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THE RETURNS TO HIGHER EDUCATION IN BRITAIN: EVIDENCE FROM A BRITISH COHORT*

Richard Blundell, Lorraine Dearden, Alissa Goodman and Howard Reed

We use British birth cohort panel data to examine the impact that degree level qualifications and other higher education qualifications have on the earnings of individuals in the medium to longer term. We compare the outcomes of these individuals with those of individuals who had the prospect of undertaking Higher Education but chose not to. Our approach involves ‘matching’ these individuals according to observed characteristics which we have in the data such as ability, family background and demographics and then comparing outcomes between individuals who proved to HE and otherwise identical individuals who had the opportunity but did not.

There have been important changes to the way that higher education is funded in the United Kingdom in recent years. Until the end of the 1980s, students’ tuition was publicly funded out of general taxation, while students’ living costs were financed by a mixture of means-tested grants and parental contributions. The funding system has since changed, firstly with the introduction of the student loans system in the early 1990s, and secondly with the abolition of student maintenance grants and their replacement by a system of loans and tuition fee payments by students, introduced fully in autumn 1999. In other words the burden of higher education finance has been shifting away from taxpayers and towards students themselves and their parents. There has been widespread public debate about whether this policy shift is justified, or indeed whether it should go further, but it seems clear that in order for an informed decision to be made about who should bear the costs of higher education, it is desirable to know who the benefits of higher education accrue to. The benefits of, or *returns to*, investments in higher education (HE) fall into three main categories:

- *private financial returns* – measured by the extent to which undertaking a degree or other form of HE improves and individual’s earnings and/or employment prospects.
- *private non-financial returns* – measured by the extent to which the welfare of individuals who have undertaken HE is improved in dimensions which are not part of measured earnings, e.g. access to more interesting types of job, better working conditions, and so on.
- *social returns* – measured by the extent to which HE may have a benefit to other members of society over and above the private returns to those under-

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taking HE. Social returns would occur if there were positive externalities to HE (e.g. through increased technical innovation or teamworking¹).

This paper sheds some light on the extent of private financial returns to HE by examining the impact that degree-level qualifications and other higher education qualifications have on the wages of a cohort of people living in Britain who were aged 33 in 1991. Unfortunately, the data used in this study are not appropriate for looking at non-financial returns or social returns, both of which are much more difficult to measure accurately. Even in the case of private financial returns, quantifying the effects of higher education is not straightforward, mainly because it is difficult to disentangle the 'pure' effects of time spent in HE and the resulting qualifications obtained on wages from the influence of other factors that affect earnings. We discuss this problem and the econometric model we use to deal with it in Section 2.

The format of this paper is as follows. Section 1 describes the main features of the NCDS data along with giving some descriptive analysis of the numbers of men and women entering and completing different types of HE. In Section 2 our methodological approach is presented. Section 3 details the results of our study while Section 4 concludes.

1. The NCDS Data

The data used in this study come from the British National Child Development Survey (NCDS), which is a continuing panel survey of all individuals born in Britain between 3 and 9 March 1958. Since birth, individuals in the NCDS have been surveyed at five different points, the most recent being the fifth wave (NCDS5) which took place in 1991 when they were 33 years old.

The NCDS data are rich in a number of aspects that make them useful for our purposes. First, they contain detailed information on the higher education qualifications achieved by each individual up to 1991. We can identify the type of qualification obtained and, for those who commenced their HE studies by 1981, the subject studied.² We also know whether individuals started HE as mature students (aged 21 or over) or earlier, and whether individuals who started a given course passed, failed or dropped out. Second, we have information from the 1978 school exams file in the NCDS on school qualifications. Third, we have a wealth of information on the family and school backgrounds of the children in the early years of the survey. This is used in our modelling procedure to examine the effects of different family circumstances and schooling backgrounds on HE attainment, and to control for possible biases arising from these effects when estimating the effect of HE on labour market outcomes. Fourth, the NCDS contains information on the results of maths and

¹ Redding (1996) describes an economic model where human capital investments augment economic growth through inducing technical change through R&D. Gemmell (1997) postulates a *teamworking* externality whereby individuals in a firm may improve not only their own productivity but also that of the less-well-educated individuals with whom they work.

² Subject information is not yet available from the NCDS5 survey.

reading ability tests administered to the children at ages seven, 11 and 16. We use the results for ability at age seven in an attempt to control for the child's 'innate' ability when estimating the effects of HE. Lastly, NCDS5 has information on hourly wages at age 33, well after most individuals complete their HE. We use this earnings data in the regressions that we estimate.

