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Aregroup members less inequality averse than individual decision makers?

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Abstract:Do groups exhibit more or less inequality aversion than individuals? Although the previous literature has shown that in many environments individuals in groups make more selfish decisions than when deciding in isolation, we findthat individuals express *more* inequality aversion when making initial proposals in a group decision-making environment compared to an individual decision-making environment. This may bedriven by a change in the decision-making environment and by beliefs about the prevailing norm in the group, but we exclude that it is driven by a loss of anonymity or by efficiency concerns. By investigating how groups aggregate individual preferences under a unanimity rule, we show that the members with median social preferences lead thegroup decisions and a higher inequality aversion compared to the median slows down the convergence process. Overall, final decisions in groups reveal the same level of inequality aversion than individual decisions.

Keywords: Group, inequality aversion, preference aggregation, social image, experiment
JEL classification: C91, C92, D03, D63, D72

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1. INTRODUCTION

Social comparisons, both among individuals and among groups, are widespread in human societies. Whilesome individuals enjoy outperforming others, many peopleare inequality averse.In economic models such as Fehr and Schmidt (1999) and Bolton and Ockenfels (2000),inequality aversion captures the fact that people care about both their own material payoff and the distribution of payoffs between them and others.To date, the experimental literature has almost exclusively considered inequality aversion when an individual interacts with other individuals. It has less deeply investigated inequality aversion when individuals decide as members of a group, although the norm of equality in groups has been shown to be often more appealing than the norm of efficiency when groups are heterogeneous (Nikiforakis *et al.* 2012; Reuben and Riedl, 2013; Gangadharan *et al*., 2015). Social dynamics, in particular the influence of peers,may generate systematic differences in preferences compared to an environment in which people decide in isolation.It is unclear, however, whether inequality aversion is stronger or weaker in a social environment than when individuals interact with a single other individual. We know even less about inequality aversion when groups interact with other groups. Group members may weigh less the difference with another group; on the opposite, they may behave more competitivelythan when interacting with a single person, expressing more disadvantageous and less advantageous inequality aversion because of the influence of group identityon behavior (Akerlof and Kranton, 2000; Chen and Li, 2009).

In this paper, we designed a laboratory experiment to compare inequality aversion in individuals when these individuals interact with another person and when they interact as a member of a groupfacing with another group, using various allocation tasks. Weaddressthree questions. First, we investigate whether the degree of inequality aversion when group members make initial proposals to the group differs from whenindividual choicesare made in isolation (*i.e*., when interacting with a single individual). Studying the first proposal made by individuals in a group decision-making environment before they receive any feedback about others' choices (and not only the final group decision, as done usually in the literature) allows us to isolate the impact of a collective decision-making context independently of the social information conveyed by peers' proposals in the next rounds. When making their first proposal to the group,individualsmay express less inequality aversionthan when making decisions in isolation if a group environment encourages selfishness; on the opposite, they may express more inequality aversion to compensate for the expected selfishness of others.

Second, we study the process of aggregation of individual proposals to form the final group decision and we examine whether it varies with the degree of inequality aversion that was expressed initially. Byobservingthe members'initial proposalsand measuring the distance withthe final votewhile keeping the group environment constant,we can characterize the formation of group decisions once people learn about others' proposals. Analyzingthe entire dynamics of the group decision formationallows us to address the question of who in the group, in terms of relative inequality aversion, has a stronger influence on the final decisions.

Finally, we study whetherindividual preferences in a group decision-makingenvironment depend on whether the anonymity of group members is preserved or not during the aggregation process, revealingthe possible role of social image concerns.

We contribute to the literature comparing group and individual decision-making. Many studies have found that groups behavein general more rationally and selfishly than individuals (Charness and Sutter, 2012), although somehave shownthat the differencedepends crucially on the nature of the task and on the decision-making procedure (*e.g*., Kocher and Sutter, 2007).

However, these studies did not explore inequality aversion directly. A recent exception is Balafoutas *et al*. (2014)who show that while groups express the sameadvantageous inequality aversionas individuals, they are more benevolent than individuals in the domain of disadvantageous inequality and much more efficiency-oriented. Our design introduces three main differences. We measure inequality aversion under the Fehr and Schmidt's (1999) theoretical framework. We use games in which the fixed option maximizes the level of inequality, instead of fixing payoff equality. And we isolate image concerns in the aggregation of preferences.

We also contribute to the literature by matching this comparative analysis of individual and group decision-makingregarding inequality aversion with the analysis on the aggregation of individual preferences in groups (*e.g*. Gillet *et al*., 2009; Zhang and Casari, 2012; Ambrus *et al*., 2014). Bycomparing the individual choicesmade in isolation before any social interaction and those made in a group environment, we canexplore whether some players have a stronger influence in the group decision-making process. In particular, wetestthe hypothesis that those with a median level of inequality aversion make less concessions than other group members, although all players have a veto power under the unanimity ruleintroduced in our experimental design.

Another contribution is related to the study ofwhether and howthe anonymityof decisionsaffectsindividual initial proposals in a groupenvironment and their adjustment during the aggregation process. In real settings,choices by voters in various policy-making procedures are typically anonymous, whilechoices by juries, boards, and familiesusually result from non-anonymous interactions. When it is common information that a proposal emanates from a physically identifiedgroup member, allocation choices may express a different degree ofinequality aversion than when choices are made anonymously. Indeed, previous literature has shown thatindividuals tend to make more selfless decisions when observed because they care about their social image (*e.g*, Andreoni and Petrie, 2004; Soetevent, 2005, 2011; Benabou and Tirole, 2006; Ariely *et al*., 2009; Linardi and McConnell, 2011; Reinstein and Riener, 2012; Karlan and McConnell, 2012). We study whether a similar effect is observed in the context of our experiment.

Precisely, in our experimentwe elicit advantageous and disadvantageous inequality aversion at the individual level by means of the multiple price listsintroduced by Blanco *et al*. (2011), based on the Ultimatum Bargaining Game (Güth *et al.*, 1982) and a Modified Dictator Game (originally developed by Forsythe *et al*., 1994; Hoffman *et al*., 1994). Weadapt this design to a groupdecision-making environmentwhenall members of a groupreceive the same payoff from the group decision. Pairs of three-player groups perform the same allocation tasks. The group decisions result from votes made undera unanimity rule. Using both within-subject and between-subject designs allows us to compare individuals' decisions made in isolation and their initial and final proposals in a group environment. To identify the role of anonymity, we make a between-subject comparison withanadditional treatment in which subjectscan physically identify their group members and their proposals.

We have threemainfindings based on the analysis of switching points in the two games. First, on average individuals express more disadvantageous and advantageous inequality aversion when they make their initial proposals to the group than when they decide in isolation. This increased inequality aversion is driven neither by social image concerns, as the lift of anonymity has little effect, nor by efficiency concerns, as similar differencesare observed in both games although efficiency is kept constant only in the Ultimatum game, nor by peer effects since no social information has been disseminated yet.It may result from the expectations about the social norm prevailing in the group orfrom a change in preferences due to a differentdecision-making environment.Second, the degree of inequality aversion revealed by the final proposals, which is also the group decisions, is similar to that observed when individual decisions are made in isolation, which indicates the importance of social information on the evolution of individual proposals. Third,we show that the group members with the median level of inequality aversion drive the aggregation process. A higher degree of inequality aversion compared to the median slows down the convergence process.

The remainder of this paper is organized as follows. Section 2 briefly reviews the related literature. Section 3 presents the experimental design and procedures. Section 4 analyzes the results, and Section 5 discusses these results and concludes the paper.

2. RELATED LITERATURE

Our main contribution is to connectthe literatures on inequality aversion and on group decision-making.Tests of inequality aversion models havefirst been developed at the aggregate level (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000). Then, studies attempted toelicitthese preferencesat the individual level(Engelmann and Strobel, 2004; Bolton and Ockenfels, 2006; Dannenberg *et al*., 2007; Güth *et al*., 2009; Bartling *et al*., 2009; Blanco *et al*., 2011; Beranek *et al*., 2015; Yang *et al*., 2016). Within-subject testshave producedmixed evidence. Engelmann and Strobel (2004) find no support for eitherFehr and Schmidt's or Bolton and Ockenfels' modelsin a simple distribution game. Blanco *et al*. (2011) conclude that the predictive power of Fehr and Schmidt's model is limited at the individual level. In contrast, Dannenberg *et al*. (2007) show that in social dilemmas thedisadvantageous inequality aversionparameter has some explanatory power.These testshave used sequential prisoner's dilemma games (Blanco *et al.*, 2011)or public goods games (Blanco *et al*., 2011;Dannenberg *et al*., 2007). Using different gamesYang *et al*.

(2016)show the robustness of the model to efficiency concerns and variations in payoff scales.In our paper weadjustthe games used in Blanco *et al*. (2011) to agroupdecision-making environment.

As regards the preferences expressed by groups, on the one hand studies have shown the strength of the norm of equality (Nikiforakis *et al.* 2012; Reuben and Riedl, 2013; Gangadharan *et al*., 2015). On the other hand,many have found that groupsbehave more rationally in non-strategic interactions[1] and more selfishly than individuals in manygames(Kugler *et al*., 2012),[2]although not all.[3] Thesemixedfindings may be due to several factors, namely different preferences in groups than in individual interactions driven by a different context or by strategic concerns, the skewness of the distribution of individual members' preferences, orthe aggregation process. While Gillet *et al*. (2009) have shown that under the majority rule the median voter departs from his individual preferences after observing more selfish proposalsthan her own preferences,Ambrus *et al*. (2014)have found that median members are more influentialthan others because extremes neutralize each other (thus if the median member's pro-social preference is belowthemean, it drives the group toward greater selfishness).However, the comparison of inequality aversion in individual and in group interactions has remained almost unexplored.[4]

[1]Groups make fewer mistakes (Fahr and Irlenbusch, 2011), suffer less from hindsight bias (Stahlberg *et al*., 1995), myopic loss aversion (Sutter, 2007), and overconfidence (Sniezek, 1992). Results on risk attitudes are less consistent: some found thatgroups are more risk averse (Baker *et al*., 2008; Shupp and Williams, 2008) but others have shown that groups are closer to risk neutrality (He *et al.*, 2012) or that they take better risks (Rockenbach *et al*., 2007).

