

Distributional Concerns in Compensation Schemes: An Experiment.

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Abstract

An equal treatment of workers when an employer rewards them is one of the most controversial topics in organizational management. In this paper, we study how principals reward their workers in an environment characterized by contractual incompleteness. We use a gift exchange game in the experiment, where every principal is matched with two agents. Our design includes three scenarios: 1) different productivities among agents; 2) pay secrecy; 3) different cost of effort among agents. We show that the level of information agents receive does not affect compensation differences among agents. This is not in line with the notion that agents' equity concerns are an explanation to apply some pay policies such as pay secrecy or pay compression. We also find that principals do not always pay more to the agent that produce more but most of times they pay more to the agent that exerts higher effort. This suggests that effort is an important issue when firms decide payments.

Keywords: equity, gift exchange game, experiment, effort, productivity, pay secrecy.

1. Introduction

1.1 Motivation

The aim of this paper is to analyze how principals pay to their agents knowing the level of effort of every agent when agents differ in productivity levels or in cost of effort. We use three different treatments to study principals' behavior. There is contractual incompleteness in all the three treatments. Each one of them is a modified version of the gift exchange game developed by Fehr, Kirchsteiger and Riedl (1993). First, agents decide their effort level. After that decision, principals have to choose a compensation for each agent knowing their effort levels.

We design this experimental timing because we want to study which equity concerns principals apply when they reward the agents. We define this compensation as a discretionary bonus.

A discretionary bonus is a monetary award, out of the salary contracted by the employee with the employer, which an employer gives to an employee just by choice after the employee has finished a specific work. This bonus cannot be contracted or earned through any specific way. This payment cannot be demanded or even expected by the employee. Some employers publicize this type of bonus to motivate their employees but maybe they will not receive the bonus because it is not in the contract (Suvorov & van de Ven, 2006). In this case we could consider this promise as an implicit contract.

Most of firms have various hierarchical layers. In these firms, many employees use to work in the same hierarchical layer. In this case, we should think in two important fairness concerns: vertical fairness and horizontal fairness. Vertical fairness means that payoffs are compared between different layers. By horizontal fairness we mean that employees compare their own payoff with the payoffs of other workers in the same layer (Güth, Königstein, Kovács & Zala-Mező, 2001). In our experiment we have two hierarchical layers. On the one hand, we have the principal, and on the other hand, we have the group of agents. We can analyze both vertical and horizontal fairness, but our work is focused on horizontal fairness.

In many jobs, some workers have better skills to perform a certain task than others. Therefore, those workers are more productive than their coworkers. Most of the firms

use to pay to their workers only by their production and they do not take their effort into account.

We want to know if principals pay more attention to the agents' effort level or to the agents' production, when the agents have different productivities, when they reward them.

We design our Baseline treatment to study this question. In this treatment every principal is matched with two agents. Agents differ in their productivity levels. At the end of each period every player knows the effort level, the production level and the compensations of every agent and the payoff of every player.

Mostly in the west countries, many firms apply a pay secrecy policy when they reward to their workers. When a firm uses this policy, the workers only know their own salary. They do not have any information about the wage of their coworkers. Actually, in some of those firms, it is forbidden to speak about salaries with the others workers. This pay policy allows to the firms to increase wage differences among workers. The workers cannot complaint about those differences because they do not know how large those differences are (Colella, A., Paetzold, R. L., Zardkoohi, A. & Wesson, M. J., 2007).

We also want to know if principals increase compensation differences when their agents only have information about their own compensation.

To study that question, we design the No Compensation Information (NCI) treatment. This treatment is the same as the Baseline but at the end of each period the agents do not receive any information about the other players.

In some neighborhoods is easier to sell a certain product or service than in other neighborhoods. Many firms have workers with similar skills working in both types of zones. It is more costly to reach a certain level of production for a worker in the neighborhood where is more difficult to sell the product than for a worker in the neighborhood where is easy to sell this product, even when they exert the same effort.

Finally, we analyze how the principals reward the agents when they have different cost of effort. By different cost of effort we mean that for one agent is more costly to exert a certain level of effort than for the other agent to exert the same level of effort.

We design the Different Cost of Effort (DCE) treatment to study this issue. Here, the agents have the same productivity level but they differ in the effort cost. At the end of each period every player has complete information about efforts, production levels, compensations and payoffs of every player.

The main findings of our experiment are as follows. First, high productivity agents receive a higher compensation than low productivity agents for the same effort level in both the Baseline and the NCI treatments. Second, principals compensate the effort cost differences among agents in the DCE treatment paying more to high effort cost agents than low effort cost agents for the same level of effort. Third, principals earn much more than agents in all three treatments. Finally, there are no strong differences in the principals' decisions when wages are not observable compare with the principals' decisions when wages are observable.

1.2 Literature Review

In this section, we firstly present works that demonstrate that fairness concerns matter in people's economic preferences. After those papers, we talk about the first authors that they researched about equity concerns. We finally present experimental papers whose authors include agents with different productivities in their designs, and papers in which experimental design agents move first as in our design.

Nowadays, fairness is an important issue for researchers in the experimental economics field. Experimenters use different laboratory experiments to study fairness preferences of individuals. Dictator games (Cappelen, Hole, Sorensen & Tungodden, 2007), ultimatum games (Kagel & Wolfe, 2001) and public good games (Fehr & Gächter, 2000) among others games have been used to study fairness preferences. All of these works find that most of people do not behave completely selfishly, and they share gains with other individuals when standard economic theory states that they should give zero to them. Almost all economics models assume that people only care about their own interest and they do not take care about others, this is true for some people but not for all the people. Bolton and Ockenfels (2000) design a model which explains that people behavior is motivated by their own payoff but also by their relative payoff. A lot of

experimental observations are consistent with this fairness model¹ (Bolton & Zwick, 1995; Slonim & Roth, 1998).

Equity began to be studied in psychology and sociology (Homans, 1961; Adams, 1965; Andrews, 1967). The main finding of this literature has been the general equity principle (Adams, 1965), which states that the ratio of outcomes to inputs should be equal for every individual. We use this equity principle in our analysis. We want to know if principals only use this equity concern or not.

The first economics work that uses the equity principle is Selten (1978). In economics there are many justice theories.² Each justice theory describes people's fairness preferences in a different way. Justice theories are well described in (Konow, 2003). In this paper, the author makes a normative analysis of leading theories of justice.

In the empirical literature there are works that analyze individuals' behavior when they have different levels of information about the other individuals. Charness and Kuhn (2007) design a gift exchange game where a principal is matched with two agents with different productivity levels. Effort and wages are not contractible. In their experiment the principal chooses the wages and then the agents choose the level of effort. Agents have little information about their peers, for example they do not know productivity levels, only the principal knows them. They analyze agents' behavior when they can observe coworkers' wages and when they cannot observe coworkers' wages. They find that coworkers' wages do not affect agents' decisions. Similar to them, we analyze principals' behavior in the same two information situations but in a different production situation.

The work of Güth et al. (2001) is also related to our paper. In their experiment they analyze principals' behavior when effort is observable and when effort is not observable. In their design a principal is matched for the whole experiment with the same two agents who differ in productivities. First, the principal offers a contract to every agent and they can accept the contract or not. If any of them do not accept, both the agent and the principal receive zero. They find that the principal offers more

¹ Fehr and Schmidt (1999) also design an inequity aversion model which includes social preferences of individuals when they take economic decisions.

² Egalitarianism, Utilitarianism, Marxism and the Equity Principle among others.

asymmetric contracts when contracts are not observable than when contracts are observable.

Equity has been also studied from the point of view of agents' equity concerns. In this line, Abeler, Altmann, Kube and Wibral (2010) use a similar design to our design to analyze the behavior of agents when the principal has to pay the same to each agent and when the principal may choose a different wage for each agent. Here one principal is matched with two agents with equal abilities. Agents move first and then the principal pays them. They find that agents exert more effort when the principal can choose a different wage for each agent. They demonstrate that pay equality is not a good way to incentivize workers.³

Our design is a mix between this design and the design of Charness and Kuhn (2007) because we have two agents with different productivities and they move first in the game. Furthermore, we also use a secrecy treatment.

