Experimenting with new combinations of old ideas

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3. Social Preferences in Private Decisions*

3.1. Introduction

Other-regarding preferences have supplanted pure egoism in many economic models, from labor economics (e.g. Demougin, Fluet and Helm, 2006) to optimal taxation (e.g. Choi, 2009). Two sets of empirical observations have precipitated this development. Firstly, behavior in games where decisions makers influence the earnings of others cannot be explained by egoism (see Fehr & Schmidt, 2006). Secondly, reported happiness appears to depend on relative as well as absolute income, the so-called Easterlin paradox (1974) (see Clark, Frijters and Shields, 2008).

Despite these origins other-regarding preference models also make behavioral predictions in other domains, like decision-making under risk. Such novel predictions provide an excellent test of these models. We consider situations in which the decision maker cannot influence the earnings of others but where the prospects determine not only the decision maker's absolute earnings but also her earnings relative to her peers. The possibility to compare one's own earnings with the earnings of peers should influence decisions, according to outcome-based social preference models. For example, inequity aversion (Fehr & Schmidt, 1999 and Bolton & Ockenfels, 2000) implies that people dislike gambles that lead to a large dispersion in earnings, i.e. where they either end up with a lot more or a lot less than their peer(s).

Earlier experiments show that social concerns can indeed influence decisions under risk. For example, Bohnet en Zeckhauser (2004) show that risk caused by others is more aversive than other forms of risk. In an earlier paper (Linde & Sonnemans, 2012) we show that people become more risk averse in a socially

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*This chapter is based on Linde and Sonnemans (2011)

disadvantageous position. However, some anticipated effects of other-regarding preferences on decision making under risk are typically not observed. For example, although people are willing to pay to raise the (expected) earnings of others they will not pay to reduce others' risk (Brennan et al, 2008 and Güth, Vittoria Levati & Ploner, 2008). Trautmann and Vieider (forthcoming) provide an extensive overview of research on other-regarding preferences and risk.

In this paper we study situations where people take risky decisions without affecting the earnings of others. Participants make pair-wise choices between sets of three cards (figure 3.1). At the end of the experiment one choice situation is randomly selected. Participants blindly draw a card from their preferred set. The number on the card they draw determines their earnings.

Participants are randomly assigned to either the individual or the social treatment. In the individual treatment all participants draw from a separate set and are not informed about the earnings of others. They therefore face an entirely private lottery. In the social treatment three participants draw from the same set, without replacement. As a consequence a set of cards not only implies a gamble but also a distribution of earnings between three participants. Therefore other-regarding preferences can influence behavior in the social treatment, but not in the individual treatment. However, because all participants draw a card from the set of their own choice, participants in neither treatment can influence the earnings of others by choosing a specific set.

Comparing behavior in the individual and social treatments reveals the impact of other-regarding preferences. If participants care about outcomes in terms of relative earnings, sets that lead to more (less) desirable earnings distributions are relatively more (less) attractive in the social treatment than in the individual treatment. We consider four different models of this kind that make different predictions. The first of these is inequity aversion (Fehr & Schmidt, 1999 and Bolton & Ockenfels, 2000). This model predicts that sets that result in a greater dispersion of earnings are less attractive in the social treatment than in the individual treatment. The second model, inequity seeking, (Bault, Coricelli & Rustichini, 2008), predicts the exact opposite. Thirdly, maximin preferences (Rawls 1971) predict that sets where the lowest possible earnings are highest are more popular in the social treatment. Fourthly, according to models where utility depends on one's rank in the group (e.g. Robson, 1992) the dispersion of earnings does not matter but the resulting ranking does.

In addition to the outcome-based models described above there exist rule-based models of social preferences. According to these models people do not care about outcomes in themselves, but about how these outcomes are reached. Procedural fairness (e.g. Trautmann, 2009), where people care about equality in terms of expected, but not realized earnings, is an example of such a model. These and other rule-based social preference models predict no differences between the treatments.

Section 3.2 describes the experimental design and section 3.3 presents the theory and the hypotheses. Section 3.4 reports the results of our experiment. In short we find that behavior in the social treatment is indistinguishable from that in the individual treatment. Our findings are therefore in line with procedural fairness. Section 3.5 concludes.

3.2. Experimental design

Although we introduce social concerns in one of the treatments, the experimental setup stays as close as possible to common individual decision-making experiments. The individual (control) treatment consists of a series of choices between two lotteries. The social treatment retains the same general structure but introduces social comparison without changing the incentives for a person who does not care about relative income or her position in the income distribution. Importantly our social treatment does not introduce the possibility to influence the payoff of others.

3.2.1. Individual treatment

Participants face 20 pair-wise choice situations in an individually randomized order. In each of these situations participants choose between two sets of three cards[35]. Each card has an integer number between 1 and 29 on it. The numbers on the three cards in a set always add up to 31. Figure 3.1 shows a screen shot of a choice situation and table 3.1 displays all 20 choice situations.

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[35] Which of these sets appears left or right is randomly determined for each participant individually.

