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Manager impartiality? Worker-firm matching and the gender wage gap

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Manager impartiality? Worker-firm matching and the gender wage gap[♦]

by

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Abstract

This paper examines whether women benefit from working under female management using Swedish matched employer-employee panel data. I account for unobserved heterogeneity among both workers and firms potentially correlated with manager gender. The results show a substantial negative and statistically significant correlation between the proportion of female managers and the establishment's gender wage gap. However, estimates that account for sorting on unobserved worker skills do not support that that managers favor same-sex workers in wage setting. Additional results show female-led organizations recruit more non-managerial, high-wage women but this is primarily due to (unobserved) firm attributes rather than gender-specific management practices.

Keywords: Gender wage gap, managers, worker sorting
JEL-codes: J31, J24, J53

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1 Introduction

The underrepresentation of women in certain occupations and managerial positions is often cited as an indicator for the persistent gender labor market disparities observed in many countries. To improve women's' outcomes in the labor market, several countries have recently taken action to encourage gender parity in top positions, for example, by imposing mandated gender quotas at the highest levels of public and private organizations.[1]

The aim of this paper is to examine whether increasing female representation among managers can lower the gender wage gap. Despite a substantial amount of theoretical work on why female representation among managers could be important, there is very little empirical evidence quantifying the effects of the manager's gender on the outcomes of their female employees.

The gender differences in labor market outcomes are still substantial throughout the industrial world (Polachek and Xiang, 2009). Findings suggest that occupational sorting accounts for around half of the estimated male-female wage gap and that there is a "glass ceiling" preventing women from moving up the career ladder (Albrecht et al., 2003, Arulampalam et al., 2005, Bayard et al., 2003). An increased share of women in decision-making positions may both directly help close the gender wage gap and also narrow the wage differences between male and female sub-ordinates through multiple indirect channels. Relative to males, female managers may for example have better information about women's productivity and/or stronger social ties to other women. They may moreover, reduce discriminatory behavior, increase womens' human capital through mentoring, or serve as important role models for lower-level female employees (Becker, 1971, Athey et al., 2000, Akerlof and Kranton, 2000).

Previous empirical research on the importance of the manager's gender on employee wages has mainly used cross-sectional data. Hence, they generally suffer from the difficulty in separating the influence of female managers from other factors that could generate gender differences in pay, such as unobserved differences in worker

[1] Norway was the first country to adopt mandated gender quotas in corporate boards in 2003. The law required at least 40 percent of the directors of public firms to be women in 2005. A similar law came in effect in France in 2010.

productivity or firm practices.[2] A few more recent studies have attempted to address this potential identification problem using longitudinal data. In particular, Bell (2005) and Cardoso and Winter-Ebmer (2010) use establishment fixed effects models to reduce bias from static unobserved establishment characteristics that are correlated with manager gender. Their approach is however limited by the fact that they are unable to control for productivity-related changes among the employed and thus separate between potential explanations for gender differences in pay.

Because the employment relationship is influenced by the choice of both workers and employers, such compositional effects are potentially important. As decision-makers of the firms, managers may not only directly affect the wages of the current workers but also affect the identity of the workers selected into employment (Bandiera et. al., 2009). Female managers may, for example recruit higher quality, non-managerial female workers because they have better information about other women's productivity. The most qualified female workers may also enter female-led firms due to self-selection, for example, if career-oriented women anticipate better opportunities in female-led firms. In any case, manager changes could be correlated with simultaneous changes in workforce composition, which in turn may lead to a positive correlation between women-led firms and female wages.[3]

The key contribution of this paper is that I am able to control for time invariant sources of heterogeneity across workers, such as their ability, when investigating the role of female managers for employee wages. In addition, the paper provides new insights to the potential mechanisms at work, specifically by examining the relationship between female managers and the gender- and skill composition of new hires and how the wage effects of having female managers vary over the employment spell.

The analysis uses administrative longitudinal matched employee-employee data from Sweden. The data contain high-quality wage measures and detailed occupational data

[2] Laboratory experiments, for example, suggest that women are more risk-averse and less willingness to compete and seek challenges compared to men (see Bertrand, 2011, for a summary of these findings). Bertrand et al (2010) empirically demonstrate that high-skilled women sort into family-friendly work environment with shorter and more flexible hours. Due to compensating differentials, these environments may also pay less on average.

[3] The only paper that I am aware of that accounts for worker heterogeneity when analyzing the role of managers is Bandiera et al. (2009) study how social connections between managers and employees affect productivity in a British fruit-picking company. However, they focus on similarity with respect to nationality and not gender per se.

for a large sample of workers over more than 20 years, which enables me to calculate and account for an individual's experience and job tenure. Importantly, I can also account for several observable establishment characteristics as well as establishment fixed effects to capture workplace attributes that could influence both the gender composition of managers and the gender wage gap, even in the absence of a causal relationship between the two.

Descriptive analysis suggests that the gender wage gap within non-managerial occupations decreased by one percentage point between 1996 and 2008. During the same period, the proportion of female managers increased by more than 10 percentage points. Despite this increase, women remain under-represented among managers, in particular among executives, and on high-paying positions in the private sector.

A more formal analysis of the association between a higher share of female managers and the gender wage gap shows that female workers receive 1.4 percent higher wages in women-led compared to male-led establishments. Male workers, in contrast, receive 3.6 percent lower wages, giving a 5 percent narrowing of the total gender wage gap in women-led firms. This result is robust to the inclusion of industry, occupation and establishment fixed effects, hence sorting of men and women into different jobs cannot explain the relationship.

However, most of the association goes away when accounting for worker fixed effects, suggesting that sorting on unobserved skills, such as unobserved human capital or effort, is an important determinant of the establishment gender wage gap. The result indicates that the relationship between female managers and the gender wage gap primarily goes through the selection of employees into male and female led organizations. To shed further insights to this conjecture, I examine how female managers affect the composition of new hires. More specifically, I use pre-determined measures of worker skills derived using the estimation methods developed by Abowd et al. (1999) and relate the skill composition of hires to the gender composition of managers. The analysis suggests that female-led establishments hire women with higher (unobserved) portable earnings capacity, although this is primarily due to unobserved firm practices rather than manager gender per se.

Finally, there is a small entry-wage premium in female-led establishments that diminishes with tenure and wage growth is higher for women who themselves are in minority but who are supervised by female, compared to male, middle managers. Nonetheless, the overall results suggest that skill sorting is more important than differential treatment of equally productive workers in explaining the correlation between female managers and the gender wage gap.

The rest of the paper is outlined as follows. Section 2 provides an overview on the literature on gender management and wages; Section 3 describes the data. Section 4 first provides a descriptive analysis of gender wage differences and women-led establishments in Sweden, followed by a more formal analysis of the association between female managers and the gender wage gap. Section 5 investigates the impact of female managers on the composition of hires and Section 6 concludes.

2 Background and related literature

There are several potential mechanisms that explain why female-led firms may have systematically narrower gender wage gaps than firms led by men. First, theoretical models suggest that both taste-based and statistical discrimination can give rise to lower female wages in male-led firms (Becker, 1971; Lazear and Rosen, 1990). If male managers have less precise information about women's productivity or systematically assign women to less favorable positions, the gender wage gap is expected to narrow when the share of female managers increase.[4]

Second, women may obtain more (or better) mentoring by female managers, either because they find it easier to establish mentoring relationships with other women or because they receive better mentoring from more similar supervisors (Athey et al.,

[4] Men and women who do the same job for the same employer receive similar wages in Sweden, in other Scandinavian countries as well as in the US. Differential treatment of men and women doing equal work for the same employer is thus likely to be of second order (Meyersson Milgrom et al., 2001). Still, gender-related differences in job assignment and promotions could be important factors for the observed gender wage gap. The empirical literature offers mixed evidence on gender differences in promotions. Some studies find that women have lower promotion rates than observably identical males (c.f. Olson and Becker, 1983; Blau and DeVaro, 2007, Cobb-Clark, 2001, Ransom and Oaxaca, 2005), while others find no relationship or a reversed relationship between gender and promotions (Barnett et al., 2000). Studying the Austrian labor market, Weber and Zulehner (2010, 2011) find that firms with a higher fraction of women upon firm entry have higher survival rates, which is consistent with a model of discriminatory employers being driven out of the labor market.

