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The effects of minimum-wage increases on wage offers, wage premiums and employee effort under incomplete contracts☆

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ABSTRACT

We experimentally investigate how increases in legally required minimum wages affect wage offers, wage premiums (i.e., the excess of wages over the minimum wage), and employee effort. Prior research has documented a gift-exchange relationship between firms and employees, whereby higher wage offers lead to higher effort. However, when the minimum wage increases, expectations regarding gift wages may also change. We predict that, following such a change, firms and employees will self-servingly determine their reference point for gift wages. As a result, while firms will increase wage offers, wage premiums will decline, and thus employees will not increase their effort. The results of (1) a laboratory experiment and (2) two online experiments are consistent with our predictions, suggesting that minimum-wage increases can have a negative effect on employee effort. Ultimately, employees respond to equivalent wages differently depending on the context surrounding the wage level. Implications for theory and practice are discussed.

1. Introduction

This study experimentally examines how increases in the legally required minimum wage affect firms' wage offers, wage premiums (i.e., the size by which the wage offered exceeds the minimum wage), and employees' effort in incomplete contracting settings. In the United States, proposals have pushed for an increase from the current federal minimum wage of $7.25 to $10.10 and more recently up to $15 per hour. The Congressional Budget Office (CBO) estimated that raising the federal minimum wage to $10.10 would affect over 16 million workers (CBO, 2014) and, undoubtedly, an increase to $15 would affect millions more. Since the establishment of the federal minimum wage, the majority of states, as well as numerous cities/municipalities, have established their own minimum wages. In January of 2018 alone, minimum-wage increases took effect in 18 states and 20 cities (Donnelly, 2017). Prior economic studies typically evaluate the macro-level effects of the minimum wage, focusing on variables such as overall employment and income distribution (Brown, 1999; Neumark & Wascher, 2008). This study takes a micro-level approach to examine the effects of minimum-wage increases on compensation as a control mechanism within firms in an incomplete contracting environment.

Raising minimum wages may be an effective tool for addressing societal concerns such as "falling real wages for lower decile workers" and "rising earnings inequality" (Freeman, 1996, p. 639). However, scholars and practitioners have expressed concerns that, at the firm level, higher minimum wages increase labor costs and, thus, affect firm profitability (Draca, Machin, & Van Reenen, 2011; Saltsman, 2013, 2016; Wilson, 2012). In fact, recently the city of St. Louis has revoked a municipal minimum-wage increase because of local business groups' concerns about "higher labor costs" (Morath, 2017).[1] On the other hand, prior research in accounting and economics has documented a gift-exchange relationship between

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[1] Elsewhere, the mayor of Baltimore vetoed a proposal for increasing the municipal minimum wage, again due to labor cost concerns (Calvert & Morath, 2017). Outside the United States, in September 2018, the new provincial government of Ontario, Canada froze the former government's plan to increase the minimum wage to C$15 by 2019, in a decision welcomed by business communities (Kelly, 2018).

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wage levels and employee effort, suggesting that offering higher wages can function as an effective control within organizations (Chen & Sandino, 2012; Fehr & Gächter, 2000; Hannan, 2005; Kuang & Moser, 2009, 2011). Along these lines, if paying higher wages motivates employees to provide higher levels of effort, the concerns about the possible negative effect of minimum-wage increases on firm profitability may not be warranted (in fact, the effect could even be positive). Therefore, we explore how legally required increases in the minimum wage influence firms' wage setting and employees' effort provision.

The gift-exchange relationship is founded on reciprocity, whereby employees' response to the firm's wage offer depends on their perception of whether the wage offer represents a "gift" (Falk & Fischbacher, 2006). For our purpose, when the minimum wage increases, individuals potentially can use (1) the absolute wage level or (2) the wage premium (the excess of the wage level over the minimum wage), as a reference for determining a gift. We posit that firms and employees will self-servingly focus on different references: firms are likely to focus on absolute wages (i.e., whether the absolute wage increases after the minimum-wage increase), whereas employees may focus on wage premiums (i.e., whether the absolute wage increases to a level that maintains the same premium). These differing references can reduce the likelihood that firms meet employees' expectations, thus affecting firms' ability to invoke high effort from employees.

In our laboratory experiment, participants take the role of either a firm or an employee and interact over 12 periods. The firm offers a fixed wage and the employee, after accepting the wage offer, makes a costly effort choice. Our experiment consists of three between-participant conditions, including a baseline condition and two treatment conditions. A minimum wage is imposed in all three conditions. We focus on two levels of minimum wages, 37 Lira (an experimental currency) and 51 Lira, from a given range of 0–120 Lira.[2] In the baseline condition, the minimum wage is constant in all 12 periods at the higher level of 51 Lira. In the two treatment conditions, the minimum wage starts off at 37 Lira for the first four periods, and (1) first increases to 44 Lira in the fifth period and then increases to 51 Lira in the ninth period (the gradual condition), or (2) increases to 51 Lira in the fifth period, remaining constant thereafter (the immediate condition).

We predict that, after an increase in the minimum wage, firms and employees will differentially interpret what wage would be a gift. Consequently, the level of firms' absolute wage offers will increase, but the level of wage premiums will likely decrease. Given the declining wage premium, employees' effort will not respond proportionately to the increase in absolute wages. Consistent with our predictions, we find that wages in the two treatment conditions increase to equivalent levels as in the baseline condition when the minimum wage of 51 Lira is in effect across all conditions. On the other hand, after the minimum-wage increase, the level of wage premiums declines in the two treatment conditions. As a result, employees' effort in the two treatment conditions decrease, despite the increase of absolute wages. These results do not significantly differ between the gradual and immediate conditions, suggesting that the pattern of minimum-wage increases does not influence employees' effort decisions.

The results of our laboratory experiment suggest that, after a minimum-wage increase, simply offering higher wages may not be able to increase employees' effort because these wage offers do not satisfy employees' self-serving expectations. Thus, an intriguing question is whether firms could elicit higher effort if they indeed satisfied employees' expectations. To systematically explore this issue and provide additional evidence for our theory, we conduct an online experiment, whereby the minimum wage increases from 37 Lira to 51 Lira as in our laboratory experiment but the discretionary range of firms' wage offers is reduced to provide for greater experimental control. Specifically, under the minimum wage of 37 Lira, firms can only offer a wage of 37 or 56 Lira, and under the minimum wage of 51 Lira, firms can only offer a wage of 56, 65, or 70 Lira. Consistent with the findings of the laboratory experiment, we find that, after the minimum-wage increase, employees *decrease* effort both when the wage does not change (56 Lira) and when the wage increases but with a smaller premium than before (65 Lira). However, we do observe an *increase* in effort if the wage increases to the level that maintains the same premium as before (70 Lira). These findings corroborate our laboratory results, suggesting that after a minimum-wage increase firms can capitalize on gift wages if they fully meet employees' expectations about wage premiums.

Following the same logic, our theory also implies that, if no wage premium were offered after a minimum-wage increase, employees would exploit this wiggle room and withhold effort, despite the increase of absolute wages. To test our theory from this new angle, we design a second online experiment, which is similar to the first online experiment except that firms are only allowed to offer the minimum wage of 37 Lira *before* the minimum-wage increase and the minimum wage of 51 Lira *after* the minimum-wage increase (i.e., there is no room for a wage premium). This design allows us to isolate the mere effect of minimum-wage increases from the effect of wage premiums. As predicted, we find that, after the minimum-wage increase, employee effort does not significantly change despite the higher wages. Overall, our laboratory experiment and two online experiments yield consistent results in support of our theory.

Our study has important implications for theory and practice. Prior minimum-wage studies in experimental economics have not explored how increases in the minimum wage affect behavior, but instead have focused on the absence or presence of a minimum wage (Brandts & Charness, 2004; Falk, Fehr, & Zehndar, 2006; Owens & Kagel, 2010). An absence/presence manipulation is not representative of naturally occurring settings, where a minimum wage is always present. More importantly, in the absence of a minimum wage, a wage premium is undeterminable, so when a minimum wage is introduced there is no prior level of wage premium that employees can use as a benchmark for their self-serving interpretation of a gift wage. Thus, the prior setting is not well suited for testing our research questions. By comparison, in our study, employees experience changes in the minimum wage, and we find that employees focus on changes in wage premiums when making effort decisions.

