The gender composition of supervisor-worker dyads: career blocks and gender pay gap

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Abstract

We study how the gender composition of supervisor-worker dyads affects workers' outcomes. We use a fine-grained longitudinal personnel data on workers from an Italian insurance company over the period 2014-2021 and assign to each worker the gender of the direct supervisor. We implement an individual worker's fixed effect model, together with a dichotomous variable that captures pre- and post- Covid-19 period and time-varying individual characteristics. Our findings show that, although both male and female people managers evaluate similarly the performance of male and female workers, female supervisors grant lower amount of one-off bonus than male people managers to both male and female workers. Moreover, both male and female workers have a lower probability of receiving a promotion from employee of level VI to middle-managers when the people manager is a female than when is a male. When exploiting a heterogeneous analysis by gender, results confirm that the gender of the supervisors does not affect workers' performance assessments, while it negatively impacts the total amount of bonus of both male and female workers. We interpret these results either as evidence that female people managers are more severe to conform to a masculine gender stereotype associated with a leadership position, or as evidence of the fact that female people managers are at the head of marginal areas and offices, hence they receive less funds to provide bonus and promotions to workers they supervise.

Keywords: supervisor-worker dyads; gender; workers' outcomes

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1 Introduction

A growing literature focuses on the economic impact of introducing international and national legislations, such as gender quotas, aiming at reaching the gender pay and opportunity equality (**Ahern and Dittmar**, **2012**; **Matsa and Miller**, **2013**; **Bertrand et al.**, **2019**; **Ferrari et al.**, **2022**). Besides analysing how such institutional policies affect both the gender-wage distributions and other relevant economic indicators, it is important to examine how the organisation and internal hierarchy of a firm itself influence the achievement of gender equality. Indeed, within a firm men and women in powerful positions can affect employees' economic outcomes.

This paper aims at studying whether and how the gender composition of supervisor-worker dyads affects workers' outcomes. In particular, this work analyses if performance assessment, the yearly one-off bonus, and the probability of receiving a promotion are influenced by the gender of the direct supervisor. The rationale is to circumvent the fact that in Italy workers' wages are set at the national level by collective agreement[1], and thus focus on outcome variables that are fully determined my direct supervisors and indirectly affect the gender pay gap. We employ a fine-grained longitudinal personnel data on employees, middle-managers and managers from an Italian insurance company over the period 2014-2021.

The existing literature reports mixing results on whether and how the gender composition of the internal hierarchy of firms affects gender earnings gap. Some studies report on a gender identity effect (or social identity) – i.e., a higher share of women in powerful positions helps other women (**Cohen and Huffman**, **2007**; **Cardoso and Winter-Ebmer**, **2010**; **Kunze and Miller**, **2017**; **Lucifora and Vigani**, **2022**). Other works, instead, show no effect of the gender composition of top positions on workers' outcomes (**Penner et al.**, **2012**; **Bednar and Gicheva**, **2014**; **Gagliarducci and Paserman**, **2016**; **Bertrand et al.**, **2019**).

Our study contributes to this literature in two aspects. First of all, our work analyses how the gender composition of supervisor-worker dyads impacts worker outcomes within a large and important Italian insurance firm. The Italian case is interesting because it has a very conservative gender culture: despite being one of the first European countries together with Norway, Germany and France to introduce gender quotas, the participation rate of women in the labour force (47%) ranks as the second to last in Europe (**Ferrari et al.**, **2022**). The second relevant contribution concerns the fact that our focus is on the employees, middle-managers, and managers of a single company over an 8-years period. Most of the studies cited before use either cross-sectional data (**Lucifora and Vigani**, **2022**) or employer-employee panel data covering several firms within a country (**Cardoso and Winter-Ebmer**, **2010**; **Gagliarducci and Paserman**, **2016**; **Abendroth et al.**, **2017**; **Kunze and Miller**, **2017**; **Bertrand et al.**, **2019**; **Flabbi et al.**, **2019**). We instead employ a fine-grained longitudinal personnel dataset on a single company, which allows us to study in detail the relationship between supervisors and workers and to control for important features such as the share of women within an office, days off, days of maternity, days of parental leave.

To perform our analysis, we derive the organizational structure of the insurance company over the period 2014-2021 and we associated to each worker the gender of the direct supervisor. We then study how the interaction between the gender of the employee and that of his or her direct supervisor affect four different workers' outcomes: the performance assessment; the yearly amount of one-off bonus; the probability of being promoted; the probability of being promoted from employee to

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[1] In Italy, the minimum and maximum workers' wages, the hours worked, and other employees' rights are negotiated and defined at the National level "Contratti Collettivi Nazionali del Lavoro".

middle-manager. We use an individual worker's fixed effect model and we account for the supervisor-worker dyads by interacting the gender of the worker with the gender of their direct supervisor. We further include a dichotomous variable that captures pre- and post- Covid-19 period and we control for other observable time-varying workers' characteristics. Our main findings can be summarised as follow. We first study the effect of the gender composition of supervisor-worker dyads on performance assessments, total amount of bonus, and promotions – both across levels within the same employment contractual status and across employment contractual status. We observe that female supervisors grant significantly lower bonus both to male and female workers compared to male supervisors. Instead, the other two dependent variables of interests are not affected by the gender composition of the dyad. Then, we consider as outcome variables only the promotions from employee to middle manager. Again, we find that both male and female workers' probability of being promoted from employees to middle-managers is significantly reduced when the people manager is a woman rather than a man.

2 Literature review

The extensive literature on the gender pay gap provides several motivations for the underrepresentation of women in top positions. Some papers observe evidence of tokenism behaviours practiced by firms towards women – i.e., the practice of promoting only few people from a minority group to show inclusivity towards this under-represented group (**Smith and Parrotta**, **2018**; **Santero-Sánchez and Núñez**, **2022**). Others explain women underrepresentation in powerful positions with the pipeline leaking or bending hypothesis (**Fernandez-Mateo and Fernandez**, **2016**; **Smith and Parrotta**, **2018**). Many researchers, instead, use models of statistical discrimination[2] to address the issue of few women in high positions (**Olson and Becker**, **1983**; **Smith et al.**, **2013**; **Addison et al.**, **2014**; **Blau and Kahan**, **2017**; **Conde-Ruiz et al.**, **2015**; **Flabbi et al.**, **2019**). Furthermore, a growing number of papers claim that the underrepresentation of female managers and CEO is (partially) due to gender differences in competitive traits (**Gneezy et al.**, **2003**; **Niederle and Vesterlund**, **2007**; **Flory et al.**, **2015**) and in risk preferences (**Croson and Gneezy**, **2009**; **Adams and Funk**, **2012**; **Carter et al.**, **2017**).

To overcome the issue of underrepresentation of women in powerful positions, governments have introduced gender quotas[3]. The first European country that approved mandating gender quotas on corporate boards was Norway, followed by Germany, France, Italy, the Netherlands, Belgium, Spain, and Iceland. While many other countries are discussing on the introduction of gender quotas, and three European Directives have been proposed (**Ferrari et al.**, **2022**), researchers have reported mixed findings on the effect of this policy on both the firms' performance and gender pay gaps. On one side, **Ahern and Dittmar** (**2012**) and **Matsa and Miller** (**2013**) observe that gender quotas in Norway negatively affect profits in the short-term and firm value. However, **Eckbo et al**. (**2022**) re-examine the identification strategy adopted by **Ahern and Dittmar** (**2012**) and re-estimate the impact of the board quotas considering another model: results suggest that the negative effect is no more significant. **Bertrand et al.** (**2019**) observe no significant effect of Norwegian mandating board quotas neither on gender earnings gap nor on an increase in women's representation in top positions[4].

