Over-Education in the Graduate Labour Market: Some Evidence from Alumni Data

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June 2001

Published by
Centre for the Economics of Education
London School of Economics and Political Science
Houghton Street
London WC2A 2AE

ISBN 0 7530 1440 8

Individual copy price: £5

The Centre for the Economics of Education is an independent research centre funded by the Department of Education and Employment. The view expressed in this work are those of the authors and do not necessarily reflect the views of the Department of Education and Employment. All errors and omissions remain the authors.

Executive Summary

Over the last 25 years there has been a rapid expansion of UK higher education with dramatically increasing graduate numbers. Recent research has shown that a considerable proportion of graduates have attained more education than is required to do their jobs. At the same point in time, employers continue to complain that there is a shortage of highly skilled labour and wage inequality has continued to widen both within as well as between narrowly defined educational groups. This has raised concerns about the value of higher education and challenges the widely held belief that a university education is a good investment and a guarantee of economic success. In particular, we examine the graduate labour market in the UK using alumni data from one large civic university.

There has been no complete theory on over-education in the literature - instead some potential explanations have been offered. Among the reasons advanced to explain over-education are ability differences between similarly qualified workers and the career-related equivalence of qualifications. Since there is no formal division between career-related and non-career-related qualifications, it is to be expected that some education-employment mismatch would arise and accordingly some employees would be over-educated for the type of work for which they are hired. In addition, family commitments, and labour force immobility may give rise to labour market rigidities that may result in over-education independent of the type of qualification obtained.

The first objective of this paper is to explore the determinants of over-education. In particular, we examine the graduate labour market in the UK using alumni data from one large civic university. Independent of job characteristics or education obtained, we consider a range of labour market rigidities that may play an important role in the determinants of over-education. In addition, we study the relationship between of over-education in the first and current job.

Furthermore, we investigate the impact of over-education on wages. In particular we model the process of over-education in first and current job endogenously with the determination of earnings using a variety of estimation techniques (instrumental variables and treatment effects models). The central conclusion of the paper is that earnings and the type of job a graduate enters are simultaneously determined and that simple estimation models of over-education (which ignore this relationship) may systematically underestimate the size of the negative effect of over-education on earnings.

Other key findings are:

- Women are no more likely than men to be over-educated either in their first or current jobs.
- Arts/humanities or languages graduates are more likely to be over-educated than graduates of other faculties. Higher degree results place graduates at the front of the queue for good jobs, with third and pass degrees moving graduates down the occupational ladder. Similarly, it is an advantage to have post-graduate qualifications.
- On-the-job experience and training have little influence on the probability of being over-educated. In addition, graduates who were initially overeducated generally find it more difficult to enter graduate level jobs later.
- Graduates bearing high financial debt commitments upon leaving university have poorer prospects in terms of employment-education match than their better off peers.
- Geographical mobility plays a significant role in allocating graduates to good jobs with graduates who relocate more likely to find work commensurate with their educational qualifications.
- There is no return whatsoever associated with surplus education in the current job. In other words, graduates with degrees in non-graduate jobs earn, on average, no more than workers with no qualifications in the same job.

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Acknowledgements

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The Centre for the Economics of Education is an independent research centre funded by the Department of Education and Employment. The view expressed in this work are those of the authors and do not necessarily reflect the views of the Department of Education and Employment. All errors and omissions remain the authors.

Introduction

The numbers of graduates leaving UK higher education have steadily risen over the last quarter century and are continuing to rise. In addition the trend towards rising wage inequality is apparent within, as well as between, narrowly defined qualification groups (see Machin, 1996). Potential explanations rely on ability differences between similarly qualified workers and the wide divergence of human capital which individuals of the same qualifications may have. At the same time as the numbers participating in higher education have steadily risen there have been important transformations in the types of qualifications being awarded by universities. While many of these new qualifications have emerged in response to changing economic needs, not all of them are career related. Since there is no formal division between career-related and non-career-related qualifications, it is to be expected that some education-employment mismatch would arise and accordingly employees would be over-educated for the type of work for which they are hired. In this paper, we examine the effects of over-education as one possible explanation for the seemingly contradictory, simultaneous emergence, of both rising wage inequality and expanding educational participation. In particular, we examine the graduate labour market in the UK using alumni data from one large civic university.

The idea of over-education has received a lot of attention in recent discussion about the value of higher education. *The Economist* in an article entitled "Degrees of Choice" highlighted that there are now about 40,000 degree courses to choose from and questioned the widely held belief that a university education is a good investment and a guarantee of economic success (see *The Economist*, July 15th-21st 2000 pp.34). In particular the author asks "Are the degree certificates worth the paper they are printed on?". The concept of over-education is not new and considerable attention has been placed on this important phenomenon. Hutt (1939) suggested that waste resulting from workers being in the wrong jobs may be more important than that associated with unemployment in the economy. Berg (1970) documented the plight of those who could not get jobs to match their qualifications and Freeman (1976) drew attention to the potential problem of over-investment in education. From these early beginnings a vast literature has evolved.

Dolton and Vignoles (2000) and Green *et al.* (2000) reveal that an estimated 30% of UK graduates have more education than their job requires six years after graduating. Sloane *et al.* (1999) find that 40% of graduates are over-educated six years after graduating using

survey carried out by the University of Birmingham. The measure of education-employment mismatch we use, taken from the Newcastle Survey, extracts the actual requirements of work from those requirements to get the job. Using this measure, our results suggest that 22% of Newcastle graduates genuinely have jobs for which a degree is not required to do the work[1]. However, 42% of graduates according to our measure held first jobs for which a degree was not required to do the work.

So far there has been no complete theory on over-education in the literature - instead some potential explanations have been offered.[2] The first objective of this paper is to investigate the reasons why a graduate would accept a lower-level job. We hypothesize that over-education is the result of labour market rigidities, and a non-competitive environment. Such rigidities could arise from family commitments or labour force immobility. We model over-education in first and current employment using both probit and bivariate probit estimation. In the bivariate probit model the dependence between over-education in first and current employment is explicitly modelled. Several reasons can be advanced to explain why over-education in the first job can result in over-education in the future. For instance, over-education could result in the deskilling of graduates or the obsolescence of skills which are not used. Another factor could be, simply that, a bad start is difficult to recover from. Furthermore, if graduate supply is plentiful, then why should an employer hire an old graduate who has been in a job beneath him rather than a new graduate straight from university?

The second objective of this paper is to investigate the impact of over-education on wages. Previous research (Sloane *et al.*, 1999; Green *et al.*, 2000 and Dolton and Vignoles, 2000) has assumed that mismatch in the labour market is essentially a random phenomenon. In addition, we make an important contribution to the literature by examining the issue of bias in the OLS estimate of over-education. "Ability" bias may arise in the presence of unobserved factors, which are correlated with over-education and yet also correlated with wages, and result in an upward coefficient in the OLS estimate. OLS estimates may be subject to discount-rate bias arising from graduates with higher discount rates choosing jobs for which less education is required[3]. On the one hand, OLS provides an estimate of the pay

[1] The numbers of recorded individuals who are classified in our sample as over-education is less than is reported by National-wide studies. This is because the Newcastle Alumni Survey has a disproportionate number of graduates who go into teaching from university and the survey contains graduates from as far back as 1970 (who are less likely to be over-educated).

[2] Sicherman and Galor (1990) have a partial theory of occupational ladders but no complete theory of over-education.

[3] Individuals with high discount rates require a job immediately.

penalty associated with over-education on average. On the other hand, using variables that affect over-education but not wages, IV estimation provides an estimate of the pay penalty for marginal graduates with high discount rates. Hence we expect that OLS estimates understate (*i.e.* less negative) the true causal effect of over-education on wages. We deal with the endogeneity issue by exploiting the natural variation in the data generated by exogenous influences on the matching outcome. More precisely, we rely on the exogenous changes in the over-education distribution of graduates caused by labour market rigidities to provide instruments for over-education. In addition to the IV approach, we also estimate a treatment effects model which allows for the endogeneity of over-education. In current employment, our IV estimates of the over-education effect are treble those found using OLS [4].

This paper is set out as follows. The next section places over-education in the context of its theoretical framework and discusses possible explanations for the phenomenon. Section 3 outlines our estimation methods. Section 4 describes the Newcastle Alumni Survey and presents some descriptive statistics. Section 5 provides estimates of the factors affecting the probability of over-education and the implications it has on wages. Section 6 concludes the paper.

2. Theoretical Framework and Measurement Issues

In the literature there are three ways in which over-education (or over-skill) has been measured. The first, we label, the "external assessment" measure. This method depends on systematic evaluation by expert job analysts who judge the level and type of education required for particular occupations. For instance Rumberger (1987) used the *U.S. Dictionary of Occupational Titles* (DOT) (U.S. Department of Labour, 1965) which provided information on the educational requirements of a range of occupations. Spenner (1983, 1988) and Wolff (2000) also relied on comparisons between the skill requirements for the individual's occupation that are recorded in various editions of the DOT. There are few European equivalents to DOT, one is the ARBI code, developed by the Dutch Department of Social Affairs (see Hartog and Oosterbeek, 1988). Job complexity is separated into seven levels where both job content and the level of ability and knowledge required are taken into account.

[4] One can place a discount rate interpretation on the educational choice decision in the manner suggested by

The second approach, which we shall call the "statistical" method, was developed by Verdugo and Verdugo (1989). This approach uses the distribution of educational qualifications in a given occupation. Most commonly, over-education is defined as a level of education one standard deviation or more above the mean for the occupation, or under-education as a level one or more standard deviations below the mean[5]. Instead of using the mean, some authors use the modal education level within an occupation to determine whether somone is over-educated (see Kiker *et al.*, 1997 and Alpin *et al.*, 1997)[6].

