

Gift exchange and the separation of ownership and control *

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Abstract

Numerous gift exchange experiments have found a positive relationship between employers' wage offers and workers' effort levels. In (almost) all these experiments the employer both owns and controls the firm. Yet in reality many firms are characterized by the separation of ownership and control. The manager in charge of wage determination is typically not the full residual claimant and thus does not receive the (full) benefits from the worker's higher effort level. In this paper we explore to what extent this affects the wage-effort relationship observed. We compare the standard bilateral gift exchange game between an owner-manager and a worker with a trilateral one where the firm is owned by a shareholder and controlled by a manager. The wage-effort relationship we observe is the same in both situations; workers still provide more than the minimum effort level even when the manager responsible for choosing the wage does not share in the profits at all.

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1 Introduction

A game that has been studied extensively in the lab is the gift exchange game. It represents the interaction between an employer and a worker in an environment where labor contracts are necessarily incomplete. In its most basic version the employer first decides on an unconditional wage transfer. After observing the wage that he will earn, the worker subsequently decides how much effort to supply. Effort increases the profits to the employer, but is also (increasingly) costly to the worker. Therefore, in case the worker is entirely selfish, he will not supply any effort at all, irrespective of the actual wage offered in the first stage. Anticipating this entirely flat wage-effort schedule, a selfish employer just offers the minimum wage that is sufficient to induce the worker to accept the contract.

Experimental findings are in stark contrast to these theoretical predictions. Workers are typically willing to supply more effort when a higher wage is offered, yielding a significantly positive correlation between wages and effort commonly interpreted as reciprocal behavior (see e.g. Fehr and Gächter (2000) for an overview). This finding appears rather robust and is found in various variations of the standard gift exchange game. For example, a number of recent studies still report a significantly positive correlation between wages and effort even with an interior optimal effort level instead of a corner solution (Engelmann and Ortmann (2002)), when high stakes levels are considered (Fehr et al. (2002)), with different productivity levels among employers (Hannan et al. (2002)), for subject pools different from the standard pool of undergraduate students (Hannan et al. (2002)), and in a setting where people act in a natural environment (Falk (2005)). The overall picture that emerges is that fairness and reciprocity considerations play a prominent role in labor relations.

However, all the robustness studies referred to above focus on bilateral, one-employer-one-worker relationships ¹(although sometimes embedded in a one-sided or double auction market).² This makes it problematic to directly extend the findings to the real world, because in the presence of social preferences – like fairness, efficiency norms, and reciprocity considerations – the actual environment in which the employer-

¹ Falk (2005) designs a bilateral gift exchange game between a charitable organization and its potential donors

²The positive wage-effort relationship is robust within and across different market institutions. See Fehr and Falk (1997) for an overview.

worker relationship is embedded becomes important. In particular, one has to take into account that in reality workers are typically part of a large(r) organization with many employees and multiple hierarchical levels. Fairness and reciprocity considerations are likely to be dependent on this more complex environment, making it (a priori) inappropriate to solely focusing on simple bilateral relationships.

This paper is part of a larger research project in which we aim to investigate how robust the results of bilateral gift-exchange experiments are when the labor relationship is placed in a more complex and more realistic social context. In Maximiano et al. (2004) we extend the gift exchange game to a situation in which the employer employs several workers (see also. Charness and Kuhn (2004)). Somewhat surprisingly, there we find that gift-exchange is very robust to increases in the size of the workforce. The results also suggest that intention-based reciprocity rather than outcome oriented social preferences are the main driving force behind gift exchange.

In this paper we explore gift exchange within multi-level hierarchies. In reality many firms have a complex hierarchical structure in which ownership and control are separated. In particular, the owners of a firm (shareholders) typically delegate authority to managers who are in charge of executive decisions. Part of the manager's job is to determine the firm's compensation structure. Within the context of the gift-exchange game this implies that the owners are not directly responsible for setting a worker's wage. It also implies that the manager who is in charge of wage determination, is not the full residual claimant. She does not bear the (full) wage costs but also does not get the (full) benefits generated by the worker's reciprocal attitude. Separation of ownership and control may therefore have important implications for the observed relationship between effort and wages. For example, the worker may not choose a high effort in response to a high wage anymore, because the manager responsible for the higher wage does not benefit (sufficiently) from the worker's increased effort herself. Alternatively, the wage-effort relationship may remain largely unaffected, because the worker mainly wants to reward those who pay for the higher wage (i.e. the owners). Our experiment aims at investigating these issues.

We consider four different treatments. Two correspond to the bilateral gift exchange game. The first one stands for the standard game and serve as baseline. In this treatment ownership and control are vested in a single person, viz. an owner-

manager. In the second bilateral treatment the owner-manager does not have any control being the wage determined at random by the experimenter. These treatments are compared with two other treatments in which the firm is owned by a shareholder but controlled by a manager. In both trilateral treatments the manager chooses the worker's wage, i.e. has full control. They differ with respect to how the manager is rewarded. In one trilateral treatment she receives a fixed wage and ownership and control are fully separated. The shareholder is the full residual claimant of the firm's profits. In the second trilateral treatment the manager is rewarded on the basis of performance pay, earning 25% of the firm's profits. Here ownership is shared between the shareholder and the manager and the separation between ownership and control is more diffuse.

Our main finding is perhaps somewhat surprising: the wage-effort relationship does not differ among the three treatments in which the wage is chosen by a firm's member. Gift exchange is thus also observed in a more complex hierarchical structure and appears to be robust to the firm's separation of ownership and control. This finding is in line with both the hypothesis that workers only care about those who pay the wage (owners) and the hypothesis that they act reciprocal towards the firm and not towards one of its members in particular. A significant less steep wage-effort relationship that we observe in our BCexo treatment suggest that the latter is indeed the most likely hypothesis.

The remainder of this paper proceeds as follows. In section 2 we describe the setup that we consider in our experiment and we discuss the behavioral predictions and hypotheses for this setup. Behavioral predictions are derived from selfish preferences, outcome oriented social preferences (like inequality-aversion and quasi-maximin preferences) and intention-based reciprocity. Section 3 presents the details of the experimental design. In section 4 we report and discuss our main findings. Section 5 concludes.

2 Setup and behavioral predictions

In this section we first describe the basic setup that we consider in our experiment. Subsequently we derive the theoretical predictions under various behavioral assumptions.

2.1 Basic setup of the experimental game

The setting that we consider concerns a firm which employs a single worker. Participation of the worker is secured, the only issue is to motivate the worker to put in (higher) effort. Effort, however, is non-contractible. The firm can just offer an unconditional wage $w \geq 0$. After the wage offer has been made, the worker chooses how much effort $e \geq e_{\min}$ to provide. Effort is increasing in costs, with $c(e)$ denoting the costs of effort in monetary terms. The marginal value product of effort is fixed per unit of effort and equals $v = 40$. The firm's net profits equal:

$$\Pi = 40 \cdot e - w + 360$$

Here the fixed term of 360 can be interpreted as the amount of net profit the firm makes when the worker only supplies the enforceable effort level e_{\min} . The monetary payoffs for the worker m_W are given by:

$$m_W = w - c(e) + 20$$

The fixed amount of 20 can be seen as the compensation the worker receives for supplying the enforceable effort level e_{\min} .

