Graduate Over-Education in the UK

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Executive Summary

The UK has been the theatre of a dramatic shift in the production of graduates; during the past decade the proportion of a cohort attending tertiary education has increased from less than 15% in 1985 to more than 33% 10 years later. However, doubts have been raised whether the demand for graduates has kept up with the supply. Furthermore, claims have been made that a large proportion of graduates are employed in "sub-graduate jobs", that is graduates are over-educated for the tasks required to do their job. Over-education would indicate that a tremendous amount of public money is wasted subsidising higher education. Thus, estimating the extent and effect of over-education is important, especially at a time when the debate on the financing of higher education is raging.

Widening participation in education may lead to an increase in over-education for various reasons. Employers faced by a more qualified pool of candidates may have upgraded some traditionally non-graduate jobs. Alternatively they may recruit graduates for jobs that have basically stayed the same and do not require graduate skills, or as educational standards are commonly suspected to decrease over-time, upgrade their qualification requirements to select candidates with the appropriate skills. Moreover, the increased participation in tertiary education has depleted the pool of well-qualified 16 year-old school leavers, thus employers may consider low ability graduates as an adequate substitute. However, it is suspected that widening the access to higher education has increased the heterogeneity of the skills of the new graduates entering the labour market. Hence, previous measures of over-education may have overestimated the true extent of the phenomenon, as some graduates are not endowed with the skills required to obtain a graduate job.

After reviewing the literature on over-education, this paper proposes an alternative measure of over-education based on occupation and job satisfaction, more precisely, whether the graduate is satisfied with the match between her education and her occupation. Graduates in a sub-graduate occupation who are satisfied are defined as apparently over-educated, whereas those who are dissatisfied are called genuinely over-educated.

Apparently over-educated workers' pay is 7% lower than that of matched graduates. The pay penalty reaches 33% for genuinely overeducated workers, which indicates that returns to a degree are nearly nil. When including a measure of idiosyncratic skills, the pay differential disappears for the apparently over-educated workers and is dampened by up to 40% for the genuinely over-educated. This indicates that over-educated graduates mostly lack the skills allowing them to compete for graduate jobs. Furthermore, the skill-gap between genuinely over-educated graduates and other graduates increases overtime as the former get less employer-training than other graduates. Evidence on the lack of skills of some graduates opens the debate on the future of higher education. Should more money be provided in order to increase the performance of students at risk of being over-educated or should the access to university be restricted and some alternative (shorter, vocational) tertiary qualifications created?

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1. Introduction

A common government policy is to encourage participation in education. The cornerstone of such policies lies in the belief that a more educated labour force leads to increased economic growth, (see Gemmel, 1996) for empirical evidence concerning the UK). The reform of the university system in the UK in the beginning of the 1990s led to a dramatic shift in the production of graduates: during the past decade the proportion of a cohort attending tertiary education has increased from less than 15% in 1985 to more than 33% 10 years later. However, doubts have risen whether the demand for graduates has kept up with the supply. Mason (1996), examining the recruitment of graduates in the UK financial industry in 1995, reports that as many as 45% of newly recruited graduates were employed in "non-mainstream" graduate jobs. Such a high degree of over-education would indicate that a tremendous amount of public money is wasted subsidising higher education. Thus, estimating the extent and effect of over-education is important, especially at a time when the debate on the financing of higher education is raging (Greenaway and Haynes, 2000).

The literature on over-education and its corollary, job-education mismatch, has recently received a renewed interest in Europe (Hartog, 1997), and especially in the UK, after reforms led to a large increase in student enrolment (Sloane *et al.*, 1999; Dolton and Vignoles, 1997, 2000; Groot, 1996; Groot and Maasen van den Brink, 1997; Battu *et al.*, 1999; Green *et al.*, 1999). All mentioned studies conclude that over-educated workers have lower returns to their education[1].

Widening participation in education may lead to an increase in over-education for various reasons. Employers faced by a more qualified pool of candidates, may have upgraded some traditionally non-graduate jobs. Alternatively they may recruit graduates for jobs that have basically stayed the same and do not require graduate skills (qualification inflation) or as educational standards are commonly suspected to decrease over-time, upgrade their qualification requirements to select candidates with the appropriate skills (grade-drift). (See Berg, 1970 or Robinson and Manacorda, 1996 for empirical evidence concerning the UK.) Moreover, the increased participation in tertiary education has depleted the pool of well-qualified 16 year old school leavers, thus employers may consider low ability graduates as an adequate substitute[2].

[1] See also Groot and Maasen van den Brink (2000) for a meta-analysis of the effect of over-education on the returns to education.

[2] Employers may benefit from spillover effects if over-educated workers provide their less qualified workmates with some informal training.

Widening the access to higher education has increased the heterogeneity of the skills of the new graduates entering the labour market[3]. Hence, previous measures of over-education may have overestimated the true extent of the phenomenon, as some graduates are not endowed with the skills required to obtain a graduate job (see also Mason, 1999) for evidence on the lack of skills of some chemistry graduates). Thus, a division of over-educated workers between *apparently* over-educated and *genuinely* over-educated is proposed and tested by comparing the training opportunities and wages of the different groups of graduates defined.

In case of a non-optimal match employers should provide more training to over-educated workers to bring their skills in line with the requirement of the job (Van Eijs and Heijke, 1997). This would be the case when the mismatch is minor, *i.e.* for *apparently* over-educated workers. Alternatively, human capital theory predicts that over-educated workers are less likely to get training as they compensate their lack of specific skills by an excess of education. Also, over-educated workers might have shorter tenure since they keep looking for a better match, therefore firms are less likely to invest in their training. This type of worker is *genuinely* over-educated. Hence, apparently over-educated workers receive more employer-funded training than genuinely over-educated workers do. The skill differential generates a difference in the productivity of the different types of graduates. Hence, the earnings of an over-educated graduate are bound to be lower than those received by matched workers; furthermore I anticipate the genuinely over-educated to earn the least.

