

MANAGER IMPARTIALITY: WORKER-FIRM MATCHING AND THE GENDER WAGE GAP

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Using a rich matched employer-employee data set from Sweden, the author examines whether female managers in a firm narrow the gender pay gap. The study's main contribution is its ability to account for unobserved heterogeneity among both workers and firms that is potentially correlated with manager gender. The results show a substantial negative association between the representation of female managers and the establishment's gender wage gap. Estimates that account for sorting on unobserved worker skills, however, do not support the conclusion that managers favor same-sex workers in wage setting. Additional results show that organizations with more female managers recruit more nonmanagerial, high-wage women. Together these findings suggest that associations between manager gender and male-female wage gaps should be interpreted with caution, as worker sorting seems to be a crucial component behind this relationship.

The underrepresentation of women in high-paying occupations and managerial positions is often described as one 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

A growing literature points out that a higher share of women in the management of firms could have important implications for firm and worker outcomes. For example, evidence from the introduction of a gender board quota in Norway suggests that the quota affected the value (Ahern and

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¹Norway was the first country to adopt mandated gender quotas in corporate boards in 2003, and a similar law went into effect in France in 2010. The law in Norway required at least 40% of the directors of public firms to be women in 2005.

Dittmar 2012), employment levels, and profits of the firms (Matsa and Miller 2013).

Furthermore, studies from other countries also indicate that women in other parts of the firm may benefit from female decision makers. Most of this evidence, however, is based on cross-sectional comparisons of male-versus female-led firms (see, e.g., Hultin and Szulkin 2003 and Cohen and Huffman 2007). Hence, the studies generally suffer from the difficulty of separating the influence of female managers from unobservable factors that could generate gender differences in pay, such as differences in productivity or human resources practices.

A few studies use firm panel data to overcome the empirical difficulties of trying to identify the role of managers. Cardoso and Winter-Ebmer (2010) explored a large representative sample from Portugal and found that female wages increased when firms received a female manager. In addition, studies based on U.S. data examine the relationship between female leadership and appointment of female managers at lower tiers of the firm's hierarchy. Bell (2005) showed that female executives received higher compensation and were more likely to be among the highest-paid executives in women-led firms, and Kurtulus and Tomaskovic-Devey (2012) presented evidence of female top managers promoting gender diversity at lower managerial levels. Compared with the cross-sectional evidence, these studies provide more convincing evidence of the role of managers, as they account for permanent firm-level differences that may simultaneously affect the gender composition of managers and gender differences in pay. Nevertheless, it is still difficult to make sure that the variation in manager gender is independent from time-varying factors that determine the wage gap, such as, for example, changes in firm policy or employee selection.

In this article I build on the longitudinal approach taken in earlier studies. I investigate the importance of female managers for women's wages using a matched employer-employee data set covering all workers in Sweden from 1985 to 2008. While Sweden is generally known for high female labor force participation and a narrow wage structure, there is a nontrivial gender wage gap, which appears to vary with the gender composition of managers in a cross-section (Hultin and Szulkin 2003). There has, moreover, been a rapid increase in the number of women in managerial occupations in the private sector in Sweden, along with a narrowing of the gender wage gap during the past 15 years, which raises the question of how women in decision making affect gender pay differences in the Swedish labor market.

First, I estimate the importance of female managers using establishment fixed-effects models that account for (potentially unobserved) factors that may be correlated with manager gender. Second, I exploit variation in manager gender by following the same workers over time and across managers. This adds to previous studies that have not been able to account for worker heterogeneity. Third, I derive a predetermined measure of the unobserved component of worker productivity, using the methods developed by Abowd, Kramarz, and Margolis (1999) as a proxy for unobserved worker skills in

order to directly assess how increased representation of female managers affects the gender and skill composition of newly hired workers.

Background and Related Studies

The recent empirical work on this topic reviews the main theoretical arguments for why female managers may narrow the gender wage gap and improve women's career opportunities (see, e.g., Cardoso and Winter-Ebmer 2010 and Kurtulus and Tomaskovic-Devey 2012 for a review). Here I provide a brief overview of the main channels discussed in this literature, grouped into two broad set of explanations.

1) Managers may first of all affect the wages and promotion probabilities of existing workers. Models of both taste-based and statistical discrimination can give rise to higher female wages in female-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 increases.²

Another reason is that women 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, Avery, and Zemsky 2000). Empirical studies have to a large extent focused on mentoring relationships in academia. Neumark and Gardecki (1998) and Hilmer and Hilmer (2007) found no evidence of positive effects from gender similarity between economics PhD students and their advisers. However, in a later evaluation of a randomized trial of a mentoring program for female economists, Blau, Currie, Croson, and Ginther (2010) demonstrated an increased number of publications and successful grants among women who received mentoring relative to those who did not.³

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 in the labor market can

²Men and women who do the same job for the same employer receive similar wages in Sweden and in other Scandinavian countries, as well as in the United States. Differential treatment of men and women doing equal work for the same employer is thus likely to be of second order (Meyersson Milgrom, Petersen, and Snartland 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 have found that women have lower promotion rates than do observably identical males (cf. Olson and Becker 1983; Cobb-Clark 2001; Ransom and Oaxaca 2005; Blau and DeVaro 2007), while others have found no relationship or a reversed relationship between gender and promotions (Barnett, Baron, and Stuart 2000). Studying the Austrian labor market, Weber and Zulehner (2010) found 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.

³Bettinger and Long (2005) looked at college faculty composition in Ohio and found that female faculty enhanced the outcomes for female students, which supports a possible role model effect.

encourage other women to invest in similar career paths. 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 1996). A similar argument is that female managers may be appointed as “gate-keepers” as a way of maintaining the majority’s dominance.⁴

2) Besides reducing the gender pay gap for existing employees, managers may also influence the selection of workers through hiring and retention. Kurtulus and Tomaskovic-Devey (2012) discussed the role of female networks, which may disseminate information about highly qualified female job candidates to managers. Alternatively, female managers may encourage self-selection in and out of the firm. Career-oriented women may, for example, enter female-led firms if they anticipate better advancement opportunities. Furthermore, Kwon and Meyersson Milgrom (2010) showed that male workers, particularly those with high education, were more likely to quit under female management in male-dominated occupations. This indicates that 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 relative wages.

Consistent with both these broad explanations, previous work documents that having more women in top leadership is associated with higher female wages and subsequent growth in managerial gender diversity at firms. Cardoso and Winter-Ebmer (2010) found that under female management women’s wages increased, whereas men’s decreased, leading to a smaller wage gap in women-led firms. This effect was found to be weaker in firms with a high share of female employees, which is consistent with the notion that female managers may provide (potentially costly) mentoring of female workers.

A related study is that by Kurtulus and Tomaskovic-Devey (2012). Relying on similar establishment-fixed effects techniques along with U.S. data, they showed that increases in the proportion of women in top management filtered through to subsequent increases in female representation in lower-level managerial jobs. This effect is stronger when firms hold federal contracts and thus are bound by affirmative action obligations.

Taken together, earlier studies consistently show that the appointment of female managers results in greater gender pay parity in the firms subject to the management change. This effect could, however, also reflect that managers are better in attracting talented workers of the same gender. In this article I take both these aspects into account, which should be important for

⁴Bagues and Esteve-Volart (2010) exploited random assignment of candidates to evaluation committees in public examinations in Spain and showed that female candidates are *less* likely to be hired when the committee consists of a greater share of women. They attributed this finding to the possibility either that female evaluators are overestimating the true quality of male candidates or that the presence of women strengthens the male committee members’ bias toward male candidates.

how we think about the role of female managers for changing the pay structure within the firm and in the economy as a whole.⁵

Data and Sample

The data used for this analysis come from administrative registers collected by Statistics Sweden. I focus on managers and workers in the private sector, as the occupation codes identifying managers are not fully comparable to those in the public sector during the time period.⁶

The main data source is a wage register (Lönestrukturstatistiken) that contains information on wages and occupations of all workers in the public sector and a sample of workers in the private sector from 1996 to 2008. The sample for the private sector is stratified by firm size and industry and covers around 50% of all private employees with sampling weights to make the results representative for the population. The data were collected once a year (in September) for all workers in the sampled firms, conditioned on at least one hour of employment during the sampling week. The main components for my analysis are wage and occupation data. A more detailed description of each of these concepts is provided below.