[2] This result holds for dictator games (Luhan *et al*., 2009), sequential games such as ultimatum (Robert and Carnevale, 1997; Bornstein and Yaniv, 1998), trust (Cox, 2002; Kugler *et al*., 2007; Song, 2009), centipede (Bornstein *et al*., 2004a), power-to-take games (Bosman *et al.*, 2006) and signaling games (Cooper and Kagel, 2005), as well as simultaneous games such as public goods (Van Vugt *et al*., 2007; Gillet *et al*., 2009), beauty contests (Kocher and Sutter, 2005; Kocher *et al.*, 2006; Sutter, 2005), and auctions (Cox and Hayne, 2006; Sutter *et al*., 2009; Sheremeta and Zhang, 2010; Casari *et al*., 2011; Cheung and Palan, 2011).

[3] Cason and Mui (1997) find in a dictator game that teams that are initially more self-regarding tend to act less selfishly. This polarization is due more to social comparisons (which give more weight to pro-social individuals) than to persuasion. In a similar game, Franzen and Pointner (2014) observe no difference. Müller and Tan (2013) find less selfish groupchoices in sequential market games, but mixed evidence is found in gift-exchange games (Kocher and Sutter, 2007).

[4]Note that one can find studies on how inequality aversion in groups affects contractual design (Rey-Biel, 2008; Bartling and von Siemens, 2010), sharing rules (Gill and Stone, 2015), peer pressure (Mohnen *et al*., 2008), or sanction and cooperation (Masclet and Villeval, 2008).

As mentioned earlier, one exception is Balafoutas *et al*. (2014)whostudy distributional preferences under both individual and teamregimes. They find that teamseliminate choices consistent with inequality aversion and spitefulness and they favor efficiency, in particular because communication allows efficiency-loversto be more assertive than others.While our objective is also to better understand how social preferences are aggregated in groups,we differ from this study in several respects. Balafoutas *et al*. (2014) elicit distributional preferences based on the double-price list technique of Kerschbamer (2015): subjects make binary allocation choices, one choice involving always the same equal payoff and the other choice asymmetric payoffs; in half of the decisions, the decision-maker is ahead the passive agent and in the other half he is behind. In contrast, we use theUG and the MDG of Blanco *et al.* (2011) and in the latterthe fixed option maximizes the level of inequality.It is interesting to compare whether the conclusions are similar when the fixed option is equality (Balafoutas *et al*., 2014) or the highest inequality (our design).Moreover, Balafoutas *et al*. (2014)treatteamsas a decision unit; instead, we consider group members as individualsand characterize how a group environment affects each member'sindividual preferences. In addition, our design allows us to isolate the role of anonymity in groups. Another contribution of our approach is that we combine a between-subject design and a within-subject design to measure whether different people and and/or the same people express different preferences in individual and group decision-making environments.[5]

The combination of the decision-making procedure and the distribution of players' types may determine the differences between individual and group decision-making (seeBosman *et al.*,

[5] There are other differences with our design. Contrary to Balafoutas *et al*., our games are played in a single session (instead in two consecutive weeks), we alternate the order between group and individual decisions, and we do not allow free communication. In their design, unanimity must be reached in five rounds maximum, while in our case we apply a time constraint. They pay subjects both as an active player and as a passive person while we pay subjects randomly in one of the two roles. In case of inability to reach an agreement, their subjects' payoffs are null, which may create a stronger pressure to reach unanimous group decisions than in our case where group decisions are randomly assigned from the possible decisions.

2006). Previous literature has shown that groups do notreach the same decisions as individuals when a majority is sufficient to make a decision or when unanimity is required (*e.g*. Bornstein *et al*., 2004b; Blinder and Morgan, 2005; Gillet *et al*., 2009).[6] Moreover, the mode of communication may matter. Manystudies use a face-to-face protocol or unrestricted communication via chat boxes(Kocher and Sutter, 2005; Kocher *et al*., 2006; Kugler *et al*., 2007; Sutter *et al*., 2009; Ambrus *et al*., 2014;Balafoutas *et al*.,2014). Kocher and Sutter (2007) show that groups behave more selfishly than individuals in an anonymous computerized procedure but not in a face-to-face protocol.Furthermore, anonymitymay affect the process of deindividuation within groups.[7]In our paper, we impose unanimity and restricted communication instead of face-to-face. This allows us to identify the role of anonymity while keeping the environment constant.

3. EXPERIMENTAL DESIGN AND PROCEDURES

In this section, we first introduce the games, then the treatments and the matching design, and finally, the experimental procedures.

3.1.The games

We first describe the individual decision-making environment before introducing the group decision-making environment.

Inequality aversion in an individual decision-making environment

To estimate the individuals' disadvantageous and advantageous inequality aversion, we replicatetwo of the games used in Blanco *et al*. (2011). Eachgame consists of 21 decision

[6] Many papers on group decisions impose unanimity (*e.g*., Sutter, 2005; Kocher and Sutter, 2005, 2007; Shupp and Williams, 2008; Luhan *et al*., 2009; Sutter *et al*., 2009). Some use the majority (Baker *et al*., 2008; Harrison *et al*., 2012) or the median (Bischoff and Krauskopf, 2013). Others allow for unrestricted deliberation (Cason and Mui, 1997; Bornstein *et al*., 2004a; Bosman *et al*., 2006; Schupp and Williams, 2008; Ambrus *et al*., 2014).

[7] Anonymity is a key factor of deindividuation. In social psychology, the deindividuation theory of Festinger *et al*. (1952) predicts that the anonymity of individuals in a group may lower their sense of personal identity and reduce compliance with the group norm. In contrast, the social identity model of deindividuation (Reicher *et al*., 1995) suggests that anonymity facilitates the alignment of the individual with the group's preferences.

problems, as shown in Table 1.The games are played under the veil of ignorance using the strategy method.[8]

The Ultimatum Game (UG, hereafter) involves a proposer and a responder. The proposer must share a pie of 400 points between himself and the responder. He makes an offer*S*to the responder, keeping (400 - *S*) to himself. If the responder rejects the offer (option A), both players earn zero. If the responder accepts the offer (option B), the share is implemented. The proposers' offers are restricted to multiples of 20, leading to 21 distributions from (400, 0), (380, 20), … to (0, 400). Subjects make their choices in each of the two roles sequentially on two separate screens to minimize interactions between the two decisions.

In the Modified Dictator Game (MDG, hereafter), the dictator decides how many of 400 points she is willing to sacrifice to equalize payoffs between herself and the receiver. There are 21 decision problems with two options. The left option always pays 400 points to the dictator and nothing to the receiver. The right option gives equal payoffs to both players and varies from (0, 0), (20, 20), … to (400, 400). Each subject makes a choice in the role of a dictator.

Table 1.The Ultimatum Game and the Modified Dictator Game

Decision problem	Ultimatum Game			Modified Dictator Game	
	Proposer's decision	Responder's decision		Dictator's decision	
		Option A	Option B	Option A	Option B
1	(400，0)	Reject	Accept	(400，0)	(0，0)
2	(380，20)	Reject	Accept	(400，0)	(20，20)
3	(360，40)	Reject	Accept	(400，0)	(40，40)
4	(340，60)	Reject	Accept	(400，0)	(60，60)
5	(320，80)	Reject	Accept	(400，0)	(80，80)
6	(300，100)	Reject	Accept	(400，0)	(100，100)
7	(280，120)	Reject	Accept	(400，0)	(120，120)
8	(260，140)	Reject	Accept	(400，0)	(140，140)
9	(240，160)	Reject	Accept	(400，0)	(160，160)
10	(220，180)	Reject	Accept	(400，0)	(180，180)
11	(200，200)	Reject	Accept	(400，0)	(200，200)
12	(180，220)	Reject	Accept	(400，0)	(220，220)
13	(160，240)	Reject	Accept	(400，0)	(240，240)

[8] Brandts and Charness (2011) survey the literature to compare the strategy method and the direct-response method. A total of 16 out of the 29 comparisons show no difference, four find differences and nine find mixed evidence.

14	(140，260)	Reject	Accept	(400，0)	(260，260)
15	(120，280)	Reject	Accept	(400，0)	(280，280)
16	(100，300)	Reject	Accept	(400，0)	(300，300)
17	(80，320)	Reject	Accept	(400，0)	(320，320)
18	(60，340)	Reject	Accept	(400，0)	(340，340)
19	(40，360)	Reject	Accept	(400，0)	(360，360)
20	(20，380)	Reject	Accept	(400，0)	(380，380)
21	(0，400)	Reject	Accept	(400，0)	(400，400)

Note: The first numbers in parentheses display the proposer's payoffs, the second numbers the receivers' payoffs.

In both games, we impose the restriction of single switching between the two options in the 21 problems.[9] Specifically, in the UG responders choose the number of the decision problem from which they accept all of the proposer's offers; in the MDG dictators select the number of the decision problem from which they always choose equal sharing. It was made clear that the subjects could switch from the first problem and that they were allowed not to switch at all. This gives each responder in the UG a single minimum acceptable offer that determines hisdegree of disadvantageous inequalityaversion. In the MDG the maximum amount that the dictator is willing to sacrifice to implement equal sharing determineshisdegree of advantageous inequalityaversion. Random draws at the end of the session determined the actual role in each game and which one of the decisions in each game was paid.

Inequality aversion in agroup decision-making environment

In a group environment, we pairedgroups of three subjectswho playa collective version of the previously described UG and MDG. We use the same tables as for decisions made in isolation. To hold themonetary incentives comparable across individual and groupconditions, the payoffs achieved in the groupgames are paid to eachgroup member. For example, if the selected decision

[9]Based on basic rationality axioms, rational players with monotone preferences should switch only once from option A to option B because their payoff becomes larger in the UG for all problems beyond the switching point; similarly in the MDG, the egalitarian outcome is always cheaper beyond this point. The same procedure has been applied notably by Tanaka *et al*. (2010) to elicit risk preferences and time consistency. We acknowledge that enforcing exactly one switching point may bias the choices of individuals who in the UG would like to reject splits giving them less than the equal share and those giving them more than the equal share. Imposing single switching, however, rules out inconsistent choices and more importantly, facilitates group decision-making by simplifying the aggregation process (although no theoretical foundation implies that the aggregation of rational individual preferences in a group should result in a single switching point), as explained below.

in the DG pays 400 points to the dictator group and leaves nothing for the receiver group, each of the three dictator groupmembers earns 400 points and each of the three receiver group membersreceives 0.The actual roles of agroupare randomly assigned at the end of the session and one decision problem in each of the UG and the MDG is randomly selected for payment.

