How Does Reducing Pay Dispersion Affect Employee Behavior?

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ABSTRACT

Prior research suggests that pay dispersion among employees can cause lower-paid employees to feel unfairly treated and thus lower their effort. Recently, some firms have reduced pay dispersion by raising lower-paid employee's wages in an attempt to mitigate this effect. However, popular press articles suggest that reducing pay dispersion could also cause higher-paid employees to leave the firm. We conduct a series of experiments to examine the effect of reduced pay dispersion on lower-paid employees' effort and higher-paid employees' turnover intentions. In Experiment 1, we find that reducing pay dispersion can increase lower-paid employees' effort by increasing their perceived pay fairness. We also show that it is the reduction in pay dispersion rather than merely the increase in the lower-paid employees' wages that yields these results. In Experiment 2, we replicate the results of our first experiment without collecting data on perceptions of pay fairness to ensure that the results of the first experiment were not the result of demand effects. Finally, in Experiment 3 we find that, contrary to concerns expressed in the popular press, higher-paid employees indicate that they are not more likely to leave the firm for a comparable job when lower-paid employees' wages are increased, and may even be less likely to leave. Our results suggest that firms should consider whether the benefit of increased effort from the lower-paid employees is worth the extra cost they incur by increasing their wages.

Keywords: effort choice; fairness; pay dispersion; turnover.

I. Introduction

Pay differences among employees performing different jobs in the same firm, referred to as pay dispersion, have received considerable recent attention from both the popular press and from regulators (e.g., Pettypiece 2015; Picchi 2015; Economist 2016; Cohen 2015a; Seetharaman 2015; Gellman 2015; Ip 2015).[1] Although such pay dispersion is often economically justified, one related concern is that the lower-paid employees might perceive such pay differences as unfair (Pfeffer and Langton 1993; Shaw, Gupta, and Delery 2002). To reduce such fairness concerns and the potential negative effect on employees' productive effort, a number of firms have recently increased their lower-paid employees' wages to reduce pay dispersion. For example, Facebook recently announced that they were increasing lower-paid employees' pay to improve employee morale and effort (Seetharaman 2015). Gravity Payments, a credit card processing firm, recently instituted a firm-wide minimum annual salary of $70,000 to reduce pay dispersion among employees (Cohen 2015a). Walmart and McDonald's have also increased wages of their lowest-paid employees (Isidore 2015; Whitehouse and Davidson 2015). However, it remains an empirical question whether reducing pay dispersion actually mitigates lower-paid employees' fairness concerns and thereby increases their effort and whether any such possible benefit might be offset by increased turnover among higher-paid employees.

Although conventional economic reasoning assumes that an employee's utility is based on the employee's own compensation independent of what other employees are

[1] In this study, we use the term "pay dispersion" to refer to differences in pay among employees performing different jobs at the same general level within a firm. Other terms for "pay dispersion" include "pay disparity," "pay spread," "pay range," "pay variation," and "pay inequality."

paid, prior research finds that concerns about pay fairness can influence an employee's behavior. Specifically, equity theory (Adams 1964; Gupta, Conroy, and Delery 2012) suggests that employees compare themselves to other employees in terms of the pay they receive from the firm. Employees who believe that they are treated unfairly relative to other employees are expected to provide less effort than if they believe they are treated fairly. That is, employees are averse to pay inequity and experience disutility when they believe that they are paid less for their effort than relevant others (Loewenstein, Thompson, and Bazerman 1989). Consistent with this reasoning, prior research finds that pay dispersion can lead to a variety of negative consequences, such as less effort, more budget slack, and increased turnover (e.g., Bazerman 1993; Cowherd and Levine 1992; Gachter and Thoni 2010; Guo, Libby and Liu 2015; Wade et al. 2006). Rather than simply examining the effects of existing pay dispersion on employee behavior as has been done in such prior research, we extend this research by examining the effects of *reducing* pay dispersion on lower-paid employees' effort and on higher-paid employees' intentions to leave the firm.

To examine these issues, we conduct a series of experiments in a setting in which the economically optimal compensation scheme initially results in pay dispersion among employees performing different jobs. Despite the economic optimality of the initial pay dispersion, we expect and find that the lower-paid employees perceived their initial pay to be unfair. We then address our main research questions by reducing the level of this initial pay dispersion by increasing the lower-paid employee's pay. In Experiment 1, we measure the change in the lower-paid employee's fairness perceptions and their level of effort in response to the reduction in pay dispersion. We find that both their perceived pay fairness and their effort increase in response to the reduced pay dispersion. We also provide evidence that it is the reduction in pay dispersion rather than simply a positive response to a pay increase that drives the lower-paid employees' increase in perceived fairness and effort. Next, in Experiment 2 we replicate the results of our first experiment without collecting data on perceptions of pay fairness to ensure that the results of the first experiment were not the result of demand effects. That is, we conduct this follow-up experiment to rule out the possibility that the results of our first experiment were driven by our asking the lower-paid employees to provide their fairness perceptions before deciding how much effort to provide. Consistent with the results of the first experiment, we find that the lower-paid employees increase their effort significantly in response to the reduction in pay dispersion. Finally, we conduct Experiment 3 using the same setting as the first two experiments to examine how the reduction in pay dispersion affects the higher-paid employees' turnover intention. In contrast to anecdotal examples in the popular press and the suggestions of various media figures about reductions in pay dispersion at Walmart and Gravity Payments (e.g., Pettypiece 2015; Picchi 2015; Economist 2016; Cohen 2015b), we find no evidence that reducing pay dispersion by increasing lower-paid employees' wages increases the turnover intentions of the higher-paid employees. In fact, we find modest evidence that, on average, higher-paid employees are actually less likely to leave the firm in response to a reduction in pay dispersion.

Our study makes several contributions to the literature on the design of employee compensation arrangements. First, we demonstrate that reducing pay dispersion by increasing lower-paid employees' wages can increase their perceived pay fairness, which in turn leads them to provide increased effort. Importantly, these results arise in a setting in which conventional economic theory predicts that the lower-paid employees will supply no more than minimal effort because increased effort reduces their payoff without increasing their compensation.

Second, we provide insight concerning the mechanism by which a reduction in pay dispersion affects employees' effort. Specifically, we show that the mechanism by which a reduction in pay dispersion leads to increased employee effort is improved perceptions of pay fairness. To our knowledge, our study is the first to empirically demonstrate the mediating effect of improved perceptions of pay fairness on the effect of a reduction in pay dispersion on employee effort. In addition, we rule out the alternative explanation that employees provide increased effort to reciprocate the wage increase rather than in response to a reduction in pay dispersion. This is important because it improves our understanding of the distinction between perceived pay fairness and reciprocity when designing compensation systems.

Third, we provide evidence concerning the suggestions in the popular press and by media figures that higher-paid employees are likely to leave firms that decrease pay dispersion by increasing the wages of lower-paid employees. Specifically, we find no evidence that higher-paid employees are more likely to leave when firms take such actions and modest evidence that they are actually less likely to leave. Thus, taken together, the results of our experiments suggest that reducing pay dispersion can increase lower-paid employees' effort without causing higher turnover among the higher-paid employees. Thus firms should consider whether the benefit of increased effort by lower-paid employees is worth the extra cost they would incur by paying higher wages.

Fourth, our study highlights the important roles that accounting and performance measurement play in how firms design employee compensation (Ittner and Larcker 2002), and how this design influences employees' perceptions of pay fairness. In particular, in our experimental setting the accounting issue of the differential ability to measure the performance of different employees is the fundamental basis for why pay dispersion arises, and hence plays a key role in why employees perceive the pay dispersion to be unfair. As such, to our knowledge ours is the first study to identify and analyze the important role of accounting in understanding the effects of pay dispersion, and particularly how firms might generate increased employee effort by reducing pay dispersion.

Section II provides background and develops our hypotheses. Section III describes the design and results of our first two experiments, which examine the effect of reducing pay dispersion on lower-paid employees' effort. Section IV describes the design and results of our third experiment, which shifts our focus from the effects of reduced pay dispersion on the lower paid employees' behavior to the turnover intentions of the higher-paid employees. Section V concludes with a discussion of our findings and a limitation of our study.

II. Background and Hypotheses Development

Our Setting

Agency theory proposes that firms design control systems to provide employees with incentives to choose the level and mix of their productive inputs that maximize shareholder value. Firms anticipate that employees choose the level of effort that maximizes their expected utility from compensation net of the personal cost of the effort they provide. As a result, an employee's pay depends on the compensation systems and associated performance measures used by the firm.

