

Strauß, Susanne; Brüggemann, Ole Jakob; Lang, Julia

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Who perceives lower wages for women to be fair? How perceptions of the fairness of men's and women's wages vary by firm and workplace characteristics

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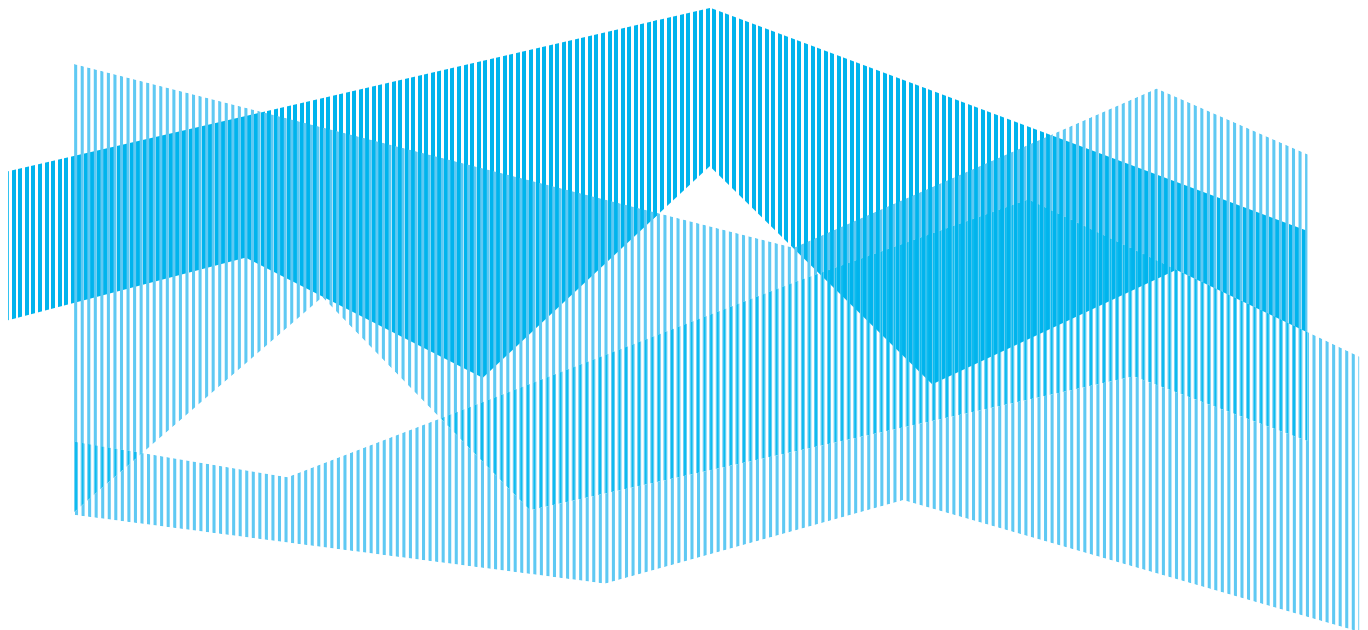
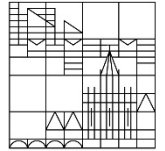
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Who Perceives Lower Wages for Women to be Fair? How Perceptions of the Fairness of Men's and Women's Wages Vary by Firm and Workplace Characteristics

Susanne Strauß, University of Konstanz, susanne.strauss@uni-konstanz.de

Ole Brüggemann, University of Konstanz, ole.brueggemann@uni-konstanz.de

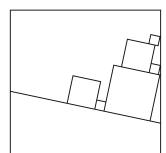
Julia Lang, Institute for Employment Research (IAB), julia.lang@iab.de

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About the authors

Susanne Strauß is a professor of sociology with a focus on gender studies and a principal investigator of the Cluster of Excellence 'The Politics of Inequality' at the University of Konstanz. Her research interests are in the field of gender inequalities on the labour market and in the educational system as well as in the area of unpaid work.

Ole Brüggemann is a doctoral researcher in sociology at the Cluster of Excellence 'The Politics of Inequality', University of Konstanz, Germany. His current research interests include (gendered) perceptions of social inequalities and their behavioural outcomes.

Julia Lang is a researcher at the research department "Active labour market policies and integration" and head of the Working Group "Further training" at the Institute for Employment Research (IAB) in Nuremberg. Her research interests are in the fields of active labour market policies and inequalities in the labour market.

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Who Perceives Lower Wages for Women to be Fair? How Perceptions of the Fairness of Men's and Women's Wages Vary by Firm and Workplace Characteristics

Susanne Strauß^{1,2,*}, Ole Brüggemann^{1,2} and Julia Lang³

¹ Cluster of Excellence: The Politics of Inequality, University of Konstanz, Konstanz 78457, Germany

² Department of History, Sociology, Empirical Educational Research and Sport Science, University of Konstanz, Konstanz 78457, Germany

³ Institute for Employment Research (IAB), Nuremberg 90478, Germany

Keywords

Gender inequality, wages, fairness, organizational context, Germany

Abstract

Previous research has shown that gender pay gaps are perceived as fair or justified, not only by men but also by women. In this paper we analyse whether this gender bias in the evaluation of fair wages still persists and whether the organizational context has an impact on fairness perceptions. We use unique data from a vignette study that was part of a representative online survey of 5,556 employees in 532 larger firms (> 100 employees) in Germany which are merged to administrative data. This allows us to consider different contextual factors at both the workgroup level and the firm level. In contrast to older studies we find that women tend to evaluate wages of female workers as unfairly too low. Moreover, the perception of (un)fair wages depends on the organizational context. Female supervisors and collective bargaining agreements in firms increase women's awareness for other women's unfairly too low wages, whereas an exchange about wages with co-workers affects the fairness perceptions of both male and female workers.

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Introduction

Despite women's increasing success in the educational system they continue to earn less than men – a phenomenon that has been termed the gender pay gap (Blau and Kahn, 2017, Schmitt and Auspurg, 2022). Moreover, a branch of the literature shows, strikingly, that this gap is perceived by some to be fair or justified (Adriaans *et al.*, 2020, Auspurg *et al.*, 2017, Sauer, 2020), – not only by men but also by women. This is important, not least when one thinks about the behavioral consequences that such a perception might have: in the case of systematic gender differences in perceptions regarding fair wages, it might contribute to explaining persistent gender pay differentials, since women might be less likely to ask for higher pay or to leave jobs for which the pay is unjustly low, as compared to men (Adriaans and Targa, 2022). It has been shown that individuals who perceive their wages to be unfair experience larger wage growth in subsequent years (Pfeifer and Stephan, 2019). Researchers should therefore look into perceptions regarding gender wage inequalities in order to understand and alleviate gender inequality in the workplace.

Previous research has shown that the gender bias of women and men perceiving lower female wages to be fair is not universal but differs by the characteristics of the given context, such as region (Lang and Groß, 2020), occupation (Auspurg, Hinz and Sauer, 2017) and federal state (Sauer, 2020). What remains less clear, however, is what the relevant factors in the contextual surroundings are that shape the gender bias. In line with previous research on the determinants of just earnings (Sauer and May, 2017), we propose that the most important frame of reference that should be addressed is employees' direct working environment: that is, the working group and – as a wider context – the firm. More specifically, in this paper we aim to assess the influence of three institutional factors that have been discussed as being related to gender wage inequality in firms: (1) the share of female managers at the firm level, as well as the gender of the direct supervisor (Kurtulus and Tomaskovic-Devey, 2012, Srivastava and Sherman, 2015);

(2) whether employees engage in open exchanges about wages (OECD, 2021); and (3) whether the firm is subject to a collective bargaining agreement (Bruno *et al.*, 2021).

