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by

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Abstract

Earlier papers have found considerable heterogeneity in the returns to degrees in relation to subjects of study, degree classification and higher education institution. In this paper we examine heterogeneity of returns across British regions using the Labour Force Survey. We find substantial regional variations in the financial rewards available to graduates, with much higher returns in London and the South East than elsewhere. Adjusting for regional differences in the cost-of-living narrows such differences considerably. Decompositional analysis suggests that coefficient effects dominate composition effects, consistent with agglomeration and productivity spillover effects being important.

Acknowledgements

1. Introduction

The recommendations of the Dearing Commission (1997) signalled a dramatic shift in focus for the funding of students in higher education. Although 'top-up loans' were still available (see DES, 1988), students were now expected to make a contribution towards their tuition fees. In turn, in the White Paper *The Future of Higher Education* (DfES, 2003) the Government announced its intention to introduce, from 2006, a new Graduate Contribution Scheme under which universities would be allowed to charge annual tuition fees of up to £3,000, although payment by students would be deferred until after they had graduated.[1] More so than ever, participation in higher education is being 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, the Department of Education and Skills had calculated the lifetime earnings differential of graduates over non-graduates to be as much as £400,000 (see Greenaway and Haynes, 2003).[2]

Moreover, 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, and there is a growing body of empirical evidence highlighting the variable returns that are available to graduates. Amongst others, Blundell *et al.* (2000), Walker and Zhu (2003) and O'Leary and Sloane (2005) have found substantial heterogeneity in the returns across subject of study. Battu, Belfield and Sloane (1999) also found that class of first degree had a significant effect on graduate earnings up to eleven years after graduation. Similarly, those graduating from a long-established university earned between 8 and 11% more than those graduating from universities which were former polytechnics. Likewise, Elias and Purcell (2004) found that graduates are assimilated into appropriate jobs within the labour market at

different rates, depending upon the type of degree and degree classification among other factors.

One area that has not attracted as much attention is how rewards available to graduates are influenced by where they choose to work.[3] Once students have selected a degree course at a given institution and have graduated with a certain class of degree, these factors then become immutable, but where they gain employment will also exert a substantial influence over their earnings potential. To the extent that previous research has focussed upon providing information to potential students before they go to university, the analysis in this paper will be relevant to decision-making in the transitionary period between education and labour market engagement, through the calculation of the private rates of return that are available to university graduates across the standard regions of Great Britain.

2. Methodology

Consider the following relationship for any given individual in region R (of which there are eleven in the empirical estimation that follows), whose highest educational attainment is either two or more A-Levels[4] (denoted as a group A individual) or a degree (group D).

$$LnY^A = \alpha^A + \sum_{R=1}^{11} \beta_R^A Age_R + \sum_{R=1}^{11} \gamma_R^A Age_R^2 + \delta^A X + \varepsilon^A \qquad [1]$$

$$LnY^D = \alpha^D + \sum_{R=1}^{11} \beta_R^D Age_R + \sum_{R=1}^{11} \gamma_R^D Age_R^2 + \delta^D X + \varepsilon^D \qquad [2]$$

where Y denotes net hourly earnings (expressed in constant prices), Age is the age in years of the respondent, X is a vector of characteristics known to influence net hourly earnings (but

which are not affected by educational attainment), α is a constant, β, γ and δ are conformable

coefficient vectors and ε is a regression disturbance term.[5]

Assuming a representative individual with two or more A-Levels, predicted annual earnings

(in constant prices) in region R at age i will be

$$\hat{Y}_{Ri}^A = \exp(\hat{\alpha}^A + \sum_{R=1}^{11} \phi_R \hat{\beta}_{Ri}^A Age_{Ri} + \sum_{R=1}^{11} \phi_R \hat{\gamma}_{Ri}^A Age_{Ri}^2 + \hat{\delta}^A \overline{X}).hours \qquad [3]$$

where a hat signifies a predicted value, ϕ denotes a dummy variable that takes a value of 1 if

the individual is observed in region R (and 0 otherwise), $\overline{X}$ denotes a fixed set of

characteristics that define the representative individual and *hours* denotes the annual hours

this person works. Likewise, we can define the predicted annual earnings for the same

representative individual in region R at age i but whose highest educational qualification is a

degree as

$$\hat{Y}_{Ri}^D = \exp(\hat{\alpha}^D + \sum_{R=1}^{11} \phi_R \hat{\beta}_{Ri}^D Age_{Ri} + \sum_{R=1}^{11} \phi_R \hat{\gamma}_{Ri}^D Age_{Ri}^2 + \hat{\delta}^D \overline{X}).hours \qquad [4]$$

Assume that the individual with two or more A-Levels leaves school and enters the labour

market at the age of 18 and that the individual with a degree completes his or her education at

the age of 21. With continuous employment until retirement (at the age of 65 for men and 60

for women), this will imply that the additional career earnings (*ACE*) of the degree holder

over the holder of two or more A-Levels in region R will be

$$ACE = \sum_{i=21}^{64/59} (\hat{Y}_{Ri}^D - \hat{Y}_{Ri}^A) \qquad [5]$$

For the degree holder, the cost of acquiring these additional career earnings can be measured in terms of direct costs (in the form of tuition fees) and indirect costs (in terms of forgone earnings). Thus,

$$Costs = fees + \sum_{i=18}^{20} \hat{Y}_{Ri}^{A} \qquad\qquad [6]$$

From this we can calculate the private rate of return on a degree for a representative individual in region R as the internal discount rate that equates the discounted increment to additional career earnings to the cost of acquiring a degree.[6]

3. Data

The data used in this analysis come from the Labour Force Survey (LFS), a large-scale survey conducted by the *Office for National Statistics* (ONS). Switched from an annual to a quarterly basis in 1992, it aims to produce a sample of approximately 60,000 responding households in Great Britain every quarter. Over the course of the survey respondents are interviewed on five separate occasions, commencing in the quarter they enter the survey and then once more in each of the next subsequent four quarters. Following their fifth interview respondents are replaced by a new cohort. This rotating sample design means that within any one quarter approximately one-fifth of all respondents are being interviewed for the first time, one-fifth for the second time etc., all the way up to the fifth who are being interviewed for the final time. There is, therefore, an eighty per cent overlap of respondents from any one quarter to the next. To avoid any possible double-counting we ensure that individuals are only picked up once during their participation within the LFS. This is done by selecting respondents only after they have provided earnings information.[7]

The data used run from the Spring of 2000 to the Winter of 2004. The end date was chosen as the most recently available year of data and the start point was chosen to provide a sufficiently large sample for the detailed analysis that follows. By pooling the separate quarters and after selecting only university graduates for whom there was no missing information, there were over 9,000 males and 8,600 females of working age remaining who had hourly earnings data available.

