Fairness and Effort -

Evidence from a Field Experiment

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Abstract

We conducted a field experiment to examine whether paying higher wages motivates workers to voluntarily provide more effort. A publishing house hired workers to distribute copies of its newly launched newspaper during a promotion campaign. Beyond randomizing wages, we conducted a follow-up study to measure the perceived fairness of the baseline wage and social preferences of the workers. We show that paying higher wages significantly increased effort. Further analysis reveals that only the workers who perceived the baseline wage as unfairly low and who displayed social preferences reacted to the wage increases. This evidence strongly corroborates the predictions of the fair-wage effort hypothesis, which has sweeping implications for the functioning of labor markets.

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1 Introduction

Do fairness concerns determine work effort? There is a growing theoretical literature that stresses the importance of fairness concerns and their far-reaching implications for the labor market.[1] A prominent example is the fair wage-effort hypothesis of Akerlof and Yellen (1990), which assumes that workers feel entitled to a fair wage.[2] Accordingly, the hypothesis states that if the actual wage is perceived to be below the fair wage an increase in wages raises effort, even when the response is costly for the workers. However, increasing wages beyond the fair wage leaves effort unchanged. The basic idea of this model is that only wage changes that induce variations in the perceived fairness of the wage are associated with effort variations (see Figure 1).

Extensive evidence from laboratory experiments and interview surveys strongly supports workers' reciprocal responses to the wage offered.[3] However, experimental evidence in real-life jobs is less clear-cut, and usually the effects found are very small. In a recent study, Gneezy and List (2006) find a positive temporary effect of a wage increase on effort. However, toward the end of the six-hour field experiment, effort is identical across the high-wage and the low-wage treatment.[4] Kube et al. (2008*a*), which use a similar design as Gneezy and List (2006), find no significant difference between the high-wage and the low-wage treatment. Al-Ubaydli et al. (2008) find a positive and significant effect between a high-wage and a low-wage treatment in a framework where workers were concerned with their reputations. Most recently, Kube et al. (2008*b*) find a very large effect of a non-monetary gift on effort. These conflicting results are sometimes taken as evidence that results from laboratory experiments do not generalize to the field (Levitt and List, 2007).

This paper reports evidence from a randomized field experiment exploring whether paying higher wages motivates workers to voluntarily provide more effort. In addition, we present evidence on whether workers' reciprocal responses to higher wages were modulated both by the wage the workers thought was fair and workers' social preferences. Our field experiment took place during an episode in which a publishing house hired workers from a promotion agency to promote its newly launched newspaper. The promotion campaign lasted 10 weeks, meaning that the publishing house employed the workers for a limited period.[5] The workers' task was to distribute

[1] For empirical evidence of potential economic implications, see Dickens and Katz (1987) on inter-industry wage differentials, Clark and Oswald (1994) on involuntary unemployment and Bewley (1999) on downward wage rigidity.

[2] For a more recent formalization of a very similar idea, see Benjamin (2006), Danthine and Kurmann (2007) and Cabrales et al. (2008).

[3] See Fehr et al. (1993), Fehr and Falk (1999), Hannan et al. (2002), Brandts and Charness (2004), Charness et al. (2004) and Charness (2004) for laboratory evidence from gift exchange experiments. For surveys of managers which suggest that fairness is of overriding importance in setting wages, see Kaufman (1984), Doeringer and Piore (1985), Blinder and Choi (1990), Agell and Lundborg (1995), Bewley (1995), Levine (1993) and Campbell and Kamlani (1997).

[4] In a pioneering study, Pritchard et al. (1972) manipulates workers' perception of their pay, but paying all workers the same wage. However, there are no significant differences in effort levels between workers, who were made believe that their pay was generous and workers who were made believe that their pay was low.

[5] There exist alternative models, which can also explain a positive relationship between wage and effort levels.

copies of the newspaper to passers-by. The promotion agency paid its workforce a flat wage of CHF 22/h (about $18/h). In collaboration with the publishing house, we temporarily raised workers' wage by CHF 5/h (about $4/h) in a randomized and controlled way. This provided us with the opportunity to examine whether raising the flat wage increases effort. Ten weeks after the field experiment was concluded, we mailed a follow-up study to the workers, that was seemingly unrelated to any of the firms involved in the experiment. This follow-up study included a survey, which asked the workers to provide details about their part-time work. Most importantly, the survey asked them about what pay they considered fair for the various jobs they worked. In addition to the survey, we conducted a sequential social dilemma game which allows us to capture whether the workers had social preferences.

This setup improves on earlier studies in several ways. Earlier studies provided the important first step of randomizing wages in the field (Gneezy and List, 2006; Kube et al., 2008*a*; Al-Ubaydli et al., 2008; Kube et al., 2008*b*). As pointed out earlier, a common finding in these studies is that raising wages above the baseline level has only a small and insignificant effect on effort. However, these studies are limited by their very small sample sizes of no more than 30, but more often 10 individuals per treatment, typically employed for six hours. Because of these low numbers of observations, statistical power is low, making it hard to reject the null hypothesis of no effect.[6] By contrast, we have 196 workers, employed for, on average, six days. This allows us to test the fair wage-effort hypothesis with greater power. Like earlier studies, we only find a small effect of raising the wage. However, because of the large number of subjects in our study, we can reject the null hypothesis of no effect. Yet, it may be wrong to conclude from these results that fairness concerns are irrelevant for wage setting. Our study allows us to go beyond studying the overall effect as we can trace whether the response is related to the fairness perceptions of individuals, as predicted by the theory. Indeed, we find strong heterogeneity in the response to the wage increases: A pay raise beyond the fair wage had no effect on effort. By contrast, a wage increase affected effort strongly if it alleviated perceived unfairness. This finding explains why the overall effect in our study, and potentially others, is rather small. It is a feature of all four previous studies that the baseline pay was comparatively high, which made it difficult to improve the perceived fairness of the wage. Moreover, in contrast to laboratory experiments, where all environmental factors can be controlled by the researcher, in the field workers' views about what constitutes a fair wage is less clear and may differ between individuals. Yet, as the fair wage-effort model predicts that workers are only susceptible to working more if they currently feel underpaid, these fairness perceptions need to be measured. In our study, about half of the workers considered the baseline wage to be unfairly low. In addition, evidence from laboratory experiments shows that some individuals do not react at all even to clear fairness

Examples include Shapiro and Stiglitz (1984), Bull (1987), Holmstrom and Hart (1987) and MacLeod and Malcomson (1989). In contrast to the fair wage-effort hypothesis, these models assume that the workers and the firm interact within the context of an infinite time horizon. In order to distinguish empirically the fair wage-effort hypothesis from these other models, it is crucial to investigate an employment relationship within the context of a finite time horizon.

[6] This problem is exacerbated by the absence of a within-subject design.

manipulations, and reveal strictly selfish preferences. The decisions from our social dilemma game allow us to classify individuals as reciprocal and non-reciprocal. We show that only the reciprocal workers exerted more effort when their wages were raised toward what they thought was fair. Conversely, for the non-reciprocal, we find no evidence of reacting at all to the wage increases, even when they felt underpaid. This difference in response is significant. Overall, our results strongly support the predictions of the fair wage-effort hypothesis and provide an explanation for the seemingly incompatible findings in laboratory and field experiments.

The remainder of this paper is structured as follows. The next section discusses the economic environment, while Section 3 lays out the design of the study. Section 4 explores the findings and Section 5 discusses the results and concludes.

2 The Economic Environment

In May of 2006 a large publishing house launched a free daily newspaper, published on weekday evenings. The newspaper hired a promotion agency to conduct the launching of the free daily.