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[2] Most of the empirical studies refers either to the standard set-up of **Becker** (**1971** [**1957**]) or to the seminal statistical discrimination model of **Phelps** (**1972**). See also **Arrow** (**1973**) and **Fryer** (**2007**) theoretical models on discrimination.

[3] **Ferreira** (**2015**) provides a short summary and open to a debate on the effects of board quota policy.

[4] **Mateos de Cabo et at**. (**2019**) find similar results when studying the introduction of gender quota in Spain, however the normative approved in Spain is softer than that of Norway.

On the other side, **Ferrari et al**. (**2022**) show that the mandating board quota in Italy leads to an overall positive effect on both the stock market performance and the representation of women in top position. Although our work does not exploit the introduction of mandating gender quotas in Italy, it provides further insights on how the firms' organization and the gender composition of the internal hierarchy affect workers' outcomes. These can inform future policies that aim at closing the gender wage gap.

Closely related to the literature on board quota is the stream of research that study the impact of the share of women in either manager or executive position on gender wage gap and firms' performance. Specifically, these works do not exploit the introduction of mandating board quotas, but directly look at the impact of a higher share of women in management positions on economic outcomes. **Kurtulus and Tomaskovic-Devey** (**2012**) and **Matsa and Miller** (**2011**) observe that a higher share of women in top management positively influence the presence of women in lower-level positions. Similarly, **Shin** (**2012**) reports on a reduction of the gender pay gap when the share of women in the compensation committee increases. Several studies show that an increase in the share of women in management position or on corporate boards reduces the gender pay gap (**Cohen and Huffman**, **2007**; **Cardoso and Winter-Ebmer**, **2010**; **Theodoropoulos et al**., **2022**). **Flabbi et al**. (**2019**) assess the impact of women executives on workers wage distributions and detect a positive effect on female's wages, but only at the top of the wage distribution. On the contrary, **Gagliarducci and Paserman** (**2015**) find no significant association between the share of women in top management positions and establishments outcomes. Our paper speaks to this literature as we also study the effect of women in powerful position on subordinate workers. However, our dataset allows us to closely examine how the gender composition of supervisor-worker dyads influences workers' outcomes.

Within the literature that study whether a higher share of females in powerful positions benefits firms' performance and gender pay gap, there are few papers that analyse whether and how the internal organization and hierarchy of firms affects gender earnings gap. In particular, these works examine whether the gender composition of supervisor-worker dyads impacts worker outcomes. **Abraham** (**2017**) finds that under less formalized pay systems gender wage gap narrows for employees reporting to female, rather than male, managers. However, she looks at the impact on the base salary, while we study how the gender composition of the supervisor-worker dyads indirectly affects workers' wage, such as promotions and the total amount of on-off bonuses. **Lucifora and Vigani** (**2016**) use data from 15 European countries and report a reduction in gender gaps when the supervisor is a woman. **Abendroth et al**. (**2017**) consider a sample of workers in German firms and observe that male supervisors tend to promote male workers, while women supervisors struggle to significantly influence gender inequality. Differently from these two works, we allow for individual-fixed effects that accounts for workers unobservable characteristics and we control for other relevant observable time-varying workers' features such as share of women within an office, days off, days of maternity, days of parental leave. **Kunze and Miller** (**2017**) exploit an employer-employee dataset on private sector workplaces in Norway to estimate the spill-over effects of increasing the share of female in seven-hierarchical levels on gender differences in promotion rates. They find that higher representation of women positively affects the promotion rates of subordinate female workers, but in their analysis, authors do not closely look at the gender composition of superior-worker dyads.

3 The company specific context

In November 2022, Euronext launched two gender equality indices[5] that rank companies on four categories: "gender balance in leadership and workforce"; "equal compensation and work-life balance"; "policies promoting gender equality"; and "commitment, transparency and accountability". The insurance company we consider in our work is among the few Italian ones that have been included in the Euronext ranking. Indeed, the examined company has approved several internal goals to achieve gender equality within few years and has introduced important programmes of inclusion and diversity equity to close the gender gap.

Despite the policies aimed at reducing the gender inequality, in our insurance firm with 4,756 individuals[6], around the 24.3% of middle-managers are females while around the 13.5% of managers are females[7]. Moreover, the share of women that are people managers – i.e., supervisors that directly manage and are responsible of a unit of the hierarchical company-organization – is about 22.9%.

At the head of each macro unit there is the Director (or Chief of the area), who is responsible for the area i.e. – Operating Officer, HR, Retail, Audit, Marketing, Business Transformation, etc. The percentage of women in Director position is around 33,3% as enforced by the Law 120/2011 (Golfo-Mosca law of 2011, modified in 2012) that imposes to Italian listed companies a representation of 33% of each gender among the board members. The number of macro units is not fixed over the period 2014-2021 and also their names changed over time. Moreover, the Director directly supervises people managers of the middle unit, of which 28,49% are females, within the area. The people managers of the middle unit in turn have as subordinate the people managers of the offices, which are the smallest units of the area. The percentage of women that are people managers of this smallest unit are about 22.25%. The people managers of the office are usually middle-managers, and sometimes employees of the highest level (level VI). In some cases, the people manager of the office is absent, hence the employees of these offices are directly supervised by the people manager of the middle unit. Moreover, if the macro area is not so large, the Director of the area directly supervises the people manager of the office. Table 1 shows summary statistics for the percentage of females in Director, managers and middle-managers positions over the years 2014-2021, and for the percentage of females' people managers of the unit levels macro unit (area), middle-unit and office unit over the period 2014-2021.

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[5] https://www.euronext.com/en/about/media/euronext-press-releases/euronext-launches-gender-equality-indices.
[6] Considering all the sample and including the Directors, the 45,3% of workers are females.
[7] We do not consider in this percentage the Directors, even though Directors in our dataset are identified as managers.

Table 1 – Summary statistics: percentage of women in the company positions over the period 2014-2021

		2014	2015	2016	2017	2018	2019	2020	2021
% women Directors		25.0	33.3	40.0	33.3	30.0	33.3	35.7	33.3
% women managers		13.7	10.7	13.4	13.1	13.4	14.4	14.2	14.1
% women middle-managers		22.9	23.5	23.8	24.0	24.6	25.1	25.4	25.7
% women employees		51.6	51.4	51.3	51.2	51.3	51.5	51.6	51.9
% women people managers									
	middle unit	31.6	26.1	34.4	27.9	29.4	29.3	26.7	26.2
	office unit	19.7	18.4	20.4	19.9	23.1	24.2	24.6	24.7
N. Workers		4,071	4,154	4,196	4,275	4,371	4,515	4,688	4,756

During the salary review[8], people managers are in charge of assigning the promotions and the amount of one-off bonuses of workers below them. These are decided based on a set of standards determined at the company level and on target achievements of workers. Furthermore, starting from 2018, people managers give a judgement on the workers' performance. This assessment is on whether and how the subordinate worker has fulfilled the assigned targets and is a criterion for the award of a promotion and the amount of one-off bonus. Note that the performance evaluations are done more than one year before the salary review. Moreover, to receive a performance assessment the worker must have worked for at least 6 months in the considered year.

