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Gender Differentiation in Higher Education: Educational Specialization and Labour Market Risks in Spain and Germany

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<u>Editorial Note:</u>

David Reimer is a researcher at the Mannheim Centre for European Social Research (MZES). He is currently working in a research project on the consequences of the expansion and the differentiation of tertiary education for social inequality, funded by the German Science Foundation (Deutsche Forschungsgemeinschaft). His main research interests include the sociology of education and the labour market – particularly with respect to higher education.

Stephanie Steinmetz is a researcher at the Mannheim Centre for European Social Research (MZES). She is currently working on her PhD on the issue of occupational sex segregation in Europe. Her main research interests include social stratification, gender inequalities, and comparative labour market research.

Abstract

The objective of this paper is to investigate the relationship between gender differentiation in tertiary education and labour market hazards. We analyze how differences between male and female tertiary graduates in the chosen degree level and field of study affect the likelihood to be unemployed or obtain a low status job. In order to learn about the role of institutional context, we compare Germany and Spain, two countries that differ with respect to horizontal (field of study) and vertical (degree level) segregation by gender as well as to the linkage between the education and labour market system. Using Labour Force Survey data from the year 2000, our results of logistic regression models as well as a non-linear decomposition technique generally confirm our expectation that the field of study explains a sizable portion of the gender gap in unemployment and low status jobs in both countries. Whereas the level of tertiary degree does not matter with respect to unemployment in either country, it explains part of the female disadvantage in holding a low status job in Spain. Moreover, our analyses show that women with a degree in a predominantly male field of study are not systematically disadvantaged compared to men. Finally, even though the role of the institutional context is hard to evaluate, it seems that, for the two selected countries, the horizontal and vertical gender segregation is more relevant in Spain than in Germany.

Contents

1. Introduction[1]

Two major trends have emerged in higher education during the past decades in all European Union countries: First, tertiary education has increased enormously and second, women's educational attainment has reached parity with men's (Müller and Wolbers 2003; OECD 2004). At the same time, almost all European countries were confronted with high rates of unemployment, often followed by the introduction of deregulation and flexibility reforms in the labour market. As a consequence, labour market integration became more fragmented and working careers increasingly involved periods of temporary and part-time employment as well as periods of unemployment (Esping-Anderson and Regini 2000).

The achieved parity of women and men with respect to tertiary degrees has been perceived as a positive step toward a more gender-egalitarian society. Nevertheless, women and men continue to choose gender-typical fields of study (Bradley 2000b; Charles and Bradley 2002; Jacobs 1995). While a considerable body of literature shows that these gender-typical study choices contribute to gender differences in earnings (e.g. Daymont and Andrisani 1984; Gerhart 1990; Grogger and Eide 1995; Kalmijn and Van der Lippe 1997; Machin and Puhani 2003) our review of the literature revealed only few studies that have analyzed labour market outcomes other than income. Kim and Kim (2003) examined how field of study affects the opportunities to enter the service class in Germany and the United Kingdom, Wolbers (2003) studied how different educational fields affect the likelihood to have a job mismatch in thirteen European countries and van de Werfhorst (2004) compared field of study effects on income and prestige in Australia, Norway and the Netherlands.

The consideration of non-monetary labour market outcomes seems to be necessary because we know little about how the choice of fields of study is associated with gender differences in unemployment and other labour market hazards. Extending the focus of analyses to non-monetary educational returns it will also be possible to gain a more complete understanding of the linkage between gendered educational choices and the labour market.

Furthermore, it is also well-known that countries differ in the extent of educational sex segregation - both in terms of the level (vertical differentiation) as well as the chosen fields of study (horizontal differentiation) (Bradley 2000a; Charles and Bradley 2002; OECD 1997; Smyth 2005). Smyth (2005), for example, found that European countries exhibiting high levels of educational sex segregation also tend to have higher levels of occupational sex segregation. Moreover, when trying to assess to what extent different educational choices lead to unequal outcomes on the labour market, it is important to take into account cross-national variations in the linkage between vertical and horizontal differentiation of educational

[1] We would like to thank Michael Gebel, Ben Jann, Irena Kogan, Walter Müller and Nicole Thieben for their helpful comments.

degrees and the labour market. However, differences in education and training systems across countries play an important role and may partly be responsible for gender-specific labour market outcomes.

This paper tries to add to the understanding of the relationship between gender, tertiary education, and the labour market by inspecting two labour market outcomes that have previously been neglected in the literature: the likelihood to become unemployed and to obtain a low status job. We estimate a set of logistic regression models and employ a new nonlinear decomposition technique developed by Fairlie (1999; 2005; 2006) in order to find out to what extent the level of gender differentiation in educational levels and fields in higher education is associated with gender differences in labour market returns. Moreover, the comparison between Germany and Spain allows us to assess the role of two different institutional contexts that could influence to what extent the vertical and horizontal gender differentiation in higher education mediates possible gender differentials on the labour market. Both countries are very well-suited as comparative case studies because they differ in three key characteristics that could determine the relative influence of tertiary qualifications on the labour market. First, the level of sex segregation in fields of study is higher in Germany than in Spain.[2] Second, research suggests that the linkage between education and work is generally closer in Germany than in Spain (Iannelli and Soro-Bonmatí 2003; Müller, et al. 1998a). Finally, both countries differ with respect to their "exclusiveness" of tertiary degrees: in Spain the overall share of tertiary degree holders is higher than in Germany.

We begin by discussing the role of gender and educational differentiation in different institutional contexts for labour market achievements and formulate some broad expectations. We then present the data and methods we use for our analyses, proceed with a presentation of the results and, finally, summarize and discuss our findings.

2. Background

2.1. Theoretical considerations

2.1.1. Gender and field of study

Even though women have gained access to higher education and to occupations and positions from which they were excluded in the past, these changes have not resulted in gender parity on the labour market regarding, for example, working conditions or wages (Jacobs 1996, Blossfeld and Hakim 1997, Cyba 1998, Kim and Kurz 2001). Numerous theoretical approaches have been put forward in order to explain gender differences on the labour market. Human capital theory, for instance, is based on the assumption that individual labour market returns depend on personal endowments, i.e. the individual educational level, occupational training, and job experience. Proponents of this theory also argue that women invest less in their human capital due to anticipated future family obligations that lower their occupational chances (Becker 1991, Mincer and Polachek 1974). Following this logic, the amount of gender inequality should be reduced when differences in the human capital endowment of men and women are reduced. Considering the aforementioned improvements of women's educational and labour market participation, this approach seems to be insufficient for explaining gender differences in educational returns. Furthermore, it seems more appropriate to relate the human capital investment not only to the vertical differentiation (degree levels) but also to the horizontal dimension of tertiary qualifications (the chosen field of study). If men and women enrol in different and gender-typical fields of study in higher education, then increasing women's educational attainment may have little impact on gender differences in employment, particularly if women are more likely than men to choose fields that tend to lead to higher labour market risks, like lower-status occupations (Jacobs 1989; Kelly and Slaughter 1991).

A further strand of research deals with sex-atypical employment. While some scholars (e.g. Hayes 1986) assume that women who choose to enter male-dominated occupations increase their opportunities for higher pay, career advancement, and status, Kanter (1977) supposed in her famous theory of "tokenism" that minorities, such as women in predominantly male organizational settings, are faced with special problems.[3] They are not perceived and treated as individuals but rather as representatives or "tokens" of their category. A related idea of Blalock (1967) is that traditionally privileged majorities may feel that their advantaged position is threatened by the minority, and that the minority is therefore subject to various kinds of hostile behaviour. Nowadays, research suggests that women who specialized in a male-dominated occupation are particularly disadvantaged on the labour market (Hultin 2003; Reskin and Roos 1990). It is assumed that women in typical male occupations face difficulties because of biased organisational structures and other demand side processes. For example, even though there has been an improvement in the legal framework, in practice, many jobs continue to be "gendered" and beliefs persist that women are not fit for certain male roles or occupations (Whittock 2002). Even though the argumentation is more related to organizational settings on the labour market we think that it can be connected to field of study: Women in typically male fields of study constitute a minority and might therefore be perceived as inadequate for typical male jobs and face

[2] This is true with respect to the data we analyze in this paper. Nevertheless, other studies also showed that Spain has lower levels of gender segregation across fields of study in higher education than Germany (e.g. Charles and Bradley 2002: 582).

[3] Vice versa the argument could also be applied to men in predominantly female organizational settings.

discrimination. An opposite argument has been made by Katz-Gerro and Yaish (2003) who argue that women who studied male dominated fields may be more committed to their studies and have higher abilities than men. In their analysis of labour market outcomes of Israeli higher education graduates they demonstrate that women who graduate in a male dominated field are not disadvantaged compared to men (and in some instances even advantaged) with respect to occupational prestige and attaining a job match. However, Katze-Gerro and Yaish's analysis of employment status revealed that women with degrees in male dominated fields have a lower average propensity of being employed than men in six out of eight fields of study (ibid.: 581). In sum, we think that it is necessary to take into account the specific labour market outcome when making assumptions about gender differences in male or female dominated fields of study. Especially at the stage where jobs are allocated to men and women beliefs or prejudices regarding the performance of women might be prevalent and discrimination relatively easy to implement (e.g. Petersen and Saporta 2004).

2.1.2. The comparative context

When addressing cross-national variations of labour market returns of graduates, the institutional structure of education and training systems is central to many explanatory frameworks. An extensive number of sociological studies, mainly focusing on broad classifications of educational systems and on secondary education, have established that countries differ in how they match the output of the educational system to the demands of the labour market (Allmendinger 1989; Maurice, et al. 1986; Müller and Gangl 2003; Shavit and Müller 1998). The different explanations refer to the variation of countries concerning their "qualificational" and "organisational space" (Maurice, et al. 1986)[4], their level of "stratification" and "standardisation" (Allmendinger 1989), or the system of vocational training (Shavit and Müller (1998). Breen (2005) synthesizes this research under the term "educational signalling". Educational systems that provide their graduates with clear signals, generally show a tighter linkage between the education and training systems and the labour market because employers can assess an applicant's productivity more easily. In this context, Breen (2005) identifies two institutional characteristics of educational systems that influence the amount of educational signalling: first, the *degree* to which educational systems provide their graduates with specific or general skills and, second the *association* between educational institutions and employers. These two signals correlate highly as best exemplified in the case of Germany, where highly specific vocational training courses exist and employers' associations directly influence the vocational training curricula.

[4] Germany, for example, is a typical "qualification space" where skills are learned in a vocationally oriented schooling system and employers select employees based on these assets.

When trying to assess the impact of different fields of study at the tertiary level for labour market returns, one has to ask to what extent they function as an educational signal for employers. Following Breen's argument, it can be assumed that field effects should matter more in countries with a high vocational (skill-specific) orientation and a strong association between the educational system and the labour market, because in these countries degree courses taken even at the tertiary level typically lead to a relatively narrowly defined set of professions. The German speaking countries might serve as a good example, because in most cases tertiary students enrol in degree programmes to become lawyers, psychologists or engineers right at the start of their studies.[5] Furthermore, in order to assess the vocational orientation of a country's tertiary system (e.g. van de Werfhorst 2004)[6], it seems useful to consider the extent to which specific skills (occupational-relevant) are taught in specific degree programmes at university or vocational colleges

While a country's vocational orientation needs to be accounted for in order to assess the impact of fields in comparative perspective, another important characteristic of the educational system is the selectivity of a degree. Kim and Kim (2003) argue that employers place more value on additional educational credentials, such as the field of study as an educational signal, if a certain degree level is attained by a large instead of a small proportion of the population.[7] Thus it can be expected that the relevance of field of study as a labour market signal increases in countries with a high proportion of tertiary graduates.

2.2. Systems of tertiary education in Germany and Spain

Before turning to the analyses of returns of tertiary education in terms of gender and field of study, it will be helpful to have a closer look at similarities and differences in the tertiary educational systems of Germany and Spain and their linkage to the labour market. When comparing patterns of tertiary education expansion in Germany and Spain interesting differences are revealed: figure 1 shows, the share of persons aged 25 to 34 with a tertiary degree increased from 19.6% in 1991 to 22.3% in 2000 in Germany. During the same period, this share more than doubled in Spain (from 16.3% to 34.1%).[8] Moreover, the tremendous

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5 It should be mentioned that due to the Bologna process most European Union countries, including the German speaking ones, are in the process of switching from one-track tertiary degree to the Anglo-Saxon system with Bachelor and Master degrees. Nevertheless, this was not the case at the time of the survey.

