CenPRIS

Centre for Policy Research and International Studies

UNIVERSITI SAINS MALAYSIA

WORKING PAPER SERIES

The role of social comparison, perceived fairness and reciprocity in labor contract: An experimental study

Dr. Ch'ng Kean Siang

The role of social comparison, perceived fairness and reciprocity in labor contract: An experimental study [1]

K.S,Ch'ng[2]

Abstract

We replicate the Gift Exchange Game in Gachter and Falk (2002) to investigate the role of social comparison of wage, the formation of fairness and its effect on the workers' reciprocal behavior. We conduct total of three experimental sessions with different treatment. In the first random matching treatment, we find that workers form fairness based on wage offered by previous employer. Since the matching is random, although the wage offered is fair and exceeds the previous wage, worker does not reciprocate. But workers are more reciprocal in the second fixed matching treatment. Since workers interact with the same employers, workers can judge the intention of the offer more easily than in the first treatment. We observe workers react to the change of wage closely. However, when the workers are exposed to market wage, workers change the anchoring behavior; market wage becomes more important than current wage in determining effort level. But the overall relative wage effect depends on the implicit behavior of the workers; high effort workers and low effort workers perceive wage differently. Although current wage exceeds market wage, low effort workers reciprocate more than high effort workers. But when the market wage exceeds own wage, high effort workers reduce effort level more than low effort workers. We conclude that different reciprocal behavior is due to self serving bias in which high effort *should* be compensated with high wage and low effort - low wage is fair. Therefore, using reciprocity to resolve problem of contractual incompleteness depends on the type of workers.

JEL Classification: D03, C91, D81,

Keywords: Reciprocity; Fairness;Wage Differential; High effort and low effort workers.

---

[2]Department of Economics, Universiti Sains Malaysia.cks@usm.my

1   Introduction

Fairness has been much studied and applied to investigate the efficiency of a market. Contrary to conventional economic assumption, humans exhibit bounded self-interest and treat fair treatment more important than material gain, particularly when rewarding fair and kind actions with kind actions and punishing unfairness and unkindness with unkindness, although the reciprocal behaviors entail material costs. This behavioral tendency explains the drop of morale of employees when there is wage reduction (Blinder and Choi; 1990 and Bewley; 1998), buyers offer higher price to induce reciprocation of sellers to increase the quality of a good (Fehr et al; 1993., Simon and Fehr; 2000) and in labor market workers reciprocate high wage with higher effort level (Gachter and Falk; 2002., Fehr and Schmidt; 1999 and Fehr at al; 1997).

The presence of empirical evidence of fairness considerations shown by the researches suggests that the action of being kind or unkind to other agents is reciprocal; if some people is being nice to you, it is considered as fair and that you return kindness with kindness. However, although we know that agents behave reciprocally based on the notion of fairness, a question remained at large how agents form the perception of fairness specifically in the labor market.

Secondly, since most of the experimental data on positive reciprocal behaviors in labor market are derived from Gift Exchange Game (GEG), as in Gachter and Falk, Feht at al and Fehr and Schmidt, which the employer interacts with only one worker, and Maximiano et al (2007) with many workers, the reciprocation exhibited excludes some vital information such as market wage. In reality, although the market wage information is not perfect, it provides a reference point for the workers to compare and evaluate fairness before deciding on the effort level. Analysis of the effect of co-workers' wage on effort level has been inconclusive, such as Clark, Masclet and Villeval (2007) find that the ranking of wage rather than average wage is strong determinant of effort level and in Charness and Khun (2007) the effect is mixed. In paper by Gachter et al (2002), the analysis of the effect on relative wage on effort level is aided by the assumption that market effort is observable. Therefore if effort exerted is higher than market effort, worker perceives negative wage differential as unfair. However, if workers cannot observe the OW ranking in the market and the market effort, the formation of fairness will be more complex.

Thirdly, and most importantly, the formation of perception of fairness by the workers are sometimes bias; self-serving bias workers may form different perception of fairness. If workers are bias in the evaluation of fairness,

inducement by employers through high wage would not be reciprocated.

Past researchers rely on consequential approach, particularly the distribution of benefit to analyze the formation of fairness and reciprocal behavior. Specifically unequal distribution of benefit is construed as unfair, and therefore workers reciprocate with low effort and equality with high effort level. In the category of distributional preferences, Loewenstein et al (1999), Bolton and Ockenfels (1999) and Fehr and Schmidt model reciprocity is motivated by differences of payoff. However, studies of intention of the proposer in the ultimatum game suggest rejection of the proposal is due to not only the distribution of the offer but the intention of the proposer. Falk et al (2003) find that a given offer is more likely to be rejected if the proposer could have proposed a more equitable offer than a more unequal offer. Rabin (1993) reciprocity is motivated by belief of other's intention in fair treatment, and Levine (1998) extends the reciprocity to include the altruistic intention of other players. We build on these two sources to explain the fairness formation in the context of labor market. We attempt to show that workers form the idea of fairness based on the equality and intention anchored on past wage and effort level. Specifically, workers evaluate an offer based on past wage and effort level exerted to decide if the current offer is equal or kind.

We conduct three different treatments of experiment to investigate the behaviors of workers. We replicate the GEG from Gachter and Falk (2002) with slight modification. We begin with one shot treatment (OS) or random matching between employer and worker. The second treatment is fixed matching in which employer and worker are matched throughout the session. We call this repeated game (RG). The third treatment is slight modification of RG, the employer and worker are told the market wage averaged across all the workers. The market wage is public knowledge and is known before the workers make any decision. The workers *do not* know the market effort. The experiment is conducted using the experimental software Z-tree.

We find that pattern of past interactions influence a lot on future decision of effort level in RG game. The repetition effect of the game in RG plays the role as punishment on workers who extend low effort. This effect encourages workers to be more reciprocal than workers in OS treatment. The results obtained are similar to the behavioral patterns observed in past literature.

We also observe the fairness formation of workers on current wage offered is based on historical wages. Workers are less concern of equality of distribution alone, but more concern of the deviation from the past wage. Egalitarian workers will exert high effort in OS treatment and the correlation of wage and effort will be high. However, the result obtained shows the correlation is weak and not significant and the effort is lower than in the RG treatment. This suggests repetition plays a significant role and workers form fairness

based on past wage.

