Closing the Gender Pay Gap within Firms: Evidence from a Field Experiment on Promoting Pay Equity*

Preliminary version. Please do not circulate.

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Abstract

We present a natural field experiment on promoting pay equity through simple and gender-neutral modifications to the salary review process in a large multinational company. The experiment takes place among 622 middle managers supervising 8,570 employees. The treatments provide for different variants of a decision guidance for middle managers and a reallocation of the salary increase budget among middle managers aimed at promoting pay equity in the salary review process. We document a pronounced gender gap in salary increases in the control group of around seven percent. The treatments serve to close this gap, with the combination of providing a proposed salary increase and reallocating the budget accordingly being the most effective. We find no evidence that the decision guidance undermines performance differentiation. We thus show that simple modifications to the salary review process can go a long way toward achieving pay equity without compromising managerial discretion.

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1 Introduction

There is ample evidence that women consistently earn less than men across a broad array of countries and occupations. While this gender pay gap has narrowed over past decades, it still persists (see, e. g., Blau and Kahn, 2017).[1]

The current debate on measures to tackle such pay disparities focuses primarily on policy interventions, such as legal standards to promote pay transparency, which indeed tend to prove effective (see, e. g., Baker et al., 2022; Bennedsen et al., 2022).[2] Such measures, however, arguably do not address pay inequity directly at its root. In this paper, we focus on the salary review process within firms—the process by which salaries are adjusted over time—as a major source of the gender pay gap and show how simple and gender-neutral modifications to this process by means of a decision guidance for middle managers, along with reallocation of the overall salary increase budget among them, can close the gender gap in salary increases.

Middle managers play a critical role as decision makers in the salary review process, as they typically have discretion in determining salary increases for their subordinates. Crucially, such discretion inherently has the potential for bias and favoritism (see, e. g., Prendergast and Topel, 1996). For example, Cullen and Perez-Truglia (2021) demonstrate that male employees in particular benefit from social interactions with male supervisors in terms of promotion prospects. Similarly, Benson et al. (2021) show that the potential for future performance of female employees is systematically underestimated in subjective evaluations compared to male employees, regardless of actual performance. Furthermore, managerial discretion in salary increase decisions may result in middle managers granting high salary increases to employees who are particularly insistent. A growing body of research reveals that women tend to be more reluctant to negotiate salaries (see, e. g., Babcock and Laschever, 2003; Dittrich et al., 2014; Leibbrandt and List, 2014; Card et al., 2016; Biasi and Sarsons, 2022), have lower salary expectations and demand lower salaries (see, e. g., Reuben et al., 2017; Kiessling et al., 2021; Roussille, 2022) than comparably qualified men. These tendencies are thus likely to exacerbate the gender pay gap when middle managers have full discretion over salary increases.

[1] For example, in 2020, the raw difference in median earnings between men and women relative to the median earnings of men among full-time employees in OECD member countries amounted to 11.6 percent overall (OECD, 2022). According to salary reports surveyed by *Glassdoor Economic Research*, the gender gap in total compensation among full-time employees in the U.S. remained at 7.1 percent in 2018, even after accounting job and employee characteristics (Chamberlain et al., 2019). For a comprehensive review of possible explanations for the persistence of the gender pay gap, see Blau and Kahn (2017).

[2] For an overview of pay transparency policies across OECD member countries, see OECD (2021).

One seemingly obvious remedy would be to restrict managerial discretion in setting salary increases and instead provide centrally administered, rigid salary schedules for every job in a firm. Indeed, Biasi and Sarsons (2022) conversely provide compelling evidence that a reform that replaced collective bargaining agreements for teachers with pay discretion and individual negotiations resulted in a gender pay gap. Crucially, however, managerial discretion can also be beneficial, allowing middle managers to leverage their private information and insight to recognize the performance of individual employees and retain employees at risk of leaving by means of targeted salary increases.

The central question of this paper is therefore how to promote pay equity in the salary review process without unduly curtailing managerial discretion. We conducted a natural field experiment in collaboration with a large multinational firm to evaluate different variants of a decision guidance for middle managers in the salary review process aimed at promoting pay equity, along with a corresponding reallocation of the overall salary increase budget among them.

The salary review process in our study firm is typical of many larger firms. Once a year, middle managers receive a budget to increase their employees' salaries within certain salary bands that are defined for each job in the firm based on market compensation data. The allocation of the available salary increase budget among employees on a team is at the full discretion of middle managers. The treatments introduce a decision guidance in the form of individual formula-based proposed percentage salary increases for each employee, which are displayed in the software tool that middle managers use to implement salary increases. The proposed salary increase is higher the lower an employee's current salary is compared to the respective salary band, which is intended to compensate for any existing pay disparities among employees with the same job. The treatments also provide for a reallocation of the overall salary increase budget among middle managers so that the budget available to each middle manager covers the proposed salary increase for each employee on a team. Crucially, however, the treatments do not restrict the discretion of middle managers in allocating the available salary increase budget among employees on a team. In addition to a control group, we introduced three different treatments that differ in how explicitly the decision guidance was provided. The *Guidance Value* treatment indicates the proposed salary increase, the *Guidance Range* treatment indicates a fixed range around this value and the *Budget* treatment indicates no explicit proposed salary increase. A total of 622 managers supervising 8,570 employees participated in the experiment, which was conducted as part of the regular 2020 salary review.

Prior to the salary review, women on average earned about 1.8 percent less than comparable men with identical jobs for which the same salary band is provided. We find that in the control group, women's salary after the salary review is on average about 0.77 percent lower than that of comparable men with the same job and prior salary. Thus, there is not only a gender gap in salaries, but also in salary increases, which implies that the existing gender gender pay gap would even tend to widen over the long run without any treatment.

We find that all variants of the decision guidance in combination with the reallocation of the salary increase budget significantly and substantially reduce the gender gap in salary increases. The *Guidance Value* treatment even closes this gap entirely. We find no evidence that middle managers compensate for the redistributive effects of the treatments by reallocating other resources at their disposal. We also find no evidence that the treatments unduly disadvantage male employees. The gender gap in salary increases and also the treatment effects are restricted to employees supervised by male middle managers. That is, by virtue of its gender-neutral design, the decision guidance does not favor women per se, but it reduces systematic disparities in salary increases as they occur. Crucially, the treatments do not appear to undermine performance differentiation in salary increases. Specifically, we find that also under the decision guidance, being classified as a talented employee with promising career prospects is associated with a salary increase surplus, which equally applies to both female and male employees. Compared to centrally administered, rigid salary schedules, this is a major advantage of the non-binding decision guidance, which deliberately provides for this discretion.