We examine a setting in which a firm pays two employees (installer and sales associate) differently because the firm can measure the performance of the sales associate more precisely than the installer (see Appendix for more discussion of the optimal contract in our setting). Because the firm can measure the sales associate's individual performance more precisely than the installer's individual performance, it is efficient for the firm to set a higher performance standard for the sales associate and to pay a correspondingly higher wage when the sales associate meets this higher standard. In contrast, for an installer the firm can only determine whether the installer meets a minimum performance standard. Therefore, it is optimal for the firm to pay a correspondingly lower wage to the installer when the installer meets the minimum standard.

Although conventional economics justifies the firm offering the installer less pay than the sales associate in our setting, we expect the lower-paid installer (higher-paid sales associate) to view the pay dispersion differently. Specifically, we expect the lower-paid installer (higher-paid sales associate) to view the pay dispersion as less (more) legitimate. This creates a setting in which, although the firm sets employee pay efficiently from a conventional economic perspective, we can examine the effects of reducing pay dispersion on lower-paid employee effort and higher-paid employee turnover intentions.

Background

In a recent review of research on pay dispersion, Downes and Choi (2014) adopt an "employee reaction" perspective to reconcile mixed results in prior literature concerning how pay differences affect firm performance. This perspective focuses on how employees respond to differences in pay dispersion as opposed to analyzing broader firm strategic issues. They note that some prior studies find that greater pay dispersion improves firm performance, whereas other studies find that greater pay dispersion is associated with worse firm performance. Such mixed results are consistent with a study by Hunnes (2009), who documents that for more than 1,700 firms over 11 years, there is no association between the extent of pay dispersion and firm performance. Downes and Choi argue that focusing on how employees respond to pay dispersion and differences in pay dispersion offers the best opportunity to resolve the inconsistencies in prior research and to provide new policy insights for firms. Consistent with this recommendation, our study analyzes how employees respond to reductions in pay dispersion that firms make to address employees' concerns with the fairness of initial pay differences.

Downes and Choi (2014) develop a typology that categorizes the prior pay dispersion research on two dimensions: 1) whether employee pay is performance-based or non-performance based, and 2) whether the dispersion reflects pay differences within a given job or between jobs. They conclude that the prior research identifies two "predictable effects of pay dispersion" (2014, p.63). First, employees generally perceive pay dispersion as legitimate when pay is linked to individual performance (Shaw, Gupta and Delery 2002), and such legitimate differences in pay are generally associated with better firm outcomes. Second, employees with higher (lower) pay are more likely to react positively (negatively) to pay dispersion. The authors argue for the importance of refining these initial conclusions.

We refine the prior conclusions by focusing on the cells in the Downes and Choi (2014) Figure 1 typology in which employees performing different jobs receive different pay that can be either performance-based on non-performance-based. We do so by considering a setting in which a firm uses performance-based compensation for the sales associate's job (a fixed wage that can be lower or higher depending on performance) in which a more precise performance measure is available, while using non-performance-based compensation (a single fixed wage) for the installer's job for which the only available performance measure is a minimum performance standard.

The potential benefit of reduced pay dispersion that we consider is different from some prior arguments for reducing pay dispersion, which focus on minimizing interpersonal competition to improve cooperation among employees (Pfeffer 1995). These benefits of reduced pay dispersion arise in environments in which employees' productivity is interdependent, making cooperation critically important. Such benefits cannot arise in our setting because each employee makes an independent contribution to the firm's outcome. In a similar way, our analysis represents an interesting counterpoint to Shaw et al.'s (2002) conclusion that reducing pay dispersion is only beneficial in settings in which employees' work is highly interdependent. They reason that in other settings "when work interdependence is low, the relationship between pay dispersion and performance should be positive when individual incentives are used" (2002, p.454). This implies that when employees' efforts have independent effects on firm outcomes, the firm would not benefit from reducing pay dispersion.

Hypotheses Development

Equity theory (Adams 1964; Gupta et al. 2012) suggests that employees make assessments about their pay fairness, and that these assessments can influence their behavior and performance. According to equity theory, employees compare themselves to other employees in terms of the effort they provide to the firm and the pay they receive from the firm. For example, employees perceive that they are treated unfairly (fairly) when they receive less (more) pay than other employees for doing comparable (harder) work (Janssen 2001). Moreover, employees are more likely to believe they are paid too little for their effort relative to other employees than they are to believe that they are paid too much relative to other employees (Mowday 1991), and the disutility from being underpaid generally exceeds that from being overpaid (Loewenstein, Thompson, and Bazerman 1989).

Prior research establishes that employees who perceive that they are not paid fairly compared to other employees often take actions to compensate for what they perceive as unfair treatment. These actions have been documented to include reduced productive effort on the job, increased job turnover and increased creation of budget slack (Bazerman 1993; Cowherd and Levine 1992; Guo, Libby and Liu 2015; Wade et al. 2006). Downes and Choi (2014) conclude that prior research establishes that employees perceive pay dispersion to be fair when the dispersion results from direct measures of differences in individual productivity, such as piece rates. However, in the absence of direct productivity measures such as piece rates or clear differences in the level of effort required from different employees, lower-paid employees are likely to believe they are unfairly paid.

Lower-paid Employee Effort

Recent experimental economics results and survey studies reach mixed conclusions with respect to how pay dispersion among employees will affect the level of effort supplied by lower-paid employees. For example, Bartling and von Siemens (2011) and Charness and Kuhn (2007) both conclude from experimental studies that wage inequality does not lead to lower paid employees reducing the level of effort they provide to the firm. In contrast, Clark, Masclet and Villeval (2010) provide a combination of experimental and survey evidence demonstrating that an employee's choice of how much effort to provide does depend on how much other employees are paid, as well as the employee's own pay.

The preceding economics studies illustrate the sensitivity of experimental results to the specific circumstances of the experimental environment. For example, the finding in Charness and Kuhn (2007) that greater pay dispersion does not lead to reduced effort might suggest that reducing pay dispersion will not increase employee effort. However, their study endows employees with differential individual productivity, which the Downes and Choi (2014) typology argues will lead employees to perceive pay differences tied to productivity differences as legitimate. Hence, participants in the Charness and Kuhn (2007) study would generally not perceive pay differences as unfair and thus would not reduce their effort. Our study differs from the Charness and Kuhn (2007) study in at least two significant ways. First, we focus on the effect of a reduction in pay dispersion whereas they analyze how employees respond to various combinations of pay offered to different teams of employees performing the same task. Therefore, their findings are not directly relevant in our setting. Second, and more specifically, their participants differ in individual productivity whereas participants in our setting are identical. As a result, based on the Downes and Choi typology, lower-paid participants in the Charness and Kuhn setting are likely to perceive pay differences as legitimate and therefore would not reduce their effort, whereas identical participants in our setting who are paid less are likely to perceive this pay dispersion as unfair and a basis for providing less effort.

Downes and Choi (2014) suggest that when pay is not tied closely to individual performance, reduced pay dispersion can benefit the firm by mitigating pay dispersion's negative effects. However, to our knowledge no study has tested whether reducing pay dispersion can actually reduce its negative effects. We apply equity theory to predict the effects that reducing pay dispersion will have on the subsequent effort of lower-paid employees. Specifically, H1 predicts that reducing pay dispersion will increase lower-paid employee effort, and H2 predicts that this increase in effort results from an increase in perceptions of pay fairness:

> H1: Reduced pay dispersion will lead to increased effort by the lower-paid employees.
>
> H2: The increase in lower-paid employees' effort resulting from reduced pay dispersion is mediated by changes in the lower-paid employees' perceptions about the fairness of their pay.

There are two sources of tension with respect to the predictions in H1 and H2. First, conventional economic theory predicts that given the firm's optimal compensation design in which the installer receives a fixed wage in each period, providing more than the minimum effort increases an installer's personal cost with no increase in pay. Therefore, in contrast to H1, the conventional economic prediction is that an installer will never provide more than the minimum effort. Second, as discussed earlier, Shaw et al.

(2002) conclude that reducing pay dispersion should only be beneficial in settings in which employees' work is highly interdependent. Our H1 is opposite to their prediction because in our environment each employee's effort has an independent effect on the firm.

Higher-paid Employee Turnover

Popular press articles suggest that reducing pay dispersion is likely to affect the behavior of the higher-paid employees (e.g., Pettypiece 2015; Picchi 2015; Economist 2016; Cohen 2015b). A frequent concern is that higher-paid employees who perceive the initial pay dispersion as legitimate will view a firm's actions to reduce that dispersion as unfair. For example, Wal-Mart recently reduced pay dispersion by raising its minimum wage, which Pettypiece (2015) suggests has decreased higher-paid employee morale and has caused higher-paid employees to leave the firm. In another example, when Gravity Payments Inc. reduced pay dispersion, some higher-paid employees said they left the company because they felt they were being unfairly compensated for the work they did relative to lower-paid employees (Cohen 2015b). Given these anecdotal examples in the popular press and our previous discussion about the negative consequences that perceptions of unfairness can have on employee behavior, our third hypothesis predicts that reducing pay dispersion will increase higher-paid employee turnover as follows:

> H3: Reduced pay dispersion will lead to increased turnover of higher-paid employees.

