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The Gender Wage Gap among recent European Graduates

by

Moris Triventi*

Abstract

The aim of this paper is to examine whether there is a gender gap in monthly wage among recent graduates in eleven European countries and which variables can explain it. In the first part of the paper previous literature is presented and some limitations of existing studies are discussed. In the theoretical framework the gender wage gap is conceived as a function of five main factors: human capital, employment characteristics, working hours, work-family conciliation aspects and residual discrimination. Different types of decomposition after OLS linear regression and Heckman selection models are applied; data comes from REFLEX survey on tertiary graduates in 2000. The main results indicate that the raw gender gap is higher in Austria and Germany, while it is lower in Belgium and United Kingdom, with Southern and Nordic countries placed in the middle. There is great variability in the unexplained part of the gender gap, which is mainly imputable to residual discrimination. This is low in Nordic countries, followed by Continental and Southern Europe. Overall the most important factors accounting for the gender gap are employment characteristics, followed by working hours. Human capital, work-family conciliation issues and individuals' preferences matter in most countries, but their role is not prominent. There is also evidence of a correlation between several macro-institutional indicators (type of wage-setting institutions and welfare policies) and the extent of the gender gap, suggesting that wage determination is deeply rooted into institutional contexts.

1. Introduction

In recent decades female graduation rates in higher education surpassed those of men in many European countries. Nevertheless, a lot of research evidence pointed out that gender inequality persists in several aspects of educational and occupational careers. Although women enrol in university more than men, they usually attend less remunerative educational sectors, have lower chances of continuing their university career enrolling in PhD courses and, once in the labour market, they get lower wages than their male colleagues with the same type of education. Given this

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situation, the main aim of this paper is to examine the gender gap in wages among a recent cohort of European graduates and to assess which factors account for its persistence.

This issue is relevant both for equity and efficiency reasons. From the point of view of equity, modern economies should rely on meritocratic principles of functioning. This means that workers should be rewarded correspondingly to their level of productivity and not in relation to ascriptive characteristics like gender or race. From the second point of view, the existence of such discriminations could represent – at least in principle – a disincentive for future generations of women to invest in education and human capital accumulation.

The present work tries to integrate the theoretical framework on gender inequalities elaborated in economic sociology with the statistical methods applied in labour economics. The main aims of this study are as follows. First, to discover whether there is a gender wage gap among recent European graduates and to establish which factors account for this gap. Second, to examine whether there is cross-country variation in women's disadvantage and in the relative role of several factors that account for this gap. Third, to assess whether the gender gap in wages is related to several macro institutional variables features of labour market and welfare.

2. Previous findings and theoretical framework

Existing research findings

Gender gap in wage is an ubiquitous phenomenon in advanced economies and a huge number of studies, mostly in the field of labour economics, have been devoted to estimate its magnitude and to identify its sources (Jarrell and Stanley 2004; Weichselbaumer and Winter-Ebmer 2005). Most of these studies analysed general population surveys, but recently interest for young cohorts of graduates has emerged.

Research conducted in the last decades in the United States suggested that women salaries were about 70% that of men in the early 1980s, but they rose to around 90% in the middle 1990s (Loury, 1997; Joy, 2003; Lewis and Soo-Oh, 2009). Little research on university degree recipients in Europe has been conducted. In a comparative study on 1995 graduates, Garcia-Aracil (2007) found that the gender gap in gross annual income was higher in Sweden, Germany and the Netherlands (around 75%), compared to Spain (83%) and Italy (89%).

In the United States Joy (2003) in the middle 1990s found that 75% of the gender gap in full-time salary was unexplained by endowments, whereas in the same period Machin and Puhani (2003) found that in Germany and United Kingdom the unexplained gender gap was around 30%. Garcia-Aracil (2007) showed that the unexplained gap among 1995 graduates was higher in Czech Republic and Southern Europe (60-70%), while it was lower in Continental Europe and Nordic countries (between 10% and 30%).

Limits of traditional economic studies

The most common approach to study gender differences in earnings in labour economics consists in the estimation of the wage gap using regression models and to apply some variants of the famous Blinder-Oaxaca decomposition method, which separates the part of the gap that is imputable to differences between men and women in productivity characteristics (like education or work experience) from a residual part that cannot be accounted for by these variables, which is usually referred to as discrimination (Blinder 1973; Oaxaca 1973).

As Rubery et al. (2005; p. 186) pointed out, 'traditional econometric analyses of the gender pay gap start from a presumption that wage structures reflect market factors or productivity differences, except for gender discrimination. The latter is supposedly captured by the residual term in the equation, although the residual may also include a range of unobservable characteristics'. From a

sociological point of view, this approach has at least two flaws, the first is empirical and the second is conceptual.

From an empirical point of view, attributing the unexplained gap to discrimination is reasonable only if the variables used in the decomposition analysis are able to capture most of the factors that – according to the literature – could account for the observed sex differences. This is often not the case because most studies are able to include only standard variables on educational attainment, occupation, (potential) experience, and sometimes family status. It is easy to recognize that several other variables could matter in this respect, like individuals’ skills, type of education, authority and responsibility on the job, family obligations, individuals’ attitudes and preferences. One major advantage of the present work is that we are able to include such variables in the models and, by this way, we try to reduce the potential role of unmeasured factors in the explanation of the gender gap.

The conceptual limitation of the traditional economic approach rooted in neoclassical economy is that it considers as ‘discrimination’ only the residual part of the gender gap that is not explained by endowments. By this way this approach neglects the fact that the differential distribution of endowments across sexes could be the product of mechanisms of social inequality. Economic sociology, for example, showed that occupational segregation, the attribution of differentiated roles to men and women on the job, and also working hours could derived from non-meritocratic processes. Furthermore, industrial relations literature showed that wages do not reward only individuals’ productivity, but serve a larger spectrum of scopes, like allocative and motivational needs (Rubery 1997). In addition, ‘wages are not determined through abstract and universal market actions but through institutionalised processes, including statutory regulation, collective bargaining, employment contracts, managerial actions and regulations requiring comparisons of wages between groups’ (Rubery et al. 2005, p. 187).

Given these considerations, in this paper we apply the traditional decomposition method but without the aim of neatly estimate the weight of productivity factors. We are instead interested in providing a general framework to identify the differentiated sources of the gender differences in wages among recent graduates and to explore whether they vary across European countries. Furthermore, the comparative nature of this work allows us – even if in a very simple way – to connect the gender gap to other macro-institutional variables, like trade union density, extent of collective bargaining and welfare policies.

The theoretical framework

In the theoretical framework adopted in this work the gender gap in wage is determined by five major factors¹:

$$WAGEGAP = f(HC, EMPL, CONC, HRS, RDISC)$$

Where *HC* represents human capital factors like educational attainment, type of education and skills, *EMPL* includes occupational-related characteristics like worker’s profile, job features and sector of employment. The third parameter is *CONC*, which represents indicators of family obligations and preferences towards family over work, whereas the fourth is working hours (*HRS*), which captures time devoted to work. The last parameter is labelled *RDISC* (‘residual discrimination’), and it refers to those differences in monthly wages between men and women with

¹ This framework was largely inspired by the work of Marin and Fan (1997), but we adopt a partially different conceptual approach. Among those factors considered by Marini and Fan, we decided to exclude social networks, because in several studies it has been found to be non significant and because it is very difficult to measure. Moreover, an exploratory analysis on REFLEX data suggested that proxies of availability and usefulness of social networks have a negligible role in accounting for the sex wage gap among graduates, even without controlling for other factors.

the same human capital factors, occupational experience and type of job, and with equal family obligations and work-family preferences.

