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Economics Working Paper  
No 2010-11

# on the role of social wage comparisons in gift exchange experiments

by Ch'ng Kean Siang, Till Requate, and Israel Waichman



# On the Role of Social Wage Comparisons in Gift-Exchange Experiments\*

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## Abstract

This study extends a bilateral gift exchange experiment by Clark et al. (2010) who investigate how feedback of information about wages paid in the market affects both employers' wage setting and workers' performance. We provide either quantitative or qualitative information on the average wage paid in all worker-employer-relationships, and we also study repeated relationships (fixed-matching). We find that information on the average wage reduces (increases) both wage offers and effort levels in one-shot (repeated) relationships.

**JEL Classification:** C91, D03, D63, J41

**Keywords:** gift-exchange, reciprocity, wage difference, economic experiment

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# 1 Introduction

Contracts between employers and employees are often incomplete since the contract between the two parties only pertains to the wage but not to the effort level. Even if effort can be observed, it is often not possible to verify its level in court. Such a situation can be modeled as a sequential game where the employer first offers a wage, and then the employee chooses his/her effort level. In subgame perfect equilibrium the employee chooses the minimum effort level and, anticipating this, the employer pays the lowest possible wage. In real situations between employers and employees we do not necessarily observe such outcomes, particularly when the relationship is of long-term nature.

By interpreting the employer-employee relationship as a “gift exchange game”, Akerlof (1982) and Akerlof and Yellen (1990) offer an explanation for the above mentioned puzzle. The authors consider the employer as offering a “gift” to the employee in terms of a high wage, and the employee in turn reciprocating this by choosing a high level of effort.<sup>1</sup> Since the seminal work by Fehr et al. (1993), a large body of experimental research has been investigating the reciprocity hypothesis in the labor market’s context. These studies reporting the so-called “gift-exchange experiments” are divided into Gift-Exchange Market (GEM) and Bilateral Gift-Exchange (BGE) experiments. In the GEM design the allocation of employees to employers is done via an auction (i.e. wages are endogenously determined by the labor market). By contrast, in the BGE design the matching between employees and employers is exogenous, and at the beginning of each round the firms have to offer wages to their workers.

Although there is strong empirical evidence that employees do compare their wages with those of other employees who do the same kind of job (see, for example, Clark and Oswald, 1996), in most bilateral gift exchange studies each employer-employee relationship is separate (i.e. employees do not know the wages emerging in other employer-employee relationships). For this reason Güth et al. (2001), Charness and Kuhn (2007), and Abeler et al. (2010) conducted further experiments with one employer and two employees to investigate whether co-employees compare their wages with each other when deciding on the effort level. While Güth et al. (2001) and Charness and Kuhn (2007) achieve ambiguous results regarding employees’ effort levels, they both find that it reduces the employers’ wage offers. Abeler et al. (2010) find that offering an equal wage to both low and high-productivity employees reduces the productivity of the high-productivity employees. Recently, Clark et al. (2010) study the effect of wage comparison between (homogeneous) employees from different firms in a BEG. They find that an employee’s effort is negatively affected by other employees’ income. The results of Clark et al. (2010) conducted with random-matching therefore raise the question whether the same effect will also be observed when employer and employee interact repeatedly. In this paper we intend to answer this question by providing information of different quality about the other employees’ average wages in both short and long term relationships.

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<sup>1</sup>For a comprehensive discussion about reciprocity and its implementation in economics, see Fehr and Gächter (2000).

Our results are as follows. In the baseline study, where no information about the previous average wage is provided, we do not find a significant difference between the wage offers in both, the random and the fixed-matching. However, in line with previous studies we find that the effort level is considerably higher under the fixed-matching. When we provide subjects with either the exact average wage in the market or with a notification about whether their wage is larger/smaller than the average wage across markets, we find that in short-term relationships it reduces both wage and effort levels. In contrast, in repeated relationships it increases the wage offers in one treatment and the effort levels in the other.

