The pay-off to human capital competences for recent college Catalan graduates

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ABSTRACT:

In this paper the impact of different types of competences in the labor market for college graduates is investigated. We use a new data set of Catalan college graduates interviewed three years after graduation. We use wages equation to calculate the payoff to management, communication, specific and instrumental competences. By far, management competences are those which command a higher pay-off. The mastering of foreign languages is also rewarded by employers. We show that most of the individual endowment in management competences is developed in the workplace. However, a strong background of theoretical knowledge (developed in the class room) helps a great deal to accumulate working related competences and, hence, has a large indirect pay-off.

PRELIMINARY VERSION

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1. Introduction

Over the last years western economies have been experiencing a great deal of structural changes. A very fast pace of technological change and an unstoppable process of globalisation are creating a very competitive environment where firms must come up with new products and produce them efficiently. It has been argued that these changes are decisively affecting the kind of skills the workforce must bring to the labour market. Basically, most research studies come to the conclusion that workers have to upgrade their qualifications. In our future knowledge societies, those who lack the correct set of skills will fall behind and will face problems assuring a minimum level of income.

Despite the difficulties in building appropriate data sets, literature has found clear evidence that the deployment of competences in the workplace carries a positive pay-off, which is independent of traditional measures of human capital. Thus, the acquisition of these competences does not only make workers more productive but also increases their earnings. However, there are still important issues that either require further research or remain unanswered. First, it is essential to ascertain which skills and competences increase workers' productivity, given the lack of agreement about which of them are more demanded by employers. A definite answer to this question should prove of invaluable aid in order to focus efforts towards the promotion of the most productive competences. Besides identifying the most demanded generic competences, it is also necessary to ascertain where the acquisition of these skills is more effective. Should the responsibility be laid on the educational system, or should the employer provide these qualifications? Main conclusions in previous research, after having found a positive impact of the utilization of competences on earnings, suggested that the transmission of competences should receive more attention by the educational system.

Then, it is implicitly assumed that competences can be easily transmitted through formal education, despite the fact that there evidence supporting the learning of job oriented skills within education is not conclusive. In order words, the learning mechanism lying behind the acquisition of competences is to some extent being neglected.

Finding the answer to these questions will not only contribute to provide firms the human capital that satisfy their needs, but will also make the learning process more efficient as a result of the correct allocation of resources as well as giving the guidelines to focus on the skills that really matter to raise productivity and pay. The object of this paper is two-fold, we address both the valuation of skills and where they should be learnt by using a survey conducted during 2005 by the Catalan Agency of University Quality. University graduates were interviewed 3 years after having completed their studies. We estimate the returns to the utilization in the workplace by university graduates of 4 generic competences: management skills, expression skills, instrumental skills and specific knowledge. The information on the survey allows us to decompose required competences between acquired competences at university and a difference that will be regarded as an increase in competences (if requirements exceed levels attained at university), or simply overqualification otherwise. Next, we estimate returns to the level of competences attained and the subsequent development of competences during the early career. Finally we explore the determinants of the future development of the most productive competences in the labour market. We are particular interested in testing whether the acquisition of competences at university contributes to work in jobs where graduates need to upgrade their competences.

The remainder of the paper is laid out as follows: in Section 2 we overview the relevant literature that addresses the causal effect of competences on earnings, in Section 3 the data used is described. In section 4 generic competences are generated by means of factor analysis. Returns to the utilization of competences are estimated in Section 5. Section 6 explores the determinants of the subsequent development of generic competences in the labour market. Finally, section 7 concludes.

2. Review of literature

As Suleman and Paul (2006) highlight, there is still no consensus on the type of competences that make employees more productive. Actually, in some of them, especially computer skills, the degree of cleavage is considerable. The fact that the election of competences is decisively influenced by the questions in the surveys is to be blamed for this lack of agreement.

Technical change and deep transformations in working environments attracted some researchers' attention towards more job oriented competences. According to Bishop (1995), productivity derives directly from social abilities and those cognitive abilities that are specific to the job, excluding academic skills such as reading, writing and mathematics skills. Nonetheless, the latter competences are essential to develop those competences that raise workers' competences. In the light of his results, Bishop advocates that the acquisition of job oriented competences is even more essential that the acquisition of academic skills during education. Altonji (1995) finds that the return to additional courses in academic subject during high school is very small. More recent empirical results obtained by Mane (1999) and Bishop and Mane (2004) favour the view that supports the premium for technical and professional competences. In recent

years, the availability of more appropriate data sets has facilitated the estimation of the returns to more detailed sets of generic competences (Green, 1998; García Aracil *et al.*, 2004; Dickerson and Green, 2004, Johnes, 2005). These studies demonstrate that there exists a premium for certain competences. This pay-off is particularly large for high-level communication and computer skills (Dickerson and Green, 2004). Green (1998) found the highest pay-off for computer skills, professional communication and problem-solving skills. Garcia Aracil *et al.* (2004) showed that jobs with higher requirements of participative and methodological competences are best paid, whereas the opposite occurs for jobs with higher requirements of organisational, applying-rules and physical competences. According to Johnes (2005) people skills, strategic skills, and IT skills carry strong and positive wage premia. The main problem of these studies resides in the fact that comparability of results between them becomes extremely difficult.

On the other hand, some researchers have stressed the importance of academic competences and cognitive ability. Numerous studies have found evidence that mathematical ability and mathematical skills yield positive wage returns (Murnane *et al*., 1995; Murnane and Levy, 1996; Tyler *et al*, 1999; McIntosh and Vignoles, 2001; Freeman and Schettkat, 2001, Johnes, 2005). Denny *et al.* (2003) used a measure of functional literacy calculated as an average of prose, document and quantitative skills. Their empirical results vary across countries, although in general returns to their measure of skills are quite large.

Heijke *et al.* (2003) are critical with contributions disregarding the impact of academic skills on wages and productivity as well as with those arguing that the educational system should pay more attention to those job-oriented competences that are more

highly compensated. By means of a cluster analysis they distinguish 3 types of competences among Italian university graduates depending on the context where they should be effectively leant: management competences, discipline-specific competences and general academic competences. They obtain a positive direct impact of management competences on earnings, which is consistent with the results of those who advocate for more specific-oriented competences being taught. They also find non-negligible indirect positive returns to discipline-specific competences and general academic competences nonetheless. The former pay-off derives from the initial job allocation which raises the probability of working inside one's own domain of study, which in turn is rewarded. General academic competences also generate an indirect positive pay-off as they contribute to the posterior development of management competences.

It is not only a matter of which competences are more appreciated by employers, it is also essential to decipher where these competences are more effectively acquired. Empirical evidence in Green *et al.* (2001) points out that both education and work-based learning contribute to the development of skills. They also found that education plays a smaller role in the production of some of the skills, signaling that the educational system may be better at transmitting skills with a high component of propositional and specialist knowledge. In line with Green *et al.* (2001), Becker (1962) and McCall *et al.* (1988) had already alerted that some skills and competences that are more easily acquired in the working context.

Although it is not the main focus of this paper, it is also interesting to briefly summarize contributions addressing the return to computer skills, which has brought in the largest degree of cleavage among researchers. There is a certain group of authors who have

provided evidence that computer skills raise productivity and earnings by themselves (Krueger, 1993; Bell, 1996; Dickerson and Green, 2004, Johnes, 2005). Alternatively, other researchers have cast doubts on this positive pay-off (Silles, 2005; Borghans and Weel, 2006). These authors are reluctant to accept a direct causality between earnings and computer usage, as the latter is correlated with unobservable abilities and skills that indeed increase earnings.

In sum, although evidence seems to converge at signaling the positive impact of job-oriented competences on earnings, it does not when assessing the effect of academic competences. Some researchers have advocated the necessity of promoting the acquisition of generic competences within education. However, there is not evidence that supports an effective learning of these competences when they are taught outside the working environment.

3. Data

One of the main obstacles researchers encounter when assessing returns to competences entails encounter difficulties to find appropriate data. Fortunately, our data base does not only offer a detailed description of the job by means of job analysis techniques, but it also contains wide information on individuals' and firm characteristics. Data used originates from a survey conducted by the Catalan Agency for University Quality named the *Transition to work of the Catalan Graduates*. The aim of this survey was to provide information about the quality of the transition to work of the Catalan graduates 3 years after having succeeded in completing their degrees.

This survey took place during the first semester of 2005. The initial potential sample consisted of 21,018 records. Finally, 10501 valid interviews were made by telephone[1] and compose our initial sample. We have dropped from the sample those graduates who had never been occupied. Likewise, those records of individuals who were not working at the moment of the interview have been neither included, as we ignore the moment when they worked, and consequently, the real value of earnings is unknown. Those who were receiving a scholarship were also deleted from the sample. Moreover, 2 universities had previously conducted a similar but not identical survey across some fields of study. As a result, there were discrepancies between the questionnaires which affected some of the variables of interest. We had to drop these individuals from the sample as well[2]. The final sample is composed of 8933 individuals. Table I in the Appendix shows the basic descriptive statistics of variables used in the empirical analysis.

Descriptive statistics are presented in table I in the Appendix, which we briefly describe. Annual earnings are divided in 6 different intervals. Thus, the exact amount of money that graduates obtain is unknown. Around 2/3 of the sample concentrate between the second and the third interval, that is between 12,000 and 30,000€. The percentage of graduates earning less than 12,000 doubles the percentage of those earning more than

[1] 1.8% did not accept to be interviewed, 37.1% could not be contacted, either because the telephone number was mistaken, or they had moved, or simply nobody picked up the phone after several attempts. 1.3% of the interviews could not be completed due to a variety of inconveniences (e.g. cut off). Another 9.1% was not interviewed because the accorded number of interviews had already been reached. The percentage of the initial sample that could not be contacted is not negligible at any rate. Dolton and Vignoles (2000) warned about the bias arising from non-respondents in the case they had fled without leaving any forwarding addresses According to them, if this mobility is non-random, it increases the chances of biasing the estimation. 41% of the phone calls were made to mobile phone numbers, diminishing the probability of not contacting a mover. In sum, although bias is likely to persist, the irruption of mobile telephones might have softened its effects.