4. Results

As background to the discussion, the distribution of graduates across the Government Office Regions and split by gender is shown in Table 1.[8] With reference to the regional distribution of the total workforce, the table also allows an inference to be drawn about the representation of graduates within regions. Thus, a ratio of the share of graduate employment to total employment in a region greater than unity suggests an over-representation of graduates relative to what we might expect on the basis of the size of the regional labour market and a ratio less than unity an under-representation.

[insert Table 1 near here]

Clearly evident from Table 1 is the fact that there is a clustering of graduate employment in London and the South East, where for example 20.4% and 14.7% of all male graduates work respectively. Given that just 11.8% (London) and 13.2% (South East) of the male workforce are to be found in these regions, the ratios of graduate to total employment are 1.72 and 1.11 respectively. Such figures are indicative of graduate over-representation in numerical terms in these areas - a phenomenon not repeated in any of the other regions. At the other extreme is the North East, which has 4.0% of the male workforce and yet only 3.1% of male graduates. Likewise for women, a very similar pattern is repeated.

The private returns available to graduates relative to those with 2+ A-Levels in the West Midlands are shown in Table 2.[9,10] There are substantial variations in the financial rewards available to graduates across regions, with far greater benefits arising from employment in the South East and London than in any other region. This may partly be driven by the size of these local labour markets, in that it may potentially be easier for graduates in London and the South East to find a well-matched job compared to other regions. For example, male graduates can expect to see an annual return on their investment in a university education (in terms of foregone earnings and tuition costs) of 4.1% in Wales at one extreme and of 20.7% in London at the other extreme.[11] To give an indication of the additional nominal lifetime earnings that such returns represent, the figure for Wales is generated from additional career earnings of £118,648 and for London of £410,486.[12,13]

[insert Table 2 near here]

The regional distribution of real earnings looks very different from that of nominal earnings. Using regional price data published by the Office for National Statistics (ONS), it is possible to deflate nominal earnings to arrive at a real earnings series. ONS produces two regional price series, one which excludes housing price differentials and the other which includes them. Both of these are presented in Appendix Table 1. In the current analysis, it is the regional deflator which includes housing cost differences that is used to construct real earnings, although given that a part of housing expenditure may be thought of as a financial investment (albeit a forced saving in many instances), real earnings are likely to be under-estimated. Using the alternative series to deflate nominal earnings gives results bounded between the two (nominal and real) sets reported in Table 2. While these alternative measures give different levels of real earnings across regions, they do not change the ordering of regional returns to any marked extent.[14] Regions with a lower cost-of-living measured relative to the UK average will have real earnings in excess of nominal earnings and vice

versa. Thus, real earnings are lower than nominal earnings in the Eastern region, the South West, the South East and London and higher in the remaining regions. So, for example, the previously noted nominal career earnings advantage of £410,486 that male graduates in London enjoy translates into a reduced £293,370 real earnings advantage, while the nominal career earnings boost of £118,128 for male graduates in Wales equates to a higher real figure of £164,116.

The rates of return implied by such real earnings remain much higher in London (14.4%) and to a lesser extent the South East (8.1%) than elsewhere, but more generally there is a narrowing of regional rate of return differentials. Indeed, the percentage point difference covering real returns across all regions has fallen from 16.6 percentage points to 10.3 percentage points.[15] The lowest return is no longer offered to men in Wales, though, but rather to those in the South West, where a cost-of-living above the UK average (and lower than only London and the South East) has led to a dramatic decline in real returns. The South West and the West Midlands stand apart in the paucity of returns offered. The returns available in the remaining regions (excluding London and the South East) are focussed in a relatively narrow band, ranging from 6.0% (Yorkshire & Humberside) to 6.7% (East Midlands and North West).

It should be noted that there will not always be a match between the region in which people are employed and their region of residence and commuting flows are particularly important for London, the South East and the Eastern region. For all other regions, ONS considers the impact of net commuting to be insignificant (see Cope *et al.*, 2003 and Cameron and Muellbauer, 1998 for a fuller description of regional commuting patterns). However, the above results are largely unaffected by such commuting patterns. When the analysis was

repeated along the lines of region of residence as opposed to region of work, the qualitative

nature of the results was unaffected and the same distinctive regional patterns were exhibited.

Quantitatively, the results were also similar, with discrepancies in rate of return estimates

being very slight. The one exception to this was the Eastern region, where approximately one

fifth of the graduate stock out-commutes to work in London. Here, rate of return estimates

based upon region of residence were approximately 2 percentage points higher than when

calculated upon the basis of region of work.[16]

For women, London (22.2%), the South East (11.4%) and the Eastern region (11.0%) again

offer a nominal earnings advantage for graduates in excess of what is available elsewhere,

particularly so in the case of London. Outside of these three regions, the spread of returns is

concentrated in a range between 6.5% (South West) and 8.8% (North West), although there is

no apparent correlation between the regional outcomes for men and women outside of the

south east of England. For example, the 8.7% nominal return to women in Yorkshire &

Humberside identifies this as a strong performing region for female graduates; while for men

the nominal rate of 4.2% represents one of the lowest returns available. Likewise, the figure

of 6.5% reported for women in the South West represents the lowest nominal return of all

regions, and yet the comparable position of men in the region was much more favourable.

However, affirming the fact that women have more to gain from investing in a university

education than do their male counterparts (see O'Leary and Sloane, 2005), the annual returns

for women are in general well in excess of the comparable regional returns for men.

The pattern of real earnings advantage for female graduates relative to nominal earnings

advantage exhibits many of the same trends highlighted for men. So while London emerges

as the dominant region, with a female graduate here receiving a substantial 15.6% real return

on her university investment, this figure is nearly seven percentage points less than the nominal return. Likewise, both the Eastern region and the South East experience a moderation in the returns available which sees their relative positions decline markedly.[17]

All regional rates of return have been calculated on the basis of students paying annual tuition fees of £3,000, the maximum permissible top-up fee chargeable by universities under the government's current proposals. Arrangements for students in Wales and Scotland are likely to be different from those in England, however, in that the National Assembly and Parliament in these regions respectively intend to charge lower fees to domiciled students. In Wales, the proposal is to limit the fee payable by domiciled students attending a domestic institution to £1,200 per annum. In Scotland, the proposal is for all domiciled students attending a Scottish institution to have their annual fees paid by the Students Awards Agency for Scotland. Such arrangements will obviously increase the rates of return available to Welsh and Scottish students who study domestically. Although it is not possible to identify such students directly within the Labour Force Survey, the effect of these fee arrangements more generally within the student population would be to raise the nominal rate of return by 0.6 (1.3) percentage points for a male graduate in Wales (Scotland) and by 1.1 (2.8) percentage points for females. It should be remembered, though, that these figures represent increases in *private* rates of return but it is unclear what the *social* returns to the economies of either Wales or Scotland would be from such a programme. However, figures from 2003/04 (National Assembly for Wales Report 2603/2604) show that a greater proportion of Scottish domiciled students attended a Scottish higher education institution (83%) than did Welsh domiciled students who attended a Welsh higher education institution (61%). Likewise, a greater proportion (87%) of Scottish domiciled students leaving a higher education institution worked in Scotland than did comparable Welsh domiciled students working in Wales (72%). Thus, it would appear

that the ability of Scotland to retain a greater part of its university-educated workforce than

Wales would mean that any additional social benefits from this programme would be higher

in Scotland than they were in Wales.