In terms of perceptions of the modifications to the salary review process, survey results reveal that middle managers who received a decision guidance tend to be less satisfied with the process than those middle managers in the control group. Thus, we concede that despite its effectiveness, the decision guidance does indeed come at a cost. Those middle managers who received the *Budget* treatment and thus received no explicit decision guidance, but were only affected by the reallocation of the salary increase budget, tend to be particularly dissatisfied. Conversely, however, we find no evidence that the most explicit form of the decision guidance, the *Guidance Value* treatment undermined the perceived accountability of middle managers for their salary increase decisions. That is, the most explicit form of the decision guidance not only proves to be the most effective among the variants considered, but also the most favorable in terms of middle manager' perceptions.

We contribute to an emerging branch of the literature that examines gender pay gaps among employees with identical jobs, where traditional explanations such as differences in human capital or occupational segregation have only limited applicability (see, e. g., Adams-Prassl, 2020; Cook et al., 2021; Biasi and Sarsons, 2022; Bolotnyy and Emanuel, 2022). We shed light on a hitherto largely neglected yet ubiquitous source of diverging salaries within firms: the salary review process.

We also add to the recent evidence from field experiments and quasi-experimental studies at the firm level showing that simple nudge-like interventions can have a significant impact on promoting gender equity in the labor market (see, e. g., Leibbrandt and List, 2014; Gee, 2019; Del Carpio and Guadalupe, 2021; Roussille, 2022). In contrast to these previous studies, which examine measures aimed at guiding the decisions of job applicants, we provide evidence that such decision guidance also proves effective for middle managers as key decision makers in pay matters.

In summary, we show that simple modifications to the salary review process can make a significant contribution toward achieving pay equity without compromising managerial discretion.

2 Experimental Design

2.1 Environment

2.1.1 Background

We conducted this study in collaboration with a large multinational firm. Management has put the issue of pay equity high on its agenda and has already made some efforts in the past to uncover and address undue pay disparities among employees, particularly with regard to possible gender pay gaps. As a next step, management collaborated with us to evaluate novel decision guidance tools to encourage middle managers to consider pay equity when determining salary increases for their employees as part of the regular annual salary review.

2.1.2 Salary structure

Salaries in the study firm are determined as follows: Each job is assigned to a career level and a grade level reflecting the level of job requirements and the proficiency required within that level, respectively.[3] For each job, the combination of career level and grade level is associated with a salary band, which is a fixed range into which the salaries of all employees with the corresponding job must fall. Salary bands are determined primarily based on market compensation data for corresponding jobs provided by external salary survey companies. In addition, local factors such as key labor market indicators are taken into account, so that salary bands are defined separately by country. Salaries consist of a fixed and a variable component, with the ratio of these components being determined by the job and country. Salary bands are defined in terms of the sum of the fixed salary and the target variable compensation. It should be emphasized that the salary band is an attribute of a particular job, not the individual employee. From the salary of an employee and the salary band of that employee's job, the employee's position in the salary band can be derived, which provides insights into the positioning of the salary relative to the market compensation for this job as defined by the company. As such, the position in the salary band allows horizontal pay comparisons between employees with the same job.[4] An employee's position in the salary band depends in particular on the salary at the time of hiring and the amount of subsequent salary increases, which are determined as part of the annual salary review.

2.1.3 Salary review process

As part of the annual salary review, middle managers are provided with a budget to increase the salaries of their employees within the respective salary band. The budget available to each middle manager for this purpose depends in particular on the country.[5] While middle managers are generally encouraged to consider individual employee performance when determining salary increases, they may allocate the available salary increase budget at their full discretion. In addition to this budget, which is designated

[3] Classification is based on an assessment of the specific job requirements using predefined criteria.

[4] It should be noted, however, that an employee's position in the salary band alone does not reveal the position of an employee's salary in the distribution of salaries of other employees with the same job.

[5] For example, the available budget in an emerging market is generally higher than in a more mature economy to account for the typically higher growth rates and cost of living increases.

to fund any regular salary increases, a separate budget is available to middle managers to specifically fund salary increases due to employee promotions. Middle managers may in principle use this promotion budget to fund salary increases exceeding the designated salary increase budget.

Salary increases are implemented as a percentage increase of an employee's current salary using a software tool. The software tool displays basic information about each employee on the team along with the percentage salary increase that is on average feasible for each employee given the available salary increase budget. Next to this information, the software tool provides an input mask where middle managers enter the desired percentage salary increase for each employee individually.

2.2 Treatments

As part of the experiment, the software tool was modified to include a decision guidance, that is, supplementary information to guide middle managers in their salary increase decisions. The purpose of the decision guidance was to encourage middle managers to put greater emphasis on pay equity considerations when determining salary increases. The decision guidance is a formula-based proposed salary increase for each employee, which is derived as follows:

$$\text{Proposed salary increase } (x) = \frac{\left(1 - \left(\frac{x}{100}\right)^2\right) \times \frac{(a+b)}{2} \times B \times \lambda}{\text{Prior salary}}, \tag{1}$$

where $x \in \{0, 1, \ldots, 100\}$ is an employee's position in the salary band of the respective job, with a and b corresponding to the lowest and highest possible salary provided for that job, respectively, such that $\frac{(a+b)}{2}$ reflects the midpoint of the salary band. The position in the salary band—expressed as a percentage of the width of the salary band—indicates how far an employee's salary exceeds the lowest possible salary provided for that job.[6] The percentage salary increase that is on average feasible for each employee in a country given the country budget is denoted by B. Finally, λ denotes an alignment factor ensuring that the proposed salary increases are budget neutral at the organizational unit level. Note that the numerator of Equation (1) reflects the absolute proposed salary increase, that is, the absolute salary increase budget provided for an employee. Division by that employee's prior salary then yields the proposed percentage salary increase, which is displayed to middle managers.

[6] If, for example, an employee's salary is equal to the midpoint of the salary band, that employee's position in the salary band is 50.

