Relative earnings and fairness*

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Abstract

I study the effect of relative earnings on fairness ideals to establish a better understanding of how wealth inequality evolves over time. We answer this question by using an experimental design that enables subjects to earn their endowments but still allows us to control for effort and income at the end of the earnings phase. In the main part of the experiment, subjects learn about the income and effort levels of all players from their group and are asked to distribute additional money between two of them. By distributing more than half of the money to the poorer player from their choice set, most subjects reveal that they perceive the payoff difference resulting from the earnings phase as unfair. Everything else equal, the higher the decision makers own earnings, the less s/he distributes to the poorer of the two players. This evidence suggests that an individuals preference for redistributive policies might be shaped by her affiliation to a particular income class even in the absence of a need to reduce cognitive dissonance arising from trading off her own payoff with fairness. Rational learning from experience and an illusion of control can explain the results.

Keywords: Real-effort, Inequality, Social Comparisons, Distributive Preferences

Working Paper

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1 Introduction

Many field and laboratory studies have shown that a large proportion of people are willing to give part of their money to help others (Camerer (2003); Andreoni (2006)). Despite the large literature on giving, there is still no clear understanding of the relationship between income and giving. Intuition suggests that as income increases, people would give more money to help others, at least in absolute terms. However, both field and laboratory studies raise questions about whether this is the case in practice. Some studies find a positive relationship (Eckel et al. (2007)), some find a U-shaped relationship, e.g. Auten et al. (2000), and some find no relationship between income and giving (Andreoni and Vesterlund (2001); Buckley and Croson (2006)). The opposing evidence presented in the literature might be in part due to confounding factors that matter for the decision to give. One of these factors has recently been identified by Erkal et al. (2011). The authors report evidence from a real-effort task experiment in which more pro-social agents exert less effort than less pro-social agents, thereby leading to a self-selection of less pro-social subjects into high income classes which explains the relatively modest willingness to give of the richest subjects in their experiment. In general, identifying factors explaining variations in redistributive preferences across income classes may help understand not only how wealth is distributed in societies, but also how wealth inequality evolves over time. In this article, I propose and test two additional factors that might influence the relationship between income and the willingness to redistribute.

First, people might not only care for their income but also for their relative position. Under such circumstances, one's willingness to give would depend on how it affects one's relative income in a reference group. Moreover, if the preference for preserving one's rank varies across ranks, so would its effect on the willingness to give. Preferences of a similar kind have been studied recently by KUZIEMKO et al. (2014). The authors present evidence in support of *last-place-aversion* which, for the player ranked second-to-last, is identical to the here stated idea of *rank-loss-aversion*. However, in their setting, earnings and thus income inequality results from (bad) luck only while I study a more realistic setting that makes earnings dependent on both effort and skill.

Second, the willingness to give depends on how people understand fairness in situations involving effort, skill and luck Camerer (2003). I hypothesize that due to both rational learning and an illusion of control, people's perceptions of the relative weights of how much luck and skill were involved in the earnings procedure vary. Rational learning predicts that a subjects posterior about his level of control in a task varies with the number of good outcomes she observes. Since the rate of success is naturally correlated with income, this induces a correlation between income and beliefs about the level of control. According to the theory of *illusion of control* agents who perform well in a task are more likely to believe the task involved skill than do agents who perform badly Langer (1975). Because i won't be able to distinguish the two factors in the current experiment, i refer to both of them as *Illusion of fairness*[1].

Cappelen et al. (2007) report experimental evidence suggesting that the fairness ideals of 56.5% of their subjects are in line with liberal egalitarianism or libertarianism. The preference for redistribution of people following these fairness ideals depends on how much luck and skill was involved the procedure which has determined all player's earnings. Hence, I expect players doing well in a skill and luck dependent task to perceive the earnings procedure as fairer than do players who do badly.

I test for the effects of *rank-loss-aversion* and the *illusion of fairness* by using an experimental design that enables subjects to earn their endowments but still allows me to control for effort and income at the end of the earnings phase. In the main part of the experiment, subjects learn about the income and effort levels of all players from their group and are asked to distribute additional money between two of them. To test for the implications of "rank-loss-aversion", decision makers (=suject making a distributive choice) in Treatment 1 are asked to choose between giving to the player one rank above and one rank below them successively for several rounds. To be able to observe income rank-dependent variations of fairness ideals in Treatment 2, I ask all subjects to make their distributive choices with respect to the same choice sets of reiceivers.

In treatment 1, I find that the amount given to the poorer player is indeed decreasing in the payoff difference to the poorer player up to a certain threshold where the difference is small but positive. Most importantly, giving to the "originally" poorer player is again increasing the more that threshold has been left behind. While the effect is strongest for the player ranked second-to-last, it does not differ significantly across ranks. I interpret this as evidence for general rank-loss aversion instead of mere last-place-aversion.

In Treatment 2, most players reveal that they perceive the payoff difference resulting from the earnings phase as unfair by distributing more than half of the money to the poorer player from their choice set. However, everything else equal, the higher the decision makers own earnings, the less she

[1]The reader may wonder how this effect differs from the well documented *self-serving bias*. The self-serving bias is a mean to reduce cognitive dissonance arising from trading off fairness views with own payoffs, resulting in an adjustment of the perception of fairness Konow (2000). *Illusion of fairness* instead, is present even if own payoffs need not be traded off.

distributes to the poorer of the two players. This evidence supports the "illusion of fairness" hypothesis.

1.1 Literature

The relationship of relative income and utility has been part of survey research as well as (field) experimental research. For example, Boyce et al. (2010) use data from Britain to show that percentile in the income distribution predicts life satisfaction better than absolute income. Similarly, Blanchflower and Oswald (2004) find that holding own income constant, own well-being decreases in the income of those living close. Card et al. (2012) demonstrate in a field experiment that learning about a peer's income has a negative effect on that employee's job satisfaction if the peer's income is higher.

What makes it hard to use thise evidence test particular hypothesises in the spirit of this paper's hypothesis are the ambigious explanations that can be supported by the data. Even though the behavior seems to contradict standard theory at a first glance, one can easily explain it by only self-regarding preferences if natural selection favors those who occupy a high relative position and thereby those who care about relative position as proposed by Eaton and Eswaran (2003). In the experimental sessions conducted, these rational status concerns are excluded. Payoffs are paid out anonymously and in private. Moreover, payoff differences of about 2 euros are unlikely to make any difference even for people exhibiting conspicuous consumption behavior.

On a broader scale, this paper contributes to the extensive literature on social preferences. I adapt the most wide-spread models: the inequality-aversion model of Fehr and Schmidt (1999a), the equity-reciprocity model of Bolton and Ockenfels (2000) and the distributional preference model of Charness and Rabin (2002) to a context involving production by adjusting them for cost of effort. I find that the observations from Treatment 1 cannot be explained by these models unless *rank-loss aversion* is accounted for. Similarly, explaining the data from Treatment 2 requires accounting for *illusion of fairness*.

The number of studies in which distributional preferences have been analysed within an environment involving production has been rising a lot in the recent past. In addition to the previously mentioned research by Cappelen et al. (2007) and Erkal et al. (2011), Durante et al. (2014) study preferences for redistribution and perceptions of fairness of a "(dis-)interested" decision maker following different earnings procedures that vary the degree of effort, skill, and luck involved. Their focus lies in providing evidence in support of the current social preference models used in a real world-framing and in estimating the utility weights attached to different sources of demand for redistribution. In contrast, I abstain from analyzing the people's absolute demand for redistribution but rather seek to observe and understand between and within subject differences. To some extent, this is also the main question addressed by Cappelen et al. (2010). However, while they look at the effect of the subjects' outside-the-lab institutional background on the utility weight assigned to fairness considerations, I find evidence for an effect of relative earnings on fairness views stemming from the lab only. Regarding the study of fairness, the work closest to mine is probably the one by Konow (2000). Seemingly similar to his findings, I observe that what a participant considers a fair share is not independent of how much he has benefited from the preceding earnings procedure. However, the author's experiment and theory is different from mine. While he employs a series of dictator games from which he concludes that dictators seek to reduce cognitive dissonance when trading off own payoffs with fairness perceptions by adjusting the ladder, there is no own material payoffs participants need to trade off when making distribution decisions in my experiment. Rather, an *illusion of fairness* effect due to illusion of control and/or rational learning might in parts explain the self-serving bias he identifies, while my design precludes the self-serving bias by construction.

2 Treatment 1

2.1 Subject Pool and Experimental Procedures

The experiment was programmed using zTree (Fischbacher (2007)) and conducted in English language. In total, 162 subjects in 9 sessions (18 subjects per session) participated in the experiment at the laboratory at the University of Mannheim between march and may 2016. Participants were recruited via the ORSEE recruitment system (Greiner et al. (2003)). 45.7% of subjects were female. The experiment lasted 70 minutes and the average payment was 11.00 Euro with a maximum of 19.00 Euro and a minimum of 5 Euro. 90 subjects (5 sessions) participated in Treatment 1.

2.2 Experimental Design

The experiment involved two parts. Part one comprises a brief skill task (stage 1), a real-effort task (stage 2) and a distribution task (stage 3). The ladder was varied across treatments. Part two comprises a trust game (stage 4) that is not varied across treatments. Prior to the first part, instructions were handed out to subjects and read aloud by the experimenter; they were also told that the experiment had a second part but that detailed instructions would be provided later. However, it said that the "significantly larger share of [their] your earnings is determined during the first three stages of the experiment" to make subjects take their redistribution decisions with care.

At the beginning of the experiment, people are randomly matched into groups of six players. Each player in a group gets assigned a unique color as ID. Because the designs of stage 1 and stage 2 are chosen in order to minimize magnitude of factors other than rank-loss-aversion but which could potentially influence distributive choices, I illustrate the design of the distribution task first.

