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The Economic Returns to Field of Study and Competencies Among Higher Education Graduates in Ireland

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Abstract: This paper looks at the economic returns to different fields of study in Ireland in 2004 and also the value placed on various job-related competencies, accumulated on completion of higher education, in the Irish labour market. In examining these issues the paper seeks to control for potential selection influences by ensuring through quantile regression that comparisons are made within sections of the wage distribution where ability differences are likely to be minimal. The impact that education-job mismatch, both education-level and field, has on earnings is also taken into consideration. The results derived indicate that, relative to the base case, there are higher returns to Medicine & Veterinary, Education, Engineering & Architecture, Science and Computers & IT. The quantile regression analysis reveals that the OLS estimates are not particularly affected by unobserved heterogeneity bias. Furthermore, this approach indicates that field specific returns diminish the more able the graduate. Small but significant returns were found for some of the competencies analysed, in particular technical skills.

JEL Classification: I20, J24, J30, J31.

Key Words: Field of Study, Competencies, Returns to Education, Quantile Regression, Ireland.

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I Introduction

It is well established within the economics literature that, in line with the predictions of the standard human capital model (Becker (1964)), earnings rise with educational attainment and that workers earn a substantial premium from gaining a university qualification [see for example Rumberger (1980) and Grubb (1992 and 1993)]. In more recent times, the extent to which the university premium varies by field of study has been given increasing attention with the stylised facts from the existing research for the United Kingdom, Canada and the United States suggesting higher returns to studying in areas such as Health, Engineering, Business and Science relative to the Arts and Humanities and some components of the Social Sciences (see Daymont & Andrisani (1984), James *et al.* (1989), Dolton & Malepeace (1990), Grubb (1992), Altonji (1993), Rumberger & Thomas (1993), Grogger & Eide (1995), Blundell *et al.* (2000), Finnie & Frenette (2003), McGuinness (2003), Walker & Zhu (2003), Arcidiacono (2004), O'Leary & Sloane (2005)).

This study adds to the literature by providing estimates on the returns to field of study in Ireland in 2004. The paper is distinctive in that it also examines variations in perceived job-related competencies, such as communication skills, technical skills, team skills, leadership skills, etc., accumulated across various subject areas and the relative pay-offs to such competencies. Due largely to a lack of available data, the returns to such skills have, to date, received relatively sparse attention in the literature. In examining these issues, this study seeks to control for potential selection influences by ensuring through quantile regression that comparisons are made within sections of the wage distribution where ability differences are likely to be minimal. Finally, the impact that education-job mismatch, both education-level and field, has on earnings is taken into consideration.

II Empirical Issues

Studies such as this need to be contextualised since increased levels of participation in higher education, particularly over the last few decades, has undoubtedly led to greater heterogeneity among college entrants, and on the grounds that such differences may be associated with field of study, whereby lower/higher ability students are likely to be more heavily concentrated within certain subject areas, sample selection is potentially an issue. If this is the case, then the field coefficients may be reflecting, at least to some extent, differences in ability levels among students as opposed to pure field effects.

The most obvious way to deal with ability differences of college entrants is to incorporate pre-college entry test scores into the model (Dolton & Vignoles (2000)), such as Leaving Certificate examination results in the Irish context. Unfortunately, pre-entry information is not available to us here. A second approach that has been adopted within the literature (McGuinness (2003)) has been to harness background information on the students, such as socioeconomic characteristics, etc., to estimate a treatment model whereby the OLS regression would contain field-specific selection terms to ensure the robustness of the estimated effects of subject choice. Once again, the lack of pre-college information in our dataset eliminates this methodological approach. Finally, more recent additions to the literature (McGuinness & Bennett (2007)) argues that in instances where the data consist of individuals who are very similar in terms of observable characteristics, such as graduate cohort data as we have here, then quantile regression (QR) provides an alternative framework for dealing with the problem of sample selection. The rationale for this approach is that, as such individuals are comparable in almost every respect (age, education, labour market experience, etc.), then the principal factor by which they will be sorted in the labour market is their ability level, thereby suggesting that an individual's position within the wage distribution will mainly reflect their ability. Consequently, comparing individuals within particular quantiles of the wage distribution ensures that the problem of selection is greatly reduced. This methodology has been applied in the over-education literature (Budría & Moro-Egido (2006) and McGuinness & Bennett (2007)) to assess the extent to which that particular phenomenon is more prevalent among low ability individuals. However, it does not appear to have been used

previously in the existing literature on the returns to field of study, thus, QR is a relatively novel approach to use within this context.