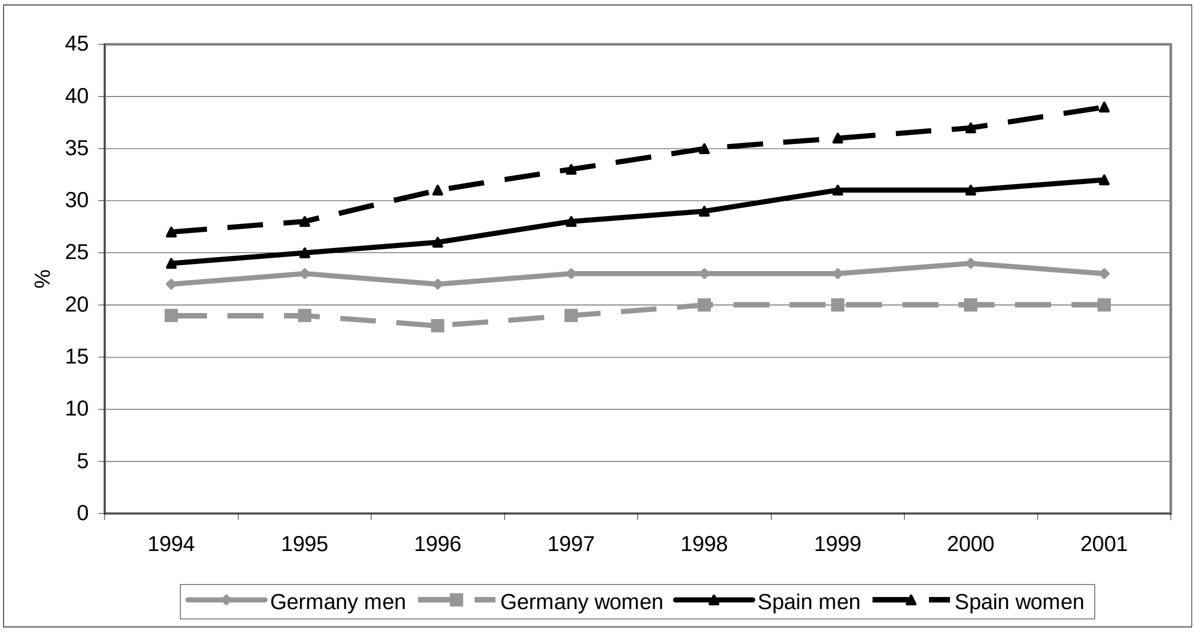
6 Van de Werfhorst (2004) also suggests that in order to assess in what way field of study functions as a selection criterion in tertiary education one also needs to take into account whether tertiary systems offer a consecutive degree structure of Bachelor and Master level degrees (vs. just one degree level) and whether it is common to graduate in a major and minor (vs. just one field). We think – at least with respect to our case studies of Germany and Spain - that a country's vocational orientation also captures these differences.

7 Lucas (2001) makes a similar argument with respect to educational attainment. He proposes that once a level of schooling becomes universal, students from privileged social background seek out qualitative differences at the respective level and try to secure “quantitatively similar but qualitatively better education” (Lucas 2001: 1652). In our case it is not students and parents who seek out qualitative differences but employers.

8 These percentages are based on OECD statistics for women and men aged 25-34. In the dataset used for the subsequent analyses, the percentage of tertiary degree holders in Spain, aged 20-35, is a little higher.

increase in tertiary level education can largely be attributed to the steady rise in female participation rates in both countries.

Figure 1: Percentage of population (25-34) that attained tertiary education, 1994-2001



Source: OECD 2003

This particularly applies to Spain where women had already surpassed men in the attainment of tertiary degrees in the early 1990s, whereas German women still lag behind men in the observation period.

Figure 2 exemplifies the "sex-typing" profiles for Germany and Spain in twelve fields of study for tertiary graduates aged 20-35 for the year 2000. It can be seen that the distribution of men and women across fields of study shows a similar pattern. In both countries social sciences, teaching, culture, and art are typical female fields because more than half of all graduates are female.[9] In contrast, architecture is a typical male field in both countries with a low share of female graduates (31% in Germany and 19% in Spain). We also define engineering and the natural sciences as typical male fields. However, some country-specific patterns can be observed. While, for example, 9% of all engineering graduates in Germany are female, the share reaches nearly 40% in Spain. This difference is weaker in the natural sciences, where 21% (Germany) and 45% (Spain) of graduates are women. We consider life sciences, law, economics, and "others"[10] as integrated fields of study because the share of men and women is nearly similar. However, in Spain, the share of women in integrated fields

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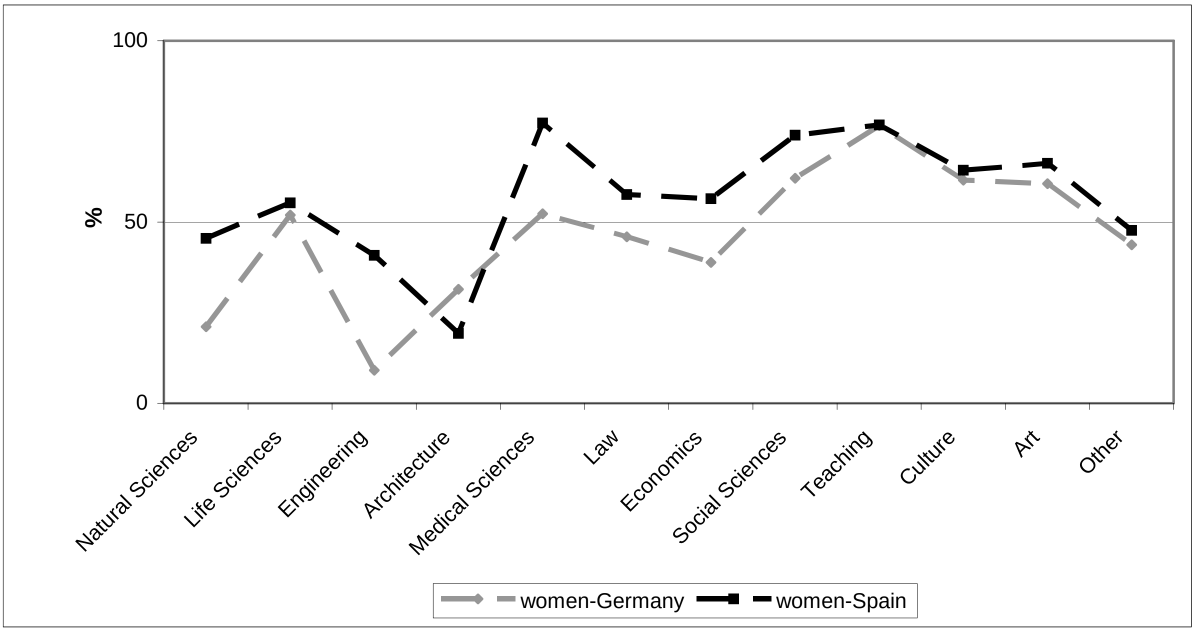
9 Due to the fact that countries differ in their share of female tertiary graduates, another approach to classify a specific field as feminized would be to take the overall participation rate of females in tertiary education in a given country and define the respective cut offs +/-20% as typical male and typical female subjects.

10 For the composition of "other" fields see table 1.

is generally higher. Finally medical science must be classified as a typical female field of study in Spain while it can be considered as integrated in Germany.[11]

Figure 2: Percentage of female graduates aged 20-35 by fields of study (12) in Germany and Spain, 2000



Source: Mikrozensus 2000, EPA 2000, own calculations

Using the Index of Dissimilarity (Duncan and Duncan (1955) to quantify the extent of gender segregation in fields results reveal that in Spain only 24% of all females and males would have to 'switch' fields in order to achieve gender parity with respect to the distribution across fields compared to 32% in Germany.[12]

Turning to relevant institutional characteristics of both countries, the connection between education and labour market outcomes is generally considered strong in Germany – at least with respect to educational level (Müller, et al. 2002; Müller, et al. 1998b). In Spain, however, educational credentials – particularly tertiary qualifications – structure the transition to the labour market less clearly (Iannelli and Soro-Bonmatí 2003).

The organisation of tertiary education also differs in both countries. Germany can be characterized as a binary tertiary system with "Fachhochschulen" on the one hand and universities on the other. These institutions differ in several aspects, such as the length of studies, "qualification" aspects, and practical orientation. In general, "Fachhochschulen" have a shorter duration of study, offer specialisation in a few applied subjects, and provide students with work-oriented training. This is very different in Spain where universities provide almost solely for tertiary education. The Spanish system is organised sequentially and one

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[11] The percentage of women, who finished a tertiary degree in medicine (in all three cycles) in Spain, was 65% for the year 1999-2000, see INE (http://www.ine.es).

[12] The index is calculated by summing the absolute differences in the proportion of male and females in each field and dividing the total by two. It should be noted that the extent of gender segregation is larger in Spain (28%) when calculating the index with the analytical sample used for the multivariate analyses (unemployment) while it remains constant in Germany.

can distinguish between three cycles of tertiary education and four different types of university establishments, leading to a complex degree system. Moreover, the Spanish educational system is oriented towards rather flexible curricula and programmes, which sometimes make it hard for employers to evaluate the skills a graduate has gained (Mora 1996).

Available research has shown that returns to lower level tertiary degrees (“Fachhochschule”) in Germany are lower than those to higher level tertiary degrees (Universities), although returns to “Fachhochschule” have nearly reached the University level (Müller, et al. 2002). In Spain, short-cycle courses of study, offered at so-called “*escuelas”*, similarly lead to lower returns than long-cycle courses (Mora, et al. 2000).

2.3. Summary

Based on these considerations some broad expectations can be formulated with regard to our two labour market outcomes, unemployment and to having a low status job.

1) As already discussed we expect women to be disadvantaged with respect to the selected labour market outcomes.
2) However, we assume that the gender effect will be partly mediated by the different distribution of men and women across level of tertiary degree as well as field of study (composition effect).
3) Applying Kanter’s and Blalock’s argumentation on fields of study, we expect that women in atypical fields face disadvantages on the labour marked.

Contextual differences between Spain and Germany will reveal the extent to which the distribution of men and women along level and field of tertiary degree is responsible for gender differences in labour market outcomes, particularly the linkage between the educational system and the labour market. However, with respect to the underlying mechanisms it seems difficult to formulate unequivocal expectations. For instance, it may be possible that in Germany the effect of differentiation along fields and degrees is stronger due to the higher educational sex segregation by fields and a stronger vocational orientation, while in Spain it might be primarily the high share of tertiary degree holders (the lower selectivity) that increases the field and level effect. Even though, we will interpret our results in light of these two possible underlying mechanisms, our research design does not allow for a direct test.

3. Data and methods

For our analyses we use the Spanish Labour Force Survey (Encuesta de Población Activa) and the German Labour Force Survey (Mikrozensus) for the year 2000. These surveys provide detailed information on the social and economic situation as well as educational achievements of the population in each country. In order to test our assumptions we study two labour market outcomes.

First, using the International Labour Organization's (ILO) standard definition of unemployment,[13] we examine the effect of fields of study and gender on the risk of being unemployed at the time of the survey. Second, we analyse how gender and field of study affect the probability of a person with a tertiary degree holding a job that we classify as a low status job. In order to construct the low status variable we first generated the International Socio-Economic Index of Occupational Status (ISEI), which was developed by Ganzeboom et al. (1992). The ISEI consists of weighted averages of standardized measures concerning the income and education of incumbents of each occupation comprised by the ISCO88 classification. We dichotomized the resulting index: persons with less than 50 points on the ISEI index were classified as holding a low status job for a person with a tertiary degree, whereas persons with 50 points and more on the scale were classified as adequately employed.[14] From a statistical viewpoint dichotomizing the ISEI also has an advantage because the given distribution of ISEI scores among graduates in our sample shows that it can hardly be considered a metric variable (see appendix, figures A1 and A2). Another way to think of the low status variable is that tertiary degree holders occupying a low status job are "overeducated" or in a vertical "education mismatch" (e.g. Allen and van der Velden 2001). In all multivariate analyses we us the same set of independent variables (table 1).