The determinants of regional graduate performance

While there is no readily available way of quantifying the determinants of regional rate of

return differences, it is possible to attribute differences in an alternative (and related) measure

of regional graduate success. This alternative indicator is average real (gross) hourly earnings.

As such, mean real earnings for male graduates are highest in London and lowest in the West

Midlands and the South West, the same pattern identified in the previous rate of return

analysis. Likewise, mean real earnings for female graduates are bounded between those in

London at one extreme and in the South West at the other.

The most obvious drivers of differences in average gross hourly earnings are occupational

and industrial structure across regions.[18] As such, Tables 3a and 3b detail the occupational

composition across regions for male and female graduates separately and Tables 4a and 4b do

the same along the lines of industrial structure. Concentrating firstly upon occupational

structure, there is a far greater representation of graduates in the highest paying "Managers

and Senior Officials" category in London than elsewhere. So, for example, while 33.1% of

male graduates occupy this position in London, the comparable figures in the North East and

Wales are far lower at 22.6% and 20.2% respectively. Indeed, it is for these two regions that

the calculated Duncan Index is at its greatest (Table 3a, row 6), suggesting that the

occupational structure in these regions is most dissimilar to that found in London. [19]

Meanwhile, the South East (30.2%), the West Midlands (29.3%) and the East Midlands

(28.1%) all have a regional representation of graduates in the highest hierarchy of

occupations closer to that in London, and certainly in the case of the South East and West Midlands this results in the closest occupational distributions to the London region.

[insert Table 3a and Table 3b near here]

However, while London and the South East have both the highest concentration of senior occupations and real earnings, it does not appear that the more favourable occupational distribution is the prime cause of the real earnings advantage. For one, we have already noted the inferior occupational base in Wales and the North East and yet average real hourly earnings of £16.14 and £16.61 respectively are higher than in a number of other regions. Indeed, similar conclusions could also be drawn from a number of other comparisons. Further, there is no evidence of a substantial increase in regional earnings once occupational distributions have been brought in line with that of London. So, for example, if the occupational base of male graduates in the North East was the same as that found for male graduates in London, mean real hourly earnings in the North East would rise from £16.61 to £17.04 (Table 3a, row 8).[20] This absolute increase of £0.43 is the largest movement reported in Table 3a and yet does little to move average earnings up to the level experienced in London. More generally, the relativities between regions are little affected by this adjustment, such that a common occupational distribution across all regions reveals the same distinct pattern of real regional earnings.

Likewise for women, substantial differences exist between the occupational base of graduates in London and that in the other regions (see Table 3b). The proportion of the graduate workforce in managerial positions in London is also greater than in other regions. At 21.2%, this is someway in excess of the next highest figure of 16.2% reported for the South East and certainly well above the figures of 11.4% and 12.1% recorded in Scotland and Wales respectively. As demonstrated for men, though, such occupational differences have little

influence over mean real earnings levels. In absolute terms, the effect of aligning occupational distributions across regions would see average real earnings rise by between £0.03 in the North West and £0.22 in the Eastern region and Wales.

With regard to industrial structure, the most striking feature for both male (see Table 4a) and female graduates (see Table 4b) is the regional over-representation of Banking and Insurance Services in London (row 4, heading J,K) and the Public Sector in the North East and Wales (row 5, heading L-N). For men, Banking and Insurance Services provide the major source of employment in London, with 41.7% of graduate employees being found within this sector. Meanwhile, even though the Public Sector accounts for a quarter (25.8%) of male graduate employment in London, its representation here is lower than the comparable proportion in any of the other regions. Indeed, in both Wales (46.2%) and the North East (51.9%), this sector accounts for approximately one out of every two graduate jobs and in all but a handful of regions employs at least one third of all male graduates.[21] However, in spite of these obvious regional differences in industrial structures, a more equal distribution of industries in itself would do little to remove regional graduate pay differentials. Moreover, mean real earnings in Wales (-£0.19), Scotland (-£0.35) and the North East (-£0.83) would even fall.[22] Elsewhere, any changes in average earnings levels are marginal, with the largest absolute increase of £0.24 in the Eastern region representing less than a 1.5% change.

[insert Table 4a and Table 4b near here]

For women, the distribution of graduates across industries exhibits a similar pattern to that already identified for men, although the Public Sector is now the dominant employer in all regions including London. In fact, although the proportion of female graduates in the Public Sector is lower in London than elsewhere, nearly one half of employees are to be found in this sector nevertheless. Elsewhere, this proportion rises to nearly three quarters in the North

East (72.0%) and Wales (73.5%). In common with our previous findings, removal of such industrial imbalances would do little to equate average earnings across regions (see Table 4b, row 9). While aligning the industrial base in the South East and the Eastern region with London would see negligible increases in average real earnings of £0.13 and £0.12 respectively, elsewhere the effect of this procedure would be to marginally lower earnings. Thus, the net effect upon the regional distribution of average earnings is insignificant.

To summarise, while there are obvious regional differences in the occupations and industries within which graduates find themselves employed, these structural differences do not account for the average real earnings differentials between regions in any significant way. However, decomposition analysis, as initially formulated by Blinder (1973) and Oaxaca (1973), can help identify the origin of these differences.[23] Thus, the extent to which differences in the average real earnings of graduates in London relative to graduates in other regions are attributable to identifiable characteristic differences (a composition effect) or the way in which these characteristics are rewarded in regional labour markets (a coefficient effect) is shown in Table 5.[24] For both men and women, the substantial log point differences that exist in average real earnings are primarily attributable to a coefficient effect i.e. the way in which individual characteristics that determine earnings are rewarded differently between regions. Following Yun (2004), it is possible to further decompose the coefficient effect in the same way that the composition effect has also traditionally been decomposed.[25] Such a procedure highlights the importance of the constant term in the underlying wage models.[26] This would be consistent with the existence of an agglomeration effect in London, such that areas of employment density are associated with higher average labour productivity (see Ciccone, 2002 for UK evidence on this). Indeed, HM Treasury (2001) suggests that productivity differences are by far the largest contributor to regional performance and *per capita* output

differentials. Similar conclusions are also reached by Esteban (2000) and Kamarianakis and Le Gallo (2003), in that regional productivity differences across the EU are the dominant component in accounting for aggregate regional productivity differentials. Likewise, Dickerson (2006) estimates that average productivity in London is 24.7% above the national average and that specialisation in high productivity sectors is not the reason for this, but rather the fact that that productivity is higher in London in most sectors relative to the national average.