[2] Those graduates who had studied Arts at the one of universities, and the degrees of Cultural and Social Anthropology, History of Music and Science, Theory of Literature and Comparative Literature, Administrative and Political Science, Catalan Philology, Publicity and Public Relations, Social Education, Chemistry, Biochemistry, Geology, Physics, Mathematics, Food Science and Technology, Veterinarian, Chemistry Engineering and Informatics Engineering at the other university.

30,000€. The sample reflects that women are more numerous in Catalan universities. Almost half of the graduates chose a degree within social sciences. More than 60% of individuals were working at some stage when they were studying, primarily in part-time jobs. The percentage of those who had been involved in some sort of mobility is relatively low. Around ¾ of the graduates decided to continue education after graduation. Half of the graduates work in small firms, while 25% are occupied in firms that employ more than 500 workers. Almost 30% of individuals work in the public sector, and more than a half have a permanent contract. Barcelona concentrates more than 2/3 of the sample observations.

4. Generic skills for graduates: when are they learnt?

Graduates were asked to evaluate a set of 14 competences using a scale that ranged from 1 to 7 (from very low to very good). One of the main advantages of the survey is the fact that the evaluation of competences refers both to the level of competences attained at university and their utilization at the workplace; thus, enabling comparisons. Graduates were asked the following question:

1. What is your opinion about the education you received at university? Evaluate the education received at university / utility for the job ranging from 1 (very low) to 7 (very good)[3].

[3] Surveys following job analysis techniques and thus, asking individuals about the content of their jobs, gave rise to these typology of data which has been previously used by Green (1998), Green *et al.* (2001) and Dickerson and Green (2004). Although these surveys have enabled researchers to gain a much deeper insight into returns to competences, they have some shortcomings nonetheless. As previous works have stressed, workers examine their jobs, not their abilities and skills. In other words, the level of competences reported by respondents can only be considered as a perfect measure of the competences that an individual possess as long as there is an exact match between individuals' competences and the job they perform. Rigidities in the labour market are a source of mismatches that allow that workers that are overskilled or alternatively, underskilled, occupy positions that should be more appropriate for other workers. Although it implies a certain bias, we assume the perfect match between job requirements and competences that graduates possess in the current job.

We are comparing measures of competences at two different moments in time: at the end of the degree (attained level) and three years later (job utilization). If the level of competences attained during Higher education surpasses the utilization of these competences 3 years later, the interpretation of the difference as overqualification is quite straightforward. Although Garcia Aracil and Van der Velden (2007) consider the opposite phenomenon simply as underqualification, the excess of the competences needed to perform the job over those possessed at the time of graduation should receive closer attention. According to Heijke *et al.* (2003), Becker (1962), Green *et al.* (2001) and McCall (1988), there are certain skills that are better acquired in the workplace and hence, enlarge human capital through working experience. Table 1 allows an initial approach to this issue by comparing means of attained levels at university and utilization of each of the competences.

Table 1. Mean level attained during Higher education and utilization at the job of each of the competences

	Mean attained level	St. Dev. attained level	Mean attained level	St. Dev. utilization	Mean Utilization / Attained	St. Dev. Utilization / Attained
Theoretical knowledge	4.96	1.13	4.11	1.56	0.83	1.38
Practical knowledge	3.77	1.59	4.04	1.85	1.07	1.17
Written expression	4.29	1.55	4.68	1.61	1.09	1.03
Oral expression	3.67	1.67	4.63	1.78	1.26	1.06
Team working	4.54	1.57	5.04	1.61	1.11	1.03
Leadership	3.26	1.54	4.16	1.74	1.28	1.13
Problem-solving	4.23	1.54	5.14	1.59	1.22	1.04
Decision-making	3.95	1.50	5.07	1.63	1.28	1.09
Critical thinking	4.45	1.56	4.80	1.60	1.08	1.02
Creativity	3.85	1.61	4.51	1.68	1.17	1.05
Management	3.70	1.56	4.60	1.68	1.25	1.08
Documentation	4.43	1.57	4.71	1.64	1.06	1.04
Languages	2.41	1.67	3.54	2.09	1.47	1.25
Computer	3.31	1.79	4.75	1.91	1.43	1.06
8933 observations						

Consistent with Heijke *et al.* (2003), the utilization of competences in the current job notably exceeds the level of competences acquired at the university with the sole

exception of the theoretical knowledge[4]. The table makes apparent that there is a non negligible part of the competences that have been acquired the 3-year-period after graduation. It is also noticeable that standard deviations of competences of job utilization measures are larger when compared to the attained levels at university. This fact reveals that competence differences among graduates widen in the labour market.

Although the set of 14 competences provides rich information on the characteristics of the job, it is necessary to simplify the data to obtain a reduced structure easier to interpret. Simplifying the data will allow us to clarify the context where university graduates are more likely to acquire the competences they need for their jobs. Factor analysis is a well known statistical technique which implies generating a lesser number of variables functioning as linear combinations of the initial set of variables in addition to a residual, called uniqueness. This latter term captures the specific part of initial variables that cannot be explained by any of the factors. We have applied factor analysis on the 14 self-reported measures of utilization of competences. Next, an orthogonal rotation is necessary for the sake of an easier interpretation[5]. Factors are obtained using the regression method[6]. Last step involves giving a proper taxonomy to the new variables. The new set of variables or factors, have a mean equal to 0, and a theoretical

[4] This type of question builds on the CHEERS Project (*Careers alter Higher Education – A European Survey*), which was the data source used by Heijke *et al.* (2003). Unfortunately, the second part regarding the utility of the job is slightly different. In the CHEERS project, graduates were asked about job requirements, whereas in our survey they were asked about the utility of competences. Although meanings are very close, conclusions drawn from comparisons between both surveys should be taken with caution. García Montalvo (2005) compared the results of a previous wave of the Catalan survey with the results of the CHEERS project and alerted to the implications of this little semantic difference. For simplicity reasons, we assume identity between both concepts and thus, from now on we will indistinctively refer to job requirements or utilization of competences.

[5] Orthogonal rotation implies that factors are uncorrelated. Oblique rotation leads to a very similar classification of the factors although correlations between them are considerably high. Taking into account potential problems that highly correlated factors can cause on the subsequent empirical analysis, orthogonal rotation is more advisable.

[6] Factors generated using the regression method have the smallest mean square error. Their main shortcoming is the fact that they may be biased. Factors generated using the method devised by Barlett, notwithstanding the avoidance of biases; might be far less accurate.

standard deviation equal to 1[7]. They can be regarded as generic competences because they measure the extent to which jobs involve a diversity of transferable dimensions.

The number of factors to be retained is an issue which entails a certain degree of subjectivity. The 2-factor structure should be chosen according to the eigenvalues emerging from a preliminary extraction of principal components[8]. Besides, only the Cronbach's Alphas of the 1st and 2ond factors are larger than 0.7, which is widely accepted as the reference threshold of acceptance. While the Alpha of the 3rd factor is very close to the limit, the Alpha of the 4th one falls clearly behind. Opposing to previous arguments, other technical reasons prompted us to side for a 4-factor structure nonetheless. First, the percentage of variance of the initial set of competences explained by the factors rises from 53.6% to 66.2%, the latter figure being much more acceptable. Second, the inclusion of the 3rd and 4th factors lower residuals to reach satisfactory uniqueness values, since most of them range from 40% to 60%[9]. There is only one uniqueness value, the one attached to languages, exceeding 0.7, considered as a critical threshold. Third, the 4-factor structure provides a more comprehensible framework in accordance with the principle of simplicity advocated by Thurstone (1947). Table 2 shows factor loadings larger than 0.4 in bold. In fact, there is only one initial variable, oral communication, which is correlated with more than one factor[10]. The fact that a clear delimitation between expression skills and instrumental skills emerges with

[7] Standard deviations would equal 1 if the original variables were perfect linear combinations of the factors and hence, the residual terms would be equal to 0.

[8] According to the traditional rule of thump eigenvalues should be greater than 1. This threshold is also subjective. The eigenvalues of the 3rd and the 4th factors are 0.95 and 0.81 respectively, which are relatively near to the unity.

[9] Furthermore, there is only one uniqueness value, the one attached to languages, exceeding 0.7, considered as a critical threshold. On the other hand, the exclusion of the 3rd and the 4rth factor makes uniqueness values grow to the extent that only 3 of them are smaller than 0.5. Moreover, 3 of them are larger than 0.6, and even one of them approaches 0.8.

[10] Additionally, it must be highlighted that factor 2 presents loadings above 0.38 (although not reaching 0.4) with respect to 3 of the initial competences.

respect to management competences once the 3rd and the 4th factors respectively are retained finally led us to side for the 4-competence structure.

Table 2: Factor loading coefficients of the competence utilization by university graduates based on orthogonal rotation

	Factor 1	Factor 2	Factor 3	Factor 4	Uniqueness
Theoretical knowledge	0.1887	0.1823	**0.583**	0.0796	0.5849
Knowledge of methods	0.261	0.2477	**0.557**	0.0755	0.5546
Written communication	0.3443	**0.533**	0.283	0.2291	0.4647
Oral communication	**0.4046**	**0.5452**	0.2725	0.1331	0.4472
Working in a team	**0.5285**	0.3981	0.2207	0.0512	0.5108
Leadership	**0.5897**	0.3874	0.1051	0.081	0.4846
Problem-solving ability	**0.7449**	0.1853	0.1692	0.1642	0.3552
Decision making	**0.7832**	0.1878	0.1881	0.1463	0.2945
Critical thinking	**0.5366**	0.1145	0.3547	0.2011	0.5327
Creativity	**0.5733**	0.1388	0.3277	0.2096	0.5008
Management	**0,6265**	0.3983	0.0791	0.1486	0.4205
Documenting	0.372	0.2078	0.2998	**0.4026**	0.5664
Languages	0.2723	0.1943	0.1062	**0.4185**	0.7016
Computer skills	**0.4032**	0.2242	0.0687	**0.4309**	0.5968
Taxonomy of generic skills	**Management Skills**	**Communication skills**	**Specific knowledge**	**Instrumental skills**	
Standard Deviation	0.8642	0.6971	0.6003	0.7161	
Cronbach's Alpha	0.8921	0.7728	0.6948	0.6518	

Notes: Loading coefficients greater than 0.4 are shown in bold.
Theoretically standard deviations are equal to 1. This result is only achieved when the initial variables are perfect linear combinations of the factors.
Cronbachs' Alphas measure inter-item factor correlations as an indicator of internal consistency.
The sample contains 8933 observations generated in the Transition to Work of Catalan Graduates Survey conducted in 2005.

