GROUP DECISION MAKING IN RISKY ENVIRONMENT – ANALYSIS OF GENDER BIAS

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Abstract

Article presents an experimental study of gender bias in group decisions. A variation of the original Gneezy and Potters (1997) lottery experiment performed by Sutter (2007) is used. Experimental data analysis confirmed that females behave more cautiously than males in individual treatments and that groups behave more risky than individuals in general. By analyzing the gender composition of the groups we showed that no statistically significant gender bias is present in the investment decisions in the group treatments among mixed groups. Male only groups invested significantly higher amounts and with higher variability than other groups.

Keywords: lottery, gender bias, risk, group decision making

JEL Code: C91, D81, Z1

Introduction[1]

The question of differences in the decisions of individuals and groups has been raised for the first time in social psychology by Stoner (1961). In his study he noted the existence of the so-called phenomenon of risk shifting. This phenomenon was based on findings that a group faced with the same dilemma of decision-making preferred more risky decisions than members of the same group under the same conditions individually. This phenomenon was initially explained by the tendency of group members to hide their own responsibility for excessive risk in the anonymity of the group. Subsequent studies indicated a shift towards riskier, but also to more cautious decisions. As such, the difference between the behaviour of groups and individuals has never been confirmed as a general phenomenon.

In subsequent years, more theories explaining group decision-making have been formulated. The social comparison theory assumed that the risky (or cautious) decision shifts

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of group members are the result of individuals adapting to more risky (or cautious) decisions preferred by the group as a whole.

One of the most respected theories, which has seen many variations, is the group polarization theory formulated by Moscovici and Zavalloni (1969). It is assumed that group members exhibit more extreme decisions after group discussions. Direction and the extent to which individual members of the group adjust to the group and each other, depends largely on the degree of persuasion abilities and the number of arguments provided by the most influential members of the group.

Several works with empirical data concerning group versus individual decisions can be found in the existing economic literature, but most come from laboratory conditions using experimental economics. Consequences of group decision-making have been observed in different areas and for different types of decisions.

Studies using a lottery to determine the risk preferences and behaviour were performed by a number of different authors, including Bone et al. (1999), Rockenbach et al. (2007), Harrison et al. (2005), Shupp and Williams (2008). Neither the results of these studies, however, have yielded a clear consensus in the results. Bone et al. (1999) brought evidence of systematic violations of expected utility theory axioms for both individuals and groups. A clearly higher frequency of riskier decisions among groups in comparison to individuals was also presented. The same conclusions were presented by Rockenbach et al. (2007). Harrison et al. (2005) analyzed the social factors affecting decisions in the lottery. Individual players were anonymously assigned into groups, with two-way communication within the group closely monitored. Using data analysis and comparison of demographic factors, no differences were found in the decisions of individuals and groups. Shupp and Williams (2008) measured the degree of risk aversion by the maximum amount the subjects were willing to pay for the lottery. They found that groups exhibited a lower risk aversion than individuals, but only in lotteries with a high probability of winning. Their aversion to risk increased with the decreasing probability of winning. This study also brought a new element in monitoring the behaviour of groups, when both versions of the experiment used the same group of participants, making it possible to study the behaviour of each participant in two different environments.

On the other hand, in the middle of the 20-th century, the gender differences in the decision making processes were investigated within the social psychology studies. Here, females showed to be more risk averse, which was explained by their higher acceptance of the outside opinion, manipulation and persuasion. Males demonstrated more aggressive

behaviour and acted more self-confident. In the last three decades, the gender behavioural differences were investigated within the behavioural economics.

Levin et al. (1988), working with the sample of 180 students, analyzed participants willingness to bet in 18 different lotteries. Here, males invested more and behaved more risky than females. Similar conclusions regarding the risky behaviour of males were also presented by Hinz et al. (1997), who did not use the experimental methods but analyzed the data of the Thrift Saving Plan in the United States.