We now briefly review existing literature on the role of these factors in explaining the wage sex gap. Adopting an approach centred on supply-side factors, earlier studies identified in human capital characteristics a major explanation of the sex gap in labour market returns. Nonetheless, since that in recent cohorts, women's educational attainment surpassed that of men, additional educational factors have been introduced to explain the persisting gender gap in wages. The most important is academic discipline of specialization.

Male and female college students have marked differentiated distributions across fields of study: men are disproportionately more present in engineering, math/science and business, while women more often opt for majors like education, humanities and social sciences. In most countries, the former fields lead to well remunerated occupations like scientists, professionals and high-ranked technicians, while the latter usually lead to less remunerative jobs, like teaching, social work, or jobs in cultural or non-profit organizations (Gerber and Cheung 2008).

Consequently, field of study has been found to be an important factor explaining the gender earning gap in United States (Jacob 1996), Netherlands (Kalmijn and van der Lippe 1997), Russia (Gerber and Schaefer 2004), United Kingdom and Germany (Machin and Puhani 2003). Gerber and Cheung (2008) in a review of relevant literature summarize findings over three decades, showing that in the 1970s and 1980s fields of study accounted for 20-45% of the wage gap among college graduates (Brown and Corcoran 1997; Daymond and Andrisani 1984; Gehart 1990), whereas in the 1990s its contribution was somewhat lower, around 15-25%, even if still relevant. This finding is the result of two tendencies: a less uneven distribution of fields of study according to sex and trends in gender-specific returns.

The second set of factors includes occupational-related characteristics, like worker's experience, type of occupation, firm and sector of employment. According to Petersen and Morgan (1995), the sex differences in gap are mainly due to different forms of occupational segregation and inequality: 1) *allocative discrimination*, 2) *valutative discrimination*, 3) *within-job wage discrimination*. The first process refers to discrimination in recruitment and promotion procedures, whereas the second one to the fact that occupations with a high proportion of women received on average lower salaries than traditional male occupations. There is 'within-job wage discrimination' when women in the same type of job and within the same firm are paid less than their male colleagues. Using a detailed occupational definition, the authors found that the first two mechanisms are more relevant the third one in the United States.

Most of the studies found that occupations are highly segregated by sex and the degree of gender segregation is stronger at lower levels of education and occupation. This is because women's integration occurred more in professional and managerial jobs than in clerical and blue-collar occupations (Cotter et al. 2004). Notwithstanding, also among graduates men are overrepresented in upper management and in the most prestigious professions (engineers, academic professors), whereas women dominate in professions like nursing and teaching (England 2005). Even if some differences across countries are recognizable, the overall pattern of occupational segregation by sex is rather similar in most of economically advanced countries (Charles and Grusky 2004).

The main reasons developed by sociologists to explain allocative inequality are socialization and peer pressure. Cultural transmission creates different interests, preferences and aspirations in males and females and these in turn affect their occupational choices. These differential preferences are reinforced by the desire to conform to other expectations about the more appropriate role in the labour market (England 2005). Feminist literature stresses that motherhood could be also a relevant factor, because it needs retirement from work for a certain period of time and this is costly for employers. If this explanation holds, *ceteris paribus*, employers would prefer men over women for jobs that require more on-the job training (and with steeper wage growth over career) in order to

minimize the risk of losing a worker.² Occupational allocative segregation could derive also from demand-side discrimination in hiring/placement: employers treat male and female applicants differently, consciously or unconsciously, preferring males for male-traditional jobs and females for female-traditional jobs (Reskin and Roos 1990).

This discrimination could be based on socially constructed notions of what sex is appropriate for what job (socialization), could derive from the attempt to keep females out of certain occupations in order to avoid a loss of status associated with that job (Goldin 2002), or from general predictions made by employers about candidates' potential productivity derived from aggregated data or informal knowledge (statistical discrimination) (Bielby and Baron 1986).

There are several explanations for the evaluative discrimination. Predominantly male jobs more often involve authority over co-workers (England 1992), while predominantly female jobs are characterized by less occupational specific training (Tam 1997). The average lower pay associated with female-typed jobs could be compensated by *non-pecuniary amenities*, like mother-friendly work time or non-risky tasks, but empirical evidence for this hypothesis is rather weak (England 1992). An additional reason is *crowding*: given the existence of discrimination in access to male-traditional occupations, it is likely that an over-supply of women applicants to traditionally female-jobs occurs (Bergmann 1974). According to the *devaluation thesis*, instead, the gender bias leads to attribute less importance to jobs more often did by women, like teaching and care, because female-typed jobs are not considered by society as of comparable worth as male-typed jobs.

The third set of factors which accounts for the sex pay gap refers to the compatibility of employment with gender-differentiated adult family roles. Even in recent cohorts women continue to do the majority of household work and are usually responsible for child caring, whereas men have primary responsibility for financially supporting the family. Given the existence of gendered societal expectations, it is likely that women have difficulties in the conciliation of family activities and occupational tasks. Support to this explanation is given by the fact that married men on average earn more than non-married men, while the opposite holds for women (Korenman and Neumark 1992).

Conciliation between family obligations and work is also strictly linked to work and family aspirations. Several studies showed the existence of differences between males and females in preferences, aspirations and general life purposes. There is evidence that men tend to attribute more importance to occupational career and income, whereas women attribute a higher value to non-job aspects like family realization (Marini et al. 1996; Halaby 2003). Thus, women's occupational aspirations are lower than those of men and, in the choice of job, they seem to consider important aspects other than income, like security and flexible employment (Croser and Gneezy 2009). According to most of social researchers these differential preferences and aspirations derive from gendered-typed processes of socialization and peer informal pressure, but recent works in the evolutionary psychology domain suggests the existence of biological differences between men and women in the desire to earn money (Kanazawa 2005).

The fourth factor accounting for the sex difference in wage is working hours, which is relevant especially when the monthly or annual wage is considered as dependent variable. From a strict economic point of view, working hours should belong to the job features. Nevertheless, sociological research suggested that societal values constrain individual choices about hours of employment because they shape expectations about how one should spend time (Nock and Kingston, 1989). From this second point of view, working hours could pertain to family-work conciliation aspects. Given this conceptual ambiguity its contribution is considered separately from the other conceptual areas.

The last aspect is what we have labelled 'residual discrimination'. Along with the factors above mentioned, it is possible that wage differences between men and women reflect pure discrimination

² Nevertheless, this is at odds with the fact that the risk of losing a worker is high also for men, even if for other reasons. In fact, men are more likely than women to change firm, to be arrested or to leave to serve in the military (England 1992; 2005)

by employers, which could evaluate better – consciously or not consciously – the work done by men. Discrimination refers to the condition in which a man and a woman of equal ability and productivity, with the same educational qualification and experience, in the same sector and occupation, and with similar family obligations and preferences receive a different salary from the same employer.

