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Graduate Earnings: An Econometric Analysis of Returns, Inequality and Deprivation across the UK

Summary Report

Alan Ramsey, Analytical Service Group
Department for Employment and Learning
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GRADUATE EARNINGS: AN ECONOMETRIC ANALYSIS OF RETURNS, INEQUALITY AND DEPRIVATION ACROSS THE UK

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**Alan Ramsey
Analytical Services Group, DEL**

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This article sets out the extent and source of variation in UK graduate earnings. It focuses in particular on estimating the effect of factors such as degree subject, degree classification, and Institution attended, as well as a range of personal and social characteristics. It concludes that estimates of the average rate of return to a university degree are likely to conceal much variation about the average. The paper also offers an assessment of the extent of graduate deprivation and inequality in the UK.

Context

With its declaration of “Education, Education and Education”, the election in 1997 of the incoming Labour Government represented a watershed for the higher education sector. The past decade has witnessed significant upheaval in almost every aspect of the sector driven, to a large extent, by the UK Government’s aspiration to see 50% of all 18-30 year olds having received higher education by 2010.

In the last 10 years the method of financing students through university has changed considerably with a shift in the burden away from tax payers and onto students themselves. The evidence base at the heart of this rebalancing has been an increasingly sophisticated analysis of graduate earnings, which show that the rate of return or ‘returns’ to higher education have not fallen over time¹. Consequently it has become increasingly difficult and seemingly disingenuous to advocate a system of higher education funded solely from the public purse.

The purpose of this article is to investigate the nature and determinants of graduate earnings and, in particular, test the hypothesis that there is significant variation in the rate of return to a first degree according to the characteristics of students and their chosen studies.

Background

With the introduction of the Graduate Contribution Scheme from 2006, universities can charge annual tuition fees of up to £3,000. Unsurprisingly then participation in higher education is being increasingly seen as a financial decision, with substantial investment costs incurred by students (and their sponsors) being set against improved labour market opportunities post graduation. Indeed, recent research has estimated that a representative graduate would enjoy a £149,761 lifetime earnings advantage over a non-graduate².

However, such opportunities will be heavily influenced by a number of factors related to personal characteristics, the nature and location of degree programmes, and the state of the economy. The aim of this article is to contribute to what is a growing body of empirical evidence highlighting the variable returns that are available to graduates. It does so by investigating the variation or heterogeneity in the average earnings of UK graduates and considers what inference, if any, can be made in relation to the rate of return of a university degree.

¹ See, for example, McIntosh (2004), Dearden *et al* (2005) and Universities UK (2007).

² O’Leary and Sloane (2005)

The Data

This article exploits the individual-level Higher Education Statistics Agency (HESA) information from the administrative records for the whole population of students leaving UK universities in 2005, combining this information with the employment and salary information obtained six months after graduation in the form of the HESA Destination of Leavers from Higher Education (DLHE) Survey.

The obvious problem associated with collecting employment and earnings data so soon after graduation is that it is generally considered to be a poor reflection of career path. In order to address this problem HESA are currently undertaking a follow-up survey on a sample of 2002/03 leavers who responded to the 2002/03 DLHE survey. This follow-up survey at approximately three and a half years after graduation will provide a valuable source of longitudinal data with information more closely aligned to the early career trajectories of graduates.

The HESA administrative records include information at the institutional level about entry qualifications, programmes taken, and outcomes, together with student characteristic variables such as age, gender, ethnicity, and disability. When combined with the DLHE data on employment and salary it represents a rich source of graduate information from which it is possible to analyse the determinants of graduate earnings.

After data cleansing and merging there is a robust sample of 40,296 graduates³. This includes all graduates who had successfully completed a full-time first undergraduate degree in 2004/05, are in full-time paid employment, and had identified salary information six months after graduation.

³ In 2004/05 there were 430,290 qualifiers from UK universities. The process of merging files and dropping observations reduces this to 40,296. For example, from the 430,290 graduates approximately 75% responded to the DLHE Survey (322,718), merging the information across 3 separate data files further reduces the sample (277,471). From this file a further 130,944 observations are dropped as follows: part-time qualifiers, 56,188; other undergraduate and Postgraduate qualifications, 69,492; unsuccessful completion, 314; medical/dentistry qualifiers, 4,950. This left 146,527 observations. From this total there are 88,740 in paid employment, 45% of whom provide salary information (i.e. 40,296).

