



Pergamon

Economics of Education Review 19 (2000) 179–198

Economics of
Education Review

www.elsevier.com/locate/econedurev

The incidence and effects of overeducation in the U.K. graduate labour market

Peter Dolton ^{*}, Anna Vignoles

Department of Economics, University of Newcastle-upon-Tyne, Newcastle-upon-Tyne, UK

Received 14 March 1996; accepted 23 September 1996

Abstract

Research indicates that a significant proportion of the U.S. work force (between 11% and 40% of white males) have more education than is actually required for their jobs, i.e. are overeducated. We consider overeducation in the context of the U.K. graduate labour market, using a one in six sample of 1980 U.K. graduates surveyed in 1986. We find that 38% of graduates were overeducated for their first job and, even six years later (1986), 30% of the sample were overeducated. Most of the literature in this field has estimated the effect of overeducation on earnings and we confirm that the overeducated earn less than their peers in graduate jobs, indicating that the return on surplus education is less than the return on required education. We also frame two additional hypotheses based on human capital theory, related to the effects of degree class and sector, on the earnings of the overeducated. We do not find support for a strict human capital interpretation of the role of education in the U.K. graduate labour market and support an assignment model in which the characteristics of the job, as well as the individual, determine earnings. [JEL I21, J24] © 2000 Elsevier Science Ltd. All rights reserved.

1. Introduction

Public opinion and policy, both in the U.S.A. and Europe, attest to the importance and value of education to the individual and society. Certainly the proportion of graduates in the work force has risen dramatically in almost all developed countries over the last 20–40 years. Yet various studies, largely from the U.S.A., have indicated that a significant proportion of the labour force has more education than is actually required for their jobs, i.e. is overeducated. Figures for white U.S. males range from 11% (Verdugo and Verdugo, 1989) to 40% (Duncan and Hoffman, 1981; Sicherman, 1991). Sloane et al. (1995a, b) have also confirmed that a significant proportion of the workforce in the U.K. is overeducated.

In this paper we focus on graduate overeducation in the U.K. Although the proportion of the U.K. work force with a college education is still less than in the U.S.A.,

higher education in the U.K. has expanded rapidly since the 1970s. For example, over the period 1981 to 1991 there was a 42% increase in U.K. higher education enrollments (Paul Hamlyn Foundation, 1993). Some British commentators have urged that higher education in the U.K. be expanded still further.¹ This paper is therefore motivated by the possible contradiction in public policy that whilst the number of graduates is expected to rise still further, many of today's graduates may be unable to secure graduate level jobs and earn the expected high private rate of return to a degree.

We have three objectives in this paper: to measure the incidence of overeducation in the U.K. graduate labour market, using data from the National Survey of 1980 Graduates and Diplomates, to estimate the effect of overeducation on graduate earnings and, finally, to consider whether overeducation can provide further evidence

^{*} Corresponding author. E-mail: peter.dolton@newcastle.ac.uk

¹ A 1990 report from the Institute for Public Policy Research (1990) argued that the U.K. needed to more than double its higher education participation rate to remain competitive.

on the validity of human capital theory. Our research is distinctive in that our survey data is from a more homogeneous population and is more detailed than that used by many other studies in this field. In particular we have cohort data on the personal characteristics and academic/work histories of more than 7000 graduates, over a period of six years. Furthermore much of the U.S. literature has relied on years of schooling to measure educational human capital. Yet what really matters is not how long a person spends at school but rather what academic standard they achieve. The U.K. education system relies heavily on examinations to measure educational progress and is hence well suited to this kind of analysis (see Appendix B).

We start by defining overeducation more precisely and exploring some possible explanations for the phenomenon. We then briefly review the data set and variables used, providing summary statistics on the incidence of overeducation amongst different types of U.K. graduates. We go on to discuss the earnings functions estimated. Our final section contains conclusions and ideas for future research.

2. Overeducation: theory and evidence

In the context of the U.K. graduate labour market, and for the purposes of this paper, a graduate in a job requiring sub-degree level qualifications (or no qualifications at all) is defined as overeducated. There are a variety of ways of actually measuring the education needed to do a particular job. We, along with most other analysts, use a “self-assessment” technique (Duncan and Hoffman, 1981; Sicherman, 1991; Sloane et al., 1995a, b) whereby survey respondents are asked directly about the minimum education level needed to do their jobs. Other researchers have used “external” methods to assess the average required education for a particular type of job, generally using job analysis data. Rumberger (1987), for example, used the *U.S. Dictionary of Occupational Titles* (U.S. Department of Labor, 1965) which provides information on the educational requirements of a wide range of occupations. Yet another method was developed by Verdugo and Verdugo (1989) who calculated the mean education level across a range of occupations and defined an individual as overeducated if he/she had more than one standard deviation above the mean education level for his or her occupation. All these methods have their limitations.

Self-assessment methods may be biased because they rely on the objectivity of respondents. Individuals who are overeducated, and perhaps more negative about their jobs, may be less likely to complete an employment questionnaire. Furthermore, workers may rely on benchmark jobs to assess the educational requirements of their own job. This is likely to be easier in larger, more struc-

ured firms and in professions where there are clearly defined jobs. All this suggests that there may be systematic bias in survey responses (and non-responses) to overeducation questions. Equally external measures of overeducation are based on the dubious assumption that workers with the same job or occupation title are doing work of equal difficulty.² Finally, with the Verdugos’ method the choice of one standard deviation as the cut off point could be seen as arbitrary. Also, if the proportion of overeducated workers is high, this will increase average educational levels in most jobs and automatically bias Verdugo-type estimates downwards. There are also more fundamental problems associated with *all* these measures. First, they tend to reflect what employers say they need, not what is actually required to do the job.³ Second, “qualification inflation”, whereby employers upgrade the educational requirements of the job but do not change their content, will lead to underestimates of the incidence of true overeducation. Finally, some jobs have become more complex over time yet continue to be associated with lower educational requirements.

Before discussing the details of our survey and data, we highlight some possible explanations for overeducation. Richard Freeman (1976) was one of the first economists to express concern about the post-war expansion of higher education in the U.S.A.⁴ and the potential problem of overinvestment. He found that the rate of return to a degree had fallen significantly in the U.S.A. in the 1970s and attributed this to an excess supply of graduates.⁵ Freeman’s results were particularly significant because they questioned the widely held belief that a college degree was a “good investment” and a virtual guarantee of economic success. His work also acted as a catalyst for research into the issue of overeducation and there was growing recognition that in a situation of excess supply, graduates might increasingly be forced to accept non-graduate jobs.

Much of the research into overeducation has focused on one key question. Do overeducated individuals earn less than their peers who find jobs commensurate with their schooling? Human capital theory assumes that individuals are paid the value of their marginal product

² For instance, clearly not all office manager jobs are the same and yet consulting a dictionary of job titles would suggest that they are.

³ This is a particular problem if education is used as a screen to identify higher ability workers. See Arrow (1973), Spence (1973) and Stiglitz (1975). For a more recent look at signalling issues see Kroch and Sjoblom (1994).

⁴ See also Berg (1970).

⁵ Later work by Murphy and Welch (1989) confirmed that, whereas in 1970 young male college graduates earned 46% more than those with simply a high school certificate, by 1976 this premium had fallen to 32%.

which is determined by their human capital (education, training, work experience, etc.), rather than the characteristics of their job (Becker, 1975). Firms are assumed to fully utilize their staff and to be able to adapt their production technology in response to changes in the relative supply of skilled labour. This suggests that overeducation is purely the result of a temporary disequilibrium in the labour market and that the rate of return to schooling is independent of whether or not the individual claims to be overeducated. However, some economists question whether firms can easily adapt their production techniques to changing relative factor input prices (Duncan and Hoffman, 1981; Hartog and Oosterbeek, 1988; Rumberger, 1987).⁶ If firms cannot adapt quickly, then an individual's productivity and hence their earnings may crucially depend on their job. If so, job characteristics (particularly educational requirements) need to be included as explanatory variables in any model of earnings and it is entirely possible that the return to required education may exceed the return to any surplus education.

Much of the research in this area has relied on reduced form earnings functions to measure the relationship between education and earnings. In the context of overeducation, researchers have split the schooling variable (S) into required (S_r^i) and surplus schooling (S_s^i) and tested whether the returns to both types of schooling are indeed equal ($\beta_3 = \beta_4$) as human capital theory suggests.

$$\ln W_i = \beta_0 + \beta_1 X_i + \beta_2 X_i^2 + \beta_3 S_r^i + \beta_4 S_s^i + \beta_5 A_i + \beta_6 Z_i + \mu_i$$

where X_i is years of work experience, A_i an indicator of ability and Z_i a vector of personal socio-economic characteristics.