When information of market wage is introduced in the third treatment, workers change the anchoring from historical own wage to market wage and effort level to form the notion of fairness. We find that the effort level is significantly influenced by market wage. Workers reciprocate positive own and market wage differential with higher effort level, and negative wage differential with lower effort level. However, the degree of reciprocation depends on the past effort level exerted. Historically high effort workers are more responsive to negative wage differential than positive wage differential. Whereas low effort workers are more responsive to positive wage differential than negative wage differential. The difference is because of self-serving bias high effort workers perceive high effort *should* be compensated by high wage, therefore, more averse to negative wage differential than positive wage differential. Low effort workers perceive positive wage differential as good intention of employers and fair, therefore exert higher effort level to reciprocate kindness. The self-serving bias pattern observed in the third treatment suggests workers perceive fairness based on historical relative wage and own effort level.

The paper is structured as follow; section two outlines the design of the experiment. We predict the behavioral patterns on the three treatments and explain the reasons in section three. The hypotheses formed in this section is tested in section four. This section reports the results of the first treatment which is then compared to second treatment, and second treatment is compared to third treatment. We conclude the paper in section five.

2   Experimental Design

In total we conducted 3 experimental sessions. First two sessions (S1-S2) were implemented as labor market with no market wage information and sessions (S3) for labor maker with market average wage information. The game is a two-player sequential game that consists of two stages. In the first stage, an "employer" offers a wage (w) to a "worker". In the second stage, the worker can either reject or accept the offer. If the offer is rejected, the game ends with both parties earn nothing. If the offer is accepted, the worker has to choose an "effort" level (e). The effort level follows the utility theory that if the level of effort is high, the worker has less leisure time, and if the effort level is low, the worker has more leisure time. Therefore, the higher the effort level, the higher the associated cost C(e). The employer payoff function in experimental money is:

$$\pi = (v - w)e \tag{1}$$

where v refers to some exogenously given value.

A worker's payoff is the difference between the wage (w) and the incurred effort costs C(e), minus the fixed travel cost of 20 experimental money:

$$U = w - C(e) - 20 \tag{2}$$

In the experiment, we set $v = 120$, and wage offer has to be integer number from 20 to 120 experimental money. The effort level and the associated costs are exhibited as in table 1.

Effort	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
C(e)	0	1	2	4	6	8	10	12	15	18

Table 1: Effort levels and the associated costs

Follow the *standard prediction* of selfishness and rationality, firm will offer wage level at $w = 21$ and effort level $e = 0.1$. Since worker is the second mover and higher effort level involves cost, the worker will exert the effort level not more than 0.1. Therefore, the best response of a firm is to offer a wage at the minimum level. Thus, $w = 21$ and $e = 0.1$ (i.e. w* and e*)are strict Subgame Equilibrium and they are our reference outcomes.

The subjects were randomly assigned to the role of "firm" and "worker". After the role was determined, they were separated into two different rooms. The "workers" and the "firms" were then given about 5 minutes to read the instructions, which included a set of questions to calculate the payoff of both worker and firm. The experiment would not start until all the questions were answered correctly and all the concerns were attended to. The experimenter then presented the screen shots of payoff functions, procedures, to familiarize the subjects to the experiment. Payoff functions of "firm" and "worker" were public knowledge and similar to all the subjects. These were explained and emphasized to the subjects. The experiment was conducted in computer lab. Each firm was connected to a worker but the identity was not revealed. The platform Z-Tree was used to run the experiment.

We recruited total of 72 students from Universiti Sains Malaysia. The students had never participated in any experimental study before, and they were from various faculties.

The One shot (OS) treatment

In this treatment, workers and firms were matched only once. The identities were not revealed to either party and the subjects knew that they would be rematched with different worker or firm in the subsequent periods. Total of 26 students participated in the one shot game.

The repeated game (RG) treatment

In the repeated game, anonymous workers and firms were re-matched throughout the experiment. The subjects knew they would be re-matched with the same partner every period. There were 24 students participated in the repeated game.[1] The goals of RG game are to ascertain the effect of repeated interactions on reciprocal behavior and the economic importance of repeated interaction as performance elicitation device.

Since the worker knew that they would be rematched with the same firm, out from the worry of negative reciprocity from the firm, worker will exert effort level above e*. Worker knew that if e=0.1, the cost of him losing all the profit if firm offered w=21 is higher than the gain if e=0.1. Therefore, the repeated interaction acts as a punishment tool for not co-operating. Thus, firm will start with wage offer above w* to elicit for reciprocal behavior from worker. Therefore, we expect higher frequency of reciprocity in RG than in OS treatment.

The relative wage treatment (RGMW)

We call RG with information about market wage as as RGMW. The setup is similar to the RG game, but with addition of market wage information. In this game, wages offered by employers are averaged as market wage. Workers know the market wage, and can compare wage received from employer to market wage. Employers also know the market wage. The difference of own wage and market wage is called market rent. There are 22 participants in the experiment.

---

[1]The instructions to subjects in the games without market average wage are give in appendix A.

3 Behavioral Prediction and explanation

We make some behavioral predictions of workers in the treatments and explain the reasons.

3.1 The OS Treatment

In the OS treatment, anonymity is maintained as workers and employers are matched only once randomly. Therefore, there is no strategic reason for both players to reciprocate kindness. Therefore, workers will extend effort only at e* independent of the wage offer. Recognizing this, employers will offer at the minimal level of wage, w*. Therefore, w* and e* are the Subgame Perfect Equilibrium level.

Since both employer and worker meet only once, workers form the notion of fairness based on current wage and wage offered previously. Specifically if the current wage is lower than the wage offered by previous employer, worker will perceive the current offer as unfair, and higher current wage as fair. However, since the workers know he will meet the employer only once, he will not reciprocate. Therefore, w above w* will be construed as good intention of employer, but workers will not reciprocate as there will not be reciprocal behavior from employer as the game is not repetitive. Thus, if worker is pure reciprocator, that is reciprocate fairness with fairness, he will return high wage with high effort. We form the hypothesis that:

Reciprocity Hypothesis: Wage and effort level are positively correlated, i.e. Corr(w,e)> 0. Following the definition by Gatcher and Falk (2002), the reciprocity means if firm offers "generous wage" ($w > w*$), worker will reciprocate by providing $e > e*$.

3.2 The RG Treatment

In the RG treatment, workers are matched with the same employers throughout the session. Since the matching is repeated with the same worker and employer, players can judge better the intention and behavior of the partner than in OS treatment based on the historical pattern of behaviors. Therefore, we expect higher reciprocal behaviors in RG than in OS treatment. Particularly, the indicator Corr(w,e) in RG is higher and more significant than Corr(w,e) in OS treatment. The robustness of the reciprocity is measured by the change of e and w in the equations $\Delta e = e_t - e_{t-1}$ and $\Delta w = w_t - w_{t-1}$.

