Communication and fair distribution: An experimental approach*

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Abstract

Facing a distribution problem most people show both self- and other-regarding behaviour; they are willing to sacrifice pecuniary gains to avoid large deviations from what they consider a fair solution to the problem. However what constitutes a fair distribution of income is ambiguous. This paper analyses the impact of communication on individual distribution decisions, and it focuses on three fairness ideals; strict egalitarianism, liberal egalitarianism and libertarianism. In order to do this analysis a dictatorship game experiment with two treatments is designed and run. In the first treatment the distribution phase is preceded by a production phase. In the second treatment there is also a pre-play communication phase. The study compares data from the two treatments, tests if communication has an effect and how this effect works, and estimates the relationship between communicated fairness ideal and distribution.

1 Introduction

Justice deals with the conflicts of interest among people in a society, and for economics the question of justice concerns the distribution of benefits and

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burdens among members of a community. A central goal of public distribution policy should according to many philosophical and economic scholars be to secure all individuals equal opportunities. All equal opportunity approaches argue that society should eliminate inequalities that arise from some, but not all, factors. However, different versions of this approach disagree as to which factors are a legitimate source of inequality and which factors that are not, and normative theories need to reformulate the principles of justice according to what claims persons legitimately can make upon each other or upon the state.

While the purpose of welfarism is in some sense to prescribe how government can maximize the welfare of society, opportunity-based and right-based theories require justice and that government should maintain and respect individual rights. The interpretation of equal opportunity favoured by most liberal egalitarians such as John Rawls (1971), John E. Roemer (1993, 1994, 1996, 1998) and Ronald Dworkin (1981a,b), is what we could call the level playing field interpretation of equal opportunity. According to this interpretation, equal opportunity requires that all inequalities that arise from factors outside the control of an agent, such as the natural and genetic abilities of a person, should be eliminated, but that inequalities that arise from factors under the agents control should be accepted. Gerald Allan Cohen (1989) refers to the factors outside the agent's control as circumstances and the factors that are within the person's control as choice.

It is commonly claimed that people have a moral intuition that responsibility is important - that there are conditions that they feel they should be responsible for and conditions that they feel they should not be responsible for. If people have this moral intuition it will most probably affect their interpretation of equal opportunity and if so it might also have an influence on the assessment of public redistribution mechanisms. If people actually are concerned about responsibility there is still the question which factors they in fact hold each other responsible for. Different theories of justice give different answers to this question. Alexander Cappelen et al (2006) study a distribution situation in which individuals differ in how much they invest and in their rate of return to investment, and investment is clearly within individual control and rate of return clearly beyond individual control, and it is assumed that an individual endorses some version of strict egalitarianism, libertarianism or liberal egalitarianism. Strict egalitarians do not hold people responsible for anything, while liberal egalitarians hold people responsible for their investment but not for their rate of return. For libertarians how-

ever, people are at liberty to use both their investment and rate of return. The study reports that the distinction between investment and rate of return matters for many people.

The aim of this paper is to test if communication has an impact on people's distribution decision and - if so - to investigate how this impact works. In order to examine this an experiment with two treatments is run. In the first treatment there is no pre-play communication opportunity while in the second treatment individuals are allowed to communicate. In both treatments people have a stake in the outcome. Accordingly I design an experiment with three phases: a communication phase, a production phase and a distribution phase. In section 2 the theory is presented. Section 3 describes the experimental design. In section 4 the results are reported. Section 5 presents related literature and section 6 concludes.

2 Theory

I study a situation where individuals differ in how much money they invest and in their rate of return to investment. The amount of investment, q_i, is within individual control and the rate of return to investment, a_i, is beyond individual control. The individual rate of return to investment is either high or low, and thus the income generated by an individual i is given by the product $x_i = a_i q_i$. I always consider two-person settings and the individuals are referred to as person 1 and person 2. My main focus is on how to distribute the total income $X(\mathbf{a}, \mathbf{q}) = x_1(a_1, q_1) + x_2(a_2, q_2)$, where $\mathbf{a} = (a_1, a_2)$ and $\mathbf{q} = (q_1, q_2)$ and each individual is to propose an amount of income y to himself and $(X - y)$ to his co-player.

2.1 Distributive behaviour

Standard economic theory assumes that individuals are exclusively pursuing their material self-interest and do not care about fairness per se. However I assume that the individuals have preferences that respond to both pecuniary payoffs and the perceived fairness of the outcome, in other words that the individuals are guided by selfish considerations as well as fairness ideals. Hence when proposing a distribution of the total income an individual i is motivated by a desire for income and by fairness considerations, and maximizes

the following utility function:[1]

$$U_i(y;\mathbf{a},\mathbf{q}) = y - \frac{\beta_i}{2}\frac{\left[y-m_i^*(\mathbf{a},\mathbf{q})\right]^2}{X(\mathbf{a},\mathbf{q})}, \tag{1}$$

where the marginal disutility of deviating from his perception of a fair distribution m_i^* is increasing in the size of the deviation from this fair distribution. The parameter $\beta_i \geqslant 0$ determines the weight individual i gives to fairness considerations. If $\beta_i = 0$ individual i assigns no importance to fairness considerations, and he keeps all the money for himself. m_i^* is individual *i's* overall fairness consideration, which he acts upon when he proposes a distribution. It is assumed that each individual has a fairness ideal $m^{k(i)}$. If individual i and his opponent individual j have an opportunity to exchange information about fairness ideals before they propose a distribution, individual *i's* overall fairness consideration m_i^* may be influenced by his opponent's fairness ideal $m^{k(j)}$. Three models for how individuals deal with information are presented - the integrity model, the compromise model and the self-serving model.

$$\text{The integrity model:} \quad m_i^* = m^{k(i)} \tag{2}$$

$$\text{The compromise model:} \quad m_i^* = \alpha_i m^{k(i)} + (1-\alpha_i)[X - m^{k(j)}] \tag{3}$$

$$\text{The self-serving model:} \quad m_i^* = \alpha_i m^{k(i)} + (1-\alpha_i)\max\{m^{k(i)}; X - m^{k(j)}\} \tag{4}$$

It follows that if $m^{k(i)} > X - m^{k(j)}$ the self-serving model reduces to the compromise model, and if $\alpha_i = 1$, the self-serving model and the compromise model reduces to the integrity model.

The integrity model reflects a commitment to act upon own fairness ideal. In this model individuals act only upon own fairness ideal when they propose a distribution. Individual *i's* overall perception of fairness depends only on

[1] The utility function is additively separable. The first term reflects self-regarding behaviour and the second term reflects other-regarding behaviour. To introduce social preferences into the utility function is a recognized approach (see for example Ernst Fehr and Klaus M. Schmidt, 1999; Gary E. Bolton and Axel Ockenfels, 2000). In line with Cappelen et al (2006) I include the possibility of plurality of fairness ideals in the loss function.

his fairness ideal. Individual *j's* fairness ideal has no impact on his overall fairness consideration. Individual i is unaffected by individual *j's* conception of fairness when he proposes a distribution. Hence the opportunity to exchange information about fairness ideals with individual j has no impact on individual *i's* overall fairness consideration.