With respect to the differentiated fields of study, several studies have shown that the amount of gender segregation in fields depends on the number of selected categories (e.g. Bradley 2000: 5). A reduced number of fields might mask gender differences when typical male and typical female fields are collapsed. That is why we coded our field variable in 12 categories in an attempt to retain a maximum number of fields, while avoiding problems with small N in certain categories.

[13] The ILO definition classifies persons as unemployed when they are not in employment at the time of the survey, are currently available and willing to take up paid work within two weeks, and were actively seeking work in the last four weeks.

[14] The cut-off at 50 points was chosen because on average occupations with ISEI scores below 50 points - for example photographers and electronic equipment operators (48 points) or physical and engineering science technicians (49 points) - seem to be inadequate for somebody with a tertiary-level qualification. Nevertheless, some of the occupations with scores from 50-55 and from 45-49 are arguably hard to place in the dichotomy of low-status and adequate status.

Our measure for level of tertiary degree was coded differently in the two countries. For Germany, graduates from traditional universities are assigned to the higher-level tertiary degree group, whereas graduates from universities of applied sciences (Fachhochschulen) comprise the lower tertiary degree group. Due to the different structure of tertiary education in Spain only graduates with higher-level university degrees (long-term courses of five to six years) and doctoral degrees are coded into the higher tertiary degree group. Finally, age was included as a control variable and as a proxy for potential work experience.

Table 1: List of independent variables

Variable name	Variable Description
Female	1= woman, 0=man
Higher Tertiary Degree	1= Higher level tertiary degree (Casmin 3b), 0=Lower level t. degree (Casmin 3a)
Field of Study	12 Dummy Variables - Natural Sciences (including Physics, Mathematics & Computer Sciences) - Life Sciences (incl. Biology, Chemistry & Pharmacology) - Engineering - Architecture (incl. Construction Sciences) - Medical Sciences (incl. Veterinary and Human Medicine) - Law - Economics (incl. Business Sciences and Economics) - Social Sciences (incl. Psychology, Sociology, Political Science, Social Work) - Teaching (incl. Sports) - Culture (incl. Languages and Humanities) - Art - Other (including Geography, Gardening/Wood Sciences, Domestic and Nutrition Sciences, Clothing and Textile Sciences, Public Security)
Control Variables	
Age	Age at time of interview

In the following section, the means of the independent variables (see table 2) for both men and women in Germany and Spain are displayed. We proceed with the presentation of some descriptive analyses of the outcome variables followed by the multivariate analysis using logistic regression models. In order to assess how the distribution of men and women across different fields of study and tertiary degrees affects a possible gender gap in unemployment and low status, a new non-linear decomposition technique is used. In all of the analyses we restrict our sample to the economically active population and exclude foreigners and students. Furthermore, only tertiary graduates aged 20-35 are included in the analyses in order to reduce problems due to unobserved differences between men and women in their respective labour market careers. A restriction to this age range is also necessary because the labour market entry for this group occurred during a time of educational expansion in both countries.

In table 2 we see that even though the share of female graduates with tertiary degrees has increased in comparison to men, they have not reached parity in Germany: only 43% of all respondents with tertiary degrees in the analytical sample are female, as opposed to 59% in

Spain. Looking at the distribution of the composition of male and female graduates it can be seen that German women with tertiary degrees more often attend university (higher level degree) than “Fachhochschule” (lower level). This difference between men and women in Germany is most likely a result of the different curricula offered at higher- and lower-level tertiary institutions. The more technically orientated “Fachhochschulen” attract fewer women than the traditional university curricula.

Table 2: Means of independent variables in the analysis (N: Spain=5831, Germany=9392)

Variable name	Germany: Women	Germany: Men	Germany: Total	Spain: Women	Spain: Men	Spain: Total
Female	-	-	0.426	-	-	0.592
Higher Tertiary Deg.	0.625	0.547	0.580	0.499	0.562	0.525
Field of Study						
Natural Sciences	0.037	0.100	0.073	0.008	0.012	0.009
Life Sciences	0.051	0.035	0.042	0.021	0.023	0.022
Engineering	0.035	0.247	0.156	0.029	0.052	0.038
Architecture	0.047	0.073	0.062	0.025	0.150	0.076
Medical Sciences	0.074	0.049	0.060	0.136	0.072	0.110
Law	0.060	0.053	0.056	0.120	0.121	0.120
Economics	0.148	0.173	0.162	0.196	0.212	0.203
Social Sciences	0.072	0.032	0.049	0.100	0.048	0.079
Teaching	0.216	0.051	0.121	0.157	0.065	0.120
Culture	0.069	0.031	0.047	0.087	0.061	0.076
Art	0.048	0.023	0.034	0.023	0.018	0.021
Other	0.143	0.133	0.137	0.099	0.167	0.126
Control Variable						
Age	30.409	31.161	30.84	28.664	29.419	28.972

Note: Statistics are based on the analytical sample for the analysis of unemployment.

Of all Spanish women in the sample, about half (49.9%) have a higher-level tertiary degree. The women in our sample are slightly younger than the men sampled in both Spain and Germany. The table also shows the overall country differences in the distribution of graduates in different fields as well as the distribution of women and men in different fields of study. Looking at overall differences in the output of graduates one can see striking differences. While more than a quarter (27%) of all German graduates in the sample acquired a degree in engineering, natural and life science only 7% did so in Spain. In Spain on the other hand, more students graduated in law, economics and social sciences (40%) compared to 27% in Germany. As previously pointed out by other authors (OECD 1993; Teichler 2000) this variation in the output of higher education graduates certainly deserves more attention in the literature concerned with the linkage between higher education and the labour market.

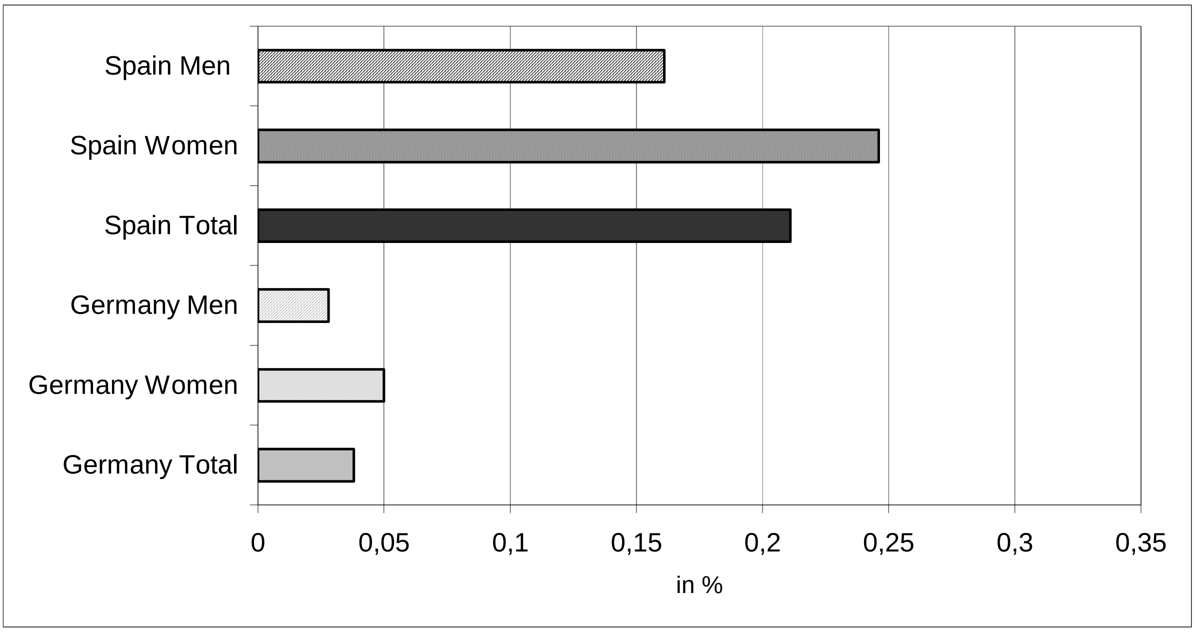
4. Results

4.1. Descriptive analysis

4.1.1. Unemployment

As a first step in the empirical analysis, figure 3 and figure 4 provide results of simple cross tabulations. Turning first to unemployment risks of tertiary graduates in Germany and Spain, clear gender-specific variations can be observed in both countries. In general, there is a relatively high level of unemployment among tertiary graduates in Spain, particularly among women. Even though the overall level of unemployment is much lower in Germany than in Spain and the gender differences are less pronounced - women are still more often unemployed than men (figure 3).

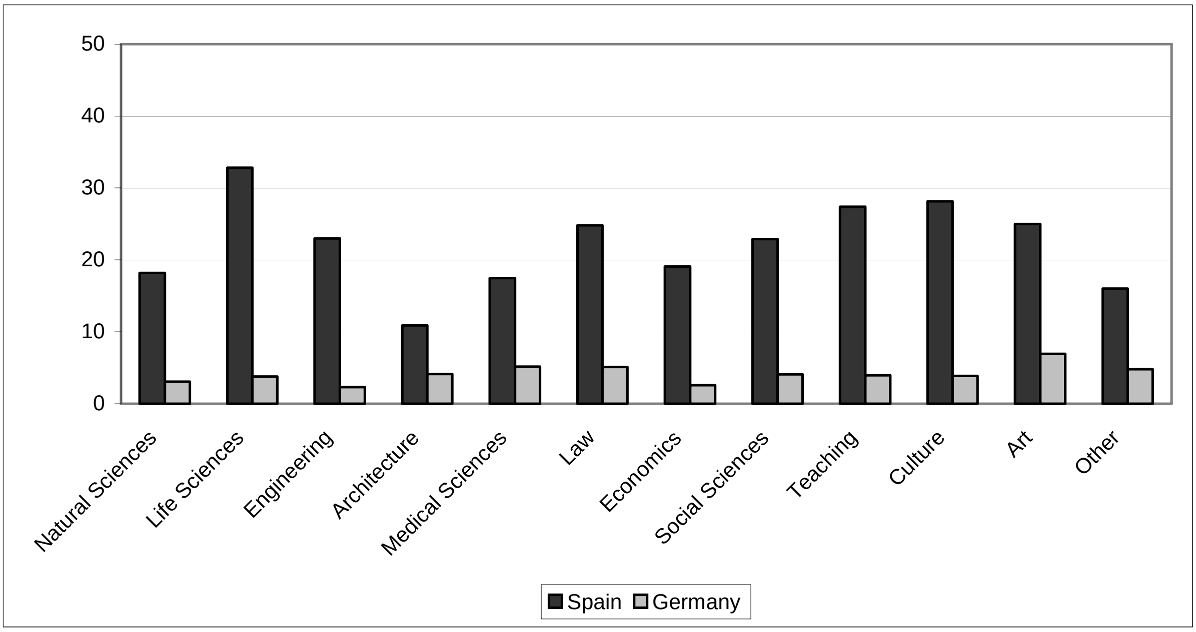
Figure 3: Bivariate association between unemployment and gender



Source: Mikrozensus 2000, EPA 2000, own calculations

Concerning the risk of unemployment in respect to different fields of study, some key findings can be observed in figure 4. There is a higher degree of variation in unemployment by field of study in Spain than in Germany.[15] In Spain the highest proportion of unemployed tertiary graduates are those of life sciences (39%), followed by culture (28%) and teaching (27%), whereas the graduates of architecture have the lowest share (11%). In Germany, the subjects most affected by unemployment are art (7%), medical sciences (5%) and law (5%), while the lowest risk can be found for graduates in engineering (2%). Thus the fact that women are more often unemployed could be connected to their overrepresentation in arts and their underrepresentation in engineering.