2000). Empirical studies have to a large extent focused on mentoring relationships in academia. Neumark and Gardecki (1998) and Hilmer and Hilmer (2007) find no evidence of positive effects from gender similarity between economics PhD students and their advisors. However, in a recent evaluation of a randomized trial of a mentoring program for female economists, Blau et al. (2010) demonstrate an increased number of publications and successful grants among women who received mentoring relative to those who did not.[5]

More recently, a growing literature has emphasized the role of social networks for gender-driven labor market outcomes. Social connections with the manager could affect employment and wages because networks disseminate information about jobs and job candidates and may also affect how workers are assigned to jobs and ranks within the workplace. When the representation of female managers increase partially segregated networks could thus help women by pulling them into better jobs than they otherwise would have obtained in a comparable male-led firm (Bell, 2005).[6]

Laboratory experiments and observational studies also point toward the importance of gender differences in preferences and attitudes related to, for example, competitiveness and the willingness to negotiate (Bertrand, 2011, provides an overview).[7] Consistent with this literature Säve-Söderberg (2009) finds that women submit systematically lower wage bids than men and are also offered lower wages in Sweden. Even if this and similar studies do not explicitly consider how negotiations vary with the gender of the negotiating parties, a higher share of female managers could potentially help neutralize the gender differences in negotiation, if negotiations between similar parties are more efficient (Kolb and McGinn, 2008).

The literature also discusses the role of gender-related norms and social status (Akerlof and Kranton, 2000, Goldin, 2002). An increasing number of women who break traditional gender roles on the labor market can encourage other women to invest in

[5] Bettinger et al., (2005) look at college faculty composition in Ohio and find that female faculty enhanced the outcomes for female students, which supports a possible role model effect.

[6] Several studies have found that a large percentage of jobs are found through social contacts. In summary, these surveys find that between one-third and two-thirds of workers find their jobs through friends, relatives, and other social contacts. See Ioannides and Datcher Loury (2004) for an overview of this literature. Bandiera et al., (2009) show that workers that have social connections to the manager are assigned to better jobs.

[7] Sweden moved to a more decentralized wage bargaining system in the 1980s with greater scope for individual wage variation. Thus, mechanisms of this kind may have become more important (Nordström Skans et al., 2009).

similar career paths. If women therefore have higher motivation under same-sex managers, this could explain why employers hire and promote same-sex employees.

Others have at the same time highlighted that persistent gender-related norms may cause traditionally "male" managerial behaviors to persist even in the event of a management change (Ely, 1995, Graves and Powell, 1995). A similar argument is that female managers may be appointed as "gate-keepers" with the intention to maintain the majority's dominance.[8]

Despite the many plausible reasons for why women could benefit from having female managers, only a few studies have looked at the empirical relevance of these arguments. Most of this evidence is based on cross-sectional studies relating the gender wage gap to the representation of managers (Hultin and Szulkin, 2003, Cohen and Huffman, 2007). While these provide suggestive evidence of the importance of managers, it should be noted that they suffer from potential problems generated by omitted variables.

Two recent studies use more reliable identification strategies relying on establishment panel data to establish a relationship between manager characteristics and individual outcomes. Cardoso and Winter-Ebmer (2010) study a large representative sample from Portugal and find that female wages are higher when female management increase within establishments. In addition, Bell (2005) shows that female executives in women-led firms have higher compensation and are more likely to be among the top-five paid executives than comparable women in male-led firms.

These studies are compelling because they deal with some of the potential differences between male-led and female-led firms that could bias the coefficients of interest. However, they are also limited in the sense that they do not account for the potentially endogenous selection of workers into male- and female-led firms.[9]

[8] Bagues and Esteve-Volart (2010) exploit random assignment of candidates to evaluation committees in public examinations in Spain and show that female candidates are *less* likely to be hired when the committee consists of a greater share of women. They attribute this finding to that female evaluators are either overestimating the true quality of male candidates or that the presence of women strengthens the male committee members' bias towards male candidates.

[9] A related literature documents substantial amounts of occupational and establishment gender segregation and that female-dense firms pay lower wages and have higher gender wage gaps (Carrington and Troske, 1995, Bayard et al., 2003, Datta Gupta and Rothstein, 2005). A few recent studies also looks at racial (Giuliano et al., 2009 and Giuliano and Ransom, 2010) and immigrant (Aslund et al., 2009) bias in hirings and quits.

3 Data

The data used for this analysis come from administrative registers collected by Statistics Sweden. The main register, Strukturlönestatistiken, contains annual information on detailed occupational characteristics and monthly full-time wages for all establishments in the public sector and for a large sample of establishments in the private sector. Individuals are included in the annual dataset conditional on being employed in the month of November. The sample is stratified by firm size and industry and small establishments are thus underrepresented. Altogether, the data cover around 50 percent of those employed in the private sector with sampling weights to make the results representative for the population. The sample contains about 1.7 million workers per year for 13 years and 60,000 unique establishments, each observed for an average of 5 years.

Managers are identified according to the Swedish Standard for Classification of Occupations (SSYK), which is based on international standards (ISCO-88). The first digit in the occupational code divides the data into ten broad occupational levels with a specific number for managerial positions. It is also possible to identify more detailed manager types using the 3-digit code, such as top managers (directors and chief executives as well as managers for small enterprises) and middle managers (production and operation managers and other specialist managers in marketing, sales, human resources, and so on).

The main analysis focuses on the impact of women among the establishment's highest ranked managers on the wages of non-managerial workers. This means that I consider the share of women in top management for establishments that have top managers (72 percent of the sampled establishments) and the share of female middle managers, otherwise. For firms with multiple managerial levels, I also examine the effects of the proportion of women in top *and* middle management, as managers at lower tiers may provide stronger mentoring relationships or role models.

The main analysis focuses on the period 1996-2008. The wage data is further linked to information on individual characteristics such as age, gender and education as well as annual earnings. This information is available for the entire working-age population, and it stretches back to 1985. I use this data to derive measures of individual work

experience and job tenure (truncated at 1985). In addition, I also calculate the annual proportion of female entry level co-workers (excluding managers) for each establishment in the sample.

In addition, I exploit auxiliary data from 1985-1995 to construct individual skill measures for the analysis of worker sorting. The data and estimation procedure for this analysis are described in more detail in Section 5.2.

4 Female managers and the gender wage gap

4.1 Descriptive evidence from Sweden

Columns 1 and 2 of Table 1 report statistics for the weighted sample, broken down by gender. These display well-known patterns documented in earlier studies for several countries; despite small gender differences in age, education and experience, women have more female co-workers, work in larger establishments and more often in the public sector. The occupational distribution also varies between men and women; more women work as clerks and service workers, whereas males are more likely to be craft workers and machine operators. One number that stands out is the low representation of women in management occupations; three percent of female employees have managerial jobs compared to nine percent of males.

Table 2 describes the characteristics of male and female managers. On average, female managers are younger and have higher education levels compared to male managers, which may reflect that the smaller group of female managers is more selected relative to the males. Yet, the wages received by female managers are slightly lower on average and display less variation. Women are in addition found at lower managerial levels on average.[10]

[10] Other Scandinavian countries display similar wage gaps and high levels of occupational segregation (Datta Gupta et al., 2006). Meyersson-Milgrom and Petersen (2006) provide evidence on trends in female management from Sweden and the US.

Table 1 Summary statistics 1996-2008

	All Workers		Female Non-Manager Workers in:	
	Females	Males	Female-led	Male-led
	(1)	(2)	(3)	(4)
Monthly wage	9.88	10.03	9.87	9.90
(standard deviation)	(0.28)	(0.36)	(0.25)	(0.28)
Share of female co-workers	0.67	0.31	0.77	0.53
Age	42.1	40.1	42.6	41.7
Experience	14.8	14.7	15.0	14.6
Tenure	6.8	7.2	6.6	7.4
Education level:				
Less or equal than primary school	0.13	0.17	0.10	0.15
2 years of high school	0.31	0.30	0.31	0.28
3 years of high school	0.18	0.21	0.16	0.20
Some college	0.17	0.14	0.17	0.15
At least 3 years of college	0.21	0.16	0.26	0.20
Graduate	0.01	0.02	0.01	0.01
Unknown	0.002	0.003	0.002	0.002
Occupation:				
Legislators, senior officials and managers	0.03	0.09	-	-
Professionals	0.19	0.17	0.24	0.21
Technicians and associate professionals	0.21	0.19	0.19	0.23
Clerks	0.15	0.06	0.10	0.23
Service workers and shop sales workers	0.30	0.07	0.38	0.14
Craft and related trade workers	0.01	0.18	0.01	0.02
Plant and machine operators and assemblers	0.04	0.19	0.01	0.09
Elementary occupations	0.07	0.05	0.07	0.07
Establishment characteristics:				
Age of establishment	14.6	14.2	14.3	15.2
Private Sector	0.35	0.62	0.28	0.51
Establishment size	441	364	299	693
Observations	13,496,367	10,149,707	4,991,116	4,800,542
Years	13	13	13	13

Notes: Establishments are counted as female-led if more than 50 percent of the highest ranked managers are women. The variables for experience, tenure and age of establishment are calculated from the data and truncated in 1985. The observations are weighted according to their sampling probabilities.