The reciprocal behavior of workers is based on the perception of fairness formed through making comparison between current wage and past wage.

Since the game is repetitive, workers can judge better the intention and fairness of the offer made by same employer. Therefore, the change of effort is affected by change of wage from previous period. Therefore, we predict that workers perceive current wage is fair if effort level increases when wage increases from the previous offer.

The co-operation attained in the repetitive game in RG treatment ensures higher efficiency. Repetitive play acts as punishment to non-conformation to reciprocal norm. Contrary to OS treatment, non-reciprocal of fairness will be reciprocated with lower wage by employer in the subsequent periods. Therefore, players in the RG treatment are more reciprocal and co-operative; workers are more hard working. Thus, we predict that high effort/ high wage strategy attains higher overall profit than low effort/ low wage strategy.

3.3   The role of relative wage

In this last treatment, workers and employers are exposed to market average wage. Particularly, wages offered are averaged and workers are informed of the market wage before deciding on the effort level. Thus, when evaluating the fairness of the current OW, workers treat market wage as reference wage. Workers perceive current offer as fair if OW exceeds market wage and unfair if market wage exceeds OW. We predict that the effect of wage differential of OW and market wage is higher than OW on effort level, and if wage differential is positive workers reciprocate it high effort level. Thus we form the hypothesis that;

Reciprocity Hypothesis: Favorable horizontal wage comparison, e.g., $r > 0$ is positively correlated with effort level,i.e., Corr(r,e)> 0, where r is denoted as wage differential or wage rent.

However, the reciprocation of workers also depends on other implicit factor such as the effort level exerted. Specifically the perception of fairness depends on how much effort extended by the worker; high effort workers perceive negative wage differential as unfair as he is under-compensated *regardless* of market effort. Therefore, the self-serving bias high effort workers will reciprocate negatively to negative wage differential but will not respond much to positive wage differential.

On the contrary, the degree of effort reduction is lower when the wage differential is negative among low effort workers. These workers perceive low effort- low wage as fair. Therefore, the degree of responsiveness to low wage is lower than high effort workers. The workers will also perceive positive wage differential as generosity and kindness, and will reciprocate more than high effort workers.

4   Experimental Results

In this section the results of the sessions (S1-S2) were presented first, followed by (S3). We will then compare the results of (S1-S2) and (S2-S3).Specifically S1 is the controlled treatment for S2 and and S2 is the controlled treatment for S3.

4.1   Regularities in Gift Exchange without social comparison

Our first hypothesis concerns the responses of workers to wage offered by firms

R1: *Fairness is reciprocal with employers offer higher wage than w* and workers extend effort level above e**

Figure 1 shows the evolution of average effort of workers and wage for employers in the OS and RG Treatment. The wages offered by firms are higher than the reference outcome w* and workers reciprocate with higher effort level than e*.
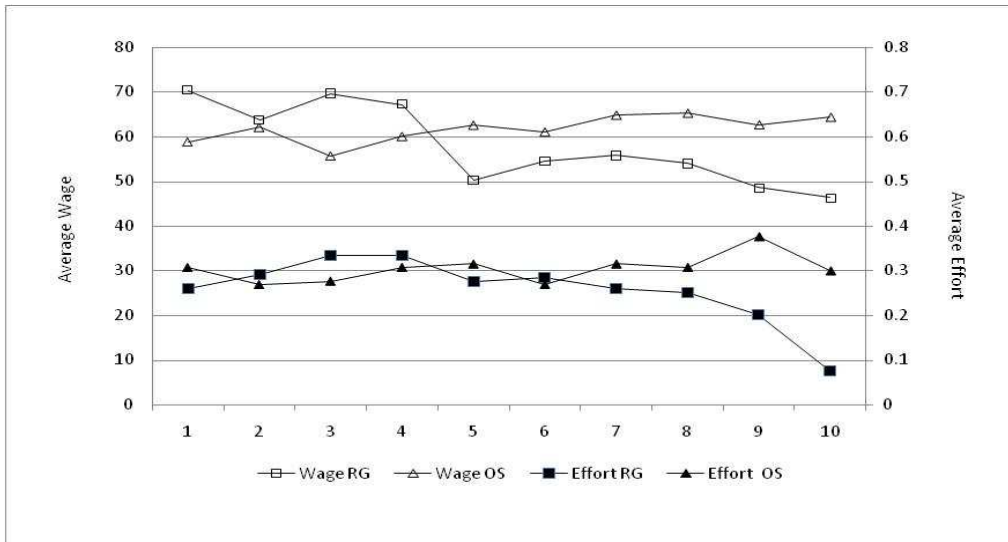

Figure 1: The Evolution of Average wage and Average Effort in OS and RG treatments.

It is apparent from the figure that employers offered higher wage than w* to induce higher effort level. There is no strategic reason for employer to

offer higher wage than w* as in each period the employer is matched with different worker. Therefore, wage offer which exceeds w* indicates generosity and intention of employer to induce high effort level from worker. On average, employers offered 62 experimental money to the worker in the OS treatment and 58 experimental money to the worker in RG treatment. And in each period, the average wage offered is higher than w*.

The deviation from Subgame Perfect Equilibrium level also can be observed from the effort level exerted among the workers in response to the wage offered. Workers extended effort level which is more than e* across the periods in both treatments. Workers in OS treatment exerted on average 0.304 effort and 0.255 in RG treatment. Higher effort level extended by the workers can be explained as reciprocal behavior of workers in response to the higher than w* level offered by employers.

According to reciprocity hypothesis, reciprocal behavior is reward kind action and punish unkind action even it involves costs . We classify that if the effort and wage is positively correlated and significant at 1 percent level, the worker is considered to be reciprocator. Table two depicts the overall individual behavior of workers in OS treatment.

