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## The impact of social comparisons on reciprocity

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August 2008

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## ABSTRACT

### The Impact of Social Comparisons on Reciprocity<sup>\*</sup>

We investigate the effects of pay comparison information (i.e. information about what co-workers earn) and effort comparison information (information about how co-workers perform) in experimental firms composed of one employer and two employees. Exposure to pay comparison information in isolation from effort comparison information does not appear to affect reciprocity toward employers: in this case own wage is a powerful determinant of own effort, but co-worker wages have no effect. By contrast, we find that exposure to both pieces of social information systematically influences employees' reciprocity. A generous wage offer is virtually ineffective if an employee is matched with a lazy co-worker who is also paid generously: in such circumstances the employee tends to expend low effort irrespective of her own wage. Reciprocity is more pronounced when the co-worker is hard-working, as effort is strongly and positively related to own wage in this case. Reciprocity is also pronounced when the employer pays unequal wages to the employees: in this case the co-worker's effort decision is disregarded and effort decisions are again strongly and positively related to own wage. On average exposure to social information weakens reciprocity, though we find substantial heterogeneity in responses across individuals, and find that sometimes social information has beneficial effects. We suggest that group composition may be an important tool for harnessing the positive effects of social comparison processes.

JEL Classification: A13, C92, J31

Keywords: reciprocity, gift-exchange, social information, social comparisons, pay comparisons, peer effects

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## 1. Introduction

Reciprocity can have an important influence on economic behaviour, as demonstrated in a wide range of experiments where many individuals forgo some of their own earnings to reward the generosity of others<sup>1</sup>. Much of this evidence, however, comes from stylised social environments which lack important elements of naturally occurring social situations. In natural settings interactions between individuals are often non-anonymous and contextualised, and the treatment and behaviour of similar others in similar circumstances is often observable. This paper investigates how exposure to *social comparison information about referent others* (i.e. learning what similar others do and how they are treated) influences the extent to which individuals comply with norms of positive reciprocity.

The next section discusses in detail the related literatures. We note that evidence of reciprocity is largely based on bilateral interactions as represented by gift-exchange, investment and sequential dilemma games. Naturally occurring interactions, on the other hand, take place in complex social environments where individuals are typically exposed to considerable amounts of social information about similar others. For example, in the workplace many co-workers interact with an employer over a period of time, and often a worker can observe the relationship between other workers and the employer, perhaps providing information that affects their own attitude towards the employer. One piece of social information that one might expect to be salient to workers is *pay comparison information* (i.e. information about what co-workers earn). In fact, empirical evidence, both from the lab and the field, on the effects of pay comparisons is decidedly mixed. A second piece of social information that is sometimes available is *effort comparison information* (i.e. information about how co-workers perform). We argue that the combination of both pieces of social information may have important influences on individual behaviour, even though the behavioural impact of pay comparison information in isolation from effort comparison information may be ambiguous.

Section 3 describes our experimental design for investigating the effects of social comparison information. We study experimental “firms” composed of three members: an “Employer” and two “Employees”, labelled as “Employee 1” and “Employee 2”. The game

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<sup>1</sup> For a review and a discussion of the relevance of reciprocity in economics, see Fehr and Gächter (2000) and Fehr and Fischbacher (2002). For a general overview of the importance of reciprocity in social interactions, see Cialdini (2001).

begins with the Employer choosing wages for each employee, which are then publicly observed. A key feature of the game is that the two employees then choose efforts sequentially: thus, while both have full information about relative wages at the time they make effort choices, only Employee 2, who moves last, has access to information about the co-worker's effort. Hence, Employee 1's behaviour reveals how pay comparison information in isolation from effort comparison information influences effort choices and reciprocity, while from Employee 2's decisions we can study the effects of the concurrent availability of pay and effort comparison information.

We report our results in Section 4. We find that exposure to both pieces of social comparison information systematically influences effort choices and affects employees' reciprocity towards the employer in important ways. A generous wage offer is virtually ineffective if an employee is matched with a lazy co-worker who is also paid generously: in such circumstances the employee tends to expend low effort irrespective of her own wage. Reciprocity is more pronounced when the co-worker is hard-working, as effort is strongly and positively related to own wage in this case. Reciprocity is also pronounced when the employer pays unequal wages to the employees: in this case co-workers' effort decisions are disregarded and effort decisions are again strongly and positively related to own wage. Exposure to pay comparison information in isolation from effort comparison information does not appear to affect reciprocity toward employers: in this case own wage is a powerful determinant of own effort, but co-worker wages have no effect. Overall, reciprocal responses tend to be less intense when larger amounts of social information are available (i.e. among Employees 2).

These results are discussed in Section 5. Our finding that, on average, social comparison information undermines reciprocity is related to other recent findings which suggest that individuals tend to evaluate the social information available in the environment in a way beneficial to their self-interest. However, we also find that sometimes social information has beneficial effects, and we suggest that group composition may be an important tool for harnessing the positive effects of social comparison processes.

## **2. Overview & Related Literature**

Numerous studies have shown the importance of positive reciprocity for economic behaviour. Using simple bilateral games such as investment (Berg, Dickhaut and McCabe, 1995),

sequential prisoner's dilemma (Clark and Sefton, 2001) and gift-exchange (Fehr, Kirchsteiger and Riedl, 1993) games, a number of experimental studies have shown that people are willing to incur costs to reward kind actions, even in non-repeated and anonymous interactions where there are no positive future consequences associated with reciprocal behaviour.

The gift-exchange game (GEG) reproduces a contractually incomplete labour relation where an "employer" makes a wage offer to an "employee" who, upon acceptance, chooses how much costly effort to supply. GEG experiments have been extensively used to examine the "fair wage-effort hypothesis" formulated in the seminal work by Akerlof (1982) and Akerlof and Yellen (1988; 1990). According to this hypothesis labour relations can be described as reciprocal "gift exchange": employees are willing to "gift" harder work effort to their employers in exchange for a fair wage. Consistently with the fair wage-effort hypothesis, many GEG experiments, including some with one-shot situations where decisions are made anonymously and pure self-interest would lead employees to shirk, have shown that employees systematically choose to reciprocate generous wage offers with higher effort (e.g., Fehr, Kirchsteiger and Riedl, 1993; Fehr, Kirchsteiger and Gächter, 1997; Fehr, Fischbacher and Tougareva, 2002; Gächter and Falk, 2002; Brandts and Charness, 2004; Charness, 2004; Maximiano, Sloof and Sonnemans, 2007; see Gächter and Fehr, 2002, for a survey).

Maximiano, Sloof and Sonnemans (2007) stress that organisations are complex social systems where employers typically interact with many employees at the same time, hardly resembling the stylised work environments studied in standard GEG experiments where employers bilaterally interact with single employees. Maximiano *et al.* conduct an experiment where, in their 1-4 treatment, an employer offers (the same) wage to four employees who then (simultaneously) choose efforts. They find that reciprocal responses are not substantially different from those observed in a 1-1 treatment where an employer is matched with one employee. Thus they find that vertical reciprocity (i.e. employer-employee gift exchange) is robust to increases in the size of the workforce. However, the presence of co-workers can create other differences between multi-worker and single-worker firms beyond the pure number effects studied by Maximiano *et al.*. In particular, in Maximiano *et al.* all workers are paid the same and do not observe each others' behaviour, whereas in general information about what co-workers earn (*pay comparison information*) and how they perform (*effort comparison information*) may be available and may in turn influence vertical reciprocity.

The relevance of pay comparison information in the workplace is suggested by abundant survey and case-study evidence pointing to the importance of horizontal fairness concerns (i.e. fairness between employees) in labour relations (e.g., Campbell III and Kamlani, 1997; Bewley, 1999). Furthermore, pay comparisons constitute a central component in a number of theoretical approaches which build on equity theory (Adams, 1963; 1965) to improve the understanding of labour relations. In fact, the “fair wage” in Akerlof and Yellen’s model is defined in relative terms, as employees compare their own pay with their peers’ to judge how fairly they are being treated by the employer.

Nevertheless, empirical support for the notion that pay comparisons systematically influence employees’ behaviour remains at best weak, both in the field and in the lab. Field studies exploring the relation between pay dispersion within an organisation and its performance produce mixed results: while some studies support the equity theory-driven view that internal pay dispersion is detrimental for work morale and job performance (e.g. Cowherd and Levine, 1992; Grund and Westergaard-Nielsen, 2008; Martins, 2008), others fail to find that pay dispersion has any effect on employees’ behaviour (e.g. Leonard, 1990; Braakman, 2008; Hunnes, 2008), and some studies even find that large pay differentials may have a beneficial effect on firm performance (e.g. Main, O’Reilly and Wade, 1993; Eriksson, 1999; Winter-Ebmer and Zweimüller, 1999; Hibbs and Locking, 2000). The empirical evidence from laboratory experiments is scarce and equally inconclusive, as some experiments report negative pay comparison effects (Thöni, 2005; Abeler, Altmann, Kube and Wibrall, 2006; Clark, Masclet and Villeval, 2007), while in others such effects are weak or absent (Güth, Königstein, Kovács and Zala-Mező, 2001; Charness and Kuhn, 2007).

A possible explanation for these mixed findings is that the prominence of horizontal fairness considerations may crucially depend on the *concurrent* availability of pay and effort comparison information. Konow (1996, p. 22) makes the general point that “...*information plays an important role in determining the extent to which, indeed whether, a situation will be judged fair or unfair...*”, and in the context of multi-worker firms we believe that individuals may struggle to develop clear judgments of what constitutes a fair distribution of earnings when they know what their co-workers are paid but have incomplete information about how they perform<sup>2</sup>.

