Graduate over-education in the UK

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Abstract:
A greater access to education has been the goal of most governments, the corollary of such policies is that doubts have emerged over the capacity of the labour market to absorb a growing proportion of qualified workforce. A large literature on over-education has therefore emerged. However, a clear and un-disputed definition of over-education is still lacking.
We stress that pupils with identical qualification are not homogeneous in their endowment of skills. This variation in talent has lead to an over-estimation of the extent and effect of over-education in previous research. We define two categories of over-educated workers. Workers from the first group, called "apparently" over-educated, are satisfied with the match between their education and their position, whereas the "genuinely" overeducated are dissatisfied with this match.
The apparently over-qualified group has slightly lower opportunities to get training and is paid nearly 7% less than well-matched graduates. On the other hand, genuinely over-qualified graduates are 12% less likely to be offered employer-funded training and suffer from a pay penalty reaching 33% compare to the reference group.
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 study, completed on a sample of two cohorts of UK graduates put some lights on the skill heterogeneity of graduates. Its omission biases the extent of over-education (estimated at 6% of the graduates, compared to previous estimates ranging from 17% to 30%), and its negative effect on earnings.

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4.1: INTRODUCTION

Britain has long been characterised by a lower proportion of its youth investing in higher education than other OECD countries. A common government policy has been to encourage participation in post-compulsory 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). The reform of the university system in the UK in the beginning of the Nineties has been a success; 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. Doubts have surged that the demand for graduates kept up with the supply. Mason (1996), examining the recruitment of graduates in the UK financial industry in 1995, discovered 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 tremendous amount of public money is wasted subsidising higher education.

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 (Sloane *et al.* (1999), Dolton and Vignoles (1996, 1997), Groot (1996), Groot and Maasen van den Brink (1997), Battu *et al.* (1999), Green *et al.* (1999)). All mentioned studies conclude that overeducated workers have lower returns to their education[2]. We propose

[2] See also Groot and Maasen van den Brink (1996) for a meta-analysis of the effect of over-education on the returns to education.

an alternative measure of over-education and estimate the penalty on pay and training affecting mismatched workers.

In the Nineties, access to higher education has been widened, which has increased the heterogeneity of the skills of the new graduates entering the labour market. At the same time, employers faced by a more qualified pool of candidates, may have upgraded the required skills for traditionally non-graduate jobs, or alternatively recruited graduates for jobs that have stayed the same (referred as qualification inflation); see Robinson and Manacorda (1996) for empirical evidence concerning the UK. Moreover, the increased participation in tertiary education has generated a lack of qualified school leavers, thus employers may consider graduates as an adequate substitute. For these various reasons, we argue that previous measures of overeducation may have overestimated the true extent of the phenomenon, as some graduates are not endowed with the skills required to obtain a graduate job. We propose a division of over-educated workers between *apparently* over-educated and *genuinely* over-educated.

We test the hypothesis that over-educated graduates do not belong to a homogeneous group by comparing the amount of training they receive and their earnings. As the labour market is not transparent, the costs of finding the perfect match are high. In some situations, employers and employees might have an incentive to agree on a non-optimal match. Employers should then provide more training to over-educated workers to bring their skills in line with the requirement of

the job (*apparently* overeducated). 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 have shorter tenure since they keep looking for a better match, therefore firms are less likely to invest in their training (*genuinely* overeducated). Hence, we hypothesise that apparently overeducated workers receive more employer-funded training than the genuinely overeducated workers.

We also examine the effects of over-education on current earnings. The skill differential generates a difference in the productivity of the different types of graduates. We expect the earnings of an overeducated graduate to be lower than those received by matched workers; furthermore we anticipate the genuinely overeducated to earn the least.

4.2: DEFINITIONS OF OVEREDUCATION

Before developing our measures of over-education, we should note that the concept of over-education has some detractors. 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 (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; investment in education did not collapse, as forecast, and returns to education remained high[3]. Similarly, in the UK, despite the recent evidence that between 29% and 47% of

[3] University attendance in the UK declined in 1999, but this is likely to be due to the introduction of university top-up fees.

the work-force is over-educated (Green *et al.* (1999), returns to education stayed stable or even increased slightly between 1978 and 1996 (Chevalier and Walker (1999)), implying that the demand for skills kept up with the supply.

