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# The Consequences of Hiring Lower-Wage Workers in an Incomplete-Contract Environment

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**ABSTRACT:** Firms frequently attempt to increase profits by replacing some existing workers with new lower-wage workers. However, this strategy may be ineffective in an incomplete-contract environment because the new workers may provide lower effort in response to their lower wages, and hiring new lower-wage workers may damage the remaining original workers' reciprocal relationship with the firm. We conduct an experiment to examine this issue and find that when new lower-wage workers become available, firms hire them to replace original higher-wage workers and pay the new workers lower wages. However, these lower wages do not improve firm profit because the decision to hire new lower-wage workers causes both the new and remaining workers to provide lower effort. Moreover, hiring lower-wage workers reduces new workers' payoffs and, thus, decreases social welfare. These unintended consequences suggest that firms should consider both the wage savings and the potential costs when deciding whether to replace some workers with new lower-wage workers. We discuss the implications of our findings for contract design, hiring practices, and managerial accountants.

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## I. INTRODUCTION

Motivating workers to provide effort to increase firm profitability is a primary goal of firm owners. Firms use output-based compensation contracts, monitoring systems, and other formal control systems to elicit the desired amount of worker effort. For example, because worker effort is typically not directly observable, firms sometimes provide workers with a well-specified incentive contract that links wages with output so that a higher wage can be earned if output is high (Holmstrom 1979; Lambert 2001). However, firms also frequently employ less-specified incomplete contracts (often fixed-wage contracts) in practice (MacLeod and Parent 1999), either because they are unable to design a more complete contract or because they believe that an incomplete contract will generate as much or more firm profit as a more complete contract (Akerlof 1982; Lazear 1986).[1] Considerable prior research in economics and accounting shows that firms can benefit from offering fixed-wage contracts because firms and workers often engage in gift exchange, in which firms offer a "gift" of a wage greater than the market-clearing level and workers reciprocate with a "gift" of greater effort than the minimum enforceable amount (Fehr, Kirchsteiger, and Riedl 1993; Fehr, Gachter, and Kirchsteiger 1997; Hannan, Kagel, and Moser 2002; Hannan 2005; Kuang and Moser 2009, 2011).

An important strategic option for many firms is the opportunity to hire new workers at lower wages. This opportunity is becoming more frequent because of the increasing ability of firms to move operations to locations with lower-wage workers and workers' ability to quickly move to locations with employment opportunities. In such situations, firm profit will increase if firms use complete-employment contracts and are able to hire new workers at lower wages. However, if firms cannot enforce a complete contract, or choose not to, but instead use incomplete-employment contracts, then the consequences of firms' decisions to hire lower-wage workers are less clear. This is especially true when firms only replace some of their higher-wage workers and retain others. The primary purpose of our study is to examine how the introduction of new lower-wage workers to an existing labor pool affects the behavior of firms and workers.

In our incomplete-contracting setting, new "lower-wage" workers have a lower minimum wage than other workers, and firms offer lower wages to these new lower-wage workers. Standard gift exchange between firms and workers in an incomplete-contracting setting means that workers' effort depends on their wage level. However, the lower minimum wage of the new lower-wage workers could have a separate effect on their effort beyond their standard gift-exchange response. Specifically, the effort of the new lower-wage workers could depend on whether they evaluate their lower wage relative to their minimum wage.

If lower-wage workers evaluate their wage offer relative to their lower minimum wage, then they could provide the same level of effort for their lower wage as other workers with a higher minimum wage provide for their higher wage. This is a possibility because the perceived gift in the wage of the lower-minimum-wage worker, i.e., the difference between their wage and their lower minimum wage, could be equivalent to the perceived gift in the wage of the higher-minimum-wage worker.[2] Consequently, firm profit would be higher for firms with lower-minimum-wage workers because they pay lower wages while receiving the same amount of effort as firms with higher-

[1] Firms may not be able to design a complete contract if output is not measurable at a reasonable cost and, therefore, is not contractible (Lazear 1986).

[2] For example, the difference between a wage offer of 35 and a minimum wage of 10 (25) is the same as the difference between a wage offer of 45 and a minimum wage of 20 (25).

minimum-wage workers receive for paying higher wages. However, the new lower-wage workers could base their effort on the absolute level of their wage, as in standard gift exchange, rather than on the difference between their wage and their lower minimum wage. In this case, workers will provide lower effort in response to their lower wage offers and firm profit may not increase because the financial benefit of paying lower wages would be offset by the cost of lower effort.

In addition to the effect on the new workers' effort discussed above, the effort of the higher-wage workers who remain with the firm could also be affected. Specifically, in an incomplete-contract environment, the remaining higher-wage workers could lower their effort when firms hire new lower-wage workers if they view the firm's action as unfair or as a violation of social norms. Prior research in accounting (Towry 2003; Hannan 2005; Zhang 2008; Kuang and Moser 2009; Tayler and Bloomfield 2011; Christ, Sedatole, and Towry 2012) provides evidence that violations of workers' social norms (e.g., fairness, trust, and reciprocity) affect their behavior. Fehr, Kirchsteiger, and Riedl (1996) and Kuang and Moser (2009, 2011) show that perceived violations of reciprocity can result in lower worker effort. Moreover, Fehr and Fischbacher (2004) provide evidence that individuals react negatively to violations of social norms that harm others even when the violations do not affect them personally. If remaining higher-wage workers lower their effort because they view hiring a new lower-wage worker as unfair or as a violation of a social norm, then this represents a social cost to the firm that would offset the financial benefit of paying lower wages.

Depending on how the hiring of new lower-wage workers affects both the new workers' and remaining workers' effort, the firm's cost savings from paying lower wages to new workers could be partially or fully offset by lower effort from both the new and remaining workers. As a result, firm profit could remain constant, or even decrease, rather than increase as firms might expect as a result of hiring new lower-wage workers.

To examine how the introduction of new lower-wage workers to an existing labor pool affects the behavior of firms and workers in a gift-exchange environment, we conduct an experiment with two experimental conditions. In our low-wage condition, the firm has the option to replace an original worker with a new lower-minimum-wage worker who can perform the same task as the original worker. In our same-wage condition, the firm has the option to replace an original worker with a new worker who has the same minimum wage as the firm's original workers. Our low-wage condition is the setting of primary interest because it reflects the situation firms face when they gain access to a new lower-wage labor pool or when additional workers who are willing to work for lower wages enter the existing labor pool. Although this is our primary setting of interest, we compare firm and worker behavior in this condition to that in the same-wage condition because this allows us to demonstrate that the observed effects of introducing new low-wage workers are not due to the increase in the labor supply that occurs when new lower-wage workers are introduced, but rather reflect the unexpected costs that arise because workers react to the fact that the firm hired a new worker who could be paid a lower wage.

During the first half of our experiment in both conditions, each firm is randomly and anonymously rematched in each period with two workers who have a common labor cost to the firm. The firm decides what wage to offer both workers, and then both workers receiving the wage offer independently decide whether to accept or reject it. Workers who accept the wage offer then decide how much effort to provide. The purpose of these early periods is to allow firms and workers to establish a baseline level of gift exchange between firms and workers.

In the second half of the experiment, each firm is randomly and anonymously rematched in each period with *three* workers, two original workers and one new worker. The firm can still only hire two workers, as was the case in the first half when there were only two workers. Consequently, the firm must decide whether to replace one of the two original workers with the new worker or hire the two original workers. Recall that in the low-wage condition, the new worker has a *lower* minimum wage than the firm's original workers, whereas in the same-wage condition, the new

worker has the *same* minimum wage as the firm's original workers.[3] This is the only difference between the conditions; all other factors are held constant.

We find that a significant portion of firms hire new workers in both conditions, but the frequency of hiring new workers to replace original workers is greater in the low-wage condition than in the same-wage condition. We also find that firms pay lower wages to new lower-wage workers than to new same-wage workers. However, despite paying lower wages, firm profit does not increase as a result of hiring new lower-wage workers for two reasons. First, new lower-wage workers provide less effort than new same-wage workers and, second, the remaining original workers also provide less effort when firms hire new lower-wage workers than when firms hire new same-wage workers. Finally, we find that hiring new lower-wage workers decreases new workers' payoffs and, thus, social welfare decreases as well.

Our findings extend the results of prior studies that investigate the reciprocal relationship between firms and workers (Hannan et al. 2002; Brandts and Charness 2004; Gachter and Thoni 2010; Owens and Kagel 2010) and the effects of social norms in accounting settings (Towry 2003; Hannan 2005; Tayler and Bloomfield 2011; Kuang and Moser 2009, 2011; Christ et al. 2012). An important function of managerial accounting is to evaluate proposed changes in organizations using cost-benefit analysis. We provide evidence that management accountants should not only consider the direct wage savings from switching to lower-wage workers, but also the potential indirect costs that can arise if hiring such workers results in lower effort.

Understanding how firms' contract choices and hiring decisions affect workers' effort can help firms design more effective contracts and employ more successful hiring policies. In particular, recognizing the potential costs of replacing some current workers with new lower-wage workers in an incomplete-contract environment may help firms decide whether to adopt this strategy. If hiring lower-wage workers results in unexpected costs of lower effort that partially or fully offset the benefits of reduced labor costs, then firms may not want to follow this strategy.

Awareness of the unintended costs of lower effort that we observe could also affect the type of employment contract firms choose to offer their workers. Firms that have the ability to enforce relatively complete employment contracts, but instead offer their workers incomplete gift-exchange contracts because of the expected benefits of worker reciprocity, may not benefit as much from this decision as they expect if they subsequently decide to replace some of their current workers with new lower-wage workers. In such cases, the benefits of offering an incomplete gift-exchange contract could be offset by the costs of lower effort associated with hiring lower-wage workers such that the firm would be better off offering a more complete contract.

