Gift Exchange in the Lab - It is not (only) how much you give ... *

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Abstract

An important aspect in determining the effectiveness of gift exchange relations is the ability of the worker to "repay the gift" to the employer. To test this hypothesis, we conduct a real effort laboratory experiment where we vary the wage and the effect of the worker's effort on the manager's payoff. Furthermore we collect additional information that allows us to control for the workers' ability and whether they can be classified as reciprocal or not. Our agency model of reciprocal motivation predicts high and low ability workers are differently affected by our experimental variations. These predictions are borne out by our results. Furthermore, we document that exactly those individuals we classify as reciprocal are the ones driving these results.

JEL classification: C91, J33, M52

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1 Introduction

The common use of compensation schemes with weak monetary incentives (and the ability of such schemes to induce employee effort) has long been a puzzle in economics. Starting with Akerlof (1982) a literature has developed that considers alternative sources of incentives in the workplace. Akerlof models the labor relation as a gift exchange where workers respond to generous treatment by the firm (i.e. generous wage levels) by exerting above minimal effort. Many laboratory experiments have corroborated the potential of gift exchange, see Fehr and Falk (2008) for a survey. However, in particular as there is recent conflicting evidence on the efficacy of gift exchange in real effort situations[1], it is important to understand what determines how well motivating workers via gift exchange works and how it can be done more effectively. We argue that a key determinant of the efficacy of using reciprocal motivation to provide incentives is the ability of a worker to "repay a gift", i.e. the magnitude of the benefit accruing to the manager from high effort by the worker. If effort by the worker provides little to no benefit to the manager, then even a highly reciprocal worker given a very generous wage may not provide much effort.

We test this hypothesis in the lab using a real effort task where we manipulate the extent to which the employer benefits from employee effort. In our experiment subjects in the role of the "manager" could hire subjects in the role of the "worker" to perform a coding task, where workers have to match as many words to a specific code as possible in a pre-specified time period of 25 minutes, for a fixed wage payment of \$10. The manager's pay depended on the number of correct answers by the workers (guessing was discouraged with a penalty). We exogenously varied how much one correct answer was worth to the manager, and we gave the managers the option to offer the workers a higher flat wage (\$20) than the publicly announced \$10 at the beginning of the experiment. Thus workers are in one of 4 possible treatment conditions facing a combination of high or low wage and having a large or a small effect on the manager's payoff. In the next part of the experiment, all agents had to complete the coding task for five minutes under a piece rate for correct answers (again, guessing was discouraged with a penalty). We use the score from this test as a measure of individual ability. In addition, the subjects played a standard trust game, which we use to classify them as reciprocal or not, and fill out a "Big 5" personality test which we use to classify their personality type. We use this additional information to more precisely estimate the impact of a wage gift.

[1]See, e.g., Gneezy and List (2006) or Hennig-Schmidt, Rockenbach, and Sadrieh (2010).

It is intuitive to argue that there should be a complementarity between an initial gift and the ability to give back. Considering a simple agency model with reciprocal motivation, we can derive additional nuanced predictions on the sets of agents affected by the treatment variations which other competing theories cannot get. To capture reciprocity, a concept formally described by Rabin (1993) for normal form games and by Dufwenberg and Kirchsteiger (2004) and Falk and Fischbacher (2006) for sequential games, we assume that the worker's utility increases in the manager's revenue whenever the manager provides the worker with a rent in excess of his outside option. Thus when the manager is generous to the worker by giving him something valuable (additional compensation), the worker desires to provide in turn something of value to the manager (high effort). The worker's reciprocal attitude can now be used by the manager to align the worker's preferences with those of the manager, thus generating intrinsic motivation. A worker's decision whether to reciprocate will depend on whether his extra effort costs are outweighed by his extra utility from reciprocity. The latter will depend on four components: The worker's concern for reciprocity, the size of the initial gift (i.e. the generosity of the wage offer), the effect of the extra effort on the manager's revenue, and the worker's ability (i.e., the inverse of his effort costs). We derive two main comparative statics on the nature of the wage-effort relationship. A worker has a greater gift exchange-based incentive to work hard if, ceteris paribus, he is more intrinsically reciprocal or when the effect of his effort on the manager's payoff is greater. Furthermore, the wage and the benefit to the manager are complements in the workers utility function and hence, while varying only one of these instruments will suffice to induce only the (relatively) high ability workers to exert high effort, changing both is necessary to also entice the (relatively) low ability workers to work harder.

A direct implication of any reciprocity based model is a positive wage-effort relationship. In addition, in our setting, we predict that the effectiveness of gift exchange is increased when the manager derives a high payoff from the worker's effort, i.e., a complementarity between the wage gift and the worker's ability to repay. Furthermore, we make the following predictions about which workers, in terms of ability, will be influenced by a change in wage. When the effect of output on the manager's payoff is small, the *high* ability workers will be induced to exert effort by a high wage relative to a low wage. When the effect of output on the manager's payoff is larger, the *low* ability workers will be induced to exert effort by a high wage, relative to a low wage. Furthermore we can show that the response to these variations is stronger for more reciprocal individuals. These detailed predictions allow us to perform a fairly specific test of the effectiveness of gift-exchange.

The results of our experiment suggest mixed and conditional evidence in favor of gift-exchange in our real-effort experiment. At the aggregate level, we find a (weak) positive wage-effort relationship. When we control for ability, we can identify a differential effect of a wage gift depending on the effect of employee effort on the principal's payoff. We find that the overall effect of high wages (measured either at the median ability worker, or averaged over all ability groups) is only significantly positive in the high manager payoff treatment (between 2% and 11%). This suggests a strong complementarity between the wage gift and the worker's ability to repay in determining the effectiveness of gift exchange, and that gift exchange incentives may not be suitable for all job settings.

Moreover, we find confirmation for our more specific predictions about which workers, in terms of ability, will be influenced by a change in wage. In the treatment where the manager has a small benefit from effort, we observe a significant positive response to high wages among high ability workers, while in the high payoff condition we find the largest differential effect of the wage on effort among the low ability workers (since in the high payoff treatment high ability workers exerted extensive effort already even under the low wage).

We also measure individual differences in reciprocal inclination, either directly via a trust game or indirectly via a personality test. Given our agency model relies on reciprocal motivation as the mechanism behind gift exchange, it is reassuring that we find that this positive response to higher wages is much stronger among highly reciprocal subjects (using either measure of reciprocity). Hence our findings might have a wider applicability as personality tests are a prominent element in firms' hiring procedures. Using them allows firms to screen for reciprocal workers and make use of the workers' reciprocal motivation, in the process tailoring their incentive and organizational structure to get the most out of them.[2]

Our mixed results on the effectiveness of gift exchange motivations fit well into the recent discussion in the literature. An extensive body of evidence, surveyed by Fehr and Falk (2008), has developed, demonstrating reciprocal behavior and gift exchange in experiments. While Fahr and Irlenbusch (2000) identify a positive wage effort relation in a real effort laboratory experiment and Falk (2007) reports strong evidence for gift exchange in the context of charitable donations, Gneezy and List (2006) hire students for a day job and document that there is only a short lived effect of a surprise rise of their hourly pay on

[2]Our results are slightly stronger if we use a quality adjusted measure of productivity that takes into account the incorrect solved questions. In some sense this is similar to Kim and Slonim (2011) who find gift exchange in the "quality" dimension.

the students' effort. In a similar setting, Kube et al. (2011) document a strong positive gift-exchange effect if subjects receive nicely packaged non-monetary gifts.