Unanimity is required to form a groupdecision. Choosing unanimity instead of the majority rule allows us to study the convergence process to the group decisionmore clearly under the circumstance thateach player is given a veto power. Specifically, in each game the groupmembers mustsimultaneously submit their individual proposal for the group decision.Then the three proposals are displayed on themembers' screens. If theyare not identical, a new round starts and each member mustsubmit a new proposal (possibly the same as in the previous round). This procedure is repeated until all groupmemberssubmit identical proposals. The number of rounds is unrestricted within the limit of 10 minutes for each groupdecision. In case unanimityhas notbeen reachedafter the 10 minutes have elapsed, the programselectsrandomly one of all possible decisions. We have preferred a formal process of decision-making with restricted communication instead of using face-to-face to have a better control of the interactions within groupsand to be able to isolate in a separate treatment the role of anonymity while keeping the rest of the environment constant.Thisalso allows us to observe the evolution of proposals, as all members make exactly the same number of proposals.

One advantage of our design is that for each subject,we are able to observe his individual decision made in isolation, his initial proposal in the group before learning others' preferences, and his final decision as aggregated in the group decision.

3.2. Treatments and matching protocol

The experiment consists of three main treatments using a between-subject design. Each treatment includes four mainparts that allow us to make within-subject comparisons across parts.[10]Parts 1 and 2 correspond to the one-shot UG and MDG played individually, whereasParts 3 and 4 differ across treatments. The I-I(for *Individual-Individual*) treatment involves only individual decision-making: Parts 3 and 4 replicate Parts 1 and 2 (UG and MDG). TheI-AG (for *Individual-Anonymous Group)*treatmentintroduces collectivedecision-making in Parts 3 and 4 (UG and MDG). Group members do not know whom they are interacting with in their groups.The I-NAG(for *Individual-NonAnonymous Group*)treatment is identical to the I-AGtreatmentwith two exceptions. First, welift anonymity within thegroup:at the beginning of Part 3,before they make their decisions, members are told that the three subjectsseated in the same row belong to the same group, with identification numbers I, II, and III assigned to the members seated at the left, middle and right of the row, respectively.[11]Second, theidentification number of each member appears next to her/his proposals so that group memberscan trace the evolution of all the three members' proposals across rounds.Lifting anonymity may expose subjects to a higher social pressure, which may influence both their degree ofinequality aversion and their bargaining behavior. In contrast, players receive no information on the composition of thegroup they are paired with and on the proposals made within theother group.To control for possible order effects, weconducted an additional NAG-I treatment. Compared totheI-NAG treatment, the appearance order of Parts 3 and 4 and Parts 1 and 2 is reversed.This allows us tostudywhether decisions made in isolation after group decisions differ from those made before group bargaining.

[10]In fact, in a fifth part we replicatedthe production game of Yang *et al*. (2016) in the original individual version or in a novel group decision-making environment to study whether inequality aversion as measured in our main games correlates with behavior in this game. For saving space, we do not report the details of this game and its results in this paper but they can be found in our working paper (He and Villeval, 2015). Inequality aversion, as measured in our games, is not correlated with behavior in the production game.

[11] Although subjects are seated in cubicles, they can move their seat a bit and see the face of their neighbors without having to stand up. They are also able to talk to their group members at the end of the session.

In all treatments, the appearance order of the UG and the MDG was randomized across sessions, but the order of the two games in the same session was held constant in Parts 1 and 2 and in Parts 3 and4. A perfect stranger matching protocol rules out reciprocity and reputation building across parts. Each group(individual) is paired with a different group(individual) across parts, whereas the composition of each groupis kept constant across parts.Subjects are informed in each part that at the end of the experiment, the program will randomly pair them with another participant (group) in the room and will randomly assign the two roles.

Table 2 summarizes the key features of our experimental design.

Table 2. Summary of the experimental design

Treatment	Part 1	Part 2	Part 3	Part 4	Part 5
I-I	Individual UG/MDG	Individual MDG/UG	Individual UG/MDG	Individual MDG/UG	Individual PG
I-AG	Individual UG/MDG	Individual MDG/UG	GroupUG/MDG Anonymity	GroupMDG/UG Anonymity	GroupPG Anonymity
I-NAG	Individual UG/MDG	Individual MDG/UG	GroupUG/MDG No anonymity	GroupMDG/UG No anonymity	GroupPG No anonymity
NAG-I	GroupUG/MDG No anonymity	GroupMDG/UG No anonymity	Individual UG/MDG	Individual MDG/UG	GroupPG No anonymity

Note: UG for Ultimatum Game, MDG for Modified Dictator Game, and PG for Production Game (not analyzed in this paper).

3.3. Procedures

The experiment was conducted at the laboratory of Beijing Normal University. 336 volunteers were recruited via announcements on the bulletin board system andin accommodation and teaching buildings of local universities.Each of the 14 sessions involved 24 subjects (2 sessions with I-I and 4 with each other treatment).In total, we have48 individual observations for the I-I treatment and 32 group observations for each other treatment. Due to inability to reach unanimityfor the final group decisions, we losta few observations in the role of the dictator in the MDG(1 in bothI-AGand NAG-I) and in the role of the proposerin the UG(4 in I-AGand 2 in NAG-I).

The experiment was computerized using z-Tree (Fischbacher, 2007). Upon arrival, the subjects were assigned randomly to a computer terminal. Each part was introduced sequentially after completion of the previous one. Instructions were distributed and questions were answered in private (see Appendix 1). Subjects were given no information about the number of parts and they received no feedback on the outcomes of any part until the end of the experiment.Sessions lasted approximately 90 minutes. Subjects receivedin cash the sum of their earnings for all parts from an assistant who was unaware of the content of the experiment. This was made common informationin the instructions. In the experiment, we used a conversion rate of 100 points= 3 Yuan≅US$ 0.84 in 2015 PPP. Participants earned on average 82.70 Yuan (about US$23.24), including a 10-Yuan show-up fee, which is above the average salary for a student's part-time job.

4. RESULTS

In this section, we first analyze the subjects' aversion to disadvantageous inequalityand to advantageous inequalityas expressed in their individual decisions made in isolation and in their final decisions made in the group decision-making environment. Second,we study the process according to which individuals change their proposals progressively when they are in a group environment.

4.1. Inequality aversionin individual and group decision-making environments

In this sub-section, we analyze individuals' disadvantageous and advantageous inequality aversion in both individual and group decision-making environments. For that purpose, we conduct our analysis using the values of the switching points in each game.Note that we do not use the estimated values of the α and β parameters of the Fehr and Schmidt's (1999) model. This is for two reasons. First, this model has been designed for capturing individual behavior in an individual decision-making environment and not in a group decision-makingenvironment. So, using these parameters for the decisions made in the group decision-making environment would not be meaningful. Second, estimating these parameters in the group decision-making environment would require assuming that in such an environment, the in-group members and the out-group members have the same weight in the individual's utility function. The literature on group identity has shown that this is frequently not the case (Akerlof and Kranton, 2000; Chen and Li, 2009).[12]

Table 3 reports the mean values of the switching pointin the various games for the individual decisions, the initial individual proposals and the group decisions, by treatment.The mean switching point indicated by the chosen decision number in the UG providesa measure of the acceptance thresholdthat we take as a proxy of disadvantageous inequality aversion. The mean switching point indicated by the chosen decision number in the MDGprovides a measure ofadvantageous inequality aversion.

We first compare the degrees of inequality aversion revealed by the decisions in the individual decision-making environment and by the initial proposals in the group decision-making environment, before analyzing the groups' final decisions.

Table 3. Mean switching points in the UG and the MDG in the individual and the groupdecision-making environments

	Individual environment	Group environment		Number of subjects
		Individual initial proposals	Group decisions	

[12]Nevertheless, we studied how the values of the α and β parametersin our individual decision-making environment compare with that found in the previous literature. We calculated these parameters as in Blanco *et al*. (2011), using non-linear monotonic conversion and income comparisons between the player and his co-participant(see details in Appendix 2).Using point estimates, Mann-Whitney rank-sum tests indicate no significant difference between the values of α and β in our experiment and those reported in Blanco *et al*.Table A1 in Appendix 2 displays the distribution of the two parameters using the same intervals as Fehr and Schmidt (1999) and Blanco *et al*. (2011).Perhaps surprisingly, considering the differences in the cultural and political backgroundsbetween China and the U.K., the distribution of each parameter is similar in our experiment and in Blanco *et al*.or in Fehr and Schmidt.

	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Switching point in the UG (acceptance threshold)							
I-I	6.00	3.50	-	-	-	-	48
I-AG	6.43	3.99	7.23***	3.73	7.04	3.04	84
I-NAG	6.14	3.30	7.09***	3.35	7.03**	3.06	96
NAG-I	6.02	3.46	6.76***	3.66	6.37	3.15	90
Switching point in the MDG							
I-I	12.60	5.73	-	-	-	-	48
I-AG	11.37	5.99	10.74**	5.64	11.29	3.88	93
I-NAG	12.44	5.60	10.83***	5.33	11.59**	4.24	96
NAG-I	14.31	5.86	13.73	5.01	14.61	4.46	93

Notes: The switching point reported for I-I are for the first set of decisions; the switching point for the second set of decisions in I-I are 5.79(S.D.=3.60) for the UGand 12.46 (S.D.=5.82) forthe MDG; there is no significant difference between the first and the second sets of decisions. The number of group observations differsinthe UG and the MDG because the number of groups reaching unanimity differs in the two games.*** and **indicate significance at the 1% and the 5% levels, respectively,in two-tailed Wilcoxon signed rank tests in which the reference is the switching pointsin the individual decisions.

Inequality aversionin individual decisions and in initial proposals in groups

In most treatments, compared to the decisions made in the individual decision-making environment, we find a higher degree of both disadvantageous and advantageous inequality aversion as soon as individuals have to express aninitial choice in a group decision-making environment. Indeed, two-tailed Wilcoxon signed rank tests (W, hereafter)reported in Table 3 show that subjects switch between options significantly later in the UG and sooner in the MDG when making their first proposal in the group compared to the individual decision-making environment.[13]This is observed in all treatments(in I-AG: p=0.006 for the UG and p=0.030 forthe MDG;in I-NAG:p<0.001 for both the UG and the MDG; in NAG-I:p=0.009 for the UG), except for the MDG in the NAG-I treatment (p=0.228).This analysis is also largely supported by post-

[13]For all thenon-parametric tests reported in this paper, we use individual observations for individual decisions and for initial proposals in the group environment (except that we use group mean values for the comparisons for NAG-I since individual decisions are no longer independent after the group decision-making phase), and we use group observations for the group decisions. Indeed, each initial proposal gives an independent observation since subjects have not interacted yet with the other group members.

regression tests reported in Table A3 in Appendix 3, which are based on random-effects Tobit models reported in Table A2.[14]

We can rule out that this effect is driven by the fact that the initial proposal in groups in I-AG and I-NAG is the subjects' second decision: indeed, the second individual decision in the I-I treatment does not differ from the first one (W tests, p=0.506 in the UG and p=0.942 in the MDG). Moreover, while the switching points for individual decisions are similar in I-I and in the other treatments,[15]the switching points for initial proposals differ from those in the second set of individual decisions in the I-I treatment(in I-AG: p=0.040forthe UG and$p$=0.068forthe MDG;in I-NAG: p=0.036 forthe UG and$p$=0.080 forthe MDG). Note thatwe find no difference in both UG(p=0.154) and MDG (p=0.266) for the NAG-I treatment.The increased degree of inequality aversion in initial proposals is unlikely driven by the order between the different treatments either. Indeed,comparing the I-NAG and the NAG-I treatments shows no significant differencein the switching points in the UG(M-W tests, p=0.981 for the individual decisions and p=0.633 for the initial proposals).Comparing the I-NAG and the NAG-I treatments shows significant differences in the switching points in the MDG but these differences are observed for boththe individual decisions (p=0.031) andthe initial proposals*(*p<0.001).[16]

Thus, this increased degree of inequality aversion in initial proposals compared to individual decisions is driven by the change from an individual to a group decision-making environment. But which aspect of the group decision-making environment can explain this increase?