Wages

The key dependent variable of my analysis is the wage the worker had during the sampling week expressed in full-time monthly equivalents. The variable includes all fixed wage components, including piece-rate and performance pay as well as fringe benefits. Overtime pay or paid leave is, however, not included.

The monthly wage is adjusted to full-time for part-time workers by Statistics Sweden. For the blue-collar workers the wage is typically obtained by the hourly pay rate times the number of hours that correspond to full-time employment. For the white-collar workers it reflects the September wage adjusted by the share of part-time work during the same month. Hence my sample includes all workers (full-time, part-time, and part-year) as long as they were employed for at least one hour during the sampling week in September.

⁵A related literature looks at the impact of racial and immigrant bias in the manager-employee relationship using a firm fixed-effects approach similar to that of Cardoso and Winter-Ebmer (2010) (see Bandiera, Barankay, and Rasul 2009; Giuliano, Leonard, and Levine 2009, 2011; Åslund, Hensvik, and Nordström Skans 2013; and Giuliano and Ransom 2013). The most closely related article is Bandiera et al. (2009). They account for worker fixed effects when analyzing the role of managers for the wages received by workers. More specifically, they examine how social connections between managers and employees affect worker productivity in a British fruit-picking company. However, they focus on similarity with respect to nationality and not gender per se.

⁶Reclassification of the occupation codes in 2004 and 2008 generated spurious variations in manager composition for these years. It should also be noted that the increasing trend in the representation of women throughout the period is occurring within the private sector, while the female share of managers is relatively constant in the public sector.

Additional Variables and Sample Means

I add individual (age, education, and earnings) and establishment (sector, industry, and size) characteristics from additional registers covering the full working-age population from 1985 and onward.⁷ By following the workers over time and across employers, I also calculate measures of worker experience and employer tenure, defined by the number of years with non-zero labor earnings (for experience) and non-zero earnings from the same employer (for tenure) since 1985.

Table 1 reports summary statistics for the unweighted (column (1)) and weighted (rest of the table) sample. The sample contains 5 million observations in total, from about 1.5 million workers and 28,000 unique establishments.⁸ The proportion of women in the sample is 36%; the average worker is 40 years of age and has 14 years of experience and 7 years of employer tenure. In order to be included in the sample, establishments must have had at least three employees (the focal employee and at least one manager and one (non-managerial) coworker).⁹ The majority of the establishments are small to medium according to the weighted sample, which mirrors the structure of the Swedish economy. While the average number of employees is 432, the median lies at 86. Roughly 10% of the employees work in establishments with more than 1,000 workers, including the largest establishment, with 8,047 employees.¹⁰

Apart from the main components of the data summarized in the table, I also construct individual skill measures from auxiliary data in 1985 to 1995 for the analysis of worker sorting. The data and estimation procedure for this analysis are described in more detail in conjunction with this analysis.

Managers

I use the Swedish Standard for Classification of Occupations (SSYK) to define managers. The classification is based on international standards (ISCO-88) and allows me to identify top (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).¹¹

I focus on the proportion of women among the establishment's *highest*-ranked managers as the measure of female leadership. This means that whenever an establishment has at least one top manager, I use the proportion of

⁷All registers contain unique person and establishment identifiers.

⁸This corresponds to 10 million workers in the weighted sample (see Table 1).

⁹Note that the manager and non-manager cannot be the same person.

¹⁰The fact that the sample size is smaller and private share higher in the weighted sample reflects that the sampling is stratified by size and industry.

¹¹Top managers are workers in the occupations 121 ("Directors and chief executives") or 131 ("Managers of small enterprises"). Middle managers are workers in the occupations 122 ("Production and operations managers") or 123 ("Other specialist managers").

Table 1. Sample Statistics, 1996–2008

Variable	Private	Private (weighted)						
	Mean	Mean	(sd)	Min	P25	P50	P75	Max
Worker characteristics								
Number of years in the sample	5.9	4.8	3.3	1	2	4	7	13
Log monthly wage	10.0	9.97	0.33	8.63	9.74	9.91	10.13	14.21
Female	0.36	0.36	0.48	0	0	0	1	1
Age	40.3	39.5	11.9	15	30	38	49	65
Actual experience	14.1	13.8	5.5	1	11	14	18	24
Tenure	7.7	7.1	5.7	1	2	5	11	24
Highest completed education								
Less than or equal to primary school	0.20	0.19	0.40	0	0	0	0	1
High school short (2 years)	0.30	0.31	0.46	0	0	0	1	1
High school long (3 years)	0.23	0.24	0.43	0	0	0	0	1
College short (≤ 2 years)	0.13	0.13	0.33	0	0	0	0	1
College long (3–4 years)	0.13	0.12	0.33	0	0	0	0	1
PhD	0.01	0.01	0.07	0	0	0	0	1
Unknown	0.00	0.00	0.05	0	0	0	0	1
Employer characteristics								
Number of years in the sample	3.6	2.3	1.9	1	1	2	3	13
Establishment age	15	14	6	1	11	15	18	24
Establishment size	741	432	995	3	27	86	316	8,047
Share female non-managers	0.36	0.36	0.26	0.00	0.16	0.30	0.55	1.00
Observations (in thousands)								
Worker-year observations	5,100				9,326			
Workers	1,437				3,597			
Establishments	28				204			

Notes: The variables for experience, tenure, and age of establishment are calculated from 1985.

women among top managers. If there are no top managers, I consider the proportion of female middle managers. Establishments without either top or middle managers are dropped from the sample. This restriction removes 24% of the workers, primarily those employed in smaller establishments with a somewhat higher female share.¹² While I will try to address the selectivity of the sample by reporting separate estimates by establishment size and female share, it should be kept in mind that the results in this article represent the sample of establishments that have at least one worker in the occupations used to define managers.

Table 2 shows the fraction of establishments defined by top and middle managers. Of the establishments in my sample, 41% have at least one top manager, and the remaining establishments (59%) have no top manager but at least one middle manager. Establishments with top managers, however, represent 68% in the private sector as a whole, which means that these are underrepresented in my sample.

I calculate the fraction of female managers in the highest ranks. Women make up 17% of the managers at this level and a quarter of the middle

¹²Establishments where nobody is assigned to a specific management occupation have a mean (median) size of 17 (10) employees and 65% women, which should be compared with 72 (28) employees and 59% women in the estimation sample.

