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DOES MANAGERIAL COMPENSATION AFFECT WORKERS' EFFORT?

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We explore in a two-level gift-exchange experiment whether the managerial compensation influences workers' effort decisions. Firstly, we find that there exists a strong positive relation between own wage and effort levels for the workers, while the managers' effort reaches a maximum for intermediate wages and decreases for very high wages. Secondly, our data suggests that the managerial compensations are significantly negatively correlated with the workers' effort choices: the higher the manager's wage, the lower the effort level chosen by the workers.

JEL classification codes: C92, J33, M12, M52

Key words: managerial compensation, social preferences, laboratory experiment, gift-exchange, effort

I. Introduction

We analyze in a two-level gift-exchange experiment the relationship between management compensation and workers' effort. The review of the relevant literature shows that 1) the broader public dislikes high managerial compensations,

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2) workers are inclined to make social comparisons with their equals and with their superiors, and 3) these social comparisons might affect their working performance. On the other hand, the effects of the perceived managerial compensation on employees' behavior at work are not tested for in experiments yet.

Opinion polls from various countries show that a significant majority of the people dislike high managerial compensations. According to a Bloomberg survey conducted in February 2006, about 81% of Americans say they think that the chief executives of large companies are overpaid — a percentage that changes little with income level or political party affiliation.¹ Data for the fairness perceptions in Germany is available from the Socio-Economic Panel (SOEP) conducted in 2005.² While 54% of the population think that their personal income is fair, only 25% think this way about the income of managers and 29% about the income level of the lowest-level employees. Accordingly, managers earn too much and the lowest-level employees earn too little in the eyes of the majority.

Many papers have shown that although effort at work is at least to some degree non-contractible, workers are more likely to perform above any minimum requirements if they feel fairly treated and have been paid a fair wage (Akerlof and Yellen 1990; Milgrom and Roberts 1992; Fehr and Gächter 2000). The own compensation is seen as the most important instrument to motivate employees to put forward an efficiency-enhancing effort level. However, as recognized by theories of distributive and procedural justice, employees' motivation is not only a simple function of financial inducement; it is also influenced by social comparisons and by the perception of causes and processes.

The research on social comparison theory shows that individuals in organizations tend to engage in vertical social comparisons with their superiors to see how well they are doing, whether their wage is fair, and how equitably they are being treated (O'Reilly et al. 2006). In this line of research, workers that feel their compensations are not equitable could respond with lower productivity and product quality, decreased morale, and increased turnover.

¹ Dash (2006). Bloomberg is the leading global provider of data, news and analytics.

² SOEP is a representative panel survey of the resident population of Germany. The 2005 wave of the survey includes 21.105 individuals from 11.453 households.

Horizontal and vertical wage comparisons seem to be particularly important after wage cuts. Cohn et al. (2014) found in a field experiment that a worker's performance decreased twice as much when only his wage was cut than when another worker's wage was cut as well.

The expectation that greater vertical inequity leads to undesirable organizational outcomes has received empirical support from a field study by Cowherd and Levine (1992). With a sample of 102 corporate business units they investigate the relationship between product quality and interclass pay equity. Their results show that a small difference in the compensation of lower- and upper-level employees enhances the commitment of lower-level employees, their levels of effort and cooperation, and as a consequence it increases the product quality. In a similar line of research, Cornelissen et al. (2011) have found that the perception of manager incomes as excessively high (and therefore unfair) could lead to higher levels of health related absenteeism from work. Stephan et al. (2014) found in a questionnaire of 1,400 employees that their motivation and willingness to cooperate sinks if they perceive their manager's bonuses as unfair.

With the exception of these papers, field data about how managerial compensation affects the working performance of lower-rank employees is not very common. It is very difficult to isolate and interpret fairness considerations regarding the managerial compensation in a real working environment, since they are only one factor among many which exert influence on workers' effort.

Our aim is to provide experimental evidence of the effect of the managerial compensation on the workers' effort. We conduct a gift-exchange experiment, since they have proven very helpful in examining behavior in an incomplete contracts environment (effort is not contractible and not observable). Gift-exchange labor-market models build upon the efficiency wage theory and test whether a positive relation between wages and effort exists. The main idea is that employees respond to a gift — “wage higher than the market wage” — with another gift — “higher effort”. One of the main findings of a vast number of simple bilateral gift-exchange experiments is that indeed a high percentage of the workers reward higher wages with higher effort (Fehr et al. 1993). Efficiency preferences and the positive forms of reciprocity and inequity aversion are typically used to explain gift-exchange behavior.³

³ See Maximiano et al. (2013) for a discussion.

However, more complex, multilateral work relations are not deeply studied yet and have mainly focused on horizontal fairness considerations among workers at the same hierarchy level (Abeler et al. 2010; Angelova et al. 2012; Bartling and von Siemens 2011; Charness and Kuhn 2007; Gächter and Thöni 2010; Gächter et al. 2012; Maximiano et al. 2013; Nosenzo 2013). There exists, to our best knowledge, no experimental study which considers fairness effects in regard to managerial compensations.

In our experimental design we distinguish between a firm owner and a manager. Thus, we extend gift-exchange labor-market models to a more realistic hierarchical structure. In the field, usually the firm owners set the manager's wage, while the workers' wages are set by the manager. This leads to a two-level principal-agent relationship: between the firm owner and the manager on the first level, and between the manager and the workers on the second level.

Our gift-exchange experiment is particularly well suited to detect the equity-driven effects of managerial compensation on workers effort, since its design allows workers to punish firms at a low cost for managerial compensations that are perceived to be inappropriately high.

The focus of our experiment and this paper is the effect of managerial compensation on workers' effort. Our findings may also contribute to the discussion about the driving forces behind gift-exchange and how robust the results of bilateral one-level gift-exchange experiments are when we have a more complex organizational hierarchy. We see some general effect of social preferences (both positive and negative) on effort choice, but are not able to discriminate explicitly between theories of social preferences (such as positive and negative reciprocity, inequity aversion, altruism, envy, social norms).