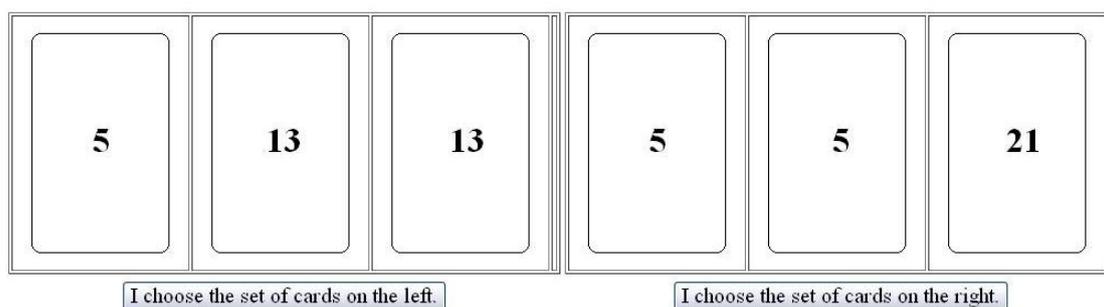Choose one of the sets of cards below. **The numbers on the three cards in a set always add up to 31.**

Figure 3.1: A translated example of the choice situation as presented to participants in both treatments.

When all participants have made their decisions one choice situation is randomly selected. Participants are informed about the selected choice situation and reminded of the set they chose in that situation. They then blindly draw one card from the set they preferred. The participant's earnings in Euros are the number on the card they draw divided by two. Choosing a set of cards implies the choice of a lottery.[36]

Because the sum of the numbers on three cards in a set is always 31 the lotteries represented by the sets of cards all have the same expected value. There are three different types of sets: LLH sets with two low numbers (L) and one high number (H), LHH sets with one low number (L) and two high numbers (H) and LMH sets with three different numbers, a low (L), middle (M) and high number (H).

3.2.2. Social treatment

In the social treatments participants face the same choice situations as in the individual treatment. One of these choice situations is again randomly selected. In contrast to the individual treatments however participants are then matched with two others who chose the same set in that choice situation. These three participants successively, blindly, draw a card from this set without replacement. As a result a set of cards not only represents a lottery over the decision maker's own earnings, but also over her relative earnings.

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[36] The experiment was computerized using php/mysql and no actual cards were used. Appendix A gives the English translation of the instructions.

Choice situation	Set A[a]			Set B			Hypotheses[b]				Results (% A)		
	#	Cards	Type	#	Cards	Type	1 Inequity aversion	2 Inequity seeking	3 Maximin prefs	4 Ranking prefs	Indiv.	Social	p^c
1	1	1,1,29	LLH	4	1,15,15	LHH	<	>	0	>	5.41%	11.90%	0.195
2	1	1,1,29	LLH	7	8,8,15	LLH	<	>	<	0	8.11%	7.14%	0.321
3	1	1,1,29	LLH	2	1,8,22	LMH	<	>	0	>	8.11%	19.05%	0.101
4	1	1,1,29	LLH	5	5,11,15	LMH	<	>	<	>	13.51%	9.52%	0.237
5	4	1,15,15	LHH	7	8,8,15	LLH	<	>	<	<	24.32%	33.33%	0.135
6	4	1,15,15	LHH	2	1,8,22	LMH	>	<	0	<	83.78%	78.57%	0.192
7	4	1,15,15	LHH	5	5,11,15	LMH	<	>	<	<	48.65%	45.24%	0.171
8	7	8,8,15	LLH	2	1,8,22	LMH	>	<	<	>	16.22%	21.43%	0.192
9	7	8,8,15	LLH	5	5,11,15	LMH	>	<	>	>	32.43%	38.10%	0.163
10	2	1,8,22	LMH	5	5,11,15	LMH	<	>	<	0	18.92%	19.05%	0.225
11	3	5,5,21	LLH	6	5,13,13	LHH	<	>	0	>	10.81%	11.90%	0.273
12	3	5,5,21	LLH	8	9,9,13	LLH	<	>	<	0	18.92%	11.90%	0.171
13	3	5,5,21	LLH	9	9,11,11	LHH	<	>	<	>	16.22%	19.05%	0.221
14	3	5,5,21	LLH	10	10,10,11	LLH	<	>	<	0	13.51%	14.29%	0.253
15	6	5,13,13	LHH	8	9,9,13	LLH	<	>	<	<	48.65%	50.00%	0.177
16	6	5,13,13	LHH	9	9,11,11	LHH	<	>	<	0	40.54%	54.76%	0.082
17	6	5,13,13	LHH	10	10,10,11	LLH	<	>	<	<	24.32%	26.19%	0.201
18	8	9,9,13	LLH	9	9,11,11	LHH	<	>	0	>	35.14%	23.81%	0.108
19	8	9,9,13	LLH	10	10,10,11	LLH	<	>	<	0	18.92%	14.29%	0.205
20	9	9,11,11	LHH	10	10,10,11	LLH	<	>	<	<	43.24%	40.48%	0.175

Table 3.1: The choice situations used in the experiment.
[a] In the experiment set A and B were randomly displayed on the left or right side, without labels.
[b] Shows per hypothesis whether choosing set A over set B is more (>), less (<), or equally (0) likely in the social treatment than in the individual treatment. Hypothesis 5 predicts no difference between treatments. These hypotheses are explained in section 3.
[c] P-values for a two-sided Fisher-exact test.

It is possible that the number of participants choosing a set is not a multiple of three. In that case the number of participants choosing one set is always a multiple of three plus one and the number choosing the other set a multiple of three minus one. We then randomly select one of the participants who chose the set chosen by a multiple of three plus one and reallocate him or her to the other set. Participants are aware of this. Given this procedure there is at most one participant per session who does not get to choose from his or her preferred set. Therefore participants in both treatments have an incentive to choose the set they prefer.

Compared to the individual treatment the social treatment only changes one thing: sets of cards now also imply a distribution of earnings between three peers. All other aspects of the decision situation such as the implied risk or the presentation of the decision situation remain the same. Importantly, although we introduce social comparison, participants cannot affect the set from which another participant draws a card or influence earnings of other participants in any way. Altruism or similar concerns therefore cannot affect participants' decisions.