In the distribution task, participants decide successively how to distribute additional money between the players ranked one position above and below them for a random number of rounds. The players ranked first choose between the players ranked second and sixth while players ranked sixth choose between those ranked first and fifth. Sample screenshots from stage 3 and all other stages can be found in the appendix. The amount players could redistribute per round was 1 Euro. The number of rounds was 5 + a random number drawn from a Poisson distribution with mean equal to 1. Participants were only told that the number was random. Thus, subjects had an incentive to choose only the allocation that did maximize their utility given the total amount that could have been distributed up to that point in every round. At the end of Stage 3, only one randomly chosen subject's decisions are implemented per group. This prevents any strategic concerns and renders each subject's decisions independent of other subject's decisions.

The design objective of Stage 1 and stage 2 is to establish an unequal income distribution where each player can be assigned a different income rank that is earned through effort. Part of the research objective of this paper is to test for between rank differences in rank-loss-aversion and fairness views. To be able to relate any difference in choices between decision makers' choices to the decision maker's rank and not to the subjects in his choice set (receivers), it would be desirable to have a constant income and effort difference between two adjacent ranks. To achieve a group and session invariant income distribution with fixed between rank income differences, I use a tournament. There are, however, several issues related to the use of tournaments that might prevent the identification of the effects searched for. First, in a classical tournament with sufficiently high incentives, those people win who possess the greatest talent required for the specific task. Being skilled in a specific task reduces the perceived cost of effort for that task. Since the decision how to distribute the additional money between the richer and the poorer player should be based on an assessment of the other players' earnings and their respective effort cost, rank-related differences in perceived cost of effort could affect the distribution choice. Second, inference from between group or subject comparisons would be difficult to make as neither would effort be constant across groups nor would be effort differences between ranks. Third, letting subjects compete in a tournament with a linear prizing scheme typically leads to a non-linear relationship between effort and income. The downside of this is a very concentrated distribution of exerted effort levels with overproportional compensation for the winner of the tournament. As Gill and Stone (2010) and Gill and Prowse (2012) show, this again can lead to a reduction of effort because of disappointment aversion. Fourth, both envy and guilt might enter beliefs as pointed out by Grund and Sliwka (2005) due to the perceived entitlements regarding not only oneself but also one's competitors expected effort. As these effects and biases might well be systematically correlated with one's rank in a group, preventing their emergence is indispensable. Fifth and last, the work by Erkal et al. (2011) has identified a self-selection bias of pro-social subjects into lower ranks which would affect results systematically as well.

The following design of the earnings phase is meant to surmount the difficulties discussed above. The task in stage 1 is the same for all participants. All subjects are shown an identical table consisting of 1200 randomly ordered zeros and ones for 15 seconds. After the time has passed, they have to provide an estimate of how many zeros there were in the table. Based on their and the other group members' estimates, a ranking is built. If a tie occurs, the computer allocates the higher rank randomly.

Stage 2 involves a real effort-task first applied by Abeler et al. (2011). The task requires counting zeros in a series of tables that each contains 150 randomly ordered zeros and ones. The time given to subjects to complete this task is 20 minutes. As Abeler et al. (2011) point out, the task does not require any prior knowledge, performance in it is easily measurable and it is boring. Most importantly, the task entails a positive cost of effort according to the authors. The piece rate per table was fixed to 50 cents. However, there was an earnings cap that was dependent on the rank acquired in stage 1. A player ranked first could continue counting until he reached 12 Euro, a player ranked second until he reached 10 Euro, etc. The player in the last place (ranked sixth) could count until he reached 2 Euro. These earnings caps are equivalent to effort caps such that the effort difference between to adjacently ranked subjects is four correctly counted tables. In order to keep the attention of subjects focused on the computer screens while waiting for higher ranked players who have to count more tables, they were given access to an article about Mannheim (where all subjects were students) taken from the English Wikipedia website.

While this design choice was mainly driven by the requirements posited above to be able to carve out the effects studied in this paper, it also has a nice real-world interpretation. In the early stages of most people's lives, exams set the stage for future careers. Relative to an entire life, the time and effort it takes to study for an exam such as the A-levels is rather short - just as the estimation task in stage 1 of the experiment. Depending on the outcome of that brief "skill challenge" most people start diverse jobs entailing them to quite disparate wages and income that is (though certainly not linearly) monotonically related to the level of effort required to perform these jobs. This resembles stage 2 of the experiment. Due to the analogy to the noticeable conformity to the real world, findings from this experiment might not only inform us about the existence of the effects discussed, but also that we should expect them to play an important role outside the lab.

2.3 Rank-loss-aversion and Alternative Models

2.3.1 Standard Models of Other-regarding preferences

Bolton and Ockenfels (2000) posit that utility is based on own income and one's share of the total surplus $\frac{y_i}{\bar{y}}$, but own income y_i is constant in my experiment and $\bar{y}$ cannot be influenced by the decision maker since all the additional money always has to be distributed across the other player. Hence, the equity-reciprocity model does not yield a prediction other than indifference between giving to the poorer or richer player for subjects' behavior in this experiment. Similarly, Charness and Rabin (2002) assume utility is dependent on $\frac{y_i}{\bar{y}}$, y_i and the income of the poorest player. Given that the experiment requires participants to provide effort, the poorest player in terms of utility need not necessarily be the player in the last place. However, as no player stopped counting zeros before the time was over or the earnings cap was reached, the piece rate of 50 cents must have been larger than the cost of effort. Therefore, the last-ranked player indeed is the poorest player. Then, the distributional preference model predicts that whenever a decision maker hast the option to give the last-ranked player, he would distribute a larger share to the poorer (last-ranked) player than he would distribute to a poorer player otherwise. In Treatment 1, the decision maker has to distribute money to the same player several times while total balances accumulate. The player ranked second-to-last should thus display a preference for giving a relatively large share to the player in the last place during the first round(s) but then be indifferent during any future rounds. In the inequity-aversion model by Fehr and Schmidt (1999b), utility of player i is given by:

$$U_i(x_i) = x_i - \alpha_i \frac{1}{n-1} \sum_{j \neq i} \max\{x_j - x_i, 0\} - \beta_i \frac{1}{n-1} \sum_{j \neq i} \max\{x_i - x_j, 0\}$$

where the authors assume $\beta_i \leq \alpha_i$, $0 \leq \beta_i < 1$ and x_i represents player i's monetary payoff. The simplest way to account for cost of effort in this model is by setting $x_i = y_i - c(y_i)$ where now y_i is player i's monetary payoff and $c(y_i)$ accounts for the cost of effort to attain that payoff. However, since I can infer from the data that $y_i > c(y_i)$ for all subjects, the question of whether a decision maker incurs a utility loss from advantageous inequality (the term weighted by β) or from disadvantageous inequality (the term weighted by α) with respect to a specific other player remains unaffected. All it implies is that the switch from advantageous inequality to disadvantageous inequality with respect to player j could be reached at some $y_j < y_i$. Since utility is assumed to be linear in all dimensions, a decision maker should be indifferent between giving to the "originally" higher ranked player k and giving to the "originally" lower ranked player j as soon as $x_j > x_i$ while prior to that point, he is predicted to allocate all the money to player j.
Hence, the model predicts the following behavior of subjects in Treatment 1: if in any round t the decision maker chooses to split the amount according to a sharing rule $s \in (0,1)$, he should be indifferent between any rule $s \in [0,1]$ in all round $t + x, \ x \geq 1$. To see why, consider a decision maker choosing $s^* \in (0,1)$ in round t. At the point when this decision implements s^*, he must be indifferent between giving more to richer player k or the poorer player j as he could otherwise have raised the share given to the poorer player to $s' > s^*$. To be indifferent in round t, $x_j \geq x_i$ must hold. Because $x_j \geq x_i$ in round t implies $x_j \geq x_i$ in all rounds $t + x$, the decision maker is indifferent in all future round. If decision makers are indifferent, they are expected to give half of the share to either player on average.

2.3.2 A Model of Fairness

The downside of the models discussed so far is their approach to consider distribute preferences to be self-centered while the decision to be made in the experiment concerns (in monetary terms) only two other players but not the decision maker himself. Therefore, i briefly discuss the alternative of a fairness minded decision maker having preferences over distribution of payoffs between any other two players. Assume $y_j > y_k$ and suppose player i considers y_j/y_k a fair split of $y_k + y_j$ if $\frac{y_j}{y_k} = \frac{c(y_j)}{c(y_k)} \Leftrightarrow 1 = \frac{y_k c(y_j)}{y_j c(y_k)}$ and player i incurs a utility loss from the unfairness according to $\gamma\big(1 - \frac{y_k c(y_j)}{y_j c(y_k)}\big)$, where γ is the weight attached to non-self-centered unfairness. To complete the model, it is necessary to make assumption about disutility from self-centered unfairness. Denote by α the weight attached to disadvantageous unfairness and by denote by β the weight attached to advantageous unfairness.

Then, by assuming all (dis-) utilities from unfairness are additively separable, we can write down the following utility function to account for such preferences:

$$U_i(x_i) = x_i - \frac{1}{n}\sum_{j\neq i}^{n}\big(\alpha \max\{1-\frac{y_j}{y_i}\frac{c(y_i)}{c(y_j)},0\} + \beta \max\{1-\frac{y_i}{y_j}\frac{c(y_j)}{c(y_i)},0\}\big)$$
$$-\frac{1}{n}\gamma\sum_{j\neq i}^{n}\Bigg(\sum_{k\neq i,j}^{n}\max\{1-\frac{y_j}{y_k}\frac{c(y_k)}{c(y_j)},0\}\Bigg)$$

An important feature of that utility function is that subject i's utility maximizing fair split of any amount $S = y_j + y_k$ between player j and k is independent of both i's own income and the income of all other players[2].