1.1. *The Comparison Group in the NCDS*

Rather than simply comparing individuals who undertook some form of HE with the rest of the people in the NCDS, our approach is to compare individuals with HE qualifications with those men and women who obtained at least one A level qualification, but did not proceed into HE. A level qualifications are the highest secondary school qualification that can be earned in Britain. Our aim in doing this is to focus on the subsample of the population who had the prospect of going on into HE but (for whatever reason) did not. This of course assumes that the only route into HE is through A levels. For those with degree-level qualifications, this assumption is indeed borne out by the data. Although there are some individuals from the original sample who never pass any A levels but do go on to get degrees, they are relatively few and including them in the overall sample does not significantly alter our empirical results. However for those with non-degree HE qualifications, such as nursing and some teacher training qualifications, we find that there *are* a large number of individuals in the NCDS who do not follow the traditional route into such qualifications and have achieved non-degree HE qualifications by 1991 without ever having passed A levels. Looking at the NCDS overall, as many as two-thirds of men who have non-degree HE qualifications by 1991, and more than half of such women, have never passed an A level. Moreover, an examination of the wage outcomes of those who do not follow the traditional route shows that they fare significantly less well in terms of wages than those who do (see Blundell *et al.* (1997) for full details). The returns to this sort of HE qualification reported in the analysis that follows must therefore be interpreted with great care. They show the returns to HE qualifications amongst a narrow group of those who actually attain them, drawing from a sample who did relatively well at school or passed A levels after leaving school. They do not represent the return to these qualifications for those who have been less successful at school.

Because we use only those individuals with one or more A level passes in our investigation, the sample size for our empirical work is reduced from 18,562 to 3,264, as shown in Table 2.1 below.

1.1.1. *Panel attrition and missing wages information*

Amongst the sample of NCDS participants with at least one A level, we lose 505 further individuals through panel attrition; these men and women were in earlier waves of NCDS but had dropped out by the fifth wave. (The overall size of the NCDS5 sample after allowing for attrition was 11,409. There are also individuals who responded to the survey in 1991 but did not provide full

information about their weekly wage or hours of work (this is only a problem for those who are employees). This reduces our main sample by a further 230.

Our main sample is therefore reduced to 2,529 individuals with at least one A level, 1,251 of whom are men and 1,278 of whom are women (see Table 1). This is the largest possible sample on which we can conduct our basic analysis. For some of these people, other important information that is used to measure ability and family background is missing from the data. For a large proportion, information about the subject studied at HE level is not available. Rather than exclude these people from the analysis altogether, we have opted to keep them in and use missing variable dummies where appropriate in the regressions. This avoids, as far as possible, the risk that we are left with a much smaller, and possibly unbalanced, sample on which to estimate the returns to HE.

In order to assess how far both panel attrition and missing wages information in Wave 5 introduced possible bias into the composition of our main sample, we have made a detailed comparison of this sample of the NCDS and the Labour Force Survey (LFS), which is a large-scale individual-level survey that is not subject to panel attrition.³ This suggests that, despite some attrition from the NCDS, the composition of the remaining sample is similar to that of the LFS, in terms of the occupational structure of employment and wages for those individuals with at least one A level.⁴

1.2. *The Determinants of Educational Attainment*

1.2.1. *Determinants of success at A level*

Given that the sample used in our analysis of the returns to higher education is restricted to those men and women who had completed at least one A level by 1991, it is useful to look at what factors determine success at A level. Regression analysis of the determinants of A Level qualifications showed that controlling for other factors, the A level group differed from the rest of the NCDS sample in several respects. They were more likely to have performed well in reading

Table 1
*Selection of the NCDS 'at least one A level'
Sample*

	Sample size
Full NCDS	18,562
less No A levels passed by 1991	-15,298
less Not interviewed in 1991	-505
less Employee 1991, missing hourly wage	-230
Main sample	2,529

³ The LFS introduced a panel element (with resulting attrition problems) from 1992 onwards, but the comparison we make uses the 1991 LFS, which was a single cross-sectional survey.

⁴ The 1991 LFS does not contain any wage information, so this comparison was made using the winter 1992 QLFS survey which has information on wages.

and maths ability tests at age seven; they were more likely to have had well-educated mothers and/or fathers; they were more likely to have had fathers who were in a professional and/or managerial social class; and they were less likely to have had no mother figure living in the household at age sixteen, or financial difficulties at age eleven or sixteen. Attendance at grammar or private school was also associated with higher A level attainment for men, as was being in a family with a low number of children. For women, being high in the birth order was associated with better A level attainment.

1.2.2. *Attainment in higher education*

The proportions of individuals who completed HE courses by 1991 are shown in Table 2. Sample sizes are given in parentheses. From this table, we see that about three-quarters of men in the 1958 cohort with A levels go on to get some kind of HE qualification by the age of 33. Just over one-fifth obtain non-degree HE qualifications as their highest qualification, whilst more than half obtain either first or higher degrees. Most of those getting degrees stop at first-degree level; the highest qualification of 38% of the sample of men is a first degree. Meanwhile, 17% of men with A levels are educated to higher-degree level.