In the compromise model individuals take their opponent's fairness ideal into account when they propose a distribution. The overall fairness consideration that individual i acts upon when he makes a proposal, fall somewhere in between his own and his opponent's fairness ideal. More formally individual *i's* overall fairness consideration is a convex combination of his and his opponent's fairness ideal. The parameter α_i determines the importance individual i assigns to his own fairness ideal $m^{k(i)}$. $(1-\alpha_i)$ determines the importance individual i assigns to individual *j's* fair proposal $X-m^{k(j)}$. However it is assumed that the individuals assign most importance to their own fairness ideal, hence $0.5 < \alpha_i < 1$.

Alternatively an individual's overall fairness consideration may be self-serving – the individual may bias his overall fairness consideration in favour of himself (Linda Babcock et al. 1993; 1995, Babcock and George Loewenstein, 1997; James Konow, 2003, 2005). In the self-serving model individuals also take their opponent's fairness ideal into account when they propose a distribution, but they do this only when the opponent's fairness ideal justifies larger share to them than their own fairness ideal does. More formally individual *i's* overall fairness consideration is a convex combination of his and his opponent's fairness ideal when that is more favourable to him than his own fairness ideal. Accordingly $(1-\alpha_i)$ is the importance individual i assigns to the fairness ideal that makes him best off.

The optimal proposal for each model is:[2]

$$\frac{y^*}{X(\mathbf{a}.\mathbf{q})} = \frac{m^{k(i)}}{X(\mathbf{a}.\mathbf{q})} + \frac{1}{\beta_i} \tag{5}$$

$$\frac{y^*}{X(\mathbf{a}.\mathbf{q})} = \alpha_i \frac{m^{k(i)}}{X(\mathbf{a}.\mathbf{q})} + (1-\alpha_i)\left[1 - \frac{m^{k(j)}}{X(\mathbf{a}.\mathbf{q})}]\right] + \frac{1}{\beta_i} \tag{6}$$

$$\frac{y^*}{X(\mathbf{a}.\mathbf{q})} = m^{k(i)} + (1-\alpha_i)\max\left\{0; 1 - \frac{m^{k(j)}}{X(\mathbf{a}.\mathbf{q})} - \frac{m^{k(i)}}{X(\mathbf{a}.\mathbf{q})}\right\} + \frac{1}{\beta_i} \tag{7}$$

[2]The alternatively formulation of the self-serving model: $m_i^* = m^{k(i)} + (1-\alpha_i)\max\{0; X - m^{k(j)} - m^{k(i)}\}$ is used in the first order condition:

If there is no opportunity to exchange information about fairness, individual i has no knowledge about individual j's fairness preferences, and it is assumed that: $m_i^* = m^{k(i)}$, and the optimal proposal is given by equation 5).

2.2 The fairness ideals

I assume that an individual endorses some version of strict egalitarianism, liberal egalitarianism or libertarianism. Each of the fairness ideals satisfies the no-waste condition, and thus we can index the fair distribution such that m^k and $X - m^k$ is what fairness ideal k assigns to person 1 and person 2, respectively.

According to the strict egalitarian fairness ideal total income should always be distributed equally amongst individuals (see, for example, Kai Nielsen, 1985). Hence, both inequalities due to differences in investment and inequalities due to differences in rate of return should be eliminated.

$$m^{SE}(\mathbf{a}, \mathbf{q}) = X(\mathbf{a}, \mathbf{q})/2 \tag{8}$$

The strict egalitarian view is closely related to the inequality-aversion models in the experimental literature, which assume that people dislike unequal outcomes (see Fehr and Schmidt, 1999).

Liberal egalitarianism, on the other hand, defends the view that people should only be held responsible for their choices (Roemer , 1998). A reasonable interpretation of this fairness ideal in the present context is to view the fair distribution as giving each person a share of the total income equal to his share of the total investment

$$m^{LE}(\mathbf{a}, \mathbf{q}) = \frac{q_i}{q_i + q_j} X(\mathbf{a}, \mathbf{q}) \tag{9}$$

This principle is equivalent to what has been described as the accountability principle (Konow, 1996, 2000). It implies that if two persons make the same choice, then the fair solution is to give them the same income.

The libertarian fairness ideal is at the opposite extreme of strict egalitarianism and does not assign any value to equality. According to libertarianism, the fair distribution is simply that each person is entitled to what he has produced (Robert Nozick, 1974).

$$m^{L}(\mathbf{a}, \mathbf{q}) = a_i q_i \tag{10}$$

Therefore, the libertarian solution may involve an unequal distribution of income due to differences in both investment and rate of return.

Even though the three fairness ideals provide different solutions to the distributional problem, is it important to notice that on average they instruct individuals to offer the same amount to the other person. In any game and for any fairness ideal k, the fair solution would be that person 1 offers $X - m^k$ to person 2 and person 2 offers m^k to person 1, which implies that the average fair offer in the game is $X/2$.

3 Experimental design

The experiment is a version of a one-shot dictator game with production. In order to study communication a pre-play communication is added to it. Two treatments were carried out – one without and one with pre-play communication. At the beginning of the experiment the participants were given complete information about how the production phase and the distribution phase would proceed and about how the outcome of the experiment would be determined. The experimental group was also informed about how the communication phase would proceed.

In the communication phase the participants in the experimental group faced three hypothetical distribution situations, and three different principles of what constitutes a fair distribution of income. The implication of the three principles in each of the three hypothetical distributive situations was also presented for them. They were asked to choose the principle that they thought would imply the fairest distribution in situations like the hypothetical situations. The hypothetical distribution situations were like the situations which would appear later in the experiment, However, at this point the participants did not know that identical real distributive situations will appear later in the experiment. The participants were also told that the alternative they chose would be communicated to other participants later in the experiment, but that the decision they made in this phase would not restrict their choices later in the experiment. The design of the communication phase was chosen so that the participants had no incentives to report wrongly.

In the production phase each participant was given money credits equal to 300 Norwegian Krone (NOK), approximately 50USD. Production was dependent on both factors within and factors beyond individual control; investment

was clearly within individual control and rate of return to investment clearly beyond individual control. In the production phase each participant in both the experimental and the control group was randomly assigned a low or a high rate of return. Participants with a low rate of return would double the value of any investment they made, while those who were assigned a high rate of return would quadruple their investment. The participants were asked to determine how much they wanted to invest in two different one-shot games. Before they made their investment choice, they were informed that they would be paired with two players with different rates of return. Their choice alternatives were limited to 0NOK, 100NOK and 200NOK, and the total amount invested in the two games could not exceed the initial money credit they received. The design with two games was chosen so as to expose the participants to different distributional situations in the distribution phase. Any money they chose not to invest they could keep after the experiment ended, and thus they faced a genuine choice of investment.

