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University Quality and Labour Market Outcomes

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Abstract

This paper uses proxies for university quality derived from the Research Assessment Exercise (RAE) and the Teaching Quality Assurance Agency (QAA) to assess the impact of university quality on the labour market outcomes of a cohort of UK graduates. The impacts on job quality and earnings were mainly limited to graduates in particular disciplines or those obtaining "poor" degrees from "good" universities. The results suggest that, after controlling for pre-entry qualifications, labour market outcomes for most graduates depended more on the subject studied and the degree classification awarded than on the university attended.

Introduction

Recent years have seen concerted efforts by government to raise standards in UK universities through the teaching quality assessment and research assessment exercise (RAE). However, the potential impact of any improvements in university quality on the labour market outcomes of graduates, specifically in the areas of job quality and earnings, is a relatively underdeveloped area of research. The scarcity of evidence linking university quality with labour market success mainly reflects a lack of available datasets matching individual and institutional characteristics, rather than any certainty surrounding the impacts of institutional quality or consensus diminishing the importance of the issue in the context of Higher Education policy development. The relationship between university quality and labour market success is important for a number of other reasons. Firstly, attending a good university and studying a subject of their choice are primary motivations influencing the decisions of large numbers of pre-university students. Whilst there is a considerable literature examining the wage gains associated with studying particular subjects (Grogger & Eide, 1995; Dolton & Makepeace, 1990; James 1989), little is known about institutional influences. Secondly, whilst graduate overeducation (the extent to which graduates are employed in non-graduate jobs) has been identified as a problem effecting substantial proportions of current university leavers (Dolton &Vignoles, 2000; McGuinness, 2002a; etc) it is unclear if the incidence of this phenomenon is more prevalent amongst graduates of less prestigious universities. Finally, recent changes in the UK Higher Education (HE) funding system, specifically the decision to grant some universities the freedom to charge higher tuition fees, suggests, at the very minimum, a tacit belief in some quarters that attending a better quality university will result in higher future earnings. Clearly, it is important to assess the extent to which students attending more prestigious and (presumably) higher priced institutions are likely to recoup their additional investment. These issues are examined here using data from a study of a cohort of all university entrants from Northern Ireland in 1991 matched against an index of university quality.

This paper adds to the existing literature by demonstrating that average gains arising from attending a better quality university tend to be limited, with institutional influences mainly operating through interactions with personal level characteristics

that vary according to individual preference and performance. The work suggests that, for the majority of students, the choice of university is less important than choice of subject and degree performance in determining labour market success.

Existing evidence

US studies dominate the very limited literature on university quality with the general consensus being that any institutional effect in relation to earnings is likely to be small. James et al (1989) found evidence of a significant prestige related gain for graduates qualifying from private East coast institutions, however, they estimate that total college quality effects explain only between 1-2% of the variance in earnings. Smart (1988) using a composite quality variable (based on entry levels likely to be highly endogenous, expenditure per student and tuition charges) reported quality related wage gains of between 3-4%. Pascarella (1992) et al found a positive relationship between tuition charges and subsequent earnings. For the UK, Belfield and Fielding (2001) report a statistically significant relationship between per student expenditures and earnings, however, resource related elasticites were quite low suggesting a 2% wage gain for every additional £1,000 of per student resources. In relation to job quality, Robst (1995) conducted the only existing study using expenditure and prestige based measures of college quality. Using US data, he concluded that workers attending higher quality colleges had significantly lower probabilities of being overeducated.

Empirical Issues

What is immediately obvious from the literature is that there is no standard approach to defining or measuring university quality. Studies tend to use either resource based measures (spending per student, staff-student ratios) or prestige ratings. However, little consideration is given exactly how these variables relate to university quality (and each other) or the transmission mechanisms through which they will impact on earnings and overeducation probabilities. Whilst variations in both university prestige and resource levels have the potential to affect the labour market position of graduates, it is likely that these quality variables will tend to influence labour market outcomes in different ways. Resource levels will be most closely linked with teaching

standards and may thus have their greatest impact through standard human capital effects associated with the accumulation of skills. Prestige effects are also likely to be associated with human capital gains through peer group learning influences and spillovers from better quality academic research. However, the primary function of university prestige may simply be as a quality signal to employers (Spence, 1973). Additional prestige related benefits might also derive from the more influential networks that are likely to be built up within more selective institutions. Within the UK, university prestige appears to be strongly linked to the quality of university research, as a quick glance down the names of the Guardian newspapers top 20 UK research universities will reveal. However, the relationship appears less clear in when viewed in the context of the Guardian teaching rankings, a measure more heavily related to resource influences[1], with just 6 institutions ranked in the top 20 for both teaching and research. Nevertheless, plotting Guardian research scores against teaching scores does reveal a strongly positive relationship with a correlation coefficient of 0.84 demonstrating that each quality indicator encapsulates much of the other (Figure 1). A notable feature of the relationship highlighted by chart is the absence of universities with research scores in the 3-4 range. The research quality of UK institutions appears to be concentrated in two very distinct clumps separated by a well-defined chasm[2]. A potential explanation for the apparently uneven distribution of research scores is that the 3-4 range operates as a separating point distinguishing the polytechnics that acquired university status in 1992 from the older more established institutions.