The proportion of women with A levels who go on to obtain some form of HE qualification is somewhat lower than that of men. About 29% of women with A levels do not go on to get any form of HE qualification at all. Almost a quarter undertake non-degree HE qualifications, reflecting the large number of women obtaining nursing and teacher training qualifications. About one-third of women with A levels complete first degrees as their highest qualification level.

We also conducted regression analysis on the determinants of higher education qualifications to see whether there were any important differences between HE graduates and men and women who completed one or more A levels but did not go on to a degree. The HE regressions showed that good performance in maths tests conducted at age seven was associated with a

Table 2
Percentage of Individuals Completing HE Courses
(sample with at least one A level)

	Percentage not completing any HE	Percentage completing non-degree HE qualification	Percentage completing first degree	Percentage completing higher degree	Total sample
Men	24 (298)	21 (268)	38 (476)	17 (209)	100 (1,251)
Women	29 (367)	25 (316)	33 (418)	14 (177)	100 (1,278)
All	26 (665)	23 (584)	35 (894)	15 (386)	100 (2,529)

Note: Sample sizes are given in parentheses.

higher chance of completing a first or higher degree and with a lower chance of only having completed a non-degree HE course or no course at all. This is also true for being in the top quintile of reading ability tests. For men, the only other statistically significant results were that a higher number of siblings in the family was associated with *better* educational attainment, as was being higher in the birth order. For women, ability in tests at age 7 had a similar impact on HE performance to that of men, but the other explanatory variables had mostly different effects. The sibling variables for women are not significant determinants of HE. However, school attendance and the type of school attended at age 16 seemed to matter for women but not for men. Family background and demographic variables⁵ were also important determinants of higher education success when considered jointly for men, but not for women. These results suggest that there are some interesting differences between the determinants of success at A level and the determinants of success in higher education.

2. Methodology

In the paper, we concentrate only on individuals with at least one A level and use matching methods to model the impact of HE on hourly wages. This methodological approach assumes that higher education decisions are made on the basis of variables that are observable (or well proxied by variables) in our NCDS data.

The endogeneity problem in estimating the returns to HE is a consequence of missing data; namely, that typically unobserved and therefore omitted individual characteristics (ability, motivation, the rate of time preference, etc.) affect HE outcomes. Because these variables are also correlated with wage outcomes, the estimates of the impact of HE on wages will be biased. The NCDS contains a wealth of data on personal and family background characteristics that we can use to proxy these typically unobserved characteristics by including them on the right-hand side of the wage equation. The success of this methodology hinges on whether the unobserved factors are adequately proxied in the data; if not, our estimates of the return to HE could be biased.

2.1. *Estimation Methodology*

The ability to proxy unobserved determinants of higher education and wages is clearly going to depend on the quality of the data used. The NCDS data used in this paper are particularly rich in this regard. Our methodological approach assumes that higher education decisions are made on the basis of (or well proxied by) the variables we observe in our NCDS data. To estimate the returns to higher education we estimate the following wage equations

⁵ The family background and demographic variables used in the HE attainment regression are identical to those used in the wage regressions (3) and (4) described in Box 1 in Section 3.

$$\ln w_i = \beta_1 HE_{1i} + \beta_2 HE_{2i} + \beta_3 HE_{3i} + \varphi X_i + \varepsilon_i$$

$$\beta' \mathbf{HE}_i + \varphi \mathbf{X}_i + \varepsilon_i \quad (1)$$

where $\mathbf{HE}_i = (HE_{1i}, HE_{2i}, HE_{3i})$ is a vector of dummy variables identifying the person's highest higher education qualification, w_i is the real hourly wage rate, \mathbf{X}_i is a vector of exogenous observed individual characteristics, and β measures the returns to each of the three higher educational qualifications conditional on \mathbf{X}_i . This is analogous to matching our sample on \mathbf{X}_i and assuming common return parameters β_j . In this context, $\varphi' \mathbf{X}_i$ can be interpreted as the matching function.

OLS estimation of (1) gives rise to an unbiased estimate of the returns to higher education if HE_{1i} , HE_{2i} and HE_{3i} are exogenous (i.e. $E(HE_{1i}, \varepsilon_i) = E(HE_{2i}, \varepsilon_i) = E(HE_{3i}, \varepsilon_i) = 0$). This will arise if conditioning on the observable variables (\mathbf{X}_i) is sufficient to control for the endogenous choice of individual's higher education qualifications. We assume that individuals who are the same in the observable dimension \mathbf{X}_i but choose different levels of higher education do not differ on average in the unobserved dimension ε_i . Formally this means that $E(\varepsilon_i | \mathbf{HE}_i, \mathbf{X}_i) = E(\varepsilon_i | \mathbf{X}_i)$.