[insert Table 5 near here]

However, these findings are also consistent with the views of Lucas (1988) and Moretti (2004), in that workers benefit from being in an environment in which educated workers congregate: thus, graduates are more productive when they are surrounded by other graduates. Indeed, Battu *et al*. (2003) identify such spillover effects operating in the UK between productivity and workplace education levels and Galindo-Rueda (2004) finds a positive relationship between productivity in British manufacturing firms and the education of the local workforce. Given the greater concentration of graduates in London, such human capital spillovers appear to be more important here than elsewhere in raising the productivity of graduates and subsequently accounting for their higher wages.[27]

Such a conclusion is reinforced by the findings of Table 6, which presents regional rate of return estimates for graduates measured relative to holders of 2+ A-Levels in the *same* region. Calculating nominal rates of return in this way will remove not only regional price differences but also fixed regional labour market effects that will cause all workers to receive a higher remuneration and not just graduates. As such, the returns available within London are moderated dramatically and are less than those for any other region. For men, this implies a return to graduates of just 1.5%, less than half the rate available in the next lowest region

(3.3%, Yorkshire & Humberside) and well below the median estimate of 5.7%. Likewise for

women, the 3.5% figure in London, the lowest of any regional return, is appreciably lower

than the 6.5% median return.[28] In a similar vein, the higher returns variously afforded to

graduates in the South East and the Eastern region are no longer in evidence when measured

relative to a regional baseline. For men, the returns in these regions are now on a par with the

returns available elsewhere, while for women the returns are some way below what is

available in the rest of the country.

[insert Table 6 near here]

5. Conclusions

There are substantial variations in the earnings benefits that accrue to university graduates

across the regions of Great Britain. This is true for both male and female graduates. Indeed,

the rate of return on nominal earnings in London is more than double the comparable rate

found in any other region outside of the South East. Cost-of-living differences play an

important role in accounting for the spread in the rates of return across regions and when

account is taken of regional living cost disparities the variance in returns is dramatically

reduced. While the return on real earnings in London is still well in excess of that found

elsewhere, the majority of other regions exhibit a similar magnitude of returns. An exception

to this is the South West, which emerges as the region with the lowest real rate of return for

both male and female graduates and a return some way below what is experienced in other

regions. An unfavourably high cost-of-living in the region is seen as the reason for this.

In comparison, the mix of jobs appears to have little impact upon the relative regional

prospects of graduates. Even though there are marked differences across regions on the basis

of occupation and industry, a homogeneous employment mix along such lines would do little

to align the average regional earnings of graduates. Notwithstanding this, there is some

evidence that the public sector is an important graduate employer in many regions outside of

London. Further, decomposition analysis highlights the importance of coefficient differences

in accounting for average earnings differentials between graduates in London and those in

other regions. Such findings would be consistent with the view that productivity spillovers in

areas of graduate concentration and the presence of agglomeration effects are the principal

drivers of the favourable earnings position of the graduate workforce in London, although it

is not possible to assess the relative importance of these two influences vis-à-vis one another

in this current analysis.

The rates of return estimated here and the regional relativities implied by them are implicitly

based upon the relative forces of demand and supply that exist at the present time. Naturally,

as the economy expands this may cause regional prosperity to diverge which would have

implications for the pattern of returns presented here, but without more precise information

upon likely changes in demand and supply factors it is difficult to say *a priori* how, or indeed

in which direction, such movements may operate. In particular, the housing market will play

an important role in shaping returns through its effect upon regional migration. Given the

linkages between house price differentials and regional migration patterns, future movements

in regional house prices will inevitably have implications for labour supply.

Likewise, it is difficult to say what the aggregate effect of the new tuition fee arrangements is

likely to be in either England, Scotland or Wales, although from the previous discussion we

can see the importance of regional mobility. What is clear is that currently the returns

available upon real earnings in Scotland and Wales are not markedly out of line with the real

returns available in the majority of other regions, but the ability of the Scottish and Welsh

economies to generate additional benefits from the proposed fee reductions for home students

will depend crucially upon their abilities to retain graduates. Given the greater cross-border migration from Wales than from Scotland, this is likely to have a more adverse effect in Wales.

Finally, a comparison of graduates with their non-graduate counterparts within their own region reveals that the relative returns to possessing a degree in London are lower than in any other region. This would be consistent with an excess demand for less qualified manpower. Consequently, a degree is a less attractive option for a resident of London who intends to stay there, even if London in itself is an attractive destination for graduates.

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Table 1
Share of Graduate Employment by Region: LFS 2001-2004 (Weighted)

	MEN			WOMEN		
	% of workforce	% of graduates	Ratio[+]	% of workforce	% of graduates	Ratio[+]
North East	4.0	3.1	0.78	4.3	3.2	0.74
Yorks & Humber	8.8	7.3	0.83	8.8	8.0	0.90
East Midlands	7.2	5.8	0.81	7.2	6.0	0.83
Eastern	9.2	8.0	0.86	9.5	8.5	0.89
London	11.8	20.4	1.72	10.3	18.6	1.80
South East	13.2	14.7	1.11	13.4	14.4	1.07
South West	8.5	7.5	0.87	8.7	7.9	0.91
West Midlands	9.1	7.7	0.84	8.9	7.5	0.84
North West	14.3	12.9	0.90	14.5	12.4	0.86
Wales	5.0	4.3	0.86	5.0	4.6	0.92
Scotland	8.8	8.4	0.96	9.4	9.0	0.96

Notes: [+]ratio of graduate employment to all other employees in a particular region.

Table 2
Degree Returns Relative to 2+ A-Levels in the West Midlands:
LFS 2001-2004

	MEN		WOMEN	
	Nominal (%pa)	**Real (%pa)**	**Nominal (%pa)**	**Real (%pa)**
North East	4.8	6.3	8.2	9.9
Yorkshire & Humberside	4.2	6.0	8.7	10.5
East Midlands	6.5	6.7	7.4	7.7
Eastern	7.7	6.1	11.0	9.3
London	20.7	14.4	22.2	15.6
South East	11.6	8.1	11.4	7.9
South West	6.0	4.1	6.5	4.9
West Midlands	4.6	4.7	8.1	8.2
North West	6.2	6.7	8.8	9.3
Wales	4.1	6.1	7.2	9.4
Scotland	5.3	6.4	8.0	9.5

Notes: estimates based on a white married employee with an undergraduate degree (not Medicine, Dentistry or Languages) working full-time (37.5 hours per week) in 2004, with current employer for 5 or more years; graduates assumed to be in continuous employment from ages 21-59/64 (women/men); A-Level holders assumed to be in continuous employment from ages 18-59/64 (women/men); 3 year course of study with no employment income during period of study (4 year course in the case of Scotland); £3,000 annual tuition fees.