Despite the national laws and the policies and guidelines of the company, there is a margin of discretion that people managers have. Indeed, promotions, the amount of one-off bonuses and performance assessments can indirectly affect the workers' wage. Therefore, studying on whether the gender composition of the supervisor-worker dyads influences workers' outcomes can provide important insights on mechanisms and features that hinder the gender equality.

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[8] This takes place once a year between June and July.

4 Data and descriptive statistics

We use data from an Italian insurance company, who directly gave us its database on their workers. The company transferred us the data with encrypted workers' identifiers to protect their privacy[9]. Identifiers allowed us to match workers across years, as the company send us the data on each year separately, and to construct our panel data. The matched data set provides the histories, together with detailed information and characteristics, of all workers of the company from 2014 to 2021, specifically up to June 2021. It includes all new hirings of the period, but it does not include workers who were fired or quitted before 2021, no matter whether they have been hired before or after 2014. Notwithstanding, this data set considers those workers who were employed after 2014 and that were still working in the company in 2021.

The data set includes for each worker and each year information on gender, date of birth, marital status, level of employment (part-time or full-time), employment contractual status (employee, middle-manager, manager). In addition, for employees we have further information on whether they are a level III, level IV, level V or level VI. Similarly, for middle-managers we know whether they are middle-manager business or senior. Note that when employees receive a promotion from level VI, they achieve the position of middle-manager business. Moreover, we have data on gross annual wage, wage variation[10], promotion, one-off bonus and the amount of it. Furthermore, the company provide us data on days off for holidays, sick leave, days off for other reasons separately. We create a variable that sums all the days off – i.e., total number of days off in a year.

The data set also comprises information on the number of children, on the date child's birth, on maternity leave and on parental leave. In Italy, maternity leave is compulsory 2 months before the child's birth (unless the doctor authorized to continue to work until the child's birth) and 3 months after the child's birth, for a total of 5 (consecutive) months. Instead, the parental leave consists of 10 months that either the mother or the father can ask within the first 12 years of the child. These days off are not mandatory as the maternity or paternity leave and are exclusive between the parents. Moreover, we have data on the date of start of motherhood/fatherhood. Notice that for women the date of start of motherhood is usually days before the date child's birth, therefore could be that the starting date of motherhood is accounted the year before the date child's birth. Instead, for men the date of starting date of fatherhood coincides with that of the child's birth.

For some workers we have information on education level and, whether they attend the university, on the major. From 2018 to 2020[11], we have performance assessments of workers. As previously mentioned, the evaluation of worker' performance is done by the direct supervisor (or people manager) more than one year before the salary review and the assessment ranges between 1 (not sufficient) and 5 (excellent)[12]. Moreover, the variables days off, date of born of children, days of motherhood, parental leave, starting date of motherhood/fatherhood are right censored because we do not have information after June 2021. We excluded all workers for which we had no information on gender for the entire period. Overall, we have information on 4,756 workers, included the Directors. In table 2 and 3 we report summary statistics on workers' characteristics, respectively for males and females, over the period 2014-2021.

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[9] We stipulate a private contract with the company to protect the workers' privacy.

[10] This is a dichotomous variable on whether the worker received an increase in wage, not a promotion.

[11] As said, performance assessments are given almost one year and a half before the salary review. Therefore, that of 2021 will be available only in March 2022.

[12] In providing the evaluation, people managers follow guidelines given by the company.

Table 2 – Summary statistics: female workers' characteristics over the period 2014-2021

Females' characteristics		2014	2015	2016	2017	2018	2019	2020	2021
n. of Women		1,849	1,874	1,888	1,913	1,961	2,032	2,118	2,155
age		42.6	43.6	44.5	45.4	46.1	46.6	46.9	47.7
		(6.8)	(6.9)	(6.9)	(7.0)	(7.3)	(7.7)	(8.3)	(8.5)
full-time		0.76	0.75	0.74	0.73	0.73	0.75	0.77	0.78
		(0.43)	(0.43)	(0.44)	(0.44)	(0.44)	(0.43)	(0.42)	(0.41)
days off		47.2	50.4	45.5	46.4	48.1	49.8	43.3	10.3
		(22.4)	(23.7)	(19.9)	(23.2)	(25.3)	(26.5)	(24.7)	(12.4)
% wage variation		0.02	0.05	0.06	0.07	0.10	0.10	0.04	0.08
		(0.13)	(0.21)	(0.24)	(0.25)	(0.30)	(0.30)	(0.19)	(0.27)
% promotions		0.06	0.05	0.07	0.06	0.06	0.05	0.04	0.05
		(0.23)	(0.23)	(0.26)	(0.24)	(0.23)	(0.22)	(0.19)	(0.22)
average performance assessment						3.25	3.27	3.34	
						(0.67)	(0.68)	(0.66)	
wage									
	employee	43107.85	44213.68	45166.68	46804.34	47471.78	48457.93	48812.71	48980.38
		(9356.1)	(9306.0)	(9304.0)	(9598.8)	(9352.9)	(9373.3)	(9416.1)	(9420.5)
	middle-manager	71139.35	71936.74	72952.42	75278.99	74900.68	75288.43	76303.63	75584.48
		(12984.5)	(13265.2)	(13602.9)	(14186.1)	(13598.7)	(13672.4)	(13263.7)	(13703.8)
	manager	120087	127814.3	136130.5	138809.8	137831	140904.8	139727.3	142181.8
		(36264.2)	(36158.4)	(44849.8)	(46349.4)	(47544.4)	(48648.6)	(48537.8)	(47534.1)
amount of bonus									
	employee	630.34	724.84	704.73	835.42	851.26	849.76	536.63	650.41
		(1162.9)	(1166.8)	(1072.1)	(1115.0)	(1157.6)	(1107.3)	(1044.2)	(1112.3)
	middle-manager	2093.57	2061.17	2426.51	2907.67	2911.50	2689.01	2493.79	2330.25
		(3141.1)	(3129.1)	(3064.0)	(2842.7)	(3127.2)	(3058.0)	(2963.6)	(2603.0)
	manager	27122.36	37134.36	39597.13	39941.38	48381.25	48934.71	0.00	44006.09
		(17651.9)	(17945.9)	(33206.5)	(27299.23)	(41666.7)	(40582.6)	(0.00)	(27152.6)

Note: Standard deviations in parenthesis. Days off is right censored because we do not have information after June 2021.