2.1 Work at the Promotion Agency

The promotion agency conducts product placement and advertising campaigns. The firm retains a large pool of part-time employees, which it contacts when the specific need arises. The workers can then sign up for work shifts. Typically, this is done approximately two weeks ahead of assignment. When a worker agrees to take on at least some assignments, she receives instructions pertaining to the job. Information is provided on the required attire, hours of work and wage. Jobs typically consist of distributing samples and pay is usually a flat hourly wage.

2.2 Newspaper Distribution

The promotion agency allocated workers to busy places and had them distribute copies of the newly launched newspaper to passers-by. A work assignment always consisted of a check-in, three hours of work and a check-out.

Upon arriving at the check-in, a supervisor provided workers with information pertaining to the assigned location and prompted them to approach customers actively, as the aim of the promotion was to reach all potential readers. Moreover, workers were requested to keep both the straps of the distributed newspaper stacks and an accurate count of the number of copies distributed of the last, not fully distributed stack.[7] After check-in, workers moved to their assigned location to distribute the newspaper. In the meantime, their supervisor patrolled the

[7]Subsequent to a work assignment, the supervisors went to the newspaper boxes to record the remaining number of copies. Output can therefore be measured accurately.

area to monitor that the workers were adequately supplied with copies and that they would not throw them away.[8] After completing a work assignment, workers returned to their supervisor to give feedback and hand over the straps. The workers were paid a flat wage of CHF 22/h.

An important feature of this work environment is that the economic incentives did not encourage the workers to exert high effort. There were several reasons for that. First, workers earned a flat wage rather than a piece rate, which means that pay was independent of output. Second, the survey indicates that baseline pay was perceived as low by more than half of the workers. Third, nobody could blame the workers if the newspaper demand was low and therefore output was low too. Finally, given the size of this campaign, the agency had a hard time filling the planned assignments. As a result, 20 percent of the planned assignments could not be filled, which means that the locations remained vacant on some days (see Figure 2). Hence, the threat of firing workers during the newspaper promotion due to little effort was not credible.

3 The Experimental Set-up

The design of the study consists of two parts. In collaboration with the publishing house, we implemented temporary wage increases in a controlled and randomized way. Ten weeks after the experiment, we conducted a survey together with a social dilemma game among the workers from the field experiment.

3.1 The Randomized Wage Increases

Our field experiment took place in the city of Zurich, Switzerland, and was conducted over a four-week period in June and July of 2006. The promotion agency divided the city into two equally-sized regions. This division was based on the organizational structure of the campaign: Each region had its own manager, responsible for recruiting and allocating the supervisors and workers for the different locations within a region. In each of the four weeks, one region was randomly assigned to be the treatment region, while the other region served as a control.

In the treatment condition, the publishing house raised the workers' wage by CHF 5/h from CHF 22/h to CHF 27/h. In the following, we will refer to this as the CHF 27 condition. The publishing house announced this wage increase on a day-by-day basis at the beginning of the work shifts in two ways: The workers received a postcard with the pay raise information, and they also received a text message on their mobile phone containing the same information.[9] Together with this information, the message (on the postcard and mobile phone) also reminded

[8] The promotion agency has the policy of firing workers if samples are thrown away. No such incident was reported.

[9] The postcard bore the newspaper logo and the text on both the postcard and text message included the name of the publishing house. This was done in order to make it plain that the publishing house, not the promotion agency, awarded them the higher pay.

the workers that it was important to keep the straps of the distributed newspaper stacks.

In the baseline condition, the workers were paid the regular wage of CHF 22/h (for this reason, we will refer to this as the CHF 22 condition). In order to keep the attention to the workers constant, the workers in the CHF 22 treatment also received a postcard and a text message at the beginning of the shift, reminding them that it was important to keep the straps of the distributed newspaper stacks.

The timing and change in the treatments is shown in Figure 3. As can be seen, the conditions were changed in the locations every week. If asked, it was explained to the workers that the choice of which location would receive the CHF 27 hourly wage was up to the publishing house, and that the promotion agency did not know which location would be paid what wage. This was done intentionally to rule out selection into particular locations on days in which the workers assumed the high wage would be paid. There were three reasons to choose a weekly rotation of the treatments. First, more frequent rotations of the treatment allow a more robust identification of confounding time effects that may have occurred as the newspaper was introduced. Second, there was strong anticipated turnover after week two of the experiment. Thus, a weekly rotation of the treatments also helped generate within-subject variation in pay, enabling us to estimate worker fixed effects in the empirical analysis below. Third, as the supervisors were in charge of handing over the appropriate postcards and as they were unaware of the experiment and timing of events, a more frequent rotation of the treatments could have confused them.

Toward the end of the experimental episode, the promotion agency conducted a feedback form among the workers. The workers were asked to fill out an evaluation of their conditions of work. In particular, the feedback form included two closed-ended questions, asking the respondents to rate the appropriateness of the baseline and high wage on a five-point scale: "I perceived the baseline pay of CHF 22/h for the exertion of this task as [*from stingy to generous*]" and "I perceived the higher pay of CHF 27/h for the exertion of this task as [*from stingy to generous*]". In order to minimize issues of demand effects, the participants were assured that their responses were anonymous.

This anonymous evaluation of the two payment conditions helps us to know whether the experimental manipulation produced the desired change in fairness judgments.

3.2 The Follow-Up Study

In October of 2006, we administered a follow-up study among the workers who worked during the experimental episode. A survey along with a social dilemma game was mailed to the workers on behalf of the University of Zurich. The recipients were informed that the University of Zurich had approached some employers to collect the addresses of their part-time employees. There was no connection visible to the workers that this follow-up study had anything to do with the variation in pay they experienced during our field experiment.

The survey asked a variety of questions related to part-time work and also collected demographic information on the participants. The respondents were prompted to indicate up to three employers of the previous 6 months and they had to answer questions relating each of their listed employers.[10] This section included the questions of key interest to us: "How much (gross in CHF/h) did you earn at employer [*name of the employer*]?" and "How much (gross in CHF/h) do you think is appropriate for the exertion of this task at employer [*name of the employer*]?". This allows us to analyze workers' responses to the wage increases conditional on their perception of a fair wage.

Subsequent to filling out the survey, workers were asked to participate in a sequential social dilemma game. We let the workers engage in an anonymous, one-shot interaction with a part-time employee of a different firm. Workers from our field experiment acted as second movers and their decisions were elicited using the strategy method. The first mover could either keep CHF 6 (about $5) for herself and give CHF 18 (about $15) to the second mover, keep CHF 12 (about $10) and give CHF 12, or keep CHF 18 and give CHF 6. The second mover could assign positive (negative) points to reward (punish) the first mover. Yet, the second mover could also decide to assign no points at all. The technology of rewarding or sanctioning was such that one positive (negative) point cost the second mover CHF 1 and increased (decreased) the first mover's payoff by CHF 3. Second movers could assign up to two positive or negative points in one out of the three decision allocations. We take workers' second mover responses to classify them as reciprocal or non-reciprocal. A second mover is classified as a positive reciprocal type if she assigned more positive points in (6,18) than in (12,12) or more positive points in (12,12) than in (18,6). In order to be counted as a reciprocal type, a second mover had to reward a for her better allocation. According to this reciprocity criterion, 77 out of 118 workers who participated in the social dilemma game behaved reciprocally.

If the respondents fully completed and returned the follow-up study within two weeks, they received a guaranteed amount of CHF 7 (about $6) for completing the survey plus the amount earned in the social dilemma game.[11] Extensive phone calls and emails were made to remind the participants of completing the follow-up study.

