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Do Higher Wages Make Up For Discrimination ?

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8 October 2009

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Abstract

This paper explores the role of social interactions at the work floor for understanding gender pay differences in the EU. Using data from the Fourth European Working Conditions Survey, we find that sex similarity of subordinate and supervisor decreases the pay disadvantage for women in non-managerial occupations, though working for a female boss is associated with a lower wage than working for a man. This may point at a 'discrimination-for-pay' effect. Female workers can avoid part of the discrimination against them by working for a woman and accepting lower pay. And when they face stronger discrimination in case of a male supervisor, they are 'bribed' by a higher salary. Different results are obtained for managerial workers where sex similarity of worker and superior instead puts women at a further disadvantage. In addition to effects of vertical gender segregation, we examine whether wage formation is influenced by the proportion of women per sector (i.e., horizontal segregation), but we find only weak support for the so-called social bias theory. Our main message is that while the traditional human capital model tends to study the wage formation process in isolation, gender pay differentials can also be seen as a social phenomenon, stemming from social interactions in labour markets

Key words: gender wage gap, discrimination, social interaction, supervision

JEL codes: J31, J71

1. Introduction

Women in EU countries earn on average about 15 percent less than men (European Commission, 2007). Though the precise magnitude of discrimination is hard to identify, we should realize that the potential costs of gender pay differences are substantial, in particular the costs associated with underutilization of human resources in the economy. For example, as a reaction to the gender pay gap, women may decide to supply less labor, they may invest less in human capital or they could be discouraged in their career development.

There is a large literature on gender pay differences. Economists who study the gender pay gap typically use human capital theory and estimate versions of the Mincerian wage equation with a gender dummy, controlling for differences in individual characteristics of workers. In this tradition part of the gender pay gap has been attributed to, for example, differences in work experience. Indeed, female employees are on average somewhat younger than male workers (e.g., because women exit the labor market earlier) and for a given age, women typically have less work experience because of career interruptions (e.g., due to maternity leave) (Hunt and von Restorff, 2004). In addition to differences in endowments (such as educational attainment or work experience), gender pay differences may arise because of differences in the returns to these endowments, for example, when women have lower returns to education than men. The latter effects correspond to the unexplained part in the well-known Blinder-Oaxaca decomposition (e.g., Beblo et al., 2003).

It seems however unnatural to study the phenomenon of the gender pay gap by studying only workers in isolation, thereby ignoring potentially important social interactions. Sociologists typically stress the role of networks for understanding gender pay differences. For example, according to social network theory (or social bias theory), gender pay differentials diminish as the ratio of females to males in an occupation increases (Cohen and Huffman, 2007; Anderson et al., 2007). Such group interactions can take place at various hierarchical levels. First, the gender composition of non-managerial workers may influence wage formation. It is found that wage levels are substantially lower in predominantly female professions (Macpherson and Hirsch, 1995). Second, pay levels may be affected by the sex of superiors. Here the question is what happens to the status of a subordinate group when some of its members attain positions from which they are able to reduce gender inequality (Cohen and Huffman, 2007). In addition to these group dynamics, direct interactions between superior and subordinate of (dis)similar sex may influence wage formation processes (Hultin and Szulkin, 2003). The present paper examines the role of both direct and group interactions in explaining wage formation, combining insights from sociology and the labor economics literature.

The contribution of the present study is twofold. First, we make use of a large representative and rich data set (Fourth European Working Conditions Survey) covering residents of 31 countries[1]. Hultin and Szulkin (1999) have emphasized the importance of replicating research on the gender wage gap within an international context. With a few exceptions (Arulampalam et al., 2007), existing studies focus on one particular country or region, even though it can be expected that there are cross-country differences (Rubery et al., 2005; Beblo et al., 2003). Next to these country effects, we are able to control for a large range of individual, organizational and occupational characteristics often associated with the wage formation

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[1] This includes the EU25, two (at the moment of data collection) acceding countries (Bulgaria and Romania), two candidate countries (Croatia and Turkey) plus Norway and Switzerland.

process. Second, we focus on the role of direct interactions between supervisor and subordinate within organizations. In doing so, we distinguish between different hierarchical levels, including both non-managerial and managerial workers. To our knowledge only one other study has examined such direct interactions within the specific context of Germany (Hunt and von Restorff, 2004)[2]. Recently, Cohen and Huffman (2007) have investigated the impact of the representation of women in management on wage formation in certain industries, but they did not link workers and managers in their actual work setting. According to Hunt and von Restorff (2004) there has been limited attention for the role of the direct supervisor in explaining the gender wage gap because most data sets do not include information on the characteristics of supervisors. Our data set not only allows for the identification of supervisors and their characteristics, it also enables us to link supervisors to individual workers within the same organization.

The remainder of this paper is structured as follows. Section 2 summarizes and discusses the literature on the gender wage gap, focusing on the role of social interactions in labor markets. In Section 3 we describe the data and outline our empirical methodology. In Section 4 the results are presented and Section 5 discusses some extensions and robustness checks. Section 6 concludes.

2. Explaining the Gender Pay Gap

There are several recurring themes in the explanation of gender differences in wages. Most well-known and widely accepted is the human capital perspective, where lower female wages are linked with differences in acquired qualifications (Becker, 1985; Mincer, 1974). Other supply side factors that are said to depress women's wages relative to those of men include a lower number of working hours, career interruptions, less labor market experience, a different educational background (Ostroff and Atwater, 2003) and lower negotiation skills (Babcock and Laschever, 2003)[3].