3.2.3.   Related experiments

This experimental design is similar to so-called "veil of ignorance" experiments, inspired by Rawls' (1971) classic thought-experiment. In such experiments, participants choose an income distribution for a group without knowing their place in the distribution (e.g. Beckman et al., 2002 and Carlsson et al., 2005). Schildberg-Hörisch's (2010) experiment comes closest to our design because she compares behavior in treatments with and without the possibility of social comparison.

The fundamental difference between our design and veil of ignorance experiments is that in the latter decisions makers affect the earnings of others while we exclude this possibility. As discussed above this allows us to exclude several other-regarding concerns such as altruism. As far as we know only three other experiments on decision making under risk and other-regarding preferences share this feature: Bault Coricelli and Rustichini (2008), Rohde and Rohde (2011) and Linde and Sonnemans (2012). All three of these experiments test a different and/or narrower set of hypotheses than we do here and do not directly compare behavior in contexts with and without the presence of social comparison.

3.3. Theory and hypotheses

As social preferences have gained credence they are ever more often incorporated into applied economic models (e.g. Demougin, Fluet & Helm, 2006 and Choi, 2009). The kind of other-regarding preferences that are assumed can have a profound impact on the predictions and policy recommendations of these applied economic models. Although the existence of other-regarding preferences is hardly ever questioned anymore the exact form these preferences take is still up for discussion.

The decision situations in our experiment have been designed to distinguish between some of these models. The primary distinction is between outcome-based social preferences, which predict a treatment effect, and rule-based social preferences, which predict the same behavior in both treatments. Furthermore, different types of outcome-based models make different predictions.

3.3.1. Outcome-based fairness

Most models of other-regarding preferences assume that people care about outcomes. Here we discuss four models that are all successful in explaining much of the existing evidence: inequity aversion, inequity seeking, maximin preferences and ranking preferences. Each of these makes a different prediction in our experiment.

Inequity aversion

Inequity aversion models such as those of Bolton & Ockenfels (2000) and Fehr and Schmidt (1999) provide an accurate description of behavior in many games where the division of money is at stake such as the dictator game and the ultimatum game. These models explain this behavior by an aversion to unequal earnings. Both earning more and earning less than peers lead to a loss in utility. In other words: an aversion to inequity implies distaste for more dispersed income distributions, for a given level of (expected) own earnings.

To see the implications of these models in our experiment we compute the difference in the utility, according to the model of Fehr and Schmidt (1999), of drawing from a certain set in the individual and the social treatment. Independent of the type of set (LLH, LHH or LMH) this difference is given by[37]:

$$-\frac{1}{3}\left(\alpha_i + \beta_i\right)\left(H - L\right) \tag{3.1}$$

α_i and β_i are the disutility caused by disadvantageous and advantageous inequality respectively.

Formula 1 shows that the difference in utility between treatments is directly related to the difference between the highest (H) and the lowest amount (L). Both α_i and β_i are assumed to be positive by Fehr and Schmidt (1999). Therefore sets with a larger difference between H and L should be relatively less attractive in the social

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[37] Appendix B provides the proof of this expression. It further shows that also according to Bolton and Ockenfels' (2000) ERC model the difference in utility between treatments is directly related to the difference between H and L for LLH and LHH sets. HML sets yield a slightly different expression but this expressions leads to the same expected treatment effects.

than in the individual treatment. Importantly, the difference in value between the social and individual treatment is independent of the type of set (LLH, LHH or LMH). Given this analysis inequity aversion models lead to the following hypothesis:

Hypothesis 1: (inequity aversion): Sets where H-L is larger are chosen less often in the social than in the individual treatment.

In the literature on reported happiness similar types of social preference model are prevalent as an explanation for the Easterlin (1974) paradox, the finding that happiness scores are strongly increasing in income within countries but much less so between countries (Clark, Frijters and Shields, 2008).[38] The usual explanation for this observation is that happiness is at least partly determined by relative income (e.g. Layard, 1980 and Clark and Oswald, 1996). In contrast to inequity aversion models these models assume that utility is increasing in advantageous inequity. People with such preferences are not inequity averse, but envious. The disutility caused by disadvantageous inequality is commonly held to be greater than the utility of advantageous inequality; in terms of the Fehr and Schmidt model $\beta_i < 0$ and $\alpha_i > -\beta_i$ and thus $\alpha_i + \beta_i > 0$. Although the assumption about the utility of advantageous inequity in such models is different than in the Fehr-Schmidt model, the predicted behavior is in line with hypothesis 1.

Inequity aversion creates a kink in the utility function around the earnings of a peer in the same way loss aversion in Prospect Theory (Kahneman & Tversky, 1979 and Tversky & Kahneman, 1992) causes a kink around the reference point. So if the earnings of a peer are considered a reference point in the sense of Prospect Theory, this theory also predicts behavior in line with hypothesis 1.[39]

Inequity seeking

Although inequity aversion provides an accurate description of behavior in some situations, research by Bault, Coricelli and Rustichini (2008) implies that it may not be an accurate description of behavior when people make risky choices that only

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[38] This claim only holds within the set of developed countries. If one looks at developing countries there is a positive effect of average income on happiness scores.

