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Management Gender Composition and the Gender Pay Gap: Evidence from British Panel Data

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Introduction

There is a persisting gender pay gap on the labor market (Eurostat, 2014; OECD, 2014). While employee and workplace characteristics explain a large share of this gap, a substantial unexplained component of about 13-19% remains (Weichselbaumer and Winter-Ebmer, 2005; Mumford and Smith, 2008)[1]. Next to considering the context of equal treatment laws (Weichselbaumer and Winter-Ebmer, 2007) and labor market institutions (Blau and Kahn, 2003; Bertola, Blau and Kahn, 2007), scholars - and feminist activists alike - have long suggested that women's limited access to organizational power structures offers a partial explanation to the gender gap in earnings (Reskin, 1988; Acker, 1992; Burton, 1991; Hultin and Szulkin, 1999). A basic premise of this argument is that having established a relative advantage in the reward distribution process, men in power will either seek to maintain this advantage, or, at the very least, will not challenge it (Reskin, 1988).

A salient subsequent question, then, is what happens to gender earnings disparities as more women occupy managerial positions. Given that managerial positions enable exerting influence on organizational outcomes and processes (Marini, 1989; Baron, 1991), the presence of female managers might bring about changes in the reward distribution practices. This would mean that beyond the benefits that managerial positions accrue to managers themselves, the effects of the gender composition of management spill over to subordinate positions at the workplace, ultimately decreasing or reversing inequality in non-management.

Despite its apparent societal repercussions, the understudy of this question manifests in two qualities of existing research. First is the scarcity of large-scale studies employing nationally representative samples that address the question, a partial result of the dearth of data matching sufficiently detailed employee and employer information. Second is the lack of empirics attempting to account for the mechanisms through which the gender composition of management affects earnings.

The present study makes three contributions. First, it studies the effect of the gender composition of management on earnings in non-management using nationally representative linked employee-employer panel data. Second, in contrast to research to date, it attempts to empirically examine the mechanisms that may account for the said effect. Third, it demonstrates the potential of previously unutilized data for the study of this question, the Workplace Employee Relations Study (WERS) 2011 (Department for Business, Innovation and Skills, 2013).

Using the two-wave panel component of the WERS 2011, which contains data on workplaces surveyed in 2004 and 2011, I first investigate the effect of management gender composition on

employee earnings with workplace fixed time fixed effects regression models. In subsequent analyses I test for three sets of mechanisms through which management gender composition may affect earnings: (1) by affecting employee performance, (2) irrespective of possible differences in performance, and (3) through institution of policies.

Next to its rich data on workplace practices concerning observability of performance and gender related policies – which enables the study of mechanisms – the WERS has a two-fold potential for addressing endogeneity problems. First, it contains extensive information on employee and workplace characteristics, thereby enabling thorough control for potential confounders. Second, the panel structure of the data allows to further address endogeneity concerns by controlling for time-invariant workplace-level heterogeneity in the estimation of workplace fixed effects regressions.

I find that employees' wages increase as more managers of their own gender are represented in management, and symmetrically, decrease as more managers of the other gender are represented in management. Rather than by affecting employee performance, the results suggest that the gender composition of management affects earnings irrespective of possible changes in performance, either directly or indirectly through the institution of policies.

Gender of the Manager and the Gender Pay Gap: Existing Evidence

To the best knowledge of the author, only six studies to date[2] (Hultin and Szulkin, 1999, 2003, in Sweden; Cohen and Huffman, 2007, in the US; Cardoso and Winter-Ebmer, 2010, in Portugal; Flabbi et al., 2014, in Italy; Gagliarducci and Paserman, 2014, in Germany) have investigated the effect of the gender of managers on the gender gap in earnings.

The majority of evidence concerns only the private sector (Hultin and Szulkin, 2003; Cohen and Huffman, 2007; Cardoso and Winter-Ebmer, 2010; Flabbi et al., 2014), and half of the studies (Hultin and Szulkin, 1999, 2003; Cohen and Huffman, 2007) are cross-sectional. Three related studies (Bertrand and Hallock, 2001; Bell, 2005; Bertrand et al., 2014) study the effect of gender representation in executive ranks, but only on the pay gap among high level executives.

The individual studies are subject to a number of distinct limitations. Hultin and Szulkin (1999), for example, analyze a nationally representative sample of workplaces, but their dataset consists of only one employee per workplace. Cohen and Huffman (2007) treat the industry as unit of analysis in the absence of linked employee-employer data. Hultin and Szulkin (2003) study the gender gap in earnings (women's relative wages) rather than the wages of women and men. In doing so, the study does not show if the pay gap changes due to changes in women's or men's wages, or changes in the wages of both women and men.

In general, and particularly the studies that employ longitudinal data (Cardoso and Winter-Ebmer, 2010; Flabbi et al., 2014; Gagliarducci and Paserman, 2014) - given that the longitudinal datasets largely come from registrar data - do not have at disposal detailed information about organizational practices and policies, thereby being unable to examine the channels through which the gender composition of management affects pay. Consequently, a majority of existing research subscribes to partisan post-hoc explanations, delivering findings open to multiple interpretations.

Why the Gender Composition of Management Affects Wages

The gender gap in earnings at the workplace can be a function of allocative and within-job earnings disparities (England, 1992; Petersen and Morgan, 1995; Hultin and Szulkin, 1999). Allocative pay disparities occur due to limited access to attractive positions (with high wages) of one of the genders, either in terms of promotion or at the time of employment. Within-job earnings disparities exist when one of the genders is paid more than the other for the same job. Managerial gender composition could influence pay through either route, as managers have the potential to influence both sorting and reward processes (Marini, 1989; Baron, 1991).

The theory of homophily (Ibarra, 1992; McPherson, Smith-Lovin, and Cook, 2001; Beckman and Phillips, 2005), or 'homosocial reproduction' (Kanter, 1977), and the similarity attraction paradigm (Byrne, 1971), represent the basis for understanding why the gender composition of management may affect earnings in non-management. Homophily means that individuals tend to prefer and form bonds with other individuals who are similar to them or who belong to the same group or category. Given that gender is an important dimension of categorization and similarity (Brewer and Kramer, 1985; Tsui and Gutek, 1999), individuals prefer other individuals of the same gender. Social networks theory likewise argues that gender similarity between individuals promotes ties within organizations (Hedström, 1999).

In the context of the present question, this means that managers choose to award, promote, or support employees of their own gender group. On the employee side, the presence of managers of their own gender enables access to networks in power, through which employees can gain specific human capital relevant for the job or increase their bargaining power in the reward distribution process (Byrne, 1971; Hedström, 1999). Additionally, managers of the same gender may serve as role models for employees, providing inspiration and motivation that ultimately increases their productive capacities.

Thus, as the share of gender A in management increases, employees of gender A would benefit because they have a wider pool of relevant human capital to draw from, more managers to seek support from and more role models to be inspired by. At the same time, as the share of gender A in management increases, the managerial gender A group increases its relative power to exert its preferences, offer support, or activate its networks (Cardoso and Winter-Ember, 2010). The parallel decrease of the share of gender B in management yields losses for employees of gender B because they have fewer managers to seek support from, and managers of gender B have less power to extend support and exert preferences.

The literature has also put forward competing theories questioning the assumption of gender being the most salient category. When speaking of a relationship between super- and subordinates – as is the case with managers and employees – one strand of this literature contends that status, rather than gender, is the primary category (Young, 1994; Elly, 1995). Managers keep to their own status group, not delivering any benefits beyond those that concern them.

The 'queen bee phenomenon' literature (e.g. Ellemers and van Heuvel, 2004; Derks et al., 2011), which specifically discusses the influence of female managers, further claims that rather than promote, women in management demote subordinate women more so than do male managers. The explanation

behind this phenomenon is that by demoting subordinate women, women in power attempt to fit in with their male counterparts' views – one of them being men's view of women's work as less valuable.

However, empirical support for these competing theoretical caveats is sparse. While the queen bee syndrome has been documented in some experimental studies (e.g. Derks, van Vaar, and Ellemers, 2016), it has not been observed in large scale studies. Studies that deal with the question at hand generally find that in workplaces with larger shares of female managers, the wages of women increase (Hultin and Szulkin, 1999; Cohen and Huffman, 2007; Cardoso and Winter-Ebmer, 2010), while those of men decrease (Cohen and Huffman, 2007; Cardoso and Winter-Ebmer, 2010; Gagliarducci and Paserman, 2014)[3], aligning with the predictions of homophily. In light of the theory and existing evidence, I hypothesize that:

> ● H1: The wages of employees are higher in workplaces with a higher share of managers of their own gender compared to workplaces with a lower share of managers of their own gender.

There are three channels through which the earnings of employees can increase with higher representations of their own gender in management. First, changes in earnings may follow changes in the productive capacities of the employees. Second, changes in earnings may occur irrespective of possible changes in productive capacities of the employees. Finally, the gender composition of management may indirectly affect pay through the institution or amendment of gender-related policies at the workplace.

Performance-related Mechanisms

One way in which the earnings of employees can increase with higher representations of their own gender in management is if through this gender representation in management, they acquire specific human capital needed for the job that increases their productivity and subsequently earnings. This human capital can be acquired through a number of channels: access to networks, personal support from managers (Podolny and Baron, 1997; McPherson, Smith-Lovin, and Cook, 2001), and role modeling (Dasgupta and Asgari, 2004; Wolbrecht and Campbell, 2007).

Since gender, as discussed above, is an important dimension of similarity and forming bonds and preferences, employees would tend to acquire this human capital from managers of their own gender, and managers would (choose to) endow with human capital employees of their own gender. As the share of one gender in management increases, employees of the same gender would have more opportunities to acquire human capital because more managers mean a larger pool of human capital, more support, more role models, and more power on the side of the managers. These benefits translate to parallel disadvantages for the other gender.

