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Do Fields of Study Matter for Over-education? The Cases of Spain and Germany

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Abstract

Resorting to European Labor Force Survey 2003–2005 data and controlling for factors traditionally accounting for over-education, we demonstrate here that fields of study influence the odds of being overeducated in Spain and in Germany. Being more stratified than the Spanish system of education, the German one uses fields of study as a signaling device for the labor market to a lesser extent than Spanish one. Cross-country similarities in terms of the relative position of fields of study within the country are discussed. Two samples have been researched: a general sample with information about individuals' fields of study as well as a restricted sample with additional information individuals' parental ISEI score, when such information was available. Heckman selection modeling has been applied to the latter (restricted) sample. A new technique has been devised to measure over-education, relying on ISCED categories instead of years of education.

Key words: fields of study • labor market studies • over-education • sociology of education • systems of education

1. INTRODUCTION

In the last three decades the industrialized world has experienced a process of educational expansion that has allowed more and more people to get access to higher education (Muller and Gangl, 2003). This has had a two-way impact on the labor markets. Employers have faced a reality where education becomes so universal that it no longer serves as a distinctive factor among potential employees. In such situation, employers start demanding all the higher levels of education at the entry to the job in order to secure themselves with the candidates least costly to train (Barron et al., 1989) and most productive employees (van Smoorenburg and van der Velden, 2000). This leads in consequence to over-education since as Hartog (2000) suggests '*the strong expansion of participation in education has out-paced the increase in the demanded levels of education*' (p. 134, italics added). The other effect of educational expansion has taken place in the labor supply side.

Since the 1970s and 1980s there has been a constantly occurring phenomenon of educational upgrading (Clogg and Shockey, 1984) marked by the fact that as Halaby (1994) says '*American [as well as European] workers increasingly found that their acquired years of schooling significantly exceeded the levels of schooling that were historically typical of the occupations in which they were employed*' [p. 47, italics added]. While education served before as a distinctive factor for the privileged social groups to keep their position, now these groups have to find themselves some qualitative distinctions within particular levels of education in order to maintain their privileged positions (Lucas, 2001). We believe fields of study serve as such distinctive qualitative factor nowadays.

Educational expansion and its subsequent impact on the labor market have increasingly made fields of study relevant for the research on over-education. Most of the studies on job mismatch show that over-education brings positive results to wages (Groot and van den Brink, 2000). Yet the incomplete utilization of skills is economically inefficient. Overeducated workers are less productive than they would be in other jobs requiring their level of education (Tsang and Levin, 1985). Underutilization of skills leads to frustration and diminished productivity (Allen and van der Velden, 2001). Interestingly, the literatures on fields of study and over-education have so far neglected each other.¹ In this article we try to fill this gap by describing the relationship between the choice of field of study and the likelihood of being over-educated.

In section 2 we explain the research background of both literature strands, on over-education and fields of study. Interestingly both concentrated on the same issue, namely labor market opportunities associated to those dependent variables. In section 3 we describe the European Labor Force Survey data (EU LFS). We explain how we constructed our main independent variables, we sketch the existent approaches to measuring over-education and shortly discuss their strengths and weaknesses. As a result, we propose a new indicator of over-education which we believe is free from some drawbacks of the other measures used in the literature. In section 4 we present the results of our investigation of distribution of over-education across fields, controlling through multivariate analyses for heterogeneity of factors influencing that phenomenon, as tenure, age, immigrant status, gender, etc. The final discussion is placed in the section 5.

2. RESEARCH BACKGROUND

The literature on over-education dates back to Richard Freeman's *Overeducated American* (Freeman, 1992), who first introduced the notion of excess of education for a given occupation. Roughly five years later in their influential article in the first issue of *Economics of Education Review*, Duncan and Hoffman (1981) measured the wage impact of over-education in the USA for the first time. Using PSID data they demonstrated that more than 40 percent of US workers reported to be over-educated for the jobs they performed with positive returns to this over-education. Since then, there were

many other country studies measuring the wage effects of over-education (Alba-Ramirez, 1993; Allen and van der Velden, 2001; Cohn and Ng, 2000; Daly et al., 2000; de Oliveira et al., 2000; Dolton and Vignoles, 2000; Hartog and Oosterbeek, 1988; Sloane et al., 1999; Vahey, 2000; van Smoorenburg and van der Velden, 2000). Few authors have drawn attention to other than wage effects of over-education such as gender differentiation of over-educated workers (Birkelund et al., 1996), on-the-job training (Barron et al., 1989) or business cycles and employment policy (Devereux, 2000). Moreover over-education as itself has not received enough attention as the phenomenon to be explained.

Among the theories to be considered to explain over-education, we will examine mainly the supply-side theories here. However, it could be argued that over-education is also due to demand-side factors. For instance, the incidence of over-education, in aggregate terms, and thus the individual likelihood of being over-educated, may well be the result of varying demand for graduates across sectors. It is important to note here that it is the evolution of the economic structure of the country what may be at stake here. In other words, the evolution of sector size before individuals got their graduation may affect their odds of getting over-educated. As far as it is possible (see later), we will control for these demand-side factors or give illustrative evidence of their presumable role in explaining over-education.

Among the supply-side theories to explain over-education, Human Capital Theory (HCT) (Becker, 1980; Becker and Tomes, 1986) claims that education and on-the-job training are substitutes, and workers are paid the wage that equals the marginal product of their work. This assumption implies that employers fully utilize the skills of their workers. Hence, there should not be any over-education in the long run (in market equilibrium). However, as observed by Dolton and Vignoles (2000), as well as Frenette (2004), Groot and van den Brink (2000), Hartog (2000) and McGuinness and Wooden (2007) the phenomenon of over-education persists and gives positive return to wages.

One explanation in favor of HCT could be that of Occupational Mobility Theory (OMT) where over-educated workers possess lower abilities than others who are matched and their over-education is a compensatory mechanism for their lack of skills. Such approach would validate the typical precarious and frequently mismatched jobs of young workers who lack experience² (Sicherman, 1991; Sicherman and Galor, 1990). In turn this argument may imply that the existent measures of over-education might not identify the right skills of people; they might misjudge their real stock of human capital.³ Fields of study in fact might be one of the factors helping to identify different stocks of human capital, which lead in turn to different recognition of skills and hence to over-education.

Under the HCT over-educated workers will be prone to job change due to dissatisfaction with their current jobs caused by excess of education. However, workers lacking skills may trade off over-education in one firm for acquiring more skills before they change to another firm (Tsang and Levin, 1985). Then

we would expect that such over-educated but under-skilled workers would persist with the same employer for prolonged time in order to achieve enough skills and their experience premium be higher than the experience premium of non-over-educated employees. According to occupational mobility theory, over-education may be corrected through internal mobility (Groeneveld and Hartog, 2004) (promotion) or external mobility (job change) (Sicherman, 1991; Sicherman and Galor, 1990).