Table 2 Manager characteristics by gender

	Females managers (1)	Male managers (2)
Monthly wage	10.29	10.42
(standard deviation)	(0.36)	(0.42)
Age	45.4	46.3
Experience	17.3	17.2
Education level:		
Less or equal than primary	0.06	0.11
2 years of high school	0.15	0.20
3 years of high school	0.14	0.20
Some college	0.28	0.20
At least 3 years of college	0.36	0.27
Graduate	0.01	0.02
Unknown	-	-
Manager type:		
Share of managers in top management	0.31	0.38
Share of managers in middle management	0.69	0.62
Observations	347,907	606,578
Years	13	13

Notes: The sample consists of all of the highest ranked managers within each establishment. The observations are weighted according to their sampling probabilities.

The analysis examines the impact of manager sex composition on wages received by non-managerial workers. Figure 1 displays the male-female wage gap for these workers in the period 1996-2008, based on yearly wage regressions that account for standard human capital variables (age, age^2, education level and experience) and 3-digit occupation. Figure 2 shows the share of female managers over the same period.

In line with previous literature, differences in the occupational distribution explain about half of the gender wage gap adjusted for standard human capital controls. We can also see that the within-occupation gender wage gap narrowed by 1.5 percentage point during this period at the same time as the proportion of female managers experienced a substantial increase from 26 percent in the beginning of the study period to 36 percent in 2008.[11] [12]

[11] The gender wage gap narrowed dramatically from the 1960's to the early 1980's. An increased wage compression was partly responsible for this, although changes in other factors, such as unobserved skills and discrimination, seem to have been more important (Edin and Richardsson, 2002). The closing of the gender gap slowed down and even increased somewhat during the 1980s.

[12] The number of female managers is steadily increasing throughout the study period. Hence the "jump" in the female management share in the beginning and end of the period is attributable to changes in the number of male-led firms, which display more variation over this period. The variation is consistent with the growth of the Swedish economy, which continued to increase since the recession in the early 1990s but slowed down between 2007 and 2008.

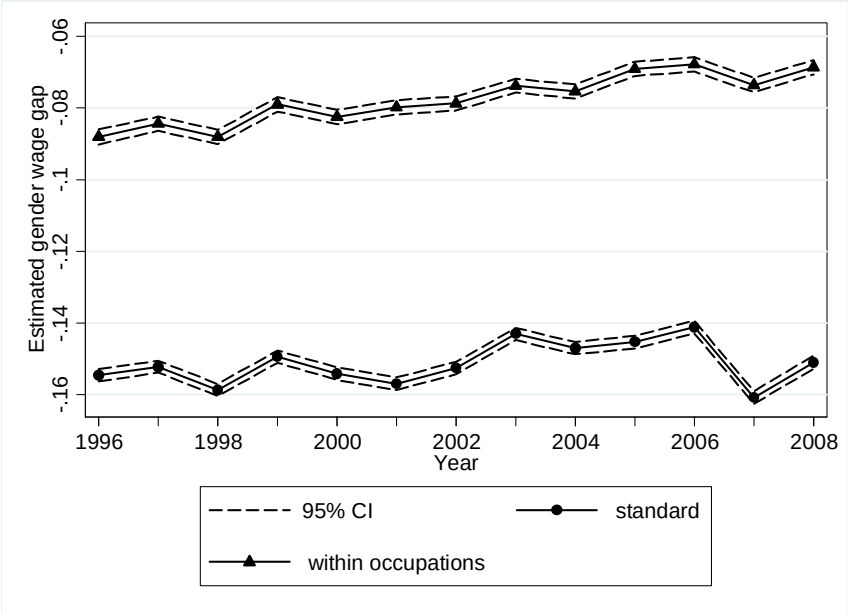

Figure 1 Estimated male-female wage gap for non-managers 1996-2008

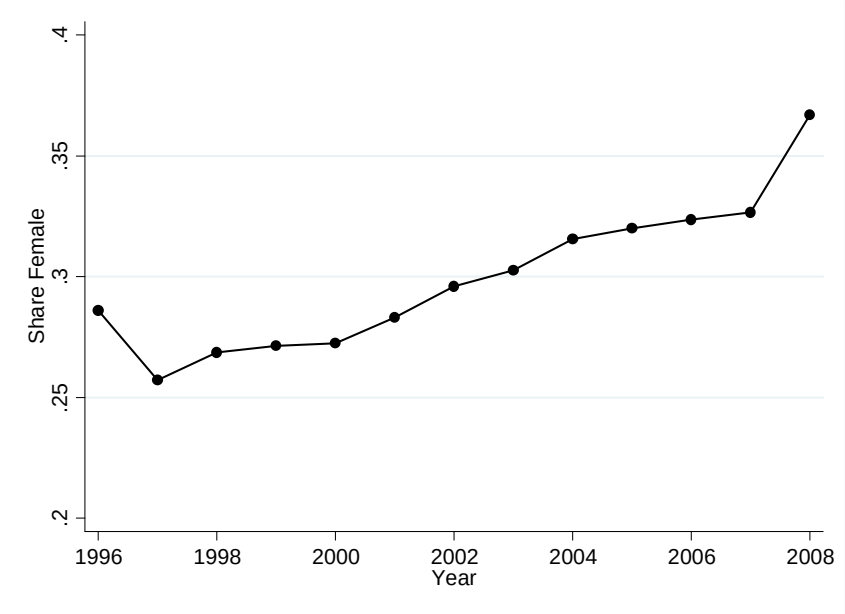

Figure 2 Share of female (highest ranked) managers 1996-2008

Columns 3 and 4 in Table 1 provide descriptive evidence on female non-managerial workers in female-led versus male-led establishments, which are defined as female-led

if more than half of the highest ranked managers are women.[13] Compared to male managers, women disproportionally manage other women in smaller establishments in the public sector; only 28 percent of female-led women work in the private sector compared to 51 percent of male-led women.

In sum, this descriptive analysis suggests that the share of female managers has increased substantially during the study period and that the gender wage gap has narrowed. However, women are still found in lower-ranked managerial positions relative to males, and they manage a substantially higher share of women. There is moreover a negative correlation between the proportion of female managers and women's wages, which seems partly due to the high concentration of female managers in the public sector and in lower-paying jobs. The next step is to try to assess whether the increased share of women in management is associated with reductions in the male-female wage gap.

5 Results

5.1 Female managers and wages

To examine whether the gender composition of managers affects the gender wage gap I estimate models of the following form:

$$\log(w)_{ijt} = \beta_1 F_i + \gamma_1 F_i \times S_{ijt}^M + \gamma_2 S_{ijt}^M + X_{ijt} + W_{jt} + \delta_i + \delta_t + \varepsilon_{ijt} \qquad (1)$$

where $\log(w)_{ijt}$ is the log monthly wage of worker *i* in establishment *j* in year *t*; F_{ijt} is a dummy that takes the value of one if the worker is female; S_{ijt}^{M} is the proportion of female managers; X_{ijt} and W_{jt} are vectors of individual and establishment

[13] Figure A 1 displays the distribution of female managers and co-workers for men and women in the sample. It confirms that women have higher exposure to both female co-workers and female managers. We also see that most workers have either zero or all female managers, which reflect that most establishments have one manager at the highest rank.

characteristics.[14] Finally, δ_t and δ_i denote year and worker fixed effects, respectively, and ε_{ijt} is the error term. The main coefficient of interest is γ_1, which measures the impact of female managers on the male-female wage gap.

