0.58	1.81	0.33	1.38	2.21	0.14
Murcia	**0.013**	**0.320**	**0.208**	**-0.832**	**-0.428**	**-0.143**	**-0.036**	**0.169**	**-0.174**
	0.11	3.08	1.47	2.39	1.08	0.36	0.09	0.43	0.45
Navarra	**0.290**	**0.434**	**0.078**	**0.673**	**0.354**	**-0.003**	**-0.310**	**-0.409**	**-0.158**
	0.88	4.07	0.50	1.43	0.63	0.01	0.57	0.89	0.26
País Vasco	**-0.700**	**-0.022**	**0.038**	**-0.733**	**0.350**	**0.625**	**-0.009**	**-0.206**	**0.437**
	3.17	0.36	0.41	2.31	0.72	1.61	0.03	0.43	1.39
Rioja	**-0.508**	**0.492**	**0.126**	**-0.130**	**0.568**	**0.325**	**-0.061**	**0.400**	**0.648**
	2.14	4.33	0.78	0.26	1.61	0.57	0.16	1.12	1.50
N	3158	12315	4771	575	579	461	596	634	470
Log Likelihood	-1774.7	-4973.5	-1954.6	-201.7	-36.9	-132.6	-184.2	-54.7	-186.9

Note: Probit estimates in bold. Absolute value of *t*-statistics computed using robust (Huber-White) standard errors are below estimates.

[a] Reference category is Andalucía. Two regions (Baleares and Ceuta-Melilla) were excluded due to multicollinearity problems.

Table A4. Earnings Equation (by Education level)

