Does high wage lead to high profits? An experimental study of reciprocity using real effort

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Abstract: Standard models in labor economics and agency theory assumes that only extrinsic motivations such as money influence behavior, with the exception of a “psychological” cost of effort. Akerlof (1982) argues that this approach is too barren, bringing in other psychological considerations such as reciprocity. In Akerlof’s gift exchange model, employers first choose wages and then employees respond with effort. The main feature of the model is that employees reciprocate to receiving a high wage by investing high effort. Some recent experimental findings (e.g., Fehr, Gachter and Kirchsteiger, 1997) support this. However, in these studies employees’ effort was represented by money, thus ignoring the psychological aspect of effort.

In this study I successfully replicate these experimental results using real effort. Introducing real tasks furthermore allows me to study other aspects of the psychology of effort and reciprocity, by varying the return on the employees’ effort. With low return, reciprocation is not sufficient to compensate the employer for the extra cost of wage. In contrast, when the return on employees’ effort is high, higher wages result in higher total profits to employers. This supports Akerlof’s theory of primary and secondary labor relations. It is also found that when the return is higher, although employers earn more money from paying a high wage, employees invest less time on the task.

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1. Introduction

Neoclassical economics assumes that labor is hired as a factor of production and is put to work like capital. In this model, the firm never chooses to pay more than the market-clearing wage, because there is no advantage to doing so, and the workers put in only the minimum effort required. The reason employees put only the minimal effort is that effort has some physical or psychological costs (e.g., cognitive effort). The descriptive validity of this assumption is not always supported by real life observations; in some professions employers pay more than the market-clearing wage, and workers invest more effort than they have to, merely in order to keep their jobs. For example, workers at a utility company studied by Homans (1953, 1954) were paid above their outside wage option, and exceeded the minimum work standards of the firm markedly. Most of these workers did not expect any promotion in the firm in return for their extra effort. Akerlof (1982) and Akerlof and Yellen (1990) extend the neoclassical model to explain this behavior using a gift exchange model, in which “On the worker’s side, the “gift” given is work in excess of the minimum work standard; and on the firm’s side the “gift” given is wages in excess of what these women could receive if they left their current jobs” (Akerlof, 1982, p.544).1

In the gift exchange model the firm might find it advantageous to pay a wage in excess of the one at which it can acquire labor, because there are some benefits to paying a higher wage. The worker does not strictly give her labor as gift to the firm; she expects a wage in return. Likewise, the worker must meet certain minimum standards in order not to be fired. However, above this minimum standard the worker determines her own level

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1 The gift exchange explanation was first studied by Adams (1963) who proposed that in social exchange between two agents the ratio of the perceived value of the inputs (e.g., wage) to the perceived value of outputs (e.g., resulting from the employee’s effort) would be equal.
of performance without constraint. In the model, norms for the proper effort are like the norm for gift giving at Christmas. Such gift giving is a trading relationship in the sense that if one side of the exchange does not live up to expectations, the other side is also likely to curtail its activities.

The gift exchange model is based on the assumption of a positive relation between wages and work effort. Workers respond to receiving a high wage by increasing effort and output (positive reciprocity) and low wage by decreasing output (negative reciprocity) to the minimum required as retaliation for a low wage. A large body of empirical evidence in support of reciprocity has been reported in the last two decades.² An early example of an experimental labor market testing this model is reported in Fehr, Kirchsteiger, and Riedl (1993) who constructed a market with excess supply of labor, ensuring a low equilibrium wage. The employees in their study had no pecuniary incentive to raise the quality of their work above the exogenously given minimum. If a selfish employer expects the employee to invest only the minimum required effort, then she has no reason to pay wages above the market-clearing level. Contrary to this prediction, most employers tried to induce employees to invest greater effort by offering them higher (by more than 100%) wages than the market-clearing one. On average, this high wage was reciprocated by greater effort on the part of the employees.

