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Economics Letters 79 (2003) 393–400
economics letters
www.elsevier.com/locate/econbase

Subject of degree and the gender wage differential: evidence from the UK and Germany

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Received 17 July 2002; received in revised form 28 October 2002; accepted 16 December 2002

Abstract

We show that controlling for subject of degree explains a significant part of the male/female gender wage differential amongst graduates. Using data from the labour force surveys of the United Kingdom and Germany, we find similar results in these two countries: subject of degree explains about 2–4% higher wages of male over female graduates after controlling for age, industry, region, part-time and public sector employment. This is a significant part (between 8 and 20%) of the overall male/female gender wage gap, and an even larger amount of the part explained by factors entered into wage equations (at around 24–30% of the explained component).

Keywords: Gender wage gap; Field of major

JEL classification: J16; J31; J71

1. Introduction

Over the years there have been many studies of the gender wage differential, which attempt to explain why women get paid less than men, and study how this has altered through time (a thorough up to date review is Altonji and Blank, 1999). The basic methodological tool used in most of this

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0165-1765/03/$ – see front matter
doi:10.1016/S0165-1765(03)00027-2

work is the human capital earnings function, which is typically estimated separately for men and women. In this setting the overall gender wage gap can be decomposed into a part due to differences in the means of variables entered into the earnings functions and a part due to differences in the estimated coefficients on those factors (the seminal references on this decomposition are Blinder, 1973, and Oaxaca, 1973).

There has been much debate about what variables one should enter into the earnings functions used in studies of the gender wage differential. The standard Mincer equation including age and schooling is typically augmented by factors available in micro-data sources (like region, industry, sector of employment and so on). In the literature on gender wage differentials, however, subject of degree has not received a great deal of attention. This may be because the standard US data sets like the Current Population Survey (CPS) or the Panel Survey of Income Dynamics (PSID) do not ask for this information. But there are a few exceptions to this in US research, although to our knowledge none that look at subject of degree and gender wage differentials outside of the US.

The existing US studies differ in their focus, with some basing their analyses on surveys like the Survey of Income and Program Participation (SIPP) (Brown and Corcoran, 1997), on specific education cohorts such as the class of 1972 in the National Longitudinal study (NLS) (Brown and Corcoran, 1997; Daymont and Andrisani, 1984; Eide, 1994; Grogger and Eide, 1995; Loury, 1997), on data from the US Educational Testing Service (Paglin and Rufolo, 1990), or on data from a particular firm (Gerhart, 1990).

Of these studies Brown and Corcoran (1997), Daymont and Andrisani (1984), and Gerhart (1990) are of most relevance for our analysis as they report decompositions of the gender wage gap for a specific cross-section.[1] These authors all find a sizable contribution of field of major to the gender wage gap in the US in the late 1970s/1980s, even though they only control for broad subject of degree types.

There are good reasons to believe that subject of study may explain an important part of why women get paid less then men. Looking at the data one sees clear differences in which degrees men and women enrol to study. Furthermore, there are clear wage differentials by subject of degree. One example of this is the recent boom in information technology that provided many computer scientists with high incomes and enjoyable lives (at least for a while). This is just one popular illustration that subject of degree may matter for income potential.

In this short paper we set out to show that subject of degree matters in explaining wage gaps between male and female university graduates in Europe, and that the contribution to the overall gender wage differential is quite sizable for a single factor. We provide evidence from large labour force surveys in the UK and (western) Germany in 1996 on the effect of controlling for subject of degree in standard wage differential decompositions.

The rest of the paper is structured as follows. In Section 2 we describe subject of degree differences between male and female graduates in the UK and Germany in 1996. Section 3 presents

[2]Eide (1994) and Loury (1997) ask how much of the change in the gender can be explained by changes in field of major, Grogger and Eide (1995) investigate how changes in types of degree subject have contributed to the rises in the US college wage premium, and Paglin and Rufolo (1990) estimate the correlation between earnings and quantitative GRE scores.

decompositions of the gender wage gap from earnings functions that do and do not consider subject of degree as a determinant of earnings. Section 4 concludes.