2. Definitions of Over-Education

In the Seventies, a surge in the number of graduates in the US triggered the first research on the demand for graduates in the labour force (Berg, 1970; Freeman, 1976). Freeman concluded that as the excess qualified workforce has to settle for jobs that "do not require a degree", the returns to education should plummet. Lower returns should reduce the investment in higher education and henceforth the labour market should return to an equilibrium point. Freeman's prediction never materialised as returns to education remained high, however, participation in college dropped in the seventies (Card and Lemieux, 2000). Similarly, in the UK, despite the recent evidence that between 29% and 47% of the work-force is over-educated (Green *et al.*, 1999), returns to education have remained stable between 1978 and 1996 (Chevalier and Walker, 1999), implying that the demand for skills kept up with the supply[4].

In this model of supply and demand, over-education is only due to a temporary dis-equilibrium; however, empirical evidence rejects this scenario, as over-education appears to be a permanent feature of the economy. Moreover, a large proportion of over-educated workers tend to remain in a mismatched situation. Dolton and Vignoles (1997), analysing the

[3] Two factors are at play. First, pupils with lower ability have had access to higher education. I assume that some of these students with lower initial ability will not acquire as many skills as traditional students during their degree. Second, the increased number of students associated with a reduction of the available funding has put strain on universities: student-staff ratios have increased dramatically especially in tutorial and other lab classes. This reduced support is likely to have affected the ability of students to acquire knowledge (See Mason, 1999 for evidence).

[4] University attendance in the UK declined for the first time in 1998, but this is likely to be due to the introduction of university tuition fees (£1,000 per year).

early careers of a cohort of 1980 UK graduates, find that 62% of male graduates, who were over-educated in their first job, remained in a sub-graduate position six years after graduation. Also, Sloane *et al*. (1999) report no evidence that the quality of the match improves with the change of employer.

These facts appear to be consistent with the hypothesis that the graduate population is not homogeneous in its skill endowment. Some graduates have developed qualities that make them suitable for a graduate job whereas others appear to lack these skills[5]. One can assume that the recent expansion in the number of pupils going to university has been associated with a greater heterogeneity in the skills of graduates. A large heterogeneity in the skills of graduates is in accordance with the persistence of over-education and non-promotion of over-educated workers (over-educated workers are trapped at the end of the job-search queue). Most of the literature has ignored the issue of educational heterogeneity by defining over-education as departing from a norm[6], and assuming the homogeneity in skills of all workers with an identical qualification, therefore overestimating the extent of over-education.

Empirical work relies on three definitions of over-education. First, one's education is compared to the self-assessed qualification required to perform one's job[7]. Second, an "expert" definition of educational requirement for a given occupation is used. Third, the distribution of education is calculated for each occupation; employees who depart from the mean or median by more than some *ad hoc* value (generally one standard deviation) are classified as over-educated. These definitions of over-education suffer from major drawbacks.

Using self-assessment to define the job's educational requirements adjusts the measure of over-education to the specific skills needed for the job and should provide a precise measure. However, this definition of over-education relies on employees accurately reporting the skills required for their job. Also and more importantly, this measure relies on the ability of an employee to match a specific level of skills with a qualification level. Additionally, employees might report the current hiring standards, which in the presence of qualification inflation or grade drift will bias the over-education measure upward.

The "expert" definition of the job requirement avoids the bias due to self-reporting. However, the information collected might not be up to date with a rapidly changing work environment. Also, this measure is based on the job title, and therefore does not account for the task-specificity of the individual's position.

The statistical definition of over-education is the least desirable. As it is based on the observed distribution of education for a given occupation, it is sensitive to cohort effects, especially in the case of a rapid change in the educational level required to perform in a given occupation. Also, the measure is sensitive to the level of aggregation that is necessary to obtain a reliable distribution of education; the higher the aggregation, the less occupation-specific the measure is. Finally, this measure defines over-education as belonging to the

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[5] See Green *et al*.(1999) and Mason (1999) for evidence on the lack of "appropriate" skills among over-educated workers.

[6] Robst (1995) includes ability and institution quality measures and finds that US graduates with higher ability and from more prestigious institutions are less likely to be overeducated and more likely to exit from an over-education spell.

[7] See Green *et al*. (1999) for a discussion on the difference between measures of over-qualification relying on the qualification "to do" and qualification "to get" a job; the empirical evidence provided is inconclusive *vis-a-vis* a significant difference between the two measures. The lack of difference between the qualifications required "to do" and "to get" a job casts doubt on the qualification inflation hypothesis.

upper tail of the education distribution. Defining over-education as departing from more than one standard deviation from the mean, results in finding similar proportions of over and under educated workers: around 15% of the population if education is measured in years and the distribution of education per occupation is normally distributed (Hartog, 1997).

All these measures of over-education rely on the assumption that all individuals with a given education level are perfect substitutes. Even in the UK, where a degree is mostly the "open sesame" to employers' graduate training schemes, this assumption would be far fetched[8]. The last two measures also imply that all jobs within a given occupation require identical skills. These two assumptions are obviously naïve in an economy where graduates are hired for their task-flexibility (Halaby, 1994).

I propose an alternative measure of over-education based on a measure of the job satisfaction[9]: " How dis/satisfied are you with the match between your work and your qualifications?" The possible answers to this question are grouped into 6 categories ranging from very dissatisfied to very satisfied. A bad-match dichotomous variable is generated by grouping the very dissatisfied and dissatisfied answers. One advantage of this definition of mismatch is that it refers to qualifications, not only education, and does not require an assessment of the educational level required to do the same job. Hence it acknowledges Halaby's (1994) criticisms that, individuals with a given education level are not always inter-changeable and that a given occupation may require different skills from each individual. However, as the satisfaction measure is defined as a dichotomous variable, the extent of the mismatch cannot be calculated[10].