Given the data available, it is difficult for the researcher to observe changes in performance of individual employees. At the workplace, however, changes in performance might be observable to employers. If changes in performance are observable, employers reward higher performance with

higher earnings. If changes in performance are not observable – even if they do occur – employers will not be able to increase their employees' earnings.

Thus, if the gender composition of management affects employee earnings through changes in employee performance, the effect of the interaction between the gender composition of management and employee gender on earnings would be stronger in workplaces where differences in performance can be observed. I rest on this argument in assessing the presence of performance-related mechanisms and hypothesize that:

> ● H2a: If the positive effect of the representation of one's gender in management on one's wages is stronger in workplaces where changes in performance are observed, management gender composition affects employee earnings by affecting employee performance.

Non-Performance-related Mechanisms

Changes in earnings can occur at different gender compositions of management irrespective of possible changes in employee performance. This can happen if managers disproportionately award or promote employees, or if employees bargain for higher earnings through networks in management.

Here too, managers form their preferences and employees acquire access to actors in central network positions along gender lines. With the increase of the representation of a gender group in management, this gender group acquires more power to influence organizational outcomes and implement changes as to fit preferences (Cardoso and Winter-Ebmer, 2010). Employees' bargaining power, similarly, becomes larger as more members of their own gender group are represented in management (Hedström, 1999).

Even though this set of mechanisms stipulates that the effect of management gender composition on pay does not happen through changes in employee performance, the disproportionate award, promotion, or bargaining power can still be in line with productive capacities. In this sense, managers awarding employees of their own gender could represent a set-off of previously unmatched pay to performance.

If non-performance-related explanations are at hand, the effect of the interaction between the gender composition of management and employee gender on earnings would be independent of whether differences in performance are observed at the workplace. Thus, I hypothesize that:

> ● H2b: If the positive effect of the representation of one's gender in management on one's wages is independent of whether differences in performance are observed, non-performance-based mechanisms explain the effect of management gender composition on earnings.

Institutional Mechanisms

Finally, the effect could occur indirectly through the institution of policies. Managers, in line with the principle of homophily, could choose to institute, amend, or scrap policies in a way that benefits the employees of their own gender. These policies could include, for example, monitoring of gender

discrimination at the time of recruitment or promotion, or offering financial help with childcare. If institutional explanations are at hand, I expect that:

> ● H2c: If the positive effect of the representation of one's gender in management on one's wages is stronger in workplaces where gender-related policies are present, management gender composition affects employee earnings indirectly, through institutional changes.

Data

I use the two-wave panel data (2004-2011) of the Workplace Employment Relations Study (WERS) from 2011, which contains a nationally representative sample of all workplaces in Britain that have at least 5 employees and participated in the WERS 2004 and WERS 2011. In the initial analyses I also make use of the 2011 cross-section. Workplace-level data is collected from interviews with the most senior managers and employee data is collected through interviews with a maximum of 25 randomly selected employees within each workplace. The panel concerns the workplaces; different employees within workplaces were interviewed in the two waves, but this is not an issue since the main independent variable (management gender composition) is an organizational characteristic.

The initial cross-section consists of 2,680 workplaces and 21,981 employees. The initial panel consists of 989 workplaces, out of which 600 returned at least one employee questionnaire. This yields a panel of 600 workplaces and 15,267 employees, out of which 7,943 took part in 2004, and 7,324 in 2011. The analytical samples were constructed through list-wise deletion of the missing values. Table A1 in the Appendix reports the number of cases lost at each step of constructing the analytical samples. The cross-sectional and panel analytical samples consist of about 60% of the initial samples.

The WERS team advises applying weights when using WERS data because of the complex sampling technique. In this article I report the results from the unweighted analyses. Unless specified otherwise, the unweighted estimations do not differ substantively from the weighted estimations.

Variables

Table 1 and Table 2 show the panel summary statistics and coding of employee-level and workplace-level variables, respectively. The outcome variable is weekly pre-tax employee earnings. The main predictor of interest, management gender composition, is a workplace-level variable. I use a continuous measure of management gender composition, expressed as the percentage of female managers of all managerial employees. There are two sets of controls: employee and workplace variables.

As introduced in the theory section, in absence of direct measures of changes in employee performance, I use a number of workplace-level proxies that measure whether performance is observed at the workplace. Particularly, I use two sets of proxies: (1) nine indicators of whether the workplace keeps performance-related records, including records of productivity and profits, and (2) nine indicators of whether the workplace has performance targets, such as targets for productivity and profits.

In using these indicators, I assume that changes in employee performance can be observed in workplaces that keep records or have performance targets more so than in workplaces that do not do

so. To assess the influence of management gender composition through policies, I use nine workplace-level indicators of the presence of gender-related policies. Table 3 reports on these indicators.

Table 1. Summary Statistics (unweighted) and Coding of Employee-level Variables

Variable	mean	sd	range	N	Description
Wage	339.73	197.85	24–971	8,174	Weekly pre-tax pay, including pay for overtime work and bonuses. Recoded as continuous variable by taking the midpoint of the original categorical variable (14 categories), following the methodological advice of Hout (2004). In the panel the 2011 wages were deflated to 2004 wages.
Female	0.56	0.50	0–1	8,174	Dichotomous variable of employee gender, with male as reference category.
Hours worked	35.00	11.87	0–70	8,174	Continuous measure of usual weekly working hours including overtime, with maximum number of hours limited to 70. This measure is preferred over contractual hours because the wage variable asks for pay including overtime.
Tenure	0.52	0.50	0–1	8,174	Dichotomous variable of employee experience at the workplace, with less than 5 years as reference category.
Training	0.69	0.46	0–1	8,174	Dichotomous variable of receipt of on-the-job training during the past year, with no training as reference category.
Commitment	2.06	2.48	-6–6	8,174	Continuous additive scale of 3 different items measuring organizational commitment and motivation.
Union member	0.43	0.49	0–1	8,174	Dichotomous variable of employee trade union membership, with no trade union membership as reference category.
Age	42.20	11.94	17–72	8,174	Continuous measure of age of employee. Recoded as continuous from the original categorical variable (9 categories) by taking midpoint values. In the analyses square of age is also included to control for non-linear effects of age.
Married	0.69	0.46	0–1	8,174	Dichotomous variable of employee marital status, with not married (single, separated, widowed) as reference category.
Children	0.38	0.49	0–1	8,174	Dichotomous variable indicating presence of any dependent children, with no dependent children as reference category.
Disability	0.12	0.33	0–1	8,174	Dichotomous variable of employee disability status, with no disability affecting daily activities as reference category.
GCSE	0.36	0.48	0–1	8,174	Dichotomous variable indicating GCSE is highest academic qualification, with no academic qualification obtained as reference category.
A-level	0.14	0.34	0–1	8,174	Dichotomous variable indicating A-level is highest academic qualification; no qualification obtained is reference category.
BA or higher	0.30	0.46	0–1	8,174	Dichotomous variable indicating BA or higher is highest academic qualification; no qualification is reference category.
Supervisor	0.28	0.45	0–1	8,174	Dichotomous variable indicating if employee has supervisory responsibilities, with no supervisory responsibilities as reference category.
Non-white	0.07	0.25	0–1	8,174	Dichotomous variable of employee ethnicity, with white as reference category.

Source: WERS 2011, own calculations.

Table 2. Summary Statistics (unweighted) and Coding of Workplace-level Variables

Variable	mean	sd	range	N	Description
Female managers	39.09	32.16	0–100	843	Continuous measure of management gender composition. Female managers as percentage of all managerial employees.
Workplace size	529.62	1,170.97	5–11,566	843	Workplace size operationalized as number of employees. Analyses use natural logarithm transformation to correct for skew.
Female employees	51.83	28.70	0–100	843	Female employees as percentage of all employment.
Share managers	10.07	10.82	0–100	843	Managers as percentage of all employees. Proxy for the level of bureaucratization of the workplace.
Manufacturing	0.14	0.34	0–1	843	Dichotomous variable indicating workplace operates in manufacturing industry sector; other community sector is the reference category for all industry variables.
Electricity	0.01	0.11	0–1	843	Workplace operates in electricity industry sector.
Construction	0.05	0.21	0–1	843	Workplace operates in construction.
Wholesale	0.09	0.29	0–1	843	Workplace operates in wholesale.
Catering	0.02	0.16	0–1	843	Workplace operates in catering.
Transport	0.07	0.26	0–1	843	Workplace operates in transport.
Financial services	0.02	0.14	0–1	843	Workplace operates in financial services.
Other business	0.09	0.29	0–1	843	Workplace operates in other business sectors.
Public	0.10	0.31	0–1	843	Workplace operates in public administration.
Education	0.14	0.34	0–1	843	Workplace operates in education.
Health	0.21	0.40	0–1	843	Workplace operates in health sector.
Public limited	0.18	0.39	0–1	843	Dichotomous variable indicating legal status of workplace is public limited company; other public sector is reference category for all legal status variables.
Private limited	0.28	0.45	0–1	843	Legal status of workplace is private limited company.
Other trading	0.24	0.42	0–1	843	Legal status of workplace is other trading sector.
Government	0.26	0.44	0–1	843	Legal status of workplace is local/central government.
Large organization	0.66	0.47	0–1	843	Size of organization workplace is part of. Dichotomous variable, with less than 250 employees as reference category.
Foreign owned	0.12	0.32	0–1	843	Ownership of organization. Dichotomous variable, with domestic owned as reference category.
Age of workplace	46.21	56.85	0–500	843	Continuous measure of age of workplace. Analyses use natural logarithm transformation to correct for skew.
Monitors recruitment	0.48	0.50	0–1	843	Monitoring of recruitment by gender. Dichotomous variable, absence of monitoring as reference category.
Encourages women	0.17	0.37	0–1	843	Procedures to encourage job applications from women. Dichotomous variable, absence of such procedures as reference category.