The next section provides background for our study. Our hypotheses are developed in Section III. Section IV describes our experimental design, Section V reports our results, and Section VI summarizes and discusses our findings.

## II. BACKGROUND

Agency theory posits that firms structure contracts to maximize firm profit. These contracts maximize firm profit by paying agents the lowest wage possible (i.e., agents' reservation wage) that induces the agents to provide the desired amount of effort (Baiman 1982, 1990). In complete-contract environments, in which firms can control worker effort (e.g., with a forcing contract), paying lower wages will, by definition, improve firm profit.

[3] For the remainder of the paper, we refer to new workers with lower minimum wages than original workers as "new lower-wage workers" and new workers with the same minimum wage as original workers as "new same-wage workers."

However, firms often offer workers incomplete contracts (primarily fixed-wage contracts) in practice. Fixed-wage contracts can generate as much firm profit as more complete contracts because of positive reciprocity between firms and workers (Fehr et al. 1993, 1996; Bewley 1999; Gachter and Fehr 2002; Hannan et al. 2002; Hannan 2005; Falk 2007). As discussed earlier, this reciprocal relationship between firms and workers is typically referred to as "gift exchange" (Akerlof 1982). Gift exchange can yield higher firm profit than expected under conventional economic reasoning because it results in increased overall welfare that can be shared by firms and workers.

Of course, fixed-wage contracts do not guarantee a profitable gift-exchange relationship. For this to occur, (1) firms must trust workers to reciprocate with higher effort before they will offer a wage above the market-clearing level, and (2) workers must actually reciprocate a firm's higher wage offer with higher effort.[4] Fixed-wage contracts are incomplete because they do not include explicit performance incentives, but rather allow workers discretion over effort (Fehr et al. 1996). As such, workers could provide low effort because the firm does not trust them to provide high effort and, thus, offers them the low equilibrium wage. In addition, even if firms trust workers to reciprocate their higher wage with higher effort, workers may not provide higher effort because they only want to maximize their wealth or because they view the firm's wage offer as unfair or other actions taken by the firm as violating social norms.

## III. DEVELOPMENT OF HYPOTHESES AND RESEARCH QUESTIONS

### Firm Behavior When New Lower-Wage Workers Become Available

When firms have the option to replace an existing original worker with a new worker, we predict that they will do so more often and will offer the new worker a lower wage when the new worker has a lower minimum wage than the original workers (low-wage condition) than when the new worker has the same minimum wage as the original workers (same-wage condition). This prediction follows naturally from a model of firms and workers as wealth-maximizers. In this model, firms offer all workers exactly their minimum wage because they anticipate that all workers will respond with the lowest possible effort. Thus, in equilibrium, firm profit is higher when firms hire new workers with a lower minimum wage than when they hire new workers with the same minimum wage.

This prediction is likely to hold even when behavior departs from the assumption of purely wealth-maximizing firms and workers. Prior research finds that workers may use their minimum wage as a reference point for evaluating the amount of gift in their wage offer (Brandts and Charness 2004; Falk, Fehr, and Zehnder 2006; Owens and Kagel 2010). For example, a new same-wage worker with a minimum wage of 20 may perceive a wage offer of 45 as including a gift of 25. However, a new lower-wage worker with a minimum wage of 10 may perceive a lower wage offer of 35 as also including a gift of 25. Therefore, firms may be able to offer lower wages to new lower-wage workers and receive a similar amount of effort, thereby increasing firm profit. If firms anticipate that the new lower-wage workers will evaluate the gift in their wage offers using their lower minimum wage as a reference point, then they may decide to offer these workers lower wages, trusting that they will reciprocate with the same level of effort as workers with a higher minimum wage. Based on the reasoning offered above, our first two hypotheses are:

**H1:** Firms will hire new lower-wage workers more often than new same-wage workers.

[4] Consistent with Rousseau, Sitkin, Burt, and Camerer (1998, 395), we define trust as "the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another," and consistent with Cox (2004), we define reciprocity as "the in-kind response by a second party who knows with certainty that he has been trusted by the first party."

**H2:** Firms will make lower wage offers to new lower-wage workers than to new same-wage workers.

### New Lower-Wage Workers' Effort

H1 and H2 predict that firms will hire new lower-wage workers more often and pay them lower wages than new same-wage workers. New lower-wage workers' effort will likely depend on the wages they receive because they are interacting with the firm in a gift-exchange setting, i.e., higher wages lead to higher effort and *vice versa*. However, in our setting, there is another factor other than the firm's wage offer that could affect new lower-wage workers' effort.[5]

As discussed in the development of H2, prior research finds that workers sometimes use their minimum wage as a reference point for evaluating the amount of gift in their wage offer (Brandts and Charness 2004; Falk et al. 2006; Owens and Kagel 2010). That is, new workers could perceive the amount of the gift in the firm's wage offer as the difference between their wage offer and their minimum wage, and this perceived "gift" could affect the new workers' effort. If this is the case, then new lower-wage workers could provide more effort than new same-wage workers for any given wage because the perceived size of the gift in any given wage is larger for new lower-wage workers than for new same-wage workers. For example, the gift in a wage offer of 45 is 35 when the minimum wage is 10, but only 25 when the minimum wage is 20.

In a gift-exchange environment such as ours, the type of effort response described above is necessary for firm profit to increase as a result of paying lower wages to the new lower-wage workers. That is, if firms pay lower wages to new lower-wage workers, but these workers do not base their effort on a perceived larger gift in their wage, but instead simply lower their effort in response to their lower wages as in standard gift exchange, then firm profit will not increase as a result of hiring the new lower-wage workers. In this case, the lower effort provided by the new lower-wage workers in exchange for lower wages is a cost to the firm of hiring new lower-wage workers that would offset the financial benefit to the firm of paying lower wages.

Because Brandts and Charness (2004), Falk et al. (2006), and Owens and Kagel (2010) provide evidence that the level of the minimum wage can have a separate effect on worker effort beyond that of the absolute wage level alone as in standard gift exchange, our third hypothesis is:

**H3:** New lower-wage workers will provide greater effort for a given wage than new same-wage workers.

### Remaining Original Workers' Effort

We are also interested in how hiring a new lower-wage worker versus hiring a new same-wage worker affects remaining original workers' effort. While we expect there to be a standard gift-exchange relationship between firms and the remaining original workers, we also expect that this

[5] Although not discussed in our hypothesis development, there is an additional factor in our setting that could affect worker effort separate from the wage offer alone. Because firms can make different wage offers to their two workers when hiring a new worker, differences in coworkers' wage offers could also affect their effort. Prior evidence is mixed. Gachter and Thoni (2010) and Cohn, Fehr, Herrmann, and Scheider (2012) find that workers provide less effort when they are paid less than a coworker, while Charness and Kuhn (2007) do not find such a difference in a setting in which workers had different productivity rates, presumably because workers believed that the wage differences were justified by the differences in productivity. The difference in minimum wages in our setting could lead new lower-wage workers to believe that their lower wages are justified and, thus, their coworkers' wages would not affect their effort. Nevertheless, we control for any such possible effect in all our tests of worker effort.

relationship will be more adversely affected when firms replace an original worker with a new lower-wage worker than with a new same-wage worker.

Remaining original workers could react negatively to the firm's decision to hire new lower-wage workers if they believe this violates a social norm. Prior research finds that workers perceive it to be unfair for a firm to exploit an increase in its power to take advantage of its workers (Kahneman, Knetsch, and Thaler 1986; Fehr et al. 1993, 1996; Kuang and Moser 2009). Moreover, Fehr and Fischbacher (2004) show that individuals react negatively to violations of social norms that harm others even when the violations do not affect them personally. In our setting, remaining original workers' negative reactions will likely result in lower effort, and this effect is likely to be stronger when firms hire a new lower-wage worker than a new same-wage worker because workers may believe that firms are taking advantage of the new lower-wage worker's lower minimum wage. This lower effort by the remaining original workers would represent a social cost to the firm of hiring a new lower-wage worker that could offset the financial benefit of paying lower wages. Based on this reasoning offered above, our fourth hypothesis is:

**H4:** Remaining original workers will provide lower effort when firms hire a new lower-wage worker than when firms hire a new same-wage worker.

### Firm Profit, Worker Payoff, and Social Welfare

We next consider the overall effect of hiring new lower-wage workers versus hiring new same-wage workers on firm profit, workers' payoffs, and social welfare (the sum of firm profit and workers' payoffs). Any difference in the profit of firms that hire a new lower-wage worker and those that hire a new same-wage worker depends on both the wages they pay to the new and remaining original workers and on the effort these workers provide. Although we predict that firms who hire new lower-wage workers will pay new workers lower wages than firms who hire new same-wage workers, it is nevertheless difficult to predict how hiring a new lower-wage worker will affect firm profit. The effect is ambiguous because H3 predicts higher effort by new lower-wage workers than by new same-wage workers for any given wage, but H4 predicts lower effort by remaining workers for any given wage when a new lower-wage worker is hired than when a new same-wage worker is hired.