The third approach we term the "self-assessment" technique or a subjective assessment. Using this approach survey respondents are asked directly the minimum educational requirements necessary to perform their jobs[7]. Following most other authors, we use this technique.

Each of these methods have their limitations and their use can lead to different results. Firstly, while the job analyst approach has the advantage of being objective, it ignores the fact there is likely to be a distribution of required education within the same occupational titles because various different skill jobs are grouped together. Consequently, misclassification of workers into over-education may occur. Also, required schooling may vary according to the individuals level of ability, experience and tenure. If education and ability are substitutes, then an individual with higher ability may require less schooling to perform at their work. Furthermore, levels of education dummies ignore the type of education received and therefore some workers who are recorded as mismatched are in fact incorrectly classified. Most importantly these studies often use data where the educational requirements of jobs do not change over time. This is in substantial part a result of the cost of and time taken to use the "external assessment" method. As a result, occupational classifications often become available long after they have been measured and are typically used for a very long period of time, therefore they assume no change in job content. However, the optimal level of skill depends on market forces (Borghans and de Grip, 2000). Technological and organisational developments may change the requirements. It is therefore not surprising that the objective method tends to provide high levels of over-education (or over-skill) and high increases in these levels over time.

The 'statistical' definition of over-education uses the theoretical foundation of the allocation theory to measure the extent of mismatch. If the labour market is working well, it

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Cameron and Heckman (1998)

[5] See for example: Asplund and Liji (2000), Sloane *et al*, (2000).

[6] The modal level, is the level of education that occurs most often in a distribution of occupation.

may be expected that the majority of workers within a certain occupation have the appropriate educational backgrounds. This approach has the advantage that it is sensitive to labour market developments and technological change. However, labour market rigidities such as labour force agreements impede the effectiveness of this method. If it is based on new labour market entrants this approach may be very responsive. Furthermore, the empirical approach allows for a range of education levels within occupations. Albeit, the demarcation line between appropriate and inappropriate levels of education are arbitrary. Also, by definition it will always describe a certain proportion of people in an occupation as over-education (and by symmetry under-educated) irrespective of the underlying excess demand or supply of skills.

The method we use, based on worker's self-assessment may be biased because it is subjective, and workers may find it difficult to categorise their work into the actual level of education required. Consequently, some authors argue that workers may rely on the actual requirements to get their job rather than on the actual requirements necessary to do the job. Therefore, credential creep may be understated in studies that use this method. Initially, perhaps workers are unaware of the skills required to do their job and reply on the actual requirements to get their job. However, where workers have been in their jobs for sometime they are better able to assess the skill requirements to do their job. Stasz (1998) found that employees reported the actual skill requirements of their jobs much more accurately than employers. Unlike the job analysis model, rather than being generally classified into occupational categories, employees are able to identify their individual jobs. Also, this method allows workers to report changes in job content each time the survey is carried out or at different points in their careers.

There are also some significant conceptual problems associated with the concept of over-education. The exact definition of the term itself often depends on the assumptions made by the author. Most researchers have defined individuals as being over-educated if he/she has more education than is required to do his/her job, regardless of the wage earned. According to pure human capital theory, an individual's earnings are a function of acquired education as job characteristics are assumed to be able to take advantage of the higher level of human capital of graduates and individuals are paid their marginal productivity (Becker, 1975). Human capital theory would suggest that firms and employees are assumed to fully utilise their human capital and the concept of over-education is meaningless and should not

[7] See for instance: Duncan and Hoffman, (1981); Green *et al.*,. (2000) Sicherman (1991); Sloane *et al.*,. (1999).

be included as an explanatory variable in the earnings function. Even in the context of human capital theory, society may over- or under-invest in education. This would result in an outward shift in the supply of qualified labour and correspondingly a reduction in the returns (wages) to qualifications, holding demand for education constant.

Within the framework of human capital theory, individuals may be permanently as well as temporarily in jobs that under-utilise their education. Disequilibrium in the labour market generated by restrictive work practices or some other form of labour market rigidities, may hinder firms from fully utilising every individual's education and paying them the value of the their potential marginal product. Where a graduate earns less than he/she would if they were employed in a graduate level job, we term him/her as being over-educated. Before examining the possible explanations of why individuals may choose to accept a job beneath their qualifications, it is instructive to examine movements in and out of various employment-education positions over time using data from the Newcastle Alumni Survey.

Table 1 presents the transition matrix between first and current employment-education matches. Employees are defined in terms of the education requirements of their jobs. All individuals in our sample at least have obtained a degree. The diagonal elements of the table show the number of graduates who remain in the same position in the two periods. The other positions in the table show the numbers who move into higher or lower level jobs.

Looking at graduates who move from higher to lower level jobs, we see that there is considerable downward occupational mobility. Of our total only about 10% of graduates move down the occupation distribution into lower level jobs. However, of the 552 individuals who enter graduate or postgraduate jobs initially, 15% switch out of these jobs into lower-level occupations. Also, 8.4% of graduates initially in sub-degree level employment move down into lower level jobs later. Moving in this downward direction across the matrix of transitions *i.e.* from left to right, may be the result of labour market rigidities such as family commitments and labour immobility; or imperfect information.

Looking at the diagonal of the table, we see that 49% of graduates are in the same level job now as when they first joined the work force. But 15% of these graduates have never held a degree level job at all.

To understand the determinants of over-education and movements along the transition matrix it is important to understand how over-education could arise and persist. Individuals may be temporarily or permanently in jobs where their skills or education are under-utilised and accordingly may not receive their potential marginal product. It is this phenomenon that is over-education. An over-educated worker earns less than a similarly educated worker whose skills are fully utilised. Accordingly, the crucial questions are: (1) Why a worker would take up such a job? (2) Why a firm would not utilise the entire endowment of its workers' human capital? We examine several possible explanations.

Consider the role that the employer plays in the matching process. Some researchers question whether firms can easily adapt their production technologies to fully utilise the human capital this is available to them (Duncan and Hoffman, 1981; Hartog and Oosterbeek, 1988; Rumberger, 1987). If some firms cannot change their production methods to take advantage of the supply of human capital available, then an individual's productivity and hence their earnings may be less than they would receive elsewhere. In the long run we would expect firms to find ways of fully utilising all the skills of their employees and accordingly over-education would only be a short-term problem. However, over-education may also be a long-run problem.

Firms may place a great deal of emphasis on the subject of study and area of specialisation, and therefore focus on only a narrow segment of the graduate population. Graduates in some disciplines may find themselves over-educated as a result of the lack of additional qualifications necessary to utilise initial education. For example law and accountancy graduates may require a professional or vocational qualification in addition to a relevant university degree to find work commensurate with their qualifications.

Many characteristics including unmeasured attitudes toward work and innate ability may vary by class of degree. The signalling models of the role of education due to Spence (1973) suggest that part of the function of education is to differentiate between workers of differing innate ability. The basic model suggests that the cost of education must be lower for higher ability graduates. Therefore, if ability is positively correlated with class of degree, then firms may favour workers with higher degree classes.

Firm size may have an important bearing on the match between work and education for several reasons. Larger firms may have more sophisticated recruitment structures and a wider range of jobs, which may decrease the probability of the under-utilisation of skills and education-employment mismatch.

Labour market institutions, such as trade unions, may restrict work practices, thereby generating labour market rigidities and a non-competitive environment. These labour market rigidities may limit the firm's ability to reward more able staff. Trade unions are more likely to be present in larger firms rather than smaller firms.

On the one hand, graduates who work in the public sectors may be more likely to be over-educated as a result of the less competitive nature of the labour market in that sector. But on the other hand, there are many jobs in the public sector which are available only to graduates *e.g.* teaching.

Part-time and temporary work could increase the likelihood of being over-educated. Part-time jobs might make it difficult to fully use all forms of human capital including qualifications attained. Temporary work may offer a "quick fix" rather than a permanent life-long career.

Employees are also responsible for creating a good match. Notwithstanding educational achievements and innate ability, several personal factors may influence the employment-education outcome. For instance, family commitments, financial debt, disabilities and the willingness to relocate to regions where more graduate jobs are available may have an important influence on the probability of finding appropriate employment. We will briefly discuss the likely impact that each of these factors may have on the probability of being over-educated.

First, family commitments may result in better matches for men as they may make more of an effort to get better jobs to financially support their families. The greater responsibility which women usually bear for the daily care of their children may make it more difficult for women to find work commensurate with their qualifications. In particular family commitments early in life may have a greater influence on over-education than family commitments later. For instance, graduates who have had children prior to their first job may find it more necessary to get some or any job and not necessarily a graduate-level job. This is because there is likely to be a higher trade off between search costs and current consumption requirements for graduates with children than without children when first entering the labour market.

Marital status may also have an impact on the probability of being over-educated. A married graduate may be limited in his/her ability to find appropriate work in consideration for his/her partner. For instance, a married graduate may relocate because of their partner's job regardless of whether they themselves can find work in the region commensurate with

their qualifications. There are also other reasons (perhaps mostly personal) why graduates may wish not to relocate to find suitable employment.

Second, health problems may make it difficult for some graduates to find graduate-level jobs. For instance, disabled individuals may face difficulties in finding work and making a good job match. However, individuals who are disabled may be well matched as a result of government legislation governing the employment of the disabled in the public sector. It is also possible that disabled graduates who work may be very determined individuals and therefore would find good matches independent of government quotas.