The model accounts for many of the possible factors that could affect both the share of female managers and the relative wages received by women. Establishment size takes into account that women tend to manage smaller establishments and the industry and sector dummies capture systematic sorting of workers into these domains, which in turn could produce a spurious correlation between female management and the gender wage gap. Finally, the year dummy variables account for secular changes in the male-female wage gap and the proportion of female managers.

To control for unobserved time-varying differences between establishments, such as wage practices and organizational structure, I also include the proportion of female co-workers. This could be a problem if female managers have a direct impact on the female composition of the establishment, in which case the inclusion of the female establishment share would produce an inconsistent estimate of γ_1. To assess the importance of this concern, I examine the relationship between female management and female hires in Section 5.2. I also test whether the estimates are sensitive to time-invariant establishment heterogeneity by including establishment fixed effect in (1).

The worker fixed effects contained in δ_i account for the fact that manager characteristics may affect the type of workers who want to join and leave the firm. The variation in exposure to female managers comes from workers switching jobs, as well as from changes in manager composition within a given job spell. This model thus addresses the main concern that the variation in the gender composition of managers is be correlated with unobserved differences in worker quality. For example, if the most talented women enter female-led establishments, either because they anticipate better career opportunities in female-led firms or because female managers have better

[14] The individual characteristics are age, age^2, educational attainment (6 levels), experience and tenure divided into five categories (0, 1-2, 3-4, 5-10, and >10 years). The workplace characteristics are ln(workplace size), industry, sector and the proportion of female co-workers.

knowledge about other women's productivity, this could bias the results towards finding a negative effect of female management on the gender-wage gap.[15]

Table 3 reports the baseline results; the last column is the worker fixed effects model obtained from estimation of equation (1). The variable of interest is the interaction term between the gender dummy and the proportion of female managers reported in the first row. The proportion of female managers and co-workers are centered around their means throughout the table, and the individual observations are weighted according to their sampling probabilities.

Column (1) shows the estimated gender wage gap and the association between the wage and the proportion of female managers when including standard Mincerian human capital controls (education, the age-earnings profile, experience and job tenure) and year effects. The estimates of the controls are not shown in the table, but these have the expected signs. The reported coefficients suggest that the adjusted gender wage gap is 14 percent and that workers receive 8 percent lower wages in female-led establishments compared to male-led establishments.

Column (2) allows the impact of having female managers to differ between male and female workers. The wage penalty of being employed in a women-led establishment is lower for female than for male employees, suggesting a negative correlation between the proportion of female managers and the gender wage gap. Column (3) further adds industry and establishment controls including the share of female co-workers, column (4) adds establishment fixed effects, column (5) adds *establishment*$\times$*(3-digit) occupation* fixed effects whereas column (6) instead of the establishment fixed effects includes worker fixed effects.[16]

Both the gender wage gap and the wage penalty from being employed in a women-led establishment diminish as more establishment attributes are controlled for, suggesting that part of these associations reflect that female employees and managers work in lower-paying industries and establishments. The estimates in column (3)

[15] Female managers may also affect the composition of those who *leave* the firm. For example, using matched employer-employee data from Sweden for the period 1970-1990, Kwon and Meyersson Milgrom (2010) show that males are more likely to quit under female management in male-dominated occupations. In female-dominated occupations, men are indifferent. These effects are particularly strong among workers with a college education.
[16] I allow the impact of female co-workers to be different for women and men.

suggest that men receive 4 percent lower and women receive 0.7 percent higher wages (4.7 versus 4.0) under female compared to male management. The relationship remains when establishment fixed effects are included in column (4), suggesting that unobservable workplace wage determinants common to both genders are not driving the relationship between female-led establishments and the gender wage gap.

One potential reason for the lower wage-gap in female-led firms is that women work in relatively better jobs when working for female employers. I test this by including *workplace*×*occupation* fixed effects in column (5), which explains about half of the wage premium from having female managers.[17] However, even when comparing the wages of men and women who hold similar jobs for the same employer, there is still a three percent lower gender wage gap in female-led versus male-led establishments.[18]

The last column includes worker fixed effects. These estimates suggest that individual sorting is very important; accounting for individual heterogeneity reduces the estimates substantially; male workers receive 0.4 percent lower wages in female-led firms, whereas women receive 0.1 percent lower wages. Thus, the impact of female managers for a given worker is economically small (but still precisely estimated). The results from separate regressions for men and women lead to the same conclusions (Table A 1).

[17] It should be noted that the inclusion of occupational controls implies that I may be over-controlling in the sense that job allocation is one of the mechanisms through which women could benefit from female managers.

[18] The 3-digit occupational code covers 113 different occupations that distinguish between, for example, college and primary teaching professionals or business and legal professionals. Meyersson et al. (2001) document an occupation-establishment gender wage gap of one and five percent for blue-collar and white-collar workers, respectively, using a large sample of private sector employees in 1990. They use a more detailed occupational code, which is a possible explanation for the smaller wage gap in their study compared to that documented in column (5) of Table 3.

Table 3 Female managers and the gender wage gap

	(1) OLS Human Capital Controls	(2) OLS Human Capital Controls	(3) OLS Industry and Establishment Controls	(4) Establishment Fixed Effects	(5) Establishment × Occupation Fixed Effects	(6) Worker Fixed Effects
Impact on gender wage gap:						
Female managers × Female		0.023***	0.047***	0.050***	0.035***	0.003**
		(0.004)	(0.004)	(0.002)	(0.001)	(0.001)
Baseline estimates:						
Female	-0.141***	-0.139***	-0.111***	-0.107***	-0.064***	-
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	
Female Managers	-0.084***	-0.100***	-0.040***	-0.036***	-0.025**	-0.004**
	(0.003)	(0.005)	(0.004)	(0.002)	(0.001)	(0.002)
Year dummies	yes	yes	yes	yes	yes	yes
Share female co-workers	no	no	yes	yes	yes	yes
Industry dummies	no	no	yes	yes	yes	yes
Establishment fixed effects	no	no	no	yes	yes	no
Establishment × Occ. fixed effects	no	no	no	no	yes	no
Worker fixed effects	no	no	no	no	no	yes
R^2	0.46	0.46	0.52	0.65	0.76	0.92
Establishments	61,684	61,684	58,150	58,150	59,486	58,150
Observations	23,232,506	23,232,506	22,275,484	22,275,484	22,329,637	22,275,484

Notes: *, ** and *** denote statistical significance at the 10, 5 and 1 percent levels, respectively. Standard errors robust for clustering at the establishment level are shown in parentheses. Apart from the controls reported in the table, all regressions control for age, age^2, education dummies (6 categories), experience and tenure dummies (0, 1-2, 3-4, 5-10, and >10 years). Columns (3)-(6) include log(workplace size) and a variable indicating whether the individual works in the public sector. Column (3) includes industry dummies at the 5-digit level, while columns (4)-(6) replace the 5-digit industry dummies with dummies defined at the 2-digit level. The occupation dummies included in column (5) are defined at the 3-digit level. The observations are weighted according to their sampling probabilities.

Table A 2 in the Appendix examines how sensitive the main results from Table 3, column (6) are to changes in the choice of the continuous measure of female managers and the use of sampling weights. First, I test whether a dichotomous measure of female leadership produces different results. I constructed a female-led dummy that takes the value of one if more than 50 percent of the highest-ranked managers are women and zero, otherwise. As we can see in Panel B, these results are very similar to those in Table 3, although somewhat less precisely estimated. This is not particularly surprising since most establishments are either managed by males or by females (Figure A 1, Appendix).[19] Unweighted regressions also produce very similar results (Panel C), suggesting that the underrepresentation of small establishments in the private sector is unlikely to affect the estimates to any large extent.

5.2 Female managers and worker sorting

The results in Table 3 contest that managers treat opposite sex workers differently once we control for their level of productivity. To further substantiate the importance of worker selection this section examines whether the gender and skill composition of hires varies with the gender composition of managers.