It can be argued that this definition does not measure over-education accurately. First, the dissatisfaction between qualification and occupation could be due to under-education. However, as the population of interest is composed of young graduates only, the extent of under-education is likely to be limited. Second, the dissatisfaction could reflect that despite being in a graduate job, this occupation is not related to the academic subject studied at university. Third, the job may require most of the skills that were learnt at university but also some more from a different field. For example General Practitioners (Medical Doctors) are likely to require some financial skills in order to run their fund-holding practice[11]. Hence despite the apparent good match, some graduates may report dissatisfaction in the match between education and occupation. These criticisms are answered in Section 3.

3. Satisfaction as a Measure of Over-Education

Let us assume that two types of graduates exist: type g are the clever and type l are the plain graduates. Graduates have perfect information about their quality. When graduates enter the labour market, employers can assess their type, for example by looking at their degree results

[8] Borghans and Smits (1997) show that in the Netherlands, 22% of graduates from higher vocational education work outside their field of study. Appropriately educated working outside their field of study suffer from a pay penalty of 3% compared to their peers.

[9] Since the writing of this paper, it came to my attention that Battu *et al*. (2000) use a similar definition of over-education based on the satisfaction of the match between education and job.

[10] A separation between dissatisfied and very dissatisfied workers could provide some measures of the degree of over-education. However, only 6.1% of graduates referred to themselves as being very dissatisfied about the match between their education and their job, which would lead to a small sample size.

[11] I thank Peter Dolton for pointing out this example.

or institution. Let us also assume that there are three types of jobs that graduates can apply for: graduate jobs (G), intermediate jobs requiring some graduate skills (U) and jobs demanding lower academic skills (L). Two queues of graduates looking for jobs are formed according to their endowment in skills. The possible outcomes for a match are presented in the following table.

	Skilled graduate	**Less skilled graduate**
Graduate job	Perfect Match (Gg)	X
Upgraded job	Genuine Over-education (Ug)	Apparent Over-education (Ul)
Non graduate job	X	Genuine Over-education (Ll)

Skilled graduates compete for graduate jobs, most of them obtain a graduate job; this is a perfect match (Gg). However, skilled graduates at the end of the queue might only be offered upgraded jobs (Ug) and hence be genuinely over-educated[12]. Less skilled graduates are not offered graduate jobs, and they compete for upgraded jobs (Ul). In most of the literature, this type of match is defined as a mismatch, as the worker appears to be over-educated for the position. However, due to the low standard of skill of łgraduates, this type of match can be considered as appropriate. The less able from that group can only get a non-graduate job (Ul) and are genuinely over-educated. In this framework, skilled graduates in an upgraded job and less skilled graduates in a non-graduate job feel that their skills are under-used and they are defined as genuinely over-educated whereas less skilled graduates in an upgraded job are apparently over-educated. With time, genuinely over-educated graduates might be able to move into a "perfect match" job if they are gtype or an "upgraded job" if they are the łtype. However, apparently over-educated graduates will not be able to move to a "perfect match" position as they lack some essential "graduate skills". Therefore, a bulk of the graduate population will appear to remain over-educated, as observed by Dolton and Vignoles (1997). This model appears to be an appropriate representation of the graduate employment pattern described by Mason (1996). Over-education has been previously over-estimated since "genuine" and "apparent" over-education were not distinguished.

By combining the expert and satisfaction definitions, it is possible to separate the graduate populations according to this framework. As mentioned at the end of Section 2, the satisfaction definition may not be appropriate; by combining it with the expert definition, these criticisms can be answered. All graduates who are in graduate jobs are defined as matched, whatever their satisfaction. Hence, graduates who are in a graduate job that does not match their subject of study are defined as adequately educated even if they claim to be dissatisfied. Similarly, to finish with the example of medical doctors requiring financial skills to do their job effectively, they would be classified as adequately educated, as 'doctor' is a graduate occupation. The graduate population is separated into three groups. Graduates in graduate jobs (Gg), as defined by their occupation (expert definition) form the control group. Only graduates who are not in graduate jobs are split between those who are satisfied (Ul) and those who are not satisfied (Ug and Ll) with the match between their education and their occupation.

[12] Lack of mobility or information of some graduates (women, new entrant) could also lead to a similar outcome.

4. Data

To conduct this study, a sample of two cohorts of UK graduates is used. The data was collected by a postal survey organised by the University of Birmingham in the winter of 1996 among graduates from 30 higher education institutions covering the range of UK institutions (see Belfield *et al.*, 1997 for details). Graduates from the 1985 and 1990 cohorts were selected, leading to a sample of 18,000 individuals. Graduates from the Open University and the University of Buckingham were dropped due to the different profile of their graduates[13]. Furthermore, graduates who were older than 25 on graduation, self employed or disabled were dropped as these characteristics might affect their satisfaction. The questionnaire covers a wide range of topics, including schooling, academic information, family background and employment history. Of particular use for this paper is the section on the satisfaction about the match between education and employment. Additionally, this survey has some longitudinal component as respondents were asked about their employment situation at three points in time: one year, six years and, in for the older cohort, 11 years after graduation.

This data allows a comparison of three different measures of over-education. First, the "expert" measure is based on a definition of graduate jobs proposed by Alpin *et al.* (1998). Using the Standard Occupation Code (2-digit), the following occupations are defined as graduate jobs: all types of managers and professionals, plus computer analysts from the associate professional category. Second, as in Battu *et al.* (1999) over-qualification is defined by using the answers to the following question: "Was your degree a requirement in the job specification for your main employment?" The recoding into a binary variable follows these authors' recommendations[14]. Third, the proposed measure of educational mismatch based on satisfaction is computed: dissatisfied workers are defined as being over-educated. (The expert and satisfaction definitions are used separately.)