3. Data and variables

To answer the research questions data from the REFLEX (acronym for ‘Research into Employment and professional FLEXibility’) survey is used. REFLEX is a survey carried out in 2005/2006 among individuals of fifteen European countries who had graduated from tertiary institutions in the year 2000. This survey focuses on general/academic tertiary education: the sample includes graduates of ISCED 5A (bachelors and masters or equivalent), but not graduates from ISCED 5B, because these programmes are more practically oriented. According to UNESCO (2006), ISCED 5A programmes are largely theoretically based and are intended to provide sufficient qualifications for gaining entry to advanced research programmes and professions with high skills requirements. Most of graduates answered a written questionnaire (around 75%), whereas a minority has been interviewed by telephone. The sampling design is stratified, where the strata include categories such as region and sector of higher education, depending on the national context. Survey weights that re-proportionate the sample according to the population figures are used in all estimations.³

Some countries in the original dataset have been excluded due to a low sample size or excessive missing values on key variables of interest. Eleven countries are included in the present analysis: Austria (AT), Belgium (BE), Czech Republic (CZ), Germany (DE), Spain (ES), Finland (FI), France (FR), Italy (IT), the Netherlands (NL), Norway (NO), United Kingdom (UK). To make the sample more homogeneous individuals over 40 years old have been excluded from the analysis. After listwise deletion of missing values the analytical sample is constituted by approximately 20,000 cases.⁴ All employment variables refer to the job held by graduates five years after graduation. This period is appropriate because it is likely that most graduates entered in a rather stable occupation after a first stage of job searching.

The main dependent variable is the natural logarithm of the gross monthly wage, harmonized in US dollars and adjusted for the purchasing power parity (available in the dataset).⁵ Gender is the main independent variable, with males as the reference category. Variables that have been used to decompose the gender gap are listed in table 1. They are classified according to the framework developed in the previous section in four domains: human capital, job characteristics, work-family conciliation and working hours.

Human capital domain comprises those characteristics that refer to individuals’ education and skills. Indicators of education and training are: course level degree (master vs bachelor), proportion of females in the field of study attended,⁶ further training in the past four weeks. Several indicators of

³ More information are available on the project website: <http://www.fdewb.unimaas.nl/roa/reflex/>.

⁴ For variables with a relatively high proportion of missing data (>5%) a dummy indicator is included in the estimation in order to preserve the sample size and to check whether non-respondents are different from others. These variables are: type of contract, sector of employment, type of organization, family care responsibility. Results with total exclusion of missing data are substantially similar, even if with larger uncertainty around the estimates.

⁵ Transformation of monthly wage in logs is the standard econometric solution for a highly skewed distribution of a dependent variable in OLS regression model. Following suggestions by Morgan and Arthur (2005), gross monthly wage has been preferred to gross hourly wage, the former being more appropriate when studying graduates’ earning outcomes.

⁶ The mean proportion of females has been calculated using a detailed version of the variable ‘field of study’ with 30 categories. Models that include ten categorical dummy variables of field of study give similar results. The metric variable has been chosen for its parsimony.

skills – usually not available in standard population surveys – are included: final grades (low, middle, high),⁷ self-assessed skills in foreign language, ICT skills and innovation skills.⁸

Table 1 – Variables used to decompose the gender gap

HUMAN CAPITAL	EMPLOYMENT CHARACTERISTICS	FAMILY-WORK CONCILIATION
<i>Education & Training</i>	<i>Worker</i>	<i>Family role</i>
<ul style="list-style-type: none"> • Course level • Field of study (feminization) • Further training 	Experience: <ul style="list-style-type: none"> • Unemployment months • Age Role: <ul style="list-style-type: none"> • Supervision • Degree of responsibility 	<ul style="list-style-type: none"> • Partner • N. of children • Family care • [WORKING HOURS]
<i>Skills</i>	<i>Occupation</i>	<i>Preferences</i>
<ul style="list-style-type: none"> • Grades • Foreign language skills • ICT skills • Innovation skills 	<ul style="list-style-type: none"> • Type of contract • Occupation (mean wage) • Job-field fit • [WORKING HOURS] 	<ul style="list-style-type: none"> • Importance of career aspects • Importance of secure job • Importance of family-related aspects
	<i>Organization</i>	
	<ul style="list-style-type: none"> • Sector • Type of organization • Firm size 	

Within the second domain, the characteristics of worker, occupation and organization are distinguished. In the first group proxies for experience (months of unemployment since graduation, age and age squared) and indicators of the graduate’s role on the job (if she supervise or not and the degree of responsibility on the job) are included.⁹ Occupation features are: type of contract (permanent, fixed-term, self-employed and others), mean hourly wage associated with occupation,¹⁰

⁷ To build this variable several steps have been followed. First, variables that measure final grades using specific national metrics have been recoded into the ECTS grading scale. This an ordinal scale (A-F) which has been recently developed by the European Commission in order to provide a common currency and facilitate the transfer of students and their grades between European higher education institutions, by allowing the different national and local grading systems to be interchangeable. Given that individuals in the sample attended higher education before the ‘Bologna process’, a perfect classification of their final grade is not possible and some grading categories are not present in all countries. For this reason the final variable assumes only three values: high (A-B), medium (C), low (D-E).

⁸ The variable on foreign language skills is the result of a question asking graduates about their own perceived ability to write and talk in a foreign language. The variable on ICT skills instead measures the perceived ability in the use of computer and internet. The innovation skills variable is an additive composite index which summarizes information from different items: information on the ability to rapidly acquire new knowledge, alertness to new opportunities, ability to come up with new ideas and solutions, willingness to question your own and others’ ideas (Cronbach’s alpha=0.699). All three variables are measured on a 5-point scale.

⁹ This is a composite index derived from four questions asking whether, on a 5-points scale, the respondent has the responsibility of: setting goals for the organization, setting goals for her own work, deciding work strategies for the organization, deciding how the respondent does her own job (Cronbach’s alpha= 0.756).

¹⁰ The mean gross hourly wage has been calculated using a detailed version of the variable ‘occupation’ with 34 categories. Models that include six categorical dummy variables indicating the level of the occupation give similar results. As in the case of the field of study, the metric variable has been chosen for its parsimony.

fit between job and field of study¹¹. Organization characteristics are: sector of employment (7 categories), type of organization (public, private, other), and firm size (small vs medium-large).¹² The last domain refers to conciliation between job and family and comprises two sets of variables. Indicators of family obligations include: cohabitation with a partner (vs living alone or living with parents), number of children, and time devoted to family/care activities.¹³ Additional variables of individuals' preferences and attitudes toward work and family are included. They are relevant because several authors suggested that females and males have different attitudes and preferences as far as occupation and family are concerned (Halaby 2003; Kanazawa 2005). The first index summarizes the importance attributed, on a 5-points scale, to career related aspects: high earnings, good career prospects, and social status (Cronbach's alpha=0.648). The second index summarize answers to two questions on the importance of having a job that gives good chance to combine work with family tasks and enough time for leisure activities (Cronbach's alpha= 0.549).¹⁴ The third variable indicates the degree of importance attributed to have a secure job. At the end, the last variable considered is weekly working hours, which has been coded following a simplified version of Hakim's distinction (1997) in 1) marginal and half-time employment (0-29 hours); 2) reduced-hours employment (30-39 hours); 3) full-time employment (40 hours or more). In the decomposition analysis its contribution is presented separately from those of the other characteristics.

4. Methods

To estimate the gender wage gap standard OLS linear regression models are applied, where log gross monthly wage is the dependent variable, female is the key independent variable and indicators discussed in the previous session are included as mediators. Given that not all graduates are employed five years after graduation, and that usually participation into the labour market varies according to gender, there is a potential problem of selection bias in the estimation of sex discrimination in pay with standard regression models. More precisely, women choose whether to work or not, and this determines the possibility to observe their wages in the data. If women made this decision randomly, it is possible ignore that not all wages are observed and use ordinary regression to fit a wage model. However, such assumption of random participation could not hold, because women who would have lower wages may be unlikely to choose to enter the labour market, and thus the sample of observed wages is biased upward. Even if this problem should be less marked in a sample of recent university graduates, it is useful to consider this potential issue. The Heckman selection model (Heckman 1976; 1979) assumes that there exists an underlying regression relationship, given by the following regression equation:

$$y_j = x_j\beta + u_{1j}$$

¹¹ Graduates were asked which is the field of study most appropriate for their work. People who declared they were working in a completely different field or no specific field are classified as 'bad fit', while the category 'good fit' identifies graduates who work in the same field of their higher education specialization.