## 2 Experimental design and procedure

The experimental design is based on the bilateral gift exchange experiment initially conducted by Kirchler et al. (1996)<sup>2</sup>. Subjects are divided into two types of players, “firms” and “workers” and during the experiment each firm is matched with one worker. The experiment lasts 10 rounds, and at the beginning of each round, each firm receives an endowment of 120 coupons. The firm, moving first, offers a wage ( $w$ ) to the worker (between 20 and 120 coupons). Then, the worker chooses whether to accept or reject the offer. If the worker rejects, both the worker and the firm receive a payoff of 0. If the worker accepts the offer, he/she has to choose an effort level ( $e$ ) from a finite grid of numbers between 0.1 and 1. Choosing an (above minimum) effort level is costly, as displayed in Table 1.

Table 1: Effort levels and costs of effort

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

Additionally, if a worker accepts the offer, he or she has to pay a fixed cost of 20 coupons, which in the instructions is interpreted as travel cost. At the end of each round the payoff is calculated. If a worker accepts the offer, the firm’s payoff for the actual round is determined by:

$$\Pi_i^F(w_i, e_j) = (120 - w_i) e_j \quad (1)$$

and the worker’s payoff is given by:

$$\Pi_j^W(w_i, e_j) = w_i - 20 - C(e_j) \quad (2)$$

In the static subgame perfect equilibrium of this game the firms offer a wage of 21 (or 20) coupons, anticipating that workers will choose the lowest positive effort level, i.e.  $e = 0.1$ .

To test whether horizontal comparison (comparison within the same type) matters, we conducted three pairs of treatments (each with random and fixed-matching). As baseline treatments we replicate the BEG treatments conducted

<sup>2</sup>This design was used several times since then, for instance by Gächter and Falk (2002).

by Kirchler et al. (1996) and Gächter and Falk (2002), providing no information about average wage and effort. In the second pair of treatments, we provide subjects with information about the average wage across markets<sup>3</sup> after each round. In the third pair of treatments, we provide subjects with qualitative information about the difference between the wage in their own relationship from the average wage. More precisely, if an employer offers a wage which is 5% larger (smaller) than the average wage across markets, both subjects receive the following statement: “The wage [offered to you/you offered] is above (below) the average”.<sup>4</sup>

Table 2: The different treatments

Treatment	Random-matching	Fixed-matching
Baseline	RM (42 subjects)	FM (60 subjects)
Disclosure of the average wage	RMAW (26 subjects)	FMAW (22 subjects)
Qualitative information on the wage difference	RMWD (30 subjects)	FMWD (32 subjects)

In total, 212 undergraduate students from different faculties of Universiti Sains Malaysia (USM) in Penang, West Malaysia, participated in the computerized experiment. The experiment was programmed and conducted using the z-Tree experimental software (Fischbacher, 2007). Upon entering the computer lab, the subjects were randomly assigned the roles of “firms” or “workers”. Both types of subjects had 10 minutes to read the instructions which include a set of four questions to test whether they had understood the experiment.

