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Is there a Genuine Under-utilisation of Skills Amongst the Over-qualified?

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Abstract. Two theories of over-qualification are considered, namely mismatch, whereby workers do not find the most appropriate jobs for their skills, because of imperfect information or labour market rigidities, and ‘heterogeneous workers’, whereby individuals with the same qualifications have different actual skill levels, so that they can be over-qualified in terms of formal qualifications, while their skills are actually appropriate for the jobs that they do. The evidence suggests that both theories are relevant in certain situations.

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1. Introduction

There is evidence that an increasing proportion of workers are finding themselves in jobs that require qualification levels lower than those they have obtained. According to the Skills Survey data set used in this study (Felstead, *et al*, 2002), some 37% of workers were ‘over-qualified’ in this sense in 2001, compared with just 32% in 1997. During this time, less than one in five workers remained ‘under-qualified,’ that is, doing jobs that would require a new recruit to have a higher qualification level than currently held by the job-holder. The rise in over-qualification followed a period of relative stability dating back to the mid 1980s, though the decade before that saw an earlier rise in over-qualification (Green *et al* 2002). If the recent rise heralds an ongoing trend, it becomes more urgent now to understand the significance and implications of this phenomenon. Who are performing the jobs for which they do not have the appropriate levels of education or skills? Are the over-qualified genuinely under-using their skills, and is there any evidence that the under-qualified are suffering from a skills deficiency?

The paper builds on an expanding literature about ‘over-education’ that exists in Labour and Education Economics¹ (see for example Alba-Ramirez, 1993, Battu *et al.*, 1999, Cohn *et al.*, 1995, Dolton and Vignoles, 2000, Duncan and Hoffman, 1981, Green *et al.*, 2002, Groot, 1993, 1996, Groot and Maassen van den Brink, 1997, 2000, Hartog, 1997, 2000, Rumberger, 1987, Sicherman, 1991, Sloane *et al.*, 1996, 1999, Tsang *et al.*, 1991, Verdugo and Verdugo, 1989). This literature has documented the extent of over-education and under-education that

exists in a number of countries, and highlighted the wage impact of working in a job for which one is over- or under-educated². Describing the results very broadly, about a quarter to a third of a nation's employees tend to work in jobs for which they are over-qualified, with a somewhat smaller proportion working in jobs for which the required education level exceeds their actual qualifications.

Despite the extent of over-qualification, it would still be of only minor importance if it was a temporary phenomenon for individuals, for example whilst gaining experience before future promotions, or accepting any job whilst continuing to search for a more appropriate opening. The limited amount of evidence available suggests that this is not the case, however. Dolton & Vignoles (2000) find that amongst UK graduates who are over-qualified in their first job, two-thirds are still working in a job for which they are over-qualified six years later. Frenette (2004) observes three-quarters of those initially over-qualified in his Canadian sample remaining in this state, although in this case there are only three years between the two survey points. To the extent that these findings can be generalised, being over-qualified therefore seems to have a degree of permanence for many individuals in this state.

Being over- or under-qualified makes a difference. Those who are over-qualified tend to earn less than their similarly qualified peers who work in appropriate jobs, although they do still earn more than those with the required qualification for the job in which they work. Similarly, those working in a job for which they are under-qualified tend to earn more than workers with the same qualification working in an appropriate job, but again this differential does not ensure parity

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with those better-educated workers employed with the appropriate required qualifications for such a job.

This paper attempts to explain why certain individuals are over- or under-qualified for the work that they do, and if so, why this has the effects that it does. The next section considers some possible answers, followed by a description of the data to be used to test these theories, and a discussion of the results.

2. Three Possible Reasons for Over-Qualification and Under-Qualification

The two ideas most often advanced to explain the phenomenon of over-qualification are some sort of assignment or job competition model, and human capital differences. Considering the former idea first, the assignment theory of job allocation is described by Sattinger (1993), while the job competition model is most often associated with Thurow (1979). The assumption behind these theories is that there is a skill level attached to a job regardless of the attributes of the person who fills it. Whilst this may sound reasonable, it does not feature in the basic human capital theory, in which an individual's particular level of human capital will provide a certain level of productivity, irrespective of the job in which that individual works. Individuals are then assigned to these jobs, according to their characteristics. Thus, higher skilled individuals are more likely to be matched with job vacancies requiring a higher level of skills. The matching process need not be perfect, however, for a couple of reasons, leading to the possibility of certain individuals being over-qualified for the work that they do, and others being under-qualified. For example, there may simply be

more skilled workers than required in an economy, so that there are insufficient skilled jobs to go round. In this case, some skilled individuals, who lose out in the race for the good jobs, will end up performing jobs for which they are over-qualified.

However, strong evidence against the ‘too many skilled workers’ theory is provided by the wage inequality literature. If wages respond to market forces, then an over-supply of skilled workers would be expected to lower the wage that they receive, relative to that of less-skilled workers. However, the evidence reveals sustained and substantial gross returns to academic qualifications at all levels and to vocational qualifications above level 2 (Machin, 1999, Dearden *et al.*, 2002). The point is reinforced by continual and sustained reports from surveys of the UK business community of skills deficiencies including, especially at times of cyclical upswing, recruitment difficulties (see Campbell *et al.*, 2001). Finally, given that the over-qualification phenomenon is observed in a range of countries, we would be reluctant to conclude that there could be such a widespread glut of skills throughout the industrialised world.