Table 2. Manager Criteria

Variable	Private	Private (Weighted)						
	Mean	Mean	(sd)	Min	p25	P50	P75	Max
(1) Highest manager is a top manager:	0.41	0.68						
Size	82	23	107	3	5	8	16	8,047
Number of managers	1.6	1.3	1.3	1	1	1	1	167
Share female top managers	0.26	0.17	0.36	0	0	0	0	1
Both top and middle manager	0.18	0.18						
Size	170	65	200	3	14	25	53	8,047
Number of top managers	2.1	1.4	2.3	1	1	1	1	167
Number of middle managers	7.8	3.6	9.9	1	1	2	3	696
Share female top managers	0.12	0.09	0.27	0	0	0	0	1
Share female middle managers	0.21	0.25	0.36	0	0	0	0.5	1
(2) Highest manager is a middle manager:	0.59	0.32						
Size	51	37	92	3	9	18	37	6,960
Number of managers	2.8	2.25	6.8	1	1	1	2	1,072
Share female managers	0.26	0.25	0.39	0	0	0	0.5	1
Observations (in thousands)								
Establishment-year obs.	105				466			
Establishments	28				211			

Notes: Managers are defined by the occupation codes for top managers (121,131) and middle managers (122,123). The establishments in the sample correspond to 684,478/253,446 establishment-year/establishments in the weighted sample.

managers. With the administrative data at hand it is of course difficult to know whether the people identified as managers in the data are responsible for the wage and employment decisions; this implies that my variable of main interest, the female manager share, will be measured with error. To address this and related issues I also provide separate estimates for the importance of female managers defined by the different criteria in Table 2. 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.¹³

Descriptive Patterns

The aim is to examine the impact of the proportion of female managers on wages received by nonmanagerial workers. Figure 1 displays the male-female wage gap for private-sector employees in the period from 1996 to 2008, based on yearly wage regressions that account for standard human capital variables (age, age², education level, and experience) and three-digit occupation. Figure 2 shows the increasing share of female managers over the same period.

We can see that the gender wage gap has narrowed over this period, which is mirrored by a substantial increase in the proportion of female

¹³Sweden has sufficient variation in the exposure to top and middle female managers in the data. This is an advantage compared with the findings of Cardoso and Winter-Ebmer (2010), who to a large extent had to rely on wage data to identify the manager.

Figure 1. Estimated Gender Wage Gap among Nonmanagerial Workers, 1996–2008

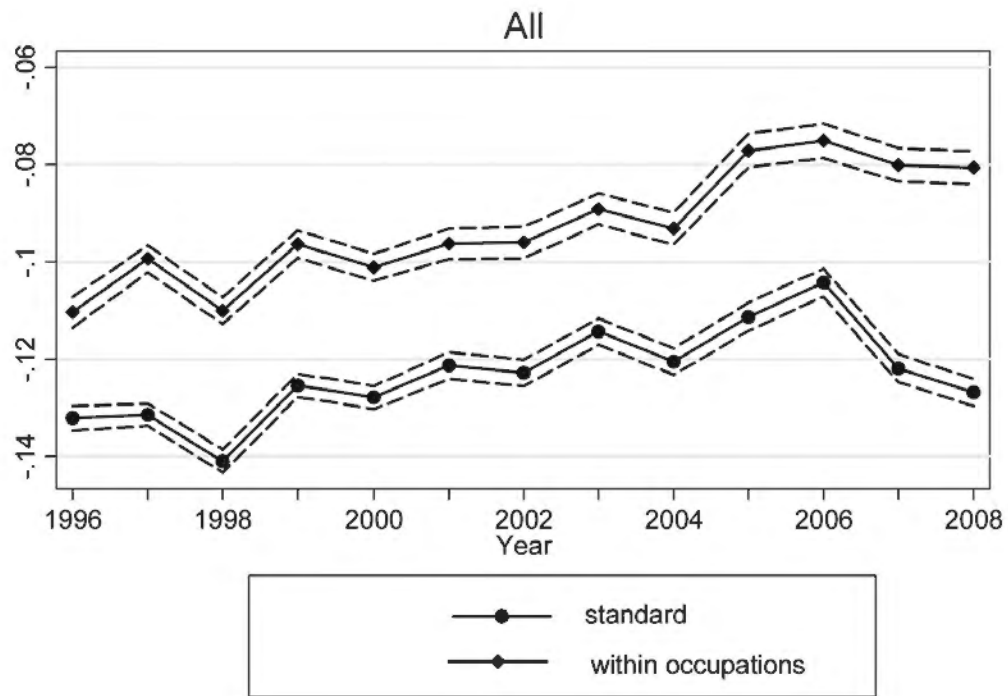
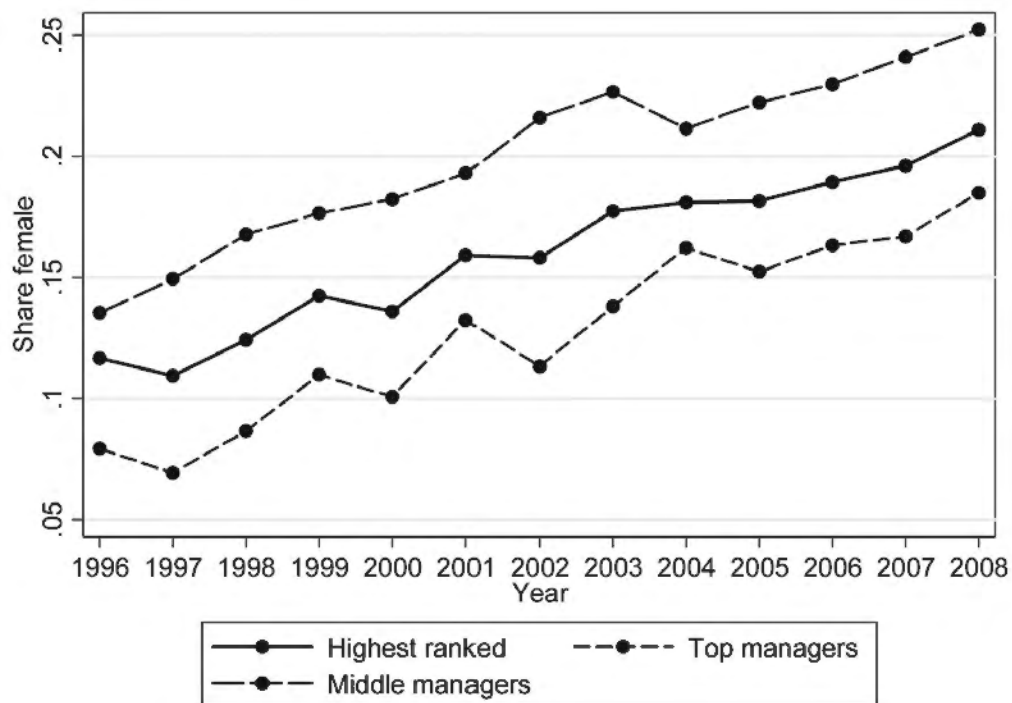


Figure 2. Proportion of Female Managers, 1996–2008



managers at all levels. The female proportion in the establishments' highest managerial rank increased from 11% in 1996 to 21% in 2008 at the same time as the wage gap narrowed by almost 3%.¹⁴

Columns (1) and (2) of Table 3 show descriptive statistics for the weighted sample of non-managers, broken down by gender. These display well-known patterns documented in earlier studies for several countries; while there are small gender differences in age, experience, and education levels, women have more female coworkers and work in other occupations. While women tend to work as clerks and service workers, men are more likely to be craft workers and machine operators.¹⁵

Columns (3) and (4) describe the managers by gender. Female managers are younger on average with somewhat higher education levels than male managers. The same pattern was found by Cardoso and Winter-Ebmer (2010) for Portugal and may reflect that the smaller group of female managers is positively selected relative to the males. The wages received by female managers, on the other hand, are slightly lower on average. As shown by Figure 2, women are also found at lower managerial levels.

The last two columns of Table 3 provide descriptive evidence about the workers employed in female-led and male-led establishments; establishments are defined as female-led if more than half of the highest-ranked managers are women.¹⁶ Compared with male managers, women disproportionately manage other women in smaller establishments. It is also worth noting that female leaders have a better-educated workforce than do male leaders.

In sum, the descriptive patterns suggest that the representation of female managers increased substantially during the study period and that the gender wage gap narrowed. Thus it is interesting to assess whether the increase in female management is associated with reductions in the male-female wage. Male- and female-led establishments also seem to differ in many dimensions, however, and this highlights the importance of accounting for industry and establishment differences in the analysis of manager composition and the male-female wage gap.

