

Degrees of Quality

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1. Introduction

The positive relationship between higher education (HE) attainment and earnings is well documented (Card, 1999; Blundell et al, 2005). But given the rapidly increasing proportion of individuals pursuing HE across the developed and developing world, the type and quality of higher education that students obtain has become of growing research and policy interest (Altonji et al, 2015). Moreover, higher education sectors are becoming more marketized, with students and graduates expected to contribute a greater share of the costs of HE through tuition fees. As such it is important to understand whether the field of study or quality of institution chosen can deliver additional wage gains. This type of information is important for policymakers, potential employers and practitioners, as well as for individual students themselves.

2. Variations in Earnings Payoffs to HE

To date, the literature has shown a great deal of heterogeneity in labour market returns to degrees. A focus has been placed on changes over time as the earnings payoff to degrees has varied in some countries over time (Autor, Katz and Kearney, 2008; Machin and Wyness, 2017), variations for workers with different demographics (for example, for gender and race see Altonji and Blank, 1999, Figueiredo, 2017, and Chiswick, 2017) and for institutional

features of the HE system like subject of degree/major choice or institution attending. To study “degrees of quality” we focus on these last two, both separately and together.

Subject of Degree/Field of Major

In the UK, Walker and Zhu (2011) have reported evidence of wage differentials varying considerably variation in returns across different degree subjects. While women enjoy large returns from all subject types, men experience very large returns from law, economics and management degrees, but less so for science, technology, engineering, maths degrees. Meanwhile degrees such as arts, education and humanities attract far lower returns.

Understanding these differences is particularly important in the UK since students specialize right at the outset of university enrolment, and transfers to different programs are extremely rare (HESA, 2016). The same is true in developing countries where students often face the widespread requirement to choose their area of specialization early in their course, and often once the choice is made institutions are relatively inflexible so that change is impossible (World Bank, 2000). However, in other places higher education is more general and students specialize later on in their degree. For example, in the United States students pick a variety of subjects. But heterogeneity in returns by major is also apparent in the US, where STEM and business majors attract the highest returns (Altonji et al, 2016). Demand for STEM majors in particular is escalating in the US, where jobs requiring STEM skills will grow at 1.6 percent annually in the 2008-18 decade versus 1 percent for other occupations, but where STEM graduates make up only 14% of graduates (in comparison to 42% in China, and 28% in Germany) (McKinsey, 2012), perhaps explaining the high wage premium. Producing STEM graduates is also a growing issue in the developing world. Indeed India and China are projected to become dominant suppliers of STEM graduates – but there are concerns about the quality of STEM degrees in these countries (McKinsey, 2012), again highlighting the need to understand whether such degrees really produce wage returns.

One research challenge that immediately jumps out from this work is defining the appropriate counterfactual for evaluating the wage differential attached to a particular degree subject. Recent research in the area has, however, made significant methodological advances. Drawing upon rich Norwegian register data matched to university admissions, Kirkboen et al (2016) ensure that wage differentials can be identified by exploiting Norway’s centralized admission process where discontinuities act to effectively randomize applicants near unpredictable admission cutoffs into different institutions and fields of study. In doing so, they pin down significant wage gains connected to different fields of study.

College Quality

Heterogeneity by institution is common throughout the world. In the US in particular, there are a wide range of institution types – public, private, for-profit – emerging in response to demand. The same is true in developing countries, where rapid expansion in the demand for HE, in conjunction with a cash-strapped public sector, has resulted in the emergence of private colleges (World Bank, 2000).

A small body of evidence reports evidence where wage returns vary according to quality of institution. Early studies in this area were very US centric and typically used measures of the ability of the student intake (usually SAT scores) as a proxy for quality, finding small positive effects (Brewer and Ehrenberg, 1996). However, as documented by Black and Smith (2006), using a single measure of college quality can exert downward bias in the effects of college quality on wages due to increased presence of measurement error (though they none-the-less conclude that SAT score is the most reliable quality measure). The small number of studies from the UK and US which use multiple dimensions of quality also tend to find small positive effects of student entry scores. These studies typically estimate statistical regressions that look at the relationship between earnings and each dimension of quality (conditioning on a rich set of characteristics), and then, to account for issues of collinearity among these quality variables, also create quality indices (usually using factor analysis) based on their input measures.