2. Subject of degree

We use data from the UK and German Labour Force Surveys of 1996. This choice of year results from 1996 being the most recent year for which subject of degree is available in the German Labour Force Survey (Mikrozensus). In both the UK and German labour force surveys graduates are asked to report the subject of study of their degree. The classifications are detailed, numbering 124 and 71 different subject areas for Britain and Germany, respectively.[3]

For descriptive purposes we have aggregated these groupings in a (broadly) comparable way across countries. Table 1 displays the gender distribution of these less detailed subjects of degree and average wages by country. One should notice that overall differences in the nature of the education systems and industrial structures of the UK and Germany mean that that German students are more likely to specialize in engineering/technology degrees, whereas UK students tend to study biological, physical, and mathematical sciences more frequently. But, despite this, one sees very marked gender differences in degree subject in both countries. The table reveals that, in both Britain and Germany, males are more heavily represented in highly paid engineering/technology and physical/mathematical

Table 1
Gender differences in degree subject, UK and Germany, 1996

	UK Labour Force Survey 1996			German Labour Force Survey 1996		
	Percentage share of male graduates	Percentage share of female graduates	Average gross hourly wage in £	Percentage share of male graduates	Percentage share of female graduates	Average net hourly income in €
Physical and Mathem. Sciences	16.5	7.8	14.6	10.2	4.5	13.8
Social Science and Business	28.7	26.1	13.4	34.5	34.5	12.8
Engineering/Technology	18.5	1.5	13.3	26.3	3.3	14.3
Medicine	4.5	8.5	12.4	4.7	7.0	12.5
Architecture and Planning	3.4	0.8	12.2	2.9	1.6	12.9
Language Studies	3.6	11.4	12.2	2.3	7.8	12.5
Agricultural Science	2.5	2.2	11.8	2.4	2.2	11.9
Not Class. Combined Studies	4.8	6.1	11.3	–	–	
Humanities, Creative Arts, Educ.	13.4	29.1	11.3	15.6	37.1	13.0
Biological/Veterinary Sciences	4.2	6.6	11.2	1.2	2.1	11.6
Sample Size	2983	2183	5166	11 871	6251	18 122

[3]A main reason for the larger number in the UK is the separate classification of combined degree courses in the UK Labour Force Survey. Such combined degrees also exist in Germany, but they are not classified in the data. As Table 1 shows, though, only 5–6% of UK graduates hold combined degrees.

sciences, whereas women have a much larger share of graduates in less well paid language studies and humanities, creative arts, and education. This larger concentration of males in (higher paid) science-related subjects and females in (lower paid) arts subjects motivates our investigation of the impact of subject of degree on the gender wage differential, which is presented in the following section.

3. Decomposition of the gender wage gap

Our interest is in how much subject of degree contributes to the gender wage differential and we approach this question by estimating separate log(earnings) functions for men and women graduates that, respectively, do not and do control for subject of degree. We then use the standard Blinder (1973)–Oaxaca (1973) decomposition which breaks down the overall mean gender wage gap as $\ln \overline{W^{\mathrm{m}}} - \ln \overline{W^{\mathrm{f}}} = \left(\overline{X^{\mathrm{m}}} - \overline{X^{\mathrm{f}}}\right)\beta^{\mathrm{m}} + \left(\beta^{\mathrm{m}} - \beta^{\mathrm{f}}\right)\overline{X^{\mathrm{f}}}$, where W is wages, X is the variables entered into the wage equations and β denotes the estimated coefficients (m and f denote male and female, and a bar denotes a mean). The first term of this decomposition is usually referred to as the 'explained' component (that due to differences in the average X values) and the second term the 'unexplained' component of the gender wage differential. The latter term is often referred to as discrimination, although of course there is much debate revolving around questions of what should be included in X and whether it may also be due to unobserved factors (see, amongst many others, Blau and Kahn, 1997). For our purposes, we simply talk of explained and unexplained components of the gender wage gap, and how much subject of study can contribute to these. This can yield an informative account of the male/female wage differential in the labour market for graduates as a whole, even if a direct interpretation in terms of fairness and discrimination is not possible (see, for example, Goldin and Rouse, 2000, for a more direct, although limited in scope, approach to measuring discrimination).

Table 2 shows the decomposition results, drawn from three different specifications of the earnings function. Specification 1 controls only for age and age squared as in a standard Mincerian wage equation (by considering only graduates, as we do, education is controlled for). In Specification 2, we add several other factors that are likely to affect wages, namely industry, region, and dummies for part-time and public sector employment. Occupation is additionally included in Specification 3, although the potential endogeneity of occupation—often particularly stressed in the discrimination literature—means that we think of Specification 2 as our 'preferred' model.