Table 2: Summary of worker behavior in the One shot treatment

Worker no	No of e=0.1	Corr(w,e)	e in t=10	No of m
1	7	0.3043	0.1	2
2	7	0.6161**	0.1	3
3	6	-0.2387	0.1	1
4 (r)	1	0.7166***	0.3	8
5 (r)	0	0.9474***	0.5	8
6	7	0.4999	0.1	5
7	10	0	0.1	0
8	0	0.6616**	0.2	5
9 (r)	0	0.9784***	0.3	9
10(r)	2	0.9781***	0.2	7
11	1	0.7059**	0.7	7
12	0	0.6386**	0.9	5
13	4	0.3839	0.3	5

Notes:
-No of e=0.1 includes all effort levels of 0.1 and the number of rejection decision if the wage offered was 20.
-(r) indicates reciprocal type
-Corr(w,e) indicates Spearman rank correlation coefficients between wage and effort. ** indicates 5 percent significance level and *** indicates 1 percent level. Rejection is included in the calculation.
-e in t=10 indicates effort level in the final round of the experiment.
-No of m refers to "measure for measure" reciprocity,i.e., the signs of Δ w and Δ e from equations $\Delta w = w_t - w_{t-1}$ and $\Delta e = e_t - e_{t-1}$ are same.

9

From table 2, there are 31% reciprocators in the OS treatment who fulfilled the reciprocity criteria. The robustness of reciprocal behavior is based on the "measure for measure" reciprocity, i.e.,the signs of Δw and Δe must be same, and we find almost 81% of the subjects reciprocate high wage with higher effort level or low wage with lower effort level when they play "measure for measure" at least 5 times.

In RG game, maximization of income depends on reciprocal behavior from both parties,i.e., non-shirking behavior is reciprocated with higher wage level from the *same* employer and higher wage level is reciprocated with higher effort level from the *same* worker. The presence of this strategic reason for reciprocity encourages more reciprocal behavior than in the One Shot Treatment.

Figure 1 shows in the first 5 periods in RG game, average wage is higher than the average wage in OS treatment. The higher wage level is reciprocated with higher effort level from the workers in the RG treatment than in OS treatment. Drop of effort level in the final period in RG treatment is due to the "last period effect".

In RG game, the repeated interaction between employer and the same worker acts as punishment and reward. Workers who shirk will be punished with lower wage level and workers who work harder will be rewarded with higher wage level. Therefore, selfish and non-compliant to reciprocal norm will be punished in RG game. Therefore, reciprocal norm plays more significant role in encouraging co-ordination in RG game than in OS game. Table 3 shows the overall individual behavior of workers in RG treatment.

From table 3, repeated interaction between employer and worker encourages worker to reciprocate. Almost 42% of the subjects are reciprocators compare to only 31% reciprocal behavior in OS treatment. The repeated game effect increases the reciprocal tendency among the workers. Based on number of "m", there are 58% of the workers reciprocate high wage with high effort level in RG treatment. Overall, Spearman Rank Correlation between wage and effort level in RG is 0.6951 (0.0256) and in OS is 0.4137 (0.2347). Higher intensity of reciprocal behavior in RG than in OS treatment suggests reciprocal norm plays vital role in encouraging conformation among workers.

R2: *Workers form perception of fairness based on previous wage level to determine effort level*

Workers refer to previous wage level as anchor to determine on effort level in future dealings. If current wage is lower than previous wage level, workers will perceive it as unfair and reciprocate with lower effort level, and with higher effort level if current wage is higher than previous wage. Similarly,

Table 3: Summary of worker behavior in the Repeated game treatment

Worker no	No of e=0.1	Corr(w,e)	e in t=10	No of m
(1)(r)	3	0.8667***	rej(25)	3
2	1	0.7145**	0.1	8
(3)	0	-0.0727	rej(80)	6
4 (r)	2	0.8361***	0.1	7
5	1	0.6976**	0.1	5
6	10	0	0.1	0
7	5	0.5544**	0.1	5
8 (r)	4	0.9343***	0.1	7
9 (r)	6	0.7817***	0.1	2
10(r)	1	0.9162***	0.1	5
(11)	7	0.6891**	rej(25)	4
12	8	0.6757	0.1	3

Notes:
-No of e=0.1 includes all effort levels of 0.1 and the number of rejection decision if the wage offered was 20. Rejection of wages > 20 cannot be explained with self interest.
-e in t=10 indicates effort level in the final round of the experiment. The rejection of the wage is denoted as "rej" and the wage offer is in parenthesis. Worker number 1, 3 and 11 are excluded from this analysis
- r indicates reciprocal type
-Corr(w,e) indicates Spearman rank correlation coefficients between wage and effort. ** indicates 5 percent significance level and *** indicates 1 percent level. Rejection is included in the calculation.
- No of m indicates "measure for measure" individual reciprocal behavior

firms reciprocate high effort with higher wage level than in previous period, and low effort level with lower wage level than in previous period. Therefore, in the absence of history of reciprocal behavior, particularly in OS treatment, reciprocal behavior observed is pure reciprocal behavior.

Therefore if fairness is reciprocal, we hypothesize that workers in RG treatment is more reciprocal than workers in OS treatment as workers in RG treatment take previous wage as measure of fairness and determine on future effort level.

To investigate the effect of wage on effort level, we ran a simple OLS regression for both OS and RG treatments:

$$effort_t - effort_{t-1} = \alpha_1 + \alpha_2(wage_t - wage_{t-1}) + \epsilon \qquad (3)$$

Table 4: OLS Regression of $Effort_t - effort_{t-1}$ on wage differential $(Wage_t - Wage_{t-1})$

Period	$\alpha_2(OS)$	R^2 Adj	$\alpha_2(RG)$	$R^2 Adj$
2	0.0047	0.114	0.000041	0.0999
	(0.1390)		(0.981)	
3	0.0086***	0.3396	0.0019	-0.0514
	(0.0210)		(0.512)	
4	0.008***	0.7039	0.0014	-0.0472
	(0.0000)		(0.494)	
5	0.0053***	0.3887	0.0046***	0.6106
	(0.014)		(0.002)	
6	0.004	0.0698	0.0029***	0.4746
	(0.1950)		(0.008)	
7	0.0044	0.0280	0.0044**	0.3422
	(0.2710)		(0.027)	
8	0.0007	-0.0850	0.0059***	0.5868
	(0.8200)		(0.002)	
9	0.0069	0.1230	0.0042*	0.1381
	(0.13)		(0.107)	
10	0.0023	-0.0230	0.005	0.0725
	(0.4120)		(0.202)	

Notes:
- The sign * indicates 10 percent significance level, ** indicates 5 percent significance level and *** indicates 1 percent level. Rejection is included in the calculation.
- α_2 is the coefficient in equation 3. The p-values are in the parentheses.