Kessler (2010) finds in two laboratory experiments that the strategic and informational environment significantly impacts observed gift exchange results. He argues that subtle differences along these two dimensions differ also between similar lab and field environments. Hence he argues that the different results on gift exchange across lab and field studies is not necessarily due to methodological differences but potentially to subtle differences in the environment. His experiments manipulate in particular whether firms are "richer" than workers, the efficiency of worker effort, and whether workers are able to take advantage of those who might benefit from their effort. Whenever the strategic and informational environment in the lab is made "more similar" to standard field environments, gift exchange diminishes.

In a similar vein, some recent studies suggest that subtle details of the environment affect how well motivating workers via gift exchange works. Irlenbusch and Sliwka (2005) investigate the impact of transparency on the effectiveness of gift exchange and document that reciprocal behavior is much stronger in a more transparent situation where exact efforts are revealed to the principals. Hennig-Schmidt et al (2010) present a real-effort laboratory experiment and show that a positive wage-effort relation as implied by gift exchange only prevails if information on the employer's surplus is provided to the experimental workers. This indicates, as predicted by our model, that the employer's surplus is an important determinant of the effectiveness of gift exchange relations. Note, however, that Hennig-Schmidt et al (2010) do neither vary the surplus accruing to the manager nor collect the additional information necessary to test our hypotheses. Finally, Englmaier and Leider (2012) replicate our design in a natural field experiment and find results similar to us, in particular the lack of gift exchange among low ability subjects and the complementarity between wage gift and the ability to repay.

To sum up this literature, it seems that the effectiveness of gift-exchange relationships is context dependent, but in a rather structured manner. Gift-exchange will be more effective when the agent is aware of the importance of the task for the employer. So testing this presumption as we do in our design is a valuable contribution.

The rest of the paper is structured as follows. Section 2 describes the details of the experiment, Section 3 derives the theoretical predictions, Section 4 sets out and analyzes the experimental results and Section 5 concludes. The Appendix contains additional tables and the experimental instructions.

2 Experimental Design

The experiment took place in the CLER lab at Harvard Business School. We ran 20 sessions in July 2007. In total we had 229 subjects from the CLER lab subject database participating. They were told that they are participating in a study on decision making behavior in markets. All subjects received a show-up fee of $10. The workers were exogenously assigned to be either workers (192) or managers (37). Detailed instructions for the lab experiment can be found in Appendix C.[3]

In our experiment, subjects in the manager role could hire one worker each to perform a "coding task" where workers have to match as many words to a specific code as possible in a pre-specified time period of 25 minutes.[4] We announced publicly that managers could choose to hire workers at a fixed wage payment of $10. If the manager chose not to hire a worker, they both got $0. No manager chose not to hire a worker. Managers could also choose to surprise the worker with a fixed wage payment of $20, i.e. substantially higher than the $10 publicly announced at the beginning of the experiment.

Of the 37 managers, 3 chose to pay the higher wage of $20. To balance the number of observations between high ($20) and low ($10) wage offers, we first randomly assigned workers to a wage and payoff treatment, and then randomly matched them (by hand) to one of the managers who had made that choice. To get the right number of observations we matched some managers to multiple workers. Also, to facilitate this procedure we had the first two sessions as just managers, and told them that we would send them their payment at the end of the experiment - which we of course did.

By doing so we endogenously create two different wage conditions for the workers but exogenously allocate workers into one of those two conditions. Hence we treat this as a random treatment assignment. If the manager decided not to offer the higher wage, the worker never learned about this option. The manager's pay depended on the number of correct answers solved by the workers (guessing was discouraged with a penalty).

We exogenously created two different payoff conditions for the managers:

Low Payoff Condition The manager receives $40, plus a premium of $0.04 for every correct answer of the worker in the coding task, minus a penalty of $0.01 for every incorrect answer, minus the wage payment to the worker. Eg., if the manager hires a worker for a

[3]On average the experiment lasted 60 minutes. Mean subject earnings were $ 29.43.

[4]During these 25 minutes, managers had a waiting screen where they could play Solitaire, Freecell, Spider Solitaire, or Minesweeper.

\$10 wage and the worker has 200 correct and 3 incorrect answers the manager's payoff is given by $\$40 + 200 * \$0.04 - 3 * \$0.01 - \$10 = \$37.97$.

High Payoff Condition The manager receives \$10, plus a premium of \$0.20 for every correct answer of the worker in the coding task, minus a penalty of \$0.05 for every incorrect answer, minus the wage payment to the worker. Eg., if the manager hires a worker for a \$10 wage and the worker has 200 correct and 3 incorrect answers the manager's payoff is given by $\$10 + 200 * \$0.20 - 3 * \$0.05 - \$10 = \$39.85$.

Based on previous tests on the coding task, we picked the fixed and variable components of the manager's pay such that the average payoff of a manager should be roughly the same across the two conditions in order to minimize the role for unconditional distributional preferences.[5] Hence we can perform a between subjects analysis as subjects were randomly allocated into one of four treatment conditions (*\$10 wage/low payoff, \$20 wage/low payoff, \$10 wage/high payoff, \$20 wage/high payoff*).

In order to control for differing ability we had all subjects do the coding task for 5 minutes after the main treatment was completed with a piece rate of \$0.30 per correct answer and a penalty of \$0.08 per incorrect answer in order to discourage guessing. We will refer to this individual performance in the piece rate treatment as *Speed* and will use it to infer the workers' differing abilities (or costs of effort respectively). On average the subjects answered 47.7 questions correctly with a standard deviation of 12.1, a minimum of 7, and a maximum of 87. We do not find any significant influence of prior treatment assignment on the performance in the test.

In order to be able to test our prediction with respect to reciprocity we had workers play a trust game which we called the "sending task". In the sending task, both the Sender [S] and the Receiver [R] were given \$10. S can choose to send between \$0 and \$10 to R. Any amount sent was tripled and S kept any money that was not sent to R. R can then send back any amount up to the total amount received. We used the strategy method and the subjects were asked for their decision profile in both roles. We randomly picked one of the roles and randomly matched it with one of the other participants' decisions to determine the payoff from this task. In order to relate our findings to real world hiring practices (which very rarely involve eliciting trust game responses from applicants) we had workers take a "Big 5" personality test, which is commonly used by firms in their hiring procedures (see, e.g., Autor and Scarborough, 2008).

[5]In fact the overall average number of correct answers was roughly 197, i.e. very close to the 200 we assumed for this calibration.

The final payment of the subjects was determined randomly and was either their payoff from the worker/manager coding task, the piece rate coding task or the sending task.

3 Theoretical Predictions

3.1 A simple Model of reciprocal Motivation

To derive our hypotheses we consider a simple model that captures the intuition of the experiment. We consider a simplified version of the model in Englmaier and Leider (2012) who solve the full moral hazard problem and derive the general structure of optimal contracts in a standard principal agent problem with reciprocal agents. Assume there is a risk neutral manager who wants to maximize expected profits and a risk averse worker who cares about reciprocity. Assume that there are n states of the world that are characterized by outputs q_i with $i = 1, ..., n$ respectively. The worker can take one of two actions (effort levels) a_1 and a_2 with $a_1 < a_2$ and corresponding costs from effort $c(\cdot)$ with $c(a_2) - c(a_1) = \Delta c > 0$.[6] The two actions imply respective probabilities of the states $\pi_i(a_1)$ and $\pi_i(a_2)$ where for the respective expected return of the manager $ER(a_2) = \sum \pi_i(a_2)q_i > \sum \pi_i(a_1)q_i = ER(a_1)$ holds. In order to capture our experimental variation we introduce the scalar M which reflects the monetary value of output q_i to the manager, i.e. $M \cdot ER(a_i)$ is the expected monetary gross return for the manager from action a_i and $M \cdot \Delta ER = M \cdot ER(a_2) - M \cdot ER(a_1)$ is the gross benefit for the manager if the worker chooses a_2 instead of a_1.