Our study aims to make two contributions to the discussion. First, it aims to assess whether earlier findings that women and men perceive women's lower wages to be fair (Auspurg, Hinz and Sauer, 2017) still hold, or whether we can replicate more recent findings suggesting that women in many countries evaluate their wages as being unfairly low (Adriaans and Targa, 2022, Brüggemann and Hinz, 2023). Second, our empirical analyses contribute to assessing the impact of several contextual factors on perceptions regarding the fairness of wages. Our analyses are based on a vignette study that was part of a representative online survey of employees in firms with at least 100 employees in Germany. In order to increase the external validity of the experiments, we linked the vignette scenarios to the respondents' actual work environment. This means that the vignette person was described as a co-worker and the wages were constructed based on the actual respondent's wages. We cannot confirm an earlier finding that suggests that men and women consider the gender pay gap to be fair or justified (Adriaans, Sauer and Wrohlich, 2020, Auspurg, Hinz and Sauer, 2017, Sauer, 2020). Instead, we find that women are more likely to consider other women's wages to be unfairly low, confirming recent findings on perceptions of fairness (Adriaans and Targa, 2022, Brüggemann and Hinz, 2023). On the basis of earlier findings that the gender bias could not be found for social science students (Sauer, 2020), and our own findings that younger women are more likely to consider other women's wages as unfairly low, as compared to older women, we assume that women are increasingly aware of the phenomenon of unfair wages, and are no longer willing to accept them as justified. While engaging in open exchanges about wages increases the level of awareness of unfair pay for both men and women, a female supervisor, as well as collective bargaining agreements, raise the level awareness of unfairly low wages of women only among

women. The paper discusses the implications of these findings for policy initiatives that (a) increase women's share in supervising positions, and that (b) encourage wage transparency.

Theoretical approaches: how to explain gender differences in fairness evaluations

Evaluations of the fairness of one's own or somebody else's pay involve a subjective sense of (un)fairness that is triggered when one's own or another person's pay is compared to the level of pay that an individual would consider as fair. If the actual pay and the level of pay that would be considered fair match, then pay is evaluated as being fair. If the actual pay is higher than what the individual would consider fair, a state of unfair over-reward is perceived; if the inverse is the case, a state of unfair under-reward is identified (Jasso, 1978, Jasso *et al.*, 2016).

When trying to understand the phenomenon of biased perceptions of the fairness of wages, two main theoretical arguments have been put forward. The first theoretical argument is related to the concept of gender status beliefs that assume that men are more competent and worthy, and thus more deserving of higher pay (Ridgeway, 2011). According to this perspective, also called the expectation states theory (Correll and Ridgeway, 2003), both men and women are expected to evaluate lower wages for women as being fair (H1a). The second theoretical approach is based on the idea that individuals compare themselves (or a person that is to be evaluated) with similar pay referents (Jasso, Törnblom and Sabbagh, 2016). Thus, women have been shown to be more likely to select female referents who are, on average, lower paid (Davison, 2014). Hence, men might have different comparison standards when comparing their own wage levels to those of other men than women who compare themselves to other women (Schneck, 2014). Similarly, it has been argued that men might be overconfident when engaging in self-evaluations and might therefore overestimate their own performance (Niederle and Vesterlund, 2008, Pelham and Hetts, 2001). From this theoretical perspective, one would expect only women to consider lower wages for women to be fair or justified (H1b).

Following from the latter perspective, one would expect that women's (and men's) evaluation of other women's wages as (un)fair should depend on the daily context in which they work, especially insofar as it impacts on the level of awareness of gender pay inequalities. One factor that can influence employees' perceptions of gender inequalities in pay is the gender of managers in the company where a person works. There are two opposing assumptions as to how a supervisor's gender should shape perceptions of the fairness of pay. The first argument, based on social psychological theories of in-group preference based on ascriptive similarity (Reskin, 2000, Tajfel and Turner, 1986), coined 'agents of change' by Cohen and Huffman (2007), suggests that increased representation of women within the management will attenuate the gender wage gap as female managers will redress the past inequalities experienced by female employees. Following this argument, we would expect a woman who has either a direct female supervisor or who works in a firm where a high share of women hold management positions to be more aware of unfairly low wages for women (H2a). By contrast, it could also be that greater representation of women in management positions decreases employees' concern about the gender pay gap because women are no longer perceived to be disadvantaged, due to an overgeneralization of women's access to equal opportunities (for empirical evidence, see Georgeac and Rattan, 2019). Cohen and Huffman (2007) refer to this phenomenon as 'cogs in the machine', meaning that women, as they assume managerial roles, will exert a negligible, or even negative, effect on the earnings of female employees (Srivastava and Sherman, 2015). Hence, we would expect that women with a direct female supervisor or working in a firm with a high share of women in management positions will be less aware of gender inequalities, and therefore less aware of unfairly low wages for women (H2b).

Moreover, in work environments with a high degree of wage transparency, employees have more information about their co-workers' wages and therefore have more reference points for making wage comparisons. Due to women's, on average, lower wages, greater wage

transparency should therefore lead to a higher awareness of this gender inequality for both men and women. We would therefore expect that a context in which employees exchange information about their wages will lead to a higher awareness of women's unfairly low wages among men and women (H3).

Likewise, we would expect that collective bargaining agreements in firms will lead to higher wage transparency. Moreover, the standardization of wages through collective bargaining agreements reduces opportunities for wage discrimination (Freeman and Medoff, 1984), as well as intrafirm wage dispersion (Freeman, 1982), and hence potentially also reduces the gender pay gap. This is achieved by establishing wage-setting, bureaucratic procedures that reduce wage dispersion, and bureaucratic wage rules that lower the degree of arbitrariness in wage rates, thus minimizing the potential for discrimination (Elvira and Saporta, 2001). Employees in firms with collective bargaining agreements can thus be expected to be used to lower wage dispersion and a high standardization of wages, and should therefore be less tolerant of wages that deviate from these standards. We therefore expect that employees in firms with collective bargaining agreements will have a higher awareness of unfairly low wages for women, both among men and women (H4).

We thus expect men's – and especially women's – evaluations of the fairness of wages to be dependent on all three context characteristics studied here, since they can be expected to increase the degree of awareness of unfair wage-setting processes. While wage transparency and collective bargaining are expected to impact on both women's and men's fairness evaluations, we expect female supervisors (or a high share of women within management positions) to have a gender-specific effect.

Previous research: what we know about perceptions of (un)fair wages

While research on gender differences in perceptions of wages is abundant, studies differ substantially as to a) the exact phenomenon that they study, as well as b) the methodological approach that they take. Regarding the phenomenon under study, previous research differs as to whether it is interested in men's and women's *satisfaction* with their wages or their *evaluation of the fairness* of wages. For the latter, it is, moreover, important to note that some studies focus on the evaluation of an individual's own wages, while others investigate evaluations of other people's wages. Related to these substantial differences in research questions are the different methodological approaches that studies take. While the degree of *satisfaction* with one's own wages is usually elicited through survey studies, *evaluations of the fairness* of wages are either survey-based, especially regarding an individual's own wages, or based on vignette studies where respondents evaluate the wages of fictitious individuals who differ by characteristics such as productivity or gender.

As to the *satisfaction* research, there is ample evidence that women evaluate their jobs and their pay more positively than their male counterparts (Buchanan, 2005, Davison, 2014, Mueller and Kim, 2008, Pfeifer and Stephan, 2019). The phenomenon that women are generally aware of and concerned about the gender wage gap, but do not report greater dissatisfaction with their own individual pay, has been termed 'the paradox of the contented female worker' (Buchanan, 2005, Davison, 2014).