Source: WERS 2011, own calculations.

Table 3. Summary Statistics (unweighted) and Coding of Performance observability and Policy Indicators

	mean	sd	range	N	Description
Performance Observability Indicators					
Sales records	0.88	0.32	0–1	843	Workplace keeps records of sales/fees/budget.
Costs records	0.89	0.31	0–1	843	Workplace keeps records of costs.
Profit records	0.62	0.48	0–1	843	Workplace keeps records of profit.
Labour costs records	0.87	0.34	0–1	843	Workplace keeps records of labour costs.
Productivity records	0.63	0.48	0–1	843	Workplace keeps records of productivity.
Quality records	0.73	0.44	0–1	843	Workplace keeps records of quality of product or service.
Turnover records	0.78	0.41	0–1	843	Workplace keeps records of labour turnover.
Absenteeism records	0.92	0.28	0–1	843	Workplace keeps records of absenteeism.
Training records	0.89	0.31	0–1	843	Workplace keeps records of workforce training.
Volume records	0.63	0.48	0–1	843	Workplace has target for volume of goods/services.
Costs target	0.65	0.48	0–1	843	Workplace has target for total costs.
Profits target	0.49	0.50	0–1	843	Workplace has target for profits/ROI.
Labour costs target	0.42	0.49	0–1	843	Workplace has target for unit labour costs.
Productivity target	0.51	0.50	0–1	843	Workplace has target for productivity.
Quality target	0.63	0.48	0–1	843	Workplace has target for quality of product/service.
Turnover target	0.35	0.48	0–1	843	Workplace has target for labour turnover.
Absenteeism target	0.57	0.50	0–1	843	Workplace has target for absenteeism.
Training target	0.43	0.49	0–1	843	Workplace has target for workforce training.
Gender-related Policies Indicators					
Encourage women	0.17	0.37	0–1	843	Workplace has procedures for encouraging job applications from women and women returners.
Opportunities gender	0.94	0.24	0–1	843	Workplace has equal opportunities policy which mentions sex/gender.
Recruitment gender	0.48	0.50	0–1	843	Workplace monitors recruitment/selection by gender.
Recruitment discrimination	0.38	0.49	0–1	843	Workplace reviewed recruitment/selection for indirect discrimination by gender.
Promotion gender	0.23	0.42	0–1	843	Workplace monitors promotion by gender.
Promotion discrimination	0.25	0.43	0–1	843	Workplace reviews promotion for indirect discrimination by gender.
Pay rates gender	0.18	0.39	0–1	843	Workplace reviews relative pay rates by gender.
Childcare	0.40	0.49	0–1	843	Workplace provides financial help with childcare.
Parental leave	0.12	0.32	0–1	843	Workplace provides additional paid parental leave.

Source: WERS 2011, own calculations.
Note: All variables are dichotomous, with the absence of record-keeping, targets, or policy as reference category.

Analytical Strategy

Endogeneity poses challenges of identifying the effect of the gender composition of management on employee pay. Endogeneity could confound the results if unmeasured factors affect both employee pay and the interaction between gender composition of management and employee gender. I employ two main strategies to overcome endogeneity problems: (1) controlling for observable variables, and (2) controlling for unobservable time-invariant heterogeneity using workplace fixed effects.

I control for two sets of observable variables, (1) employee-level variables, i.e., variables that account for ability selection processes, and (2) different characteristics of the workplace. Concerning the first set of control variables, if for example certain workplaces attract and retain female (or male) labor force of especially high quality, these workplaces would (eventually) have high representation of women (or male) among managers, as well as high wages for women (men) in non-managerial positions, due to their high quality. Under this scenario, a positive effect of the proportion of female managers on women's wages, for example, would reflect unmeasured inter-workplace variation in workforce quality. The inclusion of the employee-level controls presented in Table 1 accounts for ability selection bias.

Table 2 lists the workplace-level characteristics that might mediate the effect of management gender composition and employee gender on earnings. Previous research has shown that workplaces managed by men differ systematically from those managed by women. For example, women are more likely to manage smaller workplaces (Bertrand and Hullock, 2001), more bureaucratic workplaces (Cohen and Huffman, 2007), workplaces in the public sector (Cardoso and Winter-Ebmer, 2010) and lower paying industries (Bertrand and Hullock, 2001). At the same time, workplaces managed by women employ relatively many female employees (Hultin and Szulkin, 1999).

Given that employees receive higher earnings in larger workplaces, less bureaucratic sectors, the private sector and high paying industries (Murphy, 1985; Kostiuk, 1990; Rosen, 1992; Hultin and Szulkin, 1999; Bertrand and Hallock, 2001; Cohen and Huffman, 2007; Cardoso and Winter-Ebmer, 2010), and that these are also workplaces where many women work, these variables represent possible confounders. Finally, I control for the *women-friendliness* of the workplace. Women-friendly workplaces are more likely to have both more women in management and pay women higher wages. Controlling for workplace women-friendliness reduces the likelihood that the effect is due to women-friendliness rather than management gender composition.

I test Hypothesis H1 using the 2011 cross-section, running mixed-effects multilevel analyses, and 2004-2011 panel data, using workplace-fixed time-fixed regressions models. Both strategies have benefits and downsides. The cross-sectional design allows including a large number of time-variant and time-invariant variables. Nesting employees in workplaces further enables to model the dependency of employees within workplaces. In doing so, I am able to test for contextual effects: whether the effect of the employee gender on pay varies across different gender compositions of management.

However, the cross-sectional models compare the different workplaces at a single point in time, in 2011, and findings are drawn from whatever fits into this frame. Given this snapshot of workplaces in 2011, the cross-sectional models do not consider what happens before or after the snapshot is taken. In the scenario in which wages of males are high in 2011 at a workplace with a high share of male

managers in 2011, it is not known whether that workplace already had a high share of male managers before 2011, or whether wages of men were already high in 2011, for example. As discussed before, controlling for possible confounders increases the confidence in the estimation. However, cross-sectional analyses do not provide definite information about cause-and-effect relationships.

The panel data employed contains only two waves and arguably, the evidence on the mechanisms is still associational rather than causational. Two waves do not enable observing whether a change in gender composition of management at time *t* was followed by change in gender-related policies at time *t+1* and subsequently changes in earnings at time *t+2.* However, the panel data has more potential than the cross-sectional data because it contains information about both cross-sectional variation and dynamics. Referring back to the scenario of high wages of men in 2011 at a workplace with a high share of male managers in 2011, the two wave panel enables, at the very least, to take into account the gender management composition and pay levels in 2004.

At the same time, having two measures of the same workplace, the panel design has more potential for accounting for unobserved time-invariant workplace-level heterogeneity. Therefore, albeit limited, the panel models are preferred for they are more likely to suggest cause-and-effect relationships. This is important given the nature of the research question aiming to establish a causal effect of the gender composition of management.

I assess the influence of management gender composition on employee pay by (1) modeling a cross-level interaction between employee gender and share of female managers in the cross section, and (2) including an interaction term between the gender of the employee and the share of female managers in the panel models. To examine the channels through which this effect occurs, I add three-way interactions with each of the performance observability and policy indicators to the panel model.

Results

Selection

Table 4 and Table 5 give an insight into the selection problems discussed earlier by presenting mean levels of the employee-level and workplace-level variables at different shares of female managers. Table 4 demonstrates that workforces in workplaces with a higher share of female managers, as opposed to workplaces with a higher share of male managers, receive lower wages, consist of more females, work fewer hours, have less experience on the job, receive more on-the-job training, are more committed to the organization, and are less likely to be members of trade unions and to be married.

Furthermore we observe that the share of employees with at least a Bachelor's degree increases as the share of female managers increases, but only in workplaces where the management is still male-dominated (share of female managers is less than 50 percent). In workplaces with about equal gender composition in management the share of BA or higher educated drops, and further drops as women become the majority in management. Overall, Table 4 demonstrates the need to control for employee-level variables, given that workers generally differ at different management gender compositions.

Table 4. Mean Levels of Employee-level Variables at Different Shares of Female Managers (unweighted)

	Percentage female managers of all managers					
	0%	1-24%	25-49%	50-74%	75-99%	100%
Wage	336	403	357	314	290	236
Female	0.33	0.34	0.58	0.73	0.80	0.88
Hours worked	37	39	35	33	32	30
Tenure	0.56	0.59	0.49	0.50	0.45	0.43
Training	0.58	0.63	0.71	0.75	0.81	0.80
Commitment	1.53	1.85	2.00	2.44	2.26	2.62
Union member	0.47	0.45	0.42	0.42	0.39	0.35
Age	43	42	41	43	44	42
Married	0.72	0.71	0.67	0.68	0.66	0.65
Children	0.38	0.41	0.35	0.39	0.37	0.39
Disability	0.12	0.14	0.11	0.12	0.14	0.11
GCSE	0.40	0.38	0.33	0.32	0.38	0.39
A-level	0.14	0.11	0.16	0.14	0.15	0.13
BA or higher	0.19	0.28	0.36	0.35	0.29	0.23
Supervisor	0.24	0.26	0.28	0.32	0.28	0.29
Non-white	0.07	0.06	0.08	0.06	0.06	0.09

Source: WERS 2011, own calculations. Calculations based on the 8,174 employees in the 2004-2011 workplace panel.