Furthermore, in this model of supply and demand, over-education is only due to a temporary dis-equilibrium. Empirical evidence rejects this scenario, as over-education appears to be a permanent feature of the economy. Moreover, overeducated workers may remain in a mismatched situation. Despite the increased mobility of over-educated workers, (Sloane *et al*. (1999)) there is no evidence that the quality of the match improves with the change of employer. Dolton and Vignoles (1997), analysing the early careers of the 1980 graduates, found that 62% of male graduates, who were over-educated in their first job, remained in a sub-graduate position six years after graduation.

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[4]. 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, stable returns to education over time, and non-promotion of over-educated workers.

Human capital theory is based on the assumption that workers are paid their marginal product i.e. employers adapt the job requirements to the employee's skills. Hence over-education is an artifact that stems from the heterogeneity of graduates in human capital endowment. Most of the literature has ignored the issue of heterogeneity by defining

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

over-education as departing from a norm[5], and assuming the homogeneity of all workers with an identical qualification, therefore overestimated the extent of over-education.

Empirical work relies on three definitions of over-education. First, the employee's education is compared to the self-assessed qualification required to perform this job[6]. Second, the researcher relies on some "expert" definition of educational requirement for a given occupation. Third, the distribution of education is calculated for each occupation; employees who depart from the mean by more than some ad hoc value (generally one standard deviation) are classified as over-educated. These definitions of over-education suffer from major problems, which will now be examined.

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, employees have to match a specific level of skills with a qualification level; this might be asking too much of employees who are no longer in contact with the educational system. Additionally, employees might report the current hiring standards, which in the presence of qualification inflation will bias the over-education measure upward. Educational standards are commonly suspected to decrease over-time, therefore employers might upgrade their qualification requirement to select candidates with the appropriate skills.

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[5] Robst (1995) includes ability and institution quality measures and find that US graduates with higher ability and from more prestigious institutions are less likely to be overeducated and more likely to exit overeducation.

[6] 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.

This phenomenon (known as grade-drift) generates noise when employees self-assess the required qualification of their job.

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 specificity of the individual's position.

The statistical definition of over-education is the least desirable. As it is based on the 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 of employees in that 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 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 the distribution of education per occupation is normal (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 schemes, this assumption would be far stretched[7]. 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

[7] 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. Also Dolton (1992) provides empirical evidence on the variations in the employment and evolution of career of UK graduates (Cohort 1980) by faculty.

hired for their task-flexibility[8]. Finally, the literature on over-education has been criticised for treating education as the only human capital variable; on-the-job training and other non-academic skills are largely ignored. This critique is more important for under-education issues where employees with a large amount of on the job training or experience are likely to be classified as under-educated.

We propose an alternative measure of the match between education and job, based on one's assessment of one's position but that is not based on a required level of education. We rely on the following question: " How dis/satisfied are you with the match between your work and your qualifications?" The possible answers are grouped into 6 categories ranging from very dissatisfied to very satisfied. We generate a bad-match dichotomous variable 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.

This measure acknowledges Halaby's (1994) critique that, individuals with a given education level are not always inter-changeable and that a given occupation may require different skills from each individual. The match measure is not affected by the drawbacks of the previously exposed measures of over-education, however, as it is defined as a dichotomous variable, the extent of the mismatch cannot be calculated[9].

[8] See Halaby (1994) for a comprehensive discussion on these issues of job and qualification heterogeneity.

[9] 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 is not enough to constitute a representative group.