Our results also make an important contribution to the gift-exchange literature. Prior research suggests that increasing wages is a useful tool for firms to motivate employee effort (Choi, 2014; Hannan, 2005; Kuang & Moser, 2009). However, we find that, with an increase in the minimum wage, effort levels may not increase with absolute wages as had been found in prior studies, when the wage offers do not meet their expectation. Therefore, caution should be exercised before using gift wages as a control strategy because the benefits may be situational.

In terms of practice, increases in the minimum wage not only directly influence "near-minimum-wage" employees,[3] but also have a ripple effect on "above-minimum-wage" employees (Dube,

[2] The choice of an increase to 51 from 37 Lira represents an increase of 38 percent. This is a close match to the proposed change in the federal minimum wage from $7.25 to $10.10, which would be an increase of 39 percent.

[3] It is estimated that about 20.6 million people (or 30 percent of all hourly, non-self-employed workers 18 and older) in the United States are "near-minimum-wage" workers (DeSilver, 2017).

Giuliano, & Leonard, 2019). Specifically, firms may need to raise the wages of "above-minimum-wage" employees for internal equity considerations and/or for retention purposes (i.e., the higher minimum wage makes these employees incrementally less expensive to hire and thus more sought after in the labor market) (Grossman, 1983; Zipperer, 2015). As firms increasingly use gift wages as a control mechanism to induce desirable employee effort (Campbell & Kamlani, 1997; Irwin, 2006), the wage-setting decision can become more complicated when there are mandated changes in the minimum wage. Our results show that firms need to offer wage premiums that are high enough in order to benefit from the minimum-wage increase. Firms should consider such complications in determining wage offers, especially when the firm operates under incomplete contracts. However, our results also suggest that, once the legislation becomes the status quo (as in our baseline condition), the higher wages may prove beneficial through both increased productivity and increased compensation for workers, improving overall social welfare. Additionally, failure to maintain an acceptable level of wage premiums could cause negative externalities in other domains. For instance, perceptions of growing disparity between rising executive compensation and stagnating rank and file compensation, as demonstrated by pay ratio disclosures, can lead consumers to avoid firms viewed as inequitable (Mohan, Schlager, Deshpandé, & Norton, 2018). Firms need to carefully tradeoff between these factors and tailor their control systems to maximize the overall efficiency.

The remainder of this paper is organized as follows. Section 2 provides theoretical background and develops the hypotheses. Section 3 describes the method of our laboratory experiment. Section 4 reports the results of the laboratory experiment and two supplemental online experiments. Section 5 concludes the paper with a summary and discussion.

2. Background and hypotheses development

2.1. Gift exchange between firms and employees

Incomplete contracts are commonplace in organizations (Aghion, Bloom, & van Reenen, 2014). In an incomplete contracting environment, firms cannot perfectly monitor employees, and employees' output is either non-contractible or a noisy measure of their actual effort. As a result, firms often pay employees a fixed wage (Lazear, 1986). From a standard agency perspective, once a fixed wage is offered, the firm has no means to assure greater than minimal effort and, consequently, should only offer the market-clearing wage. However, prior literature shows that firms typically offer wages higher than the market-clearing level and employees offer higher than minimal effort in return (Fehr & Gächter, 2000).[4] This relationship has been formally modeled as a gift exchange (Akerlof, 1982). The gift-exchange model suggests that employees respond to higher compensation with higher effort. This proposition has been supported by numerous field and archival studies (e.g., Bewley, 1999; Blinder & Choi, 1990; Campbell & Kamlani, 1997; Chen & Sandino, 2012) as well as experimental research (Fehr, Gächter, & Kirchsteiger, 1997; Fehr, Kirchsteiger, & Riedl, 1993; Hannan, Kagel, & Moser, 2002; Hannan, 2005; Kuang & Moser, 2009, 2011). These prior findings suggest that gift wages may be an effective component of management control systems. Particularly, gift wages can be used as a control strategy to cope with environmental changes that potentially affect employee effort. For example, offering a signing bonus motivates higher effort when there is an excess supply of labor than when there is an excess demand for labor (Choi, 2014). Increases in wages lead to higher effort when firm profitability decreases than when firm profitability increases (Hannan, 2005).

However, as elaborated later, we propose that increasing wages may not be effective in inducing employee effort when firms face legally required increases in the minimum wage, unless the wage increase meets employees' expectations. Therefore, our study extends this literature by shedding light on the boundary conditions for using gift exchange to induce employee effort in management control practices.

2.2. Choices of reference for gift wages when minimum wages change

The gift-exchange relationship between firms and employees is founded on reciprocity, which is defined as an in-kind response to a kind or unkind act (Dohmen, Falk, Huffman, & Sunde, 2009). This definition suggests a positive association between firms' wage offers and employees' effort. In order to offer a "gift," the firm has to offer a wage above a reference point. While the gift-exchange model assumes that the market-clearing wage is a natural reference (Akerlof, 1982), firms may be constrained in the minimum level of wages that they are legally allowed to offer. We argue that changes in the minimum wage can influence firms' and employees' choices of reference point and, in turn, affect their behavior.

Specifically, in social interactions, individuals seek to achieve a fair outcome, but "the rules of fairness are often ambiguous" (Kahneman, 1992, p. 302). Such ambiguity arises because the judgment of fairness depends largely on the comparison of the outcome against a reference, which is often selected from salient, relevant transactions that have occurred in similar environments (Kahneman, Knetsch, & Thaler, 1986; Wood, 1989). When multiple standards are available that could be used as a reference, people tend to choose the standard that serves their own interest (Babcock & Loewenstein, 1997; Babcock, Loewenstein, Issachraroff, & Camerer, 1995). Relatedly, Shannon (2000, p. 304) suggests that people may opportunistically interpret whether their behavior is compliant with social norms when the norm's "prescriptions and parameters are situationally limited, undefined, or ambiguous." Particularly, in incomplete contracting environments, firms and employees may have divergent, egoistic beliefs about "what each owes the other" (Robinson & Rousseau, 1994, p. 246; Morrison & Robinson, 1997). Such differences in the choice of reference can result in interpersonal conflicts, negatively affecting efficiency (Thompson & Loewenstein, 1992). For our purpose, we posit that, after a minimum-wage increase, firms and employees will focus on different reference points, representing a self-serving bias. As a result, firms' wage offers may not satisfy employees' expectations, failing to induce reciprocity.

2.3. Firms' wage-setting behavior

After a minimum-wage increase, firms need to decide whether to increase wage offers and, more importantly, whether to maintain the same wage premium (the excess of the wage offer over the minimum wage) as before. First, we consider firms' decision regarding whether to increase wage offers. *Before* the minimum-wage increase, firms offer a wage that is lower than, equal to, or higher than the *new increased* minimum wage. When the minimum wage is increased, firms that previously offered a wage lower than the new minimum wage are mandated to increase their wages.

[4] In the experimental labor markets used in prior studies, the market-clearing wage is typically the lowest possible wage that gives the employee a net utility above zero (e.g., Fehr et al., 1993). From a standard economic viewpoint, employees should accept such a wage offer and work for the firm because otherwise they would not earn anything.

Firms that previously offered a wage equal to or higher than the new minimum wage may also feel compelled to increase wages because an increase in the minimum wage represents a pronounced change to the compensation practice and, thus, not responding to such a change would seem difficult to justify (e.g., Bandura, 1999; Kahneman et al., 1986). Along these lines, Falk, Fehr, and Zehndar (2006) compare wage offers in two treatments: one condition in which a minimum wage is present, then removed, and the other where a minimum wage is introduced after being absent. In their study, firms are guaranteed a fixed revenue once the wage offer is accepted and employees have no discretion in effort choice (i.e., employees can only accept or reject a wage offer). Owens and Kagel (2010) use two treatments similar to Falk, Fehr, and Zehnder (2006) but allow employees to choose their effort. These prior studies find that wage offers increase with the change from no minimum wage to the introduction of a minimum wage. We provide a more conservative test of firms' wage offers under less radical but more realistic changes in an established minimum wage. Based on the earlier discussion, we predict that firms will increase wage offers when the minimum wage increases.