Figure 4: Bivariate association between unemployment and field of study

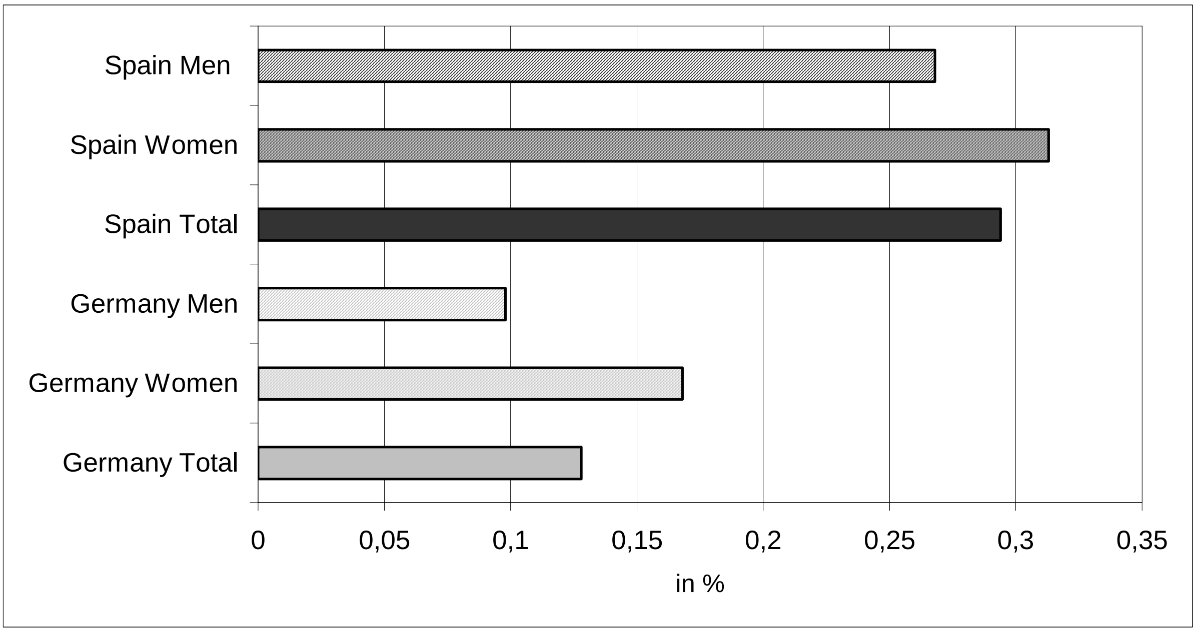


Source: Mikrozensus 2000, EPA 2000, own calculations

4.1.2. Low status jobs

The second analyzed labour market outcome is the probability of tertiary graduates to be in a low status job that can be considered as a vertical education mismatch (figure 5).

Figure 5: Bivariate association between low status and gender



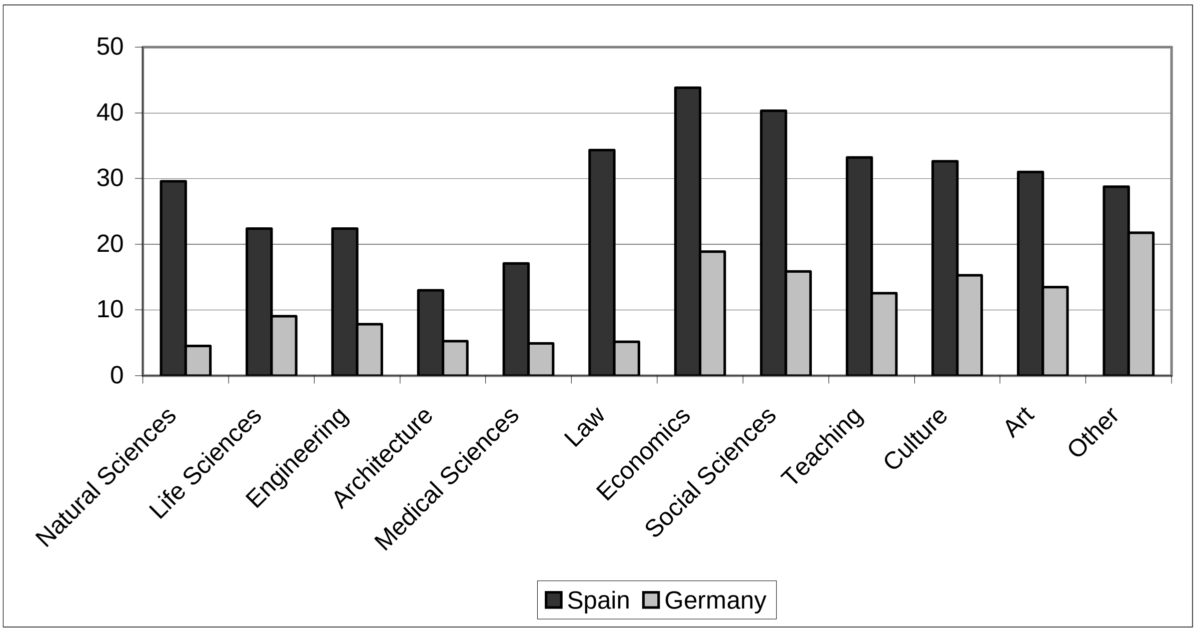
Source: Mikrozensus 2000, EPA 2000, own calculations

[15] This finding can be quantified when computing a simple analysis of variance with unemployment as a response variable and field of study as a factor variable. The variance between groups is much larger in Spain (15.982) than in Germany (1.252).

If we look at figure 5 it becomes obvious that, on average, Spanish graduates more often hold a low status jobs than graduates in Germany. It can be assumed that this partly results from the different Spanish occupational structure as well as the fact that there are considerably more tertiary graduates in Spain than in Germany. Moreover, in both countries women more often work in low status jobs than men.

A look at the different fields of study reveals that graduates seem to be affected quite similarly by low status jobs in both countries (figure 6). Again, fields with higher shares of female graduates seem to be connected to low status jobs more often than typically male fields: Graduates from economics, social sciences, and teaching are more often in low status jobs than those in architecture and engineering. In addition, the occurrence of a low status job varies considerably across fields in both countries even though the inspection of figure 4 does not necessarily reveal more variation in Spain compared to Germany or vice versa.[16]

Figure 6: Bivariate association between low status and field of study



Source: Mikrozensus 2000, EPA 2000, own calculations

4.2. Logistic regression analyses

In a next step we estimate a set of nested logistic regression models for both labour market outcomes. Separate models for Germany and Spain are computed. In model A we include gender and age. In model B we add the dummy variable for higher tertiary degree in order to see whether gender differences in unemployment can be explained by the differential distribution of men and women over level of tertiary degree. In model C, dummy variables for

[16] As in the analysis of unemployment, an analysis of variance was computed to compare variation in lower status jobs across fields of study clusters for Germany and Spain. The difference between groups was almost exactly the same (35.69 for Germany and 35.77 for Spain).

field of study are introduced to find out whether the gender-specific distribution over field of study explains the expected female disadvantage. Finally, in model D, interactions between the level of tertiary degree, field of study, and gender are included to test whether there are gender differences in the probability of being unemployed or occupying a low status job in the different fields.

4.2.1. Unemployment

If we look at the log-odds coefficients (logits) of “female” in model A both for Germany and Spain (table 3) the bivariate finding that women are more likely to be unemployed than men in both countries is confirmed when we control for age. Introducing level of tertiary degree (model B) does not alter the gender coefficient substantially, even though in Germany graduates from universities are more likely to be unemployed than graduates from the “Fachhochschule”.

The introduction of field of study on the other hand leads to a marked reduction of the coefficient for female in both countries, even though the gender coefficients in both country models remain significant. The log-odds coefficient for gender is reduced from 0.542 to 0.495 in Germany and, even more noticeably, from 0.426 to 0.306 in Spain. Judging from the model fit statistics, the introduction of field of study leads to a larger increase in model fit in Spain than in Germany: Pseudo R^2 (McFadden) increases from 0.015 to 0.022 in Germany and from 0.064 to 0.084 in Spain; the Likelihood-Ratio Test statistic (Chi^2) also increases more markedly in Spain than in Germany.

Compared to respondents in the reference category (teaching), graduates of arts and “other” fields are significantly more likely to be unemployed in Germany. In Spain, however, graduates from architecture, medical sciences, economics as well as “other” fields are less likely than graduates from teaching to be unemployed. Only graduates from life sciences and culture are more likely than those with a teacher’s education to be unemployed. Again, this result confirms the trend observed in the bivariate analysis that in both countries typical female fields are more often associated with unemployment than typical male fields.

In the last model (D) we let the dummy variable for female interact with higher tertiary degree and field of study to investigate whether there are gender differences with regard to unemployment in specific fields or degree level. Overall, the comparison of the Likelihood-Ratio Test statistic from model D and model C reveals that the interaction effects do not improve the overall fit of the model. In both countries, however, female engineering graduates are significantly more likely to be unemployed than male graduates. This effect is even more pronounced in Germany than in Spain. In Spain, female graduates in culture are also more likely to be unemployed than male graduates.

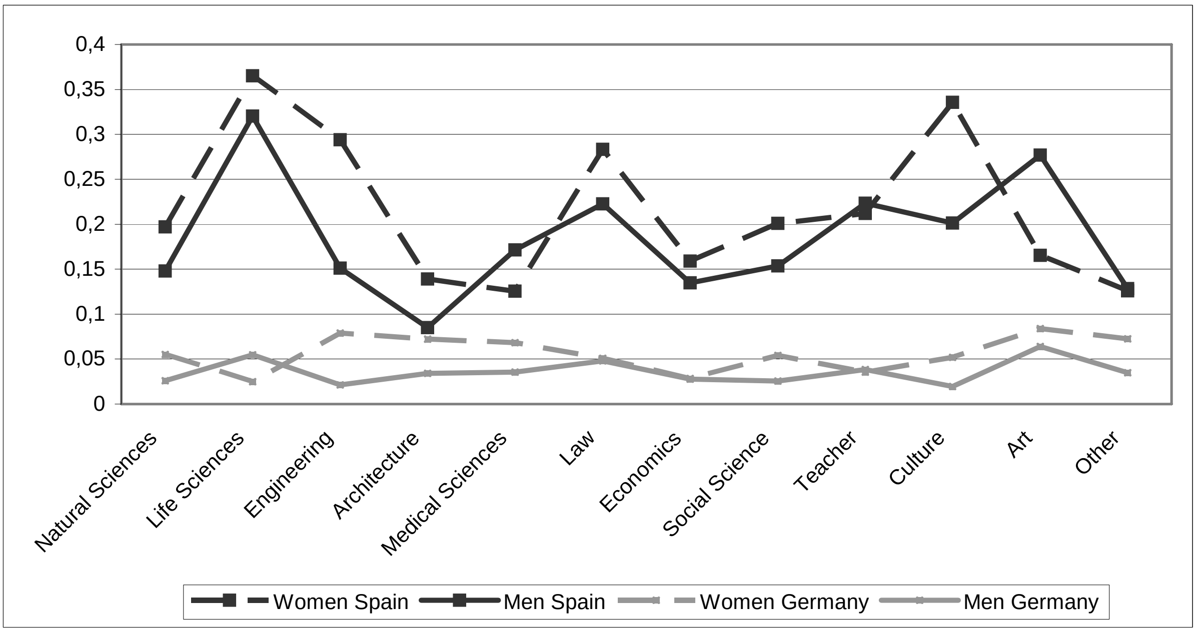
Table 3: Logistic regression of gender, field of study on unemployment for Germany and Spain. Logit-coefficients, standard errors in parenthesis, N=9392 for Germany and N=5831 for Spain