Studies of the kind being undertaken are also prone to certain types of bias. Firstly, universities (and students) tend to be selective, with better quality students who are more likely to experience labour market success drawn towards more prestigious institutions. Thus it is imperative that selection bias is adequately controlled for either through the inclusion of pre-university performance controls or the adoption of a Heckit type model (Heckman, 1979). Here selection bias is dealt by through the inclusion of A level point scores; this variable provides a highly effective pre-entry control for the well documented positive relationship between innate ability and

[1] The Guardian research scores are based on results of the QAA teaching assessment but also incorporate factors such as per student spend, staff-student ratios and unversity size.
[2] The two apparent outliers have been checked and confirmed as Wales College of Medicine (high teaching and low research) and Lampeter University (high research and low teaching).

university quality and avoids the need for a two stage estimation procedure (See Data Appendix for details). In addition to absorbing selection effects, the A level point score variable provides an additional advantage in that the resulting models can be interpreted as directly measuring the value added of obtaining a particular quality of university education. The selective nature of universities (and students), and hence the effectiveness of the selection control, can be confirmed by the strongly positive relationship between university quality and A level entry requirements. This relationship is illustrated in Table 1 which, using data from this study, gives the average A level point scores of students attending institutions ranked by 2001 Guardian university research score.

Finally, biases may also arise from using clustered data, particularly if there are large group sizes within the data. One solution to the problem is to use a multi-level model which locates quality variables in the context of specific university groupings (see Belfield & Fielding, 2001). However, whilst such models potentially allow researchers to analyse particular institutional and individual level interactions in instances where the institutional variable is categorical in nature, they cannot isolate the average impact of any particular institutional characteristic (such as university quality). Therefore, whilst potential biases relating to the use of clustered data must be acknowledged, multi-level models do not appear to provide an adequate solution in instances such as this, where we are seeking to isolate the total effect of a particular institutional characteristic using a continuous variable.

Data and Methods

The data comes from a cohort study of all Northern Ireland domiciled students entering higher education in 1991 / 92, the vast majority of whom graduated between 1994 and 1996. The data for the current study comes from the second follow up conducted via a postal questionnaire conducted in early 1999, so respondents would typically have been active in the labour market for between 2-4 years (see Leith et al 1999). The data-set contains 1,353 valid responses, however, after removing individuals who failed to graduate and those failing to provide information on key variables the effective sample was reduced to 837. Just over 60% of the sample attended NI universities with the vast majority of the rest electing to study at GB

universities. Information was available on a range of educational and personal characteristics which included university attended, in addition to employment information relating to first and current job (see Data Appendix for details). Within this study institutional quality was measured by allocating the universities within our sample teaching and research scores from the Guardian newspapers university ratings system.

The Guardian teaching scores are heavily based upon the results of the teaching assessments carried out by the Quality Assurance Agency (QAA) (2001), however, a number of other factors are also incorporated including per student spend and staff-student ratios. The research scores on the other hand are based exclusively on outputs[3] derived from the 1996 and 2001 Research Assessment Exercises (RAE). Although the QAA based scores are available for the most recent assessment only, the RAE results are available for 1996 and are thus preferred to the 2001 based RAE scores on the grounds that they provide a better match with the cohort under examination. Whilst the QAA based scores may not correspond exactly with the point of labour market entry for our cohort, university quality is unlikely to have altered much in the intervening period[4]. Research and teaching quality scores are also available at faculty level, however, it seems unlikely that a more disaggregated analysis will yield significantly different effects. Firstly, resource related variation at departmental level will be highly correlated with differences at the aggregate level. Secondly, from a signalling perspective, it might be supposed that employers are more likely to make judgements that are based on institutional, as opposed to departmental prestige. Finally, from a methodological standpoint, it is important to recognise that the Guardian scores are merely proxies and neither variable is a direct measure of either quality effect[5].

[3] Average research rating per university staff member and the average rating per submitted researcher.
[4] This is illustrated by the fact that the empirical analysis generated almost identical results for both the 1996 and 2001 RAE measures.
[5] From a methodological perspective this raises the question of measurement error, however, if the proxy is left out, then it can be shown that the asymptotic bias deriving from an omitted variables problem is more severe than if a proxy with a high degree of measurement error is included (Greene, 2000).

Sample Characteristics

The faculty distribution of the sample given in Table 2 largely conforms to expectations, although the picture may be somewhat obscured by the use of a combined subject grouping. Nevertheless, there is nothing to suggest that the sample departs markedly from the norm, particularly given that the distributional shares of the more specific groupings such as Science, Maths & Engineering and Medicine correspond with those of the total population of NI students qualifying from Higher Education Institution's (HEI's). Some variation was found for the average A level point scores within particular subject groupings (Table 3), however, the results were again largely unsurprising with students in faculties such as Medicine and Engineering possessing much better A levels than those studying for Business or Science degrees[6]. As noted earlier, just over 60 per cent of the sample attended university in NI and whilst students electing to remain at home were certainly restricted in terms of institutional choice, there is nothing to suggest from the analysis that it resulted any mismatch between student and institutional quality levels[7] (see Table 1).