An experimental study which distinguishes explicitly between a manager and a firm owner is Maximiano et al. (2013). They report that workers still reward higher wages with higher effort levels, even when the manager, who is responsible for setting the wage, does not share the firm's profits at all. In contrast to our paper, the firm owner in Maximiano et al. (2013) cannot influence the manager's wage and the manager does not contribute to the firm's revenue at all. Thus, fairness considerations regarding the managerial compensation are not tested for, while they are the focus of our experiment.

Closely related to our experiment is the one in Charness and Kuhn (2007), although there are several differences. Most importantly, we introduce a manager who sets the workers' wages in half of the sessions and who is much more decisive

for the firm's outcome than a single worker. Furthermore, our firm employs in total four employees (three workers and one manager), while Charness and Kuhn (2007) have a firm with one owner and two workers.⁴ They find (in line with Bartling and von Siemens 2011) that a co-worker's wage does not affect the worker's effort level. Gächter et al. (2012) also find that wage comparisons with co-workers do not affect reciprocity towards the firm. Nevertheless, effort comparison information (knowing the effort level chosen by the co-worker) does affect reciprocal relationships. They found that, on average, social comparison has a negative influence on reciprocity.

Gächter and Thöni (2010) found that receiving a lower salary than the co-worker affects negatively the effort level chosen, while being overpaid does not increase the effort. Güth et al. (2001) in an experiment with one principal and two workers with different productivity that may receive different contracts (wages) find that when contracts are common knowledge, the principal offers more compressed wages than when contracts are private information. Nosenzo (2013) focuses on the effect of pay secrecy. He shows that if two symmetric employees are not equally treated then effort levels are negatively affected by pay disclosure.

The above mentioned papers consider horizontal comparisons, while we consider vertical comparisons. We find that the manager's wage influences negatively the effort decision of the worker: the higher the manager's wage, the lower the effort of the worker, for a given worker's wage.⁵ Our result suggests that vertical comparisons do influence the effort choice of workers.

The results indicate that profit-maximizing firm owners should take the fairness perceptions of their employees into consideration when determining the managerial compensation. This is a crucial insight in the heated discussion about the appropriate level of managerial compensation and bonuses — especially in the financial sector recently — and it might have a moderating effect on managerial wages — without any additional regulation. As the effects of the justice

⁴ Having three workers instead of one reflects a more realistic multi-worker setting. Maximiano et al. (2007) show that gift-exchange is robust to increases in the size of the workforce. Having three workers per firm instead of two allows us to have more data on workers without having to pay other members of the firm.

⁵ The experimental results are in line with the results of the exit survey distributed at the end of the experiment, where 65% of the workers state that the managerial compensation had a decisive effect on their effort determination or was even their primary consideration.

perceptions of workers remain widely neglected in the compensation literature, we try to provide some insight on the role and the importance of workers' fairness considerations for determining the optimal managerial compensation.

The paper is organized as follows. In the following section we present our experimental design and procedures. Results are presented in section III. Conclusions are presented in section IV.

II. The experiment

The design of our experiment is intended to test whether the observation of the manager's wage influences negatively workers' effort decisions, i.e., if a higher manager's wage lowers the workers' effort.

The experiment is programmed and conducted with the software *z-Tree* (Fischbacher 2007). Subjects receive the instructions on paper. To ensure that subjects understand the experiment, all subjects have to answer a number of control questions about the instructions before the experiment starts.

There are eight experimental sessions with 20 participants per session. At the beginning of each session, students are randomly divided into three groups: workers, firm owners, and managers. Each subject stays in the assigned role for the duration of the session. In each session 30 periods are played under stranger matching, i.e., after each period subjects are re-matched, and the probability of playing with exactly the same partners consecutively is zero.

Two different types of treatment are applied in the sessions:

1) The information on the manager's wages is either private or public. In private sessions (Private) the workers are not informed about the manager's wage, while in the public sessions (Public) they are.

2) In half of the sessions, the firm owner determines the workers' wages (FD hereafter), in the other half the manager is responsible for this (MD hereafter). We conduct both types of sessions to check whether who determines the worker's wage influences the worker's effort decision.

Because of the two different types of treatments in the sessions, we have four different cases, each being conducted twice: 2 Private-FD sessions, 2 Public-FD sessions, 2 Private-MD sessions, and 2 Public-MD sessions.

Within a session, an overall cut in endowment is established after round 15. It goes from 15 laboratory euros (LE) to 10 LE. In the instructions read at

the beginning of the sessions subjects are told that: "Over the course of the session changes in the economic situation (indicated by the initial endowment) of the firm might occur, which will be communicated to you when they occur". At the beginning of period 16 firm owners and managers are told that the initial endowment will be 10 instead of 15 LE for the next 15 periods, and the workers are told that the initial endowment of the firm will decrease by 33%. With this change we want to see how firm owners divide the cut in the endowment — the tokens available for payment of salaries — between the wage of the more decisive manager and the wages of the less decisive workers. Moreover, we want to check if the managerial compensation has a stronger influence on workers in times of financial crisis.

Each period consists of four stages. In the first stage, the firm owner decides which part of the initial endowment (N) will be paid as a fixed wage w_m to the manager (w_m must be integers, $w_m \in \{0, 12, \dots, N\}$). In public sessions workers are informed about the manager's wage, while in private sessions they are not. In the second stage, the manager in MD-sessions and the firm owner in FD-sessions decides how much of the remaining endowment will be used to pay uniform wages to the three workers (w_w must also be integers). In the third stage, managers and workers decide how hard they will work for the firm. The workers and managers receive no direct benefit from providing costly effort, while the firm owner's profit depends critically on the effort levels chosen (firms owners get all the remaining endowment plus the revenue provided by the manager and almost all revenue provided by the workers -in some cases minus a small manager bonus). In the fourth stage the workers are informed about total firm revenues and their own earnings, and the manager and the firm owner are informed about the effort of each worker and their own earnings.

In the first stage we have a more clear principal-agent relationship in an incomplete-contract environment, where the manager's effort choice (and workers' wage setting in MD sessions) is a reaction to the wage assigned by the firm owner, and the person who chooses the manager's wage is the same person that pays it. In the second stage, the manager's considerations might differ from those of a principal who receives the total profit produced by the workers, since the manager does not receive the total profit provided by the workers (he receives only 20% as a bonus if the workers generate a positive profit) and he does not have to bear the costs of the salary. The profit generated by the workers is defined as the sum of the revenue provided by them (from Table 1) minus the wages they are paid.