The data for the analysis contain all newly hired workers during the period 1996-2008; defined as those who did not receive compensation from their current employer in any of the five preceding years.[20] Inspired by Carlsson et al. (2011), the data are further linked to pre-determined measures of worker skills obtained using the regression framework developed by Abowd et al. (1999), which decomposes wages into individual and firm heterogeneity. In practice, I use data for the pre-sample period 1985-1995 and estimate models of the following form:[21]

$$\log(w)_{ijt} = \delta_1 Age_{it} + \delta_2 Age^2_{it} + \theta_i + \psi_{J(i,t)} + \varphi_t + \varepsilon_{ijt} \quad (2)$$

[19] The median number of managers is one, and thus, in most cases, the female share is either zero or one.
[20] Some additional restrictions are applied to the data. First, to focus attention on actual hires, I disregard workers earning below the 10th percentile of the overall earnings distribution in order to avoid classifying loosely connected workers as new hires. Second, I also require that the establishment existed the year before the hire, and I remove establishments that changed more than two-thirds of the workforce from one year to the next.
[21] I estimate the person-effects using the a2reg.do code written by Amine Quazad. This program follows Abowd et al. (2002).

where θ_i is a vector of individual specific indicators; $\psi_{J(i,t)}$ comprises the establishment indicators; φ_t captures the time effects; and ε_{ijt} is the error term. The model also accounts for the age-earnings profile of the worker.

The estimated person effect $\hat{\theta}_i$ measures the part of the wage that does not vary as the employee moves from one establishment to another, thus reflecting the portable earnings capacity of workers. The $\hat{\theta}_i$´s may include both observable characteristics such as education and experience as well as unobservable traits, such as innate ability or motivation. For simplicity I refer to these estimates as worker "skills".[22] The main advantage of using pre-period data is that this reassures that the skill measures are exogenous to the gender composition of managers at the time of hire.[23] Moreover, as skills are measured in terms of wages, it is easy to relate the effects of female management on the skill composition of hires to the portion of the gender wage gap explained by the worker fixed effects in the main analysis.[24]

Figure A 2 in the Appendix shows the distribution of worker skills, measured by $\hat{\theta}$, among newly hired workers during 1996-2008, broken down by gender. There is a wide variation in the person effects, suggesting that workers differ substantially in their permanent skills. The skill distributions are, moreover, different in the sample of hired men and women; the estimated person effects are higher on average and display less variation for male workers compared to female workers.[25]

[22] Note that worker's observed human capital will be included in the second stage hiring equation (eq. 3).
[23] A drawback is that the early period lacks information on actual wages. Thus, instead of having wages as the dependent variable in eq. (2), I use monthly full-time earnings. These are calculated as worker's annual earnings divided by months of employment, including only employment spells that cover November each year. In order to focus on full-time or close to full-time earnings, I use a minimum wage cut-off of 75 percent of the mean wage of janitors. In addition, I retain worker's main source of income. Other studies have used this approximated wage measure and shown that the earnings distribution resembles the true wage distribution (Nordström Skans et al., 2009 and Carlsson et al., 2011). To be sure, I also checked the correlation between the person effects derived from monthly earnings and wages in the later period (see Table A3 in Appendix). The correlation is high (88 percent), suggesting that using monthly full time earnings instead of true wages is not likely to be an issue of large concern for this analysis.
[24] This is also highlighted by Carlsson et al., (2011), who use a similar strategy to examine the importance of worker selection in explaining the relationship between firm-level productivity and individual wages.
[25] Both of these may (partly) reflect differences and variations in hours worked.

Table 4 examines the association between the gender composition of managers and the skill composition of new hires. For comparability, the empirical approach is identical to that used when analyzing wages. Thus, the model is:

$$\hat{\theta}_{ijt}^{H} = \beta_1 F_i + \gamma_1 F_i \times S_{ijt}^{M} + \gamma_2 S_{ijt}^{M} + X_{ijt} + \delta_t + \varepsilon_{ijt} \qquad (3)$$

where $\hat{\theta}_{ijt}^{H}$ is the estimated skill component obtained from eq. (2) for worker *i* hired by establishment *j* in year *t*; F_{ijt} is a dummy that takes the value of one if the individual is female; S_{ijt}^{M} is the proportion of female managers; and X_{ijt} includes worker *i*:s observable human capital (age and education). The variable of interest is γ_1, which measures whether female-led establishments recruit female workers with higher permanent skills relative to males compared to male-led establishments.

The estimates in Table 4 suggest that this is indeed the case; there is a positive and statistically significant impact of female managers on the skill level of newly hired women.[26] The estimate does not change much throughout columns (1)-(4), suggesting that unobserved heterogeneity at the industry-, establishment- or job level does not explain these productivity-related gender differences in recruitments. Interestingly, the magnitudes are similar to the portion of the association between female management and the gender wage gap explained by the worker fixed effects in the main analysis presented in Table 3. This confirms that most of this relationship is explained by compositional effects, which moreover seem to arise through differential hiring rather than employee turnover.[27]

5.3 Female managers or female-friendly firms?

The establishment fixed effects in column (3) account for workplace factors that are common to workers of both sexes employed in the establishment. Hence, it could still

[26] We learn from looking at the female dummy that there is a substantial difference in the average skill level between hired men and women. Although I disregard monthly earnings below a minimum wage in order to resemble the true wage distribution when estimating the person effects in the pre-period, the distribution of the approximated wage measure displays higher variation than true wages, which probably reflects differences in hours. The magnitude of the gender difference should thus be interpreted with caution, as it may indicate systematic gender differences in hours worked in the pre-period.

[27] Using the unweighted sample also yields similar results.

be the case that some firms hire talented women and appoint female managers due to unobserved firm practices rather than female management per se. For example, earlier literature has pointed out that women have a higher demand for firm practices that help to balance work and career (Bloom et al, 2010). Hence, differences in the provision of family friendly practices may generate systematic sorting of female talent across employers.[28]

To separate between these explanations, which is crucial for the interpretation of the results, the last column includes gender-specific establishment dummies. Identification of the impact of female managers now comes from within establishment variation in female management over time. As displayed in column (5) this reduces the estimates significantly, suggesting that unobserved workplace practices is the main driver behind the relationship between female management and the sorting of women across establishments.

In the lower panel of Table 4, I also look at the relationship between the gender composition of managers and the proportion of female hires. This relationship is interesting in itself and it is also informative regarding the validity of the main empirical strategy, which uses co-worker composition to proxy for unobserved differences at the establishment level. The results are obtained from estimating linear probability models, where the dependent variable takes the value of one if the hire is female and zero, otherwise. The explanatory variable of interest is the proportion of female managers. The rest of the controls included are those indicated by the table.

As seen in the table, there is a substantial raw correlation between the female composition of managers and hires, but only a small part of this effect remains when industry and establishment characteristics are taken into account. Evaluated at the average female share of hires (54 percent), the estimates suggest that gender-biased recruitments are of minor importance in this context.[29]

[28] The provision of female practices may be one margin for firms to compete for the most talented women. Alternatively, and as argued by Bloom et al (2010) there is a social value attached to the provision of family-friendly practices, which enter into the choice of different firm strategies.

[29] Using similar models, Aslund et al., (2009) documents that immigrant managers are three times as likely to hire immigrants compared to native managers. In comparison to those findings, the impact of female managers is small. This also implies that the potential bias in the main results is likely to be small, since workplace gender composition is only mildly affected by the share of female managers.

Table 4 Female managers and the composition of hires

	(1)	(2)	(3)	(4)	(5)
Specification:	OLS Human capital controls	OLS Industry and establishment controls	Establish. Fixed Effects	Establish. × Occup. Fixed Effects	Establish. × Female Fixed Effects
A: Dep. var.: Person effect					
Female managers× Female	0.024***	0.028***	0.035***	0.029***	0.002
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
Baseline estimates:					
Female	-0.163***	-0.149***	-0.150***	-0.122***	
	(0.001)	(0.001)	(0.001)	(0.001)	
Female managers	-0.060***	-0.024***	-0.025***	-0.019***	-0.003
	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)
R^2	0.802	0.809	0.824	0.852	0.831
Observations	1,500,109	1,483,766	1,453,064	1,453,064	1,453,064
B: Dep. var.: Hire is female					
Female managers	0.386***	0.071***	0.010***	0.008***	
	(0.005)	(0.004)	(0.003)	(0.003)	
R^2	0.108	0.238	0.301	0.404	
Observations	2,902,637	2,893,096	2,815,111	2,815,111	
Year dummies	yes	yes	yes	yes	yes
Education dummies (observable general human capital)	yes	yes	yes	yes	yes
Industry dummies	no	yes	yes	yes	yes
Establishment fixed effects	no	no	yes	yes	yes
Establishment × occupation (3-digit) fixed effects	no	no	no	yes	yes
Establishment × female fixed effects	no	no	no	no	yes

Notes: . *, ** and *** denote statistical significance at the 10, 5 and 1 percent levels, respectively. Standard errors robust for clustering at the establishment level are shown in parentheses. The sample consists of newly hired workers during 1996-2008. The dependent variable in the first panel is the estimated worker fixed effects obtained from the estimation of eq. (2). The dependent variable in the second panel is a dummy that takes the value of one if the hire is female and zero, otherwise. The proportion of female managers is mean-centered. Apart from the controls reported in the table, all regressions control for age and age^2. Columns (2)-(4) include log(establishment size) and a variable indicating whether the individual works in the public sector. Column (2) includes industry dummies at the 5-digit level, while columns (3) and (4) replace the 5-digit industry dummies with dummies defined at the 2-digit level. The observations are weighted according to the sampling probabilities.