The effect of hiring new lower-wage workers versus hiring new same-wage workers on workers' payoffs is also unclear because it depends on both the wages received and the effort provided by the new and remaining original workers. Although we make directional predictions about wages and effort in our hypotheses, we cannot predict the net effect on workers' payoffs because payoffs increase from wages received, but decrease from the cost of effort. Finally, without a prediction for how hiring a new lower-wage worker versus a new same-wage worker will affect either firm profit or workers' payoffs, we are also unable to predict the impact on social welfare. Thus, we pose the following research question:

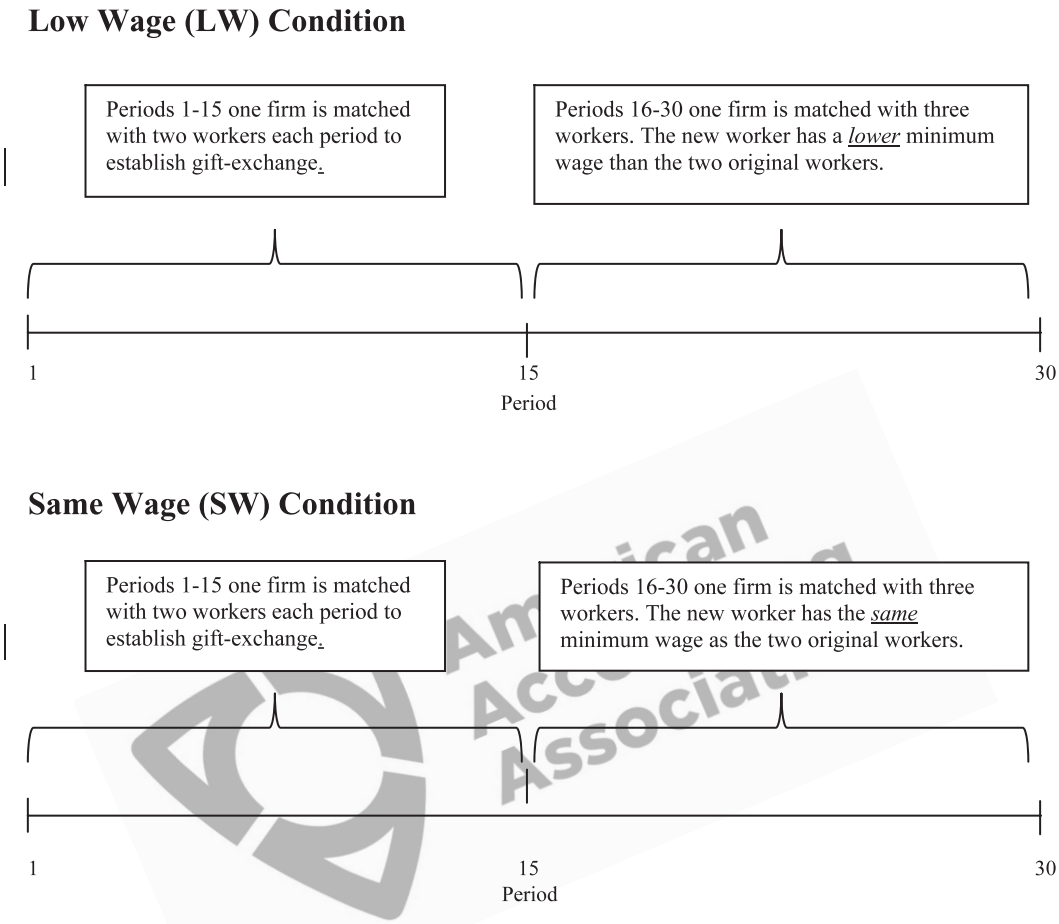
**RQ:** How does hiring a new lower-wage worker, as compared to a new same-wage worker, affect firm profit, workers' payoffs, and social welfare?

## IV. METHOD

### Overview

As explained earlier, we are primarily interested in firm and worker behavior when firms can hire a new lower-minimum-wage worker in the second half of the experiment. However, as shown in Figure 1, our experiment consisted of two conditions: Low Wage (LW) and Same Wage (SW).

**FIGURE 1**
**Experimental Design**




During the first 15 periods, the procedures are exactly the same in the Low Wage (LW) and Same Wage (SW) conditions. During the first 15 periods, there are nine firms and 18 workers that participate in the labor market in each experimental session. Each firm is randomly matched with two workers each period. Starting with period 16, in both conditions, each of the nine firms is now matched with three workers. The additional worker results in an increase in the labor supply from 18 to 27 workers. In the Low Wage condition, the additional worker can be hired at a lower minimum wage (10) than the two original workers (20). In the Same Wage condition, the additional worker has the same minimum wage (20) as the two original workers.

In both conditions, a session consisted of 30 periods, which were divided into two 15-period halves. In the second half of the experiment, the labor supply increased by one new worker in both conditions. In the LW condition, the new worker entering the market in the second half of the experiment had a lower minimum wage than the original workers, whereas in the SW condition, the new worker entering the market had the same minimum wage as the original workers.

The SW condition controls for the fact that two things change in the second half of the LW condition, i.e., firms can hire a worker with a lower minimum wage and the labor supply increases. Because the labor supply also increases in the SW condition, the only difference between the LW and SW conditions is that firms can hire a new worker with a lower minimum wage in the LW condition. This design allows us to isolate the effect of hiring a new worker with a lower minimum wage by comparing results in the LW condition to those in the SW condition.

One hundred forty-four participants completed our experiment in an experimental economics laboratory using Fischbacher's (2007) z-Tree software. The participants were recruited online from a pool of approximately 1,300 individuals using Greiner's (2004) ORSEE software.[6] We conducted two separate experimental sessions for each condition. Each session had 36 participants, for a total of 144 participants (36 participants × 4 sessions).

During the first half of each experimental session, the procedures were identical for the LW and SW conditions. In both conditions, nine randomly chosen participants did not participate in the first half of the session. These participants were in the lab with all other participants when the experimental instructions were read aloud, but did not observe what happened or receive any feedback regarding the outcomes for the other participants in the first half of the experiment. Rather, they answered trivia questions for money during the first 15 periods. The remaining 27 participants were assigned either to the role of a firm or a worker (nine firms and 18 workers) and kept these assigned roles throughout the session.

During the first half of each session, one firm was randomly rematched with two workers each period. Because firms and workers were randomly rematched each period, participants never knew with whom they were matched during the session.[7] Thus, in some sense, all workers who are hired by a firm in a period are new to that firm for that period. However, this is not what we mean when we describe a worker as a "new worker." Rather, we use the label "new" to describe the group of workers who did not participate in the first half of the experiment, but who then entered the labor pool in the second half of the experiment and could be hired to replace an original worker. We use the label "original" to describe the group of workers who participated in the first half of the experiment and the label "remaining original" to describe the group of workers who participated in the first half of the experiment and then were hired in the second half of the experiment along with a new worker.

As in the first half of each session, each firm was randomly rematched each period with workers in the second half of the experiment. However, now each firm was rematched with *three* workers each period rather than two. Two of the workers matched with the firm were "original" workers who had participated in the first half of the experiment. The third worker was a "new" worker who did not participate in the first half of the experiment. The "new" worker in the LW condition had a lower minimum wage than the two original workers, while the "new" worker in the SW condition had the same minimum wage as the two "original" workers.[8]

Amounts in the experiment were expressed in laboratory dollars. At the end of each experimental session, participants' cumulative earnings in laboratory dollars were converted to U.S. dollars.[9] Participants were then paid their earnings from the experiment, as well as their $5.00 participation fee, in cash.

[6] We recruited our participants from the subject pool used by an experimental economics laboratory. This subject pool consists primarily of undergraduate and graduate students from a large public U.S. university, but also includes a small percentage of non-students.

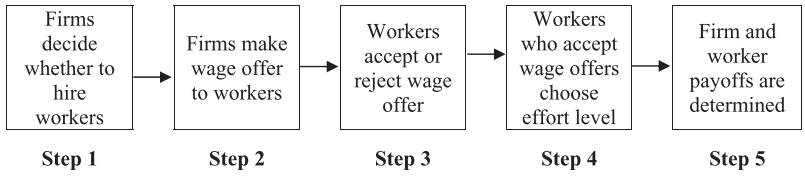
[7] We randomly rematched workers and firms to be consistent with prior gift-exchange studies (Brandts and Charness 2004; Falk et al. 2006; Charness and Kuhn 2007; Gachter and Thoni 2010) and also to develop clear economic predictions for our setting. Randomly rematching workers prohibits individual reputation formation and allows clear economic predictions.

[8] Our experiment examines the effect of a change in the existing labor market (i.e., the introduction of new workers with different minimum wages) in an environment with a series of repeated anonymous interactions. As such, we follow designs used in previous economic experiments such as Fehr and Gachter (2000), Falk et al. (2006), and Owens and Kagel (2010), in which participants are randomly and anonymously rematched throughout the experiment and in which a market change is implemented during the course of the experiment.

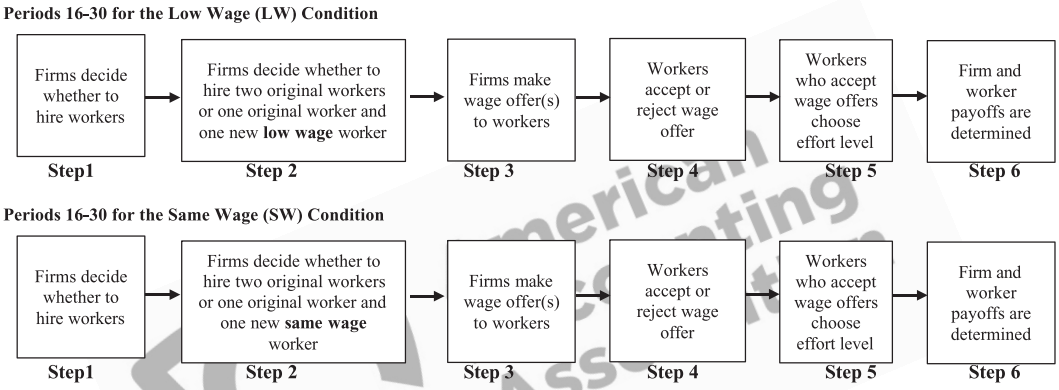
[9] In order to keep payoffs similar for firms and workers, firms had a conversion rate of 100 laboratory dollars = $1 U.S., while workers had a conversion rate of 50 laboratory dollars = $1 U.S.