Independent Variable	Without Education	Primary Education	Secondary Education	*Higher Education*								
				'Medium Level' Degrees				'High Level' Degrees				
				Technical	Teaching	Business	Others	Engineering	Natural Sciences	Health Related Sc.	Law & Economics	Other Social Sciences. & Humanities
Constant	**9.462**	**11.862**	**12.702**	**10.538**	**11.863**	**12.422**	**9.555**	**12.406**	**6.082**	**12.209**	**10.154**	**13.473**
	6.00	27.19	18.16	13.90	13.70	15.42	7.45	14.71	2.40	10.34	5.51	5.73
Age	**0.152**	**0.078**	**0.052**	**0.176**	**0.120**	**0.108**	**0.211**	**0.089**	**0.408**	**0.102**	**0.175**	**0.068**
	2.12	3.78	1.61	4.01	3.28	3.21	3.24	2.43	3.47	2.01	2.28	0.65
Age squared	**-0.002**	**-0.0007**	**-0.0004**	**-0.001**	**-0.001**	**-0.001**	**-0.002**	**-0.0008**	**-0.004**	**-0.001**	**-0.001**	**-0.0007**
	1.84	2.83	1.04	3.35	2.96	2.97	2.96	1.94	3.35	1.76	2.10	0.62
REGIONAL DUMMIES[a]												
Aragón	**0.531**	**0.181**	**-0.007**	**0.134**	**0.294**	**0.010**	**0.063**	**0.085**	**-0.024**	**-0.420**	**0.231**	**-0.254**
	6.09	3.91	0.11	0.39	1.81	0.03	0.58	0.45	0.26	1.36	0.97	1.36
Asturias	**0.382**	**0.132**	**0.106**	**0.125**	**0.044**	**0.044**	**-0.024**	**0.472**	**-0.601**	**0.164**	**-0.133**	**-0.060**
	2.03	2.48	1.32	0.46	0.40	0.33	0.16	1.62	5.58	1.14	0.40	0.28
Canarias	**-0.003**	**0.06**	**-0.023**	**-0.100**	**0.110**	**0.371**	**0.055**	**-0.117**	**-0.236**	**0.092**	**-0.036**	**0.193**
	0.02	1.50	0.29	0.26	1.27	1.63	0.38	0.80	0.58	0.60	0.21	1.39
Cantabria	**0.395**	**0.171**	**-0.064**	**-0.510**	**0.065**	**0.109**	**0.060**	**-0.066**	**0.353**	**0.030**	**-0.437**	**0.296**
	2.14	3.55	0.73	2.59	0.80	0.33	0.39	0.60	2.41	0.12	0.94	1.70
Castilla y León	**0.221**	**0.159**	**0.078**	**-0.299**	**-0.068**	**-0.093**	**0.082**	**-0.028**	**-0.100**	**-0.032**	**0.322**	**-0.104**
	1.71	4.98	1.44	1.53	0.61	0.36	1.02	0.17	1.01	0.28	1.73	1.07
Castilla-La Mancha	**0.224**	**0.168**	**0.023**	**-0.245**	**0.025**	**0.412**	**0.028**	**0.191**	**0.273**	**-0.140**	**-0.031**	**0.164**
	2.33	4.35	0.35	1.28	0.21	2.53	0.13	1.09	1.86	1.10	0.21	1.16
Cataluña	**0.360**	**0.282**	**0.131**	**-0.075**	**0.145**	**0.483**	**0.314**	**0.271**	**0.056**	**0.009**	**-0.077**	**0.308**
	2.28	6.80	1.83	0.61	1.18	2.74	2.96	2.51	0.25	0.10	0.25	2.61
Com. Valenciana	**0.234**	**0.078**	**-0.047**	**-0.103**	**0.033**	**0.262**	**0.003**	**0.011**	**-0.255**	**-0.406**	**-0.054**	**-0.833**
	2.69	2.04	0.72	0.41	0.26	1.67	0.03	0.09	0.52	1.69	0.36	3.01
Extremadura	**0.010**	**-0.122**	**-0.021**	**-0.159**	**0.031**	**0.103**	**0.114**	**0.180**	**0.486**	**0.158**	**0.344**	**-0.281**
	0.10	2.12	0.18	0.92	0.22	0.62	0.67	1.03	2.65	0.58	1.31	0.66
Galicia	**0.112**	**0.041**	**-0.010**	**-0.167**	**0.061**	**0.514**	**-0.077**	**0.275**	**0.103**	**-0.143**	**-0.227**	**-0.057**
	1.18	1.15	0.17	0.96	0.48	2.57	0.60	1.80	0.79	0.79	1.13	0.29
Madrid	**0.050**	**0.151**	**0.074**	**0.085**	**0.220**	**0.147**	**-0.169**	**-0.073**	**0.288**	**-0.236**	**0.173**	**0.101**
	0.22	3.68	1.24	0.17	1.25	0.69	1.43	0.64	2.01	1.86	0.93	0.86
Murcia	**0.074**	**0.083**	**-0.055**	**-0.002**	**0.009**	**-0.029**	**-0.076**	**-0.041**	**-0.086**	**0.095**	**-0.130**	**0.056**
	0.77	1.44	0.58	0.01	0.07	0.22	0.75	0.15	0.68	0.73	0.39	0.26
Navarra	**0.494**	**0.250**	**0.269**	**-0.163**	**-0.434**	**0.217**	**0.095**	**0.185**	**-0.050**	**0.161**	**-0.032**	**0.149**
	3.13	4.71	3.64	1.29	1.01	1.22	0.51	1.03	0.17	1.43	0.18	1.58
País Vasco	**0.258**	**0.243**	**0.103**		**-0.002**	**0.492**	**-0.015**	**-0.025**	**-0.048**	**-0.106**	**-0.128**	**-0.191**
	0.89	6.72	1.99		0.01	2.25	0.12	0.20	0.24	1.01	0.88	1.25
Rioja	**0.187**	**0.209**	**-0.014**	**-0.117**	**0.202**	**0.268**	**-0.275**	**0.150**	**-0.006**	**0.154**	**0.027**	**-0.289**
	0.59	3.49	0.15	0.59	1.46	1.51	1.45	0.86	0.04	0.77	0.15	1.48
Full- Time Employee	**1.133**	**0.824**	**0.865**	**1.027**	**0.238**	**0.171**	**0.893**	**0.730**	**0.390**	**0.863**	**1.119**	**0.218**
	9.71	17.18	7.26	2.78	1.03	1.50	2.56	3.04	1.05	3.89	2.23	1.33
Employment Selection (*Inverse Mills' Ratio*)	**0.400**	**-0.323**	**-0.542**				**0.319**	**-1.240**	**0.989**	**-0.273**	**0.945**	**-0.422**
	0.75	2.03	2.96				1.42	1.77	1.55	0.90	0.76	0.94
N	2000	9307	3033	126	189	178	388	454	336	468	508	347
Adjusted R^2	0.27	0.30	0.36	0.40	0.39	0.23	0.41	0.44	0.40	0.39	0.25	0.34