The increase in wage offers and the increase in the minimum wage have opposite effects on wage premiums in that the former positively influences wage premiums, whereas the latter negatively influences wage premiums, *ceteris paribus*. Therefore, the net effect on wage premiums depends on whether the increase in wage offers matches the increase in the minimum wage, that is, the firm's decision regarding the amount of wage increase. This decision, in turn, depends on whether the firm uses the absolute wage or the wage premium as a reference for determining the gift for employees. If the firm uses the absolute wage as the reference, any (non-negligible) increase from the prior wage will presumably constitute a gift. On the other hand, if the firm uses the wage premium as the reference, the firm will need to increase wages to a level that contains the same premium as before. As discussed earlier, when making this choice of reference, firms may self-servingly focus on the absolute wage. Consequently, the increase in wage offers may be smaller than the increase in the minimum wage, leading to a decrease in wage premiums.[5]

Overall, we expect that, after a minimum-wage increase, firms will offer higher wages, but lower wage premiums, than before the minimum-wage increase. We formally state our predictions in the following two hypotheses:

H1a. After a minimum-wage increase, firms will offer higher levels of *absolute wages* than before the minimum-wage increase.

H1b. After a minimum-wage increase, firms will offer lower levels of *wage premiums* than before the minimum-wage increase.[6]

2.4. Employees' effort choices

After a minimum-wage increase, employees could use either the absolute wage or the wage premium as a reference for deciding whether the firm offered a gift. In this subsection, we explain, respectively, the effects of absolute wages and wage premiums on employees' behavior if they are used as the reference. We then discuss which effect may play a major role in employees' effort choices. First, we consider the absolute wage. Our H1a predicts that after a minimum-wage increase firms will offer higher wages. Prior research suggests that higher wages lead to higher employee effort (Fehr, Gächter, & Kirchsteiger, 1997; Hannan, 2005; Kuang & Moser, 2009). Particularly, prior economic studies examine employee effort in the absence versus presence of a minimum wage, with mixed findings. Brandts and Charness (2004) compare two conditions with excess labor supply, one with a minimum wage versus one without, and find that the average effort does not significantly differ between these two conditions. However, they do not examine employees' effort responses to dynamic changes in the minimum wage and wage offers. More relevant to our study, Owens and Kagel (2010) find that the introduction of a minimum wage increases wage offers and that, consistent with prior gift-exchange research, the higher wage offers lead to higher effort. These prior findings suggest that, in our setting, if employees use absolute wages as a reference point, the increase in wage offers will have a positive effect on employee effort.

However, we contend that wage premiums have a different effect on employee effort than absolute wages do and that employees are more likely to use wage premiums than absolute wages as the reference point. The effect of wage premiums on employee effort has not been systematically investigated in prior studies that manipulate the absence/presence of minimum wages. In the prior setting (e.g., Owens & Kagel, 2010), when a minimum wage is absent (i.e., zero for a minimum wage), employees are not likely to consider the wage premium as a reference point because the conceptualization of a wage premium is conditional on an unambiguously delineated positive amount for the minimum wage (e.g., Gilchrist, Luca, & Malhotra, 2016). When a minimum wage is introduced, employees could either compare the new wage with the old wage or independently evaluate the wage premium contained in the new wage. In the latter case, employees may find it difficult to evaluate the level of wage premium due to the lack of a distinct prior premium as a benchmark. Consequently, employees may either form diverse expectations about wage premiums or focus instead on the absolute wage, whereby a benchmark (i.e., the old wage) is readily available.[7]

By comparison, in our setting, with a preexisting minimum wage, employees can always disaggregate the wage into the requirement (the minimum wage) and wage premium (the excess wage above the requirement).[8] When the minimum wage is increased, employees could either compare the new wage with the old wage or compare the new wage premium with the old premium. We posit that employees will focus on whether the firm maintains the same premium rather than whether the absolute wage increases because, in incomplete contracting settings, employees often take advantage of their "second mover" position to advance self-interest (Fehr & Schmidt, 1999; Bolton & Ockenfels, 2000). While employees derive utility from both wealth and social-norm compliance (e.g., reciprocity), they make tradeoffs between the two to maximize total utility (Mittendorf, 2006; Rabin, 1993). As a result, if social-norm compliance entails greater wealth losses, it will reduce employees' willingness to comply with the

[5] For example, if the wage offer is 35 under a minimum wage of 20 and 40 under a minimum wage of 30, the increase in wages (5) is smaller than the increase in the minimum wage (10), resulting in a decrease in the wage premium (from 15 to 10).

[6] Falk et al. (2006) and Owens and Kagel (2010) do not examine wage premiums. An *ex post* inspection of Falk et al.'s (2006) results show that wage premiums are lower under a minimum wage (average wage of 238 − the minimum wage of 220 = 18) than under no minimum wage (average wage of 188 − zero = 188), mainly due to the drastic increase in the "floor" from zero to 220. There is a similar pattern in Owens and Kagel's (2010) results, whereby the wage premium is 59 (average wage of 59 − zero) under no minimum wage and 30 under a minimum wage (average wage of 70 − the minimum wage of 40). Because we focus on a much less drastic increase in a preexisting minimum wage, it is not clear *ex ante* whether their results would hold in our setting.

[7] Such heterogeneity in choices of reference could be a possible reason that prior studies yield mixed results.

[8] Research in mental accounting has shown that individuals are acute at categorizing different forms of compensation such as base pay and bonus (Thaler, 1985, 1999).

norm, pushing them toward self-interest (Hannan, Rankin, & Towry, 2006; Luft, 1997).

Hence, employees may be reluctant to increase effort even if firms offer higher wages. In order to justify this behavior, employees may assess firms' wage offers in a self-serving manner. Because the higher wages are offered due to a mandated increase in the minimum wage, this is likely to weaken the perceived kindness of the wage offers. As a result, employees may not perceive a mere increase in wages as a gift but rather may focus attention on the size of the wage premium, making it more difficult for firms to offer a wage high enough to invoke norm compliance. That is, employees may anchor to the wage premium offered by firms prior to the minimum-wage increase and react negatively if new wage offers fail to provide the same level of premium. Our H1b predicts that after a minimum-wage increase firms will offer lower wage premiums, and the preceding discussion suggests that this decrease in wage premiums, *ceteris paribus*, will have a negative effect on employee effort.

To sum up, whereas prior minimum-wage studies mainly focused on the relationship between absolute wages and effort, we suggest that employees are more likely to exhibit a self-serving bias (i.e., focus on wage premiums rather than absolute wages) in our setting than in settings where a minimum wage is absent and then introduced (as in prior studies).[9] As discussed earlier, the existence of a distinct prior wage premium increases the "elasticity" (i.e., justifiability) of employees' self-interested behavior (Hsee, 1996) and, therefore, employees may compare wage premiums when choosing effort levels. While the results of prior studies are mostly consistent with the standard gift-exchange model that higher wages lead to higher effort, we contend that, with a minimum-wage increase, higher wages may not be able to induce higher effort, unless they meet employees' wage-premium expectations. However, we are not able to predict *ex ante* whether employees' self-serving focus on wage premiums will ultimately cause their effort to *decrease or remain the same* after the minimum-wage increase; thus we make the following hypothesis in the null form.[10]

H2. : Employee effort will not change after an increase in the minimum wage.