These definitions result in various measures of the extent of over-education in the UK graduate population that are presented in Table 1. The 'expert' definition of job-match leads to estimates of over education ranging from 13% to 21.5%; 10 percentage points lower than found by Alpin *et al.* (1998) who were using a sub-sample of graduates extracted from the Labour Force Survey[15] (1995). The difference may stem from cohort effects. The most commonly used measure of over-education is based on job requirement; which level of education is needed to "get" or "do" the job. Focusing on recent studies dealing with graduate over-education, the job requirement measure has lead to estimates of mismatch ranging from 30% to 41% (Dolton and Vignoles, 1997 and Battu *et al.*, 1999). The results, using the 'degree requirement measure', lie on the lower part of this interval. The satisfaction definition leads to results similar to those obtained with the expert definition. Over-education ranges from 12% to 20%. The younger males (females) are 7 (3) percentage points more likely to report a mismatch between their education and their job than their older peers. Evidence of gender and cohort differences in the likelihood of over-education are unclear.

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[13] The Open University is a distance learning centre and Buckingham University is a private university.

[14] Our results differ significantly from theirs as we restrict the population to graduates who were less than 25 on graduation, employed in 1996 and provided information on their earnings.

[15] The Labour Force Survey is a nationally representative survey of the UK population (150,000 individuals) conducted quarterly.

The three definitions of over-education provide various estimates of the extent of over-education in the graduate population. According to these figures, between 13% and 33% of the UK graduates are over-educated. The expert and satisfaction definitions result in the lowest over-education rate (around 18%), whereas the commonly used educational requirement definition generates a level of over-education 15 percentage points higher. This large difference indicates that employers do not always indicate the educational requirement that is truly necessary to perform the job, or, as Battu *et al*. (1999) stress, that a degree is not always a formal requirement for a graduate job, especially for managerial positions. It is also of interest to measure whether these various definitions of over-education define a similar group of graduates. Table 2 reports the proportion of the population that is classified in identical categories when using any combination of two definitions of over-education. Between 65% and 80% of the population is classified identically when using any two measures. The highest correlation is obtained when using the satisfaction and the expert definitions.

The extent of over-education appears to depend drastically on the definition used. By pooling the expert and satisfaction definitions, as recommended in Section 3, three groups of graduates are defined: matched, apparently and genuinely overeducated. The two cohorts of graduates are pooled leading to a sample size of 5552 observations. Graph 1 reports the distribution of answers to the following question: "On reflection and in general, in what ways has your degree contributed to you getting an interesting job?" The answers were reported on a 6 level scale from not at all, to a lot. It is expected that graduates in an upgraded position are somehow, positive about the contribution of their degree, whereas graduates in a low skill job should be much more critical.

The distribution of answer for matched and apparently over-educated graduates is similar. The mode answer for these two categories is 5, reflecting a high satisfaction in the contribution of the degree into getting an interesting job. Apparently over-educated are slightly less satisfied than matched workers, which would confirm that they are in jobs requiring some graduate skills. On the other hand, genuinely over-educated workers are highly dissatisfied with the contribution of their degree. More than 50% admit that their degree did not contribute to getting an interesting job. Genuinely and apparently overeducated graduates are typically in jobs that have different requirement regarding the use of graduate skills. Hence, the separation of the over-educated population into two types seems appropriate.

Table 3 reports the mean characteristics for the three groups of graduates defined. In the sample, 18% of employed graduates are not in a graduate job. However, two thirds of the over-educated graduates are only apparently over-educated and only 6% of the overall graduate population can be defined as genuinely over-educated. Over-education is more likely to affect graduates from the younger cohort than the older one. Three hypotheses could explain this difference. First, older workers have had more time to prospect the labour market and acquire, through on-the-job-training, some of the skills they were originally missing. Second, workers might revise their career expectations with time and accept their situation as inevitable. Third, it may be that graduates from the younger cohort were less likely to acquire graduate skills while studying due to over-crowding or changes in the curriculum. Unfortunately, these conflicting hypotheses cannot be tested with this data.

Women are more likely than men to accept non-graduate jobs. Married women might be more constrained in their job search by family preferences and hence are more likely to be over-educated (Frank, 1978 and Battu, Seaman and Sloane, 1998 for empirical evidence concerning the UK).

Respondents in graduate jobs possess better credentials than over-educated graduates. Depending on the repartition of genuinely over-educated workers between good graduates in an upgraded job (Ug) and plain graduates in a low-skill position (Ll), this group will on average have better or worst grades than the apparently over-educated. Genuinely over-educated appear to have been the least successful at school (A-level score) and university, hence it can be assumed that most of them are plain graduates working in a low skilled job. This supports the idea that the demand for g-type graduates is not sizeably smaller than its supply, thus over-education does not stem from a dis-equilibrium in the market for graduates but from the lack of skills of some graduates.

Genuinely over-educated workers receive the least training, 28% claim to have received work related training in the past 4 weeks; this proportion is respectively 43% and 40% for employees in graduate jobs and apparently over-educated graduates. Similarly, substantial pay differentials are observed between the three groups of graduates. Pay per hour is computed for respondents reporting working at least 10 hours a week[16]. Graph 2 reports the pay distribution for the three categories of graduates. The distribution of earnings for matched and apparently over-educated workers has a similar form; the distribution of pay per hour for workers in a graduate job has a heavier upper tail. On the other hand, the distribution for genuinely over-educated workers lies to the left of the previous two.

Graduates in a graduate occupation earn a median pay of £10.33 per hour. The pay penalty reaches 10% for being apparently over-educated and 33% for being genuinely over-educated. This large pay differential indicates that genuinely over-educated graduates are likely to be of the less-skilled type settling for jobs that have not been upgraded. Additionally, the decomposition of the pay distribution per decile (not reproduced here) reveals that for all decile, matched and apparently over-educated workers earn substantially more than genuinely over-educated workers.