Table 1

	MALE	FEMALE
Variable	proportion	proportion
	Academic Background	
Previous qualifications		
A-levels/SCE Highers	0.78	0.75
A-levels		
Score	134	144
	Personal characteristics	
Age<24	0.82	0.78
Age 24-27	0.11	0.09
Age 28-33	0.03	0.04
Age 34+	0.03	0.09
Disability	0.07	0.06
Overseas Student	0.02	0.02
High SEC	0.72	0.72
Low SEC	0.28	0.28
White	0.88	0.89
	Degree Classification	
First	0.13	0.11
Upper second	0.46	0.53
Lower second	0.32	0.27
Third	0.04	0.03
	Higher Education Institution	
Old	0.23	0.21
Modern	0.50	0.52
Russell	0.23	0.20

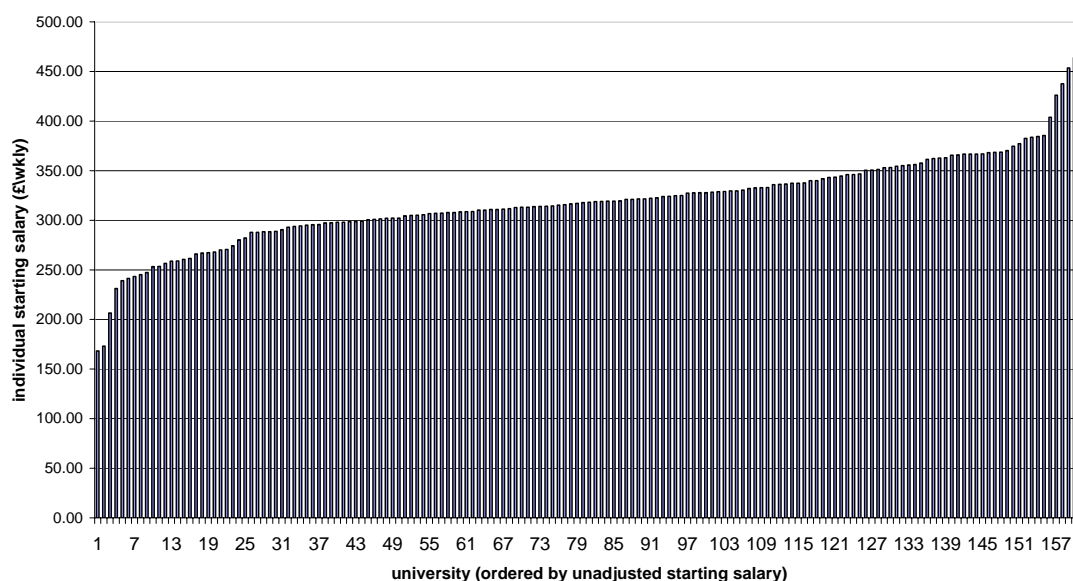
Table 1 presents summary statistics for some of the main explanatory variables used in the analysis. All figures are proportions apart from 'A-Level score', which is a mean value. Key characteristics included:

- female (male) graduates account for 59% (41%) of the sample;
- around three quarters (76.5%) of graduates took A-levels or Scottish Highers prior to university with an average A-level score of around 140 points;

- four-fifths (80%) of individuals were aged less than 24 at graduation;
- just under half of the sample identified socio-economic classification (18,434), of which approximately one in four graduates came from a low socio-economic group. Over half (55%) came from professional and managerial households;
- 11% (13%) of female (male) students graduated with a first class degree, 53% (46%) with an upper second class and 27% (32%) with a lower second class; and
- approximately half (51%) of students graduated from 'modern' universities⁴.

Figures 1, 2, 3 and 4 depict graduate earnings in terms of a few of the key variables of heterogeneity as outlined previously, that is, by gender, by degree subject, by degree classification, by institution and by region.

Figure 1: Distribution of individual starting salaries across universities



Figures 1 and 2 illustrate that, in the raw data, there is substantial variation in average graduate starting salaries across university sectors; the mean earnings of graduates ranked lowest in the distribution were around one third of the level at the highest ranked university. Furthermore, **Figure 2** shows that, on average,

⁴ 'Old universities' are those established before 1992. 'New universities' include former polytechnics and HE degree-awarding colleges created with the abolition of the binary divide in 1992. The Russell Group is an association of 20 major research-intensive universities in the UK

the 21% of graduates from the elite Russell Group of universities enjoy a small earnings perk over their counterparts; 7.6% (5.0%) over 'old' graduates ('new' graduates), with significant variation by gender, with average female earnings being somewhat lower than those for males.