In the distribution phase they were given information about the other participant's rate of return, investment level, and total contribution before they were asked to propose a distribution of the total income. The experimental group was also told which distribution principle their opponent had chosen in the communication phase and the implication of this principle in this particular distribution situation. They were also reminded of their own choice in the communication phase. The participants were not informed about the outcome of the first game before the second game was completed, i.e. they considered two one-shot games simultaneously. For each participant one of the two proposals (the participant's own or that of the opponent) in one of the two games were randomly selected to determine the final outcome. The total earnings from the experiment were the final outcome plus the amount of money not invested. Given that we have assumed that people's fairness ideals are defined on outcomes, the chosen elicitation procedure is incentive-compatible.

At the end of the experiment, the participants were assigned a code and instructed to mail the code and their bank account numbers to the accounting division of the Norwegian School of Economics and Business Administration. Independently the research team mailed a list with the codes and total payment to the accounting division, who then disbursed the earnings directly to the participant's bank account. This procedure ensured that neither the participants nor the research team were in the position to identify how much each participant earned in the experiment.

The participants were all recruited among first-year students at the Norwegian School of Economics and Business Administration. In the invitation they were told that they would initially receive 300NOK for use in an experiment that would last for 40 minutes and that their total earnings from the experiment would depend on their choices. They were not informed about the purpose of the experiment. The hourly opportunity cost for most of these students would be about 100NOK, while the average payoff was 447NOK and 442NOK, respectively. Each student was only permitted to participate once. In the first treatment we had one session with 20 participants, one session with 12 participants and four sessions with 16 participants, comprising a total of 96 participants, while in the second treatment we had one session with 12 participants and five sessions with 16 participants, comprising a total of 92 participants. The participants were in the same computer lab during a session, but all communication was anonymously and was conducted through a web-based interface.

In the distribution phase the paired players could differ with respect to both their rate of return and their investment, which implies that there were four different categories of distributional situations in the experiment, and there is a reasonable even distribution of the observations in the four categories in the two treatments. As can be seen from table 1 there are 94 observations where players are identical with respect to both their rate of return and their investment. In this situation all the three fairness ideals imply the same fair distribution, namely that both players get an equal share of the total income. In the situation where the players have the same rate of return but differ in their investment there are 92 observations. In this situation the liberal egalitarian and the libertarian fairness ideals would coincide, whereas strict egalitarianism would imply a different view of the fair distribution.

Table 1: Number of observations in each category

	Investment		
Rate of return	Same	Different	Total
Same	94	92	186
Different	92	96	188
Total	186	188	374

In the situation where the players have made the same investment but differ in their rate of return, there are also 92 observations. In these situations

both the strict and the liberal egalitarian would consider an equal split a fair distribution, while the libertarian would consider an unequal split a fair distribution. Finally, there is the situation where the players differ along both dimensions. There are 96 observations in this situation. In this situation the strict egalitarianism and libertarianism imply the same fair offer if the player with a high rate of return is the player with a low investment (100NOK). Otherwise all the fairness ideals differ in this case.

4 Results

I present some descriptive statistics before I present test results and regression estimates.

4.1 Descriptive statistics

I begin by presenting statistics from the distribution phase before I present some statistics from the production phase and the communication phase.

4.1.1 Statistics from the distribution phase

Table 2 gives some major statistical features of data from the distribution phase.

Table 2: Descriptive statistics of offers made, by treatment

Treatment	NC	C	NC	C
Variable	Absolute	Absolute	Relative	Relative
Mean	229	280	0.271	0.309
Median	200	200	0.292	0.333
Mode	0	0	0	0.5
St. dev	219	243	0.219	0.229
Min	0	0	0	0
Max	800	800	0.75	0.8
n	190	184	190	184

Note: NC refers to the treatment without pre-play communication: the control group. C refers to the treatment with communication: the experimental group. The variables Absolute and Relative are offer made to opponent in absolute and relative terms. The denominator in Relative is total income produced.

The average relative offer in the group without pre-play communication is 27.1%, which is slightly more than what is usually observed in standard dictator games without production (Colin F. Camerer, 2003; John H. Kagel and Alvin E. Roth, 1995). In the same treatment maximum offer in relative term is 75%. In the group with pre-play communication the average and maximum relative offers are 30.9% and 80% respectively. Zero is the minimum offer in both treatments, and it is also the most frequent offer in the control group, while in the experimental group the most frequent relative offer is 0.5. 30.5% of the observations in the control group are participants who offered nothing to the opponent. The corresponding percentage for the experimental group is 26.6%. 27.4% of the observations in the control group are participants who shared the production equally. For the experimental group this percentage is 31.5.[3]

Figure 1 shows the cumulative distribution of offers made. As can be seen from the figure there are more masses around the upper values of offer in the experimental group than in the control group, while for the lower values the situation is opposite.

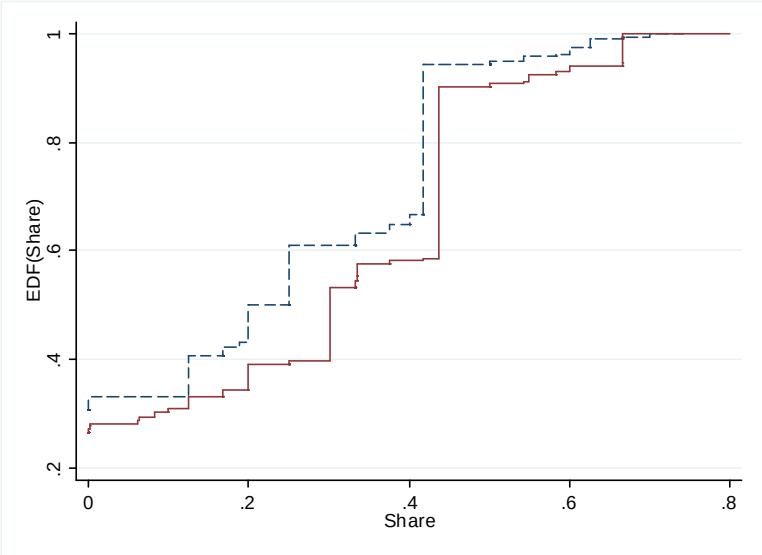


Figure 1: Cumulative distribution of offers made, by treatment
Note: Offers are calculated as shares of total income produced. The dotted and the straight lines are for the control and the experimental group, respectively.

[3]The full distribution of offer in absolute and relative terms is shown in the appendix, section 7.1

Thus it seems as if people are on average more generous when there is a pre play communication phase than if not. The fact that the most frequent amount taken by a player in a game is 600NOK in the control group and 400NOK in the experimental group indicates the same.

4.1.2 Statistics from the production phase

Table 3 displays data from the production phase. The empirical distribution of investment in the two games is only slightly different in the two treatments. Two participants kept the whole endowment of 300NOK, both in the experimental group. One participant in the control group invested only 100NOK. 15 participants - 9 from the control group - invested 200NOK. 13 of the 18 participants who did not invest the whole endowment were assigned a low rate of return before the game.[4]

Table3: Empirical distribution of investment in the two games

	Game 2			
Game 1	0	100	200	Total
0	2	0	2	4
100	1	13	84	98
200	0	86	·	86
Total	3	99	86	188

In both treatments the remaining 170 participants invested the full endowment of 300NOK, reasonably evenly distributed between (200,100) and (100, 200). The participants were given the option to invest 0NOK to make the investment decision a real one, and as some participants opted for no investment in one or both games, it was obviously also perceived as such. However as most participants did invest the full amount, the variation in choices in the production phase introduces no important bias in the analysis of the distribution phase.

