

Reciprocal Preferences and Gift-Exchange*

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Abstract

We experimentally investigate a repeated gift-exchange game where firms make binding wage offers and workers can freely decide on the effort they exert. Effort is profitable for the firm but costly for the worker. In contrast to other gift-exchange experiments we find that high effort levels are not sustained in the long run. Before the repeated game we elicit reciprocal preferences and find that only 10 percent of workers are selfish whereas 90 percent exhibit reciprocal preferences. We develop a measure for the intensity of reciprocal preferences and find that the intensity is relatively weak. In relating reciprocal preferences to behavior in the repeated gift-exchange game we find that the elicited preferences have predictive power for behavior but also that the relationship is imperfect. Consequently, firms could maximize profits not by relying on gift-exchange but by offering the lowest possible wage. Together, this leads to unraveling of gift-exchange in our experiment.

Keywords: gift-exchange, reciprocal preferences, consistency

JEL Classification: C72, C92, J59

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1 Introduction

Incomplete contracts and moral hazard in labor relations have been a topic of continuing interest for economists. Several mechanisms have been proposed to reduce moral hazard (e.g., Grossman and Hart, 1981, Shapiro and Stiglitz, 1984, Mas-Colell et al., 1995). Akerlof (1982, 1984) was the first to suggest that workers may be motivated by fairness and a taste for reciprocity, which may help overcome moral hazard (see also Blau, 1964). In his model workers are willing to exert higher levels of effort in response to higher wages, even when effort is not enforceable. In anticipation of workers' reciprocity, profit maximizing firms are offering wages above workers' reservation wages. Akerlof (1982) coined the term *gift-exchange* for this reciprocal relation between firms and workers.

Fehr et al. (1993, henceforth FKR) developed the gift-exchange game (henceforth, GEG) and tested Akerlof's hypothesis in the laboratory. The GEG is a simple two-stage game between a firm and a worker, where enforceable contracts are absent. In the first stage, the firm offers a wage to the worker who, in the second stage, decides how much effort to exert. Effort is beneficial for the firm but costly for the worker. Under standard assumptions of rationality and material self-interest, the unique subgame-perfect Nash equilibrium of a finitely-repeated GEG prescribes the worker to exert minimum effort and the firm to offer the smallest possible wage, satisfying the worker's participation constraint. Importantly, both parties would be materially better off if the firm offered a higher wage and the worker reciprocated by exerting higher levels of effort.

In contrast to the standard prediction and in line with Akerlof's conjecture, FKR found that workers do reciprocate higher wages with higher effort levels. This result sparked considerable interest as it suggested that reciprocal behavior may indeed help to overcome the moral hazard problem inherent in incomplete contracts. In a stream of studies the existence and robustness of gift exchange in various situations has been investigated. Many studies corroborate the initial findings but others put into question the robustness of the results.¹

In this paper, we contribute to the quest of uncovering reasons for gift-exchange not being sustainable in the longer-run. We thereby focus on the fundamental issue

¹See, e.g., Fehr et al. (1997, 1998a,b), Fehr and Falk (1999), Brandts and Charness (2004), Charness (2004), Bellemare and Shearer (2009), Hennig-Schmidt et al. (2010), Kube et al. (2012, 2013), Cohn et al. (2014), Gilchrist et al. (2016). Studies that suggest that the sustainability of gift exchange is not always guaranteed comprise, Hannan et al. (2002), Brown et al. (2004), Charness et al. (2004), Gneezy and List (2006), Engelmann and Ortmann (2009), Kagel and Owens (2010). Fehr et al. (2009), Charness and Kuhn (2011), Cooper and Kagel (2012), Casoria and Riedl (2013) provide surveys on gift exchange experiments and related issues.

of workers' preference for reciprocity and its role in the gift-exchange relationship. Specifically, we investigate the intensity of these preferences, their heterogeneity among workers and how this relates to the wage-effort dynamics in a finitely repeated GEG. Our research strategy is inspired by Fischbacher and Gächter (2010) and the experiment consists of two parts. In the first part, we elicit (amongst others) workers' reciprocal preference in a one-shot GEG using the strategy method (Selten, 1967). In the second part, workers play a direct-response finitely-repeated GEG.²

We find that 90 percent of subjects in the role of workers exhibit reciprocal preferences, whereas only 10 percent exhibit materially selfish preferences. Thus, a clear majority of subjects is willing to respond to higher wages with higher effort levels, even in a one-shot situation. However, the strength of reciprocity we observe is relatively weak, in the sense that firms could earn a higher profit by offering the smallest possible wage. In the repeated GEG effort and wage levels decline over time. We relate the elicited preferences to effort choices in the repeated GEG and find that they are significantly correlated. This correlation is imperfect, however, and together with firms' attempts to maximize profits and workers' relatively weak intensity of reciprocal preferences it can account for a large part of the observed downward cycle of wages and effort.

The rest of the paper is organized as follows. In Section 2 we introduce the design of the experiment. In section 3 we present the results and Section 4 discusses and concludes.

2 Experimental design and procedures

2.1 Experimental design

The experiment consists of two parts. In the first part, we elicit participants' reciprocal preferences in the gift-exchange game using a variant of the strategy method introduced by Selten (1967) (see Brandts and Charness, 2011, for a survey). In the second part, participants play a finitely-repeated version of the gift-exchange game. In the following,

²To our knowledge only a few other studies have elicited workers' preference for reciprocity in the GEG (Maximiano et al., 2007, Gächter and Thöni, 2010, Maximiano et al., 2013). These papers differ from our study as they do not classify workers' types as we do and they also do not investigate the relation of elicited preferences on behavior in the finitely-repeated game. Moreover, these studies use variants of the GEG with multiple workers.

we first introduce the gift-exchange game we implemented. Thereafter, we discuss the details of the two parts of the experiment and report on the experimental procedures.

The implemented gift-exchange game is a two-person game consisting of two stages. The first player (*firm*) decides on the wage $w \in \{0, 5, 10, 15, \dots, 95, 100\}$ to be paid to the second player (*worker*). Knowing the wage the worker decides on a level of effort $e \in \{1, 2, 3, \dots, 10\}$ to exert. Effort is costly for the worker and the costs of effort $c(e)$ are shown in Table 1.

Table 1: Costs of effort

e	1	2	3	4	5	6	7	8	9	10
$c(e)$	0	1	2	4	6	8	10	12	15	18

The profit of the firm and the earnings of the worker are given by

$$\begin{aligned}\pi &= 10e - w + 50 \\ u &= w - c(e) + 20,\end{aligned}$$

respectively.³

Assuming common knowledge of rationality and narrow material self-interest the unique subgame-perfect Nash equilibrium is given by the firm offering the lowest possible wage ($w = 0$) and the worker exerting the lowest possible effort ($e = 1$). However, a number of experiments have shown that many workers are willing to respond to higher wages with higher effort levels. That is, empirically effort is an increasing function of wage: $e = e(w)$ and $e'(w) > 0$. For a profit maximizing firm anticipating this relation the maximization problem becomes

$$\max_w \pi = 10e(w) - w + 50.$$

An important implication of this gift-exchange relationship is that offering a wage higher than the lowest possible wage can be profitable for the firm, provided the worker is sufficiently reciprocal. For our set-up, this will be the case when $e'(0) > 1/10$, as this implies $d\pi/dw(0) > 0$.

