A glimpse through the veil of ignorance: equality of opportunity and support for redistribution.

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PRELIMINARY AND INCOMPLETE - PLEASE DO NOT QUOTE

Abstract

This study is an experimental investigation into preference for redistribution of income. It had been hypothesized that (belief in) equality of opportunity in a society diminishes support for the welfare state (which could potentially explain the low taxes and social benefits in the United States vis-a-vis Europe). To verify this hypothesis, 184 participants in an experiment were assigned different Probabilities of Winning (the prize to be won was 30 euro) and matched in groups of four. Next, before finding out who would actually win (veil of ignorance), they selected preferred transfers to be paid by the winners to the group as a whole. It was found that the average transfers were about 20% lower in the sessions in which winning was determined by performance in a task rather than by sheer luck (this difference is statistically significant at 5% level and cannot be explained by overconfidence in predicting own score). It corroborates the conjecture that perceived determinants of success (i.e. whether poverty results from laziness or bad luck) affect the support for redistribution. On the other hand, greater inequality of opportunity measured simply by dispersion of Probabilities of Winning within a group did not lead to higher transfers. I was also able to establish that both risk aversion and outcome-inequality aversion affected the decisions, but little evidence of concern for efficiency could be found.

Key words: Equality of opportunity, social mobility, voting, redistribution, American exceptionalism

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1 Motivation

One of the most important roles of governments all over the world is to organize transfer of money from the rich to the poor. While scale of this activity is substantial in all developed countries, individual differences are striking (see e.g. Alesina and Glaeser 2004). This dispersion coincides with cross-country differences in prevailing opinion over necessity and optimal level of redistribution[1] (which, of course, should not be surprising in the democratic regime). Further, it is clear that transfers of wealth are very costly, in that they involve substantial efficiency loss (infamous "leaky bucket", Okun, 1975). The question about determinants of support for redistribution is thus interesting per se, and has huge potential policy implications – it gives hope for finding a cheaper substitute.

The simplest perspective on support for redistribution is an "instrumental" one – transfers are supported by those who benefit from them (cf. Meltzer and Richards 1981). However, due to progressiveness of the tax system and skewness of income distribution, the median income typically belongs to this group, which raises the question why transfers in democracies are not even greater. Explanation pertaining to the more active participation in the political process of wealthier individuals is not fully satisfying. Some insight into this apparent puzzle may be gained by assuming that redistribution policies are stable, thus individuals should rationally consider their *expected future* income when deciding upon the favorite policy. For example, Benabou and Ok (2001) show that if the expected future income is ("sufficiently") concave in current income, majority of voters might rationally expect higher-than-average income in the future even though actual incomes of the majority are below the mean in every period.

Still, it seems unlikely that approach assuming purely selfish and rational agents will succeed in explaining differences in support for redistribution. After all, transfers of wealth are there in the first place because many citizens find pre-tax income distribution *unfair* and seek to improve upon it. It appears therefore fruitful to identify factors that could reinforce or inhibit this feeling of injustice, thus weakening or strengthening legitimization of the system. It is plausible that the crucial determinant of perceived fairness of the income distribution pertains to the way in which this distribution is generated – to the equality of opportunities for upward-mobility that individuals face. This hypothesis can be traced back as far as to de Tocqueville and was recently revived i.a. by Alesina and Angeletos (2005). It posits that the more individual's lifetime earnings are thought to be determined by his or her place of birth, social status of parents, etc. (that is, the more closed the society appears to be), the less legitimate existing differences in wealth are. This, in turn, creates rich soil

[1] Corneo and Gruner (2002) provide results of a survey in 12 countries. Fraction of respondents who "agreed" or "strongly agreed" that "It is the responsibility of the government to reduce the differences in income between people with high incomes and those with low incomes" varied from around 40% in the US and Australia, to 60-65% in West Germany and Norway, to over 80% in East Germany and Bulgaria.

for redistribution policies. Whenever, on the other hand, all individuals are believed to be endowed with a fair chance to succeed in attaining high social strata, transfers seize to be perceived as necessary to restore justice. In this way one can explain relatively strong support for redistribution in European countries and relatively weak observed in the US.

Indeed, according to the World Values Survey, less than 30% of Americans think that "poor are trapped in poverty". In Europe the rate is about 60%. Interestingly, there is rather little empirical support for these beliefs (see Alesina and Glaeser, 2004, Glaeser, 2005, Ayala and Sastre, 2002). This "false consciousness" has become recently an interesting topic of study on its own (Benabou & Tirole 2005).[2]

Two aspects of the alleged "entrapment" should be distinguished here. First, equality of opportunities requires social mobility. Perceived *inequality* may result from the fact that citizens face highly divergent probabilities of reaching high social strata. Second, it might have to do with determinants of success being seen as unjustified. For example, climbing up the social ladder may require behavior seen as immoral (e.g. bribery) or simply pure luck, rather than skills and hard-working (cf. Piketty, 1995, Alesina and LaFerrara 2005, Fong 2001). In Rawl's terminology, the latter quality is referred to as "equality as careers open to talents" while combination of the two constitutes "equality of fair opportunity" (Rawls, 1999, p. 57). Fong (2001) and Alesina and LaFerrara (2005) show that those who think that "getting ahead in life" mostly takes effort and talent, generally oppose redistribution more that those who believe it is chiefly determined by luck and help of others'. The impact of social mobility is less clear (Fong, 2005). Particularly, Alesina and LaFerrara (2005) find that "generic" measures of social mobility are insignificant when future own expected income is controlled for. Alesina and LaFerrara (2001) also propose (and provide some empirical support in survey data) that these two dimensions interact, i.e. mobility is a better substitute for equality of outcomes when the process is perceived as fair.

The hypothesis that the difference in support for welfare state between US and Europe may be based on different perception of inequality found support in a study on "happiness" by Alesina et al. (2004), who conclude that disutility of inequality (coefficient on country- or state-level Gini coefficient in an ordered logit model explaining answers to the general "happiness" question) is statistically significant among European "poor" as well as leftists, whereas in the US only "rich" leftists seem to care about it. One interpretation is that inequality of outcomes is only troublesome when inequalities are perceived as unequal. Admittedly, it is also a possibility that European poor have different "taste" than American ones, independent of opportunities for upward mobility. Evidence from Great Britain (Clark, 2003) and Germany (Schwarze and Haerpfer, 2004) raise the question whether people care about inequality in the first place: in the

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former study post-government income inequality actually had positive effect on life satisfaction and in the latter – negative effect of pre-government inequality was weak and was not affected by redistribution.

Naturally, mobility also affects preference for redistribution by means of shaping expectations regarding future income, as mentioned before. Further, support for welfare state might depend on several other factors, for example social cohesion (e.g. racial heterogeneity, see Lee and Roemer, 2006), or the differentiated access to benefits from public projects or divergence of preferences regarding use of public money between social classes. Finally, it is difficult to verify using the field data whether belief in equality of opportunity is an independent reason to oppose redistribution or merely a useful way to legitimize what is otherwise materially beneficial (Alesina and Glaeser, 2004, chapter 7) or to overcome procrastination (Benabou and Tirole, 2005).

It seems thus desirable to investigate this "fairness-legitimacy" or "equality of opportunity" hypothesis experimentally. This would allow to verify the existence of the link between initial distribution of chances in the society and preference for redistribution in an environment free from cultural and institutional differences just mentioned, while controlling for monetary incentives.

The experimental design proposed here assumes a "thin" veil of ignorance, which admits a glimpse of one's future: Decision makers choose their preferred level of income tax (and resulting benefits) without knowing what their actual income would be but facing different expectations about it. For one, this approach allows focusing on the impact of ex-ante inequality (inequality of opportunity) on the support for welfare state. Besides, "grand" (or programmatic) redistribution is a long-run phenomenon (see Dixit and Londregan, 1996), it is thus natural to assume that voters have only more or less accurate *predictions* about the income of their families over the whole period during which a policy is effective.

Our results confirm the hypothesis that the nature of determinants of success affects the willingness to support redistribution: higher transfers are favoured if winning depends on pure luck rather than skill and effort. The other part of the hypothesis finds no support, in that transfer choices do not respond to the dispersion of chances to succeed. It appears thus, in line with empirical studies, that moral worthiness is more important than social mobility in shaping people's perceptions of equality of opportunity. Further than that, we conclude that perceptions of fairness of the process determining income are an independent source of support for redistribution, not merely an epiphenomenon.

The design of the experiment is presented in Section 2: Subsection 2.1 covers the general set-up, 2.2 describes the treatments, 2.3 the procedures used and 2.4 contains the predictions. Section 3 reports the results: 3.1 offers an overview of the data, 3.2 verifies the central hypothesis and 3.3 investigates several motivations behind the choices, as suggested by behavioral, survey and response time data. Section 4 contains a brief survey of some related experimental literature and Section 5 concludes. Instructions can be found in the Appendix.

2 Design, procedures, predictions

2.1 Design

To verify the hypothesis that greater inequality of opportunity leads to increased redistribution, I endowed the subjects with a "Probability of Winning" (winning a fixed prize of $V = 30$ euros) kept constant throughout the experiment. Next, in each of six periods, subjects were rematched in groups of four, such that dispersion of Probabilities of Winning (PoW) differed across periods. The group mates' probabilities of winning were revealed. Participants were asked to indicate their favorable redistribution scheme − a transfer $t \in [0, 1]$ determining what part of the prize V each winner should share with the losers (see below). These decisions were not revealed. One period was picked to determine real payment. Prizes V were individually allocated, either randomly or based on performance in a task (see Subsection on Treatments below), in accordance with PoWs such that each group had exactly 2 winners. Then, for each group one person's choice determined the transfer.[3] The earnings were given by the formula:

$$FE_i = \begin{cases} SF + V(1 - t_j) + \frac{(1-\lambda)Vt_jw}{4} & \text{for winners} \\ SF + \frac{(1-\lambda)Vt_jw}{4} & \text{for losers,} \end{cases}$$

where
$SF = 5$ euro denotes the show-up fee,
$V = 30$ euro denotes the prize
t_j is the transfer rate chosen by selected participant j, $t_j \in [0, 1]$
$w = 2$ is the number of winners in the group
$\frac{(1-\lambda)Vt_jw}{4}$ is the transfer obtained by every group member

The proposition that proportional taxes are charged and the proceeds divided evenly (as lump sum benefit) is a standard way of simplistic modeling of redistribution (cf. Meltzer and Richards, 1981). The rationale for the introduction of the λ parameter ($0 \leq v < 1$, varied across periods) is to allow for the possibility of a deadweight loss. The two natural interpretations of λ pertain to losses inherent in the process of collecting and redistributing taxes and to losses due to distortionary effect of taxes on the income base: for higher values of λ, income of the rich will be more decreased, holding value of the benefits obtained by the poor constant.