Table 3 – Summary statistics: male workers' characteristics over the period 2014-2021

Males' characteristics		2014	2015	2016	2017	2018	2019	2020	2021
n. of Men		2,222	2,280	2,308	2,362	2,410	2,483	2,570	2,601
age		44.8	45.7	46.6	47.3	48.1	48.7	49.1	50.0
		(7.0)	(7.0)	(7.1)	(7.4)	(7.6)	(7.9)	(8.4)	(8.5)
full-time		0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
		(0.08)	(0.08)	(0.09)	(0.09)	(0.09)	(0.10)	(0.09)	(0.09)
days off		38.1	40.9	38.4	37.4	39.1	41.0	39.2	8.41
		(18.6)	(18.3)	(15.0)	(18.9)	(20.8)	(19.6)	(23.8)	(13.6)
% wage variation		0.02	0.05	0.11	0.08	0.09	0.09	0.04	0.04
		(0.15)	(0.22)	(0.31)	(0.27)	(0.29)	(0.28)	(0.21)	(0.19)
% promotions		0.05	0.06	0.07	0.05	0.05	0.05	0.03	0.03
		(0.22)	(0.24)	(0.26)	(0.22)	(0.21)	(0.21)	(0.17)	(0.17)
average performance assessment						3.32	3.33	3.37	
						(0.70)	(0.71)	(0.71)	
wage									
	employee	45723.67	46739.55	47783.80	49459.54	49945.49	51024.83	51445.24	51651.48
		(10407.7)	(10387.7)	(10339.7)	(10539.02)	(10446.9)	(10420.1)	(10406.5)	(10386.4)
	middle-manager	74806.62	76165.76	77226.87	80466.43	79590.94	80320.00	80899.88	80415.48
		(13337.1)	(13236.2)	(13471.2)	(14486)	(13387.3)	(13511.8)	(13578.8)	(14066.6)
	manager	117926.2	121732.9	128447.7	138049.5	133658.7	136889.9	138401.8	144470.2
		(30394.1)	(39481.7)	(55669.6)	(70549.5)	(72285.8)	(71975.1)	(66853.5)	(83250.3)
amount of bonus									
	employee	1191.93	1063.37	1006.03	1060.82	1123.66	1120.03	801.15	1086.68
		(1765.4)	(1547.9)	(1387.6)	(1335.7)	(1449.5)	(1361.3)	(1570.1)	(1867.6)
	middle-manager	3196.01	2745.39	2528.60	2520.93	2765.06	2972.87	2449.47	2527.80
		(4009.0)	(3878.3)	(3223.7)	(2623.6)	(3169.3)	(3018.4)	(3076.3)	(3374.6)
	manager	32448.56	36591.53	41662.98	42457.72	55745.43	53760.45	0.00	44461.21
		(22540.3)	(32688.3)	(52411.1)	(59353.7)	(123747.1)	(110951.2)	(0.00)	(56523.4)

Note: Standard deviations in parenthesis. Days off is right censored because we do not have information after June 2021.

On average, male workers are 2 years older than female workers. Moreover, almost all men workers are employed full-time, while only about 75% of women workers are full-time. On average women ask 8 more days off than men. The percentage of wage variation and promotions are similar between male and female workers over the entire period. Notice that in 2020 and 2021 the percentage drops both for men and women: this fall coincide with the starting of the pandemic crisis. Furthermore, the average performance evaluation is similar for male and female workers – i.e., around 3.3, which means in line with expectations. Men receive a slightly higher wage than women, specifically employees and middle-managers. However, this higher wage might reflect the fact that most men are employed full-time (99%), while full-time women are less. Finally, a clear difference that emerges from these descriptive statistics is in the amount of one-off bonuses. In fact, men, both employees, middle-managers and managers, receive a higher amount of bonuses than women. Notice that in 2020 both male and female managers received no bonuses: they cut them-self the bonus during the first year of pandemic crisis. Moreover, starting from 2020 the amount of one-off bonuses for both employees and middle-managers is drastically reduce due to Covid-19 crisis.

Furthermore, we have information on whether the worker is a people manager over the period 2014-2021. In particular, the dichotomous variable people manager takes value 1 whenever in that year the worker is a people manger. In addition, starting from 2018 we know the office to which the worker belongs, the middle-unit in which the office is, and the macro-unit under in which the middle-unit is. Before 2018, we have the name of the office to which the worker belongs, but we do not know the macro-unit and the middle-unit to which the office belongs. Therefore, to match each worker to the direct supervisor, and specifically to assign to each worker the gender of the people manager, we proceed as follow. For the period between 2018 and 2021, since we have all the information on the macro-unit, middle-unit, office to which the worker belongs, we could easily assign the people manager gender to the supervised worker. For the period 2014-2017, we consider that the Directors of the macro-units and the people managers of the middle-units are the same as following year, unless the variable for the people manager is 0 or the worker has not been hired by the company yet. Thus, in the period 2014-2017, to the people managers of the middle-units we assigned as supervisors the Director of the macro-units that they have in the following year. For example, if in 2018 the people manager of the middle-area "Legal protection" is supervised by the Director of the macro-area "General Counsel", then also in 2017 the people manager of the middle-area "Legal protection" is supervised by the same Director. Similarly, we assigned to the people managers of the offices the people managers of the middle-unit that they have in the following year. After having matched each worker with the direct people manager also for the period 2014-2017, we could derive the gender composition of the worker-supervisor dyads.

To check whether the procedure we adopted is reasonable, we compare the share of female people managers over the period 2014-2021 with the share of workers supervised by a female over the same period. We observe that the percentage of female people managers (22.87%) is not much different from the percentage of workers supervised by a female (19.65%). We make a further check by splitting our sample into two periods, 2014-2017 period and 2018-2021 period, and we compare the share of workers supervised by a woman in these two sub-samples. Again, the two share are not significantly different: between 2014 and 2017, the percentage of workers supervised by a people manager woman is 18.36, while between 2018-2021 is 20.28.

5 Empirical Analysis

5.1 Specification and identification

In our analysis, the unit of observation is a given worker i observed in year t. Recall that in our dataset, we have only workers that have been hired either before or within the period 2014-2021 and are still employed in 2021. In order to study the effect of the gender composition of the supervisor-worker dyads on workers' outcomes, we estimate the regressions of the following form:

$$y_{it} = \beta_1 FemPeopleManager_{i,t} + \beta_2 FemPeopleManager_{i,t} \cdot Female_i + \eta_i + \delta COVID_t + X'_{i,t}\gamma + \vartheta_1 WorkOffice_{i,t} + \theta_2 ShareFemOffice_{i,t} + \varepsilon_{i,t}$$

$$(1)$$

where y_{it} is the dependent variable of interest, either workers' performance evaluation, the yearly total amount of one-off bonus or promotions. The variable $FemPeopleManager_{i,t}$ indicates whether the worker i in time t is supervised by a female people manager. To account for the gender composition of the supervisor-worker dyads we include in our model the interaction between $FemPeopleManager_{i,t} \cdot Female_i$, where $Female_i$ is a regressors that takes value 1 if the worker is a woman. Given that $Female_i$ is a time-invariant regressor, the individual fixed-effects η_i absorbed its effect. Our coefficients of interest are β_1 and β_2: the former accounts for the effect of having a female people manager, conditional on being a man worker; the latter measures the difference between male and female workers and the difference of being supervised by a male and female people manager – i.e., the difference in differences effect. Furthermore, we are interested in the sum of the two coefficients ($\beta_1 + \beta_2$), which indicates the difference between being supervised by a male and female people manager for a female worker.