Schneider and Kube (2006) use a similar design to Abeler et al. (2010) to analyze if personal relationships produce wage differences between workers. In their design, one principal is matched with two agents. In each firm, the principal and one agent are friends in the real life while the other agent is a stranger individual that is matched anonymously to the principal. They compare wages secrecy with public wages like we do in our experiment. They find that personal relationships do not create wage differences between agents in none of the treatments.

Equity is also studied in team experiments.⁴ In their work, Meidinger, Rulli  re and Villeval (2001), design an experiment analyzing agents' decisions when teams are homogeneous and when teams are heterogeneous.⁵ Agents' payoff depends on both own performance and the team performance. They find that when the teams are heterogeneous much free-riding occurs. When the teams are homogenous there is much more coordination and they achieve more efficient payoff.

³ Lazear (1989) also demonstrates that pay equality leads to a lower efficient result than others pay schemes.

⁴ In team experiments the final income of every player depends, completely or partially, on the performance of the whole group.

⁵ When teams are homogeneous all the agents have the same productivity and when teams are heterogeneous the agents have different productivities.

The paper is structured as follows. In the next section we describe the experimental design and discuss theoretical predictions. In section 3 we present our results and we discuss them. Finally, we conclude in section 4.

2. The experiment.

2.1 Design and procedures

The experimental design consists of three treatments: the Baseline, the No Compensation Information treatment and the Different Costs of Effort treatment. Each of them is a modified version of the gift-exchange game introduced by Fehr et al. (1993). All three treatments differ in two aspects with respect to Fehr et al.'s setup. First, in our experiment agents move first. Our move order allows the principal to base her compensation decision on the actually exerted effort or the production level and we can consider that compensation as a discretionary bonus. Second, a principal in our experiment is matched with two agents instead of one.⁶

Baseline: In the baseline design, one principal is matched with two agents. The subjects play a two-stage game. In the first stage, agents decide simultaneously how much effort they want to provide. Exerting effort is costly for the agents. The range of effort choices is from 1 to 10 and is associated with a convex cost function displayed in Table 1. Agents are independent and they have different productivities.⁷

Effort level e_i	1	2	3	4	5	6	7	8	9	10
Cost of effort $C(e_i)$	0	1	2	4	6	8	10	13	16	20

Table 1: *Cost of effort (baseline and NCI treatments).*

In the second stage, after observing the level of effort, the production and the cost of effort of every agent, the principal chooses a different (or equal) compensation for every agent. The compensation has to be between 0 and 100. Neither efforts nor compensations are contractible. At the end of every round, the principal and the two agents are informed about efforts, compensations and the payoffs in this round for all

⁶ For convenience, we will consider in the paper the principal as female and the agents as males.

⁷ Productivity of agent A is fourteen times his level of effort and productivity of agent B is seven times his level of effort.

three players. The payoff functions⁸ for every player are shown in Table 2. We design this Baseline treatment to test if principals only reward to their workers by the production level or they also take effort into account.

Payoff Principal	$\pi_P = 14(e_A) + 7(e_B) - (w_A + w_B)$
Payoff Agent i	$\pi_{A_i} = w_i - C(e_i)$

Table 2: *Payoffs of players (baseline and NCI treatments).*

No Compensation Information: The only difference from the Baseline is the information agents receive. In this treatment agents receive information only about their own level of effort, production and payoffs. They do not have any information about the level of effort, production or payoffs of their coworkers and about their principal payoffs either. We design this treatment to test if principals increase compensation differences when the agents cannot observe their coworkers' compensation as some authors say (Lazear, 1989; Colella et al., 2007).

Different Cost of Effort: this treatment is the same as the Baseline but differs in two aspects. First, agents have different cost of effort. As in the Baseline treatment, the range of effort choices is from 1 to 10 and is associated with a convex cost function but the cost of effort for the agent B is twice than the cost of effort for the agent A. Table 3 shows the cost of effort associated to every level of effort.

Effort level e_i	1	2	3	4	5	6	7	8	9	10
Cost of effort $C_A(e_i)$	0	1	2	4	6	8	10	13	16	20
Cost of effort $C_B(e_i)$	0	2	4	8	12	16	20	26	32	40

Table 3: *Cost of effort (DCE treatment)*

Second, agents are equally productive.⁹ The payoff functions for every player in this treatment are shown in Table 4. We design this treatment to test if the principals give an

⁸ Where P denotes the principal, A_i denotes the agents, e_A and e_B denote the level of effort of every agent, w_A and w_B denote the wages the principal chooses for every agent, $i = A, B$ and $C(e_i)$ denotes the cost of effort.

⁹ The production of every agent is fourteen times his level of effort.

extra reward to those agents who have a highest cost of effort to compensate the income differences.

Payoff Principal	$\pi_P = 14(e_A) + 14(e_B) - (w_A + w_B)$
Payoff Agent i	$\pi_{A_i} = w_i - C_i(e_i)$

Table 4: *Payoffs of players (DCE treatment).*

The game is played for twelve rounds.¹⁰ We used a stranger design to abstract from reputation or cooperation effects.¹¹ At the beginning of each period, principals and agents were re-matched anonymously and randomly within a matching group. A matching group consists in seven principals and fourteen agents, seven agents of each type.¹² This design allows us to study the pay of discretionary bonus as an altruistic award not as an incentive, because the relationship between the principal and the agents ends after the payment. All subjects stayed in his or her assigned role throughout the entire experiment. After the last round, subjects answered a short post-experimental questionnaire. The experiment was conducted in a labor market framing, i.e., agents were called “workers” and principals were called “employers” (Charness & Kuhn, 2007; Abeler et al., 2010). All of this was common information for all the subjects.

The experiment was conducted at the Universitat Autònoma of Barcelona with 120 subjects, who were recruited using the online recruitment system ORSEE (Greiner, 2004). All sessions were conducted in the lab in June 2013, using Z-Tree software (Fischbacher, 2007). No one participated in more than one treatment or session. We ran two sessions for each treatment (four sessions of 21 subjects and two sessions of 18 subjects). Points earned were converted as an exchange rate of 0.01 Euro/point. Subjects also received a show-up fee of 5 Euro. Every session lasted approximately 80 minutes. On average, every subject earned 10 Euro.

¹⁰ We use twelve rounds to avoid participants to get bored and them to lose interest about their decisions.

¹¹ Cooperation effects arise when the same people play the same game together for all the periods, people could learn each other behavior and cooperate after playing some rounds.

¹² Every matching group has seven agents with high productivity (type A) and seven agents with low productivity (type B). In two sessions the matching group consists in 6 players of every role due to a problem with the recruitment schedule.

	Agents' productivity	Agents' effort cost	Agents' information
Baseline	Different	Equal	Complete
No Compensation Information	Different	Equal	Own
Different Cost of Effort	Equal	Different	Complete

Table 5: *Treatments summary.*

2.2 Theoretical predictions

Efficiency is determined by the level of effort provided by the agents. It is maximized if both agents choose the highest possible level of effort. However, the subgame perfect equilibrium to this game is not efficient. According to standard reasoning, if players are rational and selfish the principal will not pay anything to the agents because compensations reduce her monetary payoff. Anticipating this, both agents will exert the minimum level of effort. The finite repetition of this game in randomly re-matched groups does not change this standard prediction. The subgame perfect equilibrium is the same for all three treatments. If all subjects were rational and selfish we should expect no difference between treatments. However, in laboratory experiments, it is well known that much more cooperation occurs.

3. Experimental results and discussion.

In this section we present the results of the analysis of our experimental data. We begin our analysis by presenting, a summary of the average compensations, effort levels, production levels and profits in our treatments. These data are aggregated by treatment, and they are shown in Table 6. We discuss these data below; we also provide detailed discussion by treatment. Finally, we compare the results of every treatment.

Looking at the summary table, we can observe that the principals are not selfish and they pay more than zero to their agents, when standard economic theory predicts no payment at all for every agent. We may state that our data do not support this economic prediction.