For each of these specifications, we estimate three models: one that does not enter subject of degree, one that enters only the aggregated subject of degree groups displayed in Table 1 and last a model with detailed subject of degree. The purpose of the exercise is to determine the impact of subject of degree on the explained part of the gender wage differential in these three specifications.

The top of the table shows the gender log wage difference among graduates to be somewhat larger in Germany than in the UK (at 0.280 vs. 0.208). This may concur with the general view that women in Britain are more advanced in the wage hierarchy than in more traditional Germany. However, it may also be related to data collection issues as the German Labour Force Survey only surveys net income and the UK data contain gross wages, although it is not clear why this should lead to a larger wage gap for Germany.

Table 2
Decompositions of gender wage differentials and subject of degree

	UK Labour Force Survey 1996 Female/Male Log(Wage) Gap = 0.208			German Labour Force Survey 1996 Female/Male Log(Wage) Gap = 0.280		
	Without subject of degree	With less detailed subject of degree	With detailed subject of degree	Without subject of degree	With less detailed subject of degree	With detailed subject of degree
Specification 1 (Age, Age^2)						
$(\beta^m - \beta^f)X^f$	0.159	0.119	0.092	0.222	0.180	0.166
(S.E.)	(0.014)	(0.015)	(0.016)	(0.007)	(0.008)	(0.008)
$(X^m - X^f)\beta^m$	0.050	0.089	0.117	0.058	0.100	0.114
(S.E.)	(0.003)	(0.008)	(0.010)	(0.001)	(0.003)	(0.004)
Percentage of gap explained	23.9	42.9	56.0	20.7	35.6	40.6
Absolute increase in gap explained by subject of degree	–	0.04	0.07	–	0.04	0.06
(S.E.)		(0.007)	(0.010)		(0.003)	(0.004)
Increase in percentage of gap explained by subject of degree	–	19.0	32.1	–	14.9	19.9
Specification 2 (Age, Age^2, industry, region, part time, public sector)						
$(\beta^m - \beta^f)X^f$	0.112	0.091	0.071	0.205	0.189	0.182
(S.E.)	(0.021)	(0.022)	(0.023)	(0.010)	(0.010)	(0.010)
$(X^m - X^f)\beta^m$	0.096	0.117	0.137	0.075	0.091	0.098
(S.E.)	(0.016)	(0.016)	(0.018)	(0.007)	(0.007)	(0.008)
Percentage of gap explained	46.3	56.1	66.0	26.8	32.6	35.1
Absolute Increase in gap explained by subject of degree	–	0.02	0.04	–	0.02	0.02
(S.E.)		(0.006)	(0.010)		(0.002)	(0.004)
Increase in percentage of gap explained by subject of degree	–	9.9	19.7	–	5.8	8.2
Specification 3 (Age, Age^2, industry, region, part time, public sector, occupation)						
$(\beta^m - \beta^f)X^f$	0.097	0.081	0.063	0.194	0.176	0.174
(S.E.)	(0.020)	(0.020)	(0.021)	(0.010)	(0.010)	(0.010)
$(X^m - X^f)\beta^m$	0.111	0.128	0.145	0.086	0.104	0.106
(S.E.)	(0.015)	(0.015)	(0.017)	(0.007)	(0.007)	(0.007)
Percentage of gap explained	53.2	61.3	69.6	30.7	37.2	37.9
Absolute increase in gap explained by subject of degree	–	0.02	0.03	–	0.02	0.02
(S.E.)		(0.005)	(0.009)		(0.002)	(0.003)
Increase in percentage of gap explained by subject of degree	–	8.2	16.4	–	6.5	7.3

If the alternative decomposition described in the text of the paper is applied, the increase in the percentage gap explained by detailed subject of degree is 19.7 and 1.7 for the UK and Germany, respectively, in Specification 1. In Specification 2 it is 15.3 and 8.4, respectively. The figures in Specification 3 are 8.3 for the UK and 10.3 for Germany.