Depending on the session, four equally numerous probability "classes" had PoWs (denoted P1, P2, P3 and P4) equal to 0.2, 0.4, 0.6 and 0.8 respectively or 0.1, 0.5, 0.5, 0.9 respectively (so in the latter case the two middle classes

[3]Two alternative ways to elicit preferred transfers suggest themselves: first, one could let participants vote on a redistribution scheme, second, some order statistics (preferable median) could determine actual transfer level. The first strategy, used in several related experiments, is difficult to implement directly if more than two redistribution schemes are possible. In the current experiment there were 31 options, thus voting would require additional complexity, e.g. some participants taking role of politicians choosing platforms to vote for. Median, on the other hand, is not well-defined in a group of four and other order statistics (e.g. second highest) are less natural. Besides, participants with extreme Probabilities of Winning could feel their (extreme) choices would not matter anyway.

collapsed into one). These two varieties will be referred to as "distributions of PoWs".

Three types of groups were considered with Probability of Winning vectors (P1, P1, P4, P4) (referred to as "Europe"), (P1, P2, P3, P4) ("Bermuda") and (P2, P2,P3,P3) ("US"). Note that sum of probabilities of success is identical in "Europe", "US" and "Bermuda", necessarily equal to two, as in the end there are two winners. These are the only three possible combinations of the available probabilities that add up to two and are symmetric. "Europe" corresponds to maximal dispersion of opportunities (or lowest mobility), "US" to minimal and "Bermuda" is an intermediate option (which, I hope, justifies the labels used). Because neither types P1 or P4 can play in the US nor types P2 or P3 in Europe, Bermuda is as European as it gets for the former and as American as it gets for the latter. Each player of type P1 or P4 played at least once in "Europe" and twice in "Bermuda" (or the other way around) for each value of λ; P2- and P3-types played once in "US" and twice in "Bermuda" (or the other way around) for each value of λ, repetitions serving as a reliability check.

Each of the two values of lambda, $\lambda = 0$ and $\lambda = 0.3$, was used in a block of three consecutive periods. The first value is a natural benchmark. The other, while to some extent arbitrary, roughly corresponds to the magnitude of efficiency loss involved in the real redistribution process. It is also sufficient to make (contrary to $\lambda = 0$) transfers unprofitable for players of type $PoW = 0.4$ and $PoW = 0.5$ (see: Subsubsection 2.4.1). It is thus a moderate value: high enough to change monetary incentives for a large group of participants but low enough to avoid making transfers unacceptable. Including two different values of the parameter may help discovering an important interaction effect between the perceived inequality of opportunities and efficiency of the redistribution system. It also serves as a robustness check.

2.2 Treatments

As signalled in the introduction, I wanted to verify both dimensions of the hypothesis that inequality of opportunity drives support for redistribution: the "divergent chances" hypothesis and the "luck vs skill" hypothesis. The former dimension was manipulated within-subject, as discussed above. The latter required use of two separate treatments.

Under "Random" Treatment, after the 6 periods of redistribution choices, winning/losing was determined by a random draw, in accordance with subjects' probabilities of winning.

Under "Task" Treatment, after the 6 periods, individuals had to complete a competitive task (a quiz of 10 general knowledge and IQ-type questions). The number of correct answers and the response time were combined in the final score. The low-PoW subjects generally had to score higher in the quiz than the high-PoW subjects in order to win the prize.[4]

[4] The actual procedure used, guaranteeing that i) the chance of success is equal to PoW, ii) higher scores are generally rewarded and iii) there are exactly two winners in each group is available from the author upon request. Data analysis revealed that the procedure indeed

The order of three-period blocks with a fixed value of λ was reversed across sessions. The eight sessions were thus run in a 2 X 2 X 2 (task/random X distribution of PoWs X order of λ-blocks[5]) full factorial design. Further, two different quizzes were used and in two out of 4 "task" sessions the nature of the task was revealed before the decisions on transfers.[6]

2.3 Procedures

The experiment was run in the CREED laboratory in March 2007. It was computerized using Z-tree (Fischbacher, 2006). In total 184 subjects, mostly undergraduate students, participated, 39% percent of whom were women; 62% percent studied economics or business, while the others came from a variety of other disciplines.[7] The mean age was 23 years.

The subjects, recruited via e-mail announcements and registered on the CREED website, were seated in the lab and given general written instructions (see Appendix 1) describing the decision task. The instructions explained that individual-specific “Probabilities of Winning” (PoW) would be assigned, which would then determine each participant’s chance to win a prize of 30 euros. Before this risk was to be resolved, participants would be asked to make decisions concerning “Transfers” to be paid by the “winners” (which could range between 0 and 30 euros, thus corresponded to tV). In each of the 6 periods, groups of four would be created, PoWs within the group revealed and every member’s choice of Transfers elicited. One of the periods would be selected for actual payments. Transfers postulated by one participant in each group created in this period would be collected in a Group Account and (possibly after a 30 percent reduction) distributed equally among all group members.

Once the subjects had read the instructions, the experimenter answered all arising questions and started the computer program.

The subjects were first asked to report their height, based on which PoW was assigned. This seemingly peculiar procedure was used in order to assign PoWs randomly but still make the differences between PoWs perceived as unjustified. Manipulation checks confirmed that the latter goal was achieved – two thirds of participants though it was unfair that different subjects faced different probabilities of winning. There were 5 or 6 participants in each of four probability classes, depending on the total number of available subjects.

Next, participants proceeded to make decisions regarding transfers. Generally, in each period, subjects faced a new combination of Probabilities of Winning in their group. After three periods, the experimenter distributed a

worked, i.e. actual success rates were very close to the PoW.

[5] Order of λs was found not to affect the choices significanlty. This variable is thus disregarded in the analysis.

[6] As these sessions were run at the end of the experiment, it was possible that some subjects could have found out about the nature of the task from their peers anyway.

[7] Students of economics behave differently from other subjects in some experimental tasks. The fact that the sample was dominated by the economists is thus a potentially unattractive feature, hindering external validity of the findings. However, we do not observe any difference in behavioral patters between economists and non-economists in the current experiment.

new handout explaining that in the remaining periods only 70 percent of the Group Account would be redistributed (or, conversely, all 100 percent would be distributed from now on, depending on the session).

Next, the outcomes were determined in accordance with Probabilities of Winning, either by pure luck (Random Treatment) or by competition in a computerized trivia quiz (Task Treatment)

Directly before and right after having the risk resolved, the subjects answered several questions regarding their decisions and the evaluation of the procedures used in the experiment (see Appendix).

The experiment took about 60 minutes. Earnings, including a guaranteed show-up fee of 5 euros ranged from 5 to 35 euros with an average equal to 18.45.

2.4 Predictions

2.4.1 Effect of varying dispersion of probabilities of winning

In this subsubsection I discuss predictions regarding behavior in the game (Random Treatment) depending on own and others' probabilities of winning. I start with the most strict set of assumptions and gradually relax some of them.

First consider a *risk-neutral selfish subject i* (an expected value maximizer). Then, denoting i's PoW by p_i, her expected utility in this game (disregarding the show-up fee) is given as:

$$\begin{aligned} EU_i &= p_i(V(1-t) + \frac{(1-\lambda)Vt}{2}) + (1-p_i)\frac{(1-\lambda)Vt}{2} \\ &= p_i V(1-t) + \frac{(1-\lambda)Vt}{2}. \end{aligned} \tag{1}$$

Taking derivative with respect to the height of transfer[8] we get:

$$\frac{\partial EU_i}{\partial t} = (-p_i + \frac{(1-\lambda)}{2})V. \tag{2}$$

Therefore, such a subject will always opt for full redistribution ($t = 1$) if their probability of winning is lower than a threshold $\widehat{p} = \frac{(1-\lambda)}{2}$ (for which marginal expected cost of transfer is equal to marginal expected benefit), and for no redistribution ($t = 0$) if $p_i > \widehat{p}$. Given the values of λ used, $\widehat{p}$ is equal to 0.35 (for $\lambda = 0.3$) or 0.5 (for $\lambda = 0$).

Note that expected value maximizer's decision is unaffected by the current composition of the group, as long as the sum of probabilities of success remains constant.

[8] For ease of exposition I assume that participant i is selected to decide about transfers (while in fact any group member was equally likely to be decisive). The strategy whichi is optimal under this assumption will obviously remain optimal in all of the models considered below in which final allocations are carriers of utility (including EUT and Fehr-Schmidt). It is easy to show that it also holds true for the Process Fehr-Schmidt model (Trautmann, 2006), because ordering of expected earnings depends only on probabilities and not on selected transfers (thus the same choice is optimal, no matter what the group-mates are opting for).

A sufficiently *risk-averse subject* (in terms of curvature of the utility function)[9] will opt for some redistribution also if his p_i is above the threshold. Allowing for *limited computing capacities*, we would expect t to decrease in p_i only gradually. Neither of these effects should be affected by the dispersion of others' probabilities.