5.4 Heterogeneity analysis

Despite the small effects found in Table 3, it is not possible to rule out that some women may still benefit from having female managers. To examine this in further detail, I look at the impact of female managers in various subsamples. This section provides a summary of these results, which are presented in Table A4-Table A 6 in the Appendix. For simplicity, I estimate separate regressions for women and men, but I also discuss the implications of the estimates for the gender wage gap.

I start out with the differential impact of female managers with respect to sector and establishment size. One potential explanation for the small effects found earlier is that female managers are more concentrated to the public sector, where government

objectives and policies against discrimination may limit the scope for discrimination in the first place.[30] Columns 1 and 2 in Table A4 display the results from separate estimations of model (1) for public and private employees. I find no evidence that women-led firms are more important in the private sector compared to the public sector. If anything, women receive lower wages in female-led private establishments (Panel A), but this is also true for male workers (Panel B). Hence, there is no association between the proportion of female managers and the gender wage gap in the private sector. I also test whether the impact differs with establishment size, but I reject that managers have a significantly differential impact in small (column 3) and large (column 4) establishments.

Finally, I examine whether there is a difference in the impact of female managers in female dominated versus male dominated establishments by allowing the effect of female managers to vary with the sex composition of the co-workers. The results, reported in columns (5)-(7) suggest that there is a small wage premium for women employed in a female-led, female-dense establishment compared to women employed in female-dense male-led organizations (column 5). There are at least two possible mechanisms that could motivate this finding. First, a higher proportion of women may reflect that the establishment is female-friendly, with female managers, a more women dense workforce and higher female wages. Second, women managers may have better information about women's productivity in the hiring stage, for example, if they interact more closely with their female employees or use them as referrals.[31]

Columns (6) and (7) show results from separate regressions for workers entering an establishment and for those with at least one year of job tenure. The female wage premium of being hired by a woman manager is concentrated at the beginning of the employment spell. This lends suggestive support to the notion that female managers in

[30] Although the public sector in Sweden is decentralized and wages to a large extent are determined through individual wage bargaining, wages are less dispersed in the public sector than in the private sector.

[31] Hires mediated by referrals reduce employer uncertainty about worker productivity both by transmitting information to the prospective employee about the employer and by informing the employer about potential employees (Montgomery, 1991). Dustmann et al. (2010) develop a model where networks improve the ability of employers to recognize workers with the highest match-specific productivity whereby hires found through referrals receive an entry wage premium that diminishes with tenure. If female managers are more likely to use other women as referrals, this could lead to an entry wage premium that increases with the number of potential referrals (i.e., women) and that diminishes as employers learn about the true productivity of workers.

women-dense establishments may have an information advantage in the hiring stage, which diminishes as employers learn about the true productivity of workers.

So far, I have only concentrated on the highest ranked managers in the establishments under study. This could misleading if workers are influenced by managers with whom they closely interact. For example, if managers are important as mentors or role models, then being exposed to women at lower managerial levels may be equally – or even more – important than being employed in a firm with a female executive. To examine this, I use a sample of establishments with multiple manager levels and allow for a separate impact from middle and top managers.[32] The importance of middle managers is particularly interesting because this group contains a larger fraction of women than the group of top managers.

The results, displayed in Table A 5, show that there is no significant impact of either top or middle managers on female wages. However, there is a negative and significant interaction effect between the impact of female middle managers and wages (column 2), though only for tenured workers (column 4). This indicates that being exposed to middle managers on the job seems to increase women's wages when women are in the minority in their establishment. The fact that managers only matter when the woman-to-female-manager ratio is low may suggest that there might be a cost attached to helping other women advance.[33]

To illustrate this further, I also estimated models similar to model (1), allowing both the baseline effect of managers as well as the interaction between managers and entry-level co-workers to vary with job tenure according to five categories (0, 1-2, 3-4, 5-10, and >10 years). The results for women are plotted in Figure 3. For estimates and standard errors, see Table A 6 in the Appendix.

Although the precision of the estimates is poor, they clearly support the hypothesis that women with a high share of female middle managers have higher wage growth if they are in the minority in their establishment. However, while women seem to benefit

[32] Twenty-six percent of the workers are exposed both to top and middle managers.

[33] This finding is consistent with Hultin and Szulkin (2003), who show that the proportion of males at lower decision-making hierarchical levels (i.e., supervisors) has a larger impact on the gender-wage gap than male representation at higher levels (i.e., managers), and it is also consistent with Cardoso and Winter Ebmer (2010), who show that the wage premium from having lower-level female managers decreases with the share of females in the firm.

from a low female-to-manager ratio, male workers lose out and receive a relatively lower wage growth compared to male workers in male-led firms (Figure A 3 and Figure A 4).

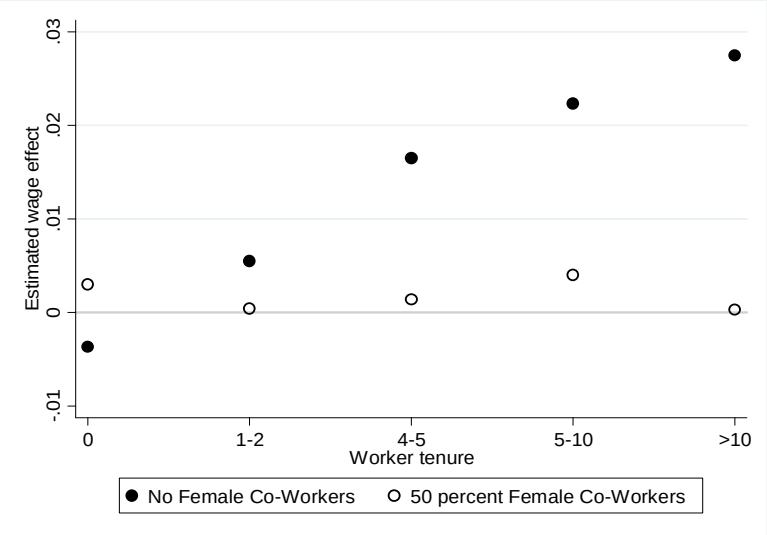

Figure 3 Female wage premium of female middle management by tenure and co–worker composition

Notes: The black circles show the estimated effect of having female middle managers for women without any female co-workers. The hollow circles show the estimated effects for women with 50 percent female co-workers. For full results and standard errors, see Table A4 in the Appendix.

6 Conclusions

The underrepresentation of women in management positions is often highlighted as one explanation for the observed gender inequality in the labor market. A theoretical literature has also argued that female managers may break the glass ceiling for female employees, e.g., by serving as mentors and role models for lower-level employees or by eliminating discriminatory behavior. However, the existing empirical evidence provides scarce evidence on the relevance of gender biased wage setting and promotion practices and has not been able to separate such effects from alternative explanations.

This paper has examined whether gender bias in the worker-manager relationship is an important determinant of wages using Swedish longitudinal matched employer-employee data covering 13 years. I document that the gender wage gap among non-managerial workers decreased by one percentage point during this period, while the

share of female managers increased by more than ten percentage points. In addition, I find a negative correlation between the proportion of female managers and the within-establishment gender wage gap, which is both economically and statistically relevant. The magnitude of this effect is in line with previous work; Carduso and Winter-Ebmer (2010) document a similar association in Portugal.

However, once I control for gender-related productivity differences I find that most of the association between female managers and the gender wage gap goes away. The remaining effects imply a 0.3 percent narrowing of the gender wage gap in female-led versus male-led establishments. The effects do not seem to vary with establishment size or sector.