[14]Table A2 in Appendix 3 reports the marginal effects of variables capturing the decision-making environment and the treatment on the switching points in the UG and the MDG, using Tobit models because of censored data both on the left and on the right (for subjects who never switch). Table A3 reports post-estimation tests.
[15]Considering the first individual decisions in I-I, Mann-Whitney tests (M-W, hereafter) give the following p-values for the switching points in the UG: 0.672 for I-I *vs*. I-AG, 0.854 for I-I *vs*. I-NAG, and 0.634for I-AG*vs*. I-NAG. The respective p-values in the MDG are 0.277, 0.942, and 0.221. Using instead Fisher's exact tests for categorical outcomes gives the same qualitative conclusions. Kruskal-Wallis tests for I-I *vs*. I-AG*vs*. I-NAG indicate p=0.861 for the UG and 0.386 for the MDG.
[16]This result does not stem from social information during the aggregation process, as the initial proposals in NAG-I already reveal less inequality aversion than individual decisions in I-NAG.

We can reject that social image drives this finding. Indeed, we find no significant difference in the switching points between the I-AG and I-NAGtreatments as regards the initial proposals (p=0.710 for the UG and p=0.834 for the MDG).We can also reject that this results from efficiency concernsthat more players are affected by the decision when moving from individual to group decision-making environment. Indeed, the difference in switching points is observed in the UG where efficiency,as measured by the sum of payoffs, is kept constant across decisions. Moreover,switching from the selfish to the equal sharing earlier than the eleventh decision problem in the MDG, which is the case for the mean values of the initial proposalsin the I-AG and I-NAGtreatments (as shown in the lower panel in Table 3), actually decreases efficiency.The remaining possible explanation is related to the increased number of players participating in the decision. Since subjects received no information about the preferences of their group members, theymay have mademore inequality averse proposalseither because they believed that the norm of the group was to be more equality concernedor,on the opposite, because they were willingtocounterbalance other players' expectedly more selfish proposals. Since we did not elicit the players' beliefs about others' preferences,[17] we cannot discriminate precisely between these explanations. However, we find that those subjects whose switching points in the initial proposals reveal increased inequality aversion are those whose individual decisions expressed less inequality aversion.[18]An explanation in terms of strategic behavior would require that these more selfish players believe that the others are even more selfish than they are themselves and that they are willing to influence them. Therefore, we believe more in an explanation based on the anticipated social normin the group or on a change of preference due to the higher number of

[17]We did not elicit beliefs to avoid hedging and to avoid introducing differences across conditions (precisely, with the individual decision-making environment) that would have affected the payoffs differently across treatments.
[18]Spearman coefficients indicate a negative correlation between the values of the switching points in the individual decisions and the difference in switching points between the individual decisions and the individual proposals (p<0.001in both UG and MDG).

players impacted by a group decision. Note that the higher degree of inequality aversion expressed by the initial proposals may have been facilitated by the fact that the initial proposals can be considered as cheap talk if players anticipate that they will not find a unanimous agreement immediately.

Before investigating how this stronger inequality aversion revealed by the switching points in the initial proposalsaffectsthe degree of inequality aversion of the final group decisions in Section 4.2, let us compare inequality aversion revealed by the switching points in the individual decisions and in the final group decisions.

Inequality aversionin individual decisions and in final group decisions

Table 3 shows that in contrast to the initial proposals, in most treatments the mean switching points for the final group decisions do not differ significantly from the mean switching points in the individual decision-making environment (W tests, $p>0.10$ in all pair-wise comparisons).[19]The only exception is the I-NAG treatment ($p=0.029$ for the UGand$p=0.051$ for the MDG).We need, however, further investigation before concluding that lifting anonymity between group members maintains a higher degree of inequality aversion in groups, sincethe switching points in the final group decisions do not differ between I-AG and I-NAG (M-W tests, $p=0.896$ for the UG and $p=0.584$ for the MDG).Finally, comparing the I-NAG and the NAG-I treatments shows no order effect in the degree of disadvantageous inequality aversion in the group decision (M-W, $p=0.193$), whereas starting a session with group decision-making reduces thedegree of advantageous inequality aversion ($p<0.001$). The dynamics between the initial proposals and the final group decisions is explored in section 4.2.

[19]Note that we find no significant differences when comparing the switching points in the second set of individual decisions in I-I and in the group decisions for the MDG in I-AG (M-W, $p=0.146$) and in I-NAG ($p=0.273$). However, the differences are significant for the UG in I-AG ($p=0.058$) and in I-NAG ($p=0.041$).

Econometric analysis

To complement the previous analysis, we now proceed to an econometric analysis. Table 4 reportsthe marginal effects of Tobit regressions.[20] The dependent variable is the switching point in the UG (columns(1) to (4)) or in the MDG (columns(5) to (8)). Depending on the model, we considerthe individual decisions from all treatments in the individual decision-making environment (excluding the second set of decisions in I-I in columns (1) and (5)), or theindividual initial proposals andthe final groupdecisions in thegroupdecision-making environment.[21]Moreover, in columns(4) and (8) we report the estimates ofrandom-effects Tobit models afterpooling the data from individual decisionsand initial proposals from all treatments.In all regressions, standard errors are clustered at the group level because it is more conservative.

The independent variables include three dummy variables indicating whether or not the MDG was played before the UG, whether or not the session started with the group decision-making environment (to control for order effects),and whether or not anonymity was lifted, when appropriate. In the regressions based on the initial proposals (columns (2) and (6)), we also include the switching point from individual decisions. In the regressions based on the finalgroupdecisions (columns (3) and (7)), we include the median switching points, as determined by the three group members' initial proposals. We also include the positive distance (and the negative distance)in initial proposals between the switching point of the member who is abovethe median (of the player below the median, respectively) in his group and the medianswitching point. This gives an indication of the impact of the skewness of theinitial proposaldistribution by different groupmates on the final group decision. We also include in columns (2) and (3) the

[20]We use Tobit models because some subjects always choose the same option and never switch between options. Interval regressions (available upon request) provide qualitatively similar results.
[21]Note that in models (3) and (7), we consider only one observation per group that achieved unanimity. This is more conservative than taking one observation per group member. To be consistent, in all the other models we only include data from individuals belonging to groups that achieved unanimity.

switching point corresponding to thegroup offer in the UG because the agreement reached by the group when determining its offer may informplayers about others' preferences, and thus affect the acceptance threshold. In columns (4) and (8), three dummy variables control for individual decisions made first (first set of decisions in I-I and individual decisions in I-AG and I-NAG), for the second set of decisions in I-I, and for individual decisions made after group decisions in NAG-I, with the initial proposals taken as the reference category.Finally, we control for individual characteristicssuch as gender, age, monthly income and number of acquaintances in the same session, except in the models relative to the group decision.[22]

First, Table 4 confirms that, controlling for order effects,subjects express higher disadvantageous and advantageous inequality aversion in their initial proposals in the group decision-making environment than when they decide in isolation: the three individual decision variables all have a negative and significant effect on the switching point in the UG (see columns (4));they have a positive –albeit not always significant- effect on the switching point in the MDG(see column (8)).[23]Second, columns (3) and (7) show that the median switching pointsin the initial proposals influence positively the degree of inequality aversion of the final decisions. However, a larger positive distance to the median in the UG (more disadvantageous inequality aversion) and a larger negative distance to the median in the MDG (more advantageous inequality aversion) both have a negative impact on the degree of inequality aversionof the final group decision. This suggests that in the aggregation process the subject who in the group is further from the median player makes more concessions. Third, we find that lifting anonymity

[22] Most are not significant. Males express more disadvantageous inequality aversion (column (2), $p<0.10$). Advantageous inequality aversion is increased by having acquaintances (column (6), $p<0.05$) and by age (column (8), $p<0.001$).

[23]We also calculated the percentages of individuals who changed their choices across ID, IIP and TD in the UG and the MDG and report the results in Table A4 in Appendix 3. This table indicates that in both UG and MDG: (1) more than half of the subjects change the choices from ID to IIP and from IIP to TD; (2)the percentage of individuals who increase inequality aversion is larger than the percentage decreasing it; (3)the percentages of individuals increasing their degree of inequality aversion from ID to IIP are comparable to the percentage decreasing it from IIP to TD.

within groups does not impact the initial proposals or the final group decision in any game, as the No anonymity variable is never significant. Regarding order effects, we observe that making one's individual decision after the group decision (NAG-I treatment) does not affect significantly any switching point in the UG nor group decisions in MDG, whereas it reduces advantageous inequality aversion in individual decisions and initial proposals in MDG.Finally, we note that when a group has made a more generous offer in the UG, this does not affect the player's initial proposal or the group decision regarding the acceptance threshold (columns(2) and (3)).

Theabove analysis can be summarized as follows.

Result 1: Individual initial proposals in groups reveal more inequality aversion than individual decisions made in isolation. Efficiency concerns and social image cannot rationalize this result. Beliefs on the prevailing norm in the group may drive this result.

Result 2: However, the degree of both disadvantageous andadvantageousinequality aversion is similar in the individual decisions and in the final group decisions.