Even if there is no over-supply of skilled workers, it is still possible that the range of jobs on offer will not be matched perfectly to the available individuals, however. This could be the case, for example, if there is mismatch in the labour market. In this case, individuals are not necessarily assigned to the most appropriate job, due to a lack of information or rigidities in the labour market. A lack of information implies that individuals do not find the most appropriate job for their skills, while rigidities may prevent them accepting the most appropriate

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job, even if they found it. Such rigidities may be related to family situations, whereby the presence of a partner or, especially, children, may prevent individuals from moving to accept the most appropriate job³. Some existing evidence supporting this mismatch explanation derives from the finding that workers with families, especially part-time workers, are more likely to be found amongst the over-qualified (Green *et al.*, 2002).

One of the most thorough tests of such ideas can be found in Büchel and Battu (2003). They find some evidence that married West German women living in rural areas are more likely to be over-qualified for the work they do than other combinations of gender, marital status and region of residence. The implication is that such women are tied to an area with few job opportunities by their families. Note that males in rural areas do not have a high over-qualification rate, because they are more likely to commute to areas of greater population density than women. Thus, once commuting distance is controlled for, married men in rural areas are also more likely to be over-qualified, though not to the same extent as married women. These results are at odds with those of McGoldrick and Robst (1996), who perform a similar analysis using US data and find no impact of marital status or region of residence on the likelihood of being over-qualified. Their analysis does not, however, allow for the possibility of commuting.

Turning to the human capital ‘explanation’ for over-qualification, the point here is that those apparently over-qualified in actual fact are not. They only appear to be over-qualified because not all aspects of their human capital are observed. It

is necessary here to drop the assumption that all individuals with the same qualifications are homogenous, and acknowledge that there will be a range of skills and abilities, not observed by the researcher, in addition to other aspects of human capital such as training, work experience and current job tenure, which may or may not be observed. If this is true, then the apparently over-qualified may simply be those workers from a particular qualification category who have low values of other, unobserved, aspects of human capital. They are therefore actually in a job commensurate with their human capital.

There is some limited evidence that such theories may be relevant. Bauer (2002) and Frenette (2004) both present wage equations estimated using panel data sets, which control for individual fixed effects. When they do this, the wage penalty associated with being over-qualified falls dramatically, suggesting that it was caused by unobserved low earnings capacity. Chevalier (2003) identifies individuals who are apparently, rather than actually, over-qualified as those workers who appear to be over-qualified in terms of their qualifications, but who claim to be satisfied with the match between their education and their work, and therefore are presumably the less able in that qualification category. He shows that the wage penalty associated with over-qualified status is greater for the genuinely over-qualified than for the apparently over-qualified. Büchel and Pollmann-Schult (2001) provide evidence that even among individuals with similar levels of formal education in West Germany, there can be large differences in the likelihood of being over-qualified, and these differences are related to school achievement and type of vocational training undertaken. Other evidence suggests that the over-qualified may not necessarily have low values of

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unobserved human capital characteristics such as ability, but may simply have acquired the ‘wrong’ type of human capital, where ‘wrong’ here means skills that are less in demand in the labour market. Thus, in the UK, Dolton and Vignoles (2000) find that graduates of social sciences, arts and languages are more likely to be over-qualified than graduates of subjects in high demand and short supply in the labour market, such as engineering and sciences. Frenette (2004) obtains similar findings in Canada, with graduates in fine arts, humanities, social sciences and agricultural and biological sciences being less likely to find graduate level work, relative to graduates in education, engineering, computer science, law and medicine.

The aim of this paper is to provide further evidence on the causes of over-qualification, focussing on the mismatch and heterogeneous ability/unobserved human capital theories outlined above. The observable difference between the two theories is that with mismatch, the over-qualified are genuinely failing to obtain appropriate jobs for their skills and abilities, and so are under-utilising these skills, while in the heterogeneous ability story, individuals are actually in appropriate jobs and are not under-utilising any skills, despite the formal qualifications that they hold. The papers mentioned above that have investigated the causes of over-qualification have not investigated this relationship between over-qualification and over-skilling, with the exception of Chevalier (2003), who investigates whether the over-qualified are *satisfied* with the match between their skills and their job, but cannot determine how well matched they *actually* are because of data limitations, something that the data set used here makes possible. The closest paper to our own is one by Allen and van der Velden (2001), who

use the same over- and under-skilled variables as us, found in their Dutch data set. We now turn to a description of our data.

3. Data

We utilise data drawn from the 2001 Skills Survey, which is a cross-sectional survey of 4470 individuals aged between 20 and 60 in Britain in paid work at the time of interview in spring 2001. The design of the survey was patterned on that of the first Skills Survey, conducted in spring 1997 (Ashton *et al.*, 1999). Random sampling methods were used, and the achieved sample was representative of the British population. Full details of the sampling frame and fieldwork methods can be found in Felstead *et al.* (2002). The questionnaire comprised a detailed investigation of the nature of the individual's job with an emphasis on the activities that the job entails. Additional information was obtained on the organisation in which the individual worked, pay and changes that had occurred in the job in the last 5 years. Some background demographic information on each individual was also collected.