The results indirectly suggest that the presence of female leadership is positively related to the skill composition of women. Looking further at the characteristics of newly hired workers I find that these compositional effects are determined by unobserved workplace characteristics rather than differing hiring strategies of male and female managers. I cannot separate whether this is mainly due to behavior on the demand or supply side of the labor market. In other words, female talent may either enter some firms because they anticipate better career opportunities or because some firms are better in finding high-wage women.

In any case, my results contradict the notion that female managers are more female-friendly in the selection of and wages paid to workers. Women do seem to benefit from having more female managers in middle management positions, but this positive impact diminishes as the share of female co-workers increase. Together, these results suggest that female supervisors might protect or mentor other women in male-dominated work environments, but the role of female managers can be overstated if we do not sufficiently account for the selection of workers into male- versus female-led establishments.

My findings are also interesting since they indicate that differences in workplace practices may influence the selection of women into establishments, which can in turn lead to a path-dependence in the supply and representation of female managers in some organizations. A deeper assessment of the factors determining the selection of appointed

and potential leadership female candidates thus seems important in order to fully understand the determinants of women's wages and careers.

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Appendix A

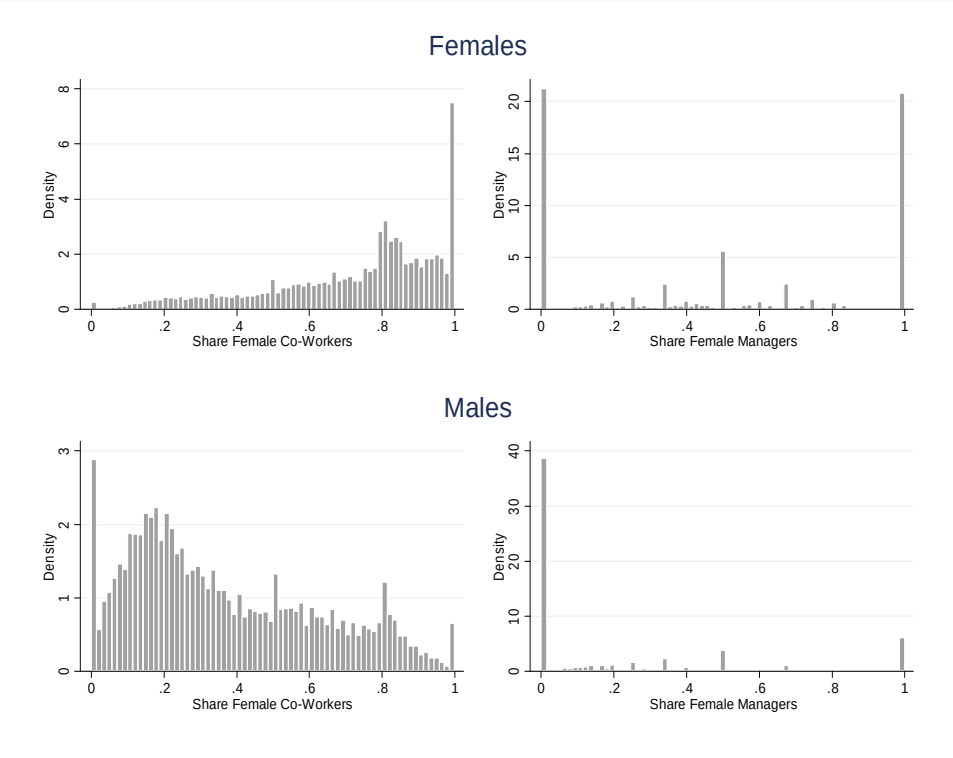

Figure A 1 Distribution of female co-workers and highest ranked female managers for female (upper) and male (lower) employees

Table A 1 Female managers and wages, separate regressions

	(1)	(2)
Specification:	Worker FE Females	Worker FE Males
Female Managers	-0.001**	-0.003**
	(0.001)	(0.002)
R^2	0.91	0.92
Establishments	55,288	52,385
Observations	11,263,781	11,011,703
Year dummies	yes	yes
Industry dummies	yes	yes
Worker fixed effects	yes	yes

Notes: Each column represents a separate regression. *, ** and *** denote statistical significance at the 10, 5 and 1 percent levels, respectively. Standard errors robust for clustering at the establishment level are shown in parentheses. The table provides results from separate regressions of model (1) on samples of non-manager male and female employees. All regressions control for age, age^2, education dummies (6 categories), experience and tenure dummies (0, 1-2, 3-4, 5-10 and >10 years), log(workplace size) and a public sector dummy.

Table A 2 Sensitivity of the main results

Variable of interest:	Female managers × Female	Female Managers
A: Baseline (column 5, Table 2)	0.003**	-0.004**
	(0.002)	(0.002)
B: Female majority (binary variable)	0.003	-0.003**
	(0.002)	(0.002)
C: Unweighted regressions	0.003**	-0.004**
	(0.001)	(0.002)

Notes: Each panel (row) represents a separate regression. *, ** and *** denote statistical significance at the 10, 5 and 1 percent levels, respectively. Standard errors robust for clustering at the establishment level are shown in parentheses. All regressions control for age, age^2, education dummies (6 categories), experience and tenure dummies (0, 1-2, 3-4, 5-10 and >10 years), log(workplace size), a public sector dummy and year effects. They also include industry (2-digit) and worker fixed effects.

Table A 3 Correlation between estimated person effects from monthly wages and monthly earnings

	Person effects monthly wages	Person effects monthly full time earnings
Person effects monthly wages	1	
Person effects monthly full time earnings	0.88	1

Notes: The table shows the correlation between the estimated person effects using monthly full-time earnings and true monthly wages obtained from equation (2) as described in Section 5.1 using data for the period 1996-2008.

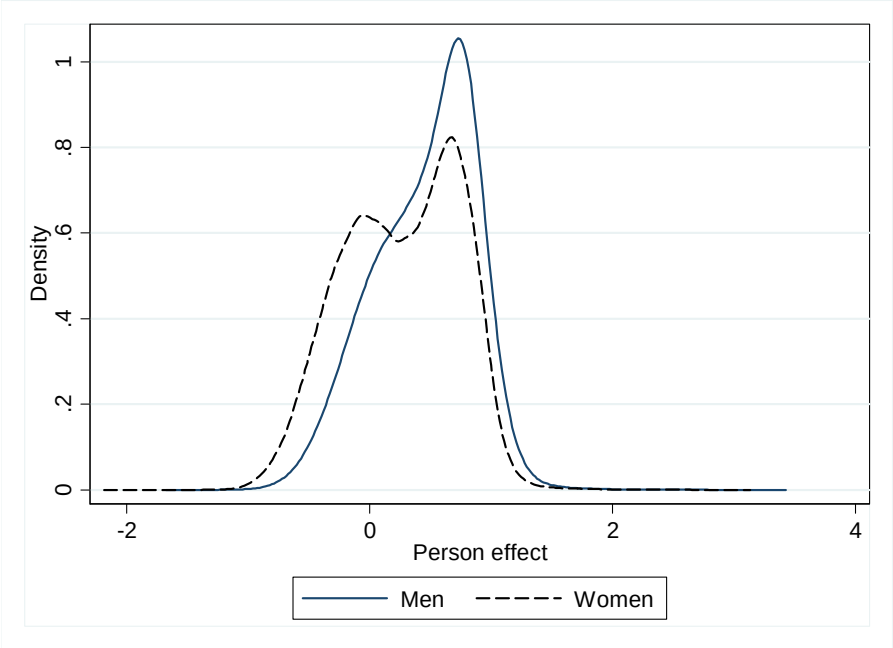

Figure A 2 Distribution of hires permanent skills

Notes: This figure shows a kernel density estimate of the person effects obtained from equation (2) in Section 5.1 I use an Epanechnikov kernel and "optimal" bandwidth. The sample consists of new hires during 1996-2008

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Table A4 Effect of female managers on wages: subsamples