Regarding the experiment, I obtain the following result:
If player i's choice is about how to distribute S between player j and player k and giving $d < S$ to player j satisfies $\frac{y_j+d}{y_k+(S-d)} = \frac{c(y_j)}{c(y_k)}$, $d < S$ maximizes i's utility as posited above. Denote by $\delta_t = \frac{d_t}{S}$ the fraction distributed to the poorer player j in round t. Then, the equality above and $c(y) < y$ (overcompensation of effort) imply that

$$\delta_1 \geq \delta_2 \geq ....\delta_T \geq \frac{c(y_j)}{c(y_k)},$$

i.e. the amount d_t given to the poorer player is monotonously decreasing. In particular, if $\frac{y_j+d}{y_k+(S-d)} = \frac{c(y_j)}{c(y_k)}$ and $d_t < S$, $\delta_{t+1} = \delta_{t+2} = ... = \frac{c(y_j)}{c(y_k)}$. Hence, the same amount d is distributed to the poorer player in all rounds succeeding round t.

2.3.3 A Model of Rank-loss-aversion

The model of rank-loss-aversion is an extension of the model of last-place aversion by KUZIEMKO et al. (2014). Assume there is a finite number of individuals with distinct wealth levels $y_1 < y_2 < ... < y_N$. Further, suppose utility is additively separable in "standard utility" and relative position. The a person's utility can be written as:

$$\Gamma_i(\gamma, y_i) = (1-\gamma)U_i(\cdot) + \gamma g(r_i)$$

where $U_i(\cdot)$ may comprise any of the utility functions discussed above, $g(r_i)$ is additional utility from one's *original relative position* r_i and γ is the weight attached to this utility. Thus, $r_i = 1$ for the person ranked first and $r_i = N$

[2] This feature also implies that the preferences represented by that utility function are transitive and complete.

for the person ranked last. *Rank-loss-aversion* implies that a person suffers a loss from giving up a relative position she feels entitled to. Entitlements to relative positions are an immediate consequence of entitlements to distinct wealth levels. To capture the idea of *rank-loss-aversion*, I impose the following functional form on $g(\cdot)$:

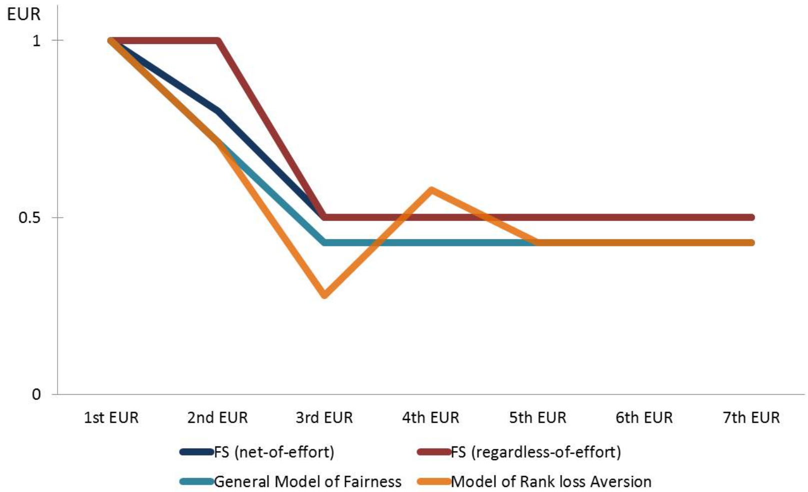
$$g(r_i) = \mathbb{1}_{r_i \geq r_i^*}$$

where r_i is player i's updated rank while r_i^* is the rank he feels entitled to after the earnings phase. Hence, $g(r_i)$ is an indicator function that gives player i additional utility from preserving his rank. The prediction of this model depends on the specification of $U_i(\cdot)$. However, I showed in the previous sections that the decision maker's optimal choice of d is either decreasing or constant[3], implying that without rank-loss-aversion, one should expect subjects to choose high d's at the beginning and to reach a plateau either at $d = \frac{S}{2}$ or at $d = S\frac{c(y_j)}{c(y_k)}$.

Accounting for *rank-loss-aversion* changes these predictions. Before giving up one's rank, a rank-loss-averse player would reduce d below the values predicted by the other models. This comes at the cost of increasing unfairness and/ or disadvantageous inequality. However, if the same player needs to make another distribution decision after having chosen an otherwise too low d in the previous round, reducing these costs by increasing d again might outweigh the loss of γ. As relative position in the experiment is of no value, I expect γ to be very small. Nevertheless, any $\gamma > 0$ implies a non-monotonicity of d_t that is not predicted by any of the other models.

Finally, we can summarize the qualitative predictions in the following chart:

[3] As noted before, the FS model implies indifference between given either of the other players once both other player's *net-of-effort* income is higher, which implies a "constant" 50-50 sharing rule only on average. However, this result is reminiscent of the linearity assumption. If inequity aversion to one's own disadvantage is an increasing and concave function of the payoff difference instead, subjects would have a clear preference for splitting any additional money evenly. Bellemare et al. (2008) provide evidence in support of such a concave relationship.



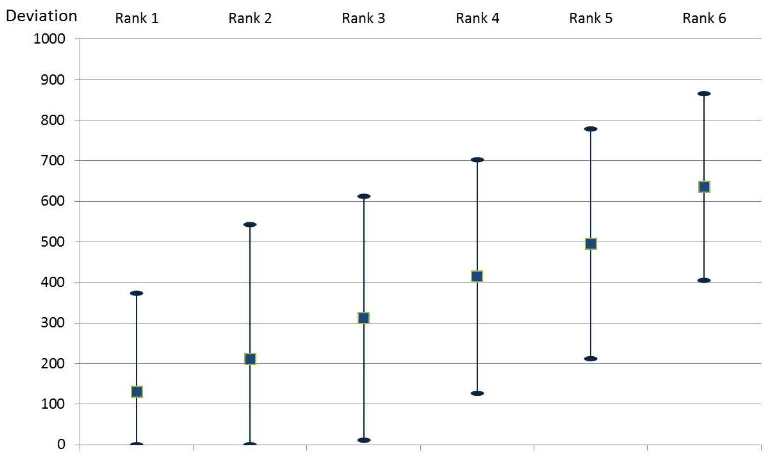
Quantitative predictions for d_t based on the 6 EUR and 10 EUR receivers endowments, 0.1 EUR/ Table as "cost of counting, and a resulting fairness bliss point ratio of $\frac{y_{poor}}{y_{rich}} = 0.75$

Figure 1: Predicted Giving to the Poorer Player

2.4 Results

In 158 out of 162 cases, subjects managed to reach their earnings cap in time. In one of the four cases left, only one table (=50cents) was missing such that I decided to not exclude this subject's data. In the other three cases however, achieved earnings were below the earnings of the originally lower ranked player, thereby causing a completely different income distribution and ranking that could not be compared with data from other groups. For this reason, I dropped all observations involving the decisions of any of these subjects from the empirical analysis.

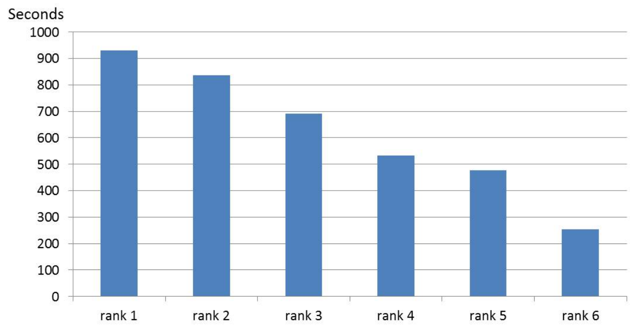
I begin with discussing the descriptive statistics before turning to a panel regression analysis of results from Treatment 1. Figure 2 shows the precision of guesses depending on the rank achieved through the guess. Notice that the mean precision of those ranked four lies still in the 95% intervall of those ranked first. I interpet this as evidence in favor of the randomness (luck) component of the guessing task.



Mean deviation of guessed from true value $\pm$ 2 SEs

Figure 2: Estimation task statistics

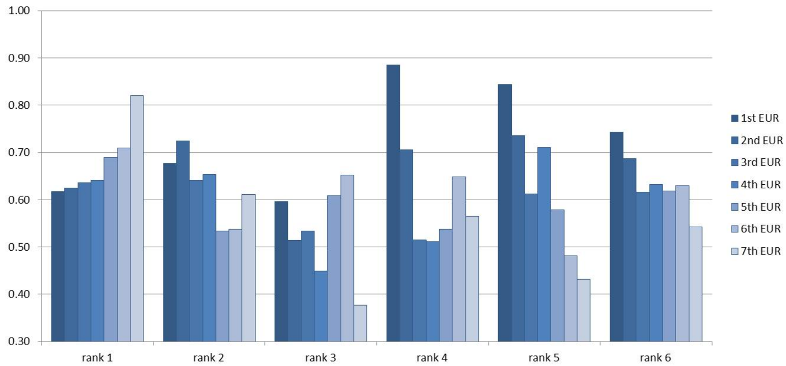
Figure 3 shows the average counting time required by subjects as a function of their rank. It will later be important to rule out increasing marginal cost of effort from counting tables. While I do not engange in a more elaborate analysis on this, the decreasing counting time increments suggest that it has become easier for subjects to count one table the more tables there were to count in total.



The data includes observations from both treatments[a].

[a]The data of three subjects is exlcuded from the analysis as they failed to reach their earnings cap by more than 2 euros.