¹⁴The gender wage gap narrowed dramatically from the 1960s to the early 1980s. 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 Richardson 2002). The closing of the gender gap slowed down and even increased somewhat during the 1980s, at the same time as the rigid pay system started to break down in favor of more decentralized wage bargaining and a greater scope for individual wage negotiations.

¹⁵Other Scandinavian countries display similar wage gaps and high levels of occupational segregation (Datta Gupta, Oaxaca, and Smith 2006). Meyersson Milgrom and Petersen (2006) provided evidence on trends in female management from Sweden and the United States.

¹⁶Figure A.1 displays the distribution of female managers and coworkers for men and women in the sample. It confirms that women have higher exposure to both female coworkers and female managers. We also see that most workers have either zero or all female managers, which reflects that most establishments have one manager at the highest rank.

Table 3. Summary Statistics, 1996–2008, Private Sector

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	<i>Non-managers</i>		<i>Managers</i>		<i>Non-managers in:</i>	
	<i>Females</i>	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Female-led</i>	<i>Male-led</i>
Log monthly wage	9.89	10.01	10.26	10.38	9.94	9.97
Age	39.3	39.6	43.1	45.6	38.2	39.7
Experience	13.7	13.9	16.6	16.8	13.4	13.9
Tenure	6.6	7.4	7.0	8.4	5.8	7.3
Highest completed education						
Less than or equal to primary school	0.19	0.20	0.10	0.13	0.15	0.20
High school short (2 years)	0.28	0.32	0.22	0.23	0.26	0.32
High school long (3 years)	0.26	0.23	0.21	0.22	0.27	0.24
College short (≤ 2 years)	0.13	0.13	0.20	0.19	0.15	0.12
College long (3–4 years)	0.13	0.11	0.25	0.21	0.16	0.11
PhD	0.00	0.01	0.01	0.01	0.00	0.01
Occupation						
Professionals	0.13	0.14	—	—	0.16	0.13
Technicians and associate professionals	0.23	0.21	—	—	0.21	0.22
Clerks	0.23	0.07	—	—	0.12	0.13
Service workers and shop sales workers	0.20	0.06	—	—	0.28	0.08
Craft and related trade workers	0.03	0.20	—	—	0.05	0.15
Plant and machine operators and assemblers	0.11	0.25	—	—	0.08	0.22
Elementary occupations	0.07	0.04	—	—	0.08	0.05
Establishment characteristics						
Age	14.0	14.4	12.8	13.2	13.6	14.3
Size	332	488	193	224	205	472
Female share	0.53	0.27	0.59	0.30	0.60	0.32
Observations (in thousands)	3,424	5,902	213	783	1,451	7,875

Notes: Establishments are counted as female-led if more than 50% 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.

Empirical Approach

To examine whether the gender composition of managers affects the gender wage gap I estimate wage equations of the following type:

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

where $\log(w)_{ijt}$ is the log monthly wage of worker i in establishment j in year t ; F_i is a dummy that takes the value of one if the worker is female; S_{jt}^M is the proportion of female managers in establishment j (defined above in the data section); X_{ijt} is a vector of individual characteristics (age, age², educational attainment, experience, and tenure divided into five categories),¹⁷ and W_{jt} includes establishment size and industry; δ_t is a vector of indicators for the year, which controls for time trends non-parametrically, and ε_{ijt} is the error term.

¹⁷The experience and tenure categories are included to account for systematic differences between genders in the time spent out of the workforce and in workplace mobility that may correlate with manager gender. The categories are 0 years, 1–2 years, 3–4 years, 5–9 years, and ≥ 10 years.

The coefficient of interest is γ_1 , which aims to capture the impact of female managers on the establishment's male-female wage gap. The main threat to the identification of γ_1 is that male- and female-managed establishments differ systematically in ways that are related to the wage structure but unrelated to manager gender. Differences in productivity or human resources practices are examples of establishment attributes that could potentially lead to a biased estimate of γ_1 .

As long as the unobserved attributes are stable over time, they can be accounted for by the inclusion of establishment fixed effects in Equation (1). I present results that adjust for unobserved time-invariant establishment heterogeneity in two different ways. I first add a full set of indicators for each establishment. I also report specifications that replace the establishment fixed effects with *establishment* \times *female* fixed effects. It should be noted that the first approach accounts for unobservable differences common to both genders that are constant over time but not those that differ between genders. If, for example, women are overrepresented in establishments that are always (for reasons unrelated to manager gender per se) more female-friendly, this will not be captured by the fixed effects. To take full advantage of the data and to make sure that cross-sectional variation is not driving the results, I therefore add gender-specific establishment dummies to exploit changes in female management within the same establishment over time.¹⁸

Even in the fixed-effects specification, it is still possible that γ_1 renders a biased estimate of the importance of female managers caused by omitted factors that vary over time and with the female share of managers. Such remaining biases are inherently difficult to fully rule out without an instrument that generates exogenous variation in the gender composition of managers.¹⁹ Unfortunately, I have not been able to find a credible instrument for the female share of managers in my setting, but to mitigate the concern about omitted variable bias I include the female establishment share (excluding the focal worker) to, at least partly, account for changes in unobservable factors at the establishment level (e.g., changes in firm policies affecting the female-friendliness of the firm).²⁰ The assumption required for identification of γ_1 is that changes in manager gender are unrelated to

¹⁸This is equivalent to estimating the establishment fixed effects separately by gender.

¹⁹For example, Ahern and Dittmar (2012) used the pre-reform share of female board members as an instrument to determine the impact of the Norwegian gender board quota. Furthermore, Kwon and Meyersson (2010) exploited shocks to the share of female managers resulting from mergers and acquisitions to estimate the effects on the relative quit rates for men and women. This strategy, however, relies on the assumption that the representation of women in management is unrelated to the firm's merger/acquisition and that there are no general effects from mergers affecting the relative quit rate of men and women.

²⁰Åslund et al. (forthcoming) used a similar strategy to mitigate omitted variable bias in their study of the effect of immigrant managers on the immigrant-native employment gap in Sweden. It should be noted, however, that it could potentially be problematic to control for the establishment female share if female managers have a direct impact on the female composition of the establishment. I will address the importance of this concern in the analysis of the direct relationship between female managers and female hires.

time-varying firm differences that influence both the male-female wage gap and female management, not captured by the (time-varying) establishment female share.

In addition, I am able to control for differences in the productivity of workers employed by male and female managers. As previously noted, it is not clear whether female managers affect the wages of existing employees in ways that reduce the gender wage gap or whether they change the wage structure through employee selection. The most talented women may, for example, enter female-led establishments either because they anticipate better career opportunities in those firms or because female managers have better knowledge about other women's productivity.²¹

To assess whether such unobserved heterogeneity is important I first include worker fixed effects in Equation (1) in order to account for the fact that manager characteristics may affect the types of workers who want to join and leave the firm. The variation in the proportion of female managers now comes from workers who switch jobs as well as from changes in manager composition within a given job spell. Second, I derive a measure for the workers' unobserved component of productivity and use this as proxy for the skills hired by male and female managers, respectively. The approach is described in more detail in conjunction with this analysis.

Results

Table 4 reports the results. Column (1) first shows the estimated gender wage gap and the association between the wage and the proportion of female managers when we include 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 all have the expected signs. The reported coefficients suggest that the adjusted gender wage gap is 13%, while the gender composition of managers seems unrelated to wages for the workforce as a whole.

Column (2) shows the estimated β_1 , γ_1 , and γ_2 of Equation (1). The reported estimates indicate that there is a female wage penalty for being employed in a women-led establishment, but this relationship seems to be driven by systematic differences in the wage structure across industries as the coefficient switches sign when industry dummies are added to the model in column (3). The estimates suggest that male wages are unaffected while female wages are 1.2% higher in female-led establishments, implying a narrowing of the gender wage gap of 1.2 percentage points.

