Decision process, preferences over risk and consensus rule: a group experiment

Morone, Andrea and Nuzzo, Simone and Temerario, Tiziana

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Andrea Morone[a, b] *Simone Nuzzo*[1 a], *and Tiziana Temerario*[a]

[a] Dipartimento di Economia, Management e Diritto d'impresa, Università degli Studi di Bari, Aldo Moro, Italy

[b] Departamento de Economía, Universidad Jaume I, Castellón, Spain

Abstract

The recent literature on individual vs. group decisions over risk has brought about divergent results, mainly depending on the institutional rules through which groups take decisions. While some studies where group decisions relied on the majority rule showed no appreciable difference between individuals and groups' preferences, others where unanimity among group members was required found collective decisions to be less risk averse than individual ones. Of course, these studies share the imposition of a choice rule to determine the groups' outcome. Alternatively, in the study at hand, we elicited groups' preferences over risk using a consensus rule, i.e. leaving groups free to endogenously solve the potential disagreement among their members, just as in many real life instances. Our results from a logit regression unambiguously show that individuals' preferences are systematically further from the risk neutrality than those of groups. In particular, individuals are more risk seeker than groups when facing gambles with positive expected payoff difference and more risk averse in the opposite case.

Keywords: Risk attitudes, group's behaviour

JEL Classification: D01, C91, C92

[1] Corresponding author. Contact information: snuzzo1@gmail.com

1. Introduction

What have in common a company managed by a board of directors, an important purchase planned by the whole family, and political parties' deliberations? All of them are (risky) decisions taken through a collective decision process. The wide recurrence of group decisions in everyday life has led many researchers to devote increasing attention to the mechanisms driving collective choices, thus raising the question of whether the groups' outcome results from a simple aggregation of individual preferences or is instead affected by some interaction among group members.

Over the last 15 years, a rich body of experimental research has focused on groups' behaviour in risky contexts (Ambrus et al., 2013; Baker et al., 2008; Charness et al., 2006; Harrison et al., 2012; Holt and Laury, 2002; Masclet et al., 2009; Shupp and Williams, 2008; Rockenbach et al., 2001). On one hand two recent studies – Zhang and Casari (2012), and Brunette et al. (2015) – analysed groups' decisions under risk when choices are derived through an exogenous unanimity rule. The former elicits risk preferences of groups of three-members, where groups' decisions result from a strong form of unanimity. In case of disagreement, group members had three trials in order to come to a unanimous decision; otherwise earnings would have been zero for everyone. This setting triggers a strong incentive to find an agreement before the last trial ends. That is, just as in the "chicken game", the more risk adverse subject is more likely to switch his/her decision in order to avoid the worst scenario of "zero earnings". The latter elicits risk preferences of three-member groups using a weak form of unanimity. In case of disagreement, the members had a maximum of five trials for each choice in order to come to a decision. If the unanimity was not reached after the fifth trial, then the probability that a choice was paid for real at the end of the experiment was zero. On the other hand, Harrison et al. (2012) studied groups' decisions when disagreement in the group is solved by an exogenous majority rule, i.e. group members had no *veto* power and they could not interact in order to reach the final decision. The results show that, if the disagreement within the group is overcome through the unanimity rule (both in weak or strong form), groups approximate the risk neutral behaviour better than individuals (Zhang and Casari, 2012; Brunette et al., 2015). If the disagreement is instead solved through majority rules – exogenously imposed –, there is no group effect (Harrison et al., 2012).

The originality of our contribution lies in endogenousing the rules that determine the groups' ultimate decision, thus leaving the subjects within a group free to overcome their disagreement endogenously. Namely, we refer to this mechanism as a consensus rule. Following Hare (1989) we conjecture that the absence of a specific institutional rule driving groups' decisions would *ceteris paribus* improving the quality of the decision process, thus stimulating subjects' cohesion and commitment to the decision reached. The article proceeds as follows: section 2 introduces the experimental design; section 3 reports the achievements obtained; and section 4 concludes.