The selected structure of factors is presented in table 2. Four main groups of generic competences can be distinguished: management skills, communication skills, theoretical knowledge and instrumental skills. We follow the procedure suggested by Garcia Aracil and Van der Velden (2007) so as to obtain comparable measures of the same competences at the time of graduation. First, each measure of the attained levels at university of the initial set of 14 competences must be standardized using the mean and the standard deviation of the initial set of utilization measures. Next, attained levels of the 4 generic competences are computed as the linear combination of the attained levels of the initial 14 competences and their respective scoring coefficients previously used to compute factors. Since we have respected the scale and structure of the measures of competence utilization, we are able to compare the level of each generic competence acquired during Higher Education with its respective level of utilization at the job.

Table 3 presents the evolution the utilization of competences during the 3-year-period after graduation.

Table 3. Evolution of competences during the early career

	N	Competence variation[a]	% of graduates who are underutilizing competences learnt	% of graduates who have increased competences
Management skills	8933	72,63%	21,83%	78,17%
Communication skills	8933	35,99%	37,64%	62,36%
Instrumental skills	8933	49,22%	32,83%	67,17%
Specific knowledge	8933	-42,91%	67,64%	32,36%

Notes: [a] Competence variation is measured as the difference between attained levels and utilization levels of the generic competences calculated as percentages of a standard deviation of their respective utilization measures.

The table reveals that while individuals have to expand their management, communication and instrumental skills, specific knowledge learnt at university notably exceeds their needs. This table is consistent with Heijke *et al.* (2003) and Garcia Aracil and Van der Velden (2007) who reported that required levels of competences were generally larger in comparison with attained levels. Furthermore, the table is also in accordance with the view of those who postulate that some generic competences, and particularly management competences, are better acquired inside the working environment. The percentage of individuals who increase their level of management skills is especially remarkable, as it approaches 80%.

5. Estimating returns to competences

We now turn to estimate an augmented mincerian wage equation in which we introduce the utilization measure of generic competences as explanatory variable. The empirical analysis entails considering factors obtained in the previous section as job attributes that must be compensated. The estimated coefficients, thus, are interpreted as shadow prices of these attributes. The wage equation to be estimated takes the following form:

$$\ln W_i = \alpha + Comp_i\beta + HC_i\varphi + Ind_i\delta + Firm_i\phi + \upsilon_i \qquad (1)$$

where $\ln W_i$ is the logarithm of annual earnings, $Comp_i$ denotes the indexes of utilization of competences derived from factor analysis, HC_i captures subsequent growth of individual human capital, and Ind_i and $Firm_i$ respectively control for individual and firm characteristics. As usual, the model also includes an error term υ_i.

We are not only interested in assessing the returns to competences, but we also intend to distinguish between returns to competences learnt during Higher Education and competences acquired within the working environment. Garcia Aracil and Van der Velden (2007) estimated the returns to required competences as well as the implications of overqualification and underqualification. Their specification assumes that graduates acquire no further competences after leaving university, and thus, when workers need to perform a job requiring more competences than they learnt, they face a problem of underqualification. Conversely, the model we put forward is grounded in the assumption that graduates can increase their human capital after graduation through experience, training and further education. This assumption seems more plausible since graduates report the level of competences deployed in their jobs is on the whole much higher than what they learnt at university, with the sole exception of specific knowledge, as shown in the preceding section. According to this view, a part of the required competences to perform a job will be acquired at university, whereas the rest of the competences will be more easily learnt within the job environment. Analogously, it is also possible that a part of the competences learnt at university are not necessary in the current job. Since we have both comparable measures of generic competences acquired at university and utilization levels in the current job, it is possible to decompose utilization measures into the level of competences possessed at the time of graduation, the acquisition of competences during the early career and a third

component reflecting competences which are redundant in the current job. This decomposition is presented by expression (2).

$$Comp_i = Comp_i^{University} + Comp_i^{Job} + Comp_i^{Over} \quad (2)$$

As a result, equation (1) can be rewritten as shown in equation (3):

$$\ln W_i = \alpha + Comp_i^{University}\beta_1 + Comp_i^{Job}\beta_2 + Comp_i^{Over}\beta_3 + HC_i\varphi + Ind_i\delta + Firm_i\phi + \upsilon_i \quad (3)$$

Both models (1) and (3) include controls for individuals' and firm characteristics so as to mitigate potential biases on estimates of the shadow prices due to the effect of non-included variables. Our data set enables us to control for a wide set of individual, job and firm characteristics that have been proved to exert a significant impact on earnings in previous studies. Individual characteristics comprise whether the graduate has completed a four-year degree or a three-year-degree, the university he/she has graduated, field of study, whether the graduate had been working and studying at the same time and mobility experiences. Job and firm characteristics included are economic sector, whether the firm operates in the public or in the private sector, employment situation (self-employed, temporary and permanent contract, without contract), firm size, geographical location and type of tasks performed by the worker. Finally, growth in human capital measures comprise experience and its square, as well as dummy variables indicating whether the graduate has received education and training (specialization courses, other degree, master studies, PhD studies, and other types).

The estimation strategy is decisively affected by the structure of the dependent variable of the model, which is not continuous. Earnings are banded within 6 intervals. Although we do not know the exact amount of earnings, we discern the observed discrete limits of the intervals. However, the lowest and the upper intervals are unbounded, and as a

result, some observations will be left-censored and similarly, other observations will be right-censored. Stewart (1983) showed that strategies implying the estimation of the model using OLS by taking mid points of each of the intervals or other ad-hoc procedures can result in inconsistent estimators. Better estimates are obtained by assuming a distribution for the continuous but unobserved variable. The maximum-likelihood estimator is a generalization of the Tobit model. Results of the estimation are shown in Table 4.

In Model 1, utilization measures are the only explanatory variables. Solely management skills and instrumental skills are rewarded, whereas the deployment of specific knowledge is penalized. Once, we control for individual and firm characteristics in model 3, all 4 generic competences turn positive and significant. In the preceding model 1, returns to competences were partially absorbing returns to individual and job attributes which were omitted from the initial specification. The utilization of management skills yields the largest premium – a one standard deviation increase of this generic competence increases earnings by approximately 2.9%[11]. For the other three competences, rewards to a one standard increase range from 0.7% to 0.9%. The inclusion of subsequent growth of human capital through experience, training or continuing education in model 5 does not produce remarkable changes in returns to generic competences.

[11] Returns to a one standard deviation increase for management skills in model 3 would be computed as exp(0.033*0.8642)-1. Being 0.8642 the standard deviation of management skills.

Table 4. Hedonic Wage equations

	MODEL 1 Required competences		MODEL 2 Competence decomposition		MODEL 3 Required competences Individual and firm charact.		MODEL 4 Competence decomposition Individual and firm charact.		MODEL 5 Required competences Individual and firm charact. Subsequent human capital		MODEL 6 Competence decomposition Individual and firm charact.. Subsequent human capital	
Use Management	0.0773***	(0.0063)			0.033***	(0.0052)			0.0334***	(0.0051)		
Use Expression	-0.006	(0.0076)			0.0104*	(0.0062)			0.0102*	(0.0062)		
Use Instrumental	0.0282***	(0.009)			0.015**	(0.0074)			0.0151**	(0.0074)		
Use Sp. Knowledge	-0.0319***	(0.0072)			0.0114*	(0.0062)			0.0121**	(0.0062)		
Univ. Management			0.064***	(0.0076)			0.014**	(0.0064)			0.0151**	(0.0063)
Univ. Expression			-0.0581***	(0.0088)			-0.0041	(0.0075)			-0.0038	(0.0075)
Univ. Instrumental			0.0074	(0.011)			-0.0048	(0.0096)			-0.0043	(0.0095)
Univ. Sp. Knowledge			-0.072***	(0.0102)			0.0102	(0.009)			0.009	(0.009)
Incr. Management			0.0767***	(0.008)			0.046***	(0.0066)			0.0462***	(0.0066)
Incr. Expression			0.0457***	(0.0112)			0.0178**	(0.009)			0.0169*	(0.0089)
Incr. Instrumental			0.0037	(0.0119)			0.0024	(0.0098)			0.0019	(0.0098)
Incr. Sp. Knowledge			-0.1225***	(0.0201)			-0.0134	(0.0162)			-0.014	(0.0162)
Over Management			-0.1048***	(0.0218)			-0.0467***	(0.0181)			-0.0487***	(0.0177)
Over Expression			-0.0542***	(0.0193)			-0.0368**	(0.0157)			-0.0366**	(0.0159)
Over Instrumental			-0.1154***	(0.0231)			-0.0641***	(0.0182)			-0.0667***	(0.0181)
Over Sp. Knowledge			-0.0259***	(0.01)			-0.0315***	(0.0086)			-0.0329***	(0.0086)
4-year-degree					0.1298***	(0.0091)	0.1236***	(0.0092)	0.1274***	(0.0094)	0.1218***	(0.0094)
Social Sciences					0.1504***	(0.0148)	0.1412***	(0.0154)	0.1544***	(0.0147)	0.1442***	(0.0153)
Experimental Sc.					0.1289***	(0.02)	0.1203***	(0.0202)	0.1319***	(0.0199)	0.1234***	(0.0201)
Health					0.2775***	(0.0235)	0.2559***	(0.0238)	0.2801***	(0.0234)	0.2585***	(0.0237)
Technique					0.3003***	(0.0205)	0.2921***	(0.0208)	0.3068***	(0.0203)	0.2979***	(0.0206)
Male					0.1365***	(0.0093)	0.1335***	(0.0093)	0.1324***	(0.0092)	0.1292***	(0.0092)
Part time related					0.0474***	(0.0097)	0.0457***	(0.0097)	0.0409***	(0.0097)	0.0391***	(0.0097)
Part time unrelated					0.0026	(0.0118)	0.0036	(0.0118)	-0.002	(0.0118)	-0.0008	(0.0118)
Full time related					0.1338***	(0.0135)	0.1288***	(0.0135)	0.1092***	(0.0135)	0.1039***	(0.0135)
Full time unrelated					0.0857***	(0.0196)	0.0885***	(0.0195)	0.0514***	(0.0197)	0.0539***	(0.0195)
Mobility studying					0.0187	(0.0127)	0.0159	(0.0126)	0.0199	(0.0127)	0.0178	(0.0126)
Mobility working					0.0658***	(0.0114)	0.0618***	(0.0114)	0.068***	(0.0114)	0.0644***	(0.0113)
Mobility both					0.0513***	(0.0156)	0.0469***	(0.0155)	0.0527***	(0.0156)	0.0491***	(0.0155)
More 1 job					-0.0135	(0.0085)	-0.0161*	(0.0085)	0.0106	(0.0091)	0.0085	(0.0091)
Private sector					-0.117***	(0.0126)	-0.1147***	(0.0126)	-0.1117***	(0.0126)	-0.1093***	(0.0126)
Self Employed					-0.0717***	(0.0185)	-0.0781***	(0.0185)	-0.0739***	(0.0184)	-0.0798***	(0.0184)
Temporary contract					-0.1779***	(0.0094)	-0.1757***	(0.0094)	-0.1576***	(0.0097)	-0.1547***	(0.0096)
No contract					-0.5671***	(0.0626)	-0.5706***	(0.0627)	-0.5671***	(0.0617)	-0.5699***	(0.0618)