The concept of satisfaction is distinct, however, from that of *perceptions of the fairness of pay*, which is, not least, deemed to be more closely related to behavioural reactions (Adriaans and Targa, 2022). Several survey studies (e.g. Pfeifer and Stephan, 2019, Valet, 2018) find that women evaluate their own pay as fairer than do their male counterparts. However, in their most recent country-comparative study, Adriaans and Targa (2022) do not find evidence that women evaluate their own earnings more favorably than men: in 15 out of 28 analyzed countries,

women reported more intensive levels of perceived unfairness than did men. Similarly, the results of Brüggemann and Hinz (2023) also challenge the idea that the paradox of the contented female worker is a universal phenomenon. While these studies focus on survey respondents' evaluations of their own wages, other studies use factorial survey experiments where respondents evaluate fictitious persons' wages with regard to their fairness, experimentally varying these persons' characteristics. These studies find that gender earnings gaps are perceived to be fair or justified not only by men but also by women (Adriaans, Sauer and Wrohlich, 2020, Auspurg, Hinz and Sauer, 2017, Sauer, 2020). The size of the gap that is considered fair varies between about a three percent gap (Adriaans, Sauer and Wrohlich, 2020) and about an eight percent gap (Auspurg, Hinz and Sauer, 2017).

However, it has been shown that this gender bias in evaluations of the fairness of wages is not universal but differs between social groups and contextual surroundings. Thus, it could not be found for social science students, which is explained by the high salience of equality norms among this group (Sauer, 2020). The more liberal the respondents are in terms of gender roles, the less they perceive females to be inferior in their performance, and the more they consider fair pay to be important (Buchanan, 2014). Moreover, Lang and Groß (2020), in their study on the German case, only find a gender bias for men with children in west Germany, suggesting that a male breadwinner norm is the basis for such beliefs. This is supported by Jann *et al.* (2021), who find that higher wages for married men (as compared to married women) are considered to be fair. Auspurg, Hinz and Sauer (2017) show that respondents who work in occupations with lower gender pay gaps are less likely to perceive gender pay gaps as justified. Likewise, respondents living in federal states of Germany that have high actual gender pay gaps report a larger bias favoring men (Sauer, 2020).

While these studies suggest that a gender bias in perceptions of the fairness (or unfairness) of wages is not universal, it remains less clear what are the relevant factors in the contextual

surroundings that shape this gender bias. Due to issues relating to data availability, earlier studies focused on factors such as different parts of countries (east/west Germany (Lang and Groß, 2020)), federal states (Sauer, 2020), or the share of women in occupations (Auspurg, Hinz and Sauer, 2017). Although these differentiations yield interesting results, they are generally rather broad as regards influencing people's evaluations of the fairness of wages directly. A more important frame of reference that should be addressed is employees' direct working environment: that is, the working group and – as a wider context – the firm. Thus, it can be assumed that, depending on this direct day-to-day environment, employees have different experiences that should impact on their evaluations of the fairness of wages (Sauer and May, 2017).

As to the first institutional factor of interest in this paper, the gender of the direct supervisor, much research has addressed the question of whether the presence of female supervisors is advantageous for women's success in an organization. Empirical studies in this context mainly examine the effects of female leadership on the wages of female employees. As argued above, theoretically, a higher share of women in leadership positions can have both positive ('agents of change') and negative ('cogs in the machine' argument) effects on the wages of female employees. However, the results of studies in this area are rather mixed. Balcar and Hedija (2019) conclude that the gender of the manager has an effect on the level of wages, but not on the gender wage gap. Srivastava and Sherman (2015) cannot find support for the proposition that female managers reduce the gender wage gap among their subordinates. Dezsö *et al.* (2022) even find that female top managers are paid less where the CEO is female than they would have earned if the CEO was male. By contrast, Zimmermann (2021), based on German-linked employer-employee data, finds that female first-level managers slightly narrow the gender wage gap among workers, while female second-level managers considerably narrow the gender wage gap.

Regarding the second contextual characteristic – that is, whether a firm or working group allows for open exchanges about wages – there has been some previous research on this matter. Thus, an evaluation of the Austrian Pay Transparency Law, introduced in 2011, which requires firms above a certain size threshold to publish internal reports on the gender pay gap, did not find any discernible effects on male and female wages (Gulyas *et al.*, 2021). In Germany, the Pay Transparency Act came into force in 2017. This entitles workers in companies with more than 200 employees to an individual right to wage comparison information (which affects about one-third of the workforce) (Ahrens and Scheele, 2022). Policy evaluations are, however, rather skeptical, since only very few employees use their new right to information, and an even smaller share of employees see a change in wages when they make use of that right (Peichl and Schrickler, 2019). On the positive side, the introduction of the law has initiated a broader public and political debate on the gender pay gap (Ahrens and Scheele, 2022), and might also have contributed to firms (especially those with more than 200 employees) increasing the attention they give to the issue.

While there is evidence that collective bargaining agreements lead to higher wages in general (Addison *et al.*, 2014), it has also been shown that the union wage benefit is most pronounced among women (Elvira and Saporta, 2001). For the period between 2000 and 2010, Grimm *et al.* (2016) can show that in firms with collective bargaining agreements, the gender wage gap decreased over time, while it remained constant (on a higher level) in firms without such an agreement. The authors conclude that this difference is mostly due to unmeasured factors, and could thus be related to discrimination.

Data

To address our research questions, we were faced with extensive data requirements as we not only need representative data, including a vignette study, to replicate previous findings, but

also detailed information on the working environment to test whether institutional surroundings constrain individuals' perceptions of the fairness of wages. Hence, we conducted a factorial survey experiment as part of an online survey (see Strauß *et al.* (2022), for survey data and detailed documentation on field work), for which we recruited employees from German firms that allowed the linkage of survey and administrative data from social security records.

For the recruitment of participants, we relied on a combination of two administrative data sources – the Establishment History Panel (BHP) and Employee History (Beschäftigtenhistorik – BeH) of the Institute for Employment Research (IAB), which cover all firms with at least one employee, and the complete working population in Germany being subject to social security contributions – and we applied the following stratified sampling approach. First, a random sample of 20,000 firms with at least 100 employees each (14,000 based in west and 6,000 in east Germany) was drawn, to make the data small enough for computational work. Second, we created a 3x3x3 matrix based on all combinations of terciles of three institutional factors that we deemed to be relevant for wage fairness (gender pay gap, share of women in management positions, Gini coefficient). This step guarantees enough observations in those specific contexts which provide variance for the later analysis of firm-level explanatory variables. Finally, we randomly selected 20 firms from each of the 27 sampling cells and then 100 employees from each of the selected firms, resulting in a total sample of 54,000 employees from 540 firms.

Between May and August 2021 the online survey was fielded using postal invitation letters and up to three postal reminders.¹ In total, 7,867 employees took part in our survey, which corresponds to a response rate of 15 percent if we take into account that around 1,500 letters were returned as undeliverable. A large majority (87.3 percent) of participants gave their informed consent to link their survey answers with administrative data. We exclude from our sample of analysis respondents that were not employed anymore (or only marginally employed) at the time of the survey (N=268), changed their firm between sampling and survey

participation (N=396), or reported contractual working hours of less than 10 or more than 60 hours per week (N=102). After excluding respondents who did not evaluate all five vignettes and listwise deletion, our analytic sample consists of 5,556 respondents from 531 firms evaluating 27,742 vignettes.

Factorial survey design

As mentioned before, it is important to understand how different methodological approaches can influence the results of studies. Of the previous studies on perceptions of the fairness of wages, some are based on survey questions and consider the respondents' own wages (e.g. Pfeifer and Stephan, 2019), while others implement vignette studies, asking the respondents to evaluate other (fictitious) people's wages (e.g. Auspurg, Hinz and Sauer, 2017). In our own study, we combine both approaches in the sense that we implement vignettes, asking respondents to evaluate others' wages. However, we ask them to imagine a person in their own firm, with a similar position to that which they themselves hold (see Figure 1).