Generally speaking studies of the graduate labour market tend to focus on earnings as the principal measure of employment success. However this can be problematic, as graduates in relatively successful jobs may well be in receipt of lower "training" wages in the early stages of their careers. Thus it is important that we also consider the quality of employment, particularly given that the ability to obtain graduate level employment is increasingly seen as a key indicator of success within a highly competitive labour market. Recent studies of the UK graduate labour market have estimated that the incidence of overeducation lies between 20 and 30 per cent (Dolton & Vignoles 2000, McGuinness 2002). In this data-set overeducation was measured subjectively by asking the respondent if a degree was a necessary requirement for the job. The particular merits of the various subjective and objective measures of overeducation has been widely debated within the literature (Hartog 2000, Chavelier

[6] Within NI students have the option of entering university to study science at level 0 (below undergraduate level), which has lower level entry requirements.
[7] Republic of Ireland universities were allocated research scores according to age and reputation; whilst such an approach is rather subjective in nature, it is unlikely to have influenced the results as just 16 cases were affected.

2000, Cohn & Kahn 1995), however, Groot & van den Brink (2000) demonstrate that subjective measures, such as the one employed here, are less likely to provide biased estimates of the incidence of overeducation.

Table 4 summarises the results of a cross-tabulation of overeducation rates in first / current employment and university research scores. The results appear consistent with previous studies with the incidence of overeducation estimated at 31% for those in first employment and 24% for those in current employment. The much lower overeducation rates amongst higher quality institutions suggest that university attended may have a significant impact on this particular measure of labour market success. However potential endogeniety problems imply that it would be naive to read too much into this relationship at this stage. The relative stability of overeducation rates, both across universities and within institutions of varying research quality, supports the contention that overeducation is a non-transitory phenomenon[8] whilst doing little to suggest that attending a more prestigious institution does much to improve ones chances of exiting from an overeducated state.

Econometric Analysis

Econometric models were estimated to assess the size and significance of any impacts of university quality on two well-defined measures of labour market success, the probability of being overeducated in employment and the value of earnings. In order to avoid problems of collinearity the models were estimated separately for each of the two quality variables. However, in none of the subsequent models did the teaching score based measure prove significant[9]. The better performance of the research based measure is perhaps not surprising, considering that, not only is it likely to encapsulate much of the human capital impacts embodied within the resource based variable but it will also tend to proxy the influences deriving from prestige and research based knowledge spillovers. The fact that research based scores tend to be highly correlated with variations in teaching quality, institutional selectivity / prestige and research

[8] For instance, Alba-Ramerex (1993) and Sicherman (1991) suggest that overeducation is temporary and will decline with job search activity and therefore exists only as long as it takes workers to find an appropriate match (see McGuinness (2002b)).
[9] The results are available from the author.

based learning effects, suggests that it represents a better proxy for university quality than the more popular resource based measures. Nevertheless, the poor performance of the QAA based proxy does raise some potentially interesting questions, such as; are these scores really providing an accurate picture of the current state university teaching quality in the UK?; and if so, is it really the case that variations in university teaching standards have no impact in determining the future earnings and / or job quality of graduates?

The subsequent analysis is restricted to the consideration of quality effects proxied by the inclusion of the university research score variable. In model 1 (Table 5) we see that overeducation in the first job is inversely and significantly related to the A level point score control for innate ability, degree class and having completed a HND (this most likely derives from a vocational study effect). Faculty based effects were also found with graduates from Maths / Engineering, Other[10] (consisting mostly of Architects and Mass Communication graduates) and Medical faculties significantly less likely to be overeducated in their first employment. Nevertheless, from the university quality perspective, the critical aspect of the regression is the insignificance of the research score variable suggesting that there is little benefit, in terms of job quality, from being educated at a superior institution.

The university quality term was then interacted with the degree classification and faculty variables on the basis that potential impacts may operate in conjunction with certain human capital related characteristics. Whilst there were no impacts deriving from the quality*faculty interactions, the research score variable did become significant and negative when interacted with degree class (model 2, Table 5). The actual relationship between the two effects is somewhat difficult to distinguish due to the fact that class is measured in terms of a continuous variable. Consequently, the model was re-estimated with basic degree class interaction dummies (model 3, Table 6). The coefficients on both interaction terms are positive and significant, however, the impact of university quality for each level of degree pass is obtained by summing the coefficients on the relevant interaction term and the research score. The quality

[10] This grouping, which accounts for 5% of the total sample, is distributed as follows; Education (9%), Mass communication (25%) and Architecture (66%).

effects for students with firsts / 2:1 and 2:2 degrees were not significantly different from zero, thus the only impact was for students with third class or pass degrees[11]. The results suggest that attending a better university only has an impact on job quality for those students obtaining relatively poor degrees. Conversely, and perhaps more importantly, students do not appear to be disadvantaged by attending lower quality institutions provided they obtain relatively good classifications. We might infer that obtaining a third or pass degree from a more established institution may signal additional attributes that counterbalance the negative effect of obtaining a poor class degree, thus lessening the probability of being overeducated.

