OVERQUALIFICATION: MAJOR OR MINOR MISMATCH?

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ABSTRACT

A large empirical literature suggests that a proportion of employees are over-educated (over-qualified) for the jobs that they do. It also estimates the impact of this mismatch on wages. The empirical results suggest that having more education than is needed for a job generates a premium relative to the job but at the same time a penalty relative to the qualification. This mismatch is often explained either by variation in skills or by a slow start to career. Both explanations are compatible with human capital theory. We measure the incidence of over-qualification in four European countries: Britain, Italy, Germany and Norway at differing educational levels, to show that overqualification is most common at the lower levels where careers tend to be flatter. The inclusion of a measure of computer skills also seems to make little difference to the relationship between overqualification and wages. However, one issue which is important is the degree of voluntarism that is associated with progression through education. Overqualification is traditionally measured through years of education required for the job and years spent in education, but this can be separated into a part that reflects the achievement of certificates and a part that reflects the passage of time. The latter is strongly influenced by individual motivation which determines final choices and by institutional factors which might either enhance or constrain these. We isolate the number of excess years a person spends in education without reaching the next qualification level in order to use this as an instrument for over-education. Our results suggest that the impact of over-qualification on wages is rather small, and becomes even smaller when the excess years spent in education are used as instrument for over-education. Overqualification can on these results never be interpreted as a labour-market choice which provides some sort of human-capital premium.

1. Introduction

A growing literature argues that a large proportion of employees are over-educated or overqualified[1] for the jobs they do (Borghans and de Grip, 2000; Hartog, 2000). Analytically this derives from decomposing the effect of education in a wage equation into a part required by the job (usually approximated by data on the respondent's assessment of the years of education the job needs) and whether the respondent has more or less than this requirement. Having excess education for a job mostly has a positive effect on the wages of the overqualified compared to 'matched' people working in the same job, but produces lower wages and returns to education compared to people with the same education who are "correctly" placed. Being overqualified therefore generates a premium relative to the job but a penalty relative to the qualification.

Because of the primacy of human capital theory (HCT) in economics, overqualification (OQ) might be seen as a puzzle. People are not expected to invest in education which they cannot fully utilise. Although it is possible to view OQ in terms of the likely implications for other theories such as job queueing (Thurow, 1979) or assignment theory (Sattinger, 1993) why people would appear to systematically overinvest in education still has to be fully understood. There have been two main responses to this problem. One, which derives from job search theory, assumes that OQ can be a wise investment, producing income additional to the return to expected education. This idea can therefore be read as an amendment to HCT (Daly et al., 2000). However, splitting education into overeducation, required education and undereducation (ORU) conflicts with HCT insofar as the latter would predict that surplus education should earn the same return as required education, and 'assignment' models perhaps explain the empirical findings of the ORU model better than HCT (Sloane, 2002). Nevertheless, in the sense that the original ORU envisages individuals as rationally overinvesting in education it can still be seen as a modification of HCT.

The second response to the problem minimises the significance of OQ, arguing that some overinvestment can arise through distortions in the market, especially stemming from inadequate information on job opportunities, or because of potential career constraints such as family responsibilities. While Dolton and Vignoles (2000) suggest that OQ lasts some time into graduate careers, Hartog (2000) and Dorn and Sousa-Poza (2006) point to evidence for an increasing tendency for potential employees to take first jobs below their educational value and subsequently to find a match. Alternatively, the "heterogeneous skills within

qualification levels" theory (Green and McIntosh, 2002), builds on the idea that a deficit in formal education can be balanced by superior skills or work experience. In this case OQ indicates a more complex matching process consisting of more than one component of human capital.

While neither of these last two accounts explicitly relate their central ideas to HCT, in treating the OQ phenomenon as a minor rather than a major mismatch, either temporal and corrected over time or adjusted through the value of skills, their refinements of OQ theory and analysis reduce the apparent contradiction between personal education as a rational investment and *over*education. If, in contrast, these refinements fail to explain the phenomenon adequately, then we must continue to view the significance of OQ for human capital theory as a problem which has to be resolved. We show that OQ occurs at low as well as high levels of education. Given that careers are less progressive at the lower levels, this is not wholly consistent with the idea of career postponement. We also show that skills – measured here by knowledge of some simple computer functions – make little difference to the wage impact of OQ relative to required education. Finally, we add a comparative element to the discussion, hitherto rarely done, through analysis of data from four European countries. The results are consistent with the idea that institutional differences in educational systems are an important factor in determining OQ, and thus that OQ should not be viewed as solely as an adjustment to demand-side theories.

2. The meaning of overqualification

The empirical existence of OQ is undisputed but its empirical significance remains unclear. Splitting years of education into overeducation, required education and undereducation is often interpreted in terms of the workings of the demand side. This is seen as one advantage in the ORU specification over the Mincer approach, correcting its supply-side bias. However, on the supply side HCT implies an over-rational motivation for people to engage in education[2]. In sociology a number of reasons have been given to explain why society might persistently produce more education than the job market requires, such as increased personal demand for social status (Bourdieu and Passeron, 1990; Collins, 1979; Heath and Cheung, 1998), or overinvestment by the state and the growth of vested interests in institutional provision (Archer, 1982; Coombs, 1985). Further, people might extend their time in education as a result of a belief in its general efficacy, yet with no necessarily clear idea of

what is needed for a particular career[3]. For all these reasons people might seek more education than their underlying ability and skills might warrant.

While sociology is weak on the demand side, it should be pointed out that the analysis of OQ is also of limited help in this respect. The difference in the return to expected and to surplus education tells us little about employers' requirements. In the original thinking behind the concept, the component 'required education' implicitly provides an indication of the value of the work people are expected to do, but the relationship between this value and the value of OQ has never been satisfactorily explained. The penalty suffered by those who underutilise their educational achievements is obvious (a graduate doing non-graduate work must generally earn less than a matched graduate). However, the premium that accrues to an overqualified person relative to a matched person in the same type of job is less easy to explain. The demand side remains a puzzle therefore.