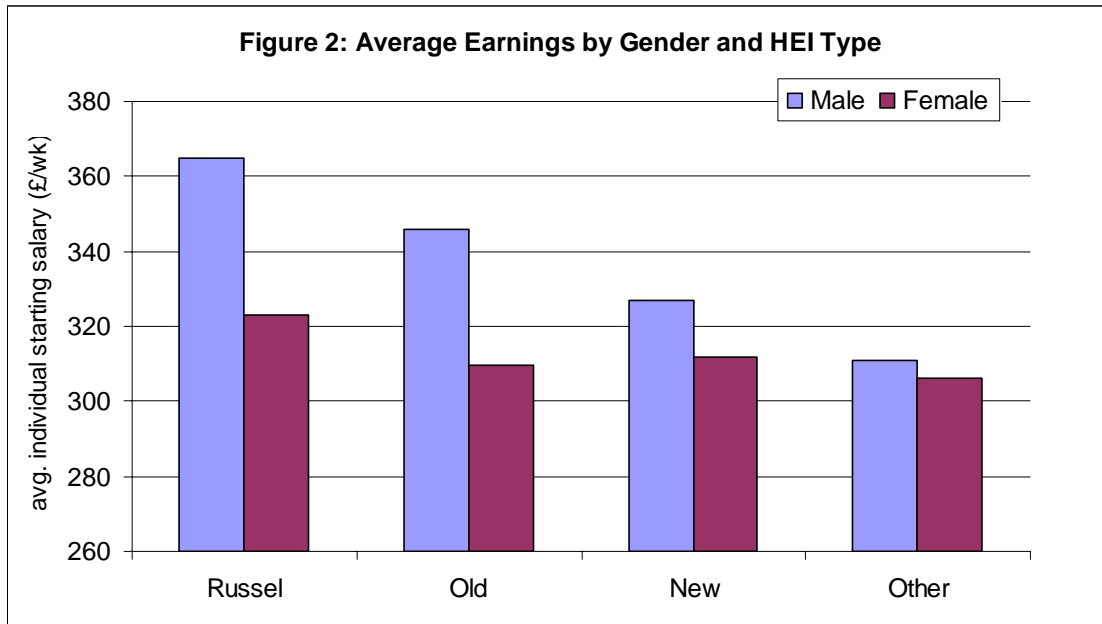


Figure 3 illustrates the effect of degree classification in the raw data; as we might expect there is a positive correlation between the level of achievement and earnings, such that, the starting salary for someone holding a First is on average 18% higher than someone holding a Third. This differential is greater for males (26.8%) than females (10.5%).



It is evident from **Figure 4** that average earnings are skewed with London, the South East, South West and the East of England regions displaying the highest average graduate starting salaries. Average starting salaries are 29% higher in London (highest earnings region) compared to Northern Ireland (lowest earnings region). Also, average male starting salaries are higher than female starting salaries in each region of the UK. Adjusting the raw data to take account of variations in the cost-of-living between regions narrows but does not significantly disturb the broad trend.