We conduct three experiments to test the hypotheses described above. All three experiments use the same setting described briefly earlier and developed further in Section III. Experiment 1 is designed to test H1 and H2. Experiment 2 replicates the first experiment, but is designed to rule out experimental demand as an explanation for the results of Experiment 1. Experiment 3 is designed to test H3.

III. Experiments 1 and 2 - Lower-paid Employee Effort

Method[2]

Overview

We test H1 and H2 using an experiment in which participants assume the role of an installer of irrigation systems for an irrigation company. Installers earn a fixed wage in each of two periods. In each period, the installers assess the fairness of their pay and choose an effort level. Choosing higher effort increases the installer's personal cost, which reduces the installer's payoff. Prior to the second period, we introduce three manipulations, which change the level of pay dispersion between installers and the sales associate as described below in the 'Experimental Conditions' sub-section. This two-period design allows us to isolate the effect of reduced pay dispersion on the installers' perceptions of fairness and their effort choices while ruling out alternative explanations for such effects.

Participants

We recruited 148 participants via Amazon's Mechanical Turk (MTurk) online platform to act as installers in our study. MTurk worker-participants are similar to traditional laboratory-participants in terms of their willingness to provide effort (Farrell, Grenier, and Leiby 2014), but are more representative of the general population in terms of demographics (Buhrmester, Kwang and Gosling 2011).[3] Our participants were 55% female, averaged 36.4 years old, and had an average of 14.4 years of work experience.[4]

[2] All three experiments received ethics clearance from the University's Institutional Review Board. Also, all p-values reported throughout the paper are two-tailed.
[3] We required all MTurk participants to be located in the USA and to be "master" Mturkers with at least a 90% approval rating in prior MTurk participation.
[4] Age, work experience, and gender are uncorrelated with *Effort Change* ($p > 0.14$). Gender is uncorrelated with *Fairness Change* ($p = 0.46$), while both age ($p = 0.03$) and work experience ($p = 0.05$) are correlated with *Fairness Change*. Including either age or work experience as covariates in analyses that examine

Procedures

Panel A of Figure 1 illustrates Experiment 1 procedures. Each participant assumed the role of a newly hired installer at an irrigation company. The experimental instrument informed the installer that the irrigation company had also hired a sales associate at the same time and that both employees initially earned a wage of 500 Lira and both reported directly to the general manager. The instrument explained further that installers dig water lines on customers' property, remove tree roots, install irrigation nozzles, connect the irrigation system pieces, test the irrigation system, and efficiently finish each job. The sales associate engages and recruits customers, provides installation quotes, answers customers' questions, checks the finished irrigation system with customers, and coordinates the weekly schedule of installations.

[Insert Figure 1 here]

The installers were next informed that based on recent positive customer survey results, the general manager increased the wage of the sales associate from 500 Lira to 1000 Lira. However, because the firm could not yet determine the quality of the installer's work, the installer's wage remains unchanged at 500 Lira.[5] The installers then assessed the fairness (*Fairness*) of their pay by rating their agreement with the statement "My wage is fair given the work that I do for Sprinkle Inc." on an 11-point scale with endpoints of -5 (strongly disagree) to +5 (strongly agree), and a midpoint of zero.

Fairness Change does not alter the inferences (direction or significance) of the results. Further, neither age ($p = 0.45$) nor work experience ($p = 0.22$) differs by condition. Therefore, we do not control for gender, age, or work experience in the subsequent analyses.

[5] The experimental materials explain to the participants (installers) why the sales associate's pay was increased while their own pay did not change in period 1. However, the installers do not receive the full, formal rationale for how the firm determines and implements pay policies (see Appendix). This distinction between what employees know and the full basis of the firm's policies appears to be consistent with typical conditions in practice.

Next, installers chose an effort level from the following menu of choices ranging from 0.1 to 1.0:[6]

Work Level	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Your Cost (Lira)	10	20	30	40	60	80	100	120	150	180

As indicated in the menu, higher levels of effort were more costly to the installer. The instrument explained that although the general manager could not determine what effort level an installer chose, the general manager preferred that installers choose the highest effort level. Period 1 ended after the installer made this initial effort choice.

In Period 2, the installers learned that the general manager has adjusted their Period 2 wage and possibly also the wage of the sales associate. The specific adjustments depended on the experimental condition to which the installer was assigned as explained in the "Experimental Conditions" sub-section below. Each installer then assessed the fairness of their Period 2 pay using the same scale as in Period 1 and chose a Period 2 effort level from the same menu used in Period 1.

Finally, each installer completed a post experiment questionnaire, which included questions that check for the effectiveness of our manipulation, measure installers' perceptions of the legitimacy (*Legitimacy*) of the initial pay dispersion in period 1, and

[6] Laboratory experiments can implement costly effort using a real-effort task, which increases external validity by replicating the exertion of effort outside of the laboratory (Gill and Prowse 2012). Alternatively, like ours, laboratory experiments can implement costly effort using a choice-effort task. A choice-effort task uses a monetary cost function, which mimics effort by specifying output as a function of how much money participants choose to contribute. The main advantage of using a choice-effort task is that it allows the experimenter full control over the cost of effort. In particular, the experimenter can control the extent of any convexity in the cost of the effort and can also determine how the cost varies over individuals rather than allowing the cost to vary endogenously (i.e., avoid individual differences in skill). Studies generally find that, although real-effort tasks lead to higher variance in effort than choice-effort tasks, participants react similarly regardless of task type (Bruggen and Strobel 2007; Dechenaux et al. 2014).

collect various demographic data. Installers took an average of nine minutes to complete the experiment and were paid within 24 hours after finishing the task.

Earnings

We state monetary amounts in the study in terms of Lira, an experimental currency, which converts to U.S. dollars at a rate of 500 Lira per U.S. dollar. An installer's earnings from the experiment equal the sum of Period 1 and Period 2 Net Wages. Net Wage for each period equals the installer's wage for the period minus the cost to the installer of the effort the installer chose that period. The Period 1 wage is always 500 Lira, but the Period 2 wage varies by condition. Participants could earn between $1.78 (890 Lira) and $2.96 (1,480 Lira) depending on the wage level in a given experimental condition and the participant's effort level choice. Across all three experimental conditions participants earned an average of $2.35 (1,173 Lira).

Experimental Conditions

Our first two experimental conditions reduce the pay dispersion between the installer and the sales associate by raising the installer's wage. In the first condition (*Partial Reduction*), the installer's wage increases from 500 Lira in period 1 to 750 Lira in period 2, while the sales associate's wage remains at 1000 Lira in both periods. Therefore, the difference in pay between the installer and the sales associate is reduced from 500 Lira in the first period to 250 Lira in the second period. In the second condition (*Full Reduction*) the installer's wage increases from 500 Lira in period 1 to 1000 Lira in period 2, while the sales associate's wage remains at 1000 Lira in both periods. Therefore, the difference in pay between the installer and the sales associate is reduced from 500 Lira in the first period to zero Lira in the second period.

In both of the first two conditions, the level of pay dispersion (sales associate wage – installer wage) is reduced by raising the lower-paid installer's wage. This corresponds to the recent actions of firms such as Facebook and Gravity Payments (Cohen 2015a). However, any observed increase in an installer's effort from Period 1 to Period 2 in these conditions could be a response to receiving a higher wage rather than a response to the reduction in pay dispersion. An extensive prior literature on gift-exchange (Akerlof 1982; Choi 2014; Fehr, Kirchler, Weichbold, and Gachter 1998; Hannan, Kagel, and Moser 2002) shows that when employers offer workers a "gift" of a wage above the market-clearing wage, workers often respond with a "gift" of costly effort above the minimum required amount. Thus, an alternative explanation for any increase in effort in our first two conditions could be that the installers responded positively to a perceived gift wage from the employer by increasing their effort.

To rule out this alternative explanation, we examine an additional condition (*No Dispersion Change*) in which the wage increase that the installers receive is held constant at the same amount as in the *Partial Reduction* condition, while the sales associate's wage is changed such that pay dispersion remains the same from Period 1 to Period 2. A finding of no increase in installers' fairness perceptions or their effort between the first and second periods in the *No Dispersion Change* condition would demonstrate that any observed increase in perceived fairness and effort in our *Partial Reduction* and *Full Reduction* conditions could not be due solely to the increase in installers' wages. Alternatively, a finding of an increase in installers' perceived fairness and effort between the first and second periods in the *No Dispersion Change* condition would be consistent with the increases in perceived fairness and effort being a response to the increased wage rather than to the reduced pay dispersion.