Table 4 (continued)

	MODEL 1 Required competences	MODEL 2 Competence decomposition	MODEL 3 Required competences Individual and firm charact.	MODEL 4 Competence decomposition Individual and firm charact.	MODEL 5 Required competences Individual and firm charact. Subsequent human capital	MODEL 6 Competence decomposition Individual and firm charact.. Subsequent human capital
< 10 workers			-0.1956*** (0.0134)	-0.1962*** (0.0133)	-0.1873*** (0.0134)	-0.1882*** (0.0133)
11 - 50 workers			-0.1066*** (0.0113)	-0.1062*** (0.0112)	-0.1002*** (0.0112)	-0.1*** (0.0112)
51 -100 workers			-0.0545*** (0.0151)	-0.0556*** (0.015)	-0.046*** (0.015)	-0.0473*** (0.015)
101 - 250 workers.			-0.0413*** (0.0153)	-0.041*** (0.0152)	-0.0346** (0.0153)	-0.0343** (0.0152)
251 - 500 workers.			-0.0498*** (0.0169)	-0.0512*** (0.0168)	-0.0458*** (0.0168)	-0.0471*** (0.0167)
Tarragona			-0.0395** (0.0188)	-0.0383** (0.0188)	-0.0398** (0.0186)	-0.0387** (0.0186)
Girona			-0.0336* (0.02)	-0.0342* (0.0199)	-0.035* (0.0199)	-0.0357* (0.0197)
Lleida			-0.0196 (0.0214)	-0.0159 (0.0212)	-0.0167 (0.0211)	-0.0131 (0.021)
Other Spain			0.0551*** (0.0188)	0.0633*** (0.0188)	0.0595*** (0.0186)	0.0676*** (0.0186)
Rest Europe			0.1933*** (0.061)	0.198*** (0.0613)	0.203*** (0.0615)	0.2067*** (0.0619)
Rest world			0.2121 (0.1406)	0.2114 (0.1386)	0.2061 (0.146)	0.2039 (0.1442)
Management			0.1258*** (0.0181)	0.1243*** (0.0181)	0.118*** (0.018)	0.1165*** (0.0179)
Assistant			0.0088 (0.0236)	0.0076 (0.0234)	0.0053 (0.0235)	0.0045 (0.0233)
Commercial			0.0728*** (0.0194)	0.0766*** (0.0194)	0.0764*** (0.0192)	0.08*** (0.0192)
Education			-0.0449** (0.0193)	-0.0456** (0.0192)	-0.0417** (0.0193)	-0.0424** (0.0192)
Design			-0.037 (0.0271)	-0.0391 (0.0268)	-0.0387 (0.0269)	-0.0411 (0.0266)
Technical			0.0273* (0.0152)	0.0246 (0.0151)	0.0281* (0.0152)	0.0256* (0.015)
I+D			-0.0172 (0.0249)	-0.0253 (0.0247)	-0.0168 (0.025)	-0.0241 (0.0248)
Other qualified tasks			-0.0386*** (0.0144)	-0.0378*** (0.0143)	-0.0397*** (0.0144)	-0.0391*** (0.0143)
Non qualified			-0.1821*** (0.0237)	-0.1657*** (0.0237)	-0.1807*** (0.0238)	-0.1641*** (0.0237)
Experience					0.0184*** (0.0035)	0.0188*** (0.0035)
Experience^2					-0.0002 (0.0002)	-0.0003 (0.0002)
Specialization					0.0031 (0.0121)	0.001 (0.012)
Other Degree					0.007 (0.0124)	0.0029 (0.0124)
Master					0.0412*** (0.0111)	0.0357*** (0.011)
PhD					0.018 (0.023)	0.0097 (0.023)
Other					-0.0023 (0.0137)	-0.005 (0.0136)
Constant	9.7481*** (0.0049)	9.7792*** (0.0101)	9.6628*** (0.0348)	9.6708*** (0.0362)	9.566*** (0.0377)	9.5784*** (0.0389)
McKelvey & Zavoina's R^2	0.022	0.055	0.354	0.360	0.360	0.366
St. error of est.	0.4439	0.4352	0.345	0.3432	0.3428	0.341
Log likelihood	-13.363.28	-13204.13	-11369.317	-11329.577	-11317.798	-11277.568
Chi^2 / Probability	199.30 0.0000	528.41 0.0000	5537.42 0.0000	5700.11 0.0000	5712.88 0.0000	5885.05 0.0000
University dummies	NO	NO	YESO	YES	YES	YES
Sector dummies	NO	NO	YESO	YES	YES	YES

N = 8933

Robust standard errors in parentheses; * denotes significant at 10%; ** denotes significant at 5%; *** denotes significant at 1%

Referential variables appear in Table I of the Appendix.

We address now the decomposition of job requirements (model 2, 4 and 6). Undoubtedly, the most remarkable result is the fact that returns to competences acquired during higher education are clearly below returns to competences learnt subsequently. Furthermore, this result is robust since we come to the same conclusion across all specifications (models 2, 4 and 6). Further competences acquired within workplaces carry larger pay-offs, although only for management and expression skills. In the light of these estimates we can conclude that generic competences learnt after leaving university have a stronger effect on graduates' earnings than those acquired during Higher education. Model 2 presents a large positive pay-off to management competences possessed at the time of graduation, and at the same time also large but negative returns to expression skills and specific knowledge learnt at university. The inclusion of individuals' and firm characteristics considerably diminishes the positive impact of management skills acquired during Higher Education, and makes the previous significant negative impacts of expression skills and specific knowledge no longer significant. According to models 4 and 6, it is noticeable that the learning at university of expression and instrumental skills in addition to specific knowledge causes no significant impact on earnings. Returns to specific knowledge and instrumental skills acquired in the early career are neither rewarded. We will address this result later on, as it is apparently inconsistent with the positive pay-off to the utilization of both competences.

Although it diverts from the main goal of this paper, it is also interesting to note the notorious negative impacts of overqualification in whichever of the competences on earnings. This depressing effect is particularly large for instrumental skills. Although not shown in the table, if a dummy indicating overeducation is introduced in the model,

coefficients on excess of competences for management, instrumental and expression skills slightly diminish, but remain significant. On the other hand, the coefficient on overqualification in specific knowledge dramatically drops and becomes insignificant. Thus, overqualification in specific knowledge is primarily associated with the traditional concept of overeducation.

Models 5 and 6 consider the growth in graduates' human capital during the 3-year-period after having completed their degrees. As expected, each year of experience carries a strong positive pay-off in both models. Alternatively, squared experience yields no significant effect. Reasons lying behind this apparently surprising result should have to do with the specific composition of the sample, which basically consists of relatively recent graduates. Continuing education is only worth in terms of a master, since none of the other options is rewarded. Variables introduced in model 6 only produce very small variations in the coefficients associated to the growth of competences. On the other hand, the pay-off that a graduate receives by undertaking a master reduces when decomposition is applied on competences. The change in the coefficient is not large, but sufficient to infer that enrolling in a master can be a successful path to access a job where the level of competences required is larger than those learnt at university.

With respect to individuals' and firm characteristics, there are no important variations in coefficients across the models (model 2, 3, 4 and 6). In spite of being generally consistent with previous research, some results are worth being highlighted. As expected, 4-year-degree graduates receive a higher pay in comparison with 3-year-degree graduates. There are considerable differences among fields of study. Graduates

in humanities (our referential category) the worst paid. On the other hand, graduates within the realm of health and technique degrees are the best paid. Men's earnings are much higher in relation to women's, although the gap looks shorter in comparison with other studies. Working and studying simultaneously can carry notable positive pay-offs, unless it is a part-time job unrelated to the field of study. Full time related jobs carry the highest pay-off, followed by full time unrelated job and finally part-time related jobs. Hence, it stands out that combining a university degree with a full time job leads to considerably higher earnings 3 years after graduation. Whereas job mobility is rewarded, mobility when studying is not. In other words, exchange programs such as Erasmus seem to yield no impact on graduates' earnings. Working in the private sector in the initial steps of career is visibly less rewarded than working in the public sector. The reason must lie in the fact that working in a qualified position as a civil servant guarantees an above market wage at this stage[12]. Employees having a permanent contract are better paid than self-employed, who in turn, are better-off than employees having a temporary contract. The largest and logical penalization is for workers whose job is not regulated by a contract. We have found the usual firm-size premium in addition to the agglomeration premium, since graduates working in the province of Barcelona are better paid than those of other provinces, save Lleida[13]. It is interesting to notice that moving both to other regions in Spain and to other regions in Europe results in higher earnings. Although positive, the pay-off to moving to work to other countries in the world is not significant. The sort of task and activities assigned to the job are also important. Whereas management and commercial tasks carry notable premiums, education and other activities are worse paid. Non qualified tasks are strongly penalized.