**FIGURE 2**
**Experimental Timelines**

**Panel A: Timeline for Periods 1–15 for both the Low Wage (LW) and Same Wage (SW) Conditions**




**Panel B: Timelines for Periods 16–30**




## Detailed Procedures

### *First Half of the Experiment*

The specific steps for the first half of the experiment for both conditions are shown in Panel A of Figure 2. In Step 1, each firm was randomly matched with two workers, and firms decided whether to hire those workers. If a firm decided not to hire the workers for the period, then the period ended and both the firm and the workers received zero payoffs for that period. In Step 2, if a firm decided to hire the workers for the period, then the firm decided what wage to offer the workers. The firm made a single wage offer to both workers. Both firms and workers were explicitly informed that possible wage offers ranged from 20 to 120 in increments of 1.

In Step 3, after a firm made its wage offer, both workers learned the wage offer and decided whether to accept or reject it. If a worker rejected the wage offer, then that worker earned nothing for the period and the firm received no payoff from that worker for that period. If a worker accepted the wage offer, then the worker chose an effort level in Step 4. Workers could choose effort levels between 0.1 and 1.0. The higher the effort level a worker chose, the higher the effort cost incurred by that worker (see Table 1).

In Step 5, firms learned each of their workers' effort choices, and the firm and worker payoffs were determined. If a worker accepted an offer, then his or her payoff was determined as: *Worker payoff* = *Wage* − *Cost of effort*. The firm's payoff for each worker was determined separately as:

**TABLE 1**

**Possible Effort Levels and Associated Costs for Workers**

| Effort Level | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 |
|---|---|---|---|---|---|---|---|---|---|---|
| Cost | 0 | 1 | 2 | 4 | 6 | 8 | 10 | 12 | 15 | 18 |

*Firm payoff* = (120 − *Wage*) × *Worker's effort level*.[10] These payoff functions, as well as the range of possible wage offers and the effort-cost schedule, are the same as those used in prior gift-exchange studies (Hannan et al. 2002; Hannan 2005; Kuang and Moser 2009, 2011).

All participants were informed of both payoff functions. In addition, at the start of the session, all participants were provided with a table that showed both the firm and worker payoff for all possible wage and effort combinations and were allowed to refer to this table throughout the session. At the end of each period, both firms and workers were shown their payoff for the period and how it was calculated, along with a history of their payoffs from all prior periods. The procedures described above were repeated in each of the first 15 periods of each session.

### *Second Half of the Experiment*

The steps for the second half of each experimental session are shown in Panel B of Figure 2. There are two differences between the first and second halves of each session: First, participants who did not participate in the first half of the experimental session now joined the session as a third worker in the randomly formed firm-worker groups. That is, in the second half of the session, each firm was randomly rematched each period with three workers rather than two. However, as in the first half, firms could still only hire two workers. Second, the new worker matched with each firm had either a lower minimum wage of 10 (LW condition) or the same minimum wage of 20 as the two original workers (SW condition). The two original workers in both conditions continued to have the same minimum wage of 20 that they had in the first half of the session. All firms and both the new and original workers in both conditions were explicitly informed of the range of wage offers that could be made in their condition.

The detailed steps for the second half of the experiment are shown in Panel B of Figure 2 (LW condition on top, SW condition on bottom). The differences between the conditions are in Steps 2, 3, and 4. In Step 2, the firm could hire the two original workers with the same minimum wage of 20 or, alternatively, could hire one original worker and one new worker with a lower minimum wage of 10 in the LW condition or one new worker with the same minimum wage of 20 in the SW condition.[11] In Step 3, if a firm decided to hire two original workers, then the firm could make a single wage offer to the two original workers. Alternatively, if a firm decided to hire one original worker and one new worker, then the firm could make one wage offer to the new worker and a

[10] We adopted this profit function for the reasons provided in Kuang and Moser (2011). That is, we adopted it from prior studies (Fehr et al. 1997; Fehr, Kirchler, Weichbold, and Gachter 1998; Hannan et al. 2002; Hannan 2005; Kuang and Moser 2009) so that we could extend such work on reciprocity between firms and their workers. "Consistent with these earlier studies, we chose not to use the more conventional profit function (i.e., *firm profit* = 120*e* − *w*) to avoid possible negative payoffs for the firm, which are typically not allowed under institutional review board rules and could induce loss aversion (Tversky and Kahneman 1991). Prior research has shown that reciprocity between firms and employees holds under both the more conventional profit function and the profit function used in our study (Fehr et al. 1997, 1998)" (Kuang and Moser 2011).

[11] Because lower wage offers could be made to the new workers in the second half of the LW condition than could be made to workers in the first half of the condition, all participants in the LW condition were provided with an additional payoff table at the start of the second half of each experimental session that provided the firm and worker payoff for all possible wage and effort combinations, including those for the lower wage offers that could be made to the new workers.

different wage offer to one of the two original workers.[12] The specific original worker receiving the wage offer was randomly determined.

In Step 4, workers receiving a wage offer decided whether to accept or reject it. Because the firm could only hire two of the three workers, at least one of the three workers did not receive a wage offer. For example, if the firm made a wage offer to the two original workers, then the new worker did not receive a wage offer, while if the firm made one wage offer to the new worker and a second wage offer to an original worker, then the other original worker did not receive a wage offer. If either worker receiving a wage offer rejected the offer, then that worker received a zero payoff for the period. If a wage offer was rejected, then the firm was able to make a wage offer to the third worker who did not initially receive a wage offer.[13] The other steps (1, 5, and 6) are the same in both the LW and SW condition. These procedures were repeated for each period for periods 16–30 in the second half of the experiment.

## V. RESULTS

### Descriptive Statistics

Table 2 presents the number of wage offers made and the number of wage offers accepted by condition (Panel A), the number of wage offers accepted by worker type and by condition (Panel B), and a reconciliation of the number of the observations used in our statistical tests (Panel C). Firms almost always made wage offers (2,132 offers out of 2,160 opportunities = 98.7 percent of the time) and workers almost always accepted the firm's wage offer (2,083 acceptances out of 2,132 offers = 97.7 percent of the time). Because only 2.3 percent of firms' wage offers were rejected, we use accepted wage offers in all of our statistical tests except where noted.[14] Table 3 presents descriptive statistics for our dependent variables for the first half (Panel A) and second half (Panel B) of the experiment.

To provide a broad overview of firms' behavior, Table 4 reports the frequency with which firms made higher, lower, and equal wage offers to new workers as compared to remaining original workers in the LW and SW conditions. Consistent with our expectation that firms will make lower wage offers to new workers in the LW than in the SW condition, firms made lower wage offers to

[12] In the LW condition, the second-half instructions informed participants that the new worker had a low minimum wage, but that the other two original workers continued to have the same high minimum wage that they had in the first half of the experiment. The instructions provided to SW condition participants did not make this distinction or use the term "minimum wage" because there was no difference between the minimum wage that could be offered to the new worker and the minimum wage that could be offered to the two original workers. This difference in wording across the two conditions could have caused the salience of the minimum-wage concept to differ across conditions and, thus, have an effect on participant behavior across conditions separate from our manipulation of a lower minimum wage for the new worker in the LW condition than in the SW condition. However, consistent with our results being driven by our manipulation and not by a difference in the salience of the minimum-wage concept across conditions, we find that firms made lower wage offers to *new* workers in the LW condition than in the SW condition, but did not make different wage offers to the *original* workers (who have the same minimum wage) across the LW and the SW conditions. Because any difference in the salience of the minimum-wage concept across the LW and SW conditions was present both when firms made wage offers to new workers and when firms made wage offers to original workers, this pattern of results suggests that participant behavior was affected by our manipulation and not by any difference in the salience of the minimum-wage concept across our conditions.

[13] There are two possibilities: (1) The initial wage offer went to the two original workers and one or both of them rejected the offer. In this case, the firm was allowed to make a new wage offer to the new worker, who could then either accept or reject it; (2) There were two separate initial wage offers, one to an original worker and the other to the new worker, and either worker rejected his or her offer (or both workers rejected their offers). In such cases, the initial wage offer to the original worker went to the second original worker, who could then either accept or reject it. As described in more detail later, very few wage offers were rejected and, thus, these possibilities almost never actually occurred.

[14] For completeness, we also conducted our statistical tests using all wage offers. The results do not change any of the statistical inferences reported in the paper.

**TABLE 2**

**Summary Statistics: Wage Offers**

**Panel A: Frequency of Wage Offers, Acceptances, and Rejections by Condition**

| | LW Condition | SW Condition | Total |
|---|---|---|---|
| Total opportunities for wage offers | 1080 | 1080 | 2160 |
| No wage offer made | 18 | 10 | 28 |
| Initial wage offers made | 1062 | 1070 | 2132 |
| Initial wage offers rejected | 33 | 16 | 49 |
| Initial wage offers accepted | 1029 | 1054 | 2083 |

**Panel B: Frequency of Accepted Wage Offers by Condition and Worker Type**

| | First Half | 2nd Half—New Workers | 2nd Half—Remaining Original Workers | 2nd Half—Both Original Workers | Total |
|---|---|---|---|---|---|
| LW Condition | 505 | 198 | 203 | 123 | 1029 |
| SW Condition | 523 | 173 | 172 | 186 | 1054 |
| Total | 1028 | 371 | 375 | 309 | 2083 |

**Panel C: Frequency of Accepted Wage Offers Used for Statistical Tests**

| | 2nd Half—New Workers | 2nd Half—Remaining Original Workers | Total |
|---|---|---|---|
| H2 and H3 | 371 | NA | 371 |
| H4 | NA | 375 | 375 |
| RQ—tests involving new workers | 371 | NA | 371 |
| RQ—tests involving remaining workers | NA | 375 | 375 |



the new worker than to the remaining original worker nearly three times as often (146 times) in the LW than in the SW condition (50 times), but this pattern reverses for equal wage offers, i.e., only 39 equal wage offers in the LW condition, but 101 in the SW condition. These data provide initial evidence that firms that decide to replace an original worker with a new worker make lower wage offers to the new worker when the new worker has a lower minimum wage. Formal support for this interpretation of our results is provided in our tests of H2.