While these experiments test alternative psychological factors that influence behavior in the labor market, they ignore the original psychological factor that was there all the time: the cost of real effort. The tradition in these tests of the gift exchange model has been to use an increasing monetary function to represent the workers’ effort; that is, workers do not invest actual effort, but rather choose a number (a monetary transfer back to the employer) that represents effort. In this paper, I focus on this psychological factor, by extending the investigation to a more representative design in which workers do not simply choose a number but rather the real effort they wish to invest in return for wage.\(^3\)

An important element of the design applied in this paper is the use of different levels of return to the employer on the effort invested by the employee (i.e., different productivity levels). This difference allows me to investigate one of the crucial elements in Akerlof’s (1982) model. In this model there are two types of market; primary labor markets in which unemployed workers are unable to obtain jobs, and a secondary market in which all workers can find work at the market clearing-wage. What distinguishes these two types of industries from each other is that in the primary, but not in the secondary, the gift component of labor input and wage is sizeable. A firm that wishes the employee to invest higher than minimal effort pays high wage (“send gift”), and workers reciprocate by investing greater effort than is required. Therefore, wages are not market-clearing.

Akerlof’s (1982) assumption about fairness and reciprocity, from which the division of industries to primary and secondary is derived, is not trivial. The use of real

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\(^3\) Psychologists and sociologists do use real effort in their studies of human behavior (e.g., in studying the effects of goal setting on performance, see the survey in Locke and Latham, 1990). See also the survey in Mowday (1991).
effort and differences in returns allow me to test this and the following related hypotheses:

*Inequity aversion:* Models that are based on this predict that the perceived value of the labor input will be equal to the perceived value of remuneration. According to this hypothesis, employers set effort in accordance with the amount of money they wish to “send” back to the employer (e.g., Bolton and Ockenfels, 2000; Fehr and Schmidt, 1999). Because effort is costly, when the return on it increases, workers adjust the level of effort down. According to this model the employers’ gain from effort will increase (or at least will not decrease) from higher return, but less than the increase in returns.

*An effort equals wage hypothesis:* This hypothesis suggests that the wage given will determine the amount of effort invested by the worker, regardless of the actual return on the effort to the employer; workers simply invest a given amount of effort (measured e.g., by the time they spend on the task), for a given wage. This amount of effort can be determined, for example, by norms. In this case, an increase in the return for effort does not affect actual effort.

*A return equals wage hypothesis:* This hypothesis simply predicts that employees will adjust their work level such that the employer will be fully compensated (not necessarily by the same amount of money) for the wage given. This would mean adjusting the level of effort when the return on it changes.

*Efficiency:* People have a preference for increasing the total payoff of the group. In this case (assuming that effort is costly for the worker) when return on effort increases, the worker will work even more. Charness and Rabin (2002) present a model that has this
feature, including a preference to being unhelpful or punishing those whose behavior does not respect these social preferences.

To test these hypotheses, I designed an experiment in which first, the employer chooses the wage level (Low, Medium, or High), and then the worker decides how much effort to invest in solving mazes on a computer. The employer is paid a dollar amount per maze solved, but the employee’s monetary payoff does not depend on the number of mazes solved. Effort is measured by the time the worker invests in solving mazes, as well as by the number of mazes solved. The key feature of the design is varying the return on time invested. This is done in two ways; by tripling the return per each maze solved relative to the base treatment and by increasing the difficulty of the mazes such that it takes, on average, twice as long to solve a maze, while keeping the payment to the employer per maze fixed.

The use of different returns to employees’ effort allows me to test the above hypothesis, and in particular the “primary and secondary” division into industries in which high wage is profitable to the employer and those in which it is not.

2. Background: Experimental findings

Recently, the conjecture that reciprocity plays a role in the choice of effort in labor relations has been investigated in an influential stream of papers. An exemplary study is Fehr, Gachter and Kirchsteiger (1997). Experimental employers could offer a wage contract that stipulated a binding wage $w$ and a desired effort level $e^*$. A worker that accepted this offer was free to choose the actual effort level $e$, which was a number between 1 and 10. Higher numbers represent greater levels of effort and, hence, higher
profit for the employer. The worker’s wage was not contingent on her choice of $e$. Markets were set such that there was an excess supply of workers (8 employees and only 6 employers who could employ at most one worker each). This excess supply of workers ensured that the workers’ reservation wage, under the assumption of pure selfishness, is zero. The crucial point is that selfish workers have no incentives to invest effort above the minimal level $e=1$.