Table 5. Mean Levels of Workplace-level Variables at Different Shares of Female Managers (unweighted)

	Percentage female managers of all managers					
	0%	1-24%	25-49%	50-74%	75-99%	100%
Workplace size	175	802	627	758	314	50
Female employees	30	26	53	70	77	88
Share managers	6	9	9	11	10	7
Manufacturing	0.18	0.40	0.08	0.02	0.02	0.00
Electricity	0.02	0.04	0.01	0.00	0.00	0.00
Construction	0.09	0.09	0.03	0.01	0.00	0.00
Wholesale	0.09	0.06	0.09	0.04	0.06	0.02
Catering	0.02	0.00	0.02	0.03	0.00	0.01
Transport	0.26	0.09	0.03	0.02	0.00	0.00
Financial services	0.00	0.03	0.05	0.00	0.00	0.00
Other business	0.08	0.12	0.08	0.06	0.06	0.03
Public	0.12	0.10	0.23	0.11	0.13	0.08
Education	0.05	0.05	0.21	0.26	0.16	0.23
Health	0.04	0.01	0.10	0.37	0.48	0.56
Public limited	0.22	0.34	0.16	0.04	0.02	0.06
Private limited	0.34	0.36	0.20	0.13	0.26	0.20
Other trading	0.23	0.16	0.21	0.32	0.23	0.33
Government	0.16	0.10	0.36	0.48	0.45	0.41
Large organization	0.75	0.70	0.70	0.70	0.70	0.53
Foreign owned	0.13	0.25	0.10	0.03	0.00	0.00
Age of workplace	51	47	48	58	67	42
Monitors recruitment	0.37	0.48	0.65	0.56	0.61	0.41
Encourages women	0.16	0.19	0.16	0.21	0.26	0.16

Source: WERS 2011, own calculations. Calculations based on the 843 workplaces in the 2004-2011 workplace panel.

Table 5 shows that workplaces dominated by female managers (at least 75%) are of smaller size than those dominated by men (at least 75%) and the share of female employees increases as the share of female managers increases. Furthermore, we observe that female managers are concentrated in some industries such as education and health, and less likely to manage workplaces in business services, wholesale, construction and transport. Moreover, women are more likely to manage workplaces in the public and governmental sectors, while men are more likely to manage workplaces in the private sector. Workplaces that are part of foreign-owned organizations are managed by a male majority. Finally, workplaces with fully male management are least likely to monitor recruitment by gender. Again, these figures suggest a need to control for these workplace-level variables.

Women were more likely to manage workplaces in 2011 than in 2004 (Panel A, Table 6). Panel B of Table 6 shows that of all fully male-dominated workplaces in 2004, only 38% continued having an all-male management in 2011. The majority of workplaces with fully female-dominated management in 2004 (64%) continued having a female-dominated management in 2011.

Table 6. Share Female Managers 2004–2011; Panel A: Main Development; Panel B: 2004-2011 Changes

	Panel A: Main Development					
	Percentage female managers of all managers					
	0%	1-24%	25-49%	50-74%	75-99%	100%
2004	20	22	21	21	4	11
2011	15	20	23	25	4	13
	Panel B: 2004-2011 Changes					
	Percentage female managers of all managers, 2011					
Percentage female managers 2004	0%	1-24%	25-49%	50-74%	75-99%	100%
0%	38	27	21	6	0	8
1-24%	11	58	23	8	0	0
25-49%	10	17	38	32	0	3
50-74%	6	3	17	51	12	12
75-99%	0	0	8	69	15	8
100%	6	0	8	14	8	64

Source: WERS 2011, own calculations. Calculations based on the 843 workplaces in the 2004-2011 workplace panel.

The Effect of Management Gender Composition on the Wages of Women and Men

Table 7 presents the results from the cross-sectional multilevel analysis. The Empty Model (Model 1) suggests that variance within workplaces contributes more to the overall variance in pay than variance between workplaces. About 42% of the total variance in pay is between workplaces. The random intercept model (Model 2) fits the data better than the empty model, indicating that mean pay varies across workplaces. Including the gender of the employee reduces the unexplained between-workplace variance of pay by about 10%, and the within-workforce variance by about 6%. The effect of being female as opposed to male on the wage is negative: weekly, women earn about 92 pounds sterling less than men.

The effect of employee gender on earnings remains significant and negative after adding the employee-level controls (Model 3). Model 4 includes the main predictor of interest, share of female managers. The Log Likelihood Test shows that this model fits the data better than the model without share of female managers. Wages decrease with the increase in share of female managers, as shown in the descriptive findings earlier. After adding the workplace-level controls in Model 5, the effect of the share of female managers on earnings remains negative and significant. Overall, adding additional variables in Model 1 through Model 5 increases the share of explained remaining variance, suggesting that the models build well on each other.

Table 7. Mixed Effects Multilevel Models; Dependent variable: weekly wage

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Female		-91.93***	-54.04***	-50.97***	-49.58***	-48.62***	-59.51***
		(-29.62)	(-21.91)	(-20.42)	(-19.74)	(-12.99)	(-9.83)
Female managers				-0.619***	-0.271**	-0.309***	-0.484***
				(-7.84)	(-2.92)	(-3.74)	(-4.30)
Female x Female managers							0.277*
							(2.29)
Employee-level controls	No	No	Yes	Yes	Yes	Yes	Yes
Workplace-level controls	No	No	No	No	Yes	Yes	Yes
Constant	319.7***	371.6***	-155.3***	-131.1***	-217.4***	-221.2***	-217.5***
	(88.65)	(96.29)	(-11.91)	(-9.77)	(-10.11)	(-11.26)	(-11.04)
Variance components							
Between-workplace	16434.8	14842.87	7644.25	7274.84	4153.53	-	-
Within-workplace	23102.02	21760.57	12997.02	12996.74	12981.3	12513.94	12515.24
Female						4678.65	4659.17
VPC	0.4156	0.4055	0.3703	0.3588	0.2424	-	-
Explained remaining variance							
Between-workplace		9.68%	48.49%	40.27%	42.90%	-	-
Within-workplace		5.80%	40.27%	0.00%	0.11%	3.60%	-0.01%
Random slope of Female							0.41%
Number of employees	13301	13301	13301	13301	13301	13301	13301
Number of workplaces	1570	1570	1570	1570	1570	1570	1570
LR test (Prob)	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0223
AIC	174238.3	173391.7	166383.3	166325.0	165719.5	165868.1	165864.9
BIC	174260.8	173421.7	166525.7	166474.9	166034.3	166190.4	166194.7

t statistics in parentheses
Source: WERS 2011, own calculations.
VPC and between-workplace variance components not estimated for crossed-effects models.
Model 1: Empty Model; Model 2: Random Intercept Model with Gender of Employee;
Model 3: Random Intercept Model with Gender of Employee including Employee-level controls;
Model 4: Random Intercept Model with Gender of Employee including Share of Female Managers and Employee-level controls;
Model 5: Random Intercept Model with Gender of Employee and Share of Female Managers, including Employee- and Workplace-level controls;
Model 6: Random Slope Model of Gender of Employee;
Model 7: Random Slope Model of Gender of Employee including Cross-level Interaction with Share of Female Managers;
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Model 6 adds a random slope of being a female employee. The random slope model does not appear to be an improvement of the random intercept model (Model 5) as indicated by the Log Likelihood Test, suggesting that the effect of being a female employee as opposed to being a male employee on earnings does not vary significantly across workplaces. Interacting employee gender with share of female managers in Model 7 yields an improved model fit.

The interaction is significant and while positive, in combination with the main effect suggests a negative effect of the share of female managers on the wages of both male and female employees. Specifically, with an increase in the share of female managers by 1 percentage point, male wages decrease by 0.484 pound sterling. Females' wages decrease to a lesser extent, by 0.207 pound sterling.

Table 8. Workplace-fixed Time-fixed Effects Models; Dependent variable: weekly wage

	Model 1	Model 2	Model 3
Female	-55.63***	-54.99***	-70.38***
	(-16.71)	(-16.50)	(-13.50)
Female managers	-0.0563	-0.00449	-0.339*
	(-0.46)	(-0.03)	(-2.15)
Female x Female managers			0.468***
			(3.99)
Employee-level controls	Yes	Yes	Yes
Workplace-level controls	No	Yes	Yes
Year	-14.84***	-17.54***	-17.26***
	(-4.73)	(-5.34)	(-5.26)
Constant	-132.70***	-75.92	-64.68
	(-7.22)	(-1.30)	(-1.11)
Number of employees	8174	8174	8174
Number of workplaces	513	513	513
LR test (Prob)		0.0000	0.0000
Adj. R-squared	0.642	0.644	0.644

t statistics in parentheses
Source: WERS 2011, own calculations.
Model 1 controls only for employee-level variables; Model 2 controls for both employee and workplace-level variables;
Model 3 includes an interaction of gender of employee and share of female managers;
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8 reports the results from the workplace-fixed time-fixed effects models. Model 1 includes the gender of the employee, the share of female managers, and the employee-level controls, Model 2 adds the workplace-level controls, and Model 3 adds an interaction term between employee gender and share of female managers. The log-likelihood test and the adjusted R-squared indicate an improvement in model fit from Model 1 through Model 3. Being a female employee has a negative effect on earnings.

Model 3 indicates that the share of female managers has a negative effect on the wages of male employees, and a positive effect on the wages of female employees. An increase in share of female managers by 1 percentage point leads to a decrease in males' weekly wages by 0.339 pound sterling and an increase in females' wages by 0.129 pound sterling. These effects are small in size. A one-*SD* increase in share of female managers is associated with a 0.012-*SD* decrease in the wages of male employees,

and a 0.024-*SD* increase in the wages of female employees[4].