³The range of wage and effort choices is in keeping with many gift-exchange experiments (cf. Casoria and Riedl, 2013) and the payoff functions closely resemble those used in Brown et al. (2004). We have chosen to add lump-sum payments of 50 and 20, respectively, to avoid issues of loss aversion. In the literature there is no evidence that such lump-sum payments adversely affect gift-exchange (see, e.g., Fehr et al., 1993, Brandts and Charness, 2004)

Part 1: Elicitation of reciprocal preferences and beliefs. As already mentioned above, to elicit workers' reciprocal preferences in the GEG we use the strategy method. Assuming that workers reciprocal preferences do not change, at least in the short term, the results from the strategy method will allow us to test the impact of these preferences on workers' effort choices in the finitely-repeated GEG. It also allows us to examine the intensity of reciprocal preferences and whether the extent of reciprocity will be sufficient for firms to earn higher profits with positive wages than with the lowest possible wage of zero.

At the start of Part 1, participants in the experiment were randomly assigned the role of either a firm or a worker. These roles remained fixed throughout the experiment. Each participant in the role of a worker was asked to fill out a wage-effort table where s/he had to state the effort level s/he was willing to exert for each possible wage $w \in \{0, 5, 10, 15, \dots, 100\}$ offered by the firm. Hence, each worker had to make 21 effort decisions.

Each participant in the role of a firm had to decide on the wage that would actually be paid to a randomly matched worker. All firms and workers made their decisions independently and anonymously. The actual wage and the chosen effort corresponding to that wage determined participants earnings in this part,⁴ which guaranteed incentive compatibility of both effort and wage choices.

After having made their wage and effort decisions, firms and workers were asked to state their beliefs regarding the actions of their matched counterparts. That is, each worker had to provide an estimate of the wage s/he would be offered by the firm and each firm had to provide an estimate of the effort chosen by the matched worker for the actually offered wage. Participants were rewarded for the accuracy of their estimates. If the estimate was exactly right, three additional points were earned. If the estimate deviated by one unit (two units) from the actual decision, then two (one) additional point(s) were earned. Larger deviations earned nothing.

At the end of Part 1, each worker was informed about the wage actually offered by the matched firm and each firm got to know the effort exerted by the matched worker. They were also informed about the accuracy of their estimates.

⁴For example if the firm offers a wage of 15, and the worker entered effort level 2 in the wage-effort table, firm's earnings are 55 and worker's earnings are 34.

Part 2: The finitely-repeated gift-exchange game. The second part of the experiment consisted of a gift-exchange game repeated for ten periods. Each participant stayed with the same role (firm or worker) as in Part 1, but workers and firms were randomly re-matched at the beginning of each period. To minimize possible repeated game effects workers and firms were not identifiable across periods. Each period consisted of two stages. In the first stage, firms had to decide on a wage level and to provide an estimate of the effort that would be chosen by the matched worker. At the same time, workers had to indicate the wage they believed the matched firm will offer. In the second stage, workers learned the actual wage and had to decide on the effort level.⁵

A note on why we do not balance the order of Part 1 and Part 2. First, reversing the sequence of the parts is not necessarily informative about order effects. In particular, the information on actual wages received during the finitely-repeated game may bias the strategies elicited afterwards, especially if subjects consider (very) high wages (i.e., wages not observed in the finitely repeated game) as unrealistic and hypothetical. Second, Fischbacher and Gächter (2010) did not find order effects between the strategy method and active play in public goods game experiments.

2.2 Procedures

The experiment was conducted at the Maastricht University Behavioral and Experimental Economics laboratory (BEElab). Four sessions were run with a total of 40 participants. All participants were students at Maastricht University. They were recruited via e-mail and had to register on-line. Interactions in the experiment were fully computerized using Z-tree software (Fischbacher, 2007).

At the beginning of each session participants were randomly allocated to a closed cubicle where they could make their decisions in complete anonymity from the experimenter and other subjects. The instructions (available in the Supplementary Materials) were given to participants on paper and each of the parts was explained in detail. Instructions for Part 1 were handed out first. Participants were informed that there would be a second part of the experiment, but did not receive any information on the content of the second part. Instructions for the second part were not given until Part 1 was finished.

⁵Since the game is played for a known finite number of periods, a subgame-perfect Nash equilibrium of the stage game is also an equilibrium of the finitely repeated game.

When participants were ready with reading the instructions, they were asked to answer a set of comprehension questions. The experiment did not start until all participants had correctly answered all questions. These procedures were the same in both parts of the experiment. At the end of the experiment the total amount of points earned in Part 1 were converted to Euro at rate of 1 point = 12 Euro cent and the total amount of points earned in Part 2 were converted to Euro at the rate of 1 point = 2 Euro cent. A typical session lasted about 90 minutes and participants earned on average €19,-.

3 Results

We first analyze workers' elicited reciprocal preferences in Part 1 and then proceed to examine whether they can explain the behavioral dynamics in the finitely-repeated GEG.

3.1 Reciprocal preferences

For the classification of workers as reciprocal or selfish types we adapt the method introduced by Fischbacher et al. (2001) (see also Fischbacher and Gächter, 2010). Specifically, the rules for determining the type of a worker are as follows. A worker is classified as having *reciprocal preferences* (is called *reciprocator*) if there is a significant positive correlation at the 1-percent level between effort and wage, using Spearman's rank order correlation coefficient. Workers who always exert the lowest possible effort (i.e., $e = 1$ for all $w \in \{0, 5, \dots, 95, 100\}$) are classified as *selfish*. Workers who do not meet any of these criteria are classified as *other*.

Result 1 *Ninety percent of workers exhibit reciprocal preferences and only ten percent are fully selfish.*

SUPPORT: Using the criteria described above, we can classify 10 percent of workers as selfish and 90 percent as reciprocators. We do not identify any other types. The individual strategies are reported in Figure A.1 in Appendix A.1.

With 90 percent the share of reciprocators is relatively high. However, the fact that a worker exerts higher effort for higher wages does not necessarily imply that a high wage is profitable for the firm. Whether high wages are profitable for firms depends on the *intensity* of the worker's reciprocal preferences. For instance, in our experiment, if $w = 50$ and $e = 5$ then a firm earns 50 and the worker 64. In such a case a profit

maximizing firm would be better off offering the smallest possible wage, $w = 0$, which secures a profit of 60. For $w = 50$ to be more profitable for the firm than $w = 0$, a worker must exert an effort of at least 6. Hence, only if the intensity of workers' reciprocal preferences is strong enough firms will have an incentive to offer positive wages.

In the following we present a measure that allows us to quantify the intensity of reciprocal preferences. We call this measure the reciprocation index, RI , which classifies workers with respect to the extent of their reciprocation. The index is build in two steps. First, the Spearman criterion determines whether a worker is classified as a reciprocator or not. Second, the index informs us about the strength of reciprocation by measuring the normalized area under the wage-effort schedule. Specifically, for each individual i , the index is defined as

$$RI_i = \frac{\sum_{k=0}^M (e_{ki} - \underline{e})}{M(\bar{e} - \underline{e})},$$

where e_{ki} is the effort level of individual i for wage $w = k$, \bar{e} is the maximum effort possible (in our case, 10), \underline{e} is the lowest effort possible (in our case, 1), and M is the number of different wage levels (in our case 21). The index ranges from 0 to 1, where 0 depicts a selfish worker who always chooses the lowest possible effort, and 1 depicts an unconditionally 'altruistic' worker who always chooses the highest possible effort, or one that strongly cares for efficiency. Concerns for inequality (e.g., Fehr and Schmidt, 1999, Bolton and Ockenfels, 2000) or the minimum payoff in a pair (e.g., Charness and Rabin, 2002) could account for intermediate values of the index.

In the following we distinguish between *strong* and *weak* reciprocators. A worker is called strong reciprocator when s/he displays an intensity of reciprocal preferences that makes it profitable for the firm to offer a wage above the lowest possible wage. That is, the wage-effort relation is strong enough such that for all wages above zero the firm earns a profit at least as high as the profit it could guarantee by offering exactly zero.⁶ Workers are classified as weak reciprocators when, although on average responding to higher wages with higher effort, firms are worse off by offering wages higher than the lowest possible wage instead of offering exactly that wage.