In the experiment the firm's wage offer w has to be a multiple of 5 and between 0 and 100. The worker's effort choice is restricted to integer values between 1 ($= e_{\min}$) and 10. The costs of effort are reflected in Table 1. With these parameters both the firm's net profits Π and the worker's monetary payoffs m_W are necessarily non-negative.

Table 1: The cost of effort function

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

Our treatment variable concerns the composition of the firm. We compare two different hierarchical structures. The first one is the ‘‘Bilateral Condition’’ (BC) and provides the baseline. In this case the firm consists of a single *owner-manager* who decides on the worker's wage herself. The baseline condition is similar to the common bilateral gift exchange game between an employer and a worker.³ The second

³However, with respect to the payoff functions we introduced some differences, which will be explained in Section 3.

hierarchical structure that we consider is labelled the “Trilateral Condition” (TC). Here the firm’s ownership and control are separated, resulting in a three-player game. In particular, the owner of the firm is now a shareholder who is not responsible for choosing the worker’s wage anymore; this responsibility has been delegated to a manager who has been hired to control the firm. The shareholder thus takes no decision at all. By keeping the firm’s total net profit Π constant, we ensure that conditions BC and TC do not differ in terms of efficiency. They thus differ solely with respect to the firm’s composition.

Separation of ownership and control implies that the one who decides does not bear the full costs and does not receive the full proceeds generated by her decisions. The characteristic feature of our trilateral condition therefore is that the manager is not the full residual claimant, instead the shareholder claims most part of the firm’s net profit. To investigate the impact of this distinction between the one who decides and the one who obtains the (net) proceeds in the starkest possible way, we consider one treatment in which the manager does not share in the firm’s net profits at all. In this treatment, which is labelled TC0, the manager is just paid a fixed wage (normalized to zero). Of course, in reality CEOs and other top-level managers in charge of controlling a firm are typically paid on the basis of performance pay, and thus share in the firm’s net profit at least to some extent. The distinction between the one who decides and the one who gets the proceeds is then less extreme. Our TC25 treatment, in which the manager obtains 25% of the firm’s net profits and the shareholder gets the remaining 75%, considers such a situation.⁴

In all three treatments that we described so far no matter who has the responsibility of choosing the worker’s wage (either the manager or the owner-manager) this decision is always taken by member of the firm. To explore how far can go the separation of ownership and control we consider another bilateral treatment in which the owner does not choose the worker’s wage, instead the wage is randomly determined by the experimenter in front of each worker. This consists to our BCexo treatment. Table 2 depicts the players’ monetary payoffs for the four different treatments that we

⁴With $\alpha + \beta\Pi$ the compensation scheme for the manager, treatments TC0 and TC25 differ with respect to the manager’s profit share β ; in TC0 we have $\beta = 0$ whereas in TC25 we have $\beta = 0.25$. Bilateral condition BC could be interpreted as having $\beta = 1$, although it is important to note that in this treatment the shareholder is completely absent and the firm just consists of two individuals ($n = 2$).

consider.

Table 2: Players' monetary payoffs

	nr. of players	Shareholder	Manager	Worker
BC/BCexo	$n = 2$	-	$40e - w + 360$	$w - c(e) + 20$
TC0	$n = 3$	$40e - w + 360$	0	$w - c(e) + 20$
TC25	$n = 3$	$30e - 0.75w + 270$	$10e - 0.25w + 90$	$w - c(e) + 20$

2.2 Behavioral predictions and hypotheses

When players are selfish and only interested in maximizing their own monetary payoffs, subgame perfect equilibrium predictions are easily derived. Given that effort is increasingly costly (cf. Table 1), the worker chooses the minimum effort level $e^* = e_{\min} = 1$ irrespective of the wage offered. Anticipating this entirely flat wage-effort schedule, the owner-manager in the BC treatment chooses the lowest possible wage $w = 0$. Likewise, also the manager in the TC25 treatment chooses $w = 0$. Both in the TC0 and BCexo treatments any wage is possible in equilibrium. In TC0 treatment the manager is actually indifferent between any feasible wage and in BCexo any wage has the same probability of being drawn.

In this paper our main interest lies in worker behavior. Selfish preferences imply that this behavior is independent of the composition of the firm. It does not matter for the worker's effort choice whether the person who decides on his wage is full residual claimant or not. This prediction could justify the focus on a simple employer-worker relationship as is done in the bilateral gift exchange game.

A large number of experimental studies, however, have shown that workers make their effort choices according to considerations going beyond material self-interest (see e.g. Fehr and Gächter (2000) for an overview). A common finding is a positive correlation between effort and wages, refuting standard predictions based on selfish preferences. Rather, the experimental evidence provides support for Akerlof (1982)'s efficiency wage theory, which argues that a worker's productivity derives from work norms that are in part endogenously determined by a firm's wage policy. In particular, according to the *fair-wage hypothesis* the firm offers higher than market clearing wages,

expecting that workers will work harder in return. The workers then compare the wage received with a norm they consider fair and choose whether to increase their effort or not.

The gift exchange relationship between the worker and the firm depends on the worker's reference point and may originate from a variety of social norms. According to Akerlof (1982) the average wage offered by other firms can act as a norm. Alternatively, workers may also compare themselves with other actors in the (same) firm. They may, for instance, be motivated by a norm of inequality aversion. In that case the reference point can for example be the average payoffs of others (Bolton and Ockenfels (2000)), or an equitable distribution of material resources (Fehr and Schmidt (1999)). Another type of social preferences used to rationalize gift exchange is the worker's concern for social welfare.⁵ The model of quasi-maximin preferences developed by Charness and Rabin (2002) takes this efficiency norm into account.⁶

The theories of social preferences referred to above are *outcome-oriented* in the sense that agents care only about the final distribution of payoffs. A second type of social preference theories assume that people also care about how the distribution of payoffs came about. Workers may then have a preference for rewarding kind intentions of the firm and punishing unkind ones, independent of the final payoff distribution that results. In the model of Dufwenberg and G. Kirchsteiger (2004), for example, the worker's reference point refers to the wages available to the firm and does not depend on other agents' payoffs. A higher wage is rewarded with a higher level of effort, not because it leads to a more desirable distribution of payoffs but rather because the worker likes to do a favor in return. These theories thus stress the reciprocal nature of the gift-exchange relationship.⁷

Both types of theories have been used to explain the positive wage-effort

⁵The attractive ratio of low marginal effort costs to high marginal returns imposed in many gift-exchange experiments allow for large potential efficiency gains. Therefore, the efficiency-enhancing role of gift-exchange has been considered as a possible cause for the behavioral deviations from standard equilibrium predictions (see e.g. Engelmann and Strobel (2004)).

⁶This model assumes that agents prefer a higher sum of total payoffs but also have a special concern for helping the worst-off player.

⁷Clearly, agents can be motivated by both the final distribution of payoffs and how this distribution came about. In the theory of Falk and Fischbacher (2000) the perceived kindness of an action depends on the fairness of the intention underlying this action. The latter is evaluated according to the inequality in the payoff distribution, relative to the set of possible payoff distributions. The full model of Charness and Rabin (2002) also combines outcome-oriented social preferences and reciprocity; individuals are motivated by efficiency but withdraw this concern when others behave unfair.

relationship observed in many (bilateral) gift exchange experiments. We therefore consider them here as well. In all cases the focus is on worker behavior.