According to Job Competition Theory (JCT) candidates compete for a job on the basis of their relative training costs (Rosen, 1972; Thurow, 1974). The more education, the less training required and hence the better is the position in the job queue. In such a setup over-educated workers should find themselves in an advantageous position since their relative training costs are smaller than the costs of other workers. This view implies that over-education may persist and become a phenomenon embedded into the labor market structure. Under the JCT theory wage is determined by the characteristics of the job, not by worker's marginal productivity. In this view the worker's marginal product is dictated by the job characteristics and not by the stock of worker's human capital. The job competition theory however, similarly as HCT, does not account for different stocks of human capital associated with different fields of study, which in the light of JCT may lead to different relative training costs of employees. Introduction of fields of study therefore should account for some of the insights coming from the job competition theory.

The middle way between the Human Capital Theory and Job Competition Theory is represented by Assignment Theory (AT) (Sattinger, 1993), which postulates that allocation of workers to jobs is done according to both job characteristics and workers' utility maximization mechanism. Workers accept jobs maximizing their utility, but utility is not necessarily maximized with top possible income. Therefore assignment theory draws attention to job characteristics but also to individuals' desires. Being over-educated, workers may find themselves in jobs which require less education than they possess, but their maximization function (maximum income or maximum utility) may still be satisfied. Wages play in these models an allocative function but they are not based on individuals' characteristics or job characteristics. Under AT then, workers may have different preferences regarding job characteristics across different fields of study. Employers from their side should also differently value candidates from different study fields since their human capital stocks differ.

We believe that the introduction of fields of study into the analysis of over-education may serve as yet another step in the investigation of the mechanisms ruling over-education.⁴ Fields of study can be understood as different stocks of human capital, differentially valued by employers. If employers do not value human capital stock represented by one field as much as the one represented by another field, then the latter one should suffer from a higher incidence of over-education. Conversely, graduates of fields well recognized by employers should

experience over-education less frequently, since their signal is more clearly defining their relative training costs and productivity among all job candidates. There are several reasons why employers may value differently the stock of human capital associated to each field of studies, or the signal their graduates convey. First, the average duration of studies may vary within a given field and a given ISCED level. It is not just that the theoretical duration of university studies may vary from one field to another; the actual number of years it takes to get a university degree may also vary from one field to another, depending on how demanding the studies belonging to each field are. Second, fields of studies intrinsically entail a degree of specialization, but some fields are more occupationally focused than others. Degrees within 'Health and Welfare' are clearly aimed at certain occupations, whereas other fields, as 'Services', 'Humanities and Arts' or 'Social Sciences', are less specific, leading to a wider range of occupations. Based on the above reasoning, we may hypothesize that over-education differs across fields of study.

Furthermore, we expect to find differences in the degree that certain fields lead to over-educated jobs between Germany and Spain, since the difference in human capital stock associated to different fields of study may in turn vary depending on the institutional differences associated to the system of education. The interplay of productivity signaling by job candidates and screening by employers of potential labor force might be contingent on this institutional setup. In this respect standardization and stratification (Allmendinger, 1989) of the system of education should be accounted for. Standardization refers to the degree to which the quality of education meets the same standards nationwide. Stratification refers to the extent of tracking at the secondary educational level (Shavit and Muller, 1998). Difference in over-education across fields should be higher the less standardized and stratified the system of education is, since a worse match between education and training may be expected. Employers might be less able to discern about the human capital stock and the further training necessary for newly graduates. Thus, the content of the degrees belonging to each field would lose importance, and employers would need to resort to the aforementioned mechanisms that would explain the variation of over-education across fields of study.

Just for the sake of exploring this cross-national variation, we have selected two countries whose systems of education are extreme in this respect. While the German system of education has always been praised as a paradigm of stratification and stratification, the Spanish one is fairly less stratified and standardized. This is already shown in some recent scores on stratification provided by OECD (2005).

3. DATA AND METHODS

3.1. Data

We used three waves of the European Union Labor Force Survey anonymized data from the years 2003, 2004 and 2005 to test the above mentioned hypothesis.

The data for Spain consist of 12 quarterly files (four quarters for each of three years of the survey); the German data consist of six quarterly files, with one quarter for years 2003 and 2004 respectively and four quarterly files for the year 2005. We appended all the files for each country constructing a merged sample encompassing all years 2003 through 2005, thus achieving a sample of over one million individuals for each country.

The LFS data contain household information and are designed to provide some longitudinal information, since 20 percent of the individuals of the sample persist in it through four consecutive quarters. Since we were interested in pure cross-section data, we eliminated repeated observations on individuals using three identifiers: *hhnum*, *seqnum* and year. This allowed us to work with a sample where all individuals of each household have been interviewed in the same year.

In the next step we selected individuals for whom we had observations about their parents. The parental background information is of key importance in order to control for selection processes into fields of study. The variable *lienref* served us to link parents with their children in the EULFS sample, so that we obtained a sample consisting of individuals for whom we have the information about their parents' education level, occupation, and field of study.

In the following step we built a classification of educational levels based on two digit ISCED categories. In our classification of educational levels, named *isced6l*, there were six levels with (I) primary education, (II) lower secondary, (III) lower vocational, (IV) upper secondary, (V) higher vocational and (VI) tertiary. The same ISCED classification was applied for Germany and Spain. We considered eight-category field classification. There were the following fields: 1) teacher training, 2) humanities and arts, 3) social sciences, business and law, 4) natural sciences and mathematics, 5) engineering and construction, 6) agriculture and veterinary, 7) health and welfare, 8) services. The fields of humanities and natural sciences with mathematics appear initially split into more detailed categories of 'foreign languages' and 'humanities', and 'life sciences' and 'computer sciences', respectively. We collapsed them into the more general categories above.

Apart from fields of study we used a number of controls in our analyses, namely *sex*, *age*, *tenure*, *immig* and *fsize*. While *sex* and *age* are self-explanatory, *tenure* and *immig* were constructed to control for the time working for the present employer and immigrant status respectively. The *fsize* variable is a control for the size of the firm measured by the number of its employees. Firm size and tenure are the main covariates controlling for demand-side factors in our model. It would have been desirable to include the effect of the sector too, but there is not any suitable indicator of sector size in our data. The EU LFS certainly provides information about the worker's sector, but not about the *size of the sector*, which is what really matters here. Moreover, it would be necessary, not just to provide cross-sectional information on the size of the sector, but on the evolution of the sector up to the moment the worker got her degree, so that it is possible to

approximate the increasing or decreasing demand of more skill-demanding sectors and its eventual effect on the demand for graduates of some fields of study. In order to compensate for this shortcoming of our data, we provide illustrative information on the evolution of these sectors for both the German and the Spanish economies in the years immediately before individuals in our sample got their graduation.