⁶Classifying workers in that way as strong reciprocators is rather conservative as it assumes narrowly selfish firms which engage in gift-exchange only if it increases their profits. Later we briefly discuss an alternative approach in which reciprocators are classified as strong when they choose effort levels that make firms not worse off than themselves.

In our experiment, the profit a firm can guarantee itself by paying the lowest possible wage ($w = 0$) is $\pi = 60$. The lowest reciprocation index of a worker i that leaves a firm, on average, with a payoff of at least 60 is $RI_i = 0.57$. Therefore, we call worker i a strong reciprocator if $RI_i \geq 0.57$ and a weak reciprocator if $RI_i < 0.57$. Note, that this classification does not imply that firms matched with a weak reciprocator will be worse off for all wages larger than the lowest possible wage. However, on average, firms matched with weak reciprocators will be better off offering them $w = 0$.

Result 2 *All workers with reciprocal preferences are weak reciprocators, in the sense that a firm maximizes its profit by offering the lowest possible wage.*

SUPPORT: Figure 1 displays the distribution of the reciprocation index of workers classified as reciprocators. Selfish participants have an index of 0 and are not shown.

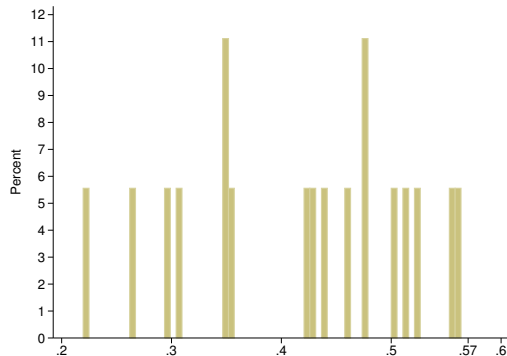


Figure 1: Distribution of reciprocation index

As can be seen *none* of the reciprocal workers has an reciprocation index equal or greater than 0.57. Consequently, all workers with reciprocal preferences are weak reciprocators.

Figure 2 shows the average effort as a function of wage for our identified types. In the figure, ‘reciprocators’ and ‘selfish’ are defined as explained above. The ‘reference level of effort,’ $r(w)$, is the effort level that guarantees the firm a profit of at least 60 for each wage level. It is given by

$$r(w) = \begin{cases} \arg \min_e \{\pi(w; e) \geq 60\} & \text{if } w < 95 \\ 10 & \text{otherwise,} \end{cases}$$

for each wage $w \in \{0, 5, \dots, 100\}$.⁷

⁷For $w \geq 95$ there is no effort level that guarantees firms a profit of at least 60. In the experiment

Figure 2 also summarizes Results 1 and 2 and highlights two points. First, overall, there is a clear positive relation between wages offered by firms and effort expended by workers. Second, while nearly all workers can be classified as reciprocators, their intensity of reciprocal preferences is below the reference level of effort, $r(w)$. A linear regression analysis (OLS and Tobit) with effort as the dependent variable and wage as the independent variable corroborates the expression gained from the figure.⁸ The OLS

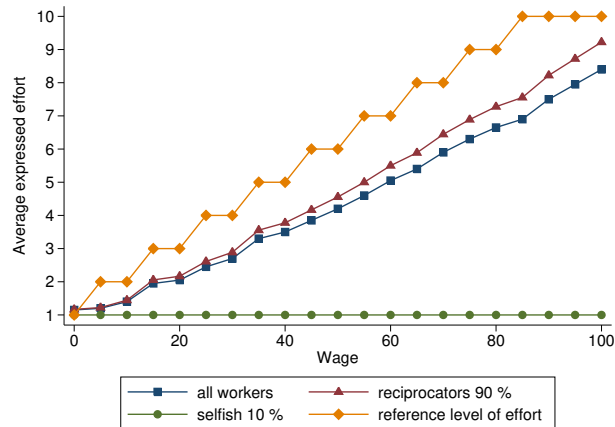


Figure 2: Effort as a function of wage (all workers and by types)

estimated coefficient for wage is 0.083 ($p < 0.001$), which is below the marginal effort of 1/10 necessary for positive wages to be profitable for firms (cf. Section 2.1).⁹ Therefore, in our experiment, the extent of workers' reciprocal preferences is not sufficient to make firms better off in monetary terms when making a gift-exchange wage offer than when offering the lowest possible wage.¹⁰ Consequently, in case workers reciprocal preferences

only in 2 out of 200 instances, a firm offered $w \geq 95$. If we define RI for wages below 95 only, the index for a worker who, on average, chooses effort levels that leaves the firm with at least 60 is 0.53. The highest RI among subjects in this case is 0.52.

⁸Qualitatively the results are the same when using random effects Tobit or GLS (see Table A.1 in Appendix A.2).

⁹Subjects have to make 21 effort choices and it is conceivable that not all decisions are considered equally carefully. For instance, workers may consider their choice more carefully for wage levels closer to their expectations. Workers wage expectations range from 0 to 80 with each number in between almost equally likely. The average wage expected by workers in Part 1 of the experiment is 46.25 with a standard deviation of 24.16. To evaluate the robustness of our OLS result where we use all observations of reciprocal workers, we compare it with the result obtained when using observations only from the range [25, 70]. We find that it is almost the same (wage coeff: 0.084, $p < 0.001$).

¹⁰This does not imply that firms never receive a payoff above 60 when making a gift-exchange wage offer. It happens very rarely, however. Of all reciprocal workers, 66.7% choose an effort level such

carry over to the finitely-repeated GEG, the prospects of sustaining gift-exchange seem rather grim. This is what we explore next.

3.2 The finitely-repeated gift-exchange game

Next we are exploring participants' behavior in the repeated gift-exchange game and relate it to the elicited (reciprocal) preferences. We will first investigate whether there is a positive wage-effort relationship in the repeated gift-exchange game and whether workers behavior is consistent with their elicited preferences. Then, we will look at the level and dynamics of wages and efforts, and how these could be related to workers' preferences.

Result 3 *In the repeated gift-exchange game, workers reciprocate a higher wage with higher effort. Moreover, workers' elicited reciprocal preferences are a good predictor of effort choices in the repeated game.*

SUPPORT: Table 2 presents the results from GLS random effects panel regression analyses with effort exerted by worker i in period t , e_{it} , as the dependent variable.¹¹ Using data from all workers, Model 1 investigates how effort choices respond to received wages. The significantly positive coefficient of the wage variable indicates that workers reciprocate higher wages with higher effort choices, which is in line with most previous results of gift-exchange experiments. The estimated coefficient is rather small, however. As discussed above, from a firm's perspective gift-exchange is profitable only if the marginal effect is larger than 0.1. Therefore, this suggests that gift-exchange will be difficult to sustain. Model 2 estimates the same relationship but excludes workers classified as selfish in Part 1. As expected the positive wage-effort relationship is stronger than in Model 1. However, the change is only marginal.

To test whether workers effort choices can be predicted with their elicited reciprocal preferences we construct the variable *predicted effort*. This variable takes for each actually received wage in the repeated GEG the value of the effort chosen in the strategy

that the firm would always be better off offering them the minimum wage. The remaining 33.3% occasionally choose an effort that would give the firm a payoff of at least 60. The profit maximizing wage for firms matched to these six workers is 10, 25, 35, and 80, respectively.

¹¹Since effort is bounded below by 1 and above by 10 we also ran Tobit random effects models which are reported in Table A.2 in Appendix A.2. The results are qualitatively the same to those reported here. See Charness et al. (2004) for a discussion of estimation methods in repeated gift-exchange games.