[4]The fairness ideals were evenly distributed amongst the participants in the experimental group who either invested nothing or kept 100NOK

4.1.3 Statistics from the communication phase

Table 4 shows the distribution of reported fairness ideals in the communication phase. Only 15 participants reported strict egalitarianism as the fairest ideal, while the remaining 77 participants were evenly distributed between the liberal egalitarian and libertarian ideals.

Table 4: Reported fairness ideals

Fairness ideal	Frequency	Percent
Strict egalitarianism	15	16.3
Liberal egalitarianism	39	42.4
Libertarianism	38	41.3
Total	92	100

Table 5 gives the number of observations of participants who have reported the same fairness ideal as their opponent in the communication phase and the number of observations of participants who have reported a different fairness ideal as their opponent. The table also gives the number of observations where the communicated fairness ideals imply the same fair distribution and the number of observations where the communicated fairness ideals imply different fair distribution.

Table 5: Observations by reported fairness ideal and the implication of this ideal

	Implication		
Fairness ideal	Same	Different	Total
Same	60	·	60
Different	70	54	124
Total	130	54	184

124 observations are participants who reported different fairness ideal than their opponent in the communication phase. For 70 of these observations the different ideals implied the same fair distribution while for 54 observations the different ideals implied different fair distribution. In the next section the variation in data reported in table 5 is utilized in the different tests of the effect of communication on distribution.

4.2 Analysis

As reported in table 2 in the previous section the participants in the experimental group offer more to their opponent than the participants in the control group do. In this section I test if the difference is statistically significant. I also try to identify the mechanisms behind the effect of communication on individual distributive behaviour.

4.2.1 Does communication matter?

I perform a two-sample t test of the null hypothesis that the population mean of offer made to opponent – in relative and absolute terms - are the same for both treatments. I expect the experimental group to act more generously than the control group (see table 2). The difference between the population means of offer to opponent in the control and in the experimental group is thus expected to be negative. Table 6 reports the results of the test.

Table 6: Result of t test of the null hypothesis

Variable	Absolute	Relative
Difference	- 50.79	- 0.038
p-value	0.017	0.053

Note: "Difference" refers to the difference between the population means of offer made to opponent in the control group and in the experimental group. The denominator in the relative term is total income produced.

For offer made to opponent in absolute terms the null hypothesis can be rejected. Communication has a statistically significant effect on the size of the average offer. Despite the fact that the information exchange is non-binding and has no monetary pay-off implication most people act on average more generously when they have considered hypothetical distribution situations compared to not having had this opportunity.[5]

4.2.2 Potential explanatory mechanisms

Individual i and his opponent – individual j - exchange information about fairness principle before they propose a distribution. The information ex-

[5]Regression with a dummy reports a statistically significant result for offer in relative terms also. The difference is - 0.033 and the p-value = 0.046. The result of the non-parametric Kolmogorov-Smirnov test is reported in the appendix, section 7.2.

change is carried out in a pre-play communication phase where the two players are exposed to hypothetical distribution situations. The pre-play communication is non-binding and has no monetary pay-off implication. Accordingly it is of the kind that is termed cheap talk in the theoretical literature (Vincent P. Crawford and Joel Sobel, 1982, Matthew Rabin, 1989, Joseph Farrell and Rabin, 1996). As it is consistent with rationality to treat cheap talk as meaningless, standard economic theory predicts that communication has no effect. However if pre-play communication is not treated as meaningless by the individuals, the information exchange may have an effect on both their overall consideration of fairness (m_i^*) and the weight they attach to fairness considerations (β_i). The weights individuals attach to fairness are unobserved. The available information about the overall fairness consideration is the reports on fairness given by the individuals in the hypothetical distribution situations. However given that the communication phase is designed so that individuals have no incentives to report wrongly, it is acceptable to assume that individuals in the distribution phase act upon the fairness principle they have reported in the communication phase. Let $m_r^{k(i)}$ denote the fairness ideal individual i reports in the communication phase as the fairest. It refers to the amount that he considers to be a fair income in the hypothetical distribution situation. Let $m_r^{k(j)}$ denote the distribution principle individual j reports in the communication phase as the fairest. It refers to the amount he considers to be a fair income in the hypothetical distribution situations. When individuals make their decision in the distribution phase - as the first order conditions in section 2 predict - both the individual weights (β_i) attached to fairness and their overall consideration of fairness (m_i^*) may matter. Accordingly changes in the individual weights attached to fairness and in the overall perception of fairness are potential mechanisms behind the effect of communication on distributive behaviour. First I test if communication has an effect on β_i. Next I test if communication has an effect on m_i^*.

Effect on the weight attached to fairness There are 130 observations where the reported fairness ideal by both players implies the same distribution (see table 5). In these distributional situations where $m^{k(i)} = m^{k(j)} = m_i^*$ the three first order conditions in section 2 coincide. Hence the optimal proposal in relative terms is,

$$\frac{y^*}{X(\mathbf{a}.\mathbf{q})} = \frac{m_i^*}{X(\mathbf{a}.\mathbf{q})} + \frac{1}{\beta_i} \tag{11}$$

Accordingly - if there is a difference in the average offer between the control group and the players in the experimental group whose reported fairness ideals imply the same distribution, it follows from equation 11) that the difference is due to a change in the weight attached to fairness considerations.

I perform a two-sample t test of the null hypothesis that the population means of offer made to opponent - in absolute and relative terms - are the same for the control group and for the group of players in the experimental group whose reported fairness ideal imply the same distribution. Individuals who have had the opportunity to exchange information about fairness are expected to assign more importance to fairness than the individuals who have not had this opportunity. The difference between the population means of offer is then expected to be negative. Table 7 reports the results of the tests. For offer in absolute terms the null hypothesis can be rejected. Communication has a statistically significant effect on the weight attached to fairness considerations.[6]

Table 7: Result of t test of the null hypothesis

Variable	Absolute	Relative
Difference	- 47.97	- 0.037
p-value	0.039	0.073

Note: "Difference" refers to the difference between the population means of offer made to opponent in the control group and by the players in the experimental group who reported fairness ideal that implied the same distribution.
The denominator in the relative term is total income produced.

Effect on the overall fairness consideration To test the effect on the overall fairness consideration, I estimate the three first order conditions from section 2 - equations 5, 6 and 7. The first one reflects the integrity model, which predicts that a player's overall fairness consideration depends only on his own fairness ideal - his opponent's fairness ideal has no effect on his overall fairness consideration.The second one reflects the compromise model,

[6]Figure A3 in the appendix, section 7.3, shows a quantile-quantile plot of offer (in relative terms) made to opponent.

which predicts that the higher the communicated offer from an opponent is, the more a player takes of the total income and vice versa. The third one reflects the self-serving model, which predicts that a player's overall fairness consideration depends on his own fairness ideal and also on his opponent's fairness ideal, but only when that is more favourable to him than his own fairness ideal.