The QR model can be formally written as follows (see Buchinsky, 1994):

$$\ln w_i = x_i\beta_\phi + u_{\phi i} \qquad \text{with} \qquad Quant_\phi\left(\ln w_i \mid x_i\right) = x_i\beta_\phi \qquad (1)$$

where x_i is a vector of exogenous variables. $Quant_\phi\left(\ln w_i \mid x_i\right)$ denotes the ϕ_{th} conditional quantile of w given x. The ϕ_{th} regression quantile, $0<\phi<1$, is defined as the solution to the problem:

$$\min_{\beta\varepsilon R^k}\left(\sum_{i:y_i\geq x_i\beta}\phi\,|\ln w_i - x_i\beta_\phi| + \sum_{i:y_i<x_i\beta}(1-\phi)\,|\ln w_i - x_i\beta_\phi|\right) \qquad (2)$$

Equation (2) is usually written as:

$$\min_{\beta\varepsilon R^k}\sum_i \rho_\phi\left(\ln w_i - x_i\beta_\phi\right) \qquad (3)$$

where $\rho_{\Phi(e)}$ is the check function defined as $\rho_{\Phi(e)} = \phi e$ if $\varepsilon \geq 0$ or $\rho_{\phi(e)} = (\phi - 1)e$ if $\varepsilon <0$.

An additional advantage of QR is that it provides a series of snapshots that enables the researcher to assess how relationships between the dependent and independent variables evolve as one moves up and down the wage distribution.

III The Data

The data used in this study come from a graduate follow-up survey that consists of a sample of individuals who received their awards from Irish higher education institutions in 2001 and had entered the labour market in spring 2002. The survey was conducted via a postal questionnaire between May and November 2004. This means

that the respondents included in the analysis were active in the labour market for approximately three years post-graduation. The dataset contains almost 2,800 valid responses; however, in order to estimate pure field effects the sample is restricted to graduates aged 36 or less who were working as employees at the time the survey was conducted. Consequently, the final sample consisted of 1,470 individuals[1]. This sample was weighted, thus ensuring that it was representative of the graduate population who were participating in the labour force in 2002.

As well as including information on field of study, the dataset also contains a rich range of controls that are required to estimate the standard sorts of earnings models that are employed in this literature. This includes various educational and personal characteristics, such as award level (degree, masters, etc.) and grade achieved (honours, first-class honours), gender, work experience, previous unemployment experience, along with detailed job (tenure, training, contract type, trainee position) and organisational (public sector, trade union membership, firm size, job location, sector) information. In addition, respondents were asked about the extent to which they felt their current job was appropriate to their education level and how matched they felt their field of study was to their current job, thus, measures of over-education and field-mismatch are also included

A relatively unique feature of the dataset used in this paper is that individuals were asked to indicate on a scale of 1 to 5, ranging from 'not at all' to 'a very great extent', the degree to which they felt they had developed a variety of job-related competencies at the time they had completed their higher-level education. The skills analysed can be categorised as follows: communication (oral, written and foreign language), technical (analytical, computer and specialist knowledge in subject area), team, leadership and ability to work under pressure[2].

[1] Graduates who failed to provide information on key variables, specifically field of study and earnings, were excluded from the analysis, as were respondents with a disability and those working outside of Ireland.

[2] The components of the two composite skill measures - communication skills and technical skills - are highly positively correlated.

IV Sample Characteristics

In this section of the paper we explore some descriptive aspects of the data, specifically how graduate earnings and competencies are distributed across field of study. Summary statistics are available on the other variables used in this paper in Table A1 in the appendix.