Table 3a
Occupational Distribution (SOC2000) of Male Graduates by Region: LFS 2001-2004

	NE	YH	EM	E	L	SE	SW	WM	NW	W	S
Managers and senior officials	22.6	24.0	28.1	26.1	33.1	30.2	25.3	29.3	26.2	20.2	26.9
Professional occupations	49.4	46.7	42.4	46.3	34.4	46.5	46.3	42.3	43.2	50.5	44.9
Associate professional and technical	15.9	16.4	18.4	16.7	22.0	13.4	17.7	16.3	18.2	16.9	17.7
Administrative and secretarial	4.5	4.2	6.3	2.6	6.1	4.5	4.1	4.6	5.2	4.0	3.6
Other occupations	7.6	8.7	4.8	8.2	4.4	5.6	6.7	7.6	7.2	8.3	7.0
Duncan Index (relative to London)	18.19	16.57	8.61	15.66	0.0	13.19	14.17	11.04	11.62	20.02	13.08
Mean gross real hourly earnings (£)	16.61	16.38	16.57	16.20	19.62	17.21	15.69	15.50	16.14	16.14	17.19
Mean gross real hourly earnings (£)[+]	17.04	16.73	16.70	16.33		17.19	15.88	15.61	16.40	16.44	17.25

Note: [+] denotes an adjusted earnings series. See endnote 20.

Table 3b
Occupational Distribution (SOC2000) of Female Graduates by Region: LFS 2001-2004

	NE	YH	EM	E	L	SE	SW	WM	NW	W	S
Managers and senior officials	13.5	15.0	13.8	14.2	21.2	16.2	12.6	15.6	14.8	12.1	11.4
Professional occupations	43.6	43.2	44.5	46.6	34.7	46.0	43.7	43.3	43.9	47.3	43.3
Associate professional and technical	26.4	24.0	23.0	22.7	27.5	20.8	23.4	22.2	24.2	23.1	27.7
Administrative and secretarial	10.5	10.6	9.6	9.6	12.4	8.4	11.4	10.0	9.2	10.4	8.6
Other occupations	6.1	7.3	9.2	6.9	4.2	8.6	9.0	9.0	8.0	7.0	8.9
Duncan Index (relative to London)	10.78	11.58	14.78	14.64	0.0	15.72	13.76	13.36	13.02	15.49	13.60
Mean gross real hourly earnings (£)	13.64	13.83	12.47	13.43	15.07	13.24	11.86	12.75	13.12	13.78	13.88
Mean gross real hourly earnings(£)[+]	13.69	13.94	12.59	13.65		13.45	12.03	12.86	13.15	14.00	14.05

Note: [+] denotes an adjusted earnings series. See endnote 20.

Table 4a
Industrial Distribution (SIC92) of Male Graduates by Region: LFS 2001-2004

	NE	YH	EM	E	L	SE	SW	WM	NW	W	S
A-F: Agriculture/ Energy/Manufacturing/Construction	19.8	21.8	29.0	25.8	14.1	24.5	21.6	28.5	28.3	21.2	25.6
G,H: Distribution/Hotels & Restaurants	3.5	6.6	7.3	7.5	5.5	6.7	4.8	7.3	7.2	6.3	5.4
I: Transport & Comunications	4.5	4.0	4.3	5.0	5.8	5.3	4.5	4.4	4.6	3.3	2.1
J,K: Banking/Finance & Insurance	16.9	20.2	17.1	24.8	41.7	30.5	24.5	22.1	21.1	14.9	24.1
L-N: Public Admin/Education & Health	51.9	43.0	38.5	30.4	25.8	29.8	40.9	30.9	34.1	46.2	38.4
O-Q: Other Services	3.5	4.5	3.9	6.5	7.1	3.2	3.7	6.8	4.7	8.1	4.4
Duncan Index (relative to London)	31.75	25.96	29.33	18.34	0.0	15.53	22.58	21.32	24.23	29.31	24.11
Mean gross real hourly earnings (£)	16.61	16.38	16.57	16.20	19.62	17.21	15.69	15.50	16.14	16.14	17.19
Mean gross real hourly earnings (£)[+]	15.78	16.55	16.75	16.44		17.23	15.70	15.67	16.14	15.95	16.84

Note: [+] denotes an adjusted earnings series. See endnote 20.

Table 4b
Industrial Distribution (SIC92) of Female Graduates by Region: LFS 2001-2004

	NE	YH	EM	E	L	SE	SW	WM	NW	W	S
A-F: Agriculture/ Energy/Manufacturing/Construction	7.4	6.6	11.6	11.6	7.4	9.5	9.3	10.3	9.4	4.5	8.1
G,H: Distribution/Hotels & Restaurants	3.0	6.5	7.3	7.2	5.7	8.3	7.1	5.5	6.6	4.2	6.7
I: Transport & Comunications	3.0	2.3	1.6	1.4	4.3	2.8	1.9	3.3	2.1	1.4	1.8
J,K: Banking/Finance & Insurance	12.2	15.4	10.8	15.3	27.0	17.5	14.6	12.4	13.9	9.0	14.9
L-N: Public Admin/Education & Health	72.0	65.3	65.7	60.3	48.4	59.1	62.6	63.5	63.8	73.5	64.6
O-Q: Other Services	2.4	4.0	3.1	4.2	7.3	3.0	4.6	5.0	4.2	7.3	3.9
Duncan Index (relative to London)	23.63	17.73	23.11	17.58	0.0	15.35	17.59	18.03	18.32	25.16	17.96
Mean gross real hourly earnings (£)	13.64	13.83	12.47	13.43	15.07	13.24	11.86	12.75	13.12	13.78	13.88
Mean gross real hourly earnings (£)[+]	13.06	13.69	12.19	13.55		13.37	11.82	12.68	12.94	13.23	13.75

Note: [+] denotes an adjusted earnings series. See endnote 20.

Table 5
Summary Log Point Decomposition of Regional Real Earnings Differential for Graduates
Relative to London: LFS 2001-2004

	MEN				WOMEN			
	Earnings Difference	Composition Effect	Coefficient Effect	Constant	Earnings Difference	Composition Effect	Coefficient Effect	Constant
North East	0.1355	0.0579	0.0776	0.1094	0.0769	-0.0019	0.0811	0.1185
Yorkshire & Humberside	0.1718	0.0527	0.1191	0.1634	0.0837	0.0073	0.0764	0.1478
East Midlands	0.1615	0.0437	0.1179	-0.0285	0.1675	0.0189	0.1486	0.2706
Eastern	0.1735	0.0343	0.1392	0.1343	0.1196	-0.0158	0.1354	0.2380
South East	0.1192	-0.0037	0.1229	0.0923	0.1367	-0.0280	0.1656	0.2054
South West	0.1956	0.0216	0.1740	0.1030	0.2263	0.0191	0.2071	0.3296
West Midlands	0.2082	0.0298	0.1784	0.1506	0.1594	0.0136	0.1458	0.1896
North West	0.1681	0.0442	0.1239	0.1069	0.1170	0.0060	0.1110	0.1627
Wales	0.1793	0.0660	0.1133	0.0992	0.0745	0.0017	0.0728	0.2402
Scotland	0.1014	0.0136	0.0878	0.0830	0.0690	-0.0015	0.0720	0.2635

Table 6
Degree Returns Relative to 2+ A-Levels in Own Region: LFS 2001-2004

	Nominal (%pa)	
	MEN	**WOMEN**
North East	5.2	7.8
Yorkshire & Humberside	3.3	6.5
East Midlands	7.5	6.3
Eastern	5.0	5.0
London	1.5	3.5
South East	5.9	4.9
South West	6.6	6.5
West Midlands	4.6	8.1
North West	6.5	6.7
Wales	5.7	6.3
Scotland	6.6	8.6

Notes: see Table 2.