2. Experimental Design and Procedure

The experiment was programmed in z-Tree (Fischbacher 2007) and conducted in the LEE experimental laboratory of the Universitat Jaume I (Castellón, Spain), where a sample of 300 students was drawn from different study courses. The experiment had two parts, namely, an individual part, and a group part. Each part was composed by ten sessions, and each session involved 30 participants. Like Zhang and Casari (2012), we employed a within-subject design which allows a more direct comparison between individual and group's behaviour, but may exhibit order effects. In order to control for this, Masclet et al. (2009) run sessions where the individual part preceded the group part, and sessions were the individual part was instead preceded by the group part. Comparing theses sessions, they do not find any order effects. In the individual part, we measured subjects' risk attitude with 10 pairwise choices questions, reported in table 1. In the group part, subjects were randomly allotted to groups of three persons and faced the same 10 pairwise choices as in the individual part. The members within each group could communicate face-to-face[2] without any limits of time. They were free to choose any method to solve an eventual disagreement. Once a decision was taken, subjects moved to the next decision problem. Groups were sufficiently apart so that each group could not listen to the others' discussion. On average, groups spent 2 minutes to come to a final choice.

Lottery A				Lottery B				EV(A)	EV(B)	EPD	Open CRRA interval if subject switches to lottery B
p	ECU	p	ECU	p	ECU	p	ECU				
0.1	50	0.9	40	0.1	96.25	0.9	2.5	41	11.88	29.12	-∞, -1.71
0.2	50	0.8	40	0.2	96.25	0.8	2.5	42	21.25	20.75	-1.71, -0.95
0.3	50	0.7	40	0.3	96.25	0.7	2.5	43	30.62	12.38	-0.95, -0.49
0.4	50	0.6	40	0.4	96.25	0.6	2.5	44	40.00	4	-0.49, -0.15
0.5	50	0.5	40	0.5	96.25	0.5	2.5	45	49.37	-4.37	-0.15, 0.15
0.6	50	0.4	40	0.6	96.25	0.4	2.5	46	58.75	-12.75	0.15, 0.41
0.7	50	0.3	40	0.7	96.25	0.3	2.5	47	68.12	-21.12	0.41, 0.68
0.8	50	0.2	40	0.8	96.25	0.2	2.5	48	77.5	-29.5	0.68, 0.97
0.9	50	0.1	40	0.9	96.25	0.1	2.5	49	86.87	-37.87	0.97, 1.37
1	50	0	40	1	96.25	0	2.5	50	96.25	-46.25	1.37, ∞

Table 1 - Binary lotteries[3]

In order to elicit subjects' risk attitudes, we resort to a gamble scheme which is similar to that in Holt and Laury (2002). Subjects had to choose between a "safe" (A) or "risky" (B) lottery, with the probability to win the highest payoff increasing in 10% intervals (Table 1).