3.2. Methods

The literature on over-education distinguishes three basic ways of measurement of over-education: job analysis (JA), worker self-assessment (WA) and realized matches (RM) (Hartog, 2000). Under job analysis (JA) professional job analyst visits the work site and evaluates the required level of education to perform the job correctly. This objective measure is based on clear definitions of the type of education and level which is correct for each job, so that it is optimally performed. The same definitions and requirements are used across all types of jobs, leading to the generation of dictionaries of occupational titles.⁵

Another way of measuring the required level of education for a given job is worker's self-assessment (WA). Workers are asked what kind of education, or level of education, does a person need to perform the worker's job well. This procedure allows for relatively cheap and easy gathering of data, but is flawed by the high subjectivity of workers' reporting.

The realized matches (RM) procedure is based on observation of workers employed in a given occupation and the measurement of their acquired levels of education. Having the years of education of workers by occupation, a variety of measures of central tendency are computed in order to extract the 'matched' group. One way of measuring the realized matches is to assume that the interval between one standard deviation below and one standard deviation above the mean years of education in a given occupation is the correct match (Verdugo and Verdugo, 1989). This method however has been criticized by de Oliveira et al. (2000) who instead of mean employ modal measurement of central location of education across occupations. De Oliveira et al. (2000) decided to limit their sample to those occupations where the modal number of years of schooling was shared by at least 60 percent of workers in that occupation. We consider that the number of year of education is not a fully reliable measure of educational attainment because it is frequently upwardly biased. A better measure of the educational attainment is the ISCED level of achieved education (Ortiz, 2007).

In our approach we decided to employ yet another way of measuring the realized matches. We excluded from our sample the three highest occupation groups according to ISCO88 1-digit classification;⁶ that is, 1) legislators, senior officials and managers, 2) professionals, and 3) technicians and associate professionals. We believe these are the occupations where over-education is more difficult to assess. Our own assessment in fact yielded a negligible incidence of over-education in

them,⁷ thus confirming that this is a relevant phenomenon mostly for the remaining six categories.

Next, we used a six-level ISCED category (*isced6l*) to measure the 80th percentile of the levels of education among individuals within each occupation. We assumed that all workers beyond the 80th percentile of education within a given occupation are over-educated. Then, we performed a series of analyses in order to test the robustness of this assumption. The results did not change significantly between 80 and 70 percent threshold⁸ except for clerks (category 4, in ISCO-88), where 72 percent turn out to be the frontier between upper vocational and tertiary education in Spain.

We believe that our method improves our understanding of over-education in a three-fold way. First, it is free of biases which are inherently involved in the years of education. Second, our measure of over-education makes more sense if it is to be applied to only some categories of occupation, since the majority of individuals in the top three occupations of the ISCO88 scale possess tertiary level of education in our sample. Finally, our method is based on internationally comparable educational and occupational categories, it can be applied across countries and it thus facilitates comparative research. Table 1 presents the empirical criteria of the 80 percent threshold which we applied in the construction of the over-education variable.

4. RESULTS

4.1. Descriptive Analysis

It should be first noted that the overall level of over-education in Spain is higher than in Germany (see Table 2). We are aware that the decision to consider Clerks

Table 1 Over-education criteria based on the 80% threshold for Spain and Germany

ISCO88	ISCED	OVERED80
Spain		
(4) Clerks	6	6
(5) Service workers, shop and market sales workers	5	6
(6) Skilled agricultural and fishery workers	4	5–6
(7) Craft and related trades workers	4	5–6
(8) Plant and machine operators and assemblers	4	5–6
(9) Elementary occupations	4	5–6
Germany		
(4) Clerks	4	5–6
(5) Service workers, shop and market sales workers	3	4–6
(6) Skilled agricultural and fishery workers	4	5–6
(7) Craft and related trades workers	3	4–6
(8) Plant and machine operators and assemblers	3	4–6
(9) Elementary occupations	3	4–6

Source: Own computations based on EU Labor Force Survey.

with tertiary ISCED as over-educated is important for the overall level of over-education in Spain. However, we strongly argue that a university degree is not needed to perform the tasks of a clerk in Spain.

A decomposed version of these results by fields of study split across tertiary and non-tertiary levels (without the 'general' field) appears in Table 3. It is immediately visible from that table that average level of over-education across majority of fields of study in Germany is less than a half of that in Spain. The results differ so much from Table 2 because Table 3 excludes the individuals who responded as a field of education 'general'. The 'general' field is not specific and should not be considered as a major of education. When we consider individuals with field of study the incidence of over-education in Spain grows remarkably to 16 percent, while in Germany shrinks from 12 percent in the previous table to roughly 7 percent here.

4.2. Multivariate Analysis

We estimated three types of models for Spain and Germany. The M1 Logistic models were estimated for the general sample of individuals aged 20–35 for whom we had observations on their fields of study (Table 4, columns 2 and 4). The M2 Logistic regressions (columns 3 and 5 in the same table) were estimated for a restricted sample of individuals for whom we had observations about their parents' ISEI score (we chose the highest educated parent and computed his/her ISEI score). Columns 4 and 6 show results of the general form equation for M2 Heckman selection models for Spain and Germany respectively. The results presented in Table 4 are all expressed as odds ratios and are comparable across models.

A general overview of the results reveals that odds ratios of the logistic regression approach unity (differences across fields shrink) when we turn to the selection models.⁹ As expected, part of the variance captured by the variables in logistic regression has been split into the selection equation in Heckman selection probits.

Table 2 Over-education by ISCO88 categories in Spain and Germany (%)

ISCO88	Over-education	
	Spain	Germany
Clerks	28.80	10.94
Service workers	9.94	14.81
Skilled agr. and fish. workers	10.41	15.47
Craft and related workers	16.71	14.17
Plant and machine operators	15.19	7.08
Elementary occupations	10.04	6.86
Total	15.06	12.03

Source: Own computations based on EU Labor Force Survey.