Moreover, we do not predefine a range of income categories for the fictitious co-workers as this could lead to a lot of unrealistic scenarios: for example, when participants working in jobs at the bottom/top of the income distribution are presented with potential co-workers earning wages similar to bottom/top positions. Hence, our survey experiment was programmed in such a way that participants' gross income and their working hours, stated at the beginning of the survey, were used to dynamically calculate a range of income values distributed around respondents' employment situation while other survey questions were answered.² This whole calculation process was designed to provide our respondents with fictitious co-workers that would be as realistic as possible with regard to their wages.

Figure 1: Sample vignette

Please imagine a person, that works in **your firm** in a position that is **similar to your position**.

A 40-year-old woman works full-time, i.e. 40 hours per week, and is overqualified for her job. She entered the firm and started in the position a long time ago and performs above-average. She is living in a stable partnership, with two children in her household.

Her monthly pay amounts to €3,000 (gross).

How fair do you consider the gross pay of the described person?

Unfairly low		Fair					Unfairly high	
-4	-3	-2	-1	0	+1	+2	+3	+4
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note: For screenshots of the vignettes, as presented in the online survey, see Strauß *et al.* (2022). Vignette text was translated from German into English.

Besides the vignette's firm and position, which were depending on the working environment of the respondents, we also assigned the same family status to all vignettes (stable partnership). We manipulated eight additional dimensions that are underlined in Figure 1. We list these, with their specific levels, in Table 1. To make our vignettes comparable with previous research, we focus on a vignette structure and conditions that are similar to previous vignette studies from the field (e.g. Auspurg, Hinz and Sauer, 2017).

We use a 6x2x9x2x3x3x4x4 design (see Table 1), leading to a vignette universe of 31,104 vignettes. To reach a lower number of vignettes while maintaining a maximum of orthogonality (minimum of correlation between dimensions) and level balance (equal frequency of each level) we rely on a d-efficient (d=91.4) design, with 360 vignettes that were blocked to 72 decks, each containing five vignettes. Each respondent was randomly assigned to one of these 72 questionnaire versions. Supplementary Table A1 contains a correlation matrix of all variables, showing no substantial associations between vignette variables ($r < 0.03$). Hence, randomization, as well as the fractional design search, worked as intended. By further randomizing the order of vignettes per respondent, making it possible to move back and forth

in the online survey to re-evaluate vignettes, and by assigning only five vignettes to each respondent, we reduce order, learning and fatigue effects (Auspurg and Hinz, 2015).

Table 1: Vignette dimensions and levels

#	Dimensions	Levels
1	Age	25/30/35/40/45/50 years
2	Gender	Male/female
3	Gross earnings/months	Nine values, ranging from -40% to +40% of a respondent's wage (about which respondents were asked earlier in the survey)
4	Working hours/week	Full-time, i.e. 40 hours per week/ part-time, i.e. 20 hours per week
5	Qualifications	Under-qualified/qualified/overqualified
6	Tenure	Entered the firm and started in the position just recently/ entered the firm a long time ago but started in the position just recently/ entered the firm and started in the position a long time ago
7	Job performance	Below-average/average/above-average/no information
8	Children	Four values, ranging from 'no children' to 'three children'

Measures

Dependent variable

The outcome variable is the evaluation of the fairness of co-workers' gross wages, as formulated in Figure 1. We use a nine-point scale ranging from 'unfairly low (-4)' to 'unfairly high (+4)', with a midpoint (0) defining perfect fairness of wages. Similar versions of this scale have been used in other surveys (e.g. European Social Survey (Round 9)) and in several other studies (see, e.g., Liebig *et al.* (2015) for an overview). Participants' average evaluation of the fairness of wages was -0.416, with women's evaluations being -0.618, and thus 0.351 scale points lower than men's average evaluation of -0.267. Hence, on average, employees evaluated their fictitious co-workers' wages as being unfairly low, and this was more pronounced for women.

Explanatory variables

The first hypothesis (a, b) is concerned with the evaluation of male and female co-workers' wages, as well as differences between respondents' gender. Hence, we use a dummy variable for both variables indicating the gender of vignettes and respondents (1=female, 0=male). Following our second hypothesis (a, b), we expect that having a female supervisor or working in firms with a higher share of women in management positions should shape evaluations of the fairness of co-workers' wages, either toward the 'agents of change' or the 'cogs in the machine' argument. The first institutional variable was measured based on the individual responses to the question of whether respondents have an immediate supervisor, differentiating between respondents with a male or female supervisor or with no supervisor.

For the share of women in management positions at the level of firms we rely on administrative data (BeH). Women in management positions are identified using the fourth digit of the five-digit German Classification of Occupations 2010 (KldB 2010), which indicates supervisors and managers. This operationalization has been applied in other studies using the same or different data, including information on occupations from the KldB 2010 (e.g. Zimmermann, 2021). As a substantial share of firms (more than 20%) in our sample did not employ women in management positions at all, we constructed the following three categories: 0 percent, 0.1 – 30.0 percent, and more than 30 percent of women in managing positions.

The third and fourth hypotheses state that greater wage transparency in a firm leads to a higher awareness of unfairly low wages of women, both for men and women. This was first measured directly by asking employees 'Have you ever had an exchange about your wages with your colleagues? (Yes/No)'. 45 percent of our respondents stated that they had never discussed their wages with colleagues, which illustrates that wages in Germany are still a sensitive topic – even among co-workers.

Additionally, we expect that collective bargaining agreements in firms lead to higher wage transparency and can create contexts with greater awareness of unfairly low wages. Hence, we asked ‘Does your establishment/office have a regional collective bargaining agreement or a collective bargaining agreement concluded between your establishment/office and trade unions? (Yes/No/Don’t know)’. In some of the firms, the respondents provided different responses on the collective bargaining coverage. We define a firm as being covered by a collective bargaining agreement if the majority of respondents from the firm stated that there is a collective bargaining agreement.³ We find that more than 65 percent of our participants work in firms that are subject to a collective bargaining agreement.

Table 2 gives an overview of the dependent variable and the main explanatory variables used in the analysis. For an overview of all variables used, see Supplementary Table A2.

Table 2: Descriptive statistics of main variables

	mean	sd	min	max
Vignette				
Evaluation of the fairness of vignette income	-0.416	2.240	-4	4
Vignette gender: female (ref.: male)	0.510		0	1
Respondent				
Gender: female (ref.: male)	0.424		0	1
Firm level				
Share of female managers:				
0%	0.205		0	1
1–30%	0.362		0	1
>30%	0.433		0	1
Collective bargaining agreement (yes=1)	0.657		0	1
Workgroup level				
Supervisor’s gender:				
male	0.694		0	1
female	0.284		0	1
no supervisor	0.022		0	1
Exchanges about wages with co-workers (yes=1)	0.549		0	1
N (evaluations); N (individuals); N (firms)		27,742; 5,556; 531		

Data: Strauß, Hinz, Zubanov, Brüggemann and Lang (2022), linked with administrative data (IAB Beschäftigtenhistorik (BeH) V10.05.01, Nuremberg 2020), own calculations.

Further control variables

For the regression analyses we additionally include information about the fictitious co-workers, employees and their firm. At the vignette level, we include all vignette dimensions (see Table 1) as we are mainly interested in whether vignettes with similar characteristics are evaluated differently depending on the assigned gender.

At the individual level, we control for inputs and outcomes following equity theory, as these might not only be relevant for the evaluation of own wages but will also influence the evaluation of co-workers' wages. As outcome, we control for the monthly gross pay (natural logarithm). For inputs, we account for weekly contracted working hours and logged seniority (days in the same firm), as well as education (highest school degree), as past inputs. Moreover, we control for the gender composition in the working group (0=no team, 1=more men, 2=more women, 3=similar shares of men and women). As the gender composition in the working group is moderately correlated with the gender of the direct supervisor ($r=0.41$ for more women in working group and female supervisor, see Supplementary Table A1), controlling for the former is required to net out the latter's effect of interest. Further control variables on the individual level are type of contract (1=fixed, 0=permanent), age (in years), a nationality dummy (1=German, 0=foreign) and a dummy for living with a partner in a household.