Third, debts incurred while studying may impact on the probability of being over-educated later. The repayment of debts may place an incentive to search harder to find employment that generates the greatest return to education. It is also very likely that banks have more of an incentive to provide loans to students on career-related programmes. Through this selection mechanism we may find that graduates with debts are less likely to be over-educated. But, high debt commitments may place more of an onus on early graduates to find some immediate work thereby often generating poor matches. Also, individuals from less-privileged backgrounds (usually less well connected) are more likely to take out loans to go to university. Thereby the effect of debt commitments may be difficult to disentangle from family background influences if we do not control for both in regression analysis. The Newcastle Survey has information on whether or not an individual received a state grant to help finance their education. We use this information to proxy family financial circumstances and socio-economic status.

Early labour market choices may also affect the fit between education and employment in the future. The accumulation of other forms of human capital necessary to work in a graduate job may take some time after graduation. For that reason, experience, tenure and training could improve many graduates' prospects in the future. Alba-Ramirez (1993) found evidence to suggest that the overeducated have less human capital such as work experience and training. Similarly, many individuals starting in low-level jobs may, in time, be promoted to better ones. However, promotion could be endogenous since individuals who are well matched may be the ones more likely to have been promoted. Therefore, promotion is not included in our final analysis.

Over-education may be caused by imperfect information where graduates end up in non-graduate jobs because they lack information about the educational status of jobs. If there is a difference between the qualifications required for entry to work and the qualifications

required to actually do the work, which may only be known sometime after starting, then many graduates may be over-educated for this reason.

Also, there are business-cycle effects, and cohort effects. First, graduates may respond to high national (or regional) unemployment by taking jobs in less educationally intensive occupations. If hysteresis effects were not generated by downward occupation mobility, over-education would be merely a short-term problem. However, if new graduates enter the labour market during a period of economic decline and take non-graduate jobs many may find it difficult to recover from this bad start to their careers.

The probability that any individual is over-educated may be partially the result of changes in the education system. In recent years as the numbers of graduates has grown the breadth of degrees has expanded. This could result in a widening in quality and career-orientation of university qualifications or a shift in the ability composition of graduates. A greater variation in the quality of qualifications could be due to a widening in the range of degree programmes. A change in the composition of graduates, in terms of their innate ability or family backgrounds, could be the result of lower entry costs to university. Subsequently, not only have the types of qualifications changed over time but the distribution of skills they represented has also changed. In addition, the extent to which learned skilled can be transferred to the labour market varies markedly with type of degree and the specialisation component of qualifications. As a result of these changes, university graduates may be taking jobs (requiring less than a university degree) that they would not have in the past.

Qualification inflation may also generate downward occupational mobility. According to (educational) signalling models part of the function of qualifications is to identify workers of different innate ability. As the numbers in education increase, the distribution of ability that qualifications represent may expand, and accordingly the validity of qualifications as a proxy for innate ability may decrease. In response, firms may raise the qualification requirements of work in order to ensure the recruitment of the most able graduates. If the educational content of job remains unchanged the net result is qualification inflation *i.e.* the devaluation of qualifications and a rise in over-education.

Many of the above factors may give rise to labour market rigidities that limit the capacity of the market to fully utilise and reward highly educated employees. The Newcastle Alumni Survey contains a considerable amount of information on individual labour market choices, family circumstances and personal commitments, which can give rise to labour market rigidities that generate employment-education mismatch. In our empirical analysis

we look at these potential determinants and focus only on those characteristics that have an important bearing on the match between workers and jobs. Accordingly, our models below only include important variables as established by our data. Before describing to our results, we will formally outline the estimation method used and present some descriptive statistics of important variables.

3. Estimation Methods

The first objective of this paper is to investigate the validity of the above explanations in the context of the determinants of over-education. The second objective is to examine the relationship between over-education and labour market earnings. A number of different model specifications are used to address both these issues.

The over-education literature to date has assumed that mismatch in the labour market is essentially an exogenous phenomenon, and has relied on the following reduced-form wage function to measure the relationship between over-education and wages:

$$\ln y_i = \beta_0 + \beta_{1k} X_{ki} + \beta_2 S_i + \mu_i \qquad (1)$$

Where S is an indicator variable taking the value 1 if the person is in a job for which they are over qualified. More recently Sloane *et al.* (1999) have modelled over-education at initial labour market state (j=1) and at some date afterwards (j=2). They have however still assumed that the over-education process is exogenously determined. Hence their model involves estimating two equations:

$$\ln y_{ji} = \beta_{0j} + \beta_{1kj} X_{kji} + \beta_{2j} S_i^j + \mu_{ji}, \qquad j = 1,2 \qquad (2)$$

where S^j for j=1,2 is a measure of skill under-utilization in first and current employment. X is a vector of other characteristics. Henceforth, we will drop the individual i subscript notation. Estimates of equation (1) or (2) by OLS will yield unbiased estimates of β_2 only if over-education (or skill under-utilization) is exogenous *i.e.* $E(S\mu) = 0$. This will arise if conditioning on the observable variables (X) is sufficient to control for the endogenous choice of over-education. Our first wage specification assumes that individuals who have the

same observable X, but who have different values for over-education, do not differ, on average, in the unobserved error term, μ, that is:

$$E(\mu \mid S \ , X \ ) = E(\mu \ \mid X)$$

However, over-education may be endogenous if family commitments and labour market rigidities, for instance, are significant determinants. In this case, over-education will be systematically greater for individuals with family commitments and working in non-competitive labour markets. Accordingly, part of the estimate on over-education may be picking up these factors. A standard solution to the problem of causal inference is instrumental variables (IV) where we posit the existence of an observed covariate that is a determinant of over-education but is uncorrelated with wages. Thus our alternative model structure, involves estimating the following over-education probit equation endogenously with the wage equation:

$$S^j = \alpha_j Z_j + \varepsilon_j, \qquad j = 1,2 \tag{3}$$

where S^j is a measure of skill under-utilization, and Z is a vector of characteristics that are thought to determine over-education. Predicted values of S^j from equation (3) are then entered in place of the actual values in equation (2).

Alternatively, if over-educated workers are less able in some way they may lack some of the abilities/skills required to do a job that is normally commensurate with their level of education. This would imply that the over-educated are not genuinely over-educated. Rather they have jobs that are appropriately matched with their abilities[8]. In other words, the over-educated are a non-random sample from the population and therefore receive lower wages than appropriately educated individuals. We therefore use an alternative wage specification (*i.e.* specification III), based on a model of treatment effects, to deal with this issue. This is an extension of the Heckman (1979, 1990) selection model, whereby all observations in the sample are included (*i.e.* both over-education and appropriately educated workers are included). Again equation 3 is estimated using a probit model and the parameter estimates are used to compute the Heckman (1979) selection adjustment term, λ. Along with the actual values for over-education λ is entered into the wage equation as follows:

[8] Green *et al.*, (1999) using the NCDS find some support for this argument.

$$\ln y_j = \beta_{0j} + \beta_{1kj} X_{kj} + \beta_{2j} S^j + \theta_j \lambda_j + \mu_j, \; j = 1,2 \qquad (4)$$

As already mentioned identification, in the IV model, or in the alternative selectivity model is provided by including variables in Z that are not elements of X. Our model identification is achieved by the inclusion of dummy variables in the set Z that generate labour market rigidities.

Finally, if over-education in current employment and first employment are correlated then the following model, which explicitly estimates the process of over-education over time, may be written:

$$S^{j*} = \alpha_j Z_j + \varepsilon_j, \; j = 1,2$$

$S^j = 1$ if $S^{j*} > 0$, $S^j = 0$ otherwise.

$[\varepsilon_1 , \varepsilon_2] \sim$ bivariate normal$[0,0,1,1,\rho]$

$$E\left[S^{1*} \mid S^2, Z_2\right] = \alpha_1 Z_1 + \rho\lambda_2$$

S^{j*} is the latent variable corresponding to S^j and we treat this as a bivariate probit rather than a simple probit. Estimation by an individual single equation probit method would be inefficient because it ignores the correlation between the disturbances.

From the above bivariate model, we can replicate wage specification III, which deals with sample selectivity in the form of treatment model effects, as follows:

$$\ln y_2 = \beta_0 + \beta_1 X + \beta_2 S^1 + \beta_3 S^2 + \theta_1 \lambda_1 + \theta_2 \lambda_2 + \mu \qquad (5)$$

where y_2 is wages in current employment, λ_1 and λ_2 are generated from the bivariate probit model above. This is our fourth wage specification.

The λ variables in the regression are:

$$\lambda_1 = \phi(w_1)\Phi\left[(w_2 - \rho_{12} w_1)/\left(1 - \rho_{12}^2\right)^{1/2}\right] / \Phi_2$$

$$\lambda_2 = \phi(w_2)\Phi\left[(w_1 - \rho_{12}w_2)/(1-\rho_{12}^2)^{1/2}\right]/\Phi_2$$

For the case where $S^1=S^2=1$

$$w_1 = -\alpha_1 Z_1 \qquad w_2 = -\alpha_2 Z_2$$

And the bivariate normal CDF is

$$\Phi_2 = \Phi(w_1, w_2, \rho_{12})$$

To get the other cases, just change the sign of w_1 when $S^1=0$, w_2 when $S^2=0$, and ρ when $S^1 \neq S^2$.

4. Data and Variables

This paper uses data from the Newcastle Alumni Survey. This data was collected at the University of Newcastle-upon-Tyne in 1998[9]. This survey was undertaken in order to permit the analysis of over-education in the graduate labour market. Accordingly the questionnaire included questions on the factors that are perceived to have an impact on the employment-education match. This information was supported by the collection of background information on graduates including their personal characteristics, educational achievements and employment histories.