Figure 3: Average effort (counting time) per rank

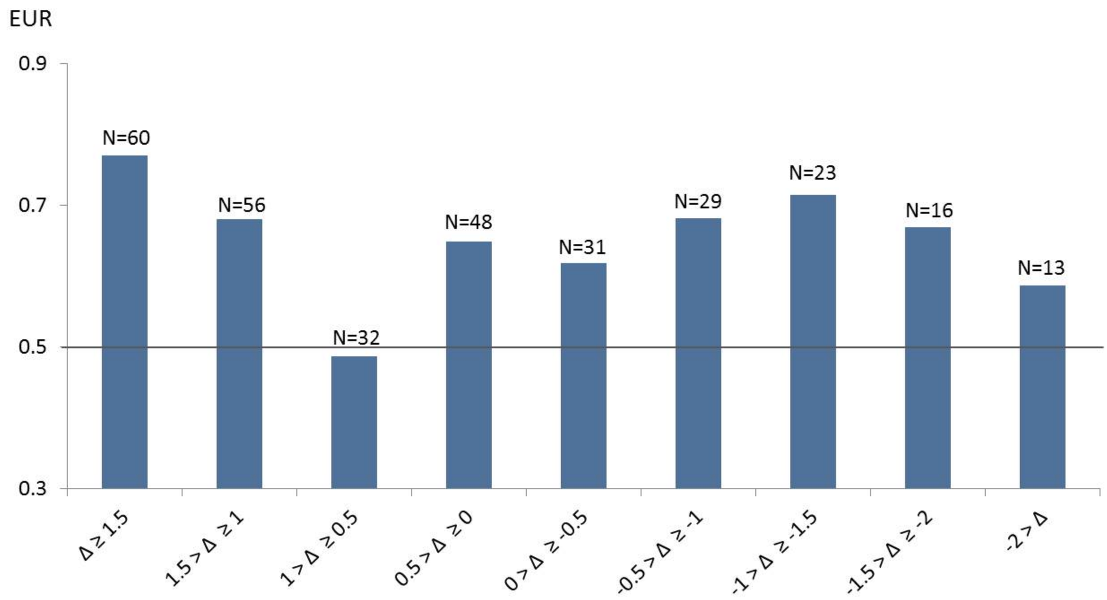


Average distributions to the poorer player per round

Figure 4:

Figure 4 pictures the average amount given in any round to the poorer player as a function of the decision maker's rank. Based on these data, Figure 5 shows the average amount given to the poorer player from the choice set projected on the payoff difference between the decision maker and the poorer player Δ[4].

[4]The data from subjects ranked first and last are not included in the analysis here and the following regression analyses unless stated otherwise for the reason that these players' choice sets could not trigger any effects resulting from rank-loss-aversion.



Δ represents the income difference to the originally lower ranked player. $\Delta < 0$ relates to having less than the poorer player.

Figure 5: Giving to the poorer player over distance

Note that $S = 1$ in this treatment and that $\Delta = 2$ before the first round of the distribution phase. Therefore, I observe every subject making a decision while being in that interval at least once. Regarding the other intervals, I do not observe decisions for all subjects as it is possible to skip an interval by distributing a relatively large share to the poorer player.

One can see that average distributions to the poorer player are lowest when the payoff difference between the decision maker lies between 1 Euro and 0.5 Euro. Both if the decision maker is more ahead or if he is more behind, the amount distributed to the poorer player is larger. I chose the displayed interval size to be slightly smaller than the average amount given to the poorer player to prevent multiple observation from the same subject while not omitting to many observations of players whose distribution are rather large. There is no theoretically founded argument in favor of the displayed interval size. The main reason for the displayed interval boundaries is that the non-monotonicity is easiest to observe for these boundaries.

One might argue that the observed non-monotonicity is due to a boundary selection bias which excludes subjects who more likely to distribute larger amounts to the poorer player and who therefore might have left out his interval. However, this is accounted for in the regression analysis by including subject fixed-effects.

Interval Dummies	(1) Ranks 2-5	(2) Ranks 2-5	(3) Rank 2	(4) Rank 3	(5) Rank 4	(6) Rank 5
$\Delta > 1.5$	0.194***	0.209***	0.159*	0.131	0.357***	0.312***
	(0.0424)	(0.0427)	(0.0793)	(0.126)	(0.0897)	(0.0672)
$\Delta \in [1, 1.5)$	0.122***	0.137***	0.177***	0.0688	0.159	0.220***
	(0.0370)	(0.0371)	(0.0585)	(0.131)	(0.0938)	(0.0525)
$\Delta \in [-0.5, 0.5)$	0.0365					
	(0.0397)					
$\Delta \in [-1.5, -0.5)$	0.0582					
	(0.0476)					
$\Delta \in [-1.5, 0.5)$		0.0642**	0.105	0.127	0.00696	0.114*
		(0.0317)	(0.0650)	(0.113)	(0.0859)	(0.0549)
$\Delta \in [0.5, 1)$	0.536***	0.521***	0.525***	0.446***	0.536***	0.512***
	(0.0224)	(0.0221)	(0.0471)	(0.0965)	(0.0663)	(0.0397)
Observations	364	364	92	90	92	90

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. SE clustered on subject level
Coefficients obtained from linear regression $giving\_to\_poor = \sum_j \beta^j \Delta_j + \epsilon_j$ incl. subject fixed-effects.
Coefficients reflect marginal changes in giving to the poorer compared to the constant $\Delta \in [0.5, 1)$

Table 1: Regression Results for Interval Dummies

Table 1 summarizes results from a regression analysis using subject-fixed effects. To increase statistical power, the interval sizes had to be adjusted. As the interval specification in Figure 1 suggests, I consider any payoff difference Δ in the interval $[0.5, 1)$ as critical and I analyze within-subject variation in giving behavior between across intervals where $[0.5, 1)$ is the left-out category. Models 1 and 2 comprise observations from all subjects ranked second to fifth. In Model 1, the alternative categories for $\Delta < 0.5$ are divided into to intervals. While the magnitude of the interval effects is in lign with the non-monotonicity prediction of *rank-loss-aversion*, the model lacks statistical power. I therefore merge all categories with $-1.5 \leq \Delta < 0.5$ into a single interval in model 2 and find a significant increase of giving to the poorer relative to the left out category of the $[0.5, 1)$ interval. The fact that the evidence for an increase in giving to the poorer beyond the threshold of $\Delta = 0.5$ is not as strong as the evidence for a decrease in giving to the poorer for the first three intervals is in lign with the theory presented in the previous section. From the fact that all subjects completed their counting task I know that $c(y) < y$. This implies that in the first round(s), subject give more to the poorer player to compensate for the unfair earnings difference. After this first round(s), giving to the player declines not only because the decision maker does not want to lose his rank, but also because the fair distribution has adjusted downwards. When the share given to the poorer player increases for $\Delta < 0.5$, theory does not predict it to go back to the original level from the first round but to a somewhat lower level keeping the payoff difference between the other two players fair. In models 3 to 6, I consider rank-specific data to compare the magnitude of the effects across the decision makers ranks. Since I have only 15 independent observations per rank, non of the differences to the left-out category is significant, despite the increase in giving behavior of the player ranked second-to-last. This latter evidence supports the theory of last-place-aversion. However, none of the coefficients is statistically different from one another. I therefore conclude that people at any relative position exhibit rank-loss-aversion.

3 Treatment 2

In this section, I test an alternative consequence of relative earnings on distributive preferences and fairness views in particular. While I will be agnostic about the precise fairness ideal of subjects, I show that fairness dependent preferences differ across relative positions despite the fairness view independent allocation of ranks. Prior to presenting results of Treatment 2, I introduce first the concepts related to *illusion of fairness* that I expect to trigger heterogeneity in disitributve choices. Before turning to the presentation of the experimental design, I derive qualitative predictions from these concepts.

Most people's working life begins with several years of schooling at primary school, grammar school, middle school and is often followed by more years in high school, college and university. After graduation from these institutions, a transcript is awarded to the graduate, allowing him to persue further education or begin a career. The prospects of most applications thereby depend to some extent on the candidate's grades he had received, in some cases only on grades of a handful of exams. Teachers of all kinds admit that grades do not perfectly correlate with a student's skill. In fact, exam performance depends on luck in many ways such as one's day-dependent physical/ mental conidition or being asked the "right questions.

Nevertheless, grades greatly affect the careers people can persue or what jobs they are offered. And even if someone consideres the salary paid for particular jobs as adequate given the effort it takes, the same person need not consider fair the resulting income inequality as it could be due to the fact that people had to assume the jobs involuntarily because of the luck-depended outcomes (grades) in their transcripts.

The problem is related to procedural justice and (in-) equality of opportunity, or more precisely, what people consider (in)equality of opportunity. It is a wideley studied question to what extent people consider different abilities they are endowed with as an inequality of opportunity. While the extent to which this inequality affects support for redistribtition may depend on one's belief in a "just" world (Bénabou et al. (2006)) or ex ante social mobility (Krawczyk (2011)), the general support we can observe in favor of some redistribution as well as experimental evidence such as by Krawczyk (2010)) shows that in general we seek to design a societal system compensating for this inequality of opportunity.

In addition, as shown by Durante et al. (2014), the willingness to redistribute depends substantially on the role of effort, skill and luck in the earnings procedure. A relationship between the belief about the role of effort and skill versus luck can be derived from the liberal egalitarian fairness ideal that holds income differences unjust if they are not due to circumstances people could control. If luck-dependent factors beyond the birth-given differences in abilities affect people's income, it creates an additional source for inequality of opportunity. Moreover, if it is unobservable to people whether (bad) luck was at play when they performed a task, they have to form beliefs about the role of luck. In contrast to the differences in abilities across individuals that the majority of people is aware of, this additional source of inequality in opportunities due du private experience (information) can lead to heterogenous beliefs and thereby to a different willingness to redistribute.

Piketty (1995) bases his predictions about the emergence of left-wing and right-wing dynasties on rational learning within dynasties. He assumes that income is determined by luck, effort, and ancestry. Dynasties receive one signal per generation about the importance of effort via experimentation (exerting effort). Naturally, dynasties with bad luck develop more pessimistic beliefs, hence exert less effort, but still strongly support redistributive politics.

One of the mechanisms I expect to be in place in the experiment shares this idea of rational learning with Piketty's paper. Similarly to his assumptions, I assume agents learn only from own experience and take others' beliefs as exogenously given and uninformative[5].

However, while ancestry and corresponding inequality in opportunity is a necessary feature for Piketty to derive different beliefs about social mobility, I will show later how similar beliefs about the controllability of a task are likely to correlate with the income earned in that task even of all subjects have identical beliefs ex ante.