Finally, at the level of firms, we rely on matched information from administrative data to control for firm size (number of employees), gender composition, gender pay gaps and federal state dummies of firm location to eliminate unobserved regional heterogeneity. Gender composition is measured as the share of women employed in a given firm and recoded in the following categories: 0–30, 30–70 and 70–100 percent. Gender pay gaps (GPG) are calculated as the difference between male and female median daily gross pay divided by male median daily gross pay, and are transformed into a categorical variable with three values (negative GPG, GPGs between 0 and 20 percent, and GPGs greater than 20 percent).

Estimation strategy

In our survey, the respondents were asked to evaluate five different vignettes. To account for the nested structure, we estimate three-level hierarchical linear models, with the vignettes at the lower level, the individuals at the medium level, and the firms at the upper level. Following Heisig and Schaeffer (2019), in addition to random intercepts, we include a random slope for respondents' gender because in our multilevel models we are also interested in cross-level interactions between contextual factors on the upper level and respondents' gender. We start with our model evaluating the employee's perception of male and female co-workers' wages, as well as the differences between respondents' gender, by including respondents' and vignette persons' gender as well as their interaction.

In the next step, in order to analyse whether the firm and work group context plays a role in evaluations of the fairness of wages, and whether this differs by respondents' gender, we estimate four different models, one for each context variable we are interested in. In these models, we include a three-way interaction between the contextual variable, respondents' gender, and vignette gender. In addition, we also present the results from a model where we jointly estimate the gender-specific effects of all context factors by including all four three-way interactions. Besides the control variables mentioned above, all contextual variables are included as additional control variables in the different models.

The first institutional variable regarding the gender of the direct supervisor actually has three categories (male, female, no supervisor). However, as the number of observations for workers without a supervisor is very small (~2 percent) we only report the results for the other two categories. We estimate predictive margins for all four combinations of vignette and respondent gender, as well as average marginal effects for the interaction of respondent and vignette gender, to see whether male and female respondents evaluate male and female vignette wages differently, in general and in different working environments.

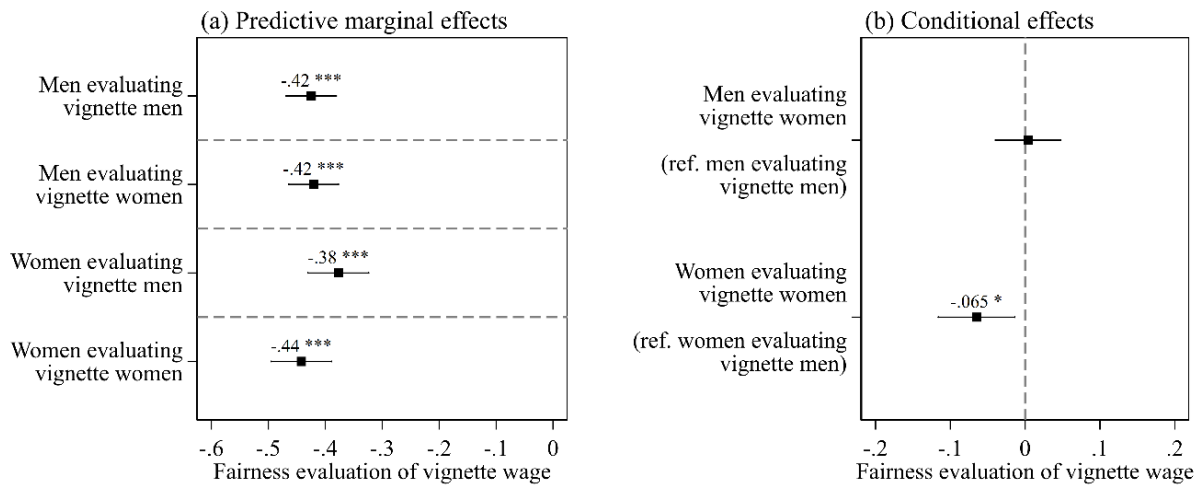
Results

Gender bias in evaluations of the fairness of wages

First, we discuss the results of our analyses regarding the gender bias in evaluations of the fairness of wages. Figure 2 shows the predictive margins for vignette and respondent gender, as well as the conditional effects of vignette gender on the fairness evaluation for the baseline model with the interaction between vignette and respondent gender. The predictive marginal effects (Figure 2(a)) show that men assess the fairness of women's wages and men's wages very similarly. The fairness evaluation of female respondents with regard to women's wages is at a similar level. However, female respondents are less likely to rate men's wages as unfairly low. Figure 2(b) shows that the assessment of the fairness of wages differs significantly by vignette gender for female respondents. Female respondents are more likely to evaluate the wages of female vignette persons compared to male vignette persons as unfairly low (the conditional effect is significant at the 5 percent level). Men, on the contrary, do not have a gender bias in their fairness evaluations. Thus, our results do not support either H1a or H1b. In contrast to previous studies, we do not find that women and men find higher wages for men to be justified. Instead, female respondents seem to be more aware of gender inequality in wages and perceive them to be unfair.

Supplementary Table A3 shows the corresponding regression results for the baseline model. With respect to our context variables, which are included as covariates in the model, we find that, without distinguishing by gender, workers who engage in exchanges with colleagues about their wages are significantly more likely to perceive wages as unfairly low. This is also true for individuals who work in firms with a high proportion of female managers.

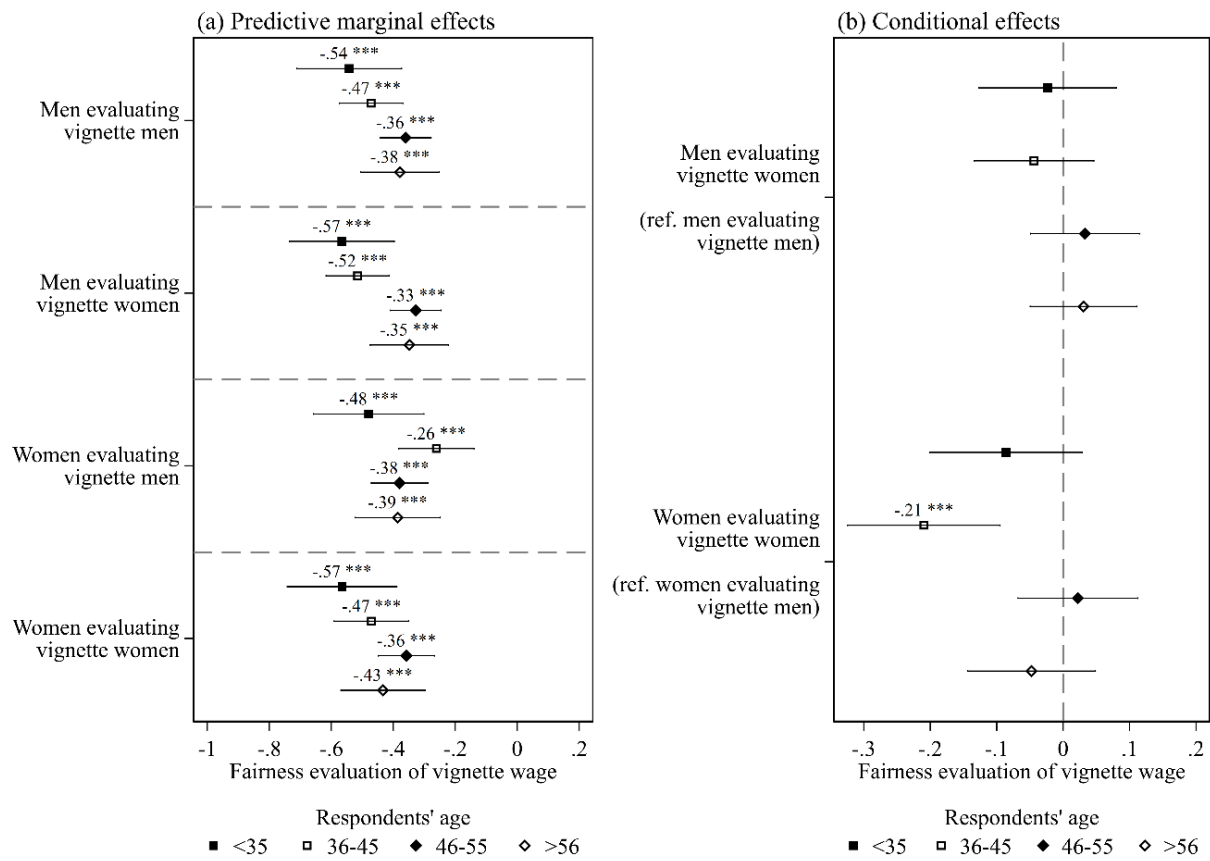
Figure 2: Gender bias – predictive marginal effects and conditional effects of interaction between vignette and respondent’s gender on evaluation of the fairness of wages