[12] To test this hypothesis, we have estimated the same model by including a dummy variable that indicates whether the graduate has accessed the job by taking a public exam, which is the most common way to access permanent jobs in the public sector. A similar pay-off emerged.
[13] Barcelona concentrates almost ¾ of the Catalan population.

Results signal that it is the deployment of competences at the job what makes workers more productive. Furthermore, the acquisition of these competences in the workplace raises graduates' income more than if they are acquired through education. However, there are some caveats that deserve closer attention. First, notwithstanding the fact that the utilization of all competences in models 3 and 5 is rewarded, neither the acquisition at Higher Education nor the subsequent development in the labour market of instrumental skills and specific knowledge yield a significant positive impact on earnings. And second, it is difficult to understand negative coefficients on the acquisition of competences (expression and instrumental skills) at university, although coefficients are not significant. We are going to test whether these inconsistencies are the result of the specification of fields of study, which could be excessively loose. We replace the initial 5 fields of study by 32 subdivisions. The more precise specification of the field of study makes returns to the utilization of instrumental skills and specific knowledge no longer significant. This result is consistent with estimates in models 4 and 6 that show that neither learning them at university nor in the labour market carry a pay-off. The more detailed way of controlling for the field of study also inverts the sign of the coefficient on the acquisition of expression skills at university. However, returns to instrumental skills possessed at the time of graduation remain negative. This new specification reveals that the field of study exerts a decisive influence on the utilization of the skills and competences. This influence is driven in part by the range of jobs that each degree give access to. In other words, undertaking certain degrees makes the graduate more prone to enter jobs where the competences he acquired are not appreciated by employers. Thus those competences that he acquired are tight to worse paid jobs, what accounts for the negative sign we initially found.

The negative sign of the returns to instrumental competences remains as a puzzle. The fact that the Cronbach's Alpha that measures the internal consistency of the factor is relatively low, in addition to the fact that the uniqueness values of the 3 competences with the highest weights in relation to instrumental skills pose a serious challenge to the quality of the factor. Besides technical criteria, taking into consideration the particular interest of estimates of the impact of documentation, languages and computer use on earnings prompted us to reestimate the model. This interest specially resides in computer use, competence in which there is still no certainty on its real impact on earnings. To capture each of the effects of the variables that possessed the highest weights with respect to instrumental skills, we applied factor analysis to the set of original competences leaving aside documentation, languages and computer use. The factor structure of management skills, expression skills and specific knowledge remain unchanged. Similarly, weights are very close to those shown in table 2[14].

Since we are considering documentation skills, computer use and languages separately, we normalize the requirements of these 3 competences. We use each respective mean and standard deviations to compute comparable measures of the attained levels at university[15]. Table 5 replicates table 3 for the 3 new generic competences[16].

[14] Previous factors have only slightly changed because we have omitted 3 of the original variables in the factor analysis. With 11 competences we have only retained 3 factors. Original competences are linear combinations of the factors. Since requirements are given by the survey, only weights and factors can vary. Variations in both weights and factors, are thus unavoidable. We do not show variations with respect to table 3 because figures lead us to the same conclusions. Management skills show the highest growth in the early career. However, we must note that both the growth of management competences and expressions skills has slightly reduced. Management skills have suffered the largest modification due to its former relatively large weights related to computer use and documentation skills.

[15] As a result, the mean of the requirements of these competences will equal 0, and standard deviation will be equal to 1.

[16] We must note that since we are taking only one competence, it is not unlikely that the level of the competence learnt at university equals the level deployed at job. That is the reason why the sum of the graduates in a situation of underutilization and the graduates who must increase their level of a competence to catch up with their jobs does not equal the whole sample.

Table 5. Evolution of "instrumental competences" during the early career separately

	N	Competence variation[a]	% of graduates who are underutilizing competences learnt	% of graduates who have increased competences
Documentation skills	8933	16.84%	21.91%	34.60%
Foreign languages	8933	54.26%	10.87%	45.22%
Computer use	8933	75.23%	9.49%	56.57%

Notes: [a] Competence variation is measured as the difference between attained levels and utilization levels of the generic competences calculated as percentages of a standard deviation of their respective utilization measures.

The table shows that graduates need to considerably improve their skills in foreign languages and computer use, whereas documentation skills acquired seem not to be so far from those required in the job. Percentages of individuals underutilizing their computer skills or foreign languages are rather low.

Table 6 shows new estimates after breaking down instrumental skills into their initial main components. This table does not present returns to individuals' and firm characteristics because changes with respect to table 4 are meagre. Conversely, as factors have been modified, we have preferred to include the complete set of estimates in the table. The structure of table 6 differs from table 4. While models 1 and 2 in table 6 simply replicate models 1 and 2 in table 4, models 3 and 4 correspond to the estimation of the full specification of equation (1), including firm and individuals' characteristics as well as further extensions of human capital (models 5 and 6 in table 4). Finally, models 5 and 6 extend the classification from 5 fields of study to 32 categories.

Table 6. Returns to competences (Breaking down instrumental skills)

	MODEL 1 Required competences		MODEL 2 Competence decomposition		MODEL 3 Required competences Individual and firm charact. Subsequent human capital		MODEL 4 Competence decomposition Individual and firm charact.. Subsequent human capital		MODEL 5 Required competences Individual and firm charact. Subsequent human capital		MODEL 6 Competence decomposition Individual and firm charact.. Subsequent human capital	
Use Management	0.0615***	(0.0072)			0.0309***	(0.0058)			0.0318***	(0.0058)		
Use Expression	-0.0242***	(0.0078)			0.0084	(0.0064)			0.0142**	(0.0063)		
Use Sp. Knowledge	-0.0182**	(0.0075)			0.0107*	(0.0064)			0.0053	(0.0064)		
Use Documentation	-0.0204***	(0.0063)			0.0008	(0.005)			0.0042	(0.0049)		
Use Computer	0.0399***	(0.0061)			-0.0058	(0.0051)			-0.0116**	(0.005)		
Use Foreign languages	0.0281***	(0.0056)			0.0199***	(0.0047)			0.0144***	(0.0047)		
Univ. Management			0.0469***	(0.0085)			0.0179**	(0.007)			0.0192***	(0.007)
Univ. Expression			-0.069***	(0.009)			-0.0044	(0.0078)			0.007	(0.0077)
Univ. Sp. Knowledge			-0.0413***	(0.0107)			0.0111	(0.0093)			0.0095	(0.0092)
Univ. Documentation			-0.0365***	(0.0074)			-0.0075	(0.0061)			-0.0003	(0.006)
Univ. Computer			0.0675***	(0.007)			-0.0122*	(0.0063)			-0.0202***	(0.0064)
Univ. Foreign languages			-0.0115	(0.0073)			0.0173***	(0.0064)			0.006	(0.0068)
Incr. Management			0.057***	(0.0088)			0.0412***	(0.0073)			0.043***	(0.0072)
Incr. Expression			0.035***	(0.0111)			0.0216**	(0.0089)			0.0215**	(0.0088)
Incr. Sp. Knowledge			-0.0865***	(0.0189)			-0.0086	(0.0153)			-0.0143	(0.0152)
Incr. Documentation			-0.0431***	(0.0092)			-0.0108	(0.0075)			-0.0082	(0.0074)
Incr. Computer			0.0068	(0.0072)			-0.0088	(0.0059)			-0.0135**	(0.0058)
Incr. Foreign languages			0.0503***	(0.0068)			0.019***	(0.0057)			0.0153***	(0.0056)
Over Management			-0.0829***	(0.0224)			-0.0408**	(0.0183)			-0.0351**	(0.0178)
Over Expression			-0.032	(0.0202)			-0.0229	(0.0165)			-0.0256	(0.0162)
Over Sp. Knowledge			-0.0219**	(0.0109)			-0.0268***	(0.0093)			-0.0201**	(0.0093)
Over Documentation			-0.0161*	(0.0095)			-0.0177**	(0.0076)			-0.0177**	(0.0075)
Over Computer			-0.0707***	(0.0183)			-0.026*	(0.0143)			-0.0206	(0.0139)
Over Foreign languages			-0.0499***	(0.0153)			-0.0261**	(0.0133)			-0.0236*	(0.0133)
McKelvey & Zavoina's R^2	0.029		0.076		0.362		0.367		0.385		0.389	
St. error of est.	0.4422		0.4297		0.3424		0.3406		0.3347		0.3332	
Log likelihood	-13330.94		-13104.92		-11310.18		-11268.086		-11141.732		-11107.103	
Chi^2 / Probability	270.80	0.00	765.98	0.00	5748.89	0.00	5944.50	0.00	6416.02	0.00	6569.73	0.00
Individuals' characteristics	NO		NO		YES		YES		YES		YES	
Firm characteristics	NO		NO		YES		YES		YES		YES	
Expanding human capital	NO		NO		YES		YES		YES		YES	
Fields of study	NO		NO		5		5		32		32	

N = 8933

Robust standard errors in parentheses; * denotes significant at 10%; ** denotes significant at 5%; *** denotes significant at 1%

Returns to management competences have diminished a little, but the major change is the fact that the utilization of expression skills does not longer exert a significant impact on earnings in model 3. However, once we replace the 5 fields of study by the extended list of 32 sub-areas, a positive significant impact emerges. Therefore, it again becomes apparent that returns to competences are undoubtedly influenced by the choice of degree. A more detailed control for the field of study partially absorbs the glass ceiling that certain degrees impose to returns to competences.