The occupational segregation in the labor market likely plays an important role in the wage formation process. In terms of *horizontal* segregation, differences in the characteristics of so-called 'female'and 'male' jobs account for, at least part of, the wage differences. Several studies show that a greater share of women in a job, organization or top management tends to depress wages of both female and male employees (Huffman and Velasco, 1997; Pfeffer and Davis-Blake, 1987; England et al., 1988; Tomaskovic-Dewey, 1995). Gattiker and Cohen (1997) find that, even in female dominated occupations, men make more money than women. They refer to this phenomenon as within-job discrimination[4]. Given a certain level and type of knowledge and skills, women may select themselves into lower-paid jobs because of their preference for work environments with supportive and team-oriented rather than competitive and outcome-oriented cultures (Niederle and Vesterlund, 2007), the latter of which are often related with higher performance and rewards (Mueller and Plug, 2004). An alternative explanation would be the presence of evaluative discrimination (Hultin and Szulkin, 1999), where the work of women is valued less, thereby lowering the value of the work of individuals within female-dominated organizations or jobs (Ostroff and Atwater, 2003). Here it is not the sex of the worker per se, but rather stereotypes and roles attributed to women and

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[2] Hunt and von Restorff (2004) use data from the German Qualification and Career Survey, 1998-1999 wave. This survey provides information on the sex of the respondent's immediate supervisor.

[3] In the latter respect it has been argued that women are more cooperative in bargaining than men (Walters et al., 1998).

[4] Hultin and Szulkin (1999) distinguish between three different types of discrimination that are relevant for understanding the gender wage gap: allocative, evaluative and within-job discrimination.

men that explain performance ratings and pay. Especially in case of information asymmetry, managers may rely upon gender stereotypes and base (expected) productivity on group membership (Holzer and Neumark, 2000).

In terms of *vertical* segregation, we see that women are still underrepresented at higher hierarchical levels within organizations, referred to as the glass ceiling effect or allocative discrimination (Hultin and Szulkin, 1999). Vertical segregation may *directly* affect the wages of women who occupy a certain position and have problems climbing the 'organizational ladder', but it may also *indirectly* affect the wages of other female employees who lack (access to) female superiors who can represent their interests. According to Hultin and Szulkin (2003), individual wages are to some extent determined by the interaction between supervisors and subordinates.

Sex similarity may strengthen the social ties between female managers and female subordinates (Hultin and Szulkin, 2003). According to Brewer and Kramer (1985) individuals tend to discriminate in favor of their own 'category'. This means that female managers have a tendency to positively evaluate the performance of female workers. Indeed, gender *dis*similarity between supervisors and subordinates has been negatively associated with supervisor performance ratings (Tsui and O'Reilly, 1989). The hypothesis that gender pay gaps are smaller when female employees have female managers is based on the managerial power assumption. According to this assumption, female managers should not only be willing, but also able to act autonomously in their own interest or in that of their female workers (Cohen and Huffman, 2007). Women are often less central in the network than men and may therefore receive less support for their arguments and requests for resources (Hultin and Szulkin, 1999). Several studies show that a greater representation of women at higher levels of the organization narrows the gender wage gap (Hultin and Szulkin, 1999; Shenkav and Haberfeld, 1992). Cohen and Huffman (2007) find that this 'narrowing' effect is larger if women occupy relatively high-status positions. They conclude that the mere representation of women in management is not sufficient for achieving equality in pay, but that it is also dependent upon the hierarchical position of female managers.

In the present study we examine the effect of the direct relation between subordinates and supervisors of (dis)similar sex and wages of female and male workers. The focus on the role of the direct boss or supervisor is in line with the assumption that gender wage gaps are more affected by the sex of close supervisors than that of more hierarchically distant managers (Hultin and Szulkin, 2003; Hunt and von Restorff, 2004)[5]. Similarly, Cohen and Huffman (2007, p. 685) argue that studies investigating the effects of supervisors on wages of subordinates should be designed in a way that workers and supervisors are as closely linked as possible[6]. The European Working Conditions Survey offers the opportunity to link managers and workers at the organizational level.

3. Data and Method

The data of the Fourth European Working Conditions Survey (EWCS) are collected by the European Foundation for the Improvement of Living and Working Conditions and contain detailed background information on individual workers. The statistical population includes all persons aged 15 or over, who are either employed or self-employed, and whose country of

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[5] This finding of Hultin and Szulkin (2003) is based on an analysis including only blue-collar workers.
[6] Note that Cohen and Huffman (2007) were not able to link managers and workers within a particular organization but link gender wage inequality in local industries to the proportion of female managers in such industries.

residence is one of the EU or Acceding, Candidate and EEA countries. The target number of interviews was 1,000 in each country, with the exception of the smaller countries where the target was 600 interviews (Estonia, Cyprus, Slovenia, Malta, Luxembourg) [7]. As we are interested in wage formation in employment relationships, we exclude the self-employed from our analysis.

The starting point of the analysis is essentially an extension of the Mincer approach in empirical labor economics (cf. Mincer, 1974). In the Mincer equations, the logarithm of the wage of a worker is explained from the worker's educational attainment and labor market experience, as well as several background characteristics such as gender, type of labor contract (e.g., full-time or part-time, fixed term or tenure), and sector of economic activity.

The dependent variable is the income of the employee. In the EWCS, income data are retrieved by asking respondents to report their usual monthly earnings from their main paid job as a position on a 10-point scale corresponding to the 10 income deciles in each country[8]. Because the dependent variable is an ordinal variable, we use an ordered logit model to estimate the Mincer regressions. The general form of the ordered logit model is:

(1) $\text{logit}(w_i) = X_i\beta + \varepsilon_i$

where $w_i = 1$ if the respondent's income is in the first income decile, $w_i = 2$ if the respondent's income is in the second income decile, etc. X is a vector of explanatory variables, discussed hereafter.

Group interactions are studied by including the proportion of women in a particular sector (based on NACE classification) and at a particular occupational level (based on ISCO classification). Table 1a reports the proportion of female employees per sector and Table 1b shows the fraction of female employees per occupation level. These proportions all apply to the EU level[9].