Most researchers have found that there is a positive return to surplus education but that this is less than the return to required education. Duncan and Hoffman (1981), Alba-Ramirez (1993) and Rumberger (1987) all found that the return to surplus education was approximately half the return to required education.⁷ If the return to surplus education is positive, this may explain why individuals continue to invest in education even though significant numbers end up overeducated.⁸ It also sug-

gests that we can reject Thurow's job competition model (Thurow, 1975), which suggests that only job characteristics, i.e. required education levels, determine earnings. Instead the evidence appears to support an assignment model interpretation (Sattinger, 1993) whereby workers' salaries are determined in part by the jobs they are doing, particularly whether they are overeducated, and in part by their human capital.⁹

We too test whether the return to surplus education is less than the return to required education and also suggest two additional hypothesis tests. First, those graduates with better quality degrees will, according to human capital theory, earn more since they are more productive. This implies that even if a person is overeducated, they should still accrue a higher return to a better quality of degree. We test to see if the overeducated with first or upper second class degrees earn more than the overeducated with lower degree classes.¹⁰

Our second hypothesis is based on the fact that pure human capital theory assumes a competitive market situation. Overeducation, and its negative effect on earnings, may therefore be the result of market rigidities and a non-competitive environment. For example, in the public sector unions are stronger and pay and working practices tend to be more restrictive.¹¹ These institutional arrangements limit the public sector employer's ability to fully utilize and reward more able staff. As an example of a less competitive environment, it is likely that the penalty for overeducation will be greater in the public sector and that individuals in similar jobs will earn the same, regardless of their education. We test to see if the earnings loss from overeducation is greater in the public sector, and whether conditioning for sector reduces the negative earnings effect from overeducation in the private sector.

⁹ Other explanations for overeducation have also been suggested (Sicherman, 1991). The overeducated may be more upwardly mobile, accepting a period of overeducation in order to achieve higher earnings in the future. Sicherman (1991), Alba-Ramirez (1993) and Sloane et al. (1995a, b) found support for this. Overeducation could also be caused by imperfect information, resulting in a bad match between firm and employee. Such a match would be likely to end in a quit, as the worker seeks out a more favourable match (Jovanovic, 1979). Finally the overeducated may substitute surplus education for other forms of human capital that they lack. Alba-Ramirez (1993) found evidence to suggest that the overeducated do have less human capital such as work experience, training, etc.

¹⁰ Degrees in the U.K. are graded in descending order as first class, upper second, lower second, third class and pass. We distinguish those with first or upper second class degrees from the others. See Appendix B for a discussion of U.K. degree classifications.

¹¹ The public sector consists of both central and local government bureaucrats, and teachers, policemen, etc. See Appendix A for a full definition of public sector.

⁶ This is especially true if firms have technology geared to team working which cannot then be easily adapted for more heterogeneous workers. Also institutional arrangements (national pay agreements, etc.) may be far more rigid than suggested by human capital theory.

⁷ Verdugo and Verdugo (1989) suggested that there was actually a negative return to overschooling but other researchers have since questioned this interpretation of their results [Cohn and Khan (1995)].

⁸ This is only rational if the return to surplus education exceeds the return to other forms of investment.

To sum up, we test the following hypotheses which are based on a narrow interpretation of human capital theory.

Hypothesis 1: Earnings are determined by actual schooling and the return on surplus and required education will be equal.

Hypothesis 2: The overeducated graduate with a better grade of degree will earn more than the overeducated individual with a lower class of degree.

Hypothesis 3: Due to the relatively less competitive nature of the public sector, overeducated graduates in this sector will be less fully utilized and hence earn less than the over-educated in the private sector.

3. Data and variables

We use the 1980 National Survey of Graduates and Diplomates,¹² a one in six random sample postal survey of U.K. graduates (1 in 4 sample of polytechnic graduates¹³). The survey was undertaken six years after graduation (1986) and includes detailed questions about academic qualifications, work history and socio-economic background. It excludes overseas students and medical/dental graduates. Since we are only concerned with the U.K. graduate labour market we also exclude those students who worked abroad during the period. Finally we exclude diplomates from our sample, concentrating on graduates only.¹⁴ This reduces the sample to 4551 plus 466 non-participants who were not working in 1986.¹⁵ The overall response rate was approximately 50%, excluding those known not to have received the questionnaire the response rate was 65%.

The approach taken by the survey organizers was to obtain the details of all 1980 graduates directly from the numerous higher education institutions in the U.K.¹⁶ From the names provided, a random sample was gener-

ated. Although the response rate was about average for a postal survey, there is the potential for some bias since the response rate was higher for university graduates, women and science graduates. Furthermore many graduates had moved house and not left forwarding addresses. If graduate mobility is not random this again may be a source of bias. Finally it is also possible that the response rate was higher amongst the more successful graduates and the reader should be aware of this when generalizing from the results in this paper. All tables show *t*-statistics alongside the coefficient estimates, to allow the reader to draw his or her own conclusions about the robustness of our results.

Full details of the variables used are given in Appendix A. We have actual work experience histories and do not have to rely on proxy measures, such as age. This is particularly important for women given that many of the females in our sample spent some time out of the work force. For the education and other human capital variables we also have exact data, including the type of postgraduate qualification and subject and standard of first degree.

The crucial overeducation variables are constructed from the survey question “What was the minimum formal qualification required for (entering) this job?”¹⁷ This question was asked for all jobs after graduation¹⁸ and we estimated earnings functions for the first job after graduation (j1) and the current job in 1986 (jc). Respondents had a choice of formal qualifications or could opt for “other”. From these we constructed five dummy variables measuring the extent of overeducation. The system of qualifications in the U.K. is complex (see Appendix B) so we have tried to give equate the various qualifications below with years of schooling.

nonejc/j1: no formal qualifications required at all.

oleveljc/j1: GCE/SCE O level or CSE required (academic qualifications often known collectively as “O levels”, generally obtained at age 16 which is the school leaving age).

aleveljc/j1: GCE A level or SCE Higher required (academic qualifications known as “A levels”, generally obtained at age 18).

vocatjc/j1: Vocational qualification or trade appren-

¹² The survey was carried out jointly by Social Community Planning Research (SCPR) and the Department of Employment’s Employment Market Research Unit (EMRU).

¹³ Universities were more academically oriented institutions and had higher entry standards than the polytechnics. Polytechnics were more technically and vocationally oriented. There has since been a change in terminology and (confusingly) polytechnics from 1991 onwards (after our data) were renamed universities.

¹⁴ Diplomates are awarded a higher diploma which is a sub-degree level qualification, normally requiring only 2 years of college education. Graduates are awarded a degree which generally takes 3–4 years to complete.

¹⁵ Includes the unemployed and those who were not participating in the labour force for domestic or other reasons.

¹⁶ Full details of the method of sampling and the response rate are described in Field and Meadows (1987).

¹⁷ As indicated in our discussion about measuring overeducation, this kind of survey question has the drawback that it does not clearly distinguish between the education required to actually do the job and the education required to get the job.

¹⁸ If an individual only had one job it is possible that he/she was overeducated at the beginning of the period and progressed into graduate level work within the same company. It is possible that such graduates would still claim that they did not require a degree to get their current job, even though they were no longer overeducated. Unfortunately we have no way of surmounting this problem.

ticeship required (including HNC, HND, ONC, OND which are technically oriented qualifications normally obtained at age 16–18, depending on the exact qualification).

othjc/j1: other sub-degree qualification required (including driving instructor licenses, typing qualifications, etc.).

As we have indicated it is possible that individuals may incorrectly assess the qualifications required for their job. Generally the overeducation categories above appear robust, although we found some overlap in that similar job titles may be found in more than one category. For example, some clerical workers claimed to need no qualifications, while others said they needed O levels or even A levels. This may simply reflect the fact that some clerical jobs are more demanding than others. We also found that some individuals claimed to be overeducated whilst their job title suggested they were not. However much of this appears due to the limitations of the job classification system used. For example there is no distinct job category for social work care assistants, so that graduates in this kind of work will tend to be classified as social workers. However, social workers require a degree or equivalent whilst a care assistant generally needs no qualifications at all.¹⁹ Nonetheless, as we have already discussed, there may also be some element of bias in graduates' responses to the overeducation question. It is possible for example, that lower paid individuals are more likely to claim to be overeducated, even if, in fact, they are not. This problem illustrates one of the difficulties associated with using any qualitative survey data. We conclude, however, that to the extent that there is a stochastic element to this assignment data, this is explicitly taken account of in our model by the error term in the wage equation.

Table 1 indicates that 38% of all graduates surveyed were overeducated in their first job. This proportion fell to 30% by the end of the survey period, six years later. Interestingly, 15% of the sample required no qualifications at all in their first job and even six years on, this figure is only down to 11%.