A contract $(w, \hat{a})$ is a fixed wage payment w, as well as an *expected* action $\hat{a}$. In a real world context we could think of $\hat{a}$ as an informal job description or a code of conduct. In the lab we will interpret $\hat{a}$ as a commonly understood norm. Given our focus here on *changes in behavior* these details are not key to our results. While $\hat{a}$ is not binding, in the model it serves to fix the worker's beliefs about the manager's intended generosity (since the expected utility of a contract depends on the worker's action).

The worker's inherent concern for reciprocity is measured by $\eta \in [0, +\infty)$. We allow for potentially differing costs of effort (i.e. differing abilities), captured by a scalar $\gamma > 0$. The worker's utility function under the contract $(\tilde{w}, \hat{a})$, given that he takes action a', is given by

$$U(a', \hat{a}) = u(\tilde{w}) - \gamma c(a') + \eta \left(u(\tilde{w}) - \gamma c(\hat{a}) - \bar{u} \right) M \cdot ER(a')$$

[6]The restriction on two effort levels is to facilitate a simple exposition of the predictions. See Englmaier and Leider (2012) for a continuous effort version of the model with analogous predictions.

where $\bar{u}$ is the worker's outside option. The utility function consists of three parts: **i)** utility from the monetary wage payment $u(\tilde{w})$, **ii)** reciprocal utility $\eta\left(u(\tilde{w}) - \gamma c(\hat{a}) - \bar{u}\right) M \cdot ER(a')$, and **iii)** effort costs $\gamma c\left(a'\right)$.

Hence a "generous" contract is one that provides a rent to the worker, i.e. an expected monetary utility in excess of the worker's outside option. A more generous contract will induce the worker to feel more reciprocal, which here means that he will derive greater marginal and absolute utility from the manager's revenue.[7]

Now consider the decision of a worker whether to work hard, i.e. choose a_2, or not. To make the problem non-trivial, assume the manager wants to implement a_2. A worker will prefer to choose a_2 over a_1 if and only if

$$\begin{aligned} U\left(a_2, a_2\right) &\geq U\left(a_1, a_2\right) \\ \eta\left(u(\tilde{w}) - \gamma c(a_2) - \bar{u}\right) M \cdot \Delta ER &\geq \gamma \Delta c \\ \gamma^* \equiv \frac{\eta\left(u(\tilde{w}) - \bar{u}\right) M \cdot \Delta ER}{\eta c(a_2) M \cdot \Delta ER + \Delta c} &\geq \gamma. \end{aligned}$$

This condition immediately tells us, that for a given wage $\tilde{w}$ and a given monetary value M only workers with effort costs below a critical threshold γ^* will choose to work hard, i.e. those with relatively high ability. This threshold can be relaxed (i.e. more people be induced to choose a_2) if M (the monetary value to the manager) is increased or when a higher wage is paid (i.e. increasing $u(\tilde{w})$). An increase in η, the worker's reciprocal inclination has the same effect as an increase in M. The following Lemma 1 summarizes these results.

Lemma 1 ***[Reciprocity]*** *The critical value for working hard, γ^*, is strictly positive and defined by*

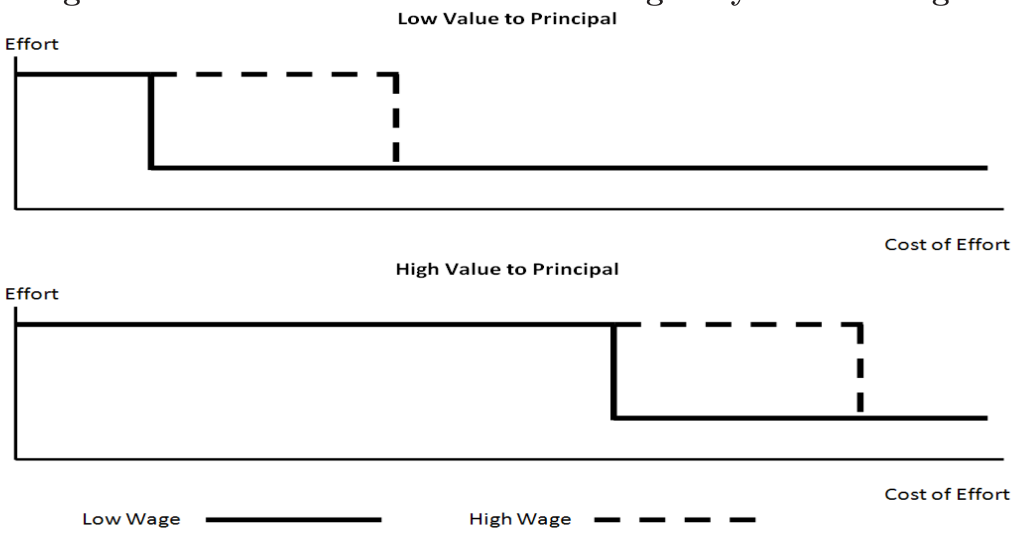
$$\frac{\eta\left(u(\tilde{w}) - \bar{u}\right) M \cdot \Delta ER}{\eta c(a_2) M \cdot \Delta ER + \Delta c} = \gamma^*.$$

γ^* increases in M and $\tilde{w}$ and M and $\tilde{w}$ are complementary:

$$\frac{\partial \gamma^*}{\partial M} > 0, \quad \frac{\partial \gamma^*}{\partial \tilde{w}} > 0, \quad \frac{\partial^2 \gamma^*}{\partial M \partial \tilde{w}} > 0.$$

[7]Note that, for tractability and to focus on our main idea, we use the principal's gross revenue, instead of revenue net of the wage payment. We want to as simply as possible capture the intuition that leaving a rent to the agent aligns his interests to the principal's interests. Our results still carry through if the agent has reciprocal utility over the principal's net profits. See Englmaier and Leider (2012) for a more detailed discussion.

Figure 1: Behavioral Predictions - Marginally Affected Agent



Furthermore γ^* *increases in* η

$$\frac{\partial \gamma^*}{\partial \eta} > 0.$$

It is important to note, that this implies that for a high M workers with relatively lower ability will be affected by a wage increase. Intuitively speaking, increasing either M or $\tilde{w}$ alone does not suffice to induce the low ability workers to work hard, but only the high ability workers. Only increasing M and $\tilde{w}$ together, due to their complementarity, induces the low ability workers to work. However, the complementarity has little effect on the high ability types as they already work hard if either M or $\tilde{w}$ is increased. We will exploit this reasoning on the identity of the marginal worker affected by our treatments to differentiate our model's predictions from alternative interpretations.

Combining these arguments leads to several predictions which can be neatly summarized in Figure 1: **1)** When the effect of output on the manager's payoff is small, the set of workers induced to exert effort by a high wage, relative to a low wage, will be the high ability (low effort cost) workers. **2)** When the effect of output on the manager's payoff is larger, the set of workers induced to exert effort by a high wage, relative to a low wage, will be the low ability (high effort cost) workers. **3)** These behavioral changes will be greatest among the most reciprocal workers.

In Appendix A we are going to contrast these predictions with three other prominent approaches that have been used to organize observed behavior in gift exchange experiments: standard preferences (as a benchmark), social welfare preferences, as stressed by e.g. Charness and Rabin (2002), and inequity aversion following Fehr and Schmidt (1999).

3.2 Predictions

Combining the results from our model and the three alternatives leads us to formulate the following predictions that we test in our experimental analysis. First there are two natural implications of our model

Prediction 1 *There is a positive wage-effort relationship.*

Prediction 2 *The wage-effort relationship is more strongly positive when the payoff to the manager from worker effort is high.*

In addition we have detailed predictions on the set of workers most affected by our treatment variations.