3.1 Heterogenous Fairness Beliefs

In order to make the distributive choice, subjects with liberal egalitarian fairness ideals with a focus on equal opportunities need to form beliefs about the importance of these factors during the earnings procedure.

3.1.1 Rational Learning

Before performing the task themselves, subjects have some prior belief about the level of control they have in the task. Denote by $CR \in [0, 1]$ the level of control. CR is formalized as a random variable which is distributed according to F over $[0, 1]$. Denote the associated probability density function by $f(x)$. This allows us to write the probability a subject assigns to the event $CR \leq x$ as:

$$Prob\big(CR \leq x\big) = \int_0^b f(x)\mathrm{d}x = F(b)$$

Upon observing a success after taking a particular action, subjects form a new posterior about the probability that the task allows control via Bayesian updating:

[5]That is, people are Bayesian rational but do not possess common knowledge of Bayesian rationality (compare Piketty (1995)).

$$f(x|success) = \frac{P\big(success\ |CR = x\big)f(x)}{\int_0^1 P\big(success\ |CR = t\big)f(t)\mathrm{d}t},$$

where $P\big(success|CR = x\big)$ is the probability of success conditional on a level of control $CR = x$. If there is control, taking the "right action leads to success[6]. Besides, success can occur even if there is no control independently of the action taken. Denote the probabilty of success if no action is taken by

$$\rho \equiv Prob\big(success|no\ action\big).$$

Based on $P\big(success\ |CR = x\big) = x * 1 + (1-x) * \rho = \rho + (1-\rho)x$, I am now able to provide an expression for the posterior $f(x|success)$:

$$f(x|success) = \frac{\big(\rho + (1-\rho)x\big)f(x)}{\int_0^1 \big(\rho + (1-\rho)t\big)f(t)\mathrm{d}t},$$

The expected probability of the role of control based on the initial prior writes as:

$$\mu_x = \int_0^1 xf(x)\mathrm{d}x.$$

Accordingly, the epxected probability of the role of control after observing a success writes

$$\mu_x'(success) = \int_0^1 x\frac{\big(\rho + (1-\rho)x\big)f(x)}{\int_0^1 \big(\rho + (1-\rho)t\big)f(t)\mathrm{d}t}\mathrm{d}x = \frac{\rho\int_0^1 xf(x)\mathrm{d}x + (1-\rho)\int_0^1 x^2 f(x)\mathrm{d}x}{\rho\int_0^1 f(t)\mathrm{d}t + (1-\rho)\int_0^1 tf(t)\mathrm{d}t}$$

Claim 1. $\mu_x' > \mu_x$.

[6]In order to prevent additional learning from experimenting with different actions, assume the "right action - if it exists - is common knowledge.

Proof.

$$
\begin{aligned}
\mu_x <& \mu_x' \\
\Leftrightarrow \mu_x(success) <& \frac{\rho \int_0^1 x f(x)\mathrm{d}x + (1-\rho)\int_0^1 x^2 f(x)\mathrm{d}x}{\rho * 1 + (1-\rho)\mu_x} \\
\Leftrightarrow \mu_x\big(\rho * 1 + (1-\rho)\mu_x\big) <& \rho\mu_x + (1-\rho)\int_0^1 x^2 f(x)\mathrm{d}x \\
\Leftrightarrow \mu_x^2 <& \int_0^1 x^2 f(x)\mathrm{d}x \\
\Leftrightarrow 0 <& \mathrm{E}(x^2) - \big(\mathrm{E}(x)\big)^2 \\
\Leftrightarrow 0 <& Var(x),
\end{aligned}
$$

which holds true for all density functions $f()$ with positive mass on $x > 0$.

□

Hence, the expected level of control is higher after observing success than it was before. The μ_x' in the claim above refers to the expected level of control after observing a success. Analogously, one obtains that $\mu_x'(failure) < \mu_x < \mu_x'(success)$.

3.1.2 Self-selection

Besides, subjects are likely to have heterogeneous prior beliefs $f(x)$. Remember that $f(x)$ corresponds to the ex ante belief about the level of control. It seems naturell to assume that the initial probability someone assignes to being able to control the outcome correlates with his the level of control s/he usually experiences in similar tasks. That experienced level of control is, in turn, likely to be correlated with one's ability and skill. Suppose the outcome of a task depends partially on skill and that there exist high skilled types and low skilled types. We denote the belief corresponding densities by $f^H(x)$ and $f^L(x)$ and assume they satisfy FOSD, i.e.

$$\int_0^a f^H(x)\mathrm{d}x \leq \int_0^a f^L(x)\mathrm{d}x \;\forall\; a \in [0,1]$$

and with strict inequality for some a. It follows immediately that

$$\mu_x^{H'}(success) > \mu_x^{L'}(success)$$

By definition, high skilled subjects are more liekly to have success in a task that does not purely depend on luck. Then, rational learning implies that the mean belief of successful subjects increases and self-selection implies that probably those subjects will be succesfull who already had the highest prior belief (in terms of FOSD).

3.1.3 Illusion of Control

The theory of illusion of control by Langer (1975) states that when introducing skill-dependent tasks in situations that are mostly luck-dependent, subjects who succeed feel inappropriately optimistic about their influence on the outcome while subjects who fail sense quite the opposite. Being more optimistic about one's possibility to influence and control the outcome of a task is similar to believing that skill rather than luck matters in the given context. Until recently, the theory of illusion of control was studied independently of Bayesian learning, see Harris and Osman (2012). In fact, it is possible that most of the data that has originally been interpreted as evidence in support of illusion of control is simply due to rational Bayesian updating. However, even after accounting for rational learning - possibly based on heterogeneous priors - illusion of control could still account for any deviation of actual beliefs from Bayesian beliefs.

3.1.4 Hypothesis

In this experiment, the aim is to find evidence in support of a relationship between income and preferences for redistribution when selfishness plays no role. The hypethesis is build on the theoretical belief considerations presented in the preceeding section. However, testing directly for beliefs and measuring the impact of the different mechanisms (rational learning, selfselction, and illusion of control) will be part of a new experiment scheduled for the beginning 2017. This experiment was designed to resemble a real worl-like setting involving real-effort, skill and luck and to establish relevance and existence of the matter. Nonetheless, the hypothesis underlying the effects the experiment aims to test is the following:

Hypothesis 1. *Higher ranked (more successfull) subjects are more optimistic about the level of control in the task they participated in. That is:*

$$\mu_x(higher\ rank) > \mu_x(lower\ rank)$$

3.1.5 From fairness views to distributive choices

I now proceed describing the expected consequences from the heterogeneous reaction of subjects' beliefs.

A decision maker whose fairness ideal follows the accountability principle (Konow (2000))or (almost) equivalently, liberal egalitarianism (Cappelen et al. (2007)), holds other subjects responsible for their situation to the extent that he assumes they were responsible for the outcome due to their own choices and actions.

If subjects are homogensous ex ante, this level of responsibility is equivalent to the degree of control subjects have over the outcome.

I then follow Cappelen et al. (2010) or Krawczyk (2010) by assuming that the belief about the responsibilty for an outcome (i.e. about the level of control) influences the degree of fairness subjects attribute to a given distribution of payoffs[7]. Then, the idea underlying the design of the distribution phase is the following: if a decision maker with such beliefs considers the payoff inequality resulting from the earnings phase as unfair because he does not believe subjects can be made fully accountable for the outcome, there must exist an alternative payoff distribution that would be justified by his beliefs.

If he regards a between-subject payoff difference as completely unfair, the decision maker prefers to eliminate it completely. On the contrary, if he considers the outcome as fair, he does not seek to reduce inequality at all. Most interestingly, for any belief between these two extremes, he chooses to reduce inequality until his ideal payoff distribution is reached.

One way to account for these different fairness views formally is by extending the general model of fairness introduced in section 2.3.2. In model presented so far, I assumed subjects would always prefer player j's and k's income to satisfy $\frac{y_j}{y_k} = \frac{c(y_j)}{c(y_k)}$, where $c(y_j)$ has been the effort exerted to earn income y_j. By modelling preferences this way, I implicitely assumed all subject would follow an (quasi-Under an egalitarian fairness ideal, the distribution of income maximizing i's utility from the pairing j, k would be $y_k - c_k = y_j - c_j$. However, modelling the fairness maximal allocation this way would add lots of complexity to the general utility function while not changing the qualitative results) egalitarian fairness ideal that always implies a willingness to redistribute (or reduce inequality in the current setting). However, as pointed in the previous section, people make their decision to redistribute dependent on their beleif about other people's accountability for the existing inequality, i.e. the degree of control. The existing model can be adapted to such a liberal egalitarian fairness ideal by weighing the previous utility function based on the quasi-egalitarian fairness bliss point with the belief that the inequality is due to luck and by adding another utility, wich is maximal of the payoff-ratio is *not* changed, weighted by the belief that the outcome is due to control/skill:

[7] If subjects exhibit an egalitarian fairness ideal, any accountability belief does not affect distributive choices, as he would always prefer equality. However, all predictions hold as long as some subjects define fairness as being dependent on other people's accountability for an outcome.

$$
\begin{aligned}
U_i(x_i) = x_i - \frac{1}{n}\sum_{j\neq i}^{n} \Big(&\mu(y_i)\big(\alpha \max\{1 - \frac{y_j}{y_i}\frac{c(y_i)}{c(y_j)}, 0\} + \beta \max\{1 - \frac{y_i}{y_j}\frac{c(y_j)}{c(y_i)}, 0\}\big) \\
&+ (1-\mu(y_i))\big(\alpha \max\{1 - \frac{y_j}{y_i}, 0\} + \beta \max\{1 - \frac{y_i}{y_j}, 0\}\big)\Big) \\
- \frac{1}{n}\gamma \sum_{j\neq i}^{n} \Big(\sum_{k\neq i,j}^{n} &\mu(y_i) \max\{1 - \frac{y_j}{y_k}\frac{c(y_k)}{c(y_j)}, 0\} + (1-\mu(y_i)) \max\{1 - \frac{y_j}{y_k}, 0\}\Big),
\end{aligned}
$$

where $\mu(y_i) \in [0,1]$, $\mu'(y_i) > 0$ is player i's (the decision maker) income dependent expected level of control and the remaining notation is as in section 2.3.2.