Equation (1) can be viewed as a form of regression-based linear matching. This estimator is a simplified version of the fully non-parametric propensity score matching estimators described in Heckman *et al.* (1997, 1998). It assumes a constant marginal effect for each educational outcome across individuals and can be generalised as described below. This estimator also assumes that conditioning linearly on the \mathbf{X} 's is sufficient to induce the mean independence condition $E(\varepsilon_i | \mathbf{HE}_i, \mathbf{X}_i) = E(\varepsilon_i | \mathbf{X}_i)$. If, however, there are unobserved determinants of wages which are correlated with higher education choices, then this condition will fail and estimation of (1) will produce biased estimates of the returns to higher education.

2.2. Extensions to the Modelling Procedure

In the model presented in (1) we assume that there is a constant return to different higher education qualifications. The model can be easily extended to allow the returns to higher education to be heterogeneous (i.e. $\beta_i = \beta + e_i$ where $\text{var}(e_i) > 0$). If we assume that only the average population value of e_i , conditional on the observables is known by the person undertaking the choice of \mathbf{HE}_i then $E(e_i | \mathbf{HE}_i, Z_i) \mathbf{HE}_i = (e_i | Z_i) \mathbf{HE}_i$. Hence the average effect β can be identified by the regression:

$$\ln w_i = \beta' \mathbf{HE}_i + \varphi' \mathbf{X}_i + \delta' (\mathbf{X}_i \otimes \mathbf{HE}_i) + v_i \quad (2)$$

where $E(v_i | \mathbf{HE}_i, Z_i) = 0$. In (2) the coefficients δ reflect the heterogeneity in the returns to higher education. Given the above assumptions the model can again be estimated by OLS. The standard errors must be computed using White's (1982) adjustment for heteroskedasticity, because the heterogeneous returns imply that the variance of v_i will depend on \mathbf{HE}_i . This extension to the

estimation methodology allows us to incorporate interactions between higher education effects and other observable characteristics of the individuals in the NCDS.

In the paper we look at whether the returns to HE are different for mature students; whether there are different returns to degree subject; and whether the returns differ for men and women considered separately. These extensions are discussed in more detail in the results section.

3. Results

The analysis of earnings encompasses two aspects; firstly, the question of what determines selection into employment (i.e. non-zero earnings), and secondly what determines hourly wages for those in work. Our results discuss these in turn, with emphasis on the effect of higher education on hourly earnings.

3.1. *The Impact of Higher Education on Employment at Age 33*

For men, the employment rate (defined as employees plus self-employed) amongst the sample from this cohort with at least one A level in 1991 was very high indeed, at around 95%. We found no significant effect of HE on men's employment prospects. However, HE appears to be an important determinant of employment for women. The raw data show that women with degrees were more likely to be employed (at around 78%) than women with just A levels (at around 69%). Even controlling for factors such as ability test scores at age seven, school type, the number of children in the family of different ages, family background and demographics, women with HE are around 8% more likely to be in employment at 33 than those whose highest qualification is at A level.

Dearden (1999) shows that if education qualifications have a positive effect on both employment and wages, then the estimated returns to these education qualifications can be downward biased if there is self-selection into employment by comparative advantage. This should be borne in mind in interpreting the estimated returns in the following sections.

3.2. *The Impact of Higher Education on Wages at Age 33*

The relationship between various types of HE qualification and wages as measured in 1991 was estimated under a variety of different specifications. Table 3 shows how the estimated returns to different levels of HE change as we include wider groups of control variables. The results for men are given on the left hand side of table and for women on the right hand side. Specification 1 in the left-hand column shows the raw returns with no controls. Specification 2 adds ability scores at age seven and region and school type at age 16. Specification 3 adds family background variables, demographic controls from the 1971 census and characteristics of the individual's job in 1991; this corresponds to a basic 'matching' approach. Our aim here is to control for

Table 3
Effect of Higher Education on Men's and Women's Hourly Wages at 33

Variable	Specification							
	Men				Women			
	1	2	3	4	1	2	3	4
Non-degree HE qualification	0.150 (0.039)	0.155 (0.039)	0.144 (0.039)	0.136 (0.039)	0.261 (0.040)	0.272 (0.040)	0.223 (0.040)	0.218 (0.040)
First degree	0.208 (0.034)	0.184 (0.035)	0.171 (0.035)	0.122 (0.036)	0.391 (0.038)	0.384 (0.039)	0.368 (0.039)	0.337 (0.041)
Higher degree	0.156 (0.042)	0.141 (0.042)	0.144 (0.042)	0.084 (0.044)	0.427 (0.046)	0.408 (0.047)	0.368 (0.048)	0.319 (0.051)
UCCA score				0.012 (0.004)				0.011 (0.004)
P-value, F-test—ability at 7		0.020	0.068	0.204		0.289	0.693	
P-value, F-test—ability at 16				0.014				0.299
P-value, F-test—family vars.			0.109	0.228			0.179	0.145
P-value, F-test—demographics			0.236	0.178			0.060	0.092
P-value, F-test—employer vars.			0.000	0.000			0.000	0.000
No. of observations	1,006	1,006	1,006	1,006	832	832	832	832
Adjusted R ²	0.0333	0.0515	0.0913	0.1133	0.1328	0.1397	0.1941	0.2067