4.3: DATA

To conduct this study, we use a sample of two cohorts of UK graduates. 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. Graduates from the Open University and the University of Buckingham were dropped due to their non-representativity of the usual graduate population. Furthermore, graduates who were older than 25 on graduation or disable were dropped as these two characteristics might affect their satisfaction. We also drop self-employed graduates. The questionnaire covers a wide range of topics, including schooling, academic information, family background and employment. Of particular use for this paper is the section on the satisfaction about the match between education and employment. Additionally, this survey has some panel components as respondents were asked about their employment situation at three points in time: one year, six years and, in the case of the older cohort, 11 years after graduation. Hence, this survey provides some hindsight on the early careers and the evolution of over-education over time for the UK graduate population.

We define three different measures of over-education. First, our "expert" measure is based on a definition of graduate jobs proposed by Alpin *et al.* (1998). Using the Standard Occupation Code, the following occupations are defined as graduate jobs: all types of managers and professionals, plus computer analysts from the associate professional category.

The other two measures are based on employee's assessments. Second, we replicate the work of Battu *et al.* (1999) on over-qualification 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[10]. As the respondents are still at an early stage of their career, this question might be considered as being similar to "what would be the qualification required to get your job?" Third, we compute our proposed measures of educational mismatch. Dissatisfied and very dissatisfied workers are defined as being over-educated.

These definitions result in various measures of the extent of over-education in the UK graduate population that are presented in Table 4.1. 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[11] (1995). The difference may stem from the absence of young graduates in our sample, who are generally found to have the highest rate of over-education. Women and younger respondents appear to be more likely to be over-educated. These early statements should be taken with caution as they might stem from differences in occupational or industry choice, and 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 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)). Our

[10] 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.

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

results, using the 'degree requirement measure', lie on the lower part of this interval. The gender differential in over-education is reversed with this definition (3% points lower for women) but the cohort differential disappears.

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 about gender difference in the likelihood of over-education are unclear.

The three definitions of over-education provide various estimates of the extent of over-education in the graduate population. According to our 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 4.2 reports the correlation coefficients between the different measures of over-education; the coefficients are quite low indicating that the various measures capture different aspect of over-education. For example, being in a

graduate job (as defined by the occupation) and being in a job which requires a degree have correlation coefficients ranging from 0.10 to 0.30.

4.4: SATISFACTION AS A MEASURE OF OVER-EDUCATION

As the correlation between the expert and satisfaction definitions of over-education is rather low, we combine them in order to capture various aspects 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. We assume that there are two types of jobs that graduates can apply for: graduate jobs (G) and jobs demanding lower academic skills (L). Graduates of lower ability (l) cannot obtain a graduate job of type G; they therefore accept offers at the lower level (job L). 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 l-graduates and the lack of workers with intermediate skills, this type of match can be considered as appropriate. Therefore, a graduate in this situation is defined as "apparently over-educated". Type g graduates get type G jobs; this is a perfect match. However, the supply of g-graduates might exceed the demand for them and some have to accept low-skill jobs[12]. These mismatched graduates are "genuinely overeducated" for their job. After a period of time, employers might note that this excess of qualified

[12] Lack of mobility or information could also lead to a similar outcome.

workforce could be better used; they might upgrade the skills required to perform some of the non-graduate jobs.

The division of the graduate job market presented above can be extended to include traditionally non-graduate jobs whose skill requirements have been upgraded to account for the improved workforce quality. The skills required for an upgraded job are somewhat lower than for a graduate job. 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, but those at the end of the queue might only get upgraded jobs. Less skilled graduates are not offered graduate jobs, and they compete for upgraded job. Similarly, some of them can only get a non-graduate job. 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, the genuinely over-educated graduates might be able to move into a “perfect

match" job if they are g-type or an "upgraded job" if they are the less skilled (l-type). 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.

For the remainder of our empirical work, we separate the graduate population into three groups. Graduates in graduate jobs (Gg), as defined by their occupation, are our control group. Graduates who are not in a graduate job are split between those who claim to be mismatched, defined as genuinely over-educated (Ug, Ll) and those who are satisfied by the match between their qualifications and their job, the apparently over-educated (Ul). To obtain a reasonable sample size of 5552 observations, we pool the two cohorts of graduates.