Table 2: Explaining effort choices in the repeated GEG

Model	Dependent variable: effort e_{it}			
	1	2	3	4
Workers used	All	Reciprocators	All	Reciprocators
Period	-0.010 (0.037)	-0.021 (0.040)	-0.033 (0.035)	-0.038 (0.039)
Wage	0.038 ^{***} (0.005)	0.042 ^{***} (0.005)		
Predicted effort			0.540 ^{***} (0.059)	0.532 ^{***} (0.063)
Constant	1.456 ^{***} (0.303)	1.560 ^{***} (0.323)	1.041 ^{***} (0.318)	1.129 ^{***} (0.348)
R^2 (overall)	0.23	0.26	0.24	0.22
Wald $\chi^2_{(2)}$	76.51	79.11	89.65	77.69
Observations	200	180	200	180

Note: ^{***} indicates significance at 1 percent level; regressions are random effects GLS clustered on individuals (clustering on sessions level yields similar results; see Table A.3 in Appendix A.2); standard errors in parentheses.

method in Part 1. Elicited preferences have predictive power for actual effort choices in the repeated GEG when the coefficient is significantly positive. Perfect consistency would be reflected by a coefficient that equals one. This is tested in Model 3 taking all workers into account. As the estimated coefficient is highly positively significant, the results indicate that workers indeed show behavior consistent with their elicited preferences. However, the estimated coefficient is only slightly above one-half and, hence, elicited preferences predict behavior only imperfectly. The same result holds when looking only at reciprocators (Model 4).

Note that, because workers state reciprocal preferences in Part 1 and are behaving reciprocally in the repeated GEG, the explanatory variables wage and predicted effort are highly correlated (Spearman's $\rho = 0.785, p < 0.0001$). Therefore, in regressions with both variables included one of them becomes insignificant and the coefficients are biased. We have also run regressions where we added the expected wage as explanatory variable. The regression results do not change and expected wages are never significant. This indicates that any potential effect of the expected wage on effort choices is overwritten by the actually received wage.

We note that if we estimate our reciprocation index using the data from the finitely-repeated GEG we find that 85% of workers (i.e., 17 out of 20) have a positive RI none

of which, however, approaches the critical threshold of 0.57 to classify them as strong reciprocators. Overall, the index takes on lower values in the finitely-repeated GEG than in Part 1 (Wilcoxon sign-rank, two-tailed, $p < 0.01$). However, at the individual level there is a significantly positive correlation between the indexes estimated from the strategy method and those estimated from the finitely-repeated game (OLS: coeff=0.33, $p = 0.05$; Spearman: $\rho = 0.42$, $p = 0.08$).¹²

Result 4 *In the repeated game, gift-exchange is not maintained. That is, wages and effort levels decline over time toward the lowest possible values.*

SUPPORT: Figures 3a and 3b show the evolution of respectively average wage and average effort over the 10 periods of the repeated GEG. For comparison, the figures show also average wage and effort of Part 1 in period 0. Both, wage and effort, decline over time, although not monotonically. The average wage in Part 2 of the experiment declines from respectively 30.25 in Part 1 (period 0) and 20.8 in period 1 to 2.5 in period 10 (the average wage over periods 1-10 is 14.2). In the last period, 85 percent (17 of 20 instances) of the wages are equal to zero. A Spearman rank order correlation test shows that the decline in wages in the repeated GEG is statistically significant ($\rho = -0.90$, $p < 0.001$). The average effort in Part 2, controlling for actually offered wages, declines from respectively 2.9 in Part 1 (period 0) and 2.2 in period 1 to 1.4 in period 10 (the average effort over period 1-10 is 1.9). In the last period, the lowest possible effort level of zero is chosen in 90 percent of the cases (18 of 20). A Spearman rank order correlation test shows that the decline in effort over time is statistically significant ($\rho = -0.67$, $p = 0.035$). Hence, gift-exchange is clearly not maintained in Part 2 of the experiment.

Result 5 *Given the workers' effort responses to wages, firms maximize profits by offering the lowest possible wage.*

SUPPORT: Figure 4a presents expected profits of firms given the effort levels chosen by workers in Part 1, while Figure 4b shows the same for the repeated GEG in Part 2).¹³ These figures clearly illustrate that the profit maximizing strategy for firms is to

¹²We exclude a subject that received the minimum wage 80% of the time and never a wage above 15, which makes it impossible to calculate a reliable *RI*.

¹³The bins in Figure 4b are constructed such that for $w > 0$ there is a similar number of observations in each bin. Specifically, there are 137 observations with $w = 0$, 21 observations with $w \in [5, 20]$, 23 observations with $w \in [25, 40]$, 19 observations with $w \in [45, 60]$, and 20 observations with $w \in [65, 100]$. To calculate the average profit in each bin, we use the *actual* average wage offered within this bin.

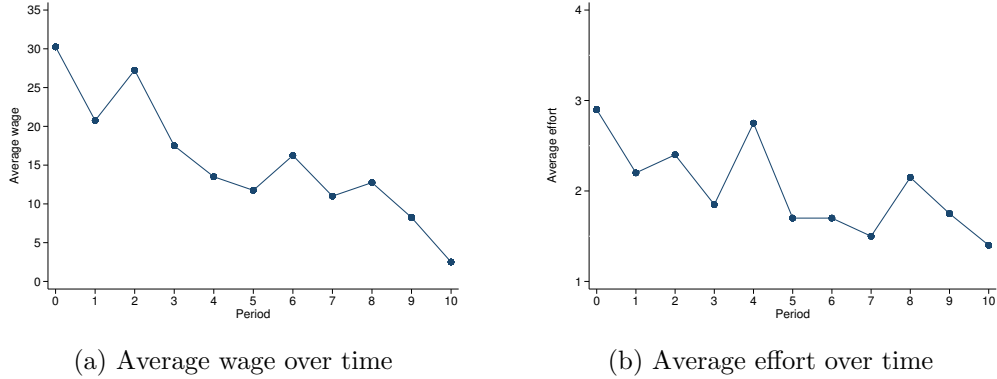


Figure 3: Wage and effort over time

offer $w = 0$ which, guarantees $\pi = 60$, in both parts of the experiment.

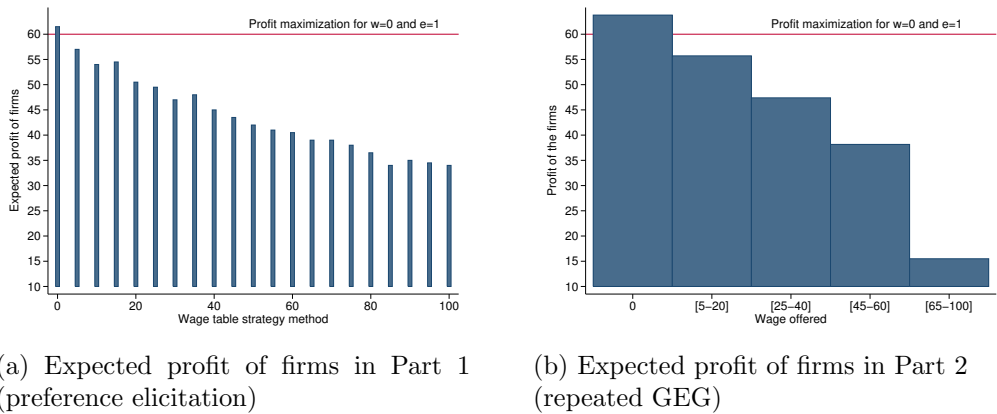


Figure 4: Firms profit as function of wage

Assuming common knowledge of elicited preferences for reciprocation and monetary payoff maximizing behavior of firms implies firms offering the minimum wage and workers providing the minimum effort, in the unique equilibrium of the finitely-repeated game. However, preferences are unlikely to be common knowledge and the progressive decline of wages over the course of the experiment suggests a role for learning. To explore this possibility we consider firms' expectations and examine how wage offers react when firms' effort expectations are not met. First, firms' expectations are not 'optimistic', even in early rounds. A linear regression with clustered standard errors using observations only from the first two rounds of the repeated game, in which the dependent variable is the level of effort firms' expected workers to provide and the only independent variable is the wage they offered, finds that the coefficient of wage