One possibility is that the overqualified do their work more efficiently. At first sight therefore the skills argument seems plausible. Yet it remains unclear if the skill variation which this suggests is a supply or a demand phenomenon. The former seems more likely. While it has been suggested by Hartog (2000) that in some countries the demand for skills has become more dispersed than supply, which implies a tendency to both over and underqualification, Groeneveld and Hartog (2004) find no direct evidence that employers systematically seek the overqualified in order to obtain higher skills. It moreover seems unlikely that employers *require* variation in skills at particular qualification levels; they generally expect a high correlation between qualifications, skills, and motivation[4] (with the first of these signalling the others). Overall, therefore, it seems reasonable to put down the correlation between OQ and skills to supply-side factors. This could work in two ways. First, if there is a general oversupply of skills employers can encourage overqualification by choosing the most skilled for the job, therefore gaining higher productivity while still paying at or perhaps just over the going rate for the job[5]. Second, OQ could be used by job-seekers as a signalling device for their skills, but perhaps especially as an insurance against job-search failure (Büchel, 2001). Against this, at least within a single firm there is limited evidence for overqualification as an individual career investment (Groeneveld and Hartog, 2004), and of course it would be an expensive way of doing things. However, the expansion of education could add to the competitive pressures that people feel, and so encourage them to obtain more education than they absolutely need for their prospective employment. This idea is in fact similar to the original ORU concept, except that now we can perhaps view

'excess' investment as generating a penalty rather than a premium. It is an insurance cost (Nicaise, 2000).

Skills variation seems to be a factor in a supply-side explanation of OQ. The alternative explanation referred to above as deriving from of an uncertain career start does not change this general supply-side argument. It too reduces to the skills thesis. Employers presumably pay new recruits who are overqualified (and who might be in that position only because they choose a wrong first job), more than others doing the same work because they have above average skills for that work[6]. Nevertheless, the idea of a career effect additionally implies a role for choice. This is central to the interpretation of the labour-market significance of OQ. To argue that OQ is the result of choice, even of constrained choice, suggests a supply side cause. While we have indicated that supply-side aspects should be given greater conceptual prominence in the analysis of OQ, we do not argue that people choose to become overqualified. Rather, they choose to be educated only partially in relation to labour-market requirements. In this sense, the expansion of education encourages people to become overqualified. Much of the discussion in the literature has in fact been of graduates, where continued education is the result of individual choices clearly related to career[7]. But if mismatches are as significant in their incidence and effects lower down the educational hierarchy, where career choices are more constrained or careers are less progressive, then OQ is unlikely to be an individual, short-term disequilibrium. People might overcome initial OQ within their careers but, if they are replaced by equally overqualified recruits, who suffer a wage loss as a result, then OQ cannot be viewed as unimportant at the structural level. The result might be like a game of musical chairs, where there is no room in a specific job sector for everyone to sit down comfortably (matched by skills). There has to be a loser, whether a new overqualified recruit who loses pay relative to an equally qualified, matched worker, or someone relatively poorly educated who is bumped down by the overqualified.

If OQ is generally unwanted it should occur least of all where the relative returns are low and where careers are more limited, that is, at the lower end of the educational hierarchy. In this case the mismatch is perhaps not at the individual but at the structural level. The following sections analyse where in the education system oversupply is most pronounced, and controlling for a measure of skills, then test their wage effects at different points in the educational distribution. When we then deal with the endogeneity of education caused by

choice, we find that the effect of OQ is never positive. It is not a good human capital investment.

3. The measurement of overqualification

3.1. Definitions

Choice in education is partly related to time spent in education. Unfortunately, the traditional treatment of OQ as based on years of education directly obscures this effect[8]. More generally, this original ORU specification entails a number of difficulties, firstly of measurement, as people are unlikely to recall the number of years spent in education but will know their highest qualification. As regards education needed for the job, certainly in the European context it is virtually impossible to answer the question, 'how many years of education are required for a job?' In terms of analysis, there are non-linearities which should be faced directly. Although it has been found in the literature that one further year of education has an impact on wages (Angrist and Krueger, 1991), the wage effect of this might not be equal over the range of education (Griliches, 1977; Denny and Harmon, 2001). Educational progress works through barriers at specific junctures (often known as 'sheepskin effects', though we prefer the more readily understood 'certification effects'[9].) Employers do not ask job applicants how many years they spent in education but what qualifications they achieved. As for interpretation, years of education describes attendance more than achievement, but excess time spent in education might represent many, quite opposed things – for instance, higher levels of ability or motivation, or alternatively a lack of these, including biding time in educational institutions accumulating education as a sort of insurance against potential futural unemployment and bridging a lack of current job opportunities (Büchel and Helberger, 1995). The question, why some people end up in a job apparently not commensurate with their qualifications is different from the question, why people in certain jobs have spent varying amounts of time in education. Overall, therefore, the term *overqualification* describes the true nature of mismatches better than the term overeducation.

The problem of the meaning of time spent in education is central to this. It has been shown that controlling for unobserved heterogeneity changes the apparent returns to either required or excess education (Bauer, 2000; Muysken et al., 2002). Some of this heterogeneity is probably linked to factors which encourage individuals to either speed up or extend their stay in education beyond what is necessary. Here we attempt to measure this

explicitly, as 'temporal overeducation', or *excess time spent in education (relative to the average) to obtain a given qualification*. If temporal overeducation is included in the measure of overqualification, it might lead to an underestimation of the true impact of mismatches on wages. Further, it is possible that if the expansion of education encourages OQ through the system, then the greatest contribution to aggregate OQ comes from people, generally in the majority, with relatively low levels of education. However, as variation in time spent in education is much greater in higher education, *temporal overeducation* will be more common at this level. The standard means of analysis, using years of education, conflates these two factors[10]. Later on, using temporal overeducation as an instrument for OQ we show that OQ as traditionally defined has little wage impact.

3.2. Measures

Given the previous considerations, OQ is best calculated from a direct comparison of qualifications held and required, ideally at all appropriate educational levels. The impact of overqualification on wages can then be estimated by means of a modified Mincer regression:

$$Ln\ w_i = \alpha + \boldsymbol{X}_i\,\boldsymbol{\beta} + \boldsymbol{Q}_i + \varepsilon_i \qquad (1)$$

where the dependent variable is the logarithm of individual wages, $\boldsymbol{X}_i$ is a vector of individual characteristics, and $\boldsymbol{Q}_i$ is a set of OQ dummies defined by any combination of actual and expected qualifications.

However, as already mentioned, the empirical literature traditionally defines the mismatch in terms of years of education rather than qualification obtained. In this case overeducation is measured by the excess of years of education compared to that required for the job:

$$Ln\ w_i = \alpha + \boldsymbol{X}_i\,\boldsymbol{\beta} + {}^{rj}\gamma\ {}^{rj}E_i + {}^{o}\gamma\ {}^{o}E_i + {}^{u}\gamma\ {}^{u}E_i + \varepsilon_i \qquad (2)$$

where ${}^{rj}E_i$ is the number of years of education required for the job in which individual *i* works. Overeducation ${}^{o}E_i$, the difference between years of education acquired and years of education needed, is zero when education acquired is less than or equal to education needed. In a similar way, undereducation ${}^{u}E_i$ is zero when education acquired is equal to or below years of education required.