Equation (1) immediately reveals that the proposed salary increase is positive and monotonically decreasing in an employee's position in the salary band. Put differently, the lower an employee's position in the salary band, the higher the proposed salary increase.[7] Thus, the proposed salary increase aims to compensate for pay disparities among employees with the same job.

Middle managers were not bound by the decision guidance and could still deviate from the proposed salary increase at their full discretion and subject to the budget available to them. In particular, it was made clear to middle managers that the proposed salary increase did not take into account an employee's performance, which they would need to additionally consider when determining salary increases.

The experiment also provided for an adjustment of how the designated salary increase budget available to each middle manager was determined.[8] Specifically, the salary increase budget available to each middle manager was adjusted to just cover the proposed salary increase for each employee on the team. It should be noted that the proposed salary increases were budget neutral within each organizational unit. That is, the salary increase that is on average feasible for each employee in a country was not exceeded overall, so the company did not have to provide additional resources to cover the proposed salary increases. Rather, the experiment provided for a reallocation of the overall salary increase budget among middle managers in the same organizational unit according to the proposed salary increases for employees on the team.

In addition to a control group, the experiment comprised three different treatments that differed in how explicitly the decision guidance was provided to middle managers:

Guidance Value In the *Guidance Value* treatment, a decision guidance was provided. Next to the input mask for entering an employee's salary increase, the software tool displayed the proposed percentage salary increase for that employee. The salary increase budget available to each middle manager was adjusted to just cover the proposed salary increase for each employee on the team.

[7] See Figure 2 in the Appendix for an illustration of the proposed salary increase as a function of the position in the salary band using an example parametrization.

[8] The promotion budget, however, was not affected by the experiment.

Guidance Range In the *Guidance Range* treatment, a decision guidance was provided. Next to the input mask for entering an employee's salary increase, the software tool displayed a range around the proposed salary increase for that employee, with endpoints equal to 90 and 110 percent of the proposed percentage salary increase. The proposed salary increase itself, however, was not displayed. The salary increase budget available to each middle manager was adjusted to just cover the proposed salary increase for each employee on the team.

Budget In the *Budget* treatment, no decision guidance was explicitly provided. That is, the software tool did not display any supplementary information. However, the salary increase budget available to each middle manager was likewise adjusted to just cover the proposed salary increase for each employee on the team.

Control group In the control group, no decision guidance was provided. The salary increase budget available to each middle manager was determined as in past salary reviews.

2.3 Sample and procedure

A total of 622 middle managers participated in the experiment, supervising 8,570 employees. Of these employees, 54 percent were located in North America, 31 percent in Southeast Asia, 12 percent in Europe and 3 percent in other parts of the world. Nearly one third (28 percent) of the employees were female. The employees' average tenure with the company at the time of the experiment was around six and half years.

Middle managers were assigned to one of the three treatments or the control group using stratified randomization at the country and organizational unit level. The *Guidance Value* treatment group comprised 185 middle managers and 2,485 employees, the *Guidance Range* treatment comprised 181 middle managers and 2,503 employees, the *Budget* treatment comprised 185 middle managers and 2,590 employees. The control group comprised 72 middle managers and 992 employees.

The experiment was conducted as part of the annual salary review in January 2020. In addition to the changes induced by the treatments, the company also modified other aspects of the salary review process compared to previous years. The treatments were communicated as a new approach to promoting pay equity through targeted budget allocations. Middle managers were unaware of the respective other treatments. The provided information about the decision guidance, which included, for example, question-and-answer sessions and support from the company's human resources department during the salary review process, was tailored to each treatment.

3 Results

3.1 Prevalence of a Gender Gap in Salaries

In a first step, we investigate whether and to what extent a gender pay gap prevails in the study firm. To this end, we examine how the salaries of employees participating in the experiment differ on average between female and male employees prior to the review process in January 2020. We also examine how these pay disparities change when successively controlling for job and employee characteristics. Column (1) of Table 1 shows that female employees on average earn about 13 percent less than male employees working in the same country and organizational unit. This largely unadjusted gender pay gap decreases as additional job and employee characteristics are taken into account. For example, the gender gap in prior salaries narrows to about 10 percent when also the job family, which captures an employee's specific function, is held constant, suggesting a certain extent of occupational segregation. A substantial decline in the gender gap in prior salaries becomes apparent when the level of job requirements and the required proficiency within that level, as captured by the career level and grade level, respectively, are also taken into account. Recall that country, organizational unit, job family, career level and grade level jointly determine the salary band that each job is assigned to. Even within the identical job, for which the same salary band is provided, female employees on average earn about 1.8 percent less than male employees. This percentage difference in earnings is robust to the inclusion of employee characteristics such as tenure and age. Overall, there is a significant gender pay gap prior to the experiment, which also persists—albeit to a lesser extent—when comparing the salaries of employees with the same job and comparable characteristics.

Table 1: Gender gap in prior salaries

	Dependent variable:				
	ln (Prior salary)				
	(1)	(2)	(3)	(4)	(5)
Female	−0.13135***	−0.09875***	−0.03068***	−0.01799***	−0.01767***
	(0.01300)	(0.01034)	(0.00421)	(0.00314)	(0.00309)
Country × Unit	Yes	Yes	Yes	Yes	Yes
× Job family	No	Yes	Yes	Yes	Yes
× Career level	No	No	Yes	Yes	Yes
× Career grade	No	No	No	Yes	Yes
Employee controls	No	No	No	No	Yes
Teams	622	622	622	622	622
Observations	8,570	8,570	8,570	8,570	8,570
R^2 (adj.)	0.829	0.870	0.974	0.988	0.988

Note: The table shows estimates of the gender gap in prior salaries, obtained from a regression of an employee's log prior salary on an indicator of an employee's female gender, controlling for combinations of an employee's country, organizational unit, job family, career level and grade level as well as a set of employee characteristics, which comprise an employee's tenure, age cohort and full-time equivalent. Standard errors clustered by team are in parentheses. *, **, *** indicate significance on the 10%, 5% and 1% level, respectively.