Table 4. Determinants of the switching point in the UG and the MDG (Tobit models)

Variables	*Switching pointin the UG*				*Switching point in the MDG*			
	Individual decision	Initial proposal	Group decision	Indiv. dec and initial proposal	Individual decision	Initial proposal	Group decision	Indiv. dec and initial proposal
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MDG played before the UG	-1.057**	-0.232	-0.319	-1.030***	-0.373	0.395	-0.538	-0.158
	(0.423)	(0.241)	(0.485)	(0.310)	(0.596)	(0.392)	(0.470)	(0.525)
Group offer in the UG		0.135	0.056					
		(0.082)	(0.113)					
No anonymity		0.183	-0.004			-0.529	0.546	
		(0.283)	(0.564)			(0.444)	(0.412)	
Individual decision made first (I-AG and I-NAG and 1st set in I-I)				-0.874***				0.826***
				(0.196)				(0.258)
Individual decision made after individual decision (2nd set in I-I)				-1.081***				0.652
				(0.247)				(0.626)
Individual decision made after group decision (NAG-I)	-0.030	-0.091	-0.337	-0.669***	2.466***	1.599***	0.181	1.070*
	(0.514)	(0.387)	(0.551)	(0.239)	(0.809)	(0.561)	(0.718)	(0.596)
SP in individual decision		0.778***				0.677***		
		(0.043)				(0.043)		
Group median SPin initial proposals			0.862***				1.051***	
			(0.084)				(0.054)	
Dist between above-median and median SP in initial proposals			-0.214**				0.053	
			(0.094)				(0.075)	
|Dist| between below-median and median SP in initial proposals			0.094				0.184***	
			(0.158)				(0.063)	
Demographics	*Yes*	*Yes*	*No*	*Yes*	*Yes*	*Yes*	*No*	*Yes*
Number of observations	318	264	88	636	330	282	94	660
Left-censored observations	38	29	5	72	12	11	0	25
Right-censored observations	1	0	0	1	31	21	5	55
Chi-squared test	0.255	<0.001	<0.001	<0.001	0.022	<0.001	<0.001	<0.001
Log-likelihood	-822.929	-561.318	-187.824	-1484.223	-996.421	-729.888	-208.961	-1875.091

Notes: Marginal effects are reported and standard errors clustered at the group level are in parentheses. In models (4) and (8), standard errorshave been clustered using bootstrapping. MDG played before the UG, no anonymity, individual decisions made first, individual decisions made after individual decisions and individual decisions made after group decisions are dummy variables. “SP” is an abbreviation for “switching point”. Demographics include variables capturing gender, age, monthly income and having acquaintances in the session.***, **, and * indicate significance at the 1%, 5% and 10% level, respectively. Including the variable “Group offer in UG” in columns (2) and (3) excludes 2 groups (6 subjects) that did not reach unanimity for proposer decisions in the UG.

4.2. Aggregation of individual choices in groups

To reconcile results 1 and 2, we now explore the aggregationof preferences in groups. We usetwo measures. The first oneis the number of proposal rounds needed to reach unanimity within the group, which captures the tension in the group. The second measure is an individual concession index equal to the mean absolute distance between an individual's initial proposal and the finalgroup decision, divided by the number of rounds needed to converge to a group decision. A higher index means larger concessions per round. We exclude four groups for which the initial proposals were already unanimous and eight groups that did not reach unanimity.

When we pool the three grouptreatments, it takes on average 4.44 rounds (S.D.=3.77) to converge to group decisionson the acceptance threshold in the UG and 4.14 rounds (S.D.=2.11) to converge to the dictators' decisions in the MDG.[24]The number of rounds does not differ significantly between the UG and the MDG (W test, p=0.327). The mean concession index is equal to 0.89 point per round in the UG (S.D.=1.49) and 1.37 (S.D.=2.07) in the MDG.Comparing I-AGand I-NAGreveals no significant differencebased on either the number of rounds or the concession indexon the acceptance threshold in the UG (W tests, p=0.849 and 0.909, respectively) or the dictators' decision in MDG(p=0.288 and 0.503, respectively). Finally, comparing I-NAG and NAG-I reveals no order effectbased on the number of rounds orthe concession index in the UG (p=0.408 and 0.727, respectively), as well as on the concession index in the MDG (p=0.589), althoughthe number of roundsdiffers in the latter (p=0.003).

Next, we study who in the group isconverging more rapidly to the group decision. In each group, we rankthe subjects based on the median initial proposal and we calculate for each rank the number of rounds until thesubject proposes the final group decision. On average,in the UG and the MDGrespectively, the median member needs 1.48 and 0.87 fewer rounds to reach the

[24] For the group acceptance decisions in UG, the number of rounds is 4.74 in I-AG, 4.19 in I-NAG and 4.44 in NAG-I, and the convergence speed is respectively 1.03, 0.81 and 0.85. For the group dictators' decisions, the number of rounds is 3.68 in I-AG, 4.13 in I-NAG and 4.61 in NAG-I; the convergence speed is respectively 1.51, 1.41 and 1.18.

group decision than the below-median player,and1.02 and 0.62 fewer rounds than the above-median player (M-W tests, $p<0.001$ in all cases). Consideringthe mean absolute distance between the initial proposal and the group decision for each rank in the group, we find that it is significantly smaller for the median player (0.40in the UG and 0.05in the MDG)than for the below-median player (0.94 in UG and 0.23 in MDG*)* and for the above-median player (1.83in the UG and 0.27 in the MDG) (M-W tests, $p<0.001$ in all comparison tests). This shows that in the UG,concessionsare significantly larger for the above-median individuals(who express more disadvantageous inequality aversion than the median player) than for the below-median group members($p<0.001$). The difference is not significant in the MDG ($p=0.200$).Overall, these observations suggest that although each member has a veto power, the aggregation process is driven mainly by the median player. This isconsistentwith the results of Ambrus *et al*. (2014).

We next turn to a more formal analysis of the aggregation process. Table 5reports the marginal effects from four regressions in which the dependent variable is either the number of rounds until convergence (Tobit models (1) and (3))[25] or the concession index at the group level (OLS models (2) and (4)). The first two columns are for the group's acceptance threshold in the UG and the last two columns for the dictator group's decisions. The independent variables include the median switching point in the three groupmates' initial proposals, the positive distance between the switching pointsin the initial proposals for the group member who is above the median and the median, and the corresponding absolute negativedistance for the group member who is below the median.They also includethree dummy variables indicating whether the MDG was played before the UG, whether the session started with the groupdecision-making environment (equal to 1 for NAG-I and 0 otherwise),and capturing the influence of a lift of anonymity. Standard errors are clustered at the group level.

[25]We use Tobit models because the data on the number of rounds needed to converge are censored on the left. Using negative binomial count data models instead of the Tobit models delivers the same qualitative results (available upon request).

Table 5. Determinants of the number of proposal rounds and concession index in groups

Variables	*Group acceptance threshold - UG*		*Group decision - MDG*	
	Number of proposal rounds	Concession index	Number of proposal rounds	Concession index
	(1)	(2)	(3)	(4)
MDG played before the UG	-0.336	0.015	0.027	-0.114
	(0.628)	(0.145)	(0.387)	(0.178)
Group decision first (NAG-I=1)	0.145	0.068	0.277	-0.065
	(0.612)	(0.137)	(0.492)	(0.229)
Non-anonymity	-0.241	-0.154	0.434	0.018
	(0.851)	(0.167)	(0.485)	(0.227)
Group median SP in initial proposals	-0.139	0.013	0.103*	-0.058**
	(0.125)	(0.030)	(0.057)	(0.026)
Distance between above-median and median SP in initial proposals	0.481***	0.101***	0.039	0.145***
	(0.115)	(0.032)	(0.059)	(0.026)
|Distance| between below-median and median SP in initial proposals	0.173	0.143***	0.171***	0.103***
	(0.169)	(0.044)	(0.053)	(0.031)
Number of observations	86	86	94	94
Left censored observations	29	-	16	-
Chi-squared test	0.013	-	0.009	-
F-test	-	<0.001	-	<0.001
Pseudo /Adjusted R^2	0.039	0.307	0.043	0.375
Log-Likelihood	-188.686	-	-187.421	-

Notes: The regressions include only groups that reached unanimity with at least two rounds of proposals. Models (1) and (3) are Tobit regressions and models (2) and (4) are OLS regressions. Marginal effects are reported and standard errors clustered at the group level are in parentheses."SP" is the abbreviation for "switching point". ***, **, and * indicate significance at the 1%, 5% and 10% level, respectively.

Columns (1) and (2) in Table 5 show that themedian switching point in the initial proposals in the UG has no significant impact on either the speed of convergence or the concession index. But controlling for the median switching point, the higher is the distance above the median (*i.e.*, a higher disadvantageous inequality aversion than the median), significantly higher are both the number of rounds needed for convergence and the concession index per round. And the higher is the distance below the median switching point (*i.e.*, a lower disadvantageous inequality aversion than the median), the higher is the concession index, but not the number of rounds for convergence.

Columns (3) and (4) in Table 5showthat a higher median switching point in the initial proposals in the MDG significantly increasesthe number of rounds needed to reach unanimity and decreases the concession index per round. Controlling for the median switching point, the greater is the distance below the median(*i.e.*, a higher advantageous inequality aversion than the median), the higher are both the number of rounds and the size of concessions per round. A greater distance above the median(*i.e.*, a lower advantageous inequality aversion) has no impact on the number of rounds but increases the size of concessions per round.

In both games, the larger is the distance between the median member and the member who is more inequality averse than the median member, the slower the group converges to the final decision:the coefficient for the distance above the median switching point is 0.481 in the UG and the coefficient for the distance below the median is 0.171 in the MDG, both significant at the 1% level. The coefficients are not significantfor the distance below the median in the UG and above the median for the MDG. Regarding concessions perround, the larger isthe distance both above and below the median switching point, the larger are these concessions:in the UG the respective coefficients are 0.101 (p=0.003) and 0.143 (p=0.002); in MDG, they are 0.145 (p<0.001) and 0.103 (p=0.001).However, the coefficients of the distances below and above the median are not significantly different (t-tests, p=0.403 for the UBG and p=0.269 for the MDG). Finally, Table 5 indicates that the order of games,beginning the experiment with the group decision-making environment, and the lift of anonymitydo not affect the aggregation process.This analysis supports our last result.

Result 3: Under the unanimity rule, the aggregation process within groups is driven mainlyby the group member with median preferences.Larger distances both below the median and above the median are associated with largermeanconcessionsper roundand larger concessions in total compared to the initial proposals in the group.A higherdegree of inequality aversion deviating from the median in the group slows down the convergence process.