	Baseline	NCI	DCE
Agent A effort	7.08	6.23	7.33
Agent B effort	6.98	7.09	6.44
Agent A production	99.08	87.23	102.58
Agent B production	48.88	49.63	90.10
Agent A compensation	32.84	31.93	42.04
Agent B compensation	25.04	29.81	40.17
Agent A income	21.39	22.76	30.20
Agent B income	14.05	18.16	20.85
Principal profit	90.08	75.12	110.47

Table 6: *Summary of behavior.*

We can also see that when agents cannot observe other individuals' decisions, low productivity agents exert more effort, on average, than high productivity agents. It is statistically significant (Mann-Whitney test: $p < 0.001$). By contrast, low productivity agents exert less effort, on average, than high productivity agents in the Baseline treatment. However, this difference is not statistically significant (Mann-Whitney test: $p = 0.362$). This could be an explanation of the decrease of compensation differences between agents in the NCI treatment.

Surprisingly, we can observe that, on average, the compensation difference between agents in the DCE treatment is very low, even when the low effort cost agents exert more effort, on average, than the high effort cost. This effort difference is significant (Mann-Whitney test: $p < 0.001$).

Now, we provide a deeper analysis of these results analyzing our data treatment by treatment.

Baseline treatment

In this treatment we can see that both the high productivity agent and the low productivity agent exert similar levels of effort (7.08 and 6.98 respectively). These effort levels are not statistically different between agents but they are significantly different from 0. However, principals pay more to more productive agents. The average

compensation is 32.84 for high productivity agents and 25.04 for low productivity agents. This compensation difference is significant (Mann-Whitney test: $p = 0.003$). We analyze the data by period to see more clearly the difference between compensations and the absence of difference in effort levels. We present average levels of effort by period in Figure 1 and average compensations in Figure 2 for both high productivity agents and low productivity agents. We can see that the average level of effort of both agents does not change over time and it is almost the same for both the high productivity and the low productivity agents. We can also see that principals pay more to high productivity agents as we stated above. This difference should be due to the existence of different productivity levels among agents for the same level of effort. High productivity agents produce twice what low productivity agents produce when they exert the same effort by design. However, principals do not pay twice to high productivity agents when they choose the same effort than low productivity agents.

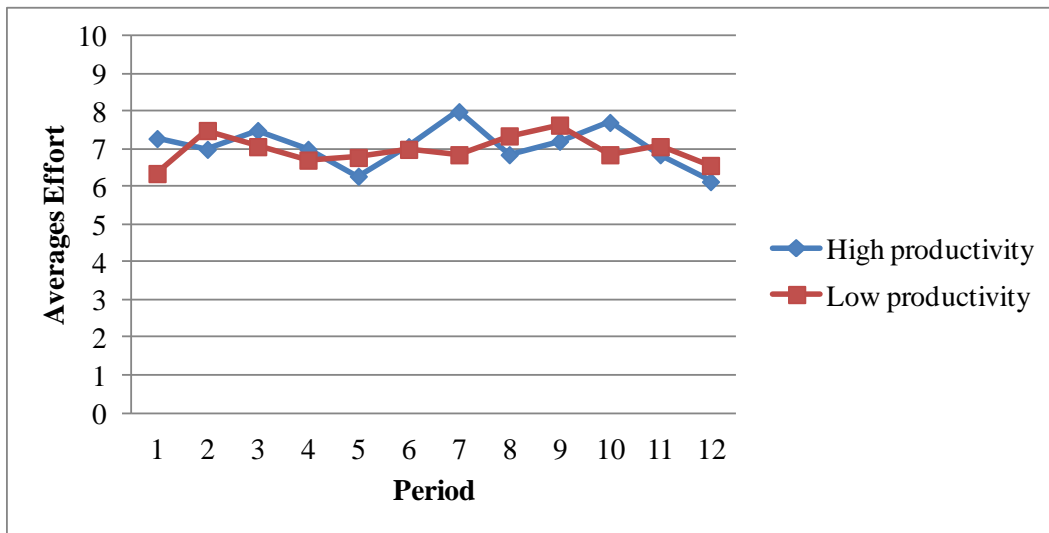


Figure 1: Average effort per period (Baseline). The effort is aggregated per period over all sessions.

We can state that the level of production matters when the principals choose compensations but principals do not pay double to agents that produce twice than their peers.

Analyzing earnings distribution we can see that principals earn, on average, more than four times than high productivity agents and more than six times than low productivity agents. Principals earn 90.08 experimental points, high productivity agents earn 21.39 and low productivity agents earn 14.05 experimental points on average.

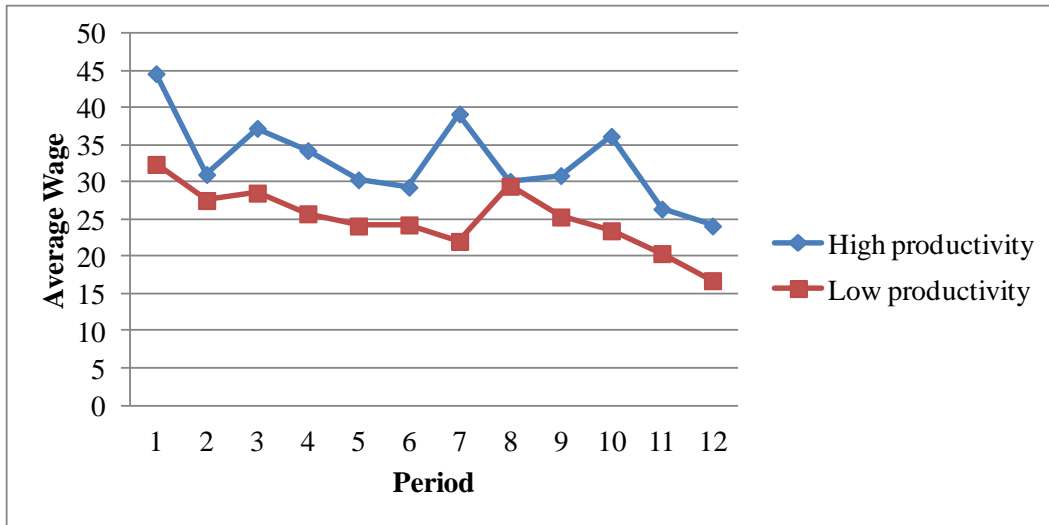


Figure 2: Average compensations per period (Baseline). Compensations are aggregated per period over all sessions.

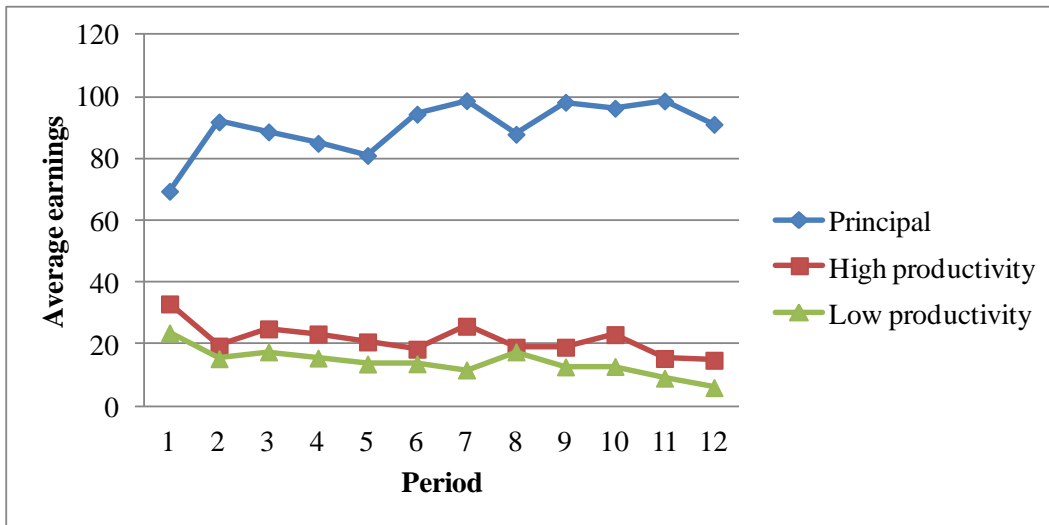


Figure 3: Average earnings for each player by period (Baseline).

We analyze the earnings distribution period by period, and we see that these differences increase over time (Figure 3).

Principals use their advantageous position to extract a high stake for themselves from the total production.¹³ And they divide unevenly the rest of the production between the two agents. High productivity agents receive more than low productivity agents as we said above.

¹³ Principals play as second player knowing agents' choices.