3.2 Do Treatments Close the Gender Gap in Salary Increases?

Having identified a gender pay gap, we next examine gender differences in salary increases and how these are affected by the treatments. Not only is the salary increase a middle manager's key choice variable in the salary review process, but it is also the variable that is directly targeted by the treatments. More precisely, we consider normalized salary increases that account for differences in country budgets. The normalized salary increase reflects an employee's salary increase as the proportion (in percent) of the salary increase that would on average be feasible for each employee in a country given the respective country budget.

First, Figure 1 shows that the mean normalized salary increase in the control group differs significantly and substantially between female and male employees. In the control group, the salary increase relative to the respective country budget is on average 7.27 percentage points lower for female than for male employees.[9] This shows that there is not only a gender gap in prior salaries, but also in salary increases, suggesting

[9]Given that the mean normalized salary increase for male employees in the control group is 100.49 percent, this gender gap in salary increases corresponds to 7.23 percent in relative terms.

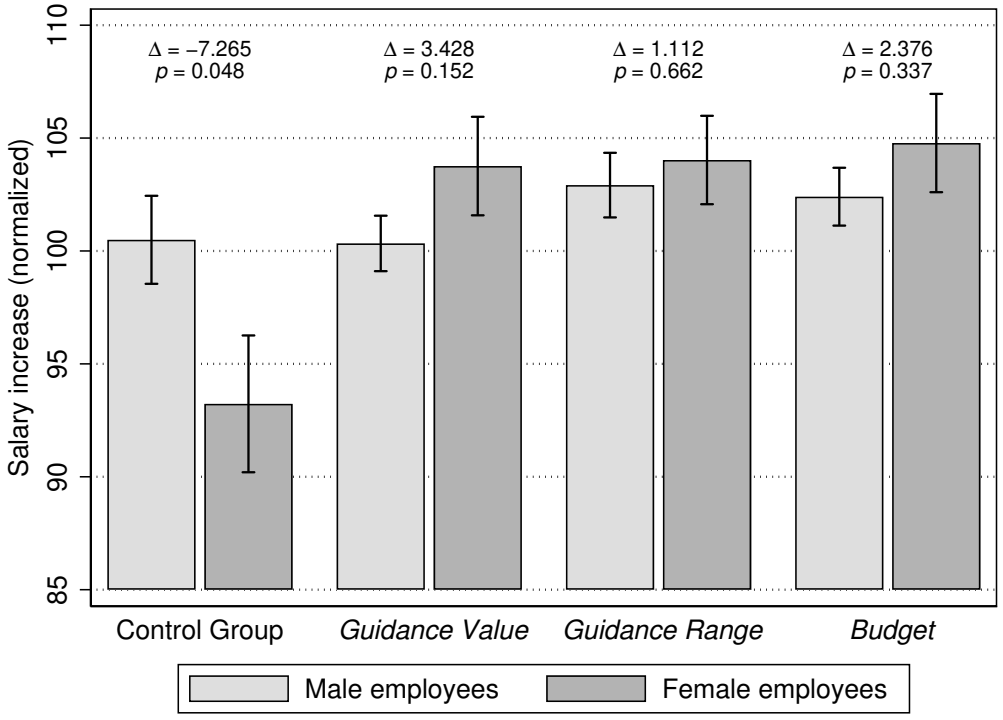

Figure 1: Treatment effects on the gender gap in salary increases (descriptive)

Note: The figure shows the mean normalized salary increase of male and female employees in the control group and in each of the treatment groups. The normalized salary increase reflects an employee's salary increase as the proportion (in percent) of the salary increase that would on average be feasible for each employee in a country given the respective country budget. Error bars indicate standard errors of the mean. Differences and corresponding p-values are from *t*-tests of the equality of means between male and female employees in the respective treatment group.

Table 2: Treatment effects on the gender gap in salaries after the salary review process

	Dependent variable:		
	ln (Post salary)		
	(1) All employees	(2) Middle manager is male	(3) Middle manager is female
Female	−0.00768***	−0.00902***	0.00492
	(0.00228)	(0.00346)	(0.00716)
Guidance Value	−0.00192	−0.00453**	0.00515
	(0.00130)	(0.00209)	(0.00849)
Female × *Guidance Value*	0.00839***	0.01003**	−0.00471
	(0.00255)	(0.00407)	(0.00836)
Guidance Range	−0.00032	−0.00240	0.00748
	(0.00133)	(0.00213)	(0.00763)
Female × *Guidance Range*	0.00633**	0.00844**	−0.00988
	(0.00254)	(0.00409)	(0.00835)
Budget	−0.00067	−0.00321	0.00582
	(0.00130)	(0.00200)	(0.00707)
Female × *Budget*	0.00581**	0.01117***	−0.00904
	(0.00260)	(0.00416)	(0.00787)
ln (Prior salary)	0.94156***	0.93625***	0.92250***
	(0.00363)	(0.00716)	(0.01495)
Salary band	Yes	Yes	Yes
Employee controls	Yes	Yes	Yes
Teams	622	192	55
Observations	8,570	2,833	801

Note: The table shows estimates of the average treatment effects, obtained from regressions of an employee's log post salary on the treatment indicators, interacted with an indicator of whether an employee is female and controlling for an employee's log prior salary, the salary band indicator as well as a set of employee characteristics. The salary band indicator captures the combination of an employee's country, organizational unit, job family, career level and grade level. The employee characteristics include an employee's tenure, age cohort and full-time equivalent. Column (1) shows the results for all employees. Column (2) and (3) show the results only for those employees whose middle manager is male and female, respectively. Standard errors clustered by team are in parentheses. *, **, *** indicate significance on the 10%, 5% and 1% level, respectively.

that the former may not merely be a relic of past and obsolete salary review practices. Crucially, Figure 1 shows that no such gender gap in salary increases is present in the treatment groups. If anything, the pattern has even reversed. While the *Guidance Value* treatment effect appears to have the most pronounced effect, all treatments tend to close the gender gap in salary increases.

To corroborate these descriptive findings concerning the direct choice variable of middle managers in the salary review process, we also examine the gender gap—and the extent to which the treatments contribute to closing it—in terms of salaries after the salary review for comparable employees with the same job and prior salary. Specifically, we estimate the effect of being female in interaction with the treatments on the log salary after the salary review, controlling for the log prior salary, salary band and employee characteristics.