While equation (1) is in some ways preferable to equation (2), the latter has the advantage of using a single interval-level variable to measure overeducation. We therefore also estimate the amount of mismatch and its impact on wages using a measure that combines the two concepts. This can be done by converting qualifications into years of education. The number of years that individual *i* takes to get a certain qualification (E_i) can then be decomposed into two components. The first is the years of education normally needed to reach that qualification by the majority of people, the mode: EQ_i. The second is the surplus/deficit years that individual *i* takes to reach that qualification: Y_i. Thus, $E_i = EQ_i + Y_i$. We call Y_i. 'temporal overeducation'.

Overqualification ${}^{o}EQ_i$ characterises those individuals with a formal qualification higher than required for their job. It is the difference between the years needed by the majority of people to get the highest level of qualification obtained by individual *i* and the years needed by the majority of people to get the qualification required for the job in which individual *i* is working. People are overqualified with a qualification higher than required but not if they have excess years of education without reaching the next level of qualification. Similarly, underqualification ${}^{u}EQ_i$ characterises individuals with a formal qualification lower than required for their job. Obviously ${}^{o}EQ_i$ is zero for the underqualified, positive otherwise, ${}^{u}EQ_i$ zero for the overqualified, otherwise negative.

Equation (2) can then be rewritten as:

$$\ln w_i = \alpha + \boldsymbol{X}_i \boldsymbol{\beta} + {}^{rj}\gamma \, {}^{rj}EQ_i + {}^{o}\gamma \, {}^{o}EQ_i + {}^{u}\gamma \, {}^{u}EQ_i + \delta Y_i + \varepsilon_i \qquad (3)$$

where years of education is split into three components. The first (${}^{rj}EQ_i$) is the mode years of education expected for a job, which is associated with the required qualification. The second (comprising ${}^{o}EQ_i$ and ${}^{u}EQ_i$) is the difference between the mode years of education associated with the actual qualification held and the one required for the job. The third, temporal overeducation (Y_i), is the difference in years of education between individual *i* and the majority of people holding the same qualification as individual *i*.

This last component might have different interpretations. Surplus or deficit years taken to reach a certain qualification might be 'noise' which should then be included in the error term. Alternatively, temporal overeducation might be a proxy for unobserved individual ability, and therefore positively related to wages. For example, less able individuals might need more years than the mode to reach a certain qualification level.

Finally, temporal overeducation might reflect idiosyncratic variation between individuals and between different institutional backgrounds. In this case it might be related to OQ, though sometimes negatively and sometime positively. If it does have such a relationship (but not with wages), modelling the relationship between temporal overeducation and OQ might reduce problems of endogeneity of education in Mincer wage regressions. Temporal overeducation might have analytical value because, rather than noise, it is a proxy for degrees of voluntarism in education.

4. Data and methods

The data derive from the *e-Living* project, funded by the EU's IST Programme. The project was based on a household survey of 1750 homes in six countries – Britain, Bulgaria, Germany, Israel, Italy, Norway. The analysis presented below excludes Bulgaria and Israel in order to produce a more homogeneous sample of European countries. Interviews in the four countries covered here were by telephone and all were with one randomly selected adult aged 16 or over in each home. Using equivalent sampling strategies, the same questionnaire wording, as well as a single co-ordinating survey organisation, this becomes a valuable comparative dataset. Against this, telephone interviewing produces lower response rates than face-to-face interviewing. The average response rate across the four countries examined here was around 40% in wave 1, though over 65% of these were re-interviewed in wave 2. The survey was undertaken towards the end of 2001, repeated in a second wave in 2002. The analysis pools the two waves (using robust standard errors where appropriate) and is based on a weighted version of the data designed to compensate for non-response bias.

The questions relating to construction of the overqualification variables are:

a) *What qualification does someone usually need to be able to do your job?*
b) *What is the highest qualification that you have?*

Years of education are obtained directly by asking for the end date of completed full-time education (which therefore ignores continuing part-time education). The data also include information on computer skills. This measure is based on six questions asking whether the respondent knows how to download files from the web, to construct a web page, to email a file, to cut and paste, to reboot, and to copy files to a floppy.

We undertake the analysis using the three measures of overqualification defined in the previous section. The first, the 'certification method' is the categorical method described in

equation (1). The number of categories of education can of course vary. We use four for this purpose, which produces ten dummies which relate required to actual qualifications. Four refer to well-matched individuals: 'Matched Degree' has value 1 for all individuals with a degree working in a job for which a degree is required. Similarly, 'Matched HSL', 'Matched LSL' and 'Matched Low' have value 1 for all individuals with a higher secondary level certificate (such as Abitur, baccalaureate, or A-levels), low secondary level (such as Realschule or GCSEs), and a low education level respectively, who are matched for their job. Three dummies characterise overqualified individuals, and three characterise the underqualified. The three OQ dummies represent different levels of OQ: 'has Degree' is 1 for overqualified graduates; 'has HSL certificate' is 1 for overqualified individuals with a higher school leaving certificate; 'has LSL certificate' is 1 for those with a low school leaving certificate. Finally, the three underqualification dummies are: 'needs Degree' is 1 for non-graduates in graduate jobs; 'needs HSL certificate' and 'needs LSL certificate' are 1 for underqualified individuals in jobs for which a high or a low school leaving certificate respectively is needed.

The second method is our version of the standard method, as in equation (2), although it is not exactly the same as the early ORU specification. It defines overqualification as the difference between actual years of education and the average years associated with the qualification deemed necessary for a job. Again, a decision has to be made on how many qualification levels to choose (for instance, the range of years of education is larger for all degrees than just for first degrees). We have tested results with both six and nine levels, but only use the six here as nine levels lead to small cell sizes in some cases. We also test different forms of average: the mean, the median, and the mode.

Our final measure of overqualification implements the combined definition shown in equation (3). It dispenses with actual years of education and uses the average years associated with the qualification held. Again we use six levels of qualification as the basis for calculating years of education, initially using the mean, median and the mode. This definition of overqualification allows us to separate out from the standard measure a component of years of education, Y_i, which is fluctuation in years of education around the average taken to obtain this qualification.

5. Results

5.1. *The extent of overqualification*

Table 1 shows the distributions of overqualification using the measure based on certification effects. These results exclude overqualification within aggregates of qualifications; thus, for example someone with a PhD doing a job requiring any university degree would not count as overqualified. Also, we do not make a distinction between an individual with one level of qualification more than needed and one with two levels or more in excess (though the proportion of individuals who have an excess of more than one level of qualification is rather small).