[39] Probability weighting as modelled in cumulative prospect theory predicts a force in the opposite direction by placing a lower decision weight on the worst outcome. However, the strong risk aversion observed for gambles that allow for both gains and losses shows that the effect of loss aversion trumps the effect of probability weighting. (Wakker 2010, chapters 8 and 9)

affect their own outcome. In their experiment participants chose between two lotteries and observed the choices and outcomes of one other participant facing the same choices. The other participant was, unknown to the participants, actually a computer who made either very risk averse or risk neutral choices. Inequity aversion models, as well as a preference for conformity, predict that participants would try to match their "peer's" choices. Bault et al. observed the opposite behavior. Participants matched to a risk averse (neutral) computer became more risk tolerant (averse).

People are apparently willing to risk earning less in order to have the chance to earn more than their peer. Translated in terms of the Fehr and Schmidt model this means that people have a β_i that is negative and in absolute terms larger than α_i. From formula 1 it then follows that a larger difference between the best and the worst outcome (H-L) actually increases the utility of an option in the social treatment. This leads to a hypothesis that is the exact opposite of the inequity aversion hypothesis:

Hypothesis 2 (inequity seeking): Sets where H-L is larger are chosen more often in the social than in the individual treatment.

A possible explanation of the difference between the Fehr and Schmidt model and Bault et al.'s findings is that the Fehr and Schmidt model is based on situations where distributing money was at stake, like ultimatum games. In that case altruism may lead to an observed dislike of advantageous inequality and reciprocity to a stronger dislike of disadvantageous inequality. Both altruism and reciprocity are not present in the situation studied by Bault et al. (2008) so their finding may be a better description of people's preferences over outcomes per se. If so, it provides a better prediction of behavior in situations, such as that studied here, where people's decisions only influence their own earnings.[40]

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[40] Our experiment can be seen as a reexamination of the effect observed by Bault et al. using methods more acceptable to economists, i.e. without deceiving subjects. Moreover Bault et al.'s findings rely on the assumption that participants form correct beliefs about their "peer's" behavior. Participants in Bault et al.'s experiment may for instance have believed that participants who took more risk in the past where actually less likely to take risk in the future. In that case the observed behavior would actually be an attempt to match the other's choices and thereby avoid unequal outcomes. Lastly, behavior observed by Bault et al. may also be an attempt to express individuality by consciously choosing something different than the other. Neither beliefs nor a preference to express individuality affect decisions in our experiment as participants have full information about the resulting distribution and no information about the choices of others.

Maximin preferences

Rawls' (1971) maximin principle is one of the most well-known philosophical ideas about distributive justice. According to this principle resources in a society should be divided in the way that most benefits the least well of. Rawls justified the maximin principle with a veil of ignorance thought-experiment. He thought that if we do not yet know our place in a society we would prefer a society in which the least well of are best off.

The empirical relevance of maximin preferences has been demonstrated experimentally. Veil of ignorance experiments (e.g. Beckman et al. , 2002, Carlsson et al., 2005 and Schildberg-Hörisch, 2010) show that people indeed care about the least well off, but also about average earnings or efficiency. Even without a veil of ignorance maximin preferences may have a bite. Engelmann and Strobel (2004) and Charness and Rabin (2002) show that a combination of efficiency concerns and maximin preferences give the best description of behavior in their experiments. In our experiment efficiency does not play a role because total earnings are equal in all sets. Maximin preferences would therefore predict that sets where the amount earned by the person who earns the least (L), are relatively more attractive in the social treatment:

Hypothesis 3 (maximin preferences): Sets where L is larger are chosen more often in the social than in the individual treatment.

In many cases this hypothesis provides the same prediction as inequity aversion. There are however choice situations where that is not the case. Take for example choice situation 1 (table 3.1): 1-1-29 versus 1-15-15. In this case the lowest amount a participant can earn is the same in both sets. Maximin preferences would therefore predict no treatment difference in this situation. On the other hand the difference between H and L is smaller in 1-15-15 and inequity aversion therefore predicts that this will be chosen more often in the social treatment than in the individual treatment.

Ranking preferences

Reported happiness studies do not only posit models where utility is based on income share or income relative to the average income level, but also models where utility is based on the agent´s income *rank* within the population (e.g. Layard,1980 and Robson,

1992). Both types of models fulfill their goal of explaining the Easterlin paradox because in both models a higher average income for others lowers a person's utility, either through a lower relative income or a lower rank. It is difficult to distinguish between these types of models with field data, however, in our experiment we created situations where these two theories make different predictions.

As discussed in the design section the sets of cards used in our experiments can be divided into three kinds. In the social treatment a LLH set means that one person will hold top rank while the two others will share bottom rank: one winner and two losers. In contrast, in a LHH set there will be two winners and only one loser. The third kind of set (LMH) results in a complete ranking without ties. Intuitively, in a game of chance is it much nicer to be the sole winner than one of the two winners and in case of losing the pain will be less if there is a fellow sufferer, which suggests that LLH would be more attractive than LHH in the social treatment (compared with the individual treatment). We will now formulate this intuition more formally.

We label ranks, from top to bottom, 1, 2 and 3 and ties as 1.5 for two winners and 2.5 for two losers. The expected utility of a set in the social treatment if people care about rank can then be represented by the following formulas[41]:

$$\text{LLH: } \frac{1}{3}H + \frac{2}{3}L + \frac{1}{3}R(1) + \frac{2}{3}R(2.5) \tag{3.2}$$

$$\text{LHH: } \frac{2}{3}H + \frac{1}{3}L + \frac{2}{3}R(1.5) + \frac{1}{3}R(3) \tag{3.3}$$

$$\text{LMH: } \frac{1}{3}H + \frac{1}{3}M + \frac{1}{3}L + \frac{1}{3}R(1) + \frac{1}{3}R(2) + \frac{1}{3}R(3) \tag{3.4}$$

where $R(r)$ is the function that represents the effect of rank on an agents utility.

