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A Panel Data Analysis of the Incidence and Impact of Over-education

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Abstract:

This paper adds to the over-education literature using panel data from the British Household Panel Survey. Much has been written about who is more likely to be over-educated, and the impact of being over-educated on wages, at particular points in time using cross-sectional data. Panel data allows us to control for unobserved individual heterogeneity in the determinants of incidence and impact of over-education. The paper goes on to estimate the determinants of transitions out of over-education, providing new information about its duration, and the factors that influence being in, and escaping from, this state.

Key words: Over-education, Skills
JEL: J24, J31, I2

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INTRODUCTION

Numerous studies have observed the phenomenon of over-education, whereby individuals perform jobs for which they are apparently overqualified, and have investigated its effects. There is now a convincing body of evidence that consistently shows that an individual who is over-educated for their job will earn more than their colleagues who are correctly qualified, but less than individuals with the same education level as them, who have found an appropriate job. In other words, while there are some wage returns to the years of unused education for over-educated individuals, they suffer a penalty in that they do not obtain the full return that they could expect if they were to work in a job that fully utilised their education level. In the presence of such a penalty, the obvious question to ask is why anyone would work in a job for which they are over-educated. Although research has been undertaken that attempts to answer such a question, it is fair to say that there is far less consensus about the causes of over-education than its consequences.

This paper is therefore primarily an investigation of the causes of over-education. Previous work has considered such a topic, though most work has considered one possible cause in isolation and attempted to find evidence for or against that cause. In this study we consider a range of possible causes of over-education, including an oversupply of graduates, mismatch in the labour market, unobserved heterogeneity amongst workers and over-education as a temporary `career progression' phenomenon. These theories are developed in the next section. The other key innovation of this paper

is the use of panel data for the analysis of why people work in jobs for which they are over-educated. Panel data allow a much more rigorous analysis of the unobserved heterogeneity and temporarily mismatched explanations of over-education, in particular.

The answer to the question why people are over-educated is an important one, given the significant rise in the number of qualified people who have recently entered, and will continue to enter, the labour markets of the UK and most other countries. For example, if it turns out that a period of over-education is a temporary stage on the path towards a more productive job where full use is made of the individual's skills and abilities, then there is probably little to worry about. On the other hand, if evidence emerges of serious mismatch in the labour market, with many people failing to obtain jobs that fully utilise their qualifications, then the policy of education expansion may need to be reviewed.

The next section of the paper describes in more detail the various theories that have been proposed to explain the existence of over-education. This will be followed by two sections explaining the empirical methodology and the data set to be used. Sections IV-VI contain the results of the analysis, concentrating on the incidence of over-education, the impact of over-education on earnings, and the transition out of over-education, respectively. A final section offers some conclusions.

I EXPLANATIONS FOR OVER-EDUCATION

Following Freeman (1976), a fully functioning labour market should ensure that aggregate over-education is a short-term dis-equilibrium phenomenon. An increase in the

supply of skilled workers, above the number demanded, would be followed by a fall in the wage return to their skills and hence a reduction in supply again, or an increased employer demand for skills, until any excess labour supply is eliminated. However, if the labour market does not function with perfect efficiency, or if an excess supply of qualified workers is not the original cause of over-education in the first place, then the existence of aggregate over-education could be a permanent feature of the labour market. Previous evidence in the over-education literature, for many countries and many points in time from the early 1980s onwards, suggests *aggregate* over-education is a permanent feature of modern labour markets. In addition, there is little evidence of any recent decline in the graduate wage premium, as predicted by this theory. If we are therefore willing to rule out an excess supply of well-educated individuals as the cause of over-education, we must then look elsewhere. We have identified three potential alternative explanations.

First, Sicherman (1991) has linked training and experience to over-education, and particularly to occupational mobility amongst workers. In this theory, over-educated workers are merely inexperienced workers in the early stages of their career (reason 1). Consistent with this theory, research has consistently found that work experience and tenure are negatively correlated with the probability of being over-educated[1]. Sicherman (1991) finds further evidence in support of his theory, showing that over-educated workers are more likely to change jobs, and more likely to move up the occupation hierarchy, than adequately educated workers. However, Buchel and Mertens (2004) show that when upward mobility is defined in terms of wage growth rather than

occupation class, and starting wages are controlled for (to allow for the fact that the over-educated by definition are at a low level and so are further below any ceiling effects than the adequately educated), then the over-educated actually have less upward mobility, contrary to the hypothesis that over-education is a temporary stage for individuals.

A second potential explanation for the continuing presence of over-education is that individuals are trapped by labour market rigidities in over-educated jobs. These could arise, for example, as a consequence of family responsibilities and regional immobility, that lead some workers to voluntarily accept employment in jobs for which they are overqualified (reason 2) (Dolton and Vignoles, 2000; Green et al, 2002). The point was originally made by Frank (1978), who argued that couples who share a household will make a rational decision to locate in a regional labour market where the partner with the most human capital can maximise his/her earnings. The other partner then has to find the best job they can within this geographical constraint, and thus may have to accept a job for which they are over-educated. In support of his argument, Frank showed that in small labour markets with fewer jobs and so a greater chance of over-education for the restricted partner (presumed female), that the male-female wage gap is greater. Some further support is provided by Buchel and Battu (2003), who find that married women living in rural areas in Germany are more likely to be over-educated, though the gender differential is greatly reduced when they control for commuting time. McGoldrick and Robst (1996), however, fail to obtain supporting evidence for this so-called 'differential overqualification' effect between men and women. When they estimate an equation predicting the likelihood of being over-educated, the size of the local labour market, as

measured by population size, has a statistically insignificant effect, both on its own and when interacted with a female dummy variable.

The final explanation for the existence of over-education is that there may be unobserved heterogeneity amongst individuals with the same level of qualifications. It is true that employers may use measures of 'quality' in addition to the level of education at the recruitment stage (such as degree classification, higher education institution and subject of degree etc). However, Chevalier (2003) shows that even after controlling for these educational 'quality' factors, there is evidence that some of the over-educated are simply less able than matched graduates, on average. As a consequence, these less-able over-educated workers are in fact matched into a job commensurate with their unobservable ability (reason 3). This explanation therefore fits within the Human Capital Theory paradigm, since an individual's earnings are still being determined by their own human capital (including skills and abilities) rather than by the characteristics of the job they are doing. An implication of this idea is that, if we can successfully control for unobserved heteroegeneity, then over-education wage penalties should disappear, and individuals should earn the same whatever job they do. This prediction can be tested in the empirical analysis that follows.