The percentages overqualified and underqualified are broadly in line with the literature, but we can also see some heterogeneity by qualification level[11]. In fact we have two profiles of overqualification, with Britain and Germany having a relative excess at the middle and lowest levels, while for the other two countries the reverse applies. Only in Norway, where 10.40 percent of workers are overqualified with a degree compared to the total of 21.70, does higher education contribute to around half of all OQ. In no country are more than one third of graduates overqualified. In all cases the proportion of people with higher school-leaving certificate who are overqualified is much higher than one third, while it is at least one third in three countries even at the lower school level. This suggests that OQ is as much a result of the general expansion of education as of its tertiary extension, and also implicitly that it includes involuntary some OQ[12]. Thus, a person with the barest of qualifications might count as overqualified where only manual work is required.

Average hourly wages in euros for each group appears in the second of each pair of columns in Table 1. The number of observations is reduced mostly through non-response to the pay question, and partly through elimination of some outliers. Being overqualified generally indicates a pay penalty relative to having the equivalent matched qualification, though less so at the lower levels. OQ is therefore more likely lower down the educational hierarchy but entails less of a wage penalty. In Britain and Norway, while the overqualified suffer a penalty relative to those with equivalent and correctly matched qualifications, they earn a premium relative to those with the same types of job but lower qualifications. The fact that this is not so in Italy and Germany suggests a different, perhaps more institutionalised relationship between the education system and the labour market. Finally, being

underqualified appears to entail only a marginal loss of income relative to being matched (though we do not observe in this table what qualifications the underqualified actually have.)

TABLE 1 ABOUT HERE

The relatively high OQ at the lower educational levels actually increases amongst younger cohorts. We do not show the results, but in Britain 6% of the sample aged 40 or over is overqualified with a degree, 8% with high school leaving certificate and 12% with low school leaving certificate. For those younger than 40 these figures become 7%, 14% and 19% respectively. This could indicate the career effect discussed above but this is unlikely at the lower educational levels. Alternatively it might show a tendency for OQ to be more common at the lower levels over time, and thus an effect of educational expansion. However, in Italy, Germany and Norway OQ barely varies by age cohort.

We now turn to more standard usage, based on years of education as in equation (2). The calculation of required education is based on average years of education required for a qualification, and here we show results using the mean, median, and mode. The proportions of over and underqualified under this definition are shown in the top half of the table (including as overqualified workers even with only one more year of education than needed for the job). In the bottom half of Table 2 the proportions of overqualified are computed using the method based entirely on years of education taken to achieve a qualification, as in equation (3). (Some differences in sample sizes occur because of missing data for one or other variable used to formulate the three different definitions of OQ.)

OQ based on years of education is always higher than where the combined method is used. However, the former includes the element of temporal overeducation, which might make the results sensitive to the form of average used. In two countries the mode produces lower, but in the other two, higher OQ than the mean. Hereafter, partly because we believe lower figures for OQ are generally more plausible, we use the mode only[13].

TABLE 2 ABOUT HERE

Two things are clear from the results so far. First, OQ occurs at all educational levels, not only at the highest. Indeed, especially taking into account absolute numbers, it is more predominant at the school than the degree level. Second, OQ as excess years of education in

the standard method reflects variation in time spent in education to achieve a particular qualification, which can have quite disparate causes, and is rather sensitive to the form of measurement used.

5.2. Skills

The core argument about skills is reflected in the fact that the overqualified might have fewer skills compared to those who are matched and with the same level of qualifications, but more than others in the same type of job. Table 3 shows the average computer skills by qualification level. While of course such skills might also be acquired on the job as much as reflecting underlying ability, the correlation with years of education suggests that achievement (and probably also motivation) is related to the acquisition of such skills.

TABLE 3 ABOUT HERE

In Britain there is a clear gradation in computer skills from 'matched degree' down through 'overqualified degree', 'matched higher school leaving certificate', then 'overqualified higher school leaving certificate', to 'matched lower school leaving certificate' and finally 'overqualified lower school leaving certificate'. This confirms that overqualification reflects levels of skills between levels of education. However, while this general pattern applies in the other countries, there it is not so consistent. Further, we can see in Table 4 that while computer skills always correlate relatively highly with years of education, they correlate with 'standard OQ' very differently in the four countries, with a positive correlation in Britain, almost none in Italy, and a negative correlation in the other two countries. Computer skills always correlate much less with OQ measured as in equation (3), possibly because the latter is less linear.

TABLE 4 ABOUT HERE

The variation in the direction of the relationship between skills and overqualification where it includes temporal overeducation strongly suggests the influence of institutional differences in educational provision rather than labour-market factors. Time spent in education means different things in different countries.

5.3. Wages

We now look at the impact that overqualification has on the log of hourly wages. Controls in the vector $\boldsymbol{X}_i$ of equations (1), (2) and (3) consist of gender, age, age squared, three dummies for industry, a dummy for whether the job is permanent, size of workplace, and a dummy for whether respondents have control over their own working schedule. Occupation itself is excluded in favour of this mix of indicators of the nature of occupations, as these might better pin down the effects of occupational differences related to education and to OQ. In addition, we include the measure of computer skills described above.

We first turn to use of the certification method. The results of the estimation of equation (1) are shown in Table 5. The coefficients for underqualification are included, but are not easy to interpret. Far more clear is that in all countries except Germany, someone who is matched with a degree earns more than someone overqualified with a degree. In all countries except Norway (where the difference is very slight) someone who is matched with a higher school-leaving qualification earns considerably more than someone overqualified at the same level. This is unsurprising, though reassuring. More important is the comparison between jobs. While in most cases higher pay accrues to an overqualified person when compared to someone matched at the next level down (e.g. an overqualified graduate compared to matched high school leaving certificate), this does not always apply. Thus OQ does not always generate a premium relative to the job. Finally, the addition of computer skills reduces the effect of both education and OQ equally. This suggests that there is no specific relationship between computer skills and OQ.

TABLE 5 ABOUT HERE

Table 6 shows the results of the estimation of equations (2) and (3). The first two columns for each country refer to equation (2), while the last two columns refer to equation (3).

TABLE 6 ABOUT HERE

Two things are quite apparent. First, and starting with the standard method, only in Britain and Italy do the overqualified seem to earn a premium. Second, while change in either OQ or UQ is in the same direction, from having insufficient education for the job to having an

excess, moving up this scale is different in the two ranges. In all countries except Italy, where the effect is zero, having more education is associated with increased wages amongst the underqualified. Thus underqualification is generally penalised. In general, therefore, that is with the exception of Norway, increased education pays over and above the effect of required education. The distinction between under and overqualification is therefore artificial. From an individual's point of view, the more education that can be supplied relative to the average expected for a job, the better. For the underqualified, it is better to be matched; but it is possible to be better than matched, that is, overqualified. In this limited sense, HCT is correct, though it does not of course mean that the extra education is a good investment.