The amount of money a player keeps in the distribution phase relative to total income is regressed on the distributive implication of his and his opponent´s choice of fairness ideal in the communication phase. Since there is an unobserved weight attached to fairness considerations, which is assumed to be uncorrelated with the fairness ideal an individual endorses, and since 26.6% of the participants keep the whole joint production, I run a random effect censored (tobit) regression.[7] The regression results are reported in table 8.

The estimation of the integrity model shows a statistically significant relationship between what an individual reports in the communication phase and what he chooses in the distribution phase. However the estimated parameter is less than unity.[8]

As can be seen from the estimation of the compromise model there is also a relationship between what an opponent reports in the communication phase and what an individual chooses in the distribution phase. The estimated effect on an individual's overall fairness consideration of his own report on fairness is greater than the estimated effect of his opponent's report on fairness ($0.5 < \alpha_i \leq 1$), as predicted by the theoretical model. However the sum of the estimated parameters is less than unity.[9]

The estimated parameter on own ideal is greater in the self-serving model than in the compromise model as predicted by the theoretical models. However the parameter is less than unity.[10] There is also an effect of the opponent´s reported fairness ideal when that benefits the individual most.

[7] To deal with panel data and unobserved effects I apply regression with a complex error structure. Two error terms are included in the econometric models. One error term is person specific and common to each individual, but differs between them. The idiosyncratic error term is game specific and unique to each of the individuals in each game. As can be seen from the table 8 the variation between individuals (sigma-u) is more than twice the variation between games (sigma-e).

[8] A parameter test reports a p-value=0.0000.

[9] A parameter test reports a p-value=0.0002.

[10] A parameter test reports a p-value=0.0001.

Table 8: Regression results

y-share on	IM	CM	SM
constant	- 0.394	- 0.382	- 0.373
	(0.049)	*(0.051)*	*(0.052)*
own ideal	0.673	0.557	0.698
	(0.078)	*(0.134)*	*(0.079)*
opponent's ideal		0.135	
		(0.137)	
max ideal			0.244
			(0.182)
sigma - u	0.279	0.287	0.290
	(0.024)	*(0.026)*	*(0.026)*
sigma - e	0.110	0.108	0.107
	(0.009)	*(0.009)*	*(0.009)*
log likelihood	- 21.367	-20.861	- 20.198

Note: IM stands for integrity model. CM stands for compromise model. SM stands for self-serving model. y-share refers to the amount of money a player keeps in the distribution phase relative to total income. Own ideal and opponent's ideal refers to the distributive implication of the player's and his opponent's choice of fairness ideal in the communication phase, respectively. Max ideal refers to the positive difference between the distributive implication of the opponent's and the player's choice of fairness ideal. Standard errors in parentheses.

Hence there is an effect of communication on an individual's overall fairness consideration. The effect of the opponent's report on fairness is strongest in the self-serving model. Comparing a goodness of fit measure of the composite model and the self-serving model indicates that the self-serving model fits the data best, and the self-serving model also has the highest log likelihood value.[11] The results of a likelihood ratio test indicate that the integrity model fits data better than the compromise model and the self-serving model do. [12]

The estimated values of the parameters in the three models are not fully in accordance with the assumed restrictions on the parameters in the theoretical models. Hence none of the models are accepted statistically. However the

[11] The goodness of fit measure is the Akaike information criterion (AIC). The model with the lowest AIC fits the data best. AIC for the composite and the self-serving model are 51.72262 and 50.39646, respectively.

[12] Result of the likelihood ratio test if IM is nested in CM: p.-value = 0.3144.
Result of the likelihood ratio test if IM is nested in SM: p.-value = 0.1262.

fact that none of the three models fits data perfectly only indicates that there is a certain degree of heterogeneity in the population with respect to how they process information. The opportunity to exchange information about fairness ideals may provoke some individuals to bias the overall fairness consideration that they act upon in favour of themselves, while others may be incited to show integrity and act upon their own reported fairness ideal, and still others may be incited to act upon an overall fairness consideration that is a compromise solution - somewhere in between their own and their opponent's reported fairness ideal.

4.2.3 Is the weight attached to fairness independent of fairness ideal?

In table 8 a random effect estimator is applied. The individual weight attached to fairness considerations, β_i is person specific and as such a fixed effect. However what turns it into a random effect is that β_i is assumed to be independent of the fairness ideal, $m^{k(i)}$ an individual endorses. The information in table 9 indicates that $cov(m^{k(i)}, \beta_i) = 0$: that the weight attached to fairness considerations is uncorrelated with the fairness ideal an individual endorses, and thus that the random effect assumption is appropriate.

Table 9: Indicators of the value of the parameter β, by fairness ideal

	$m=y<X$	$m\leq y=X$	$m<y<X$
Fairness ideal	Percentage	Percentage	$y-m$
Strict egalitarianism	36.7	23.3	235NOK
Liberal egalitarianism	55.1	20.5	158NOK
Libertarianism	34.2	34.2	210NOK
Observations	80	49	55

Note: X is total income produced. m is the fair distribution a player has chosen in the communication phase. y is money kept in the distribution phase. y-m is average deviation from the fair distribution.

Table 9 gives three indicators of how much weight individuals attach to fairness considerations, sorted by fairness ideal. Column 1 gives an indicator of an extremely high weight attached to fairness considerations. This column reports the percentage of players who offered exactly the amount they reported in the communication phase as the fair offer, by fairness ideal, which

may indicate that these players attach a relatively high weight to fairness considerations. The percentage of the players who selected liberal egalitarianism as the fairest ideal in the communication phase is somewhat higher than the percentages of the players who selected strict egalitarianism and libertarianism, respectively. However some of this could be due to noise and if so the percentages are not very different, indicating that the importance individuals assign to fairness is not dependent on the fairness ideal they endorse.

Column 2 gives an indicator of an extremely low weight attached to fairness considerations. This column reports that 34.2% of the players, who selected libertarianism as the fairest ideal in the communication phase, offered nothing to their opponent, indicating a very low weight attached to fairness considerations. The corresponding numbers for those who selected strict egalitarianism and liberal egalitarianism as the fairest ideal is 23.3% and 20.5%, respectively. However the amount justified by libertarianism as the fair amount to keep is often closer to total income produced than the amount justified by strict egalitarianism and liberal egalitarianism. Accordingly the percentages are fairly the same for each group.

Column 3 gives an indicator of a medium weight attached to fairness considerations. The column reports the average deviation from the fair distribution, sorted by fairness ideal. From the FOC it can be seen that if there is a difference in the deviation from the fair distribution between the players, this difference must - in a given situation - be due to a difference in the individual weights attached to fairness. Those who reported liberal egalitarianism as the fairest ideal in the communication phase deviate least from the fair distribution. However if some of this is due to noise, the average deviations are fairly the same in the three groups, indicating that the random effect assumption is appropriate.