3. Method

3.1. Experimental setting and design

We design our experiment around the basic setting used in prior gift-exchange studies (Brown, Martin, Moser, & Weber, 2015; Fehr, Gächter, & Kirchsteiger, 1997; Fehr, Kirchler, Weichbold, & Gächter, 1998; Hannan, 2005; Hannan et al., 2002; Kuang & Moser, 2009, 2011). Participants are randomly assigned to the role of an employer or a worker.[11] Employers and workers interact for 12 independent periods and are re-matched each period. The payoffs of the employer and worker are determined as:

$$\text{Employer Payoff} = (120 - \text{Wage}) \times \text{Worker's effort level}$$

$$\text{Worker Payoff} = \text{Wage} - \text{Cost of effort}$$

Each period, the employer decides whether to make a wage offer to the worker and, if so, what the wage offer will be. The employer can offer a wage up to 120 Lira (an experimental currency later converted to cash at 50 Lira = $1) but is limited in how low the wage can be in each period. In this way, we introduce a minimum wage.[12] We initially select two different minimum wage levels, 37 Lira and 51 Lira. These minimum wage levels were selected given their proportionate resemblance to the proposed increase from $7.25 to $10.10. As will be discussed in more detail, we also have an intermittent minimum wage of 44 Lira in one condition. If workers accept the wage offer, they then choose an effort level.[13] A higher effort level increases the employer's payoff but comes at a higher cost to the worker. The specific costs of effort for the worker are given in the table below:

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

As mentioned earlier, in our setting, we place restrictions on the lowest wage that employers can offer in order to operationalize a minimum wage. We investigate employers' wage decisions and workers' responses to wages following an increase in the minimum wage (specifically in our setting from 37 Lira to 51 Lira). We design three between-participant conditions. In order to provide a clean comparison to individuals' reaction following the minimum-wage increase, we conduct a baseline condition in which the minimum wage is always 51 Lira during the 12 periods. This baseline condition allows us to isolate the behavior invoked by the minimum-wage change from any behavior simply associated with wages at the given (higher) level of the minimum wage. We also conduct two treatment conditions. In the first treatment condition, the minimum wage starts at 37 Lira in the first period, increases to 51 Lira in the fifth period, and remains at this level for the remaining periods. This condition is referred to as the "immediate" condition. In the second treatment condition, the minimum wage starts at 37 Lira in the first four periods, then increases to 44 Lira in the fifth through eighth period and 51 Lira in the final four periods. This condition is referred to as the "gradual" condition.[14] We use these two

[9] Given the historical establishment of minimum wages (particularly at the federal level), the setting of introducing a minimum wage when there was no minimum wage prior is not generalizable.

[10] In accounting, Brown et al. (2015) examined wages and effort when cheaper labor (i.e., workers with a lower minimum wage) is available. Their study differs from ours in several ways. First, they do not change the minimum wage for any worker but rather add a new worker with a lower minimum wage. In their setting, because each firm hires two workers, whether a wage offer represents a gift is likely assessed based on *interpersonal* comparison, which differs considerably from the *intrapersonal* comparison that we are interested in because different standards are used (Messé & Watts, 1983; O'Malley, 1983). Second, they examine the effects of a *lower* minimum wage in job-outsourcing practices, whereas we focus on a *higher* minimum wage as legally required in labor markets. Finally, they find that even cheaper labor makes effort choices based on absolute wages, thus reinforcing the standard gift-exchange relationship that higher wages lead to higher effort. We depart from prior gift-exchange literature to examine how higher wages may not lead to higher effort after a minimum-wage increase.

[11] In our experiment we use the terms employer and worker to personalize the role of employer in contrast to the more abstract notion of the participant as a firm.

[12] Given that minimum wages could be viewed as a loaded term, at no point in the instructions or task is "minimum wage" explicitly referred to.

[13] We gave the worker the option to not work because the worker may use rejection of wage offer as a (costly) penalty against an unkind employer (Kuang & Moser, 2009). We also gave the employer the decision over whether to make an offer so that such a decision set was symmetrical. As we observed no statistically significant levels of employers not making offers or workers rejecting offers, we make no further discussion on this part of the design. We only make reference for completeness when we lay out our procedures.

[14] In the immediate condition, participants are informed prior to beginning period 5 that "For the remainder of the study any wage offer must be equal to or greater than 51 Lira." In the gradual condition, participants are informed, prior to the beginning of period 5, "Any wage offer must now be equal to or greater than 44," and prior to the beginning of period 9, "For the remainder of the study any wage offer must be equal to or greater than 51 Lira."

Table 1
Descriptive statistics for the laboratory experiment.

Condition	Stage 1 (periods 1–4)	Stage 2 (periods 5–8)	Stage 3 (periods 9–12)
Panel A: Wage Offers			
Baseline (n = 21)	65.1 (10.8) Minimum wage = 51	63.5 (9.7) Minimum wage = 51	63.8 (9.1) Minimum wage = 51
Treatment - Immediate (n = 20)	57.0 (8.2) Minimum wage = 37	65.2 (10.8) Minimum wage = 51	64.8 (11.2) Minimum wage = 51
Treatment - Gradual (n = 21)	55.8 (12.8) Minimum wage = 37	59.1 (12.2) Minimum wage = 44	64.3 (10.4) Minimum wage = 51
Treatment Conditions -Collapsed (n = 41)	56.4 (8.2) Minimum wage = 37	N/A	64.5 (8.2) Minimum wage = 51
The entry is the mean (standard deviation) of wage offers.			
Panel B: Effort Levels			
Baseline (n = 21)	0.39 (0.32) Minimum wage = 51	0.36 (0.32) Minimum wage = 51	0.33 (0.28) Minimum wage = 51
Treatment - Immediate (n = 20)	0.29 (0.27)Minimum wage = 37	0.27 (0.25) Minimum wage = 51	0.28 (0.26) Minimum wage = 51
Treatment - Gradual (n = 21)	0.29 (0.23) Minimum wage = 37	0.26 (0.23) Minimum wage = 44	0.26 (0.24) Minimum wage = 51
Treatment Conditions -Collapsed (n = 41)	0.29 (0.27) Minimum wage = 37	N/A	0.27 (0.26) Minimum wage = 51
The entry is the mean (standard deviation) of effort levels.			

treatment conditions to examine whether differences in the pattern of minimum-wage increases have an impact on wages and effort.

3.2. Experimental procedures

The experiment is programmed using the Z-Tree computer software (Fischbacher, 2007). We conducted seven experimental sessions using undergraduate students at a U.S. public university. Each session included 16–22 participants. The average age of the participants was 20.6 and 40.3 percent were male. Participants entered the laboratory, signed a consent form, and read through instructions that were at the computer terminal. The experimenter then gave a brief synopsis of the experiment, reviewing the basic steps in each period. Participants completed a quiz to assure their understanding. The experimenter individually checked each quiz for correctness, instructed the participant of any incorrect responses, and answered any questions the participants had.[15] Next, participants were assigned their role as either an employer or a worker, and stayed in the same role for the duration of the study.

Each period has the same steps. First, the employer decided whether to hire the worker with whom they had been paired. Second, the employer decided on a wage offer. Third, the worker viewed the wage offer (if made) and decided whether to accept or reject the offer. In the event that the worker rejected the offer or the employer did not make an offer, each participant received zero payoff for the period.[16] If the worker accepted the wage, then the next step is for the worker to choose an effort level. Finally, the employer and worker were given feedback on their payoff for the period, and all participants proceeded to the next period, with employers and workers re-paired. Participants' payouts are based on their experimental earnings in all 12 periods. At the end of the experiment, participants answered a post-experiment questionnaire and were paid in cash before leaving.[17]

4. Results

Table 1 provides the descriptive results of our experiment, with wage offers in Panel A and effort levels in Panel B. We break down the 12 periods into three stages, with each stage representing four periods. In all three conditions, the minimum wage is constant across the four periods within each stage. Fig. 1 graphs the effort and wage levels across the stages. Fig. 1 clearly demonstrates the convergence of wage offers across the three conditions. Despite that convergence, we do not see the same convergence with effort levels.

4.1. Basic behavior before increases in minimum wages (stage 1)

Before testing our hypotheses, we examine the basic behavior across conditions prior to the change in the minimum wage (i.e., stage 1). In stage 1, the minimum wage is given as default in all conditions and participants are not aware of future increases in the minimum wage. We do not make any prediction *ex ante* about the behavior of employers and workers in stage 1 because our focus is on wages and effort *after* a change in the minimum wage. For that purpose, we use stage 1 as a base for comparing later wages and effort.

We collapse the immediate and gradual conditions into a single treatment because all instructions and parameters are identical in stage 1, and the results of our measures of interest are not statistically different across these two conditions in stage 1. For stage 1, the average wage offer of the baseline condition (65.1) is significantly higher ($t_{60} = 3.04$; $p < 0.01$) than the average wage offer of

[15] One session in the gradual condition was dropped from inclusion. In this session, one of the participants during the quiz phase spent a considerable amount of time asking why the payoffs between participants was "so inequitable." The student maintained a prolonged discussion on this point that produced a significant difference in behavior over the first four periods from other sessions, primarily driven by participants seated on that student's half of the room who likely overheard the prolonged discussion. An example of this behavior includes one employer-participant not making wage offers in several periods and effort levels from several worker-participants significantly exceeding the amount of any other session. We repeat the analyses in our hypotheses tests with this dropped session included. Statistical inferences remain the same, with one exception (described later). Importantly, this difference would not change the conclusion of the hypothesis test.

