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International Journal of Comparative Sociology 2008; 49; 257
DOI: 10.1177/0020715208093077

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Field of Study and Gender Segregation in European Labour Markets

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Abstract

This article explores the role of field of study in channelling tertiary graduates into gender-appropriate occupations and the extent to which this process varies across countries. Previous research has demonstrated that such cross-country differences can be attributed to the nature of the welfare regime. However, less attention has been devoted to the potential impact of educational institutions and labour market systems. Using the European Union Labour Force Survey 2004 for 17 EU Member States, results of the multi-level analysis reveal that cross-national variation in occupational gender segregation must be seen in the context of institutional variation in education and labour market systems. The representation of women in higher education and the labour force, the gender pay gap and the provision of childcare explain a significant proportion of cross-national variation in occupational segregation by gender.

Key words: field of study • gender segregation • higher education • multilevel analyses

1. INTRODUCTION

The persistence of gender-segregated labour markets, in combination with the increasing attainment of women in higher education and on the labour market, has been discussed and analysed extensively in academic research as well as policy debate. Different individual and institutional factors shape the unequal distribution of women and men across occupations. Education and the type of educational subjects chosen by young women and men play a central role. In this respect, most research has sought to clarify *why* women and men continue to choose gender-typical fields of study. Less importance, however, has been attached to exploring the extent to which educational gender segregation is

translated into occupational gender segregation, and the way in which different institutional contexts facilitate a closer (or weaker) link between gendered educational and occupational tracks (Borghans and Groet, 1999; Smyth, 2005).

Against this background, the aim of this article is threefold. First, we want to explore the role played by field of study in channeling women and men into 'gender-appropriate' occupations. Second, we want to examine the extent to which selected institutional factors shape cross-national variation in the gender-specific occupational allocation process. Finally, we also examine whether field of study might operate differently across countries, and how far this variation can be explained by selected institutional factors. For that purpose, multi-level analysis is applied considering both individual attributes as well as institutional factors. This mode of analysis seems to be appropriate because it takes into account the nested sources of variability and allows for the combination of different levels of analysis in a single framework.

Using the European Union Labour Force Survey for 2004 for 17 European Member States and comparable macro-data from different European sources, we start with a description of occupational and educational gender segregation across Europe. This is followed by the theoretical background and a set of hypotheses concerning the impact of institutional factors on cross-national variation in the distribution of women and men across occupations. In section four, the research design and relevant variables are described. The formulated hypotheses are then empirically tested in section five. The article ends with a concluding section discussing the main findings and their implications for the understanding of gender segregation processes.

2. BACKGROUND

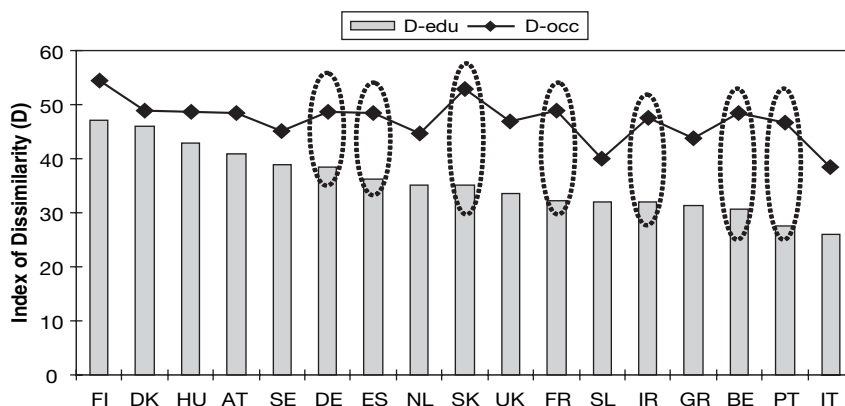
As Charles and Bradley (2002) underline, industrial societies are still characterized by a modern form of gender stratification: high rates of female access to education and labour market institutions coupled with a very high degree of gender segregation within these domains. In this context, gender segregation occurs across occupations and positions within the labour market, while in higher education it arises across fields of study and qualification levels. Various supply and demand side factors have been advanced as explanations of cross-national differences in occupational gender segregation. One possible, though often neglected, explanation is the interrelation with educational gender segregation. In this respect, not only the level of education (degree) but also the selected field of study (specialization) are central to segregation processes. It might be that men and women end up in very different jobs because they have taken very different courses of study. It is a matter of fact that women still tend to choose gender-typical fields of study, like teaching and humanities, which often lead to typical female occupations with potentially lower labour market chances in terms of income and career possibilities (OECD, 2006). Moreover, the organization of the educational system has to be considered since the extent of 'openness'

of these systems will determine the extent to which educational segregation is translated into the labour market.

To get an overview of current rates of occupational gender segregation and its interrelation with educational segregation across Europe, it is worthwhile looking at results for the index of dissimilarity (D) as an aggregated measure of segregation (see Figure 1).¹ The results for 2004 are in line with prior findings: for the 'old' Member States the degree of occupational segregation (dark grey line) is still highest in the Nordic countries (Finland and Denmark)² which are generally viewed as gender-egalitarian regimes, whereas it is lowest in the so-called traditional countries, like Italy and Greece. With respect to Eastern European countries, formerly characterized by high female employment overall, different patterns have evolved: for instance, while Slovakia is characterized by a very high level of gender segregation, Slovenia shows very low values.