4.3 Summary of results

Individuals, who have had the opportunity to exchange information about fairness principles, act on average more generously than individuals who have not had this opportunity. Communication has a statistically significant effect on individual distribution decisions. Test results indicate that communication has an effect on the individual weights attach to fairness considerations. There is a statistically significant increase in the weight attached to fairness due to communication. Regression results indicate that communication also has an effect on an individual's overall fairness consideration. The self-

serving model has the highest log likelihood value, but a goodness of fit test indicates that the integrity model fits the data best.

4.4 Alternative approach

Another possible effect of communication on individual distributive behaviour is that an individual makes a higher offer to an opponent who endorses the same fairness ideal as himself than to an opponent who endorses a different fairness ideal. To test this I compare the 60 observations of participants who have reported the same fairness ideal as their opponent in the communication phase with the 70 observations of participants who have reported a different fairness ideal as their opponent but with the same distributive implication (see table 5). Accordingly the only difference between the two groups is that in group 1 the players endorse the same fairness ideal as their opponents and in group 2 the players endorse a different fairness ideal as their opponents. I perform a two-sample t test of the hypothesis that the population means of offer to opponent are the same for group 1 and group 2. The difference between the two groups is expected to be positive. The result is reported in table 10. The null hypothesis can not be rejected. Moreover the sign contradict the alternative hypothesis. An individual offers on average more to an opponent who endorses a different fairness ideal than himself even when restricted to the situations were the distributive implications are the same.

Table 10: Result of t test of the null hypothesis

Variable	Absolute	Relative
Difference	- 92.23	- 0.061
p-value	0.017	0.068

Note: "Difference" refers to the difference between the population means of offer made to an opponent who endorses the same fairness ideal and an opponent who endorses a different fairness ideal with the same distributive implication. The denominator in the relative term is total income produced.

5 Related literature

Communication can have different potential effect on individual behaviour. In the theoretical literature there is a focus on how communication can en-

hance coordination in games with strategic interaction. Cheap talk can be a coordination tool and as such solve the coordination problem. Common information is usually assumed to facilitate settlement because it is expected to cause the individuals´ expectations to converge (Farrell and Rabin, 1996, Crawford, 1990, 1998, Tore Ellingsen and Magnus Johannesson, 2004b). Private information implies uncertainty, and uncertainty produces impasse. David Sally (1992) did a meta-analysis of the impact of communication on people's decisions. He used experimental data on prisoners dilemma games from 1958-1992 and regressed cooperation rate (probability of cooperation) on eight groups of variables including communication. The communication variables were verbal interaction, length of verbal interaction, written messages and prewritten promises. Verbal interaction and prewritten promises increased cooperation significantly. Ellingsen and Johannesson (2004b) carry out an empirical analysis of the coordination effects of communication and they report that cheap talk improves coordination. Communication is a way to assure that the co-player understands the game and the nature of the fair outcome and the authors' tentative conclusion is that in this coordination process receiving a message may be better than to send one. However Babcock et al. (1993,1995) and Babcock and Loewenstein (1997) do not find this coordination effect. Information-sharing does not necessarily promote settlement, because in trying to achieve a fair outcome the participants´ perception of fairness tends to be biased by self-interest, and thus reduce the prospects for agreement. Communication may cause people to make self-serving distortion of justice – they bias notions of fairness in favour of themselves, and the self-serving judgement of fairness interfere with settlement in bargaining. Self-serving assessments of fairness are likely to occur in morally ambiguous settings in which there are competing focal points (Babcock et al, 1993, 1995, Babcock and Loewenstein, 1997). The self-serving bias elaborated on in Babcock et al. (1993, 1995) and Babcock and Loewenstein (1997) is a kind of moral bias which according to Konow (2005) has two parts. One part he calls the self-centered bias– a kind of opportunistic behaviour - individuals intentionally act unfairly out of self-interest. In Dana et al. (2004) this part of the moral bias is called moral wriggling. The other part is the self-serving bias - individuals adjust their belief of what is fair – consciously or subconsciously - to reduce the unpleasantness of unfair behaviour. In David M. Mesick and Keith Sentis (1983) this part of the moral bias is called the egocentric bias. If there is self-serving bias at work, people engage in self-deception to reduce dissonant cognitions caused by the fact that they are motivated by the com-

bined forces of fairness considerations and self-interest, and in this mental process moral "blind spots" are generated (Konow, 2005). Fairness biases are sensitive to both the stakes and information of individuals and with data from a dictator game with a production phase and a pre-play communication phase it is possible to analyse the impact on fairness of both these factors. In an experiment run by Babcock et al (1993) to investigate the relationship between self-serving judgement of fairness and settlement two subjects were assigned the role of plaintiff and defendant in a legal dispute. The two parties read the same case materials and were informed that an actual judge had also read the materials, and that the judge had decided an award for the plaintiff. The subjects then announced what they considered a fair reward, guessed the judge's award and tried to agree on a sum of money that the defendant should pay the plaintiff. If the parties did not reach an agreement, legal costs were imposed on both parties and the judge's decision determined the value of the actual payment. The study reports that subjects are biased in their judgment of fairness and predictions of the judge's award, and the bargainers´ ability to reach voluntary settlement is negatively correlated with the magnitude of this bias. Babcock et al (1995) also examine if there is a causal link between the self-serving bias and dispersion. They used the same experiment as in the 1993 study, but they introduced a second treatment. The participants in the control group were assigned their roles before they read the materials, predicted the judge's award, assessed fairness, and negotiated, while in the experimental group (second treatment) they were given their roles just before the negotiation. A higher rate of agreement was expected in the experimental group because in this treatment there was no possibility of self-serving bias when the fairness assessment was announced - and this is also what the study reports.

Babcock et al. (1995) also introduces context in the experiment. In most experiments in economics over the years it has been a concern to remove any context. However in order to test if self-interest has an impact on fairness considerations, Babcock et al. (1995) also add context to the bargaining situation. After the negotiation was over the subjects were asked to rate the importance of 16 arguments pro and con each party. The researchers´ hunch is that self-serving bias is more likely to occur when there is context added to the experiment. A contextual effect is traced and it is strongest in the treatment where the individual stakes (roles) are common information. Allowing people to exchange information about what makes a fair distribution of income, adds context to the distribution situation, and if justice is

context dependent – dependant on information about people and variables - as reported in Babcock et al. (1995), Babcock and Loewenstein (1997) and Konow (2001, 2003), the interpretation of the fairness principle will be affected by this. In the current study the context is the pre-play communication and the study seeks to clarify the role of a pre-play communication opportunity in distributive justice meaning. If there are contextual effects, i.e. if the fairness judgements of individuals are affected by pre-play communication, then in the next turn this may affect the application of the fairness principles. In Table 6 and 8 in section 4 it is reported that the opportunity to communicate about fairness ideals before the distribution decision affects this decision.