[16] The percentage of zero-payoff pairs is similar between the baseline condition (11.9% in periods 1–4, 7.1% in periods 5–8, and 2.4% in periods 9–12) and the two treatment conditions (11.0%, 5.5%, and 1.8%, respectively).

[17] The average payoff is $8.8 for employers and $18.3 for workers.

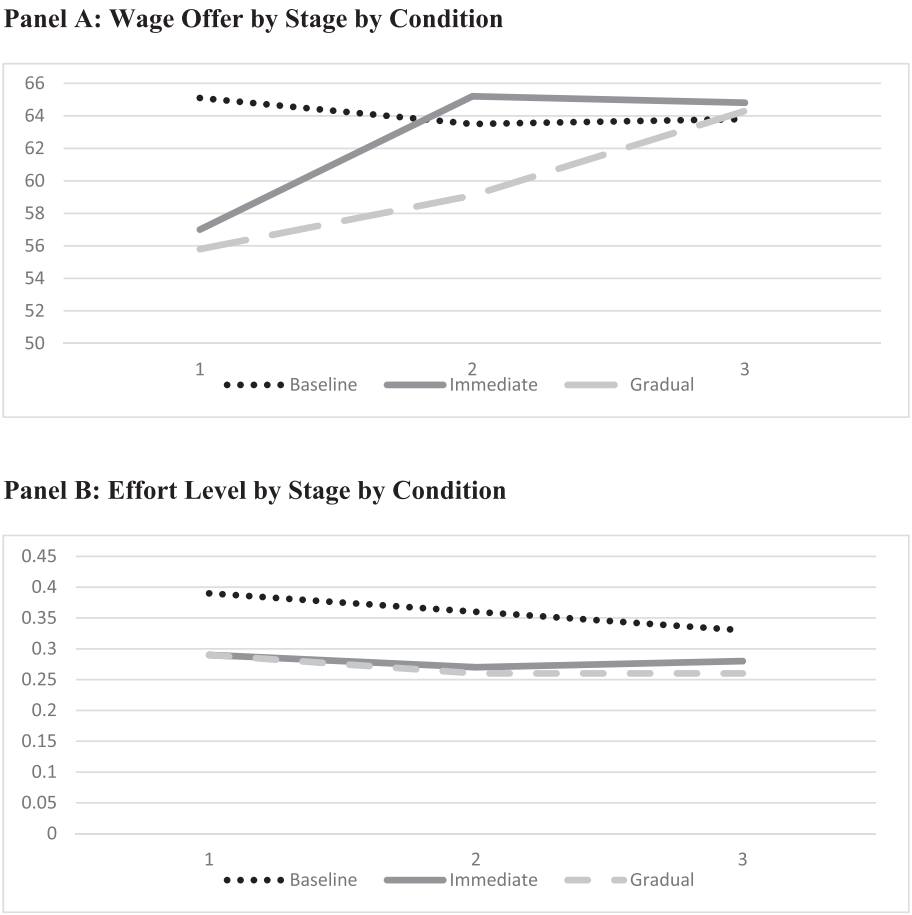

Fig. 1. Summary of Wages and Effort Levels by Stage by Condition.
The x-axis indicates the stage. Stage 1 consists of Periods 1–4, stage 2 consists of Periods 5–8, and stage 3 consists of Periods 9–12. Wage offers could range from the minimum wage in the condition to 120. Effort level is measured on a scale of 0.1–1, with 0 indicated a rejected offer (no effort provided). Baseline is the condition where the minimumis wage is 51 for all stages. Immediate is the condition where the minimum wage is 37 in stage 1 and 51 in stage 2 and 3. Gradual is the condition where the minimum wage is 37 in stage 1, 44 in stage 2, and 51 in stage 3.

the treatment conditions (56.4).[18] By comparison, the average wage premium of the baseline condition (14.1) is marginally significantly lower ($t_{60} = 1.83$; $p = 0.07$) than the average wage premium of the treatment conditions (19.4). These results suggest that, when different default minimum wages are imposed, employers offer higher wages (but smaller premiums) under a higher minimum wage.

We next examine workers' effort in stage 1. Using a repeated-measure linear mixed model, we find that effort in stage 1 is marginally significantly higher ($F_{60} = 3.71$; $p = 0.06$) in the baseline condition (0.39) than in the treatment conditions (0.29).[19] The difference between the baseline and treatment conditions remains highly significant when the wage premium is included in the model ($F_{60} = 5.38$; $p = 0.02$) but is not significant when the absolute wage is included in the model ($F_{60} = 1.35$; $p = 0.25$). These results suggest that, under a default minimum wage where workers are not informed of a minimum-wage increase, their effort choices seem to be influenced largely by absolute wages, probably because there is no obvious alternative standard for the size of the gift. However, as discussed earlier, when the minimum wage is increased, the premium contained in previous wage offers becomes a salient reference point and workers may react negatively if the level of premium is not maintained.

4.2. Tests of H1a

H1a predicts that absolute wages will increase after the increase in the minimum wage. In a post-experimental question, we have employers respond on a 7-point Likert scale to the following, "When setting the wage, I gave considerable attention to the restrictions placed on what wage I could offer," where 1 is "strongly disagree" and 7 is "strongly agree." The average response of 5.24 is significantly higher ($t_{60} = 5.70$; $p < 0.01$) than the midpoint of 4, suggesting that employers tend to incorporate the minimum wage in setting wages.

To test H1a, we compare the average wage between stage 1 and stage 3 in the treatment conditions. Given a lack of statistical differences in our measures of interest between the gradual and immediate conditions in stage 3 (as with stage 1), we collapse these

[18] Given the repeated nature of the decisions, we use the average of employers' wage offers as a single measure per stage to control for multiple observations from a single participant. The p-values reported in this section are two-tailed unless otherwise specified.

[19] The repeated-measure model is used because of the multiple observations per worker in each period. Given the influence of the wage and the need to include it in the model, we could not simply average effort levels across the stages. A mixed model is most appropriate because of the presence of intermittent observations (i.e., the fact that in some rounds employers did not make an offer, or workers did not accept the offer, and resulted in missing observations for that pairing in that round) for which these types of models automatically adjust.

Table 2
Minimum-wage offers by stage and by condition of the laboratory experiment.

Condition	Stage 1	Stage 2	Stage 3
Baseline (n = 21)	15 (18.3%) Minimum wage = 51	16 (19.5%) Minimum wage = 51	13 (15.9%) Minimum wage = 51
Treatment -Immediate (n = 20)	6 (7.7%) Minimum wage = 37	14 (17.9%) Minimum wage = 51	20 (25.0%) Minimum wage = 51
Treatment - Gradual (n = 21)	11 (14.3%) Minimum wage = 37	14 (16.7%) Minimum wage = 44	23 (27.7%) Minimum wage = 51
Treatment conditions − Collapsed (n = 41)	17 (11.0%) Minimum wage = 37	28 (17.3%) Minimum wage = 44 or 51	43 (26.4%) Minimum wage = 51

The entry is the number (percentage) of wage offers that equal the minimum wage.

two conditions into one treatment in all tests unless otherwise noted. The average wage offer in the treatment conditions increases from 56.4 in stage 1 to 64.5 in stage 3, and a paired *t*-test reveals that the increase is statistically significant ($t_{40} = 5.50$; $p < 0.01$).[20] These results support H1a.

By comparison, the average wage offer in the baseline condition does not significantly differ ($t_{19} = 0.48$; $p = 0.42$) between stage 1 (65.1) and stage 3 (63.8). Also, we find no statistical difference ($t_{60} = 0.28$; $p = 0.78$) in wages of stage 3 between the baseline condition (63.8) and the treatment conditions (64.5). This result suggests that wages in stage 3 were essentially equivalent across conditions regardless of how participants arrived at the minimum wage.