The findings for educational segregation (light grey bars), focusing only on tertiary degree-holders for 2004, are similar to those for occupational gender segregation: while the Nordic countries are characterized by high levels of educational gender segregation, the Southern European countries, like Italy, Portugal and Greece, show very low values. Furthermore, it becomes obvious that both forms of gender segregation are significantly related at the country level, with a high correlation ($r^2 = 0.35$). However, in some European Member States, particularly in Germany, Spain, Slovakia, France, Ireland, Belgium and Portugal, low educational segregation is not automatically accompanied by low labour market segregation. Here institutional settings might explain differences between countries.³ Furthermore, it should be emphasized that, although the choice of field of study is framed in the context of gender-segregated labour markets, the issue of whether gender-specific subject choice is a cause and/or a consequence of labour market segregation is open to debate (Ianelli and Smyth, 2004).

Figure 1 Index of dissimilarity for educational and occupational gender segregation for 17 European Member States, 2004 (ISCO88, 2-digit and 8 fields of study)



Source: EULFS 2004/05; own calculations.

While the index of dissimilarity allows us to compare segregation levels across countries, it does not yield insights into the way that certain occupations or fields of study become gendered. Recent research indicates that there is some consistency in the gendering of jobs across European countries (Charles and Grusky, 2004; Handl and Steinmetz, 2007). For example, while clerks and service-oriented occupations are feminized, occupations related to agriculture, crafts and operators are male dominated in most European Member States. This pattern also supports the assumption that feminized occupations are often associated with attributes of 'serving' and 'caring', whereas men's occupations are associated with attributes of 'physical strength' and 'power' (Anker et al., 2003; Charles, 2005). There are also occupations (such as professional, technical and elementary occupations) that can be classified as 'integrated' (with a comparable share of men and women) in almost all countries.

In the case of educational gender segregation too, the observed patterns can be related to the strong association of masculinity with 'technical' and 'practical' skills and femininity with 'nurturing' skills. While engineering, architecture and veterinary medicine can be classified as 'typical' male fields of study in most European Member States, medicine, humanities and teaching are 'typical' female fields (Eurostat, 2006). So-called integrated fields include social sciences, services and sciences. However, it is worth noting that in some countries sciences and services tend to be more typically male fields.

In sum, the labelling of certain occupations and fields of study as 'male' or 'female' appears to be fairly consistent across European countries. However, as demonstrated, the degree to which women and men are concentrated in different jobs and fields of study does vary cross-nationally. The following section examines some of the potential explanations for these processes.

3. THEORETICAL CONSIDERATIONS

Various theories which attempt to explain why women choose certain occupations have been couched in terms of supply as well as demand side factors.⁴ In this context, it seems plausible to assume that education, and more precisely the gender-typical choice of field of study, is a core factor in explaining the gender-specific occupational allocation process. Even though various studies have shown that individual-level constraints affect individuals' distribution across occupations (Okamoto and England, 1999; Roos, 1985), most scholars agree that substantial gender gaps in market behaviour remain. These gaps are in large part attributable to institutional constraints which seem to be particularly central for explaining why countries differ in the extent of occupational gender segregation. Therefore, in the present analyses the central hypothesis is that:

Hypothesis 1: The field of study taken along with the institutional characteristics of individual countries will affect the channelling of women and men into typical or atypical occupations.

In particular, the influence of two groups of institutional factors will be examined in more detail: the structure of the educational system and women's situation on the labour market. Both aspects may influence the interrelation between educational and occupational gender segregation and thus be crucial in explaining any observable cross-national variation.

3.1. The Structure of Educational Systems

From a comparative perspective, an extensive number of sociological studies have established that countries differ in how they match the output of the educational system to the demands of the labour market (Allmendinger, 1989; Müller and Gangl, 2003; Shavit and Müller, 1998). It seems plausible that the institutional structure of education and training systems can be seen as a 'sorting machine' (Spring, 1976) which sorts students not only into different educational levels and fields but also influences labour market entry processes (Smyth, 2002). In this context, however, the aforementioned literature has not given particular attention to how possible gender differences in occupations and fields of study are interrelated.

This issue is central to some explanatory frameworks (Bradley, 2000). In their study of gender segregation in higher education, Charles and Bradley (2002), for example, refer to the size of the tertiary system and female tertiary participation as structural features of education which might affect not only the gender distribution across fields of study but also the distribution across occupations. In their line of reasoning, an increase in participation rates, particularly among women, might increase the willingness of female students to attend gender-typical fields. This can be supported by earlier studies (Bourque and Conway, 1993) showing that the growth of female participation in higher education might reproduce and reinforce prevailing conceptions of gender-appropriate spheres of knowledge. As a consequence, occupational gender segregation processes might be reinforced by that trend. In contrast, it has also been argued that increasing participation rates might open up new and formerly male-dominated fields to women, thus yielding a reduction in segregation levels also on the labour market (see Bradley and Ramirez, 1996; Davies and Guppy, 1997). On the basis of this research, we will therefore test two contrasting hypotheses:

Hypothesis 2a: Countries with higher levels of women's participation in tertiary education will have a lower level of occupational segregation, over and above the influence of field of study.

Hypothesis 2b: Countries with higher levels of women's participation in tertiary education will have a higher level of occupational sex segregation, over and above the influence of field of study.

3.2. Women's Situation on the Labour Market

The anticipated future employment opportunities of women also act as a possible explanation of horizontal gender segregation (Morgan, 1992; Waite and

Berryman, 1985). In this respect, a higher female employment rate, particularly among older age groups, might serve as an indicator for better labour market opportunities for women. With respect to occupational segregation, Charles (1992), for instance, has assumed that higher levels of female labour force participation may have an integrative effect, as women spend more of their lives working and therefore gain similar levels of human capital to those of men. In contrast, it has been pointed out that higher levels of female labour market participation may be in specific areas of the labour market and in typically 'female' jobs rather than resulting in more integration within occupational niches (Hansen, 1997; Rubery et al., 2001). However, empirical results have been diverse and there is conflicting evidence regarding the nature of the consequences for occupational gender segregation (Anker, 1998; Jonung and Persson, 1993; Nermo, 2000; Semyonov and Jones, 1999). Against this background, here we will test two contrasting hypotheses:

Hypothesis 3a: In countries with a historically high female labour force participation (that is, with higher rates among older cohorts of women), women should be more likely to be in paid employment and will be found in greater numbers in male-dominated occupations, all else being equal.