Table 1a: Proportion of female employees per sector (NACE)

	Non-managerial workers		Managerial workers	
	Fraction female workers	Fraction female supervisors	Fraction female managers	Fraction female supervisors
Agriculture and fishing	0.37	0.16	0.28	0.15
Manufacture and mining	0.42	0.20	0.26	0.11
Electricity, gas and water supply	0.29	0.16	0.19	0.08
Construction	0.14	0.05	0.13	0.04
Wholesale and retail trade	0.59	0.29	0.48	0.23

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[7] The sampling procedure is described in a report of the European Foundation for the Improvement of Living and Working Conditions (2007). Country studies on gender pay gaps using national census data often have much more observations, and therefore may yield more precise estimates. The obvious advantage of the EWCS is that it is an international survey, making the results comparable across countries.

[8] Note that this is a limitation of our study, because ideally we would use hourly wages as the dependent variable.

[9] In the remainder of the analysis we have calculated these proportions per country.

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Hotels and restaurants	0.65	0.27	0.48	0.20
Transport and communication	0.34	0.19	0.30	0.13
Financial intermediation	0.61	0.30	0.30	0.15
Real estate	0.55	0.26	0.30	0.15
Public administration and defence	0.51	0.30	0.37	0.19
Education and health	0.79	0.58	0.71	0.50

Note: Own calculations based on the fourth European Working Conditions Survey.

Table 1b: Proportion of female employees per occupation level (ISCO)

	Non-managerial workers		Managerial workers	
	Fraction female workers	Fraction female supervisors	Fraction female managers	Fraction female supervisors
Legislators, senior officials and managers	0.48	0.26	0.36	0.16
Professionals	0.65	0.43	0.44	0.26
Technicians and associate professionals	0.66	0.44	0.49	0.30
Clerks	0.74	0.34	0.56	0.24
Service workers and shop and market sales workers	0.66	0.41	0.46	0.26
Skilled agricultural and fishery workers	0.39	0.18	0.21	0.11
Craft and related trades workers	0.22	0.13	0.12	0.05
Plant and machine operators and assemblers	0.24	0.15	0.14	0.09
Elementary occupations	0.56	0.31	0.39	0.25
Armed forces	0.10	0.03	0.05	0.03

Note: Own calculations based on the fourth European Working Conditions Survey.

The results in Table 1a show that predominantly female sectors for non-managerial workers include wholesale and retail trade, hotels and restaurants, financial intermediation, and education and health. Construction is a sector where men are prevalent. The second column shows the proportion of women among the supervisors of non-managerial workers[10]. In all sectors the fraction of female supervisors is lower than the fraction of female workers. The highest proportion of female supervisors is found in education and health, where female supervisors even outnumber male supervisors. It should be noted though that almost 80 percent of non-managerial workers in this sector is female. Hence, the pool of talent from which supervisors are selected is predominantly female. The fraction of female managers per sector is reported in the third column. We see that the proportion of female managers is somewhat higher than the fraction of female supervisors. This can be attributed to the fact that not all managers have a supervisory role (e.g., account managers). The final column shows the proportion of women among the supervisors of managerial workers, which gives an indication of the representation of women in senior management positions.

Table 1b shows the representation of women across occupational levels. Predominantly female occupations for non-managerial workers include professionals, technicians and associate professionals, clerks and service workers, and shop and market sales workers. The female representation among managerial workers is in general lower than in the case of non-managerial workers, but the allocation across sectors is roughly comparable. Relatively low proportions of women are found among craft and related trades workers as well as in plant and machine operators and assemblers.

Table 2 presents the share of workers with female supervisors by sex and hierarchical level (non-managerial versus managerial). Only a small percentage of the male workers has a female supervisor: this applies to 12 percent of the non-managerial workers and 9 percent of the managerial workers. Women in non-managerial positions are almost equally likely to have a female or male boss, while women in management more often have a male boss.

Table 2: Share of workers with female supervisors, by sex and hierarchical level

	Non-managerial workers		Managerial workers	
	Men	Women	Men	Women
Supervisor male	88.0%	51.3%	91.0%	59.8%
Supervisor female	12.0%	48.7%	9.0%	40.2%
Observations	6,113	7,271	1,548	998

Note: Own calculations based on the fourth European Working Conditions Survey.

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[10] These numbers are calculated on the basis of the question: "Is your immediate boss a man or a woman?".

Because managerial power of the superiors will depend on their level in the hierarchy, we will investigate direct interactions between subordinate and superior for non-managerial and managerial workers separately. Superiors in the latter group are often more senior. For the group of managerial workers, we distinguish between supervisors who supervise more than 10 workers and those who supervise less than 10 workers.

In addition to the share of women per sector and occupation and the sex of the immediate superior[11], we include a range of control variables in the analysis. These are factors that are often taken into account in the labor economics literature. An overview and description of these variables is provided in Table 3. We include schooling dummy variables based on the ISCED classification. Training is included as a dummy based on the question whether the employee has undergone some form of training, paid by the employer, in the past 12 months. We also take into account the extent to which a worker's human capital is used effectively. To that end, we include an over-schooling dummy with value '1' for individuals who have the skills to cope with more demanding duties and '0' otherwise. Similarly, we include a dummy capturing under-schooling with value '1' for employees who need further training to cope well with their duties and '0' otherwise. We include linear and squared variables for labor market experience and firm experience to control for possible concavity in the relationship between experience and earnings. We distinguish between workers with different labor contracts, i.e., tenured workers, workers with a fixed term contract, workers from employment agencies, and interns. As the income data refer to monthly earnings, we discriminate between full-time and part-time workers and include the number of hours worked per week. The combination of work and private life is captured by a dummy with value '1' if there are no difficulties combining these responsibilities and '0' otherwise[12]. Wage formation processes may be affected by the size of the firm. To take into account potential firm size effects, we include dummies capturing seven different size classes. We also include a private sector dummy. Finally, we include country, sector (NACE) and occupation (ISCO) dummies.