The key questions for our analysis are those that generate the over/under-qualified and over/under-skilled variables. For the qualification variables, a list with a large number of qualifications was offered to the respondents, from which they indicated those qualifications that they hold. These were then ranked and assigned a level from 1 to 5, with 0 indicating no qualifications⁴. Earlier in the interview, the same list of qualifications was presented, but here the respondent was asked which would be required by someone now in order to get the job in

which the respondent works. Using the same categories as before, this gives a required education level for the job. A respondent was then classified as over-qualified if his/her actual qualification exceeded the required qualification for the job, i.e.

$$\begin{aligned} OQ_i &= 1 \quad \text{if} \quad AQ_i > RQ_i \\ OQ_i &= 0 \quad \text{if} \quad AQ_i \leq RQ_i \end{aligned}$$

where OQ_i is a dummy variable taking the value of 1 if the respondent is over-qualified and 0 otherwise, AQ_i is individual i 's highest qualification (on the 0-5 scale described above), and RQ_i is the required qualification level for individual i 's job, on the same scale.

Similarly, the under-qualified variable is defined as:

$$\begin{aligned} UQ_i &= 1 \quad \text{if} \quad AQ_i < RQ_i \\ UQ_i &= 0 \quad \text{if} \quad AQ_i \geq RQ_i \end{aligned}$$

Turning now to the over-skilled variable, this is based upon the following two questions in the Skills Survey:

“How much do you agree or disagree with the following statement: ‘In my current job I have enough opportunity to use the knowledge and skills that I have’?:

Strongly agree

Agree

Disagree

Strongly disagree”

“How much of your past experience, skill and abilities can you make use of in your present job?:

Very little

A little

Quite a lot

Almost all”

If the respondent indicated that they were over-skilled according to either of these questions, i.e. they disagreed or strongly disagreed with the first statement, or they answered ‘very little’ or ‘a little’ to the second question, then they were classified as being over-skilled, since they were not making full use of their skills and abilities in their jobs⁵.

The under-skilled variable was based upon the following question:

“How much do you agree or disagree with the following statement: ‘I would perform better in my current job if I possessed additional knowledge and skills’?:

Strongly agree

Agree

Disagree

Strongly disagree”

A dummy variable taking the value of 1 if the respondent strongly agreed with this statement, and 0 otherwise, was defined⁶.

Turning to other variables used in the analysis, the wages measure is the log of hourly pay. The personal characteristics included are gender, age, marital status, the presence of children and work experience. As well as their highest qualification level, as described above, the highest maths qualification that each respondent has achieved is also known. For graduates only, the subject area of

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their degree and the type of institution they attended is observed. As for job characteristics, as well as the required education level for the job, as described above, information on full-time/part-time status, permanent/temporary status, whether shift work is involved, establishment size, industry, public/private sector status and occupation is also used. The next section examines some of the relationships amongst these variables.

4. Results

(i) Reliability Testing of the Main Variables

A first step to be undertaken is to check whether the over-/under-qualified and over-/under-skilled variables are performing the skill utilisation measurements that we want them to. To this end, the extent of each by one-digit industry and occupation was calculated. The results appear entirely reasonable, suggesting that these self-reported variables are picking up what we want them to pick up. In particular, one might expect to find that the over-qualified and the over-skilled are more likely to work in low-skill industries and occupations, and this is what is observed. The three industries with the highest proportion of over-qualified workers are the wholesale/retail trade, hotel and catering, and transportation industries. The lowest rates of over-qualification and over-skilling are found, as expected, in the industries where most jobs are skilled and require high level qualifications for access, for example the education sector. The industrial pattern is less clear for the under-qualified and under-skilled variables. The distribution of these variables varies less across the various industries than was the case with the over-qualified and over-skilled variables. Nevertheless, the industries with

the lowest proportions of under-qualified workers are the wholesale/retail trade, and the hotels and catering industries, while the industries with the lowest incidence of under-skilling are construction, hotels/catering and education.

There is a clearer pattern of results across occupations than across industries⁷. Particularly on the over-skilled variable, there is a monotonic relationship with the top three occupations (managers, professionals and associate professionals) having the lowest incidence of over-skilling, the middle three occupations (secretarial, skilled trades and personal services) having intermediate levels of over-skilling, and the lowest three occupations (sales, plant operatives and elementary occupations) having the highest incidence of over-skilling.

Thus, these self-reported variables seem to be behaving reasonably.

(ii) The Incidence of Over/Under-qualified and Over/Under-skilled Status

The 2001 Skills Survey data reveal that 37% of employees are over-qualified for the job that they do. This compares to the figure of 32% in the 1997 Skills Survey, implying a rise in the extent of over-qualification over these four years. This is after a period of relatively stable levels of over-qualification, as described in Green *et al.* (2002). The level of under-qualification is about half the rate of over-qualification, a finding that is commonly found in the literature. In terms of the less well-documented skill usage variables, 35% of UK employees are over-skilled and so do not make full use of all the skills and abilities in their possession, while 13% are under-skilled.

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(iii) Are the Over-qualified also Over-skilled?