Note: N evaluations = 27,742; N respondents = 5,556; N firms = 531. +P<0.1 *P<0.05, **P<0.01, ***P<0.001.
 Data: Strauß *et al.* (2022), linked with administrative data (IAB Beschäftigtenhistorik (BeH) V10.05.01, Nuremberg 2020), own calculations.

One reason why our results differ from those of previous studies, and especially from the study of Auspurg, Hinz and Sauer (2017), could be differences in the construction of the sample. Our sample differs from those authors’ 2017 study in that it is not a general population sample: it only includes employees. However, Auspurg, Hinz and Sauer (2017) report that they find similar effects when replicating their analyses for a subsample of employees only (although this analysis is not limited to large firms, as in our study). Moreover, our data is from 2021, while the data used by Auspurg, Hinz and Sauer (2017) was collected in 2009. During this time there may well have been a societal shift associated with an increased perception that women’s pay is unfairly low. To identify a possible generational shift in fairness perceptions we additionally run our estimations by age groups. The results can be found in Figure 3. Our finding that women judge women's wages to be unfairly low appears to be driven primarily by the 36- to 45-year-olds. For the youngest age group, we find the strongest perception of wages as unfairly low, regardless of respondents’ or vignette persons’ gender. Overall, our results indicate that there are generational differences in perceptions of the fairness of wages.

Figure 3: Gender bias, by age of respondents



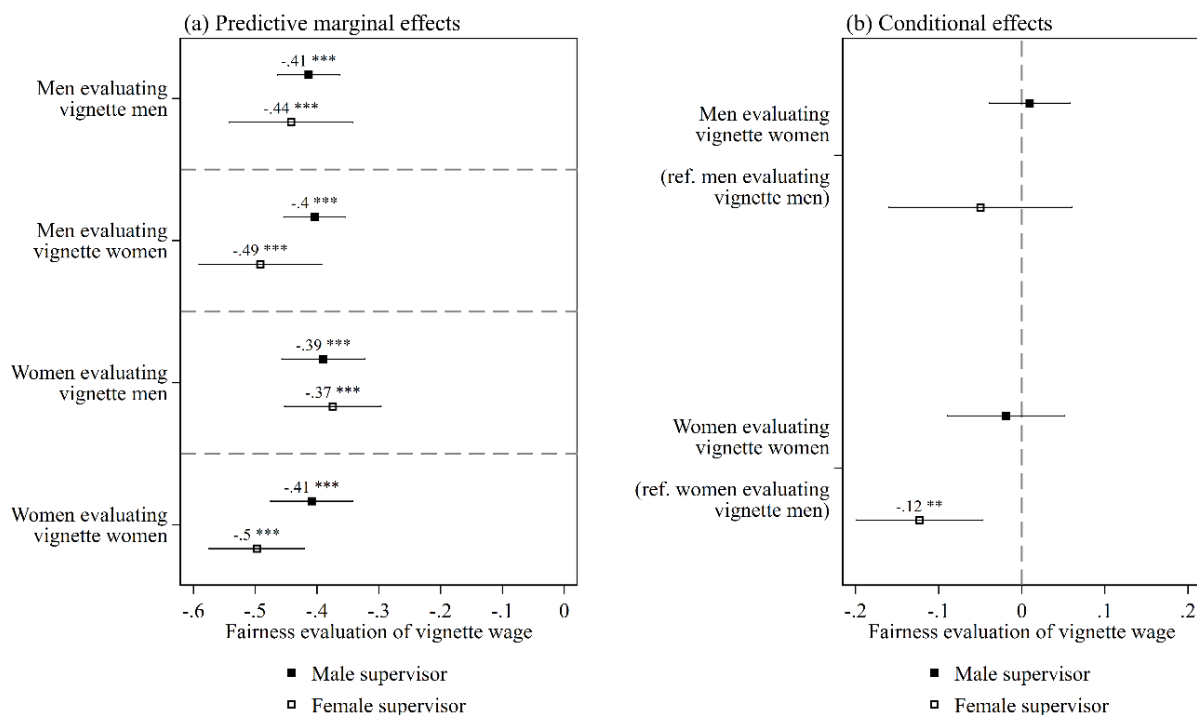
Note: N evaluations = 27,742; N respondents = 5,556; N firms = 531. +P<0.1 *P<0.05, **P<0.01, ***P<0.001. Data: Strauß *et al.* (2022), linked with administrative data (IAB Beschäftigtenhistorik (BeH) V10.05.01, Nuremberg 2020), own calculations.

The role of the working environment

We now turn to our second research question about the role of the organizational context in perceptions of the fairness of wages. The first institutional factor we consider relates to the *gender of managers*. To test our hypotheses H2a and H2b we estimate two different models with a three-way interaction of respondents' gender, vignette gender and gender of the direct supervisor (on the work group level), as well as the share of female managers (on the firm level). First, Figure 4(a) shows that both male and female respondents with a female supervisor tend to assess wages as unfairly low more often than those with a male supervisor. However, the interaction effect between respondents' and vignette persons' gender shows that only women who have a female supervisor are significantly more likely to rate women's wages as