Nevertheless, the basic Mincerian wage equations reported in the upper panel of Table 2 yield similar results for both countries, with about 21–24% of the graduate gender wage gap explained by age alone. Adding subject of degree to this simple model more than (UK)/almost (Germany) doubles the explained part of the gap in both countries. Although controlling for less detailed degree categories goes a long way to increasing the explained component of the gender gap (from 24 to 43% in the UK and from 21 to 36% in Germany), there is a clear additional gain by including the controls for detailed degree types (the percent explained rises further to 56% in the UK, and to 41% in Germany). In absolute terms an additional 7 of the overall 21% gender wage gap can be explained by detailed degree subject in the UK. An additional 6 of the overall 28% is explained in Germany. This is a sizable and statistically significant contribution to explaining wage differentials between male and female graduates in both countries.

Undertaking the same analysis with Specification 2, which includes more control variables, still shows a fairly large effect of controlling for subject of degree. In absolute terms, aggregated subject of degree categories in both countries account for a 2% male/female wage premium.[4] In the UK this doubles to 4% if the detailed degree types are included, although for this model in Germany there is not much extra contribution from detailed degree subject.[5] But even with this rich set of control variables, the percentage increase of the gap explained by degree type is large, at 20% for the UK and 8% for Germany. Indeed, the contribution of subject degree amounts to a larger fraction of the part explained by the X factors entered into wage equations (at around 30% of the explained component for the UK and 24% for Germany). As a single factor explaining male/female wage differences this is sizable.

The third set of specifications, reported in the lower panel of the Table, additionally controls for occupation. The percentage point increase of the gap explained by degree type is still large for a single factor, at 16 and 7 percentage points for Britain and Germany, respectively. Hence, subject of degree matters a lot even within occupations.

One should also note the debate about what is the appropriate decomposition of wage differentials between groups (see Cotton, 1988; Oaxaca and Ransom, 1994). This is not something we enter into here, as we merely wish to make the simple point that subject of degree matters. However, we have also looked at the alternative decomposition that uses female price structures (the β values from the female wage equation) as the reference in a sensitivity check using the decomposition: $\ln \overline{W^{\mathrm{m}}} - \ln \overline{W^{\mathrm{f}}} = \left(\overline{X^{\mathrm{m}}} - \overline{X^{\mathrm{f}}}\right)\beta^{\mathrm{f}} + \left(\beta^{\mathrm{m}} - \beta^{\mathrm{f}}\right)\overline{X^{\mathrm{m}}}$.[6] Here we just mention that the percentage point increase of the gap explained by degree type is also large when this decomposition is used: at 15 and 8% for the UK and Germany, respectively, for Specification 2 (see the note to Table 2 for comparable numbers from Specifications 1 and 3).

[4]In this note, we focus on graduates only. Given that the share of graduates in our samples is 14.3 and 13.8% in the UK and Germany, respectively, a simple simulation suggests that differences in subject of degree account for about a 0.6 and 0.4% overall male/female wage gap in the UK and German labour markets, respectively.

[5]Rounding to 3 digits (instead of 2 as in Table 2) reveals that the male/female wage premium accounted for is equal to 1.6 or 2.3% in Germany, depending on whether less detailed or detailed subject of degree is included.

[6]The full decomposition results are available on request from the authors.

4. Conclusions

This paper sets out to make a simple empirical point. Namely that subject of degree matters in explaining gender-related wage differences amongst university graduates. Using data from the labour force surveys of the United Kingdom and Germany, we find similar results in these two countries: subject of degree explains about 2–4% higher wages of male over female graduates after controlling for age, industry, region, part-time and public sector employment.

This amounts to a significant part (between 8 and 20%) of the overall male/female gender wage gap, and an even larger amount of the part explained by factors entered into wage equations (at around 24–30% of the explained component). These numbers suggest an important, sizable contribution to wage differences from degree subject and roughly correspond to the results on field of major reported in Brown and Corcoran (1997), Daymont and Andrisani (1984), Gerhart (1990) for the United States in the late 1970s/1980s. Our results give credence to the view that promotion of gender equality, and any associated reduction in the gender wage gap, should also involve looking at educational choices that shape the subject of degree chosen by men and women and hence that occur before young people enter the labour market.

Acknowledgements

The work on this paper was done during the authors' leave during the 2001/2 academic year in the Economics Department at MIT, whose hospitality and support are gratefully acknowledged. We thank Jeff Frank, Markus Frölich, Michael Lechner and an anonymous referee for helpful comments and Georgios Tassoukis from IZA, Bonn, for sending us output files from the German Labour Force Survey. Patrick Puhani also thanks the Volkswagen Foundation for supporting this research.

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