As discussed in the analytical strategy section, the findings from the panel are stronger and hence preferred. The findings from the cross-section suggest that in 2011, workplaces that had a higher share of female managers paid both males and females less, as compared to workplaces with a higher share of male employees. While a substantive number of potential confounders was controlled for, in light of the results from the panel analysis, it seems reasonable to conclude that the results between the two differ because the cross-sectional model fails to control for unobserved workplace heterogeneity.

Given the relative strength of the results from the panel design, indicating that the wages of female employees are higher at higher shares of female managers, and those of male employees are higher at higher shares of male managers, I confirm Hypothesis H1.

Performance and Non-performance-related Mechanisms

If management gender composition affects earnings of employees by affecting employee performance, the effect will be stronger in workplaces where performance differences can be observed (H2a). Alternatively, if the effect is independent of observability of performance, non-performance mechanisms are at hand (H2b). Table 9 and Table 10, respectively, show the results from the workplace fixed regressions including three-way interactions with the nine indicators of whether the workplace keeps performance-related records and whether the workplace has performance targets.

To illustrate these results, I present marginal effects of employee gender (being female) across different shares of female managers for workplaces that do and do not keep performance-related records (Figure 1) and workplaces that do and do not have performance targets (Figure 2). In Figure 1, the red lines represent workplaces that keep performance-related records, and the blue lines represent workplaces that do not keep such records. The average marginal effect of being female (compared to being male) is shown on the y-axis.

I find that being female has a negative effect on earnings in workplaces with an all-male management. This effect is less negative in workplaces that keep records of sales, profit, labor costs, productivity, quality of product, absenteeism and workforce training, and more negative in workplaces that keep records of costs and labor turnover. With the increase of the share of female managers, the effect of being female becomes less negative and at high shares of female managers becomes positive.

Figure 2 shows the same for workplaces that do and do not have performance targets. The marginal effect of being female is negative in all-male management workplaces and becomes less negative as the share of female managers increases. This effect is less negative in workplaces that have performance targets than in those workplaces that do not have performance targets.

However, the increase in the positive effect of share of female managers on women's wages is similar for workplaces that keep performance-related records and have performance targets, and workplaces that do not do so. Apart from records kept of absenteeism, the remaining seventeen three-way interactions are insignificant. This suggests that the effect of the interaction between management gender composition and employee gender is not mediated by performance observability. Thus, the results lead to rejection of Hypothesis H2a in favor of confirming Hypothesis H2b.

Table 9. Workplace Keeps Records of Sales, Costs, Profit, Labor Costs, Productivity, Product Quality, Turnover, Absenteeism, Training; Fixed Effects Models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Female	-85.59***	-67.24***	-81.00***	-90.79***	-85.52***	-97.03***	-62.93***	-110.0***	-77.93***
	(-6.11)	(-4.52)	(-9.61)	(-6.68)	(-9.60)	(-9.12)	(-5.57)	(-5.58)	(-4.77)
Female managers	-0.356	-0.0925	-0.267	-0.302	-0.0239	-0.425	-0.458	-1.013*	-0.414
	(-1.13)	(-0.30)	(-1.37)	(-0.92)	(-0.11)	(-1.70)	(-1.81)	(-2.24)	(-1.06)
Female X Female managers	0.661*	0.282	0.561***	0.648*	0.510**	0.838***	0.406	1.355**	0.506
	(2.21)	(0.94)	(3.30)	(2.12)	(2.65)	(3.71)	(1.73)	(3.10)	(1.28)
Sales	-6.974	-	-	-	-	-	-	-	-
	(-0.52)								
Female X Sales	16.28	-	-	-	-	-	-	-	-
	(1.10)								
Sales X Female managers	0.0136	-	-	-	-	-	-	-	-
	(0.04)								
Female X Sales X Female managers	-0.223	-	-	-	-	-	-	-	-
	(-0.69)								
Costs	-	3.409	-	-	-	-	-	-	-
		(0.22)							
Female X Costs	-	-4.922	-	-	-	-	-	-	-
		(-0.31)							
Costs X Female managers	-	-0.305	-	-	-	-	-	-	-
		(-0.98)							
Female X Costs X Female managers	-	0.222	-	-	-	-	-	-	-
		(0.69)							
Profit	-	-	-0.0751	-	-	-	-	-	-
			(-0.01)						
Female X Profit	-	-	14.51	-	-	-	-	-	-
			(1.39)						
Profit X Female managers	-	-	-0.246	-	-	-	-	-	-
			(-0.97)						
Female X Profit X Female managers	-	-	-0.105	-	-	-	-	-	-
			(-0.45)						
Labor costs	-	-	-	-13.93	-	-	-	-	-
				(-1.00)					
Female X Labor costs	-	-	-	22.50	-	-	-	-	-
				(1.54)					

Management gender composition and the gender pay gap

Labor costs X Female managers	-	-	-	-0.0290 (-0.09)	-	-	-	-	-
Female X Labor costs X Female managers	-	-	-	-0.209 (-0.63)	-	-	-	-	-
Productivity	-	-	-	-	9.573 (0.93)	-	-	-	-
Female X Productivity	-	-	-	-	21.59* (2.02)	-	-	-	-
Productivity X Female managers	-	-	-	-	-0.600* (-2.53)	-	-	-	-
Female X Productivity X Female managers	-	-	-	-	-0.0439 (-0.18)	-	-	-	-
Quality of product/service	-	-	-	-	-	-24.56* (-2.17)	-	-	-
Female X Quality of product/service	-	-	-	-	-	33.21** (2.78)	-	-	-
Quality of product/service X Female managers	-	-	-	-	-	0.0932 (0.37)	-	-	-
Female X Quality of product/service X Female managers	-	-	-	-	-	-0.469 (-1.80)	-	-	-
Labor turnover	-	-	-	-	-	-	-12.29 (-1.01)	-	-
Female X Labor turnover	-	-	-	-	-	-	-10.62 (-0.85)	-	-
Labor turnover X Female managers	-	-	-	-	-	-	0.146 (0.54)	-	-
Female X Labor turnover X Female managers	-	-	-	-	-	-	0.0777 (0.29)	-	-
Absenteeism	-	-	-	-	-	-	-	-51.75** (-2.69)	-
Female X Absenteeism	-	-	-	-	-	-	-	40.98* (2.02)	-
Absenteeism X Female managers	-	-	-	-	-	-	-	0.695 (1.54)	-
Female X Absenteeism X Female managers	-	-	-	-	-	-	-	-0.945* (-2.09)	-

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Workforce training	-	-	-	-	-	-	-	-	-34.85[*]
									(-2.47)
Female X Workforce training	-	-	-	-	-	-	-	-	6.979
									(0.41)
Workforce training X Female managers	-	-	-	-	-	-	-	-	0.0713
									(0.18)
Female X Workforce training X Female managers	-	-	-	-	-	-	-	-	-0.0310
									(-0.08)
Constant	-59.29	-70.09	-60.67	-54.85	-64.20	-44.33	-53.43	-18.10	-38.20
	(-1.00)	(-1.19)	(-1.04)	(-0.93)	(-1.09)	(-0.75)	(-0.90)	(-0.30)	(-0.64)
N	8174	8174	8174	8174	8174	8174	8174	8174	8174
adj. R^2	0.644	0.644	0.645	0.644	0.645	0.645	0.644	0.645	0.645

t statistics in parentheses
Source: WERS 2011, own calculations.
All models include employee- and workplace-level controls.
All variables indicating whether the workplace keeps records are dichotomous, with absence of record keeping as reference category.
[*] $p < 0.05$, [**] $p < 0.01$, [***] $p < 0.001$

Table 10. Workplace Has Targets for Goods Volume, Costs, Profits, Labor Costs, Productivity, Product Quality, Turnover, Absenteeism, Training; Fixed Effects Models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Female	-80.68[***]	-76.53[***]	-74.37[***]	-90.71[***]	-94.63[***]	-90.55[***]	-76.09[***]	-83.49[***]	-71.66[***]
	(-8.93)	(-8.51)	(-9.75)	(-13.35)	(-12.05)	(-10.18)	(-12.09)	(-10.36)	(-10.77)
Female managers	-0.365	-0.337	-0.276	-0.482[**]	-0.340	-0.467[*]	-0.320	-0.314	-0.189
	(-1.79)	(-1.59)	(-1.55)	(-2.80)	(-1.77)	(-2.22)	(-1.93)	(-1.60)	(-1.07)
Female X Female managers	0.469[*]	0.460[*]	0.433[**]	0.679[***]	0.632[***]	0.689[***]	0.451[***]	0.506[**]	0.346[*]
	(2.53)	(2.43)	(2.82)	(4.72)	(3.78)	(3.57)	(3.33)	(2.89)	(2.37)
Volume of goods/services	-15.82	-	-	-	-	-	-	-	-
	(-1.59)								
Female X Volume of goods/services	12.75	-	-	-	-	-	-	-	-
	(1.19)								
Volume of goods/services X Female managers	-0.0228	-	-	-	-	-	-	-	-
	(-0.10)								
Female X Volume of goods/services X Female managers	0.0710	-	-	-	-	-	-	-	-
	(0.30)								
Costs	-	-0.120	-	-	-	-	-	-	-
		(-0.01)							