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: *Females*	Public	Private	Workplace size <100	Workplace size >99	Female density	Worker tenure <1	Worker tenure >1
Female managers	0.0003	-0.007**	-0.001*	-0.002*	-0.001**	-0.002	-0.001*
	(0.0007)	(0.003)	(0.001)	(0.002)	(0.0007)	(0.001)	(0.008)
Female managers × female co-workers					0.010**	0.027***	0.006
					(0.003)	(0.006)	(0.004)
R^2	0.93	0.93	0.93	0.92	0.91	0.90	0.92
Establishments	34,977	25,526	52,295	6,120	55,288	46,569	53,183
Observations	7,815,406	3,448,375	5,715,810	5,517,327	11,263,781	1,815,254	9,448,527
Panel B: *Males*							
Female managers	-0.002	-0.007*	-0.003**	-0.004	-0.004**	-0.008**	-0.003
	(0.001)	(0.004)	(0.001)	(0.003)	(0.002)	(0.003)	(0.002)
Female managers × female co-workers					0.005	0.010	0.006
					(0.003)	(0.007)	(0.006)
R^2	0.94	0.93	0.95	0.91	0.92	0.94	0.93
Establishments	32,551	24,977	49,380	6,120	52,385	43,790	49,304
Observations	5,036,324	5,975,379	5,160,882	5,826,623	11,011,703	1,543,324	9,468,379
Year dummies	yes	yes	yes	yes	yes	yes	yes
Industry dummies	yes	yes	yes	yes	yes	yes	yes
Worker fixed effects	yes	yes	yes	yes	yes	yes	yes

Notes: *, ** and *** denote statistical significance at the 10, 5 and 1 percent levels, respectively. Standard errors robust for clustering at the establishment level are shown in parentheses. All regressions control for age, age^2, education dummies (6 categories), experience and tenure dummies (0, 1-2, 3-4, 5-10 and >10 years), log(workplace size) and a dummy indicating whether the individual works in an establishment in the public sector. The industry dummies are defined at the 2-digit level. All variables shown in the table are mean-centered.

Table A 5 Impact of female managers on female wages (top and middle managers)

	(1)	(2)	(3)	(4)
	Baseline	Co-worker interactions	Worker job tenure <1 (entry wage)	Worker job tenure >1
Female middle managers	0.002	0.001	0.005	0.002
	(0.002)	(0.002)	(0.005)	(0.002)
Female top managers	-0.004	-0.004*	0.002	-0.003
	(0.003)	(0.002)	(0.004)	(0.002)
Manager–co-worker interactions:				
Female middle × female		-0.015	0.018	-0.020**
co-workers		(0.008)	(0.020)	(0.010)
Female top × female		0.003	0.006	0.004
co-workers		(0.010)	(0.018)	(0.010)
Year dummies	yes	yes	yes	yes
Industry dummies (2-digit)	yes	yes	yes	yes
Worker fixed effects	yes	yes	yes	yes
R^2	0.93	0.93	0.95	0.94§
Establishments	13,404	13,404	11,441	13,302
Observations	3,529,925	3,529,925	533,321	2,996,604

Notes: *, ** and *** denote statistical significance at the 10, 5 and 1 percent levels, respectively. Standard errors robust for clustering at the establishment level are shown in parentheses. Apart from the controls reported in the table, all regressions control for age, age^2, education dummies (6 categories), experience and tenure dummies (0, 1-2, 3-4, 5-10, and >10 years), log(workplace size) and a dummy indicating whether the individual works in an establishment in the public sector. All variables shares shown in the table are mean-centered.

Table A 6 Effect of female managers, manager type and tenure interactions

	(1)		(2)	
Sample:	Females		Males	
	Estimate	se	Estimate	se
Female middle managers × tenure				
0	-0.004	0.009	-0.001	0.011
1-2	0.006	0.009	-0.014	0.009
3-4	0.017	0.012	-0.020*	0.012
5-10	0.022*	0.013	-0.008	0.016
>10	0.027*	0.016	-0.008	0.017
Manager-co-worker interactions: Female middle × female co-workers × tenure				
0	0.014	0.013	0.025	0.018
1-2	-0.010*	0.011	0.036**	0.014
3-4	-0.030**	0.016	0.043**	0.014
5	-0.037**	0.018	0.015	0.026
>10	-0.054	0.21	-0.010	0.028
Female top managers × tenure				
0	-0.011	0.011	-0.010	0.011
1-2	-0.002	0.007	-0.001	0.007
3-4	-0.007	0.009	0.001	0.010
5	0.001	0.010	-0.008	0.013
>10	0.020	0.013	-0.007	0.019
Manager-co-worker interactions: Female top × female co-workers × tenure				
0	0.016	0.014	0.022	0.014
1-2	-0.0004	0.009	-0.013	0.012
3-4	0.001	0.013	-0.030*	0.016
5	-0.010	0.014	-0.038*	0.020
>10	-0.037**	0.017	-0.005	0.030
R^2	0.93	-	0.94	-
Observations	3,529,925	-	4,693,533	-
Establishments	13,404	-	13,424	-
Year dummies	yes	yes	yes	yes
Industry dummies	yes	yes	yes	yes
Worker dummies	yes	yes	yes	yes

Notes: *, ** and *** denote statistical significance at the 10, 5 and 1 percent levels, respectively. Standard errors robust for clustering at the establishment level are shown in parentheses. Apart from the controls reported in the table, all regressions control for age, age^2, education dummies (6 categories), experience and tenure dummies (0, 1-2, 3-4, 5-10, and >10 years), log(workplace size) and a dummy indicating whether the individual works in an establishment in the public sector. All variable shares shown in the table are mean-centered.

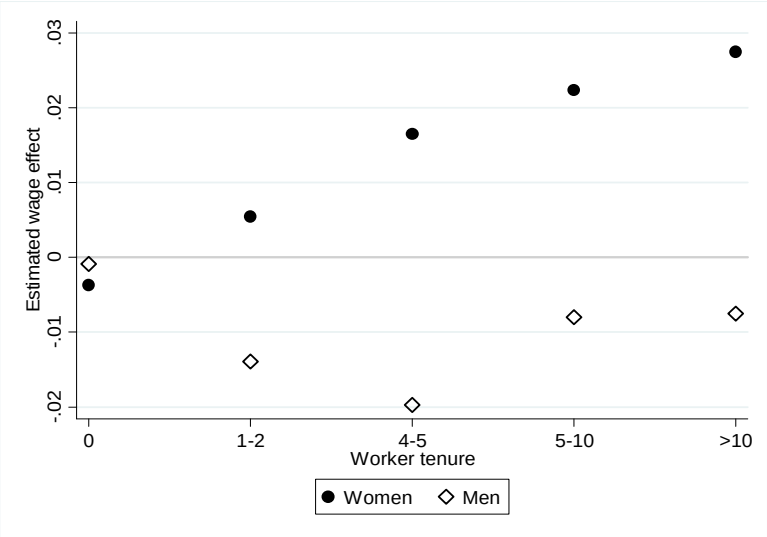

Figure A 3 Impact of female middle managers on male and female wages for employees without female co-workers

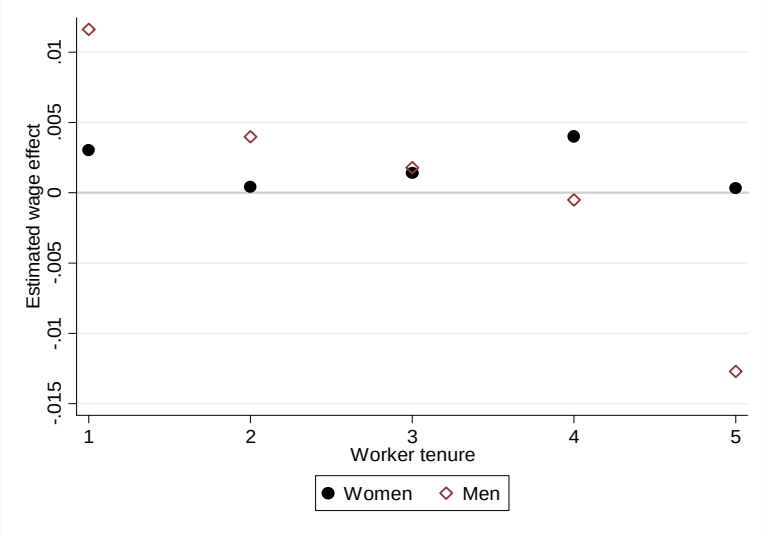

Figure A 4 Impact of female middle managers on male and female wages for employees with 50 percent female co-workers

Notes: The estimates are obtained from separate regressions of female managers on wages for males and females. For full results and standard errors, see Table A 6.

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