This section begins the investigation into the factors causing over-qualification by examining simple Spearman rank order correlation coefficients between these concepts, and the over-skilling variable. The aim is to establish whether the over-qualified are really in possession of skills that are being under-utilised in their jobs. There is a statistically significant positive correlation between the over-qualified variable and the over-skilled variable, revealing that there is some relationship, although the 0.2 coefficient suggests one of only moderate strength. Using similar variables from a Dutch data set, Allen and van der Velden (2001) find a similar weak relationship. Among the employees who are over-qualified, less than half (47%) report having skills and abilities that they are not using in their job. This compares with 28% of those who are not over-qualified who report under-utilising their skills. While some of the observed over-qualified workers thus appear to be over-skilled, consistent with the mismatch stories, other apparently over-qualified workers report being in jobs commensurate with their skills, consistent with the ‘heterogeneous skill within qualification levels’ theory.

Amongst those employees who are over-qualified and over-skilled, which skills in particular are being under-utilised? Using questions in the Skills Survey that ask about the importance of various skills in the respondent’s workplace reveals that the over-qualified are more likely to work in jobs where there is a low importance attached to professional, high-level communication (such as making presentations, writing substantive reports, instructing others), planning, numeracy, literacy and problem solving skills. Correlation between these skill-

use variables and the over-skilled variable reveals that those who claim to have unused skills and abilities work in jobs where exactly the same skills are viewed as less important (with the addition of client communication skills). This could suggest, although not prove, that it is these skills in particular that are being under-utilised amongst the over-qualified and over-skilled.

Turning to the under-qualified, there is no relationship at all between under-qualified status and under-skilling; the under-qualified are no more likely to lack sufficient skills to perform their jobs than those who are adequately qualified. Thus the under-qualified are not, on the whole, a group struggling out of their depth in jobs for which they do not possess sufficient skills. The interpretation is therefore that these are employees who have gained skills through other routes after the end of their schooling, primarily through years of working experience. They are now capable of performing jobs that demand a higher qualification level of current new entrants.

(iv) The Determinants of Over/Under-qualified, Over/Under-skilled Status

Thus far, the findings indicate that some, though far from all, of the over-qualified can be seen as having under-utilised skills, while the status of being under-qualified has no apparent relationship to being under-skilled. In this section we investigate the multivariate determinants of over/under-qualified and over/under-skilled status, in an effort to distinguish further between the competing explanations⁸.

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Table 1 shows the estimated marginal effects of various explanatory variables on the probability of being over-qualified, derived from probit equations for the full sample, and also for graduates only, for whom we have additional information about degree subject and institution attended⁹. The results reveal that the characteristics of an individual's job are closely related to over-qualified status. In particular, part-time jobs, jobs involving shift work, jobs in small workplaces and jobs in the private sector are strongly associated with the likelihood of being over-qualified. The effects of job characteristics appear to dominate those of the individual characteristics, all of which attract statistically insignificant coefficients, with the exception of the age variables, which suggest that prime-aged workers are less likely to be over-qualified than both the young and the old. However, the individual and job characteristics are closely related, so that the effects of the former may be picked up by the latter. Thus, if the job characteristics are omitted from the estimated equations, the effects of the individual characteristics are observed more clearly. In particular, such results (not shown in Table 1) suggest that individuals with children are around six percentage points more likely than the childless to work in job for which they are over-qualified. Therefore, consistent with the mismatch theory outlined above, it appears that the presence of children may restrict parents' mobility in the labour market because of attachments to particular schools or institutions. The fact that this effect is picked up by the job characteristics variables in Table 1 suggests that those who face rigidities in the labour market choose jobs that are less demanding on their time or take the only jobs available, and that these part-time, shiftwork, typically private sector, jobs do not match the higher level qualifications that they have¹⁰.

Other results in Table 1 are however consistent with the ‘heterogeneous ability’ explanation of over-qualification. The results show that higher achievements in mathematics lower the probability of being over-qualified, in particular by 15 percentage points if a maths A-level is held¹¹. A maths degree does not seem to have any further statistically significant impact on the probability of being over-qualified. However, this is due to almost all maths graduates in the sample also holding maths A level, and so maths graduates have in effect already been considered. To the extent that maths ability can be used as an indicator of general ability, or as an indicator of an ordered mind capable of planning and problem solving, this result would suggest that those of lower ability are more likely to be over-qualified.

In the graduate-only sample, subject of degree has an important impact on over-qualified status, with the negative coefficients on all of the subject variables suggesting that the omitted category, business and management studies, has the highest over-qualified graduate rate. Several subjects lead to an over-qualified probability that is significantly lower than that produced by this subject, namely, computing, physical sciences, ‘other’ (many of these are education degrees), arts and English. This subject list is consistent with those found by other researchers, as described above, although the presence of arts and English on this list is a bit surprising. With respect to institution type, the results suggest, consistent with Dolton and Vignoles (2000), that graduates of the more established universities are less likely to be over-qualified than those of the universities created since 1992, and in particular than graduates of foreign universities, although none of the institution coefficients achieve statistical significance.

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Turning to the determinants of being under-qualified, these are not reported in full, as they are essentially a mirror-image of the findings in Table 1, with full-time jobs, those not involving shiftwork and those in the public sector being more likely to be filled by an under-qualified worker. Older workers and those who are married are more likely to secure a job demanding a higher qualification than they actually hold. These findings are consistent with the view that employees in stable full time work, who are more likely to acquire skills at work, are enabled to take on jobs above their qualification level. Similarly, the ability effect is shown in that those who have achieved an A-level in maths are also more likely to obtain a job at a higher qualification level than they actually hold. These results thus reinforce the finding from the previous section that under-qualified status has no correlation with being under-skilled.