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<sup>2</sup> A number of recent field studies have proposed that pay comparison processes should be studied in light of *moderating factors*, i.e. features of the organisation that 1) differ at the firm level and 2) may condition the direction or the strength of the behavioural responses to comparison processes (e.g. Henderson and Fredrickson, 2001; Brown,



Additionally, effort comparison information may have an important influence on behaviour *per se*, independently of pay comparison processes. The ability to observe how similar others behave in a given situation often provides valuable guidance in understanding how one is indeed expected to behave (see, e.g., Cialdini, Reno and Kallgren, 1990), and this in turn can shape behaviour. For example, Sausgruber (2006) conducts a public goods experiment in which members of one group can observe the contributions of another group and finds that contributions are positively correlated across groups. Falk and Ichino (2006) conduct a field experiment with a workplace task and find pairs of workers are more productive when they can observe each other working.

Most closely related to the current study are two recent papers by Thöni and Gächter (2008) and Mittone and Ploner (2008). Thöni and Gächter design a three-person GEG with a “revision stage” where employees can amend initial effort decisions after learning their co-worker’s effort. They find that employees’ effort decisions are positively related and claim that such interactions can be explained by a tendency to conform to peers’ behaviour. Interestingly, while employees are particularly prone to reduce their effort after learning that their initial effort choice is higher than the co-worker’s, they increase their effort only insignificantly when they learn that the co-worker is more hard-working. Overall, social information has a negative impact on gift exchange behaviour in their study, although the effect is not significant. Mittone and Ploner (2008) also suggest that information about peers’ behaviour may have a detrimental effect on reciprocity. Using a particular version of the investment game where a trustor is matched with four trustees, they find that learning that a peer is already transferring positive amounts to the trustor reduces trustees’ reciprocal responses. While the results from these studies suggest that effort comparison information may also have important effects in our experiment, it should be noted that both studies use a setting where, by design, the principal must transfer the same amount of money to the agents. In our experiment, on the other hand, we are able to observe effort interactions under different relative pay conditions, and hence can study how different combinations of pay and effort comparison information impact individual behaviour.

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Sturman and Simmering, 2003; Jirjahn and Kraft, 2007). Here we follow in part this approach and propose that the availability of effort comparison information may represent one of these important moderating factors. Note that information about co-workers’ effort may depend on features of the work environment which are likely to differ from firm to firm: consider, for example, the phenomenon of teleworking, (i.e. working in locations that are remote from centralised office), which is an emergent and fast-growing trend in labour markets (see, e.g., Hotopp, 2002; Ruiz and Walling, 2005).

### 3. Experimental Design & Procedures

#### 3.1. The experimental game

Our aim is to set up a GEG where we can study how the combination of pay and effort comparison information affects employees' reciprocal behaviour. To achieve this aim, we adapt the payoff structure from the experiment by Fehr, Gächter and Kirchsteiger (1997) and modify the GEG used in Fehr, Kirchler, Weichbold and Gächter (1998). In our experiment each firm is composed of three members: Employer, Employee 1 and Employee 2. All players move sequentially in the game: the Employer moves first and chooses a wage  $w_i \in \{16, 32\}$  for each Employee  $i \in \{1, 2\}$ . The Employer can (but does not have to) choose different wages for different employees. Employee 1 observes both wages and then chooses an effort level  $e_1 \in \{1, 2, 3, 4\}$ . Employee 2 observes both wages *and* the effort chosen by Employee 1 and then chooses an effort level  $e_2 \in \{1, 2, 3, 4\}$ . After Employee 2's choice, the game ends and the Employer's earnings are computed as:

$$\pi_{ER} = 10 \cdot (e_1 + e_2) - w_1 - w_2$$

and the employees' earnings are computed as:

$$\pi_i = w_i - 5 \cdot (e_i - 1)$$

for  $i \in \{1, 2\}$ .

Our implementation of the game used the strategy method (Selten, 1967), i.e. subjects had to specify complete strategies in the game-theoretic sense. Participants in the role of Employee 1 specified four effort choices, one for each wage combination that could possibly be chosen by the Employer. Participants in the role of Employee 2 specified sixteen effort choices, each corresponding to one of the information sets where they had the move.

We implemented a one-shot version of this experimental game. The game was described to subjects using the same labour market frame that we use throughout the text.

#### 3.2. Discussion of the design

There are a number of reasons why we use the GEG with labour market frame to address the questions we are interested in. First, as discussed in the previous section, positive reciprocity

has been extensively documented in many GEG experiments, providing support for the relevance of the norm of reciprocity in these social situations. Second, also as argued earlier, individuals are typically exposed to considerable amounts of social information about similar others in naturally occurring organisations, and hence these social environments represent a suitable paradigm for studying how social comparisons influences behaviour. Lastly, the particular GEG we use in our experiment, as compared to other experimental settings, provides a cleaner environment for studying the “pure” effects of social comparison information on reciprocity. On this last point, while some environments are simply not suitable to study positive reciprocity (e.g. the dictator game), in others (e.g. public good games) actions of other players have a direct impact on one’s own monetary payoffs and hence on reciprocal considerations: thus, reactions to information about others’ contributions to a public good may reflect direct reciprocation (i.e., a reaction to a kind or unkind act by another) rather than the effect of social information *per se*<sup>3</sup>. In our three-person GEG, on the other hand, the wage the employer pays to the co-worker and the co-worker’s effort do not directly affect an employee’s payoff and hence cannot be used to develop pure reciprocal considerations.

The fully sequential structure of the game allows us to observe effort decisions in environments which contain different amounts of social information. Subjects in the role of Employee 1 make an effort decision after learning the co-worker’s wage as well as the own wage, but they cannot observe the co-worker’s effort. Thus, they have access to pay comparison information, but not effort comparison information, and their effort choices can be represented by an effort function  $e_1 = f(w_1, w_2)$ . Subjects in the role of Employee 2 are fully informed about the co-worker’s effort, and their effort choices can be represented by an augmented effort function  $e_2 = g(w_2, w_1, e_1)$ , which describes how social information affects reciprocity when both pay and effort comparison information are available.

The use of the strategy method allows us to observe subjects’ behaviour across all the information sets they control in the game. We are thus able to observe for each employee complete effort functions  $e_1 = f(w_1, w_2)$  or  $e_2 = g(w_2, w_1, e_1)$  without either resorting to repeated play (which might induce strategic confounds and lead to unequal numbers of observations on different wage and/or effort combinations) or using deception. Moreover, at the time a player

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<sup>3</sup> Brandts and Fatàs (2004) and Bardsley and Sausgruber (2005) propose experimental designs that allow to overcome this identification problem in voluntary contribution games.

makes decisions, she is not informed of the actual decisions of any other player, and so this feature of the design preserves the statistical independence of each subject's decisions *vis-à-vis* those of other subjects.

Given that our main interest is to isolate the impact of social information on reciprocal behaviour, we kept the structure of the decision situation as simple as possible. In particular our setting involves no productivity differences or technological interdependencies between employees<sup>4</sup>. One could argue that the absence of productivity differences might reduce the scope for observing wage differences between employees, thus posing a threat to the interpretability of subjects' responses to seemingly arbitrary unequal wage offers. Although productivity differences between employees constitute an important reason why employers may want to introduce pay differences between employees, there also exist other rationales for unequal wage offers. For example, employers may find it optimal to choose unequal wages if they are risk averse and uncertain about the strength of workers reciprocal preferences, or if they believe workers will supply high effort only if they are paid more than co-workers.

### 3.3. Procedures

The experiment was conducted at the University of Nottingham between May and December 2007 using subjects recruited from a university-wide pool of students who had previously indicated their willingness to be paid volunteers in decision-making experiments<sup>5</sup>. Six sessions were conducted with a total of 84 participants, 28 in each role. No subject took part in more than one session.

Upon arrival, subjects were welcomed and randomly seated at visually separated computer terminals. Subjects were given 15 minutes to read through the instructions, and then the experimenter read aloud a briefer précis outlining the most important points contained in the instructions.<sup>6</sup> Subjects were then randomly assigned to a group and a role. All decisions were made anonymously, and neither during nor after the experiment were subjects informed about the identity of the other members of their firm. Before proceeding to the decision stage, subjects were

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<sup>4</sup> The absence of technological interdependencies between employees ensures that the co-worker's actions have no direct impact on an employee's payoff. Of course, these simplifications come at a cost, as they decrease the realism of the decision situation and remove interesting perspectives for the study of social comparisons effects. See Güth, Königstein, Kovács and Zala-Mező (2001) and Charness and Kuhn (2007) for developments along these lines.

<sup>5</sup> The experiment was programmed and conducted with the software z-Tree (Fischbacher, 2007). Subjects were recruited through the online recruitment system ORSEE (Greiner, 2004).

<sup>6</sup> Experimental instructions and the précis are reproduced in Appendix A.

guided through two role-specific video presentations which carefully illustrated the main features of the decision screens they were going to use during the experiment.<sup>7</sup> The first video presentation explained the functioning of an on-screen electronic calculator (the *What-if-calculator*) that subjects could use to compute their and other players' payoffs. At the end of the first video presentation, subjects were asked to solve a set of control questions and they could not enter the decision stage unless they had solved all the questions correctly. The second video presentation showed subjects how to enter their choices in a Decision Table and explained once again the structure of the game and the strategy method.