Note: OLS estimates in bold. Absolute value of *t*-statistics computed using robust (Huber-White) standard errors are below estimates.

[a] Reference category is Andalucía. Two regions (Baleares and Ceuta-Melilla) were excluded due to multicollinearity problems.

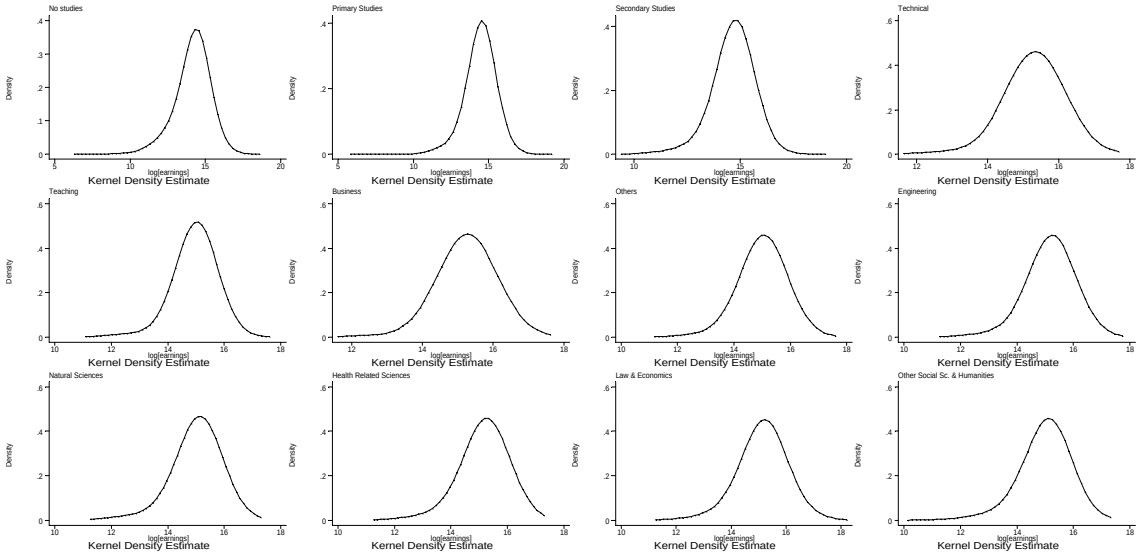
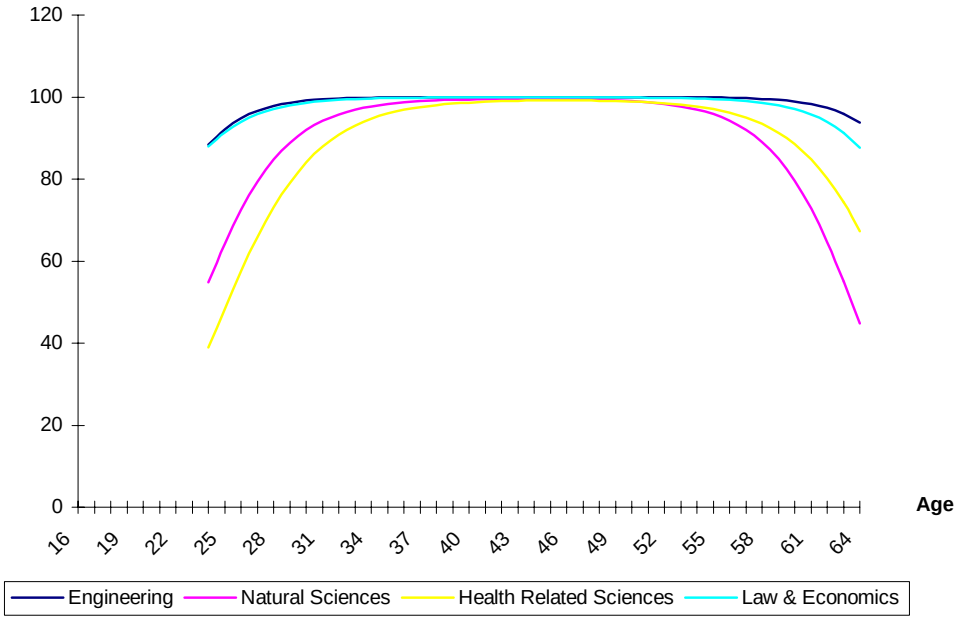