Predicted treatment effects are caused by the part of the utility function that is different between the social and individual treatments, the terms that contain the function $R(r)$. The difference in difference between the value of LLH and LHH between the social and individual treatment is given by:

$$\left(\frac{1}{3}R(1) + \frac{2}{3}R(2.5) - \frac{2}{3}R(1.5) - \frac{1}{3}R(3)\right) =$$
$$\left(\frac{1}{3}(R(1) - R(1.5)) + \frac{1}{3}(R(2.5) - R(1.5)) + \frac{1}{3}(R(2.5) - R(3))\right) \tag{3.5}$$

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[41] Like the Fehr & Schmidt model we assume linear utility in own income, but as this component is the same in both treatments this does not affect the hypotheses.

So in the social treatment LLH becomes relatively more attractive than LHH when

$$\big(R(1) - R(1.5)\big) + \big(R(2.5) - R(3)\big) > \big(R(1.5) - R(2.5)\big) \tag{3.6}$$

In words: the extra utility of winning alone above winning together plus the extra utility of losing together above losing alone should be larger than the difference between winning together and losing together. This inequality holds for a function that is relatively flat in the middle, compared to the average slope at the top and the bottom.[42] Or put differently, it holds if coming first and/or not coming last is more important to the agent than moving up a place in the ranking in the middle[43]. In our view this type of preference is intuitively plausible.

If we compare the LMH sets to LLH and LHH sets we find a similar set of inequalities. The LMH set is relatively attractive compared to the LHH set if

$$\frac{1}{3}R(1) + \frac{1}{3}R(2) > \frac{2}{3}R(1.5) \tag{3.7}$$

The LMH set is relatively unattractive compared to the LLH set if:

$$\frac{2}{3}R(2.5) > \frac{1}{3}R(2) + \frac{1}{3}R(3) \tag{3.8}$$

By the same reasoning as above we believe it plausible that both inequalities will hold. Compared to the LMH sets the LLH sets exclude the chance to be the only loser while compared to LHH sets, LMH sets introduce the chance to be the only winner. That results in the following hypotheses:

Hypothesis 4 (ranking preferences):

    a. LLH sets are chosen over LHH sets more often in the social treatment than in the individual treatment.

    b. LLH sets are chosen over LMH sets more often in the social treatment than in the individual treatment.

    c. LMH sets are chosen over LHH sets more often in the social treatment than in the individual treatment

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[42] Straightforward functions such as $(C-r)^a$ with $0 < \alpha < 1$ or $\ln(C-r)$ fulfill this requirement. (C can be any arbitrary number larger than 3. This ensures that the part between brackets is positive, because 3 is the maximum rank number possible.)

[43] Evidence of such preferences can be found in athletic competitions. In such competitions the prizes are typically Gold, Silver, Bronze or no medal (which can be interpreted as losing). Medvec, Madey and Gilovich (1995) find that Bronze winners are typically happier than Silver winners. This suggests that the difference in utility between losing and Bronze is high and that an improvement from Bronze to Silver adds little utility (in their study even negative). The authors explain this by a change in reference point; Silver winners focus on the Gold that they missed and Bronze winners on the losers who get no medal.

3.3.2. Procedural fairness

The foundation of many other-regarding preference models rest on the observation that people are often willing to pay in order to raise, or lower, the earnings of others. An obvious interpretation is that they do so because they prefer the situation created by their actions. All other-regarding preference models discussed so far indeed assume that people's action are caused by a preference over *outcomes* in terms of relative earnings. There are however competing explanations. People can have rule-based preferences, that is, preferences over the procedures or actions that determine the outcomes. This distinction between outcome-based and rule-based preferences follows the philosophical distinction between consequentialist and deontological ethics (Alexander & Moore, 2007).

An example of rule-based preferences is procedural fairness (e.g. Trautmann, 2009). According to this model agents have preferences over the rule that determines earnings. As long as people perceive everyone as having (had) a fair chance they do not care about the dispersion in final earnings. Such model can explain results in the traditional Ultimatum and Dictator Games just as well as outcome-based models, but makes different predictions in situations with uncertainty. For example, Krawzyck and Le Lec (2010) study a version of the dictator game in which the dictator divides the (100%) probability of winning a prize between herself and the recipient. The two possible final outcomes are that either the dictator or the recipient wins the prize. If the dictator dislikes disadvantageous inequity more than advantageous inequity, the dictator should keep 100% to herself, according to outcome-based preference models[44]. Procedural fairness in contrast motivates a division of the probabilities which is what Krawzyck and Le Lec find.

Several other studies also show that, as predicted by procedural fairness, people care mainly about equality in expected rather than final earnings. Bartling and Von Siemens (2011) show this in an experiment on team production. In their experiment wage schemes with the same level of ex-ante inequality but different levels of ex-post inequality are valued about the same. Brennan et al (2008) and Güth, Vittoria Levati and Ploner (2008) show that people are not willing to reduce the risk others face and thereby the expected inequality. This is in line with procedural fairness because changing others risk does not influence ex-ante inequality.

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[44] If the dictator dislikes advantageous inequity more than disadvantageous inequity (β smaller than α in Fehr and Schmidt's model) she should donate all chances to the recipient.