In our specification we include the dichotomous regressor $COVID_t$ that takes value 1 in years after 2019 and 0 before. As observed in the descriptive statistics, the COVID-19 crisis seems to have had an impact on important variables, such as the amount of one-off bonuses and days off. Moreover, the pandemic crisis could have affected crucial organizational features, as well as gender dynamics. In our regression we further consider a vector $X'_{i,t}$ of observable time-varying individual characteristics: days of *maternity leave* by worker i in year t[1]; days of *parental leave* by worker i in year t; three age dummies (*age dummy 1* if workers are under 46, *age dummy 2* if workers are between 46 and 55, *age dummy 3* if workers are over 55); a dummy variable *full-time* that takes value 1 whenever the worker is employed full-time; *days off* by worker i in year t. *Maternity leave* compares the effect of taking an increasing number of days off for maternity by women who become mothers in period t with those that do not. Instead, *parental leave*, which can be asked by both parents and is not mandatory, measures the impact of asking an increasing number of parental leave days by both mothers and fathers.

One concerns that could be addressed is that female people managers supervise offices that have fewer workers or that have a high share of women. To account for this, we include in our regression specification two other controls: $WorkOffice_{i,t}$ that counts the number of employees within the

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[1] The variable takes value 0 for male workers.

office unit (people manager excluded); and $ShareFemOffice_{i,t}$ that measures the share of women within the office unit (people manager excluded).

5.2 Descriptive analysis

Figures 1-4 plot the effect of gender composition of supervisor-worker dyad on performance assessments (figure 1), natural logarithm of total amount of bonus (figure 2 and 3), and promotions (figure 4).

Figure 1 – Average performance of male and female workers by the gender of the people manager.
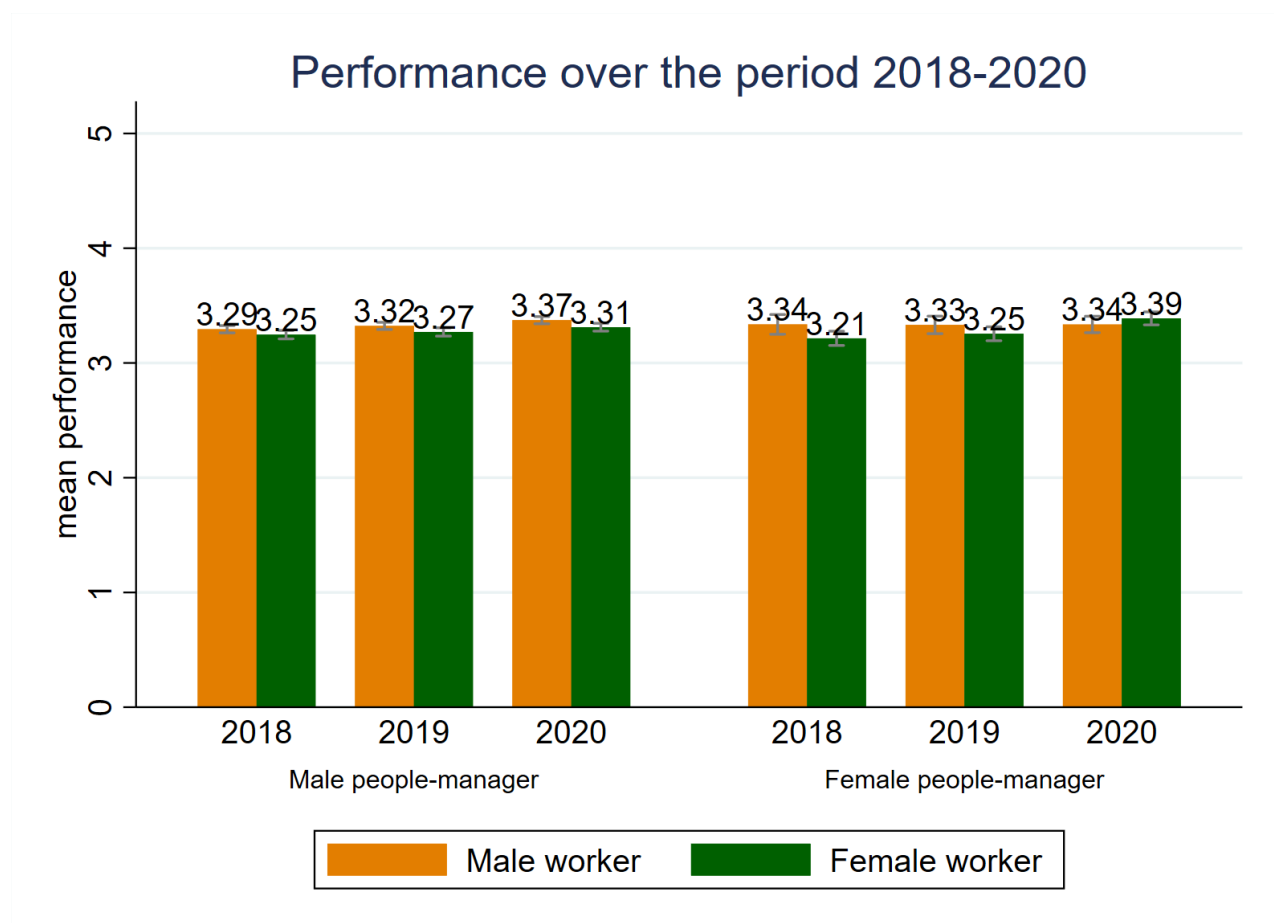
In particular, figure 1 shows the average performance assessments of male and female workers conditional on having a male or female people manager. As said in the data description, performance evaluations have been introduced only in 2018 and we have information on this outcome only until 2020. According to the results reported in figure 1, male and female workers received similar evaluation rates over the period 2018-2021 and the performance assessment is not affected by the gender of the people manager.

In figure 2, we present the kernel density of the natural logarithm of the total amount of bonus given by a male people manager (blue line) and a female people manager (red line) to either a male worker

(left plot) or a female worker (right plot). We pooled together the observations on the yearly total amount of bonus a worker received over the period 2014-2021.

Both plots of figure 2 present two peaks: one around the 0 value, which implies that the total amount of bonus is 0, and the other around 7, which indicates the second modal (positive) point of the total amount of bonus in logarithm value. The left plot of figure 2 shows that male people managers assign a higher amount of bonus than female people managers when supervising a men worker. Indeed, the distribution of male people manager (blue line) is moved more to the right compared to the that of female people mangers (red line). Moreover, the kernel density of male people managers is higher than that of female people managers around the second peak of the bimodal distribution. When instead we restrict our analysis to female workers (right plot of figure 2), we observe that the distribution of male people managers (blue line) is no more moved to the right with respect to that of female people managers (red line). Furthermore, the peak around the 0 is higher in the right plot than in the left one, indicating that female workers are less likely to receive a one-off bonus. Finally, the kernel density of male people managers is again higher than that of female people managers around the right peak of the bimodal distribution of the right plot, but the difference is lower than that in the left plot.