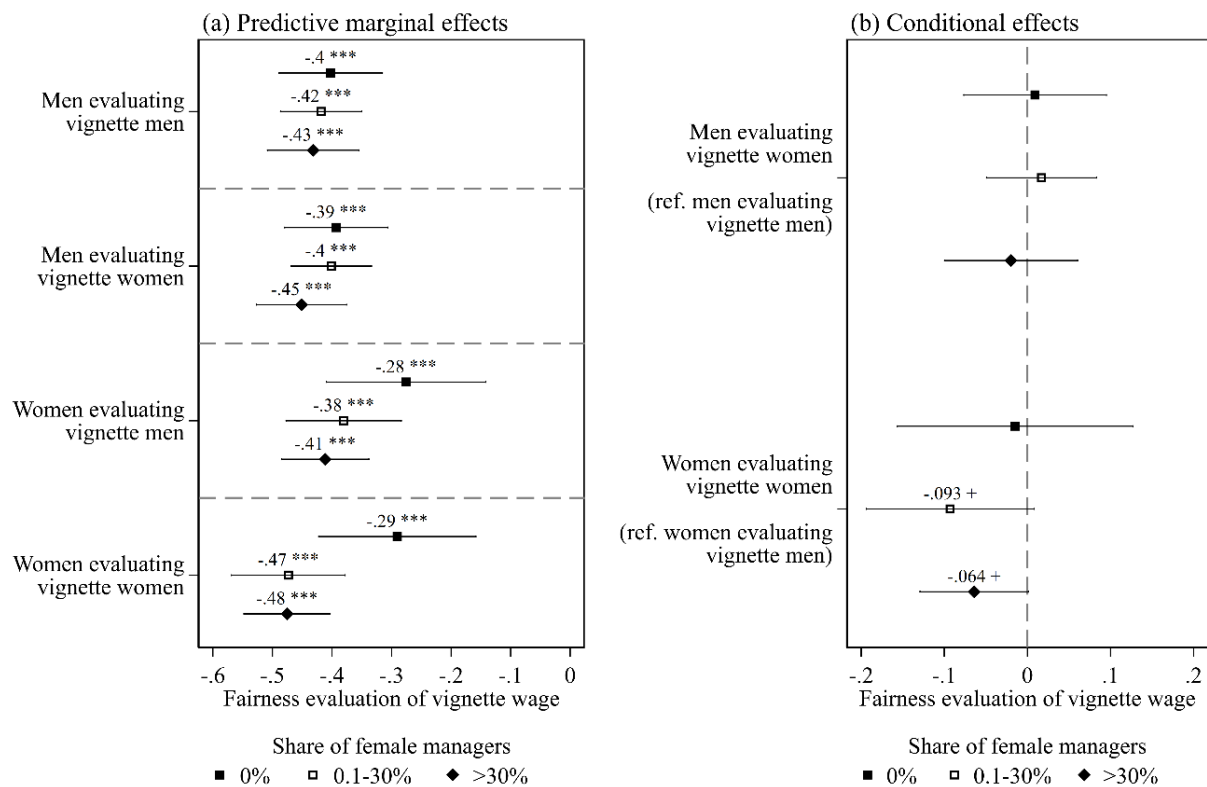
unfairly low as compared to men's wages (Figure 4(b)). The result supports hypothesis H2a, that women with a female supervisor are more likely to be aware of unfair wages paid to women. Hypothesis H2a is also supported by the results regarding the proportion of women in management positions at the firm level, presented in Figure 5. Where higher proportions of women are present in the management, respondents are more likely to rate women's wages as unfairly low as compared to men's wages. If, instead of estimating a separate model for each context variable, all contextual factors and their three-way interactions with the gender variables are included in one joint model (see Supplementary Tables A4 and A5), the effect of a high share of female managers on the gender-specific evaluation of the fairness of wages by female respondents is insignificant, whereas we still find an effect for a medium share of female managers, which is significant at the 10 percent level.

Figure 4: Gender bias, by gender of supervisor



Note: N evaluations = 27,742; N respondents = 5,556; N firms = 531. +P<0.1 *P<0.05, **P<0.01, ***P<0.001. Data: Strauß *et al.* (2022), linked with administrative data (IAB Beschäftigtenhistorik (BeH) V10.05.01, Nuremberg 2020), own calculations.

Figure 5: Gender bias, by share of female managers in firm



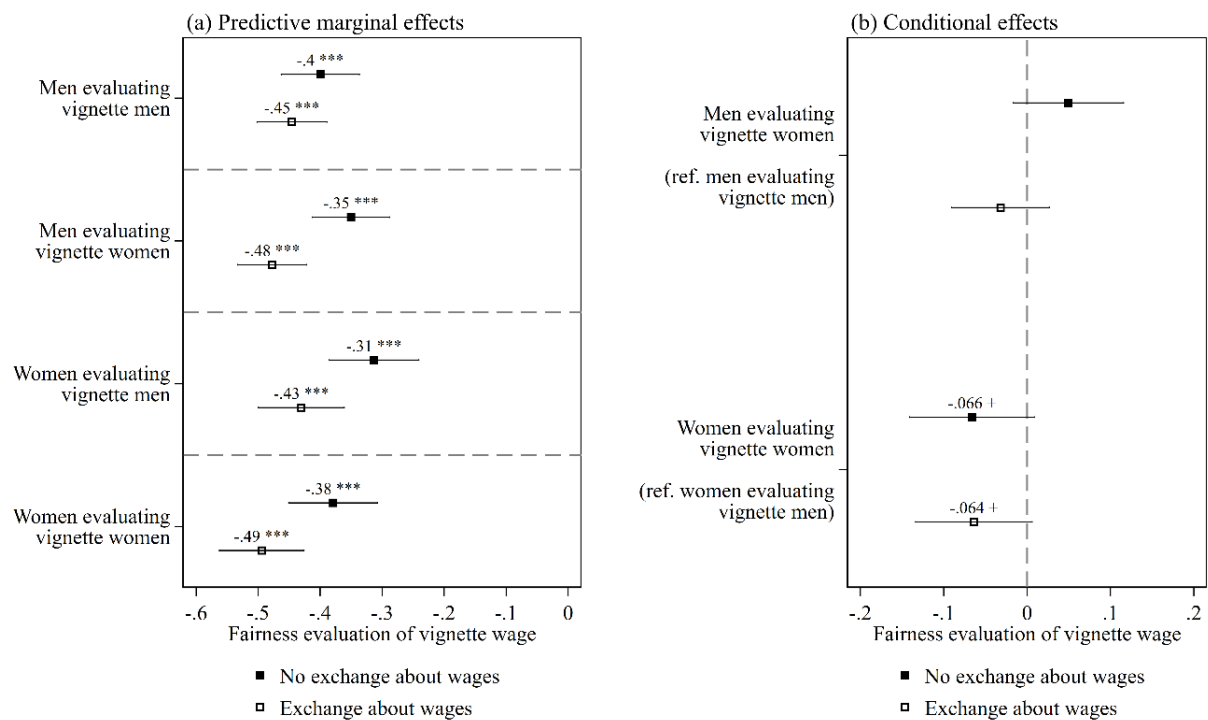
Note: N evaluations = 27,742; N respondents = 5,556; N firms = 531. +P<0.1 *P<0.05, **P<0.01, ***P<0.001. Data: Strauß *et al.* (2022), linked with administrative data (IAB Beschäftigtenhistorik (BeH) V10.05.01, Nuremberg 2020), own calculations.

Next, we analyze the role of *wage transparency* in perceptions of the fairness of wages. We consider whether employees take part in open exchanges about wages (individual level), as well as whether the firm is subject to a collective bargaining agreement. However, collective bargaining coverage not only increases wage transparency, it also reduces the wage dispersion in firms, thus potentially shaping the reference for wage comparisons of employees.

Figure 6(a) shows that employees who report taking part in exchanges about wages with their colleagues tend to more often evaluate the wages of co-workers as unfairly low, regardless of gender. With respect to gender differences, women are more likely to rate women's wages as unfairly low compared to men's wages, but this is true both for women who exchange information about wages and for those who do not talk about their wages with other colleagues (Figure 6(b)). Thus, engaging in exchanges with colleagues about wages seems to raise the

level of awareness of unfair pay in general, but does not have a significant gender-specific effect. Of course, it is also possible that employees who are highly aware of the topic of (un)fair pay in particular are more likely to talk to colleagues about wages. In addition, these effects that are conditional on a respondent's gender are no longer significant when we estimate a single model including three-way interactions for all context variables at once (see Supplementary Tables A4 and A5).