Subjects displaying *outcome-based inequality aversion* will generally opt for even more redistribution, as transfers from the rich to the poor obviously decrease inequality. Assume Fehr-Schmidt (1999) model (thereafter: FS)[10]. If we denote individual incomes by y_i, y_j etc. and parameters of disadvantageous and advantageous inequity aversion by α and β respectively, the utility is given as:

$$U_i = y_i - \frac{\alpha}{n-1}\sum_{j\neq i}\max(y_j - y_i, 0) - \frac{\beta}{n-1}\sum_{j\neq i}\max(y_i - y_j, 0) \tag{3}$$

To apply the model to the problem at hand, first note that the difference between payoff of a winner and a loser is $V(1-t)$ and there are always exactly two players better off than i or two players worse off than i. It is then easy to compute the expected utility of player i and take derivative with respect to transfer t:

$$\begin{aligned} EU_i &= p_iV(1-t) + \frac{(1-\lambda)Vt}{2} - \frac{2}{3}p_i\beta V(1-t) - \frac{2}{3}(1-p_i)\alpha V(1-t) = \\ &= p_iV(1-t) + \frac{(1-\lambda)Vt}{2} - \frac{2}{3}V(1-t)(p_i\beta + (1-p_i)\alpha) \end{aligned}$$

Thus FOC becomes:

$$\frac{\partial EU_i}{\partial t} = (-p_i + \frac{(1-\lambda)}{2})V + \frac{2}{3}V(p_i\beta + (1-p_i)\alpha). \tag{4}$$

Because $\alpha \geq \beta$, the marginal value of transfers decreases in p, similarly to the "selfish" benchmark. It can also be seen by comparing (4) to (2) that, because $\alpha, \beta \geq 0$, inequity aversion increases support for redistribution. For sufficiently high parameter values, the individual will support full redistribution regardless of his probability of winning. For intermediate values of α and β, the "switching probability" will be between $\frac{(1-\lambda)}{2}$ and 1.

Specifically, assuming the values from Fehr-Schmidt, 1999 (Table III) we find that median participant has $\alpha = 0.5$ and $\beta = 0.25$. Then solving

$$\frac{\partial EU_i}{\partial t} = (-p_i + \frac{(1-\lambda)}{2})V + \frac{2}{3}V(0.25p_i + 0.5(1-p_i)) = 0 \tag{5}$$

[9] A non-linear probability weighting function alone has limited impact on the predictions as distortion of probabilities is typically not very high in our "threshold" range of 0.35-0.5.

[10] Employing another inequality aversion, e.g. Bolton and Ockenfels (2000) would yield similar results, except for the fact that intermediate choices of transfers would generally obtain for high-PoW participants.

for p_i we find that when $\lambda = 0$, only for probability of winning 80 or 90 percent will the majority of participants opt for no redistribution, while for $\lambda = 0.3$ most participants with PoW equal to 60 percent will also do so.

Note that because utility is linear in transfers, each participant will either support full redistribution or no redistribution at all. This is a special feature of the FS formulation of inequity aversion. Again, composition of the group has no effect on behavior (as long as sum of all probabilities is held constant).

This is not the case under *process Fehr-Schmidt model* considered by Trautmann (2006), which provides a simple way to allow for the "equality of opportunity" effect. The author assumes that individuals use expected rather than actual payoffs when judging fairness of the distribution. Denote the expected payoff by player i by $E(y_i) = p_i V(1-t) + \frac{(1-\lambda)Vt}{2}$. Expected utility of player i is then given by:

$$EU_i = p_i V(1-t) + \frac{(1-\lambda)Vt}{2} - \frac{\alpha}{n-1}\sum_{j\neq i}\max(E(y_j)-E(y_i),0) - \frac{\beta}{n-1}\sum_{j\neq i}\max(E(y_i)-E(y_j),0)$$

This expression can be simplified by substituting:

$$E(y_j) - E(y_i) = V(1-t)(p_j - p_i) \tag{6}$$

which yields:

$$EU_i = p_i V(1-t) + \frac{(1-\lambda)Vt}{2} - \frac{1}{3}V(1-t)\sum_{j\neq i}|p_j - p_i|(1_{p_j>p_i}\alpha + 1_{p_j<p_i}\beta)$$

Maximization with respect to t now yields:

$$\frac{\partial EU_i}{\partial t} = -p_i V + \frac{(1-\lambda)V}{2} + \frac{1}{3}V\sum_{j\neq i}|p_j - p_i|(1_{p_j>p_i}\alpha + 1_{p_j<p_i}\beta) \tag{7}$$

Again, due to linearity of the model, extreme values of t are predicted. This time however, composition of the group affects the behavior. It is easy to see that a mean-preserving spread of others' probabilities increases the marginal utility of transfer.[11] This result corresponds to the general hypothesis discussed in the introduction, regarding link between dispersion of opportunities and support for redistribution. It is also quite intuitive. Consider an individual with $p_i = 0.5$ participating in groups with following probabilities: $(0.1, 0.5, 0.5, 0.9)$ ("Bermuda") and $(0.5, 0.5, 0.5, 0.5)$ ("US"). Even though financial incentives are identical for person i in either group, we would predict choice of higher t

[11] This is not a prediction of all "procedural fairness" models. For example, in Krawczyk (2007), where I build up on the model by Bolton and Ockenfels (2000), dispersion of others' probabilities is irrelevant.

in group 1 (transfers are likely to go from the privileged person with $p_i = 0.9$ and to the unfortunate person with $p_i = 0.1$), than in group 2, where initial probabilities seem fair. Generally, we can expect that (controlling for own probability of winning), greater dispersion of p_i's within a group will lead to greater transfers.

2.4.2 Effect of increasing deadweight loss

It is immediately obvious that increasing efficiency loss involved in the redistribution (represented by parameter λ), we diminish monetary incentives to opt for high transfer. Fairness concerns are not affected here, as the difference between subjects' incomes (or expected incomes) is independent of λ. We may hypothesize that effect of efficiency loss on behavior will be relatively stronger for high-PoW subjects, as it delivers a good excuse not to support the more "fair" but individually irrational policy. This kind of self-serving bias may thus lead to a greater swing for subjects with high probability of success.

2.4.3 Treatment effects

Incorporating the two treatments makes distinguishing different fairness motivations and perceptions possible. The question is what can serve as a basis for legitimate payoff differentiation. We speculate that superior performance in a task (presumably depending on skills and effort) may play this role, even though probabilities of success are still differentiated. If this is indeed the case, while randomization procedure is not viewed in this way, we should generally observe higher transfers under Random Treatment than under Task Treatment, as outcome inequality will be more justified in the latter case. This effect may be particularly strong for high-Pow subjects (self-serving bias). It is also possible that we observe differentiated impact of dispersion of probabilities. For example, subjects may feel that difference in probabilities is less important if the success is determined by pure luck anyway (see also Alesina and LaFerrara, 2001). In such a case the impact of inequality of opportunity will be stronger under Task Treatment. If both procedure create equal entitlements, that is, if subjects are exclusively concerned about distribution of opportunities, no treatment effect will be observed.

Further, some participants in the Task treatment may feel that their chances are higher (lower) than PoW, because they expect to do better (worse) than a typical subject. Optimistic subjects are then likely to chose lower transfers, while the opposite is true for the pessimistic subjects.

3 Results

3.1 General overview

I first analyze individual transfer choices. Table 1 presents summary statistics of the Transfer variable. It also shows that, as predicted, higher deadweight loss

Table 1: Transfer choices

λ	n	Mean	SD	Median
0 percent	552	17.52	11.17	20
30 percent	552	15.92	11.59	15
total	1104	16.72	11.36	18

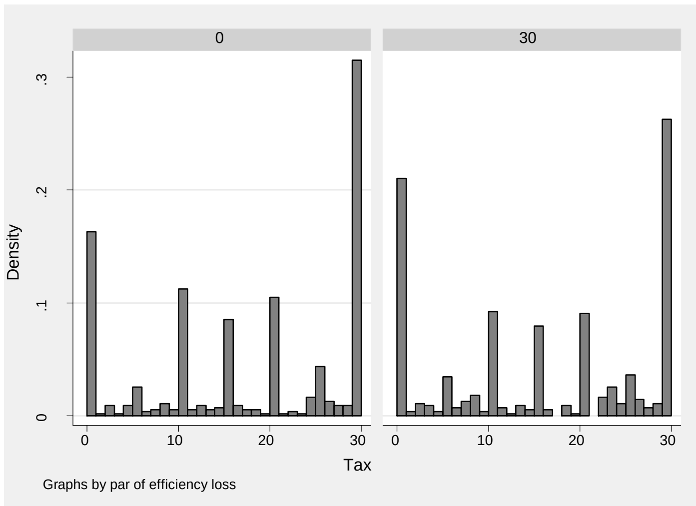

Figure 1: Histogram of transfer choices, by λ.

leads to slightly lower transfer choice:

By design, each participant made three choices for λ equal to 0 and three for λ equal to 30 percent. Averaging over these three entries and comparing matched pairs, we find that transfer choices were indeed lower for positive deadweight loss ($p < 0.01$, one-sided in a sign test). Looking at the average value of the Group Account (net of efficiency losses) resulting from proposed transfer levels, we observe a substantial decrease from 35.0 to 22.3 (38 percent decrease, most of which, however, results directly from the application of the efficiency loss). These findings are consistent with theoretical predictions that an increase in deadweight loss leads to a smaller government (see Crutzen and Sahuget, 2007 and Becker and Mulligan, 2003).

It may be instructive to look at the distribution of choices, here split into two groups by the value of λ (Fig 1)

Except for the above-mentioned shift towards lower transfers for higher efficiency loss the histograms look quite similar. Overall, about 18% of the entries are equal to 0, 28% equal to the maximum value of 30 and the rest is spread over the whole admissible range, with three very prominent values, 10, 15 and 20, attracting about 10% each.