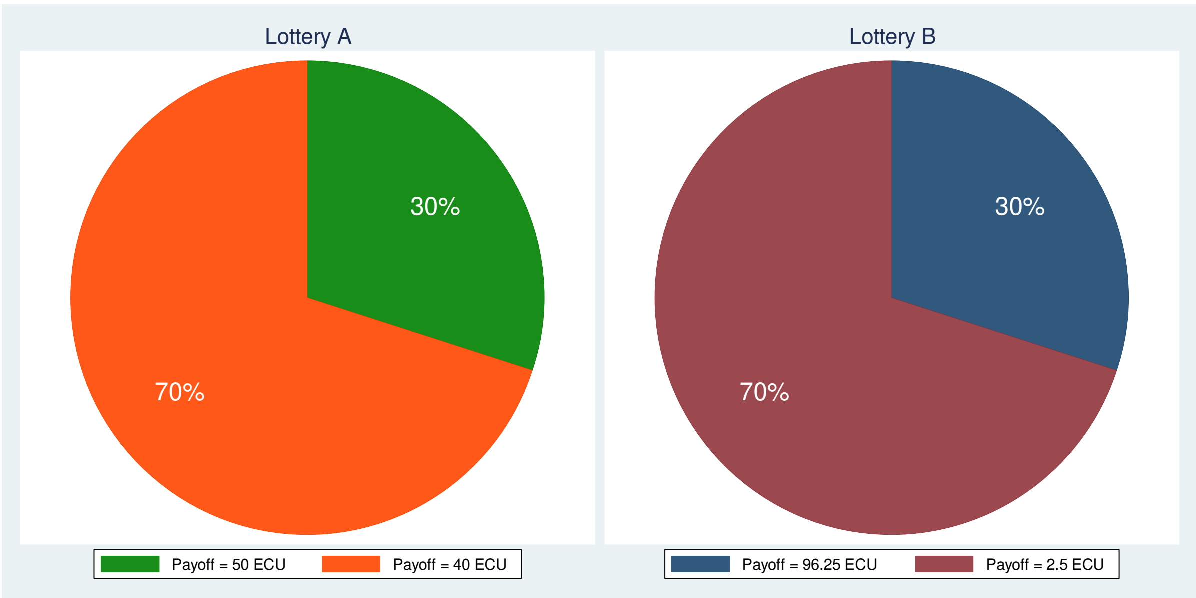

Figure 1 - Example of Lotteries Presented[4]

[2] O'Neill et al. (forthcoming) showed that "Face-to-face teams were more effective on all decision".
[3] The last four columns in this table, showing the expected values of the lotteries (EV), the expected pay-off difference between the two lotteries (EPD), and the implied CRRA intervals, were not shown to subjects.

The lotteries' payoffs have been set as in Harrison et al. (2012). Subjects were presented each decision problem singularly (in the order reported in table 1) and in graphical form (as in figure 1).

At the end of each session a pairwise choice gamble was randomly drawn for each participant, and payment was made accordingly. Each subject earned on average €20.

3. Analysis and Results

Prior to introduce our core results, it is useful to recall that a rational decision maker with monotonic preferences should switch from the safer to the riskier option just once and never switch back. Like in many other experiments (see, for example, Keck et al., 2014), in our results we observe cases of multiple switching. Indeed, some subjects (groups) switched from A to B and *vice versa* more than once, showing such a kind of inconsistency or indifference over a certain range[5]. Figure 2 shows the percentage of multiple switching in the individual and group tasks. In detail, multiple switching occurred in 24 out of 300 instances in the individual part, and in 5 out of 100 cases in the group part. A two-sample proportion test shows that the multiple switching frequency is not different between the individual and group part, (m = 300, n = 100, z = 1.00, p-value = 0.3164).

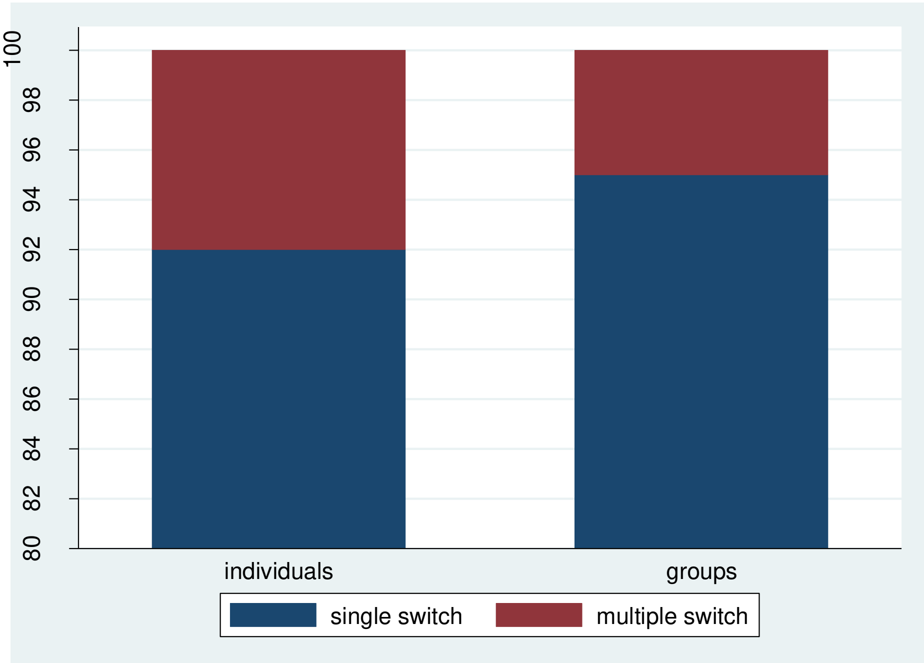

Figure 2 - Percentage of single and multiple switching in individuals and groups

We resort to the conventional CRRA function to estimate subjects' risk attitude.

$$U(y) = \frac{y^{1-r}}{1-r}$$

Where, r is the CRRA coefficient[6]. In figure 3 we report the box-plot of the CRRA coefficients for groups and individuals with monotonic preferences.