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[11] Unfortunately, we only have information on the gender of the immediate supervisor. Other relevant background information on the supervisor (such as wage, age, educational background etc.) is not available.

[12] This is based on the question: "In general, do your working hours fit in with your family or social commitments outside work very well, well, not very well or not at all well?". The dummy equals one if the answer is "very well" or "well". The EWCS also contains data on household composition (partner and children). We did not include these data in our baseline model as this would seriously reduce the number of observations available for the regression analysis. A sensitivity analysis shows that our results would not change when we would include household composition in the analysis.

Table 3: Variable descriptions

Name of variable	Description
Income	Monthly earnings on 10-point scale corresponding with the 10 income deciles in each country
%FemWorkers_NACE	Proportion of female workers per sector and country
%FemSupervisors_NACE	Proportion of female supervisors per sector and country
%FemWorkers_ISCO	Proportion of female workers per occupation level and country
%FemSupervisors_ISCO	Proportion of female supervisors per occupation level and country
Female	Sex of the worker (1=female)
FemaleBoss	Sex of the supervisor (1=female)
Supervise>10	Dummy variable with value '1' if respondent supervises more than 10 people
Training	Did the employee have some form of training over the past 12 months? (1=yes) [a]
Schooling (ISCED codes)	
No schooling	Pre-primary education
ISCED1	Primary education
ISCED2	Lower secondary education
ISCED3	Upper secondary education
ISCED4	Post-secondary non-tertiary education
ISCED5	First level tertiary education
ISCED6	Advanced level tertiary education
OverSchool	Dummy with value '1' if respondent has the skills to cope with more demanding duties
UnderSchool	Dummy with value '1' if respondent needs further training to cope with his/her duties
LaborExperience	Number of years in paid employment since finishing full-time education
FirmExperience	Number of years in this company or organization
Indefinite	Dummy with value '1' if respondent has a permanent contract
FixedTerm	Dummy with value '1' if respondent has a fixed term contract
EmplAgency	Dummy with value '1' if respondent has a contract through an employment agency
Intern	Dummy with value '1' if respondent takes part in an apprenticeship or training scheme
Parttime	Dummy with value '1' if respondent works part-time
Hours	Number of hours worked per week in main paid job
Combi	Dummy with value '1' if respondent feels that working hours fit in with family or social commitments outside work
Private	Dummy with value '1' if individual works in the private sector, and value '0' for all other sectors (i.e., public sector, private-public organization, non-for-profit sector)
FirmSize	Seven dummies per size class: 2-4; 5-9; 10-49; 50-99; 100-249; 250-499; over 500 employees
Sector (NACE codes)	
NACE1	Agriculture and fishing
NACE2	Manufacturing and mining
NACE3	Electricity, gas and water supply
NACE4	Construction
NACE5	Wholesale and retail trade
NACE6	Hotels and restaurants
NACE7	Transport and communication

		NACE8	Financial intermediation
		NACE9	Real estate
		NACE10	Public administration and defence
		NACE11	Education and health

Occupation (ISCO codes)	Ten dummies: managers; professionals; technicians & associated professionals; clerical support workers; service and sales workers; skilled agricultural, forestry and fishery workers; craft and related trades workers; plant and machine operators & assemblers; elementary occupations; armed forces occupations

[a] This includes on-the-job training (by co-workers and supervisors), on-site training and learning (e.g., self-learning, on-line tutorials) and other forms mentioned by the respondent.

Table 4 shows that, on average, employees with a female supervisor earn lower monthly incomes. This holds for workers in both non-managerial and managerial positions. Our findings are in line with those of Hunt and von Restorff (2004) who find that, after controlling for relevant background characteristics, subordinates of female supervisors earn less than the subordinates of male supervisors in Germany. In addition, Ostroff and Atwater (2003) find that having one or more female supervisors is related to lower pay for managers (US data). Our results show that these findings also hold in an international setting. The characteristics of workers appear to differ with the sex of the supervisor. By and large, employees working for a female supervisor (as compared to a male supervisor) are better educated, participate more in training, have somewhat less work and firm experience, are less likely to work in the private sector, and are more often part-time employed and work less hours per week.

Table 4: Characteristics of workers by sex of the supervisor

	Non-managerial workers		Managerial workers	
	Supervisor male	Supervisor female	Supervisor male	Supervisor female
Monthly income	5.69	4.86	7.58	6.50
Fraction female workers in sector	0.49	0.66	0.34	0.57
Fraction female supervisors in sector	0.26	0.45	0.16	0.42
Fraction female workers in occupation level	0.49	0.65	0.36	0.51
Fraction female supervisors in occupation level	0.28	0.41	0.17	0.35
No schooling	0.01	0.00	0.00	0.00
ISCED1	0.07	0.03	0.04	0.01
ISCED2	0.14	0.10	0.09	0.07
ISCED3	0.45	0.40	0.34	0.27
ISCED4	0.11	0.14	0.14	0.18
ISCED5	0.21	0.31	0.34	0.41
ISCED6	0.02	0.02	0.06	0.05
Training	0.32	0.40	0.51	0.57
Underschooling	0.12	0.14	0.14	0.16

Overschooling	0.33	0.32	0.35	0.33
Labor market Experience	18.44	17.98	21.06	20.17
Firm experience	9.46	9.42	12.39	12.24
Fixed term contract	0.11	0.13	0.06	0.07
Employment agency	0.01	0.01	0.00	0.01
Intern	0.01	0.01	0.00	0.00
Part-time	0.12	0.20	0.06	0.13
Combination work and private life	0.81	0.82	0.78	0.80
Hours	39.25	36.38	42.44	38.86
Private sector	0.66	0.42	0.66	0.44
Supervise>10			0.30	0.28
Observations	9,110	4,274	2,006	540

Note: Own calculations based on the fourth European Working Conditions Survey.