Table 2 suggests that broadly similar proportions of men and women were overeducated in the 1980s. Graduates with a higher quality education, i.e. those who attended universities (rather than polytechnics — see Appendix B) and those having better degree grades were less likely to be overeducated. Furthermore graduates with some form of postgraduate academic qualification were more likely to be in jobs requiring at least a degree

or above. Respondents from the social sciences, arts and language faculties were more likely to be overeducated than individuals with engineering, technical or science degrees. Indeed, more than half of the arts graduates were overeducated in their first job and about a third were overeducated six years later. Overeducation was found in broadly equal proportions in both the public and private sectors. However, a higher proportion of those working in government administration (specifically) were overeducated. Overeducation was highest amongst those who worked for small firms (of less than 20 people), although generally the incidence of overeducation did not decrease linearly with firm size. Interestingly, more than 70% of the graduates who were overeducated and working in small firms claimed to require no qualifications for their job. It may be that the lack of benchmark jobs and formal qualifications caused a higher incidence of overeducation to be recorded amongst graduates who work in small firms.

We conclude that a significant proportion of British graduates were overeducated in the 1980s and this was not restricted to new graduates. Overeducation appears to be less likely if an individual has more human capital (in the form of a better grade of degree for example), does not work in public administration and has an occupationally relevant degree (such as engineering).

4. Earnings functions and hypotheses

We estimated combined male and female wage equations for graduates in their first and final (1986) jobs (Tables 3 and 4), using log wages ($\ln w_{age}/\ln w_{age}$) as the dependent variables. The key human capital variables included in the earnings functions are faculty of degree (faculty), degree class (deg), professional (prof) or academic (postgrad) post graduate qualification, whether the graduate attended a university or polytechnic (univ), work experience (work), job tenure (tenure), time spent unemployed before a first job (unbj1) and in total (unem), the number of jobs since graduation (jobs) and the number of off the job training days (tdays). Many of these are self explanatory. Generally we hypothesize that the better the grade of degree, the greater their productivity and hence earnings. Off the job training (tdays) is also included as a part measure of the human capital acquired after starting work. Unemployment is included because the longer an individual spends out of the labour market the more his or her human capital is likely to depreciate. Job tenure and work experience variables measure firm specific human capital and general on the job training respectively.

We also include dummy variables related to the job, such as location (locjc/locj1) and sector of employment (sectorjc/sectorj1), whether the job is full or part time (parttime), size of firm (firmjc/firmj1) and a measure of

¹⁹ Equally, the nursing category includes nurses (O levels and sometimes A levels required) and health care assistants (no qualifications or sometime O levels). Likewise, the police work category includes police officers (O levels generally required) and traffic wardens (no qualifications formally required).

Table 1
Proportion of sample graduates that are overeducated

Variable	Minimum required qualifications	First job (%)	Final job (%)
nonej1/jc	No qualifications required	15	11
olevelj1/jc	O levels or equivalent required	9	7
alevelj1/jc	A levels or equivalent required	8	7
vocatj1/jc	Vocational qualifications required	3	3
othj1/jc	Other (sub-degree) qualifications required	3	2
overj1/jc	Total overeducated	38	30

Table 2
Incidence of overeducation amongst different categories of graduate

Variable	Category	First job (%)	Final job (%)
sex	Males	36	29
	Females	41	31
facultya	Engineering/technical	26	24
facultyb	Science	28	24
facultyc	Social science	42	31
facultyd	Languages	50	36
facultyf	Other	42	35
univ	University degree	35	28
	Polytechnic degree	44	34
deg	First class/upper second degree	31	23
	Other degree classes	42	34
postgrad1/	Postgraduate qualification	19	17
postgrad	No postgraduate qualification	42	35
sectorj1/jc	Total public sector	37	31
	Total private sector	39	30
sectorj1/jc	Sector a public administration	60	49
	Sector b education	20	16
	Sector c industry	33	28
	Sector d commerce	54	38
	Sector e self-regulating profession	20	12
	Sector f other	52	42
j1numemp/ j1numemp	Less than 20 employees	54	37
	20–199 employees	42	30
	200–999 employees	39	26
	1000–4999 employees	29	26
	More than 5000 employees	38	34

the social status of the job (occs1/occs2).²⁰ We include occs1/2 as a measure of the non-pecuniary returns to a job. The other variables are included to condition for different labour market conditions in different regions and industries. Finally, we included some socio-econ-

omic variables to condition for family background and personal characteristics. These variables are age (age), social class (sclas), whether the individual went to a private school or not (school) or had a child (child), the age of the oldest child (chage) and marital status (married). We include social class and school to measure any discrimination in favour of graduates with “better” social backgrounds and the effect of family connections. We include the child and marriage variables because these factors may have some bearing on the motivation of the

²⁰ Occs1/occs2 provide an index of the social standing of an occupation derived from the Goldthorpe and Hope (1974) index (Dolton and Makepeace, 1992).

Table 3
Starting wage equations

Description	Variable	Combined		Female		Male	
		Coefficient	<i>t</i> -statistic	Coefficient	<i>t</i> -statistic	Coefficient	<i>t</i> -statistic
Age (months)	age	0.0008	6.104	0.0007	4.386	0.0008	4.150
Sex (male = 1)	sex	0.0518	5.899				
Married (before first job)	married1	0.0165	1.072	0.0150	0.767	0.0229	0.997
Child (before first job)	childj1	0.0009	0.088	0.0332	2.406	– 0.0168	– 1.237
Social class — base case professional							
Unskilled	sclas1	0.0151	0.288	– 0.0728	– 0.653	0.0415	0.675
Partly skilled	sclas2	0.0421	1.835	0.0322	1.005	0.0594	1.866
Skilled manual	sclas3	0.0242	1.522	0.0171	0.722	0.0302	1.430
Skilled non manual	sclas4	0.0159	1.329	0.0089	0.526	0.0208	1.277
Intermediate	sclas5	0.0315	2.909	0.0145	0.965	0.0454	3.025
Private school	school	– 0.0116	– 0.912	– 0.0627	– 3.080	0.0141	0.866
A level grade	alevel	0.0014	1.254	– 0.0007	– 0.397	0.0028	1.872
Degree faculty — base case “other”							
Engineering/technical	facultya	0.0322	2.074	0.0142	0.325	0.0372	1.936
Science	facultyb	– 0.0079	– 0.639	– 0.0163	– 0.947	0.0019	0.109
Social Science	facultyc	– 0.0288	– 2.342	– 0.0188	– 1.133	– 0.0312	– 1.764
Languages	facultyd	– 0.0275	– 1.675	– 0.0111	– 0.589	– 0.0397	– 1.336
Arts	facultye	– 0.0580	– 3.650	– 0.0355	– 1.808	– 0.0674	– 2.728
First/upper second class degree	deg	0.0138	1.650	0.0141	1.180	0.0176	1.545
Professional qualification	prof1	– 0.2212	– 10.664	– 0.1848	– 6.328	– 0.2552	– 8.822
Postgraduate academic qualification	postgrad1	0.0425	3.485	0.0173	1.113	0.0657	3.581
University degree	univ	– 0.0041	– 0.431	0.0120	0.882	– 0.0111	– 0.842
Unemployment (months)	unbj1	– 0.0051	– 9.189	– 0.0055	– 5.962	– 0.0050	– 7.056
Location — base case London							
England	locj12	– 0.1435	– 15.695	– 0.1595	– 12.432	– 0.1325	– 10.473
Scotland	locj13	– 0.1690	– 11.453	– 0.1715	– 8.328	– 0.1632	– 7.988
Wales	locj14	– 0.1479	– 6.935	– 0.1718	– 5.325	– 0.1323	– 4.713
Northern Ireland	locj15	– 0.1544	– 2.036	– 0.2367	– 1.936	– 0.1275	– 1.319
Sector — base case “other”							
Public administration	sectorj1a	0.0674	4.345	0.0786	3.768	0.0624	2.793
Education	sectorj1b	0.0838	5.348	0.1297	6.636	0.0214	0.870
Industry	sectorj1c	0.0405	2.775	0.0299	1.384	0.0370	1.836
Commerce	sectorj1d	– 0.0273	– 1.865	– 0.0177	– 0.903	– 0.0303	– 1.433
Professions	sectorj1e	– 0.1951	– 11.218	– 0.1926	– 7.345	– 0.1871	– 7.861
Extent of overeducation — base case not overeducated							
No qualifications required	nonej1	– 0.1291	– 9.652	– 0.2089	– 10.705	– 0.0900	– 4.933
O levels required	olevelj1	– 0.1331	– 8.944	– 0.1433	– 7.314	– 0.1234	– 5.636
A levels required	alevelj1	– 0.0845	– 5.643	– 0.0849	– 4.081	– 0.0890	– 4.263
Vocational qualifications required	vocatj1	– 0.0236	– 1.088	– 0.1213	– 3.030	0.0077	0.293
Other sub-degree qualifications required	othj1	– 0.0301	– 1.207	– 0.0169	– 0.641	– 0.0988	– 1.881
Social standing of job	ocst1	0.0032	7.419	0.0038	6.409	0.0023	3.723
Small firm (less than 20 people)	firmj1	– 0.1351	– 10.406	– 0.1315	– 7.655	– 0.1408	– 7.495
	constant	7.3071	130.342	7.3069	102.076	7.3805	85.326
	Number of observations	5017		2035		2982	
	<i>F</i> statistic	55.25		33.65		27.89	
	<i>R</i> -squared	0.29		0.38		0.25	
	Adjusted <i>R</i> -squared	0.29		0.37		0.25	
	Root MSE	0.27		0.24		0.29	