is 0.086 ($p < 0.001$). (For all rounds, the coefficient is 0.069 ($p < 0.001$)). As discussed above, for positive wages to be on average profitable for the firm, this coefficient needs to be larger than 0.1. Thus, on average, firms in the experiment expected a level of effort which, given the wage offered, would leave them worse off than if they had chosen the minimum wage and received the minimum effort. Possible yet speculative interpretations are that (some) firms had social preferences or hoped to induce higher future efforts by offering relatively high wages, despite low expectations. Second, firms revise their expectations downwards when workers' effort falls short of firms' expectations. Support for this comes from a linear regression with standard errors clustered at the individual level, in which the dependent variable is the change in firms' effort expectations from period t to period $t + 1$ and the only independent variable is the difference between the expected and actual effort in period t . The coefficient indicates a downward revision of expectations and is highly statistically significant ($p < 0.001$). Together with workers effort responses to wages this can explain the decay of wages.¹⁴

4 Discussion and conclusion

There exists considerable evidence indicating individuals' willingness to reciprocate higher wages with higher effort levels in gift-exchange settings (Casoria and Riedl, 2013). However, there is also some literature pointing at possible limits of gift-exchange in the laboratory (Brown et al., 2004, Engelmann and Ortmann, 2009) as well as in the field (Gneezy and List, 2006, Kube et al., 2012, 2013). Given this evidence it is important to better understand the underlying reasons for when and why gift-exchange can be sustained in the longer-run.

In a laboratory experiment we used the strategy method to elicit reciprocal preferences of workers in a gift-exchange setting and found that almost all workers (90 percent) exhibit reciprocal preferences. These preferences help predict behavior in a subsequent finitely-repeated gift-exchange game, where we observe that gift-exchange unravels over time. The downward cycle of wages and effort in our experiment can to a large extent be attributed to a combination of firms' maximizing profits, workers' relatively weak intensity of reciprocal preferences, an imperfect correlation between preferences and behavior, and firms' learning of these relations.¹⁵

¹⁴Interestingly, in no instance the actual wage offered exceeded workers' wage expectations.

¹⁵Given the high percentage of reciprocal workers, one may wonder whether the presentation of the

The observed weak intensity of reciprocal preferences is reminiscent of the phenomenon of self-servingly biased fairness preferences in bargaining (Babcock et al., 1995, Gächter and Riedl, 2005) and incomplete conditional cooperation in public goods problems (Fischbacher et al., 2001, Fischbacher and Gächter, 2010). It is also worth noting that the payoff function used in the experiment was adopted from Brown et al. (2004) who, unlike other studies, also found low levels of gift-exchange when parties were unable to establish long term relationships. Future research could explore reciprocal preferences using different payoff functions, e.g., when effort is less costly or more valuable to the firms. Further it may also be interesting to explore if the strength of reciprocity is frame dependent, e.g., whether it changes with the range of efforts permitted, the lump-sum component of the payoff function or the use of loaded labor market terms.

Another possible reason for the weak intensity of reciprocal preferences is that workers have other regarding preferences and thus care about the inequality in earnings between themselves and the firms or the minimum payoff in their pair. Low effort levels for relatively high wages could be consistent with social preferences, if equality of earnings requires lower levels of effort than those securing firms a profit of 60. This is not the case, however. The level of effort required to minimize the earnings difference between firms and workers is the lowest effort of $e = 1$ only when $w \leq 20$ and increases quickly for $w \in [25, 75]$. For example, a worker who wishes to minimize inequality in earnings for $w = 65$ should choose $e = 9$. Specifically, the level of effort required to minimize inequality in earnings is greater than the level of effort that guarantees firms a profit of 60 when $w > 60$.

To test more formally how concerns for inequality affect effort levels, we constructed the variable *fair effort* = $\arg_e \min\{\pi_f - \pi_w\}$. We then run a Tobit regression with individual random effects for the reciprocal workers using the level of effort expended by the worker in the strategy method as the dependent variable and *fair effort* as the independent variable. For comparison, we run a similar regression using the reference level of effort $r(w)$ which guarantees a profit of 60 to the firm, as the independent variable. While both variables are significantly correlated with effort, the log likelihood for the second empirical model is substantially lower than for the first model (-461.9199 vs. -536.40822) suggesting that the latter model captures workers behavior better.

strategy method biases subjects into being more reciprocal. Varying the presentation of the strategy method in a public-goods game Dariel (2013) does not find evidence for such a presentation effect.

An important factor on the workers' side, contributing to the decline in gift-exchange over time, is that reciprocators only imperfectly adhere to their elicited reciprocal preferences. Fischbacher and Gächter (2010) observe a similar phenomenon in repeated public goods games. They identify “confused subjects” and beliefs about others contributions to the public good as explanatory factors for the discrepancy between elicited preferences and behavior. In our experiment none of these factors can help explaining the gap between preferences and behavior. First, none of our workers appears to be confused in the preference elicitation part. All are easily and clearly classifiable as either selfish or reciprocal. Second, beliefs — in our case expected wage — turn out to be unimportant in the determination of effort choices. We attribute this to the sequential nature of the gift-exchange game where the potential effect of expected wages is overwritten by the effect of actually received wages.

In our view, a reasonable albeit speculative explanation is that reciprocal preferences are actually not fixed but may respond to the environment the worker is in and the experiences a worker makes. Such an explanation is consistent with theoretical ideas arguing that (social) preferences indeed respond to the economic environment and experiences made within the environment. Bowles (1998) puts forward theoretical arguments along this line, which also have found some empirical support (Brandts et al., 2009, Bowles and Polania-Reyes, 2012, Brandts and Riedl, 2016). In our study the relatively low wages experienced in Part 1 of the experiment and in early rounds of Part 2 of the experiment may have crowded out reciprocal preferences or at least further weakened their intensities.

Our experiment provides evidence that a combination of firms' maximizing profits, workers' relatively weak intensity of reciprocal preferences, an imperfect correlation between preferences and behavior, and firms' learning of these relations can help explaining the breakdown of gift-exchange observed in some gift-exchange experiments in the laboratory as well as the field. Especially, the imperfect translation of elicited preferences to actual behavior is interesting and the identification of reasons for it appears to be a worthwhile avenue of future research.