Moving to the combined method, we now find that OQ has a much stronger effect than with the standard method. This is inevitable insofar as, while still measured by years of education, these are now much more lumpy, with each term representing at least two years of education. Indeed, this variable should perhaps be entered as a series of dummies, though that would make comparability harder. But the differences in the effects of the two measures of overqualification are not wholly the result of this clumping effect. As argued above, the inclusion of an unpredictable element denoted by temporal overeducation within OQ reduces its wage impact. This is clearly so in Britain, Norway and probably in Italy. It is not the case in Germany, where neither of the two measures of overqualification have a statistically significant effect. Table 5 showed that in fact OQ does have some impact in Germany, but this is limited to graduates, who are a small proportion of the total. Finally, the impact of computer skills is similar to the results shown in Table 5. Inclusion of this variable reduces the effect of education generally, however allocated.

Skills do not matter for the returns to education and overqualification, not does time. We can test the latter further by showing the effects of OQ within each qualification group separately, though we do not present the results. In Britain, Italy and Norway OQ using the standard method generates a statistically significant negative effect amongst those with a degree, and similarly at HSL level in Britain and Germany. Otherwise the effect is zero or close to zero. Although this negative effect is extremely small, time spent in education over and above achieved qualifications never helps. It is mostly penalised where is it most likely to occur - at the higher levels of education[14].

Overall, it can be seen that time spent in education does not enhance wages if it does not produce certificates (with the possible exception of Italy). When we separate out

temporal overeducation we see a stronger wage effect for OQ in Britain and Norway. However, this is not the case in Germany or Italy, both of which countries have a more regulated relationship between educational outputs and employment. (Indeed, in Germany OQ has little wage effect at all.)

This does not mean that temporal overeducation is mere 'noise', though. It reflects differing degrees of choice in education, which are institutionally influenced. This information can therefore be used to improve our models.

5.4. The endogeneity of education

Because it reflects individual inclinations either to speed up or slow down time spent in education for a specific end, temporal overeducation implies variation in either skills or motivation, while this relationship is itself likely to vary by national differences in education systems and institutions. Further, as temporal overeducation reflects differential voluntarism, and choice is more viable higher up in education, it is correlated with years of education. This is especially the case if we use the mode to calculate temporal variation, as most of the latter will then be positive. At the same time, its unpredictable nature means it is unlikely to be correlated with wages. It is therefore a potentially good instrument for OQ as defined by the standard method, where degrees of voluntarism make endogeneity more of a problem[15].

The results for a two-stage regression with overqualification in the standard formulation instrumented on temporal overeducation, and including education expected for the job in the second stage equation, produces the results shown in Table 7 (combining over and undereducation in a single variable, because as shown earlier these work in the same direction).

TABLE 7 ABOUT HERE

In two countries OQ has no significant effect; in the other two its impact is small and negative. Thus, when we model the wage effect of OQ using estimates of OQ which derive from individual and institutional variation in degrees of voluntarism associated with education systems and levels, we find that OQ never pays. What appeared to pay in the earlier results was not extra education but perhaps extra motivation or skills. Staying longer than necessary in education does not itself give a competitive edge.

6. Conclusions

We have shown above that, when explicitly measured as an excess of actual over required qualifications, overqualification exists at all levels of the educational system in four European countries, and especially at the lower and the middle levels. It is not therefore an outcome of the tertiary extension of education. Nevertheless, this broad educational distribution of the phenomenon also implies that we must see the source of overqualification in the system of education itself, not in the labour market. It would be odd indeed if the labour market required or even encouraged excess at all skill levels. What happens is simply that many people with marginal qualifications are required or pressurised to remain in education longer than they need for the very limited jobs they will subsequently get. Their education is no doubt beneficial for them and for society, but it relates poorly to the work they will do.

This also means that overqualification is a problem for standard human capital theory. The outcomes described above are not the result of planned investments in education but of a structural mismatch between the requirements of job markets and the institutional framework of education. The existence of overqualification at lower educational levels is not readily compatible with the idea that it is a response to a poor career start. Careers are limited at the lower levels where overqualification is most likely.

Where excess education is voluntary it is might often be the result of a generalised preference for education rather than of a specific investment decision based on some assessment (however imprecise) of the education deemed necessary for a job - although it is not possible to provide direct evidence for this with the data available (perhaps any available data). Our splitting of years of education into the average needed to obtain a qualification and variation around this nevertheless provides indirect evidence, as the correlation of this 'temporal overeducation' with computer skills is positive in some countries, negative in others. Excess time does not necessarily denote excess skills but rather variation in the degree of voluntarism applicable or possible in specific institutional contexts.

In contrast both to the original ORU approach and to the subsequent refinements of this, we question whether the finding of persistent overqualification is compatible with human capital theory. That the wage effects of overqualification reflect some variation in skills seems reasonable, but we cannot assume this tells us anything about demand. Certainly the overqualified have less skills than their educational counterparts who are

matched, and more than their occupational counterparts who are matched, but this does not mean that we are observing the results of some rather refined matching process. The outcome can result just as easily from people overextending themselves in education.

The clearest measures of the incidence and effects of overqualification are provided by a comparison of required and actual qualifications. However, the time spent in education to achieve a qualification is itself an important educational phenomenon. Variation in this rises with progression through education but seems to have no productivity implications; it reflects degrees of voluntarism in education, whether negative or positive. This variation has to be handled in any analysis of overqualification, if we are to take seriously the possibility that it reflects a supply-side rather than only demand-side process. Here we use this measure as an instrument for overqualification itself, and when we do so, we find that the latter never has a positive wage effect. The apparent premium associated with having more education than people who are doing the same job reflects not the extra education achieved but the motivation and skills brought to this extra education.

Notes

[1] A term we prefer, as it is impossible to be overeducated. However, for ease of presentation we use 'overeducation' below to signify measures based on years of education as opposed to excess qualifications. We also note that while these two terms are often used interchangeably specific meanings are sometimes given to them. For instance, in a working paper Dorn and Sousa-Poza (2006) seem to use overqualification to mean having excess skills.

[2] Even if in practice it allows for factors such as lack of knowledge and uncertainty.

[3] This might include education for its own sake in addition to its status appeal. Machin and Vignoles (2005) argue that the idea of education as a consumption good is redundant. However, their argument describes not the social role of education but the analytical importance of human capital theory within economics. The idea that education can be analysed as an investment good at all was introduced through the development of human capital theory (Becker, 1975), but that corrected a prior analytical deficiency. It is unlikely that people see education as only an investment good.