Table 1 presents the field distribution of our sample and the average hourly earnings associated with each. Business emerges as the largest faculty (32 percent). This is followed by Arts & Humanities, Engineering & Architecture, Computers & IT and Science, at around 11 to 12 percent, and then Education, Social Science, Medicine & Veterinary[3] and Law are the smallest fields, at below 5 percent[4].

The average hourly wage rate for graduates in 2004 was €16.31. Hourly earnings were highest for Education and Medicine & Veterinary graduates and lowest for Business and Law students. The hourly wage rate of Education graduates might seem quite high but the majority of these individuals, and also Medicine & Veterinary graduates, are employed in the public sector where wages are larger (see O'Connell and Russell (2006)) and highly regulated. In particular, the pay structure for Education graduates is such that they tend to start off on a higher wage rate relative to other fields but their earnings then grow more slowly over time. In addition, Education graduates' hourly wages are also higher because these individuals work, on average, fewer hours than graduates in other fields[5].

[3] Includes nurses

[4] A comparison of this field distribution with 2002 and 2006 Irish census data reveals that it is broadly in line with the population distribution.

[5] The contractual teaching hours of full-time secondary teachers is 22 hours per week.

Table 1: Field of Study Distribution and Hourly Earnings

	Percent	Hourly Earnings (€)
Arts & Humanities	12	15.21
Science	11	16.88
Engineering & Architecture	12	16.15
Computers & IT	12	15.80
Medicine & Veterinary	4	20.69
Social Science	5	17.22
Business	32	14.35
Law	3	14.15
Education	9	22.98
Average	-	16.31

The distribution of individuals within each field across the earnings quantile is presented in Table 2[6]. Consistent with Table 1, we find that individuals in Education and Medicine & Veterinary are more heavily concentrated in higher segments of the wage distribution, while Business and Law graduates tend to be located in the bottom two quantiles. The other fields, on the other hand, are more evenly spread across the various earnings quantiles.

Table 2: Field of Study Breakdown by Quantile

	Arts & Hum	Science	Eng &Arch	Comp &IT	Med &Vet	Social Science	Business	Law	Education
QR10th	31.7	19.6	12.6	17.1	1.0	11.7	29.7	30.7	6.4
QR25th	23.2	15.1	20.3	23.8	1.9	11.6	24.7	29.7	9.0
QR50th	18.1	20.2	29.1	20.9	9.2	20.7	21.1	15.8	9.1
QR75th	14.1	18.9	23.8	24.5	38.6	28.7	15.1	14.0	15.7
QR90th	12.9	26.3	14.2	13.7	49.2	27.3	9.4	9.8	59.8
Total (No.)	208	182	227	203	74	102	560	47	134
Total (%)	100	100	100	100	100	100	100	100	100

[6] These quantile divisions were selected on the basis that we feel they give an adequate parsimonious view of changes in the field variables across the wage/ability distribution.

Table 3 gives a breakdown of the job-related competencies individuals had developed at the end of their higher education by field of study. Based on this bivariate analysis, we do not observe much variation in competencies across faculties. However, in terms of perceived technical skills, as expected Computer & IT and Science graduates have above average skills in this area while Arts & Humanities, Business, Law and Social Science individuals have below average technical skills. In terms of perceived communication skills, the more applied and technological fields, such as Engineering & Architecture and Computers & IT, have lower levels of this competency compared to the more theoretical fields of Education, Law and Arts & Humanities. Business graduates have higher than average perceived team skills, as do Medicine & Veterinary and Computers & IT individuals, while Education graduates have lower than average team skills. Business graduates also have higher than average perceived leadership skills whereas Science, Social Science and Arts & Humanities people have lower than average levels of this competency. There is very little variation across the different fields in the perceived ability to work under pressure.