¹² In the present work small firms are identified as those with less than 50 employees, because the question refers to the number of people who work in the 'total organization' and not those in the respondent's location. The latter information is present in the dataset, but it has been excluded from the analysis due to the excessive proportion of missing values, especially among females.

¹³ Individuals are classified in three categories according to the number of hours devoted to child care or family care in the last four weeks: 1) none, 2) 0-30, 3) >30. A dummy variable is added to include people with missing information on this variable (around 8%).

¹⁴ The relatively low value of the alpha index is mainly due to the fact that only two items are included in its computation.

The dependent variable, however, is not always observed. Rather, the dependent variable for observation j is observed if the condition stated by the selection equation holds:

$$z_{1j} + u_{2j} > 0$$

where:

$$\begin{aligned} u_1 &\sim N(0; \sigma) \\ u_2 &\sim N(0; 1) \\ \text{corr}(u_1; u_2) &= \rho \end{aligned}$$

When $\rho \neq 0$ standard regression techniques applied to the first equation yield biased results. Heckman selection models provides consistent, asymptotically efficient estimates for all the parameters in such models. In the present application maximum likelihood method is used to estimate such models (StataCorp 2010). In order to avoid that the identification of the model relies only on distributional assumptions, two variables are included in the selection equation but not in the wage equation: mother educational level and the proportion of unemployed graduates in the area of residence.

In order to assess the contributions of different variables to the sex differentials in wage the Blinder-Oaxaca decomposition is applied (Blinder 1973; Oaxaca 1973). This method divides group differentials into a part that is explained by group differences in productivity characteristics and in a part that cannot be explained by these variables, usually referred as ‘discrimination’ or ‘wage structure’. In this work males (M) and females (F) identify the two separate groups, log monthly wage is the dependent variable (Y), and several variables indicating human capital, employment characteristics, working hours and work-family conciliation aspects are predictors. The question is how much of the mean outcome difference:

$$R = E(Y_M) - E(Y_F)$$

where $E(Y)$ denotes the expected value of the outcome variable, is accounted for by group differences in the predictors. Several decomposition techniques can be applied. Following suggestions by Jann (2008), in this work two specifications have been used. The first one is the ‘three-fold’ decomposition, in which the outcome difference is divided into three parts:

$$R = E + C + I$$

where

$$E = [E(X_M) - E(X_F)]' B_F$$

$$C = E(X_F)' (B_M - B_F)$$

$$I = [E(X_M) - E(X_F)]' (B_M - B_F)$$

The first summand amounts to the part of the differential that is due to group differences in the predictors (the “endowments effect”), the second component measures the contribution of differences in the coefficients (including differences in the intercept), whereas the third summand is an interaction term accounting for the fact that differences in endowments and coefficients exist

simultaneously between the two groups.¹⁵ The second decomposition is the ‘two-fold’ decomposition:

$$R = Q + U$$

where

$$Q = [E(X_M) - E(X_F)]' B^*$$

$$U = E(X_M)' (B_M - B^*) + E(X_F)' (B^* - B_F)$$

The first term Q is the part of the outcome differential that is explained by group differences in the predictors and the second term U is the ‘unexplained’ part. The latter is usually attributed to discrimination, but it also captures all potential effects of differences in unobserved variables.

5. Research results

Descriptives

In table 3, descriptive statistics according to gender are presented. They are useful because a given variable can be a relevant mediator of the gender wage gap only if it is distributed unevenly across males and females and if it substantially affects graduates’ wages. There is a sensible sex difference in the log gross monthly wages, with men that outperform women, even if the overall gap is not dramatic. Among human capital factors the most striking difference is found in field of study: the average degree of feminization of field of study attended by women is more the 16 percentage points higher than the males’ one. There are no significant differences in university final grades, while males have slightly higher self-perceived skills in ICT and language, and a stronger innovation attitude.

Looking at employment characteristics after graduation, women have experienced unemployment relatively more often than men and they also have a slightly lower degree of supervision and responsibility on the job. In line with previous research, females are to some extent more likely to have a term-time contract (5 percentage points) and to be in an lower-paid occupation. Descriptive statistics indicate a strong occupational segregation: men are more present in the industry sector and in tertiary services to firms and people, whereas females in the educational, health and social work sectors. Five years after graduation 57% of women works in a public or non-profit organization, whereas 62% of men is employed in a private firm.

Men are also more likely to work for a big firm, but the gender difference does not exceed 4-5 percentage points. Looking at the conciliation aspects, women live with a partner more often than men (65.5% vs 60.5%), but there are no major differences in the average number of children. In line with existing research on household work division, even among graduates there is a sex gap in time devoted to family obligations. Those who declare a negligible effort in family or child care activities in the last month are 73% among men and 63% among women. Females also have twice men’s probabilities of spending more than 30 hours in the last month for such activities.

Looking at preferences and attitudes, the gender gap in career orientation is substantially low, even if statistically significant, whereas women attribute more importance than men to have a secure job

¹⁵ The decomposition is formulated here from the viewpoint of females. The same decomposition can be easily rearranged to weight the group differences by the coefficient of the first group (males). See Jann (2008) for more details.

and to family and leisure activities. At the end, in line with previous research findings, there is a strong gender gap in weekly working hours, with women that on average spend less time on the job than men.

Table 2 - Descriptives statistics

Variable	All	Males	Females	Variable	All	Males	Females
Log monthly wage	7.692	7.843	7.578	Firm:			
Female	0.571	0.000	1.000	medium/large	0.678	0.702	0.659
Course level	0.557	0.583	0.537	Firm: small	0.253	0.246	0.257
Field feminization	0.592	0.495	0.665	Firm: missing	0.070	0.051	0.084
Job training	0.154	0.163	0.147	Work hours: 0-29	0.081	0.036	0.114
Grades: Low	0.269	0.278	0.262	Work hours: 30-29	0.253	0.172	0.314
Grades: Medium	0.355	0.340	0.366	Work hours: >=40	0.666	0.793	0.571
Grades: High	0.376	0.382	0.371	Live alone/friends	0.259	0.267	0.254
ICT skills	5.839	6.072	5.665	Live with partner	0.634	0.605	0.655
Foreign language	4.368	4.514	4.259	Live with parents	0.107	0.128	0.091
Innovation skills	5.359	5.436	5.301	N. of children	0.350	0.367	0.337
Age	30.2	30.6	29.9	Family care: No	0.675	0.732	0.633
Age squared	919.9	945.4	900.8	Family care: 1-30	0.148	0.158	0.140
				Family care: >30	0.082	0.040	0.114
N. of unemployment	0.500	0.424	0.556	Family care:			
Supervision	0.357	0.413	0.316	missing	0.095	0.070	0.113
Responsibility	3.272	3.311	3.242	Career importance	3.622	3.658	3.596
				Family importance	4.050	3.909	4.157
Permanent contract	0.715	0.729	0.704	Secure job			
Fixed-time contract	0.176	0.151	0.196	importance	4.234	4.084	4.346
Self-employed/other	0.109	0.120	0.100	Austria	0.083	0.093	0.076
Occupational wage	13.280	13.473	13.135	Belgium	0.113	0.113	0.113
Job-field fit	0.142	0.130	0.152	Czech Republic	0.092	0.099	0.087
Industry	0.217	0.289	0.163	Germany	0.095	0.119	0.078
Tertiary: services to firms/people	0.280	0.344	0.232	Spain	0.087	0.076	0.096
Tertiary: Public administration	0.081	0.076	0.084	Finland	0.093	0.089	0.096
Tertiary: Education	0.171	0.119	0.210	France	0.088	0.068	0.103
Tertiary: Health & social work	0.216	0.127	0.283	Italy	0.066	0.074	0.059
Primary	0.035	0.044	0.028	Netherlands	0.097	0.093	0.100
Public firm	0.478	0.358	0.569	Norway	0.099	0.090	0.106
Private firm	0.496	0.621	0.402	United Kingdom	0.086	0.085	0.087
Other/missing	0.026	0.021	0.029				