II METHODOLOGY

Following the existing literature on mismatch between education and occupation, we model the incidence of over-education using

$$O_{it}^{*} = \beta x_{it} + \varepsilon_{it} \qquad (1)$$

where the latent variable O_{it}^{*} measures the propensity for over-education and vector $\mathbf{x}_{it}$ contains relevant socio-economic and job characteristics for worker *i* at time *t*. Examining the factors that are associated with the likelihood of over-education will give a first idea as to which of the above theories can explain the existence of over-education. We estimate equation (1) using a probit model, where the observed dependent variable O_{it} =1 if the individual is over-educated and zero otherwise. Worker *i* is over-educated if his actual highest qualification ($HNQF_{it}$) exceeds the required highest qualification in his occupation *j* ($RNQF_{ijt}$) at time *t*. Following studies such as Battu and Sloane (2004), Bauer (2002), Kiker *et al.* (1997) and Mendes de Oliveira *et al*. (2000), we measure required qualifications as the mode highest qualification in each occupation, measured at the 3 digit level in the Standard Occupational Classification. This methodology is a variation of that originally proposed by Verdugo and Verdugo (1989), who measured the required amount of education by the *mean* level of education amongst workers in the individual's occupation, and defined someone to be over-educated if their actual education level was at least one standard deviation above this mean level. Using the mode rather than the mean seems preferable as it does not require the arbitrary use of one standard deviation, and it will be less affected by outliers, as argued by Mendes de Oliveira *et al*. (2000).[2]

Whether the mean or mode is used, one criticism of this methodology to measure required education is that it is determined by actual qualifications held, rather than the requirements of the job. If there is a general rise in the qualification level of the population, then we would expect the average qualifications of workers hired in

particular occupations to rise (the mean immediately, and the mode only after the tipping point in the most frequent qualification is reached). Thus, even if the job requirements have not changed at all, an increase in qualifications held will increase the measured required education and so lead to an underestimate of the incidence of over-education. We do not think that this is a serious problem over the period considered however. The wage gap between the high- and low-educated has not fallen at any point over the last the last 25 years in the UK, and increased rapidly at certain points in time, particularly in the 1980s. The large literature seeking to explain this rise in wage inequality has generally concluded that the demand for skilled or educated workers has risen faster than the supply[3]. We therefore do not think that our chosen measure of required qualifications is unduly affected by such grade inflation, where higher qualifications are asked for simply because they are available in the workforce, rather than actually required.

Given that some of the variables in vector $\mathbf{x}_{it}$ are likely to be correlated with the error term in equation (1) because of unobservable heterogeneity, we also estimate the propensity for over-education using the random effects or the Generalised Least Squares (GLS) probit model:

$$O_{it} = \beta \mathrm{x}_{it} + \alpha \overline{\mathrm{x}}_{\mathrm{i}} + v_{it} \qquad (2)$$

where $\mathbf{x_{it}}$ is a vector of socio-economic characteristics that vary over time t and $\overline{\mathrm{x}}_{\mathrm{i}}$ are individual-level mean variables for all the socio-economic characteristics contained in $\mathbf{x_{it}}$.[4] The $\overline{\mathrm{x}}_{\mathrm{i}}$ are included to proxy the fixed effects contained in the error term ε_{it} of equation (1), so that the β parameters in equation (2) can be considered an approximation to the fixed effects estimators.[5]

To assess the effect of education on earnings, we estimate a variation of the over-required and under-required (ORU) specification of Hartog (1997). Our model treats the required and over-education returns as non-linear:

$$Y_{it} = \beta x_{it} + \gamma_1 SR_{it}^1 + ... + \gamma_6 SR_{it}^6 + \delta_1 D_{it}^1 + ... + \delta_5 D_{it}^5 + \mu S_{it}^U + \varepsilon_{it} \quad (3)$$

where Y_{it} are real (2005 prices) log gross weekly earnings and $\mathbf{x_{it}}$ contains relevant socio-economic and job characteristics for worker *i* at time *t,* that can explain earnings. Required education (namely the mode highest qualification per three digit occupation *j*) is represented using six binary dummy variables (SR^m_{it}), over-education is measured using 5 binary dummy variables (D^k_{it}) showing the distance between actual and required qualifications (*k* levels where *k*=1…5) and finally a categorical variable is included to indicate undereducation, S_{it}^U. Equation (3) therefore allows the returns to each level of required and over education to differ, rather than assuming linear returns to years or levels of education.

Hence the γ_m in equation (3) measure the return to each level of education required for one's occupation, relative to having no qualifications. So an individual with the lowest level of education (< 5 good GCSEs) who is matched into an appropriate job receives γ_1 more than a matched individual with no qualifications, whereas an individual with a degree receives γ_5 more. Similarly, an over-educated worker receives a wage return of δ_k to her *k* levels of unused education. So an individual with a degree as highest qualification (level 5) employed in a job that requires A levels (level 3) would receive γ_3 for her matched returns, plus δ_2 for her over-education returns. Hence the change in the

coefficients between the required variables, measures the return to each incremental level of education, if used in the job. Similarly the change in the coefficients between the over-education variables measures the return to each incremental level of over-education. The latter should be smaller than the former if an over-education penalty exists.

We estimate the parameters in equation (3) first using OLS, but also using a fixed effect estimator since we suspect that the returns to education are likely to be correlated with the error terms ε_{it} as a consequence of unobserved heterogeneity. If unobserved heterogeneity is the reason why individuals work in jobs for which they are over-educated, then once we control for this, an individual should earn the same whatever job they do, determined by their abilities, and so the returns to an incremental level of over-education, $\delta_k - \delta_{k-1}$, should be the same as the returns to an incremental level of required education, $\gamma_m - \gamma_{m-1}$.

Finally, to investigate further whether over-education is transitory or permanent, we look at transition rates out of the state of over-education, and estimate probit models to determine the characteristics of individuals and jobs associated with such transitions. These are similar to equation (1) except that the dependent variable is now whether the individual made a transition out of over-education at some point during the data period. We restrict our sample to consist only of individuals over-educated in 1991 and estimate the model

$$T_{it} = \beta x_{it} + \varepsilon_{it} \qquad (4)$$

where T_{it} are transitions out of over-education into matched employment at time t and $\mathbf{x_{it}}$ are socio-economic characteristics of individual i at time t. This model therefore allows the variables in $\mathbf{x_{it}}$ to vary over time and estimate transitions at time t.

III DATA AND DESCRIPTIVE INFORMATION

The British Household Panel Survey (BHPS) is a longitudinal survey of households in Great Britain.[6] The first wave of data was collected in 1991 with the survey then repeated each year, such that to date there are 15 waves of data available (1991-2005). In the first wave, a nationally representative sample of 10,000 individuals, in 5,000 households, were interviewed from 250 areas of Great Britain. In subsequent years these same individuals were re-interviewed, as were any new members of their household, as well as new households to replace any households that left the survey. Information was collected at both the individual and household level, and includes individual questions on human capital and qualifications, as well as socio-economic characteristics such as income, employment status and region of residence, and job characteristics such as promotion prospects and firm tenure.