Table 3 Over-education distributed by field of study in Spain and Germany

Field	Over-education	
	Spain	Germany
Teacher training n-tert	4.98	5.61
Teacher training tert	19.27	5.66
Humanities & arts n-tert	9.53	7.67
Humanities & arts tert	17.55	9.31
Soc. sciences, business n-tert	6.30	3.87
Soc. sciences, business tert	22.89	14.01
Natural science and math n-tert	10.17	4.30
Natural science and math tert	11.17	4.44
Engineering and constr. n-tert	32.19	8.00
Engineering and constr. tert	9.57	6.45
Agriculture & vet n-tert	18.83	11.97
Agriculture & vet tert	14.14	20.64
Health and welfare n-tert	3.16	6.00
Health and welfare tert	8.92	3.25
Services n-tert.	4.18	9.15
Services tert.	33.62	20.73
Total	16.34	6.95

Source: EU Labor Force Survey.

Almost all dummies corresponding to fields of study in Table 4 are statistically significant for both the full model of logistic regression and the Heckman selection model. Results show that, even when controlling for the self-selection of individuals into fields of study, there are significant differences across fields in the likelihood of becoming over-educated. There seems to be a roughly similar ranking of fields in both countries. Relative to the reference category ('Social Sciences, Tertiary'), the other fields of study seem to provide all a lower likelihood of being over-educated, with the exception of 'Services' and 'Humanities' at the tertiary level, if just the population of workers still living in their parents' household is considered (see Figure 1a).

Interesting cross-national differences arise from the results too, although they should be treated cautiously, since odds-ratio cannot be compared cross-nationally, belonging as they do to different samples. First, as expected, the variation in the likelihood of over-education across fields of study seems wider in Spain than in Germany (odds-ratio are almost systematically further away from 1; compare the normalized odds across different fields within Spain and within Germany in Figure 1a). This possibly confirms that the role of the fields of study in the explanation of over-education is mediated by the system of education. Such a mediating role of the system of education, merely explored in this article, will be discussed in the next section.

Second, the difference between odds-ratio for tertiary and non-tertiary fields of study are more salient in Spain than in Germany. Non-tertiary studies in Spain are further away from the category of reference than the tertiary studies in the

corresponding field (compare systematically columns corresponding to tertiary and non-tertiary studies across countries and within the same field in Figure 1a). The difference between these two groups is not so salient in Germany, possibly revealing that German tertiary education is almost as well attuned with the German labor market as German vocational training, and definitely better than Spanish tertiary university education.

Third, some fields of study at the tertiary level, when considering the restricted sample (respondents living with their parents), in Spain deviate notably from the cross-national pattern established above (see Figure 1c). 'Teacher training tertiary', 'Humanities and arts-tertiary' and 'Services-tertiary' have all higher likelihood of producing over-education than 'Social sciences-tertiary'. On the contrary, 'Engineering and construction', 'Natural science and maths' and 'Health and welfare' seem to be university degrees less prone to produce over-education. This relates to a recent devaluation of some university degrees in Spain which will be also discussed below and it is obviously related to the wider cross-field divergence found in Spain.

Fourth, there are some remarkable differences between Spain and Germany at the non-tertiary level. The higher likelihood of over-education among Spanish 'Engineering and construction' non-tertiary graduates, relative to the reference category, strikingly differs from the German case, where the corresponding odds-ratio is below unity. While the German system of vocational training seem to provide students with good chances of entering the labor market for carrying out the work they have been trained for, it does not seem to be the case in Spain. We should bear in mind that 'Engineering and construction-non tertiary' agglutinates most of the industry-associated vocational training diplomas. It is remarkable that these students are even more likely to be over-educated in Spain than the highly increasing number of graduates in social sciences, where we should include law, economics and other students from other social sciences disciplines.

Finally, the comparison of the analysis for the general sample and for the sub-sample formed by workers still living with their parents also yields higher differences in Spain than in Germany (compare models M1 and M2 within Spain and Germany as well as Figure 1a and 1b within those two countries in order to compare the inter-country differences). The odds of being over-educated for 'Teacher training-tertiary', 'Humanities-tertiary' and 'Engineering and construction-non-tertiary' turn out to be higher than in the reference category in Spain, but this is just so for the sub-sample formed by workers still living with their parents. Such an effect reverses when the whole population is considered.

5. DISCUSSION

Resorting to data from 2003 to 2005 drawn from the German and Spanish samples of the European Labor Force Survey (EULFS), we have explored here the association between fields of study and the likelihood of being overeducated. For this purpose, we have built a new indicator of over-education. We have worked with a new classification of fields of study accounting for the level at

Table 4 Results of multivariate regression models for Spain and Germany

	Spain			Germany		
	M1 Logit	M2 Logit	M2 Selection	M1 Logit	M2 Logit	M2 Selection
Sex	0.868*** (0.020)	0.842*** (0.026)	1.068*** (0.017)	0.763*** (0.019)	0.790*** (0.065)	0.920** (0.036)
Age	0.981*** (0.002)	1.000 (0.003)	1.000 (0.002)	1.020*** (0.002)	1.037*** (0.007)	1.019*** (0.003)
Immig	3.791*** (0.206)	2.176*** (0.434)	1.049 (0.123)	1.854*** (0.069)	1.256* (0.171)	1.127* (0.074)
Firm size	0.995 (0.006)	0.967*** (0.007)	0.990** (0.004)	0.818*** (0.007)	0.847*** (0.021)	0.928*** (0.011)
Tenure	0.997*** (0.000)	0.997*** (0.000)	0.999** (0.000)	1.000 (0.000)	0.999 (0.001)	0.999* (0.000)
Teacher nt	0.138*** (0.026)	0.126*** (0.031)	0.526*** (0.064)	0.347*** (0.029)	0.216*** (0.070)	0.606*** (0.090)
Teacher t	0.757*** (0.029)	0.772*** (0.038)	1.471*** (0.042)	0.336*** (0.025)	0.254*** (0.084)	0.645*** (0.099)
Hlum-arts nt	0.265*** (0.025)	0.276*** (0.035)	0.861** (0.059)	0.538*** (0.039)	0.396*** (0.098)	0.805 (0.097)
Hlum-arts t	0.787*** (0.034)	0.874** (0.050)	1.613*** (0.054)	0.761*** (0.060)	1.650* (0.475)	1.804*** (0.303)
Soc-bns-law nt	0.174*** (0.007)	0.177*** (0.009)	0.360*** (0.008)	0.261*** (0.011)	0.236*** (0.035)	0.499*** (0.034)
Nat-math nt	0.276*** (0.019)	0.271*** (0.023)	0.862*** (0.040)	0.301*** (0.035)	0.224*** (0.077)	0.629*** (0.099)
Nat-math t	0.364*** (0.018)	0.377*** (0.024)	1.016 (0.035)	0.246*** (0.024)	0.184*** (0.074)	0.565*** (0.102)
Engin-const nt	1.042 (0.031)	0.955 (0.038)	1.887*** (0.039)	0.448*** (0.017)	0.357*** (0.048)	0.778*** (0.051)
Engin-const t	0.252*** (0.013)	0.217*** (0.015)	0.774*** (0.028)	0.342*** (0.023)	0.490*** (0.107)	0.905 (0.100)