5. Empirical Analysis

5.1 Over-education and training

Genuinely and apparently over-educated graduates differ in the amount of training that they receive from their employers. The former compensates their lack of job-specific skills by their excess of generic skills, whereas the latter needs to acquire job-specific skills. Training is self-reported in the survey, and for the analysis a dichotomous variable based on the answer to the following question: "Over the last four weeks have you taken part in any education or training connected with your work?" is created.

First, the determinants of training are estimated for all graduates by a probit; results are reproduced in Table 4. The exogeneous variables include dummies for faculty (11 dummies, the omitted faculty being social sciences), type of higher education institution (pre-1992, UK higher education was divided between Universities and Polytechnics, the former being more academic), three post-graduate qualifications (Masters, Ph.D., professional), A-level score, degree grade[17], and various employment characteristics.

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[16] Only grouped annual earnings are available. We use midpoints (arbitrarily fixed at £60,000 for the category £50,000 and above), and divide them by the full year equivalent of the usual weekly hours worked.

[17] UK graduates receive grades ranging from First, upper Second, Lower Second, Third, and Pass. A few institutions do not grade the results. First and upper Second are typically the requirement for a graduate job.

Institution effects on labour outcome may exist, thus in an initial step, dummies for the institution attended were included. Results were inconclusive as the number of observations per cell was drastically reduced. As a substitute the standard errors are corrected to account for some possible correlation in the non-observable characteristics of individuals attending the same higher education institution. The subject of degree significantly affects the likelihood of being trained; sciences, administration and language graduates obtain less training than social scientists, whereas graduates from education are 12% more likely to get some. Graduates with a professional qualification or a PhD, working in a medium size firm, with a permanent contract and a union representation get the most training especially if they have never been unemployed. When these covariates are introduced, no cohort or gender effect is observable. Graduates who are apparently over-educated for their job, get as much training as those in a graduate job (base category). On the other hand, graduates who are genuinely over-educated are nearly 12% less likely to have been trained in the last four weeks. The marked difference in the training obtained by the two groups of over-educated graduates confirms the assumption that over-educated workers cannot be treated as a homogeneous population. Employers provide more training to apparently over-educated workers in order to improve their productivity; as proposed by Van Eijs and Heijke (1997). On the other hand, genuinely over-educated workers, trapped in low-skill occupations, do not require training; they may compensate their lack of specific skills with formal education.

Over-education may stem from lack of information concerning the labour market (Jovanovic, 1979), or long term promotion strategy[18] (Sloane *et al.*, 1999). The realisation of these events is more likely for the younger workers. Additionally, Frank (1978) proposes that married women might be constrained in their choice of employers by their familial responsibilities. Therefore, interaction terms between gender, cohort and over-education type are added to the previous specification. The inclusion of these interactions has no significant impact on the estimates. All interaction terms are insignificant and the only change in the other independent variables is that males in a graduate job are found to be significantly less trained than females, which may come from gender differences in occupational choice (teaching and nursing are associated with high training opportunities, sometime compulsory, and are typically female occupations). Significant differences in access to employer training exist between genuinely over-educated and apparently over-educated workers. The former are 12% less likely than matched graduates to be trained, whereas no difference between apparently over-educated and matched workers is found.

5.2 Over-education and earnings

The effect of over-education on earnings has been widely documented. Previous research has generally found that the larger the spread between education obtained and education required the greater the pay penalty. Dolton and Vignoles (2000) estimate the pay penalty for over-educated graduates to range between 4% and 17%. Battu *et al.* (1999) estimate an average over-education penalty for graduates six years after graduation ranging from 11% to 17%. Log hourly pay is estimated using the same exogeneous variables as for the training regression.

Hence, dummies for these two grades are entered in the regression.

[18] Employees accept a position for which they are overeducated, as they expect that having a "foot in the door" will increase their likelihood of obtaining, in the future, a position for which they are appropriately qualified.

$$\ln(w_i) = b_x X_i + b_s S_i + b_o O_i + e_i \qquad (1)$$

In this case, S is a set of post-graduate qualifications, O is vector of dummies defining over-education and X is a vector of job and personal characteristics. ε captures unobservable idiosyncratic characteristics and the subscript i refers to the individual.

Graduates from biology, agriculture, architecture, language and humanity earn substantially less than social science graduates whereas math students earn more. The quality of education is also associated with higher wages as a higher A-level score, degree grade and a degree from a University as opposed to a polytechnic are positively rewarded. Pay increases with tenure, firm size and having a permanent contract, decreases with length of unemployment, working in the public sector and union representation. Variations in experience are limited within cohort and experience is not found to be a significant determinant of pay. Marital status and gender also have the expected effect on pay.

First, in order to offer a comparison with previous studies on the effect of over-education on earnings, a single dummy for not being in a graduate job is included. A pay penalty of 13% is estimated, in line with previous estimates. The pay penalty compared to matched graduates is estimated at 7% and 26% for respectively apparently and genuinely over-educated graduates. In the third column of Table 5, results with the gender and cohort interaction terms are reported. The interaction terms have the expected sign, females and younger workers are more penalised for their over-education but these are not statistically significant. The addition of these interaction terms does not affect the conclusion about the effect of over-education on pay. The pay penalty for being over-educated is estimated at 33% for the genuinely over-educated and 6% for the apparently over-educated. The large difference observed in pay between the two groups of over-educated workers reinforces the view that the over-educated worker group cannot be considered to be homogeneous. Moreover, gender and cohort do not affect the pay penalty for being over-educated, which confirm the previous literature (see the meta-analysis of Groot and Maasen van den Brink, 2000).