Table 4.3 reports the mean characteristics for the three groups of graduates defined. In our sample, 18 % of employed graduates are not in a graduate job. However, two thirds of the overeducated graduates are only apparently overeducated and only 6% of the overall graduate population can be defined as being genuinely over-educated. This figure is considerably lower than previously found. Over-education is more likely to affect graduates from the younger cohort than the older one. 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. Alternatively, it may be that graduates from the younger cohort were less likely to acquire these graduate skills while studying. Unfortunately, these two conflicting hypotheses cannot be tested with our data. The proportion of graduates from the 1990 cohort are 60% for the perfect match group, 78% for genuinely over-educated and 66% for apparently over-educated (graduates from the 1990 cohort represent 62% of the total sample).

We report that a high proportion of women accepts non-graduate jobs. Married women might be more likely to be constrained in their job search by family preferences and hence are more likely to be overeducated (Frank (1978) and Battu *et al.* (1998) for empirical evidence concerning the UK). At this stage we cannot comment on the differences in marital status and parenthood decisions as these variables are affected by the cohort composition of the three groups of graduates.

We expect respondents in graduate jobs to possess better credentials than the overeducated graduates. Depending on the repartition of genuinely overeducated 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. Our result shows that the genuinely over-educated appear to have been the least successful at university, hence we can assume 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. Over-education appears to generate from the lack of skills of some graduates.

Genuinely over-educated workers are more likely to change jobs in order to get a better match, hence their tenure is shorter. Looking for a better match, they might expose themselves to unemployment. Additionally, they might prospect the labour market for a longer period of time before accepting a low quality job. Hence we expect the unemployment spells to be the smallest for graduates in a graduate job and the highest for the genuinely over-educated. The data confirms that genuinely over-educated workers have a shorter tenure on the job (measured by the proportion who have spent more than 4 years with their current employers) and longer spells of unemployment. We cannot attach too much significance to these differences as cohort effects may affect them. Human capital theory predicts that over-education is a substitute for training provided by the employer. Additionally, employers might benefit from externalities provided by the over-educated workers in the form of informal training of their less educated workmates[13]. In our data, we observe that 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.

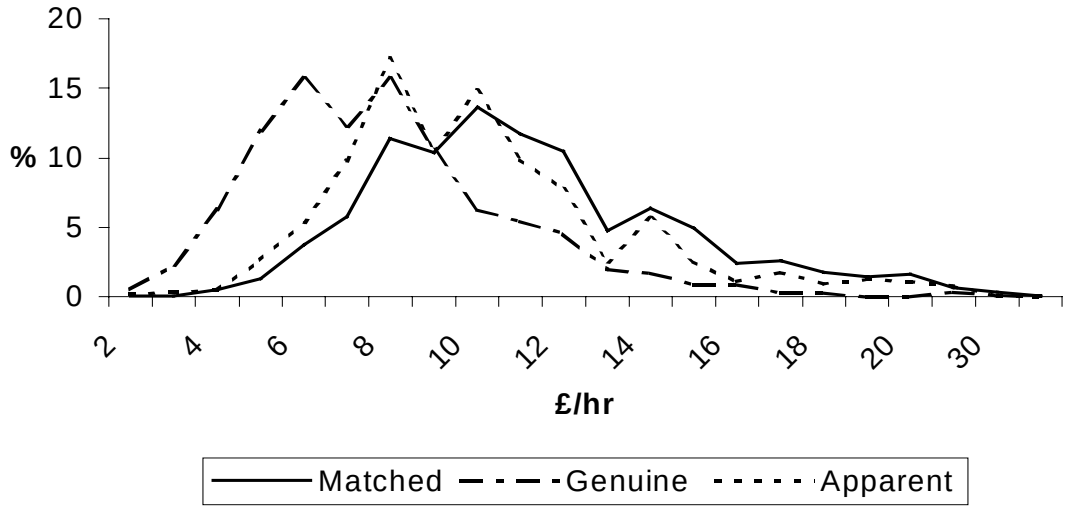
Substantial pay differentials are observed between the three groups of graduates. We compute pay per hour for respondents reporting working at least 10 hours a week[14]. See Graph 4.1 for the pay distribution for the three categories of graduates defined. The distribution of earnings for matched and apparently over-educated workers has a similar

[13] Alternatively, over-education might lead to work dissatisfaction and reduce the productivity of workers (Belfield (2000)).