Table 3: Average Competencies Rating by Field of Study

	Communication	Technical	Team	Leadership	Working Under Pressure
Arts & Humanities	3.3	3.6	3.6	3.1	4.0
Science	3.0	3.8	3.6	3.0	4.0
Engineering & Architecture	2.9	3.7	3.7	3.3	4.0
Computers & IT	3.1	3.9	3.8	3.2	4.1
Medicine & Veterinary	3.3	3.5	3.8	3.2	4.0
Social Science	3.2	3.4	3.7	3.1	3.9
Business	3.2	3.6	3.9	3.4	3.9
Law	3.4	3.6	3.6	3.3	4.0
Education	3.4	3.7	3.4	3.3	4.1
Average	3.2	3.7	3.7	3.3	4.0

While this type of bivariate analysis gives us some sense of the effect of field of study on graduate wages, the analysis may be potentially misleading because many factors will simultaneously impact individual earnings. Therefore, we move to multivariate

analysis to obtain a more accurate picture of the impact of field of study and competencies on earnings.

V Estimation Results

An initial impression of the multivariate relationship between earnings and field of study and competencies is given through OLS regression, using a modified version of the standard Mincer (1974) earnings equation, and the results from this are presented in Table 4. The dependent variable is the log of hourly earnings. A 'forward stepwise' approach was adopted as this method allows us to identify the incremental impact of various sets of characteristics on a graduate's earnings. This methodology also enables us to check the stability of the model and to ensure that it is not being affected by problems of colinearity. In specification 1 we look at the impact of field of study on a graduate's hourly earnings controlling for all human capital, job and organisational characteristics. In specification 2 we add competencies, while in specification 3 we include sector controls[7]. A fourth specification that included occupational controls was also estimated (analysis not shown here)[8]. As expected, the returns to some fields declined when these controls were included. However, generally speaking our field and competency results were robust to the inclusion of the occupational controls.

Overall, the field and competency results are stable across the various specifications. The general pattern regarding the field returns (specification 3) suggests that relative to the base case (Arts & Humanities) the returns are higher to Medicine & Veterinary (24.5 percent), Education (16.1 percent), Engineering & Architecture (13.3 percent), Science (9.9 percent) and Computers & IT (6.3 percent), while there is no significant premium to Business, Law and Social Science individuals. It is interesting to note that, when the sector controls are added to the model, the returns to Education almost halve, falling from approximately 30 percent to 16 percent. This indicates that wages

[7] Formally, the OLS earnings equation estimated can be written as follows: $\log w = \beta_1 + \beta_2 X_1 + \beta_3 F + \beta_4 C + \beta_5 S + \varepsilon_i$ where X_1 is a vector of human capital, job and organisational characteristics; F is a set of field of study dummy variables; C is a vector of perceived job-related competencies; S is a set of sector controls; and ε_i is the error term.

[8] The results are available from the authors on request.

within the Education sector are relatively high within the Irish economy, and this in turn reflects the high concentration of public servants within this sector.

With respect to the competencies analysed, the only significant effect relates to technical skills, which has a positive premium of 4 percent. Also, there is a marginally statistically significant negative impact to being able to work under pressure, which yields a 2 percent pay penalty.

The other covariates behave as expected, some of which warrant further discussion, in particular the over-educated and field mismatch variables. Those who were over-educated were found to earn 14.4 percent less than their well-matched counterparts, a result that is consist with other research that looks at the impact of overeducation on graduates' earnings (see, for example, Dolton *et al.* (2000) and McGuiness *et al.* (2007)), while those whose field was not matched to their job incurred a 5 percent pay penalty. A further hypothesis that we tested was whether this field mismatch penalty varied by field of study. The results suggest that only Education graduates who enter teaching earn a premium while those who enter other (non-matched) jobs lose out; specifically these graduates earn 16.1 percent less compared to their matched counterparts[9]. This result broadly supports those found by Robst (2007). Furthermore, Robst (2007) found that the wage effects from mismatch are greater in fields that teach occupation-specific skills.