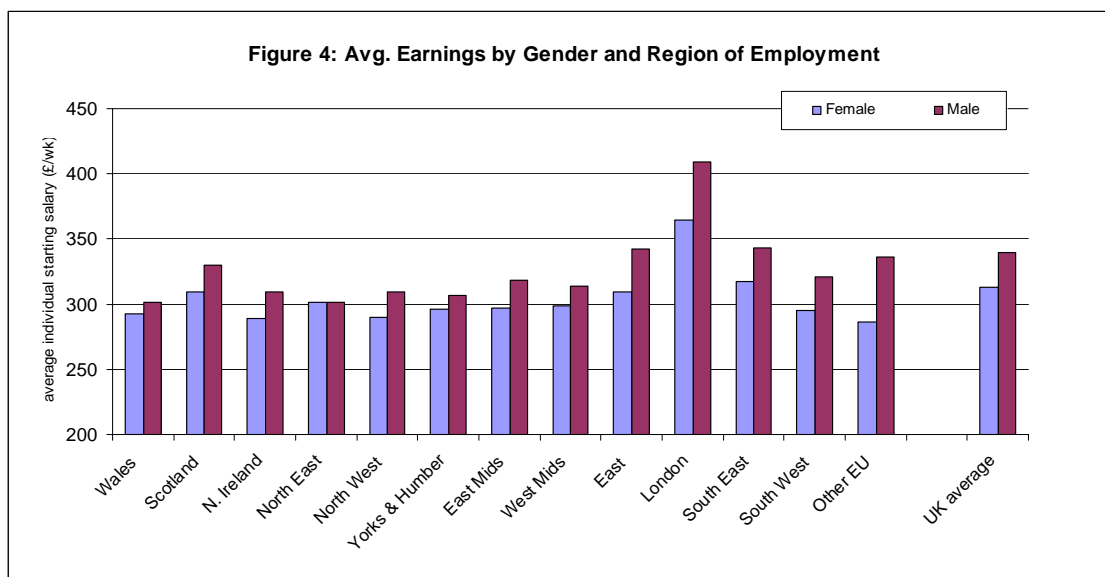


Table 2 presents the regional distribution of graduates with reference to the distribution of the total workforce, thereby allowing us to draw inference about the representation of graduates across and within regions.

Table 2: Share of Graduate Employment by Region

	MALES			FEMALES		
	% of workforce	% of graduates	Ratio	% of workforce	% of graduates	Ratio
North East	3.9%	4.5%	1.17	4.0%	4.5%	1.10
Yorkshire & the Humber	8.3%	8.6%	1.04	8.3%	8.5%	1.03
East Midlands	7.4%	6.7%	0.90	7.4%	7.0%	0.95
East of England	9.6%	7.1%	0.74	9.3%	7.3%	0.78
London	12.9%	20.4%	1.59	12.2%	18.5%	1.52
South East	14.3%	12.9%	0.90	14.3%	12.6%	0.88
South West	8.5%	8.4%	0.99	8.6%	7.9%	0.91
West Midlands	8.9%	7.8%	0.88	8.5%	8.2%	0.96
North West	10.8%	10.1%	0.94	11.3%	10.0%	0.89
Wales	4.5%	4.3%	0.95	4.7%	4.6%	0.98
Scotland	8.4%	7.1%	0.84	8.8%	8.5%	0.97
N.Ireland	2.7%	2.2%	0.83	2.6%	2.5%	0.97

Source: LFS, DLHE

There is a heavy clustering of graduate employment in London and the South East, where for example 20.4% and 12.9% respectively of all male graduates are employed. In terms of graduate representation, the ratio of graduate employment to total workforce employment is greatest in London, at 1.56 for all graduates. Interestingly, graduate over-representation is not found in the South East but rather two northern regions of England, in particular the North East. At the other end of the scale with one of the lowest graduate representation ratios (particularly for males) is Northern Ireland, which has 2.7% of the male workforce and yet only 2.2% of male graduates.

Econometric Analysis

The information below represents the results of applying standard economic techniques to the HESA dataset. These techniques allow us to isolate the effects of individual factors on graduate earnings, all other measured influences remaining constant. For example, males are more likely to have attended the “Russell Group” of universities than females. It is likely that higher male earnings will, in part, reflect this. Econometric analysis allows us to take this factor into account when making comparisons. It must be remembered, however, that this analysis can only hold those factors which are measured constant: there may be other, unmeasured, causes of variation. Bearing this in mind, the key results are as follows:

Gender

- Compared to an otherwise identical female graduate, male graduates earn on average 3.8% more. In the raw data the advantage was 8.4% so whilst the earnings differential has narrowed significantly – by more than half – there clearly remains a systematic gender difference in graduate earnings in the UK.

Domicile

- Overseas students’ earn, on average, between 9% – 11.5% more than the earnings of an otherwise identical home domiciled student.

Social Background

- There is some evidence, at least for females, that those from higher social class backgrounds progress into relatively higher paying jobs after graduation, even if the variation is quite small.
- There is no statistically significant effect of social background on male graduate earnings within the sample.

Degree subject

- Degree subject emerges from the analysis as a significant determinant of graduate earnings. To illustrate the variation, compared to the average earnings of a Social Studies graduate, an otherwise identical graduate with a Mathematical Sciences degree earns, on average, 5.5% more; and an otherwise identical female graduate with a Languages degree earns, on average, 7.3% less - and males earn 13% less.

Degree classification

- There is variation in average earnings of around 8% between the earnings associated with a first and those associated with a third class degree, for the otherwise average male graduate.
- Degree classification has only a marginal impact for females at around a corresponding 3% differential.

Institution-type

- Limited evidence that graduate earnings vary to any significant extent by the type of institution attended, particularly for females.
- For males, the premium enjoyed by Russell Group graduates over otherwise identical 'modern' graduates is, on average, 3.5% higher.