When estimating the probability of being overeducated in current job, additional controls relating to postgraduate study, marital status and occupation were available and included in the model as well as two broad sectoral dummies. The overeducation equation for current job is given in model 4 (Table 6) and, relative to first job, the equation remained relatively unchanged with respect to factors such as A level point score and faculty. However, the university quality related influences were no longer significant[12]. It is interesting to note that socio-economic background, which is generally considered to be correlated with unobserved characteristics, such as motivation, becomes important within the current job equation (see Denny & Harmon, 2000). The significance of the female*child and postgraduate variables are also worth noting. Nevertheless, model 4 would seem to suggest that any benefits deriving from university quality with respect to job quality are short lived. The possibility that university quality might affect movements into and out of overeducation between first and current employment was also considered (see Appendix 1, Table 1). Whilst A level point score, having children (females only), family background and, to some extent, faculty proved important, university quality did not. Therefore, the evidence suggests that the effects of attending a higher quality institution on the probability of being overeducated are limited and short-term in nature. These results seem somewhat at odds with the large and significant effects reported for the US by Robst (1995). However, the US study failed to make any serious attempt to control for selection effects, and thus its results must be treated with some caution.

[11] The impact for the base case is measured by the research score coefficient.
[12] This was also the case when the model was re-estimated in the same form as models 2 and 3.

Turning to the impact on earnings, OLS models were estimated for current earnings only as wage data was unavailable for first job. The simplest specification is reported in model 5 (Table 7), A level point score (pre-entry control) and degree classification exert a positive influence on wages whilst females face a 10 per cent disadvantage. Relative to the base case, Arts graduates earn less whilst Medics earn more. The regional dummy is also significant and reflects the fact that Northern Ireland is a relatively low wage labour market with non-migrating graduates earning almost 30 per cent less than those working in GB and elsewhere. Finally, the university research score variable whilst positive is not significant in model 5, indicating that we cannot reject the hypothesis that there are no average wage gains associated with attending a better quality university. The hypothesis that direct benefits are associated with attending a "premier league" institution was examined in Model 6 by including a top20 university research ranking dummy. The coefficient was indeed positive and significant with graduates from the top tier of the university system earning 10 per cent more. Nevertheless, it is reasonable to conclude from models 5 and 6 that broad based institutional wage effects may be limited. To investigate whether the effect of attending a good university varies with the course of study and / or degree performance, the earnings models were re-estimated with personal and institutional interactions terms.

The degree class* research score interaction terms were added to the equation in model 7 (Table 8). The research score once again becomes significant, however, the impact was once more restricted to those obtaining third or pass degrees. Nevertheless, potential wage gains were substantial and suggest, for example, that the expected earnings of low pass graduates from an institution with a research grade of 6 would be almost 14 per cent higher relative to someone obtaining a similar degree from a university with a research grade of 2. University research score * faculty interactions were also entered and whilst these had been found to have no effect on overeducation probabilities, they proved to be much more crucial in the wage equation (model 8, Table 8). The university quality term is now highly significant, as are several of the interaction terms. However, the coefficients on the interaction are related to the base case and are thus difficult to interpret directly from table 8. The

total impact of university quality on wages for students in each faculty was again determined by differentiating the equation with respect to job quality[13], the results of which are detailed in Table 9. The coefficients describe the impact on wages of increasing university quality by one point for students qualifying from various faculties holding degree class constant at the pass / third class level. Again, the potential impacts of university quality on wages are significant. Graduates with Arts and Medical degrees can expect an 8 - 10% per cent wage gain for each extra point in university quality whilst the advantage for Social Science gradates is 12 per cent[14]. For low qualifiers gaining Maths / Engineering & Technology, Combined or Business degrees, the quality of university attended appears to have little impact on earnings. The gains to students obtaining first / 2:1 or 2:2 degrees will be 2.1 and 3.1 percentage points lower in each case suggesting that the largest faculty based institutional gains will once more accrue to students gaining lower classifications. However, it is important, at this stage, to point out that less than one third of our sample were located within the affected faculties, suggesting that the majority of graduates do not benefit from any such institutional-wide wage premiums.

Exactly why quality impacts might vary by subject is not clear. One potential explanation is some subject areas are sensitive to changes in institutional quality, implying faculty variant levels of human capital accumulation. It is equally plausible that the signalling function of university quality or peer group learning effects are only important for graduates from particular faculties. However, the extent to which either or any particular combination of the above transmission mechanisms are driving the quality effects, is a question for future research. Nevertheless, the results from this analysis suggest that university quality does have significant impacts on earnings and job quality, however, these influences are by no means universal and vary according to faculty and degree classification.