As a consequence of the rank-induced heterogeneity in beliefs about the role of control μ_x, I conclude that decision makers' ideal fairness points are likely to vary with their own success in a way summarized by the following hypethesis.

Hypothesis 2. *The more successful a subject in a task, i.e. the higher her rank, the less she wants to reduce inequality resulting from that task.*

3.2 Experimental Design

As in Treatment 1, the game begins with players (N=72, divided into 4 sessions with 18 subjects) being randomly assigned to groups of six players. Again, players first solve the estimation task (stage 1), second complete the real-effort task (stage 2) and then proceed to the distribution phase (stage 3).

In the distribution phase, the choice sets of players to whom decision makers have to distribute additional money are different from those in Treatment 1. Instead of a repeated choice regarding the same set of players, every subject faces the following decisions exactly once: distribution to the player ranked (first and second), (second, third), (third, fourth), (fourth, fifth), (fifth, sixth) and (sixth, first), excluding choice sets involving the decision maker's rank. Hence, there are four decisions from each player. The amount subjects have to distribute in each round is 1.8 Euro. To maximize the incentive to decide with care under the constraint to obtain independent decisions, three out of the 24 (6 player, 4 decisions each) distribution decisions per group were implemented.

To ensure that all distribution decisions between subjects remained independent of one another, decisions were implemented such that no player could receive money from more than one decision. The process of how the players' decisions were chosen for implementation was explained to subjects in the instructions and tested for in several trial questions at the beginning of the experiment.

Notice the parallels between the design and the anecdotal evidence illustrated at the beginning of the section section. The guessing task dent of one another, distribution decisions were implemented such that no player could receive money from more than one decision. The process of how the players' decisions were chosen for implementation was explained to subjects in the instructions and tested for in several trial questions at the beginning of the experiment.

Notice the parallels between the design and the anecdotal evidence illustrated at the beginning of the section. The guessing task captures the key ingredients of a final exam at university: it maps skill and luck into a relative position associated with a particular (relative) grade. The eforted exerted during the exam is, compared to the the effort one needs to exert during the next decades of employment, relatively small - just as the effort in the guessing task is compared to the effort in the counting task. Depending on the guessing task's outcome (final exam), people assume different tasks (jobs) that require different amounts of real additional effort but also give different experimental payoffs (salaries).

3.2.1 Predictions

In the experiment, subjects are required to choose how to split $S = 1.8EUR$ between two unequal receivers. Because the above utility function satisfies transitivity and completeness of preferences, there is a unique share $d^* \in [0,1]$ for the poorer receiver k such that the ratio $\frac{y_k + d^* * S}{y_j + (1-d^*) * S}$ maximizes the decision maker's utility. Most importantly, while in the standard model of fairness, d was independent of y_i, I now obtain $\partial_{y_i} d\big(\mu(y_i)\big) < 0$.

Hypothesis 3. *The amount given to the poorer player decreases with the decision maker's own income.*

3.3 Results

Figure 6 displays for every income rank the average amount distributed to the poorer player. It shows that for any of the available choice sets, players ranked first and second allocated a distinctly smaller part of the money to the poorer player. Even more so, all figures from b) to f) suggest a linearly decreasing relationship between income and the amount distributed to the poorer player. By assuming a linear relationship between the amount given to the poorer player and one's own rank and by treating the latter variable as a continuous variable[8], I obtain the linear regression coefficients as displayed in Table 2.

	(1,2)	(2,3)	(3,4)	(4,5)	(5,6)	(1,6)
Rank	-0.0282	0.0794***	0.0577*	0.0551	0.166***	0.157***
	(0.0545)	(0.0292)	(0.0298)	(0.0353)	(0.0511)	(0.0568)
Constant	1.438***	0.818***	0.952***	0.943***	0.698***	0.922***
	(0.254)	(0.104)	(0.103)	(0.112)	(0.134)	(0.228)
Observations	43	39	43	48	48	47

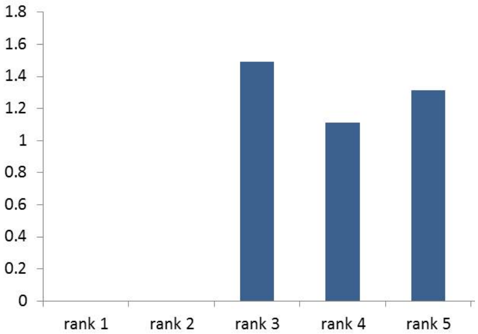
Standard errors in parentheses:* $p<0.10$, ** $p<0.05$, *** $p<0.01$

Coefficients obtained from linear regression on rank: $giving\_to\_poor = \beta^k rank_i + \epsilon_i$

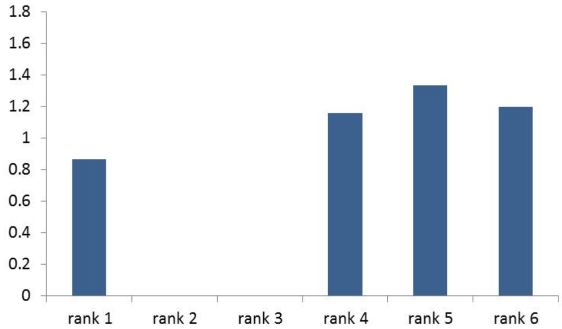
Table 2: Linear Rank Regression

Despite for the choice between the player ranked first and ranked second, all coefficients are positive with three out of the five being significant at the 1% level. Besides, the only choice set (including players ranked first and second) for which I do not obtain a positive estimate for the rank coefficient is quite different from all other choice sets for two reasons. First, there is less variation in the decision maker's income and second, it is evident from Figure 2 that the most significant drop in giving occurs between the omitted rank two and rank three. I obtain similar though less significant results by regressing giving to the poorer on rank dummies as shown in Table 3. I choose the player ranked sixth as the base category. Now, there is no significant decline in giving to the poorer from players ranked sixth to third for any of the choice sets. This might be due to a lack of power, as there are only 12 independent observations per rank. Nevertheless, the sign for the second rank is always negative and the sign for rank one is almost always significantly negative suggesting that *illusion of fairness* plays a crucial role for decision making.

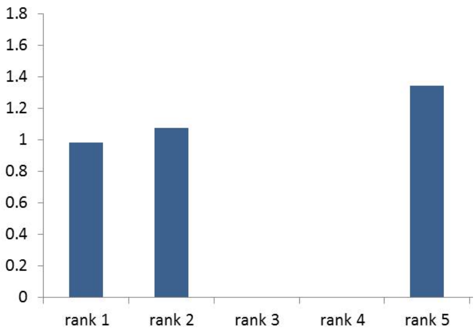
[8]Rank is of course by definition a discrete variable. However, it is perfectly co-linear to income which can be considered almost continuous.



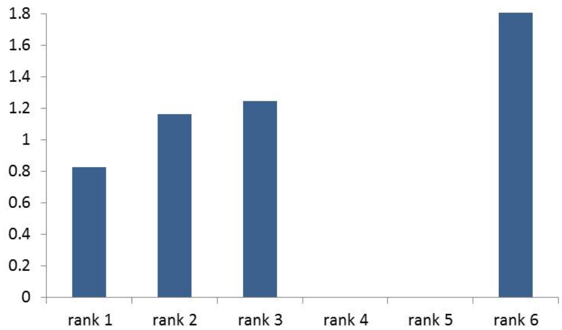
(a) Choice between 1st and 2nd rank



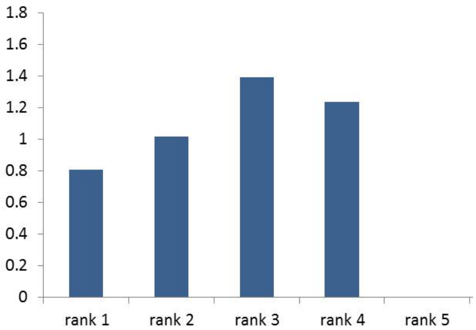
(b) Choice between 2nd and 3rd rank



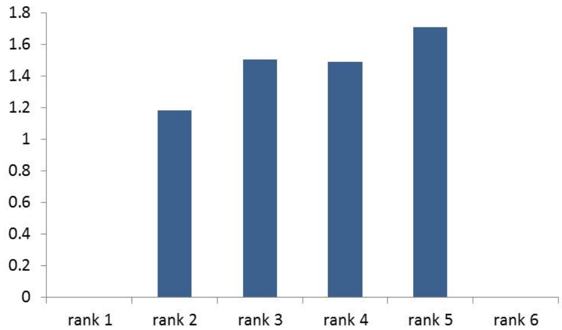
(c) Choice between 3rd and 4th rank



(d) Choice between 4th and 5th rank



(e) Choice between 5th and 6th rank



(f) Choice between 1st and 6th rank

Observed means given to the lower ranked receiver by rank of the decision maker. Total distribution amount was 1.8 EUR. 15 observations per rank per table.