No Compensation Information treatment

In this treatment, in which agents only have information about their own effort, production, compensation and payoff, the average level of effort exerted by the low productivity agents (7.09) is higher than the average level of effort exerted by the high productivity agents (6.23). Principals pay more, on average, to high productivity agents (31.93) than they pay to low productivity agents (29.81). But this difference is not significant (Mann-Whitney test: $p = 0.454$). Low productivity agents alleviate the compensation difference by increasing their effort if we compare with the results of the Baseline treatment. It could be due to low productivity agents that anticipate principals' behavior when principals pay them.

We analyze the data period by period to see efforts' trend (Figure 4), compensations' trend (Figure 5) and earnings distribution's trend (Figure 6). We can see that the level of effort of both high productivity agents and low productivity agents is almost constant but with a slightly increasing trend. In contrast with the Baseline treatment, low productivity agents, on average, exert more effort than high productivity agents in all periods. In periods where effort difference is low, principals pay more to high productivity agents even being this difference in favor of low productivity agents.

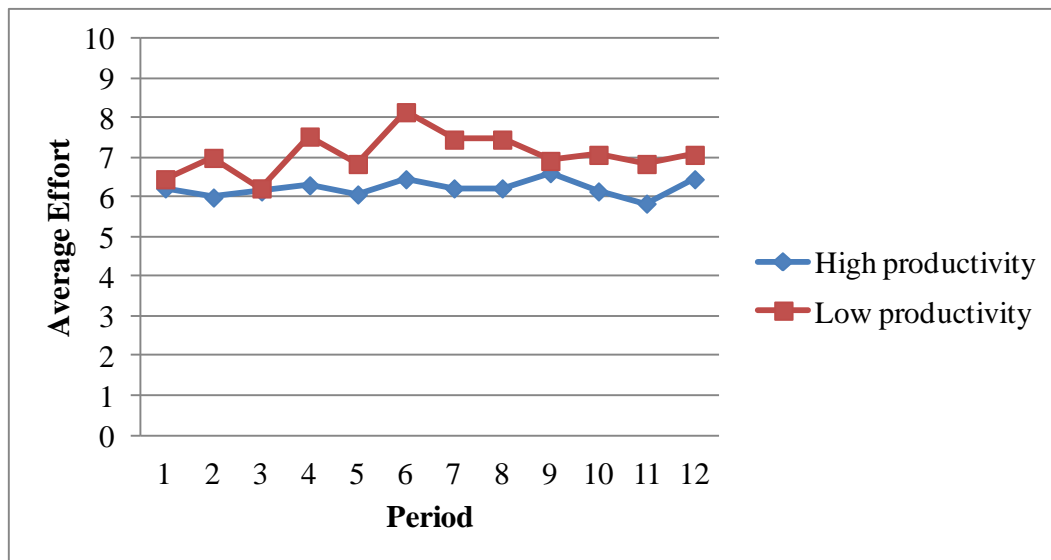


Figure 4: Average effort per period (NCI). The effort is aggregated per period over all sessions.

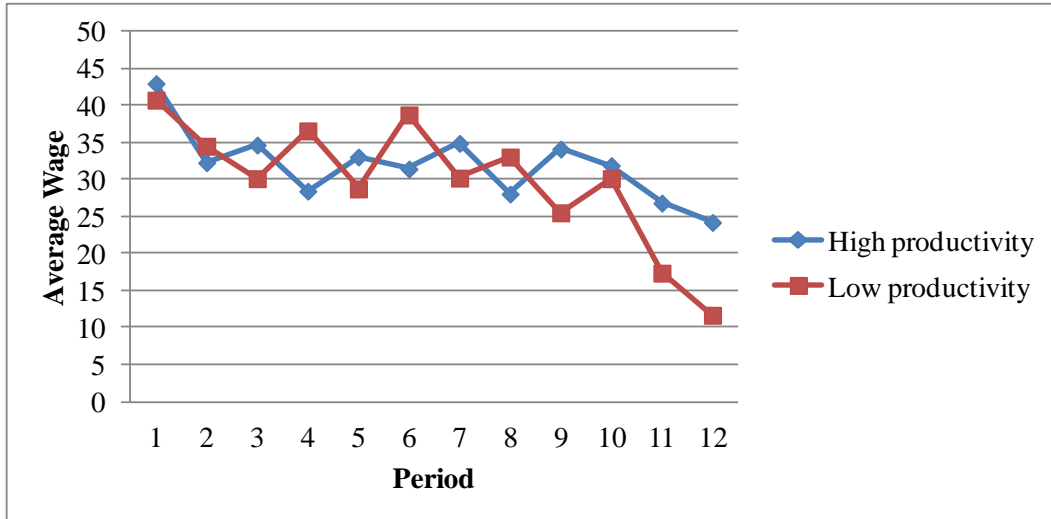


Figure 5: Average compensations per period (NCI). Compensations are aggregated per period over all sessions.

In periods where effort difference is high, principals pay more to low productivity agents. This should be due to the existence of different productivities among agents. Compensations for both the two types of agent decrease over time. This decrease is only significant for low productivity agents (Wilcoxon test for periods 1-6 against periods 7-12: $p = 0.217$, and $p < 0.001$, for high productivity agents and low productivity agents, respectively). It happens the same in the Baseline ($p = 0.162$, and $p = 0.003$, for high productivity agents and low productivity agents, respectively).

In terms of earnings, principals extract, on average, more than 60% of the total production (75.12 experimental points).

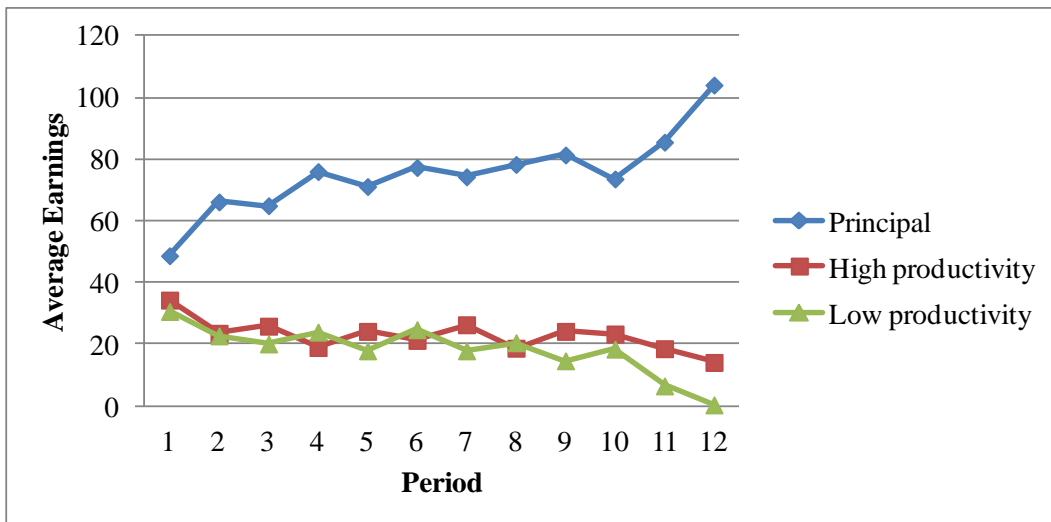


Figure 6: Average earnings for each player by period (NCI).

Principals distribute the remaining production between both the high productivity agents (22.76) and the low productivity agents (18.16). Principals' earnings increase over time (Wilcoxon test for periods 1-6 against periods 7-12: $p < 0.001$) while agents' earnings decrease over time. This is significant only for low productivity agents (Wilcoxon test for periods 1-6 against periods 7-12: $p = 0.182$, and $p < 0.001$, for high productivity agents and low productivity agents, respectively). It should happen because the principals choose the agents' compensations knowing their level of effort.

Different Cost of Effort

In this treatment, in which agents are equally productive but half of them have a higher cost of effort, agents with less cost of effort exert more effort (7.33) than agents with high cost of effort (6.44). This difference can be due to the difference in cost that exists between agents, it can be also due to low effort cost agents that anticipate principals' behavior when they reward them. Compensations are similar between both the two types of agent (Mann-Whitney test: $p = 0.583$), 42.04, on average, for the low cost of effort agents and 40.17, on average, for the high cost of effort agents. Principals also extract a lot of points from the total production for themselves as it happened in the other two treatments.