²¹Female 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 to 1990, Kwon and Meyersson Milgrom (2010) showed that males were more likely to quit under female management in male-dominated occupations. In female-dominated occupations, men were indifferent. These effects were particularly strong among workers with a college education.

Table 4. Female Managers and the Gender Wage Gap

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Specification</i>	<i>Human capital controls</i>	<i>Human capital controls</i>	<i>Industry and size</i>	<i>Female share</i>	<i>Establishment fixed effects</i>	<i>Establishment × female fixed effects</i>
Share female managers × female dummy		−0.047*** (0.009)	0.012** (0.005)	0.012** (0.005)	0.018*** (0.007)	0.016*** (0.004)
<i>Baseline estimates</i>						
Female dummy	−0.127*** (0.002)	−0.136*** (0.003)	−0.122*** (0.003)	−0.120*** (0.003)	−0.120*** (0.004)	
Share female managers	−0.007 (0.008)	0.020* (0.011)	−0.007 (0.006)	−0.006 (0.006)	−0.026*** (0.005)	−0.025*** (0.008)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	No	No	Yes	Yes	Yes	Yes
Establishment female share	No	No	No	Yes	Yes	Yes
Establishment dummies	No	No	No	No	Yes	Yes
Establishment × female dummies	No	No	No	No	No	Yes
R ²	0.467	0.467	0.549	0.549	0.620	0.633
R ² within	—	—	0.417	0.417	0.363	0.335
Establishments	27,857	27,857	27,857	27,857	27,857	27,857
Observations	5,098,299	5,098,299	5,098,299	5,098,299	5,098,299	5,098,299

Notes: 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, age², education dummies (6 categories), and experience and tenure dummies (0, 1–2, 3–4, 5–10 and >10 years). Columns (3)–(6) include log (workplace size). Columns (3) and (4) include industry dummies at the 5-digit level, while columns (5)–(6) replace the 5-digit industry dummies with dummies defined at the 2-digit level. The establishment female share excludes the focal worker.

*, **, and *** denote statistical significance at the 10, 5, and 1% levels, respectively.

The relationship between the proportion of female managers and the gender wage gap is remarkably robust when I account for the female establishment share and establishment or establishment × female fixed effects. The estimate in column (6) suggests that women's wages increase by 1.6% relative to men's wages if the share of female managers increases by 100% (in most cases this implies that one manager is replaced by another). Notably, female management is associated with lower wages for all workers, but this wage penalty is smaller for women, which leads to a smaller wage gap under female management.

It should be noted that the estimated impact of female managers on the gender wage gap is very similar to the effect found by Cardoso and Winter-Ebmer (2010) for the Portuguese labor market. Using the same identification strategy (i.e., exploiting manager changes within establishments over time), they found that a female boss reduced the wage gap by 1.5%.

Heterogeneity

Tables 5 to 7 examine whether the impact of female managers varies in different subsamples. I first consider variations with respect to the gender composition of the establishment's workforce. In practice I divide the sample

Table 5. Heterogeneity by Establishment Share of Women

<i>Specification</i>	(1)	(2)	(3)	(4)	(5)	(6)
Establishment female share (% female)	<P10 (0–10)	P10–P25 (10–18)	P25–P50 (18–29)	P50–P75 (29–53)	P75–P90 (53–72)	>P90 (72–100)
Share female managers × female dummy	0.031** (0.013)	0.020*** (0.008)	0.015* (0.008)	0.011* (0.005)	0.035*** (0.011)	0.010* (0.006)
Share female manager	–0.010 (0.010)	0.017 (0.018)	0.001 (0.009)	–0.021* (0.011)	–0.049*** (0.017)	–0.017*** (0.005)
Observations	501,461	770,047	1,265,427	1,251,405	781,923	528,036
Establishments	4,959	2,206	3,208	5,521	4,274	7,689
Median size	91	444	492	271	151	53
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Establishment female share	Yes	Yes	Yes	Yes	Yes	Yes
Establishment × female dummies	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors robust for clustering at the establishment level are shown in parentheses. The estimates reported by the table are obtained from the Establishment × female fixed-effects specification reported in column (6) of Table 4. See the corresponding table note for more details.

*, **, and *** denote statistical significance at the 10, 5, and 1% levels, respectively.

Table 6. Heterogeneity by Worker Education

<i>Specification</i>	(1) <i>College</i>	(2) <i>No college</i>
Share female managers × female dummy	0.027*** (0.006)	–0.001 (0.004)
Observations	2,573,847	2,524,452
R-squared	0.629	0.585
Year dummies	Yes	Yes
Industry dummies	Yes	Yes
Establishment female share	Yes	Yes
Establishment × female dummies	Yes	Yes

Notes: Standard errors robust for clustering at the establishment level are shown in parentheses. The estimates reported by the table are obtained from the Establishment × female fixed-effects specification reported in column (6) of Table 4. See the corresponding table note for more details.

*, **, and *** denote statistical significance at the 10, 5, and 1% levels, respectively.

into six groups based on the female share of the coworkers (by the 10th, 25th, 50th, 75th, and 90th percentile). The share of women in the establishment's workforce could, for example, indicate the female-friendliness of the firm, the amount of uncertainty about women's productivity, or the cost attached to increased mentoring of women. According to the estimates in Table 5, however, female workers benefit from female management relative to male workers in all types of establishments, suggesting that the impact of female managers on the gender wage gap is uncorrelated with the female density of the establishment. The absolute wage premium for women is, however, present only in male-dominated work environments (a female share below 30%). In contrast, both men and women lose out from a female manager in female-dense establishments (although women do so to a lesser extent). This discrepancy indicates that the overall wage impact of female

Table 7. Heterogeneity by Size and Manager Criteria

<i>Specification</i>	(1)	(2)	(3)	(4)	(5)	(6)
Establishment size bracket (Size)	<P10 (3–11)	P10–P25 (12–27)	P25–P50 (28–86)	P50–P75 (87–316)	P75–P90 (317–1,087)	>P90 (1,087–8,47)
<i>Highest-ranked managers (baseline)</i>						
Share female managers × female dummy	–0.010 (0.006)	0.014*** (0.004)	0.014*** (0.004)	0.023*** (0.004)	0.003 (0.009)	–0.007 (0.020)
Observations	164,968	386,924	898,284	1,404,779	1,264,876	978,468
Establishments	10,853	8,236	6,762	2,787	556	81
Average size	6,8	17,9	48,8	154,0	532,5	1983,4
<i>Top managers only</i>						
Share female managers × female dummy	–0.005 (0.011)	0.001 (0.008)	0.038*** (0.009)	0.033*** (0.007)	0.001 (0.011)	0.004 (0.024)
Observations	70,694	143,028	333,587	666,196	761,727	751,356
Establishments	5,248	3,355	2,432	1,248	302	56
Average size	6,7	17,5	50,2	159,2	551,2	2216,1
<i>Middle managers only</i>						
Share female managers × female dummy	–0.021** (0.009)	0.002 (0.006)	–0.011** (0.005)	0.004 (0.008)	0.016 (0.017)	0.009 (0.028)
Observations	94,274	243,896	564,697	738,583	503,149	227,112
Establishments	5,539	4,964	4,309	1,520	262	26
Average size	6,8	18,2	48,2	148,8	515,0	1831,6
<i>Both top and middle managers</i>						
Share female <i>top</i> managers × Female dummy	0.192 (0.238)	0.081*** (0.028)	0.075*** (0.011)	0.032*** (0.007)	0.000 (0.011)	0.005 (0.025)
Share female <i>middle</i> managers × Female dummy	–0.015 (0.079)	–0.014 (0.020)	–0.002 (0.008)	–0.002 (0.010)	0.004 (0.022)	0.081 (0.074)
Observations	5,348	45,067	247,266	631,965	759,025	750,223
Establishments	450	1,280	1,856	1,179	294	60
Average size	8,1	18,6	52,2	162,0	544,4	2070,8
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Establishment female share	Yes	Yes	Yes	Yes	Yes	Yes
Establishment × female dummies	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors robust for clustering at the establishment level are shown in parentheses. The estimates reported by the table are obtained from the Establishment × female fixed-effects specification reported in column (6) of Table 4. See the corresponding table note for more details.