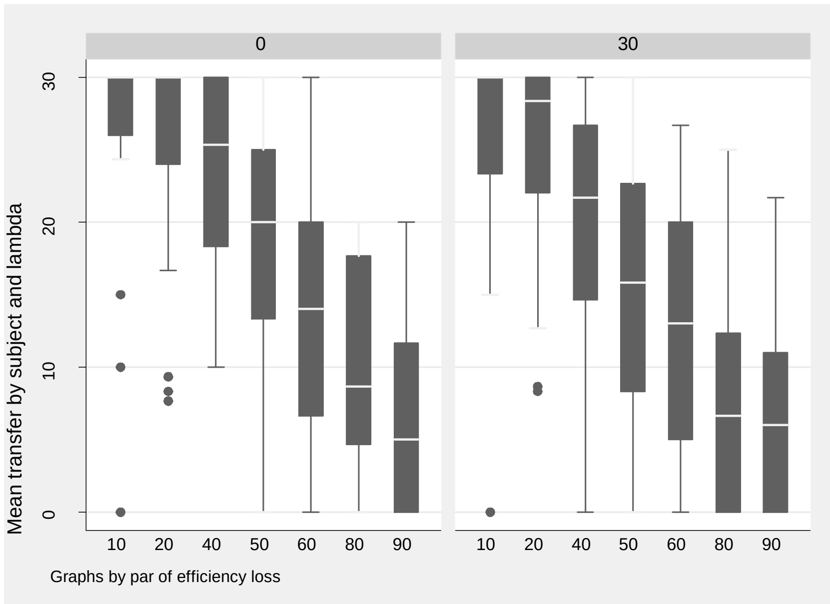

Figure 2: Box-plots of mean transfers, by λ and PoW.

Turning to the effect of the assigned Probability of Winning, we can compare distributions of individual-and-lambda-specific means of transfer choices. Resulting box plots are displayed in Fig 2.

It is immediately clear that participants respond to the monetary incentives by choosing high transfers if their probability of winning is low and low transfers if their probability of winning is high. Specifically, mean, median, and both quartiles react monotonically to probability. The same is true (with one exception) if particular transfer choices rather than means from a 3-period block are considered. There is also a great deal of heterogeneity, particularly for intermediate probabilities. However, individual transfer choices display internal consistency – in 63 percent of the cases two choices made in the same circumstances (same group type and same value of λ) were identical and in some 85 percent of the cases the difference was not greater than 5 euros).

Task vs random Table 2 presents a test for equality of sujbect-specific mean transfers in "Task" sessions and "Random" sessions.

Transfer choices were about 18% higher in the sessions in which performance in the task rather than pure luck determined earnings, a significant difference. Similar results are obtained if means for high and low λ are computed separately, the difference between transfers under "Task" and "Random" being somewhat more pronounced under positive deadweight loss ($p = 0.019$, one sided, while $p = 0.065$, one sided for $\lambda = 0$). Should a non-parametric Mann-Whitney-

Table 2: Transfers: Task vs Random

	n	Mean	Std. Er.
Random	92	18.10	1.00
Task	92	15.33	1.03
diff.		2.77	1.44
HO: diff=0	Ha: diff>0	t=1.92	p=.028

Wilcoxon test be used, the difference is only significant for the full sample ($p = 0.065$) and for high λ ($p = 0.050$).

Looking across probability groups, we see that the transfers in the Task treatment are always lower, although generally, due to smaller sample sizes, not significantly so. We also note that the treatment effect is somewhat weaker in the lowest probability groups − the difference is 2.1 euros for $PoW < .3$, 2.7 euros for $.3 < PoW < .7$ and 3.6 euros for $PoW > .7$ − which however can be explained by the fact that transfers under Task treatment are already very high in the low probability groups.

As signalled in the previous section, two potential reasons for the observed difference suggest themselves. First, it is possible that participants in the Task treatment overestimated their chances of success, thus adjusting transfer choice downwards.[12] To verify this possibility I asked the participants what their subjective belief about the probability of winning was (explaining that it should be higher (lower) than their PoW if they expected to do better (worse) than a typical student would). The results showed slight overconfidence: average subjective anticipated probability of winning was 55.8%, while average probability was equal to 50% by design.[13] I also asked (before the assessment of own subjective probability) whether they took into account, while making choices, their expectation to perform better or worse than a typical student would. Again, average entries for the question about superior performance where somewhat higher than for the question about inferior performance (4.45 vs 3.48 on a 7-point scale, a significant difference).[14]

[12] Robin Cubitt has pointed it out to me that participants could have displayed a differentiated attitude towards Task vs Random due to ambiguity aversion – while Probability of Winning clearly determines the chances under Random, it only gives a more or less vague clue under Task. This effect should make the subjects favor relatively higher transfers in the latter treatment. The observed treatment effect can be thus thought of a lower bound on the impact of the two other forces considered.

[13] While overall subjects were somewhat overconfident, high-PoW participants generally underrated their chance of success (the coefficient in the regression of subjective PoW on the assigned PoW was just .41). It is interesting to see whether this de-polarization of perceived probabilities of winning could lead to lower (or higher) transfer choices. Comparing transfers across broad probability classes, we find that the middle class (PoW between 40 and 60 percent) in the Task treatment on average chose transfer of 15.5 euros, compared to the overall average of 15.3 euros (the respective values were 18.5 and 18.1 in the Random treatment). I thus claim that this convergence toward intermediate perceived probability of winning could not significantly affect the transfer choice.

[14] Regrettably, these two questions were presented always in the same order (better-worse), possibly inflating the difference.

To sum up, we do observe some overconfidence. It appears though that it cannot account for the observed difference in transfers between Task and Random treatments. First, we have seen that this difference is actually greatest for high PoW (i.e. when there is least room for being overconfident). More importantly, as regression results in the next subsection show, the two questions about expected performance in the task do not significantly affect transfers. The subjective probability of winning is not significant either when the assigned probability is controlled for. Actually, even if the *assigned* probability of winning was 5.8 perc. points higher in the Task treatment, the value of the coefficient obtained in a regression suggests that level of transfer could increase by about 1.3, rather than 2.8 euro. It is thus likely that overconfidence plays some role in the behavior under Task treatment, but it most probably not the main force behind the observed difference.[15]

The second possibility is that unequal allocation following low transfers was considered more acceptable when it resulted from a task, which required, as stated in the instructions, "some effort, some skill and some good decisions". Indeed, there is huge experimental literature confirming that earned income is more legitimate than randomly assigned income. In the current experiment, participants reported having substantially higher influence on the earnings in the experiment under Task treatment ($p < 0.01$ in a Mann-Whitney-Wilcoxon test). Those in the Random treatment, on the other hand, scored higher on the question "It was important to me to equalize everyone's earnings" and lower on "I think the differences assigned probabilities are irrelevant. Everyone has earned his money by participating" I also asked about perceived fairness of the procedure used to identify "winners" and "losers" (see Lind and Tyler, 1992). No significant difference was observed. However, repeated questions from the participants suggested that there could have been substantial confusion about its precise meaning. Moreover, the between-subject design resulted in lack of a clear benchmark for comparison.

Finally, next section shows that the estimated value of the coefficient on treatment decreases as more questions pertaining to the fairness judgments are introduced into the regression, providing additional indication that part of the difference can be explained by differentiated justification of the unequal allocation (in other words, the treatment effect is partly mediated by the fairness perception). Further, it shows that clear impact of inequality aversion can be found for high-probability participants under Random but not under Task treatment. It appears thus that the enhanced legitimacy of the unequal allocation contributed to lower transfer choices under Task treatment.

Effect of dispersion of chances As mentioned before, dispersion of probabilities of winning took two levels within each 3-period block with specific value of λ. We can thus, separately for λ equal to 0 and λ equal to 30 percent, compare

[15] We also note that the subjectively perceived PoW was not correlated with the score in the task, not even in the sessions in which the nature of the task was revealed before the decisions. It is thus not the case that (many) participants correctly recognized their superior ability, upon which redistribution decisions could be based.

for each participant the mean transfer selected under high dispersion with mean transfer selected under low dispersion (there is always one entry for one these two categories and 2 entries for the other). Running a sign test we find no significant difference: under λ equal to 0 transfer choices are slightly higher when dispersion is high ($p = 0.33$), whereas they are not different at all under λ equal to 30 percent ($p = 0.58$). When probability classes are considered separately (or pooled into three groups to increase sample size), test results never approach significance either. The same conclusion obtains if "task" and "random" treatments are considered separately. Interestingly though, the *difference* between the treatments approaches significance in a one-sided test (t=-1.18, p=0.12): in line with Alesina and LaFerrara (2001) dispersion of opportunities impacts redistribution choices more positively when the process might be deemed as fair. That is, the mean difference between choices in high-dispersion groups and choices in low-dispersion groups is higher under Task treatment than under Random treatment (.58 vs $-.46$). This difference is particularly pronounced for low efficiency loss ($t = -1.63$, $p = .05$). Looking at the distribution of the difference between mean choice in high dispersion groups and low dispersion groups (Fig. 3) we see that it is equal to 0 for about 45-50 percent of participants, depending on the value of λ (while other entries are distributed with remarkable symmetry around 0).

The large proportion of 0s suggests a possibility that some subjects considered conditioning the choice of transfer on the group composition as "irrational" and thus tried to choose consistently. If this was the case, first-period choices would reveal the "true" preference. I therefore tested, in a between-subject manner, the effect of dispersion of probabilities on transfers in the first period only. The transfers were actually slightly higher if dispersion of probabilities was low but not significantly so ($p = 0.17$ in a Mann-Whitney-Wilcoxon test).

I also checked for the possibility that the hypothesized effect only appears in subjects who took sufficient time to think about particular group composition. No relationship between the total thinking time and the difference between transfer choices in high- and low-dispersion groups was found.

It will be also apparent in the next subsection that standard deviation of within-group probabilities is never significant in a regression explaining level of transfers.