The gender wage gap in Europe

We examine now whether and to what extent graduates' characteristics affect their monthly wage. using OLS regression and Heckman models. For each estimation three models have been estimated: the first one has been estimated on the whole sample, the second includes only men and the third only females.¹⁶ The overall finding is that even if the ρ parameter indicating the correlation among the errors of the two equations is statistical significant, the results from the OLS and Heckman models do not differ much. For simplicity, we comment main findings from the former estimations. Most of the variables have a significant effect on log monthly wages. Looking at the whole sample, we see that having a master degree and having attended additional training after graduation increase

¹⁶ Detailed results are available from the author upon request.

wages, while the degree of feminization of field of study is associated with a lower wage. Among skills variable the only one with a significant effect is ‘foreign language skills’.

Among occupational-related indicators, experience has an important role: age increases wage, while unemployment after graduation reduces it. There is a penalization for term-time contracts and self-employment, while there is a wage premium for job-field fit. Graduates who work in a private firm earn more than those in the public sector, while those employed in the educational sector are penalized compared to those in the industry and in the other tertiary services. As expected, working hours have a strong positive effect on wages, being the single most important predictor among those considered here.

Looking at work-family conciliation, time devoted to family and child care, importance attributed to have a secure job, attachment to family and leisure time all have a negative effect on monthly wage. Individuals who live with a partner are better paid than those who live alone, while having children does not matter, all else being equal. The separate models for men and women indicate some differences in the coefficients, suggesting that:

- university grades are positively associated with wage only among women;
- the penalization for self-employment and job-field mismatch is stronger among women;
- the wage premium for being employed in a private firm is stronger for men;
- time devoted to family and child care has a negative effect only for women;
- the penalization associated with preferences towards a secure job and family/leisure time is stronger among men.

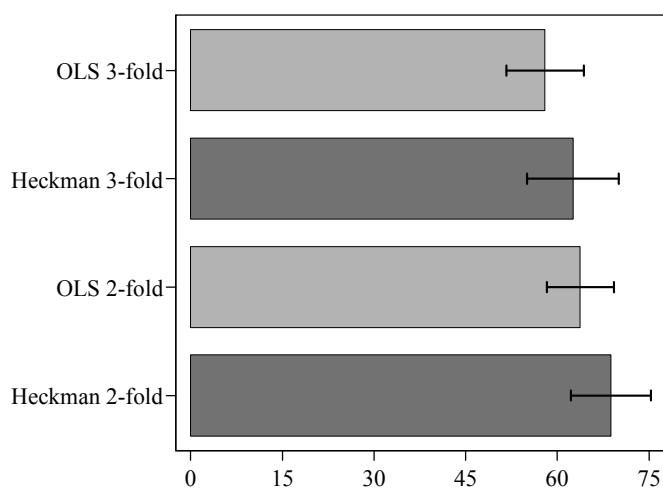


Figure 1 – Explained part (%) of the gender gap in gross monthly wage (endowment effects)

On the basis of these models we are able to decompose the gender gap in log monthly wage. As described above, we have estimated four models in order to check the sensitivity of the results to different estimation methods. The first and the second implement the three-way decomposition, while the third and the fourth models apply the two-fold decomposition. Each decomposition has been performed after an OLS linear regression and an Heckman selection model. The main results of this exercise are presented in figure 1, in which the part of the gender gap explained by observed endowments is plotted.

The analysis conducted on the overall sample indicates the existence of a sensible sex difference in wages: in relative terms women’s average monthly wage is about 78% that of men. The two-fold decomposition analysis performed after standard OLS regression model indicates that all the variables account for about 64% (confidence interval: 58-69%) of the wage gap among European graduates. The decomposition after selection model suggests a slightly higher proportion of the wage gap accounted for, about 69% (confidence interval: 62-75%).

We are now able to explore the results of the detailed decomposition analysis, in order to identify which variables are more important in accounting for the sex wage gap among recent European graduates. Since the main results using different techniques are similar, we comment those from the two-fold decomposition after the OLS regression, which divides the gender gap in an explained part due to endowments and a residual unexplained part (table 3).

Table 3 - Decomposition analysis: point estimates, standard error, p-values and % of the total gender wage gap explained

	OLS REGRESSION				HECKMAN SELECTION MODEL			
	Estimate	S.E.	p-value	%	Estimate	S.E.	p-value	%
Country	0.004	0.004	0.332	1.4	0.002	0.004	0.603	0.8
1) HUMAN CAPITAL								
Course level	0.005	0.001	0.000	1.8	0.005	0.001	0.000	1.9
Field of study	0.019	0.004	0.000	7.2	0.021	0.004	0.000	8.3
Job training	0.001	0.000	0.049	0.2	0.001	0.000	0.062	0.2
Grades	0.000	0.000	0.947	0.0	0.000	0.000	0.694	-0.1
ICT skills	0.000	0.002	0.835	-0.1	0.003	0.001	0.000	1.3
Foreign language	0.003	0.001	0.000	1.3	-0.001	0.002	0.706	-0.3
Innovation skills	-0.002	0.001	0.073	-0.6	-0.002	0.001	0.091	-0.6
<i>Total</i>				9.8				10.8
2) EMPLOYMENT								
Age	0.011	0.002	0.000	4.3	0.012	0.002	0.000	5.0
Unemployment episodes	0.008	0.001	0.000	3.0	0.008	0.001	0.000	3.3
Supervision	0.006	0.001	0.000	2.2	0.006	0.001	0.000	2.3
Responsibility	0.002	0.001	0.002	0.7	0.002	0.001	0.003	0.8
Type of contract	0.004	0.001	0.000	1.4	0.004	0.001	0.000	1.6
Occupational wage	0.010	0.001	0.000	3.8	0.010	0.001	0.000	4.1
Job-field fit	0.002	0.001	0.001	0.8	0.002	0.001	0.001	0.9
Sector	0.008	0.004	0.024	3.0	0.008	0.004	0.039	3.1
Type of rganization	0.015	0.003	0.000	5.8	0.015	0.003	0.000	6.0
Firm size	0.003	0.001	0.003	1.3	0.003	0.001	0.004	1.4
<i>Total</i>				26.5				28.5
3) CONCILIATION								
Cohabitation	-0.005	0.001	0.000	-2.0	-0.005	0.001	0.000	-2.0
N. of children	0.000	0.000	0.741	0.0	0.000	0.000	0.599	0.1
Family care	0.008	0.002	0.000	3.2	0.009	0.002	0.000	3.7
Career importance	0.004	0.001	0.000	1.4	0.004	0.001	0.000	1.6
Secure job importance	0.005	0.002	0.001	2.0	0.005	0.002	0.002	2.1
Family importance	0.005	0.002	0.006	1.8	0.005	0.002	0.012	1.8
<i>Total</i>				6.5				7.3
4) WORKING HOURS								
	0.052	0.003	0.000	19.7	0.053	0.003	0.000	21.3