For example, Black, Daniel and Smith (2006) use faculty salaries, freshman retention rates and average SAT scores as their chosen quality measures. After conditioning on a rich set of characteristics, as well as years of schooling, they find largely positive significant effects for men and women. They also create a quality index based on the three measures of quality, and find that college quality matters for the future earnings of men and women; specifically that going from the 25th to 75th quartile of the quality distribution increases wages by 7.2 percent for men and 3.5 percent for women.

Similarly, Black and Smith (2009) and Hussein, McNally and Telhaj (2009), the latter being a rare example of a UK based study of the importance of quality, both use a similar set of quality measures in their studies, again regressing each dimension separately and then together, using two factor models, and models combining all dimensions of quality. Table 1 presents a comparison of the findings of these two studies. As can be seen, both studies come up with very similar findings – that quality matters for future earnings, though in the context of an estimated average return to higher education of 48% (Blundell et al, 2005) returns to quality are potentially quite low (the numbers in the Table range from 5.6 to 8.0% of $\log(\text{wages})$).

Table 1: Impact of college quality on earnings, comparison of studies

| | Hussein, McNally & Telhaj | Black and Smith * |
|---|---------------------------|-------------------|
| Factor combines faculty student ratio and the retention rate | 7.24 (1.79) | 8.00 (3.31) |
| Factor combines faculty student ratio and total tariff score (mean SAT scores for Black and Smith) | 6.52 (1.42) | 6.10 (2.78) |
| Factor combines retention rate and total tariff (mean SAT scores for Black and Smith) | 6.35 (1.29) | 5.60 (2.25) |

* Coefficients and standard errors (in parentheses) multiplied by 100

Source is Hussein, McNally and Telhaj (2009)

But what if a student's decision to attend a particular university is driven by underlying factors which also affect their future earnings? For example, more ambitious students may choose the most selective university and may also do well in the labour market due at least in part to their ambitious nature. The studies thus far mentioned deal with this selection problem using selection on observables. That is to say, they attempt to control for these effects by conditioning on rich sets of variables, such as student ability measures and demographic characteristics. Dale and Krueger (2009) meanwhile present the first study using quasi-experimental methods to overcome this problem. Their method of adjusting for selection effects is to compare earnings of students who applied to and were accepted and rejected by a comparable set of institutions. They find that students who attended more selective colleges in fact do not earn more than other students, though they do find a positive internal rate of return from attending a college with higher resources, suggesting some role for college quality. A follow up paper (Dale and Krueger, 2014) which uses better data and longer term outcomes, again shows that after accounting for selection effects there is a limited role for college quality, but that it does matter for the future earnings of students from ethnic minority backgrounds, those whose parents are poorly educated. A potential explanation is that selective colleges provide access to networks for these types of students. This supports work by Crawford et al (2016) which concludes that returns to college are higher for students from more advantaged backgrounds, even after controlling for prior attainment, institution and subject.