Figure 6

Choice Set	(1,2)	(2,3)	(3,4)	(4,5)	(5,6)	(1,6)
rank1		-0.329*	-0.238	-0.367**	-0.428***	
		(0.168)	(0.176)	(0.173)	(0.153)	
rank2			-0.143	-0.0358	-0.218	-0.527***
			(0.186)	(0.182)	(0.178)	(0.175)
rank3	0.162			0.0475	0.156	-0.207
	(0.172)			(0.235)	(0.194)	(0.189)
rank4	-0.219	-0.0370			default	-0.217
	(0.159)	(0.181)				(0.177)
rank5	-0.0141	0.136	0.123			default
	(0.160)	(0.209)	(0.196)			
rank6	default	default	default	default		
Constant	1.329***	1.196***	1.221***	1.197***	1.236***	1.709***
	(0.124)	(0.147)	(0.147)	(0.148)	(0.115)	(0.0906)
Observations	43	39	43	48	48	47

Standard errors in parentheses:* p<0.10, ** p<0.05, *** p<0.01

Coefficients obtained from linear regression on dummies: $give\_to\_poor_i = \sum_{k=1}^{6} \beta^k rank_i^k + \epsilon_i$

Table 3: Rank Dummy Regression Model

In table 4, I report p-values from a non-parametric two-sample Wilcoxon rank-sum (Mann-Whitney) test as additional evidence. As the results from the rank dummy regression indicate no difference between all ranks below rank two, I pool all data from these ranks into one category and compare average giving in this category to average giving by subjects ranked first or second. The displayed p-values lie all below the 5% significance level so that the test indeed rejects a *no difference hypothesis.*

Clearly, the difference in beliefs causing different distributive choices is expected to be largest betweeen subjects with the highest and lowest rank. The data obtained from the first treatment allows for another analysis to test that hypothesis.

Remember that in treatment 1, subjects ranked first could either give to the player ranked second or the player ranked last while subjects ranked last could either give those ranked second-to-last oo first. Since effort is a linear function of rank by design, this implies an identical effort and payoff difference between the players in the subjects' choice sets. As in the preceding analysis, I therefore interpret any difference in distributive preferences as evidence in support of different fairness beliefs. Table 5 reports p-values from a non-parametric ranksum test based on the first and last ranked subjects distributive choices. I only include choices regarding the first and second round (= first and second euro distributed). This is because transfers accu-

Choice Set	(1,2)	(2,3)	(3,4)	(4,5)	(5,6)	(1,6)
Rank=1 or 2	(.)	0.0085	0.0140	0.0157	0.0019	0.0230
Observations	43	39	43	48	48	47

Values displayed are p-values obtained from Two-sample Wilcoxon rank-sum (Mann-Whitney) test

Table 4: P-Values of Non-parametric Mann-Whitney test

mulate in treatment 1 and can thus lead to a reversal of the income ranking. Due to the evidence on rank-loss aversion in treatment 1, distributive choices would not be solely based on one's fairness belief anymore.

Some concerns may be raised that other factors beyond beliefs account for the observed behavior, some of which I am going to discuss in the next section. However, I first want to conlcude this section by elaborating on another effect related to a biased estimate of the cost of effort that might act against the effect due to *fairness illusion*. In theory, the counting task should allow for learning and subjects should be fastest in counting their last tables. The descriptive statistics illustrated in Figure 3 support this hypothesis. This implies that the average cost of effort per table is decreasing with income. As indicated general model of fairness, decision makers take into account the cost of effort when determining their egalitarian fairness bliss point. Notice that the actual cost of effort incurred by the receivers is the receivers' private information. Decision makers thus need to estimate the cost of effort prior to choosing their preferred distribution. If these costs were estimated identically by all decision makers, it would not induce different distributive choices. However, if decision makers based their estimate on their own experienced average cost of effort, lower income would correlate with a higher estimate of the cost of effort while high income would correlate with a low estimate of the cost of effort. Both intuition and the model of fairness then predict that a subjects considers a payoff difference the fairer the more it is justified by differences in effort. Hence, high ranked (high income) subjects should prefer to distribute a larger amount the the lower ranked subject in their choice set than low ranked subjects do. Because I observe the opposite, the true magnitude of the effect of *illusion of fairness* is probably underestimated by the data of the experiment.

3.4 Discussion

In principle, an illusion of fairness captured by a belief $\mu(y_i)$ that is above (or below) the true level of control is not the only possible explanation for the difference in giving. I therefore devote this section to discussing and refute the most likely alternative explanations.

As pointed out above, a different perception of the cost of effort affects the assessment of the fair share. While the previous argument deals with the cost of effort of counting tables, I now take a closer look at the cost of waiting or doing almost nothing but reading a Wikipedia article in the lab. If there is a cost of waiting, assessing the net cost of counting tables needs to account for the cost of the outside option: waiting. To see why this is relevant, consider the following example: A participant who completes the task only shortly before the deadline might have a bad estimate of how it felt to wait for e.g. 15 minutes until the experiment continues, i.e. like a player ranked fifth or sixth. In other words, cost of waiting could (in the "worst case) be an increasing and concave function of time. Then, if subjects base their estimate about the cost of waiting on their own experience, higher ranked subjects are likely to underestimate them. When forming their fairness bliss point, they would not sufficiently account for these waiting cost which were incurred more from the poorer receiver. Hence, they want to reduce inequality less than lower ranked decision makers do. Because this mechansim could indeed explain the results described before, I analyse the effect of waiting time on giving behavior a series of regressions depected in Table 5.

	(T1) share_to_poor	(T2) share_to_poor	(T1) share_to_poor	(T2) share_to_poor
avg_time	0.000597	-0.000750		
	(0.0131)	(0.00462)		
waiting_time			-0.000231	-0.0000740
			(0.000530)	(0.000136)
Constant	0.598	0.511***	0.683***	0.504***
	(0.539)	(0.193)	(0.145)	(0.0558)
Observations	15	45	15	45

Standard errors in parentheses: * p<0.10, ** p<0.05, *** p<0.01
In in specification using data from T1, coefficients are obtained from a linear model $share\_to\_poorer_i = \alpha + \beta x\_time_i + \epsilon_i$. In in specification using data from T2, coefficients are obtained from the same linear model adding subject random effects.
Only observations from subjects ranked first are included.

Table 5: Effect of waiting time among subjects ranked first

In the last and second-to-last column of table 5 I present results on the effect of waiting time on the amount given to the poorer player based on data from both treatment 1 (T1) and treatment 2 (T2). By taking only data from subjects ranked first, I exploit the variation in waiting time that arose endogenously in the experiment[9]. Intuitively, those finishing quickly should perceive cost of waiting to be higher than those finishing late, if the marginal cost of waiting increasing (which is the only interesting case). However, i find no evidence that giving behavior is influenced by experienced waiting time.

Table 8 in the appendix shows results from an addition regression on waiting time taking into account data from both treatments by introducing choice set dummies[10]. While the magnitude of the effects and its significance remain almost unaffected compared to the results presented in Table 3, there no effect of waiting time can be identified. Model 2 considers only waiting time of the player ranked first by introducing the interaction dummy $waitingtime(1st\ rank\ only) = rank1 * waitingtime$ (rank1 is a dummy). In model 3, waiting time is considered for all subjects but has still no effect.

For completeness, Model 1 shows the effect of gender. Gender has, however, no significant effect on the choice of how much to give to the poorer player.

Finally, a higher ranked decision maker's decision to give relatively more to the richer player could be driven by the social distance to that player. In a lab where the only information about other players is their income and exerted effort, people might identify themselves with other players who put the same effort and earned identical income. Due to this kind of social identity, people might tend to give more to people resembling them. Hence, high ranked subjects would prefer to favor the rich receiver while low ranked subjects feel with the poor receiver. There is however evidence against this hypothesis. Note for example that the player ranked second is closer to the player ranked third than is the player ranked first. However, looking at the distribution decisions of players ranked first and second for the choice sets (3,4), (4,5) or (5,6) as analysed in Table 3 makes evident that the player ranked first always gives more to the richer player despite the larger economic distance.

[9]For the analysis of T2-data, I have to assume subject random-effects as subject-fixed effects would eliminate any effect of waiting time which is constant across all choices.

[10]If the relative share is the outcome variable, the only difference between distributing the *first* euro in treatment 1 and making a choice in treatment 2 is the set of receivers.

	(1) After 1st round (1€)	(2) After 2nd round (2€)
Rank 1	0.62	1.24
Rank 6	0.74	1.43
P-Values*	0.025	0.014
Observations	30	30

* P-values obtained from two-sided Mann-Whitney test

Table 6: Non-parametric test from Treatment 1

Additional counterevidence is provided in table 6 where I report the coefficients from a rank dummy regression using data from Treatment 1. I exclude the observations of the first and last ranked players since their choice sets are not comarable. In contrast to the previous evidence based on data from treatment 2, observations in treatment 1 stem from choices involving only the player ranked one position above and one position below the decision maker. Hence, none of the receiver is by any means closer to the decision maker than the other one. However, the coefficients suggest a similar negative relationship between giving to the poorer player and own income. While the fact that the player ranked third gives much more to the richer player than does the player ranked second may be seen as contradictory evidence to the theory of *fairness illusion*, there is a very simple explanation. The player ranked second chooses between giving to the player ranked third and the player ranked first. What is different from all the other players' choice sets is that giving to the player ranked first is equivalent to making the richest(!) player even richer. People with maxmin preferences as suggested by Engelmann and Strobel (2004) are known to prefer alternative actions.