[4] Green and McIntosh (2002) show that the wage penalty suffered by the overqualified falls very little when controlling for skill mismatches, which implies that the former does not represent a skill deficit (i.e. matching is in fact correct). But it is of note that the education coefficients also change little, which suggests that their measure of skills might have little to do with education, however defined.

[5] However, excess skills for the job is not a necessary outcome. If people obtain educational qualifications for a number of reasons, sometimes only loosely related to the job market, they might extend their education beyond their real abilities.

[6] The evidence for a career effect related to changes in the job market such as reduced security of tenure is itself far from clear. In a twenty-year period from 1975 the proportion of the British population of working age in

full-time, permanent work fell by around 20 percentage points from around 56% to 36%, and job-entry wages fell relative to the wages of those in continuous employment Gregg and Wadsworth (1995). However, Gregg and Wadsworth cast doubt on many aspects of the apparent trend towards flexible employment, doubts confirmed elsewhere for instance for instance Burgess and Rees (1996); European Commission (2003: 125-155); OECD (2003: 50-52). It is also unclear why the supposed 'end of jobs for life' should create uncertainty at the start, as opposed to near the end, of a career.

[7] Unfortunately we can never test the role of such factors directly. Although measures can be used which might proxy the outcome of choices, such as job satisfaction, , this type of information, however illuminating, leads to problems of interpretation.

[8] Though the concept has evolved along divergent paths since its early days. Indeed, both the measurement and analysis of OQ vary considerably across studies, and such differences are bound to produce different results. Though there are exceptions – for instance, a comparison of the empirical and subjective methods (Kler, 2005; Groot and Maassen van den Brink, 2000), these are rarely evaluated.

[9] These cannot be identified effectively through using years of education as dummies (what does 13 years mean relative to 12?). The certification method is also better than asking whether more than the required education has been obtained, which results in only one dummy variable regardless of level, or obtaining levels and then using a simple dummy to denote over and underqualification, at least without interaction terms with education.

[10] The focus in a number of studies on a single qualification (the degree) obviously makes assessment of actual education straightforward, while jobs can relatively easily be objectively evaluated as graduate or not. This inevitably means, though, that it is unclear what relationship skills have to OQ across the whole educational spectrum.

[11] This pattern does not exactly reflect national distributions of education in any obvious way. For instance, 13% of the sample in Italy (not only those in work) have a degree or the highest level of vocational qualification, 22% in both Britain and Germany, 51% in Norway.

[12] This contradicts an apparently generally held belief that overqualification occurs high up the system. Battu and Sloane (2000) find that overqualification is higher in Britain the greater the social status of the job someone does, and even that it rises with wages. Dolton and Vignoles (2000) find considerable overqualification amongst British graduates. However, in other countries the intensification of competition which this implies might apply to other skills levels – perhaps, for instance, craft skills in Germany.

[13] There are various reasons to compute *Q* as the mode rather than the average. First, we can interpret the mode as the number of years normally needed (by the majority of people) to get a certain qualification. Second, the mode is going to be an integer rather than a fraction, which facilitates interpretation. Third, unlike the mean, the mode is not affected by outliers.

[14] We also looked at OQ by occupation, which is rarely discussed. OQ is primarily associated with failure to be in a professional or managerial job. For instance, 51% of the overqualified with a degree in Britain have professional or managerial jobs compared to 79% of those matched with a degree. A roughly similar differential applies in the other three countries. But at the same time, just as overqualification is at least as prominent lower down the educational hierarchy, so it also at the lower levels primarily affects white-collar work. 24% of the overqualified with higher school-leaving exams in Britain are in professional or managerial jobs (if of a more routine kind), while where these qualifications are matched to jobs this is 54%. Other countries again reveal a broadly similar pattern.

[15] In Germany and Norway this is less the case. In Britain the correlation of temporal overeducation with years of education is .76 and zero with log wages; in Italy the figures are .42 and -.03 respectively; in Germany .19 and -.05; in Norway .22 and -.10.

References

Angrist, J.D. and Krueger, A.B. (1991) Does Compulsory School Attendance Affect Schooling and Earnings? *Quarterly Journal of Economics* 106(4): 979-1014.

Archer, M.S., Ed. (1982) *The Sociology of Educational Expansion: Take-Off, Growth and Inflation in Educational Systems*. Sage Studies in International Sociology. London, Sage.

Battu, H. and Sloane, P. (2000) Overeducation and Crowding out in Britain. *The Overeducated Worker?: The Economics of Skill Utliization*. Ed. by Borghans, L. and de Grip, A. Cheltenham, Edward Elgar: 157-174.

Bauer, T.K. (2000) Educational Mismatch and Wages: A Panel Analysis. *Economics of Education Review* 21: 221-229.

Becker, G.S. (1975) *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. New York, National Bureau of Economic Research.

Borghans, L. and de Grip, A. (2000) The Debate in Economics About Skill Utilization. *The Overeducated Worker? The Economics of Skill Utilization*. Ed. by Borghans, L. and de Grip, A. Cheltenham, Edward Elgar: 3-23.

Bourdieu, P. and Passeron, J.C. (1990) *Reproduction in Education, Society and Culture*. London, Sage.

Büchel, F. (2001) Overqualification - Reasons, Measurement Issues, and Typological Affinity to Unemployment. *Training in Europe. Second Report on Vocational Training Research in Europe 2000*. Ed. by Descy, P. and Tessaring, M. Luxembourg, Office for Official Publications of the European Communities. 2: 453-560.

Büchel, F. and Helberger, C. (1995) Bildungsnachfrage Als Versicherungsstrategie. Der Effekt Eines Zusätzlich Erworbenen Lehrabschlusses Auf Die Beruflichen Startchancen Von Hochschulabsolventen. *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung* 1: 32-42.

Burgess, S. and Rees, H. (1996) Job Tenure in Britain 1975-92. *Economic Journal* 106(435): 334-344.

Collins, R. (1979) *The Credential Society: An Historical Sociology of Education and Stratification*. New York, Academic Press.

Coombs, P.H. (1985) *The World Crisis in Education: The View from the Eighties*. New York ; Oxford, Oxford University Press.

Daly, M.C., Buchel, F. and Duncan, G.J. (2000) Premiums and Penalties for Surplus and Deficit Education: Evidence from the United States and Germany. *Economics of Education Review* 19(2): 169-178.