Prediction 3 *When the payoff to the manager from worker effort is low, the wage-effort relationship will be more pronounced among the* ***high*** *ability workers as opposed to the low ability workers.*

Prediction 4 *When the payoff to the manager from worker effort is high, the wage-effort relationship will be more pronounced among the* ***low*** *ability workers as opposed to the high ability workers.*

Note that none of the other models covered in Appendix A predicts a differential effect of a high wage on the effort of high and low ability workers based on the manager's payoff. Nor does the workers' reciprocal inclination matter in any of these models, while it naturally does in our model, as summarized below.

Prediction 5 *The predictions 1 - 4 will be more pronounced among more reciprocal subjects.*

4 Experimental Results

4.1 Results

Worker output was measured at 30-second intervals. We will use these high-frequency measurements, as well as the total output over the 25 minute task. We begin by considering the mean and median for the total number of questions answered in each treatment, presented in Table 1.

Offering a high wage increased output by almost 9.5 questions in the low payoff treatment, and by 13 questions in the high payoff treatment. Pooling the two payoff treatments, the effect of the wage offer on the raw means is marginally significant (ranksum test p = 0.0591).[8] However, since individuals vary widely in ability, we will need to control for these differences to obtain a better estimate of the treatment effect. To demonstrate the influence of ability, we report in Table 2 the mean output in each treatment for individuals in each tercile of performance in the piece rate coding task.

As one would imagine, individuals of higher ability performed better in the coding task than those with lower ability. Consistent with our Predictions 3 and 4, and not predicted by the other models, we find the impact of the treatment manipulation to be different for individuals of varying ability. In particular, in the *low manager payoff* condition, the effect of offering a high wage is positive for relatively high ability workers. By contrast, in the *high manager payoff* condition, the effect of the high wage is positive for relatively low ability workers. However, in contrast to Prediction 1 we find a **negative** wage-effort relationship for some ability groups, which we will discuss further in later sections.

Regression Analysis

To quantify our results we run the following OLS specification

$$\begin{aligned} y_i &= \beta_0 + \beta_1 * I_{wage} + \beta_2 * I_{payoff} + \beta_3 * I_{wage} * I_{payoff} \\ &\quad + \gamma_0 * Speed + \epsilon_i \end{aligned}$$

[8]Similarly, for managers the gross payoff (not including the wage payment) was higher with the \$20 wage: \$47.51 (low wage) vs. \$48.01 (high wage) in the low payoff treatment, and \$46.82 (low wage) vs. \$50.26 (high wage) in the high payoff treatment. Note, however, that the value of this increase in productivity is less than the extra \$10 in wage payments, hence firms offering the low wage had the highest profit.

Table 1: Mean Number of Correct Answers in the Coding Task

Worker Wage		Manager Payoff Low	Manager Payoff High
$10	Mean	192.51	190.79
	Std.Dev.	48.20	66.58
	N	43	53
$20	Mean	201.95	203.94
	Std.Dev.	56.20	50.91
	N	44	52

Table 2: Performance by Terciles of Speed

Baseline Speed	Low Manager Payoff			High Manager Payoff		
	$10 Wage	**$20 Wage**	**Difference**	**$10 Wage**	**$20 Wage**	**Difference**
[7,41]	168.13	131.73	-36.40**	146.50	163.65	17.15
[42,52]	184.00	199.29	15.29	178.06	215.07	37.01**
[53,87]	235.67	253.06	17.40	240.16	229.85	-10.31

Mean speed in each treatment: ($10, Low) = 47.26, ($10, High) = 47.85, ($20, Low) = 47.66, ($20, High) = 47.96. Significance of Rank Sum test for differences between wage treatments is denoted: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

where *Speed* is the log of our measure of individual ability elicited in the piece rate treatment (re-centered so that the median speed is set to zero).

We expect from Prediction 1 to find that $\beta_1 > 0$, and from Prediction 2 that $\beta_3 > 0$. Estimating the same specification on

$$Productivity = \# \text{ Correct Answers - 0.25 * Mistakes}$$

yields quantitatively and qualitatively very similar results. Repeating the same exercise with total output over 5 minutes as the dependent variable yields again very similar results.[9] We run Random-Effects with a time trend, as well as Random-Effects with AR1 errors, and GLS with AR1 errors and between-panel heteroskedasticity. A Wooldridge test for serial correlation finds autocorrelation ($p < 0.01$), and a Likelihood Ratio test suggests panel heteroscedasticity ($p < 0.01$). Hence the latter is our preferred specification.

The estimates for regressing the total number of correct answers are presented in Table 3. We find that paying the high wage when the manager has a high payoff has a significantly positive total effect in all specifications, while the wage effect in the low payoff treatment is significant and directionally smaller in the final specification. This is consistent with our theoretical predictions that high wages should induce reciprocity (and therefore higher effort), and that this effect should be strongest when the payoff from effort is highest.

Does the wage effect differ by speed?

We next examine how the wage effect varies by worker speed. To do so we include an interaction term between speed and treatment dummies:

$$\begin{aligned} y_i &= \beta_0 + \beta_1 * I_{wage} + \beta_2 * I_{payoff} + \beta_3 * I_{wage} * I_{payoff} \\ &\quad + \gamma_0 * Speed + \gamma_1 * I_{wage} * Speed + \gamma_2 * I_{payoff} * Speed + \gamma_3 * I_{wage} * I_{payoff} * Speed + \epsilon_i \end{aligned}$$

We expect that $\gamma_1 > 0$ and $\gamma_3 < 0$, as our model predicts that the wage effect should be highest for high ability workers in the low payoff treatment, and highest for low ability workers in the high payoff treatment. Table 4 reports the results of the regression, while Figure 2 displays the total wage effect at various percentiles of ability for the low payoff and high payoff treatments.

[9] In Appendix B in Table 9 we provide a comparison of our main regression specification for these four outcome measures: correct answers per 30 seconds, correct answers per 5 minutes, productivity per 30 seconds, productivity per 5 minutes.

Table 3: Number of Correct Answers (per 30-second period)

Dep. Var.: Corr. Answers per 30sec **Coefficients**	**(1)**	**(2)**	**(3)**
Speed	2.593***	2.589***	2.602***
	(0.160)	(0.180)	(0.0527)
Wage = $20	0.244	0.248	0.133***
	(0.156)	(0.166)	(0.0491)
High Manager Payoff	-0.0576	-0.0545	0.0510
	(0.171)	(0.159)	(0.0516)
($20 Wage) X (High Payoff)	0.0237	0.0161	0.0752
	(0.224)	(0.224)	(0.0695)
Period	0.0591***		
	(0.00392)		
Period^2	0.000786**		
	(0.00007)		
Panel Structure	Rand. Eff.	Rand. Eff.	Heterosked.
Time-Error Structure	Time Trend	AR-1	AR-1
Constant	3.108***	3.935***	4.087***
	(0.128)	(0.118)	(0.0363)
Observations	9600	9600	9600
Number of Subjects	192	192	192
Total Effect: $20 Wage and High Manager Payoff	0.268*	0.265*	0.208***
	(0.161)	(0.151)	(0.049)