On average the experimental sessions lasted about one hour, including the reading of the instructions and of the précis and the completion of a post-experimental questionnaire. All participants were endowed with an initial amount of 95 points, and earnings from the decision task (which could be negative) were added to this initial amount.<sup>8</sup> At the end of the session, the final point earnings were converted into British Pounds at a rate of £0.10 per point. Subjects were paid in private and in cash at the end of each session. Subject earnings ranged from £5.10 to £12.70, averaging £10.30 (approximately \$21 at the time of the experiment).

#### **4. Results**

In our experiment employers can choose from four possible wage combinations. Of the 28 employers 6 (21%) paid high wages to both employees, 4 (14%) paid a high wage to Employee 1 only, 3 (11%) paid a high wage to Employee 2 only, and 15 (54%) paid low wages to both. In the rest of this section we examine how employees reacted to the different wage combinations. We start by exploring whether pay comparison information affects reciprocal behaviour when employees can access it in isolation from effort comparison information (i.e. among Employees 1). We then turn to Employees 2 to explore the impact on reciprocity of the simultaneous exposure to pay and effort comparison information. Lastly, we compare behaviour in the two environments. In this way, we examine our conjecture that the availability of effort comparison information facilitates the formation of clearer pay fairness judgments and, hence, the extent to

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<sup>7</sup> Video presentations were shown to subjects individually in z-Tree. Video presentations and the software are available upon request.

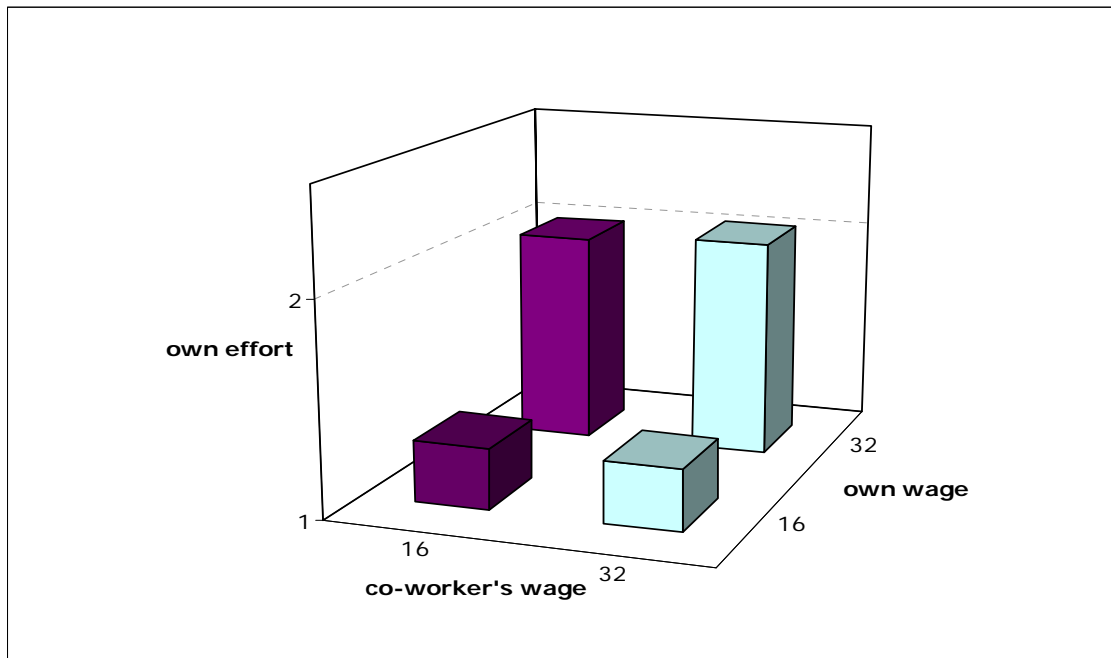
<sup>8</sup> Note that subjects in the role of the Employer could incur losses from the decision task. The initial endowment outweighed any possible losses.

which individuals respond to pay comparison processes. The overall impact of different amounts of social information on reciprocity is also assessed.

#### 4.1. Social Comparisons and Reciprocity among Employees 1

Figure 1 displays the average effort function elicited from our twenty-eight Employees 1. The two bars in the front row represent the wage combinations where the employee gets a low (16-points) own wage, while the bars at the back correspond to the two cases where the own wage is high (32-points). Darker bars represent wage combinations where the co-worker gets a low wage, while lighter bars correspond to the two cases where the co-worker is paid a high wage.

**Figure 1:** Average Effort Function of Employees 1



An immediately apparent feature of Figure 1 is that Employees 1 tend to expend more effort when they are paid a high wage. Computing employees' reciprocal responses as the change in own effort after an own wage rise *ceteris paribus*, we find that Employees 1 reciprocate higher wages by increasing their effort by around 0.714 when the co-worker's wage is low and by 0.750 when the co-worker's wage is high<sup>9</sup>. In both cases a Wilcoxon matched-pairs signed-ranks test

<sup>9</sup> More formally, we compute Employee 1's reciprocal responses as  $\Delta e_1 = f(w_1 = 32, w_2) - f(w_1 = 16, w_2)$  and evaluate them for different values (low or high) of the co-worker's wage..

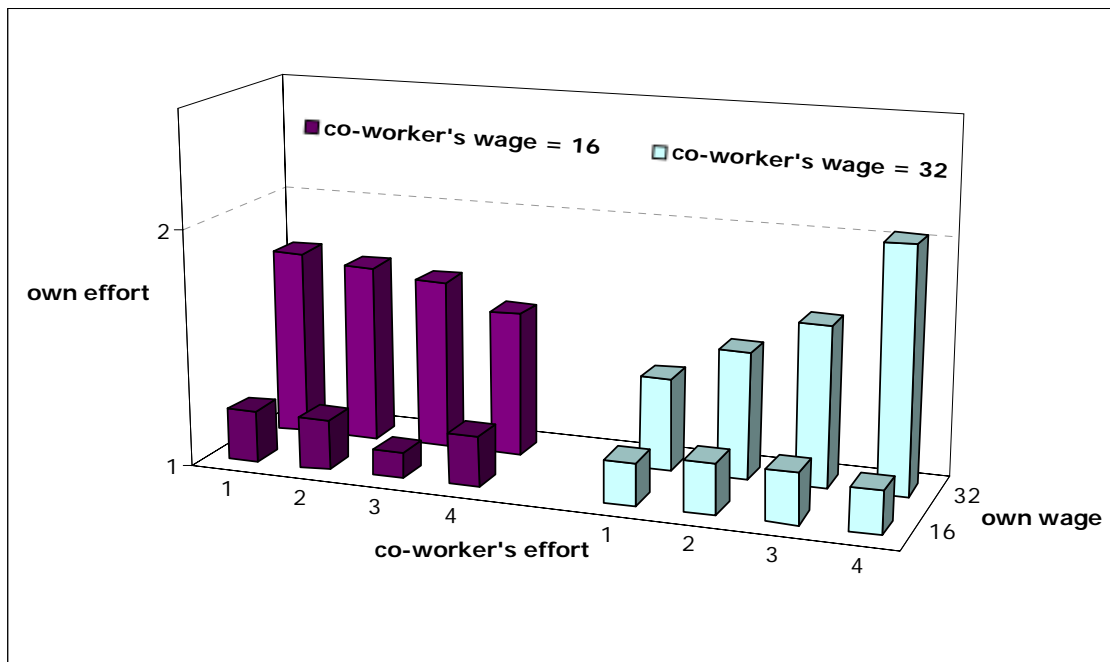
shows that the effect is highly significant ( $z = 3.503$ ,  $p = 0.000$  and  $z = 3.818$ ,  $p = 0.000$  respectively)<sup>10</sup>. This pattern reproduces the robust “reciprocity result” documented in the GEG literature: employees reciprocate higher wages with higher effort.

Another noticeable feature of Figure 1 is that social information has virtually *no* effect on Employee 1’s effort choices: for a given own wage, they expend roughly the same effort irrespective of the wage the Employer pays to the co-worker. As a result, social information does not affect Employee 1’s reciprocity: a Wilcoxon matched-pairs signed-ranks test shows that reciprocal responses are identical irrespective of the co-worker’s wage ( $z = 0.048$ ,  $p = 0.962$ ). We conclude that Employees 1 reciprocate high wages with higher effort, and that pay comparison information has no impact on reciprocal responses.

#### 4.2. Social Comparisons and Reciprocity among Employees 2

We now turn our attention to Employees 2, who were simultaneously exposed to pay and effort comparison information. Figure 2 shows Employee 2’s average effort function and is analogous to Figure 1 above, with the difference that we can now explicitly control (on the horizontal axis) for different levels of the co-worker’s effort.

**Figure 2: Average Effort Function of Employees 2**



<sup>10</sup> All tests are two-sided unless noted otherwise.

As with Employees 1, Employees 2 also tend to increase their effort when they are paid higher wages. Ignoring for a moment the effects of social information and averaging across contingencies where the own wage is the same (i.e. across rows in Figure 2), we note that Employee 2’s effort increases on average by about 0.495 and the effect is highly significant ( $z = 3.535$ ,  $p = 0.000$ ). In fact, for each combination of co-worker wage and co-worker effort level, the mean reciprocal response of Employee 2 differs from zero at the 5.8% significance level or lower<sup>11</sup>.

However, while reciprocity is apparent across all cases, its magnitude varies considerably with social information. Table 1 reports the magnitude of Employee 2’s average reciprocal responses for the various co-worker’s wage and effort combinations.