Table 4
1986 Final wage equations

Description	Variable	Combined		Female		Male	
		Coefficient	<i>t</i> -statistic	Coefficient	<i>t</i> -statistic	Coefficient	<i>t</i> -statistic
Age (months)	age	0.0002	1.330	0.0004	2.398	− 0.0001	− 0.578
Sex (male = 1)	sex	0.1087	10.859				
Married	married	0.0134	1.408	− 0.0293	− 2.137	0.0397	3.102
Child (before first job)	child	− 0.0170	− 1.085	− 0.0879	− 3.026	− 0.0117	− 0.611
Age of oldest child	chage	0.0004	1.782	0.0004	1.153	0.0007	2.018
Social class — base case professional							
Unskilled	sclas1	0.0375	0.680	− 0.1272	− 1.070	0.0880	1.384
Partly skilled	sclas2	− 0.0606	− 2.385	− 0.0507	− 1.338	− 0.0574	− 1.721
Skilled manual	sclas3	− 0.0125	− 0.706	0.0158	0.559	− 0.0214	− 0.955
Skilled non-manual	sclas4	− 0.0173	− 1.306	− 0.0198	− 0.982	− 0.0134	− 0.780
Intermediate	sclas5	0.0049	0.410	0.0191	1.067	− 0.0041	− 0.256
Private school	school	0.0417	2.943	− 0.0173	− 0.708	0.0651	3.732
Degree faculty — base case “other”							
Engineering/technical	facultya	− 0.0082	− 0.486	− 0.0772	− 1.412	0.0008	0.038
Science	facultyb	− 0.0020	− 0.143	0.0106	0.525	0.0033	0.177
Social science	facultyc	0.0197	1.447	0.0052	0.270	0.0312	1.681
Languages	facultyd	− 0.0144	− 0.780	0.0088	0.403	− 0.0335	− 1.040
Arts	facultye	− 0.0780	− 4.341	− 0.0564	− 2.417	− 0.0794	− 3.004
First/upper second class degree	deg	0.0573	6.167	0.0519	3.715	0.0622	5.113
Professional qualification	prof	0.0515	4.389	0.0451	2.460	0.0464	3.087
Postgraduate academic qualification	postgrad	0.0067	0.528	0.0111	0.623	− 0.0031	− 0.181
University degree	univ	0.0405	4.176	0.0263	1.797	0.0472	3.694
Job tenure (months)	tenure	− 0.0007	− 2.781	− 0.0006	− 1.449	− 0.0009	− 2.666
Work experience (months)	work	− 0.0006	− 0.275	0.0063	1.983	− 0.0036	− 1.400
	work2	0.0001	2.753	0.0000	0.050	0.0001	2.916
Unemployment (months)	unem	− 0.0069	− 7.780	− 0.0029	− 2.031	− 0.0096	− 8.399
Location — base case London							
England	locjc2	− 0.2012	− 19.670	− 0.2157	− 14.140	− 0.1952	− 14.478
Scotland	locjc3	− 0.2061	− 12.213	− 0.2467	− 9.824	− 0.1869	− 8.429
Wales	locjc4	− 0.2477	− 10.451	− 0.2087	− 5.716	− 0.2676	− 8.777
Northern Ireland	locjc5	− 0.2293	− 3.088	− 0.3711	− 3.189	− 0.1698	− 1.791
Sector — base case “other”							
Public administration	sectorjca	0.1282	6.891	0.1212	4.708	0.1287	4.959
Education	sectorjcb	0.0992	5.261	0.1196	4.863	0.0590	2.108
Industry	sectorjcc	0.2252	12.655	0.2003	7.514	0.2315	9.531
Commerce	sectorjcd	0.2715	15.262	0.2499	10.062	0.2832	11.477
Professions	sectorjce	0.1328	6.298	0.1896	5.992	0.1309	4.590
Extent of overeducation — base case not overeducated							
No qualifications required	nonejc	− 0.0172	− 1.144	− 0.0979	− 4.032	0.0201	1.063
O levels required	oleveljc	− 0.1101	− 6.084	− 0.1460	− 5.747	− 0.0845	− 3.406
A levels required	aleveljc	− 0.0926	− 5.243	− 0.0891	− 3.562	− 0.0882	− 3.682
Vocational qualifications required	vocatjc	− 0.0374	− 1.475	− 0.0980	− 1.741	− 0.0228	− 0.786
Other sub-degree qualifications required	othjc	− 0.0459	− 1.510	− 0.0435	− 1.324	− 0.0242	− 0.405
Number of jobs held since graduation	jobs	− 0.0217	− 3.719	− 0.0190	− 2.365	− 0.0269	− 3.325
Number of training days	tdays	0.0014	6.933	0.0013	3.635	0.0015	5.744
Social standing of job	ocst2	0.0085	14.184	0.0098	11.681	0.0065	7.747
	parttime	− 0.7785	− 23.351	− 0.7453	− 21.265	− 0.5946	− 6.828

Table 4
Continued

Description	Variable	Combined		Female		Male	
		Coefficient	<i>t</i> -statistic	Coefficient	<i>t</i> -statistic	Coefficient	<i>t</i> -statistic
Small firm (less than 20 people)	firmjc	– 0.0487	– 3.291	– 0.0792	– 3.657	– 0.0290	– 1.468
	constant	7.2405	83.659	6.8846	56.550	7.694	62.381
	Number of observations	4477		1658		2819	
	<i>F</i> statistic	96.83		52.80		39.73	
	<i>R</i> -squared	0.48		0.58		0.75	
	Adjusted <i>R</i> -squared	0.48		0.57		0.37	
	Root MSE	0.28		0.26		0.29	

graduate towards paid employment. We include the respondent's age to pick up any premium firms might pay for "maturity" in an employee.

We discuss the coefficients of these variables only briefly. Graduates with arts degrees earned less than average, otherwise faculty had no effect on earnings six years after graduation. Having a better class of degree and being a university, rather than a polytechnic, graduate had a positive effect on earnings. By 1986 a professional postgraduate qualification increased earnings by on average 5% but an academic postgraduate qualification did not make any difference.²¹ Working in London, having more work experience,²² less unemployment, a higher status job and more on the job training raised earnings and the greater the number of jobs a graduate had, the higher his or her earnings.²³ Male graduates earned 11% more than women by 1986 and, for men, marriage increased earnings. For women marriage and children reduced earnings. Social class had no effect. We also found that, initially, the type of school a graduate attended made no difference to his or her earnings but by 1986 men who attended private schools

earned more than their peers. This might indicate that the "old boy network" yields benefits later on in a career.

In our sample 466 graduates, most of whom were women, were non-participants in 1986 and it is possible that ordinary least squares (OLS) regression will yield biased and inconsistent results. Women who were still working in 1986 may be a non-random subsample of the women in our complete sample. To overcome this, we estimated a sample selection Heckman two step specification (Heckman, 1979) for the female wage equation.²⁴ We explicitly model the decision to participate in the work force, using a probit equation, and include a **lambda** term in the wage equation to model the sample selection effect. As is well known, this technique yields consistent estimates.²⁵ We find some evidence of sample selection bias, depending on the precise specification of the probit. However, sample selection has a negligible effect on the overeducation coefficients and the conclusions discussed below are robust to changes in equation specification.

²¹ In a first job a postgraduate academic qualification increased earnings by 4% whereas a professional qualification reduced earnings by over 20%. The latter is because of the low pay during the professional training period for accountants and similar professions, as predicted by human capital general training models.

²² The signs on the work variables are not as generally predicted, i.e. positive on **work** and negative on **work2**. This is because we only observe these individuals over the first six years of their working lives before diminishing returns to work experience develop. In our sample, women appear to have positive linear returns to work whilst men show increasing returns.

²³ This may provide support for the "high flier" theory, i.e. the most ambitious and able change jobs more regularly.

²⁴ We do not specifically estimate the effects of sample selection bias for men because of the small numbers involved. Slightly more than 2% of men were non-participants, generally unemployed or studying, in 1986.

²⁵ The variables included in the probit but excluded from the wage equations are domestic (number of children) and work related (starting wage and sector). We suggest that a woman's domestic circumstances may influence her decision to participate, but not her wage, and that women with a higher opportunity cost of not working will be more likely to participate. We also suggest that some jobs in certain sectors (education) are more compatible with family responsibilities and sector will therefore affect the participation decision.