Region of Employment

- There is a systematic regional bias in graduate earnings⁵.
- Graduates employed in the 'North' of the UK earn on average 11.5% less than graduates based in the 'South'.
- Compared to the average earnings of a female (male) graduate employed in Northern Ireland an otherwise identical female (male) graduate employed in the South East of England excluding Greater London earns, on average 11.1% more (6.7% more); and an otherwise identical female (male) graduate employed in Greater London earns, on average 29.8% more (25.6% more).

Occupation

- Graduates employed within 'high' status occupations⁶ in the UK earn, on average, 23.6% more than employed within Skilled Trades, Sales and other Elementary occupations.
- The financial reward to obtaining 'high' status employment is, on average, greatest in Scotland and Yorkshire and the Humber and lowest in Northern Ireland. In the case of the former regions, graduates employed in 'high' status occupations can expect to earn, on average, 27% more than graduates in 'low' status occupations. In Northern Ireland the financial reward is significantly less at 16%.

In sum, these results suggest that there is substantial variation around the average earnings of graduates according to degree subject, region of employment, occupation and industry, amongst others. There is variation by degree classification but not substantially so, certainly not for females at least. We contend, therefore, that estimates of the average rate of return to a university degree are likely to conceal much variation about the average.

As university tuition fees have become the norm and, in particular, as flat fees have been replaced with variable fees this kind of information will become increasingly vital for students to inform their decision making.

⁵ Northern Regions: West Midlands, Yorkshire and the Humber, Northern Ireland, North West, North East, Wales, and Scotland
Southern Regions: Midlands, East of England, South East (inc. Greater London), and the South West
Peripheral regions: Northern Ireland, Wales, Scotland and the North East
Central regions: West Midlands, East Midlands, Yorkshire and the Humber, and the North West
South Excl. Gr. London: South West, South East and East of England
Greater London

⁶ High status occupations include 'Managers and Senior Officials', 'Professionals' and 'Associate Professional and Technical'

Analysis by Inequality Decomposition

One question that is of particular interest in the study of inequality is this: how much of the overall income inequality that we observe in a society can be explained by inequality within groups and how much can be explained by inequality between groups?

Table 3: The Regional Divide in Graduate Income in 2005 -

Values of inequality indices based on analysis of individuals by gross weekly income

	North	South	Peripheral	Centre	South excl. Gr. London	Gr. London
Observations	6,501	9,165	1,850	5,965	4,736	3,115
Mean Income (£)	287.41	327.99	286.15	288.57	305.47	377.87
Population Share (%)	41.5	58.5	11.8	38.1	30.2	19.9
Income Share (%)	38.3	61.7	10.9	35.3	29.7	24.1

Source: Author's calculations from HESA data

Applying this idea to graduate earnings, **Tables 3** and **4** present some of the key data reflecting the incidence of graduate income inequality in the UK. Firstly, consider **Table 3**, which presents summary graduate income inequality data for the 2004/05 cohort, on a regional basis. Key findings include:

- mean gross weekly graduate income in the South (£328) was 15% higher than the corresponding level in the North (£287);
- the North, with 42% of all UK graduates, received only 38% of UK graduate income;
- at the regional level, the prosperous Greater London region with 20% of graduates in the sample, received almost one quarter of total graduate income and enjoyed a mean gross weekly per capita income that was 22% above the UK average. Conversely, the poorer peripheral region of the UK, with 12% of graduates, received 11% of total graduate income and had a mean per capita income that was 92% of the UK average;
- graduate income inequality in the North was slightly lower than in the South, though not markedly so⁷; and
- whilst average graduate earnings were greater in the South of the UK, they were also more unequally distributed.

⁷ The value of the Gini coefficient in the North was 0.15, compared to 0.17 in the South

Table 4: Percentage within- and Between-Group Contributions to Inequality

Decomposition By ↓	Contribution (%)
Region	
Within-Group Contribution	95.6
Between-Group Contribution	4.4
Total	100
Subject	
Within-Group Contribution	91.7
Between-Group Contribution	8.3
Total	100
Occupation	
Within-Group Contribution	78.8
Between-Group Contribution	21.2
Total	100
Industry	
Within-Group Contribution	94.8
Between-Group Contribution	5.2
Total	100
Institution	
Within-Group Contribution	89.0
Between-Group Contribution	11.0
Total	100

Source: Author's calculations from HESA data

Table 4 presents the results of decomposing graduate income inequality by subdividing the sample of graduates across the themes of heterogeneity already identified:

- Only 4.4% of overall graduate inequality in the UK could be 'explained' by differences in the mean income between regions. On the other hand, occupation provided the best explanation for the observed inequality in the distribution of graduate income: slightly more than one fifth (21.2%) of the inequality in incomes between graduates could be 'explained' by differences in the mean income between occupations.