Female X Costs	-	7.055 (0.66)	-	-	-	-	-	-	-
Costs X Female managers	-	-0.0180 (-0.08)	-	-	-	-	-	-	-
Female X Costs X Female managers	-	0.0377 (0.16)	-	-	-	-	-	-	-
Profits	-	-	12.73 (1.31)	-	-	-	-	-	-
Female X Profits	-	-	3.775 (0.37)	-	-	-	-	-	-
Profits X Female managers	-	-	-0.254 (-1.04)	-	-	-	-	-	-
Female X Profits X Female managers	-	-	0.179 (0.75)	-	-	-	-	-	-
Labor costs	-	-	-	-18.65* (-2.11)	-	-	-	-	-
Female X Labor costs	-	-	-	43.58*** (4.30)	-	-	-	-	-
Labor costs X Female managers	-	-	-	0.174 (0.76)	-	-	-	-	-
Female X Labor costs X Female managers	-	-	-	-0.433 (-1.81)	-	-	-	-	-
Productivity	-	-	-	-	-22.29* (-2.54)	-	-	-	-
Female X Productivity	-	-	-	-	39.32*** (3.93)	-	-	-	-
Productivity X Female managers	-	-	-	-	-0.156 (-0.71)	-	-	-	-
Female X Productivity X Female managers	-	-	-	-	-0.190 (-0.83)	-	-	-	-
Quality of product/service	-	-	-	-	-	-11.73 (-1.28)	-	-	-
Female X Quality of product/service	-	-	-	-	-	28.40** (2.67)	-	-	-
Quality of product/service X Female managers	-	-	-	-	-	0.177 (0.80)	-	-	-

|	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Female X Quality of product/service X Female managers	-	-	-	-	-	-0.314 (-1.33)	-	-	-
Labor turnover	-	-	-	-	-	-	-4.807 (-0.54)	-	-
Female X Labor turnover	-	-	-	-	-	-	11.65 (1.11)	-	-
Labor turnover X Female managers	-	-	-	-	-	-	-0.0704 (-0.29)	-	-
Female X Labor turnover X Female managers	-	-	-	-	-	-	0.111 (0.44)	-	-
Absenteeism	-	-	-	-	-	-	-	1.531 (0.16)	-
Female X Absenteeism	-	-	-	-	-	-	-	19.50 (1.91)	-
Absenteeism X Female managers	-	-	-	-	-	-	-	-0.0759 (-0.33)	-
Female X Absenteeism X Female managers	-	-	-	-	-	-	-	-0.0573 (-0.25)	-
Workforce training	-	-	-	-	-	-	-	-	10.14 (1.15)
Female X Workforce training	-	-	-	-	-	-	-	-	0.467 (0.05)
Workforce training X Female managers	-	-	-	-	-	-	-	-	-0.397 (-1.82)
Female X Workforce training X Female managers	-	-	-	-	-	-	-	-	0.325 (1.41)
Constant	-58.67 (-1.00)	-62.66 (-1.07)	-58.74 (-1.00)	-57.77 (-0.99)	-62.89 (-1.08)	-50.90 (-0.87)	-57.99 (-0.98)	-56.08 (-0.95)	-64.23 (-1.09)
N	8174	8174	8174	8174	8174	8174	8174	8174	8174
adj. R^2	0.645	0.644	0.645	0.645	0.646	0.645	0.645	0.645	0.645

t statistics in parentheses

Source: WERS 2011, own calculations.

All models include employee- and workplace-level controls.

All variables indicating whether the workplace has targets are dichotomous, with absence of targets as reference category.
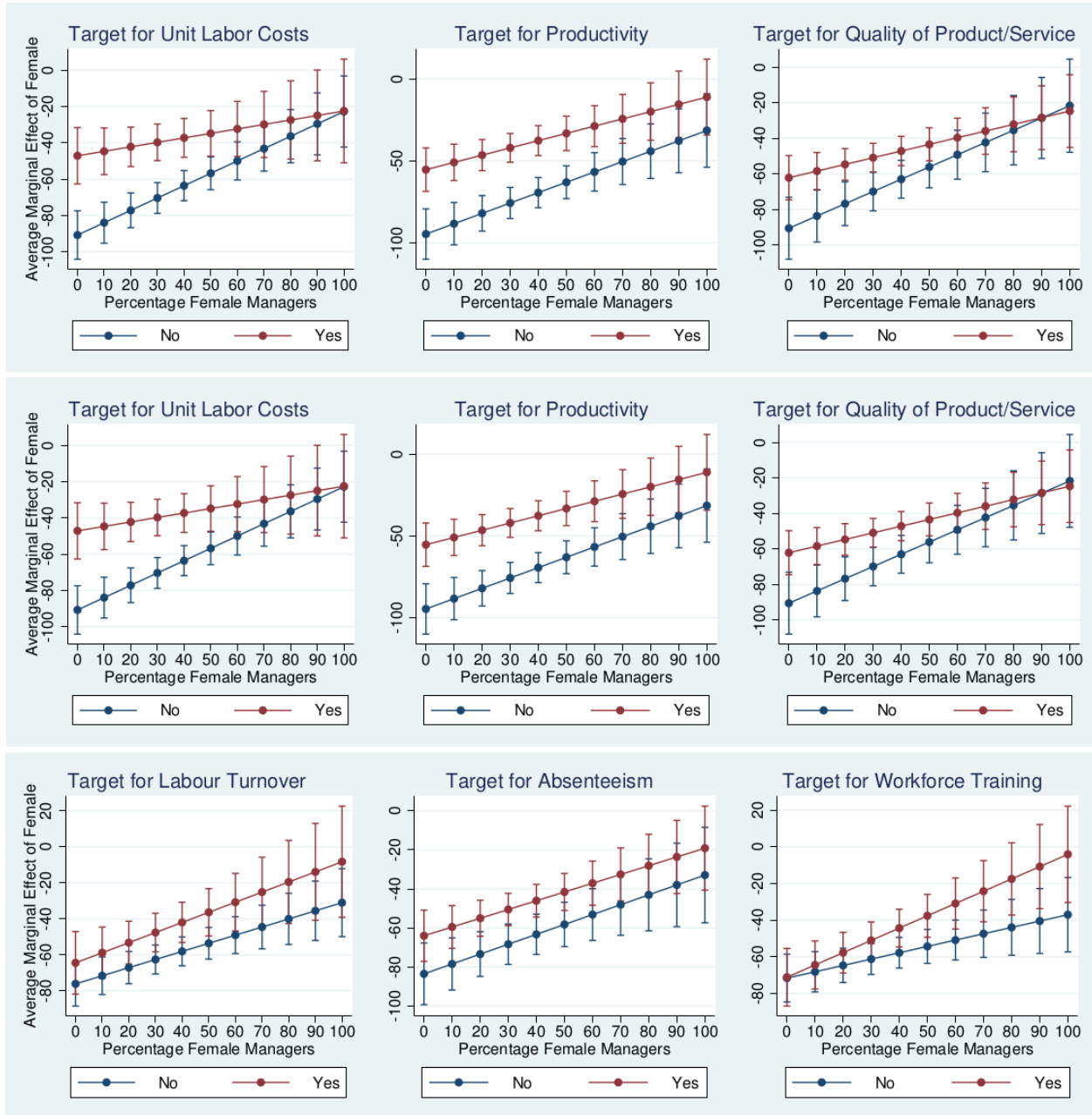
[*] $p < 0.05$, [**] $p < 0.01$, [***] $p < 0.001$