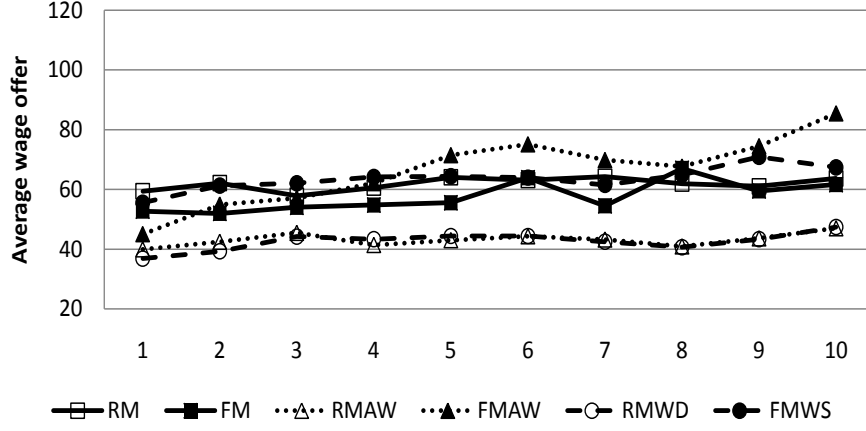
### 3 Results

Figure 1 shows the evolution of the average wage offers and effort levels over time for the different treatments, and Table 3 displays the mean outcome per accepted or rejected offer. The figure and the table demonstrate that the random-matching treatments with (any) information about market wage yield, on average, the lowest wage offers and effort levels, while the corresponding fixed-matching treatments yield the highest wage offers in one case and the effort levels in the other. In the following subsections we investigate both the impact of information on the average wage and the impact of repetition.

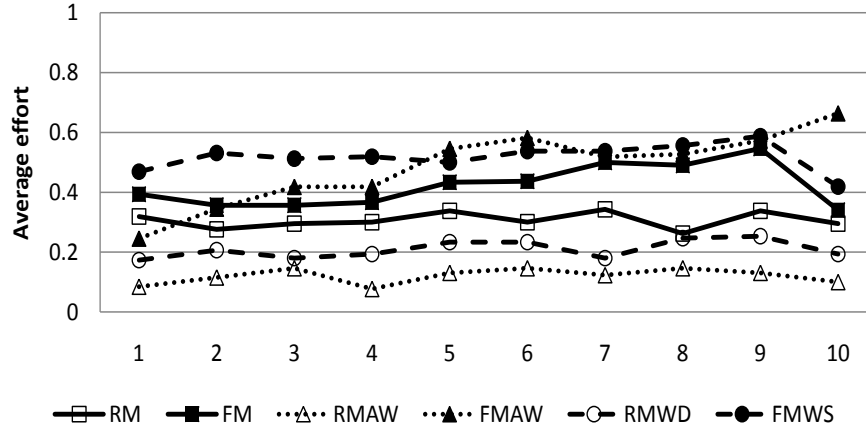
- Figure 1 and Table 3 about here -

<sup>3</sup>The average is taken only over accepted offers.

<sup>4</sup>If an employer offers a wage which is less than 5% larger or smaller than the previous round’s average wage across markets, both subjects receive the following statement: “The wage [offered to you/you offered] is equal or very close to the average”.



(a) Evolution of wage offers across treatments



(b) Evolution of effort levels across treatments

Figure 1: The evolution of wage offers and effort levels across treatments

Table 3: Mean performance in the different treatments. “ $\bar{w}$ ” and “ $\bar{e}$ ” denote average wage and average effort level, respectively. “*rej.*” denotes rejection rate and “ $\bar{\Pi}^F$ ” and “ $\bar{\Pi}^W$ ” indicate average profit of firms and workers, respectively.

Treatment	Accepted offers		Rejected offers		All offers	
	$\bar{w}$	$\bar{e}$	$\bar{w}$	<i>rej.</i>	$\bar{\Pi}^F$	$\bar{\Pi}^W$
RM	63.41	0.33	40.33	7%	15.38	37.03
FM	58.42	0.43	34.63	3%	22.92	28.67
RMAW	44.49	0.13	28.36	8%	8.69	22.09
FMAW	68.00	0.51	36.66	5%	22.85	38.99
RMWD	43.86	0.22	29.69	8%	14.93	20.22
FMWD	63.60	0.51	-	-	27.53	36.92

### 3.1 The effect of information about average wage

Firstly, we compare between each pair of random-matching and fixed matching treatments, respectively. Using a t-test, we find significant differences (at the 1% level, two-sided test) between the outcome of the baseline RM treatment and those of the treatments with information about the average wage across markets (i.e. RMAW and RMWD treatments). A comparison between the latter two treatments shows that they do not perform differently from each other regarding wage offers ( $P=0.77$ ). We find, however, significantly lower effort levels in RMAW than in the RMWD at the 1% level. Using the same method to compare between the series of payoffs we find that the workers' payoffs, in both, RMAW and RMWD, are lower than the payoff series of the baseline RM treatment ( $P=0.00$ ). There is no difference between the RMAW and RMWD ( $P=0.28$ ). Regarding firms payoffs, we do not find a significant difference between the RM and RMWD ( $P=0.70$ ), but these two treatments yield higher payoffs than the RMAW ( $P=0.00$ ).