Hypothesis 3b: In countries with a historically high female labour force participation (that is, with higher rates among older cohorts of women), women will be more likely to be in paid employment but will be found in greater numbers in 'female' occupational niches, all else being equal.

The distribution of men and women across occupations will also be related to the structure of rewards available within the labour market (Millward and Woodland, 1995; Reskin and Roos, 1990; Rubery, 1992). 'Gender discrimination' in pay may generally reduce returns to female market work and may mean that women disproportionately 'choose' female occupational niches where they are not directly competing with men for jobs and pay (Crompton and Sanderson, 1986). However, effective anti-discrimination laws might serve to reduce the gender pay gap and increase integrative forces on the labour market (Blau and Kahn, 1992; Manning, 1996). Against this background, we expect that

Hypothesis 4: In countries with greater pay differentials by gender, occupational gender segregation should be more pronounced. Men and women should more often work in 'gender appropriate' occupations, controlling for field of study.

Women's employment patterns may also be shaped by policies designed to facilitate work-life balance. While work-family reconciliation policies might enable women to enter a wider range of occupations, the concern has been expressed that they might also encourage and perpetuate working patterns associated with horizontal occupational segregation. In this context, several studies (Chang, 2000; Estevez-Abe, 2005; Mandel and Semyonov, 2003) have pointed out that the influence of available childcare facilities is crucial to the understanding of cross-national variability in occupational gender segregation. If women are

under-represented in typical male occupations because of the presence of young children, then it may be assumed that generous childcare options will allow women to enter more male-specific occupations. Even though this hypothesis seems plausible at first glance, such developments may be altered by the fact that with an outsourcing of formerly family-based services, more typical female occupations have been created on the labour market (Hakim, 2000; Rubery et al., 2001). As a consequence, it can be expected that

Hypothesis 5: In countries with more developed childcare provision, the preponderance of 'female' occupations should be greater and occupational gender segregation more evident.

4. DATA AND METHODS

4.1. Data Sources

Data for the present analyses were obtained from the European Union Labour Force Survey (EULFS) 2004 (second quarter) that provides standardized, cross-sectional information on labour force participation and education. For the UK, the data relate to 2005 rather than 2004. The sample used is restricted to men and women with a tertiary education qualification, who are employed, unemployed or inactive. In order to control for non-participation in the labour force because of involvement in full-time education among younger age groups and retirement among older age groups, analyses relate to those aged between 20 and 60 years of age. Although the original data include information on 26 European Member States, the analysis is limited to 17 countries which provide detailed information on educational, employment and basic demographic variables as well as information on relevant macro indicators. Therefore, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Portugal, Slovakia, Slovenia, Spain, Sweden and the United Kingdom are included. This gives us a sample of 216,148 adults in the selected European countries for 2004.

4.2. Variables

Applying a multi-level research design requires information on both individual-level (level 1) and country-level variables (level 2). The dependent variable is examined at level 1 and refers to the '*horizontal dimension*' of occupational segregation. Because a significant proportion of adults in the sample are not in paid employment, occupational gender-typing is divided into four categories: 'male occupations', 'female occupations', 'integrated occupations' and 'no job'. The threshold for gender-typical occupations is ± 25 percent⁵ based on the ISCO88 classification on the 2-digit level (ILO, 1988).

The log odds of having no job, being in a typical female/male versus an integrated occupation are predicted by a number of individual and macro-level variables. On the individual level, the following dummy-coded variables are included

in the analyses: field of study, age cohort and higher tertiary degree (see Table 1). The proportion of the sample in each of these categories is presented in Table A1 in the Appendix.

At the country level, the following macro-level variables compiled from several data sources are included in the analyses (Eurostat, 2006; Gauthier, 2005; Plantenga and Siegel, 2004):

- 1) Share (%) of female graduates in tertiary education.
- 2) Share (%) of women aged 45–9 in the labour market.
- 3) Gender pay gap.
- 4) Child care provision for under-threes.

The values of these variables by country are presented in Table A2 in the Appendix. As a potential problem of contextual analysis is the high correlation between macro-level variables, Table 2 presents bivariate Pearson correlations at the country level. The correlations are generally not higher than 0.44. In sum, there is no reason to doubt the results on grounds of multicollinearity between the macro-level variables.

4.3. Method of Analyses

As the concern of this article is to explore the role played by field of study in channelling women and men into ‘gender-appropriate’ occupations and the extent to which the selected macro-level factors are able to explain cross-national variation in the occupational allocation process, multi-level analysis seems appropriate (Bryk and Raudenbush, 1992; Goldstein, 1995). From a theoretical and statistical perspective, this mode of analysis is an efficient means of combining different levels of analysis (micro- and macro-) into a single framework. Furthermore, it takes into account nested sources of variability – in the present analysis individuals (level 1) nested in countries (level 2). In this case, there is variability not only between individuals but also between countries. Using normal logistic or ordinary least square regression techniques would be incorrect since the error terms at the macro-level are neglected and the standard errors of parameters are underestimated (Snijders and Bosker, 1999). As a consequence,

Table 1 Micro-level variables and descriptions

Variable	Description
Field of study	Set of dummy variables contrasting ‘male field’ and ‘female field’ against ‘integrated field’
Higher tertiary degree	Dummy coded variable distinguishing between lower and higher education tertiary qualifications based on the International Standard Classification of Education (ISCED)
Age cohort	Dummy coded variable distinguishing tertiary graduates in the age 20–34 and tertiary graduates aged 35–64

Table 2 Bivariate correlation coefficients between macro-level variables included in the analyses

	1	2	3	4
1 Share (%) of female graduates in tertiary education	1.0			
2 Share (%) of women aged 45–9 in the labour market	0.17	1.0		
3 Gender pay gap	0.16	0.33	1.0	
4 Child care provision for under-threes	0.44*	0.35	0.33	1.0

* $P < 0.10$.