The sample for this survey was selected using the Newcastle University Alumni Database of graduates and postgraduates. At the time the survey was carried out, 43,099 alumni were in this database. However, only 3,187 indicated their interest in participating in "careers research" and were posted the questionnaire. Overall, 2434 members returned the questionnaire, most of whom had graduated in the 1990s. This represents 76.37% response rate. Although a generally satisfactory response rate had been achieved, anything less than a perfect response raises the question of whether those who were assessed were representative

[9] This survey was funded by the Economics Department and the Alumni Office at the University of Newcastle-upon-Tyne, and the Government Office North East.

of the university alumni population. The main causes of non-response are unknown because the survey was posted and no other contact was made.

This marked under-representation of those who graduated prior to 1990 may be due to two factors. Firstly, the University only started keeping electronic records of graduates in 1983. As a consequence, there were thousands of alumni who have never been on the University Alumni Database. Secondly, prior to 1991 the Alumni Association was a fee-paying society, and graduates "opted in" rather than "opted out" as is now the case. The Alumni Association had about 3,000 members in 1991; today it has over 49,000. It is difficult to know if those who opted not to join prior to 1991 were a non-random sample of graduates as many would have not known about the Alumni Association. If our sample is non-random then analysis will suffer from sample selection bias.

The final sample is comprised of 2,434 graduates, for which there is reasonably consistent data for 2,348 individuals. Since we are only interested in the UK labour market our sample excludes all individuals living abroad during either their first or current job (*i.e.* 343 persons). In addition, we drop graduates from the faculty of medicine (*i.e.* 232 persons) and individuals who graduated before 1970 (*i.e.* 220 persons) since they are unlikely to be over-educated. Finally, we only focus on individuals who are currently in employment at the time of the survey. This leaves us with a final sample of 1,389 graduates, of which our estimation samples are 852 and 731. We lose a significant number of observations due to missing data. Not withstanding the potential of sample selection bias into the original sample, we generated sample weights based on our samples of 852 and 731 persons, in order to take account of the uneven distribution of responses across years. All descriptive statistics and regression analysis was performed using these weights. Summary statistics for individuals in our sample are provided in Table 1A of Appendix A.

The Newcastle Alumni Survey has a wealth of information on educational achievements. In order to examine factors such as pre-university schooling, questions were asked about school type, qualifications acquired to gain entry to the University, and details of subjects and grades achieved where A-levels or Scottish SCE 'Higher Grade' were the examinations taken. Individuals were asked questions about the faculty or department, the class of degree, whether they received a maintenance grant (partial or full) and/or the amount of bank over-draft they had upon leaving Newcastle University. Also, graduates were asked whether their course was sponsored by a company or employer organisation. Furthermore, information was gathered about qualifications (academic, professional, or vocational)

obtained since leaving Newcastle. The survey records the starting and finishing dates and subjects of all qualifications obtained.

Graduates were asked to provide information on their employment status at five specific time intervals: 6 months after graduation, 1986, 1991, 1996, and at the time of the survey. Furthermore, detailed labour market information about their current or most recent job, previous job and first job upon completion of first degree from Newcastle University was provided by the survey.

Most importantly, this is the only British dataset that contains two direct questions measuring the extent of qualification mismatch or over-education. The first question is: "What is/was the minimum formal qualification level required for ***entering*** this job?" and the second question is: "What do you believe to be the education level required to ***actually do*** this job?". Answers to both questions are on a four-point scale as follows: post-graduate qualification, degree, sub-degree qualification, and no qualifications required. The first question provides a match between acquired and required qualifications to get one's job, whereas the second question provides a direct measure of over-education in terms of job content. Contrasting information between both questions provides a measure of qualification inflation. Qualification inflation arises where the educational requirements to get a job exceed the educational requirements to do the job effectively. Table 1C in Appendix C, illustrates the level of qualification apparent in our data.

Table 2 displays the distribution of qualifications required to ***actually do*** current and first jobs. The table shows that there is considerable movement over time into graduate level employment. Just over 78% of graduates are currently in jobs that require a degree to ***actually do*** the work, while over 58% held a first job that required a degree. 15% of our sample believe that their current jobs require a sub-degree whereas the corresponding figure for first jobs is 20%. Now 6% of graduates claim that their current jobs require no qualification at all but almost 22% believed that their first job was at this level. With respect to a degree, the data suggests that 22% of graduates are currently over-educated for their jobs, and 42% were over-qualified for their first job. In Appendix C, Table 2C presents the incidence of over-education by different categories of graduates.

Table 3 sheds further light on over-education by providing information about the qualifications required for entering employment. In terms of the requirements for current jobs, 78% of graduates required a degree – the same proportion that believed a degree was necessary to do the work. By contrast, while 67% of graduates needed a degree to get their first job only 58% believe that a degree was necessary to ***actually do*** the work.

5. The Results

5.1 The determinants of over-education

We begin by looking at the determinants of over-education in the first job and the current job where over-education is estimated by probit. These results are reported in Table 4[10]. Over-education is measured with respect to a degree, therefore, there is no distinction made between graduate and post-graduate qualifications. Our specifications control for several categorical variables that influence the probability of over-education: faculty of degree; class of degree; post-university qualifications; part-time and self-employment; sector; firm size; occupation; labour market mobility; family commitments; debt commitments; cohort effects; years of actual experience as well as age; on-the-job training; and a dummy variable for over-education in the first job is added to the probit for over-education in the most recent job.

Before turning to our main results, it is important to note that we examined the relationship between each of the variables mentioned in Section 2 as potential explanations in the match between education and work. Each of these variables were included in the equations as potential determinants of over-education, however, only those mentioned in the tables were statistically significant.

Table 4 displays the results from the estimation of probit equations on the probability of being over-educated in first and current employment separately. Specification 1 reports the marginal effects and the corresponding standard errors for first employment, specifications II and III for current employment where specification III includes a dummy variable for education-employment match in first employment[11].

One of the most important results from our research is that over-education is not contingent upon gender. We find that women are no more likely than men to be over-educated either in their first or current jobs. This indicates that women are not given lower-level jobs simply because they are women. Therefore, according to our analysis, hiring practices for graduate level jobs, on average, are not subject to discrimination and provide equal opportunities in Great Britain. This is in line with the literature on technological

[10] Throughout the tables a single asterisk means that the coefficient is significant at the 10% level on a two-tailed test (*i.e.* the t-statistic is greater than 1.64) and two asterisks that the coefficient is significant at the 5% level on a two-tailed test (*i.e.* the t-statistic is greater than 1.96).

[11] Table 1B in Appendix B displays the corresponding coefficient and standard errors.

change, which asserts that new technological change has created a demand for women's as well as men's education.

Faculty of degree is an important determinant of over-education. With respect to first employment, graduates in education are substantially more likely to find employment commensurate with their qualifications than those who graduate from other faculties. Regarding current employment, graduates in arts and humanities, and in languages are more likely to be over-educated than other graduates. These results are wholly consistent with the view that graduates with less vocationally-oriented qualifications are more likely to be overqualified that those with qualifications which are vocationally-oriented.

In terms of degree class, individuals who graduated with first class honours are more likely to find first jobs for which a degree is required to do the work. By contrast, graduates with third or pass degrees are more likely to be in current jobs that do not require a degree at all. This would seem to indicate that good grades place individuals at the front of the queue for good jobs regardless of which subject of study they undertook at university.

Our results seem to suggest that undertaking postgraduate qualifications increase the probability of being in a graduate level job. Initially, we see that having a higher degree does not increase the likelihood of having a graduate job in comparison with a first degree. However, post-graduates are more likely to hold current jobs for which a degree is required to do the work. In contrast, although the coefficients are negative, professional qualifications obtained after leaving Newcastle University do not significantly increase the probability of finding graduate level employment either in first or current employment. However, we find that graduates in professional occupations or in the self-regulating professional sector more likely to be in graduate jobs than those in the comparison groups, respectively.

The probability of over-education is likely to depend on several employment characteristics. Graduates who are currently employed on a part-time basis are more likely to be overqualified than those employed on a full-time basis. This may be because graduates who wish to work on a part-time basis may be more constrained in their choice of jobs if employers cannot provide that many graduate-level jobs on a part-time basis. It is interesting that in initial employment part-time status is not statistically significant.

We find that self-employment status has no discernible impact on the probability of being over-educated. Occupation classification plays one of the most important roles in determining the probability of being over-educated. The default category is made up of clerical occupations, manufacturing crafts, personal and protective services, sales, plant and machine operatives, and other occupations. In comparison with the default category,

professionals are 42% less likely to be over-educated in their first jobs, and between 15-20% in their current jobs. Similarly in comparison with the default group, associate professionals are 28% less likely to be over-educated in the first job and between 6-8% in the current job. Managerial status is not statistically significant in first employment but by current employment managers are about 9% less likely to be over-educated than the default group. The fact that managerial status is not always consistently related with a graduate being in a graduate level job may in part be due to the fact that the managerial classification encompasses a wider range of skills or qualifications than the professional or associate professional categories.

By comparison with the default group, in first and current employment, graduates working in either the self-regulating professional sector or the education sector are less likely to be over-educated. This result is unsurprising since the majority of graduates in education are teachers and those in the self-regulating professional sector usually require a degree such as in accounting. In addition, our results suggest that over-education is not more prevalent in the public sector due to the less competitive nature of the labour market. Furthermore, graduates in small firms with less than 25 employees are less likely to hold jobs commensurate with their education and skills. As well as having more opportunities for graduates, larger firms may also have human resource functions that match workers to jobs, therefore creating better education-employment matches.