Figure A1. Kernel Density Estimates of Log Earnings by Education Level



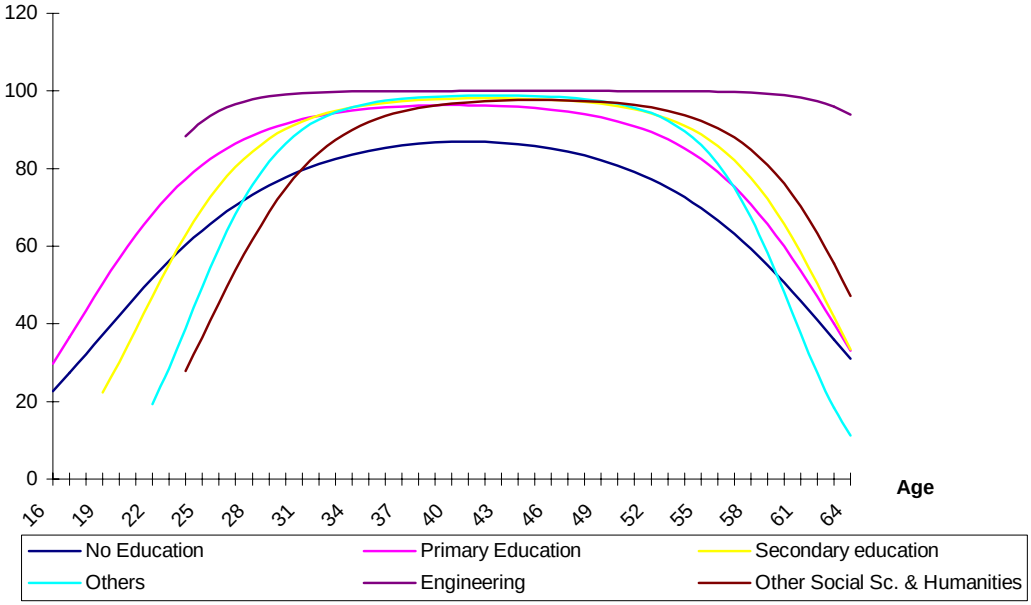
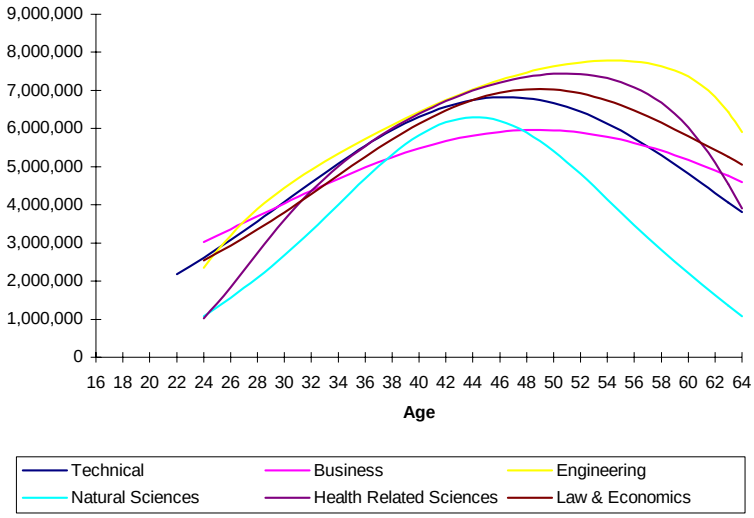
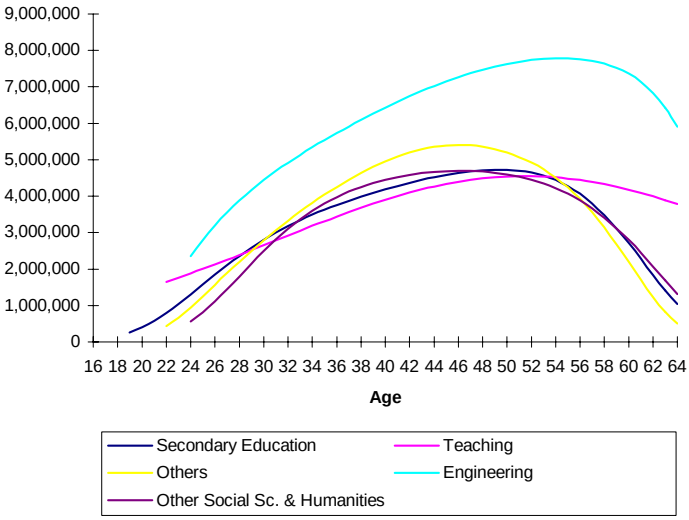