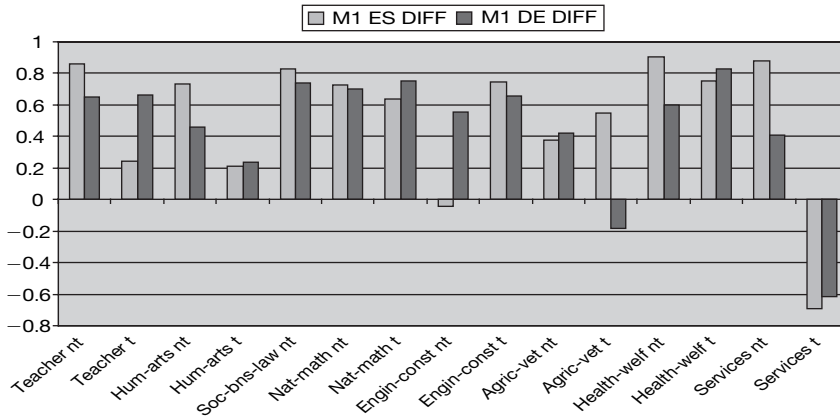
Agric-vet nt	0.624*** (0.064)	0.544*** (0.072)	1.334*** (0.105)	0.576*** (0.041)	0.566*** (0.110)	0.988 (0.097)
Agric-vet t	0.451*** (0.038)	0.385*** (0.046)	1.031 (0.069)	1.183 (0.147)	1.068 (0.421)	1.388 (0.306)
Health-welf nt	0.094*** (0.008)	0.094*** (0.010)	0.465*** (0.023)	0.399*** (0.020)	0.433*** (0.072)	0.833** (0.068)
Health-welf t	0.246*** (0.013)	0.231*** (0.016)	0.732 (0.027)	0.170*** (0.019)	0.238*** (0.097)	0.642** (0.122)
Services nt	0.123*** (0.010)	0.112*** (0.012)	0.515*** (0.028)	0.590*** (0.027)	0.486*** (0.077)	0.898 (0.071)
Services t	1.694*** (0.103)	1.984*** (0.162)	2.687*** (0.133)	1.616*** (0.197)	2.040 (0.948)	1.948** (0.534)
Observations	67748	36816	36816	126578	17461	20681

Notes: Standard errors in parentheses. Reference field category: Soc-bns-law t

*significant at 10%; **significant at 5%; ***significant at 1%.

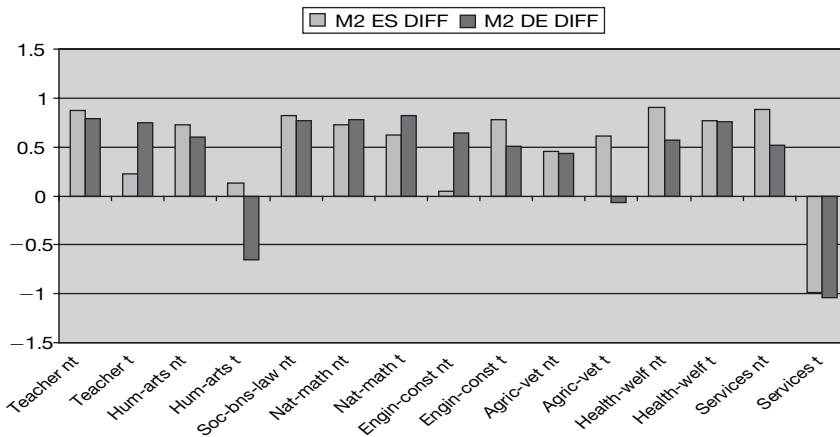
Source: EU Labor Force Survey.

Figure 1a Normalized (with respect to 1) odds for Models M1 for Spain and Germany



Source: EU Labour Force Survey.

Figure 1b Normalized (with respect to 1) odds for Models M2 for Spain and Germany

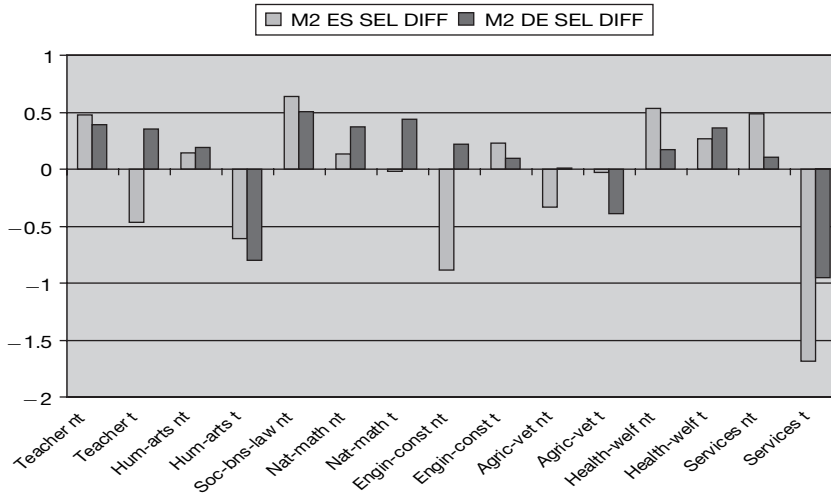


Source: EU Labour Force Survey.

which each degree is placed. Each field of study has thus been split up into two, depending on the tertiary (university) or non-tertiary level of the corresponding degree. This procedure prevents misleading interpretations of some fields of study that might be too heterogeneous, like ‘Engineering and Construction’ in Spain, which agglutinates highly prestigious university degrees and vocational training diplomas with far lower status.

As a result of this research, we claim to have made two preliminary contributions. First, we have cast light on the role of fields of study on the likelihood

Figure 1c Normalized (with respect to 1) odds for Heckman Models M2 for Spain and Germany



Source: EU Labour Force Survey.

of becoming over-educated. Such a role has largely been obliterated by the literature on over-education, more concerned with the level than with the type of education. Second, we have provided empirical evidence of the importance of controlling for the self-selection of individuals into fields of study, whenever fields of study work as an independent variable in any sociological or economic research.