Note: Dependent variable is real log hourly wage in 1991 (January 1995 prices). Standard errors in parentheses.

unobserved characteristics that might affect both HE outcomes and wages by using a rich set of observable information. Finally, specification 4 includes A level 'scores'⁶ and ability tests at age 16, in an attempt to ascertain whether including earlier measures of educational attainment and aptitude diminishes our estimates of the impact of HE on wages. Box 1 gives exact details of the variables used.

Table 3 shows raw returns for men of around 15% to a non-degree HE qualification, 21% for a first degree and just over 15% for a higher degree. Including controls for ability tests at seven, region and school type reduces the returns to degrees slightly, but has no appreciable impact on returns to non-degree courses. An F-test of the ability variables indicates that they are jointly significant. When family background and demographic variables are included, amongst others, to proxy unobserved individual characteristics that might bias the estimates of the returns, there is little change to the estimates. Neither the family background nor the demographic variables are significant. However, additional variables included to capture characteristics of the individual's job in 1991 which might exert an influence on wages (employer size dummies, union status and a public/private sector dummy) are highly significant in a joint test. When A level scores and ability tests at age 16 are included, in specification 4, they are both significant at the 5% level; the returns to first and higher degrees are reduced (from 17.1% to 12.2% and from 14.4% to 8.4% respectively) but are still statistically significant. Hence, even given the fact that

Box 1

Wage equation specifications

-
-
1. Higher education dummies only
 2. As in specification 1
 - + Quintiles of maths and reading ability test scores at age seven
 - + Region at age 16
 - + School type at age 16
 3. As in specification 2
 - + Family background variables (father's and mother's education, father's social class, mother's employment, absence of mother/father, number of siblings, number of older siblings, all in 1974)
 - + Demographic variables (information from 1971 Census returns on proportion of households in local authority with unemployed head of household, head of household in top social class, council tenancy, owner-occupation)
 - + Good school attendance in 1974
 - + Employer characteristics in 1991 (employer size, union membership dummy, private sector dummy)
 4. As in specification 3
 - + Ability test scores at age 16
 - + A level score according to UCCA formula
-
-

⁶ The A level 'score' is constructed according to the UCCA formula (where five points are awarded for each 'A' grade at A level, 4 for each 'B' grade, and so on down to 1 point for an 'E' grade pass, up to a maximum of 15 points. This score is not available for those individuals who completed A levels after 1978; for these individuals we include a missing UCCA score dummy variable.

there is likely to be a high correlation between individuals' A level scores and their decisions and opportunities to go into HE, an average return to a first degree of around 12% remains even after controlling for A level score.

For women, the raw returns to each level of HE in the first column of Table 3 appear to be considerably higher than those for men—around 26%, 39% and 43% for non-degree HE courses, first degrees and higher degrees respectively. Including ability tests at seven, region and school type dummies affects the returns only slightly. The proxy approach in specification 3, including family background variables and demographics, lowers the returns to 22% for non-degree courses, 37% (still only a marginal reduction) for first degrees and 37% (a larger reduction) for higher degrees. Including the fullest set of available controls by adding tests at 16 and A level score to the regressor set lowers the estimated returns even more (especially for higher degrees), but the returns to HE still appear highly significant and much higher than the returns for men. A woman with an UCCA score of 10 out of 15 will receive, on average, an additional return of 11% over someone with a score of zero.

The main conclusions from Table 3 are: first, that there are significant and substantial raw wage premiums for typical graduates, much of which persist even after controlling for other factors; and second, that there seem to be large differences in the returns between men and women.

3.3. *Extensions to the Analysis of the Impact of Higher Education on Wages*

3.3.1. *Returns by subject category*

An important extension to the analysis of the returns to HE conducted above involves considering whether the returns are different depending on the subject of the HE course that a person took. Table 4 considers the different returns by subject for men and women respectively. The returns to different subjects have been estimated using specifications 3 and 4 of the wage equation shown in Table 3. Splitting our sample by subject necessarily means that the sample size in each subject category is generally quite small, which means that the precision of our estimates of returns by subject is generally quite poor.