Source: EULFS 2004/05; own calculations.

multi-level analysis has certain advantages: first, it enables an estimation of the effect of country-level attributes on the allocation into gender-typical or atypical occupations; secondly, it allows the effect of field of study to vary between countries. For the estimation of the models, Mlwin, a statistical package initially developed by researchers in the Institute of Education, University of London, is used (Rasbash et al., 2000). As dependent variables are categorical, multinomial logistic regression models would usually be applied. However, problems were encountered in making these models converge using the Mlwin package. As a consequence, the multinomial method was mimicked by estimating a series of binary logistic regression models which produces comparable estimates of model parameters (see Begg and Gray, 1984). The single disadvantage is that an overall measure of model fit cannot be estimated.

5. FINDINGS

5.1. Descriptive Results

As a first step, it is interesting to examine the interrelationship between educational and occupational gender segregation for women and men (see Table 3). As expected, the gender-typing of field of study is found to be associated with the later gender-typing of occupations among both men and women across Europe. The majority (69%) of men who have taken a 'male' field of study enter 'male' occupations, while women who have taken male fields of study are divided between entering male and integrated jobs. Those persons who have taken female or integrated fields of study are most likely to enter integrated occupations. However, women from these fields are more likely to enter female jobs than their similarly qualified male counterparts.

While Table 3 presents the general relationship between field and occupation across Europe, Figure 2 shows how this gender-typical relationship varies across countries. Thus, the column for 'men' indicates the proportion of men who took a male field and entered a male job while the column for 'women' indicates the proportion of women who took a female field and entered a female

Table 3 Gender-typing of occupation by gender-typing of field of study, comparing men and women (%)

	Male field	Integrated field	Female field
<i>Men</i>			
Not employed	22.8	21.8	17.4
Employed, of which:	77.2	78.2	82.6
Male occupation	69.1	25.7	6.9
Integrated occupation	28.1	68.6	78.3
Female occupation	2.8	5.7	14.8
<i>N</i>	27,841	44,666	9173
<i>Women</i>			
Not employed	27.1	26.4	21.7
Employed, of which:	72.9	73.6	78.3
Male occupation	46.8	8.0	2.7
Integrated occupation	43.3	75.6	61.5
Female occupation	9.9	16.4	35.8
<i>N</i> (in employment)	4272	45,060	25,413

Source: EULFS 2004/05; own calculations.

job. The extent to which taking a male field of study channels men into gender-typical occupations is found to vary across countries, ranging from a high level in Germany and Greece to a weaker relationship in Slovakia, Hungary and the UK. Similarly, the extent to which female fields of study channel women into female jobs varies across countries, with a stronger relationship in Denmark and Slovenia and a weaker relationship in Spain and Greece. The reasons underlying these cross-national differences are explored in the following sections.

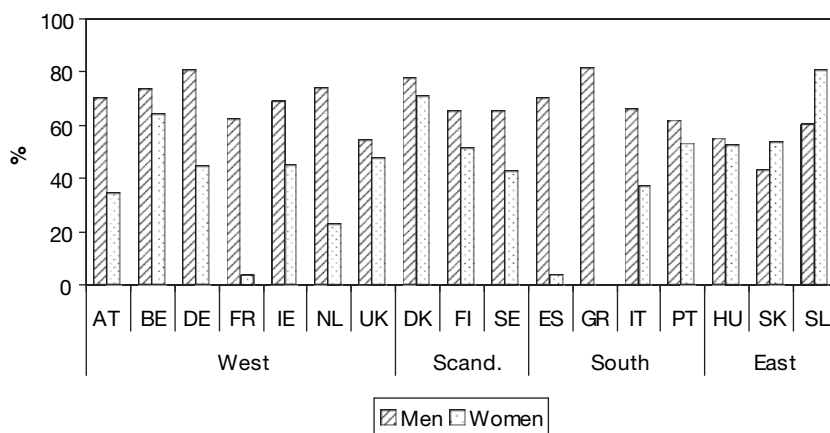
5.2. Odds of Being in a Typical or an Atypical Instead of an Integrated Occupation

In keeping with the descriptive analyses, Table 4a presents the results of binary logistic multi-level analyses concerning the odds of being in a typical female or male rather than an integrated occupation. In order to explore potential differences between women and men in the effect of individual and system-level factors, the same set of models is presented separately for both sexes in Tables A3a and A3b in the Appendix.

Model 1 (variance component model) in Table 4a estimates the systematic gross variation between countries. The random coefficients indicate that there is significant between-country variation in the gender-typing of occupations. The extent of variation is greatest in relation to concentration in female jobs.

Models 2 to 4 show the results of random intercept models, where the macro-units (countries) are permitted to have different intercepts but constrained to have the same slopes. As to the individual characteristics, the results are in line with our expectations. Women are more likely to enter female jobs and less likely to enter male jobs (Model 2). Field of study is significantly associated with occupational allocation. Those who have taken a male field of study are significantly more likely to enter a male job, and those who have taken a female field

Figure 2 The relationship between gender-typical field of study and gender-typical job by country



Source: EULFS 2004/05; own calculations.