In Table 2, skill levels rather than qualifications are considered. The results reveal that those workers whom we argued were more likely to be mismatched, namely non-prime age workers and those with family responsibilities,¹² are again more likely to be over-skilled. Therefore, those who are mismatched in this way into unstable forms of employment (part-time, shiftwork, in the private sector) are under-utilising their skills. Other results suggest that maths skills are less likely to be under-utilised.

It is interesting, however, that none of the other coefficients on the subject variables in the graduate equation attract statistically significant coefficients, with the exception of that on the medicine variable. It would therefore appear that, although graduates of business or management degrees are less likely to be

in a graduate level job than graduates of most other subjects (as shown in Table 1), they are not more likely to be over-skilled or under-utilising the skills that they have learnt, as we might have expected if there were simply too many graduates of these subjects for the available number of jobs. The fact that they are more likely to be over-qualified in terms of formal qualifications, and yet just as likely to be in a job making full use of their skills and abilities as graduates in other disciplines, suggests a number of possibilities. One is that the courses they have followed are not associated with the skills necessary to get a graduate level job. Another is that less able students, who are not suitable for graduate level jobs, choose subjects in these fields because they are perhaps perceived as less difficult than other subjects. The final possibility is that graduates of these subjects are more likely to go into jobs where a degree is less of a formal, explicit requirement, than graduates of other disciplines such as medicine, education, engineering and science, whose jobs upon graduation are more likely to stipulate a degree as a definite requirement. The first two hypotheses say that the reason for the lack of over-skilling amongst the over-qualified business graduates is that they are actually only able to do upper secondary education type jobs. In the third explanation, they have graduate level skills and perform jobs that use these skills, although not demanding a degree of applicants. The fact that the wage results that follow show that business graduates are amongst the highest paid, on average, of all graduates, suggests in fact that the last explanation could be key.

Finally the determinants of under-skilled status are again the mirror image of those in Table 2 for over-skilled status, although few variables attract statistically

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significant coefficients. The results do suggest that women and those working in part-time jobs (which, of course, overlap to a large extent) are less likely to feel under-skilled.

(v) The Wage Effects of Over/under-qualified and Over/under-skilled Status

As described in the Introduction, many papers have estimated the impact of being over-qualified (under-qualified) on earnings, and found it to reduce (increase) earnings, relative to similarly educated peers who obtain a job at the appropriate qualification level. Tables 3 and 4 provide similar results, for all employees and graduates only, respectively. In each case the dependent variable is the log of hourly pay.

The results in the first columns of each table are consistent with the previous results in the literature; amongst all employees, the over-qualified earn, on average, 18%¹³ less than individuals working in jobs for which they have an appropriate level of education. Amongst graduates this figure is 15%. Similarly, the under-qualified earn more than individuals with the same qualification level who work in a lower level job more in keeping with their formal education, by 18% amongst all employees. So far, these findings are standard¹⁴.

The key piece of analysis to be undertaken in this part of the paper, however, is to examine what happens to these wage penalties and premiums, once we control for the extent of over- and under-skilling. If the reason why the over-qualified earn less is that they are not using their skills and abilities to the same extent as someone of the same education level in an appropriate job, then once we control

for this fact via the over-skilling variable, the coefficient on over-qualification should be reduced.

The results, in the second columns of Tables 3 and 4 reveal, however, that this is certainly not the case. Although the over-qualified coefficient does fall in each table, by two percentage points and four percentage points respectively for all employees and graduates only, in each case the fall is not statistically significant¹⁵. Thus, holding constant the extent of skill-underutilisation, over-qualified workers still earn less than their appropriately-qualified peers, suggesting that the reason for the wage penalty is not that skills are being under-utilised and wasted, at least to any significant extent. There must be another reason why, for example, over-qualified graduates are still earning less than those in graduate level jobs, even when we hold constant the utilisation of skills across this comparison. One possibility consistent with, although not proved by, these results is that the over-qualified graduates are less able or have less appropriate and marketable skills than those who find graduate level employment.

Another possibility is that the over-skilling variable is a poor measure of the actual utilisation of skills, and so it does not explain much of the over-qualified effect on wages. However, over-skilling attracts a strongly significant, negative coefficient, suggesting that it does contain important information. As expected, individuals not fully utilising their skills earn less.

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The under-skilled coefficient is much smaller in absolute value, and does not achieve statistical significance in either of the presented equations. It is unlikely, however, that an employer would continue to hire an under-skilled individual, suggesting that the variable is probably picking up an acceptance that improvement in work performance is possible, rather than genuine under-skilling.

5. Conclusions

This paper has attempted to explain why some individuals are, or appear to be, over-qualified for the work that they do. One possibility is that individuals within a particular education level are heterogeneous with respect to the full range of human capital. They therefore only appear to be over-qualified because certain aspects of their human capital are unobserved. If all aspects were observed, it would be seen that such workers are in jobs commensurate with their skills, and there is therefore no under-utilisation. Using data from the 2001 Skills Survey, substantive evidence for this ‘heterogeneous skill within qualification levels’ theory is found. Thus, although the correlation coefficient between over-qualification and over-skilling was positive and statistically significant, it was quite low at only 0.2. Less than half of the over-qualified are over-skilled. In addition, the fact that the wage penalty associated with being over-qualified is not significantly reduced once possible over-skilling is controlled for suggests that the reason why the over-qualified earn less is not because they are underutilising their skills relative to the appropriately-qualified. One such possible reason is, of course, low level unobserved skills and abilities.