4.3. Tests of H1b

H1b predicts that wage premiums will decrease after the increase in the minimum wage. To test H1b, we examine changes in wage premiums between stage 1 and stage 3 in the treatment conditions. In stage 1 of the treatment conditions, the minimum wage is 37 and the average wage is 56.4, resulting in an average wage premium of 19.4. In stage 3 of the treatment conditions, the minimum wage is 51 and the average wage is 64.5, resulting in an average wage premium of 13.5. A paired *t*-test shows that the wage premium significantly decreases from stage 1 to stage 3 in the treatment conditions ($t_{40} = 3.59$; $p < 0.01$).[21] In addition, the wage premium in stage 3 of the treatment conditions is not statistically different ($t_{60} = -0.28$; $p = 0.78$) from the wage premium of 12.8 in stage 3 of the baseline condition. These results support H1b.

As a supplemental test, we compare the percentage of wage offers at the level of the minimum wage across conditions (shown in Table 2). In stage 1, minimum-wage offers are equally likely ($Z_{60} = 0.99$; $p = 0.32$) in the baseline versus treatment conditions. While the percentage of minimum-wage offers does not change from stage 1 to stage 3 in the baseline condition ($Z_{20} = 0.38$; $p = 0.70$), it significantly increases from stage 1 to stage 3 in the treatment conditions ($Z_{40} = -3.52$; $p < 0.01$). In stage 3, controlling for repeated observations and period effects, employers in the treatment conditions (26.4 percent of all offers) were marginally more likely ($Z_{60} = 1.27$; $p = 0.10$, one-tailed) to offer a wage equal to the minimum wage than employers in the baseline condition (15.9 percent of all offers), suggesting that a non-trivial portion of employers, while increasing wages, actually offer zero premium after the minimum-wage increase in the treatment conditions. Taken together, these results are consistent with our theory that employers self-servingly rely on absolute wages rather than wage premiums when setting wages after a minimum-wage increase.

4.4. Tests of H2

Our H2 is a null hypothesis that employee effort will not change after the minimum-wage increase. First, using a repeated-measure mixed model controlling for wages, we find that effort levels significantly *decrease* from stage 1 (0.29) to stage 3 (0.27) in the treatment conditions ($F_{40} = 6.65$; $p = 0.02$).[22] By comparison, in the baseline condition controlling for wage, effort does not significantly change from stage 1 to stage 3 ($F_{20} = 0.01$; $p = 0.92$). These results reject H2, suggesting that, consistent with our theory, employees provide lower levels of effort after the minimum-wage increase.

Furthermore, as presented in Fig. 2, we conduct a path analysis to simultaneously test the roles of wage offers and wage premiums in workers' effort decisions. We control for repeated measurement by including the participant as a cluster variable and estimating robust standard errors after adjusting for intra-cluster correlations (Williams, 2000; Wooldridge, 2002). The Standardized Root Mean Squared Residual (SRMR) of the path model is 0.009, which is considerably lower than the suggested threshold value of 0.08 (Hu & Bentler, 1999), and the Coefficient of Determination is 0.85, indicating that the model provides a good fit for our data.

[20] We also examine the immediate condition and the gradual condition separately. In the immediate condition, the average wage significantly increases ($t_{19} = 3.49$; $p < 0.01$) from stage 1 to stage 2 after the increase in the minimum wage, and is not significantly different ($t_{19} = 0.29$; $p = 0.88$) between stage 2 and stage 3. In the gradual condition, the average wage significantly changes ($t_{19} = 1.99$; $p = 0.04$) from stage 1 to stage 2 after the first increase in the minimum wage, and in stage 3 after the second increase in the minimum wage ($t_{19} = 2.55$; $p = 0.01$). These results are generally consistent with H1a.

[21] We also look into the immediate condition and the gradual condition separately. In the immediate condition, the average wage premium significantly decreases ($t_{19} = 2.42$; $p = 0.02$) from stage 1 to stage 2 after the increase in the minimum wage, and is not significantly different between stage 2 and 3 ($t_{19} = 0.29$; $p = 0.88$). The wage premium in stage 3 is significantly lower than in stage 1 ($t_{19} = 2.32$; $p = 0.02$). In the gradual condition, the average wage premium significantly decreases from stage 1 to stage 2 after the first increase in the minimum wage ($t_{20} = 2.38$; $p = 0.02$), but the decrease is not significant from stage 2 to stage 3 after the second increase in the minimum wage ($t_{20} = 0.64$; $p = 0.34$). The wage premium in stage 3 is significantly lower than in stage 1 ($t_{20} = 2.11$; $p = 0.03$). These results are generally consistent with H1b.

[22] We examine the immediate and gradual conditions separately. Controlling for wages, the changes in effort from stage 1 to stage 2 of the immediate ($F_{19} = 1.09$; $p = 0.31$) or gradual ($F_{19} = 1.26$; $p = 0.27$) condition, or from stage 2 to stage 3 of the gradual condition ($F_{19} = 0.00$; $p = 0.98$), are not statistically significant. The lack of statistical significance could be due to lower statistical power from smaller samples in each individual treatment. We also compare effort between stage 1 and stage 3 in each treatment controlling for wage: effort is not significantly different between stage 1 and stage 3 of the immediate condition ($F_{19} = 0.54$; $p = 0.48$) but is marginally significantly lower in stage 3 than in stage 1 of the gradual condition ($F_{19} = 3.33$; $p = 0.08$).

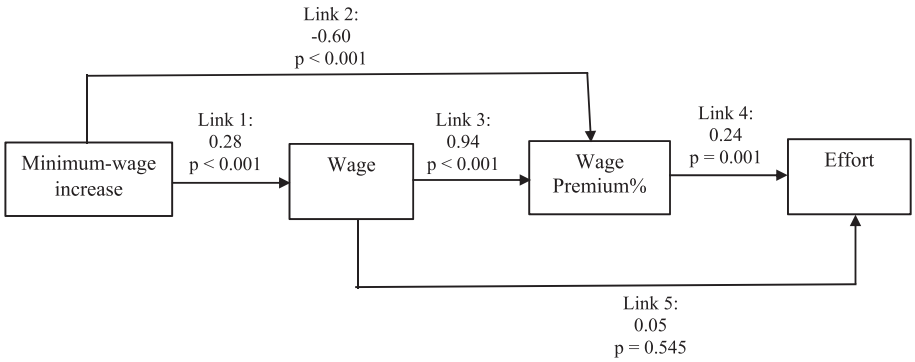

Fig. 2. Path Analysis for H2.
Standardized path coefficients and two-tailed p-values are reported for each link. The analyses are conducted after controlling for the within-participant repeated measurement. Minimum-wage increase = one for stage 3 and zero for stage 1 of the treatment conditions. Wage premium% = (wage − the minimum wage)/wage. In the path model, we use wage premium% in lieu of wage premium because wage premium is highly correlated with wage (i.e., wage premium equals wage minus a constant minimum wage) and the correlation would cause serious collinearity problems in the analyses.

Consistent with our predictions, after the minimum-wage increase, firms significantly increase wage offers (Link 1: $p < 0.001$) but significantly decrease wage premiums (Link 2: $p < 0.001$). More importantly, the decrease in wage premiums significantly influences workers' effort (Link 4: $p = 0.001$); on the other hand, after controlling for wage premiums, the increase in wages does not have a significant effect on effort (Link 5: $p = 0.545$). These results provide further support for our theory, suggesting that workers' effort responses to a minimum-wage increase are primarily influenced by wage premiums rather than by absolute wage levels.

Fig. 3 demonstrates the average effort for a given wage level in all three stages between the baseline and treatment conditions. In stages 2 and 3 (i.e., after the minimum-wage increase), for all wage levels with the exception of uncommonly high wages, we observe consistently higher effort in the baseline condition than in the treatment conditions, though this pattern does not hold in stage 1 (i.e., before the minimum-wage increase). In stage 3, where the minimum wage is 51 and wage offers are indistinguishable across conditions, we find that effort level is marginally significantly lower ($F_{60} = 3.04$; $p = 0.09$) in the treatment conditions (0.27) than in the baseline condition (0.33).[23] That is, despite equivalent wages in these conditions, workers' responses to these wages differ between conditions.