4.1. Hypothesis 1: the return to surplus education

Human capital theory suggests that overeducated graduates will earn the same return on their education as their peers in graduate jobs, *ceteris paribus*. We reject this hypothesis. In their first job, an overeducated graduate requiring no qualifications at all, or only O or A levels, earned significantly less than peers in graduate jobs (13%, 13% and 8% less, respectively).²⁶ There were however, considerable differences between the sexes, justifying the use of separate wage equations.

For example, women in a first job requiring vocational qualifications earned about 12% less than their peers in graduate jobs. However, men requiring vocational qualifications earned the same as men in graduate jobs. Women who required no qualifications at all also suffered more than men in the equivalent level of job, earning a sizeable 21% less than women in graduate jobs; for men the comparable figure is only 9%. For overeducated women, generally the higher the level of education required, the greater their earnings. This did not hold for men. Certainly, men in jobs requiring O levels earned less than those in jobs needing A levels but men who needed no qualifications at all earned about the same as those in jobs requiring A levels.

The differences between the sexes appear to partly reflect the different types of work undertaken by men and women in the 1980s. As we have already argued, typically occupational classification systems are not sophisticated enough to identify precisely the kind of work done by each graduate. Nonetheless, we did undertake some further analysis of the job titles of various groups of overeducated workers. The fact that women in unqualified jobs did so badly might be because men in jobs needing no qualifications tended to be doing labouring or manual work in industry or catering. They also worked in sales and clerk/cashier jobs. Women in the same overeducation category were largely in catering, secretarial, clerical and welfare jobs. Men in unqualified labouring or sales jobs are, on average, likely to have been paid more relative to their peers in graduate jobs than women in the equivalent level of catering or welfare job. Also, for men the **none** category of overeducation covered a more diverse range of jobs than for women, including some higher paying semi-skilled industrial processing jobs. This would have tended to boost the average earnings of this category, particularly as compared to those in lower grade clerical work requiring O levels. Hence we conclude that the penalty for overeducation appears to vary by type of job, sector and sex.

The results from our current wage equations are shown in Table 4 and again the reference group is gradu-

ates who secured graduate jobs. Overeducated graduates in certain types of non-graduate job still earned less than their adequately educated counterparts, six years into their careers. If a job required O level qualifications the earnings loss was almost 11%, for jobs requiring A levels the loss was about 9%. Graduates in jobs which required any other sub-degree level qualification, or no qualifications at all, earned the same as graduates in graduate jobs. Again there were differences between men and women.

Female graduates in jobs requiring no qualifications at all still earned significantly less (10%) than those in graduate jobs. They were again mostly doing secretarial, receptionist, clerk and, in particular, welfare work. Yet, surprisingly, these women earned more than those in O level jobs, the latter largely doing office or administrative work of some kind. It may be that women in welfare jobs requiring no qualifications (mostly in the public sector) had a reasonably defined career structure and six years into this career they were earning more than their secretarial or receptionist counterparts. It is also possible that for men and women, the greater diversity of jobs in the **none** category (performing arts, marketing, sales) pushed up average earnings. Men who required no qualifications in their 1986 job tended to be in sales, marketing, administration and semi-technical jobs. These kinds of jobs, particularly sales and marketing, have a more flexible upper pay limit and one would expect a graduate six years into their career to be progressing in terms of salary. For men there was no difference, in terms of earnings, between O and A level jobs.

To conclude, the evidence suggests that new graduates that were overeducated earned considerably less than those in graduate jobs. By and large, the lower the required job qualifications, the greater the loss of earnings. The proportion of overeducated graduates fell by the end of the six-year survey period, as did the effect of overeducation on earnings. Nonetheless a sizeable proportion of graduates were still overeducated six years after graduation and those in largely white collar/clerical work requiring only O or A levels, earned significantly less than their adequately educated peers. The earnings penalty for being overeducated was generally higher for women, especially in jobs where no qualifications were required at all. We can therefore reject a pure human capital interpretation that the return to surplus education equals the return to required education in favour of an assignment model approach which suggests that an individual's productivity and earnings depend on both on the nature of their job and their human capital.

4.2. Hypothesis 2: the return to surplus education by degree class

We test whether being overeducated but having a better grade of degree reduces the loss of earnings associa-

²⁶ The reference group for Table 3 is graduates in graduate level jobs.

Table 5
Overeducation and degree class—starting wage equation

Description	Variable	Coefficient	<i>t</i> -statistic
Sex (male = 1)	sex	0.0522	5.938
Age (months)	age	0.0008	6.080
Married (before first job)	married1	0.0165	1.073
Child (before first job)	childj1	0.0008	0.077
Social class — base case professional			
Unskilled	sclas1	0.0157	0.297
Partly skilled	sclas2	0.0416	1.812
Skilled manual	sclas3	0.0244	1.534
Skilled non-manual	sclas4	0.0158	1.323
Intermediate	sclas5	0.0313	2.893
Private school	school	− 0.0121	− 0.954
A level grade	alevel	0.0014	1.206
Degree faculty — base case “other”			
Engineering/technical	facultya	0.0318	2.048
Science	facultyb	− 0.0081	− 0.654
Social science	facultyc	− 0.0286	− 2.326
Languages	facultyd	− 0.0275	− 1.668
Arts	facultye	− 0.0573	− 3.599
First/upper second class degree	deg	0.0170	1.655
Professional qualification	prof1	− 0.2212	− 10.657
Postgraduate academic qualification	postgrad1	0.0422	3.458
University degree	univ	− 0.0041	− 0.432
Unemployment (months)	unbj1	− 0.0051	− 9.210
Location — base case London			
England	locj12	− 0.1435	− 15.688
Scotland	locj13	− 0.1690	− 11.445
Wales	locj14	− 0.1480	− 6.937
Northern Ireland	locj15	− 0.1538	− 2.028
Sector — base case “other”			
Public administration	sectorj1a	0.0666	4.289
Education	sectorj1b	0.0833	5.314
Industry	sectorj1c	0.0395	2.703
Commerce	sectorj1d	− 0.0279	− 1.900
Professions	sectorj1e	− 0.1957	− 11.239
Extent of overeducation — base case not overeducated			
No qualifications required	nonej1	− 0.1216	− 8.027
O levels required	olevelj1	− 0.1356	− 7.921
A levels required	alevelj1	− 0.0739	− 4.185
Vocational qualifications required	vocatj1	− 0.0376	− 1.445
Other sub-degree qualifications required	othj1	− 0.0351	− 1.215
Interactive degree class/overeducation dummies			
No qualifications required*first/upper second degree	degnone1	− 0.0255	− 1.054
O levels required*first/upper second degree	degolev1	0.0105	0.355
A levels required*first/upper second degree	degalev1	− 0.0359	− 1.135
Vocational qualifications required*first/upper second degree	degvocal	0.0464	1.012
Other qualifications required*first/upper second degree	degoth1	0.0204	0.374
Social standing of job	occst1	0.0032	7.435
Small firm (less than 20 people)	firmj1	− 0.1348	− 10.378
	constant	7.3070	130.154
	Number of observations	5017	
	<i>F</i> statistic	48.76	
	<i>R</i> -squared	0.29	
	Adjusted <i>R</i> -squared	0.29	
	Root MSE	0.27	

Table 6
Overeducation and degree class — final wage equation

Description	Variable	Coefficient	t-statistic
Age (months)	age	0.0002	1.335
Sex (male = 1)	sex	0.1087	10.851
Married	married	0.0133	1.400
Child	child	– 0.0170	– 1.080
Age of oldest child	chage	0.0004	1.777
Social class — base case professional			
Unskilled	sclas1	0.0396	0.716
Partly skilled	sclas2	– 0.0587	– 2.305
Skilled manual	sclas3	– 0.0134	– 0.758
Skilled non-manual	sclas4	– 0.0178	– 1.347
Intermediate	sclas5	0.0045	0.376
Private school	school	0.0413	2.911
Degree faculty — base case “other”			
Engineering/technical	facultya	– 0.0077	– 0.459
Science	facultyb	– 0.0016	– 0.118
Social science	facultyc	0.0198	1.456
Languages	facultyd	– 0.0135	– 0.726
Arts	facultye	– 0.0784	– 4.358
First/upper second class degree	deg	0.0610	5.638
Professional qualification	prof	0.0516	4.391
Postgraduate academic qualification	postgrad	0.0068	0.541
University degree	univ	0.0412	4.242
Job tenure (months)	tenure	– 0.0007	– 2.813
Work experience (months)	work	– 0.0005	– 0.254
	work2	0.0001	2.745
Unemployment (months)	unem	– 0.0069	– 7.790
Location — base case London			
England	locjc2	– 0.2013	– 19.676
Scotland	locjc3	– 0.2067	– 12.243
Wales	locjc4	– 0.2479	– 10.458
Northern Ireland	locjc5	– 0.2303	– 3.100
Sector — base case “other”			
Public administration	sectorjca	0.1287	6.906
Education	sectorjcb	0.0995	5.273
Industry	sectorjcc	0.2252	12.634
Commerce	sectorjcd	0.2718	15.244
Professions	sectorjce	0.1342	6.349
Extent of overeducation — base case not overeducated			
No qualifications required	nonejc	– 0.0198	– 1.145
O levels required	oleveljc	– 0.1164	– 5.479
A levels required	aleveljc	– 0.0778	– 3.788
Vocational qualifications required	vocatjc	– 0.0237	– 0.824
Other sub-degree qualifications required	othjc	– 0.0272	– 0.797
Interactive degree class/overeducation dummies			
No qualifications required*first/upper second degree	degnone	0.0106	0.345
O levels required*first/upper second degree	degolev	0.0220	0.590
A levels required*first/upper second degree	degalev	– 0.0533	– 1.417
Vocational qualifications required*first/upper second degree	degvoca	– 0.0589	– 0.987
Other qualifications required*first/upper second degree	degoth	– 0.0838	– 1.179
No. of jobs since graduation	jobs	– 0.0217	– 3.716
No of training days	tdays	0.0014	6.915
Social standing of job	occst2	0.0085	14.079
	parttime	– 0.7766	– 23.267