The results were different; the average desired effort was $e^*=7$ and the offered wage implied that the worker received 44% of the total profit. On the workers’ side, the average actual effort was $e=4.4$. Although shirking was quite prevalent, the evidence suggests that in response to generous job offers, workers reciprocate by, on average, investing greater effort than the minimum required. See also the results in Fehr, Kirchteiger, and Riedl (1993) described in the introduction; Fehr and Falk (1999) who study wage rigidity in markets; Charness (2002) who studies the effect of different attributions of wage on employees’ reciprocation; Hannan, Kagel, and Moser (2002) who find different levels of gift exchange with different populations; Falk and Gachter (2001) who study the difference between repeated and one shot interactions; and the survey of reciprocity in Fehr and Gachter (2000).

In a more stylized environment, Berg, Dickhaut, and McCabe (1995) study a “trust game” (or “investment game”). The trust game is a two-player game in which player A is given a fixed amount of money and is asked to decide whether to transfer any of it to player B, and if so how much. The experimenter then triples the amount and gives it to player B, who is asked to choose whether to transfer any money back to player A. In such a game, gains are obtainable through cooperation. The game is labeled a “trust
game” because the amount that player A transfers to player B serves as an indication of her trust in her game partner or of the two players’ ability to cooperate. The efficient outcome, which maximizes the total pie, would require player A to transfer all of her resources to player B (as these resources would then be tripled). The subgame perfect equilibrium, on the other hand, implies no transfers and thus does not exploit the potential gains deriving from transfer. Berg, Dickhaut, and McCabe (1995) found that typically, player A transferred a positive amount of money to player B, who often returned an even larger amount. See also the results in Abbink, Irlenbusch, and Renner (2000) who introduce the “The moonlighting game” in which player A can take money from or pass money to player B, who can either return money or punish player A. Thus, they study both positive and negative reciprocity; Chaudhuri, Sopher and Strand (2002) who study individual characteristics with regard to reciprocity; Dufwenberg and Gneezy (2000) who measure beliefs and intentions in a “lost wallet game”; McCabe, Rassenti and Smith (1998) who find trust and reciprocity in a sequential bargaining game, and study the role of punishment in this game; For a survey of the literature see Camerer (2002).

A confounding factor that may be problematic in these games is that the choices of both player A and player B may be influenced by distributional concerns, and not only by trust and reciprocity. For example, player A may send money to player B even if she does not expect anything in return—just as in the dictator game (see also Dufwenberg and Gneezy, 2000, who find support for this argument). Likewise, player B may send money to player A not because of reciprocation, but simply because of distributional concerns and inequality aversion (see Bolton and Ockenfels, 2000; Fehr and Schmidt, 1999).
In real life interactions such as in labor relations, the employer pays with money, but the employee reciprocates with a different currency—effort. Using *real effort*, this confounding factor can be eliminated, and different hypotheses can be tested. Employer’s reciprocation does not influence her monetary payoff, and hence she does not have to take into account the decrease in her monetary payoff as a result of positive reciprocity (it does, of course, influence her utility).

Some economics papers use field studies to investigate wage related questions. For example, Camerer, Babcock, Loewenstein and Thaler (1997) find that a wage increase induces taxi drivers in New York to work fewer hours per day, but makes them more likely to work on such days. See Oettinger (1999) and Fehr and Götte (2002) for similar results with different populations of workers.

While not often used in economics, psychologists and sociologists do use real effort in their studies. Two examples are the study of goal setting (see the survey in Locke and Latham, 1990), and the relation between wage and effort (see the survey in Mowday, 1991).