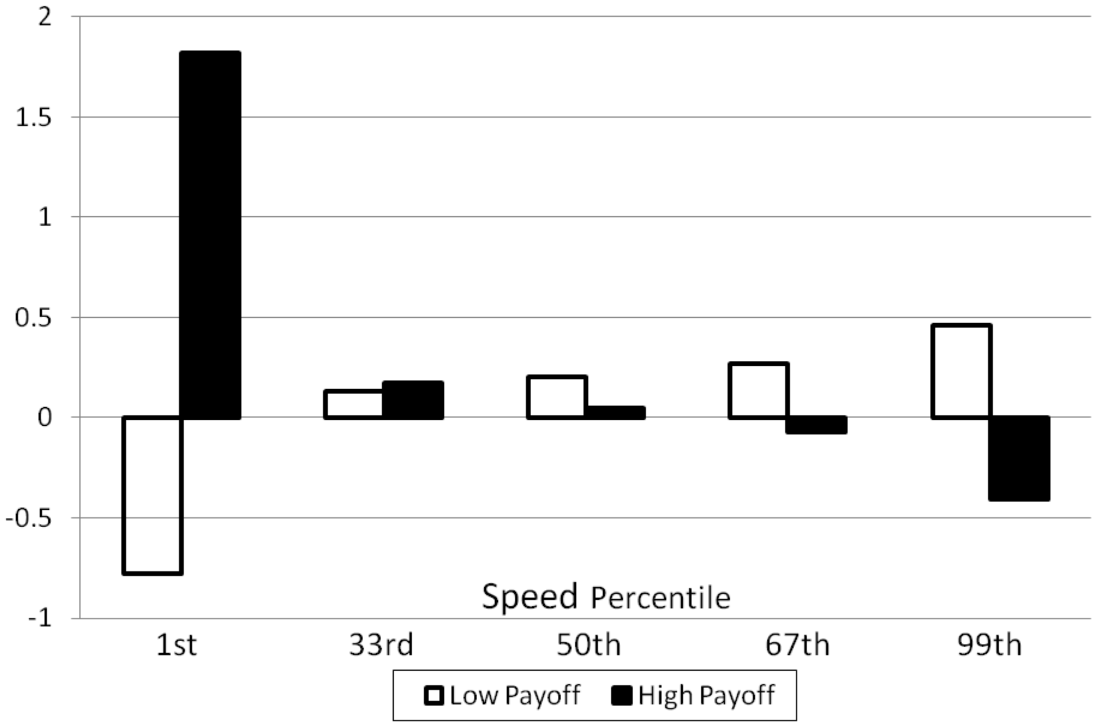
Dependent Variable is the number of correct answers per 30 second period. Robust Standard errors are reported in parentheses. Significance is denoted: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: **Number of Correct Answers (per 30-second period)**

Dep. Var.: Corr. Answers per 30sec	
Coefficients	(1)
Speed	2.180***
	(0.136)
Wage = $20	0.204***
	(0.0459)
High Manager Payoff	0.140***
	(0.0498)
($20 Wage) X (High Payoff)	-0.156**
	(0.0642)
($20 Wage) X Speed	0.590***
	(0.163)
(High Payoff) X Speed	1.327***
	(0.187)
($20 Wage) X (High Payoff) X Speed	-1.656***
	(0.233)
Constant	4.022***
	(0.0362)
Observations	9600
Number of Subjects	192
Total Effect: $20 Wage and High Manager Payoff	0.0479
	(0.0449)

Dependent Variable is the number of correct answers per 30 second period. Specification includes heteroskedastic and AR-1 errors. Robust Standard errors are reported in parentheses. Significance is denoted: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure 2: Wage Effect by Ability



The y-axis shows the change in number of correct answers induced by a wage increase. Predicted wage effects are significant for all percentiles of speed in the Low Payoff condition, and all percentiles except the 50th and 67th percentile for the High Payoff condition.

As expected, we find that the wage effect increases with speed in the low payoff treatment, so that high ability workers have a positive significant response to the wage. Additionally, we find that in the high payoff treatment the wage response decreases with ability, with low ability workers showing a positive significant response to the wage.

We also estimate a more flexible specification where we replace the log measure of speed with an indicator variable representing the subject being in the slowest, middle or fastest tercile of speed. This specification allows for potential non-linear or non-monotonic effects of ability. Table 5 presents the results, with the total average effect for each treatment being reported in the last two rows. Figure 3 displays the total wage effect for each speed tercile in each treatment.

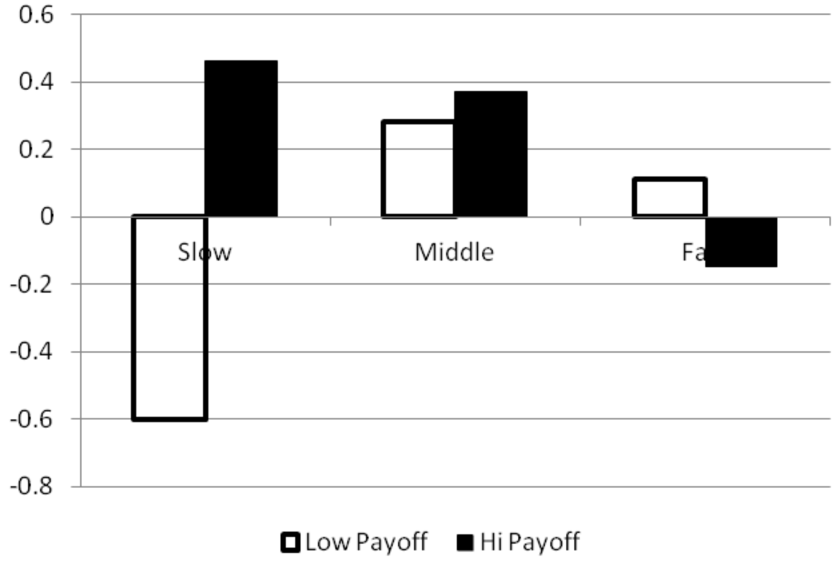
We again find that paying the high wage has an overall positive significant effect in the high payoff treatment, and a negligible effect in the low payoff treatment. As in the linear specification, the positive effect of the high wage comes from a relatively lower ability group in the high payoff treatment than in the low payoff treatment. We interpret these results

Table 5: Number of Correct Answers (per 30-second period)

Dep. Var.: Corr. Answers per 30sec **Coefficients**	(1)
Slowest Third	-0.349***
	(0.0873)
Fastest Third	1.182***
	(0.1000)
($20 Wage) X Slowest	-0.602***
	(0.0912)
($20 Wage) X Middle	0.282***
	(0.0874)
($20 Wage) X Fastest	0.110
	(0.0934)
(High Payoff) X Slowest	-0.449***
	(0.0822)
(High Payoff) X Middle	0.240**
	(0.0972)
(High Payoff) X Fastest	-0.0200
	(0.0994)
($20 Wage) X (High Payoff) X Slowest	1.064***
	(0.123)
($20 Wage) X (High Payoff) X Middle	0.0875
	(0.128)
($20 Wage) X (High Payoff) X Fastest	-0.259**
	(0.129)
Constant	3.759***
	(0.0681)
Observations	9600
Number of Subjects	192
Total Effect: $20 Wage	-0.070
	(0.0524)
Total Effect: $20 Wage and High Manager Payoff	0.228***
	(0.0511)

Dependent Variable is the number of correct answers per 30 second period. Specification includes heteroskedastic and AR-1 errors. Robust Standard errors are reported in parentheses. Significance is denoted: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure 3: Wage Effect by Ability Terciles



The y-axis shows the change in number of correct answers induced by a wage increase. Predicted wage effects are significant for slow and middle terciles of speed in the Low Payoff condition, and all terciles for the High Payoff condition (with marginal significance for the fastest tercile).

as being supportive of our model of gift exchange.

Are reciprocal subjects driving the effects?

While our results accord with the predictions of our reciprocity model, we want to further strengthen the case that the observed gift-exchange represents "reciprocity". To that end, we look to the results from our trust game to identify those individuals who are most likely to be reciprocal types. We should expect that our experimental sample is a mix of "selfish" subjects and "reciprocal" subjects, and that treatment manipulations have a stronger effect on the more reciprocal subjects. Therefore, if we can focus the estimates of the treatment effect on the reciprocal subjects, then the estimated treatment effects should be larger (since they will not be averaged with the subjects who exhibit no treatment effects).