Table 6
(Continued)

Description	Variable	Coefficient	<i>t</i> -statistic
Small firm (less than 20 people)	firmjc	– 0.0486	– 3.278
	constant	7.2390	83.421
	Number of observations	4477	
	<i>F</i> statistic	86.84	
	<i>R</i> -squared	0.48	
	Adjusted <i>R</i> -squared	0.48	
	Root MSE	0.28	

ted with overeducation, compared with the loss for overeducated graduates with lower degree results. Tables 5 and 6 show that the coefficients on the interactive degree class/overeducation dummies are not significantly different from zero and also that these variables are not jointly significant. This implies that the overeducated with first or upper second class degrees did not earn significantly more than over-educated graduates with lower grades of degree (lower second, thirds and pass degrees). We therefore reject the human capital hypothesis that graduates with better degree results are more productive and hence will earn more, irrespective of overeducation. This again supports the assignment model prediction, that the needs of the job are critical in determining earnings.

4.3. Hypothesis 3: the return to surplus education by sector

We test the hypothesis that the overeducated in the public sector earn less than the overeducated in the private sector. Tables 7 and 8 show that the coefficients on the public sector/overeducation interactive dummies are on the whole not significantly different from zero. There are some exceptions. Public sector graduates, in jobs requiring no qualifications, earned 9–10% less than the private sector equivalent. In other words public sector graduates, who required no qualifications at all, earned 20% less than those who succeeded in getting a graduate job (compared with 11% less for the overeducated in the private sector). By 1986, amongst those graduates who required no qualifications, only those in the public sector earned less than those in graduate jobs (9%). There are several possible explanations for this. More than a third of public sector graduates who required no qualifications at all were working in welfare jobs. Welfare jobs in the public sector may be badly paid relative to the kinds of jobs requiring no qualifications in the private sector (labouring, sales, industrial processing, etc.). A possible

human capital explanation is that the private sector responds more flexibly, allows the overeducated graduate to be more fully utilized and pays a wage closer to his or her productivity potential.

The human capital explanation is difficult to sustain because, by 1986, public sector graduates requiring O levels actually earned more (10%) than those in the private sector and only 6% less than graduates in graduate jobs. Furthermore, in 1986 public sector workers needing either O or A levels, earned about the same as each other. One explanation is that some highly unionized and well paid jobs fall into the O level public sector category (air traffic controller, police). It may also be because individuals joining the civil service as administrative assistants (requiring O levels) then managed to progress to executive officer level (requiring A levels) six years on and yet still claimed (correctly) that they only needed O levels to get their job.²⁷ It is also true that administrative work in the public sector has more of a career structure and therefore potentially higher earnings than the equivalent work in the private sector.²⁸

From the data available it is not possible to give a precise explanation for the conflicting signs on the coefficients of the public sector/overeducation dummies. However we give some possible suggestions and conclude that the relationship between sector and earnings for the overeducated is not systematic. We cannot say that the overeducated in the public sector always earn less than their equivalents in the private sector. There-

²⁷ The civil service/central government administration in the U.K. is highly structured. In the administrative arm the progression is generally from administrative assistant to administrative officer to executive officer.

²⁸ Elliot and Murphy (1987) also note that the proportion of male clerical jobs in the private sector fell significantly over the period 1970 to 1984. It may be that this decline depressed private sector clerical wages for men, thereby pushing up relative public sector wages for this kind of job.

Table 7
Overeducation in the public/private sector — starting wage equation

Description	Variable	Coefficient	<i>t</i> -statistic
Sex (male = 1)	sex	0.0503	5.728
Age (months)	age	0.0008	6.178
Married (before first job)	married1	0.0161	1.050
Child (before first job)	childj1	0.0013	0.137
Social class — base case professional			
Unskilled	sclas1	0.0200	0.380
Partly skilled	sclas2	0.0423	1.841
Skilled manual	sclas3	0.0239	1.504
Skilled non-manual	sclas4	0.0156	1.306
Intermediate	sclas5	0.0310	2.866
Private school	school	− 0.0122	− 0.963
A level grade	alevel	0.0014	1.194
Degree faculty — base case “other”			
Engineering/technical	facultya	0.0318	2.046
Science	facultyb	− 0.0077	− 0.627
Social science	facultyc	− 0.0280	− 2.276
Languages	facultyd	− 0.0276	− 1.678
Arts	facultye	− 0.0572	− 3.600
First/upper second class degree	deg	0.0130	1.557
Professional qualification	prof1	− 0.2211	− 10.660
Postgraduate academic qualification	postgrad1	0.0411	3.357
University degree	univ	− 0.0014	− 0.148
Unemployment (months)	unbj1	− 0.0051	− 9.163
Location — base case London			
England	locj12	− 0.1438	− 15.712
Scotland	locj13	− 0.1696	− 11.498
Wales	locj14	− 0.1488	− 6.979
Northern Ireland	locj15	− 0.1574	− 2.078
Sector — base case “other”			
Public administration	sectorj1a	0.0913	4.799
Education	sectorj1b	0.0916	5.568
Industry	sectorj1c	0.0421	2.880
Commerce	sectorj1d	− 0.0294	− 2.006
Professions	sectorj1e	− 0.1925	− 11.028
Extent of overeducation — base case not overeducated			
No qualifications required	nonej1	− 0.1053	− 6.947
O levels required	olevelj1	− 0.1325	− 7.092
A levels required	alevelj1	− 0.0811	− 4.625
Vocational qualifications required	vocatj1	− 0.0201	− 0.843
Other sub-degree qualifications required	othj1	− 0.0408	− 0.875
Interactive public sector/overeducation variables			
Public sector*no qualifications required	pubnone1	− 0.0966	− 3.452
Public sector*O levels required	pubolev1	− 0.0082	− 0.287
Public sector*A levels required	pubalev	− 0.0170	− 0.520
Public sector*vocational qualifications required	pubvoca1	− 0.0158	− 0.278
Public sector*other qualifications required	puboth1	0.0132	0.242
Social standing of job	ocst1	0.0033	7.620

fore, again we must reject a strong human capital interpretation that the loss of earnings from overeducation is entirely due to the rigidities of the labour market in the public sector. Nor do we find evidence to support the weaker hypothesis that the loss of earnings due to overeducation is *greater* in the public sector because of

the less competitive nature of that sector. Our conclusion still holds: the overeducated do earn less than those in graduate jobs and this is not restricted to the public sector. The loss of earnings from overeducation may however be due to rigidities in the labour market that apply equally to the public and private sectors.

Table 7
(Continued)

Description	Variable	Coefficient	<i>t</i> -statistic
Small firm (less than 20 people)	firmj1	– 0.1360	– 10.494
	constant	7.2920	129.475
	Number of observations	5017	
	<i>F</i> statistic	49.04	
	<i>R</i> -squared	0.29	
	Adjusted <i>R</i> -squared	0.29	
	Root MSE	0.27	

5. Conclusions

We find that a significant proportion of U.K. graduates entered non-graduate jobs when they left higher education in 1980. By 1986 a significant number were still in jobs that did not require a degree. This overeducation reduced earnings even six years into these graduates' careers, particularly for those in white collar administration/clerk jobs that required O and A levels.

We reject all three proposed narrow human capital hypotheses. First, the economic return to surplus education is, by and large, less than the return to required education, i.e. job requirements do determine earnings, at least in part. Second, once an individual is overeducated, his or her human capital (such as degree class) does not appear to impact on earnings, again supporting the view that job requirements affect earnings. Thirdly, overeducation cannot be written off as a public sector phenomenon. The overeducated in the public sector did not earn uniformly less than the private sector and in some cases they earned more. Furthermore, the earnings loss from overeducation remained for those in the private sector once the public sector dummy had been included in the model specification.