### 3. Design and Hypotheses

**Experimental procedure**

The experiment was conducted at the University of Chicago, with 378 participants. In the first stage of the experiment, 189 MBA students (the “employers”) who volunteered to participate in the experiment were given instructions (see Appendix 1) in which they were told that they would receive $10 for participating.
The choice faced by the employers was how much out of the $10 they received they wished to transfer to the student they were matched with. They could choose between $0, $5, or $10. That was the only choice made by the employers in the experiment. They were told that they would be paid, privately and in cash, in the following week—after the second part of the study had been run. Identification was made using the students’ ID number.

At the second stage, a few days later, each MBA student was matched with another student (the “employee”). The second student received instructions (see Appendix 2) in which he/she was told about the wage choice made by the other student in stage 1. This was written with a pen on the instruction sheet. The decision the second player had to make was whether he/she wanted to solve mazes on the computer (see description below)—and if so—how many. They were told that the first player would be paid a dollar amount per each maze they solved, and that they could choose any amount of time from 0 to 60 minutes to solve mazes. All this information was common knowledge (in particular, the first player knew about the task of player 2). Player 2 did not know the identity of player 1 (it was indicated with a number on his/her instructions), and player 2 was not identified to player 1.

A remark on the subjects pool: The “employees” in the experiment were mostly undergraduate students who participated in a different unrelated survey regarding marketing and product evaluations at the Experimental Lab at the University. Students were paid a flat fee of $5 for answering the marketing questionnaire. The separation of participants into the categories MBA=employer and undergraduate student=employee was made in line with the findings of Hannan, Kagel, and Moser (2002), who report
different results with different populations of participants. I believe that MBA students are the closest I can get to having participants who are familiar with being employers, and that the undergraduate students are more familiar with the role of employee in real life. The participants in the experiment did not know about this difference between populations; all they knew was that the other participant was also a student at the University.

**The task**

As mentioned above, the participants’ task was to solve mazes. The mazes can be found at [http://games.yahoo.com/games/maze.html](http://games.yahoo.com/games/maze.html) (this task was used previously by Gneezy, Niederle and Rustichini, 2002). The maze game has five levels of difficulty, from 1 = easy to 5 = hard. The game is solved by operating the arrows on the keyboard, tracking a marker through a maze appearing on the screen. Participants were allowed to use only the arrows to move the cursor. The game was considered solved, as usual, when the marker reached the end of the maze. The skill required to solve the problem requires a moderate amount of familiarity with a computer, plus the ability to look forward in the maze, as usual, to detect dead ends. After finishing a maze, participants were asked to use the mouse in order to click “OK” and “New maze,” and then start the new maze using only the arrows. They were instructed not to use any other function. After finishing a maze they were asked to record this in a table. The experimenter confirmed that they marked the table correctly, and these records become the data of the experiment.

**The Treatments**
I had three experimental treatments. In the base treatment, the difficulty level of the mazes was set at 2, and the return to the employer was $1 for each maze solved by the employee. In the second treatment, the difficulty was increased to level 5, and the return was left at $1 per maze. Pre-testing showed that it takes participants about twice as long to solve a maze at level 5 as it does at level 2. In the third treatment the difficulty level was set at 2 (as in the base treatment), but the return to the employer from a maze solved by the employee was tripled to $3.

Although the employers knew the details of the differences between treatments, they did not have access to the mazes themselves, and hence one would not expect them to be sensitive to the different treatments. Employer access to the mazes was not permitted because the behavior of the employers was not the focus of investigation in this experiment, but rather the actual effort invested by employees.

**Hypotheses**

The theoretical prediction under the assumption of purely selfish participants is straightforward. The employee has no incentive to work since her payoff does not depend at all on the number of mazes she solves, and effort is costly (“time is money”); the employer understands that the employee will not solve mazes, hence the employer chooses a wage of $0.

*The pure selfishness hypothesis*: Wage will be set at $0, and the number of mazes solved will be 0.
Given the results discussed above, one would be surprised if this hypothesis was supported by the data. The second hypothesis reflects this literature.