The most relevant endowments are occupational-related variables (26.5%), followed by working hours (20%), human capital (10%) and family-work conciliation (6.5%). It is interesting to note that within these broad conceptual domains, the relative contribution of the single variables is rather heterogeneous. Among human capital the most important variable is field of study. All else being constant, if women' distribution of field of specialization changed to be similar to that of men, the wage gap would be reduced by about 7%. Course level and foreign language skills account for the remaining 3% of the explained part, while other factors do not play a relevant role. All employment variables instead give a statistically significant contribution to the wage gap. The most important aspects are proxies of experience, which account for 7%, and occupational/sector segregation, which explains another 7%. Type of organization (public versus private) accounts for 6%, whereas

responsibility and supervision role on the job account only for 3%. Among work-family conciliation factors, preferences have the relative stronger role (5%), followed by time devoted to family and child care activities (3%). On the contrary, number of children does not matter and having a partner has a negative contribution. This means that if women had the same distribution of men's partnership, the gender gap in wages would be slightly higher than it actually is. As expected, the single most important factor explaining the wage difference is working hours. This is in line with the fact that females spend sensibly less hours at work than men and that working hours is the best single predictor of graduates' monthly wage.

Differentiation across countries

Since now we have analysed the contribution of several factors to the gender wage gap among the overall sample of European graduates. Even if these results give a useful overall picture, they neglect differences across countries, which are likely to be far from negligible. In fact European societies differ in several characteristics of their labour force, institutional arrangements, and social policies. In this section, we aim to: 1) identify whether there is a differentiation in the magnitude of the female disadvantage in pay and where this penalization is stronger; 2) estimate the contribution of human capital, employment, working hours and work-family conciliation characteristics to the gender wage gap; 3) identify whether the relative contribution of these specific endowments varies across countries.

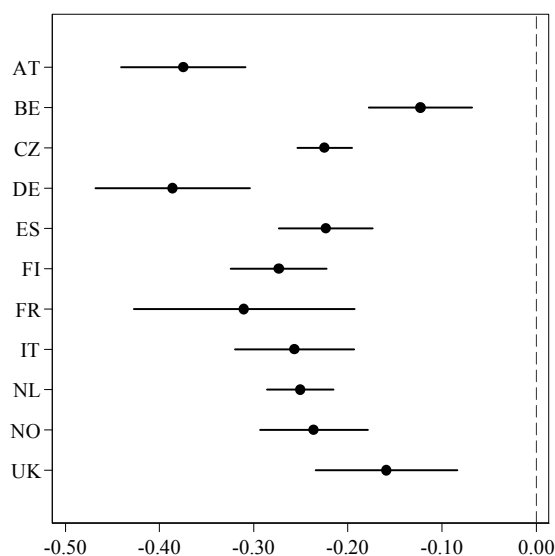


Figure 2 - Raw gender gap in log-gross monthly wage

Figure 2 shows the estimates of the raw gender gap in log gross monthly wage across countries with 95% confidence intervals, estimated by an OLS regression. Austria and Germany are characterized by the stronger gender difference: here women's wage is around 62-67% that of men. In Austria, Spain and Finland the gender gap is relatively lower, but still rather high: women's wage is approximately 75% that of men. The gender gap in pay is a little bit lower in the Netherlands, Czech Republic and Italy, while it is at the lowest level in United Kingdom and Belgium, where women's average wage is more than 90% that of men.

We are now interested in estimating the contribution of endowments to the wage gap across European countries. Figure 3 reports the results of the two-fold decomposition of the gender gap estimated after OLS linear regression (all countries) and after Heckman selection models (only for those countries in which there is a significant self-selection into employment).

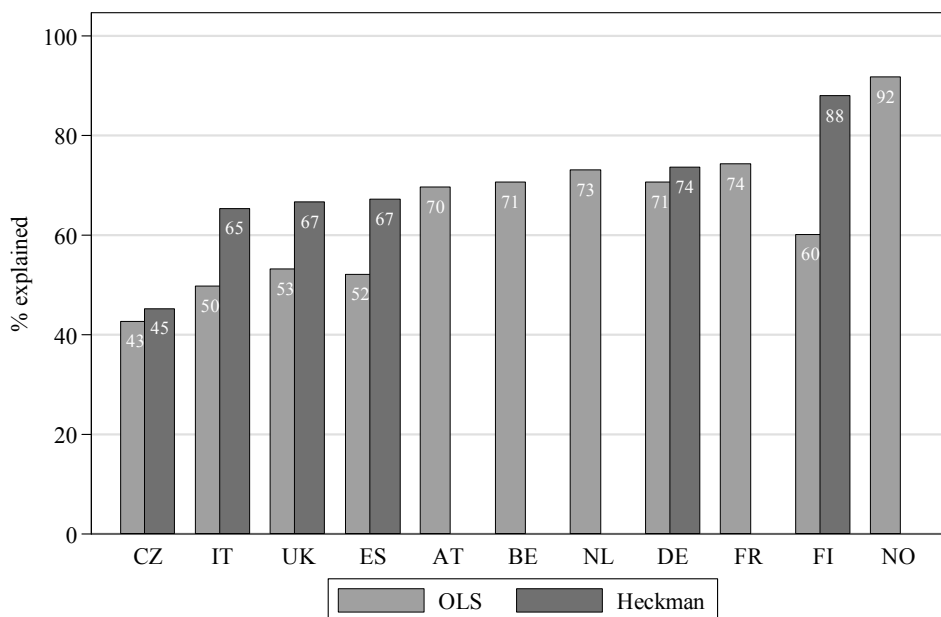


Figure 3 - Percentage of the gender gap in log-gross monthly wage explained by the variables included in the analysis: estimates based on OLS regression and Heckman selection models (when there is a significant self-selection into employment).

From a methodological point of view, it is interesting to note that accounting for selection considerably increases the proportion of the wage explained by our variables (Germany and Czech Republic are the only exceptions). The main substantial result is that there is a clear order of countries as the explained part of the gender gap is concerned. The highest proportion of the sex wage gap is found in Nordic countries (around 90%), followed by countries in Continental Europe (70-75%) and Southern Europe (65-67%). In the last position there is Czech Republic, where the high number of variables included in the analysis is not able to explain more than 45% of the gender gap. United Kingdom is collocated close to Southern European countries if we look at the proportion of the gap explained by endowments, but – as we have seen above – this country exhibits a slightly lower overall gender difference in wages.

Figure 4 shows the relative contribution of human capital, occupation, working hours and work-family conciliation factors to the estimated gap.¹⁷ Human capital factors have a negative impact in Czech Republic, meaning that if women and men had the same educational patterns and skills, the gender gap would be higher than it actually is. The contribution of education and skills to the sex wage gap is negligible in United Kingdom, Germany and Austria, while it is higher in Norway (19%) and France (27%).

¹⁷ These estimates are calculated after selection models when available, otherwise after OLS linear regressions.