**Table 1: Social Comparison Information and Employee 2’s Reciprocal Response**

	Average Reciprocal Response		
	when the co-worker’s wage is LOW	When the co-worker’s wage is HIGH	Wilcoxon matched-pairs signed-rank test
when the co-worker’s effort is 1	0.571 (0.790)	0.214 (0.568)	$z = 2.446$ , $p = 0.014$
when the co-worker’s effort is 2	0.536 (0.838)	0.321 (0.612)	$z = 1.146$ , $p = 0.252$
when the co-worker’s effort is 3	0.607 (0.875)	0.464 (0.793)	$z = 0.670$ , $p = 0.503$
when the co-worker’s effort is 4	0.393 (0.916)	0.857 (1.044)	$z = 2.869$ , $p = 0.004$

Employee 2’s reciprocal response is computed as  $\Delta e_2 = g(w_2 = 32, w_1, e_1) - g(w_2 = 16, w_1, e_1)$  and evaluated for different values of the co-worker’s wage and effort. Numbers in parentheses are standard deviations.

Two observations emerge from Table 1. First, for given levels of the co-worker’s effort, the magnitude of Employee 2’s reciprocal responses crucially depends on relative pay conditions. When an employee’s co-worker is particularly lazy (i.e. chooses minimum effort), generous wage offers trigger stronger reciprocity from the employee if the co-worker is paid a low wage. In fact, Table 1 reveals that increasing the wage of a lazy co-worker more than halves Employee 2’s

<sup>11</sup> The p-values range from 0.058 for the case where the co-worker is paid a high wage and supplies minimal effort to 0.000 for the case where the co-worker is paid a high wage and supplies maximal effort.



average reciprocal response, which drops from 0.571 to 0.214 ( $p = 0.014$ ). However, in the presence of a particularly hard-working co-worker who chooses maximum effort, an own wage rise triggers higher effort when the co-worker's wage is also increased. In fact, the intensity of reciprocity more than doubles (from 0.393 to 0.857,  $p = 0.004$ ) when the Employer increases the wage of a hard-working co-worker. When the co-worker expends intermediate effort levels (2 or 3 units) differences in reciprocity are weaker and not statistically significant. Hence, when combined with information about the co-worker's effort, pay comparison information does have important implications for what employees perceive to be the appropriate reciprocal response to the wage they are offered.

Second, Table 1 suggests that effort comparison information affects Employee 2's reciprocal responses, but that the way in which it does so depends on relative pay conditions. When the co-worker's wage is low, there is no clear relation between Employee 2's reciprocal response and the co-worker's effort choice. By contrast, when the Employer pays a high wage to the co-worker, Employees 2 strongly increase their effort response as the co-workers expend higher effort. The size of the effect is noteworthy: Employee 2's reciprocal response increases by a factor of four when the co-worker chooses maximum rather than minimum effort.

We examined these patterns in Employee 2's effort decisions using the regression model

$$e_2 = \alpha_0 + \alpha_1(\text{high wage}) + \alpha_2(e_1) + \alpha_3(\text{high wage} * e_1) + \varepsilon$$

where the explanatory variable “*high wage*” is a dummy variable which assumes the value 1 when the own wage is high and 0 otherwise. Note that this models  $e_2$  as a linear function of  $e_1$ , where the slope coefficient is  $\alpha_2$  (when own wage is low) or  $\alpha_2 + \alpha_3$  (when own wage is high). We used OLS to estimate separate models for the cases where the co-worker's wage is low or high and report the results in Table 2.

In both models the estimate of  $\alpha_2$  (the coefficient on  $e_1$ ) is very close to, and not significantly different from, zero, showing that no relation between employees' effort exists when the Employer pays a low wage to Employee 2. Thus, the divergent patterns observed in Table 1 must be driven by differences in the effort chosen by Employees 2 when they get a high wage. When the co-worker is paid a low wage the estimate of  $\alpha_2 + \alpha_3$  is negative. This reflects the decline in effort that is apparent in Figure 2 (bars corresponding to own wage = 32, co-worker's

wage = 16). However, the estimate is low and not significantly different from zero ( $F(1, 27) = 0.73$ ;  $p = 0.401$ ). In contrast, when the co-worker is paid a high wage the estimate of  $\alpha_2 + \alpha_3$  is positive and statistically significant ( $F(1, 27) = 7.24$ ;  $p = 0.012$ ). Thus, when the Employer pays a high wage to both workers, Employees 2 systematically increase their effort when the co-worker also does so. As we have already seen in Table 1, the impact of this effect on reciprocal responses is remarkable. When the co-worker receives a high wage reciprocity is minimal when the co-worker chooses minimal effort, but gets more intense as the co-worker expends higher effort and is substantial when the co-worker's effort is maximal.

**Table 2:** Employee 2's Effort Regressions

	co-worker's wage is LOW	co-worker's wage is HIGH
high wage	0.643*** (0.169)	-0.054 (0.147)
$e_1$	-0.011 (0.052)	0.000 (0.037)
$e_1$ * high wage	-0.046 (0.049)	0.207*** (0.067)
constant	1.214*** (0.145)	1.196*** (0.122)
<i>N.</i>	224	224
<i>F</i> -statistic	$F(3, 27) = 5.48$	$F(3, 27) = 6.69$
<i>Prob</i> > <i>F</i>	0.004	0.002
$R^2$ :	0.110	0.134

Dependent variable is Employee 2's effort. Robust standard errors in parentheses adjusted for intragroup correlation (subjects are used as independent clustering units).

\*\* .01 <  $p$  ≤ .05; \*\*\*  $p$  ≤ .01.

Overall, these findings show that Employees 2 do reciprocate the Employer's wage offer, but social comparisons shapes in important ways the intensity of their reciprocal response. This result contrasts with what we have observed among Employees 1, suggesting that the availability of information about the co-worker's effort is a crucial piece of social information in our setting.

#### 4.3. Amounts of Social Comparison Information and Reciprocity

As we have just seen, the concurrent availability of pay and effort comparison information has an important influence on reciprocity while the impact of pay comparison information in isolation is negligible. In the following we elaborate on this contrast and directly compare the behaviour of Employees 1 and 2 to explore: 1) explanations for these different behavioural

effects of pay comparison information, and 2) the overall effect of social comparisons on reciprocity.

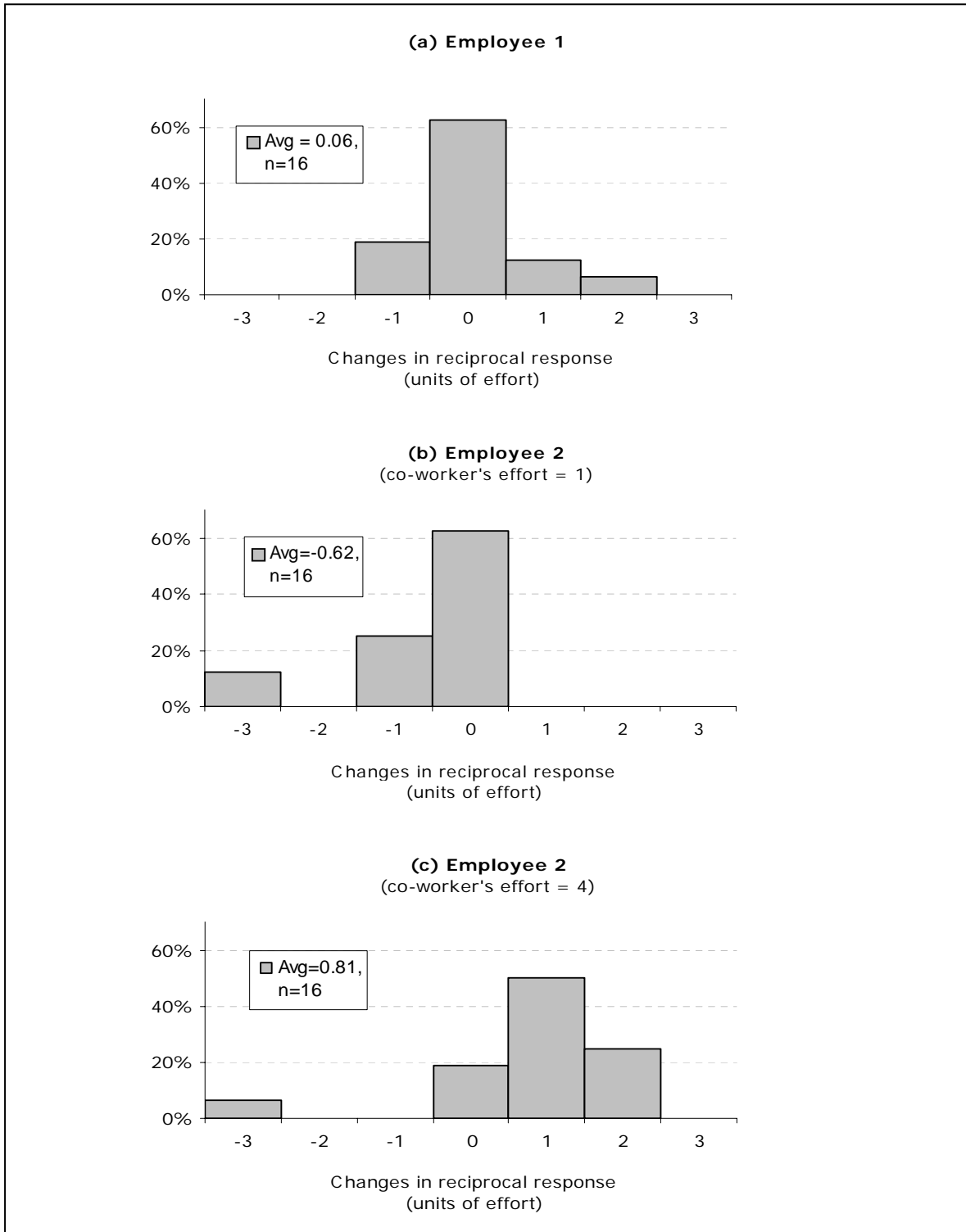
A possible explanation for why pay comparison information only affects behaviour when combined with effort comparison information is that information about the co-worker's "performance type" (lazy or hard-working) plays a central role in determining the prominence of horizontal fairness considerations. The additional information on the co-worker's effort choice may be necessary for the formation of clear and compelling pay fairness judgments and, hence, may increase the extent to which individuals attend to information about relative pay conditions.