We test whether the lower effort in stage 3 of the treatment conditions compared to the baseline condition is related to the higher frequency of minimum-wage offers (51 Lira) in the treatment conditions (26.4 percent, relative to 15.9 percent in the baseline condition). We run a repeated-measure mixed model, shown in Panel B of Table 3, whereby we treat the minimum-wage offer as a dummy variable that equals one if the offer was 51 Lira and zero otherwise. We also test the interaction of this dummy variable with condition to see if minimum-wage offers are more severely punished (i.e., workers exhibit greater negative reciprocity) in the treatment conditions. Results show that minimum-wage offers do influence effort ($F_{60} = 11.60$; $p < 0.01$). Additionally, we find no interaction effect ($F_{60} = 0.03$; $p = 0.87$) and the effect of treatment becomes non-significant ($F_{60} = 1.59$; $p = 0.22$), suggesting that minimum-wage offers are punished with lower effort across conditions. This is consistent with workers focusing on the wage premium as opposed to the absolute wage. Furthermore, in a post-experimental question, we ask workers to indicate their agreement with the following, "I wanted to punish those employers who did not make me high wage offers" (1 is "strongly disagree" and 7 is "strongly agree"). Workers' rating is marginally significantly higher ($t_{60} = 1.28$; $p = 0.10$, one-tailed) in the treatment conditions (4.6) than in the baseline condition (3.9), lending credence to our theory that workers react negatively to employers who failed to meet their expectation in the treatment conditions.

Finally, despite a low number of observations, we also examine whether identical wage offers received in stage 1 and stage 3 result in different effort levels within the treatment conditions. Seventeen of the 41 workers in the treatment conditions had one period in stage 3 (periods 9–12) that had an identical wage offer in stage 1 (periods 1–4). Effort level marginally decreases from stage 1 to stage 3 ($t_{16} = 1.73$; $p = 0.10$). However, as we note, this is a low number of observations, and a study with endogenous selection of wages (as in our experiment) is not well suited for such a test. Later, we report supplemental data collected for making such comparisons as well as comparisons to wage increases that maintain the same wage premium from a stage 1 offer.

4.5. Supplemental online experiments

The results of the laboratory experiment are consistent with our theory that, following a minimum-wage increase, workers self-servingly rely on wage premiums as the reference for making effort choices. Further, two important points are implied from our theory: first, if employers did maintain the same wage premium after the minimum-wage increase, workers' effort should not decrease because such a decrease would no longer be justifiable. Second, if no wage premium were offered, a mere increase in the minimum wage should not be able to induce higher effort because the absence of wage premium provides wiggle room that justifies withholding effort.

To examine these issues and give our theory a more stringent test, we conducted two follow-up online experiments using the Qualtrics platform with participants obtained from Amazon Mechanical Turk (M-Turk). M-Turk is an online survey-taking population pool becoming more frequently used in behavioral accounting research (e.g., Brink & Hansen, 2020; Brink & White, 2015; Grenier, Lowe, Reffet, & Warne, 2015; Koonce, Miller, & Winchel, 2015). Numerous studies have explored the appropriateness of this participant pool. Several studies demonstrate M-Turk workers are more demographically representative of the general population than most in-person convenience samples (Berinsky, Huber, & Lenz. 2012; Buhrmester, Kwang, & Gosling, 2011; Casler,

[23] If the dropped session (see footnote 15) were included, this comparison would become non-significant ($p = 0.286$).

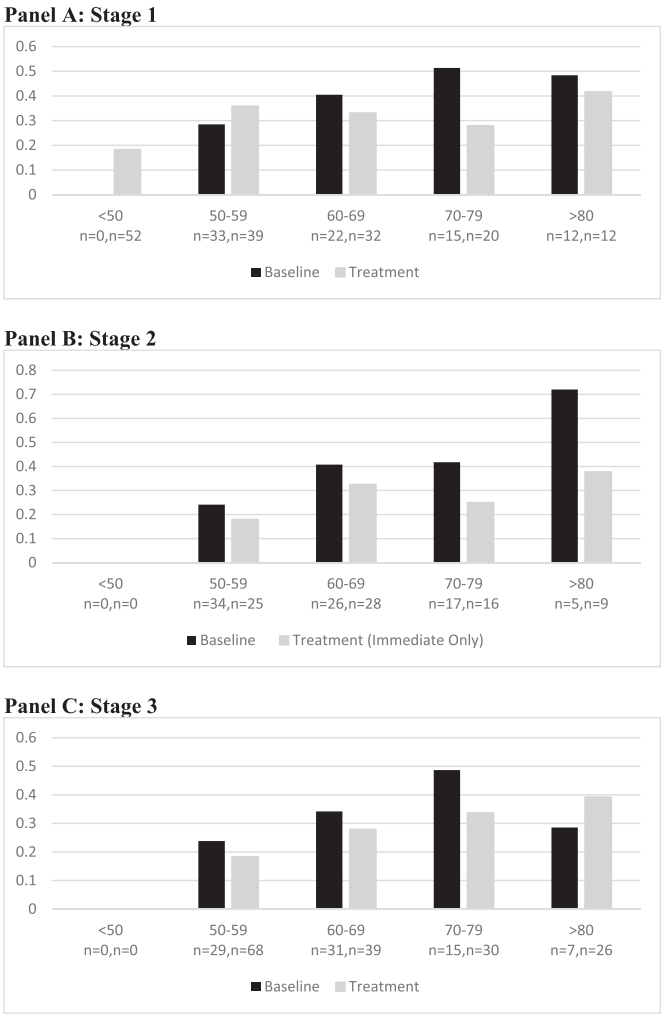

Fig. 3. Effort Level by Wage Level in Each Stage of Baseline versus Treatment Conditions.
The x-axis represents wage levels and the y-axis represents effort levels. Effort level is measured on a scale of 0.1–1, with 0 indicated a rejected offer (no effort provided). Baseline is the condition in which the minimum wage was 51 in all stages. Treatment includes both the Immediate condition (the minimum wage is 37 in stage 1 and 51 in stages 2 and 3) and the Gradual condition (the minimum wage is 37 in stage 1, 44 in stage 2, and 51 in stage 3). In Panel B (i.e., stage 2), Treatment only includes the Immediate condition because the Gradual condition has a different minimum wage than the Baseline and Immediate conditions. n provides the number of wage offers accepted at that wage level by condition.

Bickel, & Hackett, 2013; Paolacci, Chandler, & Ipeirotis, 2010). Multiple studies successfully replicate prior research using M-Turk workers (e.g., Berinsky, Huber, & Lenz, 2012; Crump, McDonnell, & Gureckis, 2013; Horton, Rand, & Zeckhauser, 2011). Particularly, in a managerial accounting setting, Farrell, Grenier, and Leiby (2017) show M-Turk workers exert as much effort as student participants.

4.5.1. Supplemental experiment one

The first online experiment is a sequential, truncated version of our original design (participants' tasks and payoff functions are the same as in the laboratory experiment). The experiment consists of two single-period stages. In stage 1, the minimum wage is 37 Lira while in stage 2 the minimum wage is 51 Lira. We conducted the online experiment in two separate sessions, with all participants in the first (second) session acting as employers (workers).

Table 3
Repeated-measure linear mixed models for stage 3.

Variable	F-Value	p-value
Panel A - Effort across Conditions		
Treatment	3.04	0.0863
Wage	38.27	<0.0001
Period	1.29	0.2865
Panel B – Effort across Conditions, Controlling for Minimum-wage Offers		
Treatment	1.59	0.2117
Minimum Wage	11.60	0.0012
Treatment × Minimum Wage	0.03	0.8747
Period	1.13	0.3438

Panel A and B of Table 3 provide estimates of the repeated-measure linear mixed model, with effort as the dependent variable. The model examines 245 observations across the three conditions over Periods 9–12 (stage 3). Given the repeated-measure nature of the test, we analyze the data clustering at the individual level controlling for the multiple observations resulting in 60 degrees of freedom.
Treatment separates the conditions between the baseline (the minimum wage is a constant 51 across all stages) and the gradual and immediate conditions (our "treatment" conditions in which the minimum wage increases to 51 in stage 3).
Wage is the wage offered to the worker by the employer for the period for the given observation.
Minimum Wage is a dummy variable that takes a value of 1 if a wage of 51 was offered and 0 otherwise.