Table 5 presents a further decomposition by sex to find out whether the characteristics of female and male workers are related to the sex of the supervisor. Table 5 highlights important income differences across the various combinations. Male workers who work for a male boss have the highest monthly incomes (their expected income decile is 6.24 for non-managerial workers and 7.94 for managerial workers). Women who work for a male supervisor earn less, but more than they would earn if they would work for a female superior. Men also earn lower incomes when they are working for a woman, but more than women who work for a female boss. These differences are striking and hold for both managerial and non-managerial workers. Inspection of background characteristics reveals some interesting facts. Compared to men, women with male supervisors more frequently have a first level tertiary education degree (ISCED5). Reversely, 38 percent of the men with female supervisors have a first level university degree, compared to 29 percent of the women. For managerial workers these percentages amount to 49 and 39 percent, respectively. Access to training for men and women is relatively similar. Women are more likely to work part-time than men, and both men and women work more often part-time when their superior is female.

Table 5: Characteristics of workers by sex of the supervisor, by sex of the workers, and by hierarchical level

| | Non-managerial workers | | | | Managerial workers | | | |
| | Supervisor male | | Supervisor female | | Supervisor male | | Supervisor female | |
	Men	Women	Men	Women	Men	Women	Men	Women
Monthly income	6.24	4.90	5.99	4.62	7.94	6.74	7.86	6.03
Fraction female workers in sector	0.42	0.59	0.59	0.68	0.27	0.51	0.41	0.62
Fraction female supervisors in sector	0.21	0.32	0.40	0.46	0.13	0.22	0.37	0.44
Fraction female workers in occupation level	0.40	0.63	0.56	0.67	0.30	0.50	0.39	0.56
Fraction female supervisors in occupation level	0.23	0.34	0.37	0.42	0.15	0.22	0.32	0.36
No schooling	0.01	0.01	0.01	0.00	0.00	0.00	0	0.00
ISCED1	0.08	0.05	0.05	0.03	0.04	0.03	0.01	0.01
ISCED2	0.17	0.10	0.09	0.11	0.09	0.07	0.06	0.07
ISCED3	0.47	0.42	0.32	0.41	0.35	0.32	0.25	0.28
ISCED4	0.09	0.12	0.11	0.14	0.13	0.14	0.12	0.20
ISCED5	0.17	0.28	0.38	0.29	0.32	0.39	0.49	0.39
ISCED6	0.02	0.02	0.04	0.01	0.06	0.05	0.06	0.05
Training	0.31	0.33	0.41	0.40	0.51	0.51	0.55	0.58
Underschooling	0.12	0.12	0.15	0.13	0.14	0.13	0.16	0.16
Overschooling	0.33	0.33	0.34	0.31	0.35	0.33	0.35	0.33
Labor market Experience	19.20	17.34	17.87	18.00	21.65	19.67	20.44	20.08
Firm experience	9.74	9.05	9.77	9.34	12.84	11.35	11.72	12.42
Fixed term contract	0.11	0.12	0.12	0.13	0.06	0.07	0.07	0.07
Employment agency	0.01	0.01	0.02	0.01	0.00	0.01	0.01	0.00
Intern	0.01	0.01	0.01	0.01	0.00	0	0	0.00
Part-time	0.05	0.21	0.10	0.23	0.03	0.12	0.05	0.15
Combination work and private life	0.79	0.83	0.83	0.82	0.77	0.79	0.73	0.82
Hours	41.28	36.32	38.40	35.96	43.71	39.47	41.95	37.79
Private sector	0.71	0.59	0.46	0.41	0.69	0.57	0.53	0.41
Supervise>10					0.32	0.26	0.37	0.25
Observations	5,382	3,728	731	3,543	1,409	597	139	401

Note: Own calculations based on the fourth European Working Conditions Survey.

4. Results

To investigate the extent to which the observed income differences (in Tables 4 and 5) are attributable to worker characteristics, we estimate individual monthly incomes while controlling for differences in characteristics across workers. Table 6 presents the results of the ordered logit estimations of Equation (1) for non-managerial workers, i.e., workers who have no supervisory role[13]. Estimates are presented for the total sample (first column) as well as for men and women separately (second and third column, respectively). For ease of presentation and interpretation, the coefficients of the control variables are not reported in Table 6. The signs and order of magnitudes of these coefficients are as expected[14].

Table 6: Impact of group and direct interactions for wage formation for non-managerial workers in the EU, ordered logit estimations

	Total	Male	Female
NACE proportion of female workers	-0.409**	-0.388	-0.247
	(0.187)	(0.258)	(0.284)
ISCO proportion of female workers	-0.605***	-0.600***	-0.512**
	(0.148)	(0.215)	(0.217)
Female employee	-1.076***		
	(0.045)		
Female superior	-0.571***	-0.467***	-0.209***
	(0.079)	(0.081)	(0.045)
Female employee × female superior	0.375***		
	(0.088)		
Observations	13,384	6,113	7,271
Pseudo R squared	0.16	0.14	0.17
Log pseudolikelihood	-25707.8	-11917.4	-13649.9

Note: Robust standard errors (corrected for clustering of observations within countries) are in parentheses. *, **, *** denote statistical significance at 10%-, 5%, and 1%-level. A set of control variables as described in the main text is included.

The first row of Table 6 shows that 'female' sectors (NACE sectors with a large proportion of female workers) pay less, though a statistically significant coefficient (at 5%-level) is only found for the total sample[15]. The second row shows that 'female' occupations (ISCO

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[13] We also estimated an ordered probit model. The results of the probit and logit estimations of Equation (1) are quite similar.

[14] The results for the control variables are available from the authors upon request.