Returns to a degree in the UK are typically in the range 30% to 50% (Chevalier and Walker, 1999; Blundell *et al.*, 2000). Thus, genuinely overeducated graduates suffer from a pay penalty compared to other graduates that nearly wipes out all returns from a degree. This is an important consideration to keep in mind as the debate on the increase of university fees has recently surged (Greenaway and Haynes, 2000).

5.3 Skills differential

This method of estimating the pay penalty for being over-educated is based on the underlying assumption that all graduates are similar in their skills, where skills also include motivation and other unobservable characteristics affecting productivity. Assuming that over-educated workers are somehow less skilled than matched workers then the estimated pay differential for being over-educated is biased upwards as it includes returns to skills specific to the better group of graduates. Formally, ε_i in (1) partly measures the endowment in unobservable (to the econometrician) skills. Since skills and over-education are correlated, the estimates of β_o is equal to:

$$\hat{b}_o = b_o + \frac{\mathrm{cov}(O_i, e_i)}{Var(O_i)} \qquad (2)$$

To overcome this difficulty a measure of these unobservables is needed. The longitudinal structure of the data is used. Earnings one-year after graduation are estimated. The residuals of this equation approximate the unobservable idiosyncratic characteristics affecting the workers' productivity. This measure of individual characteristics is then introduced as an exogeneous variable when estimating current earnings. The estimated equation has then the following form:

$$\ln(w_i) = b_x X_i + b_s S_i + b_o O_i + b_A A_i + h_i \qquad (3)$$

where A_i is a proxy for the individual unobservable skills. The over-education dummy and η are now independent, which guarantee the unbiasness of β_o.

Graduates who were matched in their first job are excluded, as their first-job earnings reflect the perfect match and are not comparable with those of mismatched workers. Only graduates from the 1990 cohort who were not in a graduate job during their first year in the labour force are kept. The base category is defined as graduates who made the transition to a graduate job by 1996 when they are observed. Dolton and Vignoles (1997) show that there is no stigma to over-education; graduates who made the transition to a graduate job have the same earnings profile afterwards than graduates who never were over-educated. Hence graduates who made the transition to a graduate job are equivalent in their endowment of skills to graduates who never were over-educated. Thus, the skill differential measured by this method is an approximation of the skill differential between g-graduates and l-graduates.

With all these exclusions, the sample size drops to 815 over-educated graduates. By 1996, 48% made the transition to a graduate job, 32% are apparently over-educated and 20% are genuinely over-educated. These figures are in range with Dolton and Vignoles' (1997) results on a population of 1980 graduates. Annual earnings in 1991 are grouped into 16 categories, band-midpoints define the annual earnings of the individual. As hours are also grouped, log annual earnings are estimated with a dummy for full-time employment among other exogeneous variables covering the human capital and labour characteristics of the individual in 1991. This specification explains 26% of the variation in pay in the first job. The main determinants are job specific as the sample is rather homogeneous in educational attainment. The residuals from this equation are used to calculate a z-score that is used as a proxy for skills and introduced as a covariate in the current pay regression.

For each individual, the z-score is a measure of the skills differential to the average skills for individuals with the same observable characteristics. This term is positive and significant[19], indicating that less talented individuals suffer from a substantial pay penalty (see Table 6). A skills differential of one standard deviation reduces current earnings by 10%. The inclusion of the proxy for idiosyncratic skills has the expected effect on the penalty for being over-educated. Genuinely over-educated workers pay is reduced by 19%, whereas apparently over-educated workers do not suffer from any wage penalty when unobserved characteristics are accounted for. However, as unobservable personal attributes not only affect earnings but also the probability of being over-educated, interaction terms between idiosyncratic qualities, as measured by the z-score, and the dummies for over-

[19] As the skill proxy variable is estimated, its inclusion in the wage regression leads to biased standard errors. The reported standard errors are estimated by bootstrap with 1000 replications (Efron, 1979).

education are also included. This specification presented in the second column of Table 6 leads to a similar conclusion. The penalty for being genuinely over-educated remains at 18%, the effect of lower skills is reduced to a pay penalty of 7.5% for one standard deviation, and genuinely over-educated workers with skills one standard deviation lower than the average are paid 7.5% less than other genuinely over-educated workers. When their skills are accounted for, workers in an upgraded job do not suffer from any pay penalty compared to their peers in a graduate job.

The skills differential explains 30% to 40% of the earnings differential between genuinely over-educated and matched graduates and the whole pay gap between apparently over-educated and matched graduates. Therefore, previous research that did not account for the skills differential within the graduate population has overestimated the effect of over-education on earnings.

6. Conclusion

Graduates, even with similar qualifications are not homogeneous in their endowment of skills. This variation in talent has led to an over-estimation of the extent and effect of over-education on earnings in previous research. The group of graduates traditionally defined as over-educated can be divided between apparently and genuinely over-educated. The apparently over-educated group has slightly lower opportunities to improve its human capital and is paid nearly 6% less than well-matched graduates. However, this pay penalty disappears when a measure of ability is introduced. On the other hand, genuinely over-educated graduates have a reduced probability of getting training (-12%) and suffer from a pay penalty reaching 33% compared to the reference group.

Alternatively, one could argue that the causality could be reversed: workers with lower pay and reduced training opportunities are more likely to report over-education. However, genuine over-education appears to be associated with a lack of skills. 30 to 40% of the pay differential can be explained by the lower amount of skills of this group compared to their peers in a graduate occupation. The reduced skills could explain lower earnings and the lack of training opportunities and thus reject the reverse causality assumption.