First assume that workers are averse to inequality and have preferences like in Fehr and Schmidt (1999).⁸ In that case a worker is willing to increase (decrease) the other firm members' material payoffs if these are below (above) the worker's own material payoffs. Given our parameter choices for Π and m_W , in both BC and BCexo treatments the owner-manager is always ahead of the worker. The worker therefore chooses $e^* = e_{\min}$ in response to all possible wage levels. In treatment TC0 the manager always earns less than the worker whereas the shareholder always earns more. Choosing a higher than minimum effort level does not affect the manager's earnings and only increases the shareholder's payoffs, thereby increasing inequality. Therefore, $e^* = e_{\min}$. Finally, in treatment TC25 the worker is always behind of the shareholder but for relatively high wages he is ahead of the manager. Although choosing $e > 1$ for high wages decreases the manager-worker payoff difference, it exacerbates the worker-shareholder inequality to a larger extent at the same time. Because the worker cares more about being behind than being ahead, he again chooses $e^* = e_{\min}$ after any wage offered. These predictions do not change if we instead assume that workers compare themselves only with the average of the other firm members' payoffs, like Bolton and Ockenfels (2000) do.

The predictions obtained from inequality-aversion coincide with the ones based on selfish preferences. The driving force here is the large difference between the fixed amount of 360 appearing in the firm's payoff function and the one of 20 the worker receives. In case these amounts are more equal, as is the case in most gift exchange experiments, at least in treatment BC (and BCexo) a positive wage-effort relationship is predicted (see e.g. Figure 1 and Hypothesis H2 in Maximiano et al. (2004)). For ease of reference we summarize the above predictions in the following hypothesis:

Selfishness/inequality-aversion hypothesis: Effort will be minimal for all wages in all treatments.

⁸In particular, for a general n -player game with monetary payoffs $m = (m_1, \dots, m_n)$, player i 's utility is given by (for $i = 1, \dots, n$): $U_i(m) = m_i - \frac{1}{k-1}\alpha_i \sum_{j \neq i} \max\{m_j - m_i, 0\} - \frac{1}{k-1}\beta_i \sum_{j \neq i} \max\{m_i - m_j, 0\}$.

Next assume that workers care about overall surplus as well. In particular, let workers be motivated by quasi-maximin preferences as introduced in Charness and Rabin (2002).⁹ Because in the BC and BCexo treatments the worker is always the worst-off player, efficiency is the only reason for the worker to provide more than the minimum effort level. Effectively, the worker's utility function can be written as $m_W + \rho_{BC(exo)} \cdot \Pi$.¹⁰ The larger the concern for efficiency, the larger parameter $\rho_{BC(exo)}$ is. By putting in one extra unit of effort the payoffs of the worker decrease by $c'(e) \in \{1, 2, 3\}$ whereas firm net profits increase with 40. The equilibrium effort level chosen by the worker thus depends on how $c'(e)/40$ compares to $\rho_{BC(exo)}$. But the important thing to note is that this effort level is independent of the wage offered; the predicted wage-effort relationship is entirely flat¹¹.

The same prediction applies for treatment TC0. Quasi-maximin preferences then again correspond to a worker's utility of $m_W + \rho_{TC0} \cdot \Pi$. Because now the manager rather than the worker is the worst-off player, a higher effort level does not decrease the payoffs of the worst-off player anymore. This effectively increases the concern for efficiency: $\rho_{TC0} \geq \rho_{BC}$.¹² The worker will therefore choose an effort level that weakly exceeds the one in the BC-treatment, i.e. $e_{TC0} \geq e_{BC}$. But again, the predicted wage effort relationship is entirely flat. Finally, in treatment TC25 the manager is worst off only for relatively high wages. Otherwise the worker earns the least. The former case is equivalent to treatment TC0 and the worker chooses e_{TC0} . The latter case reduces to the BC treatment and hence $e = e_{BC}$. The wage-effort relationship is thus given by a step function with at most one step. Because for $w \leq 60$ the manager always gets more than the worker, this step can only occur for some $w > 60$.

Efficiency hypothesis (quasi-maximin preferences): The wage-effort relationship is entirely flat in all treatments, except for at most a single step in treatment TC25.

⁹For a general n -player game with monetary payoffs $m = (m_1, \dots, m_n)$, player i 's utility is then given by (for $i = 1, \dots, n$): $U_i(m) = (1 - \lambda)m_i + \lambda[\delta \text{Min}\{m_1, \dots, m_n\} + (1 - \delta)(m_1 + \dots + m_n)]$. Here λ gives the weight that player i attaches to social welfare, with the latter a weighted (by δ) combination of the payoff of the worst-off player and overall surplus.

¹⁰In terms of the specification of Charness and Rabin (2002) we have $\rho_{BC} = \lambda(1 - \delta)$.

¹¹Assuming $\lambda = 0.4$ that corresponds to the estimates Charness and Rabin (2002) obtained for their model it can be shown that it is sufficient a very small concern for efficiency ($(1 - \delta) \geq 0.1875$) for the worker to provide always the maximum effort.

¹²Effectively it holds that $\rho_{TC0} = \frac{\rho_{BC}}{1 - \lambda\delta}$.

From the above it follows that under outcome-oriented social preferences wages and effort are likely to be uncorrelated. The two leading models within this class, viz. inequality-aversion and quasi-maximin preferences, both predict an (almost) entirely flat wage-effort relationship. Hence, if we observe a positive correlation in any of our four treatments, we can exclude that outcome-oriented social preferences are the single underlying motive for worker's behavior. In that case intention based reciprocity is likely to play an important role. The slope of the wage-effort relationship may differ among treatments though. Below we derive some hypotheses under the assumption that individuals have a preference for reciprocity. These can be seen as refinements of the reciprocity hypothesis that effort levels are increasing in the wage offered.

In the BC-treatment the owner-manager both decides on the wage offer and captures the entire net proceeds. A higher wage benefits the worker and thus can be considered kind, also because the owner-manager has to pay the wage from her own pockets. A reciprocal worker will judge the kindness of a certain wage offer and will choose the appropriate effort level in response, in order to reward the owner-manager. Such a reward is possible, because the monetary payoffs of the owner-manager are (proportionally) increasing in the worker's effort. Because higher wages can be considered more kind they will trigger a bigger reward and thus a positive wage-effort relationship is expected.

Next consider treatment TC0 where ownership and control are completely separated. The worker may then still consider higher wages as being more kind (although may be to a smaller extent because the manager does not pay the wage herself), but he has no opportunity to reward the person responsible for offering the higher wage. This holds because the manager's payoffs are independent of the worker's effort choice. We may therefore expect that the worker chooses the minimum effort level regardless of the wage. This is actually what the intention-based reciprocity model of Dufwenberg and G. Kirchsteiger (2004) predicts. The worker will feel neutral towards the shareholder, because the latter has no choice to make. And because the worker can neither be kind nor unkind to the manager, his effort choice will be guided by monetary payoffs m_W alone. Similarly, in BCexo treatment Dufwenberg and G. Kirchsteiger (2004) predicts no reciprocal behavior. In this case, the reason is the lack of intentions that characterize this treatment. Here the wage is selected

at random by the experimenter whose action cannot be perceived as being kind or unkind. In sum, when the worker only has reciprocal feelings towards the person who controls the wage, the wage-effort relationship will be less steep in TC0 and BCexo as compared to treatment BC.