Appendix Table 1
Average Regional Prices Relative to National Average Price (UK=100)

	Excluding Housing Costs	Including Housing Costs
North East	96.1	94.2
Yorks/Humber	95.9	94.2
East Midlands	97.8	97.4
Eastern	99.6	101.1
London	107.1	109.7
South East	101.6	105.3
South West	100.0	101.3
West Midlands	98.2	97.8
North West	98.4	96.9
Wales	96.5	93.1
Scotland	98.0	94.5

Appendix Table 2
Variable Definitions for Rate of Return and Decomposition Analyses

Variable	Variable description
Net earnings	Net hourly earnings from employment in Jan 2002 prices. Net hourly earnings are defined as actual net weekly earnings deflated by usual weekly hours worked excluding unpaid overtime. **(R)**
Gross earnings	The natural logarithm of gross hourly earnings from employment in Jan 2002 prices. Gross hourly earnings are defined as actual gross weekly earnings deflated by usual weekly hours worked excluding unpaid overtime. **(D)**
Age	Age of respondent in years; entered in linear and quadratic form. **(R)**
Ageband	Set of dummy variables (13) denoting the age of the respondent. **(D)**
Ethnic origin	Dummy variable indicating that the respondent is of an ethnic origin other than white.**(RD)**
Marital status	Set of dummy variables (3) denoting the marital status of the respondent. **(RD)**
Employment status	Dummy variable indicating that the respondent works on a part-time basis. **(RD)**
Job tenure	Set of dummy variables (3) denoting the number of years the respondent has been with their current employer. **(RD)**
Higher degree	Dummy variable indicating that the respondent has a higher degree. **(RD)**
Industry	Set of dummy variables (6) denoting the industry in which the respondent is employed. **(D)**
Occupation	Set of dummy variables (5) denoting the occupation in which the respondent is employed. **(D)**
Year of interview	Set of dummy variables (5) denoting the year in which the respondent completed their interview. **(RD)**

Note: (R) signifies a variable used only in the calculation of rates of return; (D) signifies a variable used only in the decomposition analysis; (RD) denotes a variable used in both analyses.

Appendix Table 3a
Log Point Decomposition of Regional Real Earnings Differential for Male Graduates
Relative to London: LFS 2001-2004

	NE	YH	EM	E	SE	SW	WM	NW	W	S
Mean earnings difference	0.1355	0.1718	0.1615	0.1735	0.1192	0.1956	0.2082	0.1681	0.1793	0.1014
Characteristic effect	*0.0579*	*0.0527*	*0.0437*	*0.0343*	*-0.0037*	*0.0216*	*0.0298*	*0.0442*	*0.0660*	*0.0136*
Ethnic origin	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0001	-0.0000
Employment status	0.0003	0.0077	0.0053	0.0034	0.0012	0.0064	0.0018	0.0013	0.0019	0.0019
Higher degree	0.0000	-0.0009	0.0030	0.0001	-0.0009	-0.0010	0.0013	0.0010	-0.0013	-0.0004
Marital status	-0.0102	-0.0097	-0.0085	-0.0083	-0.0073	-0.0137	-0.0092	-0.0072	-0.0091	-0.0088
Year of interview	-0.0003	-0.0002	-0.0005	0.0006	0.0004	0.0000	-0.0002	0.0003	-0.0003	-0.0003
Job tenure	-0.0029	-0.0025	-0.0038	-0.0030	-0.0023	-0.0056	-0.0027	-0.0035	-0.0047	-0.0051
Ageband	-0.0304	-0.0283	-0.0213	-0.0117	-0.0183	-0.0282	-0.0174	-0.0139	-0.0285	-0.0324
Occupation	0.0199	0.0224	0.0066	0.0142	-0.0005	0.0128	0.0113	0.0164	0.0257	0.0109
Industry	0.0815	0.0643	0.0630	0.0390	0.0237	0.0510	0.0448	0.0497	0.0823	0.0479
Coefficient effect	*0.0776*	*0.1191*	*0.1179*	*0.1392*	*0.1229*	*0.1740*	*0.1784*	*0.1239*	*0.1133*	*0.0878*
Ethnic origin	-0.0557	-0.0716	0.0495	0.0407	-0.0058	0.0938	-0.0118	-0.0193	0.0428	0.0256
Employment status	0.1290	0.1061	0.2013	0.0359	0.0643	0.0833	0.0665	0.0724	0.0934	0.1174
Higher degree	-0.0014	-0.0027	0.0177	-0.0124	-0.0067	-0.0016	0.0183	0.0131	0.0056	0.0014
Marital status	-0.0206	-0.0224	-0.0274	-0.0057	-0.0056	-0.0413	-0.0076	0.0005	0.0009	-0.0336
Year of interview	0.0090	0.0054	0.0154	0.0096	0.0104	0.0016	0.0114	-0.0020	0.0140	-0.0238
Job tenure	0.0024	0.0004	-0.0069	0.0010	-0.0017	-0.0063	-0.0030	-0.0041	-0.0113	-0.0176
Ageband	0.0059	0.0036	-0.0057	0.0002	-0.0008	0.0033	-0.0048	0.0006	0.0033	-0.0012
Occupation	-0.0352	-0.0489	-0.0404	-0.0598	-0.0318	-0.0120	-0.0127	-0.0261	-0.0497	-0.0306
Industry	-0.0652	-0.0143	-0.0572	-0.0046	0.0083	-0.0498	-0.0285	-0.0181	-0.0852	-0.0330
Constant	0.1094	0.1634	-0.0285	0.1343	0.0923	0.1030	0.1506	0.1069	0.0992	0.0830

Appendix Table 3b
Log Point Decomposition of Regional Real Earnings Differential for Female Graduates
Relative to London: LFS 2001-2004