As regards our first contribution, we have found significant differences across fields of study in the likelihood of becoming over-educated. There are remarkable cross-national similarities in this respect, which should reinforce the usefulness of fields of study as a concept to incorporate into any study of social and educational mobility. Qualifying somebody as a university graduate is clearly not enough anymore, in order to know what this entails in terms of intergenerational social and educational mobility. Different fields of study may actually entail different levels (and not just types) of human capital investment. Further research may be needed in order to explore the mechanisms behind a different value possibly attached to different fields of study. We hypothesize two mechanisms here: first, the cost of any degree, in terms of the theoretical and actual years it takes to attain it, may differ across fields of study *at the same level of educational attainment*; second, the occupational focus might also differ across fields of study. More occupationally focused fields, like ‘Health’, might be less vulnerable to over-education than more occupationally transversal ones, like ‘Services’.

Beyond cross-national similarities, we have found cross-national differences that offer preliminary evidence of the role of the system of education in modifying

the mechanisms explaining the effect of fields of study on the likelihood of being over-educated.

First, the variation in the likelihood of being over-educated across fields is lower in Germany than in Spain. Being a more stratified and standardized system of education, where more attention is supposed to be paid to get a perfect match between qualifications and the actual task required from the worker, fields of studies might matter slightly less in Germany than in Spain. Labor market regulation there links tightly education with labor market. As well as the stratification of that system of education, this would prevent as high a level of over-education in Germany as in Spain.

In the Spanish case, on the contrary, some fields of study may have recently turned into by-default ways of achieving either tertiary or post-secondary education. The fact that some fields of study in Spain, like 'Teacher and Training-tertiary', 'Humanities and Arts tertiary' or 'Services-tertiary', remarkably deviates from the cross-national pattern established above would reinforce this idea. Moreover, given the quite generalist training provided by the Spanish system of education, some fields of study might have been expelled from their 'natural' sites in the labor market, the vacancies in the corresponding occupations being 'invaded' by individuals with higher levels of educational attainment from fields so far not corresponding with those occupations.

A higher difference between odds-ratio for tertiary and non-tertiary fields of study was also found in the Spanish case. As it was stated above, this would possibly reveal that German tertiary education is almost as well attuned as German vocational training with its labor market while the co-ordination between Spanish tertiary education and Spanish labor market is very weak. Moreover, some cross-national differences at the non-tertiary level further confirm that, whereas the German system of vocational training is relatively capable of providing students with good chances to perform well in the labor market the tasks they have been trained for, this is not so much the case in Spain. In sum, the quality of the vocational training system might be also intervening in the role which fields of study play for explaining the variance in the likelihood of being over-educated.

Finally, we have also found that the differences between the analysis just for the general sample and the sub-sample formed by workers still living with their parents are higher in Spain than in Germany. An ad hoc explanation of this difference has to do with the relative economic position of Spanish families. Kids from 'better-off' families are at lower risk of ending up over-educated even when they choose the 'wrong' field of study. In other words, had parental ISEI been included in the selection equation for the general population in Spain, odds ratios for the aforementioned fields would have turned out to be of the same order as in the sub-population under question (Figures 1a and 1c would look more alike). We should bear in mind, though, that, by talking of workers still living in their

parents' household, we may be considering different groups in Germany and Spain. Spanish youth remains at the parental home for a long time, the average age of emancipation being one of the latest in Europe. It is also possible that the differences in the Spanish case are due to differences across cohorts that are not so great in Germany. Being younger than the general population under consideration, Spanish workers still living at their parents also show some differences relative to the general population that are not so clear in Germany.

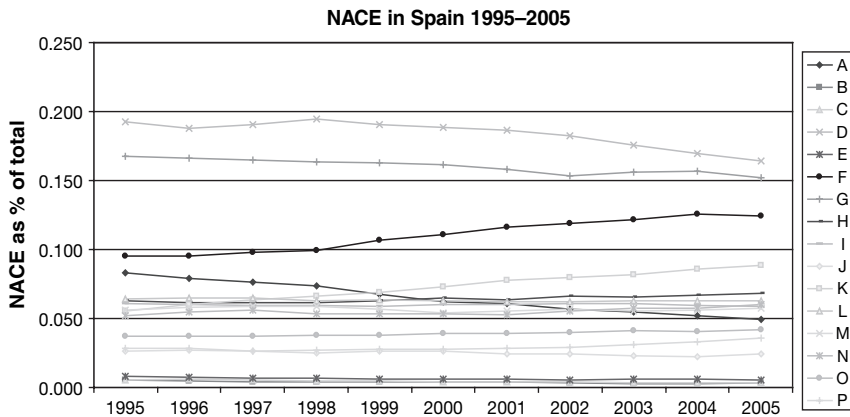
Referring now to our second contribution, the empirical analysis has provided a first glimpse of the importance of controlling for the self-selection of individuals into different fields of study when trying to use this as an explanatory variable. It has been demonstrated that choice of fields of study is clearly influenced, among other things, by sex, ethnic origin and parental socio-economic position. Such an influence reduces significantly the effect of each one of the fields of study in the likelihood of being over-educated: odds-ratios are immediately closer to one, for each one of the fields of study considered. Even so, with some rare exceptions, they do not lose statistical significance.

As a limitation of our model, we should acknowledge that it mainly focus on the supply-side of the labor market. It might be argued that the association between fields of studies and the likelihood of being over-educated actually hides a varying demand for graduates of different fields of study across sectors. Such a limitation of our research is mainly due to the lack of suitable data to account for the effect of the sector size on our dependent variable (see section on Methods). In order to compensate for this, we provide here illustrative evidence of the evolution of the sectors in Germany and Spain. As we may see in the Appendix Figures A1a and A1b, the most striking difference between Germany and Spain in the last two decades is the remarkable growth of the Construction sector in the latter country. Along with other well documented features, like the higher skill intensity of the manufacturing sector in Germany, this would credit the idea that the economic structure of Spain, and its evolution, would account for at least part of the results that we have found. Yet, it is difficult to establish which fields of studies are demanded by which sector. Moreover, the occupations where over-education has been assessed here are rather cross-sectoral.¹⁰ Appendix Table A2 shows the distribution of over-educated and matched workers by NACE sector in our Spanish sample, as well as the ratio of the latter by the former. As we may see, the higher frequencies and ratios are not in 'Construction' or 'Hotel and Services' (possibly associated with low-skilled service work), but in sectors like 'Manufacturing', 'Electricity, gas and water supply', 'Wholesale and retail trade', 'Transport, storage and communication', 'Financial intermediation' or 'Public administration', some of which are not as suspicious of having a low occupational composition (see Appendix Table A1). The exception would be the 'Manufacturing' sector, but, as in the case of Germany, the evolution of this sector is decreasing, rather than increasing, like in most post-industrial

societies. In sum, the illustrative evidence provided here (on the evolution of sectors in Germany and Spain, the occupational composition of each sector and the distribution of over-educated workers in our Spanish sample) does not support the idea that over-education is demand-driven as much as it could have been initially thought.