We also analyze the data period by period to see more clearly the evolution of our data over time. The level of effort of low effort cost agents is higher, on average, than the level of effort of the high effort cost agents as we said above. Effort increases over time for the two types of agent (Figure 7). By contrast, compensations decrease over time (Figure 8).

In the last period compensations decrease dramatically due to the final round effect that happen in almost all gift exchange games.¹⁴

Earning differences between principals and agents increases over time (Figure 9). Principals earn, on average, 110.70 experimental points. Low effort cost agents earn 30.20 points and high effort cost agents earn 20.85 experimental points on average. This difference between the two types of agent is not due to differences in compensation but in effort cost differences.

¹⁴ The final round effect indicates that the last player in a game will extract all the benefits for him or herself knowing that he or she is playing the last round and there will not be more interactions between players.

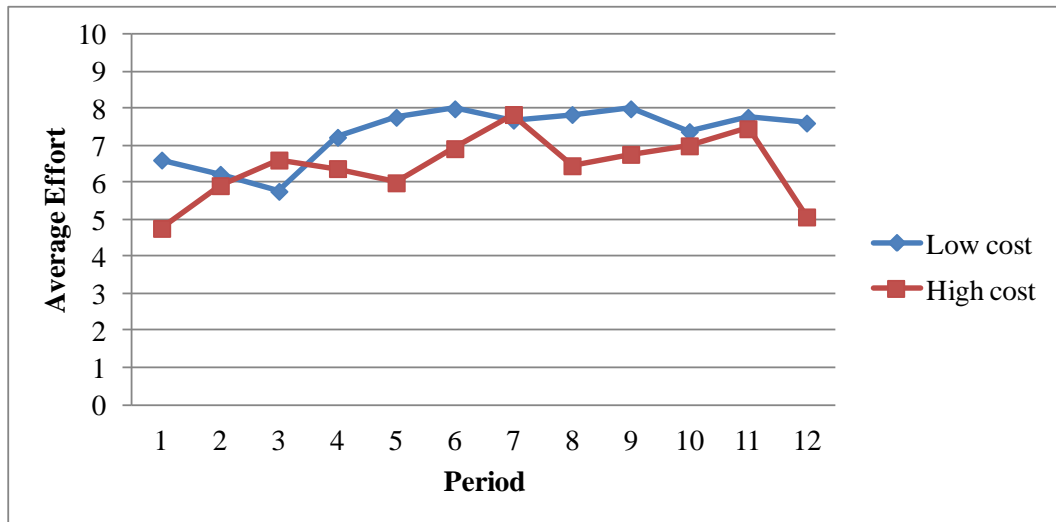


Figure 7: Average effort per period (DCE). The effort is aggregated per period over all sessions.

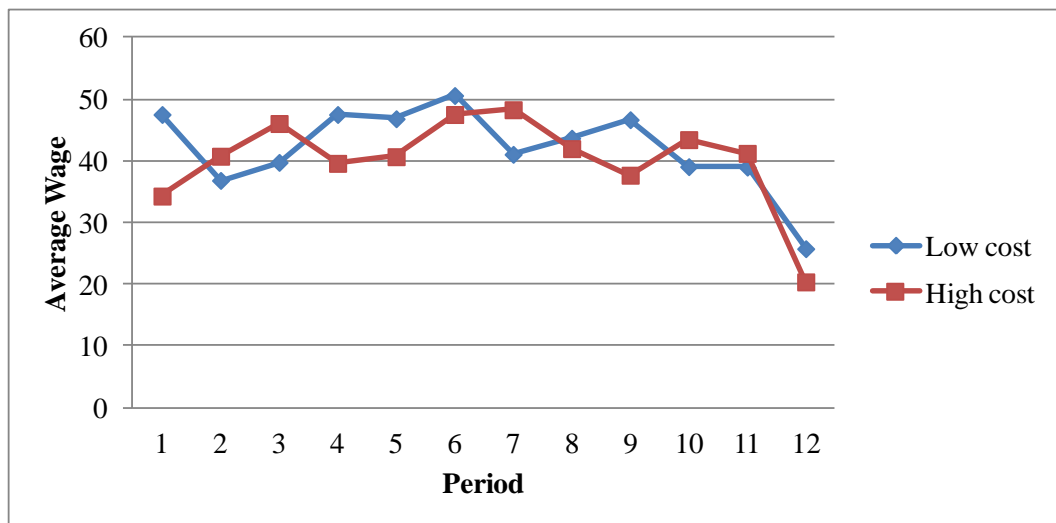


Figure 8: Average compensations per period (DCE). Compensations are aggregated per period over all sessions.

There is a common result for all the three treatments. It is that principals extract most of points from the total production for themselves as we can see in figures 3, 6 and 9.

Result 1: *Principals earn much more money than agents and the difference increases over time in all treatments.*

This result shows that principals prefer always to earn more than their agents. We can say that the altruistic behavior of the principals decreases over time.

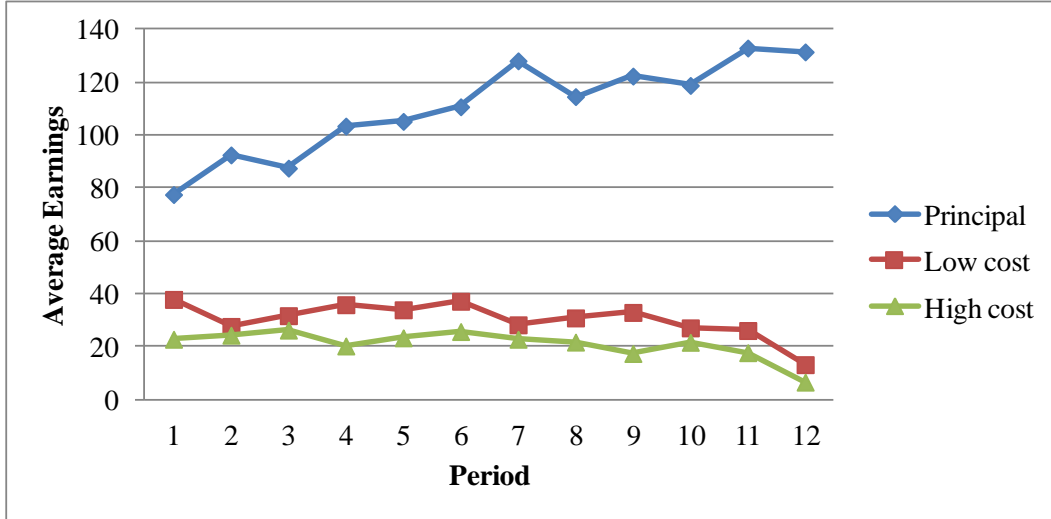


Figure 9: Average earnings for each player by period (DCE).

3.1 Secrecy

Now we compare the first two treatments, Baseline and NCI, to find if the level of information provided to agents affects their incomes or not. Standard economic theory says that there should not be behavioral differences between these two treatments. We estimate an OLS-model to analyze this claim. Firstly, in our model we regress the high productivity agent's profit per period π_A on his effort level e_A and a constant. To control for differences between treatments we include a treatment dummy NCI, and an interaction term of the treatment dummy and the high productivity agent's effort. We also control for the coworker's effort e_B . We also apply our model to regress the low productivity agent's profit on his own effort, the treatment and the coworker's effort.

The results indicate that high productivity agent's profit depends only on his own effort level. An additional unit of effort increases the high productivity agent's profit under the Baseline by 3.378 points. This coefficient is significant ($p < 0.001$). In the NCI treatment the effort-profit relation is lower: an effort increase of 1 leads to an increase of 2.516 points ($3.378 - 0.862$). However, the difference between treatments is not significant.