We can thus conclude with confidence that dispersion of chances does not make our participants opt for greater redistribution, as long as their individual probability of winning remains unchanged. It may be instructive, though, to see whether we can identify this effect in a weaker sense – do societies with greater equality of opportunity vote for lower transfers? To answer this question, I created 1000 "virtual" groups for each combination of efficiency loss (0 or 30 percent), distribution of PoWs (10-50-50-90 or 20-40-60-80) and type ("Europe", "Bermuda" or "America"). For each group, transfer choices were resampled from the actual data available for the appropriate probability, group type and efficiency loss. For each group, median choice was computed (equal to the arithmetic mean of the two non-extreme choices), as the theory predict the

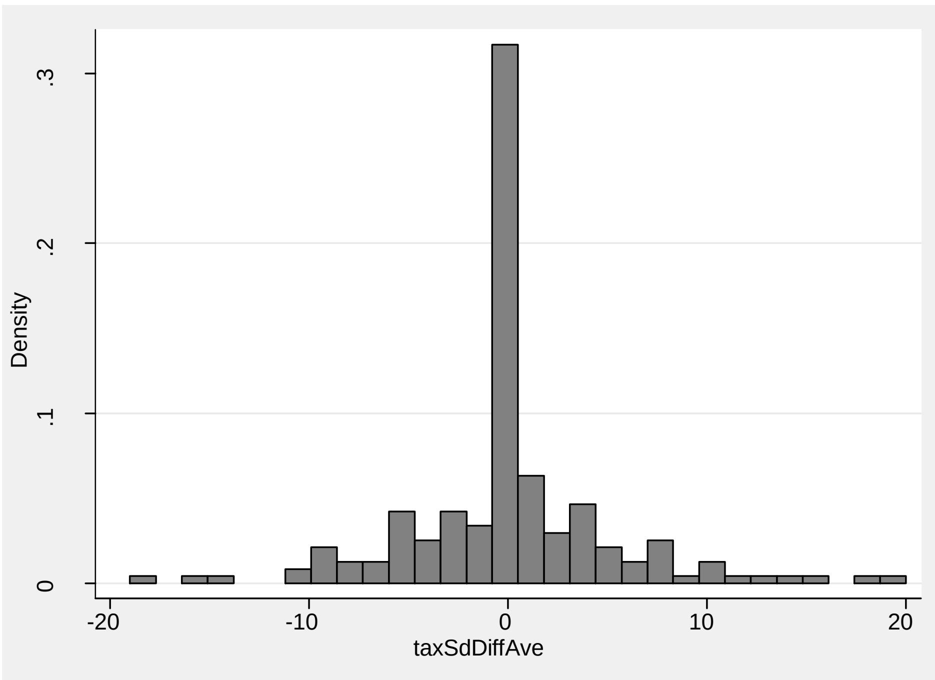

Figure 3: Difference in mean transfers between high-dispersion and low-dispersion groups

Table 3: Median choices in "virtual" groups, by PoW distribution, and group type

type	PoW distribution			
	10-50-50-90		20-40-60-80	
	lambda		lambda	
	0	30	0	30
America	20.70	12.71	19.40	16.69
Bermuda	16.85	16.32	17.53	16.38
Europe	16.88	17.82	19.25	16.11

median voter to be decisive. The medians obtained for each combination are presented in Table 3 below.

We note that only for the 10-50-50-90 PoW distribution and efficiency loss parameter $\lambda = 30\%$ the least-dispersed type has clearly lower transfers than the other two groups. With no efficiency loss, the relationship is actually reversed, as, not surprisingly, the participants with probability of winning equal to 50% react strongly to the change of λ. For the 20-40-60-80 PoW distribution no clear pattern emerges.

3.2 Risk, fairness, confusion

Taking a broader perspective, we may ask ourselves what factors and considerations determined transfer choices in the experiment. As proposed in Subsection 2.4, participants are likely to take into account their own expected value, corrected for risk aversion and aversion to inequality. For $\lambda = .3$ efficiency considerations might also play a role and under Task – equity (belief that winners deserve higher earnings). They may also make mistakes. We have three sources of information regarding subjects' motivations.

First, we may analyze the response time. For instance, if some categories of subjects chose very quickly, it may be assumed that they did not face a serious trade-off. We may also check whether or not changes in the decision situation affected response time. For example, if introducing a non-zero λ increased the response time in one group more than another, it might indicate that efficiency loss was of larger concern in the former. Second, we may try to directly identify the impact of changes in the decision situation on the choice of transfer. Third, we may summarize the rich dataset of responses to the questions asked after the decisions on transfers have been made and analyze impact of scoring highly on particular items on the observed behavior.

3.2.1 Response time

The random effect panel regression of the log response time on individual characteristics and features of the choice situation in particular period is presented in the table below.

Table 4: Determinants of response time – Loglinear regression

Random-effects GLS regression		Number of obs	= 1104
Group variable (i): subject		Number of groups	= 184
R-sq:	within = 0.5109	Obs per group: min	= 6
	between = 0.0848	avg	= 6.0
	overall = 0.3025	max	= 6
Random effects u_i ~Gaussian		Wald chi2(15)	= 967.09
corr(u_i, X)	= 0 (assumed)	Prob > chi2	= 0.0000

log_time	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
treat	.052195	.0949351	0.55	0.582	-.1338744	.2382644
_Iprob_20	.5805122	.1897356	3.06	0.002	.2086373	.9523871
_Iprob_40	.670339	.1924533	3.48	0.000	.2931375	1.04754
_Iprob_50	.5289044	.1674755	3.16	0.002	.2006585	.8571503
_Iprob_60	.6822554	.1925711	3.54	0.000	.3048229	1.059688
_Iprob_80	.4601999	.1897381	2.43	0.015	.08832	.8320797
_Iprob_90	.390448	.1896932	2.06	0.040	.0186562	.7622398
lambda_01	.1296078	.0313896	4.13	0.000	.0680853	.1911303
_Iperiod_2	-.6953455	.0543242	-12.80	0.000	-.801819	-.588872
_Iperiod_3	-.9645588	.0543374	-17.75	0.000	-1.071058	-.8580596
_Iperiod_4	-.9093696	.0544682	-16.70	0.000	-1.016125	-.802614
_Iperiod_5	-1.353272	.0543325	-24.91	0.000	-1.459761	-1.246782
_Iperiod_6	-1.464042	.0543874	-26.92	0.000	-1.570639	-1.357445
_Itype_2	.1209909	.0449924	2.69	0.007	.0328073	.2091744
_Itype_3	.1083944	.063536	1.71	0.088	-.0161339	.2329228
_cons	2.981904	.2072077	14.39	0.000	2.575784	3.388023
sigma_u	.60638788					
sigma_e	.52036875					
rho	.57589989	(fraction of variance due to u_i)				

Following observations can be made: First, decision appears to be very easy for the lowest probability group (i.e. $PoW = 10\%$; $PoW = 50\%$ is the base category) No substantial difference between the other groups are observed. Second, non-zero efficiency loss (dummy variable lambda_01) increases difficulty of the choice. Further analyses showed that this effect was slightly differentiated between probability classes: reaction time of participants with high PoW (80 or 90 percent) increased less than in the other groups. Thirdly and interestingly, while, as shown in previous subsections, varying equality of opportunity did not alter subjects' choices, higher dispersion of PoWs (as in Bermuda and Europe) did make them think longer about the situation. Not surprisingly, participants were also getting faster in subsequent periods. This effect was strongest between periods 1 and 2 and vanished between periods 3 and 4 (when the efficiency loss parameter changed). We do not observe difference between the Task and Random treatments, possibly because subjects have already considered the implications of the mode of risk resolution while reading the general instructions at the beginning of the experiment.

3.2.2 Identifying motivations from behavior

There is overwhelming evidence from the questionnaire that risk aversion was an important motivation of transfer choices. Below, I try to identify other factors affecting the observed behavior.

The case for confusion The decision problem at hand appears to be very easy for the participants with lowest probabilities of winning (10 or 20 percent). At least for λ equal to 0 (no efficiency concern) and random resolution (no equity concern) all considerations mentioned above, i.e. own expected value maximization, risk aversion and inequality aversion, should make them support maximal transfer. As shown before, indeed participants with lowest PoW (10 percent) made by far fastest decisions. To the extent that they do not choose maximal transfer, their choices are likely to be driven by some sort of confusion or irrationality. This interpretation is corroborated by the fact that average transfer choice in this group correlated positively with the score in the task ($r = .35, p = .10, n = 23$). Note that if high scorers could predict their performance they would rather choose *lower* transfers. To the extent that the score in the task is a rough measure of general intelligence and alertness during the experiment, the fact that mostly low-scorers chose non-maximal transfers supports the guess that at least some of them were confused.

Looking at the periods with λ equal to 0 we find that 17 out of 23 low-probability participants (74 percent) in the Random treatment consistently chose maximal transfers, while others' average choices were spread roughly equally over the whole range, again corroborating the confusion interpretation. If we apply the same strict identification strategy to the Task treatments, we find that only 11 out of 23 (47 percent) chose consequently 30. However, contrary to the Risk treatment, 8 out of the remaining 12 participants also chose very high transfers (the mean equal to or higher than 24), as if they thought it fair for the winners in the task to earn somewhat more than the losers. It is thus with greater confidence that the remaining four subjects can be classified as confused.[16]

The case for inequality aversion To check whether inequality aversion played a role in the experiment, I compared the transfer choices of individuals with probabilities of 10 and 20 percent with those of subjects with probabilities 80 and 90 percent, in the periods in which the deadweight loss parameter λ equaled 0 (such that efficiency considerations are absent). I propose that choices by participants with probability of winning 80 or 90 percent are virtually unaffected by risk aversion. Indeed, assuming for instance utility function given by the form $U(x) = x^{1-a}$, the risk aversion parameter a would have to take the exorbitant value of 0.72 for an individual with probability of winning equal to 80 percent to choose any positive transfer. Similarly, if we allow for non-linear weighting of probabilities or even loss aversion and assume non-zero reference level, it is very difficult to explain positive transfers on part of high-probability participants. Those that we do observe must therefore be driven by inequality aversion or simple confusion. The latter, I propose, should not be more common than in the group with very low probability of winning, namely 10 or 20 percent. If we thus observe that high-PoW participants deviate more (and more often) from their expected-value maximizing strategy than the low-PoW participants, it may be interpreted as evidence of inequality aversion. Two test have been run. First, I tested equality of proportions of subjects choosing their "optimal" transfer level in the two groups. As 61 percent of low-probability participants always choose transfer of 30 under λ equal to 0 and only 28 percent of high-probability participants always choose 0, the difference is significant at any confidence level. The same conclusion obtains if we define a variable equal to absolute deviation of average transfer choice from the own expected value maximizing choice and test whether it takes identical values in the two probability groups. This null hypothesis is rejected at p=0.0048 in a Mann-Whitney-Wilcoxon test.

