Gender Differential in Earnings for Young European Higher Education Graduates: The Role of Competencies.

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Abstract

This study explores gender earning differentials in human capital competences for young European higher education graduates. The analysis utilizes a classic regression model to explore the relationship between key competences and earnings, together with an Oaxaca decomposition which parses out the extent to which earning differentials can be attributed to differences in human capital competences or to discrimination. The analysis reveals that most of the female/male earning differential is explained not by differences in human capital competences, but by differences in the female/male earning structure. In other words, by labour market discrimination.

1. Introduction

Since Becker's (1957), many studies have investigated the widespread phenomenon of gender earnings differentials. According to Becker, gender earnings differentials may be attributed to two factors: differences in labour productivity between men and women, and market discrimination against women (employer, employee, and customer). Several studies indicate that the gender earning gap has been narrowing since the 1970s in most industrialized countries (Blau and Kahn, 1996, 1997).

Recently, European policies are strongly oriented towards closing the gender earning gap (European Commission, 2000), however, the pay gap persists between women and men. A comparative report (INSEE, 2005) identifies two main sources from which the gender pay gap arises: first of all, the segregation of men and women across occupations, firms and positions; and second, wage differences that consistently favour male-dominated jobs. In the light of these two main sources of the gender wage gap,

number of mechanisms may be seen to affect wage differences between women and men.

Another important factor contributing to the gender earnings gap is education. It is well-known that education is a source of higher pay in all European countries, and as women on average now obtain the same educational levels as men, the overall gender pay gap is closing (Blau and Kahn, 1992; Brown and Corcoran, 1997). The adjusted wage gap (the wage gap controlled for differences in human capital factors) is also narrowing in that women with higher education that have invested more in labour market competencies (understood as those talents, skills and capabilities that contribute to multi-factor productivity gains), and it seems that competencies needed for jobs requiring higher education are now regarded as less gender-specific. However, the introduction of new technology changes the nature of work, which affects the values of competencies and also their contents (Mariachristina et al., 2003). Some of the competences that workers have accumulates will become less relevant, while others will become more important.

In this paper, we will attempt to gain an insight into the composition of gender earnings gap, with a particular focus on competencies controlling for individual background and job characteristics. The data set used in this study was taken from a major representative survey comparing the situation of European higher education graduates. More than 36,000 graduates holding a first higher education degree were surveyed about four years after graduation (graduates from 1995 were surveyed in 1999). The study, named CHEERS (Careers after Higher Education – A European Research Survey), included graduates from eleven European countries: Italy, Spain, France, Germany, Austria, The Netherlands, United Kingdom, Finland, Sweden, Norway and the Czech Republic (for a full description of the survey, see Schomburg &

Teichler, in press; Teichler & Schomburg, in press). The data set used examines in detail a number of human capital competences of the graduates and their utilization on the job, as well as the extent to which the graduates consider their position and tasks linked to their educational careers. Questions on the socio-biographic background of the students, on the study conditions and provisions and the grades awarded upon graduation are raised as well in order to determine the extent to which these factors might explain varying employment and work paths of graduates.

The paper is organised as follows: Section 2 offers the data and methodology. The main results of our study are discussed in section 3 and, finally, section 4 provides a summary and concludes.

2. Data and methodology

Table 1 presents some basic labour market indicators for young higher education graduates in the different countries, estimated from the results of the CHEERS survey. It can be observed that four years after graduation, more than 87 percent of graduates surveyed formed part of the labour force (employed, self-employed or unemployed). The rate was below 85 percent only in France, Spain, Italy and the Czech Republic, 84.4 percent of female graduates were part of the labour force as compared to 91.6 percent of male graduates. The Czech Republic is the extreme case here with 18 percent fewer women than men participating in the labour force.