Looking at the relationship between on-the-job experience variables and current over-education we see that only experience squared is statistically significant, but it is numerically trivial with a coefficient of only .001. Unemployment and age are not statistically significant. It is interesting to note that employer provided training has no measurable affect on the probability of being over-educated. These results seem to suggest that over-education is generally a permanent rather than a temporary phenomenon. In addition, looking at specification III and the impact of over-education in the first job on the probability of being over-educated in the current job, we find strong support for this view. Graduates who are over-educated at the start of their careers will find it more difficult to get graduate jobs later in comparison with graduate initially in jobs for which a degree is required.

Next let us examine the instrumental variables used in our analysis, which are as follows: labour market mobility, family commitments, and debt commitments. These factors have an important bearing on over-education but are not correlated with wages.

Regional mobility plays one of the most important roles in allocating graduates to good jobs. Relocating to take a first job increases the probability of being well matched by

22%, whereas relocating to take a current job increases the probability by about 7%. Interacting mobility and gender, we see that women who relocate for their first job are 19% more likely to be in graduate level employment compared to women who don't relocate for their first jobs, however, the coefficient is only statistically significant at the 10% level of significance. With respect to current employment, women who relocate are between 10-13% better off by comparison with women who don't relocate, and this interaction term is statistically significant at the 5% level.

Looking at family commitment variables, with respect to first employment, children prior to first job significantly (at the 10% level) improves the probability of finding a graduate job. This clearly reflects the greater responsibility young parents (and particularly young male graduates) bear and therefore a greater need to get the highest possible return on their education. In contrast, having a partner prior to first job makes no discernible impact on the probability of being over-educated in first employment. In our specifications for current employment, we condition on the presence of children at any time rather than on children prior to first job. Our results show that children and marital status have no measurable affect on over-education in current employment. One might expect that this effect is different for women than for men. However, our sample is not large enough to meaningfully interact family commitment variables with gender.

High debt commitments (*i.e.* debts in excess of £1000 upon leaving Newcastle) raise the probability of being over-educated for one's first job by 14%. This is perhaps because debt places pressure on graduates to find some work immediately, and thereby forcing them into jobs for which they are over-educated. Other forms of financial support, grants and company sponsorship played no discernible impact on the propensity to find suitable employment, and therefore we did not includ these variables in our final specifications.

We also model the employment-education outcomes jointly as two dependent binary choices in which each outcome depends on the usual list of regressors and is affected through the error structure by the other outcome. The results of the bivariate probit equations are reported in Table 5. The table displays the coefficient and standard errors for first employment in column 1 and current employment in column 2. We find that the coefficients in the probit models (see Table 1B in Appendix B) of over-education and the bivariate model are very similar in magnitude and significance. The rho term displayed at the bottom of the table shows that there is a statistically significant correlation coefficient between the unobservables in the over-education equations.

5.2 The impact of over-education on wages

One of the key questions of this literature is whether the over-educated earn less than their peers who have jobs commensurate with their education. Human capital theory assumes that individuals are paid their marginal product, which is determined by their human capital rather than the characteristics of their job. However, if a firm cannot use an individual's education, then an individual's productivity may crucially depend on the requirements of their job. If this is the case, then the educational requirements needed to do the job should be included in the human capital wage equation.

This section focuses on the relationship between over-education and wages as measured using log of real annual wages as the dependent variable. The Newcastle Alumni Survey groups annual wages into 20 categories from less than £2000 to above £70,000. Since graduates started first jobs at various different times deflating the interval wage variable produces a continuous wage variable, hence estimation by OLS is appropriate in the case of first employment. However, for current employment, the interval-based dependent wage variable is preserved and we use these ranges to perform maximum likelihood estimation due to Stewart (1983). The explanatory variables used in the analysis of wages are separated in the tables under the following headings: gender, occupation, faculty, class of degree, qualifications obtained post Newcastle, sector, firm size, employment characteristics, over-education variable(s), and the selectivity term(s) in the Treatment effects models. In addition, training and years of experience are included in the analysis of current wages[12]. The tables display coefficients and robust standard errors, and at the bottom sample sizes and R-squared estimates are presented.

Table 6 allows us to examine the effect of over-education on wages in first employment. Specification I reports the simple OLS estimate of the effect of over-education on wages. Specification II reports the IV estimate where the probit model for over-educated in the first job from Table 4 specification I is used to generate a predicted value for over-education. Lastly, specification III presents the results of the treatment effects model where the same probit model is used to generate the selection term, lambda[13].

[12] We estimated the same wage equations excluding sector and occupation, and including one and excluding the other. The estimates of one categorical variable were largely unaffected by the inclusion or exclusion of the other. On the other hand, the exclusion of sector changed the magnitude of the coefficients on firm size, therefore its inclusion was necessary to guard against model misspecification.

[13] The instrumental variables used for first employment are: regional mobility (relocate for this job, relocate for this job interacted with female); family commitments (partner prior to first job, child prior to first job); and debt commitments.

With respect to first employment, Table 6 shows that the estimated pay penalty to over-education is 18% under both OLS and IV estimation techniques (specifications I and II respectively). When we correct for endogeneity using the treatment effects method (specification III) the selectivity term is statistically insignificant. Therefore, according to our analysis, over-education in first employment is a random phenomenon generating a pay penalty of 18%.

Examining the other determinants of wages in the first job, before looking at the effect of over-education in current employment, we observe several interesting findings. Firstly, women earn on average 14% less than men regardless of qualifications, occupation, sector, employment characteristics or job match. Managers, professionals and associate professionals tend to earn significantly more than other occupations. Graduates in arts and humanities earn approximately 24% less than in other faculties. Class of degree and higher degrees are not statistically significant. Graduates working in the education sector tend to earn more than those working in other sectors, perhaps due to the fact that starting salaries for teachers are relatively good. Small firm size reduces wages quite significantly. Part-time status and self-employment are not statistically significant.

Table 7 presents the effect of over-education on wages in current employment. Four wage specifications are set out. An over-education dummy is included in the simple OLS wage regression in specification I. The IV estimation is presented in specification II where the over-education variable is generated from the probit where no account is taken of over-education in the first job (*i.e.* specification II, Table 4). Specification III reports the treatment effects model, where the selectivity term is derived from the same probit model as before[14]. Finally, specification IV presents an alternative treatment effects model where the over-education terms in first and current employment are included and two associated selection terms calculated from the bivariate probit model are used to correct for sample selection.

In current employment, the effects of over-education are much more serious than in first employment. According to our OLS estimate, the pay penalty associated with over-education stands at 30%, that is 12 percentage points higher than in first employment. In contrast, the pay penalty associated with over-education fall to 17% using the IV estimation technique. However, using the Heckman Selection approach, the estimate on over-education rises to –87% and –81% in specifications III and IV respectively. This figure is almost treble the estimate produced using OLS. Moreover, the selection term with respect to over-

[14] The instrumental variables used for current employment are: regional mobility (relocate for this job, relocate for this job interacted with female).

education in current employment is statistically significant in specifications III and IV. These results indicate that the OLS estimate of the impact of over-education is biased downwards and the effects of over-education on wages are much larger than simple OLS estimates would suggest. We also re-ran specification III using a probit model for over-education in the current job that included a dummy variable for over-education in the first job. Our main conclusions did not change. These results suggest that the over-education process may be endogenous to the determination of wages.

The rise in the pay penalty in going from OLS to Heckman selection estimates is consistent with the returns to education literature which control for the potential endogeneity of education. In these studies, the general result is that the rate of return to education rises when education is instrumented. According to Harmon and Walker (1997), using the GHS for the UK, the OLS rate of return associated with leaving school at the age of 20 is 28% higher than the return associated with leaving at age 15, for men. These results are symmetric with our OLS estimates which suggest that the pay penalty associated with the under utilisation of a degree is 30%. In other words, there are no returns to surplus education. In addition, using the Heckman selection method and an ordered probit, Harmon and Walker (1997) find that the rate of return to schooling for men who leave school at the age of 20 is between 68-80% more than those who leave at 15. Under the same specification, Harmon and Walker show that men who leave education after the age of 21 earn between 88-102% more than those who leave at the age of 15. Their results, taken together with ours, suggest that there is no return whatsoever associated with over-education whether modelled using OLS or Heckman selection. Therefore we suggest that it is fully consistent to find symmetry between the rate of return to education and the pay penalty associated with the under utilisation of education.

Before examining the tests to check the validity of our instrumental variables, we briefly look at the other determinants of wages in current employment. Right across our four specifications, women earn between 20-24% less than their male counterparts. Managers earn more than other occupational groups including professionals and associate professionals. Graduates in arts/humanities and education earn significantly less in comparison with other disciplines. In specification I, first and upper second class degrees earn more than lower degrees. However, upon conditioning for selection into over-education, degree class is no longer statistically significant. This suggests that the effect of degree class is accumulated into the over-education variable, and therefore does not directly effect wages. Furthermore, once we control for selection into over-education there are no returns to a postgraduate

qualification. Our early results showed that individuals with a postgraduate degree were more likely to get a graduate level job. Sector of employment makes a significant difference with graduates working in the commerce sector earning between 46-52% more than in other sectors. Firm size is an important determinant of wages with graduates working in larger firms earning significantly more than those working in small firms. There is also a higher return to entrepreneurial skills with our estimates on the self-employment differential being approximately 23%. As expected, part-time status reduces wages. Training is not statistically significant. However, experience is important and follows in the usual U-shape pattern. In the graduate labour market there is no pay penalty associated with duration of unemployment.