[9] Results available from the authors on request

Table 4: Field of Study and Competencies OLS Regressions

Variable	(1) Field	(2) Competencies	(3) Sector
(Ref=Arts & Humanities)			
Science	0.075**	0.071**	0.099***
	(0.034)	(0.035)	(0.035)
Eng & Arch	0.091**	0.094**	0.133***
	(0.036)	(0.037)	(0.037)
Computers & IT	0.056	0.045	0.063*
	(0.035)	(0.036)	(0.036)
Medicine & Veterinary	0.254***	0.255***	0.245***
	(0.047)	(0.047)	(0.053)
Social Science	0.056	0.070	0.068
	(0.043)	(0.044)	(0.047)
Business	-0.028	-0.024	0.019
	(0.029)	(0.030)	(0.029)
Law	-0.053	-0.058	-0.059
	(0.056)	(0.058)	(0.056)
Education	0.293***	0.298***	0.161***
	(0.041)	(0.041)	(0.043)
(Ref=Degree)			
Postgraduate Diploma	0.062**	0.063**	0.055**
	(0.025)	(0.025)	(0.024)
Postgraduate Degree	0.107***	0.101***	0.074***
	(0.021)	(0.022)	(0.022)
(Ref=Pass)			
Honours	0.032	0.025	0.032
	(0.021)	(0.021)	(0.021)
First-class Honours	0.061**	0.048*	0.049*
	(0.026)	(0.027)	(0.026)
(Ref=Other College Type)			
University	0.067**	0.063**	0.063**
	(0.030)	(0.030)	(0.030)
Institute of Technology	0.011	0.006	0.009
	(0.033)	(0.033)	(0.032)
Over-educated	-0.175***	-0.168***	-0.144***
	(0.024)	(0.024)	(0.024)
Field Mismatch	-0.058***	-0.058***	-0.054***
	(0.021)	(0.021)	(0.021)
Female	-0.007	-0.003	-0.008
	(0.017)	(0.018)	(0.018)
Tenure	0.003***	0.003***	0.002***
	(0.001)	(0.001)	(0.001)
Experience	0.001***	0.001**	0.001*
	(0.000)	(0.000)	(0.000)
Previous Unemployment	-0.039**	-0.042**	-0.047***
	(0.017)	(0.017)	(0.017)
Employer Training	-0.011	-0.012	-0.016
	(0.017)	(0.017)	(0.017)
Permanent Contract	0.007	0.001	0.028
	(0.018)	(0.019)	(0.019)
Trainee Position	-0.258***	-0.268***	-0.226***
	(0.037)	(0.037)	(0.037)

Table 4 continued

Variable	(1) Field	(2) Competencies	(3) Sector
Union Membership	0.125***	0.120***	0.084***
	(0.021)	(0.021)	(0.021)
(Ref=Firm Size Less20)			
Firm Size 20-99	0.029	0.025	0.009
	(0.020)	(0.021)	(0.020)
Firm Size 100-499	0.013	0.014	0.028
	(0.024)	(0.024)	(0.024)
Firm Size 500+	0.065**	0.057**	0.067**
	(0.028)	(0.029)	(0.029)
Job Location in Dublin	0.081***	0.081***	0.094***
	(0.017)	(0.017)	(0.017)
Communication Skills		0.012	0.008
		(0.013)	(0.013)
Technical Skills		0.037**	0.040***
		(0.015)	(0.015)
Team Skills		-0.013	-0.015
		(0.011)	(0.011)
Leadership Skills		0.006	0.005
		(0.011)	(0.011)
Work Under Pressure		-0.021*	-0.018*
		(0.011)	(0.010)
Constant	2.459***	2.412***	2.371***
	(0.051)	(0.074)	(0.076)
Observations	1470	1426	1426
R-squared	0.323	0.331	0.380

Note: Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

As indicated previously, unobserved heterogeneity is a potential problem with using OLS regression to estimate the returns to different fields of study, that is unless one has pre-college entry test score information, which is information that is not available to us here. Thus, to ensure we are comparing like-with-like, we estimate QR models on the assumption that graduates of similar ability levels will be located in similar segments of the wage distribution. The results for this are presented in Table 5.