Table 1. Labour Characteristics of Graduates by Country

	Labour Force Participation *(percentages)*			Unemployment Rate *(percentages)*			Annual Gross Income *(thousand of euro)*		
	Female	Male	Total	Female	Male	Total	Female	Male	Total
Austria	86.6	94.7	90.8	5.6	2.6	4.0	23.1	28.7	26.1
Czech Rep.	76.2	94.1	83.7	2.6	1.2	1.9	11.5	14.6	12.9
Finland	91.5	97.0	93.7	1.5	1.7	1.5	23.1	28.2	25.2
France	78.5	81.0	79.7	11.8	5.0	8.6	19.7	24.0	21.6
Germany	83.6	93.2	89.0	3.6	2.3	2.8	26.9	34.6	31.3
Italy	80.8	86.6	83.6	8.6	2.7	5.7	19.2	21.6	20.3
Netherlands	92.1	97.6	94.5	2.1	1.4	1.8	22.6	29.0	25.5
Norway	86.1	93.3	89.0	0.9	0.8	0.9	23.9	29.5	26.2
Spain	80.7	87.2	83.5	15.6	9.8	13.0	16.0	19.2	17.5
Sweden	81.1	89.4	84.7	1.8	0.6	1.2	21.4	28.6	24.5
U. Kingdom	88.3	92.0	89.8	2.3	2.6	2.4	25.2	29.7	26.8
TOTAL	84.4	91.6	87.7	4.8	2.8	3.8	21.2	26.3	23.8

Source: Own calculations from CHEERS data set.

Table 1 also shows that the unemployment rate for those graduates surveyed, who participate in the labour force was higher in the cases of Spain (13 percent) and France (8.6 percent). Overall, the unemployment rate for women was 4.8 percent and 2.8 percent for men. There were gender-pattern exceptions in the unemployment rate. Women in the United Kingdom, Finland and Norway were less unemployed than male graduates. On the other hand, the unemployment rate of female graduates in Italy and Sweden was three times as high as that of men.

A key characteristic of the quality of a job is the income that can be generated from it, in case of self-employment, or the wage, in case of dependent work. Table 1 shows the annual gross income of graduates by country (figures for each country have been standardized by purchasing power parity). The average annual gross income of graduates of the eleven countries analysed was about 24,000 euro. Income was clearly higher than average for graduates in Germany (31,300 euro), the United Kingdom (26,800 euro) and Norway (26,200 euro) and clearly lower in the Czech Republic (13,000 euro) and Spain (17,500 euro). In all countries women earned less than men. Overall, the annual gross income of female graduates was around 5 points less than

male graduates' income. That difference was greater in Sweden, Germany and the Netherlands.

Taking into account other factors to explain the situation of graduates like holding a temporary contract instead of permanent or holding a part-time job instead of full-time, Table 2 shows that the proportion of temporary contracts was the highest in Spain where it applied to 39.8 percent of the working graduates. Finland comes next, 35.6 percent of the graduates had a temporary contract. In contrast, Sweden represented the smallest percentage. Overall, the proportion of temporary contracts is higher among females graduates compared to their male counterparts. With respect part time employment, countries like Italy, Spain, the Netherlands and Germany had level over 15 percent, while Finland, United Kingdom and the Czech Republic did not reach the 5 percent mark. Again, we observe that part time employment is higher among female graduates than among males.

Table 2. Job Characteristics of Graduates by Country

	Temporary-Contract Employment *(percentages)*			Part-Time Employment *(percentages)*		
	Female	Male	Total	Female	Male	Total
Austria	30.0	26.1	27.9	19.1	7.1	12.6
Czech Rep.	19.7	13.4	16.7	5.7	2.8	4.3
Finland	46.1	25.8	35.6	6.2	3.0	4.8
France	19.9	10.9	15.5	9.5	3.1	6.3
Germany	29.8	18.2	23.1	24.5	9.3	15.7
Italy	35.1	22.6	28.9	24.6	12.2	18.6
Netherlands	25.3	18.5	22.2	25.2	5.8	16.3
Norway	22.7	15.0	19.4	14.3	4.8	10.2
Spain	44.5	34.7	39.8	21.6	11.9	17.0
Sweden	14.7	8.6	11.9	9.5	1.2	5.6
U. Kingdom	18.9	16.2	17.8	5.6	3.4	4.6
TOTAL	27.3	18.8	23.2	15.2	6.1	10.8

Source: Own calculations from CHEERS data set.

According to this description, graduates from Spain, France and Italy faced harder labour market conditions than graduates from other countries. If we take job indicators into account, one is tempted to guess that in those countries the gender earnings gap would be greater than their European countries counterparts.

A number of econometric analyzes have shown that earnings differentials between groups of people result not only from differences in the groups' average human capital, but also from discrimination in the marketplace (Gunderson, 1989; Brown & Corcoran, 1997). A number of econometric techniques have been developed to parse out the extent to which wage differentials are due to human capital differences or discrimination (see Oaxaca, 1973; Blinder, 1973; Cotton, 1988; Neumark, 1988; and Oaxaca & Ransom, 1994). The Oaxaca (1973) model, modified by Oaxaca and Ransom (1994) is the most widely utilized and is the one employed here.