Table 4 shows that, in so far as we do find significant results, it appears that men completing a HE qualification in biology, chemistry, environmental sciences or geography have substantially lower returns to HE than the base group (those graduates for whom no information was available in the NCDS on the subject they took). The inclusion of A level scores in the wage equation (specification 4) does not eliminate this difference.

For women the pattern is somewhat different: higher returns appear to be achieved in education, economics, accountancy and law, and the 'other social sciences' category. Again, the inclusion of performance at A level does not dramatically alter the results.

One explanation of these differences could be that we are picking up the effects of different standards of *intake* into the different degree subjects. For example, it may be the case that better A level results are needed to gain entry

Table 4

Effects of Degree Subject, Degree Failure and Starting Late on Men's and Women's Hourly Wages at 33

Variable	Men		Women	
	Specification 3	Specification 4	Specification 3	Specification 4
Non-degree HE qualification	0.153 (0.045)	0.142 (0.044)	0.206 (0.047)	0.193 (0.047)
First degree	0.146 (0.043)	0.099 (0.045)	0.321 (0.050)	0.288 (0.052)
Higher degree	0.142 (0.046)	0.079 (0.048)	0.349 (0.053)	0.296 (0.056)
UCCA score		0.010 (0.004)		0.010 (0.004)
<i>Degree subject:</i>				
Arts	-0.102 (0.081)	-0.034 (0.081)	0.055 (0.077)	0.045 (0.076)
Engineering	0.060 (0.058)	0.031 (0.057)	0.217 (0.238)	0.197 (0.237)
Education	0.036 (0.079)	0.040 (0.078)	0.093 (0.052)	0.100 (0.052)
Economics/accountancy/law	0.104 (0.064)	0.078 (0.064)	0.242 (0.105)	0.274 (0.104)
Other social sciences	0.065 (0.058)	0.063 (0.058)	0.106 (0.064)	0.097 (0.064)
Maths/physics	0.092 (0.079)	0.050 (0.079)	0.162 (0.149)	0.166 (0.149)
Chemistry/biology etc.	-0.170 (0.075)	-0.175 (0.074)	-0.116 (0.123)	-0.115 (0.122)
Other sciences	0.070 (0.118)	0.051 (0.117)	0.010 (0.129)	0.000 (0.128)
Other subjects	-0.107 (0.069)	-0.116 (0.068)	0.008 (0.055)	0.013 (0.055)
Failed HE course	-0.094 (0.049)	-0.129 (0.050)	-0.007 (0.064)	-0.016 (0.063)
Started HE course aged 21 years +	-0.078 (0.040)	-0.069 (0.040)	-0.011 (0.049)	0.006 (0.049)
No. of observations	1,006	1,006	832	832
Adjusted R ²	0.1062	0.1272	0.2083	0.2206

Notes:

Dependent variable is real log hourly wage in 1991 (January 1995 prices).

Base subject group is missing subject information.

Standard errors in parentheses.

to an accountancy or law course than to a chemistry or biology course. On the other hand, the proxy approach adopted ought to control for such differences in the quality of workers; in addition, the controls for A level score included in specification 4 did not much alter the pattern of estimated returns across subjects. Another explanation is that studying in a subject with a high estimated return increases the graduate's potential productivity more than studying in a subject with a lower estimated return.

3.3.2. *The effects of failure and starting late*

The regressions from which the results in Tables 4 are taken included a control for whether individuals in the sample had started but failed to complete a HE course. In addition, a dummy was included for those who completed their first HE course but started it when aged 21 years or older. This allowed us to examine, first, whether there was any return to a HE course that was not completed, and, second, whether the returns measured at age 33 for 'mature students' were different from those for students who started their first course soon after leaving school.

Table 4 indicates that, for men, there seems to be a *negative* return to non-completion of a HE course: men who started but did not complete such a course had at least 9% lower wages on average than those who never attempted a HE course, controlling for other factors. There are a number of potential explanations for why non-completion of a course might be negatively related to labour market performance in a regression such as this. One is that time spent on a HE course is time out of the labour market, and therefore individuals who undertook all or part of a course are likely to have lower levels of labour market experience, and hence lower wages, than those who did not undertake a course. Another possibility is that the people who did not complete courses are 'worse' than the base group with respect to some unobserved characteristic(s) (for example, motivation) and so the negative return to non-completion reflects this. It should be borne in mind that the regression in Table 4 contains all the proxies for such unobserved characteristics that were in specification 3 of Table 3 earlier, so if the proxies are satisfactory, there should not be a negative effect of non-completion in the regression due to such unobservables. Another possibility is that the penalty on non-completion reflects the negative signal that such poor performance in HE sends to employers—this is the converse of the standard 'signalling' model of HE (see, for example, Spence (1973)). This is certainly a possible interpretation of the result. However, for women, we find no evidence that those who did not complete HE courses do any worse than the base group.