Re-running both tests for the two treatments (task and random) separately reveals an interesting difference. Both the test of proportions and the MWW test statistics are highly significant for the random condition of risk and not significant for the task condition, corroborating the conclusion that differences in earnings were more legitimate in the latter case. In short, we have a strong case for inequality aversion, but only when winning and losing is determined by a dice roll.

Recall however, that the FS model predicted "extreme" choices, i.e. full redistribution or no redistribution at all. The collected data strongly indicates that equality-motivated intermediate choices are common, corroborating the often-found result that the linear form of the Fehr-Schmidt model is an over-simplification.

[16] These participants had low scores in the task, but the sample size prevents a formal test.

Table 5: Mean transfer choices by lambda and PoW

λ	Probability of Winning						
	10	20	40	50	60	80	90
0	25.17	25.33	23.20	18.93	13.25	9.30	6.01
30	26.19	24.65	19.81	14.73	12.42	7.97	6.83

Is there any concern for efficiency? To identify the concern for efficiency I compared (across probability classes) the difference between transfer choices in the periods in which 30% of the collected transfer was lost and the periods in which no loss occurred. As indicated in earlier analysis, the introduction of non-zero λ parameter changes the monetary incentives for the individuals with PoW equal to 40 and 50 percent (to be precise, in the latter case any transfer maximizes expected value for $\lambda = 0$ while only null transfer does so for $\lambda = 30$ percent). If these two groups are the only ones to lower their transfers after the efficiency loss is imposed, this effect is likely to be due to maximization of own expected value, whereas if other probability classes react to this change as well, they might be motivated by efficiency concern.

Table 5 clearly shows that only the probability classes 40 and 50 reduce their transfer choice. Formally, a non-parametric signtest rejects the hypothesis that the difference in transfers is 0 for these two probability classes ($p = .009$, two-sided, $n = 69$), whereas no difference is found for the remaining observations ($p = .349$, two sided, $n = 115$). We thus find no evidence of concern for efficiency. Interestingly, however, the efficiency of the taxation mechanism is likely to affect the size of the government, as middle-class that reacts to it, is most likely to include the median voter (see also Table 3).

3.3 Determinants of choice transfers

Right after the end of the sixth period the participants were asked to describe the way in which the made their decisions. Not surprisingly, vast majority of participants declared that the most important factor was their own probability of winning and that they chose high (low) transfers because their PoW was low (high), typically in comparison to the others. However, many of the participants displayed what may be termed "soft maximization". One example of it is following:[17] "I looked at my chance of winning, which was 0,9, and then I decided that it was so high that I could choose quite a low transfer because I would probably win. So to maximize my winnings, I chose transfers between 5 and 12."

One in eight participants referred to the varying level of λ. In line with the behavioral results, however, only six participants referred to the reduction of total earnings for the group ("In the second part I shared less, because there the transfers were 'taxed' and that would be a shame"). Twenty percent ex-

[17] The participants were allowed to answer this question in Dutch, so some of the entries had to be translated.

plicitly mentioned risk as an important factor. Some 11.7 percent participants mentioned norms of fairness or equality ("I think that everyone in the group must earn about the same, regardless of the chance of winning"). It is noteworthy that these two concerns were highly correlated ($r = .36, p < .001$). More than that, several entries signalled risk aversion inherently intertwined with social concern ("there should be some for each, including myself, should I lose"; "However, I also took into account that even if I had a high probability of winning, there is still possibility of losing and tried to make the payouts fair to both winners and losers").

Interestingly, 17 participants (9.4 percent) reported taking the actual distribution, dispersion or differences between others' probabilities of winning into account. Only three of them can however be confidently classified as followers of the intuition that high inequality of opportunity should be compensated with increased transfers ("(...) Further, I was more willing to share when the differences between the chances of winning of particular group members were large"). For most of the others the groupmates' probabilities seemed to somehow affect perceived own chances ("I had a 60% chance of winning, so in groups of 40, 40, 60, 60 probabilities I acted as a loser, i.e. chose 30 (...) In groups of 20, 40, 60, 80 probabilities I saw myself more likely a winner, so chose a lower transfer"; "When I was the only high probability I would pick lower transfers, and when another 0.8 was with me I would pick a little higher in case I lost. After the fact [I realized that] I probably should have always picked low numbers regardless since there are always 2 winners and I suppose statistically I should win every time."; "(...) When my probability 0.8 was equal to other group member I decided i could win or loose and so to transfer 0.").

3.3.1 Closed end questions

On top of the open-end question, the participants rated several factors on a 1 to 9 scale, depending on how important they were for their decisions regarding the transfers (see Appendix for the complete list of questions). Table 6 shows the basic summary statistics

The highest entries are found for the questions whether own probability was an important factor (q_own_prob, $\mu = 7.84$), maximization of own expected outcome (q_max_own, $\mu = 6.75$) and risk aversion (q_risk_av, $\mu = 6.13$). Interestingly the question about willingness to compensate others' low PoW by choosing higher transfers (q_compensate), aimed at capturing the preference for equality of opportunity, had overall lowest entries.

The impact of particular motives on the transfer decisions was estimated by means of a regression. Unfortunately, particular items were highly intercorrelated, which make reliable assessment of individual effects difficult.[18] To overcome the problem, I run a factor analysis identifying the main dimensions (Some items, like q_lambda, had very low communality; others, like q_irri_low and q_irri_lower were almost entirely predicted by PoW. Variables from the

[18] One robust finding that holds for different specificaitions of the model is the strong impact of the question about importance of risk aversion.

Table 6: Summary statistics of closed-end questions

Variable	Obs	Mean	Std. Dev.	Min	Max
q_own_prob	184	7.842391	1.916893	1	9
q_other_prob	184	5.771739	2.859566	1	9
q_exp_better	92	4.771739	2.525054	1	9
q_exp_worse	92	3.478261	2.135407	1	9
q_max_own	184	6.75	2.481076	1	9
q_risk_av	136	6.132353	2.864363	1	9
q_compensate	136	3.080882	2.419229	1	9
q_equal	184	3.418478	2.421192	1	9
q_prob_irr	184	3.532609	2.167576	1	9
q_all_equal	184	4.673913	2.712484	1	9
q_unfair	184	5.565217	2.674732	1	9
q_pdf	184	5.065217	2.688995	1	9
q_sorry	184	4.353261	2.816848	1	9
q_irri_lower	184	4.527174	2.913942	1	9
q_irri_low	184	4.206522	2.882159	1	9
q_proc_fair	184	4.940217	2.425212	1	9
q_proc_satis	184	4.869565	2.522976	1	9
q_proc_ear~r	184	4.902174	2.210555	1	9
q_proc_ear~s	184	5.054348	2.275381	1	9
q_loc	184	4.021739	2.422473	1	9
q_politic	136	4.654412	2.070529	1	9
q_taxes	136	5.169118	1.922788	1	9

Table 7: Principal component factor analysis: eigenvalues and variance proportions

Factor	Eigenvalue	Difference	Proportion	Cumulative
1	1.87562	0.34313	0.2679	0.2679
2	1.53249	0.56843	0.2189	0.4869
3	0.96406	0.17419	0.1377	0.6246
4	0.78987	0.10738	0.1128	0.7374
5	0.68249	0.01685	0.0975	0.8349
6	0.66564	0.17581	0.0951	0.9300
7	0.48983	.	0.0700	1.0000

Table 8: Factor Loadings

Variable	1	2	Uniqueness
own_prob	-0.07620	0.76980	0.40160
other_prob	0.52674	0.43144	0.53641
lambda	0.40482	0.19903	0.79651
max_own_earn	-0.22757	0.75776	0.37401
risk_averse	0.59623	0.25242	0.58079
q_compensate	0.69596	-0.03870	0.51415
q_equal	0.73270	-0.27337	0.38842

first group were generally included in the analysis separately, and those from the second were discarded). Table 7 shows the proportion of variance explained by particular factors, while 8 presents the factor loadings.

Two factors are retained. Each of them represents a much greater part of overall variance of the underlying items than any of the remaining five. Given the factor loadings, the first factor can be said to represent both risk aversion and inequity aversion. The second captures selfishness (or focus on own probability of winning). It can thus be expected that the first factor will generally lower the transfer, while the second will push the choices toward the own-income maximizing choice. I therefore interacted the second factor with a dummy variable (above_thres) indicating whether 30 or 0 was the optimal choice, given own PoW and the efficiency loss in particular period (aboveXf_own variable). Given evidence that females behave less selfishly in some experiments (see Andreoni and Vesterlund, 2001), I also interacted above_thres with gender (aboveXmale).

Table 9 shows the result of a censored regression (tobit) with random effects for subjects.