Broadly speaking, we see the same field effects coming through as we saw in the OLS regressions presented in Table 4: Medicine & Veterinary graduates along with Engineering & Architecture, Science and Computers & IT graduates have higher earnings compared to the base case. Therefore, the results from the quantile regressions suggest that the OLS estimates are not particularly affected by unobserved heterogeneity bias. However, despite this the QR analysis is still useful in that some

additional impacts are evident within these models; specifically, some distributional differences occur.

An important pattern that is evident in the QR models, and one which can be seen clearly in Table 5, is that the impact of field on a graduate's earnings declines as one goes up the ability/wage distribution. In fact, at the 90th quantile, only Medicine & Veterinary graduates earn a premium (29.8 per cent). Thus, for the highest ability graduates, field of study is largely unimportant in determining their earnings.

With respect to the individual faculty effects, the premium to Medicine & Veterinary is somewhat uneven but it is the lowest in the bottom quantile and highest in the 90th. The premium to Engineering & Architecture is more dominant in the low to mid-ability ranges of the distribution, whereas in Science and Education premiums are only present in the inter-quartile range. Turning to Computer & IT graduates, a premium of between 9 to 10 percent was found for these individuals in the 25th quantile and the median of the distribution.

Once again, it is important to point out that the results from QR, which help to adjust for unobserved heterogeneity, suggest that the field specific returns reported in the OLS regressions are robust. However, the QR analysis does reveal that such returns diminish the more able the graduate.

In relation to competencies, the returns to technical skills do not vary much across the ability distribution (ranges from 3 to 4 percent) and are relatively consistent in terms of statistical significance. Team skills negatively impact individuals at the higher end of the ability distribution. This makes intuitive sense in that higher ability individuals with higher marginal products and higher wages are more likely to be adversely affected if they choose to use such skills in the workplace as this will serve to obscure their true marginal product, and thus earnings potential, to employers. The negative return to working under pressure only occurs in lower quantiles of the ability distribution. This particular competency may be associated with measurement error as those who are low ability may be those who also felt more pressure within the academic-work environment; thus, this perceived competency might be more prevalent among low ability graduates, which would explain the observed effect.

Table 5: Field of Study and Competency Quantile Regressions[10]

Variable	QR.10	QR.25	QR.50	QR.75	QR.90
Field of Study (Ref=Arts & Humanities)					
Science	0.019	0.123***	0.161***	0.126***	0.092
	(0.040)	(0.030)	(0.030)	(0.040)	(0.059)
Eng & Arch	0.121***	0.165***	0.156***	0.085*	0.076
	(0.043)	(0.033)	(0.034)	(0.046)	(0.067)
Computers & IT	0.052	0.097***	0.089***	0.013	-0.049
	(0.040)	(0.031)	(0.031)	(0.042)	(0.062)
Med & Vet	0.155***	0.220***	0.274***	0.214***	0.298***
	(0.058)	(0.049)	(0.051)	(0.067)	(0.100)
Social Science	0.007	0.060	0.111***	0.102*	0.087
	(0.049)	(0.040)	(0.042)	(0.055)	(0.084)
Business	-0.019	0.034	0.027	-0.011	-0.017
	(0.034)	(0.026)	(0.026)	(0.038)	(0.056)
Law	-0.079	-0.024	-0.068	-0.120*	-0.125
	(0.061)	(0.052)	(0.050)	(0.070)	(0.101)
Education	0.093*	0.224***	0.249***	0.134**	0.009
	(0.052)	(0.039)	(0.039)	(0.053)	(0.080)
Competencies:					
Communication	0.002	0.001	-0.004	-0.002	-0.010
	(0.015)	(0.011)	(0.012)	(0.016)	(0.024)
Technical	0.035**	0.028**	0.021	0.033*	0.044*
	(0.017)	(0.013)	(0.013)	(0.018)	(0.026)
Team	-0.020	-0.006	-0.016*	-0.026**	-0.021
	(0.013)	(0.010)	(0.010)	(0.013)	(0.020)
Leadership	0.011	-0.005	0.014	0.020	0.001
	(0.012)	(0.009)	(0.010)	(0.013)	(0.018)
Pressure	-0.028**	-0.017*	-0.005	-0.003	-0.003
	(0.013)	(0.009)	(0.009)	(0.012)	(0.017)
Constant	2.073***	2.165***	2.342***	2.517***	2.782***
	(0.089)	(0.069)	(0.069)	(0.094)	(0.133)
Observations	1426	1426	1426	1426	1426
Pseudo R-squared	0.262	0.251	0.257	0.261	0.272