	NE	YH	EM	E	SE	SW	WM	NW	W	S
Mean earnings difference	0.0769	0.0837	0.1675	0.1196	0.1367	0.2263	0.1594	0.1170	0.0745	0.0690
Characteristic effect	*-0.0019*	*0.0073*	*0.0189*	*-0.0158*	*-0.0280*	*0.0191*	*0.0136*	*0.0060*	*0.0017*	*-0.0015*
Ethnic origin	-0.0050	-0.0039	-0.0035	-0.0048	-0.0046	-0.0052	-0.0034	-0.0051	-0.0050	-0.0054
Employment status	0.0006	-0.0008	-0.0013	-0.0020	-0.0028	-0.0033	-0.0009	-0.0003	-0.0016	-0.0008
Higher degree	0.0018	0.0011	0.0031	0.0001	-0.0005	0.0020	0.0040	0.0011	-0.0020	0.0019
Marital status	-0.0042	-0.0036	-0.0036	-0.0042	-0.0038	-0.0037	-0.0039	-0.0033	-0.0037	-0.0030
Year of interview	-0.0030	-0.0019	-0.0011	-0.0019	-0.0017	-0.0013	-0.0004	-0.0021	-0.0022	-0.0013
Job tenure	-0.0213	-0.0146	-0.0130	-0.0073	-0.0103	-0.0070	-0.0121	-0.0128	-0.0173	-0.0207
Ageband	-0.0209	-0.0114	-0.0139	-0.0259	-0.0293	-0.0160	-0.0162	-0.0127	-0.0352	-0.0259
Occupation	0.0095	0.0111	0.0166	0.0053	0.0054	0.0235	0.0141	0.0103	0.0115	0.0207
Industry	0.0390	0.0326	0.0369	0.0265	0.0195	0.0315	0.0338	0.0324	0.0585	0.0324
Coefficient effect	*0.0811*	*0.0764*	*0.1486*	*0.1354*	*0.1656*	*0.2071*	*0.1458*	*0.1110*	*0.0728*	*0.0720*
Ethnic origin	0.0812	0.0507	0.0049	-0.0392	0.0060	0.0047	0.0469	0.0608	-0.0050	-0.0228
Employment status	-0.0361	-0.0090	-0.0290	-0.0237	-0.0093	-0.0221	-0.0229	-0.0089	0.0010	-0.0343
Higher degree	-0.0059	0.0014	-0.0026	0.0154	-0.0064	-0.0093	0.0207	-0.0035	0.0022	-0.0016
Marital status	-0.0158	-0.0125	-0.0202	0.0088	-0.0160	-0.0023	-0.0253	0.0054	-0.0038	-0.0223
Year of interview	0.0163	-0.0092	0.0095	-0.0059	0.0050	0.0095	-0.0062	-0.0107	-0.0354	-0.0094
Job tenure	-0.0052	0.0010	-0.0004	0.0039	0.0004	0.0002	-0.0022	0.0022	-0.0051	0.0022
Ageband	0.0289	0.0031	0.0058	-0.0036	0.0076	0.0032	0.0047	0.0120	0.0088	0.0082
Occupation	-0.0254	-0.0291	-0.0232	-0.0311	-0.0278	-0.0142	-0.0106	-0.0316	-0.0272	-0.0438
Industry	-0.0753	-0.0678	-0.0668	-0.0271	0.0008	-0.0923	-0.0488	-0.0773	-0.1026	-0.0677
Constant	0.1185	0.1478	0.2706	0.2380	0.2054	0.3296	0.1896	0.1627	0.2402	0.2635

Notes

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[1] Payments after graduation would be through the tax system, linked to ability to pay, with the threshold at which graduates would have to start repaying their fee contribution and maintenance loan fixed at £15,000.

[2] More recent research has suggested that this figure of £400,000 somewhat overestimated the additional career earnings a graduate could be expected to earn. Based on regression analysis, O'Leary and Sloane (2005) estimate that a representative male graduate would enjoy a £141,539 lifetime earnings advantage and a female graduate would enjoy a £157,982 advantage. These figures are more in line with a figure of £120,000 referred to in a recent Hansard Report of 8 June 2005 by the Minister of Higher Education in response to a parliamentary question arising from the above study.

[3] Notable exceptions to this are Bell and Sarajevs (2004) and Taylor and Wright (2005) who focus upon the position of graduates in Scotland.

[4] A conventional approach to measuring the returns to degrees is to base estimates relative to those who *could* have pursued further education but chose not to do so. This comparator role is filled by those individuals who have gained two or more A-Levels.

[5] Estimation of the earnings functions is by ordinary least squares (OLS). There is no doubt, however, that those who choose to undertake a degree are a self-selected group and likewise that the decisions over which subject to study and which institution to attend are not random. More generally, Dearden *et al*. (2002) highlight a number of potential sources of bias that may arise in OLS estimation. While a number of econometric techniques have been suggested to address these issues, the emerging view in the literature is that ability bias and measurement error more or less cancel each other out in OLS estimation (see for example Bonjour *et al*., 2003). Furthermore, sample selection does not appear in practice to affect greatly estimated returns to education (see Dearden, 1999 and Chevalier and Walker, 2001).

Again, given that there is no evidence to suggest that such biases may have a regional impact, it is unlikely that the regional relativities presented in this work will be affected significantly by such issues.

[6] Weale (1993) provides a good discussion of the likely biases that may arise in the calculation of both private and social rates of return. However, given the comparison group of 2+ A-Level holders used in this analysis and the fact that the focus is upon private returns, the only issue which may be relevant arises because of our assumption of continuous employment. Thus, if employment prospects are enhanced by a degree the true benefit of gaining such a qualification may be understated.

[7] Since Spring 1997, respondents to the LFS are asked about their earnings during their first (wave 1) and final (wave 5) interviews. In the analysis conducted here, we select only wave 1 respondents.

[8] Graduates are defined as those who possess a university degree and will include those whose highest educational qualification is either a first degree or a higher degree. This classification is maintained in the rate of return calculations that follow and is adopted to account for any possible ability bias that might occur by concentrating upon undergraduate degree holders only. The reasoning behind this is that if the more able students go on to pursue postgraduate studies, excluding them would truncate the ability distribution and provide biased results. To counter this, all degree holders are retained and a dummy variable included denoting the possession of a higher degree. As it turns out, there is no evidence to support the hypothesis of the ability distribution being truncated and the results are unaffected by whether higher degree holders are included or not. Meanwhile, region is taken to denote region of work as opposed to the region where a graduate lives. Again, such a definition is maintained in the rate of return calculations that follow.

[9] All returns for graduates are calculated from the same region so as to provide a common benchmark. The West Midlands was chosen as it fits the criterion of a representative region on a number of grounds: average earnings in the region are at the median of the distribution of earnings across all regions; the magnitude of its under-representation of graduates in its workforce is similar to that in many other regions; the size of the local labour market is reasonably large; the cost-of-living in the region is representative of the cost-of-living in the majority of other regions outside of London and the South East. It should be remembered, though, that the choice of the West Midlands is still arbitrary and any other region could have been selected. These returns are calculated for a representative individual, details of which are given in the notes to Table 2, and are based upon a 'typical' 3-year degree course. For this reason, holder of degrees in medicine, dentistry and languages are all excluded as such degree programmes will typically have a duration in excess of three years. Similarly, holders of degree-equivalent qualifications (including HNC/HNDs, teaching and nursing diplomas, and NVQs above level 3) have also been excluded as such courses will rarely fit the typical 3-year course offered by universities. It should be stressed, though, that these assumptions and those listed under Table 2 are not pivotal to the nature of the results and the implied regional relativities.