[15] We did not include the proportion of female workers and the proportion of female superiors in the regression model at the same time because the results could be affected by correlations between the two variables. Indeed, these correlations appear to be rather high: amounting to 0.70 and 0.85 for managerial and non-managerial workers, respectively. To inspect the possible influence of multicollinearity, we ran the regressions including both the proportion of female workers and the proportion of female superiors. We again find a significant negative influence of the fraction of female workers, but a significant positive effect of the fraction of female superiors. The latter result is driven by the earlier mentioned correlations. When including only the proportion of female superiors, no significant relationship is found. We proceed by including only the representation of female

occupations with a stronger representation of female workers) pay less. The latter result holds when the regression model is estimated for male and female workers separately. The third row presents the 'classical' gender effect (for the total sample), showing that, even when controlling for differences in background characteristics, women earn substantially lower wages than men. The estimated coefficient shows that the gender pay gap is approximately a full income decile.

The fourth row shows the role of the supervisor's sex. A strong negative income effect is found for employees with a female supervisor. This holds for the total group, as well as for men and women separately. We can only speculate about the reasons behind this effect. Are female supervisors less successful in mobilizing resources within the company, thereby lowering individual and team productivity (Hunt and von Restorff, 2004)? Are they more junior than male bosses? Are female bosses themselves confronted with gender pay discrimination, forcing them to pay less to their subordinates to protect the wage premium for managerial tasks? Or are they simply stingier? We will leave this issue for future work, though below we will present evidence that female managers are also at a pay disadvantage.

Interestingly, the negative effect of having a female boss on wages is smaller for women than for men. This is confirmed by the positive interaction effect of sex of the employee with sex of the supervisor in the fifth row. This effect tells us that the wages of men 'suffer' more from having a female supervisor than women's wages. This confirms the discrimination hypothesis, but also reveals another interesting issue. Female workers seem confronted with a trade-off. If they work for a male boss, they will receive a higher wage, but they have to accept a larger gender pay gap. If they work for a female boss, gender discrimination is smaller but they are offered a lower salary. This trade-off can be seen as a 'discrimination-for-pay' effect where female workers can avoid part of the discrimination against them by working for a woman and accepting lower pay. And when they face stronger discrimination in the situation of a male supervisor, they are 'bribed' by a higher salary. In other words, higher wages come at a price. There may however be other clarifications. For example, an alternative, yet provocative, explanation would be that women have less negotiating power in the wage bargaining process with a male supervisor, as their outside option (working for a female boss) puts them at a disadvantage.

The results for managerial workers (who supervise at least one other worker), reported in Table 7, are different from those for non-managerial workers. Managerial wages are not systematically related to the proportion of females per sector or occupation. Again, we find lower wages for women, though the coefficient is somewhat smaller than for the group of non-managerial employees. Remarkably, only female managers with a female superior earn less. We do not find a negative income effect for male managers with a female supervisor. The interaction term of sex of the employee with sex of the superior is negative. For some reason, female managers with a female superior seem to be at a double disadvantage in terms of pay. This may be a reflection of the so-called 'queen bee' effect, where women feel threatened by other women who have ambitions to climb the organizational ladder and may obstruct their progress. Obviously, this is speculation, and we should be careful in drawing conclusions from this analysis, in particular since the sample sizes are much smaller for the group of managerial workers.

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workers, leaving the representation of women in management and its influence on wage formation processes for further research.

Table 7: Impact of group and direct interactions for wage formation for managerial workers in the EU, ordered logit estimations

	Total	Male	Female
NACE proportion of female workers	0.011	-0.032	-0.056
	(0.261)	(0.389)	(0.458)
ISCO proportion of female workers	-0.160	0.062	-0.576
	(0.256)	(0.363)	(0.432)
Female employee	-0.965***		
	(0.110)		
Female superior	-0.108	-0.065	-0.509***
	(0.181)	(0.191)	(0.136)
Female employee × female superior	-0.376*		
	(0.214)		
Observations	2,546	1,548	998
Pseudo R squared	0.18	0.16	0.19
Log pseudolikelihood	-4353.9	-2471.6	-1815.0

Note: Robust standard errors (corrected for clustering of observations within countries) are in parentheses. *, **, *** denote statistical significance at 10%-, 5%, and 1%-level. A set of control variables as described in the main text is included.

5. Extensions

The basic analysis as presented in the previous section can be extended in various ways. We do this to study the robustness of our findings, and to inspect in more detail some of the mechanisms at work. In this section we present the results from various sensitivity checks and we discuss the outcomes of the direct social interactions between subordinate and immediate supervisor in greater detail.

First, we investigate whether discriminatory practices are related to firm size. Wages tend to increase with firm size (even after controlling for important observed characteristics of workers). What happens to the gender pay gap when firm size increases? We do not have an a priori expectation of the sign of this relationship. On the one hand, it may be argued that social ties are stronger in small firms than in larger companies, possibly leading to less discriminatory practices within small organisations. In addition, career prospects are often more limited in smaller firms, which may reduce the desire to discriminate against a specific group to promote ones' own career. Careers can be seen as tournaments in which performance is assessed relative to that of others (Lazear and Rosen, 1981) and 'ego bashing' is sometimes used in battles for dominance (Bénabou and Tirole, 2003). On the other hand, public accountability and corporate social responsibility policies may be more widespread in larger firms, which may limit discriminatory practices. To empirically investigate the role of firm size in the wage setting process, we have estimated our model for firms with 2-49 employees and firms with 50 or more employees, separately. Results for non-managerial and managerial workers are shown in Tables 8 and 9, respectively. For non-managerial workers, the results are relatively similar for firms with less than 50 employees and those with 50 and more employees. This suggests that the aforementioned mechanisms are very weak, or that they cancel out. Because we have only a few firms with 500+ employees and the category 'firms with 50 or more employees' contains mainly SMEs, the presented sensitivity check largely

compares small firms with medium-sized companies. Nevertheless, firm size does not appear to explain pay differences of non-managerial workers. Results for managerial workers are presented in Table 9. The key result here is the confirmation of the significantly negative interaction term of female employee with female superior for firms with less than 50 employees. This interaction term is not significant for the larger firms[16].