The evidence therefore points to an assignment theory interpretation of the labour market whereby both the human capital of the individual and the requirements of the job determine earnings.²⁹ This in turn suggests that firms may not respond as rapidly to changes in the supply of skilled labour as is implied by neo-classical theory. Human capital theory also predicts that overeducation, if it does occur, will only be a temporary phenomenon. We suggest that further research should focus on modelling the time spent overeducated by these graduates, i.e. how long it takes them to secure graduate level jobs.

From a policy perspective there is clear evidence that the U.K., like the U.S.A. has a significant number of graduates who have more than the required education for their jobs. It does not preclude consumption benefits from education but does suggest that increasing the proportion of graduates in the economy may not automatically lead to a high skill–high wage work force. It is however, the case that these graduates entered the labour market during the particularly bad economic conditions in the U.K. in the early 1980s. We are currently undertaking a comparative study of overeducation in the U.K. in the 1960s and 1970s to determine whether our results from the 1980s are atypical.

Acknowledgements

Peter Dolton would like to thank the ALCD for funding towards this research from grant number H519255006. We alone are responsible for any errors.

Appendix A

Data and variables

The data used in this study come from a cross-section survey of British graduates which took place in 1986 and generated a 1 in 6 sample of all graduates. The survey was conducted by the Department of Employment and the data contains full details of labour market progress, earnings, occupational choices, further education study and personal and demographic characteristics. Full details of the survey and descriptive statistics can be found in Dolton and Makepeace (1992).

The original data set consists of 8934 observations on graduates and diplomats.³⁰ In this paper the full sample

²⁹ This interpretation has been supported by others in this field, including Verdugo and Verdugo (1989).

³⁰ A diploma is below a degree in terms of academic achievement.

Table 8
Overeducation in the public/private sector — final wage equation

Description	Variable	Coefficient	<i>t</i> -statistic
Sex (male = 1)	sex	0.1077	10.769
Age (months)	age	0.0002	1.326
Married	married	0.0127	1.335
Child	child	– 0.0166	– 1.057
Age of oldest child	chage	0.0004	1.724
Social class — base case professional			
Unskilled	sclas1	0.0516	0.934
Partly skilled	sclas2	– 0.0585	– 2.305
Skilled manual	sclas3	– 0.0126	– 0.713
Skilled non-manual	sclas4	– 0.0164	– 1.239
Intermediate	sclas5	0.0049	0.404
Private school	school	0.0412	2.910
Degree faculty — base case “other”			
Engineering/technical	facultya	– 0.0088	– 0.526
Science	facultyb	– 0.0015	– 0.111
Social science	facultyc	0.0208	1.529
Languages	facultyd	– 0.0134	– 0.722
Arts	facultye	– 0.0777	– 4.330
First/upper second class degree	deg	0.0567	6.109
Professional qualification	prof	0.0531	4.515
Postgraduate academic qualification	postgrad	0.0076	0.604
University degree	univ	0.0414	4.269
Job tenure (months)	tenure	– 0.0007	– 2.656
Work experience (months)	work	– 0.0005	– 0.262
	work2	0.0001	2.732
Unemployment (months)	unem	– 0.0069	– 7.768
Location — base case London			
England	locjc2	– 0.2008	– 19.649
Scotland	locjc3	– 0.2055	– 12.194
Wales	locjc4	– 0.2445	– 10.319
Northern Ireland	locjc5	– 0.2337	– 3.151
Sector — base case “other”			
Public administration	sectorjca	0.1177	5.549
Education	sectorjcb	0.0908	4.666
Industry	sectorjcc	0.2226	12.494
Commerce	sectorjcd	0.2675	15.032
Professions	sectorjce	0.1293	6.119
Extent of overeducation — base case not overeducated			
No qualifications required	nonejc	0.0017	0.102
O levels required	oleveljc	– 0.1553	– 6.550
A levels required	aleveljc	– 0.1084	– 4.965
Vocational qualifications required	vocatjc	– 0.0534	– 1.815
Other sub-degree qualifications required	othjc	– 0.0875	– 1.377
Interactive public sector/overeducation variables			
Public sector*no qualifications required	pubnone	– 0.0915	– 2.628
Public sector*O levels required	pubolev	0.0992	2.801
Public sector*A levels required	pubalev	0.0420	1.166
Public sector*vocational qualifications required	pubvoca	0.0608	1.075
Public sector*other qualifications required	puboth	0.0559	0.779
No of jobs since graduation	jobs	– 0.0213	– 3.668
No of training days	tdays	0.0014	6.954
Social standing of job	ocst2	0.0085	14.113
	parttime	– 0.7754	– 23.254

Table 8
(Continued)

Description	Variable	Coefficient	<i>t</i> -statistic
Small firm (less than 20 people)	firmjc	– 0.0506	– 3.419
	constant	7.2430	83.600
	Number of observations	4477	
	<i>F</i> statistic	87.47	
	<i>R</i> -squared	0.49	
	Adjusted <i>R</i> -squared	0.48	
	Root MSE	0.28	

is not used since we are interested only in graduates; all diplomates are omitted. We also omit those graduates who have not given sufficient information on earnings or current job status, work experience, unemployment, further study, school type, gender, marital status, age, number of children and eldest child's age. An observation is also dropped if the graduate worked abroad in his or her first or current job. Our working sample size is 5017 which is further reduced to 4477 for the current wage equations because 466 respondents are not currently working (in 1986) and 74 graduates in our sample have an ambiguous current job status.

The variables used in our models are defined below:

age: Age in months.

alevel: A level results of the best three A levels in the form of a point score where: grade A counts 5 points, grade B counts 4 points, grade C counts 3 points, grade D counts 2 points and grade E counts 1 point.

chage: Age of eldest child in months.

child: Equals 1 if respondent has children and 0 otherwise.

childj1: Equals 1 if respondent has children *prior* to first job and 0 otherwise.

childnum: Number of children under 16 up to a maximum of 3.

deg: Equals 1 if respondent has a first or upper second degree class, 0 otherwise.

faculty: Dummies to indicate faculty of degree; takes value of a if engineering or technical, b if agricultural, scientific or veterinary/forestry related, c if administrative, business, social science related, d if languages, e if arts, the base case being any other faculty (including education).

firmjc: Equals 1 if firm size is less than or equal to 20 employees.

univ: Equals 1 if a university degree 0 if a polytechnic degree.

jobs: Number of jobs held since graduating.

lambda: The sample selection term (see Heckman, 1979).

locj1: Dummies indicating region of first job; takes value of 1 if first job is located in London, 2 in the rest of England, 3 in Scotland, 4 in Wales and 5 in Northern Ireland. Locj11 is generally the dummy that is dropped in our equations, so that the base case is graduates working in London.

locjc: Dummies indicating region of current job, as above.

lfwage: The logarithm of the current 1986 job salary in sterling indexed with April 1976 as the base period.

lswage: The logarithm of the first job salary in sterling indexed with April 1976 as the base period.

married: Equals 1 if married and 0 otherwise.

married 1: Equals 1 if married *prior* to first job and 0 otherwise.

ocst1: The Goldthorpe and Hope (1974) index of the social status of the first job.

ocst2: The Goldthorpe and Hope index of the social status of the current job. The values of the index are calculated from the job descriptions provided by the respondents, using the framework provided by Goldthorpe and Hope (1974). Trainees were accorded the same scale as qualified staff.

parttime: Equals 1 if the hours spent in the present job are less than 30 per week and 0 otherwise.

postgrad1: Equals 1 if the individual has an academic postgraduate qualification *prior* to first job and 0 otherwise.

postgrad: Equals 1 if the individual has an academic postgraduate qualification (masters degree (MSc/MA), doctorate (PhD), diploma, teaching certificate (PGCE)) and 0 otherwise.

prof: Equals 1 if the individual has a professional qualification and 0 otherwise.

prof1: Equals 1 if the individual has a professional qualification *prior* to first job and 0 otherwise.

school: Equals 1 if the respondent attended an independent (private) school and 0 otherwise.

sclas: Dummies for the socio-economic group of parents; takes the value of 6 for professional, 5 for intermediate, 4 for skilled (non-manual), 3 for skilled (manual), 2 for partly skilled and 1 for unskilled. Where the social class of the respondent's parents differs, the final value attached to sclas was equal to that of the parent with the highest social class. Sclas6 is generally the dummy that is dropped from our equations so that the base case is graduates with professional parents.

sex: Equals 1 if male and 0 otherwise.

sectorjc: Dummies indicating sector of first job; takes the value of a if in public administration, b if in education, c in industry, d in commerce, e in the self-regulating professions and f if any other. Sectorjcf is generally dropped so that the base case is graduates working in "other" sectors. Sector classification was constructed by comparing pairwise combinations of industry and job descriptions.