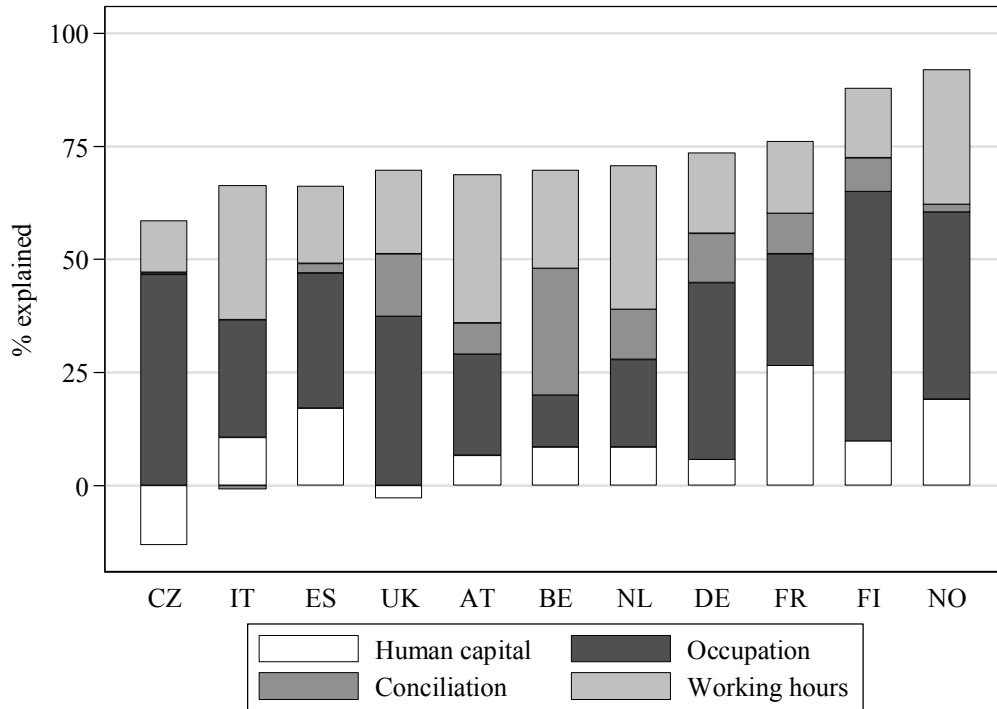


Figure 4 - Percentage of the gender gap in log-gross monthly wage (in \$, adjusted for PPP) explained by human capital, occupation characteristics, family-work conciliation factors and working hours.(pertinent model).

The contribution of the occupational-related endowments is higher in the Nordic countries, Czech Republic and Germany (more than 40%), followed by Southern European societies and the remaining Continental European countries. There is a less clear ordering looking at the role of working hours. In Czech Republic this variable plays a minor role (11%), because other occupational-related characteristics are more important. In Austria, Netherlands, Norway and Italy working hours account for about 30% of the gender wage gap, whereas in the remaining countries its contribution is around 15-22%. There is large cross-country variability in the weight of the work-family conciliation factors. Once controlled for working hours, their importance is negligible in Southern Europe, Czech Republic and Norway and it is comprised between 7% and 14% in the other countries, with the exception of Belgium, which can be considered as an outlier for its extremely large value.

Macro institutional correlates of the gender wage gap

The last step of the analysis consists in relating the gender gap and the part of the gender gap that is not explainable by endowments (residual discrimination) to several macro institutional characteristics, that have been suggested by the literature as potential correlates of these phenomena. As Arulampalam et al. (2007, p. 176) argued, ‘while clearly with just eleven observations we cannot hope to provide a conclusive test of the impact of different institutions on the gender pay gap, we are able to provide some interesting correlations between summary measures of various important institutions and our observed gender pay gaps’.

The first set of macro variables considered includes trade union density, collective bargaining institutions, the degree of coordination and centralization of wage bargaining. According to the existing literature, these characteristics may have opposite effects on gender inequality in labour market. Arulampalam et al. (2007) suggest that while these institutions might not have direct effects

on gender gap in pay, they may have indirect negative effects. For example, trade unions may be less likely to represent women interests because they may perceive them as less attached to the work force. A different perspective suggests that a high degree of trade union density and centralisation of industrial relations are often associated with more standardization of wages, which in turn is likely to restrain gender differences in wages (Rosenfeld and Kallerberg 1991; Blau and Kahn 2003; Whitehouse 1992).

Several authors suggested that globalization or internationalization could have an impact on women's pay and on the sex wage gaps, but with contrasting predictions (Oostendorp 2009). On one hand, according to the neoclassical theory increasing competitive pressures make more costly for individuals and firms to discriminate (Becker 1971). On the other hand, globalization could weaken the bargaining power of workers, especially female workers if they are disproportionately employed in sectors increasingly competing on the basis of 'cheap' labour (Seguino 2005). Given the fact that our focus is on graduates, which often are employed in skilled jobs, the first mechanism should prevail.

The last type of institutional indicators are gender-specific policies, consisting mainly in equal employment opportunity and anti-discriminatory laws, parental leave provision and formal child care policies. Given the fact that almost all European Union countries has passed the first type of laws (Blau and Kahn 2003), we focus on the provision of welfare allowances to workers in order to improve their ability to conciliate work and family obligations. As suggested by several scholars, the impact of family leave is unclear *a priori*. On the one hand, such policies may increase the relative earnings of women by promoting the preservation of their ties to particular firms and hence rising the incentives of employers and women workers to invest in firm-specific training. On the other hand, the existence of such policies could increase the incidence or duration of temporary labour force withdrawals among women, raising the gender gap for the affected group. Further, the incremental costs associated with mandated leave policies may increase employers' incentives to discriminate against women in hiring or to discount their wages (Blau and Kahn 2003, p. 111).

Table 4 - Macro indicators of institutional characteristics

VARIABLE	DEFINITION	SOURCE
Union	Trade union density (2000)	Oecd (2004), chapter 3
Bargaining	Collective bargaining coverage (2000)	Oecd (2004), chapter 3
Centralization	Centralisation of wage-setting institutions (1995-2000)	Oecd (2004), chapter 3
Coordination	Coordination of wage-setting institutions (1995-2000)	Oecd (2004), chapter 3
Internationalization	Proportion of graduates working in an international-oriented firm (2005)	REFLEX
Welfare	Index of welfare policy (2005). Synthesis of: 1) n. of fully paid weeks of maternity leave; 2) % children (age 0-6) in publicly funded child care; 3) public welfare sector as share of total	Mandel and Semyonov (2006)

Formal child care policies may have a positive effect on women's relative wages, because they are likely to increase women's attachment to firms and, by this way, their investment in the accumulation of firm-specific skills. Moreover, the presence of publicly funded child care enables women to return to work earlier than would otherwise be possible. At the end, it is possible that the gender gap is related to women's broader role in the society and their general empowerment in the labour market. Even fewer studies focused on such variables, they are included in the analysis in an exploratory way.

Macro data are derived from several sources, as listed in table 4. We use four variables that measure the degree of corporatism: trade union density, collective bargaining coverage, centralization and coordination of wage-setting institutions, as provided by OECD. We also use an indicator of internationalization of firms in which graduates are employed as a proxy for globalization. We use a composite index of welfare policy to measure family-friendly policies; this index has been developed by Mandel and Semyonov (2006).