Panel data have rarely been used in the study of over-education. Examples for the UK include Dolton and Vignoles (2000) and Battu *et al*. (1999). Both of these studies have data on graduates only, and observe their survey participants at particular, and a limited number of, points in time. Both find that significant numbers of individuals who are over-educated at one point in time are over-educated at another, suggesting over-education might not be temporary. Outside of the UK, Bauer (2002) uses panel data in a German context to estimate wage equations such as equation (3) above, though does not

estimate the likelihood of being over-educated in a panel context, as in equation (2) above.

The BHPS data have been used to generate an unbalanced panel which includes all subsequent households added to the survey after 1991. This provides a working sample of 31,776 male and 34,904 female observations, of individuals in paid employment.[7] Table A1 in the appendix provides summary statistics for real weekly pay, as well as all the explanatory variables used throughout the analysis.

The BHPS provides detailed information on actual qualifications held. These were used to generate a 7 point scale for highest qualification attained on the National Qualification Framework (HNQF). Level 6 represents a post-graduate qualification as highest, level 1 represents lower secondary education and level 0 is where respondents possess no qualifications.

Given that the QLFS has a much larger sample size than the BHPS and is more nationally representative, Table 1 compares the HNQF variable in the BHPS with that calculated using a working age sample of men and women from the Quarterly Labour Force Survey (QLFS), 1993-2003. Table 1 also compares HNQF for the earliest common period in each data set (1993). Whilst the distribution of HNQF is close across the two datasets in 1993, there is some evidence of non-random attrition in the BHPS pooled data, since there are slightly more people in the top end of the qualification distribution, compared to the QLFS. This suggests that the later periods in the BHPD are less nationally representative than the earlier periods.

<Table 1 here>

Using the QLFS, we generated the *required* qualification (RNQF) variable using the mode level of HNQF by three-digit Standard Occupational Classification (SOC90), averaged over the full 11 year period for which such data were available.[8] This RNQF variable was then matched into the BHPS by SOC90. As a consequence of the BHPS attrition, we expect to slightly over-estimate the true extent of over-education using the pooled BHPS data.[9] The raw BHPS data show that 27 of men and 25 percent of women were over-educated in 1991.

IV RESULTS FOR OVER-EDUCATION INCIDENCE

Table 2 provides the key results estimated separately for men and women.[10] The marginal effects are presented which are derived from the probit model using equation (1) and the fixed effects approximation using equation (2). There is some evidence to support the idea that over-education is a consequence of career mobility (reason 1) since job tenure is negatively correlated, whilst having promotion prospects is positively correlated with the incidence of over-education for men. Our results are consistent with those found in the existing literature, and indicate that individuals may simply be over-educated in the early part of their careers whilst they are acquiring the necessary experience to be promoted to a job commensurate with their qualifications.

<Table 2 here>

There is some evidence that over-education is a consequence of family commitments (reason 2), even though the presence of children in an individual's household does not

seem to limit their labour market choices into accepting a job for which they are over-educated. Indeed, in the female equations where this effect might have been expected to be stronger, having children is actually associated with a lower probability of being over-educated. Having no spouse increases the likelihood of over-education for men, relative to having a spouse that is not in work. One variable associated with family commitments that takes its predicted effect is that indicating individuals who have had to 'move home for non-employment purposes', who are more likely to be over-educated.

Finally, columns 2 and 4 in Table 2 provide the fixed effects estimates. Given that age and job tenure do not vary across individuals over time, these are omitted from the fixed effects specification. If over-education is a consequence of unobserved ability (reason 3), we might expect considerable change in the estimated marginal effects when unobserved heterogeneity is controlled for in the fixed effects estimates. There is some evidence that this occurs. Marginal effects that vary across individuals and that change between the specifications include those of `whether part time', `whether has promotion prospects', `union membership' and 'moved home not for job' variables for both sexes, whilst for just women `whether the household has children' and `training' seem to change. In each case, plausible explanations for why such variables might be correlated with unobserved heterogeneity exist. Thus, it appears that unobserved heterogeneity may have some role to play in explaining the existence of over-education.

V RESULTS FOR THE ORU EARNINGS EQUATIONS

The aim of this section is to use the BHPS data to estimate wage equations to investigate whether the wage penalties to over-education that are typically observed in the literature

are obtained when we use the panel nature of our data to estimate fixed effects equations. This will determine how much of the observed wage penalty can be explained by unobserved heterogeneity amongst over-educated workers (reason 3).

The existing empirical literature shows that over-educated workers receive a wage penalty, their earnings ranging between 15 and 37 percent less than their appropriately-matched peers using recent cohorts.[11] However controlling for self-reported skills (Chevalier and Lindley, 2006) and taking unobserved heterogeneity into consideration (Chevalier, 2003) reduces this pay penalty.

<Table 3 here>

Table 3 presents the key educational returns for the ORU earnings equations estimated using OLS and fixed effects, as defined by equation (3).[12] The first column shows the standard OLS wage equation using the ORU specification for men. As expected, the incremental return to required education is almost always greater than that to all over-education levels. The largest increment for required education is a move from Level 2 to Level 3 (0.27 log percentage points or 31 percent) followed by a move from Level 4 to Level 5 (0.23 log percentage points or 26 percent). In comparison each incremental level of over-education is associated with around 0.04 – 0.07 log percentage points (5 – 7 percent) increase in wages.[13]

To compare our estimates to those from the existing literature, we can use the example of a graduate (HNQF level 5) man employed in a non-graduate job (say RNQF level 3, so he has 2 levels of over-education) and compare his returns to those of a matched graduate

man and a matched non-graduate man employed in the same job. The estimated coefficients in column 1 suggest this over-educated man would receive a wage return to his qualifications of (0.496) + (0.178) =0.67 log percentage points (3 levels of required and 2 levels of unused qualifications). In contrast, a matched man employed in a HNQF level 5 (UG degree) occupation would receive 0.77 log percentage points higher weekly wages, whilst a matched man in a HNQF level 3 job (A levels) would receive 0.50 log percentage points more, than a matched man employed in an occupation that requires no qualifications. Hence, as usual in the literature, this over-educated male graduate earns more than his matched work colleagues in his HNQF level 3 job, but less than he would do if he obtained a job commensurate with his own qualification level. His over-education penalty is 0.10 log percentage points (11 percent). This is slightly lower than the estimates in the existing literature which range between 15 to 26 percent. The return to under-education is negative and smaller than the average for required education, which is also in keeping with the consensus in the existing literature (see Hartog 2000).