5. DISCUSSION AND CONCLUSION

Charness and Sutter (2012) statethat groups are “less behavioral than individuals”because they are more likely than individuals to make decisions following standard game-theoretic predictions. Comparing distributional preferences in groups and in individuals, Balafoutas *et al*. (2014) have found that while 15% of individuals can be classified as inequality averse, groupdecision-making eliminates choices consistent with inequality aversion. Our results are somewhat different. First, we find thatthe degree of disadvantageous and advantageous inequality aversion, asrevealed respectively by the switching points in an ultimatum bargaining game and a modified dictator game, is similar across the groupdecision-making environment and the individual decision-making environment. Second,the initial proposals in groups express more disadvantageous and advantageous inequality aversion than the decisions made in isolation. We suggest that this difference is more likely due to the subjects' beliefs about the prevailing norm in the group or to the change in the environmentrather than to efficiencyor image concerns.Our design does not allow us to disentangle between these two interpretations; an extension of our work could address directly this question.We observed that when subjects start the experiment with the group decision-making environment their initial proposals show less advantageous inequality aversion than when they start with the individual decision-making environment. A possibility is that the change from an individual to a group decision-making environment in itself generates a different initial behavior in the MDG when making an initial proposal to the group. This intriguing observation would deserve additional investigation.

Regarding the convergence process, a third result is that the group decision is mainly influenced by the group member who holds the median preferences. Moreover, astronger degree of inequality aversion above the median revealed by the initial proposals is associated with a slower aggregation process.Finally, anonymity in the group decision-making environment has little overall impact and does not putmore pressure on individuals.This result is surprising since the literature has shown that people whocare about their social imagetend to behave less selfishly when they know they are observed.A possible interpretation is that image matters when the individual decision is the final one, but not when an individual's proposal has to be aggregated with other proposals.Moreover, we have used minimal physical identification: in the no-anonymity condition,individuals could see who their group members were, but free-form communication was not allowed. Adding to our design the possibility for the subjects to exchange verbally, face-to-face, with their group members would reinforce physical identification. This could possiblyincrease the influence of some individuals with specific social preferences (as shown by Balafoutas *et al*.).

The differences with the results of Balafoutas *et al*. (2014) could result from at least three different sources.First, in their price lists, one option always pays symmetric payoffs whereas in our MDG the fixed option always corresponds to the highest possible inequality. This may have influenced behavior. Second, as already mentioned, verbal deliberations might allow subjects with certain types of preferences to be more assertive than others and affect group thinking. Finally, we have conducted our study in China. In the individual decision-making environment subjects expressed levels of inequality aversion similar to those observed in similar experiments conducted in Europe, despite their exposure to different political and economic institutions. But it would be interesting to further compare the sign and the size of the difference between inequality aversion in individual and groupdecision-making environments in collectivist societies *vs*.individualistic societies.

Other extensions could explore the sensitiveness of inequality aversion in groups to the environmental conditions. Informing the members of newly formed groups about the choices of their groupmates in the individual environment may influence their initial proposals. Replacing simultaneous decision-making with a sequential procedure could also affect the aggregation process. Finally, allowing people to self-select to be part of a group or manipulating the saliency of group identity could also affect the difference in inequality aversion between the individual and the group decision-making environments. This is left for further research.

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Appendix 1. Instructions for the I-NAG treatment (translated from Chinese: instructions for the other treatments available upon request)

Welcome to this experiment. You have already earned 10 Yuan for showing up on time. During today's experiment, you and the other participants will be asked to make decisions. If you read the following instructions carefully, you can earn a considerable amount of money depending on the decisions you and other participants make. It is therefore important that you take your time to understand the instructions. Please do not communicate with the other participants during the experiment. Should you have any questions, please raise your hand. The experimenters will come to you and answer your question in private.

The experiment consists of several parts. In each part you will be asked to make one or more decisions. You will receive specific instructions before each part begins. The instructions for different parts are different; please read them carefully. Your decisions and answers will remain anonymous unless explicitly specified.

Note that your final earnings from the experiment will be the sum of payoffs from all parts.All payments in the experiment are denoted in points. At the end of the experiment, points will be exchanged to Yuan at a rate of *1 point = 0.03 Yuan* .

Your experimental payoff plus the show-up fee will be paid to you in cash in private in another room at the end of the experiment, by an assistant who is not aware of the content of this experiment.

Please do not touch the computer before you are told so, and please do not fold the screen during the entire experiment.

If you have finished reading these instructions and do not have any question, please wait quietly. Otherwise, please raise your hand and the experimenters will come to you and answer your questions in private.

Part 1

In this part, there are two roles: Player A and Player B.

Player A is asked to choose between two possible distributions of money between himself/herself and Player B in each of the 21 different decision problems.

Player B knows that A has been asked to make those decisions, and there is nothing s/he can do but accept them.

The role of each participant will be randomly determined as Player A or Player B by the program at the end of the experiment. Which role a participant plays will remain anonymous.

<u>*Decisions*</u>

The 21 decision problems will be presented in a chart. Each decision problem will look similar to the following example:

Option X		Option Y		Player A's decision (Choose X or Y)
Player A's Payoff	Player B's Payoff	Player A's Payoff	Player B's Payoff	
400	0	100	100	X Y

You will have to make a decision in the role of Player A.

Hence, if in this particular decision problem you choose Option X, you decide to keep the 400 points for you, so your paired Player B's payoff will be 0 points. Similarly, if you choose Option Y, you and your paired Player B will receive 100 points each.

The 21 rows will be displayed on the computer screens as illustrated in the below chart. The payoffs in Option X are always 400 points for Player A and 0 point for Player B in all decision problems, while the payoffs in Option Y are the same for both Player A and Player B and the payoffs vary from 0 to 400 points in increments of 20 points, in decision problems #1 to #21.

The 21 decision problems for Player A (Payoffs in point)

Decision problem #	Option X		Option Y		Player A's decision (Choose A or B)	
	Player A's Payoff	Player B's Payoff	Player A's Payoff	Player B's Payoff		
1	400	0	0	0	X	Y
2	400	0	20	20	X	Y
3	400	0	40	40	X	Y
4	400	0	60	60	X	Y
5	400	0	80	80	X	Y
6	400	0	100	100	X	Y
7	400	0	120	120	X	Y
8	400	0	140	140	X	Y
9	400	0	160	160	X	Y
10	400	0	180	180	X	Y
11	400	0	200	200	X	Y
12	400	0	220	220	X	Y
13	400	0	240	240	X	Y
14	400	0	260	260	X	Y
15	400	0	280	280	X	Y
16	400	0	300	300	X	Y
17	400	0	320	320	X	Y
18	400	0	340	340	X	Y
19	400	0	360	360	X	Y
20	400	0	380	380	X	Y
21	400	0	400	400	X	Y

At the end of the experiment, the computer program will randomly assign you as the role of Player A or Player B. If you are assigned the role of Player A, your payoff will be determined as the amount you have chosen for Player A. If you are assigned the role of Player B, your payoff will be determined as the amount your paired participant has chosen for Player B.

You will have to decide the number of the decision problem until which you choose Option X and after which you choose Option Y. You will have to enter an integer between 1 and 21 into one of the two boxes on your computer screen as indicated below, to specify your decision.

I choose Option X from decision problem # 1 to decision problem # .

I choose Option Y from decision problem # to decision problem # 21 .

Once you enter a number in the range 1-20 in the box in the first line, you must fill in the box in the second line with the number equals to one plus the number in the box in the first line. This means that once you start to choose Option Y in a decision problem, you are not allowed to switch to choose Option X again in any decision problems occurring after this one.

You are also allowed to make the same choice for all 21 decision problems.

If you always choose Option X, you enter the number 21 in the box in the first line. You must keep the box in the second line blank.

If you always choose Option Y, you enter the number 1 in the box in the second line. You must keep the box in the first line blank.

Examples

If you enter 21 in the box in the first line, it indicates that you decide to choose Option X in all 21 decision problems.

If you enter 9 in the box in the first line and 10 in the box in the second line, it indicates that you decide to choose Option X from decision problem #1 to decision problem #9 and Option Y from decision problem #10 to decision problem #21.

If you enter 1 in the box in the second line, it indicates that you decide to choose Option Y in all 21 decision problems.

After you have made your choices, please validate your decision by clicking the “Validate” button on your screen.

Payoff determination

At the end of the experiment, the computer program will randomly pair you with another participant in the room and will randomly assign the two roles. The computer program will randomly choose one of the 21 decision problems, and the decision outcome in the chosen decision problem will then determine your earnings. The matching and role assignment will remain anonymous. You will make the decision as Player A, but the computer program might assign you the role of Player B when determining payoffs. The assignment of roles is random and does not depend on your decisions as Player A.

If you are assigned the role of Player A, you will receive the amount that you have chosen for Player A in the randomly selected decision problem, and the person paired with you will receive the amount that you have chosen for Player B.

If you are assigned the role of Player B, you will receive the amount that the Player A whom you are paired has chosen for Player B in the randomly selected decision problem.

Before this part begins, a few control questions will be asked to make sure that you have fully understood these instructions. If you have finished reading these instructions and do not have any questions, please wait quietly. The control questions will be displayed on your screen soon. Otherwise, please raise your hand and the experimenterswill come to you and answer your questions in private.

Part 2

In this part, there are two roles: Player A and Player B.

Player A is asked to choose one of 21 possible distributions of 400 points between her and Player B.

Player B knows that A has been asked to make this choice, and may either accept the distribution chosen by A or reject it.

If Player B accepts A’s proposed distribution, this distribution will be implemented. If B rejects the offer, both receive nothing.

The role of each participant will be randomly determined as Player A or Player B by the program at the end of the experiment. Which role a participant plays will remain anonymous.

Decisions

The 21 decision problems for Player A and Player B will be presented in a chart. Each decision problem will look similar to the following example:

Distribution chosen by Player A		Option X	Option Y	Player B’s decision (Choose X or Y)	
Player A’s Payoff	Player B’s Payoff				
300	100	Reject	Accept	X	Y

You will have to make choices in the roles of both Player A and Player B.

If you make choice in the role of Player B,you will have to decide whether you reject or accept each of A’s possible 21 proposed distributions. In this example, if you choose Option X, it rejects your paired Player A’s proposed distribution and both of your payoffs will be 0 points. If you choose Option Y, A’s proposed distribution is accepted; you will receive 100 points and your paired Player A will receive 300 points.

The following chart showing the 21 decision problems will be displayed on your computer screen. The 21 decision problems illustrate the 21 possible distributions of 400 points proposed by Player A, respectively.

For decision problems #1 to #21, the payoff distributed to Player A reduces from 400 to 0 in increments of 20 points, while the payoff distributed to Player B increases from 0 to 400 in the same increments of 20 points.