[13] As faculty is a dummy term the level effect on the interaction term drops out.
[14] The base case is given by the slope value of the university quality term in model 8.

Summary and Conclusions

Institutional prestige and the quality of education delivered are undoubtedly important in motivating the choice of university, yet there is little evidence on the benefits to be gained from attending better quality universities. This paper examines the question by matching a dataset from a cohort of Northern Ireland graduates with two alternative measures of university quality. Using a Research Assessment Exercise based proxy, institutional quality was found to have significant effects both in relation to job quality and earnings. Whilst there was evidence of some average wage gains for graduates from premier league institutions, the impact of university quality appeared to vary with degree classification and faculty. Graduates gaining third class / pass degrees from more prestigious institutions were less likely to be overeducated and more likely to earn higher wages than their counterparts with comparable qualifications from less well known institutions. University quality was also associated with wage gains for graduates from some faculties, in particular, Social Science and Medicine with these subject based effects being larger for graduates obtaining low pass degrees.

This research is of importance for a number of reasons. It suggests that, for given pre-entry qualifications, subject choice and degree classification are likely to be of greater importance in determining the return from a degree than having attended a more prestigious institution. One implication of the findings is that if "top-up" fees are introduced in the UK, many students at higher priced institutions (presumably concentrated at the upper end of the quality spectrum) may not recoup the additional costs incurred in the course of their education. Clearly further research is needed to better understand the transmission mechanisms whereby institutional quality impacts labour market variables if government policy on the future direction of Higher Education is to be better informed. For instance, if the observed effects derive from a positive relationship between human capital accumulation and university quality that is specific to certain faculties, the results imply that any expansion Medical or Social Science education should be concentrated within higher quality institutions. However, if quality impacts were transmitted through alternative paths, for instance by the university acting as a quality signal, then observed relationships could potentially breakdown under a scenario of expansion. Finally, from a research

perspective, the work demonstrates the importance of individual and institutional level interactions when considering the impact of university quality on labour market outcomes.

References

Alba-Rammírez, A. (1993). Mismatch in the Spanish labor market. *Journal of Human Resources*, 28 (2) 259-278.

Belfield, C. & Fielding, A. (2001). Measuring the relationship between resources and outcomes in higher education in the UK. *Economics of Education Review,* 20, 589-602.

Chevalier, A. (2000). Graduate over-education in the UK. Report published by the Centre for the Economics of Education, London School of Economics.

Cohn, E. & Khan, P. (1995). The wage effects of overschooling revisited. *Labour Economics*, 2, 67-76.

Dolton, P. & Malepeace, G. (1990). Graduate earnings after six years: Who are the winners? *Studies in Higher Education,* 15 (1), 31-55.

Dolton, P. & Vignoles, A. (2000). The Incidence and effects of over-education in the U.K. graduate labour market. *Economics of Education Review*, 19, 179-198.

Greene, W. H. (2000). *Econometric Analysis*. New Jersey: Prentice-Hall.

Groot, W. & van den Brink, H. (2000). Overeducation in the labor market: a meta-analysis. *Economics of Education Review*, 19, 149-158.

Grogger, J. & Eide, E. (1995). Changes in college skills and a rise in the wage premium. *Journal of Human Resources,* 30, 280-310.

Denny, J. & Harmon, C. (2000). Education policy reform and the returns to schooling from instrumental variables. CEPR Discussion paper No. 2518.

Hartog, J. (2000). Over-education and earnings: Where are we, where should we go? *Economics of Education Review*, 19, 131-147.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica*, 47 (1), 153-161.

James, E., Alsalam, N., Conaty, J. & To, D. (1989). College quality and future earnings: where should you send your child to college ? *American Economic Review,* 79 (2), 247-252.

Leith, H., Osborne, R. & Gallagher, T. Skill development and enhancement: A study of Northern Ireland graduates. Report published by the Centre for Research into Higher Education.

McGuinness, S. (2002a). Private sector postgraduate training and graduate overeducation: Evidence from Northern Ireland. *International Journal of Manpower*, 23 (6), 527-541.

McGuinness, S. (2002a). Overeducation as a sheepskin effect: Evidence from Northern Ireland. *Applied Economics (Forthcoming)*.

Pascarella, E., Smart, J. & Smylie, M. (1992). College tuition costs and early career socio-economic achievement: do you get what you pay for? *Higher Education,* 24 (3), 275-290.

Robst, J. (1995). College quality and overeducation. *Economics of Education Review, 14, 221-228.*

Sicherman, N. (1991). "Overeducation" in the labour market. *Journal of Labor Economics*, 9 (2), 101-122.

Smart, J. (1988). College influences on graduate's income levels. *Research in Higher Education,* 29, 41-59.

Spence, M. (1973). Job market signalling. *Quarterly Journal of Economics,* 87 (3), 355-374.