*, **, and *** denote statistical significance at the 10, 5, and 1% levels, respectively.

managers is very different across establishments with varying female shares, which could be due to structural differences across industries and establishments depending on the number of female employees.²²

Table 6 compares the effect of female managers on workers with and without a college education.²³ Notably, the effect is considerably stronger for workers with a college education: the estimate suggests that the gender wage gap narrows by 2.7% when the proportion of female managers increases by

²²The finding that women profit less from female management in female-dominated work environments and that the male wage penalty is amplified is in line with results in Cardoso and Winter-Ebmer (2007). In addition, while the point estimates are not statistically different from each other, the narrowing of the wage gap appears to be largest in establishments with a female share just above 50%.

²³I am grateful to one of the referees for making this suggestion.

100%. In contrast, there is no effect for workers at lower education levels. A possible reason for this difference is that managers have a larger influence over wages in high-skilled jobs in which the scope for individual wage bargaining is higher. It is also possible that informational networks are more important when filling vacant high-skilled jobs, in which case manager characteristics could be a more important predictor of the productivity of workers selected into employment.

Finally, I estimate the effect of female managers by establishment size and the criteria used to identify managers. It is far from clear that the female share among highest-ranked managers captures the relevant dimensions of female decision making. If management tasks are decentralized within firms, the share of women in highest ranks will fail to capture women's influence in decision making. This type of measurement error is likely to be more pronounced in large organizations with multiple managers/managerial levels. On the other hand, because the change from zero to 100% female managers is more likely to occur in small establishments with one manager than in large establishments, there will be a higher risk of measurement error from misclassifications in the smallest firms.

Consistent with these arguments, my results suggest that female managers are more important in establishments in which the measurement error in the female manager share is likely to be smallest; the effect is largest in establishments of medium size, while the estimates are insignificant and small in the smallest and largest organizations (Table 7). Female managers matter most in establishments with an average size of 150 employees; there the gender wage gap narrows by 2.3% when a male manager is replaced by a female.

Finally, the results in Table 7 suggest that it is the top managers that matter: there is no effect of female managers in the lower ranks. In contrast, changing from a male to a female manager narrows the gender wage gap by 3% in medium-sized establishments that have only top managers and even more (almost 8%) in establishments that have top and middle managers. This result is not consistent with the hypothesis that women benefit from female mentoring, as mentorship is likely to come from managers working close to the employees and not from the top management. It is, however, important to note that this result could also be reflecting that female managers have less decision power at lower ranks.

Robustness Checks

Table A.2 in the Appendix presents further robustness checks. I first examine whether the main results from Table 4, column (6) are sensitive 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% of the highest-ranked managers are women and of zero if this is not the case. This estimate

decreases in magnitude but is still positive and significant. This is not particularly surprising since most establishments are managed by either males or females (rather than a combination of both) (Figure A.1).²⁴ Weighting the regressions produces estimates that are almost identical to the baseline (column 2).

Finally, in column (3) I restrict the sample to workers in full-time jobs. As described in the data section, my analysis uses the wage the worker had in September as the dependent variable, adjusted to full-time for part-time workers. The focus on full-time wages is an advantage as it reduces the risk of conflicting wage differentials with systematic gender differences in hours worked. Differences in hours could still be a concern, however—for example, if the part-time work affects the productivity and promotion probabilities and in turn the full-time wage.

My data do not include information about hours worked, which is unfortunate since part-time work is higher among Swedish women than among men. However, I can calculate a proxy for the share of full-time by comparing the full-time adjusted September wage with the monthly earnings over the same year from the same employer.²⁵ It should be noted that this procedure will generate only an imperfect measure of the incidence of part-time work, as the monthly earnings averaged over all remunerated months may differ from the actual earnings the worker received in the month of September.

Table A.1 shows the incidence of part-time work for men and women according to my measure. Women are more likely to work part-time; the average woman works 85% of full-time, while the average man works full-time. Column (4) of Table A.2, however, suggests that this difference is not driving the results of my analysis; the estimated effect of female managers on the gender wage gap remains the same when the sample is restricted to individuals working close to full-time (defined as having monthly earnings of at least 90% of the full-time adjusted wage).

Explanations for the Manager Effects: Pay Setting or Worker Sorting?

The results so far suggest that a higher proportion of female managers is associated with narrower gender pay gaps, in particular in medium-sized establishments and for the highly educated. Again it should be noted that these results are very similar to the findings by Cardoso and Winter-Ebmer (2010) for the Portuguese labor market.

It is important to assess why we see narrower gender wage gaps associated with female managers. One possibility discussed in the background section is that female managers reduce the wage gap for existing workers—for

²⁴The median number of managers is one, and thus in most cases the female share is either zero or one.

²⁵I calculate the ratio between the annual earnings divided by the remunerated months and the full-time September wage.

example, by enhancing women's efforts or by changing pay practices. An alternative explanation is that the effect is mediated by worker sorting—that is, manager characteristics affect the types of workers who join and leave the firm. 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 knowledge about other women's productivity, this could lead to a reduction in the gender wage gap.²⁶

To assess these possibilities, which are important for the interpretation of the baseline estimates, I first examine how sensitive the results are to accounting for differences in unobserved worker productivity. Second, I look explicitly at hiring outcomes.

Accounting for Unobservable Productivity in the Wage Regressions

The most straightforward way to examine whether unobserved worker heterogeneity is responsible for the association between female management and the gender wage gap is to allow for individual-specific intercepts in Equation (1). Following the same workers over time will address the main concern that the variation in the gender composition of managers is correlated with unobserved differences in worker quality. The estimates, displayed in the second column of Table 8, suggest that individual sorting is very important. Adding the worker fixed effects reduces the estimates substantially; male workers receive 1.3% lower wages in female-led firms, whereas women receive 0.6% lower wages. Thus the impact of female managers for a given worker is economically small (but still precisely estimated).

The variation in the proportion of female managers comes from workers who switch jobs, as well as from changes in manager composition within a given job spell. Of the workers in my sample, 36% experience some variation in manager gender, and about 70% of this variation comes from changes in manager composition for a given worker within the same establishment. Restricting the variation to the latter (by including *establishment* × *worker* fixed effects in column (3)) reduces the estimates even further.²⁷

Female Managers and the Selection of Workers: Evidence from Hiring Outcomes

I finally examine the association between the gender composition of managers and the skill composition of new hires. This approach is rarely feasible

²⁶Female 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 to 1990, Kwon and Meyersson Milgrom (2010) showed that males were more likely to quit under female management in male-dominated occupations. In female-dominated occupations, men were indifferent. These effects were particularly strong among workers with a college education.

²⁷The specification includes a unique intercept for each worker and establishment. I have also tried including both the worker and establishment fixed effects separately, obtaining similar estimates (the coefficient for the proportion of female managers is −0.013 (0.006), while the estimated interaction term is 0.006 (0.003)). I have applied the Frisch-Waugh theorem for obtaining the standard errors.