Following Oaxaca and Ransom (1994), letting b^* denote the estimated non-discriminatory earning structure, the average earning gap in logs can be rewritten as

$$Ln\overline{Y_m} - Ln\overline{Y_f} = b^*(\overline{X}_m - \overline{X_f}) + \overline{X_m}(\hat{b}_m - b^*) + \overline{X_f}(b^* - \hat{b}_f) \qquad (10)$$

being $b^* = \Omega\hat{b}_m + (\mathrm{I} - \Omega)\hat{b}_f$ a weighted vector of the estimated vector of coefficients. The definition of the basic non-discriminatory earning structure corresponds then to the choice of the weighting matrix Ω. Several alternative choices have been suggested in the literature. According to Oaxaca (1973), either the male earning structure $(\Omega=I)$ or the female earning structure $(\Omega=0)$ could be used.

Cotton (1988) proposes the use of $(\Omega=\lambda_m I)$ where (λ_m) is the fraction of males in the sample. Newmark (1988) proposes an estimation of the non-discriminatory earning structure on the basis of the pooled sample of males and females what implies that $\Omega=(X'X)^{-1}(X'_m X_m)$.

Possible problem of selection bias due to the decision of our young graduates to participate in the paid labour force or not has been addressed following Heckman's two-step procedure (Heckman, 1979).

For the specification of the earnings equation, we have the logarithm of annual gross income (in PPP to obtain estimators in a comparable unit) depending on individual characteristics as age, competencies required at the current job and other labour-market status. Descriptive statistics for all the explanatory variables used are reported in Table 3.

Table 3. Descriptive Statistics.

Variable	Mean	Std. Dev.	Min.	Max.
Individual Characteristics				
Female	0.54	0.49	0	1
Age	29.49	2.34	26	35
Mother's higher education	0.22	0.41	0	1
Further education	0.32	0.46	0	1
Children	0.21	0.41	0	1
Partner	0.72	0.45	0	1
Competencies Required				
Foreign language proficiency	2.90	1.38	1	5
Computer skills	3.78	1.13	1	5
Planning, co-ordinating and organising	4.09	0.96	1	5
Problem-solving ability	4.29	0.79	1	5
Negotiating	3.65	1.15	1	5
Taken responsibilities, decisions	4.22	0.88	1	5
Job Characteristics				
Log. annual gross income	3.03	0.57	-1.56	6.35
Hours worked per week	37.27	7.57	10	60
Private sector	0.69	0.46	0	1
Size firm: small	0.19	0.39	0	1
Full-time job	0.89	0.31	0	1
Permanent contract	0.77	0.42	0	1
Job Titles				
Legislators, senior official and managers	0.10	0.26	0	1
Professionals	0.64	0.49	0	1
Technicians and associate professionals	0.18	0.34	0	1
Clerks	0.04	0.17	0	1
Service workers and other occupations	0.04	0.18	0	1
Field of Study				
Education	0.09	0.28	0	1
Humanities	0.11	0.31	0	1
Social sciences	0.28	0.45	0	1
Law	0.08	0.27	0	1
Natural sciences	0.09	0.28	0	1
Mathematics	0.04	0.20	0	1
Medical sciences	0.10	0.30	0	1
Engineering	0.21	0.40	0	1
Universities	0.78	0.41	0	1
Job in own domain	0.69	0.46	0	1
Countries				
Italy	0.10	0.30	0	1
Spain	0.09	0.29	0	1
France	0.09	0.29	0	1
Austria	0.07	0.27	0	1
Germany	0.11	0.32	0	1

The Netherlands	0.10	0.30	0	1
United Kingdom	0.08	0.28	0	1
Finland	0.08	0.26	0	1
Sweden	0.08	0.26	0	1
Norway	0.10	0.29	0	1
Czech Republic	0.10	0.30	0	1

3. Results

The decomposition results for female and male workers are presented in Tables 4 and 5. These two tables are based on a regression matrix *X* that contains the personal characteristics variables as age, level of competencies required at graduate's current job, as well as other labour market characteristics and job status. The last row, labelled "overall", presents the gross log earning differential. For instance, in Table 4, this would be 17.67. The row labelled "total" presents the results of the decomposition separately for the endowments component and the unexplained component (which includes measurement error and also factors unaccounted, labour market discrimination, etc…). The results indicate that discrimination might account for as much as 22.5 percent of the overall earnings differential when female coefficients are used (see column 4, Table 4), and 11.2 percent when male coefficients are used (see column 4, Table 5). The analysis also shows the contribution of each variable to the overall earning differential.