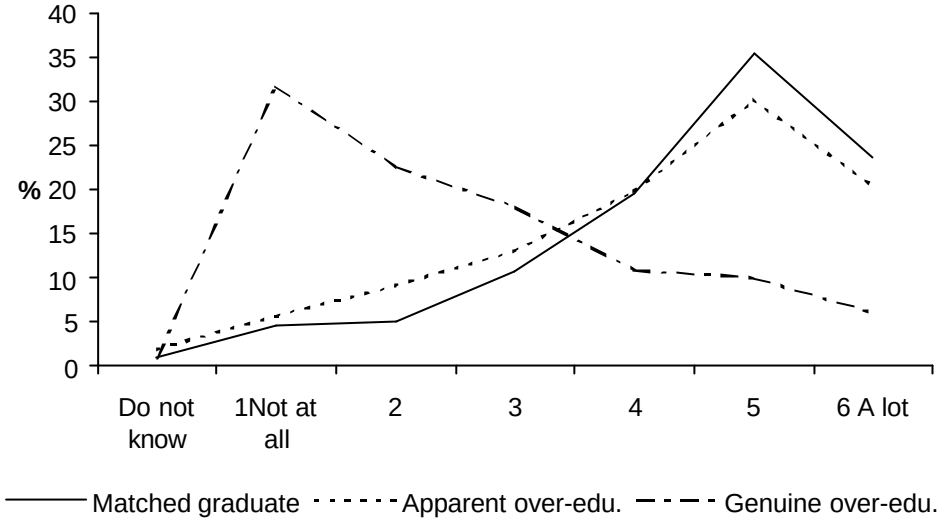
As a large number of graduates do not seem to be able to acquire "graduate" skills while at university, it is worth pondering whether mis-skilled graduates best satisfy employers' needs for employees with intermediate skills or whether employees with more vocational qualifications would be more appropriate. The mis-qualification of the workforce is costly for the society and for the individuals; with a pay penalty reaching 30%, returns to a degree are close to zero (see Blundell *et al.*, 2000). However, a degree can be viewed as a signalling device. In the absence of alternative vocational qualifications, individuals with sub-graduate qualities may make a rational choice by going to university in order to reveal their characteristics and obtain an upgraded job. Also, over-education may reduce the likelihood or the length of unemployment compared to less educated workers. For the less able graduates, a degree is an expensive way to provide a signal. The provision of less academic tertiary qualifications would lead to a more cost-efficient sorting.

This paper does not focus on the determinants of over-education, but as over-education relates to skill differentiation, it will be interesting to study the effect of university quality and field of study on the likelihood of over-education and exit rate from over-education. This issue has been explored by Robst (1995) in the US and partly by Mason (1999) in the UK. The large increase in the intake of students that took place since the mid-

eighties in the UK was associated with a reduction of the cost per student. This may have lead to less personal attention being given to student, and contributed to the increase in the heterogeneity in the skills of graduates. Over-education might also stem from the irrelevance of the university curriculum *vis-a-vis* the job market or the choice of subjects made by the students. Additionally, extra-curriculum activities might reduce the likelihood of over-education by acting as a signal for non-academic skills.

Finally, a substantial proportion of the surveyed population reported being dissatisfied with their education-job match despite being in a graduate job. The effect that this dissatisfaction may have on apparently well-matched graduates' productivity, career development and earnings profile should be worth exploring. It could also indicate that dissatisfaction about the match between education and occupation measures more than over-education.

Graph 1: Contribution of Your Degree in Getting an Interesting Job



Graph 2: Distribution of Pay Per Hour by Over-Education Group

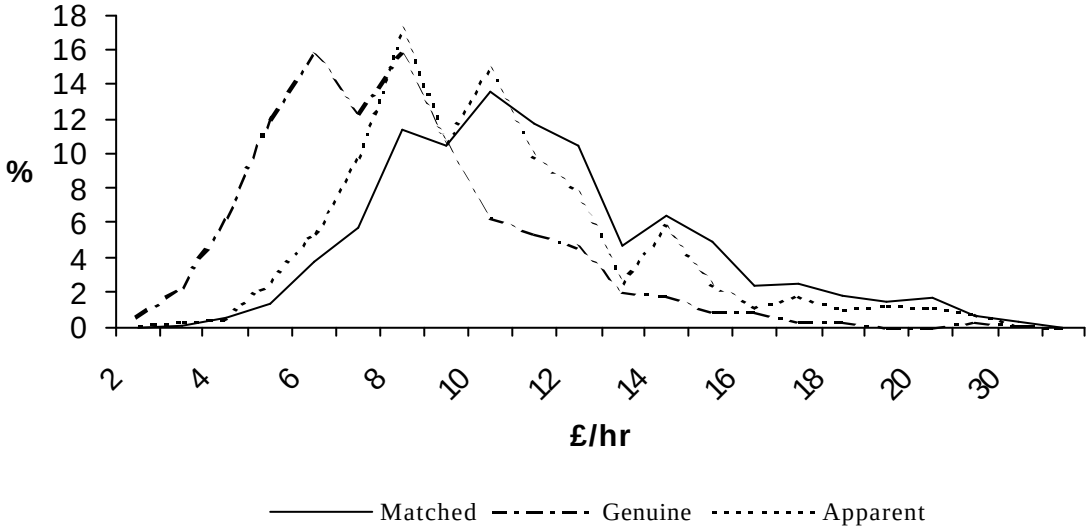


Table 1: **Measures of Over-Education, in Percentage**

	Not in graduate occupation	Degree not a requirement	Not satisfied with the match job/qualification	Observations [1]
Male cohort 85	13.00	33.83	12.73	1277 (1257)
Male cohort 90	18.88	33.82	20.02	1780 (1748)
Female cohort 85	14.68	30.87	14.42	988 (964)
Female cohort 90	21.57	30.93	17.44	1924 (1864)

1: The sample size for the match job/qualifications is smaller due to some missing values on that variable. The sample size for this variable is reported in brackets.