Note: The 'men' column refers to the proportion of men taking a male field of study who went on to work in a typically male job. The 'women' column refers to the percentage of women taking a female field who went on to work in a typically female job.

are more likely to enter a female job, than those who have studied an integrated field. As predicted in hypothesis 1, the effect of gender is partially mediated through the gender-typing of field of study (Model 3); in other words, male and female graduates enter gender-appropriate jobs in part because they have taken gendered courses within higher education. However, a direct gender effect is still apparent when field of study is taken into account. Therefore, women and men who have taken a similar field of study have different pathways subsequently. Model 4 shows that persons with a higher tertiary degree are more likely to be in integrated than in gender-typical occupations.⁶ Finally, significant differences in occupational allocation are evident between the younger and older cohorts. Younger people are more likely to be in male or female instead of integrated occupations which indicates no apparent tendency towards a decline in occupational gender-typing among young cohorts.⁷

In the next model 5 (see Table 4b), relevant macro-level variables related to the education and labour market systems are introduced in order to establish the institutional features of countries which contribute to or reduce occupational segregation processes. The analyses focus on four indicators to reflect the hypotheses outlined above: the representation of women in higher education, female labour force participation rates, the gender pay gap and level of provision for pre-school children.

The results for the educational system variable indicate that the representation of women in higher education at the national level is significantly associated with the gender-typing of occupations. Where women make up a higher

Table 4a Results for three hierarchical binary logistic regression models concerning the division between typical male versus integrated ('male'), typical female versus integrated ('female') and no job versus integrated occupations

	Model 1			Model 2			Model 3			Model 4		
	Male	Female	No job	Male	Female	No job	Male	Female	No job	Male	Female	No job
Constant	-0.979*	-1.288*	-0.803*	-0.396*	-2.068*	-0.804*	-1.045*	-2.379*	-1.008*	-1.111*	-2.416*	-1.848*
<i>Individual level (fixed effects)</i>												
Women (ref. men)				-1.653*	1.142*	0.002	-1.114*	0.978*	0.167*	-1.149*	0.932*	0.575*
Field (ref. integrated.)							1.960*	0.107*	0.848*	1.989*	0.121*	0.789*
Typically male							-1.1019	1.048*	-0.044*	-0.989*	1.087*	-0.191*
Typically female									0.249*		0.219*	0.495
Young age cohort (ref. old age cohort)										-0.156*	-1.153*	-0.629*
Higher tertiary deg. (ref. lower tert. deg.)												
<i>Variances (random effects)</i>												
Var (u _{ij})	0.102*	0.451*	0.094*	0.099*	0.460*	0.094*	0.118*	0.353*	0.086*	0.118*	0.359*	0.049*

*p < 0.05; **p < 0.01; ***p < 0.001.

Notes: N (individual level) = 121,622 for typical female versus integrated occupation, 140,984 for typical male versus integrated occupation and 150,691 for no job versus integrated occupation.

N (country level) = 17.

Source: EULFS 2004/05; own calculations.

Table 4b Results for three hierarchical binary logistic regression models concerning the division between typical male versus integrated ('male'), typical female versus integrated ('female') and no job versus integrated occupations

	Model 5			Model 6			Model 7		
	Male	Female	No job	Male	Female	No job	Male	Female	No job
Constant	2.729*	-10.380*	-1.501*	-1.064*	-2.456*	-1.814*	1.732	-11.660*	-2.552*
<i>Fixed effects</i>									
<i>Individual level</i>									
Women (ref. men)									
Field (ref. integrated.)	-1.116*	0.968*	0.575*	-1.147*	0.913*	0.563*	-1.165*	0.977*	0.571*
Typically male	1.980*	0.127*	0.788*	1.872*	0.121	0.661*	4.000*	8.375*	5.239*
Typically female	-0.990*	1.139*	-0.191*	-0.735*	1.331*	-0.009	-1.925*	2.470*	1.812*
Higher tertiary deg. (ref. lower tert. deg.)	0.251*	0.233*	0.495*	0.242*	0.176*	0.481*	0.258*	0.218*	0.493*
Young age cohort (ref. old age cohort)	-0.157*	-1.167*	-0.629*	-0.119*	-1.292*	-0.644*	-0.127*	-1.213*	-0.648*
<i>Country level</i>									
% Female in tertiary education	-0.069*	0.074*	-0.006				-0.056	0.104*	0.014
FLFP 45-9	-0.008	0.034*	-0.004				-0.005	0.030*	-0.004
Gender pay gap	-0.030	0.134*	0.034*				0.024	0.132*	0.025
Childcare for under-threes	1.397*	-0.464	-0.124				1.633*	-0.535	-0.010
<i>Cross-level interactions</i>									
Tertiary*female field							-0.027*	-0.110*	-0.090*
Tertiary*male field							-0.035*	-0.058*	-0.043*
FLFP*male field							-0.006*	-0.027*	-0.004
FLFP*female field							-0.018*	0.021*	0.002
Pay gap*male field							0.012*	-0.039*	0.009
Pay gap*female field							0.014*	0.018*	0.033*
Childcare*male field							-1.221*	1.054*	-0.229*
Childcare*female field							1.137*	0.027	-0.321*
<i>Variances (random effects)</i>									
Constant	0.062*	0.104*	0.041*	0.125*	0.537*	0.094*	0.060*	0.101*	0.042*
Male field				0.247*	0.431*	0.176*			
Female field				0.400*	1.172*	0.206*			

*p < 0.05; **p < 0.01; ***p < 0.001.
 Notes: N (individual level) = 12,162 for typical female versus integrated occupation, 140,984 for typical male versus integrated occupation and 150,691 for no job versus integrated occupation.
 N (country level) = 17.
 Source: EULFS 2004/05; own calculations.

proportion of graduates, both women and men are more likely to be found in female instead of integrated jobs and less likely to be found in male instead of integrated jobs. With respect to the institutional setting of the labour market, female labour force participation rates among those aged 45–9 are also associated with gender-typical job allocation. Both women and men are significantly more likely to be in female instead of integrated occupations in countries with higher female participation rates. The gender pay gap also has a significant influence. In countries with a larger gender pay gap, both women and men are more likely to be found in female instead of integrated occupations, which partly supports our hypothesis 4. The results for the effect of childcare provision are contrary to our hypothesis 5. Entry to male occupations among both women and men is more prevalent in countries with more extensive childcare provision for pre-school children. Taken together, these four system-level variables are found to account for a significant proportion of the variation across countries in occupational outcomes.