The results also show that low productivity agent's profit depends on his own effort and also on the coworker's effort. An effort increase of 1 leads to an increase of 1.878 points in the Baseline treatment. This coefficient is significant ($p < 0.001$). An additional unit of effort under the NCI treatment increases the low productivity agent's profit in 1.980

points ($1.878 + 0.102$). An additional unit of effort of the high productivity agent increases the low productivity agent's profit by 1.082 points in the Baseline (-0.468 points in the NCI treatment, $1.082 - 1.550$). This coefficient is weakly significant ($p = 0.029$). In this regression, the difference between treatments is almost significant ($p = 0.057$).¹⁵

Dependent variable	π_A		π_B
e_A	3.378*** (.408)	e_B	1.878** (.394)
NCI x e_A	-.862 (.771)	NCI x e_B	.102 (.631)
constant	-3.260 (4.486)	constant	-6.719 (3.780)
NCI	11.325 (7.833)	NCI	13.756 (6.914)
e_B	.106 (.589)	e_A	1.082* (.469)
NCI x e_B	-.245 (.857)	NCI x e_A	-1.550 (.917)
Obs.	324		324
R^2	.118		.098

Table 7: Profit regressions. Robust standard errors are adjusted for clustered subjects and are given in parentheses. For each agent, one observation per period is included in the analysis. The dummy “NCI” is equal to 1 for the No Compensation Information treatment. Significance at the 10%, 5% and 1% level is denoted by *, **, and ***, respectively.

Looking at our results, we can say that there is a little difference between treatments, and it is due to low productivity agents' income.

Result 2: The level of information provided to the agents only affect to low productivity agents' compensation.

¹⁵ We need more data to provide a more robust model.

3.2 The relationship between the effort and the compensation

According to standard economic theory, compensation should be 0 for all agents in all periods and in all our treatments. Contrary to this theory, our data show that compensations increase with the level of effort in all the treatments (Figures 10, 11 and 12).

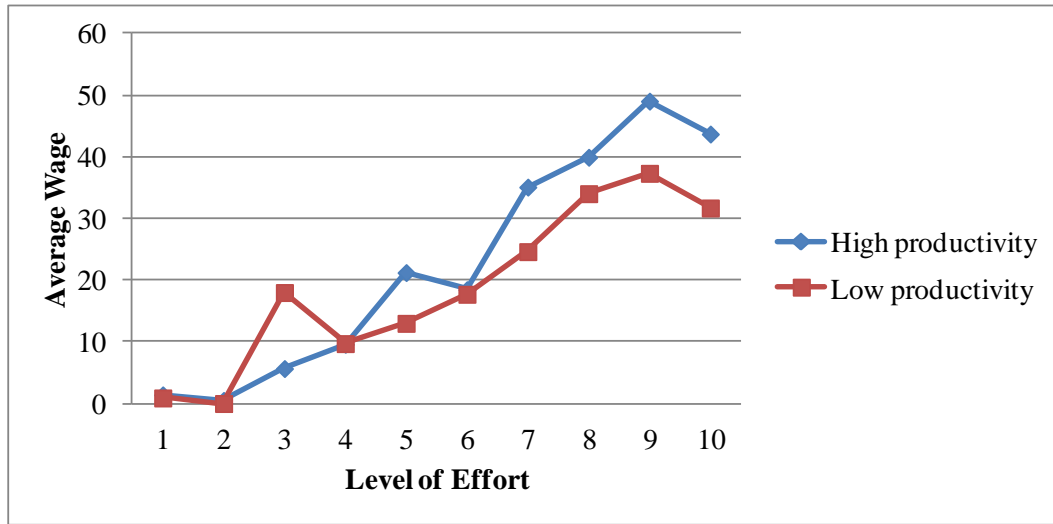


Figure 10: Average compensations by level of effort (Baseline).

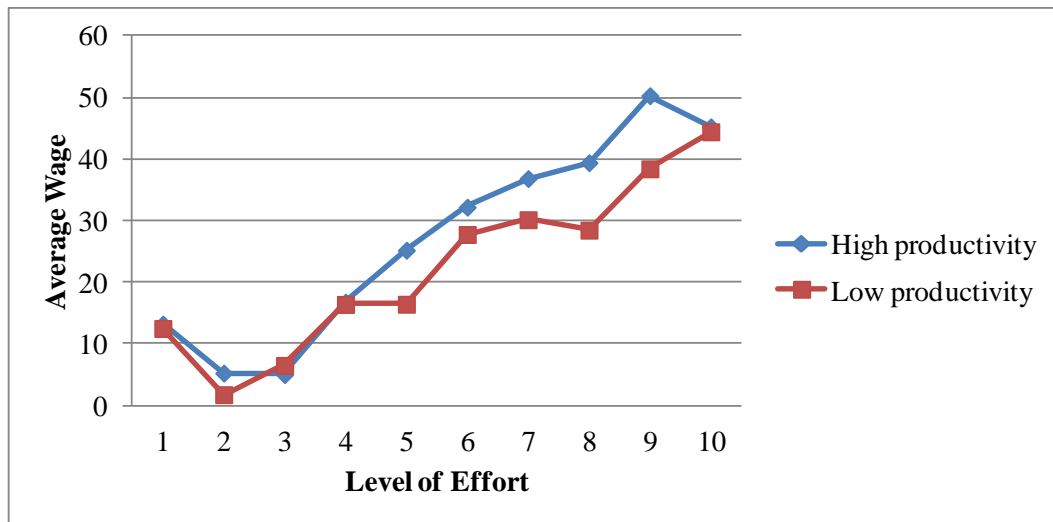


Figure 11: Average compensations by level of effort (NCI).

There is a reciprocal behavior from principals to agents. The graphs show an upward sloping effort-compensation relation as in many gift exchange experiments. For example, in the baseline treatment, a high productivity agent who exerts the lowest effort receives on average a compensation of 1.40 while an agent who exerts the highest

effort receives on average a compensation of 43.70. In the NCI treatment, the corresponding compensations are 13.2 and 45.25.

Result 3: *Principals reward higher effort levels with higher compensations for both types of agent in all treatments.*

Looking at the Baseline treatment and the DCE treatment, we can see that principals reward better to high productivity agents in the Baseline treatment and principals reward better to agents with high effort cost being the production of each agent equal.

Principals' behavior in the Baseline treatment indicates that they have the productivity difference between agents into account when they choose compensations. This behavior also occurs in the NCI treatment. We can say that productivity difference matters.

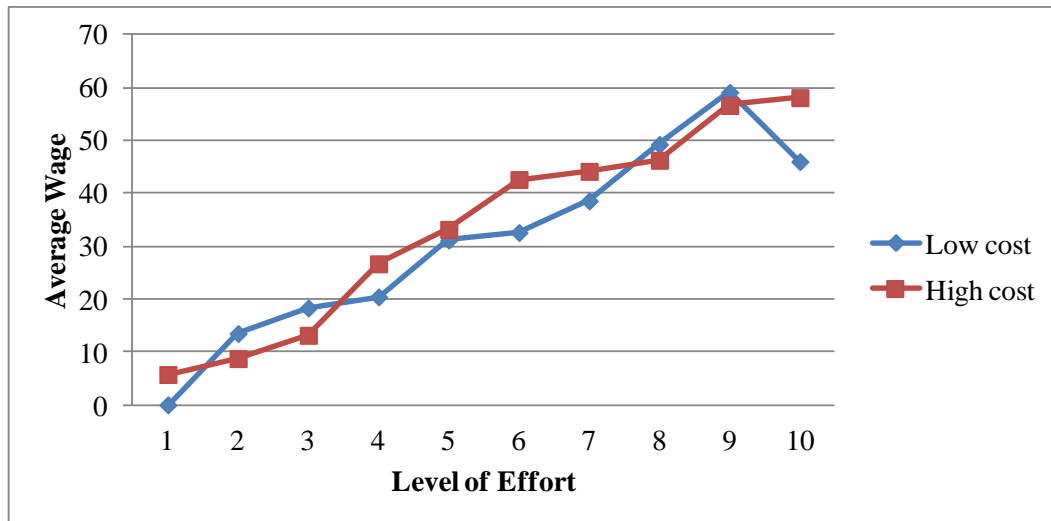


Figure 12: *Average wages by level of effort (DCE).*

In the DCE treatment, principals' behavior indicates that they try to compensate the cost difference between agents paying more to agents with a higher cost of effort when they exert the same effort than agents with a lower cost of effort.

Result 4: *Principals pay more to high productivity agents for the same level of effort in both the Baseline and the NCI treatments. Principals pay more to agents with high effort cost for the same level of effort in the DCE treatment.*

We can state that the level of production has an important impact when principals decide the compensation for every agent when agents have different productivities. We

can also say that the principals take care about effort cost differences between agents. They try to reduce these differences via compensation.