In the trust game we ask all subjects to specify an amount to return to the sender for each possible sender decision. This gives us a complete return function for all subjects. The literature on reciprocity generally considers an upwards-sloping return function (i.e. the subject returns a larger amount when the sender has been more trusting/generous) to be indicative of positive reciprocity. For example, Camerer and Fehr (2004) describe the standard results in the literature as follows: "The amount trustees repay increases with y [the amount sent], which can be interpreted as positive reciprocity, or a feeling of obligation to pay more to an investor who has exhibited trust".[10] Since subjects' decisions are largely (but not completely) monotonic, we will use as our measure of reciprocity the difference between the largest and smallest fraction returned to the sender.[11] Hence we will identify a subject as reciprocal if this difference is at least 2/9. We will also require that the minimum return fraction is no larger than 2/9 to not misidentify subjects who are largely expressing altruism, rather than reciprocity.[12] Approximately 30% of subjects are identified as reciprocal in this fashion.[13]

There is no correlation between our reciprocity and our speed measure with a correlation-coefficient of -0.0794 and $p - value = 0.2735$. One may still be concerned that the coding task may have influenced decisions in the trust game. However, our results there are very similar to the results in the literature, e.g. in Ashraf et al. (2006). Moreover, the distribution of the reciprocity measure is not different between the treatments (regressing the reciprocity measure on treatment dummies yields p-values > 0.5 for each treatment.).[14]

In Table 6 we estimate our main specification separately for subjects who were identified as reciprocal and those who were not.

As expected, the estimated wage effect is almost twice as large for reciprocal subjects as it is for non-reciprocal subjects. This suggests that a substantial portion of our main treatment effect may be driven by the highly reciprocal subjects. Additionally, non-reciprocal subjects are relatively insensitive to the payoff treatment, while reciprocal subjects have a marginally significant difference in their response to the wage under the high payoff treatment versus the low payoff treatment.

[10] Ashraf et al. (2006) have subjects play both a trust game and a dictator game, and find that for subjects in the US the increasing slope of the return function cannot be fully explained by distributional preferences, suggesting reciprocity distinctly related to positive actions by the first mover as an explanation.

[11] In our experiment, on average the difference was 0.23 with a standard deviation of 0.197, a minimum of 0, and a maximum of 0.81.

[12] The average minimum ratio was 0.20 with a standard deviation of 0.227, a minimum of 0 and a maximum of 1.

[13] Very similar results may be obtained by using the difference between the $1 and $10 decision, or by using the slope of the linear fit to the return function. We also achieve similar results from adjusting the threshold values.

[14] Note that even if one task influenced the other, it would still suggest that the two tasks are measuring the same aspect of social preferences, i.e. the same mechanism driving the behavior.

Table 6: Effects of Reciprocity

Dep. Var.: Corr. Answers per 30sec	Low Reciprocity	High Reciprocity
Coefficients	(1)	(2)
Speed	2.495***	2.850***
	(0.0596)	(0.105)
$20 Wage	0.148**	0.0892
	(0.0619)	(0.0812)
High Manager Payoff	0.0314	-0.289***
	(0.0628)	(0.0923)
($20 Wage) X (High Payoff)	0.0381	0.217*
	(0.0865)	(0.118)
Constant	4.064***	4.152***
	(0.0453)	(0.0627)
Observations	6700	2900
Number of Subjects	134	58
Total Effect: $20 Wage and High Manager Payoff	0.186***	0.306***
	(0.0607)	(0.0876)

Dependent Variable is the number of correct answers per 30 second period. The first column reports the results for low reciprocity subjects, while the second column reports the results for high reciprocity subjects (Smallest return ration $\leq 2/9$, difference in return ratio $\geq 2/9$). Specification includes heteroskedastic and panel level AR-1 errors. Robust Standard errors are reported in parentheses. Significance is denoted: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Using Personality tests to classify reciprocal subjects

While in practice firms typically will not use information from an experimental trust game when hiring workers, personality tests are quite common in the hiring practices of many firms (cf. Autor and Scarborough, 2008). Thus, we now look to the results of the Big-5 Personality Test which subjects completed at the end of the experiment.

Using their responses, we identify subjects who score highly on the trait "agreeableness", which has been shown experimentally to relate to reciprocity (see Ben-Ner et al. 2004, Ashton et al. 1997).[15] Furthermore, high agreeableness corresponds with one of the criteria Autor and Scarborough (2008) identify in the hiring practice of the firm they study.[16]

We begin by regressing our reciprocity measure on the z-scores for the five personality traits.[17] The results are presented in Table 8 in Appendix B. In accordance with the previous literature we find a (marginally) significant positive relationship between reciprocity and agreeableness. There is no correlation between our agreeableness and our speed measure with a correlation-coefficient of -0.0715 and $p - value = 0.3242$.

To identify the differing treatment effect among high agreeableness subjects we define a dummy variable denoting if a subject is above the 66th percentile in agreeableness. We then estimate our output regression separately for the low agreeableness and high agreeableness subjects. The results are presented in Table 7. As with reciprocity, subjects with high agreeableness exhibit treatment effects of greater magnitude, suggesting they are driving a substantial portion of our effect. Given the significant positive relationship between reciprocity and agreeableness it should not be surprising that the results here parallel the results we obtained using the information from the experimental trust game.

[15]While Ben-Ner et al. (2004) and Ashton et al. (1997) also find some evidence that "openness" and "emotional stability" may relate to reciprocity as well, the relationship between reciprocity and agreeableness was most robust across specification and sample.

[16]The firm gave hiring preference to applicants with positive z-scores for agreeableness, conscientiousness, and extraversion.

[17]Each subject's raw score was calculated based on the sum of their self-ratings for each trait. A few subjects skipped one of the questions; their raw score was rescaled by 10/9; our results do not qualitatively change if we exclude these subjects. The raw scores for each trait were then standardized to have mean 0 and standard deviation 1.

Table 7: Effect of Agreeableness (as a Proxy for Reciprocity)

Dep. Var.: Corr. Answers per 30sec **Coefficients**	Low Agreeableness (1)	High Agreeableness (2)
Speed	2.814***	2.482***
	(0.0890)	(0.0652)
$20 Wage	0.131**	0.133*
	(0.0647)	(0.0763)
High Manager Payoff	-0.0125	-0.0850
	(0.0688)	(0.0784)
($20 Wage) X (High Payoff)	-0.0150	0.172
	(0.0926)	(0.106)
Constant	4.084***	4.088***
	(0.0485)	(0.0554)
Observations	5750	3850
Number of Subjects	115	77
Total Effect: $20 Wage and High Manager Payoff	0.116*	0.306***
	(0.0664)	(0.0740)

Dependent Variable is the number of correct answers per 30 second period. The first column reports the results for low agreeableness subjects, while the second column reports the results for high agreeableness subjects (60th percentile on the Agreeableness score). Specification includes heteroskedastic and panel level AR-1 errors. Robust Standard errors are reported in parentheses. Significance is denoted: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4.2 Discussion

Revisiting our predictions, we find several points supporting our reciprocity-based model. We find an increase in output when subjects are paid a high wage by their manager **and** this increase is larger and more significant when the manager has a larger benefit from high effort. We also find that the strongest increase in effort in the low payoff treatment was among high ability workers, while the strongest increase in the high payoff treatment was among low ability workers. This accords with our prediction that increasing the value of output to the manager should make the marginal worker induced to exert effort to be a lower ability worker, since high ability workers may exert effort even without the high wage. We also find evidence that subjects that can be identified as reciprocal will exhibit a more positive response of their effort from a high wage offer. We can identify these subjects either directly via a trust game, or indirectly via a personality test. This latter finding points at a wider applicability of our results as personality tests are a prominent element in firms' hiring procedures. Their usage may point at firms using reciprocal motivations and tailoring their incentive and organizational structure to increase their effectiveness. In Englmaier, Kolaska, and Leider (2012) we follow this reasoning and find suggestive evidence for this kind of firm behavior in a representative sample of UK manufacturing firms.