Table 4 shows the results of the effect of wage differential on effort change in each period on average. There are 5 workers who play reciprocity in RG treatment compare to 3 reciprocators in OS treatment. If we assume the subjects take initial 3 periods to learn the reciprocity of employers, then reciprocal behaviors observed in RG treatment after period 3 explain the workers are behaving according to the fairness hypothesis; the previous wage is used as anchor wage to compare with current wage. Similarly, effort level in the previous period is used as reference to determine the future wage level

for employers. Thus, high effort level in previous period is interpreted as reciprocal behavior of worker and employers will reciprocate it with higher wage level. Therefore, when history of reciprocal fair behaviors are observable, subjects become more conforming to the relation.

R3: *Perceived fairness by workers increases the overall efficiency of labor contract*

In RG treatment, history of wage levels are treated as reference point to evaluate fair treatment from the wage offered by employers in the current period. Therefore, any negative deviation is construed as unfair and positive adjustment is perceived as fair. This perceived fairness is interpreted as good will and intention of employers to co-operate with workers. This encourages reciprocal behavior from the workers through higher effort level. Therefore, we hypothesize that positive wage differential encourages workers' conformation to the relation and increases overall profit level. We first illustrate the profit behaviors in OS treatment and then compare it with RG treatment.

Table 5: Wage and profit levels observed in the OS treatment

Effort exerted	Wage Offered	No of Trades	Average Profit of firm	Average profit of worker	Average Joint Profit
0.1	61.42	47	6.82	41.06	47.88
0.2	45.71	16	15.68	23.88	39.56
0.3	60.31	17	18.97	36.41	55.38
0.4	58.60	10	24.56	34.60	59.16
0.5	67.37	17	26.88	39.29	66.18
0.6	71.89	9	28.87	43.89	72.76
0.7	80	2	31.50	45	76.5
0.8	79.33	3	32.53	47.33	79.87
0.9	80.75	4	35.33	45.75	81.08
1	89	2	31	51	82
Average	69.43		25.21	40.82	66.03

Table 5 shows the different levels of wage and profit in the OS treatment. On average, higher than average wage level offered by employers increases the overall joint profit (p=0.0001[2]). However, at the firm level, firms offered

---

[2]One Sample t-test is used to test the difference of overall profit of wage level above

higher than average wage do not earn higher than average profit (p=1[3]). This suggests that workers do not reciprocate to high wage offered by employers. This can be seen from the income level of workers which are above average income when firms offered higher than average wage level (p=0.0087[4])

Table 6: Wage and profit levels observed in the RG treatment

Effort exerted	Wage Offered	No of Trades	Average Profit of firm	Average profit of worker	Average Joint Profit
0.1	44.29	48	7.63	25.02	32.13
0.2	68.17	20	10.25	49	57.77
0.3	67.10	10	15.99	45.1	61.09
0.4	73.67	9	18.47	49.66	68.13
0.5	78	6	21	52	73
0.6	82.75	4	22.45	54.75	77.2
0.7	74.20	5	32.16	44.20	76.36
0.8	81	2	31.4	49	80.4
0.9	68.50	2	46.5	33.5	80
1	82	3	38	44	82
Average	72.02		24.38	44.57	68.80

We will compare the profit level in OS with RG treatment. Table 6 shows the levels of profit and wage offered by employers in RG treatment. Overall joint profit in RG treatment is higher than average when firms offered higher than average wage level (p=0.12[5]). Contrary to OS treatment,at firm level, higher average enables employers to earn higher than average income (p=0.44[6]).

The higher than average joint profit in high wage/high effort strategies than in low wage/low effort strategies imply reciprocal behavior from the players. The positive wage differential is perceived as fair by workers and they reciprocate by conforming to the labor relation by increasing the effort level. This response is interpreted as co-operation by the employers and determines the wage level offered in the subsequent interactions.

---

average wage of 69.43, from the average overall profit of 66.03

[3]the average profit of firm is 25.21

[4]the average income of worker is 40.82

[5]average overall joint profit is 68.80 and average wage is 72.02

[6]average income of employer is 24.38

4.2 Regularities in Gift Exchange with Social Comparison

In this section, we focus on reciprocal behaviors when information about average wage is introduced. The treatment is a modification of RG treatment with social information about market wage. We call this treatment Repeated Game Market Wage (RGMW). Our main results are:

R4: *Workers play reciprocally to rent offered by employers*

The introduction of market wage provides a reference point to the workers to evaluate fairness of the current wage. We hypothesize that workers refer to market wage as reference wage and will reciprocate based on negative or positive deviation of current wage from the reference wage. The behavioral prediction of workers to the wage differential is explained as follow.

Workers compare own wage (OW) or wage received to market wage to decide on effort level. In the repeated interaction, market wage offered in previous period is referred to evaluate fairness of current wage offered by employer. If own wage is higher than market wage, it is said the employer offers positive wage rent, and if OW is lower than market wage employer offers negative wage rent.

Workers perceive positive rent as fair and negative rent as unfair. Positive rent is construed as generosity and intention of employer to induce high effort level from worker, and therefore worker perceives it as fair and reciprocate with high effort level. If rent is negative, workers will perceive it as unfair and will reciprocate it with low effort level.

Since workers are exposed to both OW and market wage, we need to distinguish the effect of these factors on effort level. To do that, we ran a OLS regression to ascertain the *cateris paribus* impact of rent on effort level and table 7 shows the results of the regression.

$$e_t = \alpha_1 + \alpha_2(wage_t - A.wage_{t-1}) + \alpha_3(wage_t - wage_{t-1}) + \epsilon_t \qquad (4)$$

Right panel of table 7 shows the effect of both OW and rent (OW - market wage) on effort level for each worker. On average, three workers reciprocate positive rent with higher effort level with 1 percent significance level given the effect of OW is held constant. One worker reciprocates with 5 percent level and 2 workers with 10 percent significance level. Overall, increase of 1 unit of rent increases the effort level by 0.0096 unit on average (p=0.001). Left panel of the table shows the effect of rent on effort level and the middle

Table 7: OLS regression of Effort level on r ($Wage_t - AverageWage_{t-1}$) and difference of own wage($Wage_t - Wage_{t-1}$)