3.3 Effort equity versus Production equity

Now we analyze more deeply whether differences in productivity or cost of effort are more important when principals choose wages. To do that we look at wages differences comparing by differences in effort levels between agents. We analyze paired data in this section.

We introduce a concept that we call *effort equity*. We define this equity concern as equity in terms of effort: *the agent who exerts a higher effort should receive a higher compensation independently of the level of production that every individual obtains with his or her effort*. We provide one example to clarify this concept, if two agents exert the same level of effort but one of them obtains higher production, because he or she has a higher productivity level, the principal should pay the same to each one if he or she follows the effort equity concern. We compare this effort equity concern with the equity concern of Adams (1965). This author defines equity as equity in terms of output (*production equity* in our experiment): *the agent who produces more should receive a higher compensation*.¹⁶

For the Baseline and the NCI treatments we divide our data in three groups. In the first group, we analyze what is the behavior of principals when high productivity agents exert more effort than low productivity agents. In the second group, both types of agent exert the same effort. In the third group, low productivity agents exert more effort.

We do this classification because it allows us to study which equity concerns are applied by the principals in all the possible scenarios that they can find in our experimental design. We provide a summary of all the possible scenarios in Table 8.

When high productivity agents choose a higher level of effort than low productivity agents, effort equity and production equity coincide. In the Baseline treatment there are 79 cases where this situation happens out of 168 cases. In 74 cases (93.67%) principals apply equity and in 5 cases (6.33%) they do not apply equity. In the NCI treatment, for a total of 57 cases, where high productivity agents supply an effort level higher than low

¹⁶ We do not study how much more should receive the agent who exerts more effort (or produce more) because we need to collect more data to do a robust analysis.

productivity agents, they apply equity in 44 cases (77.20%) and they do not apply equity in 13 cases (22.80%).

	Baseline and NCI	DCE
Group 1	Both equity concerns always coincide	Both equity concerns always coincide
Group 2	Both equity concerns are opposite	Both equity concerns always coincide
Group 3	<p>If low productivity agents produce more: both equity concerns coincide.</p> <p>If high productivity agents produce more: both equity concerns are opposite.</p>	Both equity concerns always coincide

Table 8: *Different scenarios principals could find in our experiment by treatment. Group 1: high productivity (low effort cost in DCE) agents exert more effort than low productivity (high effort cost in DCE) agents; Group 2: both agents exert the same effort; Group 3: low productivity (high effort cost in DCE) agents exert more effort than high productivity (low effort cost in DCE) agents.*

In both treatments, most of the times when principals do not apply equity they pay 0 to both agents, extracting all the gains for themselves (Figure 13). This occurs especially in the last period.

When both agents exert the same level of effort, effort equity cannot coincide with production equity because when both types of agent exert the same effort high productivity agents are always more productive. In the Baseline treatment, principals apply production equity in 20 cases (83.33%) and they apply effort equity, they pay the same to each agent, in 4 cases (16.67%) for a total of 24 cases. In the NCI treatment, principals apply production equity in 10 cases (90.90%) and they do not apply it in 1 case (9.10%) for a total of 11.

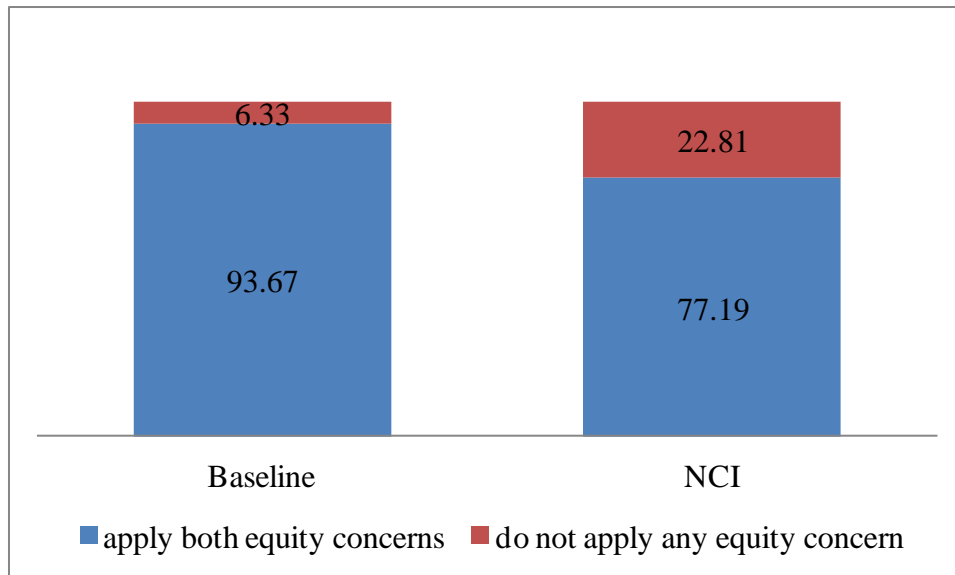


Figure 13: *Percentage of applied equity concern when high productivity agents exert more effort (low effort cost agents in DCE) by treatment.*

We can observe that when agents choose the same level of effort principals pay more to more productive agents. In this case, productivity difference matters. Productivity equity is more important in the NCI treatment than in the Baseline when the agents exert the same effort (Figure 14).

In the case where low productivity agents exert more effort we have two scenarios. The first one happens when effort equity and production equity coincide. This is possible only if low productivity agents' effort is more than twice the level of effort of high productivity agents. This scenario occurs 17 times in the Baseline treatment (14 of these times principals apply both equity concerns and 3 times they do not apply equity) and 14 times in the NCI treatment (they apply both equity concerns all the 14 times).

The second scenario happens when the high productivity agents produce more than the low productivity agents. In this case, effort equity and production equity cannot coincide. This scenario occurs 48 times in the Baseline treatment (principals apply effort equity in 28 of these times, they apply production equity in 14 of these times, and they do not apply any equity concern in 6 of the 48 times) and 72 times in the NCI treatment (39 of these times principals apply effort equity, they apply production equity 19 out of 72 times, and they do not apply any equity concern in 14 of these times).

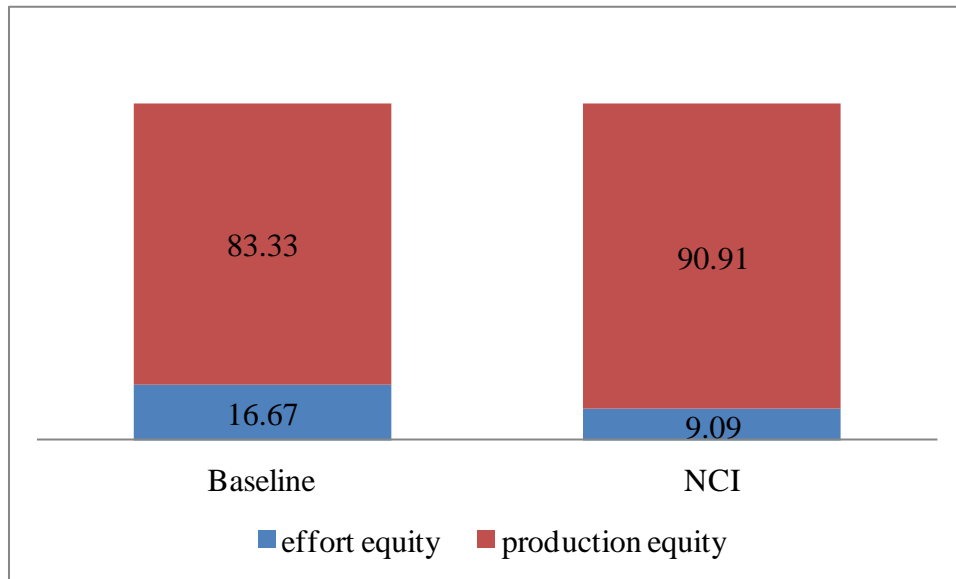


Figure 14: *Percentage of applied equity concern when both agents exert the same effort by treatment.*

We also provide the percentage of applied equity concerns out of the total number of observations for both the Baseline and the NCI treatments when low productivity agents exert more effort than high productivity agents (Figure 15).

We can observe that production equity matters when both agents exert the same level of effort and when high productivity agents choose a higher level of effort than low productivity agents. But, when low productivity agents exert more effort, there is some heterogeneity when principals pay to agents. In this case productivity matters for some principals but also effort matters for others. It occurs in both the Baseline and the NCI treatments.