The primary interest of the table resides in assessing the returns to documentation skills, foreign languages and computer use. Both computer use and languages are rewarded according to model 1, whereas the sign turns negative for documentation skills. The introduction of individuals' and firm characteristics (model 3) diminishes the positive impact of foreign languages, although a one standard deviation increase would result in pay raise close to 2%[17]. Besides, it makes the negative association between documentation skills and earnings no longer significant. Surprisingly, computer use has a negative coefficient in model 3, although not significant. And even more surprisingly, the coefficient turns negative and significant in model 5. Intuitively, more complex computer use is tight to technical degrees, which along with economics and health receive the highest premiums. The positive pay-off to technical degrees should be capturing returns to more productive use of computer equipment. Thus, what is crucial to increase graduates' productivity and earnings is not simply promoting the use of computers, but the level of complexity in their use. In fact, table 6 is informative of the fact that computer use by itself can actually depress earnings.

[17] Computed as exp(0,0194)-1=0,0196. Standard deviations of requirements of the three new competences are equal to 1.

Foreign languages, together with management skills are the only generic competences the acquisition of which at university yields a pay-off (model 4). However, in model 6 learning foreign languages during Higher Education does not bring about a significant impact on earnings anymore. We believe that its original pay-off is being captured by the field of study. Initial positive rewards to computer use learnt during Higher Education turn into a penalization in model 4 that is even stronger in model 6. Hence, the reasoning about computer complexity is suitable again. The initial penalization in model 2 to acquired documentation skills at university is longer significant in model 4. It occurs exactly the same when these competences are developed after graduation. Jobs involving documentation skills pay lower wages which are reflected on the negative influence of degrees that give access to these jobs.

The premium to the subsequent acquisition of management skills, expression skills and foreign languages during the early career is robust to the different specifications of the model. Thus, we can conclude that the further development of these competences carries a premium which surpasses the pay-off to these competences when they are acquired at university. Our attention diverts to the significant negative impact of increasing the level of computer skills beyond those acquired at university in model 6. Given the fact that the highest increases in computer use are reported by graduates in humanities pushed to catch up after having neglected computer use during the degree, this result is not a puzzle anymore.

As expected, underutilizing foreign languages and documenting skills learnt causes a loss of income similar to the one associated to overqualification in the rest of generic

competences. Controlling for 32 fields of study makes the penalization to not using computers at least to the extent their usage was taught at university non significant.

To sum up, the intensity of computer use in the current job is not as important as the level of complexity in its use. Moreover, rewards to complexity are highly determined by the degree. On the one hand, many graduates can access jobs where computers are essential to develop the tasks they are assigned. Furthermore, it is likely that they are pushed to increase their computer skills, even though this learning is not rewarded. On the other hand, more complex tasks using computers are in part rewarded by means of the credential that gives access to the job. It is not simply a fact of using computer equipment, it is much more important to what extent the task that requires using a computer increases graduates' productivity.

6. Increasing competences after higher education

We have already provided evidence that competences acquired after university are much more "profitable" for graduates. Particularly, improving management skills, expression skill and foreign languages after graduation entails positive returns. At this point, we aim to focus on the determinants of the growth of the latter competences after university. Our dependent variables are the growth of competences after graduation for management skills, expression skills and foreign languages. Independent variables of the models are individuals' and firm characteristics, extension of human capital and acquired competences at university. We are primarily interested in assessing the extent to which competences learnt during Higher education can contribute to the posterior development of more productive competences in the workplace. Models to be estimated take the following form:

$$\Delta Com_{j,i} = \alpha + Comp_i^{University}\beta + HC_i\varphi + Ind_i\delta + Firm_i\phi + \upsilon_i \quad (4)$$

where $\Delta Com_{j,i}$ denotes the growth of competences during the early career for management skills, expression skills and foreign languages (j=1,2,3). Mirroring expression (3), $Comp_i^{University}$, HC_i, Ind_i, and $Firm_i$ respectively denote the level of competences attained at university, extension of human capital during the early career, individuals' characteristics and firm characteristics for individual "i". The model is estimated using ordinary least squares. Results are shown in table 7[18].

It stands out that specific knowledge acquired at university is a key determinant of the further development of competences in the labour maket. It emerges as the only generic competence that yields a positive impact in all the 3 models. Furthermore, the size of the coefficient is not negligible. Heijke *et al.* (2003) had found that requirements of management skills in the current job depended strongly on the previous acquisition of general academic competences. Besides, we have provided evidence that specific knowledge possessed at the time of graduation is not only crucial for the further development of management skills, but also for the development of expression skills and foreign languages[19]. According to these results, specific knowledge taught at university is essential for future labour market success although it does not carry a wage premium by itself. It enables graduates to develop the most valued competences by employers which are more likely to be learnt within the working environment. Graduates who do not acquire the adequate academic background will face a higher risk of falling behind, since specific knowledge is primarily learnt outside the labour market.

[18] The field of study is classified in 5 categories. Estimates are not significantly affected by the use of the classification in 32 categories.

[19] Heijke *et al.* (2003) took as dependent variable of their model the level of competences acquired during Higher education. Although not shown, we have also estimated the model where the explained variable is the level of utilization of competences. We come to the same conclusions as specific knowledge possessed at the time of graduation has very similar impact on required competences in the current job.

However, we should take these results with some caution, since we have not been able to properly control for individual heterogeneity. In fact, part of the large positive impact of specific knowledge acquired at the time of graduation could be determined by individual unobserved ability. In other words, more able students would achieve a better learning of specific knowledge during their university courses, and once in the labour market, their individual abilities would make it easier to effectively acquire those extra competences that are needed in the labour market. Unfortunately, data available does not allow us to disentangle to what extent unobserved ability is biasing our results.

In addition to the positive effect of specific knowledge, management skills possessed at the time of graduation contribute to the posterior development of expression skills. Likewise, expression skills attained during Higher education are connected with the further learning of foreign languages. As opposed to these positive effects, there is a negative association between the acquisition of documentation skills at university and learning foreign languages in the early career. Once again, it becomes apparent that degrees where documentation skills are a central competence compromise future career success.

It is noteworthy highlighting that the level of a competence possessed at the time of graduation exerts a negative influence on its future development. In other words, learning competences at university seems to some extent to work as a substitute of future learning. However, since competences required in the current job equal the sum of competences learnt at university and their further acquisition in the labour market, the fact that adding a unity to the level of competences possessed at the time of graduation depresses their future growth by less than a unity entails that the total level of utilization

increases. In other words, despite the fact that the level of a specific competence attained at university reduces its future development, it raises the final level of utilization. To test this result, we have replaced the dependent variable of the models by the level of utilization in the current job of each of the competences analyzed. Confirming our hypothesis, there is positive significant impact of the acquired levels of the three competences on their respective levels of utilization. In terms of education policy, it is inferred that competences learnt at university although they are not as productive as those learnt in a working context, they help graduates to enter jobs where they will be required a higher level of these competences. At the same time, learning competences at university reduces part of the acquisition of competences in the workplace. This result conveys that most valued competences by employers, even though they are more productive when they are learnt within the working environment, are also useful when they are learnt within university education. In the latter case, learning them through education produces an indirect effect that contributes to work in jobs with higher levels of utilization of these competences 3 years later.

The bottom part of the table focuses on the implications of extending human capital after graduation. It reveals that experience does not contribute to increase competence utilization. In fact, more experience is associated to a lesser acquisition of foreign languages. If we assume that the largest learning of competences is made during the early career this result seems in part logical. Furthermore, more experienced workers are likely to be in workplaces that have not followed the changes in workplaces due to the advent of the knowledge society. Finally, older workers in the sample might be prompted to study in the university due to personal fulfillment issues rather than to improve career prospects. On the other hand, continuing education after university is an

invaluable aid to foster further acquisition of competences, although its impact is contingent on how graduates choose to continue education[20]. Courses of specialization enhance all three competences more or less evenly. On the other hand, enrolling in another degree would contribute to notoriously raise the utilization of management competences and foreign languages, whereas it would bring about no significant impact on expression skills. Masters and PhD are shown to yield the largest increases of competences, being particularly large the learning of foreign languages made by PhD students.

[20] Continuing education is associated with large development of competences in the labour market. However, we are not addressing the issue whether these increases are due to the fact that individuals widen their level of competences by continuing education and therefore they are hired for better jobs, or continuing education simply works as a credential that enables graduates to access better jobs where they can develop the competences they need to carry out the tasks they are assigned.