The revenue provided by the workers and the manager (depending on different levels of responsibility and productivity) and the costs of effort are given by the following table.

Table 1. Revenues and costs of effort in LE

Effort level	Cost of the effort	Revenue provided by the worker	Revenue provided by the manager
0	0	0	0
1	0.1	2	6
2	0.3	3.3	10
3	0.6	4	12

The workers are not aware of the magnitude of the productivity differences between workers and the manager, but they are informed that the manager is much more productive than a worker. The reason for this is to approximate real world labor markets, in which workers know that the manager is much more decisive for the overall outcome, but cannot determine their true relative value to the employer. We followed the idea of Charness and Kuhn (2007) that workers do not know the exact difference between their own productivity and their co-worker's productivity. Workers do not know the initial endowment of the firm owner either. We didn't give the information about the initial endowment of the firm owner, following Charness and Kuhn (2007), to avoid the possibility that the workers deduce the wage paid to the manager in the private sessions.

The payoffs (based on Charness and Kuhn, 2007) are chosen to generate non-zero effort levels from the majority of the workers and the managers, to embody the large productivity differences between workers and the manager, and to allow the workers and the manager to impose high costs on firms by choosing effort level 0. The payoffs for each participant are calculated in the following way:

Firm Owner's Payoff = *Initial Endowment* + *Total Revenue* - *Total Salaries*,

Manager's Payoff = *Manager's Wage* + *Bonus* - *Cost of Effort*,

Worker's Payoff = *Worker's Wage* - *Cost of Effort*,

where *Initial Endowment* is 15 LE in the first 15 rounds, and 10 LE in the rest of the experiment. *Total Revenue* is the sum of the revenue generated by each of the workers and the manager (see Table 1). *Total Salaries* consists of three times

the uniform worker's wage (w), plus the manager's fixed salary (w_m) plus the bonus paid to the manager. *Bonus* is 20% of the profit generated by the workers, which is the revenue provided by the workers minus the wages assigned to them, as long as this difference is positive. The workers' effort is directly connected to the managerial compensation through the bonus. If the benefit generated by the workers is zero or negative, then the bonus is 0.

All participants are paid privately at the end of a session. Earnings accumulate over the course of the session, and are then converted from lab euros to real euros with a conversion rate of 5 LE = 1 € for the workers and the managers, and 20 LE = 1 € for the firm owners.⁶

Additionally, at the end of the experiment, we administered a survey to the participants.

III. Results

The experiment was conducted at Universitat Autònoma de Barcelona. Almost all subjects were undergraduate students.⁷ Including the show up fee, the 160 participants earned on average 19 €.

Following the literature on gift exchange, social comparisons, and the corresponding empirical results from opinion polls, we test the following three hypotheses:

Hypothesis 1: There exists a positive relation between the own wage and the chosen effort level.

Hypothesis 2: In public sessions, the manager's wage influences negatively the workers' effort decisions: the higher the manager's wage, the lower the workers' effort.

Hypothesis 3: The effect of managerial compensation on workers' effort is more significant in times of financial restrictions. In other words, the response of the workers to the manager's wage is stronger in Part II than in Part I.

⁶ We choose the same conversion rate for workers' and managers' wage, because we are interested mainly in the relation between these two types of subjects, and in the fairness considerations of workers regarding managerial compensation. Workers and managers are aware that the conversion rate for both groups is the same and that the conversion rate of the firm owners might differ. Firm owners are being told only their own conversion rate.

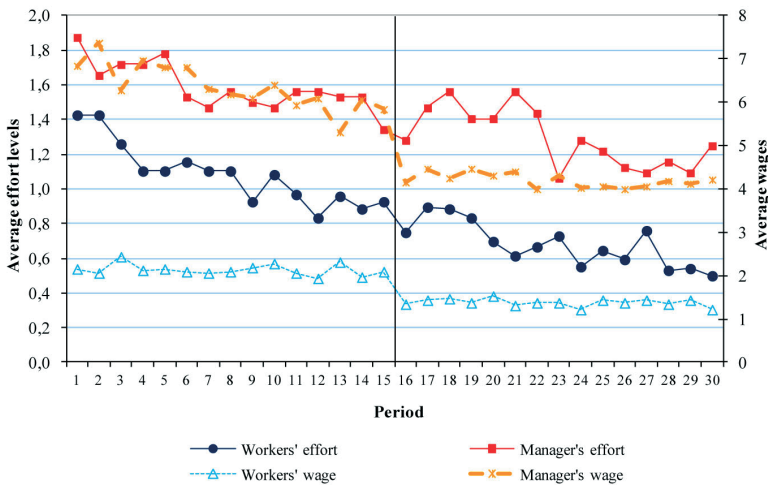
⁷ We had only one participant who was not an undergraduate student, but an employee of the university.

First we present the average wages and effort levels over time and for the different sessions. Next, we analyze the impact of the managerial compensation on workers' effort.

A. Own wages and efforts

In Figure 1 we have plotted the average wages and effort levels of the eight sessions by period.⁸ We observe a decrease in efforts and wages over time, for both workers and managers.⁹ The period effect is particularly observable in the efforts: they decrease throughout the experiment. The wages exhibit a level difference between Part I (periods 1-15) and Part II (periods 16-30), but not a period effect. Exceptions to this are managers' wages in Part I, when they show a decrease throughout the periods.

Figure 1. Average wages and effort levels by period

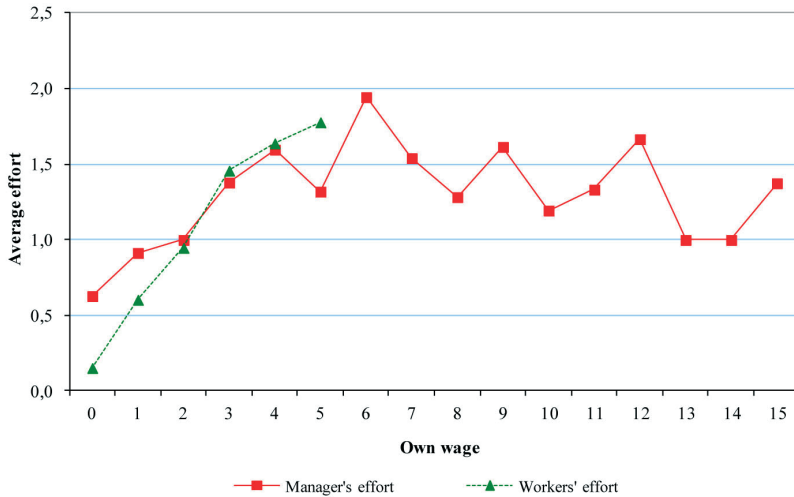


⁸ Recall that after period 15 we have a cut in the endowment that goes from 15 LE to 10 LE.