The second column in Table 3 provides the fixed effects estimates for men in the ORU model.[14] As described in Section II, once we control for individuals' unobserved heterogeneity, we would expect an individual to earn the same whatever job they do, if over-education is simply an indicator of unobserved heterogeneity. Take the example of a graduate man (5 levels of education). If he works in a job requiring that level of education, then according to the coefficients in column 2 of Table 3, he will earn a wage premium of 0.66 log percentage points, relative to unqualified workers in unqualified jobs. If he works in a Level 4 job he will earn a wage premium of 0.62 log percentage

points (γ_4 = 0.515, + δ_1 = 0.106). If he works in a Level 3 job he will earn a wage premium of 0.58 percentage points (γ_3 = 0.415, + δ_2 = 0.166). Similarly, his wage premia in Level 2 and Level 1 jobs will be 0.51 log percentage points. Thus, even once we control for unobserved heterogeneity, a wage penalty still exists, that grows (non-linearly) with the extent of over-education (at least until 3 or 4 levels of over-education are reached). So unobserved heterogeneity cannot be the only explanation for the existence of over-education, though the fact that it has some role to play is shown by the over-education penalties being smaller once we control for unobserved heterogeneity (contrast the wage penalty of 0.08 (=0.66-0.58) log percentage points for a graduate working in a Level 3 job in the fixed effects specification, with the 0.11 log percentage points wage penalty for the same situation in the OLS specification, discussed above)

Columns 3 and 4 provide educational returns for women. Generally, the returns for required education are higher than for men, whilst the returns to over-education are lower and consequently the over-education penalties are also higher. For our example of a graduate woman (with HNQF level 5) working in a job that requires HNQF level 3 qualifications, her return using the OLS estimates is (0.621) + (0.133) = 0.75 log percentage points more than an equivalent female with no qualifications. Compared to a matched graduate's earnings differential of 1.00 log percentage points, this involves an over-education penalty of 0.25 log percentage points (29 percent) which is higher than that found for men (11 percent). This is consistent with the literature since Lindley (2008) finds an estimated over-education penalty of 29 percent for women for QLFS data averaged over 1993-2002.

In column 4, after controlling for unobserved heterogeneity, women still earn different amounts depending on the level of job they do, suggesting that the over-education wage penalty is not simply a penalty for low ability. Thus, a graduate woman would earn a wage differential relative to a matched unqualified woman of 0.89 log percentage points if employed in a graduate (Level 5) job. This differential would fall to 0.86, 0.79, 0.70 and 0.59 log percentage points if she worked in a Level 4, 3, 2 or 1 job respectively. Hence the fixed effects over-education penalties are larger for women than for men, so that the difference between the OLS and the fixed effects is smaller, suggesting that controlling for unobserved heterogeneity (reason 3) is less important for women.

In short, for men, the over-education wage penalty is smaller in the fixed effects specification but still differs by level of job, suggesting that some, though not all, of the over-education wage penalty can be explained by unobserved heterogeneity. There is less evidence of this for women.

VI RESULTS FOR OVER-EDUCATION TRANSITION PROBABILITIES

The results discussed above have not presented conclusive evidence in favour of any of our three possible reasons for the existence of over-education. Of the three, the career mobility reason seemed to attract the most support, with, for example, the negative correlation of job tenure and positive correlation of promotion prospects, with the likelihood of over-education, being consistent with the idea that over-education may be a

temporary phenomenon in the early stages of ones career, whilst individuals acquire the necessary experience to obtain a job commensurate with their qualifications. We can use the panel element of the BHPS to investigate this hypothesis further, in particular to examine transition likelihoods out of over-education.

Table 4 provides information on transitions between being over-educated, being matched into an appropriate job (Matched) and out of employment (NE) for 1991, 1996, 2001 and 2005, conditional on being over-educated in 1991.[15] The first column shows that in 1991 there were 4750 individuals in employment, of whom 1187 (25 percent) were over-educated.[16] The first row in the second column shows that almost half (544 individuals or 46 percent) of these 1187 over-educated individuals were still over-educated in 1996, although 42 percent found employment more commensurate with their education level and 12 percent moved out of employment or left the survey. Continuing across the table to further track these individuals, 322 were still over-educated in 2001 and 218 in 2005. Thus, although a majority of those individuals observed to be over-educated in the first wave of the BHPS in 1991 leave this state at some point over the subsequent 15 years, a significant minority of those initially over-educated remained so for the whole period (218 out of 1187). This will be an upper bound estimate, since some individuals could have spent time out of over-education between the 4 points in time we observed them in this table. Note that the likelihood of escaping over-education falls the longer people have been over-educated. Thus, of the individuals over-educated in 1991, 46 percent were still over-educated in 1996, whilst of these 59 percent were still over-educated in 2001 and of these, 68 percent were still over-educated in 2005[17].

<Table 4 here>

Table 4 also tells us something about the permanence of matched employment for those who escaped over-education. Most of those who escaped into a matched job stayed matched. Of the 496 who moved into a matched job by 1996, 411 (83 percent) were still matched in 2001, and 371 (75 percent) were still matched in 2006. However, there is evidence that a small number of individuals moved back into over-education after a matched job had been found. Of those originally over-educated but who found a matched job between 1991 and 1996, 12 percent were over-educated again by 2001. For those who did not find a matched job until 2001, 13 percent were back in over-education by 2005. These figures will be a lower bound since some people may have cycled in and out of over-education and matched employment between the years we observe them.

Table 4 also shows that the longer the time spent in a matched job, the lower the probability of falling back into an over-educated job. Of those who escaped over-education before 1996, and were in a matched job in 1996 and 2001, only 7 percent fell back into over-education in 2005. But for those who failed to escape over-education until some time between 1996 and 2001, and so were only in a matched job in 2001, 13 percent had fallen back into over-education by 2005. Finally, there is very little evidence that individuals cycle between over-educated jobs and being out of the labour force (NE). This is contrary to

the evidence on the low-skilled who do cycle between low-skilled jobs and unemployment.[18]

In order to investigate the characteristics associated with the likelihood of leaving over-education, we estimated multivariate probit regressions for the transition probabilities presented in Table 4 using job characteristics measured in the pre-transition job.[19] Table 5 provides results estimated separately, for the 592 men and 586 women who were over-educated in 1991.[20] Table 2 showed that older men are more likely to be over-educated, however, Table 5 shows that for older men who stay over-educated, their chances of exiting over-education fall as they get older. A similar result holds for job tenure, for those who are over-educated, their chances of escaping fall the longer they stay in the same job (although the marginal effects are small). Recently received training helps women to exit over-education. Table 2 showed that training is positively related to over-education incidence for women, so that women receiving training are more likely to be over-educated at the time, but engaging in training helps women to escape over-education as shown in Table 5. Thus, although these workers are already over-educated in terms of their formal qualifications, it seems that further learning through training helps them to escape over-education. Possibly, the original skills embodied in formal qualifications were inadequate for performing at the level that the formal qualification might predict. This evidence is therefore consistent with our reason 3 for the existence of over-education, that there is heterogeneity amongst individuals with the same qualifications, so that, for example, not everyone with a degree has the skills to do a graduate level job without receiving training.