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Appendix

A Additional statistics

A.1 Individual effort choices

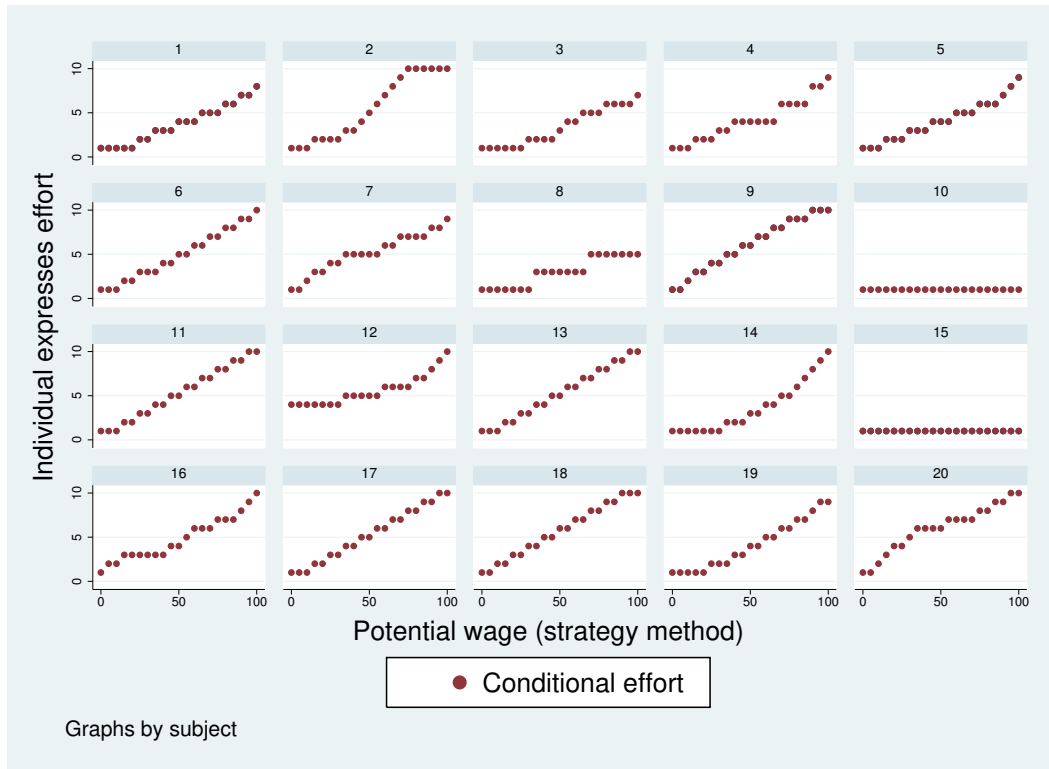


Figure A.1: Individual effort choices in strategy method

A.2 Robustness estimates

Table A.1: Relationship between effort levels and wages in Part 1 (random effects Tobit and GLS)

Model	Dependent variable: effort e_{it}	
	Tobit	GLS
Wage	0.092*** (0.001)	0.074*** -(0.001)
Constant	-0.940 (1.239)	0.679** (0.336)
Log-L	-444.97	
Wald $\chi^2_{(2)}$	3459.85	1950.26
R^2 (overall)	0.6240	
Observations	420	420

Note: ***(**) indicates significance at 1 (5) percent level; Tobit: random effects Tobit regression clustered on individuals; GLS: random effects GLS regression clustered on individuals; standard errors in parentheses.

Table A.2: Explaining effort choices in the repeated GEG (Tobit)

Model	Dependent variable: effort e_{it}			
	1	2	3	4
Workers used	All	Reciprocators	All	Reciprocators
Period	-0.071 (0.127)	-0.083 (0.125)	-0.140 (0.121)	-0.144 (0.122)
Wage	0.106*** (0.016)	0.106*** (0.016)		
Predicted effort			1.387*** (0.201)	1.340*** (0.201)
Constant	-3.109** (1.239)	-2.430** (1.160)	-3.889*** (1.295)	-3.377*** (1.280)
Log-L	-194.33	-189.94	-193.61	-191.77
Wald $\chi^2_{(2)}$	47.92	49.14	51.02	48.19
Observations	200	180	200	180

Note: ***(**) indicates significance at 1 (5) percent level; regressions are random effects Tobit clustered on individuals.

Table A.3: Explaining effort choices in the repeated GEG (GLS)

Model	Dependent variable: effort e_{it}			
	1	2	3	4
Workers used	All	Reciprocators	All	Reciprocators
Period	-0.013 (0.041)	-0.024 (0.044)	-0.040 (0.040)	-0.046 (0.044)
Wage	0.037*** (0.005)	0.040*** (0.005)		
Predicted effort			0.465*** (0.061)	0.454*** (0.065)
Constant	1.526** (0.368)	1.615** (0.372)	1.274*** (0.386)	1.359*** (0.406)
R^2 (overall)	0.23	0.26	0.24	0.23
Wald $\chi^2_{(2)}$	60.95	63.36	62.91	52.83
Observations	200	180	200	180

Note: ***(**) indicates significance at 1 (5) percent level; regressions are random effects GLS clustered on sessions (cf. Table 2 in the main text for results when clustering on individuals); standard errors in parentheses.

B Supplementary Materials for On-line Publication

***** For On-line Publication *****

Experimental Instructions used in

“Reciprocal Preferences and Gift-Exchange”

Aurélie Dariel & Arno Riedl

Specific instructions – Part 1

In this part of the experiment you can earn money with the decisions you make. How much you earn depends on your own decisions and the decisions of other participants. We will not speak of Euro during the experiment, but rather of points. All your earnings will first be calculated in points. At the end of the experiment the total amount of points you earned in this part will be converted to Euro at the following rate:

1 point = 12 Euro cent

At the beginning of this part of the experiment all participants will be divided into pairs. **You will not get to know the identity of the other person**, neither during nor after the experiment. **The other person will also not get to know your identity.**

We now describe how this part of the experiment proceeds. First you will be introduced to the basic decision situation, thereafter you will learn more specifically how the experiment is conducted. You will also be asked some control questions that will help you to understand the decision situation.

The decision situation:

You will be randomly **paired with one other participant**. In each pair one participant will be randomly assigned the role of a **firm** and the other participant will have the role of a **worker**. You will be informed about your role at the beginning of the experiment. You - as every other participant - will keep the assigned role throughout this part of the experiment.

You have to make a decision without knowing the decision of the other participant. The other participant in your pair also has to make a decision without knowing your decision. Which kind of decision you have to make depends on your role.

If you are assigned the role of a **firm** you have to make a **wage offer**.

The **wage you offer** can be any amount from **0 to 100** (as long as it is a multiple of 5). That is you can offer a wage of 0, or 5, or 10, ..., or 90, or 95, or 100.

If you are assigned the role of a **worker** you have to decide **which effort level you provide for each possible wage** offered by the firm.

The **effort level** you choose can be any integer number from **1 to 10**. That is you can decide to provide effort levels of 1, or 2, or 3, ..., or 8, or 9, or 10. You can choose different effort levels for different wage offers but you can also choose the same effort level for different wage offers.

To each effort level correspond some costs the worker has to bear for this effort level. How the effort levels and costs are related is show in this table:

effort	1	2	3	4	5	6	7	8	9	10
cost of effort	0	1	2	4	6	8	10	12	15	18

The earnings are calculated in the following way:

If you are a **firm**:

First, multiply the effort level chosen by the worker with 10,
second, subtract the wage you offered,
third, add an endowment of 50.

As formula:

Earnings of firm = 10 * effort level – wage offer + 50

Note: if the earnings of the firm determined in this way would be negative they are set to zero.

For example, if you are the firm and you offer a wage of 35 and the worker chooses an effort of 9 for this wage then you will earn $10*9 - 35 + 50 = 105$ points; if you are the firm and you offer a wage of 85 and the worker chooses an effort of 2 for this wage you would earn $10*2 - 85 + 50 = -15$ points, which will be set equal to 0 points.

If you are a **worker**:

First, take the wage offered by the firm,
second, subtract the costs associated with effort level chosen (see table),
third, add an endowment of 20.

As formula:

Earnings of worker = Wage offer – cost of effort + 20

For example, if you are the worker, the firm offers a wage 35 and you choose an effort of 9 for this wage then you will earn $35 - 15 + 20 = 40$ points; if you are the worker, the firm offers a wage of 85 and you choose an effort of 2 for this wage you would earn $85 - 1 + 20 = 104$ points.

Control questions – decision situation:

Please answer the following control questions. These questions are arbitrary examples of what could happen in the experiment. In the experiment you will in the role of either a worker or a firm. The questions will concern both roles. They will help you to gain an understanding of the calculation of your earnings. Your earnings vary with your own decision and with the decisions of the other person you are paired with.

Please answer all the questions and write down your calculations.