Table 9: Determinants of transfer decisions – Tobit regression

```
Random-effects tobit regression                 Number of obs      =      1104
Group variable (i): subject                     Number of groups   =       184

Random effects u_i ~Gaussian                   Obs per group: min =         6
                                                               avg =       6.0
                                                               max =         6

                                                Wald chi2(13)      =    300.82
Log likelihood  = -2558.6635                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
    transfer |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        prob |  -.3534974   .0364513    -9.70   0.000    -.4249406   -.2820542
 above_thres |  -3.344476   1.732161    -1.93   0.054    -6.739449    .0504969
  aboveXmale |  -3.429494   1.864448    -1.84   0.066    -7.083745    .2247567
 aboveXf_own |  -1.376064   .6815133    -2.02   0.043    -2.711806   -.0403226
       treat |  -6.018198   1.584263    -3.80   0.000    -9.123295     -2.9131
   lambda_01 |   4.202921   1.488699     2.82   0.005     1.285124    7.120719
lambda_q_lam |   -.968495   .2420882    -4.00   0.000    -1.442979   -.4940109
 f_risk_ineq |   5.638218   1.032441     5.46   0.000     3.614672    7.661765
   q_politic |  -1.677139    .436392    -3.84   0.000    -2.532451   -.8218263
      q_male |   .7338774   2.140284     0.34   0.732    -3.461003    4.928758
         age |   .4242703   .1997329     2.12   0.034     .0328009    .8157396
eco_business |   2.986223   1.473328     2.03   0.043     .0985527    5.873893
noexperime~s |   .0297651   .0430985     0.69   0.490    -.0547065    .1142367
       _cons |   41.70732   7.134424     5.85   0.000     27.72411    55.69054
-------------+----------------------------------------------------------------
    /sigma_u |   12.50309    1.10407    11.32   0.000     10.33916    14.66703
    /sigma_e |   9.135385    .307093    29.75   0.000     8.533494    9.737276
-------------+----------------------------------------------------------------
         rho |   .6519545   .0423799                      .5658782    .7308268
------------------------------------------------------------------------------
  Observation summary:       584     uncensored observations
                             206  left-censored observations
                             314 right-censored observations
```

Not surprisingly, we observe a strong negative effect of PoW. Additionally, transfers decrease if maximization of own payoff requires zero transfers. While choices of male participants were not significantly different from those of females for low probabilities of winning, males were less "generous" when transfers opposed their self-interest (coefficient on variable aboveXmale is negative and marginally significant). Similarly, participants focused on own probability additionally decrease transfers when it is in their material interest (aboveXf_own). Transfer are lower in the Task treatment and for positive efficiency loss, but only for the participants who declare paying a lot of attention to the λ parameter (lambda_q_lam, note that the average value of the question about importance of λ was 4.8, such that the impact of this variable more than overweights the negative coefficient on lambda_01). The "risk and inequality aversion" (f_risk_ineq) increases transfers and right-wing political preferences (q_politic) decrease transfers. Older participants and, somewhat surprisingly, students of economics or business chose slightly higher transfers.

4 Related experimental literature

The experimental evidence on preference for redistribution has been growing at increasing speed over the last years. The current design is, however, different in many respects from experiments conducted thus far.

Two of the few studies that elicited preference for allocation before the roles were assigned are Frohlich, Oppenheimer and Eavy (1987) and Lissowski, Tyszka and Okrasa (1991). These studies focused on comparing relative appeal of particular principles or distributive justice, including maximization of the lowest outcome (Rawlsian solution), maximization of the average (egalitarian solution) and variations on the two. After getting familiar with the concepts, subjects ranked the principles from the most attractive to the least attractive and applied them in individual and group decision-making tasks of choosing between specific distributions (unanimity was required in the latter case). In both studies the principle of maximization of average income under the constraint on the lowest income received highest ranking and was most commonly applied. This corresponds with our finding that substantial proportion of high-probability participants chose low but non-zero transfers.

More recently, Hoerisch (2007) verified the intuitive notion that choice from behind the veil of ignorance is driven by social concerns, not only risk aversion. To this end, the author compared behavior in a dictator game with role uncertainty (and efficiency loss) with an equivalent individual gamble, finding that (female) participants opted for a more equalized allocation in the former. My study confirms that female choices of redistribution are less affected by self interest.

Another related study is Tyran and Sausgruber (2002), who investigated to what extent (outcome) inequity aversion in the sense of Fehr and Schmidt (1999) may induce support for redistribution policies. In the experiment, subjects were assigned to five-person committees, each consisting of two "rich" voters (with initial endowment of 250 Austrian Schillings), 2 "middle-class" voters (AS185) and one "poor" voter (AS60). An anonymous "referendum" was held (using simple majority rule) to decide whether or not impose a tax of AS50 on each of the rich voters and support the poor voter with the collected amount of AS100. Also, if implemented, this policy cost middle-income voters AS5 each (deadweight loss). Subjects had to indicate for each of the roles (rich, middle, poor), whether they would opt for redistribution or not. The results showed strikingly good match with the predictions based on the model with the parameters suggested in the FS paper: 33.7% of high-income and 70% of middle-class voters approved (unprofitable) redistribution. The current study shows that the FS model cannot be taken at face value any more when choice predates the resolution of risk.

Clark (1998) also employed a simple majority voting scheme to choose between two transfer schemes. The main difference with respect to Tyran and Sausgruber, was that virtually all members of 8-person groups bore costs of the scheme *and* drew benefits from it. Explicit presentation of these let the author investigate whether a preference for proportionality of benefits to costs exists. Clark confirmed strong preference for equality and weaker for proportionality. He also found that redistribution decreases if roles are "earned" rather than assigned randomly, the finding confirmed in the current study.

Interestingly, partly contradictory observations are made in Cabrales, et al. (2006). Here, participants were matched in 9 person groups and decided whether or not to exert costly "effort" that increased probability of realizing positive individual income. Next (i.e., after the resolution), subjects voted whether or not to (fully) redistribute the achieved income. The main finding was that the "rich" opposed sharing, rather independent on whether the poor had exerted effort (and been unlucky) or not. Of the two equilibria in this game, most groups converged over time to the low effort – high redistribution one.

Checchi and Filippin (2003) and Beckman (2006) provide an experimental verification of the Benabou and Ok's Prospect of Upward Mobility hypothesis. By and large, subjects, equipped with a pre-programmed devise to compute expected future income given transition matrix, responded correctly to the financial incentives, i.e. opted for lower redistribution if expected future income was higher-than-average, but effects were not as dramatic as the POUM hypothesis would predict. The major limitation of both studies is that each subject's choices affected only his or her payoff – there was no interaction or interdependence between the subjects. Under these circumstances "fairness" preference postulated by Checci and Filippin could only mean being fair to the experimenter.

Czarnik (2006) appears to be one of very few experimental studies with inherent asymmetry (albeit, unlike in the current study, one based on differentiated amount of previous work). However, different focus of the study (which, on top of redistribution, allowed for voluntary donations) and use of incentive incompatible elicitation scheme make comparison of the obtained results difficult.

5 Conclusion

I verified two aspects of the hypothesis that inequality of opportunity calls for a compensation by ex-post redistribution. The notion that greater dispersion of chances leads to increased support for welfare state finds no support in the collected data.[19] This negative result appears to be driven to some extent by the fact that, strange as it might be, some participants perceived their own chance as greater (and thus did not want to share) when the dispersion of chances increased. However, we do observe higher redistribution choices when the income is determined randomly rather than by performance in a task (and it cannot be reduced to the effect of overconfidence).

In contrast to several studies, also in the redistribution context, we observe that the Fehr-Schmidt inequality aversion model does not correctly explain the observed behavioral pattern. Still, some form of aversion to overly divergent earnings appears to operate, as well as risk aversion and simple confusion. Interestingly, risk- and inequality aversion appear to be intertwined in participants' minds. I find little evidence of concern for efficiency, as the only group that reacts significantly to change in the efficiency of "taxation" is the "lower-middle" class whose monetary incentives are directly affected by this change.

[19] This finding, while inconsistent with the process Fehr-Schmidt model, does not, of course, invalidate all models accounting for the "procedural" or "ex-ante" fairness.

Appendix: Instructions

Handout 1 [here: Random, $\lambda = 0$ in periods 1-3]

This is an experiment in which you may earn money.

NB: All instructions in all handouts distributed in this experiment apply equally to all participants (others' handouts are identical to yours).

You have already earned 5 euros as a show-up fee.

Whenever earnings are mentioned below, they are earnings on top of this show-up fee. These earnings will depend on your decisions, decisions by other participants as well as on pure luck.

The experiment consists of three closely inter-related parts. We shall call them: Assignment, Decisions and Resolution respectively. It will be easiest to explain the "Assignment" first, then the "Resolution" and finally the "Decisions".

Part 1: Assignment

In this very short part your **Probability of Winning** will be determined. We will base your Probability of Winning on your reported height. **This Probability of Winning will remain constant throughout the experiment and will represent your chances in Part 3 (Resolution) of the experiment.** Because you will not know how the Probability of Winning is generated given your reported height, you cannot benefit from providing false information.

Part 3: Resolution

In Part 3 of the experiment **the computer will randomly determine whether or not you win a prize of 30 euros**. This will be done in such a way that:

1. **You chance of winning will be (not surprisingly) equal to your assigned Probability of Winning**.
2. **There will always be exactly 2 winners in each 4-person group** (in the explanation of "Part 2: Decisions" you will find out how the groups are formed). This can be any two of the four group members, yet, due to point 2., not with identical probabilities.

Part 2: Decisions

Your earnings will not be entirely determined by the computer in Part 3. Rather, **you may influence your earnings and earnings of other participants by choosing Transfers in Part 2** of the experiment (that is, **before Part 3 is played**).

The procedure will be the following. Part 2 will consist of 6 periods. In each period you will be matched with three other participants. You will not know the identity of your group-mates and they will not know yours. In every period you will have new group mates. It may happen that you will be matched with the same person twice (but not more than twice) during the course of the experiment, but you will not be able to find out. In every period you will learn the Probabilities of Winning of your group-mates.

The sum of probabilities in each group is identical (necessarily equal to 2), but the individual Probabilities of Winning of your group-mates will be different in each period. For example, if your Probability of Winning (PoW) is equal to

0.5, you might face a group in which one participant has a PoW of just 0.1, you and another participant have PoW of 0.5 each, and one participant has a PoW of 0.9 (it will be shown as (0.1, 0.5, 0.5, 0.9) on the screen). In another period, all your group-mates' Probabilities of Winning might be equal to yours (0.5, 0.5, 0.5, 0.5).

You will be asked to choose Transfers (a number between 0 and 30 euros) for your group. The Transfer is an amount that every participant who wins in Part 3 pays to the Group Account. Out of every euro in the Group Account, 25 cents will be paid to each of four participants in the group.