A look at individual level data supports this interpretation: pay comparison information affects employees' reciprocity more heterogeneously when effort comparison information is not available. Out of our 56 employees, 32 (57%) are "non-selfish" (i.e., make at least one non-minimal effort choice). Figure 3 restricts attention to these employees, 16 in each role. The figure shows the distribution of changes in reciprocal responses after an increase in the co-worker's wage, *ceteris paribus*.

Figure 3(a) shows the distribution of changes in reciprocal responses among Employees 1. While about 62% of subjects did not change the intensity of their reciprocity between the case where the co-worker gets a low wage and the case where she gets a high wage, the remaining subjects are equally divided among those who strengthened or weakened reciprocal responses. Thus pure pay comparison information can cause a variety of responses.

Figures 3(b) and 3(c) show the distributions of changes in reciprocal responses among Employees 2 for the cases where the co-worker expends either minimum or maximum effort (where we detected significant pay comparison effects). Reactions to an increase in the co-worker's wage are more uniform among Employees 2: when the co-worker is lazy - Figure 3(b) - Employees 2 either did not react to an increase in the co-worker's wage or unanimously reacted negatively by weakening their reciprocal response. By contrast, a predominant share of Employees 2 (75%) accepted favourably that a hard-working co-worker gets a pay rise - Figure 3(c) - and increased the intensity of their reciprocity.

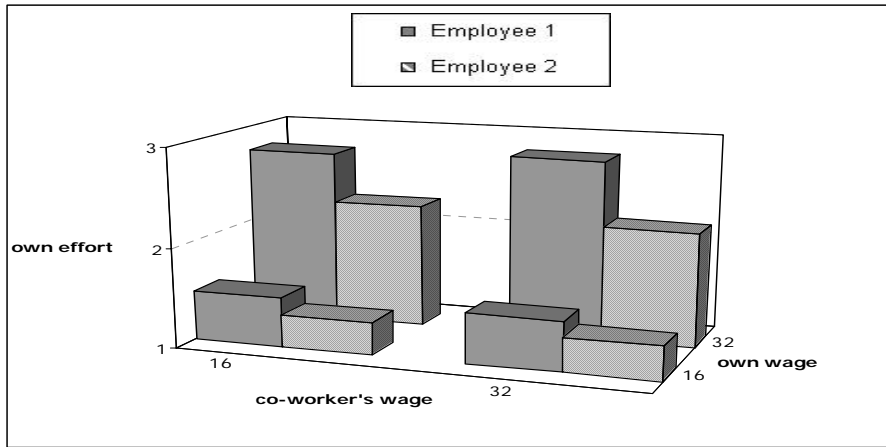
**Figure 3: Distribution of Changes in Reciprocal Response among Non-Selfish Employees**



Changes in reciprocal responses are computed as  $\Delta(\Delta e_1) = [f(w_1 = 32, w_2 = 32) - f(w_1 = 16, w_2 = 32)] - [f(w_1 = 32, w_2 = 16) - f(w_1 = 16, w_2 = 16)]$  for Employees 1 and as  $\Delta(\Delta e_2) = [g(w_2 = 32, w_1 = 32, e_1) - g(w_2 = 16, w_1 = 32, e_1)] - [g(w_2 = 32, w_1 = 16, e_1) - g(w_2 = 16, w_1 = 16, e_1)]$  for Employees 2.

A second interesting question is whether being exposed to different amounts of social comparison information has an *overall* effect on the reciprocity observed among Employees 1 and Employees 2. To explore this issue, we compare how strongly Employees 1 and Employees 2 respond to increases in the own wage, controlling for relative pay conditions. Figure 4 shows the effort expended on average by non-selfish Employees 1 (n=16, plain bars) and Employees 2 (n=16, striped bars) in the four wage combinations possibly chosen by the Employer<sup>12</sup>.

**Figure 4:** Average Effort Chosen by Employees 1 and Employees 2



Employees 1 appear to be systematically more responsive to own wage increases and reward the Employer’s generosity with higher effort than Employees 2, irrespective of the co-worker’s wage. To assess whether the observed differences are significant, we estimate with OLS the following regression model (restricting attention to non-selfish employees)<sup>13</sup>:

$$\begin{aligned} \text{own effort} = & \alpha_0 + \alpha_1(\text{high wage}) + \alpha_2(\text{co-worker's wage}) + \\ & + \alpha_3(\text{employee 1}) + \alpha_4(\text{employee 1} * \text{high wage}) + \varepsilon \end{aligned}$$

where “*employee 1*” is a dummy variable assuming value 1 if the subject’s role was “Employee 1”.

The coefficient  $\alpha_4$  turns out to be positive and marginally significant ( $t=1.98$ ;  $p=0.057$ ) suggesting that the own effort response to an increase in the own wage is stronger among Employees 1 than Employees 2. Furthermore, a Wald test rejects the null hypothesis that

<sup>12</sup> An Employee 2’s average effort in each wage combination is simply the average effort choice across the four co-worker’s effort contingencies.

<sup>13</sup> We allow for correlated error terms within subjects by clustering on individuals.

$\alpha_3 + \alpha_4 = 0$  ( $F(1,31) = 5.15$ ;  $p = 0.030$ ) showing that Employees 1 expend significantly more effort than Employees 2 when the own wage is high.

These results show that reciprocity towards the employer is significantly weaker when employees are exposed to both pay and effort comparison information than is the case when only pay comparison information is available.

## 5. Discussion & Conclusions

We have designed an experimental situation to study reciprocal behaviour in an environment where subjects can observe the treatment and behaviour of similar others before deciding on their reciprocal response. We argue that exposure to these pieces of social information is typical in naturally occurring social environments (e.g. in the workplace) and hence we believe that studying behaviour in such a setting can add in important ways to the understanding of individual decisions in social situations.

Focusing on the study of behaviour in the workplace, we have found that the extent to which individuals comply with norms of reciprocity is significantly affected by two pieces of social information: pay and effort comparison information. We find that reciprocity towards employers is weakest when lazy co-workers are paid generously. In such circumstances the prominence of the norm of reciprocity appears to be substantially eroded by the influence of competing behavioural tendencies, such as horizontal fairness concerns (i.e. “keeping up” with the equally well paid co-worker) and a preference to conform to a peer’s behaviour. This result suggests that social comparisons may have detrimental effects on reciprocal relations. By contrast, the very same motivations which induce employees to disregard generous own wage offers in some circumstances may end up amplifying reciprocal responses in others. We find that high wage offers trigger substantial reciprocity from an employee if she is matched with a well paid and hard-working co-worker: under such circumstances effort responses are four times stronger than when the well paid co-worker is lazy and twice as intense as compared to the case where the co-worker is hard-working but receives a lower wage. Reciprocity appears to be less sensitive to social information when the employer pays unequal wages to the employees: in this case effort choices are strongly related to own wage offers and do not depend significantly on the effort expended by the co-worker. Lastly, we find that exposure to pay comparison information in isolation from effort comparison information does not have significant effects on reciprocal behaviour. In this

case, effort choices respond strongly to own wage considerations only. This (surprising) result suggests that the availability of information about the co-worker's type (lazy or hard-working) may be crucial in determining the extent by which individuals attend and respond to horizontal fairness concerns<sup>14</sup>. Consistent with our conjectures, we find evidence that this may be due to the fact that in the absence of effort comparison information individuals may struggle to form clear and uniform pay fairness judgments.

These findings are in line with those of several other recent studies that suggest that social information can systematically affect behaviour in a variety of settings. For example, a number of dictator game experiments have shown that dictators tend to behave more (less) generously towards recipients when they are informed about generous (selfish) choices made by other participants (Cason and Mui, 1998; Krupka and Weber, 2007; Bicchieri and Xiao, 2008). Analogous evidence on the importance of social information comes from ultimatum game (Knez and Camerer, 1995; Bohnet and Zeckhauser, 2004) and public goods game experiments (Carpenter, 2004; Bardsley and Sausgruber, 2005)<sup>15</sup>.

What is the general impact of social comparisons on reciprocity? The overall patterns that emerge from our data suggest that reciprocal behaviour tends to be less pronounced in more complex social environments (i.e. where there are larger amounts of social information): on average Employee 2's reciprocal responses are less intense than Employee 1's. Such results appear in line with the recent findings by Mittone and Ploner (2008) and Thöni and Gächter (2008), which also report an overall negative impact of social information on reciprocal behaviour in related experimental settings. One explanation for these findings could be that individuals tend to use the social information available in the environment in a way beneficial to their self-interest. Indeed, other studies have argued that when the informational structure of a social situation leaves room for ambiguity about appropriate behaviour, or makes different and perhaps competing norms of conduct salient, individuals tend to comply with the behavioural motivation that best suits their own self-interest (e.g. Dana, Weber and Kuang, 2007; Xiao and

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<sup>14</sup> This interpretation is consistent with the point made by Greenberg, Ashton-James and Ashkanasy (2007), who stress that the existence of constraints on the availability of pieces of social information may have important consequences for the very nature of comparison processes. Conner (2003), for example, claims that in the lack of workers physical proximity individuals may cope with the scarcity of comparison information about their co-workers by changing the comparison referent (e.g. oneself in the past or similar others outside of the organisation), by relying more on dissimilar comparisons, or by substituting person-based comparisons (i.e. comparisons between oneself and other individuals) with system comparisons (e.g. comparisons between the organisations one has worked for).