⁹ This could be caused by the type of matching we have in the experiment: we change partners every period. Gächter and Fehr (2002) compare a one shot-treatment (change partners) with a repeated interactions-treatment (play with the same partners) and they find that efforts are higher (and increasing) when they play with the same partners. The same pattern is found in public goods experiments.

Next, we show the relation between wages and effort considering all eight sessions. Figure 2 indicates that a robust positive relation between own wage and effort exists for the workers and in a weaker manner also for the managers.

Figure 2. Average workers' and manager's effort by wage



The Pearson correlation coefficient between effort and own wage is 0.563 (p-value = 0.000) for workers and 0.104 (p-value = 0.000) for managers.¹⁰ The result related to workers is consistent with previous research on gift-exchange labor markets. Even in a more complex organizational hierarchy than the typical one firm/one worker environment, we find that the higher the wage, the higher the effort level chosen by the workers, in line with Maximiano et al. (2013).

On the other hand, the manager's effort reaches a maximum for intermediate compensations (6 LE) and decreases for very high compensations. We find a positive Pearson correlation coefficient between effort and wage of 0.189 (p-value = 0.000) for manager's wage up to 5 LE, and a *negative* coefficient of -0.146

¹⁰The Pearson correlation coefficients are calculated at the individual level.

(p-value = 0.000) for wages equal to or higher than 6 LE. It seems that the managers prefer a reasonable relation between their wages and the workers' wages. The gift exchange seems to work only up to a certain wage level. This result suggests that managers dislike unfair treatment of the workers. When the income inequality is too high they consider this unfair and react by choosing a low level of effort to signal their dislike of such situations.

Table 2 presents summary statistics about average wages and effort levels for the different sessions and parts of the experiment.¹¹

Table 2. Average wages and effort levels

	Firm decides workers' wages (FD)				Manager decides workers' wages (MD)			
	PART I		PART II		PART I		PART II	
	Private	Public	Private	Public	Private	Public	Private	Public
Workers' wage	2.44	2.38	1.68	1.59	1.83	1.88	1.23	1.01
Manager's wage	5.56	5.20	3.71	3.63	8.02	6.65	4.84	4.64
Workers' effort	1.49	1.07	0.93	0.76	0.77	1.01	0.46	0.57
Manager's effort	2.07	1.74	1.88	1.40	1.28	1.27	0.87	1.03

Part I vs. Part II

As expected, wages are lower in Part II in comparison with Part I of the experiment. The average workers' (manager's) wage is 2.14 (6.36) in Part I and 1.38 (4.20) in Part II. Both comparisons yield a p-value < 0.05.¹² The decrease in wage levels is accompanied by a decrease in the average effort levels of both workers (the average effort goes from 1.08 to 0.68, p-value < 0.05) and managers (it goes from 1.59 to 1.29, p-value < 0.05). When we compare the means of wages and efforts for each of the four cases in the table (FD/MD and Private/Public) we do not find significant differences, most likely due to the small sample sizes.

¹¹ Part I of the experiment refers to the first 15 rounds when the endowment is 15 LE, and Part II refers to the last 15 rounds when the endowment is 10 LE.

¹² The mentioned p-values for the comparison of Part I and Part II refer to Wilcoxon signed ranks tests. The tests are conducted at the session level.

FD vs. MD

When we compare wages and effort levels between FD (the firm decides the workers' wages) and MD (the manager decides the workers' wages) we see that workers receive a higher average wage (2.03) when the firm sets their wages than when managers do so (1.49). The p-value is 0.016.¹³ The relatively low workers' wages in MD sessions are the result of relatively high managerial compensations in MD sessions, which narrow the manager's scope to set high workers' wages.

The same happens with the workers' average effort. Workers' effort levels are higher in FD (1.06) than in MD (0.70); with a p-value of 0.002. Nonetheless, if we consider each one of the four cases in the table separately (Private/Public and Part I/Part II), we cannot reject the equality of means for any of them. Again here the lack of significance is probably due to the low number of observations.

On the other hand, managers' wages are higher in MD (6.04) than in FD (4.52) (p-value < 0.050). However, the managers' average effort does not differ statistically between FD (1.77) and MD (1.11) sessions. Again, we do not reject the equality of means for each case separately.

Public vs. Private

When we compare the average wages and efforts of workers and managers we observe that they are higher in the private than in the public sessions. The average workers' wage (effort) is 1.80 (0.91) in private sessions and 1.72 (0.85) in public sessions. In the case of the managers, the average of the wage (effort) is 5.53 (1.52) in private sessions and 5.03 (1.36) in public sessions. Despite being higher, the differences are not statistically significant. The same holds for each of the four cases in the table.

Econometric regressions

The positive relation between own wage and effort level is corroborated by the estimates reported in the table below. Table 3 reports the average marginal effects

¹³ The mentioned p-values for the FD vs MD and Public vs Private comparisons refer to Wilcoxon rank sum test (or Mann-Whitney U test). The tests are conducted at the session level.

of an ordered logit estimation with clustered standard errors (at the subject level) where the dependent variables are the levels of effort chosen by workers and managers respectively.¹⁴ These variables can take the values 0, 1, 2, or 3. The independent variables are the own wage, the own wage squared, a dummy variable that takes the value 1 if the manager's wage is public (*Public*), a dummy variable that shows whether the observations corresponds to the second part of the experiment (*Part II*), a dummy that takes the value 1 if the manager — instead of the firm owner — sets the worker's wage (*Manager Decides*), a dummy variable that takes the value 1 if the subject is a woman (*Female*), the age, a dummy reflecting whether the subject studies economics (*Study Economics*), and the period.¹⁵ Similar estimations are traditionally used in the bilateral gift-exchange literature. The estimates of the coefficients can be found in the Appendix (Table A1).