Alternatively, the worker may want to reward the person who bears the actual costs of the kind wage choice. If that is an important motivational force, we also predict a positive wage-effort relationship in both treatment TC0 and BCexo. When the worker only cares about who pays the wage we expect no difference between all three treatments BC, BCexo and TC0.

A different type of motivation can justify an equality between TC0 and BC treatment. A worker may perceive the firm, independently of its composition, as being his employer. This will make him reciprocal towards of the firm and not towards one of the firm members (e.g. the one who controls it or the one who owns it) in particular. However, when this is the case, the wage-effort relationship will be steeper in both BC and TC0 as compared with BCexo as in this last treatment the wage is not a firm's choice and intentions are not present at all.

Predictions for treatment TC25 are related to the ones above. In the model of Dufwenberg and G. Kirchsteiger (2004) the kindness of a particular wage offer is judged relative to what the firm could offer the worker in principle. The perceived kindness of a particular wage offer is thus the same in all treatments except for BCexo treatment. The effort level the worker chooses in response to this wage then depends on the effectiveness of effort as a reciprocation device. The more effective effort is in this regard, the higher effort level will be chosen. Hence when the worker prefers to reward only the one who controls the wage, we predict that the wage-effort relationship falls in between the one for TC0 or BCexo (where it is predicted to be flat) and BC. In case the worker prefers to reward the ones who pay the wage, TC25 is predicted to yield the same results as TC0 (and also BC and BCexo). This holds because in both treatments effort is equally effective in rewarding the group of contributors to the wage. So, if the worker prefers to reciprocate the ones who pay we will actually observe equality among all four treatments. As before, this observation is also consistent with the worker being reciprocal towards the firm, taking both the fact that the firm controls the wage and pays for it into account.

Reciprocity hypothesis: Effort levels are increasing in the wage offered in treatment BC. This is consistent with a motivation to reward the one who controls the wage, with a motivation to reward the one who pays the wage, or a combination of both. These underlying motives predict differences among treatments though, as follows:

Reciprocity towards who controls the wage: Effort levels are increasing in the wage offered in treatment BC and to a smaller extent in TC25. Effort levels will be minimal in TC0 and BCexo.

Reciprocity towards who pays the wage: Effort levels are increasing in the wage offered and the slope of the wage-effort relationship will be the same in all treatments.

Reciprocity towards the firm: Effort levels are increasing in the wage offered and the slope of the wage-effort relationship will be the same in BC, TC0 and TC25 treatments. Effort levels will be minimal in BCexo.

Finally, the theory of Falk and Fischbacher (2000) combines oriented social preferences and reciprocity (see also the full model of Charness and Rabin (2002)). In their model, the (un)kindness worker experiences from the (owner)-manager's wage choice depends on the intentions and on the (dis)advantageous inequality. Whenever the kindness term is negative the worker does not benefit from being reciprocal and provides $e^* = 1$ for all possible wages. This is the case in treatment BC as the worker earns always less than the owner-manager. The same prediction holds in both treatments BCexo and TC0 despite founded on different arguments. In BCexo treatment intentions are absent and in TC0 the worker earns always more than the manager but the worker's reciprocal attitude is ineffective as it can not change the manager's earnings. Finally, in treatment TC25 the wage-effort relationship is also flat at minimum wage whenever the manager payoffs are higher than the worker, which happens for $w \leq 60$. For $w > 60$, we might observe a positive wage-effort relationship. However, the worker still earns substantial less than the shareholder and the steepness of the effort-wage relationship is negatively related with the worker's concerns for an

equitable outcome.

3 Experimental design and procedures

In this section we first discuss some relevant features of our experimental design. After, we present the experimental procedures.

3.1 Experimental design

Our experiment is inspired by the bilateral gift exchange game of Fehr et al. (1998). The specifics of our design are more in line with Maximiano et al. (2004) though. Like in that paper we let the subjects play the gift exchange game only once, rather than repeatedly in a row. One-shot interaction has the advantage that subjects' choices cannot be guided by intertemporal considerations. For example, if a worker displays a reciprocal attitude, this cannot be explained by a desire for reputation formation or other repeated game considerations. A second important feature is that we make use of the strategy method. Each worker has to make a contingent effort choice, indicating his/her response to every possible wage offer. Because there are 21 possible wage levels, each worker has to make 21 effort choices.

The main advantage of using the strategy method is that it allows us to elicit the wage-effort relationship of every individual worker. Besides that, given that in our experiment subjects interact only once, the use of the strategy method generates a relatively large amount of data at low cost. Theoretically the use of the strategy method should not matter. In practice, however, behavior may be affected because subjects are forced to consider the complete strategy space. In particular, workers have to think about all possible wage offers and not just about the firm's actual wage offer.

The literature is still inconclusive about the impact of the elicitation method. A number of experimental studies finds that the strategy method does not affect subjects' behavior; Cason and Mui (1998) for a dictator game, Brandts and Charness (2000) for both a chicken and a prisoners' dilemma game, Oxoby and McLeish (2004) for an ultimatum game, Bosch-Domènech and Silvestre (2005) for an individual decision setting and Falk and Kosfeld (2005) for a simplified principal-agent game. This last experiment is closest to ours with respect to the game studied. Some other studies do

find different results. For instance, Güth et al. (2001) do find differences for a binary-offer ultimatum game and Brosig et al. (2003) for two different one-shot sequential games. Taking all these results together it seems fair to conclude that the impact of using the strategy method is rather limited. Moreover, even if the strategy method influences behavior, there is no reason to expect that this influence will differ among our treatments. Treatment comparisons are thus likely to be unaffected.

Compared to Fehr et al. (1998) and Maximiano et al. (2004) the payoff functions that we use here differ in two notable ways. First, the marginal returns to effort in our present experiment are four times higher, i.e. we have $v = 40$ rather than $v = 10$. This secures that even in treatment TC25 effort is a sufficiently effective instrument to reward the person who controls the wage (i.e. the manager). Second, in all our treatments the worker's payoffs are always (i.e. for any possible wage) substantially below the firm's net profits. This allows a better identification of the motives underlying workers' reciprocal behavior. As discussed in Subsection 2.2, because the worker is now always behind, inequality-aversion cannot explain a positively sloped wage-effort relationship. Also quasi-maximin preferences do not predict this. If the two fixed amounts of 360 and 20 appearing in Π and m_W respectively were chosen more equally these underlying motives would be more difficult to separate. This holds because in that case also under inequality-aversion and quasi-maximin preferences a positive wage-effort relationship may result, see e.g. Figures 1 and 2 in Maximiano et al. (2004).

3.2 Experimental procedures

The experiment was run at the University of Amsterdam in November 2005 and February 2006. Overall 293 subjects participated, most of them were undergraduate students in Economics (58%). The average age of participants was 22 years and 42% of them was female. Overall we conducted 14 sessions. Three sessions considered the BC treatment (62 participants in total), another three sessions the BCexo treatment (60 subjects), four sessions the TC0 treatment (87 subjects) and another four sessions the TC25 treatment (84 subjects). Subjects earned on average 18.7 euros (including a show-up fee of 12 euros) in less than one hour. Earnings varied substantially, with the minimum earnings equal to 12 euros and a maximum of 35.3 euros.