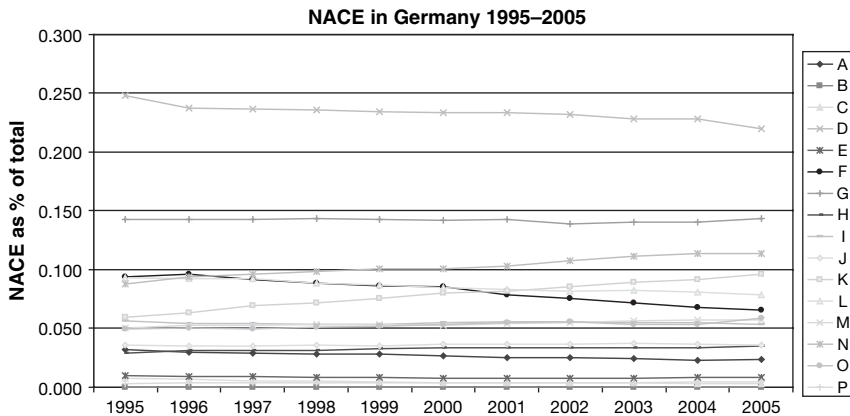
APPENDIX

Figure A1a Evolution of the sectors sizes in Spain 1995–2005



Source: International Labour Organization.

Figure A1b Evolution of the sectors sizes in Germany 1985–2005



Source: International Labour Organization.

Table A1 Distribution of occupations (ISCO88) across sectors (NACE) in Spain and Germany

NACE/ISCO88	Total	Percentages								
		1	2	3	4	5	6	7	8	9
Spain 1999										
A	1161.4	0.02	0.00	0.01	0.01	0.01	0.56	0.01	0.03	0.36
B	61.1	0.02	0.01	0.06	0.01	0.04	0.70	0.08	0.05	0.03
C	66.9	0.04	0.05	0.09	0.04	0.01	0.00	0.08	0.05	0.11
D	2854.1	0.05	0.04	0.09	0.07	0.01	0.00	0.44	0.21	0.10
E	89.4	0.04	0.14	0.21	0.10	0.01	0.01	0.36	0.29	0.12
F	1652.9	0.04	0.02	0.02	0.03	0.00	0.00	0.28	0.09	0.12
G	2503.4	0.20	0.02	0.10	0.10	0.30	0.00	0.61	0.05	0.21
H	990.8	0.22	0.00	0.01	0.04	0.58	0.00	0.12	0.04	0.12
I	849.8	0.04	0.04	0.08	0.22	0.03	0.00	0.01	0.01	0.12
J	383.7	0.12	0.08	0.26	0.51	0.00	0.00	0.05	0.46	0.07
K	1030.2	0.05	0.23	0.18	0.16	0.07	0.00	0.00	0.00	0.02
L	971.7	0.02	0.14	0.15	0.21	0.18	0.02	0.05	0.02	0.26
M	847.9	0.01	0.77	0.05	0.05	0.04	0.00	0.01	0.00	0.14
N	818	0.01	0.37	0.09	0.07	0.34	0.00	0.02	0.02	0.06
O	579.1	0.04	0.12	0.16	0.12	0.30	0.01	0.03	0.05	0.18
P	446.5	0.00	0.00	0.00	0.00	0.18	0.01	0.01	0.00	0.80
Germany 2000										
A	982	0.07	0.10	0.08	0.09	0.14	0.04	0.16	0.09	0.15
B	152	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C	8542	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
D	290	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
E	3118	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F	5190	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
G	1219	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
H	2008	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I	1333	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
J	2923	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	3103	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
L	1928	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
M	3696	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N	1944	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
O	137	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: International Labor Organization.

Table A2 Distribution of over-educated and matched workers by sector (NACE)

NACE	Over-education		Ratio overed/ non-overed
	No	Yes	
9	121,763	0	0.09
A	9783	837	0.12
B	507	62	0.11
C	804	86	0.18
D	35,661	6302	0.22
E	1056	228	0.10
F	27,891	2673	0.11
G	38,322	4301	0.10
H	14,142	1372	0.18
I	10,584	1913	0.39
J	3584	1411	0.10
K	19,517	1925	0.13
L	12,093	1573	0.04
M	11,551	474	0.08
N	12,709	969	0.08
O	10,369	805	0.10
P	5015	505	0.44
Q	18	8	0.09
Total	335,369	25,444	

Source: EU Labor Force Survey.

NOTES

- 1 For an excellent overview of the over-education literature, see Clogg and Shockey (1984), Halaby (1994) and Hartog (2000). For fields of study, see DeGraaf and Wolbers (2003), Iannelli and Smyth (2005), Kim and Kim (2003), Machin and Puhani (2003), Smyth (2005) and van de Werfhorst (2004). The only possibly exceptions are studies of Robst (2007) and Wolbers (2003) where a stylized version of horizontal mismatches are discussed.
- 2 For discussion on that, see Groot (1996).
- 3 The discussion on different measures of over-education and their strong and weak sides is presented in section 3.2.
- 4 Frenette's analysis of Canadian graduates (2004) does not consider European educational codifications which differs significantly from the one used here.
- 5 Dictionary of Occupational Titles is the measure most frequently used in the USA to measure over-education, but it is relatively rare in Europe.
- 6 Our statistical criterion (described below) excluded those categories as well. It results that the 80th percentile of educational levels within those occupations was university degree which automatically excluded any degree of over-education within those three top ISCO88 categories.
- 7 Results may be shown upon request.

- 8 The results did not change in terms of their relative distribution of over-education across fields with respect to the base category. The only noticeable effect we observed lowering the threshold to 70 percent is that the magnitude of the over-educated graduates of given fields increases, but it did so steadily for all fields.
- 9 Recall that the selection models have been computed for restricted sample of individuals for whom we had information about their parental background.
- 10 See Table A1 (in Appendix) for distribution of occupations across sectors in Spain and Germany.