1. Assume that the firm has chosen a wage of 0 and the the worker has chosen an effort level of 0 for a wage offer of 0.

What will **your earnings** be if you are the **worker**? _____

What will **your earnings** be if you are the **firm**? _____

2. Assume that the firm has chosen a wage of 100 and the the worker has chosen an effort level of 10 for a wage offer of 100.

What will **your earnings** be if you are the **worker**? _____

What will **your earnings** be if you are the **firm**? _____

3. Assume that the firm has chosen a wage of 80 and the the worker has chosen an effort level of 2 for a wage offer of 80.

What will **your earnings** be if you are the **worker**? _____

What will **your earnings** be if you are the **firm**? _____

4. Assume that the firm has chosen a wage of 30 and the the worker has chosen an effort level of 7 for a wage offer of 30.

What will **your earnings** be if you are the **worker**? _____

What will **your earnings** be if you are the **firm**? _____

The experiment:

In experiment you will be confronted with the described decision situation only **once**. Before the experiment starts you will be assigned **either** the role of **worker** or the role of **firm**.

What **types of decisions** you have to make depends on your role. Here we explain first the types of decisions for a workers and then the decisions for a firm,

Decisions for workers:

If you are a worker you have to indicate your **effort level for each possible wage offer by the firm**. What this means will be immediately clear to you if you take a look at the computer screen shown below. This screen shows a table as it will be presented to you in the experiment, in case you are a worker: The numbers to the left to the empty boxes are the possible **wage offers** of the **firm**. You simply have to insert in the boxes the effort level you will choose, conditional on the indicated wage offer. **You have to make an entry into each of the boxes**. For example, you will have to indicate your effort level if the firm offers a wage of 0 points, your effort level if the firm offers a wage of 5, 10, or 15 tokens, etc. You can insert **any integer number from 0 to 10** in each box. When making your decisions you may want to consult the summary of the decision situation you received with these instructions. When you have made your entry in each box, please click “OK”.

Period
1 out of 1

You are a Worker.

Below, please indicate the **effort** level you will provide for each possible wage offer.

You do this by entering the effort you provide when the wage offered is the number next to the respective box.
Please confirm by clicking the "OK" button.

Wage	Effort	Wage	Effort	Wage	Effort
0	<input type="text" value="1"/>	35	<input type="text"/>	70	<input type="text"/>
5	<input type="text"/>	40	<input type="text"/>	75	<input type="text"/>
10	<input type="text"/>	45	<input type="text"/>	80	<input type="text"/>
15	<input type="text"/>	50	<input type="text"/>	85	<input type="text"/>
20	<input type="text"/>	55	<input type="text"/>	90	<input type="text"/>
25	<input type="text"/>	60	<input type="text"/>	95	<input type="text"/>
30	<input type="text"/>	65	<input type="text"/>	100	<input type="text"/>

OK

Note: You do not know the wage offer actually chosen by the firm when you make your effort level decisions.

After you have made your effort decisions you have to **estimate** the **wage offer actually chosen by the firm**. You will be paid for the accuracy of your estimate:

- If your estimate is **exactly right** (that is, if your estimate **exactly** matches the actually chosen wage offer by the firm), you will receive **3 points** extra to your other earnings from the experiment.
- If your estimate **deviates by 1 point** from the actual result, you will receive **2 points** extra.
- If your estimate **deviates by 2 points** from the actual result, you will receive **1 point** extra
- If your estimate **deviates by 3 or more points** from the actual result, you will receive **no points** extra.

You will make your estimation decision on a screen as shown below.

Period
1 out of 1

You are a Worker.

Below, please indicate **your best estimation** of the wage offered by the firm.

You do this by clicking on one of the possible wages offered.
Please confirm by clicking the "OK" button.

Note that if your estimation exactly matches the actual wage, you receive 3 points in addition to your other earnings. If it differs by 1 point from the actual wage, you receive

Your estimation:

- 0
- 5
- 10
- 15
- 20
- 25
- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70
- 75
- 80
- 85
- 90
- 95
- 100

OK

Decisions for firms:

If you are a firm you have to indicate the **wage level you offer the worker**. What this means will be immediately clear to you if you take a look at the computer screen shown below. This screen shows a decision column as it will be presented to you in the experiment, in case you are a firm: The numbers to the right of the empty circles are the possible **wage offers** of the **firm**. You simply have to click on one of the circles to indicate your wage offer. **You can only make one wage offer**. When making your decisions you may want to consult the summary of the decision situation you received with these instructions. When you have made your entry in each box, please click "OK".

Period
1 out of 1

You are a Firm.

Below, please indicate the **wage you offer** to the worker.

You do this by clicking on one of the possible wages given below.
Please confirm by clicking on the "OK" button.

The offered wage is:

- 0
- 5
- 10
- 15
- 20
- 25
- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70
- 75
- 80
- 85
- 90
- 95
- 100

OK

Note: You do not know the effort level actually chosen by the worker when you make your wage offer decision.

After you have made your wage offer decision you have to **estimate** the **effort level actually chosen for your wage offer**. You will be paid for the accuracy of your estimate:

- If your estimate is **exactly right** (that is, if your estimate **exactly** matches the actually chosen effort by the worker for your wage offer), you will receive **3 points** extra to your other earnings from the experiment.
- If your estimate **deviates by 1 point** from the actual result, you will receive **2 points** extra.
- If your estimate **deviates by 2 points** from the actual result, you will receive **1 point** extra
- If your estimate **deviates by 3 or more points** from the actual result, you will receive **no points** extra.

You will make your estimation decision on a screen as shown below.

Period
1 out of 1

Your offered wage is **XX** .

Given your offered wage, please indicate below **your best estimation** of the effort provided by the worker.

You do this by clicking on one of the possible effort levels given below.
Please confirm by clicking the "OK" button.

Your estimation: 1
 2
 3
 4
 5
 6
 7
 8
 9
 10

OK

After all participants of the experiment have made their decisions you will be informed about the choice made by the participant with whom you are paired (and will be reminded of your own choices). You will also be informed about the number of points you have earned in this part of the experiment.

This is the end of the instructions. If you have a question please raise your hand.

Specific instructions – Part 2

In this part of the experiment you can earn money with the decisions you make. How much you earn depends on your own decisions and the decisions of other participants. We will not speak of Euro during the experiment, but rather of points. All your earnings will first be calculated in points. At the end of the experiment the total amount of points you earned in this part will be converted to Euro at the following rate:

1 point = 2 Euro cent

At the beginning of this part of the experiment all participants will be divided into pairs. **You will not get to know the identity of the other person**, neither during nor after the experiment. **The other person will also not get to know your identity.**

The decision situation in this part of the experiment is similar as in part 1, with one important exception that will be explained below. For your convenience we briefly describe the whole decision situation.

The decision situation:

You will be randomly **paired with one other participant**. In part 1, in each pair one participant was randomly assigned the role of a **firm** and the other participant was assigned the role of a **worker**. You - as every other participant - will keep the role assigned in part 1 also throughout this part of the experiment.

Compared to part 1, there is an **important difference in the sequence of the decisions** in this part of the experiment. Now the **firm first** has to make a **wage offer** and this **wage offer** will be **transmitted** to the **worker**. Only **then** the **worker** has to decide on the **effort level**.

If you are assigned the role of a **firm** you have to make a **wage offer**.

The **wage** you **offer** can be any amount from **0 to 100** (as long as it is a multiple of 5). That is you can offer a wage of 0, or 5, or 10, ..., or 90, or 95, or 100.

If you are assigned the role of a **worker** you will get informed about the wage offer by the firm, then you have to decide **which effort level you provide for the received wage** offer by the firm.

The **effort level** you choose can be any integer number from **1 to 10**. That is you can decide to provide effort levels of 1, or 2, or 3, ..., or 8, or 9, or 10.