As explained above, in the *No Dispersion Change* condition we raise the lower-paid installer's wage by the same amount as in our *Partial Reduction* condition while also raising the higher-paid sales associate's wage by the same amount so that the level of pay dispersion remains constant. Specifically, in the *No Dispersion Change* condition, we hold the level of pay dispersion constant with the level in the first period by increasing both the installer's and sales associate's wage by 250 Lira from Period 1 to Period 2 (i.e., from 500 Lira to 750 Lira for the installer and from 1000 Lira to 1250 Lira for the sales associate). As discussed above, comparing the results from the No Dispersion Change condition with those from the *Partial Reduction* condition allows us to distinguish between reduced pay dispersion and gift exchange as the explanation for any observed increase in perceived fairness and effort in our *Partial Reduction* and *Full Reduction* conditions.

Dependent Variables

Our primary dependent variables in Experiment 1 are *Effort*, measured as the cost of effort, and *Fairness*, based on the installer's fairness assessment prior to making their effort choices. As described earlier, we measure *Effort* and *Fairness* both before and after our manipulations. Therefore, we measure the effect of our manipulation as the changes in effort and fairness perceptions between Period 1 and Period 2. That is, *Effort Change (Fairness Change)* equals an installer's *Effort (Fairness)* in Period 2 minus their *Effort (Fairness)* in Period 1.

Results

Tests of Hypotheses[7]

We test our hypotheses using multi-level model analysis, which controls for correlated error terms caused by our repeated measure research design that produces two observations of both *Fairness* and *Effort* from each installer.[8] Multiple observations from the same installer are likely to generate correlated error terms and underestimated standard errors for OLS regression coefficients. Multi-level model analysis (Luke 2004) and clustering standard errors (Petersen 2009) are alternative approaches to correcting for the correlated error terms. All inferences in our study are the same under both approaches.

H1 predicts that lower-paid installers will provide increased effort when the difference in their pay versus the higher-paid installers' pay is reduced. Table 1 shows that the mean *Effort Change* was an increase of 15.88, a 24.2% increase over the mean first period Effort in the *Partial Reduction* (PR) condition and an increase of 38.43 or a 54.3% increase in the *Full Reduction* (FR) condition. We test H1 by running separate regressions for the *Partial Reduction* and *Full Reduction* conditions with *Effort* as the dependent variable and *Period* as the independent variable. For each installer the regressions include two observations of *Effort*, one in each period. A positive *Period* coefficient is evidence that the reduction in pay dispersion had a positive effect on an

[7] Table 1 shows that at least 92% of participants in each condition passed our manipulation check by correctly identifying their period 2 pay condition in the post experiment questionnaire. Because the inferences about our results do not change if we exclude those participants who failed the manipulation check, we use the full sample of installers to test our hypotheses.

[8] Other terms for a multi-level analysis model include a hierarchical linear model, a nested model, a mixed model, and a random coefficient model. The term multi-level indicates combining data at the most disaggregated level such as firm-year data in archival studies and individual effort level data in a given period in the experimental data for this study. A second level of data in the archival study would be data at the firm level and in our experimental study would be data at the individual participant level.

individual installer's *Effort*. Panel A of Table 2 shows that the estimated coefficient on *Period* is positive and significant for both the *Partial Reduction* ($\beta_1 = 15.88$, $p < 0.01$) and the *Full Reduction* conditions ($\beta_1 = 38.43$, $p < 0.01$).[9] These results support H1.

[Insert Table 1 here]

[Insert Table 2 here]

We use the results from the *No Dispersion Change* (NDC) condition to address the 'gift exchange' alternative explanation for the H1 results reported above.[10] Table 1 shows that the mean *Effort Change* is -1.09 in the *No Dispersion Change* condition. The results in Table 2, Panel A show that *Period* is not significant in the *No Dispersion Change* condition, indicating that there was no increase in *Effort* from period 1 to period 2. These results provide evidence that the previously reported support we find for H1 is not due to installers reciprocating the firm's gift of a higher wage in period 2, but rather due to the reduction in pay dispersion.

[9] We also conducted an untabulated combined multi-level regression that combines data from both reduction conditions to examine whether the *Full Reduction* effect on *Effort* is greater than the *Partial Reduction* effect. We include *Period, Condition,* and a *Period by Condition* interaction to test whether the there is a significant difference between conditions. While *Period* remained significant (not tabulated: $\beta = 15.88$, $p < 0.01$) and *Condition* was insignificant (untabulated: $\beta = 5.29$, $p = 0.66$), there was a significant positive *Period by Condition* interaction such that the *Full Reduction* condition had a more positive effect on *Effort* than the *Partial Reduction* condition (untabulated: $\beta = 22.54$, $p < 0.01$).

[10] Pay dispersion can be measured by level or by ratio. The *No Dispersion Change* condition measures pay dispersion as the difference between the two employees' pay (level) and holds pay dispersion constant because the installer receives the same amount of pay increase as the sales associate, which means the difference between their pay is unchanged. Alternatively, pay dispersion could be held constant in terms of the ratio of the sales associate pay to the installer pay before and after the pay increase. We collected data on an additional condition in which the lower paid installer's 250 Lira wage increase is matched by a corresponding 500 Lira increase in the higher-paid sales associate's wage, such that the ratio of their pay remained two-to-one before and after the increases. Mean of *Effort Change* is -6.47 in this *No Ratio Change* condition and *Period* is insignificant in multi-level analysis (untabulated; $p = 0.23$), which indicates there was no increase in *Effort* from period 1 to period 2. Thus, our conclusion that installer responds to changes in pay dispersion rather than to a gift wage is robust to whether pay dispersion is measured as the difference in the two employees' pay (level) or the ratio of their pay.

H2 predicts that installers' perceptions of the fairness of their pay (*Fairness)* mediate the effect of the pay dispersion reduction on *Effort Change*. Baron and Kenny (1986) present three steps for checking for mediation by testing whether: 1) the predictor variable, *Period*, is associated with the dependent variable, *Effort*, 2) the predictor variable, *Period*, is associated with the mediator, *Fairness*, and 3) the mediator, *Fairness*, affects the dependent variable, *Effort*, while controlling for the predictor, *Period*. As previously shown in the test of H1, we find that *Period* has a significant effect on *Effort* in both the *Partial Reduction* and *Full Reduction* conditions. Next, we examine the effect of pay dispersion reduction on *Fairness*. The results in Table 2, Panel B show that the estimated coefficient on *Period* is positive and significant for both the *Partial Reduction* ($\beta_1 = 2.00$, $p < 0.01$) and *Full Reduction* conditions ($\beta_1 = 5.11$, $p < 0.01$).[11]

Finally, we re-examine the effect of *Period* on *Effort* after controlling for the effect of *Fairness*. The results in Table 2, Panel C show that *Period* has a positive estimated coefficient but is no longer significant at conventional levels for either the *Partial Reduction* condition ($\beta_1 = 6.99$, $p = 0.16$) or the *Full Reduction* condition ($\beta_1 = 14.17$, $p = 0.21$). However, *Fairness* remains positive and significant for both the *Partial Reduction* condition ($\beta_2 = 4.45$, $p < 0.01$) and the *Full Reduction* condition ($\beta_2 = 4.74$, $p < 0.01$). Therefore, we conclude that *Fairness* fully mediates the positive effect of the reduction in pay dispersion on *Effort*, meaning that the effect of the pay dispersion reduction on *Effort* operates exclusively through *Fairness*.

[11] We also conducted an untabulated combined multi-level regression that included data from both pay reduction conditions to examine whether the *Full Reduction* effect on *Fairness* is greater than the *Partial Reduction* effect. We also included *Period*, *Condition* and a *Period by Condition* interaction to test whether the there is a significant difference between conditions in terms of *Fairness*. While *Period* remained significant ($\beta = 2.00$, $p < 0.01$) and *Condition* was insignificant ($\beta = -0.06$, $p = 0.91$), there was a significant positive *Period by Condition* interaction such that the *Full Reduction* condition had a more positive effect on *Fairness* than the *Partial Reduction* condition ($\beta = 3.12$, $p < 0.01$).