Work no	$Wage_t-$ $Awage_{t-1}$	R^2 Adj	$wage_t-$ $wage_{t-1}$	R^2 Adj	$Wage_t-$ $Awage_{t-1}$	$wage_t-$ $wage_{t-1}$	R^2 Adj
1	0.016***	0.8225	0.0122**	0.4997	0.0136***	0.0041	0.8107
	(0.001)		(0.033)		(0.008)	(0.269)	
2	0.008	0.1142	0.0048	0.0484	0.0070	0.0017	0.1188
	(0.374)		(0.569)		(0.515)	(0.866)	
3	0.008	0.2837	-0.0078	0.0662	0.0073	-0.0060	0.3214
	(0.14)		(0.504)		(0.184)	(0.585)	
4	0.012***	0.6918	0.0062**	0.4281	0.0146*	-0.0017	0.6005
	(0.005)		(0.056)		(0.058)	(0.692)	
5	-0.008	0.4088	-0.0063	0.1814	-0.0085	0.0009	0.2141
	(0.064)		(0.253)		(0.178)	(0.896)	
6	0.023***	0.6888	0.0059	0.0834	0.0297***	-0.0082	0.7098
	(0.006)		(0.451)		(0.005)	(0.160)	
7	0.016	0.1116	-0.0323	0.7961	0.0172***	-0.0326***	0.8965
	(0.38)		(0.001)		(0.020)	(0.000)	
8	0.001	0.0472	0.007	0.1806	-0.0002	0.0070	0.1806
	(0.574)		(0.254)		(0.992)	(0.361)	
9	0.006***	0.607	0.0048	0.2639	0.0060*	0.0001	0.4672
	(0.013)		(0.157)		(0.062)	(0.967)	
10	0.007***	0.7583	0.0033	0.3562	0.0080**	-0.0013	0.7060
	(0.002)		(0.09)		(0.015)	(0.479)	
11	0.01	0.2021	0.0119*	0.3637	-0.0001	0.0121	0.1516
	(0.225)		(0.086)		(0.982)	(0.263)	
All	0.009***	0.211	0.0039	0.452	0.0096	-0.0017	0.2167
	(0.0000)		(0.035)		(0.001)	(0.404)	

Notes:
- *** indicates 1 percent significance level, ** indicates 5 percent and * indicates 10 percent level.
- *p-values* are in the parentheses.

panel shows the effect of OW on effort level. It is apparent that workers are more responsive to rent than OW in deciding on the effort level.

The introduction of market wage provides a reference point to evaluate fairness and decide on future effort level. However, different workers behave non-similarly to the reference point as different workers form different perception of fairness from the rent received. We next analyze the fairness perception and response of different workers to the different level of rent.

R5 : *The high effort workers are more responsive to fairness than low effort workers*

Workers' responsiveness to wage offered depends on the effort level exerted *regardless* of the market effort level. This is because worker perceives effort level should be compensated with fair wage and therefore, negative rent is interpreted as unfair. If worker is bounded by self interest, negative rent will be reciprocated with lower effort level and positive rent will be reciprocated with higher effort level. Therefore, we hypothesize that high effort workers are more responsive to fairness, especially to positive rent than low effort workers.

If the reciprocal workers fit the characteristics mentioned above, high effort workers will reduce effort level more than low effort workers when the rent is negative. If rent is positive, high effort workers will increase effort level but the degree is less than low effort workers. Figure 2 shows the response of workers to the wage level when the rent is negative.
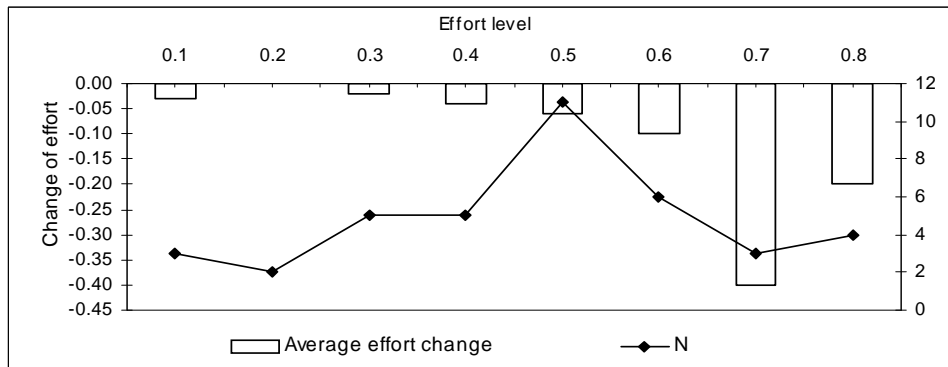

Figure 2: The average change of effort level according to effort level when the rent is negative

The horizontal axis in the figure denotes the initial effort level and the left vertical axis shows the change of effort. It is obvious from the figure that high effort workers are more responsive to the negative rent; the reduction

17

of effort among high effort workers are higher than the reduction of effort among low effort workers. Workers who exerted initial effort at 0.6, 0.7 and 0.8, reduce the effort level by -0.1, -0.4 and -0.2 respectively. The average reduction of effort change is -0.153 and -0.042 for high and low effort workers respectively. Wilcoxon matched-paired test reveals the difference of effort exerted between the two types of workers is significant at 5 percent level.

We next analyze the response of workers to positive rent. Figure 3 shows the effort change according to different effort levels.
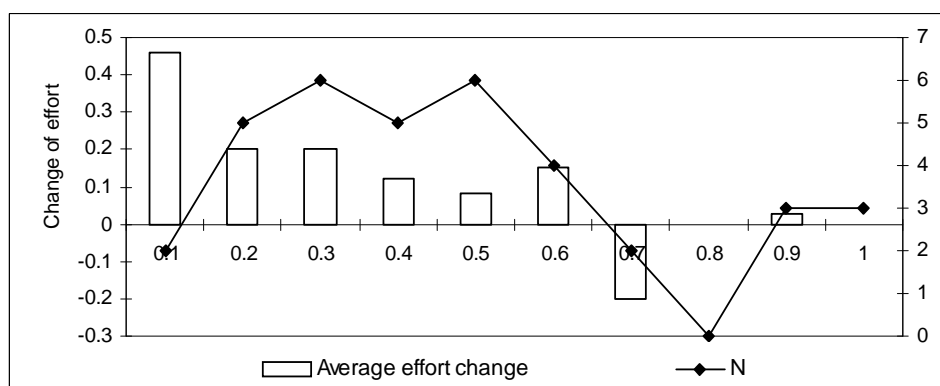

Figure 3: The average change of effort level according to effort level when the rent is positive

The response of high effort workers to rent is lower than low effort workers when the rent is positive. The average change of of effort among the workers from effort category 0.1-0.5 is 0.204 and the effort change among workers from category 0.6-1 is 0.03. The difference of effort change under these two regimes are significant at 1 percent level.