Note: Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

VI Conclusion

This paper examines the economic returns to different fields of study and also various job-related competencies. Relative to the Arts & Humanities base case, there were higher returns to Medicine & Veterinary, Education, Engineering & Architecture, Science and Computers & IT. In general, these results are consistent with what has been found in other countries (see, for example, O'Leary & Sloane (2005) and Finne

[10] See Table A2 in the appendix for the results on the other controls included in the quantile regressions.

& Frenette (2003)). The one exception, however, is the significantly higher return obtained for Education graduates, a result that is almost certainly due to nature of the pay structure that exists for such graduates in the public sector in Ireland.

The results from the quantile regressions suggested that the returns reported in the OLS regressions were robust and unaffected by unobserved heterogeneity bias. However, the QR analysis did reveal that the field specific returns diminish the more able the graduate. Thus, for the highest ability graduates field of study was largely unimportant in determining their earnings.

The job-related competencies examined in this paper were communication, technical, team, leadership and ability to work under pressure. Of these, technical skills emerged to be the most significant, yielding a positive premium of 4 percent.

The impact of both over-education and field mismatch on earnings were also analysed. Level was found to be important but there was also an effect from field; specifically, those who were over-educated earned 14.4 percent less than their well-matched counterparts, while those who were employed in an area not related to their field of study incurred a 5 percent pay penalty. Thus, while the cost associated with being over-educated is larger than that from being in a job that is not related to a person's field of study, field mismatch still exerts an independent and significant effect on a person's earnings.

From a policy perspective, this paper demonstrates that an individual's subject choice at university is an important factor in determining their earnings. However, the field specific returns do vary according to a person's ability, and generally speaking at the very highest ability quantile field of study is not as important as some other factors, such as tenure and job location, in influencing graduates' wages. Furthermore, the analysis illustrates that the job-related competencies individuals develop through their courses can also affect their earnings. Thus, the research undertaken reinforces that subject choice and the skills developed through college courses are important to returns within the graduate labour market.

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Appendix

Table A1: Mean and Standard Deviation of Independent Variables

Variable	Mean	Standard Deviation
Hourly Wage (€)	16.31	6.72
Field of Study:		
Arts & Humanities	0.12	0.33
Science	0.11	0.31
Engineering & Architecture	0.12	0.32
Computers & IT	0.12	0.33
Medicine and Veterinary	0.04	0.20
Social Science	0.05	0.23
Business	0.32	0.47
Law	0.03	0.16
Education	0.09	0.29
Human Capital & Personal Characteristics:		
Degree	0.57	0.50
Postgraduate Diploma	0.21	0.41
Postgraduate Degree	0.23	0.42
Pass	0.11	0.32
Honours	0.60	0.49
First-class Honours	0.18	0.38
Grade not Applicable	0.11	0.31
University	0.62	0.49
Institute of Technology	0.28	0.45
Other College Type	0.09	0.29
Over-educated	0.19	0.39
Field Mismatch	0.27	0.44
Tenure	23.33	17.28
Experience	24.93	25.76
Female	0.58	0.49
Previous Unemployment	0.52	0.50
Job and Organisational Characteristics:		
Employer Training	0.49	0.50
Permanent Contract	0.58	0.49
Trainee Position	0.05	0.23
Union Membership	0.25	0.43
Firm Size Less than 20	0.31	0.46
Firm Size 20-99	0.36	0.48
Firm Size 100-499	0.21	0.41
Firm Size 500+	0.12	0.32
Job Location in Dublin	0.51	0.50
Traditional Manufacturing	0.06	0.25
High-tech Manufacturing	0.08	0.28
Construction	0.02	0.14
Retail & Wholesale	0.06	0.23
Hotels & Restaurants	0.02	0.14
Transport & Communications	0.03	0.17
Financial Services	0.12	0.32