Perceived Legitimacy

Prior research suggests that pay dispersion has a negative effect on lower-paid employees' effort when they do not believe the dispersion is legitimate (Gachter and Thoni 2010; Pfeffer and Langton 1993). Therefore, we first examine whether the lower-paid installers in our experiment perceived the initial pay dispersion in period 1 to be legitimate. Installers' indicated their agreement with the statement "The General Manager at Sprinkle Inc. had a legitimate reason to initially raise the sales associate's wage to 1,000 Lira while keeping your wage at 500 Lira" on an 11-point scale with endpoints of -5 (strongly disagree) and +5 (strongly agree). As shown in Panel A of Table 3, the mean of *Legitimacy* was -1.73, which is significantly less than the mid-point of 0 on the scale (Panel B of Table 3: $t = -7.54$, $p < 0.01$). Thus, although the initial pay dispersion reflected rational, profit-maximizing behavior by the firm in the absence of fairness effects, on average installers nevertheless believed that the pay dispersion was not legitimate.

[Insert Table 3 here]

We next test whether individual differences in perceived legitimacy in period 1 influence installers' perceptions of pay fairness and whether these fairness perceptions, in turn, affect installers' period 1 effort. As shown in Table 3, Panel C, *Legitimacy* is positively and statistically significantly associated with *Effort* ($\beta_1 = 5.11$, $p < 0.01$). Further, *Legitimacy* is positively and statistically significantly associated with *Fairness* (not tabulated: $\beta = 0.49$, $p < 0.01$). As shown in Table 3, Panel D, the effect of *Legitimacy* on *Effort* is fully mediated by *Period 1 Fairness* such that *Period 1 Fairness* is positively and statistically significant ($\beta_2 = 4.65$, $p = 0.06$) when included in the model and

Legitimacy is no longer statistically significant ($\beta_1 = 1.96$, $p = 0.41$). Taken together, these results are consistent with prior studies that suggest legitimacy perceptions influence the degree to which pay dispersion affects effort. Moreover, these results are also consistent with our previously reported results that perceptions of pay fairness mediate the effects of reductions in pay dispersion on installer effort.

Experiment 2

A potential concern regarding Experiment 1 is that participants' effort choices could have been influenced by their preceding assessments of pay fairness (Spencer, Zanna, and Fong 2005). That is, participants' effort choices might have differed had we not made fairness concerns salient by first asking about pay fairness. To address this concern, we conducted Experiment 2, using the identical design as for Experiment 1, except that participants made their effort choices without first assessing pay fairness. For Experiment 2, we recruited 93 participants via Amazon's Mechanical Turk (MTurk) to act as installers. Our participants were 55% female, averaged 37.4 (11.7) years old and had an average of 14.8 (10.8) years of work experience.[12]

As reported in Table 4, Panel A, mean *Effort Change* was 13.87 and 27.94 in the *Partial Reduction* and *Full Reduction* conditions, respectively. Consistent with Experiment 1 results, these *Effort Changes* are significantly greater than 0 (Panel B of Table 4, $p < 0.01$). Also consistent with Experiment 1, mean *Effort Change* in the *No Dispersion Change* condition (-12.14) is not significantly less than 0 (Panel B of Table 4, $p = 0.83$). These results indicate that Experiment 1 *Effort Change* results were not the

[12] We do not allow Mechanical Turk workers who participated in Experiment 1 to participate in Experiment 2. Consistent with participants being drawn from the same pool of workers, the proportion of women, mean age, and mean work experience of participants do not differ between our two experiments ($p > 0.44$).

result of experimental demand caused by asking participants to provide an assessment of pay fairness prior to making their effort choice.[13]

[Insert Table 4 here]

IV. Experiment 3 - Higher-paid Employee Turnover

Method

The design of Experiment 3 is the same as that for Experiments 1 and 2 except that now participants assumed the role of the sales associate (the higher-paid employee) rather than the installer (the lower-paid employee). Further, instead of asking sales associates to choose an effort level in periods 1 and 2, we provided them with a job offer from another firm in period 2 and ask them to provide the probability that they will accept the job. Specifically, following our manipulation in period 2, sales associates received an offer to leave Sprinkle Inc. for the same position and pay in a competing irrigation company, Nozzle Inc. Sales associates then responded on a 0% to 100% scale to the question: "What is the probability (0% to 100%) that you will ACCEPT Nozzle Inc.'s job offer?" This measure of *Turnover* is the primary dependent variable in Experiment 3. We also measure participants' perceptions of pay fairness in period 2 in a similar manner as in Experiment 1, except that in Experiment 3 we collected the measurement in our post experiment questionnaire. Panel C of Figure 1 illustrates Experiment 3 procedures.

[13] We combine our data sets across our first two experiments and repeat the multilevel regression for each individual condition as shown in Table 4 with one exception. We include experiment (1 or 2) and the interaction between experiment and round in each regression. Neither the main effect of experiment ($p > 0.28$) nor the interaction between experiment and round ($p > 0.24$) is significant in any of the three conditions. This provides further evidence that the coefficients in each condition do not differ between our two experiments.

Experiment 3 examines four between-subject conditions and their effect on *Turnover* and *Fairness* as shown in Table 5. The first is a *Control* condition, which holds pay levels the same from period 1 to period 2 so that pay dispersion remains constant between the two periods for both the installer and the sales associate. Our next two conditions are the same as the *Partial Reduction* and *Full Reduction* conditions in Experiments 1 and 2, and therefore the sales associate's pay remains the same, but the installer's pay is increased by 250 Lira and 500 Lira in the two conditions, respectively. Finally, our fourth condition is the same as the *No Dispersion Change* condition in Experiments 1 and 2, and therefore both the sales associate and the installer received a 250 Lira increase in pay from period 1 to period 2.

[Insert Table 5 here]

We recruited 163 participants via Amazon's Mechanical Turk (MTurk) to act as sales associates in Experiment 3.[14] Our participants were 55% female with a mean age of 33.0 and a mean of 12.0 years of work experience. We conducted a post-experimental manipulation check of whether participants could identify their wage in the final round and the wage of the installer. Twenty-six participants (16%) failed the manipulation check and their responses were removed from the analyses. We retain the 137 participant-responses who passed the manipulation check and report the number of participants in each condition in Table 5.[15]

Results

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[14] Similar to our first two experiments, Experiment 3 required all MTurk participants to be located in the USA and to have a 90% approval rating in prior MTurk participation. However, unlike our first two experiments, in order to obtain sufficient participants, Experiment 3 did not require participants to be "master" Mturkers. Instead, we required participants to have completed a minimum of 500 MTurk tasks.
[15] All inferences are unaffected by the inclusion of those sales associates who failed the manipulation check.

H3 predicts that higher-paid sales associates turnover will increase when pay dispersion is reduced by raising the lower-paid installers wage. As shown in Table 5, the mean *Turnover* rate is 33.26% for the *Control* condition, 25.67% in the *Partial Reduction* condition, and 21.36% in the *Full Reduction* conditions. Interestingly, reducing pay dispersion actually led to a decrease in sales associate *Turnover* compared to the control condition, with a statistically significant decrease in the *Full Reduction* condition ($p = 0.04$) but not in the *Partial Reduction* condition ($p = 0.19$). These lower rates of *Turnover* of higher-paid employees are inconsistent with both H3 and with popular press suggestions that reducing pay dispersion by raising lower-paid employees pay causes higher-paid employees to leave the firm because of a decrease in pay fairness.

To explain this lack of support for H3, we examine sales associates' responses to *Fairness*. Although *Fairness* is negatively associated with turnover (one tailed $p = 0.07$), *Fairness* is not significantly different between the *Control*, *Partial Reduction*, and *Full Reduction* conditions ($p > 0.31$). Instead, we find higher-paid employees in the full reduction condition believe reducing pay dispersion was fairer to the installer (*Fair to Them*) as measured by employees' rating of their agreement with the statement "To what extent do you agree with the following statement: The change in the Installers pay in the final period is fair to them"on an 11-point scale with endpoints of -5 (strongly disagree) to +5 (strongly agree). Participants in the *Full Reduction* condition indicated higher *Fair to Them* ratings than respondents in the *Partial Reduction* condition ($p < 0.01$), and *Fair to Them* is negatively associated with turnover ($p = 0.06$). This may explain why turnover significantly decreased in the *Full Reduction* condition compared to the *Control* condition.

For completeness we also examine *Turnover* in the *No Dispersion Change* condition. In the *No Dispersion Change* condition, the turnover rate of sales associates was lower than the turnover rates in the *Control*, *Partial Reduction*, and *Full Reduction* conditions (all $p < 0.10$). This reduced *Turnover* rate for sales associates in our *No Dispersion Change* condition is consistent with this being the only condition in which the pay for sales associates increased from period 1 to period 2 and their pay in period 2 was greater than the pay being offered by Nozzle Inc.[16] Thus, our No Dispersion Change condition provides strong evidence that sales associates responded to their own financial incentives.