A Mann-Whitney U test cannot reject the null hypothesis of equality between the distributions of the r coefficients in the two parts (m = 95, n = 297, z = 0.098, p-value = 0.9223). Then, we

[4] According to Habib et al. (2016), graphical displays of MPL pushes subjects towards risk neutrality. However, they show that this effect is lower when payoff labels are shown.

[5] This behaviour can be due to a bunch of reasons: either subjects (groups) are genuinely indifferent or they are irrational (do not respect monotonicity) or it is just a mistake.

[6] $r=0$ denotes risk neutrality, while $r > 0$ risk aversion and $r < 0$ risk loving.

conclude that individuals' risk attitude were not different from that of groups.

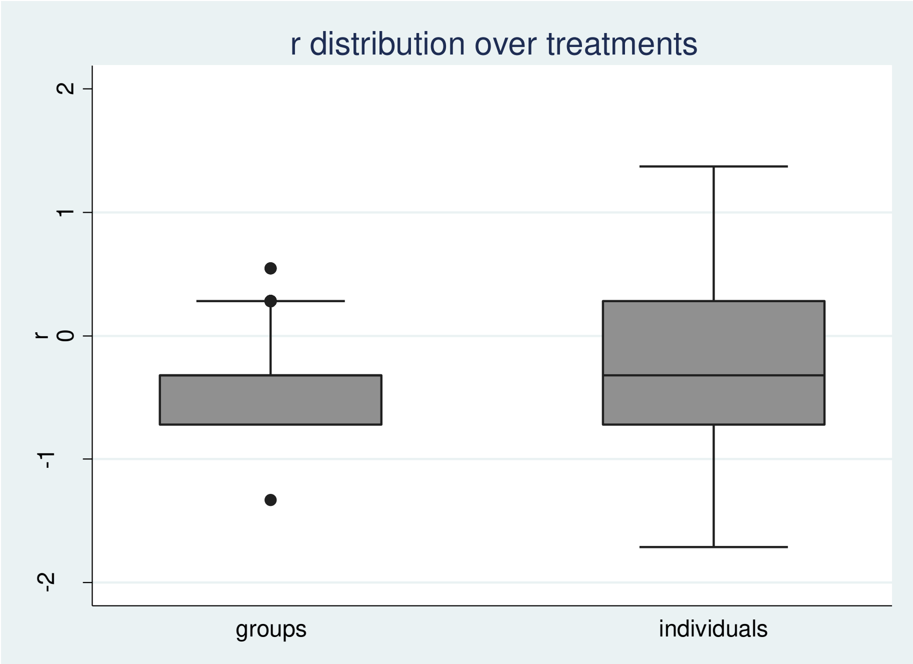

Figure 3 - CRRA coefficients for groups and individuals with monotonic preferences