The own wage has a significant and positive effect on the effort level, especially for workers. The higher the own wage the higher the probability that a worker chooses a positive level of effort and the lower that he chooses zero effort. For the managers, a higher own wage implies a lower probability of effort zero and a higher probability of effort equal 2 or 3. This suggests that both types of employees have “positive” social preferences such as positive reciprocal preferences. They seem to be willing to reward actions perceived as generous, kind or fair (a positive wage) even when it is costly for them (a higher effort implies a higher cost).

There exists a positive effect of *Part II* on the effort level chosen by the workers. Being in the second part of the experiment (with the firm suffering financial restrictions) increases the probability of choosing a positive level of effort, controlling for the own wage. Also for the workers, we find an age effect with older subjects choosing higher levels of effort. Subjects that study economics choose lower effort. Those effects are not found for managers. When the managers also choose the workers' wage, the probability that they choose higher effort levels decreases. For both types of subjects there is a period effect — effort decreases across rounds. The rest of the variables are not statistically significant in the determination of the effort level.¹⁶

¹⁴ Marginal effects are calculated following Karaca-Mandic et al. (2012).

¹⁵ Marginal effects for wage squared are not calculated, but its effect is considered when calculating the marginal effects of the wage.

¹⁶ If instead of clustering on subjects we cluster on sessions, we find almost the same results.

Table 3. Effort and own wage

Dependent variable: Effort	Workers			Managers				
	Pr(Effort=0)	Pr(Effort=1)	Pr(Effort=2)	Pr(Effort=3)	Pr(Effort=0)	Pr(Effort=1)	Pr(Effort=2)	Pr(Effort=3)
<i>Own Wage</i>	-0.1683***	0.0440***	0.0660***	0.0582***	-0.0331**	-0.0036	0.0099*	0.0267**
	0.016	0.008	0.009	0.008	0.013	0.003	0.005	0.011
<i>Public</i>	-0.0032	0.0006	0.0013	0.0014	0.0059	0.0005	-0.0016	-0.0054
	0.055	0.009	0.022	0.024	0.088	0.016	0.024	0.080
<i>Part II</i>	-0.1040***	0.0160**	0.0393***	0.0486***	-0.0615	-0.0110	0.0158	0.0566
	0.025	0.006	0.010	0.013	0.044	0.009	0.012	0.041
<i>Manager Decides</i>	0.0431	-0.0076	-0.0175	-0.0180	0.2292***	0.0501	-0.0674**	-0.2119**
	0.056	0.010	0.023	0.024	0.080	0.032	0.027	0.085
<i>Female</i>	-0.0610	0.0107	0.0246	0.0257	0.0616	0.0143	-0.0153	-0.0605
	0.055	0.010	0.022	0.023	0.059	0.014	0.016	0.057
<i>Age</i>	-0.0297***	0.0050**	0.0119***	0.0127***	0.0074	0.0014	-0.0020	-0.0068
	0.009	0.002	0.004	0.004	0.016	0.003	0.004	0.015
<i>Study Economics</i>	0.1072*	-0.0221	-0.0431*	-0.0420*	0.0228	0.0039	-0.0063	-0.0204
	0.058	0.014	0.023	0.022	0.135	0.021	0.039	0.117
<i>Period</i>	0.0114***	-0.0019***	-0.0046***	-0.0049***	0.0071**	0.0013*	-0.0019*	-0.0066**
	0.002	0.001	0.001	0.001	0.003	0.001	0.001	0.003
Number of observations	2880	2880	2880	2880	960	960	960	960

Note: Average marginal effect (standard error). Ordered logit estimation. *** significant at 1% level. ** significant at 5% level. * significant at 10% level.

B. Impact of managerial compensation on workers' effort

The ordered logit estimations that follow give an answer to the key question whether the managerial compensation has an impact on the workers' effort choices in public sessions. The dependent variable is the workers' effort choice, a variable that can take the values 0, 1, 2, or 3. The independent variables are the worker's wage, the manager's wage, a dummy variable that shows whether the observations correspond to the second part of the experiment (*Part II*), a dummy variable that takes the value 1 if the manager (instead of the firm owner) sets the worker's wage (*Manager Decides*), a dummy that takes the value 1 if the subject is a female, the age, a dummy variable that takes the value 1 if the subject studies economics (*Study Economics*), and the period. These regressions are run only for the public sessions.¹⁷ In Table 4 we report the marginal effects; the estimates of the coefficients can be found in the Appendix (Table A2).¹⁸

Table 4 shows that the worker's own wage has a positive effect on positive effort levels (as also seen in Table 3) while the manager's wage, on the contrary, has a negative effect on the workers' effort, i.e., the higher the manager's wage, the lower the probability that workers choose a positive effort, and the higher the probability that they choose effort equal to zero. This suggests that when the manager's wage is too high workers can feel they are not fairly treated and they are likely to shirk, i.e., the workers are also negatively reciprocal -they punish an action that leads to an unfair outcome or is driven by unfair intentions. This result is in line with our *Hypothesis 2* that says that the observation of the manager's wage influences negatively the workers' effort decisions: the higher the manager's wage, the lower the workers' effort.

¹⁷ That is why the number of observations is only half of those in Table 3. When running the regressions in the tables below for the private sessions we find, with very few exceptions, that the manager's wage does not affect the workers' effort.

¹⁸ The same happens in the following tables, in the text we present the tables with marginal effects calculated using the complete models, while the original regressions can be found in the Appendix.