Appendix 1

Tables and Figures

Table 1 : Average A level Point Score of Entrants to Institutions of Varying Research Quality		
University Research Score	Average Point Score of entrants	% student distribution by institutional quality
1 - 2	13.70	10
2 – 3	16.61	32
3 – 4	19.17	1
4 – 5	22.00	43
5 – 6	22.64	11
6 – 7	25.81	1
7	37.54	2
Total	19.36	100

Table 2: Distribution of Sample by Faculty		
	Number of Respondents	%
Arts	63	8
Social Science	106	13
Business	152	18
Maths & Engineering	131	16
Science	100	12
Medicine	88	11
Combined	153	18
Other	44	5
Total	837	100

Table 3: Average A level Point Score by Faculty	
	Average point Score
Arts	19.65
Social Science	19.83
Business	17.98
Maths & Engineering	20.51
Science	18.35
Medicine	23.82
Combined	20.42
Other	17.10
Total	19.79

Table 4: Cross Tabulation of University Quality and Incidence of Overeducation		
University Research Score	% Overeducated 1st Job	% Overeducated 2nd job
1 - 2	45	40
2 – 3	39	28
3 – 5	24	19
5 – 6	27	23
6 +	8	4
Total	31	24

Table 5: Overeducated Probit s: First job		
	Model 1	Model 2
Dependants: Overeducated in first job (1,0 dummy)	Overeducation job 1	Overeducation job 1 with class* quality interaction
Constant	1.892 (0.602)***	3.771 (1.095)***
Human Capital Related Variables		
Age	-0.008 (0.016)	-0.007 (0.016)
HND	-0.533 (0.284)*	-0.840 (0.323)***
A Level Point Score	-0.061 (0.009)***	-0.061 (0.009)***
Degree Class	-0.123 (0.059)**	-0.696 (0.283)***
Guardian Research Score	-0.087 (0.070)	-0.512 (0.218)**
Arts Degree[15]	0.287 (0.212)	0.305 (0.212)
Business Degree	-0.307 (0.175)*	-0.294 (0.176)*
Maths / Engineering / Technology	-0.625 (0.195)***	-0.613 (0.194)***
Science	-0.330 (0.193)*	-0.326 (0.193)*
Medicine	-0.512 (0.218)**	-0.469 (0.219)**
Other	-0.705 (0.261)***	-0.697 (0.262)***
Combined	0.007 (0.172)	0.013 (0.172)
Research Score * class		0.127 (0.061)**
Personal Characteristics / Other		
Female	-0.011 (0.104)	-0.010 (0.104)
Catholic	-0.152 (0.100)	-0.149 (0.100)
Both parents professional	-0.171 (0.131)	-0.190 (0.131)
First job in NI	0.206 (0.107)*	0.207 (0.108)*
Log likelihood	-451.999	-448.810
Regression Significance	99%	99%
Pseudo R2	0.131	0.135

[15] Social Science degree is the base case

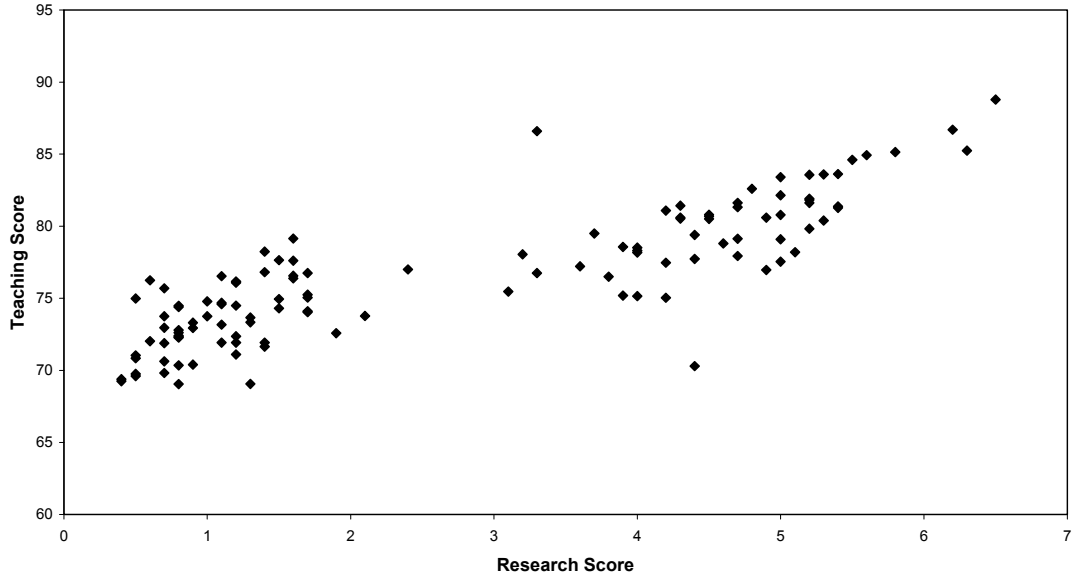
Table 6: Overeducated Probit s: First / Current job		
	Model 3	Model 4
Dependants: Overeducated in first & current job (1,0 dummies)	First job equation	Current job equation
Constant	2.855 (0.769)***	1.413 (0.716)***
Human Capital Related Variables		
Age	-0.007 (0.016)	-0.019 (0.017)
HND	-0.905 (0.374)**	-0.495 (0.367)
A Level Point Score	-0.060 (0.009)***	-0.053 (0.009)***
Degree Class	-0.416 (0.151)***	-0.096 (0.130)
Guardian Research Score	-0.250 (0.101)***	0.077 (0.072)
First / 2:1 * Res. Score – base 3rd / pass	0.216 (0.096)**	-0.034 (0.080)
2:2 * Research Score	0.145 (0.066)**	-0.005 (0.056)
Arts Degree	0.273 (0.212)	0.224 (0.216)
Business Degree	-0.290 (0.176)*	-0.265 (0.181)
Maths / Engineering / Technology	-0.586 (0.195)***	-0.593 (0.204)***
Science	-0.330 (0.194)*	-0.544 (0.211)***
Medicine	-0.477 (0.220)**	-0.616 (0.251)**
Other	-0.713 (0.262)***	-0.211 (0.240)
Combined	0.001 (0.172)	-0.078 (1.786)
Postgraduate Qualification		-0.280 (0.103)***
Personal Characteristics		
Female	-0.020 (0.104)	0.009 (0.114)
Catholic	-0.162 (0.100)	-0.155 (0.103)
Single		0.091 (0.123)
Female * child		0.886 (0.244)***
Male * child		-0.158 (0.379)
Both parents professional	-0.188 (0.131)	-0.547 (0.149)***
Job Related Dummies		
Manufacturing		-0.018 (0.162)
Public Sector		-0.180 (0.119)
Employed in NI	0.212 (0.108)**	-0.049 (0.107)
Log likelihood	-448.324	-415.383
Regression Significance	99%	99%
Pseudo R2	0.136	0.141