Bound *et al.* (1995) drew attention to the importance of the correlation between the instruments and over-education. If this correlation is too weak, and at the same time the instruments are not completely orthogonal to the earnings residual, the IV-estimate might be inconsistent. In finite samples, IV is biased in the same direction as OLS and the magnitude of the bias increasing as the R-squared between the instruments and over-education approaches zero. Bound *et al*. (1995) suggest that the partial R-squared and the F statistic of the identifying instruments in the first-stage estimation be reported as useful indicators of the correlation between the excluded (or identifying) instruments and over-education. The F statistic on the excluded instruments needs to indicate statistical significance. For first employment, the F statistic on the excluded instruments in the first stage over-education equation is 7.69 and the partial R squared from regressing over-education against our instruments once common exogenous variables have been partialled out, has a value of 0.055[15]. The corresponding results for current employment give an F statistic of 2.84 and a partial R squared value of 0.0098[16]. While we are concerned about the low F statistic associated with current employment, these results compare favourably with the criteria suggested by Bound *et al.* (1995) and suggest that the instruments were legitimate and the specification was not subject to finite sample bias.

Also, we use the familiar Hausman t-test for the endogeneity of over-education and wages. Simply put, this tests whether the IV estimate of the over-education dummy differs significantly from the OLS estimate. The version of the Hausman test statistic that we use is obtained by adding the first stage residuals to an OLS estimate of the wage equation, and

[15] On advice from Professor Bound the OLS model rather than the probit model was used to estimate the first-stage equations.

[16] It is important to note that in our first-stage equation no account was taken of over-education in the first job.

using t for the residual coefficients being equal to zero (see Davidson and MacKinnon, 1993, pp.236-242). For first employment, the Hausman test produces a t statistic of 2.103 (using probit in the first stage of the IV estimation rather than OLS). These results reject the hypothesis that wages in first employment are not adequately modelled by OLS. Therefore, IV estimation is necessary to produce a consistent estimator of over-education in first employment. The corresponding results for current employment give a t-test on the coefficient of the residual of 2.246 (using probit in the first stage of the IV estimation rather than OLS). Again these results suggest that OLS is not appropriate.

6. Conclusion

Using data from Newcastle Alumni Survey this paper focuses on the incidence and consequences of over-education in the UK graduate labour market. The results reported in this paper suggest that 42% of graduates entered non-graduate jobs upon leaving university. In current employment 22% are still in jobs for which a degree is not necessary to do the work. These findings are in line with recent contributions to the literature based on other UK data.

The primary motivation of this paper was to examine the consequences of modelling the over-education process endogenously with the determination of wages. We find that women are no more likely than men to be over-educated either in their first or current jobs. Arts/humanities or languages graduates are more likely to be over-educated than others, a fact that is wholly in line with the view that graduates with less vocationally-oriented qualifications are more likely to be overqualified. We also find some evidence that higher class degrees place graduates at the front of the queue of good jobs with third and pass degrees moving graduates down the occupational ladder. Similarly, it is an advantage to have post-graduate qualifications. However, on-the-job experience and training have little influence on the probability of being over-educated. Moreover, graduates who are initially overeducated generally find it more difficult to enter graduate level jobs later. These results seem to suggest that over-education may be a long-term or even a permanent state rather than a temporary phenomenon. This may give support to the hypothesis that the overeducated are in some way less able than those who have jobs commensurate with their qualifications. It

also seems to contradict the hypothesis that graduates may be temporarily overeducated due to a bad match or that they are substituting education for other forms of human capital which they lack.

Independent of job characteristics or education obtained, we also consider a range of labour market rigidities that may play an important role in the determinants of over-education. Regional mobility plays a significant role in allocating graduates to good jobs with graduates who relocate more likely to find work commensurate with their qualifications. Reflecting the greater responsibility young parents bear, students with family commitments are more likely to find graduate-level jobs than those without families. In contrast, graduates bearing high financial debt commitments upon leaving Newcastle have poor prospects in terms of employment-education match than their better off peers. Numerous studies have shown that financial circumstances have a negative affect on the probability of entering university in the first place, and now we find that financial circumstances also reduce the probability of using that education later at work.

Moreover, we find that there is a substantial pay penalty associated with over-education and that penalty is much more severe in current than in first employment. The selectivity-corrected estimates of the pay penalty associated with over-education indicate the presence of a large and positive (less negative) bias in the least-squares estimate of the over-education wage relationship. Therefore, estimates which do not take account of over-education endogeneity under-estimate the negative implications which education-employment mismatch has on the wages of graduates.

There are a number of reasons why policy makers should be concerned about over-education especially in a time when there is a rising shortage of highly skilled labour. Firstly, if a graduate ends up in a job that could be done without a degree, then there is a huge waste of tax payers' money. Secondly, if individuals leave university inadequately trained for the labour market, not only has tax payers' money been wasted but firms may have to spend additional time and money re-training graduates. In the meantime, many graduates will find themselves in lower-level jobs.

Consequently, for future education policy over-education has at least four implications. The first is that career-related qualifications should be closely linked to the changing requirements of the labour market. This might be achieved by encouraging the involvement of organisations in the design of qualifications. The second objective of policy might be to provide advice to students on the labour market relevance of various qualifications. This way, aspiring students can make an informed career choice.

Thirdly, it is often argued that education yields non-monetary benefits to both the individual and society. However, there is some evidence which suggests that graduates in jobs which under-value their qualifications tend not to receive much in the way of work satisfaction in comparison with those in graduate jobs (see Sloane *et al*., 1999). And it is generally agreed that individuals undertake education for both monetary and non-monetary benefits, and a good education would combine the two.

Finally, our analysis suggests that if debt has been incurred while at university, labour mobility will have important implications for the under-utilisation of education. The policy areas to address these issues are in the structure of loans to students, especially the repayment components, and educating and encouraging students about the benefits of moving to take up good jobs.

Table 1: Matching transition between first and current employment

First job	Current job: Postgrad	Degree	Sub-degree	No qual	Total
Postgraduate	79	7	4	3	93
Degree	94	287	34	44	459
Sub-degree	19	58	32	10	119
No qualifications	44	119	38	58	259
Total	236	471	108	115	930

Source: Newcastle Alumni Survey

Table 2: Distribution of qualifications required to ***actually do*** work

	Current job			First job		
	N	%	Cum. %	N	%	Cum. %
Post-graduate qualification	394	28	28	236	17	17
Degree	698	50	78	577	41	58
Sub-degree qualification	216	15	94	283	20	78
No qualifications	86	6	100	304	22	100
Total	1394	100		1400	100	

Source: Newcastle Alumni Survey. Answers to question 33 of the survey.

Table 3: Distribution of qualification required for ***entering*** work

	Current job			First job		
	N	%	Cum. %	N	%	Cum. %
Post-graduate qualification	355	26	26	211	15	15
Degree	730	53	78	730	52	67
Sub-degree qualification	148	11	89	164	12	78
No qualifications	154	11	100	303	22	100
Total	1387	100		1408	100	

Source: Newcastle Alumni Survey. Answers to question 32 of the survey.

Table 4: The determinants of over-education – probit model

	I, First		II, Current		III, Current	
	dF/dx	Std. Err.	dF/dx	Std. Err.	dF/dx	Std. Err.
Gender						
Female	0.015	0.06	0.016	0.036	0.013	0.030
Faculty - Engineering & technology						
Agric, science	0.078	0.077	0.086*	0.053	0.074*	0.046
Admin, bus, soc sc, prof'al, voc'al subjects	-0.087	0.077	0.007	0.047	0.022	0.044
languages	-0.162	0.116	0.170*	0.126	0.177*	0.119
Arts & humanities	0.045	0.103	0.152**	0.072	0.158**	0.071
Education	-0.399**	0.051	-0.079	0.051	0.017	0.097
Class of degree - default Pass/Third						
First class	-0.186*	0.101	-0.094*	0.036	-0.066	0.030
Second upper	-0.003	0.09	-0.078*	0.041	-0.068*	0.034
Second lower	0.022	0.088	-0.103**	0.042	-0.094**	0.035
Qualifications						
Professional qualification	-0.031	0.05	-0.014	0.029	-0.011	0.025
Postgraduate degree	-0.053	0.051	-0.098**	0.037	-0.077**	0.033
Employment characteristics						
Part-time	-0.05	0.064	0.091*	0.057	0.140**	0.059
Self-employed	-0.13	0.092	0.004	0.052	-0.014	0.041
Occupation - default (all the others)						
Manager	-0.126	0.106	-0.091**	0.032	-0.085**	0.024
Professional	-0.422**	0.053	-0.200**	0.037	-0.158**	0.033
Associate prof	-0.288**	0.056	-0.082**	0.031	-0.062**	0.027
Sector - default education						
Public admin	0.374**	0.087	0.031	0.068	0.023	0.056
Industry incl public utilities	0.378**	0.091	0.050	0.063	0.026	0.051
Commerce	0.525**	0.066	0.150**	0.084	0.122*	0.073
Self-regulating prof	0.112	0.127	-0.024	0.067	-0.011	0.057
Other	0.447**	0.081	0.094	0.074	0.047	0.058
Firm size - default <25						
25-99 employees	-0.162**	0.065	-0.053	0.036	-0.057*	0.028
100-499 employees	-0.146**	0.068	-0.043	0.034	-0.051*	0.027
>500 employees	-0.210**	0.061	0.026	0.043	0.000	0.034
On-the-job experience (Years)						
Training			-0.025	0.031	-0.012	0.025
Age			0.007	0.026	0.012	0.023
Experience			0.007	0.027	0.005	0.025
Experience squared			-0.001**	0.000	-0.001**	0.000
Unemployment			0.000	0.029	-0.011	0.026
Mobility						
Relocate for this job	-0.222**	0.058	0.066*	0.042	0.074**	0.040
Relocate for this job* female	-0.188*	0.101	-0.130**	0.021	-0.101**	0.017
Family commitments						
Partner prior to first job	-0.04	0.081				
Child prior to first job	-0.111*	0.063				
Partner			-0.002	0.032	0.007	0.026
Child (0,1)			-0.022	0.040	0.002	0.033
Debt commitments						
Debts>1000	0.141**	0.059				
Cohort effects						
Participation rate	0.666	1.889				
Unemployment rate	-0.112	1.331				
Year of grad (1,2..)	-0.002	0.008				
First job match						
Over-educated in first job					0.205**	0.034
N		852		731		731
Log likelihood		-389.981		-278.829		-248.541

Source: Newcastle Alumni Survey.