*The positive reciprocity hypothesis:* A higher wage will result in, on average, greater effort.

This hypothesis is based on the results discussed above (see Fehr and Gachther, 2000, for a survey of this literature). All of the remaining hypotheses refine this positive reciprocity hypothesis. They all concern only the behavior of the employee.

*The inequity aversion hypothesis:* Workers will adjust effort in the different treatments to compensate employers for high wages; in particular, they will work harder when the return to the employer is lower.

According to this assumption, employees care about the relative payoffs to the two participants, and in particular are averse to inequality (see the models in Bolton and Ockenfels, 2000, and Fehr and Schmidt, 1999). For a given wage, employees invest more effort (time) in performing the task when the return is low. Note that since effort is costly, and employees’ utility depends not only on distributional concerns but also on the cost of effort, this hypothesis does not imply that the actual return to the employer will be constant. With lower returns the employer’s payoff will be lower.
The effort equals wage hypothesis: Workers will respond with the same level of effort, regardless of the return to the employers.

According to this hypothesis, employees will simply respond by investing a constant amount of time for a given wage, regardless of the return to the employer.

A return equal wage hypothesis: Workers will respond with the same level of employer’s profits for a given wage, regardless of the return for their effort.

Efficiency hypothesis: Workers will adjust the effort they invest in the different treatments according to the level of efficiency; in particular, they will work harder when the return to the employer is higher.

Charness and Rabin (2002) show that people prefer outcomes that increase the overall joint profits from an interaction. According to this, employees are willing to invest effort because it increases the overall joint payoff (assuming that the marginal cost of time to the employee is smaller than the marginal profit to the employer). In their model, Charness and Rabin (2002) include also a preference to be unhelpful or punish participants whose behavior does not respect these social preferences.

The final hypothesis, based on Akerlof’s (1982) model, states that employers will receive higher profits as a result of giving a high wage when the return on the employees’
effort is “high,” but lower profits when this return is “low” (high and low scope for gift exchange).

*The primary and secondary labor relations:*

a. Employers will earn more from a high wage than from a low wage when the return on employees’ effort is high, and

b. Employers will earn less from a high wage than from a low wage when the return on employees’ effort is low.

4. Results

*Employers’ behavior*

I start by giving the employers’ decisions. Given the results in the literature discussed above, it is not surprising that many employers chose to send more than the low wage. Employers’ choices are presented in Table 1.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Low Wage</th>
<th>Medium Wage</th>
<th>High Wage</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Treatment</td>
<td>23</td>
<td>17</td>
<td>22</td>
<td>62</td>
</tr>
<tr>
<td>Triple Pay Treatment</td>
<td>20</td>
<td>21</td>
<td>23</td>
<td>64</td>
</tr>
<tr>
<td>Level 5 Treatment</td>
<td>20</td>
<td>17</td>
<td>26</td>
<td>63</td>
</tr>
</tbody>
</table>

Table 1: Wage choices by employers in the different treatments.

It is also not surprising that the choices do not differ significantly ($p>.1$) in the different treatments since the employers did not have any experience with the task.
Employees’ behavior

This section is divided into three comparisons: According to the number of mazes solved, the amount of time invested, and the employer’s payoff from mazes solved.

The number of mazes solved

One measure of an employee’s output is the number of mazes he/she solved. The number of mazes solved according to treatment and wage level is presented in Figure 1.

![Number of mazes solved](image)

Figure 1: The number of mazes solved

With low wage, the median number of mazes solved is zero, and the average number is 2.3, 1.9, and 1.95 in the base treatment, the level 5 treatment, and the tripled
payoff treatment, respectively. The differences between the distributions are not statistically significant ($p>0.1$).  

With median wage, the average number of mazes solved is 4.8, 4.2, and 2.95 in the base treatment, the level 5 treatment, and the tripled payoff treatment respectively. Again, these differences are not statistically significant ($p>0.1$).