V. Discussion and Conclusion

Our results support our hypotheses that lower-paid employees increase their effort when the firm reduces pay dispersion by raising their pay and that this effect is mediated by their perceptions of pay fairness. Further, additional data show that these results are not due to employees simply responding to their increased pay as a "gift" from the firm, but rather are a response to a decrease in pay dispersion. However, contrary to our hypothesis, our results do not support the popular press claim that the turnover of higher-paid employees increases when pay dispersion is reduced by increasing the pay of lower-

[16] Similar to Experiment 1 and Experiment 2, in Experiment 3 we asked sales associates whether the "The General Manager at Sprinkle Inc. had a legitimate reason to initially raise their own wage to 1,000 Lira while keeping installers' wage at 500 Lira". Participants responded on an 11-point scale with endpoints of -5 (strongly disagree) and +5 (strongly agree). The mean of this measure (*Legitimacy)* was +1.32, which is significantly greater than the mid-point of 0 on the scale ($t = 7.06$, $p < 0.01$). Thus, unlike installer participants, on average, sales associate participants believed that the initial pay dispersion was legitimate. This finding further supports the surprising nature of our *Turnover* results in that, despite perceiving the initial dispersion as legitimate, sales associates did not respond negatively to Sprinkle Inc. actively reducing that dispersion by increasing the lower-paid installer wage while leaving their own wage unchanged.

paid employees.

Our experiments are set in an environment in which the firm hires employees to perform two different jobs, installer and sales associate. In this environment, the firm's optimal strategy is to specify that the sales associate is to provide a relatively higher level of effort for a relatively higher fixed wage, whereas the installers are to provide a minimum level of effort for a relatively lower fixed wage. The firm treats the two types of employees differently in terms of specified effort and pay because the firm has an informative outcome signal on which to base the sales associate's pay, but for the installer can only determine whether the employee meets a minimum performance standard that might be interpreted as being present for work.

Although the pay arrangement in our experimental setting was economically optimal, we expected and found that the installers nevertheless perceived their relatively lower pay to be unfair. In turn, these perceptions that their pay was unfair led the lower-paid installers to provide less effort. We chose this experimental setting because we expected the resulting pay dispersion would be perceived as unfair by the lower-paid employee despite the fact that there was an economic justification for the pay arrangement. As such, we provide evidence that in a setting in which employees understand some, but not all features of how pay is determined, and the firm chooses a pay arrangement that is optimal given the information available to the firm, employees can nevertheless perceive that they are unfairly treated and that this can affect the level of effort they provide.

More importantly, we find that reducing pay dispersion by raising the lower-paid employees' wages leads them to perceive their pay as fairer, which in turn increases the level of effort they provide. Because we examine a setting that incorporates information asymmetries that frequently occur in practice, we believe that our results are likely to generalize to other settings in practice in which pay differences are economically justified if fairness concerns are not taken into account.

A setting different from ours in which pay dispersion is receiving considerable current attention is the large pay dispersion between the CEO and rank-and-file employees within firms (Washington Post, 2014; Smith and Kuntz 2013). Some of this attention stems from concern regarding whether such very large pay dispersion is socially desirable. We address a related question of whether raising the pay of lower-paid employees could potentially benefit the firm if the lower-paid employees respond favorably enough to the pay increase. Although it is less natural for lower-level employees to compare their pay with that of the CEO, such a comparison is possible and appears to be encouraged in the popular press (Morgenson 2015; Pinsker 2015). Therefore, a firm that raises the pay of lower-paid employees to reduce pay dispersion and perceptions of unfair pay might either voluntarily or by regulatory requirement disclose the effect of such a pay increase on the pay dispersion between lower-level employees and the CEO.

Most prior research on pay dispersion use archival data. By emphasizing the role of such behavioral effects as fairness perceptions, our experimental approach responds to the call by Downes and Choi (2014) for additional research on pay dispersion using experimental methods to “better understand the mechanisms of individuals’ responses to pay dispersion” (2014, 64). We provide evidence that perceptions of pay fairness are the mechanism by which reduced pay dispersion leads to increased employee effort.

An advantage of our experimental approach to examining the effects of pay dispersion is in providing greater transparency concerning the role of “pay basis”; i.e., how an employee’s pay is determined. Archival research has identified pay basis as the most important moderator of the relation between pay dispersion and firm performance (Downes and Choi 2014, 56). However, archival pay dispersion studies that relate pay basis to firm performance face the problem that the firm’s choice of pay basis is endogenous, and therefore archival researchers must try to adjust for various factors that influence the firm’s underlying pay basis choice.

Our experimental approach overcomes many of the difficulties encountered in archival pay basis studies. For example, in archival studies that relate pay basis to firm performance, employee characteristics such as experience, skill and risk preferences can affect both the firm’s choice of pay basis and firm performance. As a result, firms that tie pay closely to firm performance are likely to attract and retain employees who have more skill and are less risk averse than employees attracted and retained by firms that base pay less on individual performance. Properly adjusting for this selection effect is a significant challenge in archival studies. By randomly assigning participants to our experimental conditions, we overcome such selection problems. Further, our study provides a transparent description of how pay basis is determined for our two categories of employees (installers and sales associates).

An important qualification of our results offers an opportunity for future research. Our design does not incorporate the compensation cost to the firm of either increasing the lower-paid installer’s pay or increasing both the lower-paid installer’s pay and the higher-paid sales associate’s pay. Therefore, a possible extension would be to compare the benefit of increased lower-paid employees effort to the cost of increased pay to lower-paid employees or to higher-paid employees or to both.

Appendix - Sketch of the Economic Setting and Optimal Compensation

This appendix describes the general economic setting that is the basis for our experiments. We use an economic setting in which the firm's choice of optimal employee hiring and compensation yields the form of payments to employees that we use in our experiment. We provide these details here rather than in the text because, by design, only some of these details are provided to our participants. Participants receive a full description of how their own compensation is calculated, but they receive only a limited description of the rationale for the firm's general employee compensation policies. Therefore, in the text of the paper we describe only those employment details that are made explicit to the participants in the experiment.

The installer-participants are informed that the firm also has hired a sales associate and how much the sales associate is paid. Further, the firm provides a brief explanation for why the sales associate receives an increase in pay effective for the first experimental period while installers do not. However, the installers do not learn the full details that we provide in this appendix concerning why the pay structures that the firm uses for the two types of employees is profit-maximizing for the firm. Providing only summarized compensation information to installer-participants in the experiment parallels the typical circumstances in practice. That is, in practice lower-level employees are likely to have some awareness of how their pay relates to that of other employees performing work at a similar level in their firm, and perhaps some general justification from the firm for any differences in pay. However, employees are unlikely to have full insight into the details of the firm's entire compensation design process and rationale.

In our setting the firm hires three installers and one sales associate, all from the same labor market comprised of homogeneous job candidates. All four employees report to the firm's general manager. We abstract away from issues concerning how firms match employees with different skills to different jobs by assuming that all job candidates in the labor market are identical. Therefore, the firm simply hires four candidates and randomly assigns three as installers and one as the sales associate without any matching of individual employees to jobs. The firm pays each new employee a wage of w^0 during an initial probationary period and provides no further information about future compensation. All employees are identical, either risk-neutral or risk-averse, with utility for wealth (w_i) and disutility for effort (e_i), as $U(w_i) - V(e_i)$, where i = I for installers and S for sales associates, and $U'>0$, $U''\leq 0$. Installers perform the physical job of installing the irrigation systems and the sales associates recruit customers and interact with them to schedule their irrigation system installation.

We assume that the reservation level of utility determined in the labor market for both types of workers is K. Installers and the sales associate choose how much effort to devote to their job, given their employment contract. In our experiment installer-participants are provided with specific values of the cost of effort function, $V(e_I)$, such that in a first-best environment the firm would prefer that the installer provides the first-best level of effort, e^F_I, which exceeds the minimum possible installer effort, e^M_I; i.e., $e^F_I > e^M_I$. The first-best effort reflects careful attention by installers to all details of the installation process, which would benefit the firm in the long-run by extending the irrigation system's expected life. Therefore, in a first-best environment in which the firm could contract directly on the precise level of installer effort, the firm would hire the installer to provide a first-best work level of e^F_I, and would pay the installer a wage of w^F_I, where $U(w^F_I) – V(e^F_I) = K$.

However, we assume that in the short-run, second-best environment that includes the two periods in our experiment, the only signal that is available to the firm as a performance measure concerning the installer's level of effort is whether or not the installer meets a minimum performance standard that we interpret as being present for work. If the firm could write a long-term contract with the installer based on the ultimate quality of the installation work, they would do so, but we assume that this is not feasible.[17] This means that during the two periods of our experiment the firm cannot determine whether or not an installer has provided more than the minimal effort. Therefore, the firm pays the installer a second-best wage of w^S_I as long as the installer is present for work. Further, the firm sets the wage w^S_I such that $U(w^S_I) – V(e^M_I) = K$, where $V(e^M_I)$ is the installer's disutility of providing the minimum work level of e^M_I.