Subject/Field of Study and Institution

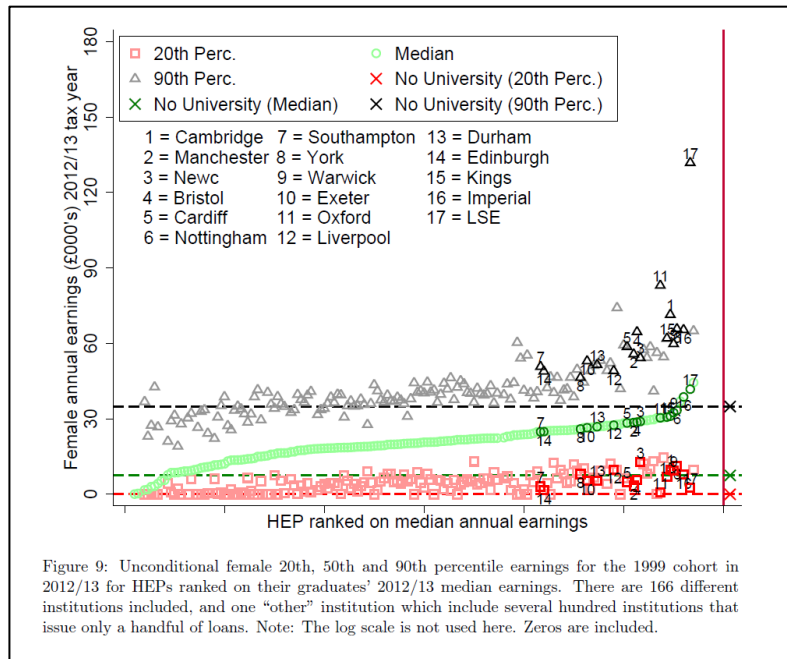
The above literature tells us that in order to maximise their labour market returns, students should study subjects such as economics and law, and (at least for certain groups) they should attend a higher quality institution. But what about the interaction between the two?

Should students study economics or law at Oxford or Harvard to get the best return? And which is the most important factor?

Until recently, researchers had not broached this question, presumably due to data limitations. Generating a robust wage return for studying economics at Harvard, compared to economics at Yale, or maths at Columbia would require a large scale dataset. However a significant advance in this dimension is the availability of administrative data, which furnishes the analyst with data of sufficient magnitude to make these inferences.

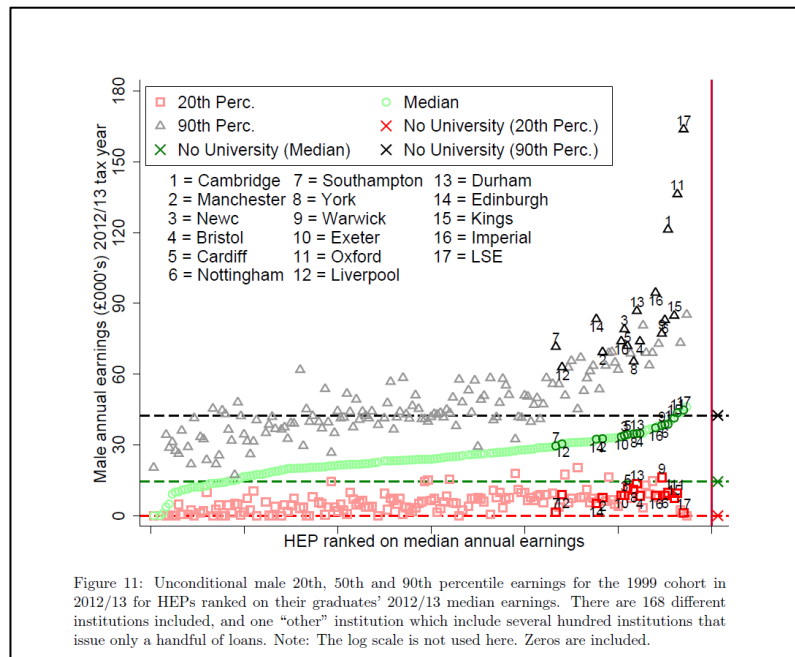
Britton et al (2016) have made considerable advances by using tax and student loan administrative data to measure how the earnings of English graduates vary by institution, subject, and also by subject groupings within institution. Confirming the findings from the studies highlighted above, their analysis reveals considerable variation in earnings according to subject choice (with economics and law delivering the biggest gains, and arts degrees deliver earnings that are similar to non-graduates). As Figures 1-2 show, they also confirm that institution itself matters for earnings, with male and female students studying at more selective UK institutions (e.g. Oxford, Cambridge, London School of Economics (LSE)) going on to earn considerably more than those studying at less selective institutions. For example, as Figures 1-2, which show the distribution of earnings by higher education institution indicates, male and female graduates of the prestigious LSE are among the highest earners in the country. Moreover, even among the top 10% of earners in the country, there is variation in earnings by institution, with LSE graduates earning the most.