- The general conclusion is that, for all five types of disaggregation the substantial part of overall inequality is the result of within-group inequality and only a very small part is due to between-group inequality.

Deprivation Analysis

Having applied the methodology of inequality decomposition to graduate earnings the analysis can be taken to a natural conclusion by investigating the source and extent of deprivation in UK graduate earnings. In this instance of course it is 'relative' as opposed to 'absolute' deprivation being examined. Consider Table 5, which presents an overall assessment of graduate deprivation in the UK.

Table 5: Graduate Poverty in the UK, 2004/05

	Graduate Poverty in the North		Graduate Poverty in the South	
	50%	75%	50%	75%
Poverty Line				
Head Count, H (%)	0.80	3.42	1.60	6.8
Poverty Gap Ratio, R (%)	0.32	0.72	0.33	1.10
Sen index (%)	0.44	1.10	0.52	1.56
Gini (poor), G^p	0.20	0.14	0.16	0.08

Source: Author's calculations from HESA data

The key findings from **Table 5** indicate that:

Headcount (H): the South had a greater *proportion* of graduates who were poor than did the North, for every poverty line; at the highest poverty line 6.8% of graduates in the South were poor as compared to 3.4% for the North.

Poverty Gap Ratio (R): the value of the Poverty Gap Ratio, at the higher poverty line, was significantly higher in the South indicating that the *depth* of graduate poverty was greater than in the North or, in other words, graduates based in the South were more poor than their counterparts in the North.

(G^p): Interestingly, the values of the Gini (poor)⁸ index suggest that there was a greater degree of income inequality among the poor in the North than in the

⁸ The Gini coefficient is a measure of income inequality where, for example, a country (or group of individuals) with a higher Gini coefficient (computed over all incomes) has a greater amount of income

South, even though the South had greater *numbers* (H) and *depth* (R) of graduate poverty.

However, looking at poverty in its totality, the lower value of (G^P) in the South was not enough to offset its disadvantage in terms of higher values of (H) and (R); there was – judging by the Sen index⁹ – ‘less’ graduate poverty in the North of the UK.

Conclusion

In summary then this article presents some of the key findings from the DEL research report ‘The Extent and Sources of Variation in UK Graduate Earnings’. The paper exploits individual-level HESA data for 2004/05 leavers from the UK university sector in order to investigate the determinants of graduate earnings. Further it presents an assessment of the source and extent of graduate income inequality and deprivation in the UK.

Applying econometric techniques we find that there is a relatively large and significant variation in graduate earnings according to the degree classification awarded, particularly for males. Given that degree classification is an *ex ante* outcome we can reasonably conclude that there must be considerable risk and uncertainty around the expected returns to a first undergraduate degree, again particularly for males. After controlling for the heterogeneity of students, we find limited evidence that graduate earnings vary to any significant extent by the type of institution attended. These two findings lead us to express concern at the introduction of, from Sept 2006, variable tuition fees. We argue that, firstly, the significant variation around the average return for a first degree will expose itself in the form of rather lower expected returns for some students. Secondly, if it is only better off students who can afford to finance the cost of relatively risky investments in those university courses associated with relatively high earnings, then there is likely to be an adverse impact on equality of opportunity and intergenerational mobility over time. Whether the operation of income-related exemptions and allowances will be sufficient to off-set this effect remains to be seen.

The problems associated with surveying graduates six months after graduation have already been noted. With a longitudinal DLHE Survey in the pipeline it will be possible for researchers and policymakers to gain a more accurate understanding of the early career trajectories of UK graduates. In particular it represents an exciting direction in which to develop this research paper.

inequality than a country with a lower Gini coefficient. The Gini coefficient takes a value within the closed interval [0,1], 0 representing complete income equality and 1 complete income inequality. Therefore, the Gini (poor) or G^P is a measure of income inequality amongst ‘poor’ individuals, that is, those whose income falls below the predetermined poverty-line level of income.

⁹ The Sen index represents the most comprehensive measure of poverty by introducing the concept of relative deprivation; computing income inequality over the incomes of ‘poor’ individuals. In this sense the Sen index is an increasing function of H, R and G^P .

'Graduate Earnings: An Econometric Analysis of Returns, Inequality and Deprivation Across the UK' is available to download from the DEL website.

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