As in many previous studies, **standard preferences** do not explain behavior well in our experiment, since the standard model predicts no change in effort for any of our treatments. Additionally, **social welfare preferences**, while predicting a positive effort response to an increase in the effect of output on the manager's payoff, fail to explain the positive response to an increase in the wage and the differential effects of the treatments on the different ability types. **Inequity aversion**, rather than reciprocity, has often been used to model gift-exchange in studying agency problems. However, inequity aversion has significant limitations in modeling gift-exchange. With weak or no monetary incentives, social preferences in the form of inequity aversion will only induce the worker to exert effort if either **1)** effort reduces the worker's advantageous inequality, i.e. if the worker begins with a larger payoff than the manager and the manager receives $> 50\%$ of the profit from the worker's effort OR **2)** effort reduces the worker's disadvantageous inequality, i.e. the worker begins with a smaller payoff than the manager and the worker receives $> 50\%$ of the profit from his own effort. Moreover, the introduction of a high wage will only induce excess effort if it creates (or exacerbates) one of these conditions. Typically lab gift-exchange games operate under the first setup. If the manager offers a low wage, then the manager and the worker will have relatively equal payoffs if the worker does not work, and the manager will be enriched by effort. If the manager offers a high wage, then the worker will have a much higher payoff if he does not work, but can make the manager's payoff more equal if he does work. Given that **social welfare preferences** and **inequity aversion** fail to explain the data along the same dimension, combining the two as in Charness and Rabin (2002) does not explain the patterns.

In our experiment, however, in the low payoff treatment neither of these conditions – **1)** effort reduces the worker's advantageous inequality OR **2)** effort reduces the worker's disadvantageous inequality – is true. For both the low and high wage, the manager has a higher payoff than the worker, and when the worker works hard he only further increases the inequality. Therefore, inequity aversion could not be causing the worker to work hard, and if anything should cause the worker to purposefully answer questions incorrectly to lower the manager's payoff. Moreover, since the marginal effect of effort on inequality is the same under the low and high wage, under the standard Fehr-Schmidt preferences for inequity aversion, the effect of this form of social preferences should be the same regardless of the wage. Moreover, since the effort of higher ability workers will increase inequality by a greater amount, they should be less likely to work hard in both wage conditions. For the high payoff treatments, while the high wage case is in general ambiguous (since for less than 150 correct answers the worker has a higher payoff than the manager) the vast majority of workers (88%) answer enough questions correctly that the manager will have a higher payoff, and more than half (57%) answer enough questions that the manager's payoff is at least $10 larger than theirs. Moreover, in the low wage condition, the worker will be at a disadvantage if he answers at least 50 questions correctly (which all but one worker does), and 88% answer enough questions that the manager has at least a $10 higher payoff than the worker. However, the higher value of correct answers to the manager, and in particular the higher impact of effort for high ability workers, should mean that inequity averse workers work less hard (especially high ability ones). Hence, inequity aversion does not explain the treatment effects in our experiment.

As mentioned above, the negative effect of a wage increase for low ability workers is not directly predicted by our theory, nor any of the other models, however it can be consistent with the model if we consider negative reciprocity. In our basic model reciprocity can only have positive effects, since the contract must meet the worker's individual rationality constraint - i.e. he has to be willing to accept the contract because it is better than his outside option. In our experiment, however, the worker did not have the ability to choose an outside option. Low ability workers may interpret a high wage (given low payoffs) from the manager as indicative of high expectations of output to justify the wage. In fact, if low ability is equivalent to a high cost of effort, then the low ability worker may feel that the manager's expectations for his effort/output are too high. That is, he may believe that the manager expects such a high effort that the worker's utility is in fact negative. This may lead the worker to shirk so that the manager is "punished". Similarly, high payoffs may also lead the workers to believe the manager expects great effort and output (since it is so valuable to the manager). Moreover, if we use

$$\textit{Productivity} = \textit{\# Correct Answers - 0.25 * Mistakes},$$

i.e. the monetary payoff accruing to the principal, as dependent variable the overall effect of a wage increase is in fact positive. Overall, the patterns of our results are quite robust to using different output measures. In Table 9 in Appendix B we report the results for our main regressions for our preferred specification for alternative output measures. We look at three plausible alternatives to the number of correct answers per 30 second period (specification 1). In particular we use Productivity in a given 30 second period (specification 2), the number of correct answers per 5 minute period (specification 3), and Productivity in a given 5 minute period (specification 4).

5 Conclusion

The importance of fairness and social preferences for the work relation has long been documented. Based on our earlier theoretical work, Englmaier and Leider (2012), we argue that a key determinant of the effectiveness of using reciprocal motivations to provide incentives is the ability of a worker to repay a gift, i.e. the magnitude of the manager's benefit from high effort is crucial to the efficacy gift-exchange. We test our model in the lab by manipulating the extent to which the manager benefits from worker effort. In the experiment we find that the manager's benefit has important effects on behavior: we observe positive gift exchange when the manager directly benefits from worker output. We collect additional data so we can identify the non-trivial role workers' abilities play in determining individual responses to an initial gift. Furthermore, we can identify reciprocal subjects from their trust game responses, and show that they exhibit a stronger response to a high wage. We also use standard personality tests to classify types as reciprocal and get closely comparable results.

Our study indicates that employing workers' reciprocity to provide incentives is a viable alternative and can be successfully done. However, if a firm wishes to use reciprocal incentives, it may be important that various complementary parts of the firm's compensation and HR policy are coordinated to maximize the effect of reciprocity. Our experimental results suggest that a firm hoping to induce a gift-exchange with its workers may be most successful when the worker's manager directly benefits from worker effort, and when workers have been selected at hiring to be highly reciprocal.

Our study is an early step towards more fully exploring this topic, and there are many fruitful directions for future research. For example, further empirical work can explore the optimal magnitude of the wage gift and the proper mix between reciprocal and explicit motivation to maximize the profitability of gift exchange. Our theoretical model suggests that a job where explicit incentives work poorly due to a noisy production function, and where output is highly valuable to the manager is the environment where reciprocal incentives should be most attractive.

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A Alternative Preference Specifications

A.1 Behavioral Predictions under Standard Preferences:

The standard model of selfish preferences is a special case of the reciprocity model with $\eta = 0$. Because our experiment has only flat wages (rather than outcome-contingent transfers), there is no way to induce a selfish worker with positive effort costs to choose a_2. Trivially therefore, increasing M or $\tilde{w}$ will have no effect. This is summarized in Lemma 2.

Lemma 2 ***[Standard Preferences]*** $\gamma^*_{Standard} = 0$ *and the according comparative statics are trivially given by* $\frac{\partial \gamma^*_{standard}}{\partial M} = 0, \quad \frac{\partial \gamma^*_{standard}}{\partial \tilde{w}} = 0, \quad \frac{\partial^2 \gamma^*_{standard}}{\partial M \partial \tilde{w}} = 0.$

A.2 Behavioral Predictions under Social Welfare Preferences:

As stressed by e.g. Charness and Rabin (2002), social welfare preferences, i.e. the desire to increase social efficiency, might play a role in determining behavior. Not doing justice to Charness and Rabin's model but to capture this idea in a simple way, consider a worker who maximizes the weighted sum of his own utility and the manager's revenue,

$$u_{SW} = \theta \left(u(\tilde{w}) - \gamma c(a) \right) + (1 - \theta) \left(M \cdot ER(a) - \tilde{w} \right)$$

where $\theta \in [0, 1]$ is the relative weight of the two components. Analogously to above consider the decision of a worker whether to work hard, i.e. choose a_2, or not. A worker will prefer to choose a_2 over a_1 if and only if

$$\begin{aligned} U_{SW}(a_2) &\geq U_{SW}(a_1) \\ -\theta\gamma c(a_2) + (1-\theta)\left(M \cdot ER(a_2)\right) &\geq -\theta\gamma c(a_1) + (1-\theta)\left(M \cdot ER(a_1)\right) \\ \gamma^*_{SW} \equiv \frac{(1-\theta)}{\theta} \frac{M \cdot \Delta ER}{\Delta c} &\geq \gamma. \end{aligned}$$

We can immediately see that there is a strictly positive threshold for γ^*_{SW} that is increasing in M but independent of $\tilde{w}$ as it is only a transfer with no welfare implications. Hence there is no complementarity between M and $\tilde{w}$.