Figure 2 – Distributions of the log of total amount of bonus given by male and female people managers to either male or female workers.
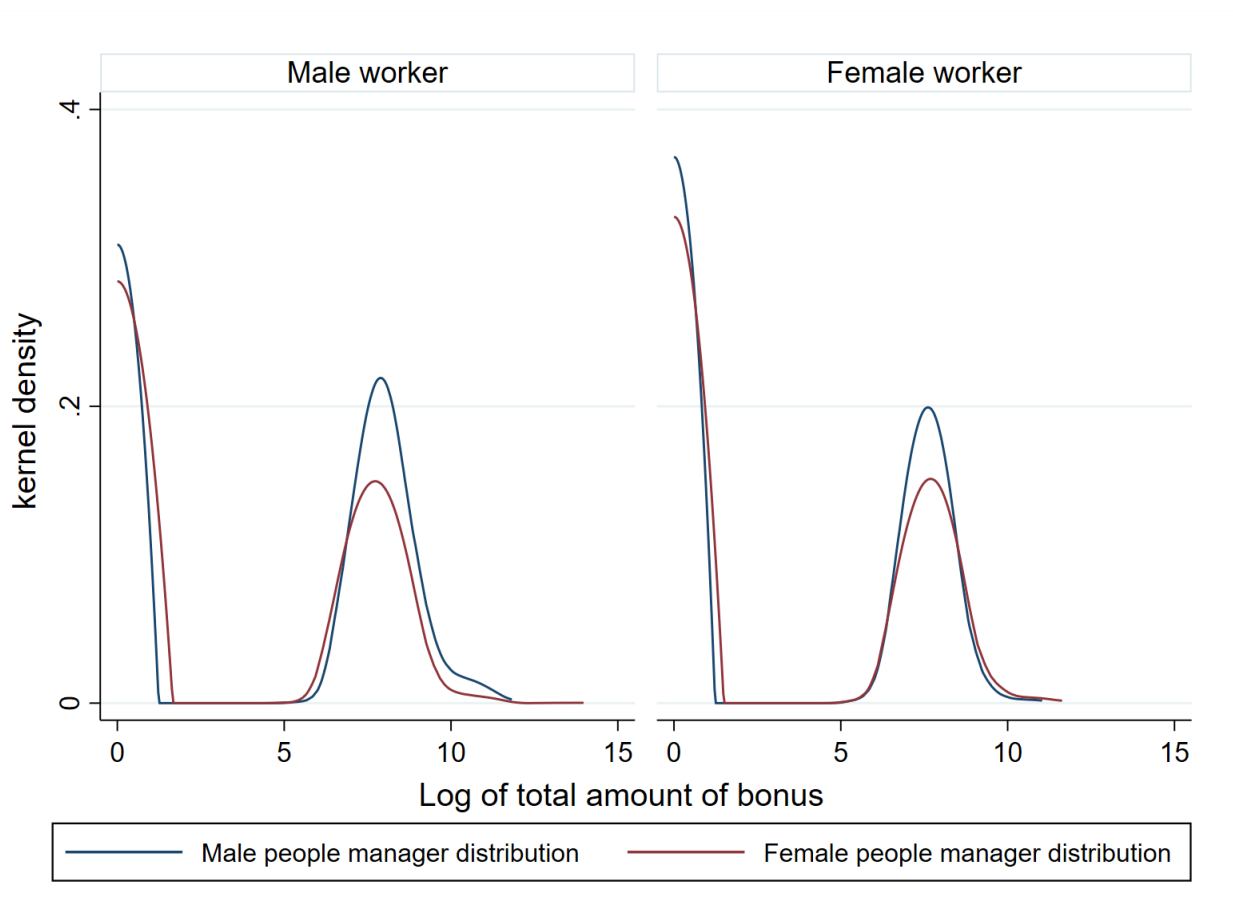
Notice that the left plot of figure 2 shows a flatter right-tale of the distribution of female people managers with respect to male people manager. This result is driven by the amount of bonus received

by managers that are significantly higher than that obtained by both employees and middle-managers. Therefore, figure 3 shows again the kernel density of the natural logarithm of the total amount of bonus given by a male people manager (blue line) and female people manager (red line) to either a male worker (left plot) or a female worker (right plot), but now excluding managers.

Figure 3 – Distributions of the log of total amount of bonus given by male and female people managers to either male or female workers, excluding managers.

Results from figure 3 are similar to those of figure 2. Male people managers assign to male workers a positive amount of bonus more often than to female workers, and a higher amount of total bonus to men than to women. Instead, female people managers assign a similar amount of total bonus to female and male workers. Overall, female people managers give lower amount of total bonus with respect to male people managers, no matter the gender of the worker.

Figure 4 depicts the average number of promotions of male and female workers by the gender of the people manager between 2014 and 2021. The variable promotion is a dichotomous variable that takes value 1 whenever in time t the worker i receives a career advancement and 0 otherwise. The rate of promotions of female workers is higher than that of male workers, both when the people manager is a male and a female, however this difference is not statistically significant.

Figure 1 – Average promotions of male and female workers by the gender of the people manager.
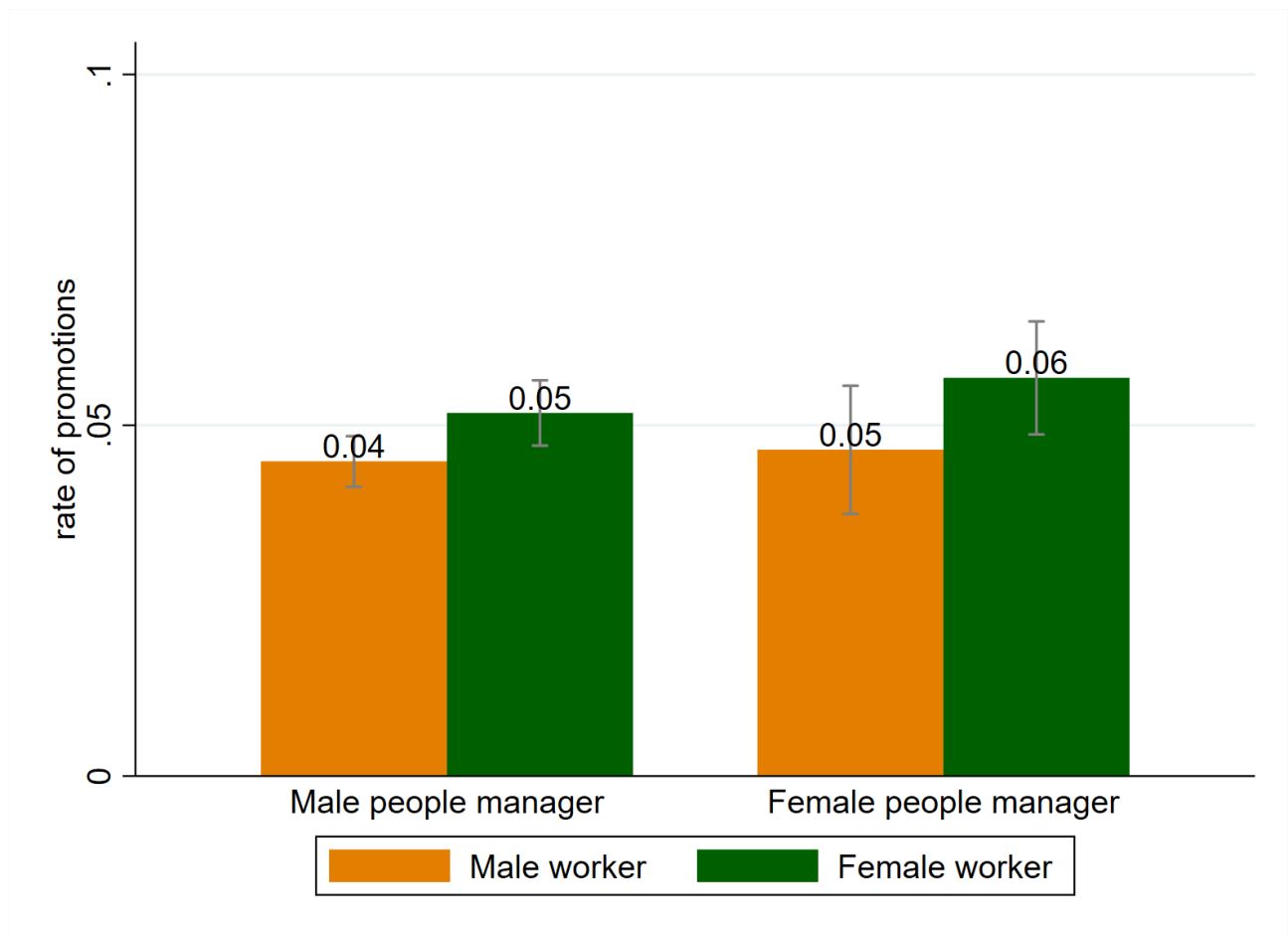
5.3 Estimation results