Table 7. Determinants of the growth of competences

	MODEL 1 Management skills		MODEL 2 Expression skills		MODEL 3 Foreign languages	
Univ. Management	-0.5860***	(0.0143)	0.0492***	(0.0103)	0.0008	(0.0144)
Univ. Expression	0.0205	(0.0142)	-0.5319***	(0.0135)	0.0581***	(0.0164)
Univ. Sp. Knowledge	0.0919***	(0.019)	0.086***	(0.0152)	0.0998***	(0.0207)
Univ. Documentation	0.012	(0.0108)	0.0072	(0.0089)	-0.0376***	(0.0123)
Univ. Computer	-0.0082	(0.0109)	-0.0064	(0.009)	0.0007	(0.0127)
Univ. Foreign languages	-0.0067	(0.0117)	0.0092	(0.0093)	-0.5299***	(0.014)
4-year-degree	0.0448**	(0.0196)	0.0429***	(0.0157)	0.1594***	(0.0227)
Social Sciences	0.1239***	(0.034)	0.07***	(0.0259)	-0.0841**	(0.0366)
Experimental Sc.	0.1137**	(0.048)	0.0593	(0.0395)	-0.0409	(0.0535)
Health	0.1812***	(0.0524)	0.1087***	(0.0373)	0.1934***	(0.0538)
Technique	0.1894***	(0.0458)	0.0787**	(0.0371)	0.0499	(0.0524)
Male	-0.0149	(0.0194)	-0.0549***	(0.0155)	-0.0511**	(0.0216)
Part time related	0.0814***	(0.0203)	0.0662***	(0.0163)	0.1608***	(0.0237)
Part time unrelated	-0.0064	(0.026)	-0.0215	(0.0204)	0.0419	(0.0287)
Full time related	0.0918***	(0.0287)	0.076***	(0.0232)	0.1203***	(0.0327)
Full time unrelated	0.0314	(0.0454)	-0.0408	(0.0354)	0.087*	(0.0488)
Mobility studying	0.0833***	(0.0258)	0.0433**	(0.0208)	0.1317***	(0.0304)
Mobility working	0.1117***	(0.0242)	0.079***	(0.0192)	0.184***	(0.028)
Mobility both	0.0654*	(0.0341)	0.1152***	(0.0268)	0.1656***	(0.0401)
More 1 job	0.0135	(0.0189)	0.0272*	(0.0148)	-0.0269	(0.0216)
Private sector	0.0288	(0.0255)	-0.0278	(0.0193)	0.0475*	(0.0283)
Self Employed	-0.0576	(0.0363)	-0.0461	(0.0283)	-0.0156	(0.0384)
Temporary contract	-0.0547***	(0.0208)	-0.059***	(0.0164)	-0.0048	(0.0238)
No contract	-0.0499	(0.0946)	-0.0017	(0.0725)	-0.0212	(0.0982)
< 10 workers	0.0329	(0.0282)	-0.0184	(0.0224)	-0.0961***	(0.0317)
11 - 50 workers	0.0482**	(0.024)	-0.0126	(0.0194)	-0.031	(0.0279)
51 -100 workers	0.0126	(0.0319)	0.0108	(0.0249)	-0.0413	(0.0361)
101 - 250 workers.	0.0836***	(0.0318)	0.0146	(0.0272)	0.023	(0.0391)
251 - 500 workers.	0.0512	(0.0366)	0.0051	(0.029)	0.0225	(0.0425)
Tarragona	0.009	(0.0406)	-0.019	(0.0308)	-0.0491	(0.0444)
Girona	0.0456	(0.0404)	-0.0426	(0.0329)	0.0015	(0.0461)
Lleida	0.0328	(0.0438)	-0.0352	(0.0335)	-0.0592	(0.049)
Other Spain	-0.0557	(0.037)	-0.0841***	(0.0289)	-0.0528	(0.0426)
Rest Europe	-0.1587	(0.1137)	-0.1888**	(0.0856)	0.3605***	(0.1396)
Rest world	-0.0825	(0.195)	-0.1725	(0.1408)	0.2284	(0.216)
Management	0.1177***	(0.0379)	0.0362	(0.0309)	-0.0378	(0.043)
Assistant	0.0609	(0.0504)	-0.0739**	(0.0377)	-0.1698***	(0.0554)
Commercial	0.1222***	(0.0437)	0.0439	(0.0355)	0.0515	(0.0515)
Education	0.186***	(0.041)	0.0648**	(0.0321)	-0.0311	(0.0464)
Design	0.0674	(0.052)	-0.0708	(0.0498)	-0.0343	(0.0664)
Technical	0.0979***	(0.0314)	0.089***	(0.0257)	0.047	(0.0371)
R+D	0.1499***	(0.0519)	-0.0148	(0.0456)	0.1995***	(0.0682)
Other qualified tasks	0.0458	(0.031)	0.0428*	(0.025)	-0.0135	(0.0363)
Non qualified	-0.1962***	(0.0521)	-0.127***	(0.0388)	-0.2656***	(0.0546)
Experience	0.0015	(0.0074)	0.0042	(0.0054)	-0.0155**	(0.0071)
Experience^2	-0.0004	(0.0003)	-0.0003	(0.0002)	0.0004	(0.0003)
Specialization	0.0598**	(0.0251)	0.052***	(0.0199)	0.064**	(0.0284)
Other Degree	0.0949***	(0.0259)	0.034	(0.021)	0.1357***	(0.0297)
Master	0.1024***	(0.0236)	0.0792***	(0.0185)	0.1268***	(0.0265)
PhD	0.156***	(0.0504)	0.0675*	(0.0396)	0.3166***	(0.0573)
Other	0.0241	(0.029)	0.093***	(0.023)	0.0802**	(0.0333)
Constant	-0.1309*	(0.0794)	-0.0983	(0.0647)	0.2463***	(0.0921)
R^2	0.2783		0.2790		0.2364	
F / Probability	32.52	0.00	29.99	0.00	35.71	0.00
University dummies	YES		YES		YES	
Sector dummies	YES		YES		YES	

N = 8933

Robust standard errors in parentheses; * denotes significant at 10%; ** denotes significant at 5%; *** denotes significant at 1%

Referential variables appear in Table I of the Appendix.

There are other variables related to individuals' and firm characteristics that exert a remarkable influence on the development of generic competences in 3-year-period after graduation. As expected 4-year-degrees are associated with the further development of generic competences in comparion with 3-year-degrees, and more particularly foreign languages. Increase of competences is decisively conditioned by the field of study. Health is the field of study which is connected with the largest increment, followed by technical studies. Again, graduates in humanities seem to fall behind. Interestingly, men are less likely than women to continue improving their expression skills and their knowledge of foreign languages. Jobs related to the field of study are positively associated with the future development of generic competences, irregardless of whether it is part-time job or a full-time job. On the other hand, unrelated jobs are not connected to increases in the use of competences, with the sole exception of unrelated full time jobs which favour improving the knowledge of foreign languages. Although mobility when studying did not have a positive impact on earnings, it is linked with increasing competences after graduation. The impact of mobility when working is higher for all three generic competences nonetheless. Having had more that one job favours the development of expression skills, whereas working in the private sector is associated with improving the mastering of foreign languages. Temporary contracts impinge on the growth of management skills and expression skills, whereas working in very small firms makes it more difficult to improve the mastering of foreign languages. Moving to other regions in Spain or to other countries in Europe has a negative effect on further developing expression skills. However, moving to other countries in Europe makes a real difference in the development of foreign languages. The sort of tasks being assigned in the current job becomes another key determinant of the evolution in the utilization of competences after graduation. As expected, management tasks are crucial

for the growth of management competences. Although surprisingly increases of management skills are larger if the graduate is in charge of commercial, technical or education tasks. Moreover, the latter two sorts of tasks are also linked to enhancing expression skills. Assistant tasks diminish the chances of improving expression skills and foreign languages, whereas tasks involving design do not yield any significant impact on any of the competences. R&D tasks aid to strongly develop further management skills and foreign languages. Alternatively, carrying out non qualified tasks seriously impinges on the evolution of generic competences.

7. Conclusions

In this paper we aimed to examine the direct influence of the utilization of a set of generic competences on graduates' earnings three years after graduation. We were also interested in assessing the distinct impact of competences possessed at the time of graduation and competences developed in the subsequent 3-year-period. The survey Transition to work of the Catalan Graduates was suitable for this purpose since it provides wide information on graduates' jobs and individuals' characteristics. It also asked graduates to evaluate the level of competences attained at the time of graduation and the level of utilization of the same competences in their current jobs. We have generated 4 generic competences by applying factor analysis on the job requirements of the original competences: managerial skills, expression skills, instrumental competences and specific knowledge. Due to technical reasons we have also considered a model where we have introduced computer use, documentation skills and foreign languages separately, instead of instrumental skills. Given the characteristics of the data it was possible to decompose the utilization of generic competences obtained in the current job into the level of competences acquired at university and the development of the same

competences during the early career. Consistent with Heijke *et al.* (2003) we have found that Catalan graduates are likely to complete the acquisition of management, expression and instrumental skills in the working environment, whereas a part of the specific knowledge acquired at university lacks application in their current jobs.

By means of earnings equations we have found the expected positive and significant impact of the utilization of generic competences on graduates' earnings. Once the decomposition is applied, it becomes apparent that generic competences acquired after graduation carry a higher premium in comparison with those learnt during Higher education. Management skills developed during the early career carry the largest premium. Also expression skills and foreign languages acquired in the labour market are rewarded, even though to a lesser extent. No significant impact emerges from documentation skills and specific knowledge. More surprisingly, computer use is penalized, both in terms of the level attained at university and its further learning in the labour market. Since computer use carries a positive pay-off in the model with no controls for the field of study, we attribute its negative impact in the full model to the fact that employers actually value complexity in computer use, instead of simply using them. Results also make apparent that returns to competences are to some extent contrived by the election of the field of study made before entering university.

Finally we have explored factors that influence the development of generic competences that carried positive pay-offs in the early career. Evidence signals that specific knowledge acquired at university is a key determinant for the future development of the most productive competences in the labour market. However, this result should be taken with some caution given that we have not been able to control for unobserved ability

that could be inflating the size of this effect. We have also found that management skills, expressions skills and foreign languages learnt at university contribute to increase their respective levels of utilization in the current job. At the same time, the acquisition of these competences at university diminishes the extent to which they need to be acquired in the labour market. Increase of competences is also favoured by mobility, being employed in job related to the degree content and continuing education after graduation, especially if the graduate undertakes a master or a PhD. Another element of interest is the fact that the field of study exerts a remarkable influence on the development of competences during the early career.

To sum up, we have been able to shed some light on the academic debate that seeks to decipher which competences are critical to graduates' career success. Our results point out that management and expression skills as well as foreign languages are the most valued competences by employers. However, the environment where they are acquired is also important. These competences are partially learnt in a working context, where their acquisition makes the worker more productive. It does not mean that competences acquired at university are useless. In addition to some modest pay-offs, they are an invaluable aid to work in jobs where those competences carrying the highest pemiums during the early career are more required. Our results are mainly consistent with previous research that stressed the importance of specific knowledge learnt at universities even though its impact on earnings is not direct. Specific knowledge, despite the fact that it is apparently redundant in the workplace, exerts a remarkable influence on the competences that are later on rewarded in the labour market.

References

Altonji, J.G. (1995), "The Effects of High School Curriculum on Education and Labor Market Outcomes", *Journal of Human Resources*, 30 (4), 409-38.

Becker, G.S. (1962), "Investment in Human Capital: a Theoretical Analysis", *The Journal of Political Economy*, 70 (5), supplement, 9-49.

Bell, B. (1996) "The Labour Market Consequences of Technical and Structural Change", Discussion Papers Series, nº 8, Centre for Economic Performance, Oxford University.

Bishop, J. (1995), "Expertise and Excellence", Working Paper 95-13, Center for Advanced Human Resource Studies, ILR, Cornell University.

Bishop, J. and F. Mane (2004) "The Impacts of Career-technical Education on High School Completion and Labor Market Success", *Economics of Education Review*, 23 (3), 381-402.