[14] 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.

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.

Graph 4.1: Distribution of pay per hour by over-education group



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, we decompose the distribution of pay per earnings decile (not reproduced here). For all decile, matched and apparently over-educated workers earn substantially more than genuinely overeducated workers.

4.5: EMPIRICAL ANALYSIS

4.5.1 Over-education and training

We previously argued that genuinely and apparently overeducated graduates differ in the amount of training that they receive from their employers. Genuinely overeducated workers compensate their lack of job-specific skills by their excess of generic skills, whereas apparently over-educated workers need to acquire job-specific skills. Training is self-reported in our survey, and we create 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?"

First, we estimate the determinants of training for all graduates by a probit, results are reproduced in Table 4.4 for the three groups of graduates. 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, A-level score, degree grade (first and upper second), and various employment characteristics.

We test whether higher education institutions affected the labour outcome of their graduates, by including dummies for the HE institution attended. Results were inconclusive as the number of observations per cell plummeted. As a substitute we correct the standard errors to account for some possible correlation in the non-observable characteristics for individuals who attended the same higher education institutions.

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 adjusting for these various variables, no cohort or gender effect is observable. Graduates who are apparently overeducated 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 overeducated graduates confirms our assumption that overeducated 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) but genuinely over-educated workers are in low-skills occupation and do not require training; they may compensate their lack of specific skills with formal education.

So far, we have assumed that over-educated workers lack specific skills. However, other possible determinants can be put forward, such as lack of information concerning the labour market (Jovanovic (1979)), or long term promotion strategy[15] (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

[15] 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.

choice of employers by their familial responsibilities. Therefore, interaction terms between gender, cohort and over-education type were added to the previous specification to test whether younger workers and females are more affected by over-education. Estimates of the probability of getting training are presented in the second column of Table 4.4. The inclusion of these interactions has no significant impact on our estimates. The penalty for being genuinely over-educated is a reduction of 12% in the likelihood of receiving paid training compared to matched graduates. No significant difference in the training of matched graduates and apparently over-educated graduates is observed. 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. Assuming that training is associated with a better match, we reject the assumptions that graduates from the 1990 cohort and females are more prone to over-education.

4.5.2 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 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%. We estimate the log hourly pay using the same exogeneous variables as for the training determinants, in a simple Mincerian specification:

$$Ln(w_i) = \beta_x X_i + \beta_s S_i + \beta_o O_i + \varepsilon_i \quad (1)$$

In our 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. Since we have cohort data, variations in experience are limited 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. However, when differentiating between the two groups of over-educated graduates, we find that apparently overeducated graduates suffer from a pay reduction of 7% whereas genuinely overeducated are penalised by a 26% reduction, see Table 4.5. In the third column of Table 4.5, we report results with the gender and cohort interaction terms. The interaction terms have the expected sign, females and younger workers are more penalised for their over-education but this is not statistically significant. Moreover 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 our view that the overeducated 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 (1996)).

4.5.3 Skills differential

This method of estimating the pay penalty for being overeducated is based on the underlying assumption that all graduates are similar in their skills. If we assume 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, we assume that 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:

$$\hat{\beta}_o = \beta_o + \frac{\text{cov}(O_i, \varepsilon_i)}{Var(O_i)} \qquad (2)$$

To overcome this difficulty, we propose to estimate the earnings one-year after graduation and keep the residuals of this equation as a proxy for unobservable idiosyncratic characteristics affecting the workers' productivity. This measure of

individual characteristics is then introduced as an exogeneous variable when estimating current earnings and training. The estimated equation has then the following form:

$$Ln(w_i) = \beta_x X_i + \beta_s S_i + \beta_o O_i + \beta_A A_i + \eta_i \quad (3)$$

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. We therefore keep only graduates who were not in a graduate job during their first year in the labour force. 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 overeducated. 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 is an approximation of the skill differential between g-graduates and l-graduates.