### Test of H1 (Hiring of New Workers)

H1 predicts that firms will hire new workers more often in the LW condition than in the SW condition. Firms in each condition had 270 opportunities to hire a new worker in the second half of the experiment (18 firms × 15 periods in each condition).[15] Firms in the LW condition made wage

[15] We use all wage offers to test H1 because H1 is concerned with the firm's intention to hire or not hire a new worker in the second half of the experiment.

**TABLE 3**

**Average Wage Offer, Effort, Firm Profit, Worker Payoff, and Social Welfare**

**Panel A: Periods 1–15**

| | LW Condition[a] (n = 505) | SW Condition[a] (n = 523) |
|---|---|---|
| Wage Offer | 59 | 52 |
| Effort | 0.38 | 0.38 |
| Firm Profit | 21 | 24 |
| Worker Profit | 55 | 48 |
| Social Welfare | 76 | 71 |

**Panel B: Periods 16–30**

| | LW Condition | | | | SW Condition | | | |
|---|---|---|---|---|---|---|---|---|
| | Remaining Original[b] (n = 203) | New[c] (n = 198) | Both Original[d] (n = 123) | All[e] (n = 524) | Remaining Original[b] (n = 172) | New[c] (n = 173) | Both Original[d] (n = 186) | All[e] (n = 531) |
| Wage Offer | 50 | 42 | 64 | 50 | 49 | 48 | 52 | 49 |
| Effort | 0.27 | 0.24 | 0.34 | 0.28 | 0.33 | 0.30 | 0.32 | 0.32 |
| Firm Profit | 17 | 17 | 18 | 17 | 21 | 20 | 20 | 20 |
| Worker Profit | 48 | 39 | 60 | 47 | 45 | 45 | 48 | 46 |
| Social Welfare | 65 | 56 | 78 | 64 | 66 | 64 | 68 | 66 |

[a] Data when the firm hired two original workers in the first 15 periods of the experiment.
[b] Data for the remaining original workers when the firm hired a new worker in the second half of the experiment.
[c] Data for the new workers when the firm hired a new worker in the second half of the experiment.
[d] Data for the original workers when the firm did not hire a new worker, but rather hired the two original workers in the second half of the experiment.
[e] Data for all accepted initial wage offers in the second half of the experiment.

offers to the new worker 77 percent (207/269) of the time, whereas firms in the SW condition did so 65 percent (176/270) of the time.[16]

We formally test H1 by comparing the frequency of hiring a new worker with a lower minimum wage in the LW condition to the frequency of hiring a new worker with the same minimum wage in the SW condition. We estimate a logistic regression with *New Worker* as the dependent variable, and *LW Condition* as a dichotomous independent variable.[17] *New Worker* equals 1 (0) if the firm hired (did not hire) a new worker. *LW Condition* equals 1 (0) for the LW (SW) condition. As shown for Model 1 in Panel A of Table 5, *LW Condition* is positive and marginally significant ($z = 1.44$, $p = 0.08$), providing modest support for H1.[18] That is, firms were more likely to hire new workers when this option became available in the LW condition than in the SW condition.

[16] The total number of decisions in the LW condition is 269 because, in one case, a firm in the second half of the LW condition chose not to hire any workers.
[17] To control for repeated measures, standard errors for all tests reported in the paper are estimated using Huber-White corrected standard errors clustered by participant.
[18] All reported p-values are one-tailed for directional predictions and two-tailed otherwise.

**TABLE 4**

**Firms' Wage Offers to New Workers versus Remaining Original Workers by Condition**

| | LW Condition | | SW Condition | |
|---|---|---|---|---|
| | **Frequency** | **Mean Difference[a]** | **Frequency** | **Mean Difference[a]** |
| Higher Wage Offer to New Worker[b] | 22 | (20.64) | 25 | (19.36) |
| Equal Wage Offers[c] | 39 | 0 | 101 | 0 |
| Lower Wage offer to New Worker[d] | 146 | 16.58 | 50 | 12.28 |
| Total | 207 | 9.50 | 176 | 0.74 |

[a] Mean Difference = mean of the difference between the wage offer made to the remaining original worker and the wage offer made to the new worker.
[b] Higher Wage Offer to New Worker = cases in which the wage offer made to the new worker was higher than the wage offer made to the remaining original worker.
[c] Equal Wage Offers = cases in which the wage offer made to the new worker was the same as the wage offer made to the remaining original worker.
[d] Lower Wage Offer to New Worker = cases in which the wage offer made to the new worker was lower than the wage offer made to the remaining original worker.

Although, as reported above, we find that firms are more likely to hire a new worker when that new worker has a lower minimum wage than the same minimum wage, Figure 3 shows that that this difference decreases with experience. To examine this further, we compared firms' decisions to hire new workers in the earlier versus later periods in the second half of the experiment. We repeated the regression reported above including a dichotomous variable for *LaterPeriod* (equal to 1 [0] if the observation is from the last eight periods [first seven periods]) and the interaction variable *LaterPeriod* × *LW Condition*. Consistent with the pattern in Figure 3, the results for Model 2 in Panel A of Table 5 yield a significant *LaterPeriod* × *LW Condition* interaction ($z = -2.19$, $p = 0.03$).[19] Thus, the tendency to hire new workers more frequently in the LW condition than in the SW condition was less pronounced in the later periods.

### Test of H2 (New Worker Wages)

H2 predicts that firms will make lower wage offers to new lower-wage workers in the LW condition than to new same-wage workers in the SW condition. We test H2 using a random-effects regression with *NW Wage* as the dependent variable and *LW Condition* and *First-Half Wage* as independent variables.[20] *NW Wage* is equal to the wage offer made to the new worker in the second half of the experiment. *LW Condition* is defined as described for our tests of H1. *First-Half Wage* is the average wage paid by each firm in the first half of the experiment. We control for *First-Half*

[19] Because this result provides evidence of a difference in behavior over time between the LW and SW conditions, we conducted all tests reported in the paper controlling for the effect of period both as an ordinal variable using each period and also as a dichotomous variable by splitting periods into an early period group (periods 16–22) and a late period group (periods 23–30). Because controlling for period did not change any of our statistical inferences, we do not include period in the regression models reported in the paper.

[20] Consistent with prior research (Brandts and Charness 2004; Gachter and Thoni 2010; Owens and Kagel 2010), we use Generalized Least Squares (GLS) random-effects models in this test, as well as in all subsequent tests, because the variation across participants is assumed to be random and uncorrelated with the independent variables in our models. Our results are unchanged when we instead conduct Ordinary Least Squares (OLS) regressions.

**TABLE 5**

**Tests of H1 and H2**

**Panel A: Tests of H1**

| | Coefficient | z-value | p-value[h] |
|---|---|---|---|
| Model 1: *New Worker*[a] $= \alpha_1 + \alpha_2$*LW Condition* $+ \varepsilon$. | | | |
| Constant | 0.63 | 2.44 | 0.02 |
| *LW Condition*[b] | 0.58 | 1.44 | 0.08[c] |
| Wald Chi-square | 2.07 | | |
| Number of observations | 539 | | |
| Model 2: *New Worker*[a] $= \alpha_1 + \alpha_2$*LW Condition* $+ \alpha_3$*Period* $+ \alpha_4$*Period* $\times$ *LW Condition* $+ \varepsilon$. | | | |
| Constant | 0.74 | 2.68 | <0.01 |
| *LW Condition*[b] | 1.17 | 2.57 | 0.01 |
| *LaterPeriod*[d] | −0.18 | −0.86 | 0.39 |
| *LaterPeriod* $\times$ *LW Condition*[e] | −0.87 | −2.19 | 0.03 |
| Wald Chi-square | 13.24 | | |
| Number of observations | 539 | | |

**Panel B: Test of H2**

| | Coefficient | z-value | p-value[h] |
|---|---|---|---|
| Model: *NW Wage*[f] $= \alpha_1 + \alpha_2$*LW Condition* $+ \alpha_3$*First-Half Wage* $+ \varepsilon$. | | | |
| Constant | 4.06 | 0.51 | 0.61 |
| *LW Condition*[b] | −10.66 | −2.92 | <0.01 |
| *First-Half Wage*[g] | 0.85 | 6.21 | <0.01 |
| Wald Chi-square | 46.09 | | |
| Number of observations | 371 | | |

[a] *New Worker* is an indicator variable that equals 1 (0) if the firm chooses to hire (not to hire) a new worker.
[b] *LW Condition* is an indicator variable that equals 1 (0) if the firm is in the LW (SW) condition.
[c] One-tailed p-value based on the directional prediction for this variable; all other p-values presented are two-tailed p-values.
[d] *LaterPeriod* is an indicator variable that equals 1 if the observation is in the last eight periods of the second half of the experiment.
[e] *LaterPeriod* $\times$ *LW Condition* is the interaction between the *LaterPeriod* and *LW Condition* variables.
[f] *NW Wage* is the wage offer made to the new worker in the second half of the experiment.
[g] *First-Half Wage* is equal to the average wages paid by each firm in the first half of the experiment.
[h] p-values are estimated using Huber-White corrected standard errors clustered by participant.

*Wage* in this regression because we expect a positive relation between a firm's wage offers in the first and second halves of the experiment.