To each effort level correspond some costs the worker has to bear for this effort level. How the effort levels and costs are related is show in this table:

effort	1	2	3	4	5	6	7	8	9	10
cost of effort	0	1	2	4	6	8	10	12	15	18

The earnings are calculated in the following way:

If you are a **firm**:

First, multiply the effort level chosen by the worker with 10,
second, subtract the wage you offered,
third, add an endowment of 50.

As formula:

Earnings of firm = 10 * effort level – wage offer + 50

Note: if the earnings of the firm determined in this way would be negative they are set to zero.

If you are a **worker**:

First, take the wage offered by the firm,
second, subtract the costs associated with effort level chosen (see table),
third, add an endowment of 20.

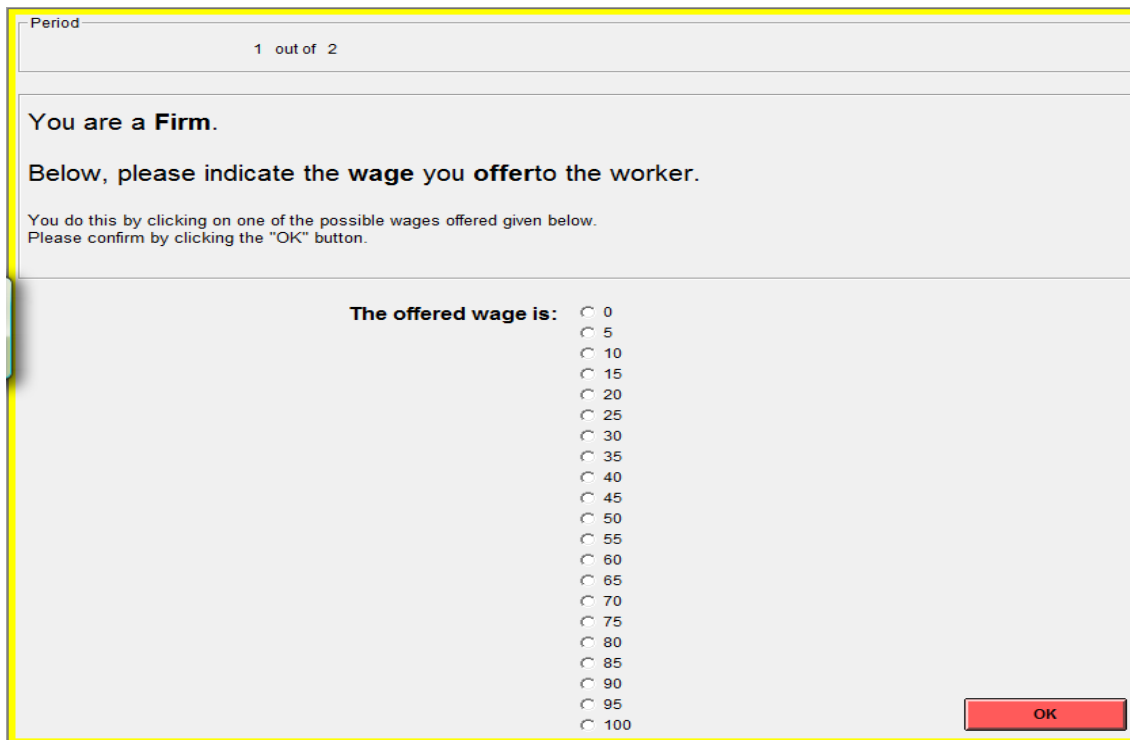
As formula:

Earnings of worker = Wage offer – cost of effort + 20

In this part of the experiment you will be engaged in the decision situation for **10 successive periods**. In each period you will be randomly rematched with another participant. Thus, **in no period will your pair consist of the same two people for sure..**

If you are a **firm**, in **each period** you have to make a **wage offer** without knowing what effort level will be chosen by the worker. If you are a **worker**, in **each period** you have to decide on the effort level after being informed about the **wage offer**. At the end of a period firm and worker will be informed about the offered wage and chosen effort levels in the pair in that period.

If you are a **firm**, in each period you will make **your wage offer** decision on a computer screen as shown here:



The screenshot shows a computer interface for a firm's wage offer decision. At the top, it says "Period 1 out of 2". Below that, it says "You are a Firm." and "Below, please indicate the wage you offer to the worker." It then provides instructions: "You do this by clicking on one of the possible wages offered given below. Please confirm by clicking the 'OK' button." The main part of the screen is titled "The offered wage is:" and lists 21 radio button options from 0 to 100 in increments of 5. An "OK" button is located at the bottom right.

Period 1 out of 2

You are a Firm.

Below, please indicate the wage you offer to the worker.

You do this by clicking on one of the possible wages offered given below.
Please confirm by clicking the "OK" button.

The offered wage is:

- 0
- 5
- 10
- 15
- 20
- 25
- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70
- 75
- 80
- 85
- 90
- 95
- 100

OK

On this screen, you have indicate the **wage level you offer the worker**. You simply have to click on one of the circles to indicate your wage offer. **You can only make one wage offer.**

In each period, after you have made and confirmed your wage offer you have to **estimate the effort level actually chosen for your wage offer.**

In each period you will indicate your estimation on a computer screen as shown here:

Period
1 out of 2

Your offered wage is **XX** .

Given your offered wage, please indicate below **your best estimation** of the effort provided by the worker.

You do this by clicking on one of the possible effort levels given below.
Please confirm by clicking the "OK" button.

Your estimation:

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

OK

As in the part 1 of the experiment you can earn money with the accuracy of your estimate.

- If your estimate is **exactly right** (that is, if your estimate **exactly** matches the actually chosen effort by the worker for your wage offer), you will receive **3 points** extra to your other earnings from the experiment.
- If your estimate **deviates by 1 point** from the actual result, you will receive **2 points** extra.
- If your estimate **deviates by 2 points** from the actual result, you will receive **1 point** extra
- If your estimate **deviates by 3 or more points** from the actual result, you will receive **no points** extra.



If you are a **worker**, in each period, before you are informed about the actually chosen wage offer you have to **estimate the wage offer actually chosen by the firm**.

Period
1 out of 2

You are a Worker.

Below, please indicate **your best estimation** of the wage offered by the firm.

You do this by clicking on one of the possible wages offered below.
Please confirm by clicking the "OK" button.

Your estimation:

0
 5
 10
 15
 20
 25
 30
 35
 40
 45
 50
 55
 60
 65
 70
 75
 80
 85
 90
 95
 100

OK

As in the part 1 of the experiment you can earn money with the accuracy of your estimate.

- If your estimate is **exactly right** (that is, if your estimate **exactly** matches the actually chosen effort by the worker for your wage offer), you will receive **3 points** extra to your other earnings from the experiment.
- If your estimate **deviates by 1 point** from the actual result, you will receive **2 points** extra.
- If your estimate **deviates by 2 points** from the actual result, you will receive **1 point** extra
- If your estimate **deviates by 3 or more points** from the actual result, you will receive **no points** extra.

Next, in each period after receiving your wage offer, you will make your effort level decision on a computer screen as shown here:

Period
1 out of 2

You are a Worker.

Below, please indicate **your best estimation** of the wage offered by the firm.

You do this by clicking on one of the possible wages offered below.
Please confirm by clicking the "OK" button.

Your estimation:

- 0
- 5
- 10
- 15
- 20
- 25
- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70
- 75
- 80
- 85
- 90
- 95
- 100

OK

On this screen, you will be informed about the wage offered by the firm. You then have to indicate the **effort level you choose**. You simply have to click on one of the circles to indicate your effort level. After the 10 periods of this part are over you will be asked to fill in a short questionnaire. Thereafter, the whole experiment is over and you will be confidentially be paid out your total earnings in the experiment in cash.

This is the end of the instructions. If you have a question please raise your hand.