Happiness studies at first sight appear to provide strong evidence for outcome-based preferences. Research in this field shows that happiness is strongly correlated with relative income (Clark, Frijters & Shields, 2008). Participants in these studies rate the situation they are in, so apparently their feelings have to be based on their preference over different possible situations. However, besides the inherent problem with self-reported, non-incentivized date, there are alternative explanations for this pattern. People may not feel bad about their relative earnings or wealth per se, but because they feel they did not receive a fair chance to become rich (Alesina, Di Tella & MacCulloch, 2004).

In our experiment participants cannot affect the earnings of others and all three matched participants in the social treatments have the same expected earnings so there is no ex-ante inequality. Participants who base their decisions on procedural fairness only should therefore behave the same way in the social and the individual treatments. This leads to the following hypothesis[45]:

Hypothesis 5: (procedural fairness): choices are the same in the social and the individual treatment.

3.4. Results

The experiment was run at the CREED lab in June 2010. A total of 79 participants participated in 4 sessions, 42 in the social treatment and 37 in the individual treatment. 58% was male and 40% were economics majors. All participants had first participated in another, unrelated experiment. That experiment was a pure individual experiment where social comparison was impossible (Sonnemans & van Dijk, forthcoming). The experiment took about 20 minutes and the average earnings were around 5.2 euro (in addition to the show up fee and the earnings in the other experiment).

To test our hypotheses we calculate, for each hypothesis, per individual how often she chose the lottery predicted to be more attractive in the social treatment. This we take as an independent observation. We then compare the distribution of percentages in both treatments to test the hypotheses. All tests in this section are two-sided.

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[45]   A person who is not concerned with fairness would also behave the same way in both treatments. However, there is overwhelming evidence that many individuals have social preferences.

3.4.1. Hypothesis 1 (inequity aversion) and 2 (inequity seeking),

Inequity aversion predicts an aversion to a greater dispersion of earnings: sets with a larger difference between the highest amount (H) and the lowest amount (L) should be relatively less attractive in the social than in the individual treatment (hypothesis 1). On the other hand findings by Bault et al. (2008) suggests that the exact opposite behavior, leading to hypothesis 2.

Table 3.2 shows that neither of these hypotheses holds up. People choose the set with the smaller difference between H and L about as often in the individual treatment as in the social treatment. A Wilcoxon-Mann-Whitney test shows that the difference between treatments is far from significant (p=0.81).

Statistic (percentage of choices)	Individual treatment	Social treatment	Difference	p-value Wilcoxon-Mann-Whitney test[a]
Hypothesis 1 (Inequity Aversion) and 2 (Inequity seeking)[b] (20 choice situations)	76.90%	75.35%	1.55%	0.81
Hypothesis 3 (Maximin preferences) (15 choice situations)	69.73%	69.20%	0.53%	0.90
Hypothesis 4 (Ranking preferences)				
a) LLH versus LHH (8 choice situations)	41.22%	38.99%	2.23%	0.72
b) LLH versus LMH (4 choice situations)	43.24%	42.26%	0.98%	0.74
c) LMH versus LHH (2 choice situations)	33.78%	38.10%	4.31%	0.44
Total (14 choice situations)	40.57%	40.14%	0.43%	0.94

Table 3.2: Treatment differences: Average percentage of choices for the set predicted to be more attractive in the social treatment.
[a] One individual is one independent observation.
[b] In this case the percentages shown are the percentage of choices for the set predicted to be more attractive in the social treatment by hypothesis 1.

3.4.2. Hypothesis 4 (ranking preferences)

Ranking preferences hypothesize that behavior is not influenced by the size of the difference between earnings, but only by the implied ranking. In our experiment that means only the type of set, LLH, LHH or LMH, matters. Specifically hypothesis 4 states that in the social treatment LMH sets should be relatively more attractive than LHH sets and LLH sets should be relatively more attractive than both LMH and LHH sets. However the treatment difference predicted by this hypothesis is not observed. Testing the three parts of hypothesis 4 on the choice between LLH and LHH sets (a), LLH and LMH sets (b) and LHH and LMH sets (c) separately shows that for none of these types of decision situations behavior is different in the social and individual treatments. (Wilcoxon-Mann-Whitney all p-values >0.44) and also taking the three parts of the hypothesis together does not show a difference (p=0.94).

Rejecting hypothesis 4 provides evidence against the importance of rank as a driver of behavior. However caution is warranted because hypothesis 4 is based on some specific assumptions about the type of ranking preferences used. For example, linear ranking preferences, where each change in position is equally important, predicts no difference in behavior between treatments.

3.4.3. Hypothesis 5 (procedural fairness)

The rejection of all other hypotheses is in line with hypothesis 5 that states that behavior should be the same in both treatments. It is however possible that behavior is influenced by some other type of social preferences over outcomes. Comparing behavior in each of the 20 choice situations shows that this is not the case. According to a Fisher exact test there is no difference in choices between the social and individual treatments for any choice situation (all 20 p-values are larger than 0.08), see table 3.1. This persistent rejection of outcome-based fairness models is an implicit support for procedural fairness models that predict no treatment effects.

3.5. Conclusion

Other-regarding preference models were developed to explain consistent violations of selfishness, like the spending of money to affect the earnings of others in ultimatum and other games. As always, it is easier to explain old facts than predict new ones. A

real test of these models can be found in novel situations that were not yet available when the models were created. Our experiment provides such a situation.

In our experiment the decisions of the participants influence only their own outcomes and in that sense they face purely individual and non-strategic decisions. We compare an individual treatment without peers with a social treatment where social comparison is possible (there are winners and losers). Models that assume preferences over outcomes, like inequity aversion or seeking, maximin preferences and ranking preferences, all predict that the introduction of social comparison would affect behavior in our experiment. Procedural fairness on the other hand predicts no effect. Our results are in line with this second type of model.