The experiment was computerized using the z-Tree software developed by

Fischbacher (1999). Subjects started with general on-screen instructions. They also received a summary of the instructions on paper (see the Appendix). To ensure that subjects understood the experiment, in particular how their payoffs were calculated, all subjects had to answer a number of control questions correctly before the experiment started.¹³ At the start of the experiment subjects learned their roles. In the bilateral sessions half of the subjects performed the role of owner-manager, the remaining half were assigned the role of worker.¹⁴ In the trilateral sessions, one-third of the subjects were given the role of shareholder, one-third the role of manager and the remaining one-third were assigned the role of worker. In all treatments subjects were randomly and anonymously matched into firms with either two (BC and BCexo) or three (TC0 and TC25) firm members.

When making actual choices, workers had to fill in a wage-effort table without knowing the actual wage set by (or for) their firm. In particular, for all 21 possible wage levels (multiples of 5 between 0 and 100) they had to indicate their effort choice, an integer between 1 and 10. In the BCexo treatment, the owner-manager did not take any decision. The wage was randomly drawn individually by the experimenter in front of each worker after the workers have taken all their choices. In the BC-treatment the owner-manager had to set the wage without knowing her/his worker's effort choices. In the trilateral treatments the manager did so. Note that in the trilateral treatments shareholders did not take any decision at all. As soon as everyone had made a decision (if any), all subjects were informed about the choices of (for) the other members in the firm. They also learned their own and the other firm members' payoffs. No information was given about choices and payoffs in firms to which the subject does not belong.

At the end of the experiment the number of points a subject had earned were converted into euros, with 30 points corresponding to 1 euro. Each participant learned his/her own earnings in euros, filled in a short background questionnaire and was individually and privately paid.

¹³Like in Maximiano et al. (2004) subjects generated the numerical examples for the control questions themselves, by first making hypothetical choices for both the (owner-)manager's and the worker's role.

¹⁴In order to keep treatments similar with respect to the labels used we named "manager" the owner-manager in the bilateral treatments.

4 Results

In this section we report and discuss the main results of our experiment. Because we are mainly interested in workers' willingness to reciprocate, we first present workers' effort choices and use these to evaluate the hypotheses presented in Subsection 2.2. After that we turn to (owner-) manager behavior and overall earnings.

4.1 Worker behavior

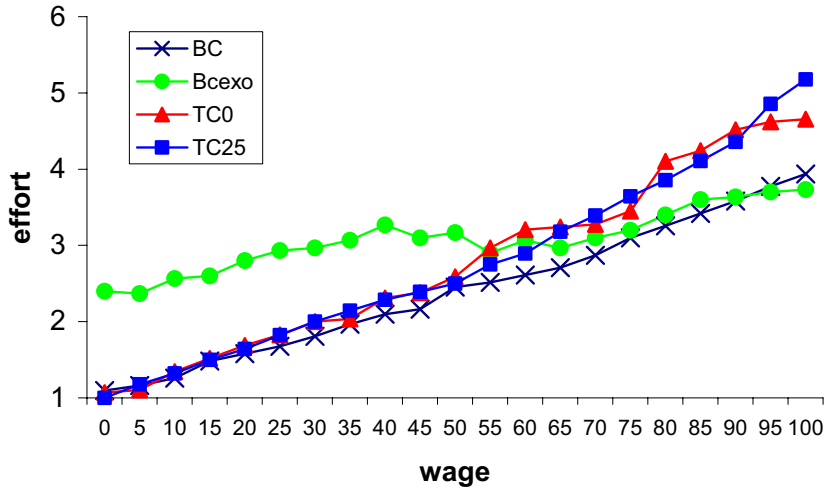
In all treatments the average effort of the workers over all possible wages is higher than the minimum effort level. In particular, it equals 2.41 in treatment BC, 3.07 in BCexo, 2.77 in TC0 and 2.76 in treatment TC25. This contradicts the predictions based on standard theory and inequality-aversion, i.e. the worker will always provide the minimum effort regardless of the wage received. Moreover, also the efficiency hypothesis based on quasi-maximin preferences is rejected. This follows from Figure 1 below, which displays the average effort by wage for each treatment separately. The higher the wage offered, the higher the average effort level that is chosen in response. This positive wage-effort relationship holds no matter the firm's composition and how profits are distributed among firm members. Specifically, the Spearman rank correlation between effort and wages is significant at the 1% level and around 0.29 in BC treatment, 0.15 in BCexo treatment, 0.35 and 0.33 in TC0 and TC25 respectively.¹⁵. The following result summarizes these findings.

Result 1. In all treatments mean effort levels are increasing in the wage offered.

Figure 1 also suggests that the wage-effort relationship is less steep when wages are determined exogenously than when wages are chosen by a firm's member. Moreover, worker's behavior is very similar across treatments in which wages are endogenously chosen. To further explore these two findings we regress average effort on the wage level, three treatment dummies and three interaction terms. To account for the panel structure of our data (we have 21 data points per individual worker),

¹⁵The Spearman rank correlation does not take into account the dependency between the effort choices made by the same worker. However, estimating a random effects model such as $e = \alpha + \beta w$ for each treatment we find that β is significant different from zero in all four treatments.

Figure 1: Average effort by wage



we estimate a random effects model. The results are presented in Table 3. The intercepts in BC treatment and in both trilateral treatments are equal and figure around one. The intercept in BCexo treatment is significantly different from one and around 2.4. Moreover, the average effort provided for low wages is higher in BCexo treatments when compared with all other treatments. Two-sample (Mann-Whitney) ranksum tests for each wage separately show that differences in average effort levels between BCexo and BC and BCexo and TC0 are statistically significant for really low wages.¹⁶ The test results are reported in Table 4. These findings indicate that there is negative reciprocity for intentional low wages. This is in line with previous experiments that investigated the role of intentions in reciprocal behavior (see for e.g., Charness (2004), and Falk et al. (2000b)). The highly significant wage coefficient reinforces the reciprocity hypothesis and rejects that only inequality-aversion and/or efficiency considerations are at play. As expected, the effort-wage relationship is significantly steeper (at 5 percent level) in BC treatment compared to BCexo treatment.¹⁷

Result 2. The wage-effort relationship is steeper when the wage is chosen by a member of the firm than when it is exogenously determined.

¹⁶The differences in average effort levels between BCexo and BC and BCexo and TC0 are statistically significant for wages of 0,5 and 10. The differences in average effort levels between BCexo and TC25 are statistically significant for wages of 0 and 5.

¹⁷Estimating a random effects model like: $e = \alpha + \beta w + \theta_1 BC + \theta_2 TC0 + \theta_3 TC25 + \delta_1 BC * w + \delta_2 TC0 * w + \delta_3 TC25 * w + \varepsilon$ we see that the value of δ_2 and δ_3 is small, but positive and significant at $p < 0.01$.