3.3 Descriptive Statistics and Randomization Checks

Table 1 provides basic descriptive statistics for our set-up. The first panel of Table 1 gives an impression of the workers' productivity and work intensity. They handed out on average 230 copies of the newspaper per hour. The table also shows that on average, the workers distributed copies on 6.4 days during the four weeks of the experiment. The workers were relatively young (22 years), mostly female (73 percent), and most of them worked only part-time. Many of

[10] The 6 months covered the time period of the promotion campaign.

[11] The participants of the follow-up study had the possibility to ask one of the authors if they had questions concerning the study.

them were enrolled or already graduated from university (23 percent), respectively college (24 percent).

As the recruitment of the workers and the plan of action was done approximately two weeks in advance of the assignment date, workers should not have been able to select into the CHF 27 treatment. However, we examine this in two ways: We run the following regression

$$s_{ic} = \alpha_i + I(\text{CHF } 27)_{ic} + \epsilon_{ic}, \tag{1}$$

where the dependent variable s_{ic} is the number of shifts each worker i worked in treatment c. We include a fixed effect α_i for each worker and a treatment indicator. We run a second test to check whether the number of unfilled shifts differed by treatments. That is, we run the regression

$$u_{tc} = \delta_t + I(\text{CHF } 27)_{tc} + \epsilon_{ic}. \tag{2}$$

The dependent variable u_{tc} is the ratio of unfilled shifts per day t and treatment c. We include date fixed effects δ_t in the estimation. In both estimations, we report OLS standard errors, which may be too small because of remaining correlations in the residuals. But they provide a stricter test of randomization. The results in column (1) of Table 2 show that workers worked the same number of shifts in either treatment condition. An average worker worked 3.14 shifts in each condition. The difference between shifts in the CHF 22 condition and the CHF 27 condition is only 0.18 and insignificant. Column (2) shows the results for the estimates of equation (2). Again, the indicator for the treatment condition is small and insignificant. To sum up, we find no indication that workers were able to select into the high-wage condition.

Table 3 also provides a randomization check based on a variety of individual characteristics, using data from the survey. The table reports the means of the individual characteristics for each of the two treatment conditions, and performs a non-parametric test on the two distributions. As can be seen, we cannot reject the null of no difference for any of the characteristics.[12] Thus, the table shows that the way the workers were allocated to the CHF 22 and CHF 27 condition is random.

4 Empirical Results

This section reports the results from our study in four steps. First, we report the wage the workers considered fair for the job they were working using data from the survey. Subsequently, we test whether increasing the wage improved the perceived fairness of the wage employing

[12] Notice that the p-values for the tests are calculated assuming independence between all observations. Because we have repeated observations from individuals, this likely understates the variance in the data. Thus, if anything, these tests are biased toward finding a difference. Nevertheless, the lowest p-value we find is 0.215.

data from the anonymous feedback form. Second, we present evidence on workers' reciprocal responses to the wage increases using data from our field experiment. Third, we examine whether workers' perceived fairness of the baseline wage modulated their responses to the wage increases by combining the data from our field experiment and survey. Fourth, we provide evidence on whether social preferences of the workers can predict their responses to the wage increases by incorporating the data from our social dilemma game.

4.1 Fairness Perceptions and Pay

There is substantial heterogeneity in fairness perceptions. Figure 4 displays the difference between the wage the workers considered fair, and the wage they were paid in the baseline condition. Thus, a positive number indicates that the worker felt underpaid, while a negative number indicates that the worker felt overpaid. The figure shows that of the 119 survey respondents, 53 percent considered the baseline pay as inadequately low. Thus, a large number of workers accepted the job even though they thought that the wage was unfairly low. Of the remaining 47 percent, 35 percent felt that the wage was adequate, while very few (12 percent) thought that they were paid more than what they thought was adequate for the job.

This suggests that for the majority of the workers, it was possible to significantly improve the perceived fairness of their wage in the CHF 27 condition. Indeed, we find strong evidence that raising pay from CHF 22/h to CHF 27/h significantly affected the fairness of pay. Figure 5 displays that of the 113 workers who returned the feedback form, 30 percent rated the baseline wage in the two lowest fairness categories, while only 2 percent reported the same for the higher pay. Thus, there is a clear shift to a more fair evaluation of pay. In particular, the strongest shift in the distribution of fairness judgments seems to come from the bottom end of the distribution. When we compute a Wilcoxon signed-rank test, we can clearly reject the null hypothesis that both distributions are the same ($p < 0.001$). These results confirm that the perceived fairness of the wage was effectively manipulated.

4.2 The Response to the Wage Increases

We find a rather small overall effect of raising the wage, as found in many other studies that experimentally raised wages above a baseline for which workers are willing to work (see Gneezy and List, 2006; Kube et al., 2008*a*; Al-Ubaydli et al., 2008; Kube et al., 2008*b*). Figure 6 presents the overall effects from our study, both, for the entire sample and for the individuals who also participated in the survey. The data for the figure are demeaned by location, as the manned locations altered over the course of the experiment. Thus, a zero corresponds to an average number of copies distributed in a particular location, while a positive number indicates greater-than-average output of copies. As can be seen, in our study, there is only a small average difference of about 0.04 log points, or approximately 4 percent, between the CHF 27 and CHF

22 condition. To test this formally, we estimate the following equation

$$\log(y_{it}) = \gamma_0 \log(w_{it}) + \psi_{j(it)} + \delta_t + \epsilon_{it}, \tag{3}$$

where $\log(y_{it})$ denotes the logarithm of the number of hourly copies distributed by worker i on day t, $\log(w_{it})$ is the log hourly wage, which depending on the treatment was either CHF 22 or CHF 27. We include location fixed effects ψ_j to control for differences in output due to alteriations in manned locations, as well as date fixed effects δ_t for each day to control for changes in the demand for the newspaper over time. Finally, ϵ_{it} is the idiosyncratic error term, which we allow to be correlated within individuals. We also run a more conservative specification in which we additionally include worker fixed effects, denoted by α_i, to control for differences between workers. The regression equation is then given by

$$\log(y_{it}) = \gamma_0 \log(w_{it}) + \alpha_i + \psi_{j(it)} + \delta_t + \epsilon_{it}. \tag{4}$$

We estimate equations (3) and (4) using OLS, and adjust the standard errors for clustering on workers. The results are displayed in Table 4, and the estimated coefficients can be interpreted directly as elasticities. The point estimate, using the full sample, varies between 0.175 and 0.134, that is, doubling the wage would have led to an increase in effort between 17.5 and 13.4 percent. Our point estimate is small, but it is solidly within the confidence intervals the earlier studies have found. However, because of the large number of subjects in our study, we still have enough precision to reject that the workers did not react to the wage increases, unlike the earlier studies.