Table 8. Female Managers and Wages: Unobservable Productivity Differentials

Specification	(1) <i>Establishment fixed effects</i>	(2) <i>Worker fixed effects</i>	(3) <i>Establishment × worker fixed effects</i>
Share female managers × female dummy	0.018*** (0.007)	0.006* (0.004)	0.004 (0.004)
Female dummy	−0.120*** (0.003)		
Share female managers	−0.026*** (0.005)	−0.013** (0.006)	−0.009 (0.007)
Estimated skill, $\hat{\theta}_i$			
R^2	0.620	0.928	0.947
Observations	5,098,299	5,098,299	5,098,299
Establishments	27,857	27,857	27,857
Year dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Establishment female share	Yes	Yes	Yes
Establishment dummies	Yes	No	Yes
Worker fixed effects	No	Yes	Yes
Establishment × worker fixed effects	No	No	Yes

Notes: 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, age², education dummies (6 categories), experience and tenure dummies (0, 1–2, 3–4, 5–10 and >10 years), and log (workplace size). Column (1) repeats the establishment fixed-effects estimate from column (5) of Table 4; column (2) replaces the establishment fixed effects with worker fixed effects. Column (3) includes establishment × worker fixed effects, which implies exploiting variation in exposure to different managers for a given worker within a job spell.

*, **, and *** denote statistical significance at the 10, 5, and 1% levels, respectively.

as most available data sources lack information about pre-hire worker productivity. Here, I take an alternative approach. More specifically, I link data on all newly hired workers in the period 1996 to 2008 to measures of worker skills obtained using the regression framework developed by Abowd et al. (1999), which decomposes wages into individual and firm heterogeneity.²⁸ In practice, I use data for the pre-sample period 1985 to 1995 and estimate models of the following form:²⁹

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

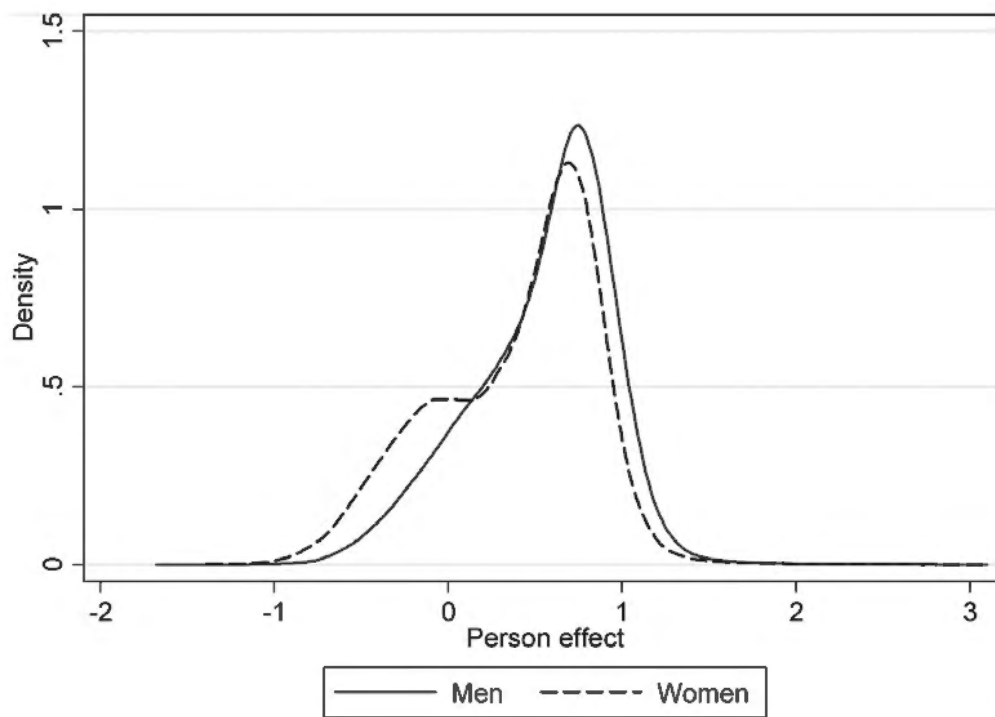
where θ_i is a vector of individual specific indicators; $\psi_{J(i,t)}$ comprises the establishment indicators; φ_t captures the time effects; and ε_{ijt} is the error term. The model also accounts for the age and tenure profile of the worker captured by the vector X_{it} .

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.³⁰ It may

²⁸This analysis is inspired by Carlsson, Messina, and Nördstrom Skans (2011).

²⁹I estimate the person effects using the a2reg.do code written by Amine Quazad. This program follows Abowd, Creecy, and Kramarz (2002).

³⁰A drawback is that the early period lacks information on the actual September wage. Thus, instead of having wages as the dependent variable in Equation (2), I use the monthly earnings. These are calculated as worker's annual earnings divided by months of employment, including only employment spells that cover September each year. In order to focus on full-time or close to full-time earnings, I use a minimum wage cutoff of 75% 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 distribu-

Figure 3. Distribution of Hires' Permanent Skills

Notes: This figure shows a kernel density estimate of the person effects obtained from Equation (2). I use an Epanechnikov kernel and “optimal” bandwidth. The sample consists of new hires during 1996–2008.

thus include observable characteristics, such as education and experience, as well as unobservable traits, such as innate ability and motivation. Figure 3 shows the distribution of $\hat{\theta}$ among newly hired workers during 1996 to 2008, broken down by gender.³¹ There is a wide variation in the estimated person effects, suggesting that workers differ substantially in their past earnings capacity. The distributions in the samples of hired men and women differ; the estimated person effects are higher on average and display less variation for male workers than for female workers.

For simplicity, I will refer to $\hat{\theta}$ as worker’s “permanent skills.” It should, however, be noted that this is an imperfect proxy for individual skill that could potentially also incorporate other time-invariant determinants of past

tion resembles the true wage distribution (Nordström Skans, Edin, and Holmlund 2009 and Carlsson et al. 2011). To be sure, I also checked the correlation between the person effects derived from monthly earnings and the September wage in the period when both measures were available (1996 to 2008). The correlation is high (88%), suggesting that using monthly full-time earnings instead of true wages is not likely to be an issue of large concern for this analysis.

³¹I define new hires as those who did not receive compensation from their current employer in any of the five preceding years. However, 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. Furthermore, I 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.

earnings that differ systematically between genders, such as, e.g., permanent gender discrimination or differences in hours worked.³²

The main advantage of using pre-period data is that this ensures that the skill measures are orthogonal to the gender composition of managers at the time of hire. 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.³³

For comparability, the empirical approach is identical to that used when analyzing wages. Thus, the model is

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

where $\hat{\theta}_{ijt}^H$ is the estimated skill component obtained from Equation (2) for worker i hired by establishment j in year t . As before, F_i is a dummy that takes the value of one if the individual is female; S_{ijt}^M is the proportion of female managers; X_{ijt} and W_{jt} are vectors of individual (age, age², educational attainment, and experience divided into five categories) and establishment characteristics (log workplace size, industry, and the proportion of female coworkers). The variable of interest is, as before, γ_1 , which now measures whether female-led establishments are more likely than male-led companies to recruit female workers whose permanent skills are higher than males.

The estimates in Table 9 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.³⁴ 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 4; when a male manager is replaced by a female manager, the skills of male hires go down by 1.3% (in terms of wage capacity), while the skills of female hires go up by 0.4%. Together these imply a narrowing of the skill gap by 1.7%.

In the lower panel of Table 9 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 also informative regarding the validity of the main empirical strategy, which uses coworker composition to proxy for unobserved differences at the establishment level. The results are obtained

³²In order to violate the empirical strategy used for this analysis, such past differences would have to correlate with the gender of the recruiting manager.

³³This 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.

³⁴We 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 capture the true wage distribution when estimating the person effects in the pre-period, the distribution of the monthly earnings displays higher variation than true wages, which probably reflects differences in hours worked. 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.