Column (1) of Table 2 shows that in the control group, the salary after the salary review is on average about 0.77 percent lower for female employees than for male employees, even when controlling for prior salary, salary band and employee characteristics. Thus, a gender gap is also prevalent in salaries after the salary review for comparable employees with the same job and prior salary. Column (1) of Table 2 also confirms that all treatments significantly and substantially reduced this gender gap. Most notably, the *Guidance Value* treatment closed it completely, as indicated by the estimate of the interaction effect of being female and the *Guidance Value* treatment exceeding in magnitude the estimate of the effect of being female. However, also the *Guidance Range* and *Budget* treatments, which provided less explicit decision guidance, reduced the gender gap in salaries after the salary review for comparable employees with the same job and prior salary relative to the control group by about 82 and 76 percent, respectively.

Indeed, it appears that middle managers in the *Guidance Value* treatment group are most likely to comply with the proposed salary increase.[10] For 9.01 percent of employees supervised by middle managers in the *Guidance Value* treatment group, the salary increase, rounded to one decimal point, is exactly equal to the proposed salary increase. In the *Guidance Range* and *Budget* treatment groups, where less and no explicit decision guidance was provided, respectively, this proportion is less than half, at 4.31 and 3.47 percent. In the control group, where middle managers neither receive any decision guidance nor face reallocation of the salary increase budget, this proportion is lowest at 2.32 percent.

[10] See Figure 3 in the Appendix for the distribution of deviations from proposed salary increases by control and treatment group.

3.3 Is There Evidence of Compensating Effects?

Having demonstrated a considerable gender gap in salary increases and that the treatments significantly and substantially reduce this gap, the question arises as to whether these desirable features of the decision guidance are accompanied by any adverse side effects. For example, middle managers could compensate for the reallocation of the designated salary increase budget according to the decision guidance by reallocating other resources. Recall that in addition to the designated salary increase budget, middle managers also have another budget available, the promotion budget, which was not affected by the treatments but may likewise be used to fund salary increases. Thus, middle managers could in principle allocate the designated salary increase budget according to the decision guidance, but then use the promotion budget to offset its redistributive effects.

Note that the results presented above already implicitly contradict this concern. The estimates reflecting relative differences in salaries after the salary review process for comparable employees with the same job and prior salary presented in Table 2 already account for salary increases funded from the promotion budget, as these are also included in salaries after the salary review process. Crucially, these estimation results are consistent with the descriptive results concerning the salary increases funded from the designated salary increase budget only, as presented in Figure 1. Thus, there is no evidence that the redistributive effects of the treatments on salary increases funded from the designated salary increase budget were offset.

Another conceivable side effect would be that male employees, for example, or, more generally, the group of employees not benefiting from the decision guidance, would incur significant losses, which could lead to reversing any existing gap as a result. However, column (1) of Table 2 shows no discernible negative effects of the treatments on the relative salary increases for male employees, as indicated by the estimates of the treatment effects, which are consistently close to—and not significantly different from—zero. Note that this may be possible despite the budget neutrality of the proposed salary increases, since the decision guidance is designed to redistribute the overall salary increase budget from high to low earners. Thus, given the inherent difference in prior salaries, a corresponding redistribution of the absolute salary increase budget has the effect that, in relative terms, the gains of lower earners are larger in magnitude than the losses of higher earners.

3.4 Is There Heterogeneity With Respect to Middle Manager Gender?

In a next step, we examine possible heterogeneity in the gender gap in salary increases and in the treatment effects with respect to middle manager gender. In fact, Biasi and Sarsons (2022) find that the gender pay gap among public school teachers following a reform introducing pay discretion and negotiations is limited to teachers under male supervision. Similarly, Cullen and Perez-Truglia (2021) show that male employees benefit disproportionately from social interactions with male supervisors in terms of career prospects.

To test the claim that middle manager gender matters, we estimate the treatment effects on the gender gap in salaries after the salary review process for comparable employees with the same job and prior salary separately for employees supervised by a male and a female middle manager, respectively.[11] Column (2) of Table 2 suggests that the overall gender gap in salaries after the salary review for comparable employees with the same job and prior salary is primarily due to teams led by male middle managers. Likewise, the treatment effects on closing this gender gap tend to be particularly pronounced for male middle managers.

In contrast, column (3) of Table 2 reveals that in the control group and under female leadership, female employees even appear to earn slightly more, if anything, than comparable male employees with the same job and prior salary. The estimates of the interaction effects of being female and the treatments consistently show negative signs for employees supervised my female middle managers. However, there is also no corresponding gender gap in the first place. This emphasizes that the decision guidance, by virtue of its gender-neutral design, does not per se favor female employees, but reduces inequity as it occurs.

3.5 Do Treatments Undermine Performance Differentiation?

A potential drawback of the decision guidance is that by reallocating the overall salary increase budget from high to low earners, it may also undermine any warranted performance-based salary increase differentiation. The study firm deliberately opted for a less paternalistic modification to the salary review process—as opposed to rigid regulations—precisely to give middle managers the discretion to consider performance in addition to equity concerns when determining salary increases. In the absence of objective performance criteria, as is often the case in practice, such discretion is indeed

[11] Since we cannot observe gender for each of the middle managers, the sum of observations underlying the two analyses by middle manager gender is smaller than the total number of observations.

Table 3: Treatment effects on performance differentiation

	Dependent variable:		
	ln (Post salary)		
	(1) All employees	(2) Male employees	(3) Female employees
Talent	0.01164***	0.00987***	0.01242*
	(0.00313)	(0.00353)	(0.00663)
Guidance Value	0.00030	−0.00208	0.00682**
	(0.00122)	(0.00134)	(0.00264)
Talent × *Guidance Value*	0.00253	0.00546	−0.00067
	(0.00376)	(0.00419)	(0.00833)
Guidance Range	0.00109	−0.00045	0.00661***
	(0.00122)	(0.00136)	(0.00255)
Talent × *Guidance Range*	0.00284	0.00318	0.00490
	(0.00372)	(0.00425)	(0.00772)
Budget	0.00030	−0.00120	0.00472*
	(0.00119)	(0.00135)	(0.00262)
Talent × *Budget*	0.00645*	0.00765*	0.00657
	(0.00369)	(0.00418)	(0.00805)
ln (Prior salary)	0.94310***	0.94136***	0.94548***
	(0.00355)	(0.00401)	(0.00702)
Salary band	Yes	Yes	Yes
Employee controls	Yes	Yes	Yes
Teams	622	613	576
Observations	8,570	6,143	2,427