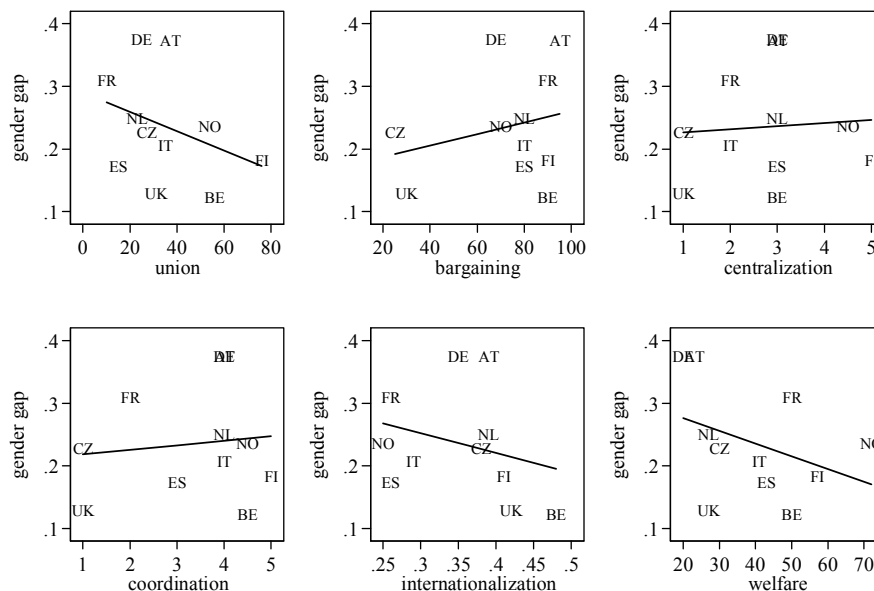


Figure 5 - Relation between several macro variables and the raw gender gap in log gross monthly wage: scatterplot and simple OLS regression.

Figure 5 shows the scatterplots in which macro institutional variables are related to the raw gender gap, while figure 6 shows the relation with the unexplained part of the gender gap. The two dependent variables suggest different mechanisms through institutional factors could affect wage differences across sexes. The first one focuses on the total sex gap, that is likely to be produced by all factors that we have previously examined, like field of specialization, occupational and sector segregation, working hours, or discrimination. The second one instead allows to assess the effect of institutional factors in decreasing or magnifying the average wage difference between men and women with equal human capital and working hours, employed in the same occupation, firm and sector and with the same family obligations and career preferences.

There are contradictory results looking at the wage-setting institutions, because the raw gender gap is negatively correlated with trade union density, it is positively correlated with the extent of bargaining, whereas it is only weakly correlated with centralization and coordination of the wage-setting institutions. Interestingly, all these factors have a strong negative correlation with gender residual discrimination; Pearson's correlation coefficients vary between -0.442 for trade union density to -0.802 for centralization of the wage-setting institutions.

On the contrary, degree of internationalization is negatively correlated with the raw sex wage gap, while it is not related to women's wage discrimination. The index of welfare policy is negatively correlated with both raw gender gap and women discrimination in wages: countries with more child care formal policies, parental leave and a stronger welfare sector (Norway, Finland, Belgium) are those with the lowest level of sex differences in pay among graduates.

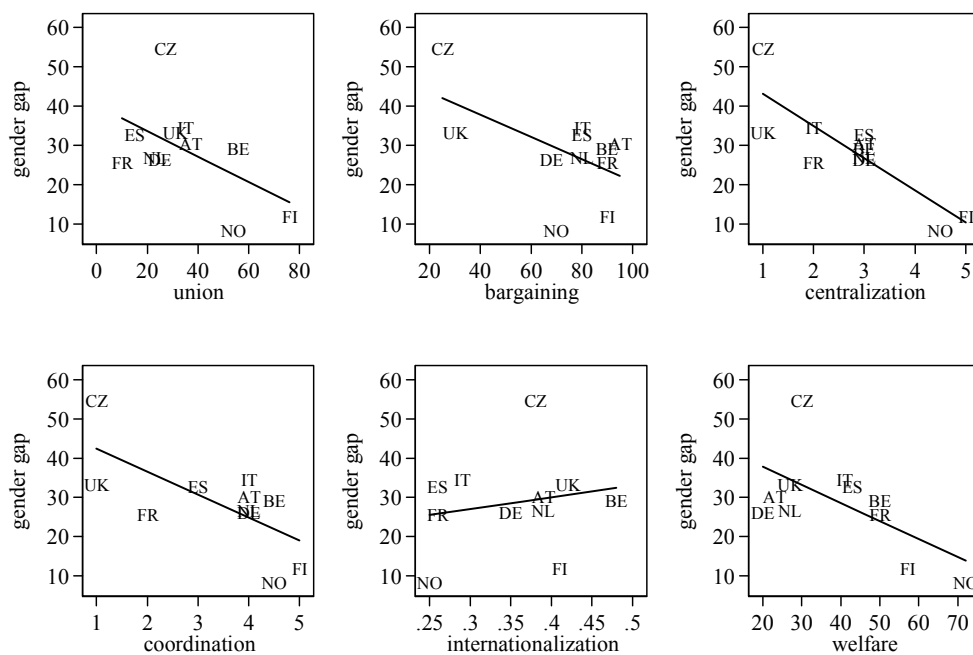


Figure 6 - Relation between several macro variables and the row unexplained gender gap in log gross monthly wage: scatterplot and simple OLS regression.

Additional analyses (available from the author) indicates that not only gender gap, but also the contribution of specific factors to this gap varies according to such institutional features. For example, the role of human capital factor in accounting for the gender wage gap increases as the proportion of graduates in recent cohorts is higher. This finding suggests that with expansion of higher education it is likely that, all else being equal, there will be a growth of differentiation of educational supply on the wage sex gap. There is also a positive relation between the strength of welfare policies and the contribution of conciliation issue to the sex wage gap: as expected, those countries with more family-oriented policies are also those in which the contribution of conciliation aspects to gender inequality is minor.

6. Conclusions

This article tried to place the topic of the gender wage gap into a broader sociological perspective, in three ways. Firstly, it showed that not only 'pure discrimination' in wage - that is, differences between men and women's wages after controlling for productivity characteristics - is relevant to assess to what extent women are disadvantaged in the labour market. From a sociological point of view, it is also important to stress the fact that the accumulation of what economists call 'productivity characteristics' can be strictly linked to processes of social inequalities and individuals' preferences could be affected by relevant social constraints.

Secondly, in order to assess the magnitude of employers' discrimination towards women this work proposed to consider a wider range of factors than those traditionally taken into account. Along the type of educational qualification and the main job features (type, sector, firm, experience), perceived skills, individuals' preferences towards job qualities, and several indicators of family obligations have been investigated. The analyses showed that the raw gender gap is the product of many small disadvantages that females face in several socio-institutional domains, but some seem

more relevant than others. The most important factors explaining differences in monthly wages seems to be working hours and occupational segregation of women in less remunerative occupations, public organizations and in the teaching sector. Field of study has the strongest role among human capital factors, but its contribution is lower than those found by previous research. It is likely that part of the effect of field of specialization in higher education is captured by graduates' occupational sectors. Furthermore, even if differences in preferences matter in most of the countries, they are able to account only for a small part of the wage gap. The additional role of family obligations, net of working hour, is higher in United Kingdom and Continental Europe, while it is lower in Mediterranean societies: this finding is not easy interpretable, but it could be due the larger spreading of voluntary part-time work in the former countries compared to the constrained nature of reduced-hours jobs in Spain and Italy.

Thirdly, the comparative nature of this article allowed to show that the strength of females' penalization in monthly wage is not homogeneous across countries and it varies according to several macro-institutional variables. There is a clear ordering of European countries as far as residual discrimination is concerned: this is higher in Southern Europe, followed by Continental Europe and Nordic countries. Furthermore, as suggested by previous studies, both collective bargaining features and welfare-related policies are associated with a different level of discrimination towards women in the labour market. This work showed that these relations hold also as the subpopulation of tertiary graduates is considered. Countries with a higher trade union density, centralized and coordinated wage-setting institutions, and a well-developed welfare sector are those where women and men with the same type of education, job, preferences and family duties have the closest wages. Thus, wage determination is a process deeply rooted in the institutional context and there is the need of further research in order to understand which combinations of institutional features are better suited the persistence of gender inequality in the labour market, especially in those countries where well-educated women are still at a disadvantage compared to their male colleagues.

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