Public administration includes central government administration (Civil Service), local government, public utilities, public transport, hospital services, the Atomic Energy Authority and the National Coal Board.

Education includes universities, polytechnics and schools.

Industry includes manufacturing, building contracting, civil engineering, construction and industrial research.

Commerce includes banking, insurance, retail and wholesale distributive trades, services, hotels and restaurants.

Self-regulating professions includes private professional practice such as solicitors, accountants, etc.

sectorj1: Dummies indicating sector of first job; takes the value of a if in public administration, b if in education, c in industry, d in commerce, e in the self-regulating professions and f if any other (as above).

tdays: The number of days spent away from work on training courses since graduation.

unbj1: Months spent out of work before first job.

unem: Total months spent out of work and actively seeking employment.

work: Total of months spent in work after graduation (June 1980). Work experience prior to graduation is not included. Details are recorded up to a maximum of four jobs. If a respondent has more than four jobs, total work experience is estimated from the data on the four jobs given and time since graduation, deducting study time and unemployment.

work2: The square of **work**.

tenure: Total months spent in current job at time of the survey, i.e. job tenure.

Overeducation variables

nonejc/j1: No formal qualifications required.

oleveljc/j1: GCE/SCE O level or CSE required.

aleveljc/j1: GCE A level or SCE Higher required.

vocatjc/j1: Vocational qualification or trade apprenticeship required (including ONC, OND, HNC, HND).

othjc/j1: Other sub-degree qualification require (including driving instructor licenses, typing qualifications etc.).

degnone/1: Equals 1 if respondent has first of upper second class of degree and is overeducated in a job requiring no qualifications at all, zero otherwise. Interaction of deg and nonejc/j1.

degolev/1: Interaction deg and oleveljc/j1.

degalev/1: Interaction deg and aleveljc/j1.

degvoca/1: Interaction deg and vocatjc/j1.

degoth/1: Interaction deg and othjc/j1.

pubnone/1: Equals 1 if in public sector and nonejc/j1 equals 1. The public sector consists of all those in public administration of some kind (sectorjca/j1a — see definition above) and those in the education sector (sectorjcb/j1b).

pubolev/1: Equals 1 if in public sector and oleveljc/j1 equals 1.

pubalev/1: Equals 1 if in public sector and aleveljc/j1 equals 1.

pubvoca/1: Equals 1 if in public sector and vocatjc/j1 equals 1.

puboth/1: Equals 1 if in public sector and othjc/j1 equals 1.

Appendix B

The British education system

British education has changed considerably over the last two decades and so this discussion is primarily relevant to the 1980s. At that time the British education system was based almost entirely on a series of examinations. There were a variety of different qualifications that students could take and the student body was divided at an early age into what can be loosely termed "dropout", "vocational" and "academic" students.

In 1980 more than half of all sixteen year olds left school with no formal qualifications at all. For those who did leave at sixteen, part time educational options were limited although some went on youth training programs

and others secured trade apprenticeships. Those who stayed on at school faced their first major examination at sixteen, but most had to make decisions about what subjects and type of exams to take much earlier (at 14–15 years of age). Generally therefore a student followed one of the two distinct academic or vocational tracks from the age of about fourteen.

For the less academic there were a variety of vocational qualifications. *Ordinary National Certificate* (ONC) and *Ordinary National Diploma* (OND) which were examinations generally taken at around sixteen and tended to be in practical subjects such as hairdressing, catering, building techniques, office skills, computing etc. For students wishing to continue beyond sixteen, there was another tier of higher vocational qualifications *Higher National Certificate* (HNC) and *Higher National Diploma* (HND) taken at around eighteen. Most students pursuing the vocational route did not continue into higher education.

The more academic students could choose to take ordinary (= O) levels or Certificates of Secondary Education at sixteen. O levels were more academically demanding and students could take from five to ten examinations in different subjects. Both O levels and CSEs enabled the student to continue with academic study until eighteen, although those who continued were more likely to have O levels. O levels, and to a lesser extent CSEs, broadly corresponded to the junior year of U.S. high school, although strict comparisons between the U.S. and U.K. systems are not easy.

For those continuing down the academic route, there was another set of examinations called advanced (= A) levels to be taken at eighteen. A levels remain the primary route into higher education in Britain today. Generally students take up to three or four A levels which are graded with grade A as the highest grade, down to grade E which is the lowest grade of pass. A levels are considered equivalent to the first year of U.S. college, although again comparisons are not easy and the A level curriculum is very narrow as compared to the U.S. system.

Students that succeed at the A level stage then have the option to continue into higher education. Entrance to higher education is competitive, as places are limited and A level grades are used as the rationing device. In the 1980s, depending on how well they did at A level, students could opt for either a university or a polytechnic (these institutions are now all classified as universities) and a full degree course or a higher diploma. Universities were considered more academically oriented and generally demanded higher A level grades. Polytechnics were more technically and vocationally oriented and required lower A level grades. Students who had taken higher vocational qualifications were more likely to attend a polytechnic if they did continue in education. The choice between a diploma or a degree course would also be lar-

gely based on the candidate's academic ability. Diplomas are sub-degree level qualifications normally taking 2 years to complete, compared with the 3–4 years required to complete a degree course. Degrees from both universities and polytechnics are graded. The best grade possible is a "first" class down to an "upper second", "lower second", a "third" and finally a "pass" degree.

References

- Alba-Ramirez, A. (1993). Mismatch in the Spanish labor market: overeducation? *The Journal of Human Resources*, 27(2), 259–278.
- Arrow, K. J. (1973). Higher education as a filter. *Journal of Public Economics*, 2, 193–216.
- Becker, G. S. (1975) *Human capital*, 2nd edn. National Bureau of Economic Research (NBER), New York.
- Berg, I. (1970) *Education and Jobs: The Great Training Robbery*, New York: Praeger.
- Cohn, E., & Khan, S. P. (1995). The wage effects of overschooling revisited. *Labour Economics*, 2, 67–76.
- Dolton, P. J., & Makepeace, G. H. (1992) *The early careers of 1980 graduates, work histories, job tenure, career mobility and occupational choice*. Research Paper 79. Department of Employment, London.
- Duncan, G. J., & Hoffman, S. D. (1981). The incidence and wage effects of overeducation. *Economics of Education Review*, 1(1), 75–86.
- Elliot, R. F., & Murphy, P. D. (1987). The relative pay of public and private sector employees, 1970–1984. *Cambridge Journal of Economics*, 11, 107–132.
- Field, J. and Meadows, P. (1987). National Survey of 1980 Graduates and Diplomats: Methodological Report. London: Social and Community Planning Research.
- Freeman, R. B. (1976). *The overeducated American*. New York: Academic Press.
- Goldthorpe, J., & Hope, K. (1974). *The social grading of occupations*. Oxford: Clarendon Press.
- Hartog, J., & Oosterbeek, H. (1988). Education, allocation and earnings in the Netherlands: overschooling? *Economics of Education Review*, 7(2), 185–194.
- Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica*, 47(1), 153–161.
- Jovanovic, B. (1979). Job matching and the theory of turnover. *Journal of Political Economy*, 87(1), 972–990.
- Kroch, E. A., & Sjoblom, K. (1994) Schooling as human capital or a signal: some evidence. *Journal of Human Resources*, 1994 (winter), 156–180.
- Murphy, K. M., & Welch, F. (1989). Wage premiums for college graduates: recent growth and possible explanations. *Educational Researcher*, 18, 17–26.
- Paul Hamlyn Foundation: National Commission on Education, (1993). *Learning to succeed: A radical look at education today and a strategy for the future*. Heinemann William Ltd.
- Rumberger, R. W. (1987). The impact of surplus schooling on productivity and earnings. *Journal of Human Resources*, 22(1), 24–50.
- Sattinger, M. (1993). Assignment models of the distribution of earnings. *Journal of Economic Literature*, XXXI, 831–880.

- Sicherman, N. (1991). “Overeducation” in the labor market. *Journal of Labour Economics*, 9(2), 101–122.
- Sloane, P. J., Battu, H., & Seaman, P. T. (1995). Overeducation and the formal education/experience and training trade-off. Discussion Paper 95-08. University of Aberdeen, Department of Economics.
- Sloane, P. J., Battu, H., & Seaman, P. T. (1995). Overeducation, undereducation and the British labour market. Discussion Paper 95-08. University of Aberdeen, Department of Economics.
- Spence, M. (1973). Job market signalling. *Quarterly Journal of Economics*, 87(3), 355–374.
- Stiglitz, J. E. (1975). The theory of “screening” education and the distribution of income. *The American Economic Review*, LXV, 283–300.
- Thurow, L. C. (1975). *Generating Inequality*. New York: Basic Books.
- Verdugo, R. R., & Verdugo, N. T. (1989). The impact of surplus schooling on earnings: some additional findings. *The Journal of Human Resources*, 24(4), 629–643.