Note: Dependent variable: over-education. Estimation is by Probit and marginal effects are presented. Robust standard errors are reported. The data has been weighted using p weights in stata. A single asterisks means that the coefficient is significant at the 10% level on a two-tailed test (*i.e.* the t-statistic is greater than 1.64) and two asterisks that the coefficient is significant at the 5% level on a two-tailed test (*i.e.* the t-statistic is greater than 1.96).

Table 5: The determinants of over-education – bivariate probit model

	I, First Coef.	Std. Err.	II, Current Coef.	Std. Err.
Gender				
Female	0.076	0.162	0.025	0.179
Faculty - Engineering & technology				
Agric, science	0.074	0.189	0.474**	0.228
Admin, bus, soc sc, prof'al, voc'al subjects	-0.380*	0.217	0.120	0.248
Languages	-0.504	0.406	0.734*	0.403
Arts & humanities	-0.118	0.238	0.708**	0.274
Education	-1.716**	0.830	-0.360	1.067
Class of degree - default Pass/Third				
First class	-0.301	0.321	-0.601*	0.334
Second upper	0.206	0.228	-0.391*	0.218
Second lower	0.281	0.216	-0.490**	0.217
Qualifications				
Professional qualification	-0.211	0.133	-0.146	0.149
Postgraduate degree	-0.108	0.139	-0.512**	0.211
Employment characteristics				
Part-time	-0.177	0.211	0.477*	0.246
Self-employed	-0.253	0.543	-0.066	0.274
Occupation - default (all the others)				
Manager	-0.127	0.240	-0.581**	0.225
Professional	-1.054**	0.177	-1.031**	0.201
Associate prof	-0.737**	0.166	-0.421**	0.180
Sector - default education				
Public admin	1.065**	0.296	0.277	0.294
Industry incl public utilities	0.939**	0.301	0.241	0.301
Commerce	1.458**	0.314	0.705**	0.305
Self-regulating prof	0.135	0.361	0.018	0.411
Other	1.143**	0.300	0.403	0.282
Firm size - default <25				
25-99 employees	-0.363**	0.181	-0.356*	0.211
100-499 employees	-0.371**	0.186	-0.298	0.211
>500 employees	-0.679**	0.168	-0.026	0.179
On-the-job experience (Years)				
Training			-0.030	0.145
Age			0.037	0.101
Experience			0.032	0.105
Experience squared			-0.003**	0.001
Unemployment			-0.049	0.112
Mobility				
Relocate for this job	-0.585**	0.159	0.232	0.162
Relocate for this job* female	-0.419	0.300	-1.090**	0.482
Family commitments				
Partner prior to first job	-0.007	0.270		
Child prior to first job	-0.279*	0.167		
Partner			0.045	0.166
Child (0,1)			-0.089	0.171
Debt commitments				
Debts>1000	0.346**	0.137		
Cohort effects				
Participation rate	4.170	5.014		
Unemployment rate	-2.578	3.639		
Year of grad (1,2..)	-0.004	0.021		
Constant				
Constant	-0.581	0.967	-1.211	2.173
Disturbance correlation				
RHO(1,2)	0.666**	0.070		
N		731		
Log-likelihood		-578.510		

Source: Newcastle Alumni Survey.
Note: Dependent variable is over-education. Estimation is by bivariate probit. Robust standard errors are reported. A single asterisk means that the coefficient is significant at the 10% level and two asterisks that the coefficient is significant at the 5% level. Data is weighted.

Table 6: The effect of over-education on wages in first employment

	I, OLS		II, Instrumental Variables		III, Treat. Effects, Probit	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Gender						
Female	-0.140**	0.066	-0.138**	0.066	-0.140**	0.066
Faculty - Engineering & technology						
Agric, science	-0.114	0.111	-0.089	0.111	-0.108	0.114
Admin, bus, soc sc, prof'al, voc'al subjects	-0.014	0.112	-0.039	0.112	-0.015	0.112
Languages	-0.216	0.157	-0.271*	0.160	-0.220	0.158
Arts & humanities	-0.255**	0.130	-0.237*	0.131	-0.249*	0.132
Education	-0.057	0.216	-0.255	0.254	-0.073	0.225
Class of degree - default Pass/Third						
First class	-0.044	0.173	-0.120	0.165	-0.057	0.170
Second upper	-0.092	0.111	-0.094	0.111	-0.092	0.111
Second lower	-0.108	0.110	-0.103	0.110	-0.107	0.111
Qualifications						
Professional qualification	0.026	0.071	0.013	0.069	0.024	0.070
Postgraduate degree	0.071	0.072	0.050	0.071	0.067	0.071
Employment characteristics						
Self-employed	0.038	0.221	-0.011	0.225	0.029	0.222
Part-time	-0.234	0.143	-0.241*	0.146	-0.235	0.145
Occupation - default (all the others)						
Manager	0.061	0.108	-0.016	0.113	0.045	0.115
Professional	0.147	0.097	-0.031	0.128	0.112	0.119
Associate prof	0.046	0.083	-0.074	0.120	0.021	0.105
Sector - default education						
Public admin	-0.360**	0.156	-0.228	0.182	-0.343**	0.169
Industry incl public utilities	-0.476**	0.156	-0.344*	0.180	-0.456**	0.169
Commerce	-0.340**	0.166	-0.132	0.219	-0.306	0.202
Self-regulating prof	-0.551**	0.181	-0.504**	0.180	-0.548**	0.181
Other	-0.355*	0.192	-0.203	0.230	-0.330	0.218
Firm size - default <25						
25-99 employees	0.251**	0.107	0.167	0.114	0.239**	0.111
100-499 employees	0.200*	0.103	0.131	0.100	0.190*	0.101
>500 employees	0.208**	0.084	0.119	0.111	0.194**	0.097
Over-education variable						
Over-education (0,1)	-0.176**	0.061	-0.179**	0.085	-0.260	0.237
Selectivity term						
Lambda					0.053	0.136
Constant						
Constant	10.056**	0.232	10.008**	0.231	10.107**	0.245
N		852		852		852
R squared		0.175		0.174		0.175

Source: Newcastle Alumni Survey.
Note: Dependent variable: log of real annual wages in first job (lrsalj1). Estimation is by OLS , IV and Treatment effects models. Robust standard errors are reported. The probit models are from table 4, specifications 1 and 2. The data is weighted.

Table 7: The effect of over-education on wages in current employment

	I		II		III		IV	
Selection model	None		Probit		Probit		Bivariate Probit	
Earnings estimation method	Stewart		IV-Stewart		Heckman-Stewart		Heckman-midpoints	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Gender								
Female	-0.215**	0.042	-0.235**	0.047	-0.233**	0.045	-0.208**	0.084
Faculty - Engineering & technology								
Agric, science	0.075	0.068	0.12	0.077	0.112*	0.068	0.103	0.116
Admin, bus, soc sc, prof'al, voc'al	-0.042	0.086	-0.029	0.088	-0.055	0.085	-0.067	0.113
Languages	-0.155	0.107	-0.092	0.118	-0.084	0.117	-0.073	0.224
Arts & humanities	-0.163**	0.081	-0.093	0.098	-0.09	0.088	-0.075	0.142
Education	-0.426*	0.227	-0.494**	0.234	-0.438**	0.224	-0.456*	0.24
Class of degree - default Pass/Third								
First class	0.240**	0.106	0.187	0.122	0.158	0.121	0.149	0.173
Second upper	0.134*	0.073	0.091	0.083	0.085	0.084	0.1	0.121
Second lower	0.086	0.071	0.032	0.085	0.022	0.086	0.035	0.122
Qualifications								
Professional qualification	-0.014	0.048	-0.025	0.049	-0.026	0.049	-0.023	0.075
Postgraduate degree	0.175*	0.106	0.119	0.116	0.121	0.124	0.12	0.102
Employment characteristics								
Self-employed	0.238*	0.132	0.232*	0.13	0.232*	0.132	0.222*	0.134
Part-time	-0.249**	0.09	-0.200*	0.105	-0.201**	0.091	-0.193	0.124
Occupation - default (all the others)								
Manager	0.529**	0.124	0.495**	0.129	0.420**	0.155	0.392**	0.155
Professional	0.326**	0.136	0.222	0.161	0.156	0.192	0.146	0.164
Associate prof	0.240**	0.12	0.219*	0.123	0.136	0.151	0.133	0.137
Sector - default education								
Public admin	-0.04	0.069	-0.021	0.076	-0.041	0.07	-0.021	0.131
Industry incl public utilities	0.033	0.075	0.059	0.079	0.036	0.075	0.053	0.135
Commerce	0.464**	0.081	0.518**	0.095	0.524**	0.091	0.460**	0.156
Self-regulating prof	0.116	0.086	0.099	0.09	0.094	0.085	0.093	0.165
Other	-0.003	0.098	0.042	0.111	0.031	0.105	0.046	0.138
Firm size - default <25								
25-99 employees	0.200**	0.061	0.164**	0.069	0.159**	0.064	0.143	0.113
100-499 employees	0.235**	0.065	0.201**	0.07	0.210**	0.066	0.193*	0.109
>500 employees	0.272**	0.059	0.279**	0.061	0.285**	0.06	0.256**	0.106
On-the-job experience (Years)								
Training	0.056	0.042	0.046	0.045	0.045	0.043	0.055	0.076
Age	-0.145*	0.081	-0.144*	0.078	-0.146*	0.082	-0.149**	0.049
Experience	0.210**	0.081	0.217**	0.077	0.217**	0.08	0.210**	0.055
Experience squared	-0.001**	0	-0.002**	0	-0.002**	0	-0.002**	0.001
Unemployment	0.112	0.083	0.114	0.082	0.118	0.083	0.120**	0.058
Over-education variables (0,1)								
Current job	-0.308**	0.068	-0.174**	0.078	-0.871**	0.357	-0.805**	0.347
First job							-0.085	0.141
Selectivity term								
Lambda-current job					0.334*	0.191	0.339*	0.206
Lambda-first job							0.039	0.118
Constant								
Constant	12.179**	1.641	11.960**	1.608	12.482**	1.6	11.994**	1.112
N		731		731		731		731
Log likelihood		-504.972		-509.423		-504.122		
R-squared								0.515

Source: Newcastle Alumni Survey.