We focus on graduates from the 1990 cohort, who were in a non-graduate job, as defined by Alpin *et al* (1998) in 1991. The sample size drops to 815. By 1996, 48% made the transition to a graduate job, 32% are apparently over-educated and 20% are genuinely overeducated. 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, we use midpoints to define the annual earnings of the individual. As hours are also grouped, we estimate annual earnings and include 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.

We estimate the determinants of current pay for this group of graduates including the skills proxy; results are presented in Table 4.6. For each individual, the z-score is a measure of the skills differential to the average skills for individuals with the same characteristics. This term is positive and significant, indicating that less talented individuals suffer from a substantial pay penalty. A skills differential of one standard deviation reduces earnings by 10%. The inclusion of the proxy for idiosyncratic skills has the expected effect. The penalty for being genuinely overeducated is reduced to less than 19%, whereas apparently over-educated workers do not suffer from any wage penalty when unobserved characteristics are accounted for.

However, some selection issues may affect this specification. Unobservable personal attributes not only affect the earnings but also the probability of being over-educated. We augment the previous specification with interaction terms between idiosyncratic qualities, as measured by the z-score, and the dummies for over-education. This specification presented in the second column of Table 4.6 leads to a similar conclusion. The penalty for being overeducated 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 graduates 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 is likely to have overestimated the effect of over-education on earnings.

4.5: CONCLUSION

We hypothesised that graduates, even with similar qualifications are not homogeneous in their endowment of skills. This variation in talent has lead to an over-estimation of the extent and effect of over-education on earnings in previous research. The group of graduates traditionally defined as being overeducated can be divided between apparently and genuinely overeducated. This framework offers a better representation of the graduate population. The apparently over-qualified 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-qualified graduates have a reduced probability of getting training (-12%) and suffer from a pay penalty reaching 33% compare to the

reference group. Thirty to 40% of the pay differential can be explained by the lower amount of skills of this group of graduates compared to graduates in a graduate occupation.

Employers not only demand graduates but also workers with intermediate skills. As a large number of graduates do not seem to be able to acquire "graduate" skills while at university, it is worth wondering whether mis-skilled graduates best satisfy employers' needs or whether young adults with higher vocational qualifications would be more appropriate and less costly to educate. The mis-qualification of the workforce is costly for the society and for the individuals. However, this process can be viewed as a signalling device. In the absence of relevant 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. For the less able graduates, a degree is an expensive way to provide a signal, acquiring some less academic tertiary qualifications would be more cost-efficient.

We did not focus on the determinants of over-education, but as we relate over-education 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) for the US and partly by Dolton (1996) in the UK. 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,

Finally, a substantial proportion of our 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.

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Table 4.1: Measures of over-education, in percentage

	Not in graduate occupation	**Degree not a requirement**	**Not satisfied of 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 into brackets.

Table 4.2: Correlation between the different measures of over-education

		Graduate job		Job requirement	
		Cohort 1985	Cohort 1990	Cohort 1985	Cohort 1990
Job requirement	Male	0.1912	0.3137		
	Female	0.2553	0.2998		
Satisfaction	Male	0.1024	0.2245	0.1271	0.2678
	Female	0.1978	0.3022	0.2697	0.3217

Table 4.3: 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 4.4: 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 HEI)
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 4.5: 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.

Table 4.6: OLS ln pay per hour 90' graduates with mismatched spell

	Specification 1	Specification 2
Genuine Over education	-0.1871	-0.1847
	(0.0270)	(0.0278)
Apparent over education	-0.0145	-0.0153
	(0.0256)	(0.0267)
Skill: z-score	0.1001	0.0747
	(0.0134)	(0.0193)
Skill * genuine ov.ed.		0.0745
		(0.0333)
Skill * apparent ov.ed.		0.0475
		(0.0367)
Constant	1.8110	1.8411
	(0.2309)	(0.2308)
Observations	815	815
R^2	0.4004	0.4076

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.
Standard errors not corrected for the inclusion of residuals.