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3 An alternative to low-level skills is the holding of higher level skills that are
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5 simply not in large demand relative to supply.
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10 Also consistent with the same explanation is the finding that holding a maths
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12 qualification, which is often taken as an independent signal of an ability that is
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14 valued in the labour market, is associated with a lower likelihood of being over-
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16 qualified and a greater likelihood of being under-qualified. At a degree level
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18 only, it appears that graduates of the more science-based subjects are also less
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20 likely to be over-educated.
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26 Finally, evidence here suggested that the over-qualified are more likely to work
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28 in jobs that do not attach a large importance to communication, planning and
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30 problem solving skills. One interpretation of this finding is that it is these skills
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32 and abilities that the over-qualified are lacking, so preventing them from working
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34 in jobs that might appear more commensurate with their formal qualification
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36 levels. It is perhaps interesting that these are precisely the skills often mentioned
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38 as being in short supply by employers in surveys such as the Employers' Skill
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40 Survey¹⁶.
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49 Putting several literatures together, therefore, evidence suggests that currently in
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51 the UK there are growing numbers of highly-educated individuals, growing, or at
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53 least steady, returns to high level qualifications, yet at the same time, employer
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55 reports of skill shortages, as well as the presence of large numbers of seemingly
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57 over-qualified people. One possible way to make sense of these various results,
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59 consistent with the findings obtained here, is that there is a shortage of the skills
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required by employers in the labour market, amongst the well-qualified individuals being produced. This could be a shortage of technical science, engineering and computing skills, or more practical planning, problem-solving and communication skills. This shortage of skills creates a high demand for the graduates who possess such skills, thus raising the *average* returns to high level qualifications, as observed in the returns literature. Those lacking such skills, however, cannot get access to the high level jobs demanding these skills, and have to be content with lower level jobs, for which they are apparently over-qualified, but which are actually quite commensurate with their skills and abilities.

Finally, it should be noted that the above description does not cover all incidences of over-qualification, and in some cases there is a genuine under-utilisation of skills amongst the over-qualified, which may be caused by mismatch. Evidence for this is the positive relationship between over-qualification and the presence of dependent children and associated part-time working. This evidence of some mismatch supports the need for policies to ensure labour market flexibility, especially to reduce constraints implied by shortages of childcare facilities. More research on employment dynamics would be helpful to determine how long people tend to remain over-qualified, and hence gain a better understanding of the extent to which skills mismatch is a permanent problem.

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Table 1 : The Determinants of Over-qualified Status

	All with qualifications	Graduates
female	0.001 (0.020)	-0.044 (0.048)
age	-0.014 (0.007)*	-0.058 (0.020)**
Age ² / 100	0.014 (0.009)	0.073 (0.025)**
married	-0.036 (0.020)	-0.036 (0.047)
has children	0.022 (0.021)	0.033 (0.052)
in a permanent job	-0.033 (0.036)	0.013 (0.072)
in a full-time job	-0.197 (0.025)**	-0.172 (0.066)**
ever do shift work	0.152 (0.021)**	0.332 (0.062)**
25-99 employees	-0.048 (0.023)*	-0.150 (0.051)**
100/499 employees	-0.050 (0.024)*	-0.113 (0.053)*
500/999 employees	-0.085 (0.036)**	-0.154 (0.066)*
1000+ employees	-0.109 (0.031)**	-0.161 (0.058)**
Public sector	-0.143 (0.019)**	-0.098 (0.047)*
highest maths = GCSE	-0.030 (0.019)	-0.037 (0.062)
highest math = A level	-0.151 (0.026)**	-0.173 (0.062)**
highest maths = degree	-0.083 (0.094)	
Maths degree		-0.166 (0.095)
Computing degree		-0.232 (0.074)**
Physical Science degree		-0.210 (0.060)**
Biology degree		-0.131 (0.075)
Social Science degree		-0.007 (0.081)
English degree		-0.170 (0.079)*
Art degree		-0.176 (0.079)*
Humanities degree		-0.070 (0.080)
Law degree		-0.136 (0.097)
Medicine degree		-0.039 (0.101)
Other degree		-0.177 (0.070)*
Oxbridge university		-0.063 (0.092)
Old university		-0.078 (0.050)
other HE institution		0.055 (0.099)
foreign university		0.153 (0.097)
Observations	3316	637

Robust standard errors in parentheses. * significant at 5%; ** significant at 1%.
Estimation by probit. Marginal effects reported.