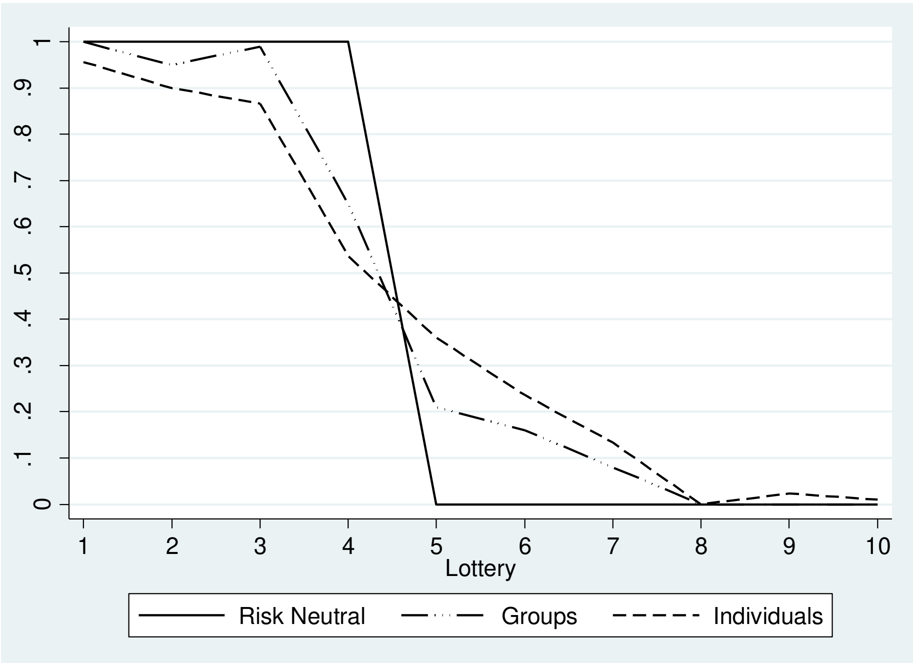

FIGURE 4 - Fraction of individuals and groups who chose the safe option A over the ten decision problems

Figure 4 shows the percentage of safe option (A) choices along with the ten decision problems in the two tasks. In theory, a risk-neutral subject (whose proxy behaviour is tracked by the solid line in figure 4) is expected to switch from A to B when the expected payoff of the two lotteries is equal, i.e. between the 4th and 5th decision problem. While a switch in later decisions reveals risk aversion, a switch in earlier decisions reveals risk-seeking behaviour.

We employ the following Logit model to explain the determinants of the likelihood to choose the safe option (A).

$$y_i = \alpha + \beta_1 \cdot Group_i + \beta_2 \cdot Neg_{epd_{choices}_i} + \sum_{j=1}^{k} \gamma_j \cdot Session_j + \varepsilon_i$$

Where y_i is a dichotomous dependent variable which takes on value 1 if the decision maker i chose the safe option (A) and 0 otherwise. $Group_i$ is a dummy variable which assumes value 1 if the decision maker i is a group and 0 if the choice is instead taken individually. $Neg\_epd\_choices_i$ is a dummy which takes on value 1 within the decision problems with a negative expected payoff difference ($EP[A] < EP[B]$), i.e. in all the choices from 5 up to 10, and 0 otherwise. Finally, $\sum_{j=1}^{k} \gamma_j \cdot Session_j$ is a vector of dummies which controls for specific session effects. The results from the logit model are summarized in table 5.

Dep. Var. Pr(A_choice)	1_10 Choice	1_4 Choice	5_10 Choice
Group	0.0145	0.690***	-0.589***
	(0.0961)	(0.181)	(0.171)
Neg_epd_choices	-3.702***		
	(0.0943)		
Constant	1.765***	1.642***	-1.822***
	(0.159)	(0.228)	(0.199)
Session Control	Yes	Yes	Yes
Observations	4,000	1,600	2,400
Pseudo_r2	0.4220	0.0172	0.0148
Prob > chi2	0.0000	0.0092	0.0062

Table 5 - Probability of choosing the safe option (A): Logit model. "1_10 Choice" denotes the entire set of decision problems. "1_4 Choice" refers to the restricted model in which only the decision problems from the 1st to the 4th have been accounted for. "5_10 Choice" refers to the restricted model in which we only include the decision problems from the 5th to the 10th. Heteroskedasticity-consistent standard errors (robust) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Dep. Var. Pr(A_choice)	Interactions
Group	0.690***
	(0.181)
Neg_epd_choices	-3.435***
	(0.104)
GroupXneg_epd_choices	-1.279***
	(0.248)
Session Control	Yes
Observations	4,000
Pseudo_r2	0.4274.
Prob > chi2	0.0000