[10] The variables used in the rate of return calculations are described in Appendix Table 2.

[11] The rates of return calculated in Table 2 are based upon the assumption that students do not work during the course of their studies. As such, if students have some sort of paid employment at the same time as they are studying, the implied annual rate of return to their increased career earnings will increase as the costs of obtaining these (in terms of foregone earnings) will have fallen. For example, assuming that a student works for 16 hours per week at the national minimum wage for 18-21 year olds of £4.25 (October 2005) for 42 weeks of the year, the calculated annual returns to a degree for men in Wales and London would

increase to 5.2% and 29.9% respectively. It is likely that the returns reported in Table 2 will represent a lower bound to the returns available to graduates as some degree of part-time employment is becoming increasingly more important for university students. Furthermore, the question of whether such increasing distractions from studies will affect educational outcomes and subsequently returns is an interesting issue, but it is one that is ultimately beyond the scope of this current analysis.

[12] Although annual rates of return are derived from additional career earnings, such earnings are not presented in Table 2 as it would be misleading to make a direct comparison between additional earnings in different regions as these are allowed to accrue to graduates at different rates across regions. As already shown in equations (1) and (2) in section 2, the age-earnings profiles of workers (both graduates and non-graduates) are estimated separately for each region. Thus, it is not only *how much more* a graduate earns that is important, but also *at what time in their career* they earn it.

[13] It should be borne in mind that the estimated return of 5.3% for male graduates in Scotland is calculated on the basis of a four year degree course and not the three assumed for the regions of England and Wales. Some students in Scotland will, however, complete an ordinary degree in three years.

[14] As a consistent series is not available for all years in our pooled sample, figures for 2004 are used to deflate nominal earnings in all years. For information on how the regional price series is constructed see Wingfield, Fenwick and Smith (2005). As respondents do not necessarily work and live in the same region, the deflator used to calculate real earnings is based upon region of residence and not region of work.

[15] Even excluding London, there is a fall in the spread of returns across regions from 6.5 percentage points to 4.0 percentage points.

[16] Other than providing information on region of residence and region of work, the LFS does not contain any further details on commuting, such as commute time, which could be used as a control in the analysis.

[17] As an alternative estimation strategy, a full set of regional dummies was included in the earnings functions modelled in equations (1) and (2) to capture regional fixed effects. For example, one might surmise that migration and commuting exert some particular influence around London and south east England that will not be picked up elsewhere in the analysis. However, the effect upon estimated rates of return of this alternative strategy was negligible and the pattern of returns identified above was unaltered (results available on request).

[18] This is borne out of *a priori* expectations and inspection of the data and is also vindicated by the research of Blackaby and Manning (1990). In their examination of nominal earnings in the UK, regional cost-of-living differences and differences in the industrial and occupational base were found to be the major determinants of regional wage differentials between the South East of England and the rest of Great Britain. Thus, our examination of real earnings will concentrate upon regional differences in the mix of jobs across industrial and occupational dimensions. It should be noted, though, that such information is not included in the calculation of rates of return, as where graduates find themselves employed will be part of the return to education in itself.

[19] The Duncan index of dissimilarity (see Duncan and Duncan, 1955) is based upon absolute deviations in the percentage employed in each occupation and indicates the percentage of graduates in any region that would have to move between occupations to achieve distributional equality with London.

[20] To calculate average earnings, a random sample of graduates in the North East was selected such that there was an exact match in the proportion in each of the five broad occupations used in Table 3a with that found in London. To avoid any potential bias, the

sample was redrawn 1,000 times and earnings averaged across all draws. The same procedure

was repeated in each of the standerd regions.

[21] Given the distinct patterns of industrial clustering across regions, it comes as no surprise to

note that the Duncan index for all regions (measured relative to London) is higher than that

calculated along the lines of occupation.

[22] Given the wage premiums afforded to public sector workers in the UK (see Blackaby *et al*.,

1996), public sector employment is seen as an important institution for holding up wage

levels in many regions. Thus, the process of adjustment used above would reduce the number

of relatively highly paid public sector workers and so have a detrimental effect upon average

earnings levels.

[23] The decompositions results that are presented have been derived from the following model:

$$\overline{LnE}^{L} - \overline{LnE}^{O} = \hat{\rho}^{L}(\overline{Z}^{L} - \overline{Z}^{O}) + (\hat{\rho}^{L} - \hat{\rho}^{O})\overline{Z}^{O} ,$$

where E denotes gross hourly earnings, Z represents a vector of characteristics that determine

earnings (described in Appendix Table 2), ρ denotes a conformable vector of estimated

rewards to these characteristics, a bar denotes a mean value, a hat denotes a coefficient

estimate, and the superscripts L and O denote the London region and another comparison

region respectively. The first term on the RHS will measure the extent to which differences in

mean characteristics between regions explain the difference in average earnings and is

labelled the *composition* effect. Meanwhile, the second term on the RHS will measure the

extent to which differences in the way that these characteristics are rewarded across regions

explain the difference in average earnings. This second term is labelled the *coefficient* effect.

[24] While Table 5 presents only summary results of the decomposition analysis, full results,

including a list of control variables that were included, are given in Appendix Tables 3a

(males) and 3b (females).

[25] The approach of Yun (2004) allows the identification of the individual components on the coefficient effect by imposing a linear restriction of zero upon any set of dummy variables (or any single category dummy variable). While this provides a tractable way of circumventing the *baseline* problem highlighted by Jones (1983), it does not solve the *scale* problem associated with the inclusion of continuous variables. For this reason, the underlying specification used in the estimation of the regional wage equations was composed entirely of dummy variables.

[26] The constant term is the dominant element in all of the regional decompositions with the exception of London versus the East Midlands for male graduates. From Appendix Table 3a we can see that the difference in returns to the employment status dummy variable in this decomposition is substantially greater than for any other region. Why this should be the case is not clear. However, when the sample of graduates was restricted to full-time workers only, this anomalous result disappeared and the constant term emerged as the dominant element in all decompositions. Indeed, the magnitude of the influence of the constant term and its relative effect increased markedly when the analysis excluded part-time workers.

[27] While we have raised the possibility of agglomeration and spillover effects being important, data limitations prevent an assessment of their relative contributions. To pursue this matter further would require data that could match workers within workplaces in addition to identifying individuals at a finer regional level than is publically available within the LFS.

[28] Consistent findings are presented by Dickerson (2006), where returns to National Qualifications Framework (NQF) at Level 4+ are lower in London as compared to the other regions of the UK.