Note: The table shows estimates of the average treatment effects on performance differentiation, obtained from a regression of an employee's log post salary on the treatment indicators, interacted with an employee's talent indicator and controlling for an employee's log prior salary, the salary band indicator as well as a set of employee characteristics. The talent indicator captures whether an employee has been classified by the middle manager or higher-level managers as having promising career prospects. The salary band indicator captures the combination of an employee's country, board area, job family, career level and grade level. The employee characteristics include an employee's tenure, age cohort and full-time equivalent. Column (1) shows the results for all employees. Column (2) and (3) show the results only for male and female employees, respectively. Standard errors clustered by team are in parentheses. *, **, *** indicate significance on the 10%, 5% and 1% level, respectively.

necessary to adequately account for performance differences. To examine whether the treatments undermined performance differentiation in salary increases, we exploit information on the internal classification of employees as talents. Classification is based on an assessment of an employee's potential by the middle manager, who may nominate highly rated employees to a panel of higher-level managers, who ultimately decide whether to award this attribute.[12]

In analogy to our analysis of the gender gap in salary increases, we now estimate the effect of being classified as talent in interaction with the treatments on the log salary after the salary review, again controlling for the log prior salary, salary band and employee characteristics. The resulting estimates thus provide insights into the returns to talent classification and the extent to which they are affected by the treatments. We conduct this analysis separately for male and female employees in order to find out whether there are any gender-related differences.

Column (1) of Table 3 shows that in the control group, employees classified as talents on average earn about about 1.16 percent more than comparable employees with the same job and prior salary who have not been awarded this attribute. This suggests that in the absence of any decision guidance, performance differentiation is intact in that being classified as a talent tends to translate into higher salary increases. Columns (2) and (3) of Table 3 shows that this relationship likewise holds when regarding only male and female employees, respectively.

As indicated by the predominantly positive or close to zero point estimates of the interaction effects of being classified as talent and the treatments, the treatments do not appear to have diminished these returns to talent classification. This, too, appears to apply to both male and female employees. Thus, there is no evidence that the decision guidance appears to have undermined performance differentiation in salary increases, neither for male nor for female employees.

Note that due its subjective nature, the classification of talent may not be free of bias, which could result in a gender gap in the propensity to be classified as talent. Using extensive firm data, Benson et al. (2021) show that supervisors in a retail chain systematically rate the potential for future performance of female employees lower than that of male employees, even though the former on average have better performance ratings than the latter. Our data reveals that in the control group, female employees are on average about 34.71 percent less likely to be classified as talents than comparable

[12]The core objective of this classification is to keep track of employees classified as talents and, in particular, to prevent them from leaving. Overall, 11.11 percent of the employees participating in the experiment are classified as talent.

male employees with the same job, although this difference is only weakly significant.[13] To corroborate our results with respect to the treatments effects on performance differentiation, we therefore draw on an additional measure of employee performance, which is, however, only available for employees with certain jobs in our study firm. Specifically, we regard the utilization rate of employees in consulting jobs, which reflect an employee's productive—that is, billable—working time as a percentage of that employee's total working time in a given period. The results are qualitatively similar in that also with respect to this alternative performance measure, there is no evidence that the treatments systematically undermined performance differentiation in salary increases.[14]

3.6 Effects on Middle Manager and Employee Perceptions

In addition to the treatment effects on middle managers' salary increase decisions, we also examine how the treatments affected middle managers' and employees' perceptions of the salary review process. For an instrument like a decision guidance to become established in the long term and to fully unfold its benefits, it is crucial that the decision makers concerned do not fundamentally reject it. In particular, the question arises of whether the treatments make middle managers feel less accountable for their salary increase decisions. In addition, we examine whether the treatments have an impact on how fair employees perceive their compensation overall. Finally, we seek to uncover potential differential effects of the different treatments in terms of middle manager and employee perceptions.

To address these questions, we conducted a survey of the middle managers and employees participating in the experiment following the salary review.[15] In particular, we had middle managers rate their perceived accountability for their salary increase decisions as well as their satisfaction with the salary review process and considered their standardized responses. In the same way, we elicited employees' perception of fairness.

[13] More precisely, this reflects the relative difference in the predicted probability of being classified as talent between female and male employees, obtained from a regression of the talent indicator on an indicator of whether an employee is female, controlling for the salary band and employee characteristics. For female employees, the predicted probability of being classified as talent is about 8.66 percent, for male employees it is about 13.26 percent.

[14] See Table 5 in the Appendix for the results.

[15] In total, 41.16 percent of the middle managers and 31.05 percent of the employees participating in the experiment completed the respective survey. The surveys also contained a number of other questions, but these were primarily of interest to the study firm.

Table 4: Treatment effects on manager perceptions

	Dependent variable:		
	Middle manager		Employee
	Pay Accountability z-score	Process Satisfaction z-score	Pay Fairness z-score
	(1)	(2)	(3)
Guidance Value	0.11648	−0.30782	0.09449
	(0.27482)	(0.22070)	(0.08902)
Guidance Range	0.26311	−0.40688*	0.17275**
	(0.28508)	(0.23310)	(0.08540)
Budget	−0.09867	−0.75199***	0.04217
	(0.28807)	(0.23513)	(0.08822)
Salary band	n/a	n/a	Yes
Employee controls	n/a	n/a	Yes
Teams	256	256	592
Observations	256	256	2,661

Note: The table shows estimates of the average treatment effects on manager and employee perceptions, obtained from regressions of the respective standardized survey response on the treatment indicators, controlling for the salary band indicator as well as a set of employee characteristics where applicable. The "Accountability z-score" captures the standardized response to the middle manager survey question: "I feel accountable for my merit decisions." The "Satisfaction z-score" captures the standardized response to the middle manager survey question: "I am satisfied with the overall merit process at COMPANY." The "Fairness z-score" captures the standardized response to the employee survey question: "I feel I am being paid fairly for the work I do." All survey responses were measured on a five-point rating scale ranging from "disagree strongly" to "agree strongly" and then standardized to have a mean of 0 and a variance of 1. The salary band indicator captures the combination of an employee's country, board area, job family, career level and grade level. The employee characteristics include an employee's tenure, age cohort and full-time equivalent. Standard errors clustered by team are in parentheses. *, **, *** indicate significance on the 10%, 5% and 1% level, respectively.