The main focus of this article is to analyse how macro-level factors contribute to the explanation of the cross-national variation in the impact of field of study. By including random slope terms as a first step, Model 6 allows the effects of field to vary across countries.⁸ The findings support the effect of field of study on gender-typical job allocation (illustrated in Figure 2), which varies significantly across countries. It is particularly high in relation to the impact of typically female fields indicating that the degree to which female fields channel people into female jobs is particularly variable across countries.⁹ This finding is interesting in itself. However, in a further step we explore whether the institutional context shapes the nature of the relationship between course taken and job obtained. Therefore, our final model (Model 7) includes the cross-level interactions between field of study and the selected contextual factors. This allows us to explicitly model whether the relationship between field and occupation is stronger in some systems than others. Some significant interactions are evident. First, the channelling of workers into female jobs in countries with a higher representation of female tertiary graduates does not apply to those who have taken male fields of study. Second, the channelling of workers into female jobs in countries with higher female labour force participation levels does not apply to those who have taken male courses. Third, the channelling of workers into female jobs in countries with a larger gender pay gap is not as apparent for those who have taken male fields of study. Finally, childcare provision appears to reduce the impact of gender-typing of field on occupational gender-typing. This may reflect a broader emphasis on gender equality in these countries, an emphasis which facilitates entry to non-traditional occupations. In sum, the institutional context is found to make a greater difference for those who have taken ‘female’ or ‘integrated’ fields of study than for those who have taken typically male courses.

6. CONCLUSION AND DISCUSSION

This article has explored the impact of field of study, on the one hand, and different education and labour market systems, on the other hand, on the extent to

which men and women enter gender-typical or gender-atypical occupations across 17 European countries. The results indicate that educational segregation by gender plays a significant role in shaping gender segregation within the labour market. Those who have taken male fields of study are more likely to be found in typically male jobs, while those who have taken typically female courses are more likely to be found in typically female jobs. However, it is worth noting that a significant direct gender effect is evident even when field of study is taken into account, with women and men who took similar fields having different occupational outcomes. Even taking account of field of study, cross-national variation in the extent of occupational gender segregation is still apparent. The challenge is, therefore, to unpack the reasons underlying these differences between countries.

Using multi-level analysis, occupational gender segregation is also found to reflect four country-level characteristics: the representation of women within higher education, female labour force participation rates, the gender pay gap and the level of provision for pre-school children. These institutional features are crucial for occupational allocation among both women and men. A growth in female representation in higher education appears to be accompanied by a rebalancing of the workforce towards female-type jobs, with more women and men entering these jobs in countries which have experienced such a shift. A similar pattern is evident in relation to levels of female labour force participation; again countries which have experienced a growth in female employment have also experienced a rebalancing of employment opportunities in the graduate labour market towards female-type jobs. The causal mechanism influencing the relationship between the gender pay gap and occupational allocation is difficult to determine. It may be that the gender pay gap is itself a product of occupational segregation by gender. However, it may also be that women avoid integrated occupations where their pay levels are likely to be relatively lower than those of their male counterparts, in keeping with our hypothesis. Finally, provision for pre-school children appears to be associated with less occupational segregation. It may be that national systems facilitating a work-life balance through childcare provision have been more successful in challenging gender-stereotyped behaviour and attitudes within the workforce as a whole.

As expected, our analyses confirm that the extent to which gender-typical fields of study channel women and men into gender-typical jobs varies across countries. In other words, field of study within higher education is a stronger 'sorting mechanism' in some national systems than others. Furthermore, a country's gender regime in terms of educational and labour market structures is found to have a stronger effect on those who take female or integrated fields of study than on those who take male fields. It is likely that this reflects the fact that women who have taken male fields are quite selective in profile, having already made less gender-traditional choices. They are, therefore, likely to be less responsive to the institutional context in their occupational entry patterns.

In conclusion, recent years have seen a significant increase in women's participation in higher education across most European countries. However, this

increase has occurred in a context of relative stability in the extent to which women and men take different fields of study. This persistent gender segregation in field of study has consequences for occupational segregation by channelling people into 'gender-appropriate' jobs, based on their prior choices regarding field of study. The rigidity of this sorting process is significantly variable across countries; in some national contexts, there is a much closer association between field and occupation, while in other contexts, this link is somewhat weaker. The strength of this connection itself reflects the national setting since key features of the educational and labour market system are found to shape the context within which women and men enter gender-typical or atypical occupations.