Historically the development of models in experimental and behavioral economics about social preferences on the one hand and the models of individual decision-making on the other hand occurred parallel without much interaction. However, economists who try to predict real world behavior or give policy advice face the problem that many real situations combine elements of both fields and they have to fit two kind of models together in some way. Camerer and Loewenstein, (2004) suggest viewing behavioral economics as a toolbox. After looking at a situation the economist can turn to this "toolbox", select the appropriate behavioral models and combine them as required. In practice things can be more difficult than the analogy suggests because many different models are available and it is not always clear what will be the best choice in these specific circumstances. Of course, these are in essence empirical questions. Our research gives an answer for one particular situation, to wit a situation where both risk and social comparison are relevant: it suggests that outcome-based models such as inequity aversion or seeking, maximin preferences or ranking preferences are not relevant here.

An obvious conclusion of our study is that the outcome-based fairness models we studied are less general than supposed and are only valid in situations where decision makers can influence the earnings of others. However, this would mean that we need two separate models. One for situations where people can influence the earnings of others and an other for situations where they cannot. However, procedural fairness, which so far provides accurate predictions in both situations, allows for one more general model.

We do not claim that this is the end-all answer. Other research has found social comparison effects on decisions under risk, behavior predicted by none of the

existing models. For example Bohnet en Zeckhauser (2004) show that the source of the risk, "nature" or other people needs to be considered. As we show in an earlier paper (Linde & Sonnemans, 2012) the relative position of a person prior to making the decision also influences risk attitudes. A general model that aims to describe behavior in situations with both social comparison and risk will need to incorporate these findings.

3.6. Appendix A: Experimental instructions

(Translated from Dutch. Original Dutch instruction available upon request)

Instructions individual treatment
Your earnings in this experiment are determined by drawing 1 card from a set of 3 cards. Each card has a number on it: the number of points you get if you draw that card. Your earnings in euros are the number on the card divided by 2 (each point is worth 50 cents). **The numbers on the 3 cards in a set always add up to 31.**

When drawing a card you do not get to see the number on the card and each card has the same chance to be in a certain position. **Therefore you cannot know which card you will draw.**

The set of cards you will draw from depends on your choices. In total you will be asked 20 times to choose between two sets of cards. One of these choice situations is randomly selected. The set from which you will draw a card is the set you choose in that choice situation. **Therefore you should always choose the set you prefer.**

Instructions social treatment
In this experiment you are matched with 2 other participants. Your earnings are determined by consecutively, without replacement, drawing a card from a set of 3 cards. You cannot draw a card that has already been drawn by another participant. Each card has a number on it: the number of points you get if you draw that card. Your earnings in euros are the number on the card divided by 2 (each point is worth 50 cents). **The numbers on the 3 cards in a set always add up to 31.**

When drawing a card you do not get to see the number on the card and each card has the same chance to be in a certain position. **Therefore you cannot know which card you will draw.** You cannot see which numbers are on the cards already drawn by the other participants.

The set of cards you will draw from depends on your choices. In total you will be asked 20 times to choose between two sets of cards. One of these choice situations is randomly selected. You are then matched to 2 other participants who choose the same set in the selected choice situation. Then all three of you will draw, in a randomly determined order, a card from the set you choose. Sometimes it is impossible to match everyone to two others who choose the same set. In that case in participant is randomly selected to draw from the set he or she did not choose. The chance you do

not get to draw from the set you choose is therefore very small. **Therefore you should always choose the set you prefer.**

3.7. Appendix B: Inequity aversion hypothesis

The hypothesized effect of inequity aversion can be found using the Fehr & Schmidt model. For two peers becomes the utility function of this model is:

$$x_i - \frac{1}{2}\alpha_i \left(\max\left(x_1 - x_i, 0\right) + \max\left(x_2 - x_i, 0\right)\right) - \frac{1}{2}\beta_i \left(\max\left(x_i - x_1, 0\right) + \max\left(x_i - x_2, 0\right)\right) \tag{3.9}$$

with $\alpha_i \geq \beta_i$ and $0 \leq \beta_i \leq 1$

In this formula x_i are the earnings of the decision maker and x_1 and x_2 the earnings of her two pears. α_i and β_i are the disutility caused by respectively disadvantageous and advantageous inequality. Using this utility function the expected utility, according to the Fehr and Schmidt model, of choosing a certain set in the social treatment can be computed. The expected utility of a LLH set is:[46]:

$$\frac{1}{3}\left(H - \beta_i\left(H - L\right)\right) + \frac{2}{3}\left(L - \frac{1}{2}\alpha_i\left(H - L\right)\right) = \frac{1}{3}H + \frac{2}{3}L - \frac{1}{3}\left(\alpha_i + \beta_i\right)\left(H - L\right) \tag{3.10}$$

By the same reasoning the expected utility of a LHH set is:

$$\frac{2}{3}\left(H - \frac{1}{2}\beta_i\left(H - L\right)\right) + \frac{1}{3}\left(L - \alpha_i\left(H - L\right)\right) = \frac{2}{3}H + \frac{1}{3}L - \frac{1}{3}\left(\alpha_i + \beta_i\right)\left(H - L\right) \tag{3.11}$$