With high wage, the average number of mazes solved is 6.3 in the level 5 treatment, and 7 in the tripled pay treatment; this difference is not statistically significant ($p>0.1$). However, in the base treatment, participants solved almost twice as many (11.95) mazes than in the other two treatments. The difference between the number of mazes solved in the base treatment and the other two treatments is highly significant ($p<0.01$).

The time invested

A good measure of effort in this experiment is the time invested by participant into solving mazes. Figure 2 presents these times for the different treatments and different wage levels.

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4 In all the tests reported in the paper I use the non-parametric Mann Whitney $U$-test.
Figure 2: The time invested in solving mazes

With low wage, the average time invested is 3.2, 3.4, and 2.9 minutes in the base treatment, the level 5 treatment, and the tripled payoff treatment respectively. The differences between the distributions are not statistically significant ($p>0.1$).

With median wage, the average time invested is 8, 9.9, and 5 in the base treatment, the level 5 treatment, and the tripled payoff treatment, respectively. None of the differences are significant at $p<.1$, apart from the difference in time invested between the level 5 treatment and the tripled payoff treatment, which is marginally significant ($p=.0637$).

With high wage the average time invested is 16.3 in the base treatment, and 15.2 in the level 5 treatment. The difference between the base treatment and the level 5 treatment is not significant ($p>0.1$). However, in the high pay treatment, participants spent only about half the time (8.3 minutes) solving mazes. The difference between the
time invested in the high payoff treatment and the other two treatments is highly significant ($p<0.01$).

**Payment to employer from mazes solved**

After studying the time invested by participants in the different treatments, a related issue is the amount of money they generated for the employer in the different treatments. Note that the return on time invested in terms of payoff to the employer is highest in the triple pay treatment, intermediate in the base treatment, and the lowest in the level 5 treatment. Figure 3 presents the actual value generated by the employees in the different treatments and different wage levels.

![Payment to employer from mazes solved](image)

Figure 3: Return to employer from the employees’ effort.

As can be seen from Figure 3, the payoff from solving mazes was higher in the triple pay treatment for all levels of wage; for the low wage, the difference between the return with the triple pay and the other two treatments is significance at a $p<.5$ level; for
the medium wage, these differences are not significant ($p>.1$); with high wage, the differences are highly significant ($p<.01$). For the high wage case, the difference between the base treatment and the level 5 treatment is also highly significant ($p<.01$). Other differences are not significant at the .1 level.

5. Discussion

Employers’ profits

Does high wage lead to high profits? The evidence presented in this paper supports previous results that high wage is reciprocated by high “gift” (effort) in return. But that of course is not enough to ensure the profitability of high wage. Figure 4 below presents the total profit of the employers in the different treatments as a function of the wage chosen.

Figure 4: Average total payment to employers in the different treatments as a function of the wage they chose.
For the base treatment, employer’s expected profits are 12.3, 9.8 and 12 for the low, medium and high wage respectively. That is, the highest payoff is achieved for the low wage. The difference between the profits with the low and high wage are not statistically significant, but in the medium wage they are significantly lower than the other two wage levels. Note that the low wage also has the advantage of no risk: by choosing it the employer guarantees herself profit of at least $10.

For the level 5 treatment, the profit function decreases with respect to wage; from 11.9 for the high wage to 9.2 for medium wage, going down to 6.3 for the high wage. All the differences in profits for the level 5 are highly significant (p<.01).

Finally, in the triple pay treatment the picture is different. The profits with low wage and medium wage (15.85 and 13.86, respectively) are not statistically significant from each other. However, with high wage, the profit is 21.95, and the difference is statistically significant from the other two wage levels.

From these results we learn that the answer to the question “does high wage lead to high profits?” is: it depends. When the return is high enough, employers earn significantly more money by paying a high wage. This means that even if the employer is completely selfish, she is better off paying a high wage. However, when the return on effort is low, employers earn significantly less by paying high wages. This is true although employees do reciprocate high wage with high effort.