	(1) After 1st round (1€)	(2) After 2nd round (2€)
rank 2	-0.167*	-0.179
(choice: 1st & 3rd)	(0.0965)	(0.159)
rank 3	-0.247**	-0.469***
(choice: 2nd & 4th)	(0.0968)	(0.153)
rank 4	0.0413	0.0120
(choice: 3rd & 5th)	(0.0671)	(0.135)
Constant (rank 5)	0.844***	1.579***
(choice: 4th & 6th)	(0.0526)	(0.102)
Observations	60	60

Standard errors in parentheses: * p<0.10, ** p<0.05, *** p<0.01

Table 7: Rank Dummy Regression from Treatment 1

4 Conclusion

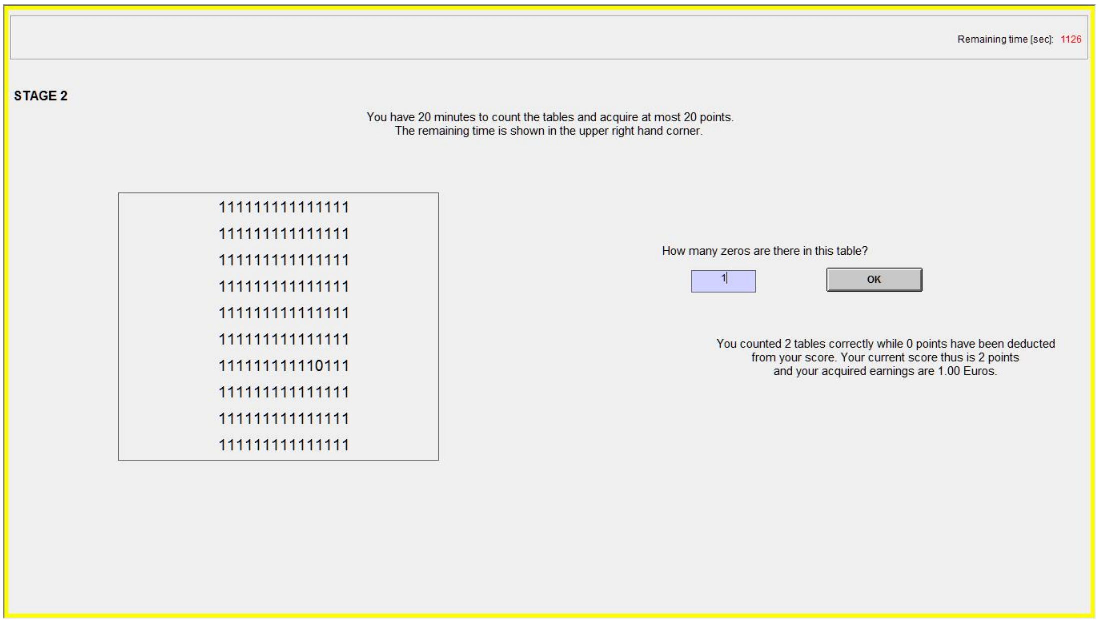
I have presented data from two related experiments requiring subjects to first work for their endowments and second participate in a distribution task. I show in the first experiment that subjects increase the amount they distribute to the richer player when reducing the amount for the poorer player helps them preserve their rank. The result is most striking because the share given to the poorer player from the decision maker's choice set is larger both if the poorer player's income is much lower or even higher than that of the decision maker. Only if the income difference is small but positive, giving decreases. I interpret this observed behavior as evidence for rank-loss-aversion as no other-regarding or fairness-oriented preference model I am aware of can explain these findings while accounting for rank-loss-aversion predicts the behavior observed. In the second experiment, I further observe a negative relationship between own income and the amount distributed to the poorer player in someone's choice set. I build on the idea of rational learning and illusion of control to derive predictions in line with these findings. Moreover, I provide evidence against alternative behavioral explanations for the observed phenomenon. While the observation that the willingness to compensate the poorer player decreases with income seems interesting on its own, it would be desireable to directly test for the belief driving mechanism I assume to be at work.

Therefore, I am now designing a new experiment that both provides a benchmark for rational beliefs and elicits subject's actual beliefs about control. Subjects will participate in an effortless choice task repeatedly. Based on chance, some choices yield higher payoffs than others. By providing all subjects with a common prior distribution and eliciting beliefs about the role of luck in the given task, I will be able to compare rational beliefs with actual beliefs. Choices in the subsequent distribution task will allow me to separate the effects of rational learning and false beliefs (illusion of control) from mere income on redistributive preferences.

5 Appendix

5.1 Additional Regressions

Sample Screen - Effort Task



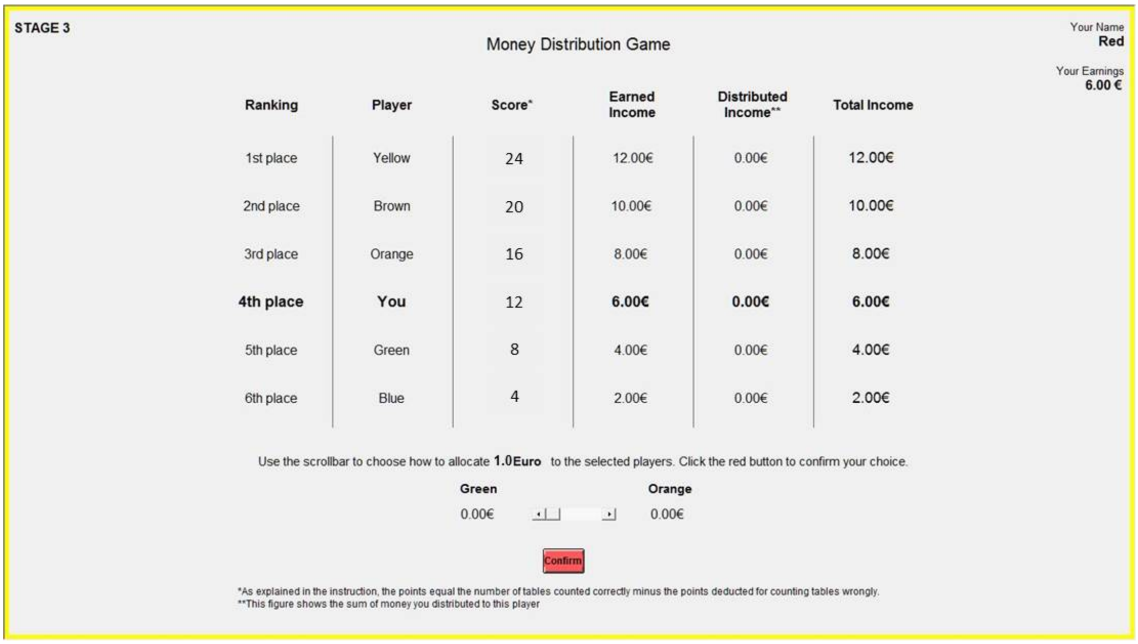
Note: actual numbers were different

	(1) giving_poor	(2) giving_poor	(3) giving_poor
gender (1=male)	0.0797		
	(0.0814)		
rank1	-0.386***	-0.310**	-0.232
	(0.125)	(0.143)	(0.184)
rank2	-0.172	-0.158	-0.0457
	(0.148)	(0.147)	(0.192)
rank3	0.116	0.117	0.204
	(0.159)	(0.165)	(0.189)
rank4	-0.0455	-0.0121	0.0351
	(0.139)	(0.138)	(0.146)
rank5	0.152	0.156	0.209
	(0.131)	(0.129)	(0.141)
Choice between 1st and 2nd	0	0	0
	(.)	(.)	(.)
Choice between 2nd and 3rd	-0.0584	-0.0584	-0.0581
	(0.0516)	(0.0516)	(0.0516)
Choice between 3rd and 4th	0.0190	0.0195	0.0196
	(0.0748)	(0.0747)	(0.0747)
Choice between 4th and 5th	-0.0288	-0.0280	-0.0284
	(0.0724)	(0.0724)	(0.0723)
Choice between 5th and 6th	-0.0211	-0.0205	-0.0210
	(0.0771)	(0.0771)	(0.0771)
Choice between 1st and 6th	0.210***	0.210***	0.210***
	(0.0700)	(0.0700)	(0.0701)
Waitingtime (1st rank only)		-0.000120	
		(0.000245)	
Waitingtime (all ranks)			0.000163
			(0.000205)
Constant (rank 6)	1.208***	1.234***	1.069***
	(0.106)	(0.105)	(0.228)
Observations	268	268	268

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

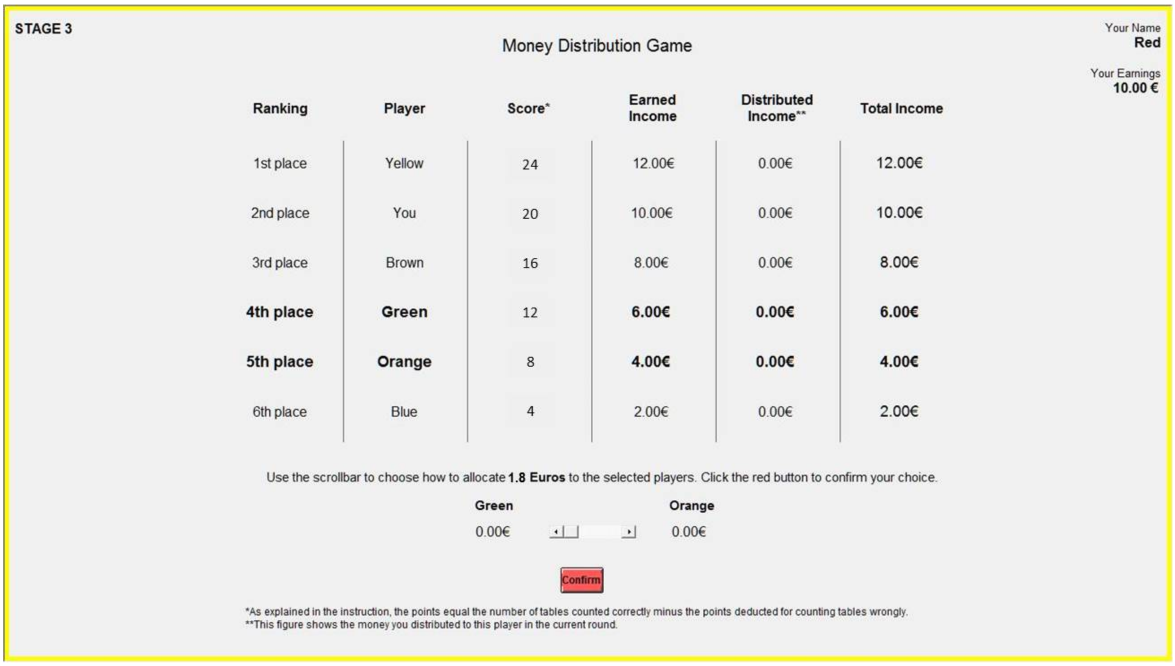
Table 8: Random-effects Regression

Sample Screen - Distribution in Treatment 1



Note: actual numbers were different

Sample Screen - Distribution in Treatment 2



Note: actual numbers were different

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