Table A1 continued:

Variable	Mean	Standard Deviation
Job and Organisational Characteristics:		
Real-estate & Business	0.26	0.44
Public Administration	0.07	0.26
Education Sector	0.14	0.35
Health & Social Work	0.10	0.30
Other Services	0.04	0.19
Competencies:		
Communication	3.23	0.72
Technical	3.68	0.66
Team	3.75	0.97
Leadership	3.26	1.00
Working under Pressure	4.04	0.89

Table A2: Field of Study and Competencies Quantile Regression Controls

Variable	QR.10	QR.25	QR.50	QR.75	QR.90
Postgrad Dip	0.024	0.046**	0.070***	0.059*	0.070
	(0.030)	(0.023)	(0.023)	(0.030)	(0.046)
Postgrad Deg	0.059**	0.089***	0.117***	0.064**	0.054
	(0.023)	(0.019)	(0.019)	(0.026)	(0.036)
Honours	0.041*	0.039**	0.054***	0.006	-0.020
	(0.025)	(0.019)	(0.019)	(0.025)	(0.036)
First-class Hons	0.073**	0.037	0.039*	0.040	0.029
	(0.030)	(0.023)	(0.023)	(0.030)	(0.046)
University	0.049	0.076***	0.080***	0.068*	0.074
	(0.033)	(0.027)	(0.027)	(0.037)	(0.049)
Institute of Tech	0.014	0.026	0.053*	0.013	0.013
	(0.035)	(0.030)	(0.030)	(0.040)	(0.056)
Over-educated	-0.109***	-0.090***	-0.138***	-0.136***	-0.149***
	(0.026)	(0.021)	(0.021)	(0.028)	(0.041)
Field Mismatch	-0.054**	-0.054***	-0.049***	-0.074***	-0.036
	(0.022)	(0.018)	(0.018)	(0.025)	(0.036)
Female	-0.003	-0.013	-0.013	-0.032	-0.018
	(0.020)	(0.016)	(0.016)	(0.022)	(0.033)
Tenure	0.002**	0.002***	0.002***	0.003***	0.003***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Experience	0.001**	0.000	0.000	0.001	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Previous UE	-0.028	-0.072***	-0.069***	-0.034*	-0.021
	(0.020)	(0.015)	(0.015)	(0.021)	(0.031)
Employer Train	0.022	-0.005	-0.009	-0.010	-0.034
	(0.019)	(0.015)	(0.015)	(0.021)	(0.030)
Permanent Con	0.076***	0.053***	0.025	0.022	0.013
	(0.022)	(0.017)	(0.017)	(0.023)	(0.033)
Trainee Post	-0.313***	-0.256***	-0.242***	-0.194***	-0.155**
	(0.042)	(0.035)	(0.034)	(0.050)	(0.072)
Union Member	0.075***	0.049**	0.039**	0.047*	0.074*
	(0.025)	(0.020)	(0.019)	(0.027)	(0.040)
Firm Size 20-99	-0.016	0.001	0.032*	0.022	-0.042
	(0.023)	(0.018)	(0.018)	(0.024)	(0.036)
Firm Size 100-499	0.023	0.037*	0.023	0.029	-0.014
	(0.027)	(0.022)	(0.022)	(0.029)	(0.044)
Firm Size 500+	0.102***	0.074***	0.067**	0.064*	-0.012
	(0.032)	(0.026)	(0.026)	(0.037)	(0.055)
Job Loc Dublin	0.081***	0.090***	0.111***	0.110***	0.104***
	(0.020)	(0.016)	(0.016)	(0.021)	(0.030)
Constant	2.073***	2.165***	2.342***	2.517***	2.782***
	(0.089)	(0.069)	(0.069)	(0.094)	(0.133)
Observations	1426	1426	1426	1426	1426
Pseudo R-squared	0.262	0.251	0.257	0.261	0.272

Note: Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
Sector controls included[11]

[11] Available from the authors on request

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