4.3 Fairness Perceptions and the Response to the Wage Increases

Average results may be misleading for an assessment of the role of fairness concerns as there is substantial heterogeneity in fairness perceptions. Figure 7 gives a first visual impression on the importance of controlling for fairness perceptions when estimating the impact of wage increases on effort. The figure shows the log of the hourly copies distributed, with the location means subtracted like in Figure 6, yet controlling for fairness perceptions. The dark-blue bars represent the averages in the two payment conditions for the individuals who felt already adequately paid at CHF 22/h. As can be seen in the graph, raising pay from CHF 22/h to CHF 27/h led to no increase in the number of copies distributed. Conversely, workers who felt underpaid in the CHF 22 condition responded strongly to the wage increases. The light-blue bars in Figure 7 show the averages of these workers across the two pay conditions. As can be seen, higher pay is associated with clearly higher work effort. The standard error bands of the two means do not overlap, indicating a significant difference between the two groups. However, the standard errors in Figure 7 are calculated under the assumption that each observation is an independent draw. Since we have multiple observations per individual, these standard errors may be too small. To

address this problem, as well as to include tighter controls, we estimate the regression

$$\log(y_{it}) = \gamma_0 \log(w_{it}) + \gamma_1 \Delta_i + \gamma_2 \log(w_{it})\Delta_i + \psi_{j(it)} + \delta_t + \epsilon_{it}. \tag{5}$$

The variable Δ_i is the difference between the wage considered fair and the baseline wage of CHF 22/h. Thus, a positive number means the worker felt that the wage was unfairly low. A value of zero means that the wage was considered fair, and negative numbers mean that the wage was more than fair in the perception of the worker (though this hardly ever occurs, as Figure 4 shows). We reestimate the model, yet include worker fixed effects. This specification has the advantage that it does not impose that Δ_i enter (5) linearly, but allows for any relationship between individual characteristics, including fairness perceptions, and work effort. The regression equation is then given by

$$\log(y_{it}) = \gamma_0 \log(w_{it}) + \gamma_2 \log(w_{it})\Delta_i + \alpha_i + \psi_{j(it)} + \delta_t + \epsilon_{it}. \tag{6}$$

The estimates are shown in Table 5 and confirm the impression from Figure 7. The results show that γ_0, the coefficient on $\log(w_{it})$ is not significantly different from zero. Because of the interaction with Δ_i, this coefficient represents the impact of a wage increase on effort when Δ_i is zero, i.e., when the baseline wage was already considered fair. Since we specify both sides of equation (5) in logs, the coefficient can directly be interpreted as an elasticity. The point estimate of 0.07 is very low, it implies that doubling the wage would have led to 7 percent more effort. The 90 percent confidence interval ends at 25 percent, which is still very small. Thus, for individuals who already felt paid fairly at the baseline wage, raising the wage had no significant impact on their output. By contrast, we find a significant effect of wages on effort for individuals who felt paid unfairly. As Table 5 shows, the coefficient on the interaction between $\log(w_{it})$ and Δ_i is significantly different from zero, showing that individuals who felt paid unfairly at the baseline wage, responded to the experimental manipulation in a significantly different way than individuals who thought that the baseline pay of CHF 22/h was fair. The point estimate implies that for every CHF that an individual felt underpaid, the elasticity of effort with respect to wages increases by 0.093. In other words, for an individual who thought the fair wage was CHF 27/h, the elasticity of effort in response to a wage increase is $0.07 + 5 \cdot 0.093 = 0.54$. We obtain the same result for the fixed effect specification as shown in Column (2) of Table 5: There is virtually no response to the wage increases by individuals who felt paid adequately at the baseline wage, but a substantial response by individuals who felt underpaid at the baseline wage. Thus, heterogeneity in fairness perceptions led to different responses to the wage increases. This suggests that controlling for fairness perceptions is crucial.

We additionally perform a variety of robustness checks to test that the interaction is not due to other variables that may happen to be correlated with fairness perceptions and that fairness perceptions were not biased due to the ex-post measurement. We do not find strong predictors of fairness perceptions. However, we look at ability, as one may think that high ability workers

may more likely felt underpaid so that fairness perceptions could just be a proxy for skills. We interpret the worker fixed effect α_i from equation (4) as a measure of each worker's ability. Workers with a high α_i were on average more productive than workers with a low α_i. Thus, we divide the workers in two groups: workers with an α_i above the median (high-skilled), and workers with an α_i below the median (low-skilled). We now reestimate equations (3) to (6), yet include a dummy for high ability and interact this dummy with the response to the wage increases. The results are displayed in Table 6. We find no evidence of such an alternative explanation. Including a dummy for high ability does not change the conclusions and the dummy does not interact with the response to the wage changes. We also examine whether exposure to the higher pay affected the perceived fairness of the baseline wage. Workers with a high exposure to wage increases may more likely felt treated unfairly in the baseline condition so that underpayment could merely be a proxy for exposure to the pay raises. Exposure is measured as the percentage of shifts in which a worker received the higher pay. We again divide the workers in two groups: workers with an exposure above the median (high exposure), and workers with an exposure below the median (low exposure). Figure 8 gives a visual impression of the fairness perceptions in the two groups. The figure suggests a similar pattern of fairness perceptions for the two groups. Moreover, a Mann-Whitney rank sum test cannot reject the null that the two distributions are the same ($p = 0.909$). To provide a more rigorous test, we additionally regress our measure for fairness perceptions on exposure to wage increases using OLS. The point estimate of 0.19 is very low as shown in Table 7: It means that raising the fraction of high-wage shifts from zero to hundred percent increases the wage the workers considered fair by 0.19 CHF/h. The 90 percent confidence interval ends at 1.3 CHF/h, which is still modest considering that the fair wage varies by as much as 12 CHF/h.

4.4 The Role of Social Preferences

Having found evidence for the particular importance of controlling for fairness perceptions, we now seek to analyze the role of fairness concerns in greater detail. As we mentioned above, the decisions in the social dilemma game allow us to classify individuals as reciprocal and non-reciprocal. We find that only the reciprocal workers voluntarily provided more effort when their wages were raised toward what they thought was fair. For the non-reciprocal, we find no evidence of reacting at all to the higher wage, even when they felt underpaid. Column (1) of Table 8 shows the results for the estimates of equation (6) restricted to only the reciprocal workers, while Column (2) shows the same for the non-reciprocal. The results in Column (1) reveal that the coefficient on $\log(w_{it})$ is not significantly related to changes in the number of copies distributed. This coefficient represents the impact of a wage increase on effort of reciprocal workers when they considered the baseline wage as fair. However, the point estimate on the interaction between $\log(w_{it})$ and Δ_i is large and positive, implying that for every CHF that a reciprocal worker felt underpaid, the elasticity of effort with respect to wages increases by 0.16. Put another

way, for reciprocal workers who thought the fair wage was CHF27/h, the elasticity of effort in response to the higher pay is -0.02 + 5·0.16 = 0.78. Conversely, workers who were "egoistic" did not respond significantly to the wage increases no matter whether they felt underpaid as shown in Column (2) of Table 8. Even if we compute a very strict difference-in-difference test, there is clear evidence that the reciprocal workers responded differently to the wage increases than the non-reciprocal ($p = 0.07$).[13] Thus, considering the underlying preferences and fairness perceptions of the workers, our results demonstrate that the impact of wage increases on effort is mainly driven by workers who cared about fairness and who perceived the baseline wage as unfairly low. Overall, this evidence strongly corroborates the predictions of the fair-wage effort hypothesis.