Lemma 3 ***[Social Welfare Preferences]*** *The critical value for working hard, γ^*, is strictly positive and defined by*

$$\frac{(1-\theta)}{\theta} \frac{M \cdot \Delta ER}{\Delta c} = \gamma^*_{SW}.$$

γ^*_{SW} *increases in M but not in w and hence M and $\tilde{w}$ are not complementary:*

$$\frac{\partial \gamma^*_{SW}}{\partial M} > 0, \quad \frac{\partial \gamma^*_{SW}}{\partial w} = 0, \quad \frac{\partial^2 \gamma^*_{SW}}{\partial M \partial w} = 0.$$

A.3 Behavioral Predictions with Inequity Aversion:

Inequity aversion is perhaps the most prominent form of (outcome based) social preferences that has been employed to organize non-standard laboratory behavior. Using the formulation of inequity aversion (IA) by Fehr and Schmidt (1999) the worker's utility is given by

$$u_{IA} = u(\tilde{w}) - \gamma c(a) - \alpha \max\left[ER(a) - 2\tilde{w} + \gamma c(a), 0\right] - \beta \max\left[2\tilde{w} - \gamma c(a) - ER(a), 0\right]$$

where α weights unfavorable inequality and β favorable inequality.[18] For the specific parametrization of our experiment the manager is (almost) always better off, hence - to ease exposition - we focus on this case. See below for a case where the worker is better off.

$$u_{IA} = u(\tilde{w}) - \gamma c(a) - \alpha \max\left[M \cdot ER(a) - 2\tilde{w} + \gamma c(a), 0\right].$$

Analogously to above consider the decision of a worker whether to work hard, i.e. choose a_2, or not. A worker will prefer to choose a_2 over a_1 if and only if

$$\begin{aligned} u_{IA}(a_2) &\geq u_{IA}(a_1) \\ -\alpha M\left[ER(a_2) - ER(a_1)\right] &\geq (1+\alpha)\gamma c(a_2) - (1+\alpha)\gamma c(a_1) \\ \gamma^*_{IA} \equiv -\frac{\alpha \cdot M \cdot \Delta ER}{(1+\alpha)\,\Delta c} &\geq \gamma. \end{aligned}$$

There exists no positive value γ^*_{IA} such that a_2 is induced and increasing M **decreases** γ^*_{IA} while the increase of $\tilde{w}$ has no effect. Hence M and $\tilde{w}$ are not complements.

Lemma 4 ***[Inequity Aversion]*** *There exists no positive value γ^*_{IA} such that a_2 is induced:*

$$-\frac{\alpha \cdot M \cdot \Delta ER}{(1+\alpha)\,\Delta c} = \gamma^*_{IA}.$$

Moreover, γ^*_{IA} ***decreases*** *in M and is independent of $\tilde{w}$:*

$$\frac{\partial \gamma^*_{IA}}{\partial M} < 0, \quad \frac{\partial \gamma^*_{IA}}{\partial \tilde{w}} = 0, \quad \frac{\partial^2 \gamma^*_{IA}}{\partial M \partial \tilde{w}} = 0.$$

Using the formulation of inequity aversion (IA) by Fehr and Schmidt (1999) and focussing on the case where the worker is better off, the worker's utility is given by

$$u_{IA} = u(\tilde{w}) - \gamma c(a) - \beta\left[2\tilde{w} - \gamma c(a) - M \cdot ER(a)\right].$$

[18] Given that we have only two actors, the formulation of Bolton and Ockenfels (2000) would give the same results.

Analogously to above consider the decision of a worker whether to work hard, i.e. choose a_2, or not. A worker will prefer to choose a_2 over a_1 if and only if

$$\begin{aligned} U_{IA}(a_2) &\geq U_{IA}(a_1) \\ u(\tilde{w}) - (1-\beta)\gamma c(a_2) - \beta\left[2\tilde{w} - M \cdot ER(a_2)\right] &\geq u(\tilde{w}) - (1-\beta)\gamma c(a_1) - \beta\left[2\tilde{w} - M \cdot ER(a_1)\right] \\ \gamma^*_{IA} \equiv \frac{\beta \cdot M \cdot \Delta ER}{(1-\beta)\,\Delta c} &\geq \gamma. \end{aligned}$$

Lemma 5 ***[Inequity Aversion*** **(β)*****]*** *There exists a positive value γ^*_{IA} such that a_2 is induced:*

$$\frac{\beta \cdot M \cdot \Delta ER}{(1-\beta)\,\Delta c} = \gamma^*_{IA}.$$

Moreover, γ^*_{IA} increases in M and is independent of w:

$$\frac{\partial \gamma^*_{IA}}{\partial M} > 0, \quad \frac{\partial \gamma^*_{IA}}{\partial w} = 0, \quad \frac{\partial^2 \gamma^*_{IA}}{\partial M \partial w} = 0.$$

B Additional Tables

Table 8: Reciprocity and Personality Characteristics

Dep. Var.: Corr. Answers per 30sec Coefficients	(1)
Agreeableness	0.0269*
	(0.015)
Extraversion	-0.0242
	(0.016)
Conscientiousness	-0.0110
	(0.015)
Emotional Stability	-0.0192
	(0.015)
Imagination	0.0245
	(0.016)
Constant	0.230***
	(0.014)
Observations	192

Standard errors are reported in parentheses. Significance is denoted: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: Number of Correct Answers - Comparing Various Output Measures

Dep. Var.: Coefficients	**corr. answers (30sec)** (1)	**productivity (30sec)** (2)	**corr. answers (5min)** (3)	**productivity (5min)** (4)
Speed	2.602***	2.712***	25.81***	26.58***
	(0.0527)	(0.0529)	(0.935)	(0.881)
Wage = $20	0.133***	0.139***	1.769**	1.916**
	(0.0491)	(0.0507)	(0.740)	(0.791)
Manager Payoff High	-0.0510	-0.0813	0.228	-0.0427
	(0.0516)	(0.0538)	(0.816)	(0.889)
($20 Wage) X (High Payoff)	0.0752	0.107	-0.417	-0.0848
	(0.0695)	(0.0720)	(1.079)	(1.163)
Panel Structure	Heterosked.	Heterosked.	Heterosked.	Heterosked.
Time-Error Structure	AR-1	AR-1	AR-1	AR-1
Constant	4.087***	4.060***	40.16***	39.69***
	(0.0363)	(0.0378)	(0.566)	(0.609)
Observations	9600	9600	960	960
Number of Subjects	192	192	192	192

Dependent variables are the number of correct answers per 30 second period (specification 1), productivity, i.e. the monetary payoff for the principal, accruing in a given 30 second period (specification 2), the number of correct answers per 5 minute period (specification 3), and productivity, i.e. the monetary payoff for the principal, accruing in a given 5 minute period (specification 4). Robust standard errors are reported in parentheses. Significance is denoted: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.