	Germany				Spain			
	Model A	Model B	Model C	Model D	Model A	Model B	Model C	Model D
Female	0.563***	0.542***	0.495***	-0.023	0.423***	0.426***	0.306***	0.205
	(0.110)	*(0.111)*	*(0.120)*	*(0.403)*	*(0.070)*	*(0.070)*	*(0.074)*	*(0.223)*
Higher Tertiary Deg.		0.256*	0.227	0.256		0.086	-0.121	0.047
		(0.114)	*(0.123)*	*(0.187)*		*(0.067)*	*(0.077)*	*(0.129)*
Field of Study[a]								
Natural Sciences			0.052	-0.512			-0.248	-0.523
			(0.277)	*(0.417)*			*(0.373)*	*(0.590)*
Life Sciences			0.095	0.266			0.664**	0.475
			(0.306)	*(0.448)*			*(0.224)*	*(0.385)*
Engineering			-0.067	-0.707			0.034	-0.499
			(0.250)	*(0.378)*			*(0.194)*	*(0.331)*
Architecture			0.361	-0.209			-	-
			(0.266)	*(0.430)*			*(0.185)*	*(0.270)*
Medical Sciences			0.407	-0.188			-	-0.348
			(0.247)	*(0.460)*			*(0.141)*	*(0.290)*
Law			0.367	0.126			0.246	-0.022
			(0.253)	*(0.414)*			*(0.139)*	*(0.266)*
Economics			-0.185	-0.443			-	-0.630**
			(0.228)	*(0.375)*			*(0.121)*	*(0.242)*
Social Sciences			0.170	-0.529			-0.174	-0.480
			(0.282)	*(0.594)*			*(0.149)*	*(0.331)*
Culture			0.070	-0.807			0.396**	-0.150
			(0.292)	*(0.659)*			*(0.153)*	*(0.312)*
Arts			0.764**	0.426			-0.102	0.268
			(0.271)	*(0.498)*			*(0.239)*	*(0.411)*
Other			0.432*	-0.210			-	-0.689**
			(0.205)	*(0.380)*			*(0.139)*	*(0.251)*
Interactions w. female								
Higher T. Deg*Female				-0.077				-0.287
				(0.248)				*(0.161)*
Natutal Sci.*Female				0.879				0.427
				(0.581)				*(0.766)*
Life Sci.*Female				-0.723				0.282
				(0.661)				*(0.476)*
Engineering*Female				1.460**				0.932*
				(0.534)				*(0.416)*
Architecture*Female				0.808				0.346
				(0.554)				*(0.422)*
Medical*Female				0.785				-0.283
				(0.545)				*(0.332)*
Law*Female				0.161				0.403
				(0.532)				*(0.313)*
Economics*Female				0.129				0.275
				(0.488)				*(0.280)*
Social Sci.*Female				0.880				0.408
				(0.676)				*(0.370)*
Culture*Female				1.114				0.776*
				(0.736)				*(0.359)*
Arts*Female				0.392				-0.577
				(0.594)				*(0.509)*
Other*Female				0.873				0.059
				(0.450)				*(0.306)*
Age	-0.052**	-0.055**	-0.056**	-0.056**	-	-	-	-
	(0.017)	*(0.017)*	*(0.017)*	*(0.017)*	*(0.010)*	*(0.010)*	*(0.011)*	*(0.011)*
Constant	-	-	-	-1.641**	3.361***	3.371***	4.100***	4.215***
	(0.531)	*(0.536)*	*(0.557)*	*(0.629)*	*(0.294)*	*(0.295)*	*(0.314)*	*(0.357)*
Likelihood-Ratio-Test	-1487.784	-1485.203	-1474.244	-1464.356	-2815.654	-2814.834	-2755.387	-2745.803
Comparison of LR-	-	5.16(1)*	21.92(11)*	19.78(12).	-	1.64(1)	118.90(11)	19.17(12)
Pseudo R² (McFadden)	0.013	0.015	0.022	0.029	0.064	0.064	0.084	0.087

*[a]Reference Field=Teaching, [b] Comparison of LR Chi² test statistic with previous Model (df in parenth.), p<0.05, ** p<0.01, *** p<0.001*

Finally, in order to provide a more illustrative interpretation of the results of the logistic regression analysis and to avoid that the effects of different fields are only shown in comparison to the reference category (teaching), we calculate predicted probabilities of being unemployed for women and men in both countries according to model D in table 3 (figure 7). The predicted probabilities are computed for men and women with a higher tertiary degree and mean age. Again, the figure confirms the bivariate finding that the probability of being unemployed varies substantially more in different fields in Spain than in Germany. The high risk of unemployment for life sciences graduates in Spain (over 30%) as well as female graduates of the culture and humanities field is surprising. There is no clear indication that female graduates of typically male fields are more likely to be unemployed than men in either country, even though women are disadvantaged in engineering, the most representative "male" field. In addition, one of the most typical female fields, teaching, shows no gender differences in either country.

Figure 7: Predicted probabilities for unemployment (=1) for men and women from different fields of study in Germany and Spain (estimated values from Model D).



Source: Mikrozensus 2000, EPA 2000, own calculations

Note: Age held constant at mean, Higher Tertiary Degree held constant at =1.

Overall, most of the previous expectations are confirmed in the analysis of unemployment. Female tertiary graduates are more disadvantaged with regard to unemployment than men in both countries; the different distribution of men and women over fields of study leads to a considerable reduction of the gender disadvantage – more noticeably in Spain than in Germany. Finally, no clear pattern with respect to the assumptions in the literature regarding female advantages or disadvantages in typically female (or male) fields could be observed when testing the differences between men and women in the 12 fields of study. One important finding, however, is that female engineering graduates seem to face a higher risk of unemployment in Germany and Spain and that there is no gender difference for teaching graduates. The latter finding could be seen as an indication that fields, like teaching, that typically channel graduates into public sector occupations, show no or few gender differences on the labour market.

4.2.2. Low status jobs

For the multivariate analysis of low status jobs (table 4) we estimated the same set of regression models as we did in the analysis of unemployment. In model A one can see that women are significantly more likely to hold a low status job in both countries, but that the female disadvantage is more distinct in Germany. Contrary to the analysis of unemployment, the next model (B) shows that the addition of the tertiary degree level has a significant impact regarding the status outcome, as the model fit increases considerably in both countries.

Graduates with a higher-level tertiary degree are less likely to be in a low status job in both countries. Surprisingly, the main effect for gender somewhat increases when tertiary degree type is added to the model in Germany, implying that women would be even more disadvantaged with respect to low status jobs if it was not for their overrepresentation in higher level tertiary degrees.[17] In Spain, however, the gender coefficient is marginally reduced with the introduction of the level of tertiary degree. The introduction of field of study in model C leads to a similar reduction of the gender main effect in Germany (0.660 to 0.530) and Spain (0.152 to 0.042). However, the effect for female loses its statistical significance in the Spanish case. The addition of field of study in both countries leads to an improvement of model fit that is quite similar in both countries: Pseudo R^2 increases from 0.031 to 0.068 in Germany and from 0.034 to 0.69 in Spain; the Likelihood-Ratio Test statistic also shows a relatively analogous improvement in model fit. Inspecting how graduates of different fields fare in comparison to graduates of teaching does not reveal any surprises. When controlling all other variables for Germany, graduates of the typically male fields, natural sciences, engineering, and architecture, as well as of the more gender integrated fields, medical sciences and law, are less likely to hold a low status job than teaching graduates. Graduates from culture fields, however, are more likely to be in a low status job. The disadvantage of economics graduates is somewhat surprising given the supposedly good labour market prospects of graduates of this field. The Spanish case shows that graduates from law, economics, social sciences and culture are disadvantaged compared to teaching graduates whereas only medical science and architecture graduates are at an advantage with respect to low status jobs.

Table 4: Logistic regression of gender and field of study on low status for Germany and Spain. Logit-coefficients, standard errors in parenthesis. N=9196 for Germany and N=4808 for Spain

	Germany				Spain			
	Model A	Model B	Model C	Model D	Model A	Model B	Model C	Model D
Female	0.592***	0.660***	0.530***	-0.127	0.175**	0.152*	0.042	-0.225
	(0.063)	*(0.064)*	*(0.070)*	*(0.221)*	*(0.065)*	*(0.066)*	*(0.071)*	*(0.217)*
Higher Tert. Deg.		-0.675***	-0.581***	-0.487***		-0.667***	-0.914***	-1.005***
		(0.064)	*(0.069)*	*(0.102)*		*(0.065)*	*(0.076)*	*(0.118)*
***Field of study*[a]**								
Natural Sciences			-0.932***	-1.415***			0.252	0.585
			(0.211)	*(0.276)*			*(0.349)*	*(0.475)*
Life Sciences			-0.134	-1.186**			0.379	0.317
			(0.192)	*(0.384)*			*(0.270)*	*(0.426)*
Engineering			-0.400**	-1.006***			-0.024	-0.254
			(0.143)	*(0.209)*			*(0.219)*	*(0.320)*
Architecture			-0.931***	-1.533***			-0.921***	-1.123***
			(0.209)	*(0.306)*			*(0.178)*	*(0.249)*
Medical Sciences			-0.725***	-1.890***			-0.570***	-0.233
			(0.212)	*(0.449)*			*(0.145)*	*(0.282)*
Law			-0.796***	-1.208***			0.359*	0.079
			(0.218)	*(0.334)*			*(0.146)*	*(0.258)*
Economics			0.516***	-0.071			0.630***	0.422
			(0.115)	*(0.198)*			*(0.118)*	*(0.219)*
Social Sciences			0.123	-0.268			0.595***	0.741*
			(0.158)	*(0.287)*			*(0.148)*	*(0.290)*
Culture			0.369*	-0.180			0.750***	0.796**
			(0.159)	*(0.297)*			*(0.163)*	*(0.288)*
Arts			0.130	-0.460			0.340	0.729
			(0.185)	*(0.344)*			*(0.255)*	*(0.436)*
Other			0.665***	-0.092			-0.129	-0.645**
			(0.116)	*(0.206)*			*(0.133)*	*(0.235)*
Interactions w. fem.								
High T. Deg.*Female				-0.190				0.124
				(0.138)				*(0.155)*
Natutal Sci.*Female				0.302				-0.918
				(0.488)				*(0.744)*
Life Sci.*Female				1.408**				0.051
				(0.445)				*(0.554)*
Engineering* Female				0.904**				0.388
				(0.343)				*(0.455)*
Architecture* Female				0.755				0.347
				(0.428)				*(0.429)*
Medical*Female				1.556**				-0.451
				(0.510)				*(0.329)*
Law*Female				0.408				0.418
				(0.446)				*(0.316)*
Economics*Female				0.714**				0.299
				(0.244)				*(0.261)*
Social Sci.*Female				0.438				-0.203
				(0.344)				*(0.337)*
Culture*Female				0.689*				-0.111
				(0.351)				*(0.352)*
Arts*Female				0.728				-0.619
				(0.408)				*(0.541)*
Other*Female				1.048***				0.894**
				(0.249)				*(0.288)*
Age	-0.033**	-0.026**	-0.027**	-0.028**	-0.083***	-0.072***	-0.075***	-0.074***
	(0.010)	*(0.010)*	*(0.010)*	*(0.010)*	*(0.009)*	*(0.010)*	*(0.010)*	*(0.010)*
Constant	-1.192***	-1.083***	-1.075**	-0.509	1.444***	1.474***	1.582***	1.747***
	(0.318)	*(0.316)*	*(0.332)*	*(0.369)*	*(0.282)*	*(0.284)*	*(0.314)*	*(0.350)*
Likelihood Ratio Test	-3468.049	-3411.475	-3280.997	-3266.226	-2866.693	-2813.600	-2709.439	-2692.740
Comparison of LR-Test[b]		$113.15_{(1)}$***	$260.95_{(11)}$***	$29.54_{(12)}$**		$106.19_{(1)}$***	$208.32_{(11)}$***	$33.40_{(12)}$***
Pseudo R² (McFadden)	0.015	0.031	0.068	0.073	0.015	0.034	0.069	0.075

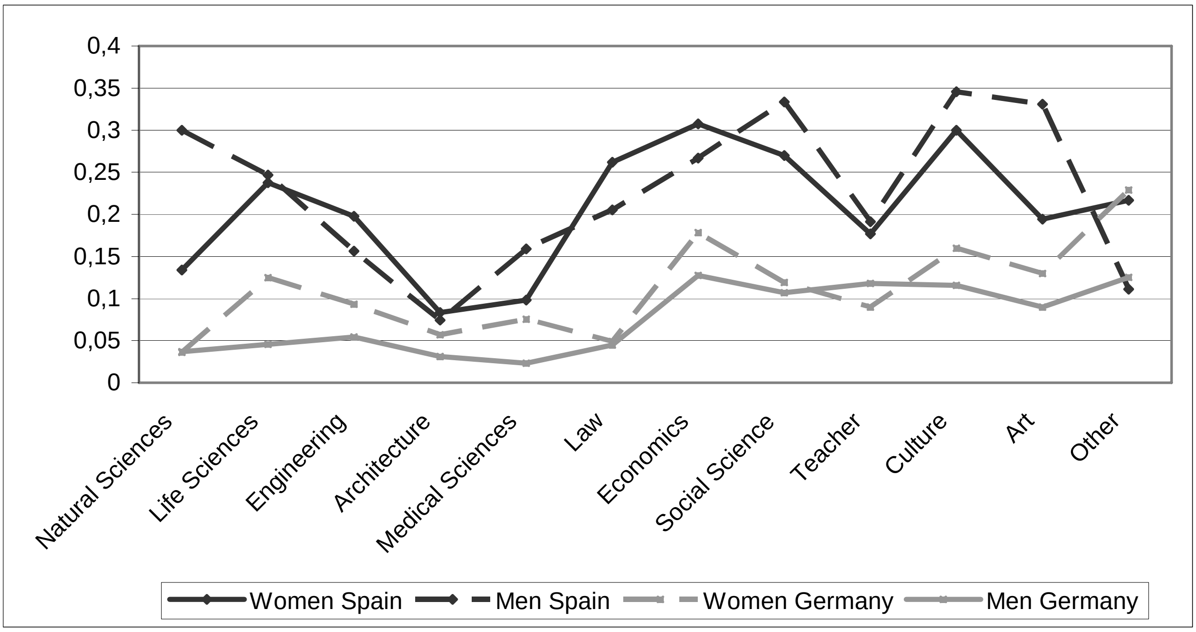
*[a]Reference Field=Teaching, [b] Comparison of LR Chi² test statistic with previous Model (df in parenth.), p<0.05, ** p<0.01, *** p<0.001*

17 Of all German women in the analysis 62% hold a higher level tertiary degree (see table 2 in the appendix).

Considering that more women than men in the Spanish sample have degrees in law, economics, social sciences, culture and art, our results show that fields chosen more frequently by women lead to a higher risk of holding a low status job (with the exception of medical sciences).