<Table 5 here>

Table 5 also shows that having a permanent job, working in a large firm and having a job with promotion prospects has a positive effect on exiting over-education for men (reason 1), but this is not the case for women. Also, the education coefficients show that the better educated are less likely to exit over-education. So over-education is a more serious, permanent problem the higher the qualifications held. Explanations include a lower scarring effect for lower qualified workers, since it might be easier to transit between low skilled jobs than transit between an A-level to a graduate job for someone with a degree. Another explanation is that are likely to be fewer job opportunities for higher qualified workers compared to lower qualified workers, even if jobs vacancies are distributed equally across required qualifications. Hence there will be more opportunities for lower skilled workers to exit over-education simply because moving to an intermediate skilled job would do so, whereas this is not the case for graduates.

VII CONCLUDING COMMENTS

This paper has used panel data to investigate the reasons why some people work in jobs for which they are over-educated. Three possible reasons have been considered, namely that individuals accept jobs for which they are over-educated at the beginning of their career, whilst they accumulate sufficient experience to obtain a job commensurate with their skills, that individuals choose over-educated jobs or cannot find appropriate jobs due to constraints such as family obligations, and that there is unobserved heterogeneity

within qualification levels such that the apparently over-educated are less able and are in fact appropriately skilled for their jobs.

The evidence did not find conclusively in favour of any one of these explanations over the others. There was little support for the family constraints argument, although the effect of children and marital status had a counter intuitive effect on the likelihood of being over-educated, women who had recently moved home for non-employment reasons were more likely to be over-educated. Only a minority of respondents were in this situation however, and this cannot be the prime explanation of the existence of over-education. There is more evidence in favour of the unobserved heterogeneity argument with training helping women to escape this state. Controlling for individual fixed effects reduced the size of the male over-education wage penalty, though a wage penalty still remained, and so again this can be only part of the story.

The theory receiving most support is the one hypothesising that over-education is a temporary phenomenon at the start of individual's careers, as the likelihood of over-education is negatively related to job tenure. Further examination of the data in terms of transmission mechanisms revealed significant movement out of over-education. For many individuals, over-education therefore does seem to be a temporary phenomenon, from which they will progress, and therefore need be of no great concern. However, it must also be acknowledged that for a minority of individuals, over-education is a reasonably permanent state, extending over many years. Investigation of the factors associated with leaving or remaining in over-education reveals that the longer individuals

remain in an over-educated job, and the older they get, the lower their chances of leaving over-education. Also, the likelihood of leaving over-education is apparently reduced the higher one's level of qualifications. On the other hand, receiving training significantly improves women's chances of leaving over-education. Also, being in a large firm with a permanent job and good promotion prospects is beneficial to leaving over-education, but only for men. It is not clear why this effect is not observed for women. It is apparently not related to family circumstances, since marital status, employment status of spouse and the contemporaneous presence of children are unrelated to the likelihood of leaving over-education. Further investigation is therefore required to determine why a job with good career prospects does not benefit over-educated women as much as it does over-educated men, to determine whether this is an optional choice of such women, or whether some sort of discrimination is at work.

Table 1: Highest qualification (percent).

	BHPS		LFS	
	1993	1991-2005	1993	1993-2003
HNQF=0, No Qualifications	23	16	24	18
HNQF=1, <lower secondary	13	12	13	14
HNQF=2, lower secondary	22	19	20	21
HNQF=3, upper secondary	23	25	23	24
HNQF=4, post-secondary	9	12	10	10
HNQF=5, tertiary undergraduate	9	13	8	9
HNQF=6, tertiary postgraduate	2	3	2	4
N	6,578	98,949	52,715	529,745

Notes: All Men and women, age 16-65.

Table 2: Key results for the propensity to be over-educated (marginal effects).

	Men		Women	
	Probit	FE	Probit	FE
Age	0.0065	-	-0.0007	-
	(0.0017)***	-	(0.0017)	-
Age Squared	-0.00011	-	-0.00008	-
	(0.00002)***	-	(0.00002)***	-
Household has children	-0.0072	-0.0233	-0.0298	-0.1327
	(0.0082)	(0.0389)	(0.006)***	(0.0387)***
Spouse employed	-0.0148	-0.0831	-0.0059	0.1057
	(0.008)*	(0.0478)*	(0.0112)	(0.0643)
Has no Spouse	0.0337	0.1416	-0.0075	0.1737
	(0.0103)**	(0.0642)**	(0.0119)	(0.0737)**
Lives in London	0.0052	0.1601	0.0154	0.0732
	(0.01)	(0.0684)**	(0.0097)	(0.0756)
Union Member	-0.0334	-0.0350	-0.0417	-0.1098
	(0.0070)***	(0.0426)	(0.0066)**	(0.0406)**
Permanent Job	-0.0389	-0.0986	-0.0059	0.0217
	(0.0121)**	(0.0558)*	(0.0096)	(0.0459)
Part Time	0.137	0.3749	0.0536	0.2718
	(0.0128)***	(0.0609)***	(0.006)***	(0.0356)***
Has promotion prospects	0.0345	0.1870	0.0332	0.0360
	(0.0119)**	(0.0537)***	(0.0114)**	(0.0513)
Training (in the last year)	0.0112	0.0221	0.0625	0.1116
	(0.007)	(0.0320)	(0.0068)***	(0.0296)***
Commute time	0.00002	-0.0018	0.0001	-0.0013
	(0.00012)	(0.0007)**	(0.0002)	(0.0009)
Moved for job purposes	-0.0111	-0.0404	0.0028	-0.1392
	(0.0186)	(0.0866)	(0.0213)	(0.0941)
Moved not for job	0.0421	0.0362	0.0431	0.0825
	(0.009)***	(0.0409)	(0.009)***	(0.0395)**
Job Tenure	-0.0086	-	-0.0044	-
	(0.0005)***	-	(0.0006)***	-
Observations	31776	31776	34904	34904
Number of cross-wave person identifiers		6680		7314

Robust standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%.
Controls include year, firm size and industry dummies. The fixed effects specification excludes age, age squared and employment tenure given that they do not vary across individuals over time.
[1] Estimated using the Mundlak approximation using a random effects probit.

Table 3: Key results for the educational returns to log real gross weekly pay.