Not all decisions on Transfers will actually affect the earnings. One period has already been selected and, within each group formed in this period, one participant has been chosen. This participant's choice of Transfer will affect the earnings of the whole group (every "winner" in this group will pay the Transfer chosen by the selected participant). Because it may always be you and because you do not know which period's decisions will matter, it is important to make a careful decision in each period.

EXAMPLE 1. Suppose that the Transfers postulated by the four group members, A3, B9, A1 and C9 are 7, 25, 10 and 0 respectively. Now assume that A1 had been selected in this group so the choice of 10 is implemented. Suppose that A3 and C9 win. Each of them earns 30 euros, yet transfers 10 to the Group Account, keeping 20. The amount collected is 2·10=20. Each group member (including the "winners") receives 25 cents per each euro collected in the Group Account or 5 euros in total. The "winners" earn 25 euros and "losers" earn 5 each.

EXAMPLE 2. In another group, B3, B1, C7 and A5 chose Transfers of 30, 30, 22 and 5 respectively. Choice of B3 (Transfer of 30) is selected. Everybody earns 15 euros.

The exact formulas for earnings (in euros) are:

WINNERS: $earnings = 30 - Transfer + 2 \cdot Transfer \cdot 0.25 = 30 - \frac{1}{2} Transfer$

LOSERS: $earnings = 2 \cdot Transfer \cdot 0.25 = \frac{1}{2} Transfer$

Of course, the "2" in the formulas refer to the number of winners, and "0.25" to 25-cents-per-1-euro paid out of the Group Account.

The table on a separate sheet gives an overview of winners' and losers' earnings for each possible Transfer (remember there are always 2 winners and 2 losers in a group).

For instance, the numbers mentioned in EXAMPLE 1 above (5.00 EUR for losers and 25.00 EUR for winners) can be found in the row corresponding to Transfer of 10. Similarly, numbers from EXAMPLE 2 are in the last row (Transfer of 30).

You must consider that, while you are deciding upon the Transfer, you do not know yet who will actually pay it (but you do know the probability that you and everyone else in your group will become a winner and thus a Transfer-payer).

During the course of the experiment, your decision will not be revealed to anyone, including your group-mates. Of course, you will not learn others' decisions either. You will only learn the Transfer actually implemented in your group in the relevant period.

Also note that the experimenter, while knowing your earnings, will not be able to infer from them anything about any of your decisions.

Summary:

- In part 1 you will learn what your Probability of Winning is.
- In Part 2, in every period you will see the Probabilities of Winning of three other participants with whom you will be matched in this period and you will make a decision regarding the Transfer (how much money should be transferred from each winner to the Group Account).
- Then you will move to the next period, where you will be matched with other participants and the same pattern will be repeated.
- After the final period, winners and losers will be determined by the computerized random mechanism, according to everyone's chances.
- Then you will find out whose decisions from which period will actually determine Transfers. Your earnings including transfers and show-up fee will be computed and you will see them on your screen.
- We will also ask you to answer some questions about the game. These will be asked before and after Part 3.

Table 1. Earnings for "winners" and "losers".

Transfer	loser	winner
0	0.00	30.00
1	0.50	29.50
2	1.00	29.00
3	1.50	28.50
4	2.00	28.00
5	2.50	27.50
6	3.00	27.00
7	3.50	26.50
8	4.00	26.00
9	4.50	25.50
10	5.00	25.00
11	5.50	24.50
12	6.00	24.00
13	6.50	23.50
14	7.00	23.00
15	7.50	22.50
16	8.00	22.00
17	8.50	21.50
18	9.00	21.00
19	9.50	20.50
20	10.00	20.00
21	10.50	19.50
22	11.00	19.00

23	11.50	18.50
24	12.00	18.00
25	12.50	17.50
26	13.00	17.00
27	13.50	16.50
28	14.00	16.00
29	14.50	15.50
30	15.00	15.00

Please raise your hand if you have any questions.

Handout 2 [distributed after the third period]

In the periods played so far, every group member would obtain 25 cents out of every euro transferred to the Group Account, i.e. 100% of the collected money would be used. **In the remaining 3 periods, only 70% of the amount collected in the Group Account will be transferred to the group members. In other words, each group member will obtain 17.5 cents out of every euro in the Group Account (when one of these periods is selected to be played for real).**

Other than that, the rules remain exactly as they were before.

EXAMPLE 1 (revised version of EXAMPLE 1 from Handout 1). Suppose that the Transfers postulated by the four group members are 7, 25, 10 and 0. The transfer of 10 is selected and implemented. Each winner earns 30 euros, yet transfers 10 to the group, keeping 20. The amount collected in the Group Account is 2·10=20. Each group member (including the "winners") receives 17.5 cents per each euro in the Group Account, or euro 3.5. Winners earn 23.50 and "losers" earn 3.50.

EXAMPLE 2. (revised from EXAMPLE 2 in Handout 1). In another group chosen Transfers are 30, 30, 22 and 5. Suppose that the Transfer of 30 is selected. 60 euros is collected in the Group Account. Everybody earns 10.50.

The formulas for earnings (in euros) are:

WINNERS: $earnings = 30 - Transfer + 2 \cdot Transfer \cdot 0.175 = 30 - 0.65 \cdot Transfer$

LOSERS: $earnings = 2 \cdot Transfer \cdot 0.175 = 0.35 \cdot Transfer$

The table below gives an overview of winners' and losers' earnings for each possible Transfer. The numbers mentioned in the EXAMPLE 1 can be found in the row corresponding to Transfer of 10: the earnings are 3.50 euros for losers and 23.50 euros for winners. Similarly, the last row shows earnings from EXAMPLE 2.

Table 2. Earnings for "winners" and "losers"

	Earnings	
Transfer.	loser	winner
0	0.00	30.00
1	0.35	29.35
2	0.70	28.70
3	1.05	28.05
4	1.40	27.40
5	1.75	26.75
6	2.10	26.10
7	2.45	25.45
8	2.80	24.80
9	3.15	24.15
10	3.50	23.50
11	3.85	22.85
12	4.20	22.20
13	4.55	21.55
14	4.90	20.90

15	5.25	20.25
16	5.60	19.60
17	5.95	18.95
18	6.30	18.30
19	6.65	17.65
20	7.00	17.00
21	7.35	16.35
22	7.70	15.70
23	8.05	15.05
24	8.40	14.40
25	8.75	13.75
26	9.10	13.10
27	9.45	12.45
28	9.80	11.80
29	10.15	11.15
30	10.50	10.50

Post-decision questionnaire [Task treatment]

Before the two winners are determined in each group, we ask you to answer a few questions regarding your decisions in the experiment.

There are no correct or incorrect answers. Your answers will remain anonymous.

First, please describe in one or a few sentences how you decided about the level of Transfers in particular periods. You can answer this question in Dutch if you wish.

For each of the following factors indicate how important they were when you were making your decisions regarding transfers. [Answers on a 1-9 scale from "not important" to "very important"]

- Your Probability of Winning.[q_own_prob]
- Probabilities of Winning of your group-mates in particular period [q_other]
- Equalizing everyone's earnings [q_equal]
- Increasing transfers in periods in which some participants had very low Probability, to compensate for their misfortune [q_comp]
- Whether 17.5 or 25 cents out of every euro in the Group Account would be paid to each of group members [q_lambda]
- Maximizing the expected (average in the long run) value of your own earnings [q_max_own]
- Making sure (by choosing somewhat higher transfers) that you earn something even if you lose [q_risk]
- Your expectation to do better in the task than a typical student would [q_better]

- Your expectation to do worse in the task than a typical student would [q_worse]

Please answer the following quesion

You know your assigned Probability of Winning. However, if you expect to do better (or worse) in the task than a typical students, you may conclude that your actual probability to win money might be different from your assigned Probability of Winning. To the best of your judgment, what is your actual probability to win the prize? (in percentage points: 0-100)

For each of the following statements please indicate whether or not they are true when applied to you. [Answers on a 1-9 scale from "not true" to "very true"]

- I think there is no place for transfers in this game. Every winning participant has earned their prize by investing their time and performing well in the task.
- In the end some people will win and others will lose. The question is then if and how much of the earnings the lucky ones should share with the unlucky ones. The initial chances of succeeding are irrelevant here. [q_prob_irr]
- I think the fair thing to do is to equalize the final earnings by choosing maximal transfers. [q_all_equal]
- I think it is unfair that different participants have different Probabilities of Winning [q_unfair]
- I didn't like the fact that Transfers could go to the participants who had high Probability of Winning in the first place.[q_pdf]
- I felt sorry for participants who had lower chance of winning then I did.[q_sorry]
- I felt irritated by the fact that my chance of winning was lower than those of (some) other participants. [q_irri_lower]
- I felt irritated by the fact that my chance for winning was low [q_irri_low]

Post-resolution questionnaire

Please answer the following questions

- How fair was the procedure used to determine who would win a prize? ["1=very unfair" to "9=very fair", q_proc_fair]
- How satisfied are you with the procedure used to determine who would win a prize? ["1=very dissatisfied" to "9=very satisfied" q_proc_satis]

- How fair was the procedure used to determine how much money everyone would earn in the experiment? ["1=very unfair" to "9=very fair", q_proc_earn_fair]
- How satisfied are you with the procedure used to determine how much money everyone would earn in the experiment? ["1=very dissatisfied" to "9=very satisfied", q_proc_earn_satis]
- How much influence did you have in determining how much you earned in the experiment? ["1=very little" to "9=very much" q_influence]

Please answer these two questions

- In political matters, people talk of "the left" and "the right". How would you place your views on this scale, generally speaking? ["1=left" to "9=right", q_politic]
- Many governments tax the rich and subsidize the poor. People have different opinions about the extent to which this should be done. In your view, should the taxes and the transfers to the poor be generally low or high? ["1=low" to "9=high", q_taxes]

Personal data

- sex
- age
- number of experiments in which you have participated

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