<sup>15</sup> On the other hand, Brandts and Fatás (2004) cannot find any significant impact of social information on behaviour in a two-person public goods game.

Bicchieri, 2008)<sup>16</sup>. In our setting, Employees 2 face a relatively complex social environment where a number of relevant motivational forces are salient. In some cases these motivational tendencies pull in different directions: consider the case of an employee receiving a high wage and observing the equally well-paid co-worker expending little effort. Vertical reciprocity would require that the employee expends high effort to repay the employer's generous wage offer. Nevertheless the employee may dislike earning less than the co-worker and hence may prefer to reduce her reciprocal response in order not to "fall behind". Conformism considerations may also induce the employee to match the co-worker's low effort. What should one do in the face of such competing norms of behaviour? Under such circumstances our subjects tended to disregard vertical reciprocity and choose low effort, a choice which is also payoff-maximising. Although social information can also have a positive effect on reciprocity in some circumstances – e.g., when the different behavioural motivations are less discordant – in our experiment this positive impact of social information was outweighed by the negative effects which occur when social information introduces competing norms of behaviour.

Nevertheless, our finding that there exist circumstances where social comparisons have beneficial effects on reciprocity points to the importance of devising mechanisms that can reshape the social environment such that social information may end up fostering reciprocal behaviour. We propose that selective group composition may be one such mechanism. We see considerable heterogeneity across players: some appear reciprocally motivated whereas others choose uniformly low effort. An employer choosing employees should avoid low effort providers for two reasons. First, such employees cannot be motivated to supply high levels of effort, since they respond to high wages by shirking. Second, as we have stressed, they also undermine the employer's ability to induce gift exchange from reciprocally motivated employees. In fact, social information within heterogeneous groups tends to undermine performance, as observation of shirkers tends to induce "team players" to adopt more selfish behaviours<sup>17</sup>. Similarly, employers should find reciprocally motivated employees attractive for two reasons. First, they can be motivated to supply high levels of effort, and second, they induce higher levels of reciprocity

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<sup>16</sup> Other related studies also point to the existence of a *self-serving* or *egocentric bias* when one's self-interest is at stake. See Konow (2005) for an overview and related literature. For an exploration of this phenomenon in the workplace, see Charness and Haruvy (2000).

<sup>17</sup> A similar process has been observed in public goods experiments, where it has also been suggested that selective group composition may foster cooperation, see for example Burlando and Guala (2005) and Gächter and Thöni (2005).



from other employees. Thus homogeneous groups of reciprocally motivated employees may provide the best environment for harnessing the positive effects of social comparisons. This argument is complementary to those made by the business executives interviewed by Bewley (1999): in their view layoffs do less damage to work morale and performance than pay cuts, because layoffs “get the misery out the door” while pushing the remaining workers to work harder in order to avoid future dismissal, whereas pay cuts have a negative impact on all workers’ motivation. In addition, our results suggest that if layoffs target less productive workers this has the further advantage of reducing the heterogeneity of the workforce thus strengthening the effort responses of reciprocally motivated employees.

## References

- Abeler, J., S. Altmann, S. Kube and M. Wibrall (2006) “Reciprocity and Payment Schemes: When Equality Is Unfair”, IZA Discussion Paper N. 2500.
- Adams, J.S. (1963) “Toward an Understanding of Inequity”, *Journal of Abnormal and Social Psychology* 67, 422-436.
- Adams, J.S. (1965) “Inequity in Social Exchange”, in “Advances in experimental social psychology” (L. Berkowitz ed.), Vol. 2, 267-299, Academic Press, New York.
- Akerlof, G. (1982) “Labor Contracts as Partial Gift Exchange”, *The American Economic Review* 97, 543-569.
- Akerlof, G. and J. Yellen (1988) “Fairness and Unemployment”, *The American Economic Review* 78, 44-49.
- Akerlof, G. and J. Yellen (1990) “The Fair Wage-Effort Hypothesis and Unemployment”, *Quarterly Journal of Economics* 105, 255-283.
- Bardsley, N. and R. Sausgruber (2005) “Conformity and Reciprocity in Public Good Provision”, *Journal of Economic Psychology* 26, 664-681.
- Berg, J., J. Dickhaut, and K. McCabe (1995) “Trust, reciprocity and social history”, *Games and Economic Behavior* 10, 122-142.
- Bewley, T. (1999) “Why Wages Don’t Fall During a Recession”, Harvard University Press, Cambridge, MA.
- Bicchieri, C. and E. Xiao (2008) “Do the Right Thing: But Only if Others Do So”, forthcoming *Journal of Behavioral Decision Making*.
- Bohnet, I. and R. Zeckhauser (2004). “Social Comparisons in Ultimatum Bargaining” *Scandinavian Journal of Economics* 106, 495-510.
- Braakmann, N. (2008) “Intra-firm wage inequality and firm performance – First evidence from German linked employer-employee-data”, University of Lüneburg Working Paper Series in Economics, N. 77.
- Brandts, J. and G. Charness (2004) “Do Labour Market Conditions Affect Gift Exchange? Some Experimental Evidence”, *Economic Journal* 114, 684-708.
- Brandts, J. and E. Fatás (2004) “Endogenous social influence in an experimental dilemma game”, Centra, Documento de Trabajo E2004/59.
- Brown, M.P., M.C. Sturman and M.J. Simmering (2003) “Compensation Policy and Organizational Performance: the Efficiency, Operational and Financial Implications of Pay Levels and Pay Structure”, *Academy of Management Journal* 46, 752-762.
- Burlando, R. and F. Guala (2005) “Heterogeneous Agents in Public Goods Experiments”, *Experimental Economics* 8, 35-54.
- Campbell III, C.M. and K. Kamlani (1997) “The Reasons for Wage Rigidity: Evidence from a Survey of Firms”, *Quarterly Journal of Economics* 112, 759-789.

- Carpenter, J.P. (2004) "When in Rome: conformity and the provision of public goods", *Journal of Socio-Economics* 33, 395-408.
- Cason, T.N. and V.-L. Mui (1998) "Social Influence in the Sequential Dictator Game" *Journal of Mathematical Psychology* 42, 248-265.
- Charness, G. (2004) "Attribution and Reciprocity in an Experimental Labor Market", *Journal of Labor Economics* 22, 665-688.
- Charness G. and E. Haruvy (2000) "Self-serving biases: evidence from a simulated labour relationship", *Journal of Managerial Psychology* 15, 655-667.
- Charness, G. and P. Kuhn (2007) "Does Pay Inequality Affect Worker Effort? Experimental Evidence", *Journal of Labor Economics* 25, 693-723.
- Cialdini, R.B. (2001) "Influence: Science and Practice", 4<sup>th</sup> ed, Allin & Bacon, MA.
- Cialdini, R.B., R. Reno and C. Kallgren (1990) "A Focus Theory Of Normative Conduct: Recycling The Concept Of Norms To Reduce Littering in Public Places" *Journal of Personality and Social Psychology* 58, 1015-1026.
- Clark A., D. Masclet and M.C. Villeval (2007) "Effort and Comparison Income Experimental and Survey Evidence", working paper available at <http://www.pse.ens.fr/clark/ClarkMascletVilleval.pdf>.
- Clark K. and M. Sefton (2001) "The Sequential Prisoner's Dilemma: Evidence on Reciprocation", *Economic Journal* 111, 51-68.
- Conner, D.S. (2003) "Social comparison in virtual work environments: an examination of contemporary referent selection", *Journal of Occupational and Organizational Psychology* 76, 133-147.
- Cowherd D.M. and D.I. Levine (1992) "Product Quality and Pay Equity between Lower-level Employees and Top Management: An Investigation of Distributive Justice Theory", *Administrative Science Quarterly* 37, 302-320.
- Dana, J., R.A. Weber and J.X Kuang (2007) "Exploiting moral wiggle room: experiments demonstrating an illusory preference for fairness", *Economic Theory* 33, 67-80.
- Eriksson, T. (1999) "Executive Compensation and Tournament Theory: Empirical Tests on Danish Data", *Journal of Labor Economics* 17, 262-280.
- Falk, A. and A. Ichino (2006) "Clean Evidence on Peer Pressure", *Journal of Labor Economics* 24, 39-57.
- Fehr, E. and U. Fischbacher (2002) "Why Social Preferences Matter: The Impact of Non-Selfish Motives on Competition, Cooperation and Incentives", *Economic Journal* 112, C1-C33.
- Fehr, E., U. Fischbacher and E. Tougareva (2002) "Do high stakes and competition undermine fairness? Evidence from Russia", Working Paper no. 120, University of Zurich.
- Fehr, E. and S. Gächter (2000) "Fairness and Retaliation: The Economics of Reciprocity", *The Journal of Economic Perspectives* 14, 159-181.
- Fehr, E., S. Gächter and G. Kirchsteiger (1997) "Reciprocity as a contract enforcement device - Experimental Evidence", *Econometrica* 64, 833-860.
- Fehr, E., E. Kirchler, A. Weichbold and S. Gächter (1998) "When Social Norms Overpower Competition: Gift Exchange in Experimental Labor Markets", *Journal of Labor Economics* 16, 324-351.
- Fehr, E., G. Kirchsteiger and A. Riedl (1993) "Does Fairness Prevent Market Clearing? An Experimental Investigation", *Quarterly Journal of Economics* 108, 437-459.
- Fischbacher, U. (2007) "z-Tree: Zurich Toolbox for Ready-made Economic Experiments", *Experimental Economics* 10, 171-178.
- Gächter, S. and A. Falk (2002) "Reputation and Reciprocity: Consequences for the Labour Relation", *Scandinavian Journal of Economics* 104, 1-26.
- Gächter, S. and E. Fehr (2002) "Fairness in the Labour Market - A Survey of Experimental Results", in "Surveys in Experimental Economics. Bargaining, Cooperation and Election Markets" (Friedel Bolle and Marco Lehmann-Waffenschmidt eds.), 95-132, Physica-Verlag, Berlin.
- Gächter, S. and C. Thöni (2005) "Social Learning and Voluntary Cooperation among Like-minded People", *Journal of the European Economic Association* 3, 303-314.
- Greenberg, J., C.E. Ashton-James and N.M. Ashkanasy (2007) "Social comparison processes in organizations", *Organizational Behavior and Human Decision Processes* 102, 22-41.