5 Discussion and Conclusion

This paper provides evidence on whether paying higher wages motivates workers to voluntarily provide more effort. Like earlier field studies, we only find a small overall effect of raising the wage on effort. Because of the large number of subjects in our study, we can reject the null hypothesis of no effect. However, the small and positive overall effect masks substantial heterogeneity in the response. Our study allows us trace whether the response is related to the fairness perceptions and underlying preferences of individuals. We show that the workers who perceived the baseline wage as unfairly low put in significantly more effort when their wage was raised toward what they thought was fair. The estimated elasticity of this effect is 0.54. That is, for a 10 percent increase in wage, effort increases by 5.4 percent. By contrast, workers who felt paid fairly at the baseline wage did not change their effort at all when we raised their wage, and this behavior is significantly different from the group of workers who felt treated unfairly. We consider several possible confounds that would threaten the validity of our estimates. We find no evidence that the effect is due to other variables that may happen to be correlated with fairness perceptions. We also show how underlying preferences of the workers affected their responses to the higher wage. Evidence from laboratory experiments shows that some individuals do not react at all even to clear fairness manipulations, and reveal strictly selfish preferences. We use the decisions from our social dilemma game to classify workers as reciprocal and non-reciprocal. We find that only the reciprocal who considered the baseline wage as unfairly low responded to the pay raise. For the non-reciprocal, we find no evidence of reacting at all to the wage increases, even when they felt underpaid. This behavior is significantly different from the group of reciprocal workers. On the whole, this evidence strongly corroborates the predictions of the

[13] More formally, denote the coefficient estimates for $\log(w_{it})$ and $\log(w_{it}) \times \Delta_i$ for the reciprocal workers by $\gamma^{rec} = (\gamma_0^{rec}, \gamma_2^{rec})'$, and for non-reciprocal workers by $\gamma^{no} = (\gamma_0^{no}, \gamma_2^{no})'$, respectively. Then, $(\gamma^{rec} - \gamma^{no})'(\Sigma^{rec} + \Sigma^{no})(\gamma^{rec} - \gamma^{no})$ will be asymptotically $\chi^2(2)$-distributed, where Σ^i denotes the relevant parts of the covariance matrix for group i. This is equivalent to estimating a fully interacted model for the two worker types and testing for significant interaction effects in the response to the wage increases between the reciprocal and non-reciprocal workers.

fair-wage effort hypothesis put forward in Akerlof and Yellen (1990).

Our findings have important implications for wage setting and provide a potential reconciliation for the seemingly incompatible findings in laboratory experiments and earlier field studies. It is a feature of all these earlier studies that the baseline wage was comparatively high, such that many subjects, like in our study, may already have felt being paid fairly at the baseline wage. Our results show that a wage increase only affects effort if it alleviates perceived unfairness, but not if it merely improves an already fair outcome. A key implication is that only wage changes that induce variations in the perceived fairness of the wage are associated with effort variations. When we apply the methodology of earlier studies, and ignore how fairness perceptions affect the response to wage increases, we also find a modest overall effect. However, thanks to a sample much larger than in earlier studies, we have enough power to reject that even this effect is zero. Our finding that wages only affect effort when workers feel treated unfairly is consonant with Mas (2006), who finds that police officers' effort is very sensitive to disappointing arbitration outcomes in wage bargaining. On the other hand, Mas (2006) finds little evidence that effort is sensitive to the size of a surprisingly good outcome. It is tentative to conclude that disappointing outcomes were below what the police officers perceived as fair. Given that our results share these two qualitative features, this channel appears particularly plausible.

From a methodological point of view, our results highlight the importance of complementing field experiments with additional outside information (e.g., through surveys or laboratory experiments) that allow one to probe deeper into psychological mechanisms that drive the response to an experimental intervention. We show that not only fairness perceptions affected the response to wage changes, but also that the underlying preferences of the workers modulated their response to higher wages. Like in laboratory experiments, we find that not all individuals respond to a change in perceived unfairness. Our additional "laboratory" experiment reveals that only the reciprocal individuals responded strongly to changes in fairness, while selfish individuals did not. Hence, an important implication is that the composition of the workforce not only in terms of fairness perceptions but also with regard to social preferences crucially determines the profitability of wage increases. Because of many potential confounds, field evidence rarely allows the measurement of underlying preferences of workers. Therefore, our results also underline the usefulness of laboratory experiments for understanding field behavior.

It is difficult to find plausible alternative interpretations of our findings. In particular, one interpretation that has received attention in previous work does not apply here: Al-Ubaydli et al. (2008) find that treating workers more generously increases effort. They interpret their results in terms of a repeated-game context, as there is at least some scope for repetition in their setting.[14] Such concerns in our setting would have led to the opposite result that we find.

[14]This channel is not explicitly tested within the experiment, e.g., by comparing the outcomes to a subset of subjects certain to leave this job. Therefore, it is difficult to conclusively attribute the effects to repetition. For a field experiment offering an explicit test of the role of repetition in other markets with incomplete contracts, see List (2006).

If individuals feared being dismissed for insufficient work effort, despite that this was highly unlikely, we should expect an interaction of the opposite sign: Workers who felt particularly well-paid had more at stake if they got fired. They should have been particularly sensitive to the demands of the employers and should have reacted more to the wage increases. But we find that they responded less, which is inconsistent with this interpretation.

Our results also point to new questions for future research. If a higher wage only affects work effort when it alleviates perceived unfairness, profit-maximizing firms should only increase wages of workers who initially feel low-paid. Yet, little is known about how workers' perceived fairness of their wage depends on the wages paid to their coworkers. In addition, more research is needed to understand how managers can manipulate fairness perceptions and how they adjust to labor market conditions.

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A Figures

Figure 1: The Fair Wage-Effort Hypothesis

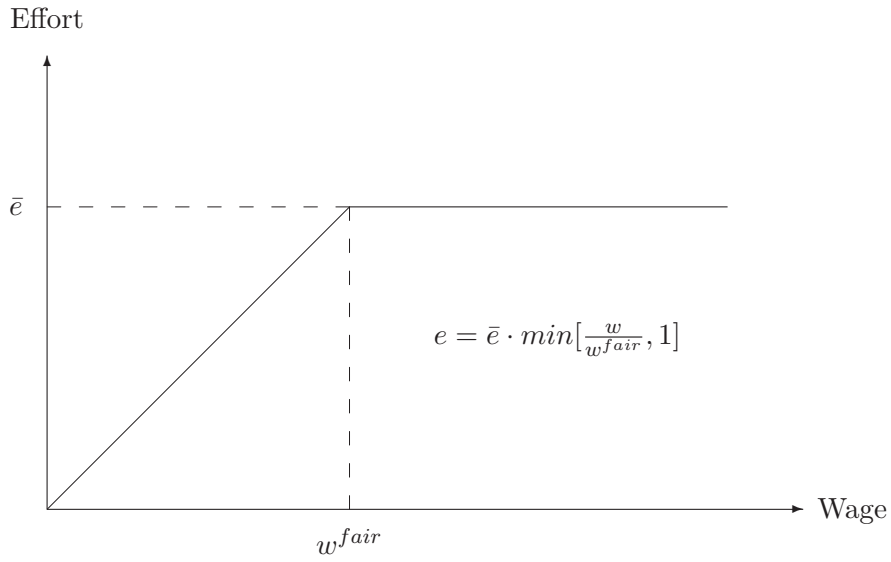
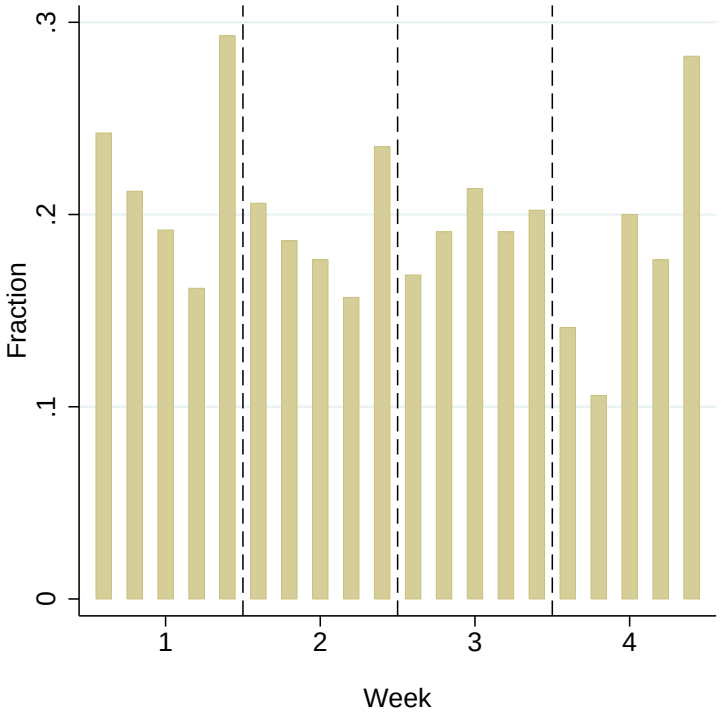


Figure 2: Fraction of Vacant Locations



Notes: The figure shows the percentage of planned assignments which the promotion agency could not fill with workers.