Table 4. Effort level chosen by workers in public sessions

Dependent variable: <i>Workers' Effort</i>	Pr(Effort=0)	Pr(Effort=1)	Pr(Effort=2)	Pr(Effort=3)
<i>Workers' Wage</i>	-0.1619*** 0.019	0.0363*** 0.009	0.0687*** 0.013	0.0569*** 0.011
<i>Manager's Wage</i>	0.0141*** 0.005	-0.0032** 0.001	-0.0060*** 0.002	-0.0049*** 0.002
<i>Part II</i>	-0.1097*** 0.031	0.0229** 0.009	0.0444*** 0.013	0.0423*** 0.012
<i>Manager Decides</i>	-0.0657 0.078	0.0145 0.017	0.0275 0.033	0.0237 0.028
<i>Female</i>	-0.1661** 0.070	0.0384** 0.016	0.0709** 0.029	0.0568** 0.029
<i>Age</i>	-0.0412*** 0.013	0.0092*** 0.004	0.0175*** 0.005	0.0145*** 0.005
<i>Study Economics</i>	0.0331 0.078	-0.0077 0.019	-0.0140 0.033	-0.0114 0.027
<i>Period</i>	0.0116*** 0.002	-0.0026** 0.001	-0.0049*** 0.001	-0.0041*** 0.001
Number of observations	1440	1440	1440	1440

Note: Average marginal effect (*standard error*). Ordered logit estimation. *** significant at 1% level . ** significant at 5% level. * significant at 10% level.

As in Table 3, the variable *Part II* has a positive and significant effect on the effort level chosen. In the second part of the experiment the probability that workers choose effort levels 1, 2, and 3 are 0.0229, 0.0444, and 0.0423 higher than in Part I, respectively; and the probability that they choose effort = 0 is 0.1097 lower than in Part I, *ceteris paribus*. Their willingness to contribute to the firms' outcome is higher in times of financial restrictions. Moreover, the probability that females and older workers choose high effort levels is higher than that for males and younger workers, and the probability of choosing positive effort levels decreases across periods.¹⁹

Even though our experimental design cannot fully discriminate between the different possible motivations for workers to exert extra effort for higher own wages, the comparison between FD and MD sessions gives some hint on the role of reciprocal preferences. If they play an important role, it could be expected that the workers' gift — effort — is mostly higher in FD sessions when the reciprocal

¹⁹ If instead of clustering on subjects we cluster on sessions, we find almost the same results.

connection between the “Decider/Giver” (firm owner), and the worker (who receives the wage and exert effort) is more clear, than in MD sessions, where the reciprocal connection is less clear (manager decides, but receives only 20% of the gift through the bonus).

The results are not straightforward. On the one hand, as seen in section III, the “absolute” effort levels for workers in FD sessions are higher than in MD sessions. That supports the thesis of the importance of reciprocal preferences when the connection is clear, i.e., the firm owner decides (workers’ wages, however, are also higher in FD sessions). On the other hand, we find no significant impact of who is setting the worker wages in Table 4 — the variable *Manager Decides* is not significant. A reason for the lack of significance of the variable MD might be that even in these sessions workers’ wages are often *de facto* determined by the firm, since the manager can only use what is left over of the endowment to pay them.

Given that the workers’ and manager’s wages in a firm are very much correlated,²⁰ we estimate the same model for each one of the workers’ wages. In the next table we report the marginal effects of the manager’s wage on the workers’ effort for each one of the workers’ wages. The control variables are the same as in Table 4, excluding the own wage (*Workers’ Wage*).²¹ For workers’ wage levels of 2 and 3 LE (two of the three most frequently assigned wages) the impact of the managerial compensation on workers’ effort is significant and negative.^{22, 23}

It should be noted that when the workers’ wage is equal to 4 LE, the manager’s wage can be 3 LE at the most. In this case workers are overpaid relative to managers. We show the results of the estimations for two different situations: when the managers are overpaid in comparison with the workers (*Workers’ Wage* < *Manager’s Wage*) and when the opposite happens. The first situation is observed in 81% of the cases and the second one in 11% of the cases. The remaining 8% correspond to the case where the workers’ wage is equal to the manager’s wage,

²⁰ This is because the firm owner has a fixed initial endowment at his disposal to pay all the wages.

²¹ *Workers’ Wage* = 4 LE is only observed in the first part of the experiment, therefore the variable Part II is not included in the regression when the workers’ wage is 4 LE.

²² We do not report estimates for *Workers’ Wage* = 5 LE because there are not enough observations to conduct an estimation for this wage.

²³ If instead of clustering on subjects we cluster on sessions, we find very similar results when estimating the coefficients, just some changes in the significance of some variables, so the main conclusions stand.

but we do not include the results of the regression for this case because it would not be possible to discern the effect of each one of the wages.

Table 5. Effect of the manager's wage on the workers' effort

Dependent variable: <i>Workers' Effort</i>	Pr(Effort=0)	Pr(Effort=1)	Pr(Effort=2)	Pr(Effort=3)	Number of observations
<i>Workers' Wage</i> = 0	-0.0024	0.0017	0.0006	0.0001	213
<i>Workers' Wage</i> = 1	0.0142	-0.0062	-0.0050	-0.0030	387
<i>Workers' Wage</i> = 2	0.0423***	-0.0072**	-0.0187***	-0.0164**	519
<i>Workers' Wage</i> = 3	0.0568**	0.0236	-0.0442**	-0.0362**	243
<i>Workers' Wage</i> = 4	0.0198	0.0087	-0.0054	-0.0231	72

Note: Average marginal effect . Ordered logit estimation. *** significant at 1% level . ** significant at 5% level. * significant at 10% level.

Table 6 shows clearly that especially when the manager receives a higher wage than the workers — a situation that is usually observed in real firms — the manager's wage has a negative effect on the effort level chosen by the workers.²⁴

The previous tables have shown evidence that indeed the manager's wage has a negative impact on the workers' effort. Now, what we want to know is whether this effect is constant throughout the experiment or if there is a difference between the first and second part of the experiment, when the endowments fall from 15 to 10 LE. To do so we have run the regressions in Tables 4, 5, and 6 separately for Part I and Part II. Below we report a summary of the results in Tables 7, 8, and 9.

²⁴ Very similar results are found if instead of clustering on subjects we cluster on sessions, just some minor changes in the significance of some variables.