- Greiner, B. (2004), "The Online Recruitment System ORSEE 2.0 – A Guide for the Organization of Experiments in Economics", Working Paper Series in Economics 10, University of Cologne, Department of Economics.
- Grund, C. and N. Westergaard-Nielsen (2008) "The Dispersion of Employees' Wage Increases and Firm Performance", *Industrial and Labor Relations Review* 61, 485-501.
- Güth, W., M. Königstein, J. Kovács and E. Zala-Mező (2001) "Fairness within Firms: The Case of One Principal and Many Agents", *Schmalenbach Business Review* 53, 82-101.
- Henderson, A.D. and J.W. Fredrickson (2001) "CEO Pay Gap: A Competitive Test of Economic and Behavioral Views", *Academy of Management Journal* 44, 96-117.
- Hibbs, D.A. and H. Locking (2000) "Wage Dispersion and Productive Efficiency: Evidence for Sweden", *Journal of Labor Economics* 18, 755-782.
- Hotopp, U. (2002) "Teleworking in the UK", *Labour Market Trends*, June, 311-318.
- Hunnes, A. (2008) "Internal Wage Dispersion and Firm Performance: White-Collar Evidence", working paper available at <http://ahunnes.net/pdf/dispersion-2008-06-04web>.
- Jirjahn, U. and K. Kraft (2007) "Intra-firm wage dispersion and firm performance – Is there a uniform relationship?", *Kyklos* 60, 231-253.
- Knez, M. J. and C.F. Camerer (1995). "Outside Options And Social Comparison In Three-Player Ultimatum Game Experiments" *Games and Economic Behavior* 10, 65-94.
- Konow, J. (1996) "A positive theory of economic fairness", *Journal of Economic Behavior & Organization* 31, 13-35.
- Konow, J. (2005) "Blind Spots: The Effects of Information and Stakes on Fairness Bias and Dispersion", *Social Justice Research* 18, 349-390.
- Krupka, E. and R.A. Weber (2007) "The Focusing and Informational Effects of Norms on Pro-Social Behavior", IZA Discussion Paper N. 3169.
- Leonard, J. (1990) "Executive Pay and Firm Performance", *Industrial and Labor Relations Review* 43, 13-29.
- Long, S.J. "Regression Models for Categorical and Limited Dependent Variables", SAGE Publications, Thousand Oaks, CA.
- Main B.G., C.A. O'Reilly and J. Wade (1993) "Top Executive Pay: Tournament or Teamwork?", *Journal of Labor Economics* 11, 606-628.
- Martins, P.S. (2008) "Dispersion in wage premiums and firm performance", forthcoming in *Economic Letters*.
- Maximiano, S., R. Sloof and J. Sonnemans (2007) "Gift exchange in a multi-worker firm", *Economic Journal* 117, 1025-1050.
- Mittone, L. and M. Ploner (2008) "Social Effects in a Multi-Agent Investment Game: An Experimental Analysis", CEEL Working Paper 5-08.
- Ruiz, Y. and A. Walling (2005) "Home-based working using communication technologies", *Labour Market Trends*, October, 417-426
- Sausgruber, R. (2006) "Testing for Team Spirit - An Experimental Study", working paper available at [http://homepage.uibk.ac.at/~c40422/TeamSpirit\\_Revised\\_08\\_2006.pdf](http://homepage.uibk.ac.at/~c40422/TeamSpirit_Revised_08_2006.pdf).
- Selten, R. (1967) "Die Strategiemethode zur Erforschung des eingeschränkt rationalen Verhaltens im Rahmen eines Oligopolexperimentes", in "Beiträge zur experimentellen Wirtschaftsforschung" (Heinz Saueremann ed.), Vol. I, 136-168, Tübingen: J.C.B. Mohr (Siebeck).
- Thöni, C. (2005) "Social Learning, Comparison and Interaction: An Experimental Approach", PhD Dissertation 3037, University of St. Gallen.
- Thöni, C. and S. Gächter (2008) " 'Kinked Conformism' in Voluntary Cooperation", mimeo.
- Winter-Ebmer R. and J. Zweimüller (1999) "Intra-firm Wage Dispersion and Firm Performance", *Kyklos* 52, 555-572.
- Xiao, E. and C. Bicchieri (2008) "When Equality Trumps Reciprocity: Evidence from a Laboratory Experiment", MPRA paper N. 9375.

## Appendix

### *Appendix A: Experimental Instructions and Précis*

#### Instructions

You are now taking part in an economic experiment on decision-making that has been financed by various foundations for research promotion.

If you read the following instructions carefully, you can – depending on your decisions – earn a considerable amount of money. It is therefore very important to read these instructions with care.

**During this experiment you are not allowed to communicate with the other participants in any way.** If you have any questions, please raise your hand and the experimenter will come to your desk. If you violate this rule, you will be excluded from the experiment and from all payments.

During the experiment your earnings will be calculated in points. You will receive an initial endowment of 95 points, which will be enough to cover any loss that might occur during the experiment. The points you lose will be subtracted from your endowment.

At the end of the experiment we will convert your point earnings into money at the following rate:

$$1 \text{ Point} = 10 \text{ Pence}$$

Your total money earnings will be paid out to you in private and **in cash** at the end of the experiment.

#### 1. Introduction

In this experiment you will be randomly matched with two other participants to form a group of three persons. We will refer to **each group as a firm, and to the three group members as Employer, Employee 1 and Employee 2**. You will be assigned to a firm and a role entirely at random, and the computer will inform you of your role before the decision-making part of the experiment begins. You will not be informed about who of the other participants are in your firm, either during or after the experiment. Therefore, all decisions are made anonymously.

#### 2. Decisions within a Firm

The structure of the decision-making within each firm is as follows.

- ✓ First, **the Employer** chooses the wages to pay to Employee 1 (**Wage<sub>1</sub>**) and Employee 2 (**Wage<sub>2</sub>**). The Employer can choose between two wage levels, 16 or 32. If he or she wants to, the Employer can choose different wages for different Employees.
- ✓ Next, **Employee 1** learns the wages the Employer pays to each Employee, and then chooses an effort level (**Effort<sub>1</sub>**), either 1, 2, 3 or 4.
- ✓ Finally, **Employee 2** learns the wages the Employer pays to each Employee, and also the effort decision of Employee 1. Employee 2 then chooses an effort level (**Effort<sub>2</sub>**), either 1, 2, 3 or 4.

#### 3. Distribution of earnings within a Firm

Earnings within the Firm are determined according to the following rules:

##### Employer

The Employer receives revenue from the effort chosen by the two Employees, and incurs costs from the wages paid to the two Employees. The revenue produced by each Employee equals 10 times the effort he or she chooses. The

costs are simply the sum of the two wages the Employer pays to the Employees. The Employer's earnings are therefore:

$$\text{Employer's Earnings} = 10 * (\text{Effort}_1 + \text{Effort}_2) - \text{Wage}_1 - \text{Wage}_2$$

The Employer's earnings increase with higher effort levels. The higher the wages the Employer pays to the two Employees, the lower are the Employer's earnings. Note that the Employer's earnings could be negative.

### **Employee 1**

Employee 1 receives the wage from the Employer as revenue, and may incur an effort cost. The minimum effort choice of 1 is costless. Each additional unit of effort costs 5 points to the Employee. Therefore the effort cost is calculated as:  $5 * (\text{Effort} - 1)$ . The earnings of Employee 1 are therefore:

$$\text{Employee 1's Earnings} = \text{Wage}_1 - 5 * (\text{Effort}_1 - 1)$$

The earnings of Employee 1 only depend on his or her own wage and effort. The higher the wage, the higher are the earnings. The higher the effort he or she chooses, the lower are the earnings.