Figure 1: Higher Education Provider ranked on median annual earnings – females



Source is Britton, Dearden, Shephard and Vignoles (2016)

Figure 2: Higher Education Provider ranked on median annual earnings – males

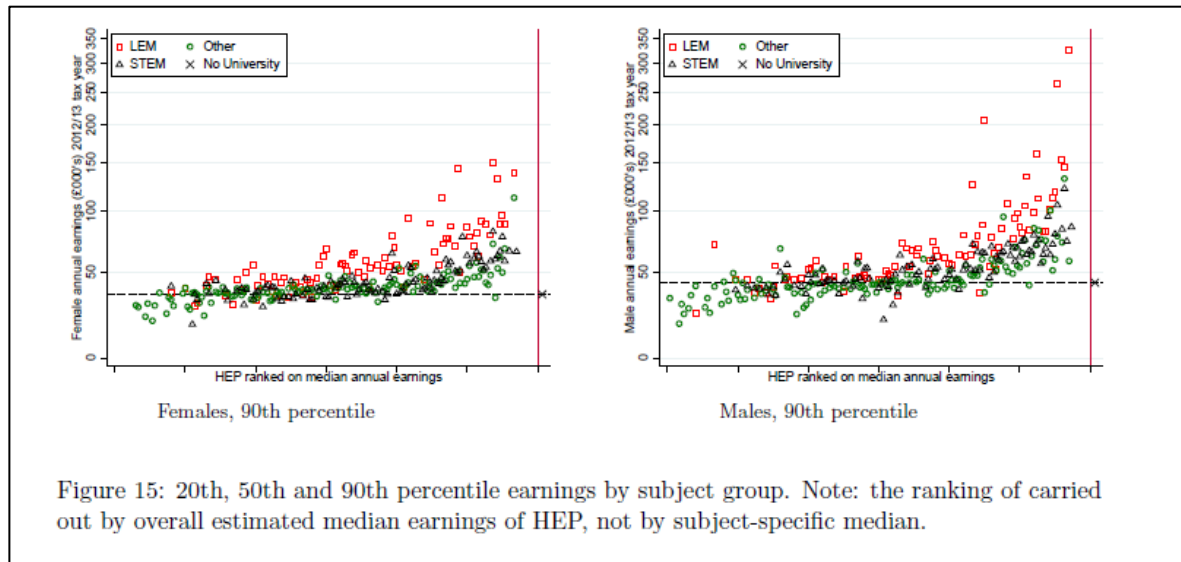


Source is Britton, Dearden, Shephard and Vignoles (2016)

Putting these two findings together, Britton et al show there is an important interaction between institution and subject. Figure 3 highlights this, showing earnings by subject group and institution among earners in the 90th percentile. As the figure shows, not only do students at certain (usually highly selective) institutions earn more than others at less selective institutions, but those studying certain subjects at these institutions (notably law, economics

and management) can earn even more besides. This is a powerful finding and the first attempt in the literature to provide evidence of the importance of subject and institution combined.

Figure 3: Graduate earnings by subject group and institution



Source is Britton, Dearden, Shephard and Vignoles (2016)

The Norwegian study of Kirkoboen et al (2016) is also able to study the labour market impact of both subject of study and institution attended. In their analysis, they too report significant wage differentials connected to both. However, the former are larger than the latter, which they attribute to individuals gaining wage premia by choosing fields in which they have a comparative advantage.

3. Conclusions

Evidence from a wide range of settings shows considerable heterogeneity in earnings differentials connected to higher education. In this (short) piece, we focus on subject/major and on institution attended, showing that there are significant differences in labour market outcomes connected to both. The use of very rich administrative data has become a key feature of the newer research in the area, with the work moving in the direction of testing the key question of selection effects. Put differently, does the huge earnings power of graduates in particular degrees and institutions arise from the subject and institution they graduated from, or the underlying factor that led them to choose this course in the first place? Offering evidence on this remaining piece of the quality puzzle is still for the most part missing, but with advances in the availability of large scale datasets, it is surely soon to come.

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