	Men		Women	
	OLS	FE	OLS	FE
Req Ed level = 1	0.1178	0.1383	0.1594	0.1842
	(0.0118)***	(0.0139)***	(0.0165)***	(0.0193)***
Req Ed level = 2	0.2251	0.2265	0.3583	0.3528
	(0.0108)***	(0.0141)***	(0.0099)***	(0.0151)***
Req Ed level = 3	0.4955	0.4150	0.6210	0.5903
	(0.0098)***	(0.0160)***	(0.0125)***	(0.0195)***
Req Ed level = 4	0.5358	0.5149	0.8119	0.7671
	(0.0131)***	(0.0226)***	(0.0133)***	(0.0260)***
Req Ed level = 5	0.7669	0.6569	1.003	0.8874
	(0.0119)***	(0.0248)***	(0.0132)***	(0.0278)***
Req Ed level = 6	0.8570	0.7388	1.0718	1.0659
	(0.0242)***	(0.0387)***	(0.0230)***	(0.0411)***
Over-ed level = 1	0.1107	0.1064	0.0511	0.0931
	(0.0073)***	(0.0091)***	(0.0072)***	(0.0091)***
Over-ed level = 2	0.1783	0.1664	0.1325	0.2037
	(0.0090)***	(0.0123)***	(0.0096)***	(0.0138)***
Over-ed level = 3	0.2164	0.2823	0.2032	0.3445
	(0.0111)***	(0.0160)***	(0.0125)***	(0.0179)***
Over-ed level = 4	0.2579	0.3669	0.9185	0.4082
	(0.0277)***	(0.0298)***	(0.0315)***	(0.0360)***
Over-ed level = 5	0.3065	0.5880	0.2501	0.6588
	(0.0474)***	(0.0432)***	(0.0741)***	(0.0814)***
Under Educated	-0.0735	-0.0787	-0.0968	-0.1139
	(0.0032)***	(0.0052)***	(0.0041)***	(0.0009)***
Constant	3.299	5.2499	3.215	4.6455
	(0.0395)***	(0.02508)***	(0.0425)***	(0.0323)***
Observations	31776	31776	34904	34904
Cross-wave person id		6680		7314
R-squared	0.61	0.60	0.68	0.65

Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%.

Controls: age, age squared, children, spouse employment status, year dummies, regional dummy, union status, permanent job, part-time, promotion prospects, training, commute time, firm size dummies, industry dummies, moved job and employment tenure. The fixed effects specification excludes age, age squared and employment tenure given that they do not vary across individuals over time.

Table 4: Over-education transitions for men and women in 1991, 1996, 2001 and 2005

1991		1996		2001		2005			
								%	N
				Over-ed	322	**Over-ed**	218	67.70	322
				%	59.19	**Matched**	85	26.40	322
				N	544	**NE**	19	5.90	322
								%	N
		Over-ed	544	**Matched**	154	**Over-ed**	20	12.99	154
		%	45.83	**%**	28.31	**Matched**	128	83.11	154
		N	1187	**N**	544	**NE**	6	3.90	154
								%	N
				NE	68	**Over-ed**	17	25.0	68
				%	12.50	**Matched**	20	29.41	68
				N	544	**NE**	31	45.59	68
								%	N
				Over-ed	61	**Over-ed**	32	52.46	61
				%	12.30	**Matched**	22	36.07	61
				N	496	**NE**	7	11.47	61
								%	N
Over-ed	1187	**Matched**	496	**Matched**	411	**Over-ed**	28	6.81	411
%	24.99	**%**	41.79	**%**	82.86	**Matched**	371	90.27	411
N	4750	**N**	1187	**N**	496	**NE**	12	2.92	411
								%	N
				NE	24	**Over-ed**	3	12.5	24
				%	4.84	**Matched**	8	33.33	24
				N	496	**NE**	13	54.17	24
								%	N
				Over-ed	26	**Over-ed**	14	53.85	26
				%	17.69	**Matched**	7	26.92	26
				N	147	**NE**	5	19.23	26
								%	N
		NE	147	**Matched**	67	**Over-ed**	7	10.45	67
		%	12.38	**%**	45.58	**Matched**	55	82.09	67
		N	1187	**N**	147	**NE**	5	7.46	67
								%	N
				NE	54	**Over-ed**	6	11.11	54
				%	36.73	**Matched**	15	27.78	54
				N	147	**NE**	33	61.11	54

Notes: Men and women (age 16-65) over-educated in 1991.
Individuals can be in three states; employed in a job for which they are over-educated (over-ed), employed in a job which requires at least their level of education (matched), or not employed/out of the labour force (NE).

Table 5: Probit for the probability of exiting over-education in 1991-2005 (marginal effects).[A]

	Men	Women
Age	-0.0026	-0.0004
	(0.0005)***	(0.0005)
HQNF=2, Lower Secondary	-0.0208	-0.0249
	(0.0184)	(0.0136)*
HQNF=3, Upper Secondary	0.0046	-0.1045
	(0.0202)	(0.0148)***
HQNF=4, Post Secondary	-0.0584	-0.0701
	(0.0158)***	(0.0088)***
HQNF=5, Tertiary UG	-0.0572	-0.0740
	(0.0162)***	(0.009)***
HQNF=6, Tertiary PG	-0.112	-0.0796
	(0.0121)***	(0.0054)***
Children	0.0146	0.0089
	(0.0108)	(0.0097)
Spouse employed	0.0001	0.0288
	(0.0133)	(0.0181)
Has no Spouse	-0.0309	0.0418
	(0.0164)*	(0.0262)
Lives in London	-0.0037	0.0101
	(0.0172)	(0.0159)
Union Member	-0.0202	-0.0079
	(0.0109)*	(0.0101)
Permanent Job	0.0371	-0.0231
	(0.0179)**	(0.0202)
Part Time	-0.0028	-0.0127
	(0.0254)	(0.0097)
Has promotion prospects	0.0413	-0.0399
	(0.0161)**	(0.0202)**
Training (in the last year)	0.0102	0.0217
	(0.0139)	(0.0118)*
Commute time	0.0003	0.00006
	(0.0002)	(0.0003)
Firm Size: 25-99 employees	0.00007	0.00714
	(0.0139)	(0.0106)
Firm Size: 100-499 employees	0.03766	-0.0102
	(0.0146)*	(0.0115)
Firm Size: 500+ employees	0.0515	0.0019
	(0.0161)**	(0.0129)
Moved for job purposes	0.0401	-0.0037
	(0.0447)	(0.0371)
Moved not for job	-0.0110	-0.0014
	(0.0162)	(0.0149)
Job Tenure	-0.0025	-0.005
	(0.0010)**	(0.0011)***
Observations	3857	4041

Notes: Controls include year and industry dummies.

A The dependent variable equals 1 if exited over-education and zero otherwise. The dependent and explanatory variables are allowed to vary across 1991-2005. The sample consists of 1178 individuals over-educated in 1991 and then subsequently over-educated in each following year, but it is unbalanced so that some may leave the sample by leaving employment or leaving the survey.