Figure 3: Timing of Events

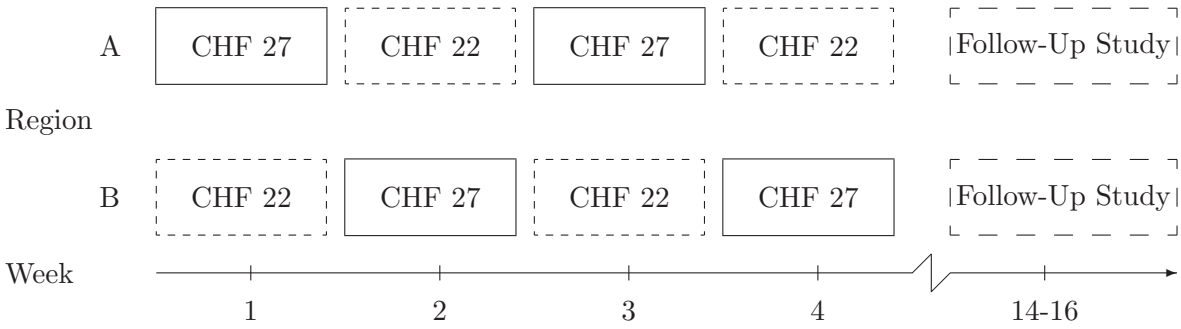
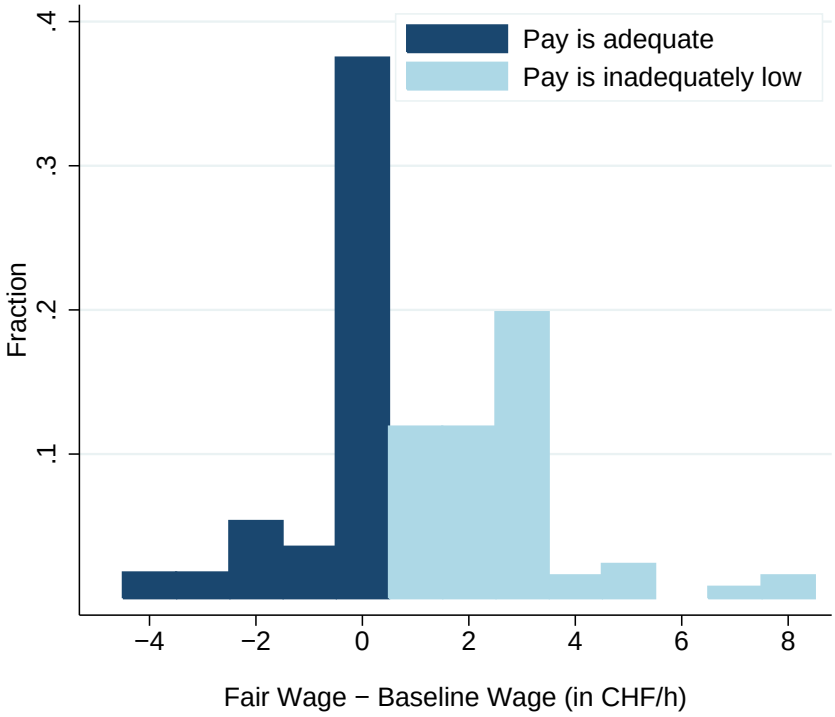
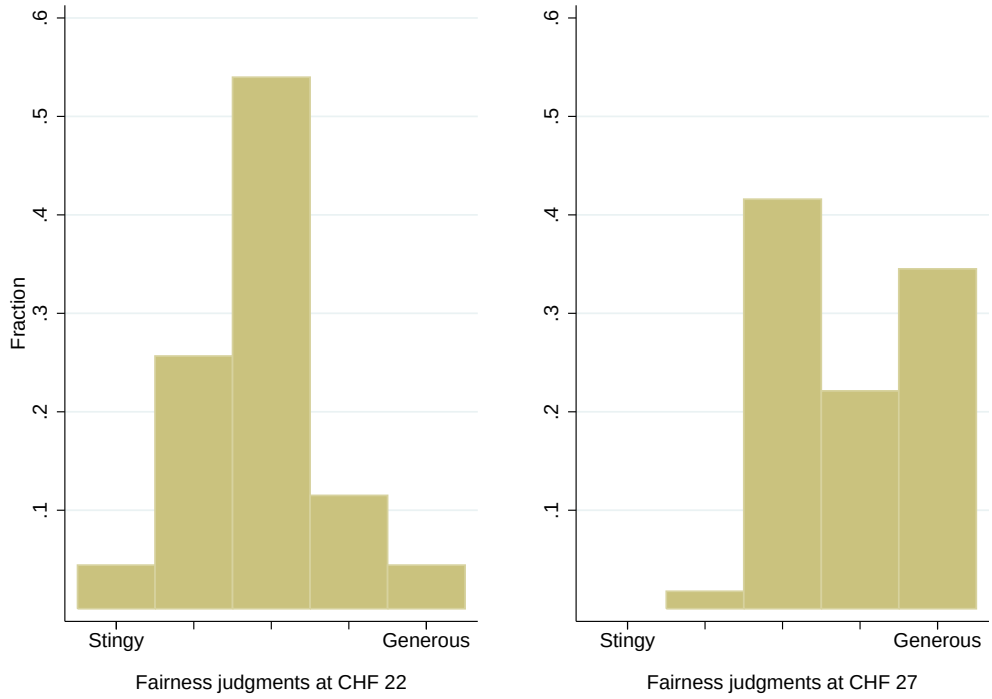


Figure 4: Fairness Perceptions of the Baseline Pay



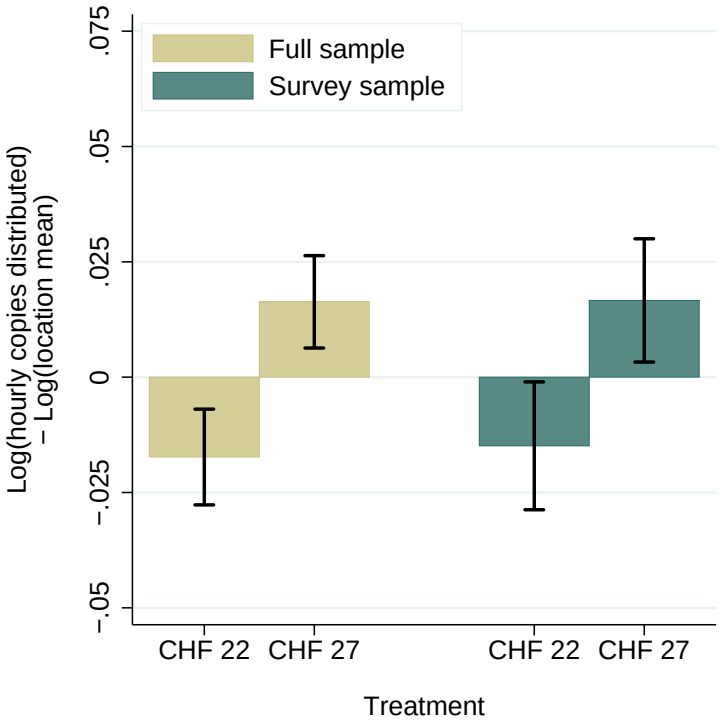
Notes: This figure plots the difference between the wage the workers considered fair, and the wage they were paid in the baseline condition.