Table 6 - Probability of choosing the safe option (A): Logit model with interaction between "Group" and "Neg_epd_choices". Heteroskedasticity-consistent standard errors (robust) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Considering the whole set of decision problems, these results show that moving from individual to group decision making does not affect the probability of choosing the safe lottery (A). *Ceteris paribus*, a switch from positive expected payoff difference (EPD) lotteries (problems from 1 up to 4) to negative EPD lotteries (problems from 5_10) significantly reduces the probability of choosing the safe option (A). The latter evidence was widely expected, and in line with the prevalent literature. Instead, the most interesting achievements come from the restricted model. Indeed, considering only those lotteries with positive EPD, playing in group significantly increases the probability of choosing the option A, thus meaning that individuals are more risk seeking than groups. The opposite pattern is instead interestingly (and significantly) detected in the lotteries with negative EPD, in which individuals appreciably exhibit a greater degree of risk aversion than groups. To better appreciate this trend we augment our model with the interaction term "$\beta_3 \cdot$ Group_X_ Neg_epd_choices", and report the output in Table 6 and Figure 5.

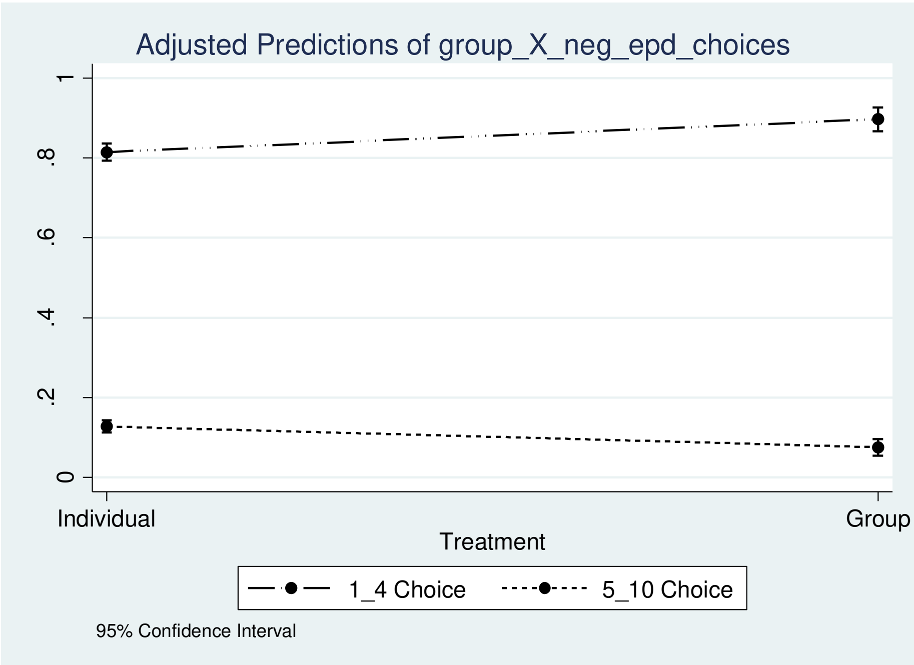

Figure 5 - Adjusted predictions of the interaction "Group_X_Neg_epd_choices" on the probability of choosing the safe option (A).

We find a negative and significant interaction between the variable "Group" and "Neg_epd_choices", which highlights how the effect of playing in group – rather than individually - on the average predicted probability of choosing the safe option (A) crucially changes depending on whether the positive rather than negative domain of the EPD between the two gambles is considered.

4. Conclusions

This paper investigates whether subjects' attitude toward risk changes depending on whether decisions are taken individually or in a group. On one hand, Zhang and Casari (2012), and Brunette et al. (2015) show that, if disagreement is solved on the basis of a (weak or strong) unanimity rule, subjects in the group condition tend to be less risk averse than when they are not part of a group. On the other hand Harrison et al. (2012), report no significant differences between individuals and group risk aversion, if disagreement is solved on the basis of a majority rule. The originality of our paper is not to impose an exogenous disagreement-breaking rule, but we left each group free to resolve the disagreement. The only restriction we imposed is that subjects have to come to a group decision. We clearly show that, although no appreciable difference in risk attitudes arises comparing individual and group behaviour over the whole set of decision problems; groups always better proxy the risk neutral behaviour than individuals. In particular, we find that groups are more likely than individuals to choose the safe option (A) when playing lotteries with positive expected payoff difference and less likely than individuals to choose the safe option (A) when playing lotteries with negative expected payoff difference. In both the domains, groups' decisions appreciably better approximate the risk neutrality than individuals'.

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