Consistent with H2, the results of the regression reported in Panel B of Table 5 show that *LW Condition* is negative and significant ($z = -2.92$, $p < 0.01$), indicating that firms made lower wage offers to new workers in the LW condition than in the SW condition. This result is consistent with firms expecting that the new workers will use their lower minimum wage as a reference point when evaluating the size of the gift in the firm's wage offer and, therefore, trusting the new workers to reciprocate the firm's lower wage offer with effort similar to that provided by the higher-wage workers for a higher wage. In addition to supporting H2, the results reported in Panel B of Table 5

**FIGURE 3**
**Firms' Decisions to Hire New Workers**

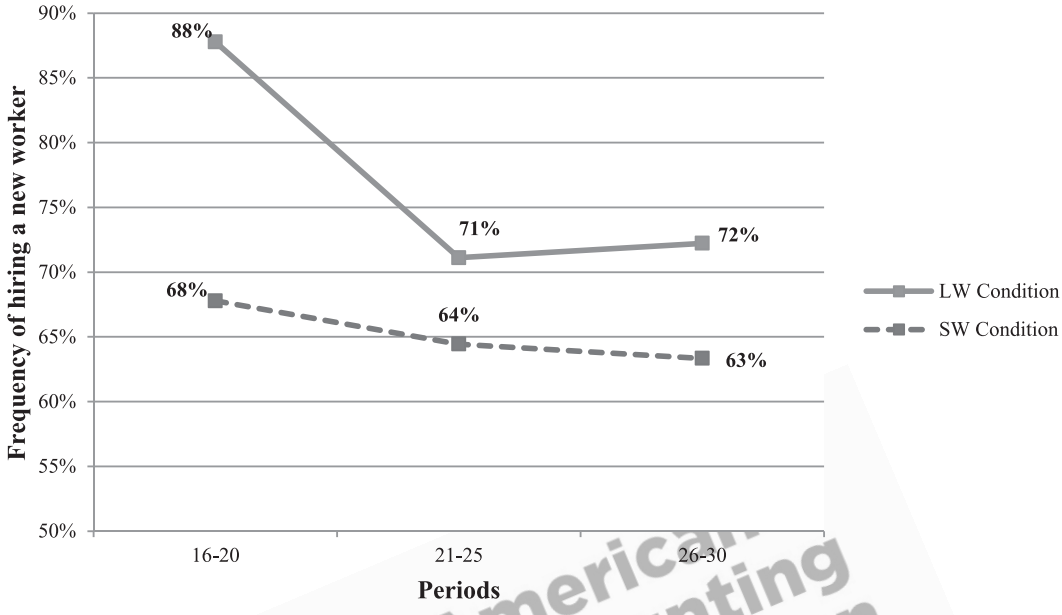



Figure 3 presents firms' decisions to hire new workers in the LW and SW conditions during the second half of the experiment. The percent of time firms hired new workers is calculated as the number of times firms chose to hire new workers divided by the total number of hiring decisions made by firms. Overall, in the LW condition, firms chose to hire new workers 77 percent (207/269) of the time and firms in the SW condition chose to hire new workers 65 percent (176/270) of the time.

show that, as expected, *First-Half Wage* is a significant predictor of the wages offered to new workers in the second half of the experiment.

Although, as reported above, firms in the LW condition hired new workers and paid them a lower wage when this option was available, it appears that this option was more attractive to certain types of firms. Most firms engaged in gift exchange in the first 15 periods, as evidenced by the fact that very few firms offered the lowest wage possible. However, some firms offered wages well above the minimum wage (i.e., the more-trusting firms), while other firms offered lower wages (i.e., the less-trusting firms). LW-condition firms that offered lower wages in the first half of the experiment were more likely to hire new lower-wage workers in the second half of the experiment. Specifically, although the overall average wage offer made by LW-condition firms in the first half of the experiment is 59, the average first-half wage offers of LW-condition firms that hired new workers more frequently in the second half of the experiment is only 54, whereas the average first-half wage offers of LW-condition firms that hired new lower-wage workers less frequently in the second half of the experiment is 63.[21] Thus, hiring new workers with a lower minimum wage in the LW condition was apparently more attractive to firms that made lower wage offers in the first half

[21] Firms who hired new lower-wage workers more than two-thirds of the time were classified as doing so more frequently. The wage offers of firms who hired new lower-wage workers more frequently (54) are significantly lower ($t = 4.13$, $p < 0.01$) than the wage offers of firms who hired new lower-wage workers less frequently (63).

of the experiment.[22] Because new workers in the SW condition had the same minimum wage in the second half of the experiment as the original workers, this pattern of behavior did not occur in the SW condition.

**Test of H3 (New Worker Effort)**

H3 predicts that new lower-wage workers will provide greater effort for a given wage than new same-wage workers because new lower-wage workers will perceive their wage offers to include larger gifts. New workers in the LW condition could view a given wage offer as including a larger gift because they have a lower minimum wage than new workers in the SW condition. Therefore, the difference in minimum wages across the two conditions captures whether new workers evaluate their wage offers relative to their minimum wage. Accordingly, we test H3 by comparing new workers' effort responses in the LW condition to that of new workers in the SW condition using a regression with the new workers' effort, *NW Effort,* as the dependent variable, and *LW Condition* as our primary independent variable.

*LW Condition* is the same dichotomous variable for condition as used in our tests of H1 and H2. *NW Wage* and *Wage Diff* are included in the regression as control variables. *NW Wage* is the new worker's wage, and *Wage Diff* is the difference between the new worker's wage and the remaining original worker's wage. We control for new workers' wages because prior gift-exchange studies document a positive association between the wages and effort (e.g., Fehr et al. 1993, 1996) and because this also controls for any possible differential firm-level effects across conditions. We control for any difference between new workers' wages and the remaining original workers' wages because such wage differences have been shown to affect worker effort in some settings. Controlling for these variables allows us to isolate any effect of a lower minimum wage beyond the normal gift-exchange response and any response to wage differences between the new and remaining original workers.

The results reported for Model 1 in Panel A of Table 6 indicate that our primary variable of interest, *LW Condition,* is not significant ($z = -0.33$, $p = 0.37$), suggesting that, inconsistent with H3, new workers did not evaluate the size of the gift in their wage based on their lower minimum wage. Moreover, *NW Wage* is significantly related to effort ($z = 5.18$, $p < 0.01$), which is the typical gift-exchange result. Thus, new workers in both the LW and SW conditions appear to have based their effort only on their absolute wage level, lowering their effort in response to their lower wages. Finally, *Wage Diff* is not significant ($z = 0.46$, $p = 0.64$).[23]

Although the analysis reported above shows that, on average, new workers did not evaluate the size of the gift in their wage relative to their lower minimum wage, that analysis cannot tell us whether the lower minimum wage in the LW condition had a different effect on new worker effort at different levels of wages. To test this, we repeat the regression reported above including the interaction term *NW Wage* × *LW Condition*. The results are reported for Model 2 in Panel A of Table 6. The interaction term is marginally significant ($z = -1.74$, $p = 0.08$), providing modest evidence that the impact of condition on new worker effort depends on the wage level. Panel A of Figure 4 depicts

[22] Because this result shows that different types of firms may be self-selecting into hiring new workers across the LW and SW conditions, it is important to control for this possibility in any tests for which the dependent variable could be affected by such self-selection. We control for this possibility in our tests of H2 and our research question by including a control variable for the average first-half value of the dependent variable at the individual firm level. For example, since the dependent variable in our tests of H2 was the wage offer made to the new worker in the second half of the experiment, we included a control variable for average first-half wage offers made by the firm in our tests of H2. We also control for any possible effects of firm self-selection in our tests of worker effort in H3 and H4 by controlling for the wage offer made by the firm in the second half of the experiment.

[23] This result is consistent with the findings of Charness and Kuhn (2007) and suggests that the new workers in the LW condition believed that their lower wage offers were justified by their lower minimum wage.

**TABLE 6**

**Tests of H3 and H4**

**Panel A: Tests of H3**

| | Coefficient | z-value | p-value[k] |
|---|---|---|---|
| Model 1: *NW Effort*[a] $= \alpha_1 + \alpha_2$*LW Condition* $+ \alpha_3$*NW Wage* $+ \alpha_4$*Wage Diff* $+ \varepsilon$. | | | |
| Constant | 0.05 | 0.95 | 0.34 |
| *LW Condition*[b] | −0.02 | −0.33 | 0.37[c] |
| *NW Wage*[d] | 0.01 | 5.18 | <0.01 |
| *Wage Diff*[e] | 0.0003 | 0.46 | 0.64 |
| Wald Chi-square | 30.56 | | |
| Number of observations | 371 | | |
| Model 2: *NW Effort*[a] $= \alpha_1 + \alpha_2$*LW Condition* $+ \alpha_3$*NW Wage* $+ \alpha_4$*LW Condition* $\times$ *NW Wage* $+ \alpha_5$*Wage Diff* $+ \varepsilon$. | | | |
| Constant | −0.07 | −1.30 | 0.19 |
| *LW Condition*[b] | 0.14 | 2.36 | 0.02 |
| *NW Wage*[d] | 0.01 | 5.05 | <0.01 |
| *NW Wage* × *LW Condition*[f] | −0.003 | −1.74 | 0.08 |
| *Wage Diff*[e] | 0.0003 | 0.44 | 0.66 |
| Wald Chi-square | 39.95 | | |
| Number of observations | 371 | | |