Figure 5: Fairness Evaluation of the Two Payment Conditions



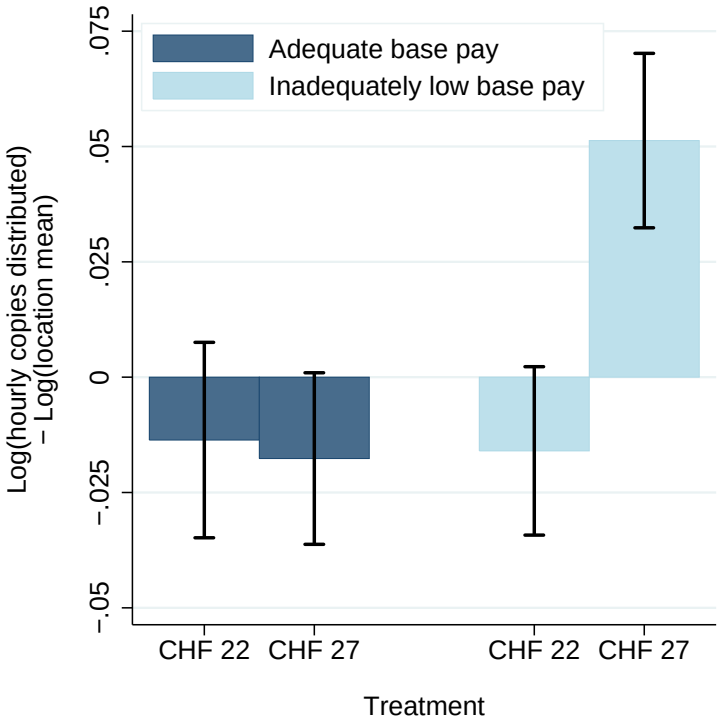
Notes: The figure compares fairness judgments of the baseline pay (CHF 22/h) and the higher pay (CHF 27/h).

Figure 6: The Response to the Wage Increases



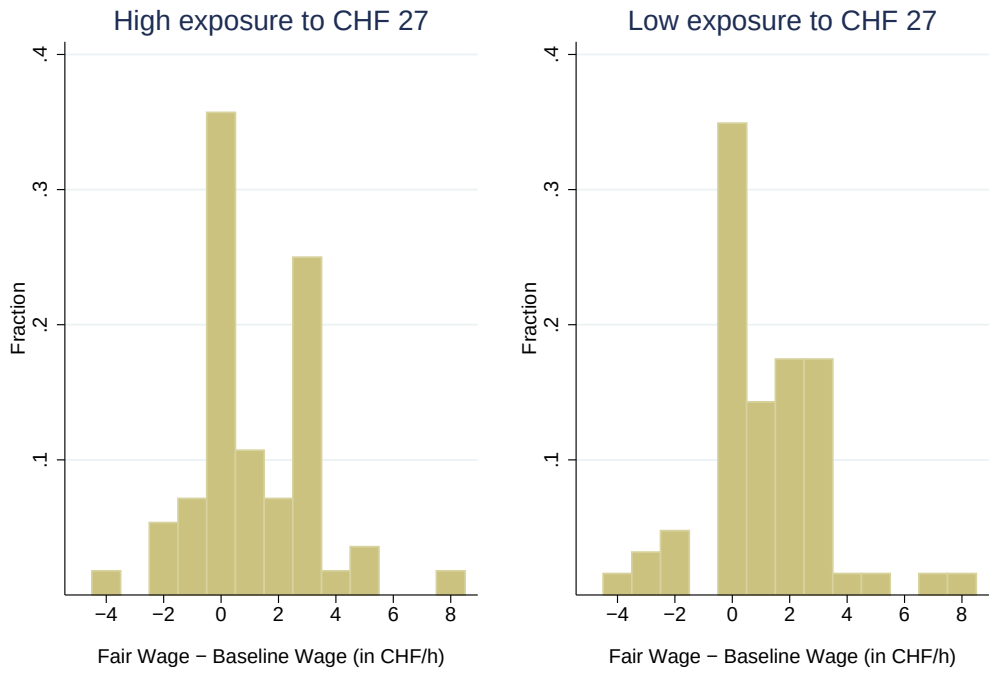
Notes: The khaki bars show the average response to the wage increases for the full sample illustrated in logs of the hourly copies distributed, with the location means subtracted. The green bars display the same for the participants of the follow-up survey.

Figure 7: Fairness Perceptions and the Response to the Wage Increases



Notes: The dark-blue bars present the log of hourly copies distributed, corrected for the location means, in the two payment conditions for the individuals who felt adequately paid at CHF 22/h. The light-blue bars show the same for the individuals who felt underpaid in the CHF 22 condition.

Figure 8: Robustness Check for Exposure to Wage Increases



Notes: The figure shows fairness perceptions of the baseline wage of those workers with a high exposure compared to those with a low exposure to the wage increases.

B Tables

Table 1: Summary Statistics

Data Variable	Mean	Std. Dev.	Min.	Max.	N
Newspaper Distribution					
Hourly copies distributed	229.777	84.409	16.667	578.212	1269
Number of shifts	6.474	4.248	1	19	196
Feedback Form					
Fairness evaluation of CHF 22	2.858	0.844	1	5	113
Fairness evaluation of CHF 27	3.894	0.910	2	5	113
Follow-Up Study					
Fair Wage - Baseline Wage (in CHF/h)	1.092	2.052	-4	8	119
Age (in years)	22.465	4.698	16	42	114
Male	0.272	0.447	0	1	114
Foreigner	0.132	0.340	0	1	114
Number of siblings	1.439	0.912	0	5	114
Secondary education	0.614	0.489	0	1	114
Apprenticeship	0.281	0.451	0	1	114
Continuing education	0.211	0.409	0	1	114
High school	0.675	0.470	0	1	114
College	0.237	0.427	0	1	114
University	0.228	0.421	0	1	114
Assigned points in (6, 18)	0.890	0.885	-2	2	118
Assigned points in (12, 12)	0.254	0.730	-2	2	118
Assigned points in (18, 6)	-0.559	1.050	-2	2	118

Notes: The table describes the data used in this paper. Data come from three types of sources: the newspaper distribution, covering the number of copies distributed per actual working hour and the number of work assignments taken, the feedback form, containing anonymous fairness judgments of the two payment conditions; and the follow-up study, which allows to measure individual fairness perceptions, and to track the characteristics and social preferences of the workers.

Table 2: Randomization Check
Dependent variable: (1) number of shifts, (2) fraction of unfilled shifts
OLS Estimates

	(1)	(2)
CHF 27 (=1)	0.189	0.008
	(0.130)	(0.019)
Constant	3.143***	0.193***
	(0.092)	(0.014)
Observations	392	40
R^2	0.846	0.519

Notes: OLS estimates. The unit of observation in column (1) is workers · wage condition, and the dependent variable is the number of shifts per condition. The unit of observation in column (2) is days · wage condition, and the dependent variable is the fraction of unfilled shifts. Fixed effects are normalized such that the constant reflects the mean of the base category. Standard errors are in in parentheses. *** indicates significance at the 1 percent level.