Result 5: *Principals pay more to high productivity agents when they exert the same or more effort than low productivity agents in Baseline and NCI treatments. When low productivity agents exert more effort than high productivity agents there is some heterogeneity in principals' wage decisions. Most of the times, low productivity agents receive a higher compensation even when their effort is not enough to compensate their lack of productivity.*

In the DCE treatment we also divide our data in three groups. In the first group, high effort cost agents exert more effort than low effort cost agents. In the second group, both types of agent exert the same effort. In the third group, low effort cost agents exert

more effort than high cost agents. In all three groups effort equity coincides with production equity because both agents have the same productivity level (Figure 16).

In the first group, principals apply equity 4 times (they pay the same to each agent) and they do not apply equity in 15 cases (most of these times principals compensate the higher cost of high effort cost agents). In the second group, principals apply equity 98% of the times (49) and they do not apply that once (this principal pay 0 to both agents) for a total of 50. Finally, in the third group, principals apply equity in 72 cases, paying more to low effort cost agents and they do not apply equity in 15 cases (most of the times principals compensate cost differences).

The main result we can observe in the DCE treatment is that principals try to compensate the higher effort cost of high effort cost agents independently of which type of agent exerts more effort.

Result 6: *Principals reduce cost differences between agents independently of who exerts more effort in the DCE treatment.*

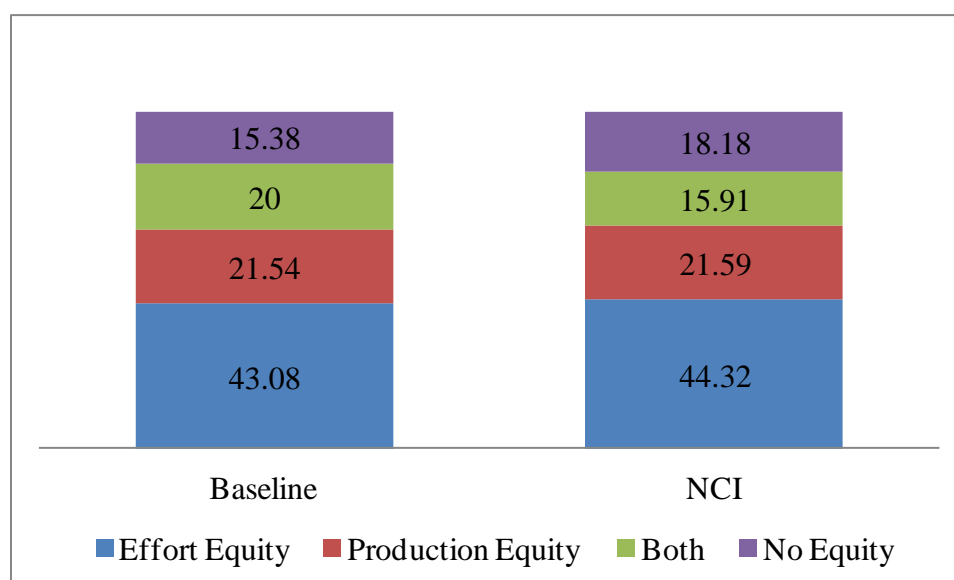


Figure 15: *Percentage of applied equity concern when low productivity agents exert more effort (high effort cost agents in DCE) by treatment.*

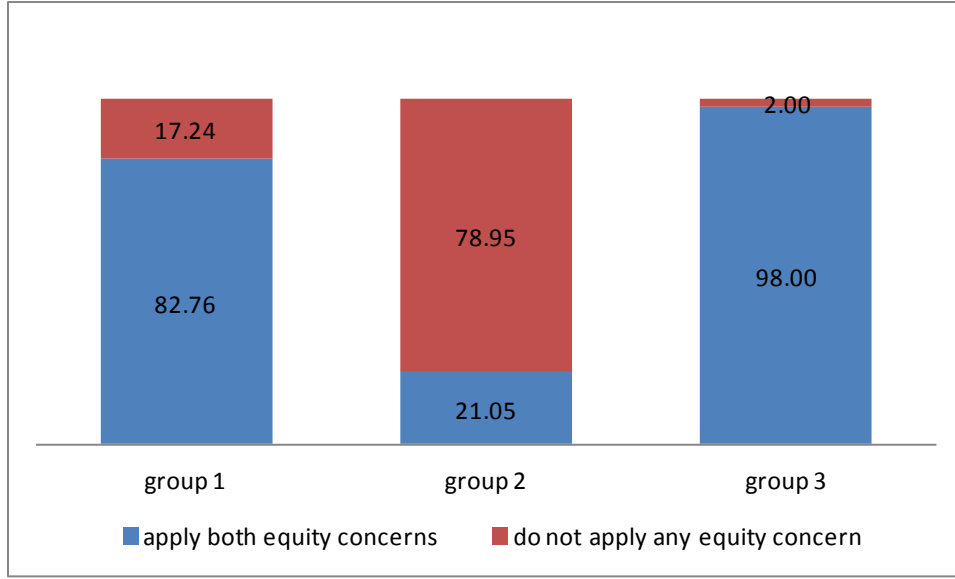


Figure 16: *Percentage of applied equity concerns in the DCE treatment by groups (group 1: when both agents exert the same effort; group2: when high effort cost agents exert more effort than low effort cost agents; group 3: when low effort cost agents exert more effort than the high effort cost agents).*

4. Conclusions

In this paper, we study the interaction between a principal and two agents when the agents have different productivities or different effort cost. We analyze principal's behavior when they have to choose agents' compensation. In our experiment, one principal is matched with two agents. Firstly, agents choose their effort level and then the principal pays them a compensation knowing their effort levels. In the Baseline treatment, agents know their coworkers' compensations and they have different productivities. In the NCI, agents only know their own compensations and they also have different productivities. In the DCE, agents know their coworkers' compensations but one of them has a higher effort cost.

Our results contribute to the literature that analyzes individuals' behavior when they have different levels of information about coworkers' wages (Lazear, 1989; Akerloff & Yellen, 1990).

Akerloff and Yellen (1990) suggest that when wages are observable and the firm has to pay a higher salary to a given worker expecting more production, the wage of the others workers tends to be increased because the workers expect some equity. When a firm

applies a pay secrecy policy, this problem disappears and the firm can discriminate among workers. Lazear (1989) says that some firms apply a pay secrecy policy because if they apply a pay openness policy, some workers could use this information against them or against their coworkers.

We show that principals change their behavior when compensations are not observable. They pay more to low productivity agents when compensations are not observable than when compensations are observable. They pay the same to high productivity agents in both situations, when compensations are observable and when compensations are not observable. This result is partially similar to Charness et al. (2007), they also demonstrate that principals do not increase or reduce compensation differences when agents can observe their coworkers' compensation compare to when agents cannot observe their coworkers' compensation.

We also contribute to the existing literature that states that people do not have a selfish behavior but most of them have social preferences when they have to share some money with other people (Fehr & Schmidt, 1999).

Our findings also contribute to the literature that shows that in the gift exchange relationships the higher the gift first player give to the second player the higher the return second player give back to the first player. (Fehr et al., 1993).

We show that, most of the times, principals use different distributional concerns to reward their agents, and only a few times they do not pay anything to their agents.

Our main contribution is that when the principal can observe the agents' effort she takes it into account when she pays agents, and she does not pay always based in the production level. When an agent exerts more effort than the other agent, the principal rewards him much more even when the other agent has a higher production level.

We also demonstrate that principals compensate to agents with a higher effort cost when they produce the same or even less than agents with a lower effort cost.

The main limitation of our work is that we need more data to provide a more robust analysis. We also have to take care about our results when we extrapolate them to the real world because our data are provided by a laboratory experiment.

For a further research, it could be interesting to design a treatment as our DCE but also with pay secrecy to analyze if this pay policy modifies principals' behavior.

An analysis of agents' behavior could be also interesting. We could study how agents' effort reacts to the different distributional concerns applied by the principal, and whether these reactions affect principals' behavior over time. We could modify our experiment and apply a design where every principal is matched with the same two agents for the whole experiment, to analyze agents' behavior in a better way.

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