In the next step, interactions of gender with field of study and level of tertiary degree are introduced again (model D). Here the model fit increases significantly for both Germany and Spain, even though the increase in Spain seems to be solely driven by the residual category "other" since no other interaction coefficient is significant. In Germany, however, 6 out of 12 fields show significant gender differences. Women seem to be more disadvantaged than men in life sciences, engineering, medical sciences, economics, arts and in the "other" field than men, controlling for higher tertiary degree and age. In order to find out whether the interaction between female and the level of tertiary degree would be statistically significant without the other interaction coefficients we reran model B (not reported) and included the interaction coefficient between higher tertiary degree and gender. While the interaction was not significant in Spain, the coefficient was negative and significant in Germany. Thus higher tertiary degrees offer better protection from low status jobs for women than for men. As model D shows, this advantage is linked to gender differences in field effects. Again, we present a plot with predicted probabilities from model D for respondents with higher tertiary degree and mean age (figure 8).

Figure 8: Predicted probabilities for low status (=1) for men and women from different fields of study in Germany and Spain (estimated values from model D).



Source: Mikrozensus 2000, EPA 2000, own calculations
Note: Age held constant at mean, Higher Tertiary Degree held constant at =1.

As in the analysis of unemployment, no clear pattern regarding typical female or male fields can be observed. For female graduates with a higher tertiary degree and mean age in

Germany the predicted probability of holding a low status job is lower than that for men with the same characteristics in only one of twelve fields (teaching).[18] The question why some fields show marked gender differences (for example life sciences) and others no differences at all (natural sciences) cannot be answered with the present analysis but clearly deserves more attention in future research. The gender specific pattern is much more erratic in Spain: predicted probabilities of holding a low status job are lower for women in natural sciences, medical sciences, social sciences, teaching, culture, art, and, above all, in the "other" field. Yet, these predictions should be handled with caution because of the lack of statistical significance of the interaction effects (with the exception of "other").

4.2.3. Sensitivity analyses of the status variable

Even though we chose our cut-off point for the low status variable carefully based on substantive considerations (i.e. 50 points), it is probable that different recodings influence the results. In order to test this we estimate model C again with two alternative recodings of the low status variable (appendix, table A1). In specification one we define a job as 'low status' when the ISEI is below 40; in specification two we use an ISEI score of below 60 as the threshold. The results confirm the sensitivity of the gender effect to the respective thresholds. In Germany an ISEI score below 40 leads to an insignificant gender effect which is most likely due to the small proportion of tertiary graduates who fall in this category (4.8%). In Spain, on the other hand, the gender effect is reversed and significant when defining low status more conservatively at below 40. The more generous recoding of low status in specification two leads to a pattern more congruent with the results of our baseline model, even though the (negative) gender effect is somewhat smaller in Germany. The effect of the dummy variable for higher tertiary degree is less sensitive to the alternative recodings in both countries. The effects of the field dummy variables vary somewhat but not much in specification one and two. While we think that the validity of our results regarding the low status outcome holds, the sensitivity analyses exemplify that women and men – especially in Spain – are channelled into specific occupational (ISEI) categories. As can be seen in figure A1 (appendix) female tertiary graduates in Spain rarely hold positions with an ISEI score below 40 while men seem to be overrepresented in the area between scores of 50 and 70. Women in Spain are channelled into occupations with 'average' ISEI scores, while men hold more low and high level jobs. Thus, the way we classify those occupations influences the way how possible gender differences are perceived.

In sum, it is clear that female graduates in both countries are disadvantaged with respect to holding a low status job. As assumed, field of study can partly explain this disadvantage,

[18] Nevertheless, the interaction between female and teaching in model D, Germany was not significant (ß=-0.127,s.e.=0.221).

while the level of tertiary degree matters with respect to male-female differences. However, no case can be made for a stronger effect of field of study in either country. Also, graduates of the lower level degree programs are more exposed to the risk of holding a lower status job in both countries. However, this effect does not explain the female disadvantage. Finally, unlike in the analysis of unemployment, significant gender differences within a number of fields can be observed – at least in Germany. Even though no clear pattern with respect to advantages or disadvantages for women in gender-typical fields emerged, the analysis revealed that gross field effects are sometimes restricted to female graduates only. Furthermore, female engineering graduates in Germany seem to be more disadvantaged not only with respect to unemployment, but also with regard to holding a low status job, while the probability of occupying a low status job is about the same for women and men with teaching degrees in both countries.

4.3. Decomposition of the gender gap in unemployment and low status jobs[19]

Even though the coefficient estimates of the logistic regression models give us a good overview of the relative weight of the different independent variables, they do not allow us to quantify the extent to which the different distribution of men and women in different fields and degree levels contributes to the gender gap in unemployment and low status jobs. In order to achieve this we apply a relatively new non-linear decomposition technique. The gap in unemployment or low status between male and female tertiary graduates can be decomposed in two parts. One part of the male/female differential is due to the different distributions of men and women across different fields (i.e. segregation) as well as gender differences in the means of the other variables in the model. The other part is due to gender differences in the processes that generate unemployment. These processes can be divided into a) differences in the way the independent variables operate for both genders (i.e. the effects of the independent variables), and b) gender differences with respect to other unobserved characteristics.

To decompose the gender gap in unemployment into these two parts, we apply a technique developed by Fairlie (1999; 2005; 2006). His basic approach follows the logic of the widely applied Blinder-Oaxaca decomposition technique evolved for linear regressions (Blinder 1973; Oaxaca 1973) – typically for gender or racial differences in wages. The male-female ($\overline{Y}^M - \overline{Y}^F$) gap in the linear dependent variable, such as gender differences in wages, can be decomposed into two parts:

(1.1) $\overline{Y}^M - \overline{Y}^F = [(\overline{X}^M - \overline{X}^F)\hat{\beta}^F] + [\overline{X}^M(\hat{\beta}^M - \hat{\beta}^F)]$

$\overline{X}^j$ represents a row vector of average values of the independent variables and $\hat{\beta}^j$ represents a vector of coefficient estimates for gender. The first term in brackets, which is typically referred to as the “explained” component, represents the part of the gender gap that exists due to group differences in the distribution of X (for example gender differences in level of education). The second term in brackets, often labelled as “discrimination”, represents the part due to differences in the in the group processes that determine levels of Y. Fairlie (2006) suggests a decomposition technique for a nonlinear equation $Y = F(X\hat{\beta})$ which is similar to the linear approach. Differences in average predicted probabilities for an outcome such as unemployment can be decomposed in the following way:

(1.2) $$\overline{Y}^M - \overline{Y}^F = \left[\sum_{i=1}^{N^M}\frac{F(X_i^M\hat{\beta}^F)}{N^M} - \sum_{i=1}^{N^F}\frac{F(X_i^F\hat{\beta}^F)}{N^F}\right] + \left[\sum_{i=1}^{N^M}\frac{F(X_i^M\hat{\beta}^M)}{N^F} - \sum_{i=1}^{N^M}\frac{F(X_i^M\hat{\beta}^F)}{N^F}\right]$$

Again, the first term in brackets can be attributed to gender differences in distribution of X, and the second term is due to group differences in the group processes determining levels of Y.[20] While the first term in brackets in (1.2) provides an estimate of the overall contribution of all independent variables to the (gender) gap, the contribution of specific variables to the gap needs to be identified in an additional calculation (see appendix, Decomposition, equation A.1). According to this calculation, the contribution of each variable to the gap is equal to the change in the average predicted probability from replacing the female distribution with the male distribution of that variable, while holding the distributions of the other variables constant.

In order to apply the decomposition, Fairlie (2006) recommends using coefficient estimates from a pooled model ($\hat{\beta}^*$) to calculate average predicted probabilities for outcome Y for both groups under consideration. Next, a random subsample of the group with smaller N is drawn, equal to the size of the larger group.[21] Each observation in the subsample and the larger sample is then separately ranked by the predicted probabilities and matched by their respective rankings. For the analysis of unemployment this procedure matches women (men) who have characteristics placing them at the bottom (top) of their distribution with respect to the risk of unemployment with men (women) who have characteristics placing them at the bottom (top) of their distribution. Because the results of the decomposition depend on the subsample that is drawn, it is advisable to draw a large number of random subsamples in order to achieve reliable results.

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[19] The decomposition was computed with a user written Stata program (fairlie.ado) by Ben Jann.

[20] One could also write the decomposition (1.2) using the male coefficients as weights for the first term in the decomposition and the male distributions of the independent variables as weights for the second term (see Fairlie 2006: 3)

[21] It follows that if there are more men in the sample, a subsample of women equal to the N of the male sample would be drawn.

4.3.1. Decomposition of the gender gap in unemployment

In table 5 results of the non-linear decomposition of unemployment for Germany and Spain are presented. In specification one, the male sample is used in order to calculate the coefficients which are the basis of the decomposition; in specification two, the pooled sample of men and women is used. The results are based on the mean values of decompositions with 1000 different subsamples.

We are mainly interested in the contribution of field of study and higher tertiary degree to the gap. Overall, the differences in the average values of the independent variables account for about a third of the raw gender gap in unemployment in Germany (35.4-31.2%), while the raw gap is at only at 2.2% and about half in Spain (50.8-52.8%), where the raw gender gap is 8.5%. Interestingly, only a very small and statistically not significant part of the gender gap can be attributed to gender differences in higher tertiary degree in both countries. The individual contribution of field of study – a set of dummy variables – is calculated by simultaneously switching the gender distribution of all field dummy variables.

Table 5: Non-linear decomposition of the gender gap in unemployment (Fairlie-Method) for Germany and Spain, standard errors in parenthesis

	Specification			
	Germany		**Spain**	
Sample used to estimate coefficients	**(1) male coefficients**	**(2) pooled coefficients**	**(1) male coefficients**	**(2) pooled coefficients**
% of men unemployed	.0282	.0282	.1607	.1607
% of women unemployed	.0504	.0504	.2461	.2461
female/male gap	-.0222	-.0222	-.0854	-.0854
Contribution to the gap from gender differences in the following variables				
Higher Tertiary Degree	-.0008	-.0007	.0005	-.0014
	(.0006)	*(.0004)*	*(.0006)*	*(.0009)*
% of female/male gap	3.5%	3.4%	-0.6%	1.69%
Field of Study	-.0058*	-.0050*	-.0256***	-.0278***
	(.0027)	*(.0016)*	*(.0051)*	*(.0032)*
% of female/male gap	25.9%	22.7%	30.0%	32.6%
Age	-.0013*	-.0011*	.0183***	-.0158***
	(.0006)	*(.0004)*	*(.0020)*	*(.0011)*
% of female/male gap	5.9%	5.2%	21.4%	18.5%
All variables (total explained)	-.0079	-.0069	-.0434	-.0451
% of overall gap	35.4%	31.2%	50.8	52.8%
N estimation sample	5388	9392	2377	5831

**p<0.05, ** p<0.01, *** p<0.001*
Notes: Standard errors are approximated by the "delta method", see Fairlie 2003: 5 and appendix.
Contribution estimates are mean values of the decomposition using 1000 subsamples of women for Germany and 1000 subsamples of men for Spain.