Table 8: Impact of group and direct interactions for wage formation for non-managerial workers in the EU, ordered logit estimations per firm size class

	Firms with 2-49 employees			Firms with 50 employees and more		
	Total	Male	Female	Total	Male	Female
NACE proportion of female workers	-0.517**	-0.399	-0.501	-0.335	-0.568	0.115
	(0.234)	(0.336)	(0.349)	(0.330)	(0.435)	(0.527)
ISCO proportion of female workers	-0.500***	-0.468*	-0.345	-0.800***	-0.917**	-0.787**
	(0.188)	(0.271)	(0.283)	(0.243)	(0.362)	(0.353)
Female employee	-1.049***			-1.109***		
	(0.058)			(0.072)		
Female superior	-0.575***	-0.449***	-0.219***	-0.524***	-0.439***	-0.231***
	(0.105)	(0.111)	(0.057)	(0.124)	(0.130)	(0.076)
Female employee × female superior	0.393***			0.295**		
	(0.116)			(0.141)		
Observations	8,253	3,564	4,689	5,131	2,549	2,582
Pseudo R squared	0.16	0.13	0.18	0.16	0.14	0.16
Log pseudolikelihood	-15813.4	-7064.3	-8645.0	-9823.0	-4802.4	-4944.8

Note: Robust standard errors (corrected for clustering of observations within countries) are in parentheses. *, **, *** denote statistical significance at 10%-, 5%, and 1%-level. A set of control variables as described in the main text is included.

[16] An alternative strategy would be to run regressions where only some regression coefficients are allowed to vary across different firm size categories. This could be done by creating a dummy variable with value '1' if the company employs less than 50 workers and zero otherwise, and subsequently interacting this dummy with the gender variables (i.e., 'female employee', 'female superior', 'female employee×female superior'). For non-managerial workers these interaction terms are insignificant in all cases (results are not reported), as already expected from the results in Table 8. Also for the managerial workers the interaction terms are insignificant in all cases.

Table 9: Impact of group and direct interactions for wage formation for managerial workers in the EU, ordered logit estimations per firm size class

	Firms with 2-49 employees			Firms with 50 employees and more		
	Total	Male	Female	Total	Male	Female
NACE proportion of female workers	0.195	0.242	-0.144	-0.274	-0.680	0.263
	(0.337)	(0.550)	(0.593)	(0.451)	(0.620)	(0.873)
ISCO proportion of female workers	-0.512	-0.452	-0.592	0.101	0.550	-0.787
	(0.376)	(0.524)	(0.653)	(0.406)	(0.598)	(0.752)
Female employee	-0.997***			-0.843***		
	(0.158)			(0.165)		
Female superior	0.054	0.029	-0.542***	-0.304	-0.139	-0.638***
	(0.290)	(0.306)	(0.182)	(0.260)	(0.278)	(0.237)
Female employee × female superior	-0.572*			-0.309		
	(0.329)			(0.319)		
Observations	1,379	770	609	1,167	778	389
Pseudo R squared	0.17	0.15	0.19	0.20	0.19	0.24
Log pseudolikelihood	-2481.7	-1303.5	-1125.3	-1824.7	-1123.7	-642.2

Note: Robust standard errors (corrected for clustering of observations within countries) are in parentheses. *, **, *** denote statistical significance at 10%-, 5%, and 1%-level. A set of control variables as described in the main text is included.

Second, the organization of labour markets shows large differences within the EU, which may lead to differences in the wage formation process and the gender wage gap across countries. The Nordic model (Denmark, Finland, Sweden and the Netherlands) is commonly considered to exhibit high efficiency and high equity, basically because of relatively flexible hiring and firing regulations combined with generous social insurance schemes. The countries with an Anglo-Saxon model (Ireland and the United Kingdom) are characterized by loose employment protection legislation and a basic level of social security. Countries with the Continental model (Austria, Belgium, France, Germany and Luxembourg) feature relatively strict employment protection and generous welfare systems. Finally, the Mediterranean countries (Greece, Italy, Portugal, Spain) have relatively sober social welfare provisions and strong labour market regulations. Gender pay differences could vary from one labour market model to the other. We study the sensitivity of our findings by re-estimating the results presented in Table 6 and 7 for country groups, confining ourselves to the total sample (i.e., men and women together). Specifically, we present results for the EU15 and the New Member States (NMS), and the former group is further decomposed according to the social model in place. We do this only for the group of non-managerial workers as the number of observations for managerial workers is too small to obtain reliable regression results.

Table 10: Robustness of the results for sub-groups of countries

	Female employee	Female supervisor	Female employee × female supervisor	Observations
Non-managerial workers				
EU15	-1.013***	-0.711***	0.415***	6651
NMS	-1.196***	-0.617***	0.486***	5071
Nordic	-1.060***	-0.659***	0.379*	2290
Anglo-Saxon	-0.950***	-0.198	0.161	784
Continental	-1.022***	-0.737***	0.410	1938
Mediterranean	-1.014***	-0.739***	0.426*	1639
Managerial workers				
EU15	-0.818***	0.105	-0.499	1288
NMS	-1.168***	-0.562*	0.016	831

Note: *, **, *** denote statistical significance at 10%-, 5%, and 1%-level. A set of control variables as described in the main text is included. The Nordic countries are Denmark, Finland, Sweden and the Netherlands. The Anglo-Saxon countries are Ireland and the UK. The Continental countries are Austria, Belgium, France, Germany and Luxembourg. The Mediterranean countries are Greece, Italy, Portugal and Spain.