The 21 decision problems for Player B (Payoffs in point)

Decision problem #	Distribution proposed by Player A		Option X	Option Y	Player B's decision (Choose X or Y)	
	Player A's Payoff	Player B's Payoff				
1	400	0	Reject	Accept	X	Y
2	380	20	Reject	Accept	X	Y
3	360	40	Reject	Accept	X	Y
4	340	60	Reject	Accept	X	Y
5	320	80	Reject	Accept	X	Y
6	300	100	Reject	Accept	X	Y
7	280	120	Reject	Accept	X	Y
8	260	140	Reject	Accept	X	Y
9	240	160	Reject	Accept	X	Y
10	220	180	Reject	Accept	X	Y
11	200	200	Reject	Accept	X	Y
12	180	220	Reject	Accept	X	Y
13	160	240	Reject	Accept	X	Y
14	140	260	Reject	Accept	X	Y
15	120	280	Reject	Accept	X	Y
16	100	300	Reject	Accept	X	Y
17	80	320	Reject	Accept	X	Y
18	60	340	Reject	Accept	X	Y
19	40	360	Reject	Accept	X	Y
20	20	380	Reject	Accept	X	Y
21	0	400	Reject	Accept	X	Y

In the role of Player A, you will have to choosehow to distribute 400 points payoff between Player A and Player B as stated in one of the 21 decision problems. You will have to enter an integer between 1 and 21 in the box on your computer screen as indicated below, to specify your choice.

> **I chooseto distribute the 400 points payoff between me and my paired Player B as the way stated in decision problem # .**

In the role of Player B, you will have to decide whether you reject or accept each of A's possible 21 proposed distributions. You will have to decide the number of the Player A's proposal until which you reject Player A's proposals (i.e., choose Option X) and after which you accept Player A's proposals (choose Option Y). You will have to enter an integer between 1 and 21 into one of the two boxes on your computer screen as indicated below, to specify your decision.

> **I reject the distribution (choose Option X) as shown from decision problem # 1 to decision problem # .**
>
> **I accept the distribution (choose Option Y) as shown from decision problem # to decision problem # 21.**

Once you enter a number in the range 1-20 in the box in the first line, you must fill in the box in the second line with the number equals to one plus the number in the box in the first line. This means that once you start to accept Player A's proposal in a decision problem, you are not allowed to switch to rejecting the proposals again in any decision problems occurring after this one.

You are also allowed to make the same choice for all 21 decision problems.

If you always reject the proposals of Player A, you enter the number 21 in the box in the first line. You must keep the box in the second line blank.

If you always accept the proposals of Player A, you enter the number 1 in the box in the second line. You must keep the box in the first line blank.

Examples

If you enter 21 in the box in the first line, it indicates that you decide to reject Player A's proposals (choose Option X) in all 21 decision problems.

If you enter 9 in the box in the first line and 10 in the box in the second line, it indicates that you decide to reject Player A's proposals (choose Option X) from decision problem #1 to decision problem #9 and accept the proposals (choose Option Y) from decision problem #10 to decision problem #21.

If you enter 1 in the box in the second line, it indicates that you decide to accept Player A's proposals (choose Option Y) in all 21 decision problems.

After you have made your choices, please validate your decisions by clicking the "Validate" button on your screen.

Payoff determination

At the end of the experiment, the computer program will randomly pair you with another participant in the room and randomly assign the two roles. The assigned roles and decision outcomes of the two matched participants will then determine your earnings. The matching and the role assignment will remain anonymous.

If you are assigned the role of Player A at the end of the experiment, you will receive the payoff you have chosen for yourself only if your paired person B accepts your offer. Otherwise, both will receive nothing.

If you are assigned the role of Player B at the end of the experiment, you will receive the payoff that your paired Player A has chosen for B, only if you accept that particular offer. Otherwise, both will receive nothing.

Before this part begins, a few control questions will be asked to make sure that you have fully understood these instructions. If you have finished reading these instructions and do not have any question, please wait quietly. The control questions will be displayed on your screen soon. Otherwise, please raise your hand and the experimenters will come to you and answer your questions in private.

Part 3

This part is identical to *Part 1*, with one exception. The only difference from Part 1 is that you are now a member of a group, and your group must make group decisions jointly as one decision-maker. Your group consists of three participants in this room.

Please note that your group consists of members with the ID numbers I, II, and III. The other two members in your group are seated next to you in the same row. Members I, II and III are seated at the left, middle and right of the row, respectively. For example, if you are seated at the far right of your row, the two persons to your left from left to right are members I and II, respectively. If you are seated in the middle of your row, the persons to your left and right are members I and III, respectively. If you are seated at the far-left of your row, the two persons to your right from left to right are members II and III, respectively. Thus, each member's proposal will be identified by the two other members by his ID number.

In the role of Player A, your group has to make a collective group decision on the number of the decision problem until which you choose Option X and after which you choose Option Y.

Player B makes no decisions.

At the end of the experiment, the computer program will randomly assign your group the role of Player A or the role of Player B.

The three members of the group must makeindividual proposals and enter them on their computer screens independently. **Unanimity is required for the three membersto reach a collective group decision**. The following procedure determines the group decision:

- The three individual proposals will be simultaneously displayed on all members' screens.
- If the three proposals are not identical, a new proposal round starts. Each member must enter a new proposal. Each member may choose the same proposal as in previous rounds or make a different proposal.
- This group decision-making procedure must be repeated until all group members propose an identical number. This proposal will be automatically converted into the group's decision.
- Members have unlimited number of rounds to enter new proposals **in a 10 minute window**. Proposals made by each member during previous rounds can be observed in the proposal history box on the right-hand side of the screen.
- If group members have not reached an identical proposal after 10 minutes, the computer program will randomly select one of the possible decisions as the group decision.

Please note that members are not allowed to communicate orally during the entire experiment.

Payoff determination

The rules of payoffs determination are identical to that in *Part 1*.

Please note that each member of the group will receive the determined payoff rather than sharing this amount. That is, for the selected decision, each member in your group will receive this amount.

If you have finished reading these instructions and do not have any questions, please wait quietly. The decision-making screen will be displayed soon. Please enter your proposal as if yourgroup was Player A for this part. Otherwise, please raise your hand and the experimenters will come to you and answer your questions in private.

Part 4

This part is identical to *Part 2,* with one exception. The only difference from Part 2 is that now you will be grouped up with the same two other members with the same ID numbers as in *Part 3*, and your group must make groupchoicesjointly as one decision-maker.

In the role of Player A, your group will make a collective groupchoicefor the distribution of 400 points payoff between Player A and Player B as stated in one of the 21 decision problems.

In the role of Player B, your group will make a collective group decision on the number of the Player A's proposal until which you reject Player A's proposals (choose Option X) and after which you accept Player A's proposals (choose Option Y).

At the end of the experiment, the computer program will randomly assign your group the role of Player A or the role of Player B.

The three members of the group must makeindividual proposals and enter them on their computer screens independently. **Unanimity is required for the three membersto reach a collective group decision**.

The procedure to determine group decisions is identical to that in *Part 3*. In the role of Player A, members have unlimited number of rounds to enter new proposals in a 10 minute window. If group members have not reached an identical proposal after 10 minutes, the computer program will randomly select one of the possible decisions as the groupchoice.

In the role of Player B, the same procedure applies. Group members have again 10 minutes maximum to reach an identical proposal, otherwise the computer program will randomly select one decision as the groupchoice.

Payoff determination

The rules of payoffs determination are identical to that in *Part 2*.

Please note that each member of the group will receive the determined payoff rather than sharing this amount. That is, for the selected decision, each member in your group will receive this amount.

If you have finished reading these instructions and do not have any questions, please wait quietly. The decision-making screen will be displayed soon. Please enter your proposals as if your group was Player A and

Player B, respectively, for this part. Otherwise, please raise your hand and the experimenters will come to you and answer your questions in private.

Part 5

You are a member of the same group with the two other members with the same ID numbers as in *Parts 3 and 4*. In this part, your group will participate in a production game.

The production game involves two working groups, Group A and Group B, who are in charge of Departments 1 and 2, respectively. Each group chooses an effort level (an integer between 0 and 100 that is a multiple of 10, i.e., 0, 10, 20, … , 100), which will determine the production of the department the group is in charge of. A group's total income from this game consists of four parts: (1) Basic salary; (2) A bonus dependent on the production of Department 1; (3) A bonus dependent on the production of Department 2; (4) Effort cost, which is dependent on group's own effort level. We introduce each part in turn.

1. **Basic salary**. The basic salary is 200 points for Group A and 0 point for Group B.
2. **Bonus 1**. The production of Department 1 will be equally divided between Group A and Group B as Bonus 1. Production is wholly determined by Group A's effort level. The higher the effort level Group A chooses, the more Department 1 produces, and, hence, the larger Bonus 1 received by both Group A and Group B .
3. **Bonus 2**. The production of Department 2 will be equally divided between Group A and Group B as Bonus 2. Production is wholly determined by Group B's effort level. The higher the effort level Group B chooses, the more Department 2 produces, and, hence, the larger Bonus 2 received by both Group A and Group B .
4. **Effort cost**. A group bears the cost of each unit of effort input into the department's production. Each unit of effort in Department 1 costs Group A 2 points. Each unit of effort in Department 2 costs Group B 1 point.

For each group, the total payoff from the production game is represented by the following equation:

Total income = Basic salary + Bonus 1+ Bonus 2 - Effort cost.

Please note that, because Group A's basic salary is 200 points while Group B's is 0, total income for Group A is always higher than Group B regardless of the effort levels chosen by Group A and Group B. Of course, the difference varies with different effort levels chosen by the two groups.

After you enter an effort level, you can immediately view the corresponding potential amount of bonus and effort costs displayed. You may test different effort levels to observe the corresponding variation in total income for Group A and Group B. When make your final decisions, ensure that the numbers in the boxes are correct, and press "Submit" at the bottom of the page.

In this part, you will be randomly paired and assigned the role of Group A or Group B. The results of the random pairing and role assignment will remain anonymous and will not be revealed until the end of the experiment. For this reason, every participant is asked to make a decision as Group A and Group B. At the end of the experiment, your decisionfor Group A's effort level will only apply if you are assigned the role of the Group A, otherwise, if you are assigned the role of Group B, your decision for Group B's effort level will adopted.

<u>*Group decisions*</u>

The three members of the group must propose individual proposals and to enter them into their computers independently. **Unanimity is required for the three membersto reach a collective group decision**. Group members must propose individual proposals simultaneously in both the roles of Group A and Group B on the same computer screens. The procedure to determine group decisions is identical to that in *Parts 3 and 4*.

In the roles of Group A and Group B, members have unlimited number of rounds to enter new decisions **in a 20 minute window**.

If group members have not reached identical decisions in the roles of the two types of working groups after 20 minutes, the computer program will randomly select one of the possible decisions as the group decisions for Group A and for Group B, respectively.

Payoff determination

Each of the members will receive the determined payoff for a working group rather than sharing this amount. That is, for the selected decision, each of the members in your group will receive this amount.