And for a LMH set:

$$\frac{1}{3}\left(H - \frac{1}{2}\beta_i\left(H - L\right) - \frac{1}{2}\beta_i\left(H - M\right)\right) + \frac{1}{3}\left(M - \frac{1}{2}\alpha_i\left(H - M\right) - \frac{1}{2}\beta_i\left(M - L\right)\right) +$$

$$\frac{1}{3}\left(L - \frac{1}{2}\alpha_i\left(H - L\right) - \frac{1}{2}\alpha_i\left(M - L\right)\right) =$$

$$\frac{1}{3}H + \frac{1}{3}M + \frac{1}{3}L - \frac{1}{6}\left(\alpha_i + \beta_i\right)\left(H - L\right) - \frac{1}{6}\left(\alpha_i + \beta_i\right)\left(H - M\right) - \frac{1}{6}\left(\alpha_i + \beta_i\right)\left(M - L\right) =$$

$$\frac{1}{3}H + \frac{1}{3}M + \frac{1}{3}L - \frac{1}{3}\left(\alpha_i + \beta_i\right)\left(H - L\right)$$

$$\tag{3.12}$$

The last term of all these three formulas: $-\frac{1}{3}\left(\alpha_i + \beta_i\right)\left(H - L\right)$ is relevant to determine the hypothesized treatment difference as this term is only relevant in the social

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[46] The Fehr & Schmidt model assumes linear utility as a simplification. This does not allow for anything but risk neutrality when social concerns are irrelevant. This is obviously an inaccurate description of observed behavior. Risk attitudes can however easily be incorporated by a non-linear utility function of own earnings. This would not change the difference between the social and individual treatments illustrated here as there wouldn't be any difference in this regard between treatments.

treatment, as in the individual treatment there is no social comparison. It shows that, according to the Fehr and Schmidt model sets where H-L is large become relatively unattractive in the social treatment.

To make the Bolton and Ockenfels ERC model most comparable to the Fehr and Schmidt model we assume a utility function that is separable in terms of the individual and social component and linear in the social component with a kink at the social reference point. Advantageous inequality yields a disutility of β_i, disadvantageous inequality a disutility of α_i. Such a utility function fulfills Bolton and Ockenfels' assumptions.

The most important difference with the Fehr and Schmidt model is that agents compare their own outcome to a fair share of the pie instead of with the earnings of each referent. In our experiment a fair share is always 10 1/3 because the numbers on the cards always add up to 31. This yields the following utility function:

$$x_i - \alpha_i\left(\max\left(10\frac{1}{3} - x_i, 0\right)\right) - \beta_i\left(\max\left(x_i - 10\frac{1}{3}, 0\right)\right) \tag{3.13}$$

The expected utility of a LHH set is therefore given by:

$$\frac{1}{3}\left(H - \beta_i\left(H - 10\frac{1}{3}\right)\right) + \frac{2}{3}\left(L - \alpha_i\left(10\frac{1}{3} - L\right)\right) \tag{3.14}$$

As the numbers in a set add up to 31 we know that $H - L = 31 - 3L = 3\left(10\frac{1}{3} - L\right)$ and

$H - L = H - \frac{31 - H}{2} = \frac{1}{2}3\left(H - 10\frac{1}{3}\right)$. Combining these equalities with function A6

yields:

$$\frac{1}{3}H + \frac{2}{3}L - \frac{1}{3}\beta_i\left(\frac{2}{3}(H-L)\right) - \frac{2}{3}\alpha_i\left(\frac{1}{3}(H-L)\right) = \frac{1}{3}H + \frac{2}{3}L - \frac{2}{9}(\alpha_i + \beta_i)(H-L) \tag{3.15}$$

For the LLH set we have the following expected utility:

$$\frac{2}{3}\left(H - \beta_i\left(H - 10\frac{1}{3}\right)\right) + \frac{1}{3}\left(L - \alpha_i\left(10\frac{1}{3} - L\right)\right) \tag{3.16}$$

In this case $H - L = H - (31 - 2H) = 3\left(H - 10\frac{1}{3}\right)$ and

$H - L = \frac{31 - L}{2} - L = \frac{1}{2}3\left(10\frac{1}{3} - L\right)$. Combining with 3.16 yields:

$$\frac{1}{3}L + \frac{2}{3}H - \frac{2}{9}\left(\alpha_i + \beta_i\right)\left(H - L\right) \tag{3.17}$$

As with the Fehr and Schmidt model the last term shows the hypothesized treatment effect. Dropping the assumption of linear social effects causes the effect of *H-L* to be non-linear, but utility is still decreasing in *H-L* in the social treatment.

For LMH set the utility is given by:

$$\frac{1}{3}\left(H - \beta_i\left(H - 10\frac{1}{3}\right)\right) + \frac{1}{3}\left(M - \beta_i\left(M - 10\frac{1}{3}\right)\right) + \frac{1}{3}\left(L - \alpha_i\left(10\frac{1}{3} - L\right)\right) \tag{3.18}$$

if *M* is bigger than 10 1/3. If M is smaller it is given by:

$$\frac{1}{3}\left(H - \beta_i\left(H - 10\frac{1}{3}\right)\right) + \frac{1}{3}\left(M - \alpha_i\left(10\frac{1}{3} - M\right)\right) + \frac{1}{3}\left(L - \alpha_i\left(10\frac{1}{3} - L\right)\right) \tag{3.19}$$

From A10 and A11 the utility in the social treatment decreases if an amount is transferred from L to H. Utility is no longer linearly deceasing in *H-L* though. For example if *M* is bigger than 10 1/3 transferring an amount from *H* to *M* decrease *H-L* but does not affect the disutility from inequity. However for all choice situations in our experiment it still holds that the set where *H-L* is bigger should be relatively less attractive in the social treatment.