Table A1 Individual level descriptive statistics by country

Country	% Male field	% Female field	% Higher degree	% 20-34
<i>Women</i>				
Austria	11.7	18.7	1.6	35.3
Belgium	4.4	24.3	0.5	41.2
Germany	9.1	24.5	5.3	25.8
Denmark	7.3	43.8	0.5	29.2
Spain	5.2	33.5	1.0	53.7
Finland	5.3	35.9	1.4	28.2
France	4.8	20.5	1.6	48.8
Greece	6.9	0.0	1.3	42.3
Hungary	7.4	78.6	1.1	36.9
Ireland	2.9	36.7	1.1	53.6
Italy	5.8	5.5	0.7	39.6
Netherlands	6.3	25.1	1.0	38.8
Portugal	4.5	25.2	3.3	48.7
Sweden	6.1	62.3	2.2	32.3
Slovenia	6.9	35.9	4.6	40.0
Slovakia	13.9	65.9	0.5	39.8
United Kingdom	3.0	38.6	1.9	38.1
<i>Men</i>				
Austria	49.2	8.1	3.1	25.7
Belgium	25.1	9.6	2.1	35.0
Germany	43.2	6.8	7.3	18.7
Denmark	30.8	9.4	1.3	26.1
Spain	38.0	12.4	1.7	45.0
Finland	45.0	9.0	2.9	23.2
France	30.4	8.3	3.0	45.6
Greece	21.9	0.0	2.2	30.5
Hungary	34.8	37.1	2.9	31.3
Ireland	28.1	10.2	2.1	47.2
Italy	24.8	1.7	1.1	30.3
Netherlands	31.5	9.2	1.9	28.7
Portugal	27.0	8.5	78	40.8
Sweden	28.8	23.9	5.6	32.8
Slovenia	32.1	11.0	6.4	29.0
Slovakia	36.7	35.3	1.0	33.9
United Kingdom	26.6	11.1	4.0	32.8

Source: EULFS 2004/05; own calculations.

Table A2 Values of macro-level variables by country

Country	Share of female graduates in tertiary education (%) ^a	Share of women aged 45–9 in labour market (%) ^b	Gender pay gap ^c	Child care provision for under-threes ^d
Austria	53	83	10.8	9
Belgium	54	73	7.8	28
Germany	50	84	10.5	7
Denmark	58	86	13.2	56
Spain	54	66	3.0	10
Finland	53	91	11.5	21
France	55	84	9.0	43
Greece	52	64	7.3	7
Hungary	57	79	13.0	6
Ireland	55	66	16.0	40
Italy	56	62	4.1	6
Netherlands	51	79	4.9	35
Portugal	56	79	6.5	19
Sweden	60	87	9.5	41
Slovenia	57	88	8.6	27
Slovakia	54	88	8.3	18
United Kingdom	57	81	6.9	28

Source: ^a OECD Education At A Glance, 2004; data for Slovenia are from 2005, Statistical Office.

^b EUROSTAT LFS, 2004; data for Slovenia relate to 2006.

^c EUROSTAT, 2004.

^d EUROSTAT, 2004

Table A3a Results for three hierarchical binary logistic regression models concerning the division between typical male versus integrated ('male'), typical female versus integrated ('female') and no job versus integrated occupations: men only

	Model 1			Model 2			Model 3		
	Male	Female	No job	Male	Female	No job	Male	Female	No job
Constant	-0.426*	-2.041*	-0.836*	-1.041*	-2.354*	-1.041*	-1.112*	-2.509*	-1.975*
<i>Individual level</i> <i>(fixed effects)</i>									
Field (ref. integrated.)									
Typically male		1.878*	0.233*	1.878*	0.233*	0.876*	1.879*	0.281*	0.825*
Typically female		-1.243*	1.038*	-1.243*	1.038*	-0.296*	-1.198*	1.130*	-0.396*
Higher tertiary deg. (ref. lower tert. deg.)				0.289*				-0.906*	-0.740*
Young age cohort (ref. old age cohort)				0.266*				0.486*	0.825*
<i>Variances</i> <i>(random effects)</i>									
Var (u_{ij})	0.107*	0.414*	0.135*	0.125*	0.403*	0.123*	0.126*	0.422*	0.060*
	Model 4			Model 5			Model 6		
	Male	Female	No job	Male	Female	No job	Male	Female	No job
Constant	3.315*	-8.861*	-2.104*	-1.062*	-2.515*	-1.909*	2.314	-13.110*	-3.947*
<i>Fixed effects</i> <i>individual level</i>									
Field (ref. integrated.)									
Typically male	1.911*	0.286*	0.823*	1.786*	0.233	0.661*	4.392*	10.840*	6.602*

Typically female	-1.200*	1.148*	-0.396*	-0.960*	1.410*	-0.334*	0.089	8.924*	3.040*
Higher tertiary deg. (ref. lower tert. deg.)	-0.295*	-0.911*	-0.741*	-0.237*	-1.056*	-0.705*	-0.254*	-0.999*	-0.724*
Young age cohort (ref. old age cohort)	0.269*	0.496*	0.825*	0.262*	0.445*	0.820*	0.277*	0.494*	0.835*
Country level									
% Female in tertiary education	-0.080*	0.059*	-0.006				-0.065*	0.133*	0.028
FLFP 45-9	-0.008	0.025\$	-0.003				-0.005	0.028*	0.005
Gender pay gap	0.024	0.108*	0.016				0.013	0.112*	0.003
Childcare provision for under-threes	1.412*	0.421	0.325				1.760*	-0.116	0.379
Cross-level interactions									
Tertiary*male field							-0.038*	-0.160*	-0.110*
Tertiary*female field							0.012	-0.157*	-0.052*
FLFP*male field							-0.005*	-0.021*	-0.001
FLFP*female field							-0.029*	0.002	-0.015*
Pay gap*male field							0.020*	-0.028	0.030*
Pay gap*female field							0.024*	0.034*	0.055*
Childcare*male field							-1.125*	0.345	-0.376
Childcare*female field							0.602	1.156*	0.283
Variances (random effects)									
Constant	0.069*	0.208*	0.053*	0.146*	0.476*	0.091*	0.065*	0.203*	0.055*
Male field				0.264*	0.344*	0.216*			
Female field				0.544*	1.390*	0.107*			

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; \$ $p < .10$.
 Notes: N (individual level) = 51,422 for typical female versus integrated occupation, 80,770 for typical male versus integrated occupation and 71,458 for no job versus integrated occupation.
 N (country level) = 17.
 Source: EULFS 2004/05; own calculations.