The firm also pays the sales associate an initial wage of w^0, and as in the case of the installer, the firm would ideally prefer the sales associate to provide more than the minimum level of effort. However, in contrast to the case for the installer, for the sales associate the firm does have an informative signal in the form of a customer satisfaction survey that informs the firm whether the sales associate has provided at least an "Acceptable" level of service to customers, that exceeds the sales associate's minimum possible effort. We assume that in a first-best environment in which the firm could

[17] This limitation on contracting on the long-term outcomes is similar to the assumption in Feltham and Xie (1994) that the "consequences of the manager's actions are not observable, in large part because the impact of those actions extend beyond…his time as manager of that subunit" (1994, 429-432). In our context, entry-level operational employees typically stay with a firm for a relatively short period, which makes it impractical in most cases to base their pay on the firm's longer-run operational performance.

directly contract on the sales associate's actual effort level, the firm would prefer that the sales associate provides an even higher "Superior" level of service to customers. However, the customer satisfaction survey is not precise enough to distinguish Superior versus Acceptable service from the sales associate. Hence, the firm can compensate the sales associate for providing at least Acceptable service, but cannot distinguish whether the sales associate provides Acceptable versus Superior service.

Given the customer satisfaction survey measure of the sales associate's performance, the firm's profit maximizing policy specifies that, starting in the first experimental period, the sales associate's compensation will be raised to $w^A_S > w^0$ if the customer satisfaction survey rates the service as Acceptable. Otherwise, the sales associate's compensation will remain at w^0. The increased wage of w^A_S will be chosen such that $U(w^A_S) - V(e^A_S) = K$, where $V(e^A_S)$ is the sales associate's disutilty from providing Acceptable service to customers. Finally, if we assume that $V(e^M_I) < V(e^A_S)$, which is reasonable based on how the effort levels e^M_I and e^A_S are defined, it follows that $w^A_S > w^M_I$. Given our incentive parameters, in equilibrium the installer will choose the minimum possible effort, e^M_I, receive wage w^M_I and earn the reservation utility, K. The sales associate will choose effort e^A_S, receive wage w^A_S and also earn the reservation utility, K.

For our experiment the key implication from the preceding analysis is that there will be pay dispersion in equilibrium because $w^A_S > w^M_I$; i.e., the sales associate will be paid more than the installer. We assume that the installer knows the sales associate's wage is w^A_S, but does not know that the sale's associate's wage is contingent on providing at least Acceptable customer satisfaction survey results.

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Table 1: Experiment 1 Descriptive Results by Experimental Condition[1]

	Period 1	Period 2 Experimental Condition		
	All Conditions	**PR**	**FR**	**NDC**
Installer	500 Lira	750 Lira	1000 Lira	750 Lira
Sales Associate	1000 Lira	1000 Lira	1000 Lira	1250 Lira

	PR	**FR**	**NDC**	**Total**
Participants	N = 51	N = 51	N = 46	N = 148
Pass Manipulation Check (%)	48 (94%)	47 (92%)	44 (96%)	139 (94%)
Mean (SD) Period 1 Effort	65.49 (58.42)	70.78 (56.03)	80.65 (65.57)	
Mean (SD) Period 2 Effort	81.37 (60.89)	109.21 (65.87)	79.56 (63.21)	
Mean (SD) Effort Change	15.88 (29.33)	38.43 (49.25)	-1.09 (35.10)	
Mean (SD) Period 1 Fairness	-2.12 (2.41)	-2.17 (2.76)	-1.36 (2.96)	
Mean (SD) Period 2 Fairness	-0.12 (2.64)	2.94 (2.28)	-1.13 (2.87)	
Mean (SD) Fairness Change	2.00 (2.16)	5.11 (3.30)	0.23 (1.82)	

Legend:

PR = Partial Reduction condition
FR = Full Reduction condition
NDC = No Dispersion Change condition

[1] One hundred forty-eight participants took part in Experiment 1 and assumed the role of an installer who made decisions in two *Periods*. *Effort* reflects the cost of effort installers paid in Lira. *Effort Change* is *Period 2 Effort* minus *Period 1 Effort. Fairness* is workers' rating of their agreement with the following statement on a -5 (strongly disagree) to +5 (strongly agree) scale: "My wage is fair given the work that I do for Sprinkle Inc." *Fairness Change* is *Period 2 Fairness* minus *Period 1 Fairness*. The three conditions are: 1) *Partial Reduction (PR):* Installer wage increases from 500 Lira in period 1 to 750 Lira in period 2, whereas sales associate wage is 1000 Lira in period 1 and period 2; 2) *Full Reduction (FR):* Installer wage increases from 500 Lira in period 1 to 1000 Lira in period 2, whereas sales associate's wage is 1000 Lira in period 1 and period 2; 3) *No Dispersion Change (NDC):* Installer wage increases from 500 Lira in period 1 to 750 Lira in period 2, whereas sales associate wage is increased from 1000 Lira in period 1 to 1250 Lira in period 2.

Table 2: Experiment 1 Multi-level Analysis of Effort and Fairness[1]

Panel A: The Effect on Effort

Model: $Effort_{it} = \beta_0 + \beta_1 Period_{it} + \varepsilon_{it}$

	PR	FR	NDC
Intercept	49.61***	32.35***	81.74***
	(10.08)	(0.64)	(11.86)
Period	15.88***	38.43***	-1.09
	(4.07)	(12.85)	(5.11)
Bryk-Raudenbush R^2	0.230	0.383	0.001
Observations	n=102	n=102	n=92

Panel B: The Effect on Fairness

Model: $Fairness_{it} = \beta_0 + \beta_1 Period_{it} + \varepsilon_{it}$

	PR	FR	NDC
Intercept	-4.12***	-7.29***	-1.61***
	(0.55)	(0.76)	(0.57)
Period	2.00***	5.11***	0.24
	(0.30)	(0.46)	(0.26)
Bryk-Raudenbush R^2	0.466	0.585	0.017
Observations	n=102	n=102	n=92

Panel C: The Effect on Effort Controlling for Fairness

Model: $Effort_{it} = \beta_0 + \beta_1 Period_{it} + \beta_2 Fairness_{it} + \varepsilon_{it}$

	PR	FR	NDC
Intercept	67.91***	66.93***	90.29***
	(11.78)	(18.03)	(11.95)
Period	6.99	14.17	-2.36
	(5.01)	(11.28)	(4.95)
Fairness	4.45***	4.74***	5.32***
	(1.60)	(1.79)	(2.08)
Bryk-Raudenbush R^2	0.307	0.431	0.077
Observations	n=102	n=102	n=92

Table 2: Continued

Legend:

PR = Partial Reduction condition
FR = Full Reduction condition
NDC = No Dispersion Change condition

[1] See Table 1 for variable definitions. In all three panels, model subscript i refers to participant (i = 1, …, or 51 in "PR" and "FR"; i = 1, …, or 46 in "NDC") and model subscript t refers to period (t = 1 or 2). Each panel reports four stand-alone regression results, one for each condition. The cells report regression coefficients (standard errors). Our manipulation was applied between period 1 and period 2. We use multi-level model regressions to correct standard errors for correlated error terms caused by two observations of effort and fairness for each participant. Random effect parameters are not shown. p-values are two tailed and ***p < 0.01, **p < 0.05, *p < 0.10.

Table 3: Experiment 1 The Effect of Legitimacy on Period 1 Effort[1]

Panel A: Descriptive Statistics (N =148)

Mean of Legitimacy = -1.73
Standard Error = 0.23
Median = -2.00

Number of observations > 0 = 95
Number of observations < 0 = 36
Number of observations = 0 = 17
Total observations = 148

Panel B: t-test Result (N = 148)

Comparison of Legitimacy mean to scale mid-point (0): $t = -7.54$, $p < 0.01$

Panel C: OLS Regression with Dependent Variable of Period 1 Effort (N =148)[2]

Model: $Period1Effort_i = \beta_0 + \beta_1 Legitimacy_i + \varepsilon_i$

	Total
Intercept	80.90***
	(5.65)
Legitimacy	5.11***
	(1.72)
Adjusted R^2	0.05

Panel D: OLS Regression with Dependent Variable of Period 1 Effort, Controlling for Period 1 Fairness (N = 148)[2]

Model: $Period1Effort_i = \beta_0 + \beta_1 Legitimacy_i + \beta_2 Period1Fairness_i + \varepsilon_i$

	Total
Intercept	84.29***
	(5.87)
Legitimacy	1.96
	(2.38)
Period 1 Fairness	4.65*
	(2.45)
Adjusted R^2	0.07

Table 3: Continued

[1] *Legitimacy* is calculated as installers' rating of their agreement with the following statement on a -5 (strongly disagree) to +5 (strongly agree): "The General Manager at Sprinkle Inc. had a legitimate reason to initially raise the sales associate's wage to 1,000 Lira while keeping your wage at 500 Lira". See Table 1 for all other variable definitions.