This supports the prediction made in Akerlof (1982) that in some industries, even if employees reciprocate by working harder when they receive a wage higher than the market-clearing one, this will not be profitable to the firms. This is true even if, in principle, the employees could have fully compensated the employers for the high wage.
However, in markets in which this reciprocation by employees can benefit the employer greatly, a wage higher than the market-clearing one will increase the employers’ profits. Hence, in some industries we will observe high wage and an excess supply of workers (unemployment), and in other industries we will see the market-clearing wage, and no unemployment.

**Hypotheses testing**

The prediction of the model under the assumption of pure selfishness is clearly rejected. For the employers, 126 (67%) out of 189 sent either a medium or high wage. For the employees, 59 (83%) out of the 71 who received a high wage invested some time in solving mazes.

The positive reciprocity hypothesis, on the other hand, is supported by the data. For example, in all treatments and with all indexes (profit, time, number of mazes), employees invested significantly more when paid a high wage than when paid a low one.

The inequity aversion concerns are also supported by the data. If effort is costly, this hypothesis predicts that when the return on effort increases, employees will invest less effort but will yet generate more profit to the employers. To see this, consider for example Fehr and Schmidt’s (1999) model of inequality aversion. Let \( x \) be the employee’s payoff and \( y \) the employer’s payoff, then the employee’s utility \( U \) is:

\[
U = x - \alpha \max \{0, y - x\} - b \max \{0, x - y\}
\]
Where $a$ and $b$ are restricted such that $0 \leq b < 1$, $b \leq a$. Note that $x$ is increasing in wage and decreasing in effort. Thus, the employee’s choice of effort determines both $x$ and $y$, and she is assumed to choose the effort level which maximizes $U$.

For a given wage, if $y$ is larger than $x$, then clearly $U$ is not maximized, since the employee can simply increase $x$ and by that $U$ will increase. Hence, to show that when the return of effort increases both $x$ and $y$ are increased, it is sufficient to consider the following function:

$$U = x - b \max\{0, x - y\}$$

Given that, the following two observations can be made to support the above claim:

1. When the return increases, an increase of effort by the employee relative to the original situation would lower $U$ relative to its original value, since $x$ will be lower, and $(-b\max\{0, x - y\})$ increases by less than $x$ given the parameters restriction.

2. $y$ will not decrease. To see this, note that working less (increasing $x$) was possible also with the original return. The reason $x$ was not increased was the cost in terms of increasing the inequality $(-b\max\{0, x - y\})$. Given the increased return, lowering $y$ would only increase the inequality relative to the original case since $x$ will higher and $y$ lower.

3. If, when the return on effort increases, both $x$ and $y$ are increased, then $U$ is larger than in the original situation.
These three observations assert that $x$ does not go down (i.e., the employee does not work harder when return is increased), and that $y$ does not go down (its easy to show that $x$ and $y$ also does not stay the same). Hence, the employee will work less, but the employer will only benefit from an increase in the return on effort.

This prediction is supported by the data: Employees indeed work less, but employers earn more money in the triple pay treatment relative to the other two treatments. The same is true for the base treatment relative to the level 5 treatment.

The effort equals wage hypothesis, on the other hand, is not supported by the data: we see significant differences in the effort level invested for a given wage in the different treatments. The efficiency hypothesis is also not supported by the data. As argued above, this hypothesis predicts that effort level invested would increase in the return on effort. This does not happen. Even worse, participants invested significantly less time in the triple pay treatment relative to the other two treatments. The return equals wage hypothesis is also not supported by the data; we observe significant differences in profit with different returns.

Finally, the “primary and secondary” industries hypothesis is supported by the data. Although employees could have chosen, for example, to work harder and compensate employers even when the return on effort is low (e.g., like in the wage equals return hypothesis), we observe differences in the profitability of choosing a high wage. As argued above, this supports Akerlof’s (1982) prediction.

6. Conclusions
The motivation for constructing behavioral theories, such as Akerlof’s (1982) gift exchange model in the labor market, is to better describe and understand empirical observations. This model was tested successfully in a series of papers. These tests were conducted using money to represent effort, ignoring the psychology of effort. The first encouraging result of the current paper is that when this simplification is removed, i.e., when employees invest real effort, the results are even stronger.