The results show that field of study accounts for 25.9%-22.7% of the raw gap in Germany and between 30.0%-32.6% of the gender gap in Spain. In other words: the female disadvantage with respect to unemployment would be reduced by about a third in Spain and roughly by about a fourth in Germany if the female distribution across the different fields would be equivalent to that of men. Virtually no change in the female disadvantage in unemployment would occur if men and women were equally distributed with respect to the type of higher tertiary degree. It should also be noted that a part of the gender gap, at least in Spain, is due to the fact that men in the sample are a slightly older than women. Table 5 further reveals that the decomposition estimates do not differ much in the two specifications.[22]

The decomposition exercise shows that studies concerned with female/male differentials in unemployment that do not account for field of study miss a significant factor that contributes to the gender gap. Not accounting for this factor might lead us to misattribute one fourth (Germany) or one third (Spain) of the gender differential to other unobserved differences between men and women and to underestimate the role of the educational degrees for unemployment.

4.3.1. Decomposition of the gender gap in low status

In table 6 we present results of the decomposition of the gender gap in low status positions. Again, we present two specifications based on average values of 1000 different subsamples. Differences in means in the independent variables explain from 30.6% to 30.9% of the gender disparity in low status jobs in Germany and between 128.3% and 84.4% in Spain. The "overexplanation" in the case of the specification with the female coefficients in Spain essentially means that women would be less often in low status jobs than men if we assign them the male average x-values. In Germany, higher tertiary degree only explains a very small proportion of the gender gap, whereas in Spain the level of tertiary degree explains from 53.5% to 45.3% of the low status gap. Results for field of study account for 26.4% to 23.0% of the gap in Germany and for 61.4% to 25.1% in Spain. The large difference in specifications in Spain makes it hard to accurately assess the impact of fields. Even after running a series of additional decompositions[23] we could not reduce the uncertainty about the size of the contribution of field of study to the gap, which leads us to conclude that field of

[22] We used coefficient estimates from a female sample as a third specification. The results revealed that the magnitude of the individual contributions of the independent variables was about the same but taken together the variables explain slightly less of the overall gap (see appendix table A2).

[23] In order to obtain a more reliable result regarding the individual contribution of field of study in Spain to the low-status outcome we ran a number of additional non-linear decompositions. First we replicated the analysis running a probit instead of a logit model. The results were essentially the same in all specifications. Secondly we collapsed life sciences and natural sciences as well as arts and culture to see whether the relatively small N in those fields might be problematic: results for all three specifications (based on a logit model) mirrored the results with the more detailed field categories. We proceeded to run decompositions without the higher university degree variable. Again the variance in the contribution of field to the gap is large and the specification with the male reference sample produced a result where the independent variables "overexplain" the actual raw gap. Next, we excluded the field dummy variables altogether from the decomposition and found that level of tertiary degree explains about a fourth of the raw gap in each specification. Finally, we computed a linear Blinder-Oaxaca decomposition with our binary outcome variable using pooled coefficients. This

study explains *at least* a fourth of the gender gap in low status in Spain. Part of the gender gap in Spain can also be attributed to gender differences in age in our sample.

Table 6: Non-linear decomposition of the gender gap in low status (Fairlie-Method) for Germany and Spain, standard errors in parenthesis

	Specification			
	Germany		**Spain**	
Sample used to estimate coefficients	**(1) male coefficients**	**(2) pooled coefficients**	**(1) male coefficients**	**(2) pooled coefficients**
% of men low status	.0981	.0981	.2679	.2679
% of women low status	.1678	.1678	.3134	.3134
female/male gap	-.0697	-.0697	-.0456	-.0456
Contribution to the gap from gender differences in the following variables				
Higher Tertiary Degree	-.0011	-.0028***	-.0244***	-.0206***
	(.0006)	*(.0007)*	*(.0033)*	*(.0020)*
% of female/male gap	1.6%	4.0%	53.5%	45.3%
Field of Study	-.0184***	-.0160***	-.0280***	-.0115**
	(.0042)	*(.0024)*	*(.0065)*	*(.0039)*
% of female/male gap	26.4%	23.0%	61.4%	25.1%
Age	-.0018	-.0027**	-.0061***	-.0064***
	(.0012)	*(.0008)*	*(.0014)*	*(.0009)*
% of female/male gap	2.6%	3.9%	13.5%	13.9%
All variables (total explained)	-.0213	-.0216	-.0585	-.0385
% of overall gap	30.6%	30.9%	128.3%	84.4%
N estimation sample	5227	9196	2054	4808

**p<0.05, ** p<0.01, *** p<0.001*
Notes: Standard errors are approximated by the "delta method", see Fairlie 2006: 5 and appendix.
Contribution estimates are mean values of the decomposition using 1000 subsamples of women for Germany and 1000 subsamples of men for Spain.

Overall we see that the difference in distribution across fields is accountable for at least a fourth of the gender gap in both countries. Contrary to the analysis of unemployment the level of tertiary degree plays a significant role in explaining gap in low status in Spain - but not in Germany.[24] The latter result is interesting given the distribution of men and women into the level of tertiary degree: In Germany 63% of all women (see table 2) have a higher tertiary degree compared to 55% of all men. In Spain 50% of all women have a higher tertiary degree compared to 56% of all men. While in Germany the female "advantage" does not help to reduce the gap in low status, the female disadvantage in Spain translates into a disadvantage with respect to the status outcome.

showed that about 85% of the overall gap could be explained by the differences in means in all independent variables and that field of study accounts for about 35% of the gap.

[24] As in the decomposition of unemployment we used coefficient estimates from a female sample as a third specification. The results revealed that the magnitude of the individual contributions of the independent variables as well as the contribution of all variables taken together is substantially lower when the female sample is used (see appendix table A3).

5. Discussion

The purpose of this paper was to examine how level of tertiary degree and gender-specific distribution across fields of study mediate gender differences in unemployment and low status jobs for tertiary graduates. Furthermore, we wanted to find out whether women with a degree in a male-dominated field of study are disadvantaged compared to men. We chose to compare Germany and Spain because they differ with respect to three important contextual factors: the level of sex segregation by field, the linkage between the educational system and the labour market and the exclusiveness of tertiary degrees.

Regarding the first labour market outcome, our analyses confirmed the expectation that female tertiary graduates are more often unemployed than male graduates in Germany and Spain, even when controlling for level and type of tertiary degree. As expected, the female disadvantage is reduced substantially in both countries when field of study is taken into account. However, the female disadvantage in unemployment is not influenced by the level of the tertiary degree in either country. Furthermore, typically female fields are more often affected by unemployment than typically male fields. Concerning country differences, field of study seems to be more relevant in Spain, where the gender disadvantage is more reduced when field of study is introduced in the regression model than in Germany. This result was also confirmed by the nonlinear decomposition, where the individual contribution of field of study accounts for about a fourth of the gender gap in unemployment in Germany compared to about a third in Spain. Thus, even though Spain has lower levels of gender segregation by field and the education-labour market linkage is less close, fields matter more than in Germany with respect to the gender gap in unemployment. Finally, there is no clear indication that female graduates of typically male fields are more likely to be unemployed than men in either county. An exception is engineering, the most representative “male” field. Furthermore, one of the most typical female fields, teaching, shows no gender differences in unemployment, neither in Germany nor Spain.

When looking at the second labour market outcome, low status jobs, the results show interesting similarities and differences compared to unemployment. Contrary to the previous analysis, the level of the tertiary degree plays an important role for low status jobs. Graduates with higher-level tertiary degrees are less affected by low status jobs, even though the gender differential is influenced by this variable in Spain only. Concerning the differences in the effect of field of study, the impact seems to be the same in Germany and Spain: in the decomposition analysis, field of study accounts for at least a fourth of the gender gap in low status jobs in both countries. However, in the case of Spain it should be kept in mind that the results are sensitive to the different operationalizations of the low status variable. Finally, no clear pattern with respect to advantages or disadvantages for women in gender-typical fields emerged, the analysis revealed that gross field effects are sometimes restricted to female graduates only. Furthermore, female engineering graduates in Germany seem to be more disadvantaged not only with respect to unemployment but also with regard to holding a low status job. In addition, the probability of occupying a low status job is about the same for women and men with teaching degrees in both countries. Possibly this is an indication that fields, like teaching, that typically channel graduates into public service occupations, show no or little gender differences on the labour market. In any case the results do not support the assumption that employers see a degree from a gender-atypical field of study as a positive educational signal.

The analyses of both labour market outcomes shows that differences in the chosen specialization in tertiary education not only account for gender differences in income, but also for a sizable portion of the gender gap in unemployment and low status jobs of tertiary graduates. This is true for both countries even though field of study choices are more consequential with respect to unemployment in Spain. Thus, studies concerned with gender differences in non-monetary labour market outcomes that do not control for the horizontal differentiation of educational degrees might misattribute a considerable portion of possible female disadvantages to unobserved heterogeneity or discrimination. Another interesting finding is that German tertiary graduates on average fare a lot better on the labour market than their Spanish counterparts. Average levels of unemployment and the proportion of graduates in low status jobs are much lower in Germany than in Spain. This partly reflects the problem Southern European labour markets display in bringing school-leavers into employment, regardless of their educational level (e.g. Gangl 2003). Regarding the two mechanisms that we thought to be important for the relevance of field effects for mediating labour market outcomes, a country's vocational orientation and the selectivity of a tertiary degree, the latter one seems more influential, at least with respect to our two case studies.

Finally, for future research we think that incorporating more country cases with a greater variance in the relevant institutional characteristics might help to test the mechanisms that were outlined more directly. Furthermore, recognizing that unemployment and low status employment might be only transitory states for tertiary graduates, longitudinal data with information on field of study is needed in order to gain deeper insights into the role of educational differentiation and labour market outcomes.

6. References

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Appendix

Table A1: Logistic regression of gender and field of study on different recodings of the low status variable for Germany and Spain. Logit-coefficients, standard errors in parenthesis N=9196 for Germany and N=4808 for Spain