Focusing on treatments in which wages are endogenously chosen we see that the slopes in both trilateral treatments are steeper. Increasing the wage by 10 points leads to an estimated increase in effort of around 0.28 in treatment BC, 0.38 in TC0 and 0.39 in treatment TC25. However, these differences are not statistically significant. Moreover, also two-sample (Mann-Whitney) ranksum tests for each wage separately show that differences in average effort levels between BC and TC0, BC and TC25 and TC0 and TC25 are statistically insignificant for all wage levels. Results are reported in Table 4.¹⁸

Table 3: Random effects linear regression with effort as dependent variable

<i>Independent variable</i>	<i>coefficient</i>	<i>robust std. err.</i>
Constant	0.9891	0.1904***
Wage	0.0283	0.0070***
BCexo	1.4939	0.5800***
TC0	-0.1123	0.3160
TC25	-0.1762	0.3049
BCexo*Wage	-0.0165	0.0082**
TC0*Wage	0.0095	0.0102
TC25*Wage	0.0107	0.0105

***Indicates significance at the 1%-level. ** Indicates significance at the 5%-level. There are $N = 2478$ observations in total, with 118 clusters (workers) and 21 observations per cluster. The Wald statistic equals $\chi^2 = 195.52$; $p = 0.000$.

Result 3. The overall wage-effort relationship is equally steep in all treatments in which the wage was endogenously chosen.

¹⁸Table 4 only reports the statistics for wages that are multiples of 10. None of the test results concerning the wages that are not reported are significant.

Table 4: Effort distribution measures and Mann-Whitney test

wage	0	10	20	30	40	50	60	70	80	90	100
BC											
average	1.10	1.26	1.58	1.81	2.10	2.45	2.61	2.87	3.26	3.58	3.94
Percentile 25	1	1	1	1	1	1	1	1	1	1	1
Median	1	1	1	1	1	1	1	1	1	1	1
Percentile 75	1	1	2	2	3	4	4	5	6	7	8
BCexo											
average	2.4	2.57	2.8	2.97	3.27	3.17	3.07	3.1	3.4	3.63	3.73
Percentile 25	1	1	1	1	1	1	1	1	1	1	1
Median	1	1	1	1	1	1	1	1	1.5	1.5	1.5
Percentile 75	1	3	3	5	5	5	5	4	6	7	6
p-values ^a	0.0370	0.0682	0.3556	0.3577	0.3886	0.8789	0.8255	0.8936	0.7847	0.7291	0.8746
TC0											
average	1.07	1.34	1.69	2.00	2.31	2.59	3.21	3.28	4.10	4.52	4.66
Percentile 25	1	1	1	1	1	1	1	1	1	1	1
Median	1	1	1	1	1	1	1	1	3	3	2
Percentile 75	1	1	2	2	3	4	5	6	7	8	10
p-values ^b	0.9810	0.5043	0.8154	0.7473	0.6844	0.9347	0.5465	0.7273	0.3845	0.3467	0.4325
p-values ^c	0.0456	0.0249	0.3423	0.6059	0.6635	0.8046	0.8308	0.9538	0.5878	0.5877	0.5530
TC25											
average	1	1.32	1.64	2.00	2.29	2.50	2.89	3.39	3.86	4.36	5.18
Percentile 25	1	1	1	1	1	1	1	1	1	1	1
Median	1	1	1	1	1	1	1	1	1	1	4
Percentile 75	1	1	2	3	3.5	4	5	6	7	8	10
p-values ^d	0.3419	0.6357	0.8789	0.5276	0.6281	0.9533	0.7401	0.5957	0.6189	0.5139	0.2675
p-values ^e	0.0134	0.1646	0.3567	0.7642	0.7078	0.8411	0.9865	0.8193	0.8733	0.8468	0.3163
p-values ^f	0.3258	0.2566	0.8952	0.7106	0.9218	0.9929	0.7423	0.9513	0.7119	0.7634	0.7348

^ap-values for Mann-Whitney test that compares BC with BCexo; ^bp-values for Mann-Whitney test that compares BC with TC0; ^cp-values for Mann-Whitney test that compares BCexo with TC0; ^dp-values for Mann-Whitney test that compares BC with TC25; ^ep-values for Mann-Whitney test that compares BCexo with TC25; ^fp-values for Mann-Whitney test that compares TC0 with TC25;

Apart from the average effort levels, Table 4 also presents the median effort levels and the first and the third quartile of the effort distribution. These measures show that workers' behavior is not only on average similar across treatments, but also that the whole distribution seems rather equal. Furthermore, they also reveal that there are large individual differences between subjects within a treatment. We therefore investigate individual worker behavior in more detail, in order to check whether the findings at the aggregate level are replicated at the individual level. For that purpose we analyse individual worker's choices and classify all workers into four categories. In particular, we fit a linear effort function $e_i = a + b * w_i$ for each individual subject. The estimated wage coefficient is then used together with the observed monotonicity

of the relationship to classify the individual workers. The precise definition of our four different categories is as follows:

Selfish/inequality-averse behavior: This group consists of workers that provide the minimum effort level regardless of the wage.

Reciprocal behavior: These subjects increase their effort with wages in a monotonic way. Workers within this category have a significant positive wage coefficient; $b = \partial e / \partial w > 0$. We exclude subjects from TC25 treatment whose wage-effort relationship is a step function with a single step¹⁹

Quasi-maximin behavior: This group include subjects with a flat wage-effort relationship and $e^* > 1$ in treatments BC, BCexo and TC0 and subjects treatment TC25 whose wage-effort relationship is a step function with a single step at wage of 60.

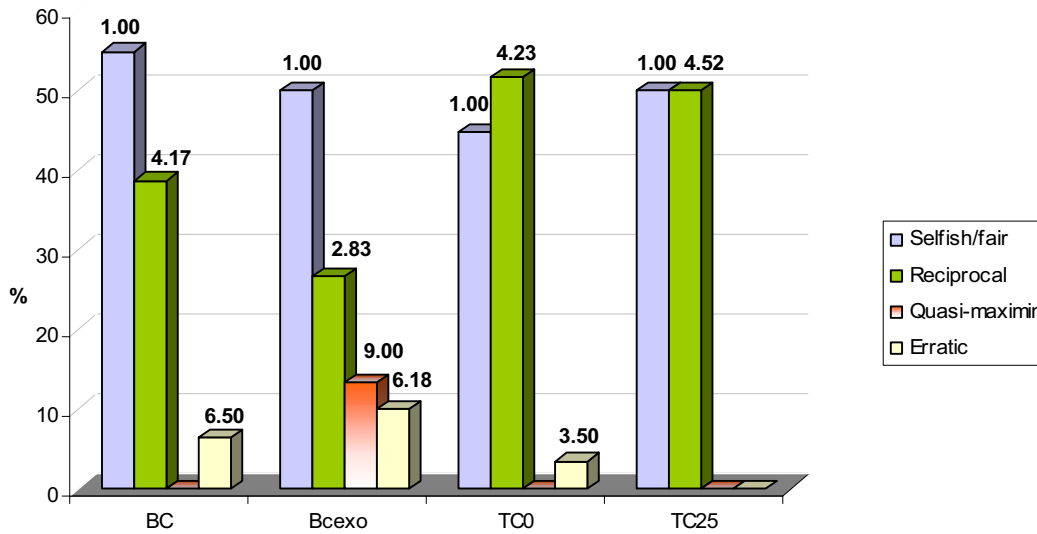
Erratic behavior: These subjects do not make monotonic effort choices. Possibly these subjects made some typing mistakes, did not understand the experiment, or were not taking it seriously (or only filled in a realistic effort level for wages they considered realistic).