Note: Dependent variable: log real annual wages. Estimation is by Stewart (1983) technique except where mid-point values and OLS have been used for the Treatment Effects model with bivariate probit estimation *i.e.* specification 4. Robust standard errors are reported. No account is taken of over-education in first job in 1,2 and 3. The data is weighted.

Appendix A

Table 1A: Summary statistics

	Summary Statistics 731 Observations	
Variable	Mean	Std. Dev.
Log of wage variable		
First job	9.640	0.753
Current job, mid-points	9.503	0.616
Over-education		
First job	0.459	0.499
Current job	0.196	0.397
Gender		
Female	0.345	0.476
Faculty		
Engineering & technology	0.189	0.392
Agric, science	0.303	0.460
Admin, bus, soc sc, prof'al, voc'al subjects	0.286	0.452
Languages	0.032	0.175
Arts & humanities	0.161	0.368
Education	0.029	0.168
Class of degree		
First class	0.082	0.274
Second upper	0.386	0.487
Second lower	0.411	0.492
Third	0.060	0.238
Pass	0.060	0.238
Qualifications		
Professional qualification	0.437	0.496
Postgraduate degree	0.405	0.491
Employment characteristics		
Part-time first job	0.126	0.332
Self-employed first job	0.037	0.189
Part-time current job	0.103	0.304
Self-employed current job	0.110	0.313
Sector - first employment		
Public admin	0.208	0.407
Education	0.141	0.349
Industry incl public utilities	0.220	0.414
Commerce	0.141	0.349
Self-regulating prof	0.083	0.276
Other	0.206	0.405
Sector - current employment		
Public admin	0.183	0.387
Education	0.176	0.381
Industry incl public utilities	0.222	0.416
Commerce	0.154	0.362
Self-regulating prof	0.085	0.279
Other	0.181	0.385
Firm size - first employment		
<25 employees	0.238	0.426
25-99 employees	0.231	0.422
100-499 employees	0.194	0.396
>500 employees	0.282	0.450

Table 1A: (Concluded) Summary statistics

	Summary Statistics 731 Observations	
Variable	Mean	Std. Dev.
Firm size - current employment		
<25 employees	0.234	0.424
25-99 employees	0.209	0.407
100-499 employees	0.251	0.434
>500 employees	0.282	0.450
Occupation - first job		
Manager	0.057	0.232
Professional	0.350	0.477
Associate prof	0.260	0.439
Other occupation	0.334	0.472
Occupation - current job		
Manager	0.178	0.383
Professional	0.393	0.489
Associate prof	0.292	0.455
Other occupation	0.137	0.344
Labour market mobility		
Relocate for first job	0.301	0.459
Relocate for first job* female	0.057	0.231
Relocate for current job	0.268	0.443
Relocate for first current* female	0.062	0.241
Family commitments		
Partner prior to first job	0.089	0.284
Child prior to first job	0.304	0.460
Partner	0.719	0.450
Child	0.479	0.500
Debt commitments		
Debts>1000	0.231	0.421
Cohort effects		
Participation rate	0.239	0.037
Unemployment rate	0.061	0.022
On-the-job experience - current job only		
Traning	0.659	0.474
Age (years)	36.852	7.986
Experience (years)	14.778	7.846
Experience squared	279.862	242.660
Unemployment (years)	0.379	1.139

Source: Newcastle Alumni Survey. The data is weighted using a weights in stata.

Appendix B

Table 1B: The determinants of over-education – probit analysis

	1, First		2, Current	
	Coef.	Std. Err.	Coef.	Std. Err.
Gender				
Female	0.037	0.151	0.077	0.166
Faculty - Engineering & technology				
Agric, science	0.197	0.196	0.379*	0.212
Admin, bus, soc sc, prof'al, voc'al subjects	-0.223	0.201	0.035	0.221
languages	-0.438	0.342	0.614*	0.370
Arts & humanities	0.114	0.258	0.594**	0.239
Education	-1.486**	0.404	-0.503	0.458
Class of degree - default Pass/Third				
First class	-0.504*	0.302	-0.614*	0.356
Second upper	-0.008	0.227	-0.393*	0.216
Second lower	0.055	0.224	-0.516**	0.219
Qualifications				
Professional qualification	-0.08	0.128	-0.065	0.140
Postgraduate degree	-0.134	0.131	-0.496**	0.203
Employment characteristics				
Part-time	-0.129	0.165	0.371*	0.207
Self-employed	-0.346	0.257	0.019	0.246
Occupation - default (all the others)				
Manager	-0.334	0.296	-0.536**	0.220
Professional	-1.178**	0.168	-1.076**	0.204
Associate prof	-0.783**	0.168	-0.438**	0.175
Sector - default education				
Public admin	0.983**	0.256	0.141	0.293
Industry incl public utilities	0.991**	0.266	0.226	0.263
Commerce	1.535**	0.281	0.583**	0.275
Self-regulating prof	0.282	0.319	-0.121	0.365
Other	1.212**	0.266	0.395	0.274
Firm size - default <25				
25-99 employees	-0.426**	0.177	-0.281	0.208
100-499 employees	-0.381**	0.187	-0.217	0.183
>500 employees	-0.553**	0.168	0.120	0.193
On-the-job experience (Years)				
Training			-0.119	0.141
Age			0.036	0.124
Experience			0.032	0.131
Experience squared			-0.003**	0.001
Unemployment			0.000	0.141
Mobility				
Relocate for this job	-0.587**	0.164	0.293*	0.176
Relocate for this job* female	-0.513*	0.308	-1.168**	0.340
Family commitments				
Partner prior to first job	-0.102	0.209		
Child prior to first job	-0.285*	0.165		
Partner			-0.008	0.154
Child (0,1)			-0.107	0.191
Debt commitments				
Debts>1000	0.356**	0.149		
Cohort effects				
Participation rate	1.691	4.796		
Unemployment rate	-0.285	3.379		
Year of grad (1,2..)	-0.005	0.021		
Constant				
Constant	-0.03	0.93	-1.102	2.708
N		852		731
Log likelihood		-389.981		-278.829

Source: Newcastle Alumni Survey.
Note: Dependent variable is over-education. Estimation is by probit. Robust standard errors are reported. Data is weighted.

Appendix C

Table 1C: Qualification inflation in the requirement for work

Panel A Qualification inflation

	Current job			First job		
Levels	N	%	Cum. %	N	%	Cum. %
0	1174	85	85	1265	91	91
1	146	11	96	102	7	98
2	45	3	99	22	2	100
3	10	1	100	3	0	100
Total	1375	100		1392	100	

Panel B Qualification deflation

	Current job			First job		
Levels	N	%	Cum. %	N	%	Cum. %
-3	2	0	0	…	…	…
-2	21	2	2	43	3	3
-1	115	8	10	174	13	16
0	1237	90	100	1175	84	100
Total	1375	100		1392	100	

Source: Newcastle Alumni Survey. Answers to questions 32 and 33 of the survey.
Note: Levels refer to the extent of qualification inflation.

Table 2C: Incidence of over-education by different categories of graduates

Variable	Current job %	First job %
Gender		
Female	35	40
Male	65	57
Faculty		
Engineering & technology	15	16
Agric, science	36	35
Admin, bus, soc sc, prof'al, voc'al subjects	24	28
Languages	6	4
Arts & humanities	19	16
Education	1	1
Class of degree		
First class	7	6
Second upper	43	43
Second lower	39	42
Third	7	6
Pass	4	4
Qualifications post Newcastle		
Professional qualification	29	31
Postgraduate degree	27	33
Employment characteristics		
Part-time	14	17
Self-employed	13	4
Sector		
Public admin	15	16
Education	5	3
Industry incl public utilities	25	24
Commerce	21	20
Self-regulating prof	5	5
Other	30	33
Firm size		
<25 employees	28	30
25-99 employees	13	16
100-499 employees	23	16
>500 employees	32	19
Manager	14	6
Occupation		
Professional	19	16
Associate prof	33	21
Other occupational groups	34	57
Regional mobility		
Relocate for current job	31	15
Relocate for current job*female	4	3
Family commitments		
Partner prior to first job	4	5
Child prior to first job	13	11
Debt commitments		
Debts > stg£1001	29	32

Source: Newcastle Alumni Survey.

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