We further test the perception of fairness of high effort workers under positive and negative rent regimes. If high effort workers perceive negative rent as unfair, workers will reduce effort more than when the rent is positive. Wilcoxon statistical test reveals the difference of effort change between the two regimes is significant at 5 percent level.

Contrary to perception of high effort workers, low effort workers perceive positive rent as fair and will reciprocate with higher effort level than when the rent is negative. The difference of effort change between these two regimes is significant at 1 percent level.

The different response of workers to level of rent can be interpreted as workers form different levels of expectation based on own effort level. More hard working workers expect higher compensation from the employers regardless of effort level from other workers. If the expectation is not fulfilled,

workers will perceive it as under-compensation and the treatment is unfair, which results in significant reduction in effort level. However, when the effort level is compensated with positive rent, workers perceive it as fair treatment from the employers. This also explains the reciprocal behavior of low effort workers, the only difference is that low effort workers are more responsive to positive rent than high effort workers.

R6: *Reciprocal fairness between workers and employers increases overall joint profit*

On average, rent offer is 3.3. At that level firms' profit is 28.65 and overall joint profit is 68.60. To distinguish between profits of high (e,r) and low (e,r) we take profits obtained at 3.3 as our benchmark case. Specifically we want to investigate if profit level at high (e,r) is higher than profit level at low (e,r).
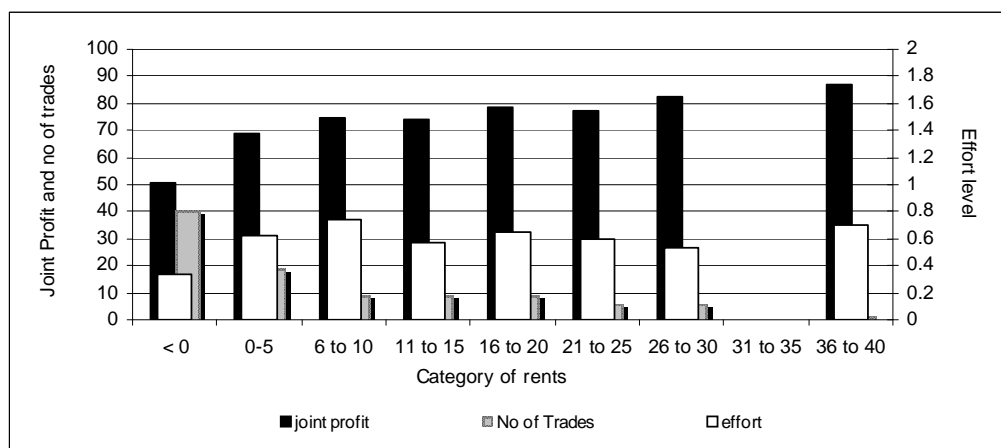

Figure 4: Levels of joint profit according to rents offered and effort level.

Figure 4 shows the responses of effort level to the different level of rent offered by employers. Our benchmark rent lies in the 0-5 category, effort level increases with rent offered except in 11-15 and 26-30 categories as shown by the black bars. One Sample t-test reveals that when rents is higher than average, joint profit is higher than average joint profit (p=0.0000).

At the firm level, higher than average rent offered by employers increases the average profit. Figure 5 shows the evolution of employers' profit according to different levels of rent.

From the figure, rent offered in the interval 6-10 category earns profit of 49.33, which is higher than average employers' profit at 28.65 at category 0-5.
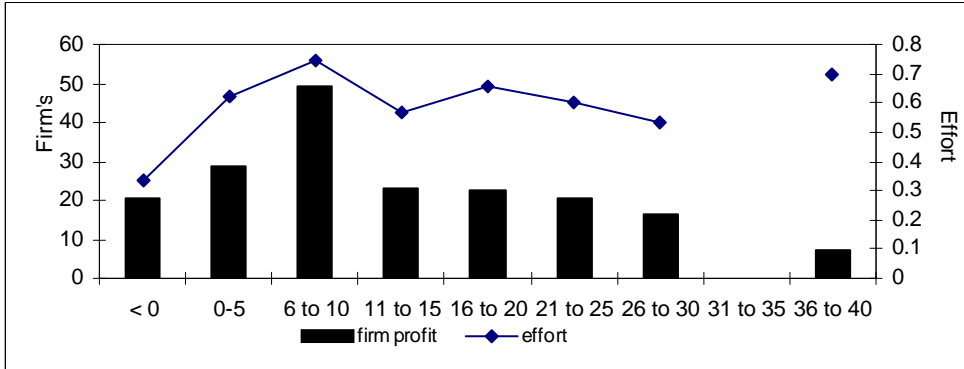
19

Figure 5: Firms' profit according to rents offered and effort level.

However, rent does not ensure indefinite rise of profit level. Although high rent is reciprocated with high effort level, rent higher than 11 unit reduces the average employers' profit. This is because high rent eats into employers' profit margin as there are less coupons left.

5   Conclusion

We study how workers form fairness and its effect on reciprocal behavior in resolving contractual incompleteness and unenforceibility. We conclude that, besides evaluating material offer to form notion of equality in distribution and intention of proposer, workers also perceive fairness based on implicit factor such as his own effort level. The different capability and own effort extended enable workers to form different belief and evaluation on the offer made by his employer. We conduct three experimental sessions with different treatments, One Shot (OS), Repeated Game (RG) and Repeated Game Market Wage (RGMW) to investigate how workers form perception of fairness.

We find that when the workers do not know the intention of the employer or the proposer and the information about the mechanism to distribute the wealth equally is not perfect, workers evaluate fairness of the offer based on past offer made by the same proposer. Particularly, if current offer deviates negatively from the past offer, it is construed as unfair and workers reciprocate with lower effort level and reciprocate with higher effort level if current wage is higher than previous wage. This is because absence of information about the intention of employer, workers treat past wage as reference point.

When market wage information is introduced, workers treat the market wage as reference to evaluate the fairness of the current offer. We find when both current own wage and market wage are known to workers, relative own

wage to market wage has more influence than own wage alone on effort level as in RG treatment.

The effect of relative wage on effort level depends on type of workers. The effect is more pronounced among high effort workers when relative wage is negative than low effort workers. The effort is therefore, stickier among high effort workers than low effort workers when relative wage is positive. But when employers pay less than market wage, morality of high effort workers drop more than low effort workers.