4.5.1.1. Employers' session. In the employers' session, we collected employers' wage decisions. We truncated the range of possible wage offers to increase experimental control and to allow for a parsimonious test of our theory. In stage 1, employers chose one of two wage offers, either 37 Lira (the minimum wage for stage 1) or 56 Lira (the average wage in stage 1 of the treatment conditions of the laboratory experiment). In this stage, the higher wage offer would provide a wage premium of 19 Lira. Then in stage 2, after the minimum age was increased to 51 Lira, employers could offer a wage of 56 Lira, 65 Lira (the average wage across stage 3 of all conditions of the laboratory experiment), or 70 Lira (the wage that maintains the same 19 Lira wage premium at the new minimum wage).[24]

4.5.1.2. Workers' session. After the employer data were collected, we conducted the second session, where the employer decisions were distributed to workers. In stage 1, workers were offered a wage of either 37 or 56, and made an effort choice. In stage 2, workers were offered a wage of either 56, 65, or 70, and made an effort choice. After the worker data were collected, employers and managers were matched and paid.[25]

Table 4 shows the effort choices made by the workers who received a wage offer of 56 in stage 1, grouped by the wage that they received in stage 2.[26] Based on our theory and the laboratory

[24] In stage 2, we did not give employers the option of offering the minimum wage of 51 because (1) it might be too close to 56 to be perceived as a distinctive wage offer and (2) in the final stage of the lab experiment the majority of participants (73.6 percent) offered a wage higher than the minimum wage. Since we need to keep the 56 wage level to allow for employers' choice of offering the same wage as in stage 1, removing the 51 wage level can simplify participants' decision task and focus their attention on the key issue that this online experiment is designed to examine (i.e., whether to offer the same wage premium as in stage 1).

[25] To follow the design of the laboratory experiment, workers were matched with a different employer in stage 1 and stage 2, though all workers who were given a wage of 56 in stage 1 were also matched with an employer that offered 56 in stage 1. Participants were provided with the same payoff functions from the laboratory experiment.

[26] We only collect a full sample of responses from workers at the 56 wage level in stage 1 given the objective of this online experiment. We do distribute offers of 37 made by the employers in stage 1 to workers to maintain the authenticity of the design. These participants were then paid based on the responses as outlined in the instructions. In total, eight employer participants made offers of 37 in stage 1 of this online experiment.

Table 4
Descriptive statistics for supplemental experiment one.

Groups	Effort in Stage 1	Effort in Stage 2
Workers who were offered a wage of 56 in stage 2 (n = 48)	0.46 (0.29)	0.42 (0.31)
Workers who were offered a wage of 65 in stage 2 (n = 51)	0.49 (2.94)	0.45 (0.26)
Workers who were offered a wage of 70 in stage 2 (n = 50)	0.40 (0.25)	0.49 (0.26)

Effort in Stage 1 is the mean (standard deviation) of effort levels provided by workers who were offered a wage of 56 in stage 1 only.
Effort in Stage 2 is the mean (standard deviation) of effort levels provided based on the wage received in stage 2 by workers who were offered a wage of 56 in stage 1 only.

results, we expect that effort levels will decrease from stage 1 to stage 2 when workers are offered a wage of 56 or 65 in stage 2. As expected, paired t-tests reveal a significant decrease in effort when offered 56 in stage 2 ($t_{47} = 1.93$; $p = 0.03$, one-tailed) and a marginally significant decrease in effort despite the increase in the absolute wage to 65 in stage 2 ($t_{50} = 1.53$; $p = 0.07$, one-tailed). More importantly, based on our theory, we would expect that, if the wage premium is kept constant after a minimum-wage increase, then worker effort will not decrease. Notably, because these workers were offered a wage of 56 in stage 1 (minimum wage is 37), the wage of 70 in stage 2 (minimum wage is 51) contains the same wage premium (19), thus satisfying workers' expectation. We therefore predict that effort should not decrease when offered 70 in stage 2. Indeed, in this case, we observe a significant increase in effort ($t_{49} = 3.85$; $p < 0.01$). Overall, the results of the first online experiment are consistent with the main findings from the laboratory experiment. In addition, we find strong evidence that, after the increase in the minimum wage, workers react positively to a wage offer that maintains the premium over the minimum wage. These findings lend additional credence to our theory.

4.6. Supplemental experiment two

The second online experiment is similar to the first one in terms of design and procedures, with a key difference: in stage 1, the minimum wage is 37 Lira and employers can only offer a wage of 37; in stage 2, the minimum wage is 51 Lira and employers can only offer a wage of 51. That is, we create a setting where both the minimum wage and absolute wages can increase but there is no room for a wage premium. This design helps disentangle the effect of a mere increase in the minimum wage from the effect of wage premiums. Based on our theory, we expect that workers will self-servingly focus on the fact that they are not offered any wage premium (even though this is not the employer's volition). As a result, workers may not increase effort despite the increase in absolute wages.

As expected, a paired *t*-test shows that workers' effort in stage 2 (0.34) is not significantly different ($t_{48} = 0.78$, $p = 0.44$) from the effort in stage 1 (0.32), despite the higher wages. This result suggests that, in the absence of a wage premium, simply increasing the minimum wage would have no impact on effort. Overall, the results of the two supplemental experiments are consistent with our laboratory results, thus lending further credence to our theory.

5. Conclusion

In this study, we investigate the effects of increases in the legally required minimum wage on several managerial accounting variables including compensation, employee effort, and firm profit. In recent years, scholars and business practitioners have voiced concerns that widespread minimum-wage increases can negatively affect firm profitability. However, such concerns may not be justified because prior research suggests that higher wages lead to higher effort and, therefore, do not necessarily hurt firm profitability. Our study provides useful insight for reconciling these views. Our findings show that minimum-wage increases affect firms' wage setting. Depending on how firms set wages in response to the minimum-wage increase, employees may differentially assess the wage offers and, thus, either increase or decrease their effort level. Therefore, the ultimate effects of minimum-wage increases on employee effort need to be considered in light of firms' wage decisions.

Our study extends the gift-exchange literature by shedding light on the role of an important policy factor, minimum-wage regulation, in management control practices. Our findings suggest that increases in the minimum wage moderate the effectiveness of management control through gift exchange by affecting the reference point in employees' effort choices. While prior research suggests that higher wages induce higher effort, we find that the effort-inducing effect of gift wages may be dampened when the minimum wage increases if firms do not appreciate employees' expectations, thus providing caveats for using gift wages as a control mechanism. Firms need to carefully consider these effects in designing control systems to maximize the overall organizational efficiency.

Some limitations of the study provide avenues for future research. We focus on an incomplete contracting environment, where employers are not able to contract upon workers' effort or productive output. In certain organizational settings, however, employers may be able to obtain some sort of informational signals that are correlated with workers' performance. To the extent that obtaining such signals is costly, whether it can improve contracting efficiency is an empirical question. Future research can explore whether our findings hold in settings where workers are compensated based on a performance-contingent contract.

In our experiments, we do not consider the effect of labor supply and demand but rather focus on a balanced labor market whereby one employer is matched with one worker. The labor market conditions, however, could impact individuals' behavior. For example, employers might make wage decisions differently if workers have alternative employment opportunities. If workers who are dissatisfied with the current employer's wage offer can switch to another employer, the occurrence of the negative effort responses observed in this study might be less frequent. Following Brown et al. (2015), in the laboratory experiment participants' payouts are based on their cumulative earnings over the 12 periods. The use of cumulative payoffs could potentially cause wealth effects on participants' behavior. We note that our online experiments use a simple two-stage design and thus would not be influenced by wealth effects. The fact that the online experiments replicate our general results offers reassurance that our primary findings are not subject to wealth effects. To preclude reputation concerns, we use an experimental setting where employers and workers are randomly matched each period. On the other hand, reputation concerns may exist in naturally occurring employment relationships, and such concerns can have both an economic effect (e.g., re-contracting; renegotiation) and a behavioral effect (e.g., impression management) on workers' effort. It would be interesting to investigate whether these effects can be incorporated in the management control system to improve operating efficiency.

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