Another difference between using real effort and choosing a number is that, just as in real life, the cost of the “gift” given by the employer and the one returned by the employee are not in the same currency: the first gives money and the latter time, cognitive effort, etc. Using this difference, one can test hypotheses regarding reciprocity and fairness that are difficult to distinguish otherwise.

The results of the experiment reported in this paper support the prediction of the inequality aversion models (Bolton and Ockenfels, 2000; Fehr and Schmidt, 1999). According to these models, the decision maker cares not only about her own payoff, but also about the payoff of the other participant. In particular, the employee is averse to having inequalities in payoffs. These models predict that when the return on employees’ effort is increased, they invest less effort in the job, yet the employers earn more money relative to the low return case.

The results also support the prediction of Akerlof’s (1982) labor market model that in some industries employers are better off following the conventional rule of offering market-clearing wages. In these industries the scope for gift exchange is too small to justify the initial gift by the employer (even when the employees can choose to invest enough effort to fully compensate the employers for “the gift.” In contrast, in
industries in which the return on effort is sufficiently high, wages higher than the market-clearing one can increase the expected profit of the employer. It might be interesting to conduct future research to test this model in experimental markets with different returns on effort.
References


Appendix 1: Employer’s instructions

Instructions for Player A

Welcome to this experiment in decision-making. The instructions are simple, and if you follow them carefully, you can earn a considerable amount of money. All the money you earn is yours to keep, and will be paid to you, in cash, next week.

The interaction in the experiment will be in pairs of students. You are student A and the student you will be matched with in few days is student B.

You will receive $10 at the beginning of the experiment. Student B will participate in an unrelated study at the decision Lab at the University, for which he/she will be paid separately; he/she will receive no extra money for this experiment.

You are asked to decide how much money to send to student B out of the $10 you received. You have three options: $0, $5, or $10.

Player B’s task is to solve mazes on the computer. For each maze player B solves, you will be paid $1. Player B will not be paid any additional money for this task apart from the money you send him. Player B will know about the details of your instructions.

Player B will have to decide when to finish working on the task; he/she can choose any amount of time between 0 to 60 minutes. That is, he/she can choose to solve any number of mazes he/she can within the allotted time of 60 minutes, and may choose not to solve any maze and spend no time on the task.

Your total earnings for the experiment are the sum of:

\[
\text{(the $10 you received)} - \text{(the amount you sent to player B)} + \text{(the number of mazes he/she solves times $1)}
\]

Player B’s total earning is the amount of money you chose to send him/her.

Do you have any questions?

Your Student Number:________________
The amount of money you choose to send player B:______________
Appendix 2: Employer’s instructions

Instructions for Player B

Welcome to this experiment in decision-making. The instructions are simple, and if you follow them carefully, you can earn a considerable amount of money. All the money you earn is yours to keep, and will be paid to you, in cash, after the experiment.

The interaction in the experiment will be in pairs of students. You are student B and the student you are matched with is student A.

Student A received $10 but you receive no extra money. Student A was asked to decide how much money to send to you out of the $10. He/she had three options: $0, $5, or $10.

Player A with whom you are matched sent you: ________________

Your task is to solve mazes on the computer. The experimenter will show you how to do that after you finish reading the instructions. For each maze you solve, player A will be paid $1. You will not be paid any additional money for this task apart from the money player A sent you. Player A knew about the details of your instructions.

You will have to decide when to finish working on the task; you can choose any amount of time between 0 to 60 minutes. That is, you can choose to solve any number of mazes you can within the allotted time of 60 minutes, and may choose not to solve any maze and spend no time on the task. The experiment will be over once you decide to finish it.

Player A’s total earnings for the experiment are the sum of:

\[(\text{the }$10\text{ he/she received}) - \text{(the amount he/she sent you}) + \text{(the number of mazes you solve times }$1)\]

Your total earning is the amount of money player A sent you.

Do you have any questions?

This is an anonymous form (please do not write your name on it).