As for the effect of starting HE late, men who start late seem to have an average return of 7 or 8% less than those who undertook HE courses earlier. However, this still means that there is a significant positive return to HE, even for late starters. The lower returns to late starters might simply be a consequence of the fact that, as they will have entered (or re-entered) the labour market later than the early starters, they may not have built up as much recent labour market experience and so their returns may be lower. Alternatively, it might be that courses that are started late are qualitatively different from the earlier courses. For women, we find no evidence that those who started HE courses later do any worse than the base group.

3.3.3. *Gender wage differentials and the returns to higher education*

In analysing the results presented so far, it has been noted that a consistent feature of the estimated returns to HE is that they appear to be higher for

women than for men. In this section, we analyse how differences in the returns to HE by gender affect the 'gender earnings gap' which is a prominent feature of UK data on earnings (as documented by, for example, Harkness (1996) and Dearden (1999)). The regressions reported in Table 5 are run on a pooled sample of men and women. The HE variables are interacted with male dummies to examine whether there are significant gaps between men's and women's hourly wage levels by education group. A raw specification with no controls (specification 1) is considered, followed by a regression with a set of control variables and proxies for unobservable characteristics (specification 3). In specification 3, variables that relate to employer and job characteristics, family background and school type are also interacted with gender.

Table 5 shows that there is a gender wage gap of 38% between men and women with no HE qualifications in the raw specification. For the sub-groups of people with HE qualifications, there are *smaller* earnings gaps, and the gaps *decrease* the further up the education distribution we go, to a minimum of under 11% between men and women with higher degrees. When we control for ability, family background, demographics and employer characteristics, the estimated gender wage gap increases at all education levels. This indicates that, if anything, the raw differential understates the true extent of differences

Table 5
Gender Wage Differentials for Different Higher Education Groups

Variable	Specification 1	Specification 3
<i>Basic return from:</i>		
Non-degree HE qualification	0.261 (0.040)	0.229 (0.040)
First degree	0.391 (0.038)	0.363 (0.038)
Higher degree	0.427 (0.046)	0.366 (0.047)
<i>Additional return for men from:</i>		
A level	0.380 (0.039)	0.426 (0.039)
Non-degree HE qualification	0.269 (0.040)	0.338 (0.041)
First degree	0.197 (0.033)	0.233 (0.034)
Higher degree	0.109 (0.048)	0.207 (0.048)
P-value, F-test—ability at 7		0.042
P-value, F-test—family background vars.		0.114
P-value, F-test—demographics		0.033
P-value, F-test—employer variables		0.000
No. of observations	1,838	1,838
Adjusted R ²	0.1532	0.2086

Notes:

Dependent variable is real log hourly wage in 1991 (January 1995 prices).

Base group is women with A levels.

Family variables, school variables and employer variables are fully interacted with gender in specification 3.

Standard errors in parentheses.

between the earnings of similarly-qualified men and women. None the less, the finding that the gap is smaller for more-highly-educated groups is an interesting result.

If we attribute differences in wages between similarly-qualified men and women to discrimination, then the narrowing of the gap at higher education levels might indicate that it is more difficult for employers to discriminate in jobs that attract graduates. An alternative hypothesis is that the observed gender earnings gap is due to differences in the characteristics of men and women which affect productivity but which are not controlled for in our regression specification. One possibility is that the labour market histories of the men and women in the NCDS cohort are very different, and that the men are, on average, more productive because of this. For example, men are on average more experienced than women due to women spending time out the labour force to have children. We used a control for labour market experience as a crude test of this theory and found that this reduced the gender gap; nonetheless, a substantial earnings gap persisted. However, other work has identified many other differences between men and women (e.g. labour market history, post-school training) which might help explain differences if more detailed data were available (see Blundell *et al.* (1996), for example).

Another possibility is that there are differences in unobservable characteristics (for example, motivation) between men and women which account for the gap. Even if this were the case, the proxy approach in specification 3 is designed to control for it as much as possible, and the persistence of an unexplained earnings gap under this hypothesis would indicate the failure of the proxy approach.

A third possibility is that the earnings gap can be explained by compensating differentials. To be credible, this explanation would have to involve some feature of women's work which is not controlled for in the regression as it stands, but which is valuable to women and thus facilitates the paying of lower wages to women than to men. One possible feature of women's work that might fulfil this role is the fact that part-time working is widespread among women. To explain the gender wage gap as a compensating differential in this context, one would have to argue that women valued the flexibility of part-time work as opposed to full-time work, and hence that controlling for part-time status in the wage equation would substantially change the results. Analysis of the returns to higher education for full-time and part-time workers in Blundell *et al.* (1997) shows that female part-timers have almost 10% lower hourly wages than female full-timers, on average. However, even if we were to make the (strong) assumption that this 10% gap wholly reflects a compensating differential for part-time work, this would leave a large proportion of the earnings gap unexplained (particularly as women with HE qualifications are less likely to be part-timers than less-educated women).