However, not all the studies reached the same conclusions. Brining (1995) performed the experimental draw lottery and showed that the gender difference in risk acceptance is ambiguous and age dependent. Based on the lottery experiment with 73 students, Schubert et al. (1999) reached the conclusions that females were more risk averse in case of winning lotteries, while if playing the loss lotteries, the females acted more risky when compared to males. Gysler et al. (2002) introduced the experimental conclusion, where inexperienced females were highly risk averse and with increasing experience and self-confidence their risk aversion decreased. The male sample demonstrated an inverse behavioural pattern, where risk aversion increased with experience and self-confidence. Atkinson et al. (2003) compared investment behaviour of the male and female investment fund managers. Here, the observed differences were caused by the differences in the managerial investment practices knowledge and not by the gender itself.

Our motivation for the presented study is a variation of the original Gneezy and Potters (1997) experiment, performed at the University of Innsbruck by Sutter (2007). His intention was to prove the existence of myopic loss aversion, linked to the impact of group decision-making. Part of the study looked at individual and group decisions under conditions of risk in a simple lottery. We extend this part of his study to examine the existence of differences in decision-making by individuals and groups in relationship to the gender differences.

1. Experiment design

The experiment was designed as a lottery with two different treatments for studying the behaviour of individuals and groups. Both treatments consisted of 20 rounds. Before each of the 20 rounds, the participants were endowed with 100 cents. Then they had to decide whether to retain this amount with zero interest or invest any amount X_t in to a lottery $(0 \le X_t \le 100, t = 1,...,20)$. If the lottery was successful (with the probability set to $p_w = 1/3$),

the participant would receive 2,5 times his investment, while at the same time retaining the initial endowment. However, if the lottery has not been successful (with the probability set to $p_l = 2/3$), the money contributed would be lost. The payoff function $\pi_{i,t}$ of participant i in round t with the investment $X_{i,t}$ was:

$$\pi_{i,t}\begin{cases} 100 + 2{,}5X_{i,t} & p_w = 1/3 \\ 100 - X_{i,t} & p_l = 2/3 \end{cases} \qquad (1)$$

All participants were fully informed about likelihood of wins and losses. It should be stressed that participants could not invest funds accumulated in the previous rounds. Individual rounds are thus independent and the maximum bet in each round was 100 cents. The participants were informed about the win/loss results after each round.

In the first treatment of the experiment (noted INDIV) the participants made their decisions individually. In the second treatment of the experiment (noted GROUP) the participants were randomly assigned to groups of 3 players, who then repeated the experiment under the same conditions as in the treatment INDIV. At the end of each round of this treatment, the payoff of each participant was calculated using the full score of his group to ensure the same potential payoff as in the INDIV treatment.

The entire experiment was performed in the program Z-tree (Fischbacher, 1999), which is designed to carry out economic experiments.

The experiment was conducted during the courses of Econometrics and elective courses of Game Theory at the Faculty of Economics, Technical University of Kosice in the spring semester of 2011. A total of 55 students of the third and fourth grade participated in the experiment (32 female and 23 male) and were motivated by a financial reward. The average age of participants was 21,75 years. All students took part in both INDIV and GROUP treatments. Each experiment session lasted approximately 90 minutes and consisted of a total of 40 rounds (20 rounds of the INDIV treatment and 20 rounds of the GROUP treatment). At the beginning of each session, participants were informed about the details of the experiment, computer software being used and the financial rewards. To ensure the participants understood the experiment, a trial round of the game was presented by the organizers. After this, the experiment commenced. After all rounds were completed and the participants filled out the provided questionnaires, the financial rewards were paid out. The reward consisted of a fixed sum of 50 cents as a reward for participation and a variable sum

dependent on the score achieved during the course of the experiment by the given participant. The average reward was 184,49 cents for both treatments combined.

2. Experiment results

2.1 Individual versus group treatments

Comparison of the empirical results according to both treatments is provided in Tab. 1. To analyze our data from the point of view of the Sutter's (2007) statement on the rising risk acceptance if the decisions are adopted within the group of individuals, we first observe that both median and mean investments in the individual treatments are lower than the corresponding statistics in the group treatments. On the other hand, standard deviation in the GROUP treatment is lower, which can be explained by groups settling on a compromise, where risky individuals are enforced to behave more cautiously and conservative players are enforced to accept more risky decisions.