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%

Table A1. Summary Statistics for Employed Workers (aged 16-65), BHPS 1991-2005

	Men		Women	
Variable Description	Mean	S.Dev.	Mean	S.Dev.
Real Weekly Pay	453	312	261	221
Age	38	12	38	12
Job Tenure (years)	4.79	6.43	4.08	5.37
Children	0.39	0.49	0.40	0.49
Employed Spouse	0.55	0.50	0.63	0.48
Non-Employed Spouse	0.16	0.36	0.07	0.26
No Spouse	0.29	0.45	0.30	0.46
Union Member	0.27	0.44	0.27	0.44
Permanent Job	0.93	0.25	0.91	0.29
Part Time	0.07	0.25	0.38	0.48
Promotion Prospects in Current Job	0.86	0.35	0.86	0.35
Received Training in the last 12 months	0.22	0.41	0.24	0.43
Commute Time	24	23	20	18
Agriculture, Forestry & Fishing	0.01	0.12	0.01	0.07
Energy & Water	0.03	0.18	0.01	0.11
Mining, Minerals Metals Manu & Chemicals	0.08	0.27	0.02	0.15
Metal goods, Engineering & Vehicles	0.12	0.33	0.04	0.19
Other Manufacturing	0.10	0.31	0.05	0.22
Construction	0.09	0.28	0.07	0.25
Distribution, Hotels & Catering	0.15	0.36	0.18	0.38
Transport & Communication	0.13	0.33	0.08	0.27
Banking, Finance, Insurance & Bus services	0.12	0.33	0.21	0.41
Other Services	0.16	0.37	0.33	0.47
Moved house for Employment Reasons	0.02	0.15	0.02	0.13
Moved house not for Employment Reasons	0.12	0.32	0.12	0.32
Lives in London	0.09	0.28	0.09	0.29
N	31776		34904	

Notes: Employed Men and women, age 16-65.

Table A2: Key results for the propensity to be over-educated (marginal effects) for a pooled sample of men and women.

	Probit[1]
Female	-0.0166
	(0.0044)***
Age	0.0003
	(0.0012)
Age Squared	-0.0001
	(0.00002)***
Household has children	-0.0211
	(0.0045)***
Spouse employed	-0.0114
	(0.0066)*
Has no Spouse	0.0052
	(0.0052)
Lives in London	0.0106
	(0.0069)
Union Member	-0.0348
	(0.0048)***
Permanent Job	-0.0226
	(0.0075)**
Part Time	0.0655
	(0.0055)***
Has promotion prospects	0.0327
	(0.0082)***
Training (in the last year)	0.0371
	(0.0049)***
Commute time	0.0001
	(0.0001)
Moved for job purposes	-0.0039
	(0.0139)
Moved not for job	0.0425
	(0.0064)***
Job Tenure	-0.0067
	(0.0004)***
Observations	66680

Robust standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%.
Controls include year, firm size and industry dummies.
[1] Estimated using a Probit only. Given there is no time variation in the gender variable it is not possible to estimate a fixed effects model.

Table A3: Probit for the probability of exiting over-education in 1991-2005 for a pooled sample of men and women (marginal effects).[A]

Variable	Marginal Effects and Standard Errors
Female	-0.0388 (0.0076)***
Age	-0.0011 (0.0004)***
HQNF=2, Lower Secondary	-0.0296 (0.0112)***
HQNF=3, Upper Secondary	-0.0625 (0.0113)***
HQNF=4, Post Secondary	-0.0713 (0.0085)***
HQNF=5, Tertiary UG	-0.0729 (0.0088)***
HQNF=6, Tertiary PG	-0.1018 (0.0048)***
Children	0.0159 (0.0074)**
Spouse employed	0.0098 (0.0106)
Has no Spouse	0.0017 (0.0125)
Lives in London	0.0022 (0.0119)
Union Member	-0.1065 (0.0077)
Permanent Job	0.0021 (0.0145)
Part Time	-0.0084 (0.0093)
Has promotion prospects	0.0039 (0.0126)
Training (in the last year)	0.0149 (0.0092)
Commute time	0.0002 (0.0002)
Firm Size: 25-99 employees	0.0061 (0.0091)
Firm Size: 100-499 employees	0.0152 (0.0096)
Firm Size: 500+ employees	0.0283 (0.0109)***
Moved for job purposes	0.0255 (0.0314)
Moved not for job	-0.0074 (0.0113)
Job Tenure	-0.0039 (0.0007)***
Observations	7898

Notes: Controls include year and industry dummies.

A The dependent variable equals 1 if exited over-education and zero otherwise. The dependent and explanatory variables are allowed to vary across 1991-2005. The sample consists of 1178 individuals over-educated in 1991 and then subsequently over-educated in each following year, but it is unbalanced so that some may leave the sample by leaving employment or leaving the survey.

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%

Table A4. Multinomial Logit marginal effects for the probability of exiting over-education in 1991-2005 into matched and out of the labour force (NE).[A]