	Baseline ISEI <50	Spec. 1 ISEI<40	Spec. 2 ISEI<60	Baseline ISEI <50	Spec. 1 ISEI<40	Spec. 2 ISEI<60
% low status	12.8%	4.8%	28.6%	29.4%	9.6%	48.0%
Female	0.530***	0.001	0.351***	0.042	-0.807***	0.074
	(0.070)	*(0.112)*	*(0.054)*	*(0.071)*	*(0.109)*	*(0.068)*
Higher Tertiary Deg.	-0.581***	-0.924***	-0.613***	-0.914***	-1.115***	-1.124***
	(0.069)	*(0.110)*	*(0.052)*	*(0.076)*	*(0.123)*	*(0.075)*
Field of study [a]	-0.932***	-1.640***	0.746***	0.252	-1.059	0.032
Natural Sciences	*(0.211)*	*(0.318)*	*(0.120)*	*(0.349)*	*(0.744)*	*(0.343)*
	-0.134	-1.320***	0.238	0.379	0.692*	0.964***
Life Sciences	*(0.192)*	*(0.376)*	*(0.151)*	*(0.270)*	*(0.344)*	*(0.241)*
	-0.400**	-0.915***	0.428***	-0.024	0.164	0.624**
Engineering	*(0.143)*	*(0.188)*	*(0.108)*	*(0.219)*	*(0.282)*	*(0.191)*
	-0.931***	-1.172***	-0.297*	-0.921***	-0.624**	-0.201
Architecture	*(0.209)*	*(0.261)*	*(0.145)*	*(0.178)*	*(0.215)*	*(0.147)*
	-0.725***	-1.183***	-1.019***	-0.570***	-1.281***	-0.781***
Medical Sciences	*(0.212)*	*(0.327)*	*(0.197)*	*(0.145)*	*(0.257)*	*(0.138)*
	-0.796***	-1.441***	-0.310	0.359*	-0.487*	1.179***
Law	*(0.218)*	*(0.357)*	*(0.159)*	*(0.146)*	*(0.240)*	*(0.137)*
	0.516***	-1.962***	1.289***	0.630***	-0.718***	1.691***
Economics	*(0.115)*	*(0.243)*	*(0.097)*	*(0.118)*	*(0.181)*	*(0.122)*
	0.123	-0.491*	0.719***	0.595***	0.268	0.907***
Social Sciences	*(0.158)*	*(0.223)*	*(0.128)*	*(0.148)*	*(0.203)*	*(0.145)*
	0.369*	-0.177	0.688***	0.750***	0.772***	0.967***
Culture	*(0.159)*	*(0.230)*	*(0.133)*	*(0.163)*	*(0.224)*	*(0.156)*
	0.130	-0.354	1.288***	0.340	0.952**	1.142***
Arts	*(0.185)*	*(0.255)*	*(0.141)*	*(0.255)*	*(0.305)*	*(0.237)*
	0.665***	-0.030	1.190***	-0.129	-0.431*	0.510***
Other	*(0.116)*	*(0.154)*	*(0.099)*	*(0.133)*	*(0.185)*	*(0.125)*
	-0.027**	-0.021	-0.000	-0.075***	-0.062***	-0.060***
Age	*(0.010)*	*(0.016)*	*(0.008)*	*(0.010)*	*(0.015)*	*(0.009)*
	-1.075**	-1.193*	-1.348***	1.582***	0.740	1.571***
Constant	*(0.332)*	*(0.506)*	*(0.263)*	*(0.314)*	*(0.459)*	*(0.301)*
	0.530***	0.001	0.351***	0.042	-0.807***	0.074
Likelihood Ratio Test	-3280.997	-1638.105	-5044.952	-2709.439	-1397.039	-2941.143
Pseudo R^2 (McFadden)	.068	.073	.084	.069	.083	.116

[a] *Reference Field=Teaching, * p<0.05, ** p<0.01, *** p<0.001*

Figure A1: Distributions of ISEI scores by gender in Spain (analytical sample from low status analysis)

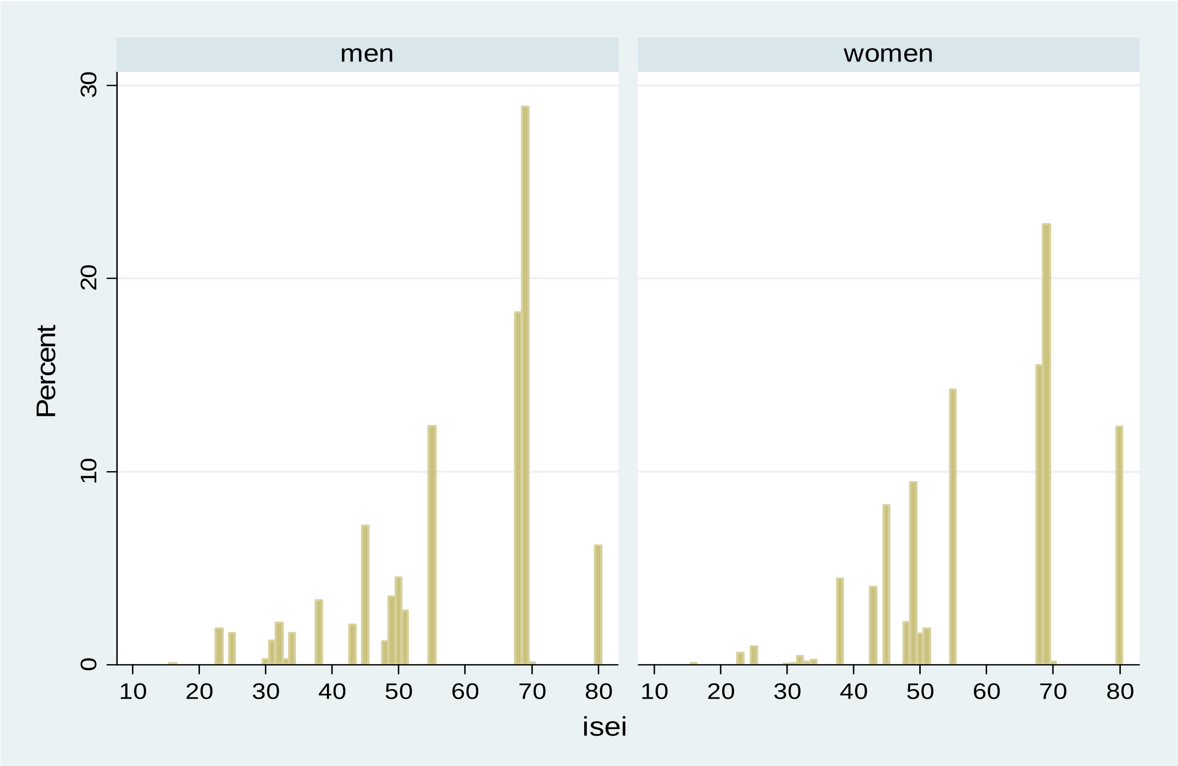

Figure A2: Distributions of ISEI scores by gender in Germany (analytical sample from low status analysis)

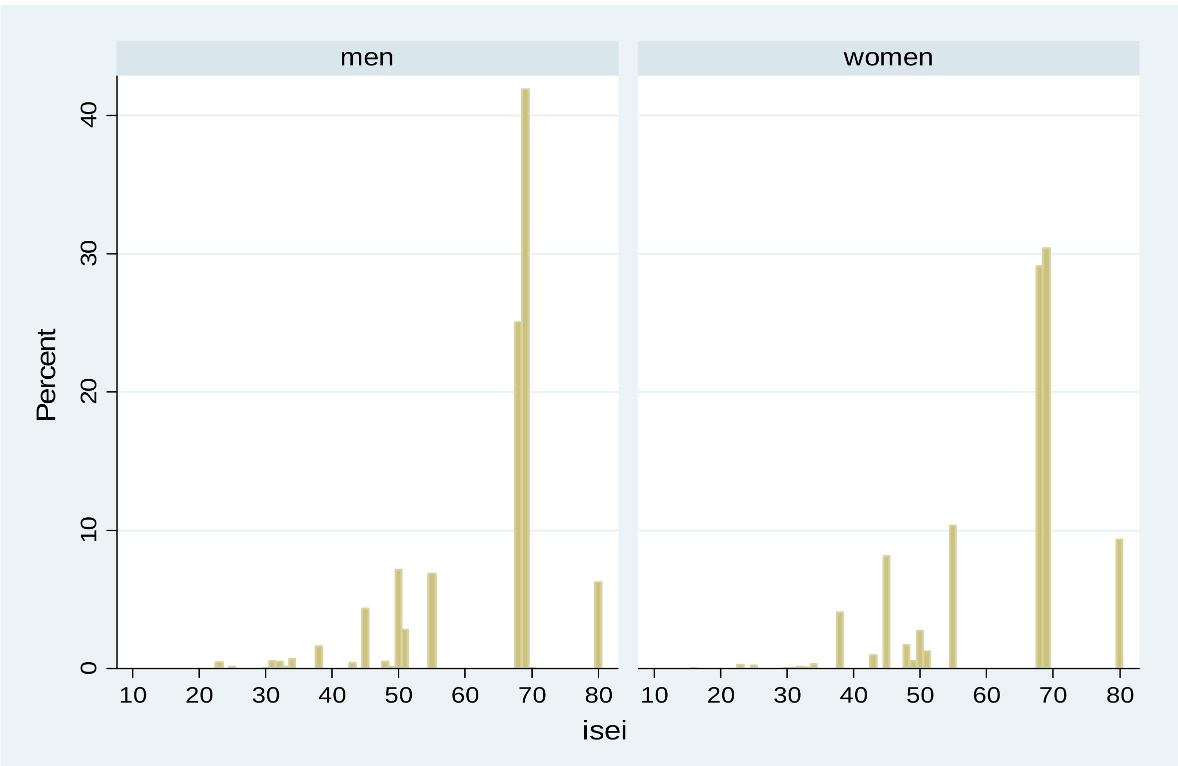

Table A2: Non-linear decomposition of the gender gap in unemployment for Germany and Spain, Specification with female coefficients, standard errors in parenthesis

Sample used to estimate coefficients	**Germany** **female coefficients**	**Spain** **female coefficients**
% of men unemployed	.0282	.1607
% of women unemployed	.0504	.2461
female/male gap	-.0222	-.0854
Contribution to the gap from gender differences in the following variables		
Higher Tertiary Degree	-.0010	-.0032*
	(.0011)	*(.0013)*
% of female/male gap	4.7%	3.8%
Field of Study	.0062	-.0206***
	(.0053)	*(.0058)*
% of female/male gap	-27.9%	24.1%
Age	-.0007	-.0152***
	(.0006)	*(.0014)*
% of female/male gap	3.0%	17.8%
All variables (total explained)	.0045	
% of overall gap	20.3%	45.8%
N estimation sample	4004	3454

**p<0.05, ** p<0.01, *** p<0.001*
Notes: same as table 5

Table A3: Non-linear decomposition of the gender gap in low status for Germany and Spain, Specification with female coefficients, standard errors in parenthesis

Sample used to estimate coefficients	**Germany** **female coefficients**	**Spain** **female coefficients**
% of men low status	.0981	.2679
% of women low status	.1678	.3134
female/male gap	-.0697	-.0456
Contribution to the gap from gender differences in the following variables		
Higher Tertiary Degree	-.0002	-.0183***
	(.0014)	*(.0064)*
% of female/male gap	0.3%	40.2%
Field of Study	-.0062	-.0021
	(.0059)	*(.0064)*
% of female/male gap	8.8%	4.5%
Age	-.0026*	-.0061***
	(.0012)	*(.0011)*
% of female/male gap	3.7%	13.4%
All variables (total explained)	-.0090	-.0265
% of overall gap	12.9%	58.2%
N estimation sample	3969	2754

**p<0.05, ** p<0.01, *** p<0.001*
Notes: same as table 5

Appendix Decomposition (e.g. Fairlie 2006: 4-5)

Calculation of the contribution of an indivdiual variable to the (gender) gap:

In order to apply the decomposition technique it must be assumed that the sample size of both groups under consideraton (here: men and women) must be equal and that there is one-to-one matching of male and female cases. Using the coefficient estimates from a logit regression with two independent variables (X_1 and X_2), where $\hat{\beta}^*$ are the coefficient estimates from a pooled sample of men and women, the contribution of X_1 to the gap can be expressed as (Fairlie 2006: 4):

(A.1) $$\frac{1}{N^F}\sum_{i=1}^{N^F} F(\hat{\alpha}^* + X_{1i}^M \hat{\beta}_1^* + X_{2i}^M \hat{\beta}_2^*) - F(\hat{\alpha}^* + X_{1i}^F \hat{\beta}_1^* + X_{2i}^M \hat{\beta}_2^*)$$

A property of this technique is that the sum of the contributions from individual variables is equal to the total contribution from all of the variables evaluated with the full sample (Fairlie 2006: 5)

Calculation of standard errors

Fairlie (Fairlie 2006: 5) suggests to use the 'delta method' developed by Oaxaca and Ransom (1998) in order to approximate standard errors for the contribution of each individual variable. For that purpose A.1 can be rewritten as:

(A.2) $$\hat{D}_1 = \frac{1}{N^F}\sum_{i=1}^{N^F} F(X_i^{MM}\hat{\beta}^*) - F(X_i^{FM}\hat{\beta}^*)$$

The variance of $\hat{D}_1$ can be approximated as:

(A.3) $$Var(\hat{D}_1) = \left(\frac{\delta \hat{D}_1}{\delta \hat{\beta}^*}\right)' Var\left(\hat{\beta}^*\right)\left(\frac{\delta \hat{D}_1}{\delta \hat{\beta}^*}\right)$$

where $$\frac{\delta \hat{D}_1}{\delta \hat{\beta}^*} = \frac{1}{N^F}\sum_{i=1}^{N^F} f(X_i^{MM}\hat{\beta}^*)X_i^{MM} - f(X_i^{FM}\hat{\beta}^*)X_i^{FM}$$

and f is the logistic probability density function.