There is also the aspect that justice is context specific, indicating that there are no general principles of justice. What is a fair distribution is revealed in the words and actions of people in real life experiences. Elisabeth Hoffman and Matthew L. Spitzer (1985) advocate this aspect. They emphasize that there is a tendency to over-attribute human behaviour to human characteristic or traits rather than situational determinants, and one should be careful about predicting behaviour generated by moral norms over different sorts of situation, and there is always a possibility to make "the fundamental attribution error" because the experimental institutions or treatments may trigger a certain aspect of the individual concept of justice within that experiment. This is also a matter of external validity - the extent to which the findings obtained in the laboratory generalise to settings outside, and according to Graham Loomes (1999) the real issue in individual decision experiments should perhaps be to gain a better understanding of the context dependent way in which people handle decision problems, including how reflection, interaction, learning from experience etc may modify behaviour rather then assume that people have stationary complete and consistent preferences. More generally variation in the presentation of a scenario will cause framing effects. Accordingly if pre-play communication has an impact on the people's distribution decision, it is most probably communication per se that makes a difference but it might also be the new experimental setting in the distribution phase that makes the difference. However simple design - as the one in the current study - reduces potential framing effects.

Other-regarding behaviour may not be a result of a subject's preference for fairness, but rather due to the subject's reliance on the reciprocity of others (Joyce Berg et al, 1995, Hoffman et al 1994, Hoffman et al 1996). Hence other-regarding behaviour may reflect both distributive and recipro-

cal preferences. While distributive preferences are related to consequences or outcomes, reciprocal preferences are related to intentions. In some sense these are the social science counterparts to the traditions in ethics in philosophy referred to as teleology and deontology, respectively. With a dictator game one often thinks that any kind of strategic elements are absent. However a dictator may have a concern for what other thinks and a wish to be held in high regard by others (Ellingsen and Johannesson, 2006). Moreover responders in a dictatorship game with communication may reciprocate the dictator's suggested offer. Jordi Brandts and Gary Charness (2003) analyse this phenomenon in a game with communication where the players use the messages to infer others intentions. The study focuses on process satisfaction rather than outcome satisfaction. They employ a three-stage game with communication and the possibility of costly retribution. In the first stage non-binding and costless messages are sent, in the second phase the sender and the receiver choose actions simultaneously and in the third phase the receivers can at a cost punish or reward the sender according to desert. They find that intention – promises and deception – has an influence on behaviour, and accordingly that process-satisfaction is important in distributive justice. People punish false messages and reward honest ones reflecting that communication matters and in the next turn affects the application of the fairness principles.

Communication narrow the social distance between subjects and elicit an involuntary commitment to act unselfishly (Sally, 1995, Johannesson and Erik Mohlin, 2005, Ellingsen and Johannesson, 2004a, Konow, 2000). Johannesson and Mohlin (2005) investigate how much of the effect of communication that is due to the content of the communication per se and how much is relationship specific. They utilize a dictatorship game and consider three treatments: one without communication, one in which the recipient can send a written free-form message to the dictator and in the third treatment the dictator receives a written message from a third party. The messages are sent before the allocation decision. The study reports that 1) communication matters, 2) content matters and 3) relationship matters (donations are higher with communication than with third-party communication), but this result is not significant. Ellingsen and Johannesson (2004a) use an ultimatum game with investment and consider one treatment with no communication and two treatments with communication. To investigate whether it matters who sends the message, the seller sends a written message together with his investment decision in one of these treatments, while in the other the buyer

sends a written message before the investment decision had been made. The buyer proposes how to divide in both the treatments. No restrictions were put on the content of the message, nor did the experimenters propose what it may contain. The experimenters read the messages and found that nine out of 21 messages from sellers contained threats and only four of them were respected, while 10 out of 21 messages from buyers were promises and all ten were kept. The study reports that communication increases investment, and promises are much more credible than threats. Ellingsen and Johannesson (2005) also elaborate on impartiality and morality, and they test if impartial reasoning affects people's choices after they are told which future position in society they will possess. The social reference point is the weak version of strict egalitarianism. To vary the degree of impartial deliberation two treatments are considered. In one treatment the players are assigned their roles before they read the instruction, and in the other they are assigned their role after they have read the instruction. The study reports a relationship between impartiality and fair distribution. In the communication phase in the current study the participants make impartial reasoning on the fairness matter. However when they make the real decision in the distribution phase they are not totally behind a veil of ignorance. As reported in Table 6 and 8 in section 4 impartial communication affects the participants´ distribution decision.

6 Conclusion

In this paper I have analysed the effect of communication on individual assessment of fairness in an experiment where both the control and the experimental group have a stake in the outcome. It seems as if individuals are on average slightly more generous when there is a production phase than if not (see for example Cappelen et al., 2006) and even more so when there is an opportunity to exchange information about fairness ideal. Accordingly assessment of fairness seems to be sensitive to both the stakes and information of individuals. The information exchange in the communication phase is non-binding and it has no direct pay-off implication, but it comes out more than cheap talk – pre-play communication has a statistical significant effect on individual behaviour in the distribution phase. The information exchange has an impact on both the weight individuals attach to fairness considerations and on their overall fairness consideration. The weight (β_i) individuals

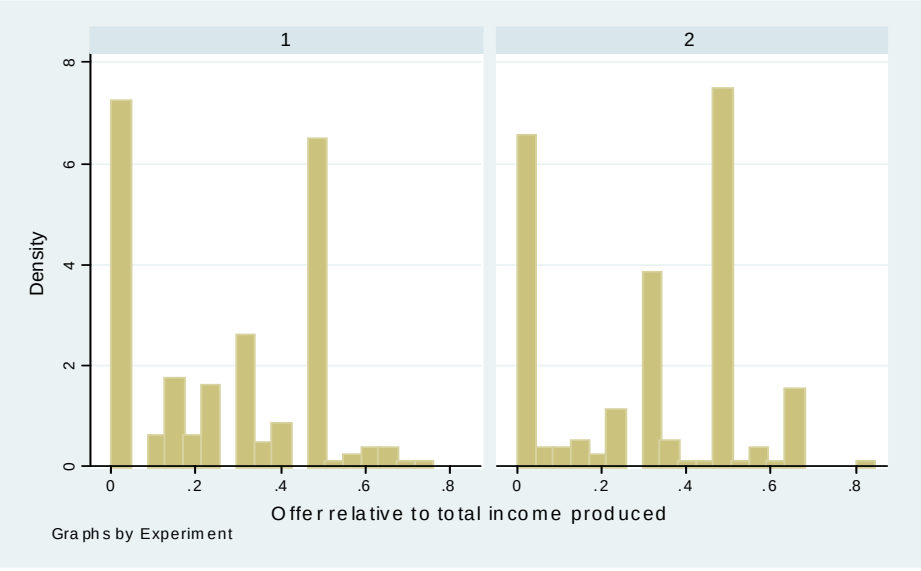
attach to fairness considerations increases due to communication and the increase is statistically significant. The estimated relationship between the fairness ideal reported by an individual $\left(m_r^{k(i)}\right)$ and his distribution decision is significant, while the estimated relationship between the fairness ideal reported by the opponent $\left(m_r^{k(j)}\right)$ and the individual´s distribution decision is insignificant. Thus an individual's overall fairness conderation is affected by communication. However the parameter values in the three estimated models are not fully in accordance with the assumed restrictions on the parameters in the theoretical models. The self-serving model has the highest log likelihood value, but the integrity model fits the data best. None of the three models fits data perfectly, which indicates that there is a certain degree of heterogeneity in the population with respect to how they process information. Some individuals may bias the overall fairness consideration that they act upon in favour of themselves, while others may commit to and act upon their own reported fairness ideal, and still others may act upon an overall fairness consideration that is a compromise solution - somewhere in between their own and their opponent's reported fairness ideal.