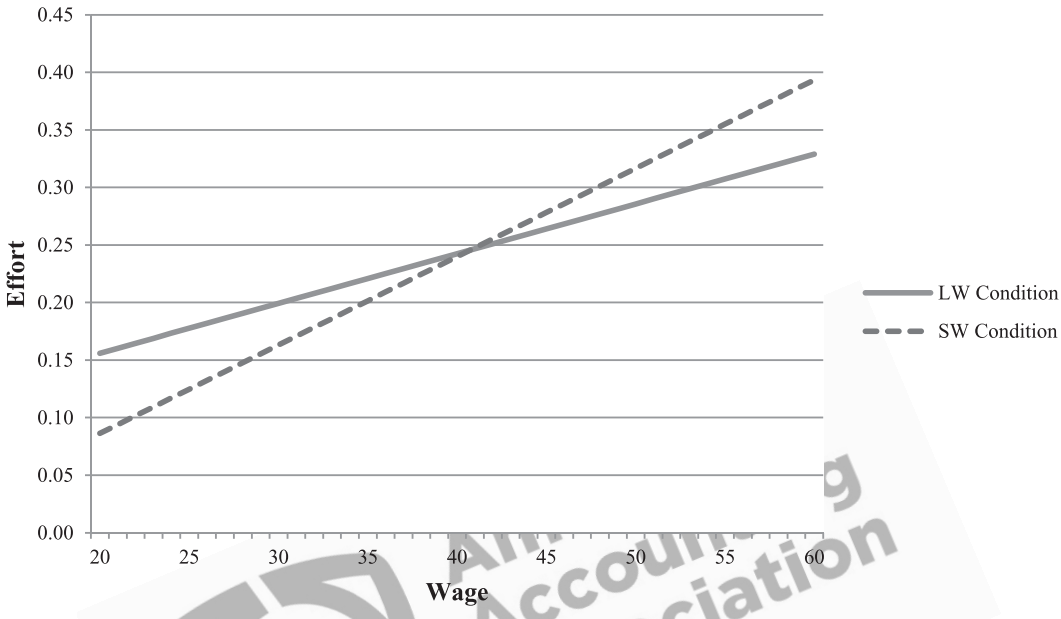
**Panel B: Tests of H4**

| | Coefficient | z-value | p-value[k] |
|---|---|---|---|
| Model 1: *RW Effort*[g] $= \alpha_1 + \alpha_2$*LW Condition* $+ \alpha_3$*RW Wage* $+ \alpha_4$*Wage Diff* $+ \varepsilon$. | | | |
| Constant | 0.07 | 1.58 | 0.11 |
| *LW Condition*[b] | −0.07 | −1.64 | 0.05[c] |
| *RW Wage*[h] | 0.01 | 6.28 | <0.01 |
| *Wage Diff*[i] | 0.001 | 1.00 | 0.32 |
| Wald Chi-square | 49.80 | | |
| Number of observations | 375 | | |
| Model 2: *RW Effort*[g] $= \alpha_1 + \alpha_2$*LW Condition* $+ \alpha_3$*RW Wage* $+ \alpha_4$*LW Condition* $\times$ *RW Wage* $+ \alpha_5$*Wage Diff* $+ \varepsilon$. | | | |
| Constant | −0.03 | −0.51 | 0.61 |
| *LW Condition*[b] | 0.07 | 1.12 | 0.26 |
| *RW Wage*[h] | 0.01 | 5.54 | <0.01 |
| *RW Wage* × *LW Condition*[j] | −0.003 | −1.67 | 0.10 |
| *Wage Diff*[i] | 0.0003 | 0.62 | 0.54 |
| Wald Chi-square | 54.25 | | |
| Number of observations | 375 | | |

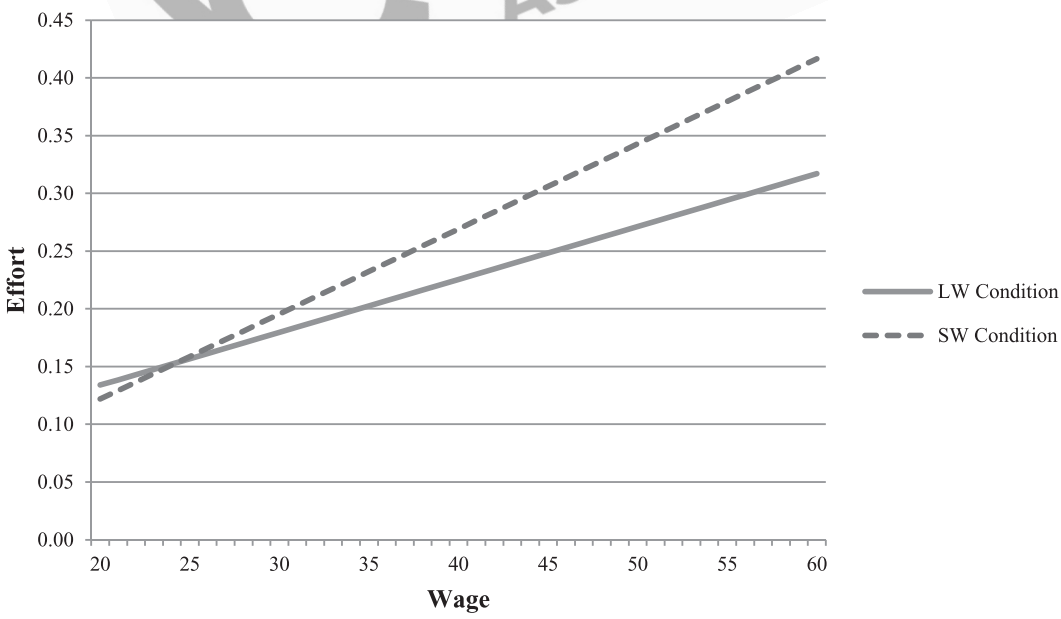
[a] *NW Effort* is the new worker's effort level when the firm hires a new worker.
[b] *LW Condition* equals 1 (0) if the observation is in the LW (SW) condition.
[c] One-tailed p-value based on the directional prediction for this variable; all other p-values presented are two-tailed p-values.
[d] *NW Wage* is equal to the wage offer made to the new worker when the firm hires a new worker.
[e] *Wage Diff* is equal to the wage offer made to the remaining worker minus the wage offer made to the new worker.
[f] *NW Wage* × *LW Condition* is the interaction between the *LW Condition* and *NW Wage* variables.
[g] *RW Effort* is the remaining worker's effort level when the firm hires a new worker.
[h] *RW Wage* is equal to the wage offer made to the remaining worker when the firm hires a new worker.
[i] *Wage Diff* is equal to the wage offer made to the new worker minus the wage offer made to the remaining worker.
[j] *RW Wage* × *LW Condition* is the interaction between the *LW Condition* and *RW Wage* variables.
[k] p-values are estimated using Huber-White corrected standard errors clustered by participant.

**FIGURE 4**
**Wage-Effort Relationship**

**Panel A: New Worker**




**Panel B: Remaining Worker**



the relationship and shows that for wage offers of less than 40, the results are consistent with H3 in that new workers provide more effort for a given wage in the LW condition than in the SW condition. However, for wage offers above 40, workers provide more effort for a given wage in the SW condition than in the LW condition, which is opposite to the relation predicted in H3. While we did not predict this pattern of results, it is consistent with results reported by Owens and Kagel (2010), who only found a positive effect of minimum wages on effort when wages were closer to the minimum wage.

**Test of H4 (Remaining Original Worker Effort)**

H4 predicts that the remaining original workers will respond with lower effort when firms hire a new lower-wage worker than when firms hire a new same-wage worker. We test H4 by examining remaining workers' effort in the LW condition versus the SW condition. Specifically, we estimate a regression with the remaining workers' effort, *RW Effort,* as the dependent variable and *RW Wage, Wage Diff,* and *LW Condition* as independent variables. *LW Condition* is the main variable of interest and is the same dichotomous variable for condition used in our earlier tests. Similar to the regression used to test H3, we control for *RW Wage* and *Wage Diff* in order to isolate any possible effect of *LW Condition* on the remaining workers' effort beyond the effect of wages and differences in wages between the remaining workers and the new workers. *RW Wage* is the remaining original workers' wage and *Wage Diff* is defined as for H3.

The results, which are reported for Model 1 in Panel B of Table 6, show that, consistent with H4, *LW Condition* is significant ($z = -1.64$, $p = 0.05$), indicating that the remaining workers in the LW condition responded with lower effort than the remaining workers in the SW condition. As expected, *RW Wage* also significantly affects effort ($z = 6.28$, $p < 0.01$), which is the typical gift-exchange result. *Wage Diff* is not significantly related to effort ($z = 1.00$, $p = 0.32$), indicating that the remaining workers' effort choices were not significantly influenced by any differences between their wages and the wages of the new workers.

The results reported above describe average remaining original worker behavior for all wage levels, but it is possible that the difference between remaining original workers' effort in the LW and SW conditions varied by wage level. To examine this issue, we repeat the regression reported above including the interaction term *RW Wage* × *LW Condition*. The results of this regression are reported for Model 2 in Panel B of Table 6. The interaction term is marginally significant ($z = -1.67$, $p = 0.10$), providing modest evidence that the impact of condition on remaining worker effort depends on the wage level. Panel B of Figure 4 depicts the relationship between wages and effort for remaining workers in the two conditions. As shown in Figure 4, the remaining workers' negative reaction in the LW condition to the firm's decision to hire a new worker increases as the wage level increases. In summary, Model 1 in Panel B of Table 6 provides support for H4, and Model 2 in Panel B of Table 6 and Panel B of Figure 4 show that this support increases for higher wages.

**Tests of Research Question (Firm Profit, Worker Payoff, and Social Welfare)**

Our research question relates to the effect of hiring a new lower-wage worker versus a new same-wage worker on firm profit, worker payoffs, and social welfare. When the firm hires a new worker, it also hires a remaining original worker. Thus, the impact of hiring a new lower-wage worker versus a new same-wage worker on firm profit and workers' payoffs depends on the impact on both the new and remaining original workers. Because the impact differs for the new and remaining original workers, we first examine the new and remaining original workers separately in our analyses.