Denny, K.J. and Harmon, C.P. (2001) Ireland. *Education and Earnings in Europe. A Cross Country Analysis of the Retuerns to Education*. Ed. by Harmon, C., Walker, I. and Westergaard-Nielsen, N. Cheltenham (UK), Edward Elgar: 146-156.

Dolton, P. and Vignoles, A. (2000) The Incidence and Effects of Overeducation in the UK Graduate Labour Market. *Economics of Education Review* 19(2): 179-198.

Dorn, D. and Sousa-Poza, A. (2006) Overqualification: Permanent or Transitory, Paper Presented at the 3rd International Conference of Panel Data Users, Neuchatel, Switzerland.

European Commission (2003) *Employment in Europe 2003: Recent Trends and Prospects*. Luxembourg.

Green, F. and McIntosh, S. (2002) Is There a Genuine Underutilisation of Skills Amongst the Overqualified?, SKOPE Research Paper No. 30.

Gregg, P. and Wadsworth, J. (1995) A Short History of Labor Turnover, Job Tenure, and Job Security, 1975-93. *Oxford Review of Economic Policy* 11(1): 73-90.

Griliches, Z. (1977) Estimating the Returns to Schooling. *Econometrica* 45(1): 1-22.

Groeneveld, S. and Hartog, J. (2004) Overeducation, Wages and Promotions within the Firm. *Labour Economics* 11: 701-714.

Groot, W. and Maassen van den Brink, H. (2000) Overeducation in the Labour Market: A Meta Analysis. *Economics of Education Review* 19(2): 149-158.

Hartog, J. (2000) Over-Education and Earnings: Where Are We, Where Should We Go? *Economics of Education Review* 19(2): 131-147.

Heath, A. and Cheung, S.-Y. (1998) Education and Occupation in Britain. *From School to Work: A Comparative Study of Educational Qualifications and Occupational Destinations*. Ed. by Shavit, Y. and Muller, W. Oxford, Clarendon Press: 71-101.

Kler, P. (2005) Graduate Overeducation in Australia: A Comparison of the Mean and Objective Methods. *Education Economics* 13: 47-72.

Machin, S. and Vignoles, A. (2005) Education Policy and the Evidence. *What's the Good of Education?* Ed. by Machin, S. and Vignoles, A. Woodstock, Oxfordshire (UK), Princeton University Press: 217-226.

Muysken, J., Hoppe, M. and Rieder, H. (2002) The Impact of Education and Mismatch on Wages. Germany, 1984-2000. Maastricht, Mastricht Economic Research Institute on Innovation and Technology (MERIT) Research Memorandum Series 2002-031.

Nicaise, I. (2000) The Effect of Bumping Down on Wages: An Empirical Test. *The Overeducated Worker? The Economics of Skill Utilisation.* Ed. by Borghans, L. and de Grip, A. Cheltenham, UK, Edward Elgar: 175-187.

OECD (2003) *ICT and Economic Growth: Evidence from OECD Countries, Industries and Firms*. Paris, Organisation for Economic Co-operation and Development.

Sattinger, M. (1993) Assignment Models of the Distribution of Earnings. *Journal of Economic Literature* 31(2): 831-880.

Sloane, P.J. (2002) Much Ado About Nothing? What Does the over-Education Literature Really Tell Us?, WELMERC Discussion Paper 2002-01.

Thurow, L. (1979) A Job-Competition Model. *Unemployment and Inflation: Institutionalist and Structuralist Views*. Ed. by Piore, M.J. White Plains (New York), Sharpe: 17-32.

Tables

Table 1: Proportion of matched, over- and under-qualified workers and their hourly wages (certification method)

	Britain		Italy		Germany		Norway	
	%	Pay	%	Pay	%	Pay	%	Pay
Underqualified:								
needs degree	3.4	19.5	3.7	12.6	2.5	21.9	4.5	19.2
needs HSL certificate	1.8	14.5	2.1	10.5	4.5	14.5	2.8	18.1
needs LSL certificate	1.6	10.9	1.8	5.8	5.2	14.2	1.8	15.5
Overqualified:								
has degree	6.2	17.3	6.5	11.9	3.4	19.3	10.4	19.8
has HSL certificate	11.4	13.2	7.6	8.5	13.6	12.3	5.1	17.7
has LSL certificate	15.4	11.5	5.1	6.4	10.6	11.0	6.2	16.6
Matched:								
has degree	18.2	21.3	13.0	17.4	7.0	17.7	46.7	21.6
has HSL certificate	7.5	16.1	3.5	12.2	11.8	17.0	4.1	18.5
has LSL certificate	5.9	11.7	54.8	8.1	16.4	13.3	15.9	16.5
has low/no qualification	28.2	10.8	1.9	8.2	25.0	10.9	2.6	15.6
Total	100		100		100		100	
% overqualified	33.0		19.2		27.6		21.7	
% graduates overqualified	25		33		33		18	
% HSL overqualified	53		60		49		48	
% LSL overqualified	69		8		36		23	
Observations	1,225	909	1,369	611	1,408	847	1,700	1396

Table 2: Percentages overqualified, using actual years of education (standard method) and average years associated with qualification levels (combined method)

Definition of overqualification	Britain	Italy	Germany	Norway
Standard method				
The mean	55.5	60.0	52.3	43.3
The median	58.9	49.6	57.0	51.3
The mode	44.7	71.5	60.6	32.6
Observations	1,391	1,326	1,435	1,663
Combined method				
The mean	36.3	19.0	30.8	21.0
The median	35.7	19.0	37.3	21.0
The mode	16.8	13.9	26.0	17.0
Observations	1,193	1,292	1,366	1,631

Table 3: Average computer skills by qualification levels (certification method)

	Britain		Italy	
	Matched	Overqualified	Matched	Overqualified
Lower School Leaving Certificate	3.4	2.8	2.6	1.4
Higher School Leaving Certificate	3.9	3.7	2.9	3.8
Degree	4.6	4.2	4.1	3.8

	Germany		Norway	
	Matched	Overqualified	Matched	Overqualified
Lower School Leaving Certificate	3.3	2.5	3.7	2.9
Higher School Leaving Certificate	4.2	3.8	3.6	3.2
Degree	4.3	4.6	4.7	4.3

Table 4: Correlation of computer skills with different measures of education, overqualification and 'overeducation'

	Britain	Italy	Germany	Norway
Years of education	0.38***	0.39***	0.22***	0.27***
Years overeducation (standard)	0.15***	0.04	-0.14***	-0.19***
Years OQ (combined method)	0.08*	0.00	0.06**	0.04
Temporal overeducation	0.19***	0.14***	-0.18***	-0.29***