Table 2: **Proportion Similarly Defined Between Measures of Over-Education**

		Graduate job		Job requirement	
		Cohort 1985	Cohort 1990	Cohort 1985	Cohort 1990
Job requirement	Male	67.3	72.0		
	Female	71.7	72.2		
Satisfaction	Male	79.4	75.7	65.6	70.2
	Female	80.0	78.4	72.6	73.8

Table 3: **Mean and Standard Deviation of Selected Variables**

	Well match	**Genuinely over-educated**	**Apparently over-educated**
Cohort90	0.6061	0.7800	0.6619
	(0.4887)	(0.4148)	(0.4734)
Gender	0.5161	0.4457	0.4921
	(0.4998)	(0.4978)	(0.5003)
Married	0.4513	0.2714	0.3884
	(0.4977)	(0.4453)	(0.4878)
Child number	0.3650	0.2286	0.2972
	(0.7357)	(0.5954)	(0.6768)
University	0.6697	0.4771	0.5770
	(0.4704)	(0.5002)	(0.4944)
A-level	9.1873	7.4657	8.1069
	(4.0655)	(3.7809)	(4.0762)
First	0.0769	0.0400	0.0519
	(0.2664)	(0.1962)	(0.2220)
2:1	0.3932	0.3114	0.3616
	(0.4885)	(0.4637)	(0.4809)
Employment	85.4265	70.6571	82.6447
	(32.3454)	(28.0742)	(31.5766)
Unemployment	2.5463	7.2057	3.9403
	(5.8253)	(9.7691)	(7.5049)
Tenure >4 years	0.5056	0.3829	0.4277
	(0.5000)	(0.4868)	(0.4951)
Training last month	0.4280	0.2857	0.4009
	(0.4948)	(0.4524)	(0.4905)
Pay per hour	11.2429	7.6015	10.1255
	(4.7800)	(3.6947)	(4.5870)
Size 25-99	0.1965	0.1457	0.1903
	(0.3974)	(0.3533)	(0.3928)
Size 99 or more	0.6600	0.6771	0.6698
	(0.4738)	(0.4682)	(0.4707)
Union	0.3078	0.2571	0.2248
	(0.4616)	(0.4377)	(0.4178)
Public sector	0.3575	0.3171	0.2657
	(0.4793)	(0.4660)	(0.4421)
Observations	4566	350	636

Table 4: **Probit- Training in the Last 4 Weeks**

	Marginal effect	**z-value**	**Marginal effect**	**z-value**
Genuine Over education	-0.1172 (0.0303)	-3.65	-0.1261 (0.0530)	-2.22
Apparent over education	-0.0023 (0.0319)	-0.07	-0.0453 (0.0646)	-0.69
Man* genuine over ed.			0.0039 (0.0503)	0.08
Man* apparent over ed.			0.0738 (0.0407)	1.83
Cohort90* genuine over ed.			0.0101 (0.0771)	0.13
Cohort90 * apparent over ed.			0.0116 (0.0593)	0.2
Cohort90	-0.0185 (0.0554)	-0.33	-0.0211 (0.0555)	-0.38
Male	-0.0256 (0.0141)	-1.81	-0.0343 (0.0164)	-2.09
Observations	5552		5552	
Pseudo R^2	0.0424		0.0427	

Note: Hubert White standard error and cluster analysis (by type of Higher Education Institutions)
The regression also includes dummies for faculty, type of HEI, post-graduate qualification, A-level score, degree grade, tenure, employer's size, union, public sector and type of contract. Also, months of unemployment and a quadratic in month of employment are included.

Table 5: OLS Ln Pay Per Hour - All Graduates

	Specification 0	Specification 1	Specification 2
Over-education	**-0.1340** **(0.0146)**		
Genuine Over education		**-0.2595** **(0.0195)**	**-0.3371** **(0.0456)**
Apparent over education		**-0.0699** **(0.0148)**	-0.0623 (0.0361)
Man* genuine over ed.			0.0214 (0.0447)
Man* apparent over ed.			0.0192 (0.0153)
Cohort90* genuine over ed.			0.0871 (0.0570)
Cohort90 * apparent over ed.			-0.0256 (0.0383)
Cohort90	0.0443 (0.0497)	0.0416 (0.0497)	0.0371 (0.0479)
Male	**0.0187** **0.0080)**	**0.0185** **(0.0078)**	0.0146 (0.0080)
Constant	**1.7088** **(0.0826)**	**1.7302** **(0.0839)**	**1.7332** **(0.0848)**
Observations	5552	5552	5552
R^2	0.3781	0.3871	0.3879

Note: Hubert White standard error and cluster analysis (by type of HEI)
The regression also includes dummies for faculty, type of HEI, post-graduate qualification, A-level score, degree grade, region, tenure, employer's size, union, public sector and type of contract. Also, months of unemployment and a quadratic in month of employment are included.
Bold characters are significant at the 5% level

Table 6: OLS Ln Pay Per Hour 90s Graduates With Mismatched Spell

	Specification 1	Specification 2
Genuine Over education	**-0.1871**	**-0.1847**
	(0.0300)	**(0.0306)**
Apparent over education	-0.0145	-0.0153
	(0.0233)	(0.0254)
Skill: z-score	**0.1001**	**0.0747**
	(0.0147)	**(0.0190)**
Skill * genuine ov.ed.		**0.0745**
		(0.0389)
Skill * apparent ov.ed.		0.0475
		(0.0358)
Constant	**1.8110**	**1.8411**
	(0.2309)	**(0.2308)**
Observations	815	815
R^2	0.4004	0.4076

Note: Standard errors obtained by bootstrap, 1000 replications.
The regression also includes dummies for faculty, type of HEI, post-graduate qualification, A-level score, degree grade, region, tenure, employer's size, union, public sector and type of contract. Also, months of unemployment and a quadratic in month of employment are included.
Standard errors not corrected for the inclusion of residuals.
Bold characters are significant at the 5% level

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