Figure 1. Estimated Life Cycle Employment probabilities by Education Level





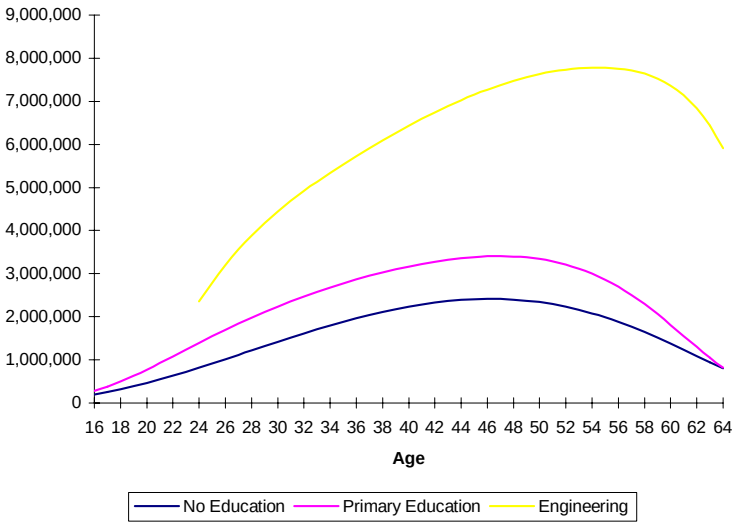


Figure 2. Estimated Life Cycle Earnings by Education Level

Últims documents de treball publicats

NUM	TÍTOL	AUTOR	DATA
99.04	Not All University Degrees Yield the Same Return: Private and Social Returns to Higher Education for Males in Spain	Josep Oliver Xavier Ramos José Luis Raymond	Abril 1999
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