Regarding the fixed-matching treatments, using a Fligner and Policello robust rank order test<sup>5</sup> we find a significant difference regarding wage offers ( $P=0.00$ ) between the outcomes of the baseline FM and those of the FMAW treatments. We do not find this difference regarding effort ( $P=0.59$ ). By contrast, comparing the FM and the FMWD treatments we find a significant difference regarding effort ( $P=0.08$ ), but not regarding wage offers ( $P=0.15$ ). A comparison between the RMAW and RMWD shows that they are not different from each other regarding both wage offers ( $P=0.41$ ) and effort levels ( $P=0.48$ ). Using the same method to compare between the series of payoffs we find that the workers' payoffs, in both, FMAW and FMWD, are higher than the payoffs in the baseline FM treatment ( $P=0.00$ ). There is no difference between the FMAW and FMWD ( $P=0.66$ ). Regarding firms' payoffs, we do not find a significant difference between the FM, FMAW and FMWD ( $P$  values are between 0.11 and 0.79).

This result may indicate asymmetry in the perception of information. In one-shot relationships where reputation does not play a role, the information about average wage leads to a "race to the bottom" that drives the result closer to the static subgame perfect equilibrium. In a repeated relationships this information leads to a "race to the top" that ends up in higher wages or effort levels.

### 3.2 The effect of repetition

To study the effect of long-term versus short-term relationships, we make a pairwise comparison of the random and fixed-matching per information condition using a (two-sided) t-test. Starting with the baseline RM and FM treatments, we do not find that the wage offers are significantly different between the two treatments ( $P=0.22$ ), but we find that effort levels are considerably higher in the fixed-matching treatment ( $P=0.00$ ). Comparing between RMAW and FMAW, on the one hand, and between RMWD and FMWD, on the other, we find that

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<sup>5</sup>Since the number of independent observation are 24, 11, and 16 in the three treatments we use a non-parametric test to compare between the fixed-matching treatments.



the fixed-matching treatments with (any) information about the average wage yield significantly higher wage offers and effort levels than their corresponding random-matching treatments. These findings are significant at the 1% level. We also find that the payoff series of both firms and workers are larger in the FMAW and FMWD than in their random-matching counterparts (at the 1% level for all comparisons). Comparing the payoffs in the two baseline treatments, we find that the firms earn significantly more in the FM treatment, but the workers earn more in the RM treatment (both at the 1% level).

## 4 Concluding remarks

This paper presents results from a bilateral gift-exchange experiment mimicking an employer-employee relationship. We are particularly interested in investigating the effect of information about the average wage across markets on the outcome in both random and fixed-matching schemes. Provision of average wage (or information about a deviation from the average wage) has a decreasing effect on both wage and effort level in the random-matching treatments, but has an increasing effect on wage offers or effort levels under fixed-matching.

Our findings may have an important policy implication. For industries characterized by long-term relationships between employers and employees, transparency on the average wage may have a positive effect on employees' productivity (and also on their wages), while in sectors with only short-term relationships between employers and employees, (e.g. in the agricultural sector where strawberry pickers are hired for a few days only), publishing the average wage could have an adverse effect on both wages and productivity (i.e. effort levels). Interestingly, we find that transparency regarding the average wage impacts employees more than their employers. In particular, employees suffer payoffs' reduction in one-shot relationships, but enjoy the raise in wages in repeated relationships. By contrast employers' payoffs are less affected by transparency.

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