Figure 6: Gender bias, by exchanges about wages

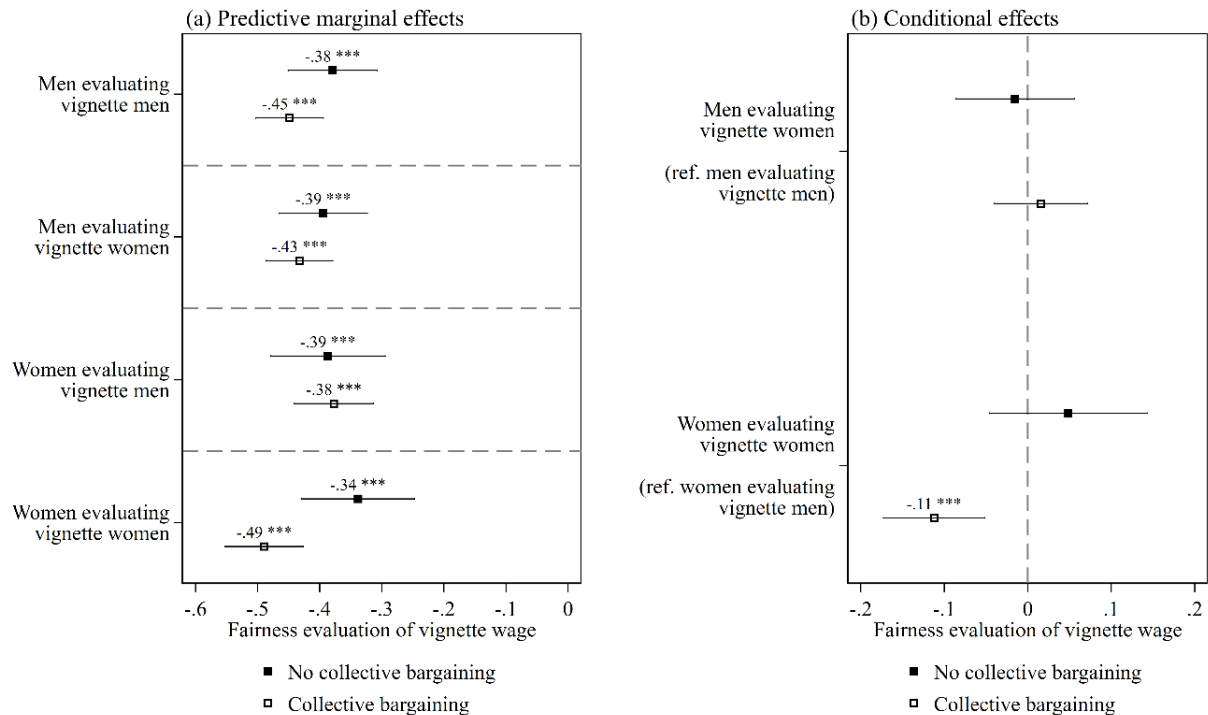


Note: N evaluations = 27,742; N respondents = 5,556; N firms = 531. +P<0.1 *P<0.05, **P<0.01, ***P<0.001. Data: Strauß *et al.* (2022), linked with administrative data (IAB Beschäftigtenhistorik (BeH) V10.05.01, Nuremberg 2020), own calculations.

Finally, Figure 7 shows the results of evaluations of the fairness of wages for firms with and without collective bargaining agreements. On the whole, employees in firms with a collective bargaining agreement are more likely to assess wages as unfairly low than people in firms without a collective bargaining agreement (Figure 7 (a)). In terms of gender differences, we find that women in firms covered by collective bargaining agreements especially perceive the wages of other women to be unfairly low (Figure 7 (b)). This effect also holds when estimating

a joint model for all contextual variables (see Supplementary Tables A4 and A5 in the Appendix).

Figure 7: Gender bias, by collective bargaining coverage



Note: N evaluations = 27,742; N respondents = 5,556; N firms = 531. +P<0.1 *P<0.05, **P<0.01, ***P<0.001. Data: Strauß *et al.* (2022), linked with administrative data (IAB Beschäftigtenhistorik (BeH) V10.05.01, Nuremberg 2020), own calculations.

Discussion and conclusion: what have we learned and where should we go next?

Previous research has repeatedly shown that people’s perceptions of the fairness of wages are biased in such a way that they see the gender pay gap as fair or justified (Adriaans, Sauer and Wrohlich, 2020, Auspurg, Hinz and Sauer, 2017, Sauer, 2020). Moreover, there is empirical evidence that perceptions regarding fair (or unfair) wages are not a universal phenomenon but can depend on the contextual surroundings. In this paper we use unique data to analyse whether the gender bias found in older studies in evaluations of the fairness of wages still persists, and whether the organizational context has an impact on perceptions of the fairness of wages.

Where previous studies have been based on generic third-person evaluations, and in some cases on direct questions about the earnings of the evaluators, we explicitly set a point of reference

for comparison at the firm level by asking participants to evaluate hypothetical peers working in the same firm and in the same position as the respondents. Beyond data from a factorial survey experiment, we are able to exploit information on the broader social context of the participants in the firm and in their working group.

In contrast to older studies, we find a reverse gender bias for women. Female employees more frequently evaluate the wages of female co-workers as unfairly low compared to the wages of male co-workers. Moreover, we find that perceptions of (un)fair wages depend on the organizational context. Engaging in exchanges about wages with co-workers increases the level of awareness of unfair wages, but does not have a gender-specific impact. In contrast, female managers have an impact, especially on female employees, and sensitize them to unfairly low wages of women. Finally, collective bargaining agreements in firms also increase women's awareness of other women's unfairly low wages.

Overall, our findings suggest a higher awareness among women, but not men, of unfairly low wages for other women. Moreover, they show that a stagnation or decrease in collective bargaining agreements might have adverse effects when it comes to perceptions of gender inequalities in wages. In contrast, the – slowly – rising share of female managers, as well as policy initiatives (such as the German law on wage transparency) that aim to increase open exchanges about wages, can contribute to increasing at least female employees' awareness of unfairly low wages for women.

It is important to note that there might be more firm-specific characteristics that shape employees' perceptions of the fairness of wages than the three that we include in our analysis. Thus, the wage dispersion in a firm, the economic situation of the firm, or organizational aspects, such as the degree of hierarchy, might also have an impact on employees' perceptions of the fairness of wages. However, the inclusion of additional firm characteristics in our study was not possible, for several reasons. First, especially for firm characteristics that are not

normally distributed, we had to rely on those characteristics that were used for the sampling strategy, since this was the precondition for an empirical distribution that made it possible to compare, for example, firms with very high or very low shares of female supervisors. Second, the inclusion of more firm characteristics would most likely lead to high correlations between them, and hence to collinearity in the models. Our selection of firm characteristics therefore followed a strict theoretical selection, focusing only on those characteristics that can be argued to increase employees' awareness of unfair wage distributions.

Generally speaking, however, we are convinced that our research provides an important contribution to the previous literature in different respects. First, it confirms earlier findings based on survey research that cannot replicate the paradox of the contented female worker (Adriaans and Targa, 2022, Brüggemann and Hinz, 2023). Instead, women seem to be gaining an increasing awareness of wage inequalities among other women. In addition, we demonstrate the importance of the firm surroundings as a contextual factor that seems theoretically more prone to moulding individuals' fairness perceptions directly: for example, through social comparisons with colleagues or experiences with wage negotiations. While previous studies had already shown how larger social entities, such as country parts, are related to individuals' fairness perceptions, this finding is an important contribution as understanding the influence of firm characteristics brings us much closer to understanding how the social context matters in shaping perceptions of the fairness of wages than does the comparison of large entities.

Notes

¹ We randomly varied the number of reminders (one to three) and the weeks between reminders (one to three).

² For more details on the exact calculations of the fictitious vignette wages, linked to the actual respondent wages, see Strauß *et al.* (2022).

³ Approximately 10 percent of respondents reported a different collective bargaining agreement status than the majority in their company. If we instead directly use respondents' own information on collective bargaining coverage, our results do not change (results available on request).

Data availability statement

Survey data and documentation can be found at Strauß *et al.* (2022) (datasets are subject to an embargo until 31 December 2024). The administrative data we additionally use is an excerpt from the Employee History (Beschäftigtenhistorik - BeH) of the IAB. This data is not publicly available due to data restrictions. To access this social data on site at the IAB, external researchers need to enter into a contract with the IAB, which needs to be authorized by the Federal Ministry of Labour and Social Affairs. Linked datasets are only available after approval of data access and upon request to conduct data analysis locally at the IAB, in cooperation with project members.

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