Table 6. Workers' effort levels and pay differentials

Dependent variable: Workers' Effort	Workers' Wage < Manager's Wage			Workers' Wage > Manager's Wage				
	Pr(Effort=0)	Pr(Effort=1)	Pr(Effort=2)	Pr(Effort=0)	Pr(Effort=1)	Pr(Effort=2)	Pr(Effort=3)	
Workers' Wage	-0.1430***	0.0370***	0.0604***	0.0456***	-0.0984***	-0.0369**	0.0546**	0.0807**
	0.032	0.012	0.017	0.011	0.038	0.019	0.022	0.033
Manager's Wage	0.0300***	-0.0078***	-0.0126***	-0.0096**	0.0321	0.0120	-0.0178	-0.0263
	0.009	0.003	0.004	0.004	0.035	0.013	0.019	0.028
Part II	-0.0398	0.0101	0.0166	0.0131	-0.0911	-0.0291	0.0397	0.0805
	0.043	0.012	0.018	0.014	0.081	0.023	0.029	0.075
Manager Decides	-0.0518	0.0134	0.0217	0.0167	-0.0695	-0.0315	0.0387	0.0624
	0.083	0.022	0.035	0.026	0.086	0.045	0.046	0.086
Female	-0.1805**	0.0490**	0.0763**	0.0551*	-0.1180	-0.0465	0.0704	0.0941
	0.074	0.020	0.031	0.029	0.085	0.040	0.056	0.068
Age	-0.0429***	0.0111***	0.0181***	0.0137***	-0.0211	-0.0079	0.0117	0.0173
	0.012	0.004	0.005	0.005	0.020	0.008	0.011	0.016
Study Economics	0.0486	-0.0132	-0.0204	-0.0150	-0.0644	-0.0262	0.0355	0.0550
	0.084	0.024	0.035	0.025	0.082	0.042	0.047	0.078
Period	0.0105***	-0.0027**	-0.0044***	-0.0034***	0.0133***	0.0050**	-0.0074**	-0.0109***
	0.002	0.001	0.001	0.001	0.004	0.002	0.003	0.004
Number of observations	1164	1164	1164	1164	159	159	159	159

Note: Average marginal effect (standard error). Ordered logit estimation. *** significant at 1% level. ** significant at 5% level. * significant at 10% level.

Table 7. Effort level chosen by workers in public sessions - by endowment

	Pr(Effort =0)	Pr(Effort =1)	Pr(Effort =2)	Pr(Effort =3)
Part I	0.0147** 0.006	-0.0013 0.001	-0.0067** 0.003	-0.0067** 0.003
Part II	0.0158** 0.007	-0.0052** 0.003	-0.0065** 0.003	-0.0042* 0.002

Note: Marginal effect of the manager's wage (standard error). Ordered logit estimation. *** significant at 1% level . ** significant at 5% level. * significant at 10% level.

Table 8. Effect of the manager's wage on the workers' effort- by endowment

Dependent variable: Workers' Effort	Pr(Effort =0)	Pr(Effort =1)	Pr(Effort =2)	Pr(Effort =3)	Number of observations
Part I					
Workers' Wage = 0	0.0098	-0.0070	-0.0028		
Workers' Wage = 1	0.0058	-0.0026	-0.0021	-0.0012	150
Workers' Wage = 2	0.0451***	-0.0084**	-0.0189***	-0.0178**	246
Workers' Wage = 3	0.0458**	0.0200	-0.0313*	-0.0345*	192
Workers' Wage = 4	0.0198	0.0087	-0.0054	-0.0231	72
Part II					
Workers' Wage = 0	-0.0015	0.0010	0.0004	0.0001	159
Workers' Wage = 1	0.0336**	-0.0139*	-0.0121*	-0.0076	237
Workers' Wage = 2	0.0398	-0.0064	-0.0181	-0.0153	273
Workers' Wage = 3	0.3143**	0.0662	-0.3438***	-0.0368	51
Workers' Wage = 4					

Note: Average marginal effect . Ordered logit estimation. *** significant at 1% level . ** significant at 5% level. * significant at 10% level.

Table 9. Workers' effort levels and pay differentials - by endowment

	Workers' Wage < Manager's Wage				Workers' Wage > Manager's Wage			
	Pr(Effort=0)	Pr(Effort=1)	Pr(Effort=2)	Pr(Effort=3)	Pr(Effort=0)	Pr(Effort=1)	Pr(Effort=2)	Pr(Effort=3)
Part I	0.0312*** 0.010	-0.0043* 0.002	-0.0148*** 0.005	-0.0121** 0.005	0.0145 0.032	0.0067 0.015	-0.0034 0.008	-0.0178 0.039
Part II	0.0337*** 0.013	-0.0114** 0.005	-0.0132*** 0.005	-0.0090* 0.005	0.1674 0.114	0.0112 0.041	-0.1413 0.089	-0.0373 0.025

Note: Marginal effect of the manager's wage (standard error). Ordered logit estimation. *** significant at 1% level . ** significant at 5% level. * significant at 10% level.

According to the tables above we do not find evidence that supports our third hypothesis, i.e., we cannot say that the manager's wage affects in a different way the workers' effort in the second part of the experiment.

In summary, we find support for:

- (i) *Hypothesis 1*: There exists a strong positive relation between own wage and effort levels for the workers, i.e., the higher the own wage, the higher the effort, while the manager's effort reaches a maximum for intermediate wages and decreases for very high own wages.
- (ii) *Hypothesis 2*: Workers' effort decisions are negatively influenced by the manager's wage.

IV. Conclusions

Evidence from opinion polls shows that a significant majority of the people dislike high managerial compensations, and many research papers show that workers are more likely to perform above any minimum requirements if they feel fairly treated and have been paid a fair wage. However, experimental data about how managerial compensation affects the working performance of lower-rank employees is not very common. Our aim was to provide this evidence. We explored in a two-level gift-exchange experiment whether the managerial compensation influences workers' effort decisions. Our experimental results indicate that workers' effort decisions are negatively correlated with the manager's wage. This suggests that vertical comparisons influence the choice of an effort level by the workers.

This behavior may be explained by the fact that workers exhibit social preferences such as inequity-aversion and/or negative reciprocity. Both types of preferences would cause workers to react negatively to a high difference between their own wage and the manager's wage.

On the one hand, rising managerial compensation has a positive incentive effect on the effort of the manager up to a certain level, but on the other hand, rising inequality can have a negative incentive effect on workers' effort because of workers' fairness considerations. Knowledge about the interplay of the two effects is very important when creating an efficient compensation policy in firms. A beneficial pay policy will always depend on the relative significance of these two effects. Opinion polls conducted on a regular basis among the firm's own workers could be especially helpful for assessing the acceptance of the managerial compensation system by the firm's own personnel.