Table 2 : The Determinants of Over-skilled Status

	All employees	Graduates
female	-0.023 (0.018)	0.023 (0.041)
age	-0.024 (0.006)**	-0.051 (0.016)**
Age ² / 100	0.025 (0.008)**	0.062 (0.020)**
married	-0.054 (0.018)**	-0.089 (0.041)*
has children	0.018 (0.019)	0.034 (0.043)
in a permanent job	0.014 (0.032)	0.007 (0.062)
in a full-time job	-0.182 (0.022)**	-0.159 (0.060)**
ever do shift work	0.050 (0.019)**	0.066 (0.058)
25-99 employees	0.005 (0.020)	-0.043 (0.045)
100/499 employees	0.066 (0.021)**	-0.010 (0.046)
500/999 employees	0.003 (0.033)	-0.136 (0.048)**
1000+ employees	-0.020 (0.029)	-0.141 (0.043)**
Public sector	-0.063 (0.017)**	-0.060 (0.040)
highest maths = GCSE	-0.076 (0.017)**	-0.158 (0.050)**
highest math = A level	-0.076 (0.024)**	-0.144 (0.050)**
highest maths = degree	-0.223 (0.056)**	
Maths degree		-0.192 (0.041)**
Computing degree		-0.077 (0.086)
Physical Science degree		0.048 (0.068)
Biology degree		0.026 (0.082)
Social Science degree		-0.056 (0.063)
English degree		-0.091 (0.069)
Art degree		0.066 (0.094)
Humanities degree		0.026 (0.076)
Law degree		0.020 (0.108)
Medicine degree		-0.140 (0.058)*
Other degree		-0.044 (0.070)
Oxbridge university		-0.041 (0.083)
Old university		-0.026 (0.043)
other HE institution		-0.061 (0.063)
foreign university		-0.063 (0.071)
Observations	3925	643

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

Estimation by probit. Marginal effects reported.

Table 3 : The Effect of Over/under-qualified and Over/under-skilling on**Wages :****All Employees**

	log hourly pay	log hourly pay
overqualified	-0.164 (0.015)**	-0.144 (0.015)**
underqualified	0.167 (0.018)**	0.161 (0.018)**
Low level qualifications	0.144 (0.024)**	0.132 (0.024)**
GCSE qualifications or eq.	0.215 (0.021)**	0.193 (0.021)**
A level qualifications or eq.	0.353 (0.022)**	0.327 (0.022)**
Higher qualification below degree	0.557 (0.026)**	0.528 (0.026)**
Degree level qualification	0.735 (0.028)**	0.701 (0.028)**
female	-0.131 (0.014)**	-0.134 (0.014)**
years of work experience	0.028 (0.002)**	0.027 (0.002)**
work experience squared/100	-0.050 (0.005)**	-0.048 (0.005)**
married	0.063 (0.013)**	0.060 (0.013)**
has children	0.042(0.014)**	0.043 (0.014)**
in a permanent job	-0.008 (0.028)	-0.005 (0.028)
in a full-time job	0.134 (0.017)**	0.122 (0.017)**
ever do shift work	-0.047 (0.014)**	-0.046 (0.014)**
25-99 employees	0.066 (0.016)**	0.067 (0.016)**
100/499 employees	0.107 (0.017)**	0.116 (0.017)**
500/999 employees	0.124 (0.029)**	0.126 (0.029)**
1000+ employees	0.197 (0.025)**	0.199 (0.025)**
highest maths = GCSE	0.087 (0.015)**	0.086 (0.015)**
highest math = A level	0.173 (0.029)**	0.174 (0.029)**
highest maths = degree	0.378 (0.145)**	0.366 (0.146)*
overskilled		-0.099 (0.013)**
underskilled		0.006 (0.020)
Constant	1.157 (0.043)**	1.229 (0.044)**
Region dummies	yes	yes
Observations	3572	3572
R-squared	0.50	0.51

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

**Table 4 : The Effect of Over-qualified and Over/under-skilling on Wages :
Graduates**

	log hourly pay	log hourly pay
overqualified	-0.141 (0.044)**	-0.097 (0.045)*
female	-0.102 (0.042)*	-0.101 (0.042)*
years of work experience	0.044 (0.007)**	0.042 (0.007)**
work experience squared/100	-0.096 (0.021)**	-0.091 (0.020)**
married	0.121 (0.040)**	0.107 (0.039)**
has children	0.046 (0.046)	0.045 (0.046)
in a permanent job	-0.051 (0.073)	-0.046 (0.072)
in a full-time job	0.125 (0.065)	0.096 (0.065)
ever do shift work	-0.281 (0.058)**	-0.270 (0.057)**
25-99 employees	0.145 (0.054)**	0.146 (0.054)**
100/499 employees	0.117 (0.055)*	0.120 (0.054)*
500/999 employees	0.090 (0.078)	0.068 (0.076)
1000+ employees	0.227 (0.069)**	0.207 (0.068)**
highest maths = GCSE	0.049 (0.059)	0.020 (0.057)
highest math = A level	0.093 (0.066)	0.066 (0.064)
Maths degree	0.087 (0.153)	0.040 (0.154)
Computing degree	0.099 (0.175)	0.087 (0.176)
Physical Science degree	-0.157 (0.074)*	-0.140 (0.073)
Biology degree	-0.108 (0.087)	-0.111 (0.087)
Social Science degree	-0.180 (0.079)*	-0.200 (0.079)*
English degree	-0.329 (0.080)**	-0.349 (0.079)**
Art degree	-0.233 (0.108)*	-0.213 (0.107)*
Humanities degree	-0.276 (0.078)**	-0.276 (0.078)**
Law degree	-0.258 (0.112)*	-0.255 (0.113)*
Medicine degree	-0.083 (0.086)	-0.114 (0.084)
Other degree	-0.257 (0.072)**	-0.270 (0.072)**
Oxbridge university	0.142 (0.122)	0.148 (0.123)
Old university	0.101 (0.045)*	0.104 (0.044)*
other HE institution	0.021 (0.070)	0.009 (0.072)
foreign university	-0.123 (0.100)	-0.137 (0.100)
overskilled		-0.187 (0.046)**
underskilled		0.003 (0.055)
Constant	1.982 (0.148)**	2.099 (0.149)**
Observations	591	591
R-squared	0.37	0.39

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

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¹ In our own analysis, we prefer the terms ‘over-qualified’ and ‘under-qualified’, and prefer not to use the terms over- and under-education because of the connotation attached that there is too much or too little education being provided, which, as we describe below, is only one possible reason for the presence of over-qualified or under-qualified workers.