Table 7: OLS Wage Equations – No Interactions		
Dependant: Log Wages	Model 5	Model 6
Constant	9.629 (0.158)***	9.671 (0.151)***
Human Capital Related Variables		
Age	0.005 (0.005)	0.004 (0.005)
HND	0.076 (0.067)	0.068 (0.067)
A Level Point Score	0.006 (0.002)***	0.006 (0.002)***
Degree Class	0.029 (0.013)**	0.029 (0.013)**
Guardian Research Score	0.011 (0.011)	
Top 20 ranked university		0.103 (0.053)**
Arts Degree	-0.104 (0.054)**	-0.102 (0.054)*
Business Degree	0.009 (0.042)	0.009 (0.042)
Maths / Engineering / Technology	0.061 (0.046)	0.070 (0.046)
Science	0.010 (0.047)	0.016 (0.047)
Medicine	0.205 (0.052)***	0.207 (0.052)***
Other	-0.062 (0.058)	-0.068 (0.056)
Combined	-0.083 (0.042)*	-0.077 (0.042)*
Postgraduate Qualification	-0.010 (0.024)	-0.008 (0.024)
Personal Characteristics		
Female	-0.103 (0.026)***	-0.104 (0.026)***
Catholic	0.029 (0.024)	0.032 (0.023)
Single	-0.046 (0.026)*	-0.048 (0.028)*
Female * child	0.013 (0.062)	0.011 (0.062)
Male * child	-0.121 (0.086)	-0.123 (0.086)
Both parents professional	0.023 (0.030)	0.019 (0.030)
Job Related Dummies		
Manufacturing – base other	0.064 (0.037)*	0.060 (0.037)*
Public Sector	-0.053 (0.028)*	-0.054 (0.028)**
Employed in NI	-0.274 (0.024)***	-0.267 (0.024)***
R^2	0.278	0.281
F Statistic	13.76***	13.94***