REFERENCES

- Alba-Ramirez, A. (1993) 'Mismatch in the Spanish Labor Market: Overeducation?', *Journal of Human Resources* 28: 259–78.
- Allen, J. and van der Velden, R. (2001) 'Educational Mismatches vs. Skill Mismatches: Effects of Wages, Job Satisfaction and On-the-job Search', *Oxford Economic Papers* 3: 434–52.
- Allmendinger, J. (1989) 'Educational Systems and Labor Market Outcomes', *European Sociological Review* 5: 231–50.
- Barron, J.M., Black, D.A. and Loewenstein, M.A. (1989) 'Job Matching and On-the-job Training', *Journal of Labor Economics* 7: 1–19.
- Becker, G. (1980) *Human Capital*. Chicago, IL: University of Chicago Press.
- Becker, G.S. and Tomes, N. (1986) 'Human Capital and the Rise and Fall of Families', *Journal of Labor Economics* 4: S1–S39.
- Birkelund, G.E., Goodman, L.A. and Rose, D. (1996) 'The Latent Structure of Job Characteristics of Men and Women', *American Journal of Sociology* 102: 80–113.
- Clogg, C.C. and Shockey, J.W. (1984) 'Mismatch between Occupation and Schooling: A Prevalence Measure, Recent Trends and Demographic Analysis', *Demography* 21: 235–57.
- Cohn, E. and Ng, Y.C. (2000) 'Incidence and Wage Effects of Overschooling and Underschooling in Hong Kong', *Economics of Education Review* 19: 159–68.
- 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: 169–78.
- de Oliveira, M.M., Santos, M.C. and Kiker, B.F. (2000) 'The Role of Human Capital and Technological Change in Over-education', *Economics of Education Review* 19: 199–206.
- DeGraaf, P.M. and Wolbers, M.H.J. (2003) 'The Effects of Social Background, Sex, and Ability on the Transition to Tertiary Education in the Netherlands', *The Netherlands Journal of Social Sciences* 39: 172–201.
- Devereux, P.J. (2000) 'Task Assignment Over the Business Cycle', *Journal of Labor Economics* 18: 98–124.
- Dolton, P. and Vignoles, A. (2000) 'The Incidence and Effects of Over-education in the UK Graduate Labor Market', *Economics of Education Review* 19: 179–98.
- Duncan, D. and Hoffman, S.D. (1981) 'The Incidence and Wage Effects of Over-education', *Economics of Education Review* 1(1): 75–86.
- Freeman, R.B. (1992) *The Over-educated American*. Orlando, FL: Academic Press.
- Frenette, M. (2004) 'The Overqualified Canadian Graduate: The Role of the Academic Program in the Incidence, Persistence, and Economic Returns to Over-qualification', *Economics of Education Review* 23: 29–45.
- Groeneveld, S. and Hartog, J. (2004) 'Over-education, Wages and Promotions within the Firm', *Labor Economics* 11: 701–14.

- Groot, W. (1996) 'The Incidence of, and Returns to Over-education in the UK', *Applied Economics* 28: 1345-50.
- Groot, W. and van den Brink, H.M. (2000) 'Over-education in the Labor Market: A Meta-analysis', *Economics of Education Review* 19: 149-58.
- Halaby, C.N. (1994) 'Over-education and Skill Mismatch', *Sociology of Education* 67: 47-59.
- Hartog, J. (2000) 'Over-education and Earnings: Where Are We and Where Should We Go?', *Economics of Education Review* 19: 131-47.
- Hartog, J. and Oosterbeek, H. (1988) 'Education, Allocation and Earnings in the Netherlands: Over-schooling?', *Economics of Education Review* 7: 185-94.
- Iannelli, C. and Smyth, E. (2005) 'Unequal Pathways? The Effect of Gender, Social Background and Education on Early Labor Market Transitions in Europe', Centre for Educational Sociology, Edinburgh University, Working Papers No. 0426.
- Kim, A. and Kim, K.-W. (2003) 'Returns to Tertiary Education in Germany and the UK: Effects of Fields of Study and Gender', MZES Working Paper 62.
- Lucas, S.R. (2001) 'Effectively Maintained Inequality: Education Transitions, Track Mobility, and Social Background Effects', *American Journal of Sociology* 106: 1642-90.
- Machin, S. and Puhani, P.A. (2003) 'Subject of Degree and the Gender Wage Differential: Evidence from the UK and Germany', *Economics Letters* 79: 393-400.
- McGuinness, S. and Wooden, M. (2007) 'Over-skilling, Job Insecurity and Career Mobility', IZA Discussion Papers 2938: 1-27.
- Muller, W. and Gangl, M. (eds) (2003) *Transition from Education to Work in Europe*. Oxford: Oxford University Press.
- OECD (2005) *Yearly Employment Outlook*. Paris: OECD.
- Ortiz, L. (2007) 'Not the Right Job, But a Secure One: Over-education and Temporary Employment', DEMOSOC Working Papers 23.
- Robst, J. (2007) 'Education and Job Match: The Relatedness of College Major and Work', *Economics of Education Review* 26: 397-407.
- Rosen, S. (1972) 'Learning and Experience in the Labor Market', *The Journal of Human Resources* 7: 326-42.
- Sattinger, M. (1993) 'Assignment Models of the Distribution of Earnings', *Journal of Economic Literature* 31: 851-80.
- Shavit, Y. and Muller, W. (eds) (1998) *From School to Work. A Comparative Study of Educational Qualifications and Occupational Destinations*. Oxford: Clarendon Press.
- Sicherman, N. (1991) "'Over-education" in the Labor Market', *Journal of Labor Economics* 9: 101-22.
- Sicherman, N. and Galor, O. (1990) 'A Theory of Career Mobility', *Journal of Political Economy* 98: 169-92.
- Sloane, P., Battu, H. and Seaman, P.T. (1999) 'Over-education, Under-education and the British Labor Market', *Applied Economics* 31: 1437-53.
- Smyth, E. (2005) 'Gender Differentiation and Early Labour Market Integration across Europe', *European Societies* 7: 451-79.
- Thurow, L.C. (1974) *Generating Inequality*. New York: Basic Books.
- Tsang, M.C. and Levin, H.M. (1985) 'The Economics of Over-education', *Economics of Education Review* 4: 93-104.
- Vahey, S.P. (2000) 'The Great Canadian Training Robbery: Evidence on the Returns to Educational Mismatch', *Economics of Education Review* 19: 219-27.

- van de Werfhorst, H. (2004) 'Systems of Educational Specialization and Labor Market Outcomes in Norway, Australia and the Netherlands', *International Journal of Comparative Sociology* 45: 315–35.
- van Smoorenburg, M. and van der Velden, R. (2000) 'The Training of School-leavers: Complementarity or Substitution?', *Economics of Education Review* 19: 207–17.
- Verdugo, R.R. and Verdugo, N.T. (1989) 'The Impact of Schooling Surplus on Earnings: Some Additional Findings', *Journal of Human Resources* 24: 629–43.
- Wolbers, M.H.J. (2003) 'Job Mismatches and their Labor Market Effects among School-leavers in Europe', *European Sociological Review* 19: 246–66.

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