² Over- and undereducation are defined as the difference between actual qualifications held, and required qualifications for the job (overeducation if this difference is positive and undereducation if negative). Required qualifications for the job can be measured by self-reported qualifications required to get or to do the job, by expert job study analyses of the occupation being undertaken, or by the average qualification level amongst workers in a particular occupation grouping. See, amongst others, Hartog (1997) or Groot and Maassen van den Brink (2000) for a fuller description of these measurement methods, and for a discussion of their various benefits and limitations in econometric analyses.

³ This may be a rational choice by the individual who, for example, may actively choose part-time employment that does not make full use of their skills, so that their energies can be reserved for their other responsibilities, such as childcare. The term ‘rigidities’ therefore refers to impediments to the labour market achieving its most efficient allocation, and not to impediments that prevent individuals working in the job that they wish (which will be decided according to work allocations across labour market and household time, rather than simply the efficient allocation from the labour market’s point of view).

⁴ The five levels are a degree or higher degree (level 5), higher level academic or vocational qualifications below degree level, (level 4), qualifications taken upon completion of upper secondary education (A-levels) or their equivalent in vocational qualifications (level 3), qualifications taken upon completion of lower secondary, compulsory, education (GCSE/O-levels, at grade C or above) or their equivalent in vocational qualifications, and finally GCSE/O-level passes below grade C or their vocational equivalent (level 1).

⁵ The answers to these two questions were quite highly correlated, and just using one or the other as our measure of over-skilling did not substantially alter the results.

⁶ It was decided to classify only those strongly agreeing with this statement as under-skilled. This is because almost 2/3rds of respondents either agreed or strongly agreed that they could perform better with additional knowledge and skills. This suggests many respondents are performing

adequately, while still admitting that there is room for improvement. The ‘strongly agreeing’ individuals therefore seemed to represent a more extreme group, who may be struggling to even perform adequately in their job, and need additional skills or abilities just to reach such a level.

⁷ Obviously, an industry can only be classified as high skill or low skill on average, with each industry actually employing workers from the full range of skills. With occupations, it is more likely that almost all will be of a certain required skill level, for example professional jobs requiring a high level of skills, and elementary occupations requiring a lower level of skills.

⁸ Separate probit equations are estimated for the likelihood of being over-qualified and under-qualified. An alternative estimating strategy would have been to estimate a bivariate probit, thus allowing the error terms in the two equations to be correlated, under the reasonable assumption that the same unobservables will influence the probabilities of being over-qualified and under-qualified (with opposite signs presumably). However, this implied that different samples could not be used in the two equations, and so if the full sample was used, then those with no qualifications would be included in the over-qualified equation, and those with the highest level of qualifications would appear in the under-qualified equations. Since neither of these situations (unqualified being over-qualified and highest qualified being under-qualified) can occur, when a bivariate probit was estimated, this led to suspect and sometimes perverse coefficients on any variables correlated with the likelihood of being unqualified or highly qualified. For example, those in part-time work, who are more likely to be unqualified, suddenly seem to have a lower probability of being over-qualified, this of course being due to the fact that they have no qualifications, rather than anything to do with the nature of part-time work. Similar outcomes occurred when over-qualified and under-qualified status were combined, together with adequately qualified, into a single variable, and a multinomial logit used to explain variation in this variable.

⁹ Individuals with no qualifications are excluded from the analysis in this table as they cannot, by definition, be over-qualified.

¹⁰ We also investigated whether the burden of childcare falling principally on women meant that it was women who were taking such jobs for which they are over-qualified, by including separate interaction terms between gender and number of children and between gender and full-time/part-time status. The coefficient on the former interaction term implied that the effect of children on

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the probability of being in an over-qualified job is 60% higher for women than for men, though this coefficient was not statistically significant. The coefficient on the latter interaction term was highly statistically insignificant, suggesting that both men and women who choose or accept part-time jobs are more likely to be over-qualified. It is true, however, that about 90% of those individuals working in part-time jobs are women.

¹¹ In a further estimation, not shown, we also controlled for the highest qualification held, although this potentially creates an endogeneity problem as this variable is used in the construction of the dependent variable. This estimation did not alter the pattern of results.

¹² The children coefficient is again statistically significant when the job characteristics are omitted (not shown), but loses this significance once the job characteristics are included, again suggesting that the driving of some such workers into unstable forms of employment is causing their over-skilling.

¹³ Calculated as $e^{\beta} - 1$, where β is the estimated coefficient in the log-linear equation, in this case -0.166 .

¹⁴ In addition, the other coefficients are all consistent with wage equation results in the literature.

¹⁵ Similar effects are observed by Allen and van der Velden (2001).

¹⁶ See DfES (2002).