Table 4. Decomposition of earnings, female reference coefficient. Europe as a whole.

	Contribution of Each Variable to (Log) Earnings Differential		Contribution as a Percentage of Total Earnings Differential	
Variables	Endowments	Pay Structure	Endowments	Wage Structure
Age	0.0053	0.0122	3.0	6.9
Foreign language proficiency	0.0059	0.0406	3.4	23.0
Computer skills	0.0037	-0.0535	2.1	-30.3
Planning, co-ordinating, organising	0.0001	0.0764	0.0	43.2
Problem-solving ability	-0.0011	0.0185	-0.7	10.5
Negotiating	0.0031	-0.0323	1.7	-18.3
Taken responsibilities, decisions	0.0007	0.0383	0.4	21.7
Hours worked per week	0.0266	-0.1894	15.1	-107.2
Private sector	0.0084	0.0406	4.8	22.9
Size firm: small	0.0001	0.0043	0.1	2.5
Full-time job	0.0208	0.0959	11.8	54.3
Permanent contract	0.0100	0.0076	5.7	4.3
Legislators/managers(ref.professionals)	0.0015	-0.0006	0.8	-0.3
Technicians/associate professionals	0.0010	0.0007	0.6	0.4
Clerks	0.0013	0.0009	0.7	0.5
Service workers and other occupations	0.0014	-0.0003	0.8	-0.2
Education (ref. engineering)	0.0110	-0.0008	6.2	-0.4
Humanities	0.0111	-0.0034	6.3	-1.9
Social sciences	0.0008	0.0075	0.5	4.3
Law	0.0005	-0.0034	0.3	-1.9
Natural sciences	-0.0017	0.0013	-1.0	0.7
Mathematics	0.0042	0.0000	2.4	0.0
Medical sciences	0.0002	-0.0007	0.1	-0.4
Universities	-0.0003	-0.0259	-0.2	-14.7
Job in own domain	0.0023	-0.0019	1.3	-1.1
Country dummies (ref. Germany)	0.0200	0.0071	11.29	4.00
Total	0.1370	0.0398	77.5	22.5
Overall	0.1767		100	

Source: Own calculations from CHEERS data set.

Table 5. Decomposition of earnings, male reference coefficient. Europe as a whole.

	Contribution of Each Variable to (Log) Earnings Differential		Contribution as a Percentage of Total Earnings Differential	
Variables	Endowments	Pay Structure	Endowments	Wage Structure
Age	0.0055	0.0119	3.1	6.8
Foreign language proficiency	0.0114	0.0351	6.4	19.9
Computer skills	-0.0028	-0.0470	-1.6	-26.6
Planning, co-ordinating, organising	0.0027	0.0738	1.5	41.8
Problem-solving ability	0.0000	0.0174	0.0	9.8
Negotiating	0.0014	-0.0306	0.8	-17.3
Taken responsibilities, decisions	0.0019	0.0370	1.1	21.0
Hours worked per week	0.0210	-0.1837	11.9	-104.0
Private sector	0.0146	0.0344	8.3	19.4
Size firm: small	0.0001	0.0044	0.1	2.5
Full-time job	0.0302	0.0865	17.1	49.0
Permanent contract	0.0108	0.0068	6.1	3.9
Legislators/managers(ref.professionals)	0.0014	-0.0005	0.8	-0.3
Technicians/associate professionals	0.0008	0.0009	0.5	0.5
Clerks	0.0010	0.0013	0.5	0.7
Service workers and other occupations	0.0016	-0.0005	0.9	-0.3
Education (ref. engineering)	0.0127	-0.0025	7.2	-1.4
Humanities	0.0160	-0.0083	9.0	-4.7
Social sciences	-0.0004	0.0088	-0.2	5.0
Law	0.0012	-0.0041	0.7	-2.3
Natural sciences	-0.0015	0.0010	-0.8	0.6
Mathematics	0.0042	0.0000	2.4	0.0
Medical sciences	0.0008	-0.0013	0.5	-0.7
Universities	-0.0002	-0.0260	-0.1	-14.7
Job in own domain	0.0021	-0.0017	1.2	-1.0
Country dummies (ref. Germany)	0.0204	0.0066	11.57	3.73
Total	0.1570	0.0198	88.8	11.2
Overall	0.1767		100	

Source: Own calculations from CHEERS data set.