Table 9. Female Managers and Worker Sorting: Hiring Outcomes

<i>Specification</i>	(1) <i>Human capital</i>	(2) <i>Industry and size</i>	(3) <i>Share female</i>	(4) <i>Establishment dummies</i>	(5) <i>Establishment × Female</i>
(1) <i>Dep. var: Hire productivity</i>					
Share female managers × female dummy	−0.008 (0.005)	0.006 (0.005)	0.006 (0.005)	0.014** (0.006)	0.017** (0.008)
Baseline					
Female dummy	−0.170*** (0.002)	−0.165*** (0.002)	−0.165*** (0.002)	−0.165*** (0.002)	
Share female managers	−0.010* (0.005)	−0.007* (0.004)	−0.007* (0.004)	−0.016*** (0.005)	−0.013* (0.007)
R^2	0.778	0.783	0.783	0.801	0.833
Observations	277,497	277,497	277,497	277,497	265,888
Establishments	18,478	18,478	18,478	18,478	18,478
(2) <i>Dep. var: Hire is female</i>					
Share female managers	0.349*** (0.008)	0.053*** (0.005)	0.023*** (0.004)	0.010* (0.006)	—
R^2	0.059	0.184	0.201	0.250	—
Observations	530,472	530,472	530,472	530,472	—
Establishments	21,645	21,645	21,645	21,645	21,645
Year dummies	Yes	Yes	Yes	Yes	Yes
Industry dummies	No	Yes	Yes	Yes	Yes
Establishment female share	No	No	No	Yes	Yes
Establishment dummies	No	No	No	No	Yes
Establishment × female dummies	No	No	No	No	No

Notes: 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 Equation (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 regressions include individual controls (age, age², education dummies (6 categories), and experience dummies (0, 1–2, 3–4, 5–10, and >10 years). Column (2) and (3) includes industry dummies at the 5-digit level, while columns (4)–(5) replace the 5-digit industry dummies with dummies defined at the 2-digit level.

*, **, and *** denote statistical significance at the 10, 5, and 1% levels, respectively.

from estimating linear probability models, where the dependent variable takes the value of one if the hire is female and zero otherwise.³⁵ 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 that of hires, but only a small part of this effect remains when industry and establishment characteristics are taken into account. Compared with the average female share of hires (54%), the estimates suggest that gender-biased recruitments are of minor importance in this context.³⁶

³⁵Using a conditional logit model instead produces very similar estimates.

³⁶Using similar models, Åslund et al. (forthcoming) documented that immigrant managers were three times as likely as native managers to hire immigrants. In comparison with those findings, the impact of

Finally, I replicated the extended analysis in Table 9 for the subsample of workers with a college education, as the estimates in Table 6 suggested that the impact of female managers was concentrated to the highly educated. These results were well in line with the ones reported above, suggesting that manager gender is particularly important for the selection of workers into high-skilled jobs.³⁷

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 by, for example, serving as mentors and role models for lower-level employees or by eliminating discriminatory behavior. The existing empirical evidence, however, has not been able to separate such effects from alternative explanations related to worker sorting.

This article 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 nonmanagerial workers decreased by three percentage points during this period, while the share of female managers increased by more than 10 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 as well as is in line with previous work.

Once I control for gender-related productivity differences of workers, however, I find that most of the association between female managers and the gender pay gap goes away, which indirectly suggests a positive sorting of workers to establishments with same-gender managers. Supporting this notion, I also find that female hires are of relatively higher skill than male hires under female management. These results are in line with an information story in which female managers are better informed about other women's productivity. It could also be, however, that female talented workers may choose to enter women-led firms because they anticipate better career opportunities. Providing a better understanding of these sorting patterns therefore seems like an important area for future research.

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.

³⁷To save space within this article, I leave these results available on request.

Appendix Robustness Checks

Figure A.1. Proportion of Female Coworkers and Proportion of Female (Highest-Ranked) Managers for Female (Upper) and Male (Lower) Workers

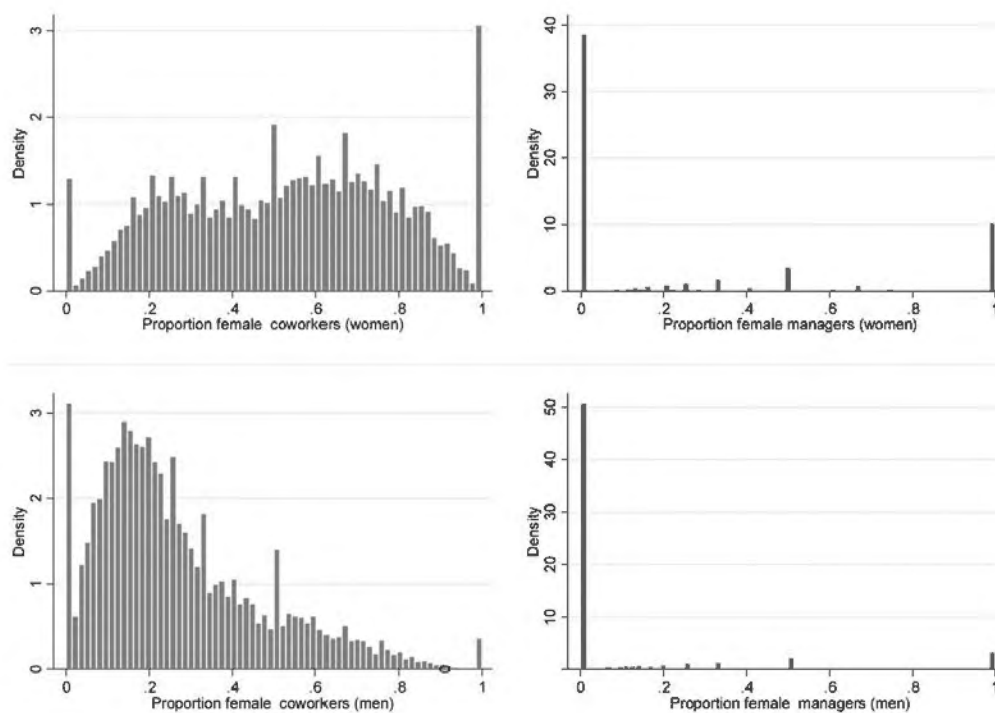


Table A.1. Share of Full-Time Work, by Gender

	<i>Actual</i>	<i>Weighted</i>						
	<i>Mean</i>	<i>Mean</i>	<i>(sd)</i>	<i>P1</i>	<i>P25</i>	<i>P50</i>	<i>P75</i>	<i>P99</i>
Share of full-time work for								
Women	0.85	0.83	0.31	0.08	0.70	0.92	1.01	1.37
Men	1.00	0.99	0.26	0.20	0.93	1.01	1.09	1.57

Notes: Share of full-time work = (annual earnings/months with employer j)/September wage from employer j .

Table A.2. Robustness Checks

Specification	(1) Baseline	(2) Male vs. Female-led	(3) Weighted	(4) Full-time
Share female managers \times female dummy	0.016*** (0.004)	0.008** (0.003)	0.016*** (0.004)	0.016*** (0.005)
Share female managers	-0.025*** (0.008)	-0.018** (0.007)	-0.022*** (0.005)	-0.026*** (0.007)
Observations	5,098,299	5,098,299	9,305,711	3,634,369
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Establishment female share	Yes	Yes	Yes	Yes
Establishment \times female dummies	Yes	Yes	Yes	Yes
Establishment \times occupation dummies	No	No	No	No

Notes: 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, age², education dummies (6 categories), experience and tenure dummies (0, 1–2, 3–4, 5–10, and >10 years), and log (workplace size). The industry dummies are defined at the 2-digit level.

*, **, and *** denote statistical significance at the 10, 5, and 1% levels, respectively.

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