We now estimate equation (1) using as dependent variables the workers' outcomes we have considered in the descriptive analysis – i.e., performance assessment; natural logarithm of the total amount of one-off bonus; promotions. Moreover, we further estimate the effect of the gender composition of the supervisor-worker dyad on the total amount of bonus, excluding from the estimation the amount received by managers (as in figure 3). As previously mentioned, our main regressors of interest are *FemPeopleManager* and its interaction with *Female* – i.e., *FemPeopleManager · Female*. Moreover, all regressions include individual fixed-effects, a dichotomous variable that captures pre- and post- Covid-19 period, time-varying individual characteristics, the number of workers and the share of female workers within the office. Table 4 provide results from our estimations. In particular, in column 1 the dependent variable is the performance assessments of workers, and it ranges between 1 (not sufficient) and 5 (excellent)[2]. In both columns 2 and 3 the dependent variable is the natural logarithm of the total amount of one-off

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[2] Recall that to receive a performance assessment the worker must have worked for at least 6 months in the considered year. If the worker was not evaluated for that year, we assigned a missing value to that entry.

bonuses, however in column 3 we exclude bonuses assigned to managers. In column 4 we estimate the probability of promotion, hence the outcome variable takes value 1 whenever a worker receives a career advancement.

Table 4 – The effect of the gender composition of supervisor-worker dyad on workers' outcomes.

	performance	log bonus	log bonus (no manag)	promotion
	(1)	(2)	(3)	(4)
FemPeopleManager	0.022	-0.304**	-0.342**	0.0002
	(0.042)	(0.153)	(0.152)	(0.009)
FemPeopleManager × Female	-0.043	-0.165	-0.129	0.015
	(0.058)	(0.191)	(0.190)	(0.011)
COVID	0.050***	-0.704***	-0.669***	-0.024***
	(0.010)	(0.050)	(0.050)	(0.003)
Maternity leave	-0.005***	-0.002	-0.002	-0.0004***
	(0.001)	(0.001)	(0.001)	(0.000)
Parental leave	-0.002**	-0.019***	-0.019***	-0.0005***
	(0.001)	(0.002)	(0.002)	(0.000)
Reference: Age dummy 1 (≤ 45)				
Age dummy 2 (≥ 46 and ≤ 55)	-0.094***	0.185*	0.173	-0.015**
	(0.033)	(0.105)	(0.106)	(0.007)
Age dummy 3 (≥ 56)	-0.104**	0.364**	0.342**	-0.010
	(0.046)	(0.147)	(0.147)	(0.008)
Full-time	0.088	-0.024	-0.025	0.044***
	(0.063)	(0.191)	(0.191)	(0.010)
Days off	-0.003***	-0.009***	-0.009***	-0.000
	(0.000)	(0.001)	(0.001)	(0.000)
WorkOffice	-0.000	0.005	0.005	0.000
	(0.002)	(0.006)	(0.006)	(0.000)
ShareFemOffice	0.044	-0.094	-0.063	0.008
	(0.057)	(0.174)	(0.174)	(0.012)
Constant	3.358***	3.780***	3.734***	0.022*
	(0.070)	(0.216)	(0.216)	(0.012)
Individual FE	✓	✓	✓	✓
R-squared	0.0165	0.0134	0.0127	0.0051
N	4,236	4,550	4,505	4,550

Notes: * p<0.10, ** p<0.05, *** p<0.01. Robust standard errors clustered at the individual levels are in parenthesis. Column 1: number of observations 11,690 (3 years). Column 2: number of observations 24,812 (8 years). Column 3: number of observations 24,680 (8 years). Column 4: number of observations 24,812 (8 years).

Column 1 of table 4 shows that none of the coefficients of our main regressors, $FemPeopleManager$ and $FemPeopleManager \cdot Female$, are significant. Therefore, the gender composition of the supervisor-worker has no effect on the performance evaluation. Instead, the pandemic crisis has a positive and significant impact on the evaluation of performances: in 2020 and 2021 workers receive significantly greater grades. Furthermore, women that take maternity leave receive a lower evaluation with compared to those who do not. Similarly, workers that take an increasing number of paternal leave days are penalised on their performance assessments. Also, asking for an increasing number of days off negatively affects the evaluation performance. Finally, being older than 45 years old decreases the evaluation of performance.

When considering as outcome variable the logarithm of the total amount of bonus (column 2), the coefficient of the regressor $FemPeopleManager$ is significant and negative. Since the coefficient of the interaction term is not significant, we interpret this result as a reduction of about 30% of (log) total amount of bonus for both male and female workers when the people manager is a woman. When excluding the amount of bonus received by managers, we observe similar results (column 3): female people managers give about 34% less of (log) total amount of bonus to both male and female workers with compared to male people managers. These results are consistent with what we observe in figures 2 and 3: female people managers grant lower amount to workers, no matter the gender. Furthermore, columns 2 and 3 show similar outcomes when looking at the other coefficients. Differently from when considering performance assessment, the pandemic crisis has a negative impact on the total amount of bonus, while maternity leave is no more significant. Moreover, an increasing number of paternal leave days and days off negatively affect the amount of total bonus, both when managers' total amount of bonus are included (column 2) and not (column 3). Finally, both columns 2 and 3 report that being older than 55, with respect to being younger than 45, positively increases the total amount of bonus. Instead, being between 46 and 55 positively affects the total amount of bonus only if we include managers' amount.