[2] Subscript i refers to participant (i = 1, …, 148). The cells report regression coefficients (standard errors). p-values are two tailed and ***p < 0.01, **p < 0.05, *p < 0.10.

Table 4: Experiment 2 Descriptives and Multi-level Regressions[1]

Panel A: Descriptives

	PR	FR	NDC	Total
Participants	N = 31	N = 34	N = 28	N = 93
Pass Manipulation Check (%)	30 (97%)	31 (92%)	28 (100%)	89 (96%)
Mean (SD) Period 1 Effort	80.32 (67.95)	84.12 (63.87)	87.50 (58.29)	
Mean (SD) Period 2 Effort	94.19 (68.84)	112.06 (64.37)	75.36 (58.15)	
Mean (SD) Effort Change	13.87 (25.78)	27.94 (47.78)	-12.14 (45.73)	

Panel B: Multi-level Regression for The Effect on Effort

Model: $Effort_{it} = \beta_0 + \beta_1 Period_{it} + \varepsilon_{it}$

	PR	FR	NDC
Intercept	66.45***	56.18***	99.64***
	(13.69)	(15.74)	(16.14)
Period	13.87***	27.94***	-12.14
	(4.55)	(8.08)	(8.49)
Bryk-Raudenbush R^2	0.230	0.261	0.068
Observations	n=62	n=68	n=56

Legend:

PR = Partial Reduction condition
FR = Full Reduction condition
NDC = No Dispersion Change condition

[1] Ninety-three participants participated in Experiment 2 and assumed the role of an installer the responded made decisions in two *Periods*. See Table 1 for variable definitions. In panel B, model subscript i refers to participant and model subscript t refers to period (t = 1 or 2). Panel B reports four stand-alone regression results, one for each condition. The cells report regression coefficients (standard errors). Our manipulation was applied between period 1 and period 2. We use multi-level model regressions to correct standard errors for correlated error terms caused by two observations of effort. Random effect parameters are not shown. p-values are two tailed and ***p < 0.01, **p < 0.05, *p < 0.10.

Table 5: Experiment 3 Descriptives[1]

	Period 1	Period 2			
	All Conditions	**Control**	**PR**	**FR**	**NDC**
Installer	500 Lira	500 Lira	750 Lira	1000 Lira	750 Lira
Sales Associate	1000 Lira	1000 Lira	1000 Lira	1000 Lira	1250 Lira
Outside Option	1000 Lira	1000 Lira	1000 Lira	1000 Lira	1000 Lira

	Control	PR	FR	NDC	Total
Participants	41	39	41	42	163
Pass Manipulation Check (%)	34 (83%)	33 (85%)	33 (80%)	37 (88%)	137 (84%)
All Participants:					
Mean (SD) Turnover	34.90%	29.67%	25.76%	16.69%	
	(30.47)	(30.81)	(24.79)	(26.03)	
Only Pass Manipulation Check:					
Mean (SD) Turnover	33.26%	25.67%	21.36%	11.57%	
	(25.40)	(22.75)	(12.11)	(8.35)	
Mean (SD) Fairness	3.26	2.87	2.85	3.16	
	(1.48)	(1.63)	(1.80)	(1.74)	
Mean (SD) Fair to Them	NA	1.45	3.21	0.72	
		(2.95)	(2.00)	(2.96)	

Legend:

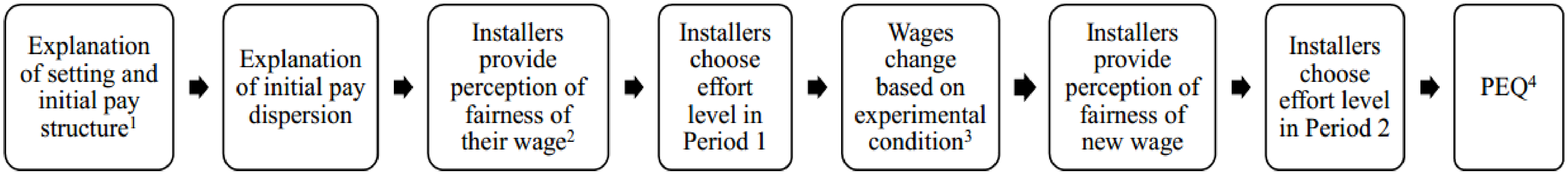
Control = Control condition
PR = Partial Reduction condition
FR = Full Reduction condition
NDC = No Dispersion Change condition

[1] One hundred sixty three mturkers participated in Experiment 3 and assumed the role of a sales associate. The four conditions are: 1) *Control:* No change in pay dispersion; 2) *Partial Reduction (PR):* Installers wage increases from 500 Lira in period 1 to 750 Lira in period 2, whereas sales associate's wage is 1000 Lira in period 1 and period 2; 3) *Full Reduction (FR):* Installers wage increases from 500 Lira in period 1 to 1000 Lira in period 2, whereas sales associate's wage is 1000 Lira in period 1 and period 2; 4) *No Dispersion Change (NDC):* Installers wage increases from 500 Lira in period 1 to 750 Lira in period 2, whereas sales associate's wage is increased from 1000 Lira in period 1 to 1250 Lira in period 2; Turnover is measured on a 0% to 100% scale. *Fairness* is workers' rating of their agreement with the following statement on a -5 (strongly disagree) to +5 (strongly agree) scale: "My wage is fair given the work that I do for Sprinkle Inc." *Fair to Them* is workers' rating of their agreement with the following statement on a -5 (strongly disagree) to +5 (strongly agree) scale: "To what extent do you agree with the following statement: The change in the Installers pay in the final period is fair to them." rating of their agreement with the following statement on a -5 (strongly disagree) to +5 (strongly agree) scale: "My wage is fair given the work that I do for Sprinkle Inc.

Figure 1

Experiment Timelines

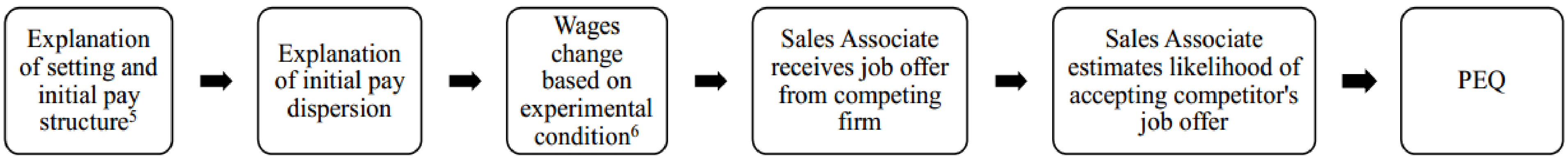
Panel A: Experiment 1 Timeline



Panel B: Experiment 2 Timeline

Experiment 2 was identical to Experiment 1, but with questions about perception of fairness of Installer wage removed.

Panel C: Experiment 3 Timeline



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[1] This step asked participants to take the role of an Installer and included information about the nature of the work for both Installers and Sales Associates. It also included information about the organizational structure of the firm. Employees were informed that Installers and Sales Associates received equal initial compensation when they were hired by the firm.

[2] To rule out potential experimenter demand effects, these questions are removed from Experiment 2.

[3] This change in wage varied by experimental condition. Experimental conditions were partial reduction of pay dispersion, full reduction of pay dispersion, and an equal raise for all employees with no change in level of pay dispersion. Experimental conditions were the same for both Experiment 1 and Experiment 2.

[4] The PEQ contained a manipulation check and collected information on the factors that influenced choice of effort, perceived legitimacy of the initial pay dispersion, and demographic information. The PEQ for Experiment 2 collected the same information, as well as the perceived fairness of the change in wage to the Installers and to the Sales Associate separately.

[5] The information in this step was similar to Experiments 1 and 2, but this time asked participants to take the role of the Sales Associate.

[6] This change in wage varied by experimental condition. The experimental conditions were a control condition, partial reduction of pay dispersion, full reduction of pay dispersion, an increase in pay for all employees with no change to the level of dispersion and the competing firm offering a job that paid equal to the pre-raise compensation, and an increase in pay for all employees with no change to the level of dispersion and the competing firm offering a job that paid equal to the post-raise compensation. In the control condition, this step is omitted. The worker indicates turnover intentions based on only the initial pay dispersion.