Column (1) of Table 4 reveals no significant impact of the treatments on middle managers' perceived accountability for their salary increase decisions. The concern that the decision guidance would lead to middle managers evading responsibility for decisions on salary increases or even feeling redundant in their role as decision-makers in salary matters cannot therefore be substantiated. In particular, note that the *Budget* treatment, which provides the least explicit decision guidance of all three treatments and thus may arguably be perceived as the least intrusive on middle managers' decision autonomy, is in fact the only treatment with a negative estimate of the effect on perceived accountability, although it is not significantly different from zero. One possible explanation would be that middle managers tend to feel more accountable for their salary increase decision if there is explicit decision guidance from which they may deviate, in addition to the mere reallocation of the salary increase budget that all treatments equally provide but which may appear intransparent without such explicit decision guidance.

Furthermore, column (2) of Table 4 shows that middle managers receiving a decision guidance tend to be less satisfied with the salary review process than middle managers in the control group. It should therefore be acknowledged that the decision guidance—despite its benefits—does indeed come at a cost. Again, of all three treatments, the *Budget* treatment turns out to have the most pronounced adverse impact on middle managers' perceptions. Specifically, perceived satisfaction with the salary review process is on average about three-fourths of a standard deviation lower for middle managers receiving the *Budget* treatment than for middle managers in the control group. This finding is likewise consistent with middle managers being dissatisfied with the reallocation of the salary increase budget if it is incomprehensible to them due to the sparser information provided in the *Budget* treatment.

With regard to employees' perception of fairness, column (3) of Table 4 shows that employees receiving the *Guidance Range* treatment on average perceive their compensation significantly fairer than employees in the control group. More generally, there is no evidence that the decision guidance had an adverse impact on employees' fairness perception.

To explore potential heterogeneity with respect to the salary increase budget allocated to each middle manager and the individual salary increase budget provided for a single employee according to the proposed salary increase, we regard a variant of the analysis in which we interact the treatment indicator with indicators of whether the available budget of a middle manager exceeds the country budget and whether an employee's position in the salary lies below the median position in the salary band among all employees, respectively.[16]

It turns out that particularly those middle managers are dissatisfied with the salary review process who received a relatively small salary increase budget as a result of the reallocation induced by the treatments. Regarding employees' perceived fairness, however, no systematic heterogeneity becomes evident with respect to whether an employee's position in the salary band is low or high.

4 Conclusion

We have shown that simple modifications to the regular salary review process can go a long way toward achieving pay equity without curtailing managerial autonomy. A decision guidance in the form of a specific proposed salary increase, which is aimed at compensating for existing pay disparities, in combination with a corresponding reallocation of the overall salary increase budget among middle managers, turned out to be particularly effective. The decision guidance is particularly effective where the most pronounced gap in salary increases between female and male employees was also prevalent: namely, in teams led by male middle managers. However, the gender-neutral design of the decision guidance, in contrast to any rigid regulation, offers the advantage that it does not favor any specific group, but reduces inequity where as it occurs. Thus, the favorable effects of the decision guidance likely apply also to pay gaps originating, for example, from other types of discrimination. Another crucial advantage is that the decision guidance does not appear to undermine performance differentiation in salary increases, which is a major pitfall of rigid pay regulation. Certainly, eliminating the gap pay gap entirely will take more time than a single iteration of the salary review process. However, closing the gap in salary increases and establishing equity in the salary review process by means of the decision guidance and a reallocation of the salary increase budget can be key to achieving this goal in the long term.

[16] See Table 6 in the Appendix for the complete results.

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Appendix

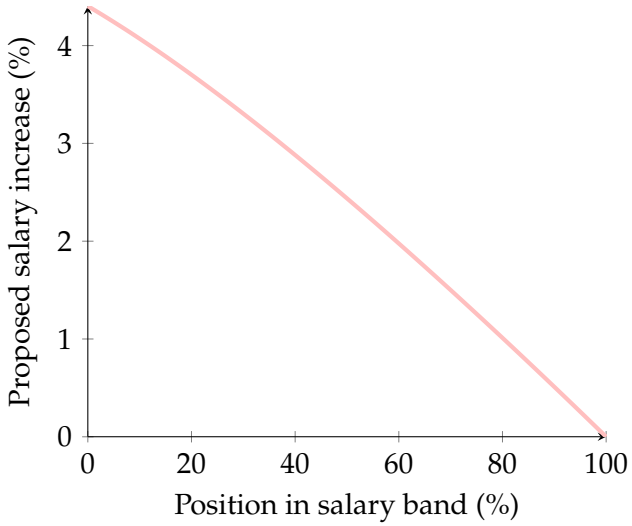

Figure 2: The proposed salary increase as a function of the position in the salary band

Note: The figure shows the proposed salary increase as a function of the position in the salary band using an example parametrization. It is important to note that the resulting proposed salary increase crucially depends on the respective country budget. The figure serves primarily to illustrate the functional form, while the indicated values of the proposed salary increase do not universally apply to all employees.