Figure 1: Average marginal effect of gender of employee on pay across different shares of female managers in workplaces that keep and do not keep performance-related records.
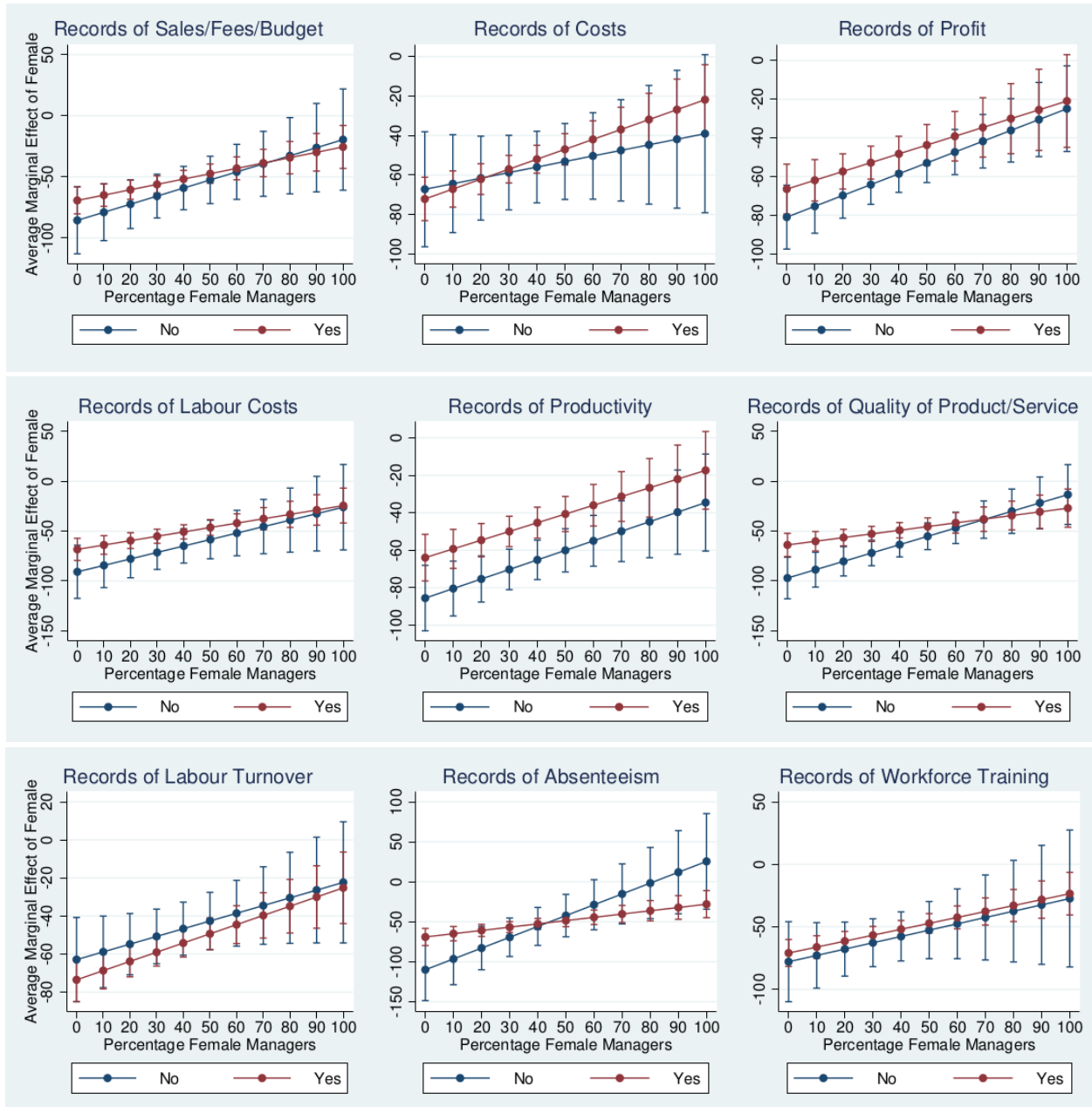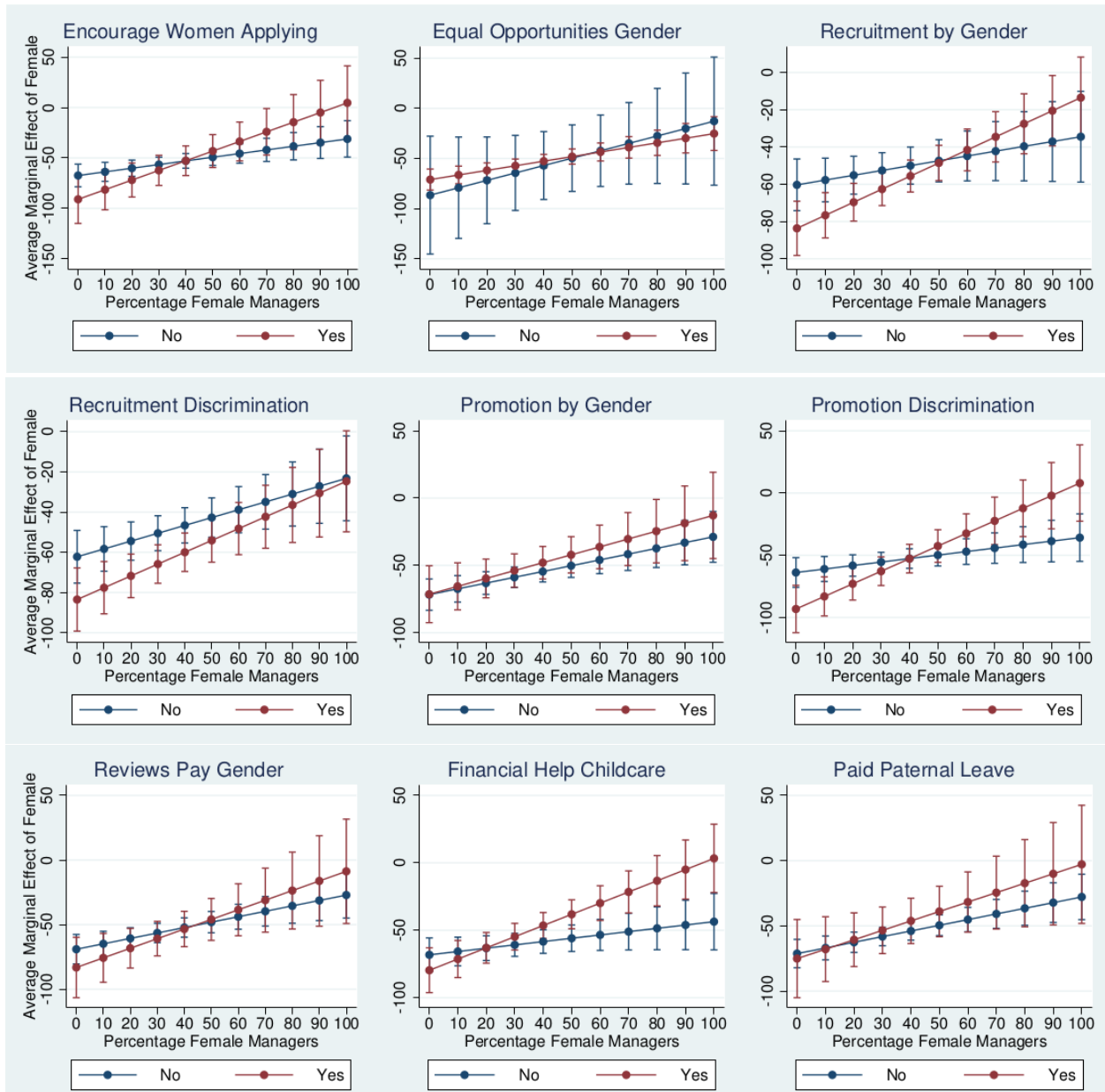

Source: WERS 2011, own calculations.
All models include employee- and workplace-level controls.

Figure 2: Average marginal effect of gender of employee on pay across different shares of female managers in workplaces that have and do not have performance-related targets.

Institutional Mechanisms

Are there any indications of an indirect effect of managers through institutional policies and practices? Figure 3 visualizes the effects and Table 11 shows the results from the three-way interactions with the nine gender related policies/practices indicators.

Figure 3: Average marginal effect of gender of employee on pay across different shares of female managers in workplaces that do and do not have gender-related policies.

Source: WERS 2011, own calculations.
All models include employee- and workplace-level controls.

Table 11. Presence of Gender-related Policies; Fixed Effects Models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Female	-67.41***	-86.53**	-60.33***	-62.22***	-71.75***	-63.87***	-69.02***	-68.21***	-71.25***
	(-11.77)	(-2.89)	(-8.52)	(-9.30)	(-12.06)	(-10.49)	(-11.85)	(-10.68)	(-12.85)
Female managers	-0.276	-0.236	-0.166	-0.545**	-0.318	-0.319	-0.271	-0.182	-0.312
	(-1.68)	(-0.48)	(-0.82)	(-3.01)	(-1.81)	(-1.87)	(-1.64)	(-1.01)	(-1.92)
Female x Female managers	0.363**	0.738	0.258	0.390**	0.430**	0.280*	0.419***	0.246	0.434***
	(2.82)	(1.40)	(1.56)	(2.62)	(3.22)	(2.07)	(3.30)	(1.70)	(3.50)
Encourage applications from women	16.47	-	-	-	-	-	-	-	-
	(1.45)								
Female x Encourage applications from women	-23.62	-	-	-	-	-	-	-	-
	(-1.79)								
Encourage applications from women x Female managers	-0.348	-	-	-	-	-	-	-	-
	(-1.25)								
Female x Encourage applications from women x Female managers	0.594*	-	-	-	-	-	-	-	-
	(2.02)								
Equal opportunity policy mentioning gender	-	7.194	-	-	-	-	-	-	-
		(0.29)							
Female x Equal opportunity policy mentioning gender	-	15.53	-	-	-	-	-	-	-
		(0.51)							
Equal opportunity policy mentioning gender x Female managers	-	-0.113	-	-	-	-	-	-	-
		(-0.23)							
Female x Equal opportunity policy mentioning gender x Female managers	-	-0.280	-	-	-	-	-	-	-
		(-0.52)							
Monitors recruitment by gender	-	-	14.03	-	-	-	-	-	-
			(1.59)						
Female x Monitors recruitment by gender	-	-	-23.34*	-	-	-	-	-	-
			(-2.35)						
Monitors recruitment by gender x Female managers	-	-	-0.338	-	-	-	-	-	-
			(-1.49)						
Female x Monitors recruitment by gender x Female managers	-	-	0.443	-	-	-	-	-	-
			(1.94)						
Reviews recruitment to identify discrimination by gender	-	-	-	-7.885	-	-	-	-	-
				(-0.90)					

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Female x Reviews recruitment to identify discrimination by gender	-	-	-	-21.30[*] (-2.10)	-	-	-	-	-
Reviews recruitment to identify discrimination by gender x Female managers	-	-	-	0.478[*] (2.09)	-	-	-	-	-
Female x Reviews recruitment to identify discrimination by gender x Female managers	-	-	-	0.198 (0.85)	-	-	-	-	-
Monitors promotions by gender	-	-	-	-	-2.981 (-0.26)	-	-	-	-
Female x Monitors promotions by gender	-	-	-	-	0.316 (0.03)	-	-	-	-
Monitors promotions by gender x Female manager	-	-	-	-	-0.0992 (-0.37)	-	-	-	-
Female x Monitors promotions by gender x Female manager	-	-	-	-	0.156 (0.57)	-	-	-	-
Reviews promotion to identify discrimination by gender	-	-	-	-	-	-3.971 (-0.42)	-	-	-
Female x Reviews promotion to identify discrimination by gender	-	-	-	-	-	-29.33[**] (-2.63)	-	-	-
Reviews promotion to identify discrimination by gender x Female managers	-	-	-	-	-	-0.281 (-1.13)	-	-	-
Female x Reviews promotion to identify discrimination by gender x Female managers	-	-	-	-	-	0.732[**] (2.83)	-	-	-
Reviews relative pay by gender	-	-	-	-	-	-	18.19 (1.58)	-	-
Female x Reviews relative pay by gender	-	-	-	-	-	-	-14.13 (-1.08)	-	-
Reviews relative pay by gender x Female managers	-	-	-	-	-	-	-0.442 (-1.41)	-	-
Female x Reviews relative pay by gender x Female managers	-	-	-	-	-	-	0.325 (1.02)	-	-
Financial help with childcare	-	-	-	-	-	-	-	0.745 (0.09)	-