* Significant at 10%, ** Significant at 5%, *** Significant at 1%

Table 5: Effects on log of hourly wages of differentials in levels of actual and expected qualifications (certification method)

	Britain		Italy		Germany		Norway	
Underqualified:								
needs degree	0.474***	0.418***	0.692**	0.638*	0.624***	0.545***	0.263***	0.232**
	(0.079)	(0.085)	(0.258)	(0.260)	(0.136)	(0.141)	(0.078)	(0.076)
needs Higher School Leaving certificate	0.261**	0.226*	0.727**	0.688*	0.199	0.145	0.156*	0.107
	(0.097)	(0.093)	(0.270)	(0.271)	(0.113)	(0.111)	(0.075)	(0.076)
needs Low School Leaving certificate	0.109	0.067	0.112	0.099	0.165*	0.121	0.039	0.020
	(0.077)	(0.076)	(0.310)	(0.311)	(0.072)	(0.074)	(0.109)	(0.104)
Overqualified:								
has degree	0.448***	0.391***	0.776**	0.734**	0.447***	0.378***	0.262***	0.215**
	(0.066)	(0.064)	(0.262)	(0.262)	(0.091)	(0.092)	(0.077)	(0.077)
has Higher School Leaving certificate	0.201***	0.162**	0.587*	0.557*	0.108	0.050	0.188*	0.163*
	(0.054)	(0.053)	(0.260)	(0.259)	(0.063)	(0.064)	(0.077)	(0.076)
has Low School Leaving certificate	0.053	0.038	0.152	0.146	-0.019	-0.033	0.125	0.101
	(0.056)	(0.054)	(0.253)	(0.254)	(0.080)	(0.081)	(0.090)	(0.089)
Matched:								
has degree	0.566***	0.510***	0.970***	0.920***	0.384***	0.321**	0.368***	0.319***
	(0.047)	(0.049)	(0.262)	(0.262)	(0.097)	(0.099)	(0.066)	(0.067)
has Higher School Leaving certificate	0.365***	0.323***	0.841**	0.802**	0.354***	0.288***	0.119	0.087
	(0.056)	(0.055)	(0.258)	(0.259)	(0.066)	(0.067)	(0.096)	(0.095)
has Low School Leaving certificate	0.095	0.061	0.479	0.450	0.255***	0.218***	0.115	0.082
	(0.070)	(0.069)	(0.244)	(0.244)	(0.061)	(0.063)	(0.070)	(0.070)
Computer Skills		0.027***		0.017		0.028**		0.017*
		(0.008)		(0.009)		(0.010)		(0.007)
Adjusted R^2	0.429	0.437	0.396	0.399	0.393	0.401	0.274	0.278
Observations	910	910	619	619	849	849	1395	1395

Robust standard errors in parenthesis; * Significant at 10%, ** Significant at 5%, *** Significant at 1%

Other explanatory variables: gender; age and its square; dummy for whether the job is permanent; dummy for whether the individual has a fixed working schedule; size of the working place; three dummies for industry.

Table 6: The effects of expected qualifications, and over and underqualification on the log of hourly wages

	Britain				Italy			
	'Standard' Method		*'Combined' Method*		*'Standard' Method*		*'Combined' Method*	
Mode years education required by the job	0.091***	0.083***	0.103***	0.094***	0.044***	0.042***	0.043***	0.041***
	(0.007)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.007)	(0.007)
Years overeducation	0.011*	0.006			0.021***	0.019***		
	(0.005)	(0.005)			(0.006)	(0.006)		
Years undereducation	0.031**	0.032**			0.000	-0.000		
	(0.011)	(0.011)			(0.018)	(0.018)		
(Years of) overqualification			0.066***	0.057***			0.023*	0.022*
			(0.010)	(0.010)			(0.009)	(0.009)
(Years of) underqualification			0.035	0.032			0.020	0.021
			(0.019)	(0.018)			(0.012)	(0.012)
Temporal overeducation			-0.000	-0.002			0.013	0.011
			(0.006)	(0.006)			(0.007)	(0.007)
Computer skills		0.034***		0.030***		0.016		0.023*
		(0.007)		(0.008)		(0.009)		(0.010)
Adjusted R^2	0.402	0.417	0.427	0.438	0.362	0.365	0.367	0.374
Observations	1018	1018	887	887	614	614	590	590

Table 6 continued

	Germany				Norway			
	'Standard' Method		*'Combined' Method*		*'Standard' Method*		*'Combined' Method*	
Mode years education required by the job	0.026***	0.021***	0.023***	0.018***	0.018***	0.015***	0.019***	0.018***
	(0.005)	(0.005)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)
Years overeducation	-0.001	-0.003			0.006	0.005		
	(0.006)	(0.006)			(0.003)	(0.003)		
Years undereducation	0.016*	0.014			0.003	0.002		
	(0.008)	(0.007)			(0.004)	(0.004)		
(Years of) overqualification			0.007	0.003			0.015***	0.013***
			(0.004)	(0.004)			(0.003)	(0.003)
(Years of) underqualification			0.016	0.015			0.009*	0.007
			(0.009)	(0.008)			(0.004)	(0.004)
Temporal variation			-0.001	-0.002			0.001	0.000
			(0.005)	(0.005)			(0.003)	(0.003)
Computer skills		0.039***		0.038***		0.022***		0.018**
		(0.009)		(0.010)		(0.007)		(0.007)
Adjusted R^2	0.346	0.366	0.345	0.363	0.252	0.261	0.274	0.280
Observations	864	864	823	823	1366	1366	1341	1341

Robust standard errors in parenthesis; * Significant at 10%, ** Significant at 5%, *** Significant at 1%
Other explanatory variables: gender; age and its square; dummy for whether the job is permanent; dummy for whether the individual has a fixed working schedule; size of the working place; three dummies for industry.

Table 7: Impact of OQ (standard method) on the log of wages, where OQ is instrumented on temporal overeducation

	Britain	Italy	Germany	Norway
Required years of education	0.081***	0.033***	0.007	0.005
	(0.008)	(0.007)	(0.008)	(0.003)
Overqualification	-0.008	-0.002	-0.012	-0.013**
	(0.006)	(0.009)	(0.011)	(0.004)
Computer skills	0.052***	0.040***	0.049***	0.033***
	(0.008)	(0.009)	(0.009)	(0.006)
Adjusted R^2	0.373	0.333	0.359	0.225
Observations	887	590	823	1341
First-stage regression:				
Temporal overeducation	0.952***	0.683***	0.301***	0.486***
	(0.038)	(0.053)	(0.038)	(0.028)

Robust standard errors in parenthesis; * Significant at 10%, ** Significant at 5%, *** Significant at 1%