Appendix

Table A1. Effort and own wage: original regressions

Dependent variable: Effort	Workers						Managers					
	(I)	(II)	(III)	(IV)	(V)	(VI)	(I)	(II)	(III)	(IV)	(V)	(VI)
Own Wage	1.3885***	1.3967***	1.3935***	1.3130***	1.3905***	1.3537***	0.4273***	0.4142***	0.3932**	0.4491***	0.4630***	0.4624***
Own Wage Squared	0.145	0.150	0.150	0.154	0.161	0.168	0.132	0.131	0.136	0.145	0.144	0.146
Public	-0.1380***	-0.1375***	-0.1525***	-0.1421***	-0.1518***	-0.1427***	-0.0285***	-0.0277***	-0.0282***	-0.0267***	-0.0271***	-0.0275***
Part II	0.033	0.036	0.035	0.034	0.034	0.036	0.009	0.008	0.008	0.008	0.008	0.008
Manager Decides	-0.0100	-0.0100	-0.0105	-0.0080	0.0308	0.0163		-0.1638	-0.1725	-0.1197	-0.0250	-0.0321
Female	0.272	0.271	0.271	0.272	0.274	0.277		0.434	0.432	0.430	0.475	0.476
Age	-0.2804***	-0.3059***	-0.3032***	0.5481***				0.3950**	-0.2439	-0.2290	0.3379	0.3379
Study Economics	0.107	-0.306	0.111	0.145				0.185	0.204	0.204	0.248	0.248
Period	-0.2616	-0.2169	-0.2136					-1.2189***	-1.2358***	-1.2324***		
Number of observations	0.280	0.275	0.278	0.3054	0.3061			0.426	0.470	0.470	0.470	0.470
Prob > chi2	0.272	0.275	0.275	0.1479***	0.1485***			-0.3517	-0.3446	0.324	0.324	0.324
	0.046	0.046		0.046	0.046			-0.0401	-0.0401	0.086	0.087	0.087
	-0.5307*	-0.5354*		0.287	0.290			-0.1274	-0.1225	0.715	0.717	0.717
	-0.0569***	0.009						-0.0387**	0.016			
	2880	2880	2880	2880	2880	2880	960	960	960	960	960	960
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0037	0.0093	0.0000	0.0000	0.0000	0.0000

Note: Coefficients (robust standard error). Ordered logit estimation. *** significant at 1% level. ** significant at 5% level. * significant at 10% level.

Table A2. Workers' effort in public sessions: original regressions

Dependent variable: <i>Workers' Effort</i>	(I)	(II)	(III)	(IV)	(V)
<i>Workers' Wage</i>	0.8551*** 0.093	0.7806*** 0.094	0.8201*** 0.120	0.9071*** 0.119	0.8715*** 0.121
<i>Manager's Wage</i>	-0.0231 0.023	-0.0496** 0.024	-0.0535** 0.024	-0.0573** 0.025	-0.0757*** 0.026
<i>Part II</i>		-0.2833* 0.147	-0.2620* 0.149	-0.2456 0.163	0.6196*** 0.190
<i>Manager Decides</i>			0.3015 0.424	0.3457 0.426	0.3579 0.432
<i>Female</i>				0.8760** 0.363	0.8869** 0.368
<i>Age</i>				0.2197*** 0.073	0.2216*** 0.074
<i>Study Economics</i>				-0.1775 0.414	-0.1782 0.422
<i>Period</i>					-0.0622*** 0.012
Number of observations	1440	1440	1440	1440	1440
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000

Note: Coefficients (*robust standard error*). Ordered logit estimation. *** significant at 1% level . ** significant at 5% level. * significant at 10% level.

Table A3. Workers' effort in public sessions by wage: original regressions

Dependent variable: <i>Workers' Effort</i>	<i>Workers'</i> <i>Wage = 0</i>	<i>Workers'</i> <i>Wage = 1</i>	<i>Workers'</i> <i>Wage = 2</i>	<i>Workers'</i> <i>Wage = 3</i>	<i>Workers'</i> <i>Wage = 4</i>
<i>Manager's Wage</i>	0.0308 0.081	-0.0689 0.057	-0.2109*** 0.061	-0.3675** 0.163	-0.1380 0.255
<i>Part II</i>	0.7072 0.869	0.2550 0.373	0.5928 0.419	-1.2525 1.016	
<i>Manager Decides</i>	-0.7952 0.735	0.5710 0.595	0.4017 0.463	0.2119 0.571	0.3260 0.664
<i>Female</i>	0.6140 0.519	1.0934** 0.521	1.0825** 0.445	0.3544 0.520	1.0486* 0.621
<i>Age</i>	0.1622 0.129	0.1936 0.121	0.2642*** 0.068	0.2290*** 0.079	0.1280 0.141
<i>Study Economics</i>	-0.6766 0.677	-0.4698 0.534	-0.1632 0.498	-0.0620 0.592	0.7441 0.627
<i>Period</i>	-0.0469 0.064	-0.0559*** 0.019	-0.0736*** 0.019	-0.0405 0.026	-0.1262*** 0.041
Number of observations	213	387	519	243	72
Prob > chi2	0.5919	0.0073	0.0000	0.0000	0.0388

Note: Coefficients (*robust standard error*). Ordered logit estimation. *** significant at 1% level . ** significant at 5% level. * significant at 10% level.

Table A4. Workers' effort in public sessions by pay differentials: original regressions

Dependent variable: Workers' Effort	Worker's Wage < Manager's Wage	Worker's Wage > Manager's Wage
Workers' Wage	0.7613*** 0.177	0.6616*** 0.256
Manager's Wage	-0.1594*** 0.050	-0.2158 0.230
Part II	0.2149 0.237	0.6365 0.582
Manager Decides	0.2779 0.447	0.4879 0.631
Female	0.9496** 0.390	0.7864 0.570
Age	0.2286*** 0.071	0.1421 0.132
Study Economics	-0.2588 0.447	0.4409 0.614
Period	-0.0560*** 0.013	-0.0893*** 0.027
Number of observations	1164	159
Prob > chi2	0.0000	0.0000

Note: Coefficients (*robust standard error*). Ordered logit estimation. *** significant at 1% level . ** significant at 5% level. * significant at 10% level.

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