Table 6 presents the Cotton and pooled decomposition method results. The estimates of the Cotton method are, as expected, between the bounds of the estimates for the female and male methods. The most conservative measures of the proportion of the gross earning gap due to discrimination are provided by the pooled method, as well as the largest values for the component attributable to attributes.

Table 6. Decomposition of gender earnings gap. Europe as a whole.

	Contribution of Each Variable to (Log) Earnings Differential		Contribution as a Percentage of Total Earnings Differential	
Variables	Endowments	Pay Structure	Endowments	Wage Structure
Cotton	0.1462	0.0305	82.7	17.3
Pooled	0.1608	0.0159	91.0	9.0

Source: Own calculations from CHEERS data set.

4. Conclusions

In this paper we have examined the composition of gender earnings gap among young European higher education graduates, with a particular focus on competencies controlling for individual background and job characteristics. Separate regressions are estimated for females and males following the two-step procedure introduced by Heckman as method of sample selection bias correction. We then apply the standard Oaxaca decomposition to examine how much of the female-male difference in the log earnings cannot be explained by the model. This unexplained portion of the difference is normally interpreted as resulting from discriminatory differences in the female and male earning structure.

In general, observable firm characteristics have an important explanatory power in the variation of the difference between the earning paid to men and women. With respect of the competencies required at the current jobs, we can see that foreign language proficiency and computer skills play a large role in explaining part of the female earnings advantage.

To know what is actually happening to the young higher education graduates in terms of their human capital competences is relevant for debates about the economic role of higher education in Europe and for the debate on the new socio-economic challenges of higher education in educated societies. The past and the present employment situation for higher education graduates are also relevant to individual and to societal decision-making processes. The attitudes of students, families, employers (including governments) and society at large towards higher education are no doubt influenced by the evolution of the labour-market outcomes of the system; besides, policy makers should consider the labour-market effects of higher education in the rational analysis of educational investment, organization, financing, and planning.

References

Becker, G.S. (1957). *The economics of discrimination*, University of Chicago Press, Chicago.

Blau, F.D. and Kahn, L.M. (1992). The gender earnings gap: Learning from international comparisons, *Amercian Economic Review*, 82(2), 533-538.

Blau, F.D. and Kahn, L.M. (1996). Wage structure and gender earnings differentials: an international comparison, *Economica*, 63 (250), S29-S62.

Blau, F.D. and Kahn, L.M. (1997). Swimming upstream: trends in the gender wage differential in the 1980s, *Journal of Labor Economics*, 15(1), 1-42.

Blinder, A.S. (1973). Wage discrimination reduced form and structural estimates. *Journal of Human Resources*, 81, 436-455.

Brown, C. and Corcoran, M. (1997). Sex-based differences in school content and male-female wage gap, *Journal of Labor Economics*, 15(3), 431-465.

Cotton, J. (1988). On the Decomposition of Wage Differentials, *Review of Economics and Statistics*, 70, 236-243.

European Commission (2000). http://www.eiro.eurofound.ie/2000/07/feature/eu0007264f.html

Gunderson, M. (1989). Male-Female Wage Differentials and Policy Responses, *Journal of Economic Literature*, 27(1), 46-72.

Heckman, J. J. (1979). Sample Selection Bias as a Specification Error, *Econometrica*, 47, 153-161.

INSEE, Institut National de la Statistique et des Études Économiques (2005): *The gender wage gap in Europe: women, men and the public sector*, Document de travail, F0502, France.

Mariachristina, P., Santarelli, E. & Vivarelli, M.(2003). The Skill Bias Effect of Technological and Organisational Change: Evidence and Policy Implications, *IZA Discussion Paper Series*, Discussion Paper, 934.

Newmark, D. (1988). Employers' Discrimination Behaviour and the Estimation of Wage Discrimination, *Journal of Human Resources*, 23, 279-295.

Oaxaca, R. (1973). Male-Female wage differentials in urban labor market, *International Economic Review*, 9, 693-705.

Oaxaca, R. and Ransom, M. (1994). On Discrimination and the Decomposition of Wage Differentials, *Journal of Econometrics*, 61(1), 5-21.

Schomburg, H. and Teichler, U. (in press). *Higher Education and Graduate Employment in Europe: Results of graduate Survey from Twelve Countries*, Kluwer Pub.

Teichler, U. and Schomburg, H (in press). *Careers of Higher Education Graduates, View and Experiences in Comparative Perspectives*, Kluwer Pub.