	Men		Women	
	To Matched	To NE	To Matched	To NE
Age	-0.0008	0.00002	-0.0001	-0.0004
	(0.0002)***	(0.0001)**	(0.0001)	(0.0006)**
Lower Secondary	-0.0056	0.0071	-0.0066	-0.0058
	(0.0054)	(0.0064)	(0.0031)**	(0.0035)*
Upper Secondary	0.0016	0.0014	-0.0286	-0.0093
	(0.0061)	(0.0041)	(0.0043)***	(0.0039)**
Post Secondary	-0.0174	-0.0027	-0.0173	-0.0056
	(0.0045)***	(0.0034)	(0.0023)***	(0.0038)
Tertiary UG	-0.0173	-0.0050	-0.0188	-0.0088
	(0.0045)***	(0.0030)*	(0.0023)***	(0.0035)**
Tertiary PG	-0.0347	-0.0001	-0.0199	-0.0091
	(0.0030)***	(0.0043)	(0.0015)***	(0.0041)**
Children	0.0043	-0.0015	0.0033	0.0028
	(0.0033)	(0.0019)	(0.0031)	(0.0034)
Part time* children	0.0068	0.0128	-0.0021	-0.0039
	(0.0192)	(0.0011)	(0.0048)	(0.0043)
Spouse employed	-0.0006	-0.0043	0.0073	-0.0125
	(0.0041)	(0.0021)**	(0.0049)	(0.0051)**
Has no Spouse	-0.0097	-0.0003	0.0108	-0.0130
	(0.0045)**	(0.0023)	(0.0079)	(0.0031)***
Lives in London	-0.0019	-0.0006	0.0013	0.0033
	(0.0052)	(0.0023)	(0.0042)	(0.0046)
Union Member	-0.0061	-0.0057	-0.0016	-0.0008
	(0.0032)*	(0.0016)***	(0.0027)	(0.0028)
Permanent Job	0.0073	-0.0299	-0.0093	-0.0338
	(0.0059)	(0.0102)***	(0.0063)	(0.0089)***
Part Time	-0.0003	0.0075	-0.0013	0.0128
	(0.0104)	(0.0055)	(0.0040)	(0.0045)***
Has promotion prospects	0.0122	0.0025	-0.0109	0.0019
	(0.0046)**	(0.0025)	(0.0058)*	(0.0042)
Training (in the last year)	0.0027	-0.0014	0.0055	-0.0064
	(0.0043)	(0.0021)	(0.0032)*	(0.0026)**
Commute time	0.00001	0.0001	0.00003	0.0001
	(0.0001)*	(0.00003)**	(0.00003)	(0.0001)*
Firm Size: 25-99 employees	0.0001	0.0003	0.0014	-0.0031
	(0.0044)	(0.0022)	(0.0029)	(0.0026)
Firm Size: 100-499 employees	0.0108	-0.0012	-0.0028	-0.0031
	(0.0047)**	(0.002)	(0.0031)	(0.0028)
Firm Size: 500+ employees	0.0158	-0.0008	0.0007	-0.0039
	(0.0052)**	(0.0023)	(0.0034)	(0.0031)
Moved for job purposes	0.0149	0.0099	0.0002	0.0081
	(0.0154)	(0.0125)	(0.0103)	(0.0142)
Moved not for job	-0.0037	0.0008	-0.0002	-0.0052
	(0.0048)	(0.0036)	(0.004)	(0.0035)
Job Tenure	-0.0008	0.0003	-0.0013	-0.00002
	(0.0003)**	(0.0001)**	(0.0003)***	(0.0003)
Observations	3857		3979	

Notes: Controls include year and industry dummies.
A The dependent variable equals 1 if exited over-education into matched employment between 1991 and 2005; equals 2 if exited over-education into unemployment or economic inactivity between 1991 and 2005; and zero otherwise. The sample consists of 1178 individuals over-educated in 1991 and then subsequently over-educated in each following year.
Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%

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ENDNOTES

[1] See amongst others Duncan and Hoffman (1981), Alba-Ramirez (1993), Kiker *et al.* (1997) and Sloane *et al.* (1996).

[2] For example, consider an occupation where a high proportion, say 75%, of the workforce are graduates. With the modal method, anyone with a degree in this occupation will be classified as adequately educated, as we would want them to be, no matter what qualification the remaining 25% of workers hold. However, if some workers can enter this occupation without a degree (substituting experience, for example) then the mean level of education in the occupation will be less than a degree, and depending on the size of the standard deviation, all the graduates in this occupation could appear over-educated.

[3] See, for example, Gregg and Manning (1997).

[4] Where $\varepsilon_{it} = a_i + u_{it}$ in equation (1) since a_i are the fixed effects and u_{it} is the idiosyncratic error term. Therefore $v_{it} = \varepsilon_{it} - \lambda\bar{\varepsilon}_i = (1-\lambda)a_i + u_{it} - \lambda\bar{u}_i$ in equation (2) is the Generalised Least Squares (GLS) estimator since variables are transformed by $\lambda = 1 - \sqrt{\sigma_u^2/(\sigma_u^2 + T\sigma_a^2)} = 1 - \sqrt{\theta}$. Here σ^2_u is the variance of u_{it}, σ^2_a is the variance of a_i and T is the number of years in the sample (here equal to 15). See Wooldridge (2002), chapter 10, for a detailed derivation of these terms.

[5] See Mundlak (1978).

[6] See Taylor et al. (1998) for a detailed discussion of the BHPS sampling procedure.

[7] Estimates are qualitatively robust to the choice of an unbalanced panel. All models were also estimated on a balanced panel where only individuals present in all fifteen waves were used. Results are available from the authors on request.

[8] Detailed occupational information is not provided at the SOC90 level after 2003 since this saw the introduction of the SOC2000 measure. There is evidence suggesting that it is not possible to provide a direct mapping of SOC90 into SOC2000 at anything higher than the one digit level (see Elias and Purcell, 2004). In some cases the occupational categories were too small for calculating the mode HNQF. Those

occupational categories that contained fewer than 30 individuals were amalgamated to similar categories within the same 2 digit level, so that sensible estimates could be obtained.

[9] This attrition is unlikely to be a problem for the transition analysis since this uses a sample of individuals who were over-educated in 1991.

[10] Table A2 in the appendix provides probit estimates for over-education incidence using a pooled sample of 66680 men and women. This shows that after conditioning on human capital and socio-economic characteristics, women were only slightly (1.7 percent) less likely to be over-educated compared to men. A likelihood Ratio test gives a test statistic of 382.5 providing clear evidence that the determinants of over-education differ for men and women. Given that gender does not vary over time, it was not possible to estimate a fixed effects model in this instance.

[11] See Sloane *et al*.(1999); Battu *et al*. (1999); Dolton and Vignoles (2000); Chevalier (2003); Chevalier and Lindley (2006); Green and McIntosh (2007).

[12] The Chow test for gender differences across parameters provided a test statistic of 37.20 indicating that the structural determinants of pay differ by gender.

[13] Where percentages can be calculated using $[\exp(\beta)-1]\cdot 100$.

[14] If qualifications held are correlated with fixed effects because of unobservable ability, then we would expect the OLS estimates to be larger than the fixed effects estimates to the extent of the omitted variable bias. Indeed column 2 shows that this is the case for most of the over-educational returns.

[15] The matched category includes being under-educated here. The `out of employment' category (NE) also includes individuals who left the sample. Given that the sample used is conditional on being over-educated in 1991, this unbalanced panel excludes those individuals who joined the survey after 1991.

[16] Small cell sizes prevented looking at males and females separately.

[17] An alternative interpretation to the one offered here is that the likelihood of leaving over-education is falling over time, due to changes in the labour market.

[18] See for example Dickens *et al.* (2000) in the UK or Holzer and LaLonde (1999) in the US.

[19] Table 5 allows the dependent variable and the explanatory variables to vary over time. Only 1178 of the 1187 individuals over-educated in 1991had a full set of observables for the 1991-2005 period. Table A3 in the appendix shows that women are 3.9 percent less likely to exit over-education between 1991 and 2005 compared to men, after conditioning on human capital and socio-economic characteristics. A Likelihood Ratio test provides a test statistic of 130.63 suggesting that the structural determinants of over-education transitions differ for men and women.

[20] Table A4 in the appendix includes a multinomial logit equation for exiting over-education based on whether the individuals moved to matched employment or out of the labour force (NE). The results support those found in Table 6. Most exits from over-education are to matched jobs rather than NE, as shown in Table 4.