We conclude in this section that there is a substantial gap between male and female hourly earnings which is not attributable to differences in educational background. The gap seems to be narrower for men and women with HE than for those with just A levels.

4. Conclusions

This paper looks at the effect which higher education has on wages by comparing a group of British men and women born in March 1958 who undertook some form of higher education prior to 1991 with a corresponding group who obtained one or more A levels at school but, despite this, did not proceed into HE. Examining the wage returns to men and women in their early thirties has the advantage that this cohort has potentially been in the labour market long enough after graduation for their full returns to be measured. The returns were estimated using a 'proxy' or 'matching' approach which attempted to control for possible biases to the regression estimates induced by unobserved individual characteristics. This was achieved by including a whole range of individual and family background variables in the NCDS that might reasonably be expected to proxy the unobservables.

The results showed that there were average 'raw' returns to an undergraduate degree of around 21% for men and 39% for women. Controlling for ability at age seven, region, school type, family background, demographic characteristics and various other features of the job (for example, employer size and unionisation) reduced the estimated return to around 17% for men and 37% for women. None the less, it is clear that the returns appear substantial even when controlling for other factors. The returns to higher degrees and non-degree HE courses were generally lower than those to undergraduate degrees, but still statistically significant.

We also attempted to investigate various subsidiary issues concerning the impact of HE on wages and produced some interesting findings. In particular, we found that the gender earnings gap was lower between men and women at various levels of higher educational attainment than it was between men and women with just A levels. A substantial gap remained which did not appear to be fully explained by either differences in experience between men and women or differences in hours of work. It was found that failure in a HE course seemed to be related to lower wages for men but not for women. Similarly, men who started their first HE course at the age of 21 or older seemed to have lower wages than those who started before the age of 21, controlling for other factors.

Of course, the results presented here show the returns to HE for a group of men and women who were making the decision whether to stay on at school or not and whether to undertake HE in the late 1970s and early 1980s. However, the climate in which today's school leavers have to make those decisions is dramatically different. Since the mid-1980s, there has been a massive expansion in the numbers of pupils staying at school beyond 16 and continuing on into HE. More than one-third of young people now pass one or more A levels, compared with just over one in six at the time the NCDS cohort was at school. Around one in three young people now go into full-time HE in Great Britain, compared with one in eight in 1979.⁷ This means that there are now many

⁷ Source: Department for Education and Employment (1998).

more highly-educated workers entering the labour force every year than when the NCDS cohort went out to work for the first time. The demand conditions for such workers have also altered fundamentally since this cohort entered work. Technological change and increased international trade have meant that the demand for highly-skilled workers has grown alongside the growing participation in HE. The impact of these important labour market changes on the wage outcomes of the NCDS cohort will be reflected in the returns to HE that we measure in this study. However, the extent to which the large influx of new graduates into the job market in the 1990s will affect the returns to the older cohort analysed in this study depends on the relative demand of firms for younger and older graduates and the extent to which young and old graduates are in competition with each other or with their peer groups; these are difficult issues which this paper does not address directly. Certainly, ascertaining the potential longer-term returns to HE for younger workers, who will be most affected by the labour market changes that have taken place, is important from a policy perspective. On the other hand, they have not yet been in the work-force long enough for their returns to HE to be assessed fully—it is difficult to believe that the full returns to HE have set in much before an individual's mid-thirties. As such, they are beyond the scope of this paper.⁸

In addition, we have only considered the private financial returns to higher education, and not whatever other private returns or social returns may exist. Our finding of large private returns should imply that individuals will be able to contribute towards the cost of their education and still secure a net benefit (at least on average); however, without knowing the size of any social returns to HE it is impossible to say what the overall efficient mix of private and public funding should be. Existing research seems to indicate that social returns may exist due to spillover effects, but the magnitude of these effects is far from certain.⁹ Clearly however, if private returns of the magnitude shown in this study are achievable by today's graduates then substantial economic incentives exist for school leavers to pursue higher education even after the reductions in *per capita* government support that we have seen in the 1990s.

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⁸ The early returns to HE have been considered by Bryson and Lissenburgh (1996), who use the 1987 Youth Cohort Study to look at the returns to HE in 1994 of a cohort of individuals aged 22–23. They have also been studied by Harkness and Machin (1999) using GHS data over the period 1974 to 1995.

⁹ A fairly recent study of educational spillovers in the United Kingdom is Jenkins (1995). See Blundell *et al.* (1999) for a detailed review of the returns to the economy from education and training in general.

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