**TABLE 7**

**Tests of Research Question**

**Panel A: Tests of Firm Profit**

| | Coefficient | z-value | p-value[h] |
|---|---|---|---|
| Model 1: *NW Profit*[a] $= \alpha_1 + \alpha_2$*LW Condition* $+ \alpha_3$*First-Half Profit* $+ \varepsilon$. | | | |
| Constant | 4.95 | 1.55 | 0.12 |
| *LW Condition*[b] | −1.47 | −0.88 | 0.38 |
| *First-Half Profit*[c] | 0.63 | 4.85 | <0.01 |
| Wald Chi-square | 32.73 | | |
| Number of observations | 371 | | |
| Model 2: *RW Profit*[d] $= \alpha_1 + \alpha_2$*LW Condition* $+ \alpha_3$*First-Half Profit* $+ \varepsilon$. | | | |
| Constant | 6.10 | 1.57 | 0.12 |
| *LW Condition*[b] | −2.34 | −1.55 | 0.12 |
| *First-Half Profit*[c] | 0.65 | 4.28 | <0.01 |
| Wald Chi-square | 25.36 | | |
| Number of observations | 375 | | |

**Panel B: Tests of Worker Payoffs**

| | Coefficient | z-value | p-value[h] |
|---|---|---|---|
| Model 3: *NW Payoff*[e] $= \alpha_1 + \alpha_2$*LW Condition* $+ \alpha_3$*First-Half Payoff* $+ \varepsilon$. | | | |
| Constant | 2.79 | 0.35 | 0.73 |
| *LW Condition*[b] | −10.43 | −3.07 | <0.01 |
| *First Half Payoff*[f] | 0.89 | 5.92 | <0.01 |
| Wald Chi-square | 42.27 | | |
| Number of observations | 371 | | |
| Model 4: *RW Payoff*[g] $= \alpha_1 + \alpha_2$*LW Condition* $+ \alpha_3$*First-Half Payoff* $+ \varepsilon$. | | | |
| Constant | 1.24 | 0.20 | 0.85 |
| *LW Condition*[b] | −2.24 | −0.84 | 0.40 |
| *First-Half Payoff*[f] | 0.92 | 7.76 | <0.01 |
| Wald Chi-square | 60.43 | | |
| Number of observations | 375 | | |

[a] *NW Profit* is equal to the firm's profit from hiring a new worker in the second half of the experiment.
[b] *LW Condition* equals 1 (0) if the firm is in the LW (SW) condition.
[c] *First-Half Profit* is equal to the average profit per worker for each firm in the first half of the experiment.
[d] *RW Profit* is equal to the firm's profit from the remaining worker when hiring a new worker.
[e] *NW Payoff* is equal to the new workers' payoff when they accept an initial wage offer made to them by the firm.
[f] *First-Half Payoff* is equal to each firm's average worker payoff in the first half of the experiment.
[g] *RW Payoff* is equal to the remaining workers' payoff when they accept an initial wage offer made to them by the firm.
[h] p-values are estimated using Huber-White corrected standard errors clustered by participant.

### *Firm Profit*

Model 1 in Panel A of Table 7 presents the results of a regression that compares the firm profit from new workers in the LW condition to firm profit from new workers in the SW condition, while controlling for first-half firm profit. The dependent variable is *NW Profit,* which is the amount of profit the firm earns from each new worker. The two independent variables are *LW Condition* (as defined for our previous tests) and *First-Half Profit* (the average first-half profit for each firm). We

include *First-Half Profit* to control for any differences in firm profits across the LW and SW conditions in the first half of the experiment. Because *LW Condition* measures whether firm profit from new workers differs between the LW and SW conditions, this is the main variable of interest. As shown for Model 1 in Panel A of Table 7, *LW Condition* is not significant ($z = -0.88$, $p = 0.38$), indicating that hiring a new lower-wage worker does not increase the firm's profit from the new worker. Thus, even though firms hired new workers more often and paid them lower wages in the LW condition than in the SW condition, firm profit was not higher in the LW condition than in the SW condition.

We next examine the effect on firm profit from the remaining original worker using the same regression as in Model 1, except that the dependent variable for this analysis is firm profit from the remaining worker (*RW Profit*) rather than *NW Profit*. As shown for Model 2 in Panel A of Table 7, *LW Condition* is marginally significant ($z = -1.55$, $p = 0.12$), indicating that firm profit from the remaining original worker is marginally *lower* when the firm hires a new lower-wage worker.[24] This result is consistent with our earlier tests of H4 that found that the remaining workers reduced their effort when firms hired a new lower-wage worker. Finally, we test the combined effect on firm profit of both new and remaining original workers and find similar results for firm profit between the LW and SW conditions ($p = 0.14$, untabulated) when the firm hires a new worker.

### *Worker Payoff*

Models 3 and 4 in Panel B of Table 7 report the results of regressions that compare worker payoffs when a firm hires a new worker in the LW versus SW condition for the new and remaining original workers, after controlling for first-half worker payoffs. The dependent variables are *NW Payoff* (the new workers' net earnings) in Model 3 and *RW Payoff* (the remaining original workers' net earnings) in Model 4. We include *First-Half Payoff* (the average payoff for each worker in the first half of the experiment) in both models to control for any differences in worker payoff in the first half of the experiment. The variable of interest in both models is *LW Condition* (as defined in previous tests). The results for Model 3 in Panel B of Table 7 show that the new workers' payoffs are lower in the LW condition than in the SW condition ($z = -3.07$, $p < 0.01$), reflecting the fact that the combination of the lower wages they received and the effort they provided resulted in lower payoffs. The results for Model 4 in Panel B of Table 7 show that the remaining original workers' payoffs are not different across the LW and SW conditions ($z = -0.84$, $p = 0.40$). Because new workers' payoffs are lower, the combined payoff for the new and remaining original workers is also significantly lower ($z = -2.28$, $p = 0.02$, untabulated) in the LW condition than in the SW condition when the firm hires a new worker.

With no improvement in firm profit, no difference in the remaining workers' payoffs, and a significant decline in the new lower-wage workers' payoffs, a formal statistical test of social welfare (not tabulated) shows that, as expected, social welfare is lower ($z = -3.71$, $p < 0.01$) in the LW condition than in the SW condition.[25]

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[24] We report a two-tailed p-value because this is a test of a research question in which we did not have an *a priori* directional prediction. However, a one-tailed p-value would also be appropriate because, given that we know from our test of H4 that the remaining workers' effort decreased, the logical direction of the effect on firm profit could only be a decrease.

[25] We also examine the effects when firms chose not to hire new lower-wage workers when the option was available and find that there are no significant differences in wage offers, workers' effort, firm profit, workers' payoffs, or social welfare across the LW and SW conditions (all p-values $> 0.23$). These results increase our confidence that, as hypothesized, the differences across conditions that we document in our main analyses are driven by the firms' decisions to replace an original worker with a new lower-wage worker.

## VI. CONCLUSION

As firms often do in practice, firms in our experiment replaced existing higher-wage workers with new lower-wage workers when this option became available. However, despite paying these new workers lower wages, firm profit did not increase for two reasons. First, the new lower-wage workers provided lower effort in response to lower wage offers and, second, the remaining original workers lowered their effort in response to the firm's decision to replace existing workers with new lower-wage workers. Finally, the decision to hire new lower-wage workers decreased new workers' payoffs and, therefore, social welfare also decreased.

Our results extend prior studies in accounting and economics that investigate the impact of social norms on firm and worker behavior (Fehr et al. 1993; Hannan et al. 2002; Towry 2003; Hannan 2005; Zhang 2008; Kuang and Moser 2009, 2011; Tayler and Bloomfield 2011; Christ et al. 2012). Specifically, we identify unintended costs of replacing existing workers with new lower-wage workers that neither management accountants, who assess the financial feasibility of this strategy, nor firm managers, who ultimately decide whether to adopt this strategy, may anticipate. Anticipating the full effect of replacing existing workers with new lower-wage workers on firm profit is critical because firm managers may not adopt this strategy if they are unsure about the effect on firm profit. Moreover, if hiring new lower-wage workers does not increase firm profit and lowers workers' payoffs, then social welfare declines. Consequently, even if hiring new lower-wage workers is expected to increase firm profit, some firm managers may decide not to take this action because of the potential negative effect on social welfare. Finally, even if firm managers hire new lower-wage workers to increase firm profit despite the potential negative effect on social welfare, government officials may want to establish policies to discourage such behavior.

Although we believe that our setting captures critical aspects of actual field settings in which firms have the option to hire new lower-wage workers, there are, of course, aspects of specific field settings that are not captured in our experiment. For example, we do not examine whether the effects of hiring new lower-wage workers vary depending on any national, ethnic, or cultural differences between the remaining original workers and the new lower-wage workers. Remaining original workers could react more negatively than in our experiment if the new lower-wage workers are from a different country or different ethnic or cultural background, and this could lead to even lower firm profit and social welfare than observed in our experiment. However, it is also possible that new workers in a more distant location would be more aware of, and focused on, the gift in their wage offers than the new workers in our study and, thus, provide more effort than the new workers in our study. Future research could investigate whether and how such ethnic, cultural, or location differences might affect our findings.

Another potential limitation of our study is that we did not allow individual reputation formation via repeated interaction between the same firms and workers. However, we note that allowing such individual reputation formation over multiple periods would not likely affect our results because all of our statistical tests compare outcomes in the LW condition versus the SW condition. Because any such individual reputation effects would likely be similar across these conditions, any differences across the conditions that we identified in our study would likely be similar in a setting with individual reputation. Nevertheless, because our design prevented such individual reputation formation, we cannot be certain whether allowing it would affect our results. Future research could examine whether and how allowing such individual reputation formation would affect firm and worker behavior when the firm can replace a worker with a new lower-wage worker.

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