### **Employee 2**

The earnings of Employee 2 are calculated in the same way as those of Employee 1, except, of course, that Employee 2's earnings depend on his or her own wage ( $\text{Wage}_2$ ) and his or her own effort choice ( $\text{Effort}_2$ ):

$$\text{Employee 2's Earnings} = \text{Wage}_2 - 5 * (\text{Effort}_2 - 1)$$

## **HYPOTHETICAL EXAMPLE FOR DEMONSTRATION PURPOSES**

Assume that the Employer chooses the following wages for his or her Employees:

WAGE FOR EMPLOYEE 1 = 32

WAGE FOR EMPLOYEE 2 = 16

The Employees choose the following effort:

EFFORT EMPLOYEE 1 = 2

EFFORT EMPLOYEE 2 = 3

This situation results in the following earnings:

**EMPLOYER'S EARNINGS:** The Employer receives revenue from the effort of the two Employees, i.e.:  $10*(2 + 3) = 50$ . The Employer pays a total of 48 points to the Employees.

The earnings of the Employer are:  $50 - 48 = 2$ .

**EMPLOYEE 1'S EARNINGS:** Employee 1 receives a wage of 32. The effort choice of 2 has a cost of  $5*(2 - 1) = 5$ .

The earnings of Employee 1 are:  $32 - 5 = 27$ .

**EMPLOYEE 2'S EARNINGS:** Employee 2 receives a wage of 16. The effort choice of 3 has a cost of  $5*(3 - 1) = 10$ .

The earnings of Employee 2 are:  $16 - 10 = 6$ .

#### 4. The Decision Task

Although the structure of the decision-making within each firm is the one described above, in this experiment we ask you to take a decision for each possible situation that may arise. Please note that one of these situations will be actually relevant, so make your choices carefully.

The situations you face when making your decisions will depend on your role.

If you are an **Employer you must choose two wages**, one for each Employee within the Firm. The Employer can choose between:

- Wage<sub>1</sub> = 16 and Wage<sub>2</sub> = 16;
- Wage<sub>1</sub> = 16 and Wage<sub>2</sub> = 32;
- Wage<sub>1</sub> = 32 and Wage<sub>2</sub> = 16;
- Wage<sub>1</sub> = 32 and Wage<sub>2</sub> = 32.

Depending on the choice of the Employer one of four situations will arise:

- Employee 1 and Employee 2 could both have a wage of 16;
- Employee 1 could have a wage of 16 while Employee 2 has a wage of 32;
- Employee 1 could have a wage of 32 while Employee 2 has a wage of 16;
- Employee 1 and Employee 2 could both have a wage of 32.

If you are **Employee 1** you will be in one of these four situations. However, before knowing which of these situations you are actually in, you will be asked to **indicate what you would do for each of the four possible situations** you may be in. You will see a decision screen like the one below:

Decision Table: Your effort choice		
Please choose your effort. You have to choose a level of effort between 1 and 4 for all <b>four</b> possible combinations of the wages you and Employee 2 receive.		
	Suppose the wage for <b>you</b> is: <b>16</b>	Suppose the wage for <b>you</b> is: <b>32</b>
Suppose the wage for <b>Employee 2</b> is: <b>16</b>	<input type="text"/>	<input type="text"/>
Suppose the wage for <b>Employee 2</b> is: <b>32</b>	<input type="text"/>	<input type="text"/>

Each box represents one of the four possible situations you may be in. In each of these boxes, you must enter an effort choice, either 1, 2, 3 or 4. Your actual effort choice will depend on which of these four possible situations will actually realise, i.e. on the wage combination actually chosen by the Employer.

Depending on the choices of the Employer and Employee 1 one of sixteen situations may arise:

- Employer could choose Wage<sub>1</sub>= 16 and Wage<sub>2</sub>=16 while Employee 1 chooses 1 unit of effort;

- Employer could choose  $Wage_1 = 16$  and  $Wage_2 = 16$  while Employee 1 chooses 2 units of effort;
- ....and so on.

If you are **Employee 2** you will be in one of these sixteen situations. However, before knowing which of these situations you are actually in, you will be asked to **indicate what you would do for each of the sixteen possible situations** you may be in. You will see a decision screen like the one below:

Decision Table: Your effort choice				
Please choose your effort. You have to choose a level of effort between 1 and 4 for all <b>sixteen</b> possible combinations of the <i>wages</i> you receive and the <i>wages and effort</i> of Employee 1.				
	Suppose the wage for <i>you</i> is: <b>16</b>	Suppose the wage for <i>you</i> is: <b>16</b>	Suppose the wage for <i>you</i> is: <b>32</b>	Suppose the wage for <i>you</i> is: <b>32</b>
	Suppose the wage for <i>Employee 1</i> is: <b>16</b>	Suppose the wage for <i>Employee 1</i> is: <b>32</b>	Suppose the wage for <i>Employee 1</i> is: <b>16</b>	Suppose the wage for <i>Employee 1</i> is: <b>32</b>
Suppose <i>Employee 1</i> chooses effort: <b>1</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Suppose <i>Employee 1</i> chooses effort: <b>2</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Suppose <i>Employee 1</i> chooses effort: <b>3</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Suppose <i>Employee 1</i> chooses effort: <b>4</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Each box represents one of the sixteen possible situations you may be in. In each of these boxes, you must enter an effort choice, either 1, 2, 3 or 4. Your actual effort choice will depend on which of these sixteen possible situations will actually realise, i.e. on the wage combination actually chosen by the Employer and on the effort actually chosen by Employee 1.

More information about how to solve your specific Decision task will be provided to you via computer later on during the experiment, once your role has been determined.

You have to perform this task **only once**.

### 5. How do we determine your actual earnings?

Although Employee 1 will take four effort decisions, **only one** will be relevant in determining the earnings of members of the Firm. Similarly, only one of the sixteen effort decisions made by Employee 2 will be actually used in the earnings' computation.

Which decision is actually relevant will be determined at the end of the experiment, once everyone in the firm has taken his or her decisions: the actual wage combination chosen by the Employer will determine which of the four

possible situations is relevant for Employee 1. Employee 1's choice in this relevant situation will determine which of the sixteen possible situations is relevant for Employee 2.

## 6. What happens next?

- I. When the experiment starts you will be informed about whether you are an Employer or an Employee in this experiment. In case you are an Employee, it will be specified whether you are Employee 1 or Employee 2.
- II. When you press the "Continue" button, a screen with a brief video-presentation about the main features of the experiment will appear. In this video-presentation you will receive some information about the "*What-if-calculator*", a tool you can use during the experiment to facilitate your computations. It is important to note that no other participant will be informed about your calculations and that these calculations do not have any effect on your earnings.
- III. After this brief video-presentation, you will access a new screen where you will be asked to answer a few questions. You will have to calculate the earnings of all members of your Firm for five hypothetical scenarios, with the help of the "*What-if-calculator*". Press "Check" when you have answered all the questions. You will be informed about whether your answers are correct.
- IV. Once you have answered all the questions correctly, you will be guided to a new short video-presentation that will give you specific information about how to enter your decisions into the Decision Table.
- V. After that, you will finally enter the Decision Task screen. Depending on whether you are an Employer or an Employee you will have to choose wages or effort levels. In this screen, you will again have the possibility to use the "*What-if-calculator*".

Please, raise your hand if you have any questions.

## Précis

I will now briefly summarize the content of the instructions you have just read.

At the beginning of the experiment you will be randomly matched with two other participants to form a group of three people and you will be randomly assigned a role within this group, which we will call "firm". You will be either the Employer or Employee 1 or Employee 2.

The structure of the decision-making within each firm is as follows.

First, **the Employer** chooses one wage to pay to Employee 1 (**Wage<sub>1</sub>**) and one wage to pay to Employee 2 (**Wage<sub>2</sub>**).

Next, **Employee 1** learns the wages the Employer pays to each Employee, and then chooses an effort level (**Effort<sub>1</sub>**).

Finally, **Employee 2** learns the wages the Employer pays to each Employee and also the effort decision of Employee 1, and then chooses an effort level (**Effort<sub>2</sub>**).

The Employer's earnings increase with higher effort levels and decrease with higher wages.

The Employees' earnings increase in the wage they receive and decrease with higher effort. The earnings of each Employee only depend on his or her own wage and effort.

**Although the structure of the decision-making within each firm is the one I have just described, in this experiment we ask you to take a decision for each possible situation that may arise. This is a crucial point, so make sure you have understood it correctly.**

The possible situations you will face when making your decisions will depend on your role.

If you are an **Employer you must choose two wages**, one for each Employee within the Firm. Thus, depending on the choice of the Employer one of four situations will arise:

- Both Employees could get a wage of 16;



- Both Employees could get a wage of 32;
- And the two situations where one Employee gets a wage of 16 while the other Employee gets a wage of 32;

If you are **Employee 1** you must indicate an effort choice for each of these four possible situations, before knowing which one you are actually in. Remember, one of these four decisions will be the one that is actually relevant, so make your choice carefully.

Depending on the choices of the Employer and Employee 1 one of sixteen situations may arise:

- Both Employees get a wage of 16 and Employee 1 chooses 1 unit of effort
- Both Employees get a wage of 16 and Employee 1 chooses 2 units of effort;
- ....and so on...

Since there are 4 possible levels of effort and 4 possible wage combinations, 16 situations in all may arise.

If you are **Employee 2** you must indicate an effort choice for each of the sixteen possible situations. Remember, one of these sixteen decisions will be the one that is actually relevant, so make your choice carefully.

Which decision is actually relevant will be determined at the end of the experiment, once everyone in the firm has taken his or her decisions: the actual wage combination chosen by the Employer will determine which of the four possible situations is relevant for Employee 1. Employee 1's choice in this relevant situation will determine which of the sixteen possible situations is relevant for Employee 2.

Please, raise your hand if you have any questions.