Table A3b Results for three hierarchical binary logistic regression models concerning the division between typical male versus integrated ('male'), typical female versus integrated ('female') and no job versus integrated occupations: women only

	Model 1			Model 2			Model 3		
	Male	Female	No job	Male	Female	No job	Male	Female	No job
Constant	-1.976*	-0.940*	-0.775*	-2.157*	-1.407*	-0.823*	-2.244*	-1.452*	-1.180*
<i>Individual level (fixed effects)</i>									
Field (ref. integrated)									
Typically male				2.261*	-0.133§	0.636*	2.255*	-0.117	0.695*
Typically female				-0.765*	1.043*	0.027	-0.744*	1.065*	-0.146*
Higher tertiary deg.							0.196*	0.145*	0.306*
(ref. lower tert. deg.)									
Young age cohort							0.287*	-1.271*	-0.445*
(ref. old age cohort)									
<i>Variances (random effects)</i>									
Var (u_{ij})	0.106*	0.506*	0.086*	0.130*	0.368*	0.081*	0.127*	0.375*	0.070*
	Model 4			Model 5			Model 6		
	Male	Female	No job	Male	Female	No job	Male	Female	No job
Constant	2.840	-9.971*	-0.797*	-2.216*	-1.544*	-1.185*	-0.486	-10.160*	-1.166
<i>Fixed effects</i>									
<i>Individual level (ref. integrated.)</i>									
Field (ref. integrated.)									
Typically male	2.280*	-0.118	0.695*	2.254	-0.090	0.643*	1.615*	5.803*	2.803*

Typically female	-0.747*	1.130*	-0.147*	-0.533*	1.316*	0.051	3.531*	0.959	1.226*
Higher tertiary deg. (ref. lower tert. deg.)	0.290*	-1.295*	-0.444*	0.270*	-1.396*	-0.490*	0.281*	-1.329*	-0.480*
Young age cohort (ref. old age cohort)	0.198*	0.154*	0.307*	0.178*	0.101*	0.290*	0.190*	0.136*	0.298*
Country level									
% Female in tertiary education	-0.045	0.080*	-0.004				-0.038*	0.094*	0.008
FLFP 45-49	-0.010	0.038*	-0.006				-0.005	0.030*	-0.009
Gender pay gap	0.044*	0.141*	0.044*				0.048*	0.138*	0.039*
Childcare provision for under 3s	1.333*	0.881	0.484				1.329*	-0.680	0.329
Cross-level interactions									
Tertiary*male field							0.045*	-0.080*	-0.045*
Tertiary*female field							-0.081*	-0.033*	-0.040*
FLFP*male field							-0.020*	-0.021\$	0.006
FLFP*female field							-0.002	0.024*	0.010*
Pay gap*male field							0.007	-0.022	-0.014
Pay gap*female field							-0.014	0.016\$	0.021*
Childcare*male field							-1.311*	1.799*	-0.231
Childcare*female field							1.332*	0.273	-0.397*
Variances (random effects)									
Constant	0.059*	0.087*	0.051*	0.131*	0.538*	0.118*	0.059*	0.203*	0.048*
Male field				0.211*	0.077*	0.127*			
Female field				0.470*	1.151*	0.217*			

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; \$ $p < .10$.

Notes: N (individual level) = 70,200 for typical female versus integrated occupation, 60,214 for typical male versus integrated occupation and 79,239 for no job versus integrated occupation.

N (country level) = 17.

Source: EULFS 2004/05; own calculations.

NOTES

- 1 The index of dissimilarity (D) was proposed in 1955 by Duncan and Duncan; D equals 0 in cases of complete equality and 1 in cases of complete segregation. Even though D is the most frequently used measure, it is also the most frequently criticized (see, for example, Blackburn et al., 1993; Watts, 1995).
- 2 Interestingly, while Sweden was formerly one of the countries with the highest values for occupational gender segregation, by 2004 it had significantly reduced this level. This might be related to the fact that Sweden was often instructed by the European Commission to increase measures for reducing occupational gender segregation in their National Action Plans (see details in Rubery et al., 2004).
- 3 For example, it might be possible that in Spain, a country with a moderate level of educational gender segregation, a very rigid and inflexible labour market increases labour market risks for women independently from the attained level of education and the chosen field.
- 4 Supply-side factors relate the different allocation of women and men across occupations and hence fields of study to anticipated future market roles and opportunities, gender-specific role socialization, cultural values about the appropriate role of women in society, and so on (Becker, 1964; Marini and Brinton, 1984; Mincer and Polachek, 1974; Polachek, 1978; Morgan, 1992; Perlman and Pike, 1994). Important demand-side processes, like statistical discrimination, internal labour markets and the gendering of labour queues, are also used by sociologists to explain gender segregation in the labour market.
- 5 Typically male/female occupations and fields are those which have a share of at least 75% of male/female tertiary graduates (for more detail, see Anker, 1998).
- 6 An interesting result can be observed when looking at the women-only model (see Table A3b in the Appendix) because higher degrees seem to facilitate the entry of women to male jobs.
- 7 Separate models for both men and women show (see Tables A3a and A3b in the Appendix) that young women and men are more likely to enter male jobs but they are also more likely to be in female jobs.
- 8 For ease of presentation, the covariance terms are not included in the table.
- 9 The calculation of an additional model shows that the direct effect of gender on occupational outcomes also varies across countries, controlling for field of study. However, with respect to the cross-national variation in the field effect, separate models for women and men show similar patterns (see Tables A3a and A3b in the Appendix). There seems to be a high cross-national variation for both women and men in the effect of a typical female field on allocation to a typical female occupation.

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