Figure 2 shows the distribution of subjects over these four categories by treatment. The figure also indicates the average effort provided by the different worker types in each treatment. First note that in all treatments great part of workers behave selfish or according to inequity-averse preferences. However, this does not explain our Result 3. Estimating a random effects model like in Table 3 restricted to the reciprocal types only, the wage-effort relationship is still not statistically significant different among treatments with an endogenously chosen wage. Second, and as expected, there are less subjects acting reciprocal in BCexo treatment. This difference is significant comparing BCexo with both TC0 and TC25 by means of a Binomial test ($p < 0.05$). Moreover,

¹⁹We do not have a single subject in treatment TC25 that behave according to Quasi-maximin preferences and that could be included in this category.

the average contribution of reciprocal workers is also lower in BCexo treatment. Third, we observe workers behaving according to quasi-maximin preferences only in BCexo treatment. At last, focusing on treatments in which the wage was endogenously chosen, we observe that in the bilateral treatment there are more workers choosing the minimum effort level regardless of the wage. Compared to the trilateral treatments the reciprocal workers also act slightly less reciprocal. Interestingly, the highest percentage of reciprocal workers is found in treatment TC0. Differences are not significant though. A chi-square test reveals that there is no difference in the frequency distribution of worker types between the BC and TC0 treatment and between treatments BC and TC25. This also applies when comparing the two trilateral treatments. The main findings are summarized in Results 4, 5 and 6 below.

Figure 2: Classification of workers by treatment and average contribution per worker type



Result 4. In all treatments there is a large proportion (around 50%) of individuals that behave selfish or inequality-averse.

Result 5. There are less workers behaving reciprocal in BCexo treatment and their average effort contributions is lower.

Result 6. The distribution of worker types does not differ across treatments in which the wage was chosen by a firm's member.

Taken together, Results 1 through 6 support the reciprocity hypothesis. On average we find a positive wage-effort relationship. However, we also observe a clear heterogeneity in workers' behavior. In all treatments, around half of the subjects provides the minimum effort regardless of the wage, while the other half behaves reciprocal. Looking to our treatments in which the wage was endogenously chosen and comparing to other bilateral gift exchange experiments we observe that the percentage of reciprocal workers that we find is somewhat lower. For example, in Maximiano et al. (2004) we find a fraction of 64% of reciprocal workers and the overall wage-effort relationship found there is steeper than the one we observe here.²⁰ The explanation for this is straightforward. Because of the highly asymmetric fixed amounts in Π and m_W in the present experiment, also inequality-averse subjects should display a flat wage-effort relationship (cf. Section 2). In most previous experiments the initial endowments are much more symmetric and therefore inequality-averse subjects are predicted to choose a positive wage-effort relationship. This explains why we find a significantly lower slope (and also around 10% more workers that always choose the minimum effort). At the same time, we still find that the slope is substantial and significantly different from zero. Like in Maximiano et al. (2004), therefore, we conclude that intention-based reciprocity rather than outcome-oriented social preferences is the main driving force behind gift exchange (see also Falk et al. (2000a) and Falk et al. (2000b) for evidence that reciprocity is quantitatively the more important motivational force).

Looking at whom the worker likes to reciprocate, the results for treatment TC0 clearly reject the hypothesis that the worker is only reciprocal towards the one who controls the wage. The one who pays for it certainly plays an important role. Our finding that the wage-effort relationship does not differ among BC, TC0 and TC25 treatments is in fact in line with the worker only caring about the one who pays the wage. But it also supports the hypothesis that the worker is reciprocal towards the firm in general and that he is not particularly sensitive to the firm's composition.²¹ The

²⁰Here we use the 1-1 treatment in Maximiano et al. (2004) as comparison. In this treatment the owner-manager's earnings equal $10e - w + 90$ whereas the worker's earnings are $w - c(e) + 90$. The wage coefficient found for that treatment equals 0,0556 compared to 0.0283 here for the bilateral treatment (cf. Table 3). We acknowledge though that this is not a perfect comparison, given that also the returns on effort differ besides the initial endowments.

²¹According to Offer (1997) the notion of reciprocity is essentially interpersonal and in large corporations the employer is perceived as an abstract and anonymous concept, rather than as a real person. In this view the worker cannot feel reciprocal towards the firm.

results for treatment BCexo actually suggest that this is the more plausible explanation. In this bilateral treatment the wage is determined by a random device, rather than by the owner-manager. The owner-manager, now better labelled as simply ‘owner’, is still the one who entirely bears the wage costs and who captures the proceeds from the worker’s effort. We found that the wage-effort relationship is significantly less steep as compared to the treatment in which the manager controls the wage that it totally paid by the shareholder. This indicates that control itself is important for the reciprocal relationship (see also the experimental evidence in Falk et al. (2000a)). However, we cannot exclude that some individuals choose to reciprocate the one who pays the wage, otherwise we would observe no reciprocal behavior in BCexo treatment. Unlike earlier experiments, (see Charness (2004)) a positive wage-effort relationship in our BCexo treatment cannot be explained by distributive concerns and only a reciprocal behavior can account for it.

Overall we conclude that in most cases the worker feels reciprocal towards the firm; both the fact that the firm controls the wage and pays for it are important. Exactly how ownership and control are subdivided among (potentially) various firm members is unimportant though.

4.2 Wage offers and earnings

Although our main interest lies in workers’ effort choices, we briefly look at (owner-) managers’ behavior as well. Standard theory predicts that (owner-) managers should pay the minimum wage in treatments BC and TC25. However, if the (owner-) manager herself is inequality-averse or expects to gain from a positive reciprocal reaction of the worker, she may pay more than the minimum wage.²² Because in treatment TC0 the manager does not benefit herself from the worker’s reciprocal reaction, a higher wage there may reveal the manager’s preferences for equality and/or efficiency. But as noted before, any wage offer in TC0 is consistent with selfish preferences as well. Table 5 presents the average wages (and other distributional measures) for all treatments.

²²In the inequality-aversion model of Fehr and Schmidt, if we assume that α_i (i.e. the extent to which player i dislikes disadvantageous inequality) is equal to 1 and β_i (the extent to which he dislikes earning more than others) is equal to 0.6, the owner-manager should always pay $w = 100$ in treatments BC and TC0 and pay a wage of at least 65 in TC25.

Table 5: Wage distribution measures and Mann-Whitney test

	BC (n=31)	BCexo (n=30)	TC0 (n=29)	TC75 (n=28)
Average	61.45	64.5	67.24	49.29
Percentile 25	35	45	35	17.5
Median	70	65	90	52.5
Percentile75	100	90	100	77.5
% offers=0	19.35	0	13.79	17.86
% offers=100	29.03	13.33	44.83	14.29
p-value		0.3858†	0.1630‡	0.0469§

† p-values for Mann-Whitney test that compares BC with TC0; ‡p-values for Mann-Whitney test that compares BC with TC25; §p-values for Mann-Whitney test that compares TC0 with TC25;

In all treatments only a small percentage of (owner-) managers pays the minimum wage of zero and the average wage is substantially higher. In the bilateral treatment the mean wage equals 61.5 points. In TC0 the manager offers on average around 6 points more and in TC25 on average 12 points less. The differences between treatments increase when we look at the median wage. Especially in treatment TC0 the median wage is very high and equal to 90. Moreover, a larger percentage of managers (44.8%) offers the maximum wage of 100 when they do not bear the wage costs. Despite the observed differences between treatments, the Mann-Whitney test fails to find significant differences in wages between the bilateral treatment and the two trilateral ones. But wages are significantly higher (at the 5% level) in treatment TC0 as compared to treatment TC25. (RS: This should also be reported in Table 5.) These results carry over to the proportions of minimum and maximum wage offers. We only find a significant difference (at the 5% level) for the proportion of maximum wage offers between treatments TC0 and TC25.