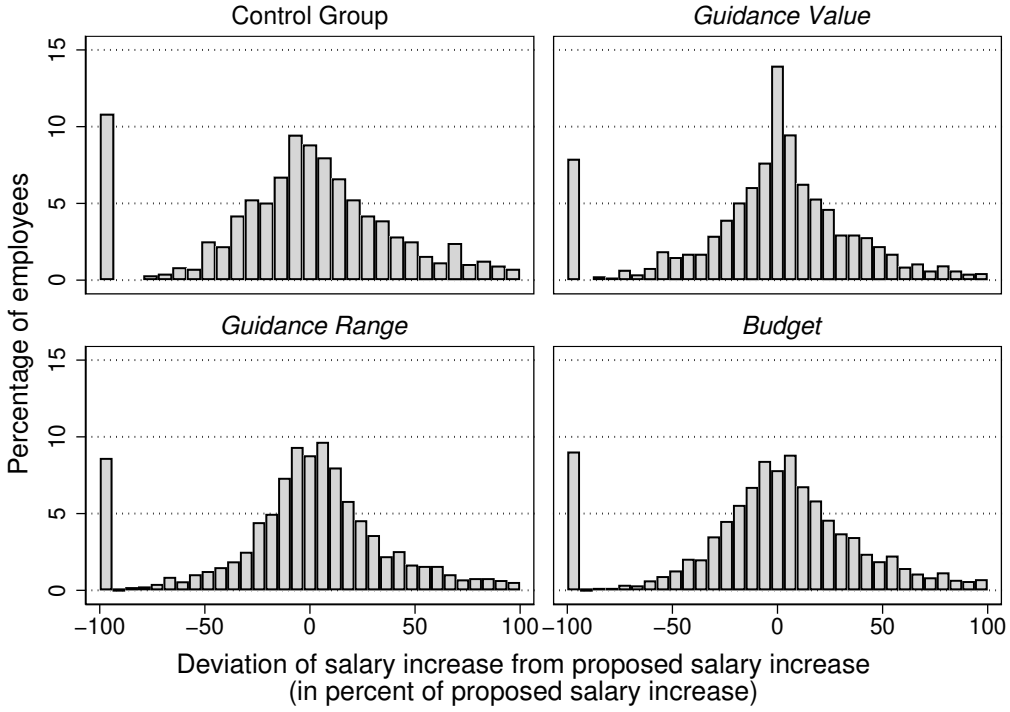

Figure 3: Distribution of deviations from decision guidance

Note: The figure shows the distribution of the deviation of salary increases from proposed salary increases for each employee by control or treatment group. For all employees, proposed salary increases were derived according to Equation (1). Salary increases and proposed salary increases were rounded to one decimal point. For the sake of clarity of the figure, only deviations of at most 100 percent, which account for more than 95 percent of the data, were illustrated.

Table 5: Treatment effects on performance differentiation

	Dependent variable:		
	ln (Post salary)		
	(1) All employees	(2) Male employees	(3) Female employees
Productivity	0.00001	0.00001	0.00004
	(0.00005)	(0.00005)	(0.00029)
Guidance Value	−0.00479	−0.00599	−0.00740
	(0.00651)	(0.00543)	(0.03306)
Productivity × *Guidance Value*	0.00004	0.00005	0.00014
	(0.00007)	(0.00006)	(0.00040)
Guidance Range	−0.02027***	−0.01561*	−0.02300
	(0.00735)	(0.00852)	(0.02442)
Productivity × *Guidance Range*	0.00021**	0.00018*	0.00020
	(0.00008)	(0.00010)	(0.00029)
Budget	−0.00072	−0.00006	−0.04385
	(0.00447)	(0.00483)	(0.03190)
Productivity × *Budget*	−0.00000	−0.00000	0.00046
	(0.00005)	(0.00005)	(0.00037)
ln (Prior salary)	0.94882***	0.95098***	0.94627***
	(0.00577)	(0.00619)	(0.01184)
Salary band	Yes	Yes	Yes
Employee controls	Yes	Yes	Yes
Teams	111	107	79
Observations	1,165	951	214

Note: The table shows estimates of the average treatment effects on performance differentiation, obtained from a regression of an employee's log post salary on the treatment indicators, interacted with an employee's productivity and controlling for an employee's log prior salary, the salary band indicator as well as a set of employee characteristics. Productivity is a continuous variable capturing an the billable working time of an employee as the percentage of that employee's total working time in a given period. The salary band indicator captures the combination of an employee's country, board area, job family, career level and grade level. The employee characteristics include an employee's tenure, age cohort and full-time equivalent. Standard errors clustered by team are in parentheses. *, **, *** indicate significance on the 10%, 5% and 1% level, respectively.

Table 6: Treatment effects on manager and employee perceptions

	Dependent variable:		
	Middle Manager		Employee
	Pay Accountability z-score	Process Satisfaction z-score	Pay Fairness z-score
	(1)	(2)	(3)
Guidance Value	0.18931	−0.47510**	0.04092
	(0.31370)	(0.22985)	(0.11324)
Guidance Range	0.26517	−0.86596***	0.18063
	(0.33697)	(0.23520)	(0.11013)
Budget	−0.36383	−1.11041***	−0.03773
	(0.34253)	(0.24719)	(0.11376)
High budget	−0.16914	−0.79611	−0.22291*
	(0.64573)	(0.51571)	(0.12793)
Guidance Value × High budget	−0.04409	0.68280	0.08600
	(0.67166)	(0.55086)	(0.15417)
Guidance Range × High budget	0.07207	1.22466**	−0.02475
	(0.68922)	(0.56672)	(0.15281)
Budget × High budget	0.57683	1.03453*	0.14561
	(0.69276)	(0.57233)	(0.15504)
Salary band	n/a	n/a	Yes
Employee controls	n/a	n/a	Yes
Teams	256	256	592
Observations	256	256	2,661

Note: The table shows estimates of the average treatment effects on middle manager and employee perceptions, obtained from regressions of the respective standardized survey response on the treatment indicators, interacted with an indicator of whether the overall budget allocated to a middle manager and the individual budget allocated to an employee, respectively, is high and controlling for the salary band indicator as well as a set of employee characteristics where applicable. The "Accountability z-score" captures the standardized response to the middle manager survey question: "I feel accountable for my merit decisions." The "Satisfaction z-score" captures the standardized response to the middle manager survey question: "I am satisfied with the overall merit process at COMPANY." The "Fairness z-score" captures the standardized response to the employee survey question: "I feel I am being paid fairly for the work I do." All survey responses were measured on a five-point rating scale ranging from "disagree strongly" to "agree strongly" and then standardized to have a mean of 0 and a variance of 1. In the specification underlying the results presented in column (1) and (2), "High budget" is a binary indicator of whether the overall budget available to a middle manager following the budget redistribution exceeds the respective country budget. In the specification underlying the results presented in column (3), "High budget" is a binary indicator of whether an employee's position in the salary band before the salary review process lies below the median position in the salary band among all employees. The salary band indicator captures the combination of an employee's country, board area, job family, career level and grade level. The employee characteristics include an employee's tenure, age cohort and full-time equivalent. Standard errors clustered by team are in parentheses. *, **, *** indicate significance on the 10%, 5% and 1% level, respectively.