Table 3: Randomization Check for Personal Characteristics

Data	CHF 22		CHF 27		
Variable	Mean	Std. Dev.	Mean	Std. Dev.	p-value
Follow-Up Study					
Fair Wage - Baseline Wage	1.084	(2.096)	1.081	(2.142)	0.731
Age	23.370	(5.257)	23.344	(5.397)	0.770
Male	0.281	(0.450)	0.267	(0.443)	0.681
Foreigner	0.161	(0.368)	0.172	(0.378)	0.697
Number of siblings	1.376	(0.849)	1.367	(0.854)	0.912
Secondary education	0.648	(0.478)	0.633	(0.483)	0.692
Apprenticeship	0.331	(0.471)	0.308	(0.462)	0.516
Continuing education	0.248	(0.432)	0.242	(0.429)	0.852
High school	0.618	(0.487)	0.658	(0.475)	0.268
College	0.251	(0.434)	0.211	(0.409)	0.215
University	0.245	(0.431)	0.211	(0.409)	0.290
Assigned points in (6, 18)	0.811	(0.902)	0.857	0.891	0.461
Assigned points in (12, 12)	0.251	(0.726)	0.248	(0.684)	0.878
Assigned points in (18, 6)	-0.651	(1.017)	-0.663	(1.004)	0.976

Notes: The table provides a check for the randomization design. Sample averages (and standard deviations in parentheses) are reported in the first four columns. The last column contains p-values (two sided Pearson's χ^2 tests for the binary, respectively Mann-Whitney tests for the non-binary variables) for the null hypothesis of perfect randomization.

Table 4: The Response to the Wage Increases
Dependent variable: log of number of copies distributed
OLS Estimates

	(1)	(2)	(3)	(4)
$\log(w_{it})$	0.175**	0.134*	0.175*	0.110
	(0.078)	(0.078)	(0.100)	(0.105)
Controls:				
Individual fixed effects?	No	Yes	No	Yes
Location fixed effects?	Yes	Yes	Yes	Yes
Date fixed effects?	Yes	Yes	Yes	Yes
Sample	Full	Full	Survey	Survey
Observations	1269	1269	722	722
R^2	0.597	0.716	0.590	0.716
Prob$> \chi^2, F$	0.000	0.000	0.001	0.000

Notes: OLS estimates. Standard errors, adjusted for clustering on individuals, are in in parentheses. The dependent variable is the number of hourly copies distributed in logs. The independent variable $\log(w_{it})$ is the log of the hourly wage paid (CHF 22 in baseline, CHF 27 in treatment condition). The sample "Full" involves all individuals participating in the field experiment and the sample "Survey" means only those workers who completed the follow-up survey. *, ** indicate significance at the 10 percent and 5 percent level.

Table 5: Fairness Perceptions and the Response to the Wage Increases
Dependent variable: log of number of copies distributed
OLS Estimates

	(1)	(2)
$\log(w_{it})$	0.067	0.010
	(0.108)	(0.109)
Δ_i	–0.281***	–
	(0.104)	
$\log(w_{it}) \cdot \Delta_i$	0.093***	0.091**
	(0.033)	(0.040)
Controls:		
Individual fixed effects?	No	Yes
Location fixed effects?	Yes	Yes
Date fixed effects?	Yes	Yes
Observations	722	722
R^2	0.599	0.718
Prob$> \chi^2, F$	0.000	0.000

Notes: OLS estimates. Standard errors, adjusted for clustering on individuals, are in in parentheses. The dependent variable is the number of hourly copies distributed in logs. The independent variable $\log(w_{it})$ is the log of the hourly wage paid (CHF 22 in baseline, CHF 27 in treatment condition). Δ_i is the difference between what a worker considered fair and what she was paid in the baseline condition. The sample is restricted to only those workers who reported their fairness perception of the baseline wage in the follow-up survey. **, *** indicate significance at the 5 percent and 1 percent level.

Table 6: Robustness Check for Skills
Dependent variable: log of number of copies distributed
OLS Estimates

	(1)	(2)	(3)	(4)
$\log(w_{it})$	0.147	0.074	0.062	0.009
	(0.169)	(0.190)	(0.170)	(0.184)
Δ_i			–0.291***	–
			(0.105)	
$\log(w_{it}) \cdot \Delta_i$			0.094***	0.091**
			(0.033)	(0.041)
high-skilled (=1)	0.139	–	0.288	–
	(0.739)		(0.738)	
$\log(w_{it})$ · high-skilled	0.035	0.068	–0.013	0.001
	(0.230)	(0.251)	(0.230)	(0.252)
Controls:				
Individual fixed effects?	No	Yes	No	Yes
Location fixed effects?	Yes	Yes	Yes	Yes
Date fixed effects?	Yes	Yes	Yes	Yes
Observations	722	722	722	722
R^2	0.652	0.716	0.658	0.718
Prob> χ^2, F	0.000	0.000	0.000	0.000

Notes: OLS estimates. Standard errors, adjusted for clustering on individuals, are in in parentheses. The dependent variable is the number of hourly copies distributed in logs. The independent variable $\log(w_{it})$ is the log of the hourly wage paid (CHF 22 in baseline, CHF 27 in treatment condition). High-skilled is a measure of each worker's ability, which takes the value one if a worker's fixed effect is above the median and a zero otherwise. Δ_i is the difference between what a worker considered fair and what she was paid in the baseline condition. The sample is restricted to only those workers who reported their fairness perception of the baseline wage in the follow-up survey. **, *** indicate significance at the 5 percent and 1 percent level.

Table 7: Robustness Check for Exposure to Wage Increases
Dependent variable: Fair Wage - Baseline Wage (in CHF/h)
OLS Estimates

	(1)
Exposure to CHF 27	0.190
	(0.684)
Constant	0.992**
	(0.431)
Observations	119
R^2	0.000
Prob> χ^2, F	0.782

Notes: OLS estimates. Standard errors are in parentheses. The dependent variable Δ_i is the difference between what a worker considered fair and what she was paid in the baseline condition. The independent variable *Exposure to CHF 27* is the percentage of shifts in which a worker received the higher pay. The sample is restricted to only those workers who reported their fairness perception of the baseline wage in the follow-up survey.

Table 8: The Response to the Wage Increases: Reciprocal and Non-reciprocal Workers
Dependent variable: log of number of copies distributed
OLS Estimates

	(1)	(2)
$\log(w_{it})$	–0.017	0.306
	(0.129)	(0.253)
$\log(w_{it}) \cdot \Delta_i$	0.156***	–0.094
	(0.047)	(0.097)
Controls:		
Individual fixed effects?	Yes	Yes
Location fixed effects?	Yes	Yes
Date fixed effects?	Yes	Yes
Observations	466	243
R^2	0.760	0.783
Prob> χ^2, F	0.000	0.000

Notes: OLS estimates. Standard errors, adjusted for clustering on individuals, are in in parentheses. The dependent variable is the number of hourly copies distributed in logs. The independent variable $\log(w_{it})$ is the log of the hourly wage paid (CHF 22 in baseline, CHF 27 in treatment condition). Δ_i is the difference between what a worker considered fair and what she was paid in the baseline condition. Column (1) is limited to only the reciprocal workers, Column (2) to the non-reciprocal. The sample is restricted to only those workers who participated as second movers in the social dilemma game. *** indicates significance at the 1 percent level.