Result 7. Wages are on average substantially higher than minimal. Wages are highest in treatment TC0 and lowest in treatment TC25, although differences among treatments are typically insignificant.

We next turn to the actual earnings subjects obtain in the experiment. Table 6 reports the subjects' average earnings by treatment and by role, excluding the show up fee of 12 euros every participant received for showing up on time. Workers earn slightly more in TC0, which is driven by the higher wages they receive in this treatment. The firm's overall profits are highest in TC25; here the wage costs are the lowest and the effort provided is the highest. Despite the higher wage costs in TC0, the firm's overall profits are higher in TC0 than in treatment BC.

The disparity between the workers' overall earnings and the firms' overall earnings (profits) is mainly driven by the difference in the initial endowments of 20 for the worker and 360 for the firm. Ignoring these, the average additional earnings the firm makes are smaller than those of the worker in treatment BC.

Table 6: Average earnings by treatment (excluding show up fee of € 12)

		<i>BC</i>	<i>BC_{exo}</i>	<i>TC0</i>	<i>TC25</i>
Workers	Endowment	20	20	20	20
	Overall earnings	78.71 (€ 2.62)	80.5 (€ 2.68)	82.97 (€ 2.77)	65.54 (€ 2.18)
Managers	Endowment	360	360	0	90
	Overall earnings	403.06 (€ 13.44)	427.5 (€ 14.25)	0 (€ 0)	109.11 (€ 3.64)
Shareholders	Endowment			360	270
	Overall earnings			432.07 (€ 14.40)	372.32 (€ 10.91)

Remark: Earnings in points. The conversion rate is 30 points = 1 euro.

5 Conclusion

In this paper we investigate the following question: does the separation of ownership and control between shareholders and managers in modern corporations influence workers' reciprocal attitudes? We do so by checking the robustness of experimental gift exchange in a three-tier hierarchy, where a manager controls the worker's wage but is not full residual claimant. She therefore does not get the full benefits generated by the worker's reciprocal reaction (if at all). Our experimental design covers four treatments. The standard bilateral gift exchange game, with a single owner-manager and a worker, serves as baseline (BC). This treatment is compared with another bilateral treatment in which the wage the wage is chosen by a random device, rather than by the owner-manager, and with two other treatments in which the firm is owned by a shareholder

but controlled by a manager. In these trilateral treatments the manager chooses the worker's wage. The manager either receives a fixed wage such that the shareholder is full residual claimant of the firm's profits (treatment TC0), or the manager is paid on the basis of performance pay receiving 25% of firm's profits (treatment TC25).

The firm's profit function is kept constant across treatments. Hence the bilateral and trilateral conditions do not differ in terms of efficiency but only with respect to the firm's composition. The profit function is chosen such that (like in reality) the firm is always much richer than the worker. Compared to previous experiments we also increased the marginal return to effort. Our parameter choices allow us to exclude inequality-aversion and efficiency concerns (quasi-maximin preferences) as possible explanations for a positively sloped wage-effort relationship. Other characteristic features of our design are that we employ the strategy method and only a single period is played.

We find that workers on average exhibit a reciprocal attitude in all treatments. The higher the wage paid, the higher the effort level the firm receives on average. Somewhat surprisingly, this also holds in treatment TC0 where the manager who chooses the wage does not benefit from the worker's reciprocal behavior at all. Also, but at a lesser extent, we still found reciprocity in BCexo. The wage-effort relationship does not differ between the baseline treatment and the two trilateral treatments. Also the proportion of reciprocal workers is the same in BC treatment and both trilateral treatments and around 50%. Gift exchange thus appears to be robust to the firm's separation of ownership and control. This result jointly with the results for BCexo treatment suggest that the worker is mainly reciprocal towards the firm and not to one of its members in particular. Overall our findings tentatively suggest that a worker's motivation to reciprocate does not vanish (or does not even diminish) in firms with diffuse ownership stock. Workers may reciprocate a kind wage offer with higher effort even if it implies that a large part (or all) of the benefits goes to an anonymous, impersonal group of wealthy shareholders. Clearly more research is needed to establish whether this is indeed the case though.

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Appendix: Summary of the instructions

In this experiment you are taking part in a study of the labor market. There are three types of participants: shareholders, managers and workers. One third of the participants will be assigned the role of shareholder; one third the role of manager and the remaining one third will be workers. You will be randomly assigned one of these roles. Which role you have, you will hear at the start of the experiment. Your role will not change during the experiment.

The experiment consists of one period only. In this period you will be randomly and anonymously matched with two other participants. All groups will be composed of three participants: one shareholder, one manager and one worker. (Each group represents a firm.) You will not know with whom you are matched. During the experiment you will earn money based on the choices you and the participants with whom you are matched make. These earnings are calculated in points.

The single period has two stages. These stages have the following setup:

Stage 1 In this stage you (may) have to make a decision without knowing the choices of those with whom you are matched. If you are a shareholder, you actually do not have to make a decision at all. If you are a manager, you have to set the wage of the worker. This wage should be a multiple of 5 and in between 0 and 100. Each manager is allowed to set only one wage.

If you are a worker, you have to decide which effort level you want to provide for each possible wage set by the manager. There are 21 possible wages (ranging from 0 till 100), so each worker has to make 21 effort choices. These effort levels should be integers and in between 1 and 10. Effort is costly for the worker, and the costs (in number of points) belonging to a particular level of effort are reflected in the following cost schedule:

Cost schedule of feasible effort levels

Effort	1	2	3	4	5	6	7	8	9	10
Cost	0	1	2	4	6	8	10	12	15	18

Stage 2 In this stage you will be informed about the choices of the others. If you are a shareholder, you will learn the wage chosen by the manager and the corresponding effort level of the worker. If you are a manager, you will learn the worker's effort choice for the wage that you offer. And if you are a worker, you will learn the wage chosen by your manager. You will also be informed about your period earnings and those of the two participants with whom you are matched. These period earnings (in number of points) are calculated as follows:

$$\text{Shareholder's period earnings} = \frac{3}{4} * (40 * \text{Effort level of worker} - \text{Wage offered} + 360)$$

$$\text{Manager's period earnings} = \frac{1}{4} * (40 * \text{Effort level of worker} - \text{Wage offered} + 360)$$

$$\text{Worker's period earnings} = \text{Wage} - \text{Cost of effort provided} + 20$$

Note that the shareholder earns 75% of the firm's total profits, the manager earns 25%.

At the end of the experiment the period earnings will be converted into euros at the rate of 30 points = 1 euro. In addition to the period earnings earned in the experiment you will receive a show up fee of 12 euros.