Tab. 1: Average amounts invested in INDIV and GROUP treatments

Treatment	N	Mean	Median	Min.	Max.	Standard deviation	Shapiro-Wilk normality test	
							SW stat.	P values
INDIV	55	39,7	40,5	0,0	75	16,6	0,988	0,84
GROUP	55	52,8	53,5	20,7	72,9	13,8	0,633	0,96

Average amounts invested in 20 rounds

We also performed the Shapiro-Wilk normality test for money invested in both treatments separately but neither of them indicated significant departures from normality (see Tab. 1). The difference between mean levels of the money invested in the GROUP and INDIV treatments was 13,1 cents. As the both experiments were carried out with the same participants, the one-tail paired t-test was chosen to accept the alternative hypothesis that the mean investment within the group treatment is higher than in the individual one (t-stat = -5,92, p-value=0,000). It means, that the Sutter's conclusion is valid also in our experimental group.

Besides the results presented above, we also observed that up to 80% of all participants presented risky shifts (increase in investment) when investing in GROUP

compared to INDIV treatment. The remaining 20% of participants presented cautious shifts (decrease in investments).

2.2 Male versus Female in individual treatments

A total of 23 males and 32 females participated in the experiment. Mean investment in the INDIV treatment for males reached 47,7, while only 34,3 for females. While the average minimum investment in the INDIV treatment for males was 13,1, for females it was equal to 0. The higher risk aversion of females is also reflected by the maximum investment value. While for males it was equal to 75 out of possible 100 invested cents, for females it was only 69,3.

Tab. 2: Average amounts invested by males and females in individual treatment

Treatment	N	Mean	Median	Min.	Max.	Standard deviation	Shapiro-Wilk normality test	
							SW stat.	P values
Males	23	47,7	50,0	13,1	75,0	14,1	0.977	0,84
Females	32	34,3	30,6	0,0	69,3	16,7	0,968	0,45

Average amounts invested in 20 rounds

As the data seem to be normally distributed in both the Male and Female cases (see Tab.2), we applied the standard F test to test the difference in variance. Here, no statistically significant difference was detected (F = 0.716, p-value=0.420). If testing the alternative hypothesis of males investing more than females, we used the standard t-test (without Welch approximation), where alternative hypothesis was accepted (t=3,107 with p-value = 0.001). It means that the generally accepted hypothesis of females behaving more conservatively than males, was also accepted in our individual treatment.

2.3 Gender factor in the group treatment.

In the following, the individuals were grouped into the 17 three-member groups and one group with 4 members. The average investments descriptive statistics in division into the males/females prevailing groups are given in Tab. 3. In both types of groups, the risk shifting according to the gender categorization (similar to the individual treatment given in Tab. 2) was registered. On the other hand, the males prevailing groups keep their risky profile if comparing to the females prevailing groups, but the differences in means and medians

diminished. The statistically significant difference in the variances regarding the males vs. females prevailing groups was not registered (F statistics = 0,634, p-value=0643). On the other hand, the mean investment value of the males prevailing group was not significantly greater than the one of the females prevailing groups (t-stat=1,03, p-value=0,159).

Tab. 3: Average amounts invested by males/female prevailing groups in the group treatment

Treatment	N	Mean	Median	Min.	Max.	Standard deviation	Shapiro-Wilk normality test	
							SW stat.	P values
Males prevailing	6	57,6	57,6	44,3	72,9	12,0	0.914	0,47
Females prevailing	12	50,3	52,6	20,7	72,0	15,1	0,962	0,81