In column 4 of table 4 we observe that neither $FemPeopleManager$ nor its interaction with the independent variable $Female$ significantly affect the probability of getting a promotion. The pandemic crisis decreases by about 2.4% the probability of receiving a promotion. As in column 1, increasing days of maternity leave and parental leave negatively affect the probability of a promotion, however the estimated coefficients are close to zero. Furthermore, workers aging between 46 and 55 years old have less probability of receiving a promotion with respect to younger workers. The effect of being employed full-time positively affects the probability of a promotion.

To sum up, we find that female people managers are tighter in granting one-off bonus to both male and female workers. Moreover, the pandemic crisis has improved the performance assessments of the workers, but this does not reflect on neither the bonuses nor the chances of a promotion. Indeed, Covid-19 has negatively affected both the total amount of one-off bonus and the career advancements. Common to all workers' outcomes is the negative effect of asking days of parental leave.

When analysing the effect of the gender composition of the supervisor-worker dyad on the probability of promotion we are considering all the promotions, pooling together promotions both across levels within the same employment contractual status – i.e., levels III, IV, V and VI for employees, and level business and senior for middle-managers – and across employment contractual status. However, there is a significant difference between a worker who gets a promotion from level IV employee to a level V employee, compared to one who receives a promotion from level VI employee to a middle-manager business. Indeed, this difference lies both in the prestige of the career advancement, in the

burden of responsibility, and in wages increase, which are higher when a worker is promoted from employee to middle-manager.

Therefore, we now study whether the gender composition of supervisor-worker dyad impacts the probability of workers of reaching upper-level positions. In particular, this analysis allows to detect whether there are barriers that restrain workers, and in particular female workers (glass ceiling), to reach higher positions. We use the estimation model (1), but now we consider as dependent variable promotion to middle-manager. This dichotomous variable takes value 1 if in time t the worker i receives a career advancement from employee of level VI to middle-manager and 0 otherwise. Hence, our sample is restricted to those workers that have a VI level employee position and we study whether their promotion to middle-manager is affected by the gender of their people manager. As before, we include individual fixed-effects, the COVID regressor, and all the individual-time varying controls. Table 5 reports our main results of this analysis.

Table 5 – The effect of the gender composition of supervisor-worker dyad on promotions to middle-managers.

	promotion (from employee of level VI to middle-manager)
FemPeopleManager	-0.010*
	(0.006)
FemPeopleManager × Female	0.001
	(0.008)
COVID	0.010***
	(0.002)
Maternity leave	-0.000
	(0.000)
Parental leave	-0.000
	(0.000)
Reference: Age dummy 1 (≤ 45)	
Age dummy 2 ($\geq 46 and \leq 55$)	0.000
	(0.003)
Age dummy 3 (≥ 56) -0.008**	
	(0.004)
Full-time -0.001	
	(0.001)
Days off	-0.0002***
	(0.000)
WorkOffice	0.0003
	(0.000)
ShareFemOffice	0.028***
	(0.010)
Constant	0.005
	(0.006)
Individual FE	✓
R-squared	0.0088
N	1,996

Notes: * p<0.10, ** p<0.05, *** p<0.01. Robust standard errors clustered at the individual levels are in parenthesis. Number of observations 9,805 (8 years).

Table 5 shows that female people managers negatively affect the probability of receiving a promotion from employee of level VI to middle-manager for both male and female workers. Indeed, the coefficient of *FemPeopleManager* is negative and significant, while the coefficient of the interaction term, *FemPeopleManager · Female*, is not significant. Differently from when we consider all promotions, we find that female people managers are stricter in awarding a promotion to higher position to both male and female workers. Furthermore, the coefficient of the regressor COVID is now positive and statistically significant, indicating that the pandemic crisis has increased the probability of receiving a promotion to higher positions. Instead, being over 55 years old negatively and significantly affects the probability of being promoted from employee to middle-manager. The coefficient of days off is statistically significant and negative, but not large. Interestingly, a higher share of women within the office has a strongly significant and positive effect on the probability of getting promoted to middle-manager.

5.5 Summing up and possible mechanisms

To summarise, we observe that within the insurance company the gender composition of supervisor-worker dyads significantly affects the total amount of bonus and the probability of promotion from employee of level VI to middle-manager. Even though both male and female people managers evaluate similarly the performance of male and female workers, female people managers grant lower amount of one-off bonus than male people managers to both male and female workers. Furthermore, female people managers significantly reduce the probability of a promotion from employee of level VI to middle-managers of both male and female workers with compared to male people managers.

We try to explain these results with two plausible mechanisms. The first one considers the paradigm think manager-think male introduced by **Schein** (**1973**) who first studies the relationship between gender role stereotyping and the characteristics a successful manager should have[3]. Indeed, a mechanism by which a leader or a supervisor should show attitude and characteristics mainly associated with a masculine stereotype can explain why female people managers are more strict than male people managers in awarding one-off bonus and promotions from employee of level VI to middle-managers. This more severe approach of the female people managers could be the consequence of the fact that women in powerful position feel they have to prove and confirm their being in such a higher position. This mechanism fits well with the Italian cultural situation, where the gender stereotype is still widespread.

The second possible mechanism that can support our findings relates to the areas and offices headed by women. It may be that female people managers are more often at the head of marginal areas and offices of company. This would imply that these areas and offices receive less funding and therefore woman supervisors are able to grant lower amount of bonuses and promotions from employee of level VI to middle-manager. However, our data does not allow us to investigate and test this second mechanism.

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[3] Following this seminal paper, several empirical works have tested and built up on this paradigm, see **Brenner et al**. (**1989**); **Koening et al**. (**2011**); **Gipson et al**. (**2017**); **Mohan et al**. (**2022**).

6 Conclusion

Our paper adds to the growing literature that studies the impact of the share of women in leadership positions on gender wage gap and firms' performance, and particularly we contribute to those works that closely look at how the internal organization and hierarchy of firms affects gender earnings gap. Specifically, we investigate how the gender composition of supervisor-worker dyads affects, assessment of performance, one-off bonus of employees, and promotions. We use a fine-grained longitudinal personnel data on workers from an Italian insurance company over the period 2014-2021 and we match workers to their direct supervisor, and so we assign to each worker the gender of the people manager above them. Our main specification model considers individual fixed effects together with a dichotomous variable that captures pre- and post- Covid-19 pandemic crisis. We mainly find that female people managers grant lower total amount of bonus (about 30% in log scale), with respect to male people managers, to both male and female workers. Furthermore, when both male and female workers are supervised by a woman, their probability of receiving a promotion from employee of level VI to middle-manager is significantly decreased. This difference does not reflect the performance assessments given by people managers to workers, in which both male and female people managers evaluate similarly male and female workers.

These findings might fit two possible mechanisms. According the first mechanism, female people managers are more severe in granting bonus and promotions to conform to a masculine gender stereotype associated with a leadership position. The second plausible mechanism concerns the fact that female people managers are at the head of marginal areas and offices of the insurance company, hence they receive less funds to provide bonus and promotions to workers they supervise. However, our data do not allow us to confirm whether one or both mechanisms are actually in place. Moreover, we acknowledge that alternative explanations might fit out findings. Future research is needed to study how the organisation and internal hierarchy of firms and companies influence the achievement of gender pay equality. Indeed, the gender composition of the supervisor-worker dyad can significantly affect several workers' outcomes.

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