APPENDIX A

Instructions (Firm)

General Information for firms

Welcome to our experiment of the labor market. If you read these instructions carefully you may earn a considerable amount of money. From now until the end of the experiment you are not allowed to communicate with the other participants. If you have any questions, please raise your hand, and we will answer them individually. During the experiment your income will be calculated in Coupons. At the end of the experiment Coupons will be converted into Malaysian Ringgit at a rate of

$$10 \ coupons = RM1$$

At the end of the experiment your income will be paid to you in cash. The labour market has 10 periods consisting of two stages each:

Stage 1:   Each of the participants will be randomly assigned to one of two groups: half will be "workers" and half will be "firms". Whether you are a worker or a firm is noted at the top of the computer screen. In the first stage firms will make a wage offer to the workers. Workers can either work for this wage or not accept the offer. If a worker accepts the wage offer the second stage follows.

Stage 2:   At the second stage, those workers who accepted a wage offer must determine how much they work. The exact procedure is described below.
   Overall, there will be ten periods. **Your total income for the participation in this market will be the sum of your earnings in each of the ten periods.**

Please note:

In each period you will be assigned to a same worker. Thus, your worker will always be the same person!

22

Information Concerning the Labor Market

- At the beginning of each period you may offer a wage to a worker. This wage offer will be transmitted to the worker by the experimenters. Wages must lie between 20 and 120. Please do not tell anybody about the wage offer that you make. No other worker and no other firm will get to know your wage offer. Please record the wage offer you have made on the decision sheet for that period.

- The worker may either accept the wage offer and work, or he may not accept the wage offer.

- If the worker accepts a wage offer he must decide how much he wants to work. We will then transmit his choice to you. No other worker and no other firm will get to know about the amount of work chosen. If a worker accepts a contract he has to bear travel costs of 20 Coupons.

- If a worker does not accept the wage offer no labour contract is concluded and you will earn nothing in that period. The worker is unemployed in that period and will earn nothing as well.

How do you calculate the income of a worker in each period?

1. If a worker does not accept a wage offer, he will receive nothing in this period.

2. If a worker has accepted a wage offer he will receive this wage. From this wage he must then subtract the **travel costs** and the **costs of the amount of work chosen**.

3. The worker determines his quantity of work by choosing a number between 0.1 and 1.0 from the schedule below. The lowest amount of work is 0.1, the second lowest is 0.2, and so on up to the highest amount 1.0.

4. The higher the work quantity the worker chooses the better it is for you. The higher the number he chooses that is, the higher the quantity of work, the higher is your income.

5. The higher the work quantity the worker chooses the higher his work-related costs will be. You can find out how the costs are related to quantity of work by looking at the schedule below

23

6. If a worker has accepted a wage offer his income in Coupons will be determined by the following formula:

Income = wage - costs of quantity of work - travel costs

Travel Costs= 20 Coupons

Effort	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
C(e)	0	1	2	4	6	8	10	12	15	18

How do you calculate your income in each period?

1. You receive 120 coupons from the experimenter which you may use to pay for wages. If you make a wage offer of 120 Coupons to a worker, then you will have no coupons left. If your offer is 20 Coupons then you will have 100 coupons left. In general, you will have

120 coupons - wage income in Coupons.

2. How the income is then calculated? The number of coupons retained is multiplied by the quantity of work that "your" worker chooses. The result is your income in Coupons. Thus:

Income in Coupons = [amount of coupons - wage] x amount of work

3. If no worker accepts your wage offer you will earn nothing during that period.

The income of all workers and firms will be computed according to the same rules. Every firm has 120 coupons and the work related cost-schedule as well as the travel costs are the same for every worker. Every worker is able to compute the income of "his" firm and every firm is able to compute the income of the firm's worker.

Let's have some exercises!

Let's assume that you make a wage offer of 110 Coupons to a worker.
1. The worker does not accept! What will your income and the income of "your" worker be?
My income = ... coupons
Coupons Worker's income= .... coupons

2. The worker accepts the wage offer and chooses a quantity of work of 0.5! What will your income and the income of "your" worker be?
My income = ...coupons
Coupons Worker's income= .... coupons

Let's assume that you make a wage offer of 28 Coupons to a worker:
1. The worker does not accept! What will your income and the income of "your" worker be?
My income = ... coupons
Worker's income= .... coupons

2.The worker accepts the wage offer and chooses a quantity of work of 0.6! What will your income and the income of "your" worker be?
My income = ... coupons
Worker's income= .... coupons

References

Bazerman, L. M. and L. Thompson (1989), 'Social utility and decision making in interpersonal contexts', *Journal of Personality and Social Psychology* **57**, 426–441.

Bewley, Truman F. (1998), 'Why not cut pay?', *European Economic Review* **42**, 459–490.

Bolton,G and A, Ockenfels (2000), 'Erc: A theory of equity, reciprocity and competition', *American Economic Review* **90**(1), 166–193.

Charness, Gary and Peter, Kuhn (2007), 'Does pay inequity affect worker effort? experimental evidence', *Journal of Labor Economics* **25**(4), 693–723.

Clark, A., D.Mascelot 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.

Fehr, Ernst and Klaus Schmidt (1999), 'A theory of fairness, competition and cooperation.', *Quarterly Journal of Economics* **114**, 817–868.

Fehr, Ernst.,Gachter,Simon and Georg Kirchsteiger (1997), 'Reciprocity as a contract enforcement device: Experimental evidence.', *Econometrica* **65**(4), 833–860.

Fehr, Ernst.,Georg Kirchsteiger and Riedl,A (1993), 'Does fairness prevent market clearing? an experimental investigation', *Quarterly Journal of Economics* **108**, 437–460.

Gachter, Simon., Daniele Nosenzo and Martin Sefton (2008), The impact of social comparisons on reciprocity. Working paper available at http://ideas.repec.org/p/iza/izadps/dp3639.html.

Gachter, Simon and Falk, Armin (2002), 'Reputation and reciprocity: Consequences for the labor relation', *Scandinavian Journal of Economics* **104**(1), 1–26.

Gachter, Simon and Fehr, E (2000), 'Reciprocity and economics: The economic implications of homo reciprocans.', *European Economic Review* **42**, 845–859.

Levine, D. (1998), 'Modeling altruism and spitefulness in experiments', *Review of Economic Dynamics* **1**, 593–622.

Maximiano, S., R. Sloof and J. Sonnemans (2007), 'Gift exchange in multi worker firm', *Economic Journal* **117**, 1025–1050.

Rabin, M. (1993), 'Incorporating fairness into game theory and economics', *The American Economic Review* **83**(5), 1281.