Results are presented in Table 10. Note that the columns show the effects (in each of the regressions) of female employee, female supervisor, and an interaction term representing the sex (dis)similarity of supervisor and worker, respectively. For non-managerial workers we find a robust negative coefficient for female employees in the wage equation. This effect is about one income decile in each country group. The negative effect of having a female supervisor is found for most country groups, but not in countries with the Anglo-Saxon model[17]. With respect to the interaction effect (female worker × female supervisor) we find that, while the positive effect is confirmed for the EU15 and NMS separately, this effect is less robust when the EU15 countries are further decomposed according to their social models. A positive coefficient (significant at the 10% level) is found for the Nordic and Mediterranean countries, but not for the Anglo-Saxon and Continental countries. Furthermore, we see that employees working for a woman in Continental Europe receive lower wages while gender pay differences are not lower for women with a female superior. Hence, the conjectured 'discrimination-for-pay' effect is not at work in this group of countries. Gender pay differences appear relatively small in the Anglo-Saxon countries, which is consistent with Gary Becker's claim that gender pay gaps should be smaller in more competitive economies (Becker, 1957). For managerial workers the negative wage effect for female employees is confirmed for the EU15 and NMS separately. A negative influence of having a female supervisor on wages is now only found for NMS, whereas the interaction term is insignificant in both cases. This underlines the disclaimer provided in connection with the results presented in Table 7.

A third issue is that of choosing an appropriate group when investigating group interactions. In our analysis we included the proportion of female workers per NACE code (calculated at country level) and per ISCO level (calculated at country level). Cohen and Huffman (2007)

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[17] Note that we only have 784 observations in the Anglo-Saxon country group, and this result should therefore be interpreted with caution.

define the relevant group as the local labour market, for instance at the city level. Although the EWCS includes NUTS 2 data, sample size considerations made us decide to use only national averages for the proportions of females per ISCO and NACE codes.

By examining the influence of sex similarity, we are (perhaps somewhat implicitly) testing for the role of networks. We can explore this issue in more detail by looking at various forms of interaction between employee and supervisor. The EWCS contains some questions that give insight into the frequency and nature of such contacts. Relevant questions include the following: "Did you have a frank discussion with your boss about your work performance?"; "Were you consulted about changes in the organisation of work and/or your working conditions?" and "Did you discuss work-related problems with your boss?". Table 11 shows the fraction of respondents answering "yes" to these questions. The table shows that (i) contacts are more frequent when employees have a female superior, and (ii) for both groups of supervisors (male and female), female workers have somewhat less contact with their boss than male workers: for example, 60 percent of non-managerial male employees with a female superior indicate that they were consulted about organisational change against 55 percent of female employees. For managerial workers these percentages amount to 74 and 70 percent, respectively. To the extent that these questions capture access to (in)formal networks within organisations, we find some support for a gender bias, but further research is needed.

Table 11: Communication intensity between workers and their superiors (% "yes")

	Non-managerial workers				Managerial workers			
	Supervisor male		Supervisor female		Supervisor male		Supervisor female	
	Men	Women	Men	Women	Men	Women	Men	Women
Had a frank discussion with your boss about your work performance	54%	52%	60%	57%	69%	70%	74%	67%
Been consulted about changes in the organisation of work and / or your working conditions?	48%	51%	60%	55%	71%	68%	74%	70%
Discussed work-related problems with your boss?	67%	66%	72%	69%	83%	83%	83%	80%
Observations	5,382	3,728	731	3,543	1,409	597	139	401

6. Conclusion

This paper studies gender pay differentials in the EU. In addition to the factors proposed in the labor economics literature, we draw upon alternative explanations behind gender pay differences. In particular, we examine horizontal segregation effects by taking into account the proportion of females working in a particular sector or occupation level. It would be expected from social bias theory that a larger representation of women would bring down the gender pay gap. Our results provide, at best, only weak evidence in support of the social bias

theory. Secondly, we investigate effects of vertical segregation by looking at direct interactions between worker and supervisor, and whether sex composition in management matters. We find relatively strong effects for subordinate-supervisor interactions. For the group of non-managerial workers evidence points at a 'discrimination-for-pay' effect. While the gender wage gap is smaller when worker and superior are of the same sex, teams working for a female boss receive lower wages. That is, women working for a male boss receive a better wage (as compared to a situation where they would have a female boss), but are confronted with a larger gender pay gap. Thus, sex similarity between worker and boss plays a role in the wage formation process, where female bosses pay lower wages, and female workers seem to face a trade-off between pay levels and the strength of gender discrimination. Note that working for a male or female boss is not necessarily a deliberate choice. Also, (female) workers may simply not be aware of the existence of wage discrimination within the organization, let alone react to it and switch between jobs and managers. However, it is now common knowledge that female jobs pay less and women are still choosing to work in female dominated sectors. But even if workers would be aware of the gender pay gap, this does not mean that they are also willing and able to take on another job. First of all, there may not be similar jobs available within the organization, sector or region (in particular in times of economic adversity) and, secondly, the lower paid jobs may have other advantages that compensate for the lower wage, e.g., female managers are often strong in their social skills and motivating their employees, leading to a pleasant, often non-competitive, work environment.

We should be careful interpreting the results for several reasons. First, though the obvious advantage of the EWCS is that it is an international dataset covering all EU countries as well as the Acceding, Candidate and EEA countries, the number of observations per country is relatively small. Second, the income data are not very precise, as only income deciles are available. Third, we have no information about productivity or other performance indicators that would enable us to further analyze whether salary differences in groups led by male or female supervisors are related to efficiency factors or whether there are other forces at work.

What implications for policy can be drawn from this analysis? The main message is that on top of economic explanations that draw on the human capital literature, we can gain additional insights in the phenomenon of the gender wage gap by drawing upon sociological literature and, more specifically, by focusing on the importance of sex similarity of worker and supervisor in wage setting processes as well as differences in wage outcomes for team members with a male or a female supervisor.

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