Average amounts invested in 20 rounds

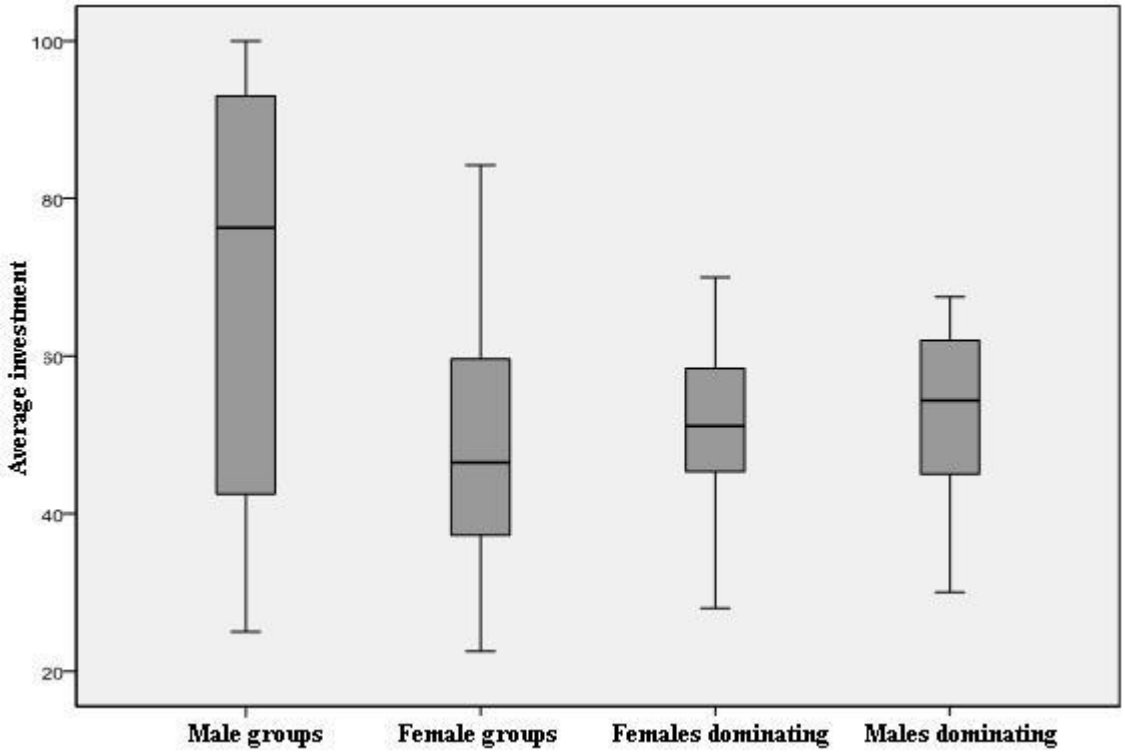
The gender analysis of the group treatments presented above has some shortages. The main objection can be the small number of the degrees of freedom, which can result into the spurious accepting of the normally distributed data assumption, and, finally, rejecting of the alternative hypothesis in the t-test at all. In order to increase the number of observations, we use all the observations of the money invested in each of the 20 rounds. As these observations are not mutually independent, we do not use them for the statistical inference, we just introduce the box-plot given in Fig. 1, where the division of the experiment participants into the groups is fourfold: exclusively male groups (2 groups), males prevailing groups (4), females prevailing groups (8) and exclusively female groups (4).

Inspecting Fig. 1, we observed some tendencies:

1. Groups whose members were exclusively male, invested significantly higher amounts than other groups. Conversely women, despite the co-decision, maintained their cautious decisions and again invested the lowest amounts among all the groups.

2. However, in the case of mixed groups, the gender differences are almost entirely offset, as the difference between median invested amount between male dominated and female dominated groups was negligible.
3. The exclusively male groups demonstrated rather high variability of the money invested when compared to the other groups.

Fig. 1: Average investment of different group types in the GROUP treatment



Conclusion

In the presented article, the gender bias in the group decisions is considered. Here, the experiment motivated by Gneezy and Potters (1997) and later by Sutter (2007) was performed with university students. In addition to similar experiments, our approach was extended by introduction of the group decisions, where the domination of the males/females was present. According to the experimental results, females in individual treatments behave more conservatively when comparing to males and, on the other hand, the group decisions in general were characterized by higher acceptance of risks. On the other hand, the statistically significant gender bias was not identified within the group investments decisions. If analyzing the individual investments in all the rounds individually, the exclusively male groups demonstrated high risk acceptance followed by rather large variability of the invested

amounts. The exclusively female and mixed groups did not demonstrate any extraordinary investments pattern.

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