7 Appendix

7.1 Full distribution of absolute and relative offer

Table A1: Empirical distribution of offer made to co-player, by treatment

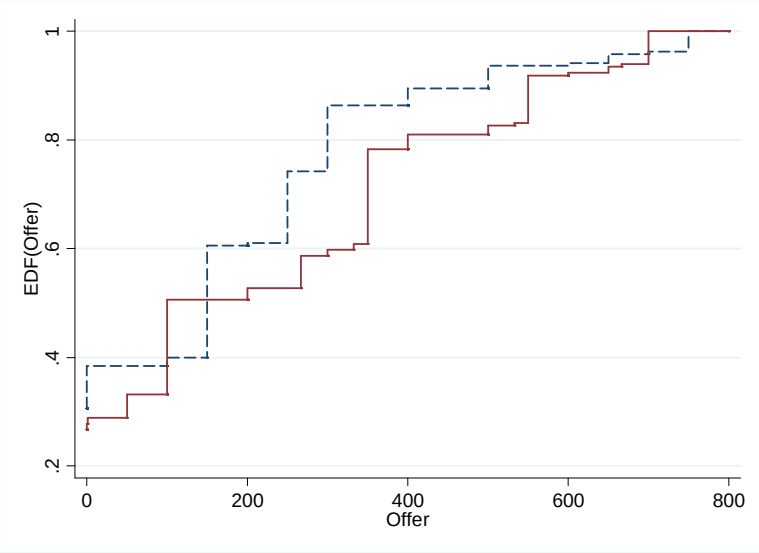
NC	NC	NC	NC	C	C	C	C
Offer	Frequency	Percent	Cumulative	Offer	Frequency	Percent	Cumulative
0	58	30.53	30.53	0	49	26.63	26.63
				1	2	1.09	27.72
				50	2	1.09	28.80
100	15	7.89	38.42	100	8	4.35	33.15
150	3	1.58	40.00				
200	39	20.53	60.53	200	32	17.39	50.54
250	1	0.53	61.05				
				267	4	2.17	52.72
300	25	13.16	74.21	300	11	5.98	58.70
				333	2	1.09	59.78
				350	2	1.09	60.87
400	23	12.11	86.32	400	32	17.39	78.26
500	6	3.16	89.47	500	5	2.72	80.98
				533	3	1.63	82.61
				550	1	0.54	83.15
600	8	4.21	93.68	600	16	8.17	91.85
650	1	0.53	94.21	650	1	0.54	92.39
				667	2	1.09	93.48
700	3	1.58	95.79	700	1	0.54	94.02
750	1	0.53	96.32				
800	7	3.68	100	800	11	5.98	100
	190	100			184	100	



7.2 Kolmogorov-Smirnov test I: Has communication an effect on distribution?

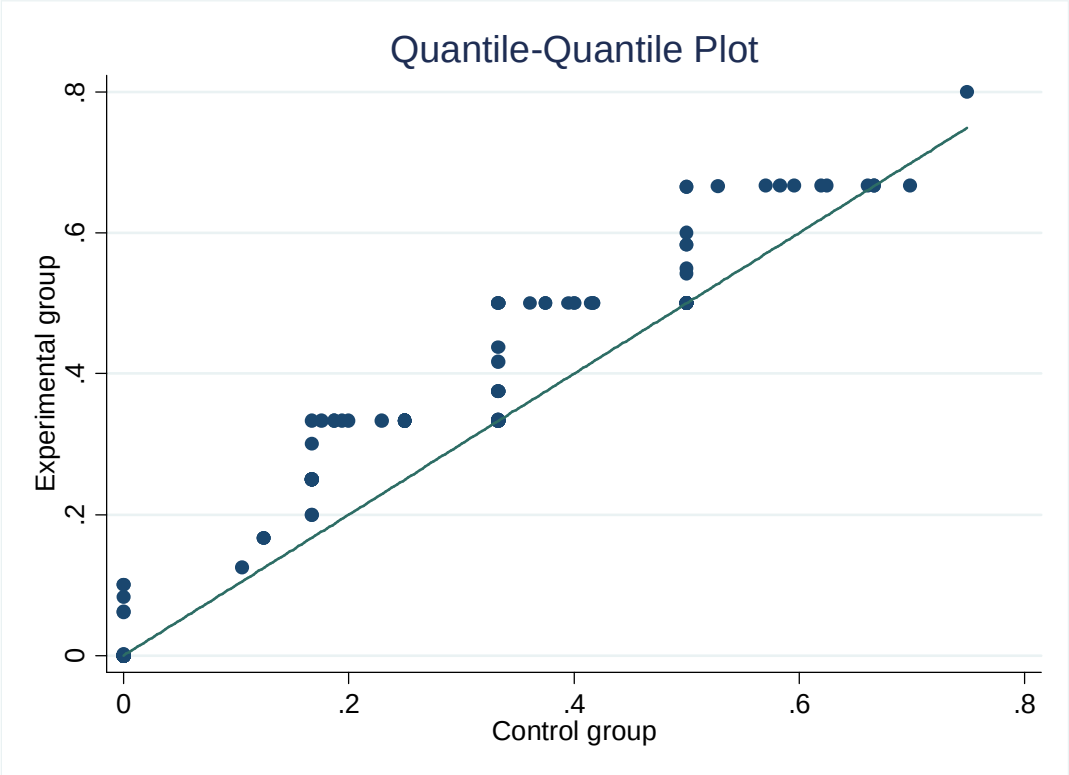
I perform a two-sample Kolmogorov-Smirnov test of the null hypothesis that the cumulative distribution functions (EDF) of offer made to opponent in the control group and in the experimental group are equal. Two hypotheses are tested. The first hypothesis test if the control group contains smaller values of offer than the experimental group and the second hypothesis tests if control group contains larger values of offer than the experimental group. The p-value for the largest difference in test 1 is p=0.011 and in test 2 p=1.000. The p-value for the combined test is 0.022. Hence the null hypothesis can be rejected. There is a statistical significant difference between the EDFs of offer in the two groups. The difference is shown in figure A2.

Figure A2: Empirical distribution functions of offer by treatment
The dotted and straight lines are for treatment 1 and 2, respectively



7.3 Kolmogorov-Smirnov test II: Effect on the weight attached to fairness?

I perform a two-sample Kolmogorov-Smirnov test of the null hypothesis that the cumulative distribution functions (EDF) of offer are equal for the control group (n=190) and the group of players in the experimental group whose communicated fairness ideal imply the same distribution (n=130). The p-value for the combined test is 0.063. Hence the null hypothesis can be rejected at ten percent level. There is a statistical significant difference between the EDFs of offer in the control group and the experimental group. A qq-plot of relative offers in the two groups is shown in figure A3.



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