Borghans, L. and B. Weel (2006) "Do We Need Computer Skills to Use a Computer? Evidence from Britain", *Review of Labour Economics and Industrial Relations*, 20 (3), 505-532.

Denny, K., C. Harmon and V. O'Sullivan (2003) "Education, Earnings and Skills: A Multi-country Comparison", The Institute for Fiscal Studies, WP 04/08.

Dickerson, A. and F. Green (2004) "The Growth and Valuation of Computing and Other Generic Skills", *Oxford Economic Papers*, 56 (3), 371-406.

Dolton, P. and A. Vignoles (2000) "The Incidence and Effects of Overeducation in the U.K. Graduate Labour Market." *Economics of Education Review*, 19 (2), 179-98.

Freeman, R. and R. Schettkat (2001), "Skill Compression, Wage Differentials and Employment: Germany vs. the US", *Oxford Economic Papers*, 53, 582-603.

García-Aracil, A., Mora, J., and Vila, L.E. (2004) "The Rewards of Human Capital Competences for Young European Higher Education Graduates", *Tertiary Education and Management*, 10, 287–305.

García-Aracil, A., and R. Van der Velden (2007) "Competencies for Young European Higher Education Graduates: Labor Market Mismatches and Their Payoffs", *Higher Education*, (http://dx.doi.org/10.1007/s10734-006-9050-4).

García Montalvo, J. (2005), La Inserció dels Universitaris: la Qüestió de la Sobrequalificació i el Desajust Formatiu, *Nota d'Economia*, 81, 99-119.

Green, F. (1998) "The Value of Skills", Studies in Economics Series, Department of Economics, University of Kent, Kent, OH.

Green, F., D. Ashton and A. Felstead (2001), "Estimating the Determinants of Supply of Computing, Problem-solving, Communication, Social, and Teamworking Skills", *Oxford Economic Papers*, 53 (3), 406-33.

Heijke, H., C. Meng, and G. Ramaekers (2003) "An Investigation into the Role of Human Capital Competences and Their Pay-off", *International Journal of Manpower*, 24 (7), 750-773.

Johnes, G. (2005) "Skills and Earnings Revisited" Lancaster University Management School, UK.

Krueger, A. (1993) "How Computers Have Changed the Wage Structure: Evidence from Micro Data 1984-1989", *Quarterly Journal of Economics*, 108 (1), 33-60.

McCall, M.W., M.M. Lombardo, and A.M. Morrison (1988), *The Lessons of Experience. How Successful Executives Develop on the Job*, The Free Press, New York, NY.

McIntosh, S. and Vignoles, A. (2001), "Measuring and assessing the impact of basic skills on labour market outcomes", Oxford Economic Papers, Vol. 53 No. 3, pp. 453-81.

Mane, F. (1999) "Trends in the Payoff to Academic and Occupation-Specific Skills", *Economics of Education Review*, 1999, 18, 417-37.

Murnane, R. and F. Levy (1996) T*eaching the New Basic Skills: Principles for Educating Children to Thrive in a Changing Economy*, The Free Press, New York.

Murnane, R., J.B. Willet and F. Levy (1995) "The Growing Importance of Cognitive Skills in Wage Setermination", *Review of Economics and Statistics*, 77, 251-66.

Silles, M. (1995) "Computer use and Earnings", Working paper 2005-05, Centre for Applied Microeconometrics, University of Copenhagen.

Stewart, M.B. (1983) "On Least Squares Estimation when the Dependent Variable is Grouped." *The Review of Economic Studies*, 50 (4), 737-753.

Suleman , F. and J.J. Paul (2006) "What Did We Learn from the Introduction of Competences into Earnings Models?" International Jean-Claude Eicher Conference, Dijon, France.

Tyler, J.H., R. Murnane, and J.B. Willet (1999) "Do the Cognitive Skills of School Dropouts Matter in the Labor Market?", Working Paper 7101, NBER, Cambridge.

Thurstone, L.L. (1947) *Multiple Factor Analysis*, University of Chicago Press, Chicago.

Table I. Descriptive Statistics

Dependent variable						
	Variable	**Obs**	**Mean**	**St. Dev.**	**Min**	**Max**
Earnings	< 9000€	8933	0.08		0	1
	9000 - 12000€	8933	0.15		0	1
	12001 - 18000€	8933	0.31		0	1
	18001 - 30000€	8933	0.36		0	1
	30001 - 40000€	8933	0.08		0	1
	> 40000€	8933	0.03		0	1
Individuals' and firm characteristics						
	Variable	**Obs**	**Mean**	**St. Dev.**	**Min**	**Max**
University	A*	8933	0.27		0	1
	B	8933	0.17		0	1
	C	8933	0.20		0	1
	D	8933	0.08		0	1
	E	8933	0.11		0	1
	F	8933	0.09		0	1
	G	8933	0.09		0	1
Experience	Experience	8933	3.60	2.91	0	41
	Experience^2	8933	22.45	68.18	0	1681
Continuing education	Not continuing education*	8933	0.27		0	1
	Specialization	8933	0.17		0	1
	Another degree	8933	0.16		0	1
	Master	8933	0.24		0	1
	PhD	8933	0.04		0	1
	Other continuing.	8933	0.12		0	1
Field of study (5)	Humanities*	8933	0.12		0	1
	Social Sciences	8933	0.45		0	1
	Experimental Sciences	8933	0.06		0	1
	Health	8933	0.09		0	1
	Technique	8933	0.27		0	1
Field of study (32) [a]	Geography and History	8933	0.048		0	1
	Philosophy	8933	0.013		0	1
	Compared studies	8933	0.001		0	1
	Philology (Spanish and Catalan)	8933	0.025		0	1
	Philology (European languages)	8933	0.031		0	1
	Philology (Classical languages)	8933	0.003		0	1
	Economic and business (4-year-degrees)*	8933	0.082		0	1
	Business (3-year-degrees)	8933	0.061		0	1
	Law	8933	0.046		0	1
	Labour	8933	0.041		0	1
	Politics	8933	0.021		0	1
	Communication	8933	0.025		0	1
	Documentation	8933	0.007		0	1
	Psychology	8933	0.031		0	1
	Pedagogy	8933	0.031		0	1
	Teachers	8933	0.110		0	1
	Chemistry	8933	0.016		0	1
	Biology and nature	8933	0.032		0	1
	Physics and Mathematics	8933	0.014		0	1
	Health (3-year-degrees)	8933	0.044		0	1
	Health (Medicine and dentistry)	8933	0.032		0	1
	Veterinarian	8933	0.016		0	1
	Architecture	8933	0.035		0	1
	Civil engineering (3-year-degrees)	8933	0.010		0	1
	Civil engineering (4 year-degrees)	8933	0.007		0	1
	Nautical studies	8933	0.004		0	1
	Advanced production technologies (3-year-deg.)	8933	0.066		0	1
	Advanced production technologies (4-year-deg.)	8933	0.029		0	1
	ICT (3-year-degrees)	8933	0.043		0	1
	ICT (4-year-degrees)	8933	0.029		0	1
	Agriculture (3-year-degrees)	8933	0.032		0	1
	Agriculture (4-year-degrees)	8933	0.014		0	1

Table I. Descriptive Statistics (continued)

Individuals' and firm characteristics

	Variable	Obs	Mean	St. Dev.	Min	Max
Previous activity	No work *	8933	0.38		0	1
	Part-time related	8933	0.29		0	1
	Part-time unrelated	8933	0.16		0	1
	Full-time related	8933	0.12		0	1
	Full-time unrelated	8933	0.05		0	1
Time to enter first job	While studying	8933	0.44		0	1
	< 1 month	8933	0.17		0	1
	< 3 month	8933	0.17		0	1
	< 6 month	8933	0.09		0	1
	< 1 year	8933	0.07		0	1
	> 1 year	8933	0.06		0	1
Sex	Male	8933	0.41		0	1
Type of degree	4-year-degree	8933	0.55		0	1
Mobility	No mobility*	8933	0.64		0	1
	When studying	8933	0.13		0	1
	When working	8933	0.16		0	1
	Both Studying Working	8933	0.07		0	1
Functions[b]	Management	8933	0.10		0	1
	Social or Medical Assistant	8933	0.08		0	1
	Commercial	8933	0.05		0	1
	Education	8933	0.19		0	1
	Design	8933	0.02		0	1
	Technical support	8933	0.21		0	1
	I+D	8933	0.03		0	1
	Other qualified	8933	0.37		0	1
	Other non qualified	8933	0.05		0	1
Sector	Agriculture	8933	0.01		0	1
	Energy	8933	0.02		0	1
	Chemistry	8933	0.04		0	1
	Metallurgic	8933	0.05		0	1
	Manufacturing*	8933	0.04		0	1
	Building industry	8933	0.06		0	1
	Commerce	8933	0.06		0	1
	hostel	8933	0.01		0	1
	Transport	8933	0.01		0	1
	Telecommunications	8933	0.08		0	1
	Financial Services	8933	0.08		0	1
	Company Services	8933	0.11		0	1
	Public services	8933	0.39		0	1
	Social Services	8933	0.02		0	1
Working situation	Permanent*	8933	0.57		0	1
	Autonomous	8933	0.09		0	1
	Temporary	8933	0.33		0	1
	Without contract	8933	0.01		0	1
Public/Private	Private	8933	0.72		0	1
Size of the company	< 10 workers	8933	0.21		0	1
	11 - 50 workers	8933	0.29		0	1
	51 -100 workers	8933	0.10		0	1
	101 - 250 workers.	8933	0.09		0	1
	251 - 500 workers.	8933	0.06		0	1
	> 500 workers*	8933	0.25		0	1
Geographic situation	Barcelona*	8933	0.68		0	1
	Tarragona	8933	0.09		0	1
	Girona	8933	0.10		0	1
	Lleida	8933	0.07		0	1
	Other in Spain	8933	0.06		0	1
	Rest of Europe	8933	0.01		0	1
	Rest of the world	8933	0.00		0	1

Note: * This variable is used as the referential category in the regressions.

[a] 4-year-engineering degrees can be longer than 4 years

[b] Functions are not dummy variables as graduates can develop more than 1 of them in their current jobs.

We have not computed standard deviations for dummy variables