Table 8: OLS Wage Equations – Interactions		
Dependant: Log Wages	Model 7	Model 8
Constant	9.554 (0.180)***	9.194 (0.209)***
Human Capital Related Variables		
Age	0.005 (0.005)	0.005 (0.005)
HND	0.053 (0.084)	0.022 (0.083)
A Level Point Score	0.005 (0.002)***	0.005 (0.002)***
Degree Class	0.049 (0.028)*	0.041 (0.029)
Guardian Research Score	0.035 (0.017)**	0.120 (0.031)***
First / 2:1 * Res. Score – base 3rd / pass	-0.027 (0.018)	-0.02 (0.018)*
2:2 * Research Score	-0.035 (0.013)***	-0.031 (0.013)**
Arts Degree	-0.106 (0.053)**	0.089 (0.209)
Business Degree	0.007 (0.042)	0.410 (0.152)***
Maths / Engineering / Technology	0.053 (0.046)	0.812 (0.205)***
Science	0.004 (0.047)	0.266 (0.188)
Medicine	0.184 (0.052)***	0.282 (0.211)
Other	-0.064 (0.058)	0.530 (0.157)***
Combined	-0.081 (0.042)*	0.513 (0.184)***
Arts * Res. Score - *Base SocialSc * Score*		-0.042 (0.046)
Business * Res. Score		-0.090 (0.034)***
Math / Eng. / Tech. * Res. Score		-0.167 (0.044)***
Science * Res. Score		-0.059 (0.041)
Medicine * Res. Score		-0.023 (0.045)
Combined * Res. Score		-0.132 (0.040)***
Other * Res. Score		-0.151 (0.037)***
Postgraduate Qualification	-0.007 (0.024)	-0.003 (0.024)
Personal Characteristics		
Female	-0.101 (0.026)***	-0.106 (0.025)***
Catholic	0.031 (0.023)	0.029 (0.023)
Single	-0.045 (0.027)	-0.045 (0.027)
Female * child	0.023 (0.062)	0.046 (0.061)
Male * child	-0.129 (0.085)	-0.113 (0.084)
Both parents professional	0.026 (0.029)	0.026 (0.029)
Job Related Dummies		
Manufacturing	0.060 (0.037)	0.060 (0.036)*
Public Sector	-0.055 (0.028)**	-0.059 (0.027)**
Employed in NI	-0.275 (0.024)***	-0.280 (0.024)***
R^2	0.288	0.315
F Statistic	13.15***	11.50***

Table 9: % Wage Increase for a 1 Point Rise in Research Rating	
	Third / Pass
Arts	7.9**
Business	3.1
Maths & Engineering	-4.5
Science	6.3*
Medicine	9.8**
Combined	-1.1
Other	-3.0
Social	12.1***

Figure 1: Research / Teaching Score Crosstabulation



Appendix 1: Transition Probits for Non-exit from and Entry to Overeducation		
Dependant: Overeducated in current job	Current contingent on overeducated job1	Current contingent on not overeducated job1
Constant	2.154 (1.252)*	-0.518 (0.956)
Human Capital Related Variables		
Age	-0.031 (0.029)	0.002 (0.024)
HND	-0.460 (0.649)	-0.069 (0.529)
A Level Point Score	-0.036 (0.016)**	-0.028 (0.013)**
Degree Class	-0.088 (0.257)	0.039 (0.162)
Guardian Research Score	0.010 (0.119)	0.100 (0.080)
First / 2:1 * Research Score – base 3rd / pass	-0.028 (0.156)	-0.112 (0.093)
2:2 * Research Score	0.025 (0.105)	-0.022 (0.067)
Arts Degree – *Base Case Social Science*	0.451 (0.337)	-0.366 (0.351)
Business Degree	0.094 (0.288)	-0.336 (0.260)
Maths / Engineering / Technology	-0.148 (0.343)	-0.533 (0.274)**
Science	-0.519 (0.329)	-0.430 (0.294)
Medicine	0.057 (0.418)	-1.233 (0.445)***
Other	0.194 (0.457)	-0.048 (0.310)
Combined	0.285 (0.280)	-0.396 (0.269)
Postgraduate Qualification	-0.316 (0.165)*	-0.103 (0.156)
Environmental / Other		
Female	0.035 (0.019)	-0.098 (0.163)
Catholic	-0.212 (0.172)	0.023 (0.150)
Single	-0.018 (0.203)	0.151 (0.185)
Female * child	0.907 (0.395)**	0.811 (0.374)**
Male * child	0.407 (0.743)	-0.431 (0.597)
Both parents professional	-0.804 (0.238)***	-0.212 (0.204)
Current job in NI	-0.012 (0.175)	-0.066 (0.160)
Log likelihood	-166.241	-182.885
Regression Significance	99%	99%
Pseudo R2	0.115	0.097

Data Appendix

Age = 1998 – birth year

Female: Gender Dummy

Catholic: Religion Dummy

Tot_al = Total A-level point score (10=A, 8=B, 6=C, 4=D, 2=E, 0=F/U)

HND: Dummy indicating the attainment of a Higher National Diploma.

Art Degree: Dummy indicating that individual held an Arts degree

Social Science Degree: Dummy indicating that individual held a Social Science degree

Science Degree: Dummy indicating that individual held a Science degree

Business: Studies Degree: Dummy indicating that individual held a Business Studies degree

Maths Engineering or Computing: Dummy indicating that individual held a degree in Maths, Engineering or Computing.

Medicine: Dummy indicating that individual held a Medical degree

Combined: Dummy indicating that individual held a Combined degree

Other: Dummy indicating that individual held in other subject degree

DegClass: degree classification: 5=first, 4=2:1, 3=2:2, 2=third, 1=general/pass.

First / 2:1: Degree class dummy

2:2: Degree class dummy

Research Score: Guardian Research rating.

Single: Marital status dummy.

Fem * child: Female with child dummy.

Male * child: Male with child dummy.

Both parents professional: Economic background dummy.

Current job in NI: Current job locational dummy.

Manufacturing: Dummy employed in manufacturing sector.

Public sector: Dummy, employed in public sector.