If you have finished reading these instructions and do not have any questions, please wait quietly. The decision-making screen will be displayed soon. Please enter your proposals as if your group was Group A and Group B, respectively, for this part. Otherwise, please raise your hand and the experimenters will come to you and answer your questions in private.

Appendix 2. Estimation of advantageous and disadvantageous inequality aversion parameters according to Fehr and Schmidt's (1999) model

We can use our data to calculate the parameters of disadvantageous inequality aversion(α) and advantageous inequality aversion (β) according to Fehr and Schmidt's (1999) modelin the individual decision-making environment. We start by explaining how to calculate the point estimates, then how to calculate the individual parameters. Finally, we provide statistical tests comparing our data to the estimates from Fehr and Schmidt(1999) and from Blanco *et al*. (2011).

1.Calculation of point estimates

If a subject switches between two points in the UG, this does not mean that he is indifferent at both points; he may be indifferent at one of the endpoints of the interval or at one point in-between. As explained by Blanco *et al*. (2011), to determine a near point estimate of α_i for each individual, we can suppose that s_i' is the minimum offer responder i is willing to accept and s_i' *- 20* is the highest offer that i rejects.

A responder is indifferent between accepting an offer $s_i \in [s_i' - 20, s_i']$ and rejecting it. Thus, $U_i(s_i, 400 - s_i) = s_i - \alpha_i(400 - s_i - s_i) = 0$, which gives $\alpha_i = \dfrac{s_i}{[2(200 - s_i)]}$

Determining a near point estimate of β_i for each individual requires identifying the decision (x_i, x_i) for which the dictator in the MDG is indifferent between sharing equally and keeping her 400 points. If she switches to equal sharing at (x_i', x_i'), she prefers (400, 0) over $(x_i' - 20, x_i' - 20)$ but (x_i', x_i') over (400, 0). Thus, she is indifferent between (400, 0) and $(\tilde{x}_i, \tilde{x}_i)$, where $\tilde{x}_i \in [x_i' - 20, x_i']$ and $x_i' \in \{0, ..., 400\}$. So, β_i is estimated from the equation $U_i(400,0) = U_i(\tilde{x}_i, \tilde{x}_i)$ iff $400 - 400\beta_i = \tilde{x}_i$, which gives $\beta_i = 1 - \dfrac{\tilde{x}_i}{400}$.

We assume $s_i = s_i' - 10$ and $\tilde{x}_i = x_i' - 10$. For the responders who accept only $s_i > 200$ in the UG, we only know that $\alpha_i \geqslant 4.5$, and therefore we consider arbitrarily that $\alpha_i = 4.5$, and if $s_i' = 0$, we set $\alpha_i = 0$.

Similarly, we set $\beta_i = 0$ for subjects who prefer (400,0) to (400,400) but who perhaps would have $\beta_i < 0$, and we set $\beta_i = 1$ for subjects who prefer (0,0) over (400,0) but who perhaps would have $\beta_i > 1$ because we cannot observe a switching point. ■

2.Calculation of the inequality aversion parameters in the individual decision-making environment

In the individual decision-making environment, individuals compare themselves to a single other individual. Fehr and Schmidt (1999) define utility for n-players as follows:

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

assuming that $0 \leq \beta_i \leq \alpha_i$ and $\beta_i < 1$, with α representing the disadvantageous inequality aversion parameter and β the advantageous inequality aversion parameter, and with x_i and x_k representing the payoffs of players i and k, respectively. In a two-player game, this gives:

$$U(x_i, x_j) = \begin{cases} x_i - a_i(x_j - x_i), if\ x_i \leq x_j \\ x_i - b_i(x_i - x_j), if\ x_i > x_j \end{cases}$$

■

3. Distribution of the *α* and *β* parameters

Table A1 displays the distribution of the α and β parameters in Fehr and Schmidt (1999), Blanco *et al*. (2011) and in our dataset in the individual decision-making environment, using the same intervals as Fehr and Schmidt (1999) and Blanco *et al*. (2011).

Table A1. Distribution of the α and β parameters of the Fehr and Schmidt's (1999) model in the individual decision-making environment

	Disadvantageous inequality aversion parameter (α)				*Advantageous inequality aversion parameter (β)*		
	α<0.4	0.4≤α <0.92	0.92≤α <4.5	4.5≤α	β< 0.235	0.235≤β <0.5	0.5≤β
Fehr and Schmidt (1999)	30%	30%	30%	10%	30%	30%	40%
Blancoet al. (2011)	31%	33%	23%	13%	29%	15%	56%
Our data							
Individual environment in all treatments	35%	24%	31%	10%	23%	23%	54%

Using point estimates, Mann-Whitney rank-sum tests[26] indicate no significant difference between the values of α and β in our experiment and those reported in Blanco *et al*. (2011) (*p*=0.594 for α and *p*=0.878 for β).Moreover, the distribution of each parameter is similar in our experiment and in Blanco *et al*. (Kolmogorov-Smirnov tests, *p*=0.234 for α and *p*=0.562 for β). In the absence of individual data to compare with Fehr and Schmidt (1999), we conducted Chi-squared tests like Blanco *et al*. with the aggregate data for the distribution percentages in the various categories. There is no significant difference either between our distributions and those reported in Fehr and Schmidt (*p*=0.785 for α and *p*=0.140 for β).

Spearman correlation coefficients indicate that $\alpha$and $\beta$are not correlated in individual decisions made in isolation, in any treatment (*p*>0.10 in all cases). This is consistent with Blanco *et al*. but contrasts with Fehr and Schmidt's assumption. When pooling treatments, we find that 40% of the subjects violate Fehr and Schmidt's assumption that $\alpha \geq \beta$ when making individual decisions (this percentage was 38% in Blanco *et al*. and 55% in the British sample of Beranek *et al*., 2015).

[26] Considering $s_i = s_i' - 10$ and $\tilde{x}_i = x_i' - 10$ in the calculation of the parameters is an approximation that does not impact the results of the non-parametric statistics because they are based on ordinal rankings (see Blanco *et al.*, 2011).

Appendix 3. Tables and Figures

Table A2. Influence of the decision-making environment and of the treatment on switching points in UG and MDG

Variables	*Switching point in UG*	*Switching point in MDG*
	(1)	(2)
Ref.: First individual decision in I-I	-	-
Second decision in I-I	-0.200	-0.139
	(0.375)	(0.670)
Individual decision in I-AG	0.292	-1.130
	(0.653)	(0.980)
Initial proposal in I-AG	1.112*	-1.730*
	(0.651)	(0.979)
Group decision in I-AG	1.722**	-0.797
	(0.733)	(1.128)
Individual decision in I-NAG	0.067	0.010
	(0.637)	(0.976)
Initial proposal in I-NAG	1.017	-1.603*
	(0.636)	(0.974)
Group decision in I-NAG	1.566**	-1.576
	(0.708)	(1.119)
Individual decision in NAG-I	0.079	1.838*
	(0.643)	(0.978)
Initial proposal in NAG-I	0.709	1.327
	(0.643)	(0.979)
Group decision in NAG-I	0.721	2.656**
	(0.719)	(1.131)
Observations	726	754
Left-censored obs.	77	25
Right-censored obs.	1	60
Number of subjects	318	330
Chi-squared test	<0.001	<0.001
Log-likelihood	-1729.835	-2148.181

Notes: Regressions are random-effects Tobit models. Reported values are marginal effects. Standard errors are in parentheses. *** and ** indicate significance at the 1% and 5% level, respectively.

Table A3.Comparisons between the individual and the groupdecision-making environments based on the estimates of Table A2 (*p*-values from Chi-squared tests)

Variables	*Switching point in UG*	*Switching point in MDG*
	(1)	(2)
GD *vs*. ID in I-AG	0.001***	0.650
GD *vs*. ID in I-NAG	<0.001***	0.029**
GD *vs*. ID in NAG-I	0.127	0.275
IIP *vs*. ID in I-AG	0.004***	0.213
IIP *vs*. ID in I-NAG	<0.001***	0.001***
IIP *vs*. ID in NAG-I	0.021**	0.292
GD *vs*. IIP in I-AG	0.166	0.205
GD *vs*. IIP in I-NAG	0.179	0.970
GD *vs*. IIP in NAG-I	0.976	0.076*
(GD-ID) in I-AG*vs*. I-NAG	0.910	0.063*
(GD-ID) in I-NAG*vs*. NAG-I	0.144	0.021**
(IIP-ID) in I-AG*vs*. I-NAG	0.739	0.135
(IIP-ID) in I-NAG*vs*. NAG-I	0.399	0.105
(GD-IIP) in I-AG*vs*. I-NAG	0.918	0.381
(GD-IIP) in I-NAG*vs*. NAG-I	0.361	0.212
ID first time *vs*. second time in I-I	0.594	0.836
ID in I-I *vs*. I-AG	0.655	0.249
ID in I-I *vs*. I-NAG	0.916	0.992
ID in I-I *vs*. NAG-I	0.902	0.060*
ID in I-AG*vs*. I-NAG	0.677	0.156
ID in I-AG*vs*. NAG-I	0.698	<0.001***
ID in I-NAG*vs*. NAG-I	0.982	0.022**

Table A4. Percentage of individuals changing choices across ID, IIP and GD in the UG and the MDG

	Percentage of individuals having different switching points in IIP and ID	Percentage of individuals switching earlier in IIP than in ID	Percentage of individuals switching later in IIP than in ID	Percentage of individuals having different switching points in GD and IIP	Percentage of individuals switching earlier in GD than in IIP	Percentage of individuals switching later in GD than in IIP	Number of subjects
In the UG (acceptance threshold)							
I-AT	44.05	13.10	30.95**	58.33	35.71	22.62	84
I-NAT	54.17	11.46	42.71***	57.29	31.25	26.04	96
NAT-I	58.89	21.11	37.78**	60.00	34.44	25.56	90
All 3 treatments	52.59	15.19	37.41***	58.52	33.70	24.81*	270
In the MDG							
I-AT	48.39	32.26	16.13**	60.22	24.73	35.48	93
I-NAT	47.92	35.42	12.50***	63.54	25.00	38.54*	96
NAT-I	64.52	32.26	32.26	72.04	34.41	37.63	93
All 3 treatments	53.55	33.33	20.21***	65.25	28.01	37.23*	282

Notes: ID for individual decisions, IIP for individual initial proposals, and GD for groupdecisions. ***, ** and * indicate significance at the 1%, the 5% and the 10% levels, respectively,in two-tailed Wilcoxon signed rank tests in which the reference iseither the percentage of individuals switching earlier in IIP than in ID or the percentage of individuals switching earlier in GD than in IIP.