Female x Financial help with childcare	-	-	-	-	-	-	-	-11.44	-
								(-1.12)	
Financial help with childcare x Female managers	-	-	-	-	-	-	-	-0.360	-
								(-1.70)	
Female x Financial help with childcare x Female managers	-	-	-	-	-	-	-	0.584*	-
								(2.52)	
Paid parental leave	-	-	-	-	-	-	-	-	9.709
									(0.70)
Female x Paid parental leave	-	-	-	-	-	-	-	-	-3.837
									(-0.24)
Paid parental leave x Female managers	-	-	-	-	-	-	-	-	-0.137
									(-0.42)
Female x Paid parental leave x Female managers	-	-	-	-	-	-	-	-	0.288
									(0.81)
Constant	-59.87	-67.68	-67.51	-31.06	-62.02	-67.71	-68.46	-63.93	-51.55
	(-1.03)	(-1.08)	(-1.15)	(-0.53)	(-1.06)	(-1.16)	(-1.17)	(-1.10)	(-0.88)
N	8174	8174	8174	8174	8174	8174	8174	8174	8174
adj. R^2	0.645	0.644	0.645	0.645	0.644	0.645	0.644	0.645	0.644

t statistics in parentheses
Source: WERS 2011, own calculations.
All models include employee- and workplace-level controls.
All variables indicating whether the workplace has a specific women-friendly policy are dichotomous, with absence of targets as reference category.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.00$

Figure 3 shows that the effect of being female is negative in an all-male management. With the increase of share of female managers, the decrease in the negativity of the effect of being female is stronger in workplaces that have gender-related policies as opposed to those who do not, with the exception of the policy of equal opportunities for both genders.

Out of the nine policies and practices considered, three, namely whether the workplace encourages applications from women and women returners, whether the workplace reviews promotion to identify indirect discrimination by gender, and whether it offers financial help with childcare, are positive and statistically significant. This offers some support for the hypothesis that the positive effect of the representation of one's gender in management on one's wages is stronger in workplaces where gender-related policies are present.

This leads to concluding that management gender composition affects employee earnings indirectly, through institutional changes, partially confirming Hypothesis H2c.

Robustness checks

Before concluding, I conduct two robustness checks. First, I address possible bias introduced through list-wise exclusion of missing values in the panel. Second, I make use of two alternative, employee-level measures of employee performance.

Table 12. Robustness checks; Dependent variable: weekly wage

	(1)	(2)	(3)
Female	-68.70***	-83.27***	-71.30***
	(-11.65)	(-10.25)	(-11.20)
Female managers	-0.287	-0.607**	-0.465**
	(-1.73)	(-2.81)	(-2.78)
Female x Female managers	0.402**	0.719***	0.592***
	(3.04)	(3.41)	(4.12)
Female x Employee training		17.97	
		(1.90)	
Female managers x Employee training		0.371	
		(1.88)	
Female x Female managers x Employee training		-0.362	
		(-1.53)	
Female x Employee commitment			0.0952
			(0.05)
Female managers x Employee commitment			0.0695*
			(2.15)
Female x Female managers x Employee commitment			-0.0627
			(-1.52)
Constant	-82.99	-56.80	-59.77
	(-1.37)	(-0.97)	(-1.02)

N		6555	8174	8174
adj. R^2		0.639	0.645	0.645

t statistics in parentheses
Source: WERS 2011, own calculations
All models contain employee- and workplace-level controls.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As reported in Table A1, the list-wise exclusion of cases with missing values yields an unbalanced panel. Out of the 513 unique workplaces, 330 participated in both waves, 73 only in 2004, and 110 only in 2011. The results presented above are based on the unbalanced sample. Column 1 (Model 1) of Table 12 presents the findings from running the analyses using the balanced sample of 330 workplaces. As evident, the results are not substantially different from those in the unbalanced sample. The interaction between the share of female managers and being female is positive and significant. With an increase in share of female managers by 1 percentage point, the weekly wages of female employees increase by 0.116 pounds sterling, and those of male employees decrease by 0.286 pounds sterling.

Columns 2 and 3 present the three-way interactions from the models using two employee-level variables that could arguably serve as measures of performance: training and commitment. As evident, these interactions are not significant, further supporting the argument that the gender composition of management does not affect employee pay through changes in performance.

Conclusions

The starting drive for asking the question of whether the gender composition of management affects the gender pay gap at the workplace stemmed from the suggestion that women's limited access to organizational power structures may explain their relative disadvantage in the reward system. Using the share of female managers as a measure of management gender composition, the analyses above showed that female managers – although the effect size is small – do decrease the gender wage gap. However, this happens not only at the benefit of increasing women's wages: a larger share of women in management simultaneously yields losses for male employees.

These findings have important societal and policy implications. If equity for women is a policy goal, then an obvious instrument to tackle this goal would be affirmative action promoting women's representation in management. However, the findings invite for envisioning a provocative scenario. While a move towards female-dominated management – in contrast to the current male-dominated management – is unlikely, provided that female managers deliver relative benefits to female employees, a female-dominated management would mean reversed gender inequality in earnings. Thus, it appears that an equal representation of both genders in management is the best option for both women and men, while simultaneously being the relatively worse option for either gender.

The present study attempted to bring the state of research further by formally accounting for the channels through which management gender composition may affect earnings. I find no evidence of the suggestion that the gender composition of management realizes changes in earnings through changes in the human capital of employees. This does not mean that managers to not bring about any changes in employees' human capital. It does however mean that regardless of whether changes in

human capital occur at different gender compositions of management, these do not explain the effect of gender management composition. Instead, it appears more likely that employees are treated differently (or acquire different benefits) at different management gender compositions regardless of any changes in performance. This can be interpreted as positive discrimination as well as offsetting earlier discrimination. The findings also suggest that the presence of certain gender-related policies represents an indirect channel through which earnings are affected.

An obvious disadvantage of the design is that it uses workplace-level proxies for measuring differences in employee performance. It could be that even though overall, workplaces keep performance records and have performance targets, they do not connect these to the individual employee, but rather to the employees as a group. This would mean that even if managers affect earnings through changes in employee performance, I have not been able to identify this because of the aggregate measure. However, using employee training and commitment – the only two available employee-level measures that come closest to on-the-job acquired human capital – I reach the same conclusion.

Finally, the disadvantages of having only two-wave panel data were delineated above. Given its plethora of information, however, this data appears to be best available. Upon the availability of data with measurements at more than two time points – yet which simultaneously offers richer information than registrar data – conducting similar analyses may bring the effect of management gender composition of the gender gap in earnings closer to the understanding of the scientific community.

Notes

1. In a meta-analysis of 260 published papers across 63 countries, Weichselbaumer and Winter-Ebmer (2005) show that during the time period 1960s-1990s, the unexplained component of the gender wage gap had decreased by about 0.17% annually.
2. Two of these studies (Flabbi et al., 2014; Gagliarducci and Paserman, 2014) are unpublished manuscripts with preliminary results.
3. Hultin and Szulkin (2003) look at women's relative wages and do not show what happens to the wages of women and men individually. Gagliarducci and Paserman (2014) and Flabbi et al. (2014) find a negative and null effect – respectively – of the share of female managers on the wages of women. Hultin and Szulkin (1999) and Flabbi et al. (2014) find a null effect of the share of female managers on men's wages. However, one should note that the findings in Flabbi et al. (2014) and Gagliarducci and Paserman (2014) are preliminary, and should hence be taken with caution.
4. For comparison, the largest effect on earnings is of employee age. An increase of one-*SD* increase of employee age is associated with a 0.5-*SD* increase in earnings.

Supplementary Data

Supplementary data are available upon request.

Data acknowledgment

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Appendix

Table A1. Missing Data in the WERS 2011; Panel A: Cross-Section, Panel B: Panel Data

	Employees lost	Employees left	Workplaces left
Panel A: WERS 2011 cross-section		21981	2680
+ Workplace returned at least 1 employee questionnaire	763	21981	1923
+ Only non-managerial employees surveyed	2634	19347	1896
+ Missing data on outcome	899	18448	1892
+ Missing data on gender of employee	93	18355	1892
+ Missing data on share female managers	653	17702	1794
+ Missing data on employee-level controls	2522	15180	1776
+ Missing data on workplace-level controls	1879	13301	1570
Panel B: WERS 2004-2011 panel		15267	600
+ Workplace returned at least 1 employee questionnaire	0	15267	600
+ Only non-managerial employees surveyed	1632	13635	600
+ Missing data on outcome	451	13184	600
+ Missing data on gender of employee	45	13139	600
+ Missing data on share female managers	775	12364	586
+ Missing data on employee-level controls	2168	10196	585
+ Missing data on workplace-level controls	1084	9112	562
+ Missing data on performance indicators	13	9099	562
+ Missing data on women-friendly policy indicators	925	8174	513

Source: WERS 2011, own calculations.

Note: The list-wise exclusion of cases with missing values yields an unbalanced panel. Of the 513 unique workplaces, 330 participated in both waves, 73 only in 2004, and 110 only in 2011. The total number of workplace-level observations is 843.