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The Effect of Gender Composition on Group Decisions under Risk

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Highlights

- We look at the effect of the gender composition of groups on the shift of risk taking between group and individual decisions.
- We derive a gender-specific polarization hypothesis that states that group decisions of male dominated groups shift to higher risk taking than female dominated ones.
- Our experimental results show a significant impact of the group composition on risk taking of groups and support our gender-specific polarization hypothesis.

Abstract

This study contributes to the public debate on gender quotas and the literature on gender and risk taking by analysing how the level of risk taking within a group is influenced by its gender composition. In particular we look at the shift of risk taking between group and individual decisions and analyse to which extent this shift depends on the gender composition. We derive a gender-specific polarization hypothesis which states that compared to individual preferences, male dominated groups will shift towards higher risk taking than female dominated ones. Our experimental tests reveal a systematic impact of gender composition on group shifts which supports our hypothesis and points into the direction that a higher share of females may prevent excessive risk taking.

Key words: risky shift, risk taking, group decisions, gender, monetary incentives

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I. Introduction

Many important economic and politically relevant decisions are made by groups, for example in boards of directors or supervisory boards, but also in parliaments or other political bodies. The overwhelming majority of these decision-making bodies are dominated by men, a fact that has been critically debated in public for years. In order to strengthen the equal participation of women and men in leadership positions, gender quotas have been introduced in many European countries, e.g. Italy, Norway and Germany. While gender quotas are justified by promoting gender equality it remains an open question how a rising share of women in these positions will impact decision making.

The introduction of the quota in many countries motivated studies on the general impact of gender quotas. Studies in the domain of policy making, find that the introduction of quotas in political bodies has no impact on policy making in general (Ferreira & Gyourko, 2014). Though gender quotas can increase the qualification of elected politicians as more highly educated women enter politics and low educated men leave (Baltrunaite et al., 2014). Focusing on decision making bodies of firms studies for Norway, where the quota for corporate boards was already introduced in 2005, find mixed evidence of the impact of the quota on firm performance and valuation (Johansen & Sandnes, 2008; Nygaard, 2011; Ahern & Dittmar, 2012; Matsa & Miller, 2013; Eckbo et al., 2016). Yet, studies related to the gender composition of management teams in general and their performance find some evidence for better performance of more divers teams in case of real firms (Bansak et al., 2011; Adams and Ragunathan, 2015), business games (Apesteguia et al., 2012; Hoogendorn et al., 2013) and asset markets (Cueva & Rustichini, 2015).[1]

In this paper we focus on the impact of changing gender composition of groups on one main characteristic of many firm decisions, the fact that they involve risk. There are good reasons to expect that gender composition has a strong impact on group decisions under risk. Literature indicates that women and men differ with regard to their economic preferences (see Croson & Gneezy (2009) for an overview). There exists abundant evidence which documents that women are more risk averse than men in financial risk taking and many other domains (Byrnes et al., 1999; Croson and Gneezy, 2009), although the size and economic relevance of this gender difference is debated (Filippin and Crosetto, 2016). However, group decisions do not always reflect the individual preferences of its group members. The difference between individual risk taking and risk taking of groups has been an intensively debated issue in social psychology since the seminal work of Stoner (1961) and in recent years also in the economics literature. A pattern that is often

[1] Adams & Ragunathan (2015) find that mixed-gender teams reduce mispricing across different types of asset markets.

observed is the polarization of group decisions. Groups tend to take more risk than individuals on average, called the "risky shift" phenomenon. The evidence on risky shifts is originally based on studies employing choice dilemma questionnaires. In recent years, several studies analysed group decisions under risk with monetary incentivized experiments. Here the evidence is rather mixed. While some studies replicate a risky shift (Sutter, 2009; Nieboer, 2015), others find that groups predominantly take less risk (i.e. a cautious shift) than individuals (Masclet et al., 2009; Baker et al. 2008; Shupp and Williams, 2008) or observe no systematic differences at all (Harrison et al., 2013). There are several potential reasons for these choice shifts discussed in the literature. Prominent reasons are the conformity hypothesis (Cialdini & Goldstein, 2004; Jagau & Offermann, 2018), the assumption of diffusion of responsibility (Wallach et al, 1962, 1964; Eliaz et al., 2006) and the risk as value hypothesis (Vidmar, 1970; Bauer and Turner, 1974).

Our paper contributes to the literature on group decision making under risk in two ways. First, we add to the public debate on gender quotas and decision making by focusing on how gender quotas affect group decisions. Second, we contribute to the literature on choice shifts in group decision making by testing how choice shifts are affected by the gender composition. Surprisingly, to the best of our knowledge no previous study systematically analysed whether gender composition affects the incidence of risky and cautious shifts.

Evidence that gender is important for group decision under risk is reported by Nieboer (2015) and Bogan et al. (2013). They find that gender is the only individual characteristic that significantly affects risk taking in group settings and that a male presence increases risk taking. Evidence that gender might also be important for choice shifts of groups is indirectly provided by the experiment of Daly and Wilson (2001). They compare individual risky decisions made in private with those made in public where subjects have to announce their individual choice in front of a group of peers. It turned out that men took significantly more risk in the public than in the private condition whereas there was no effect for women. Transferring this result to group decisions suggests that a risky shift could be caused by male group members who want to appear more risk tolerant in a group than an individual context. A risky shift would thus be enhanced by the share of males in the group. Additional insights are given by Ertac & Gurdal (2012), who find that men are in general more willing to lead groups and that those men take more risk on behalf of the group than those who are not willing to lead. For women they find no differences.

We analyse the impact of the gender composition on group decisions under risk and on choice shifts by using a simple lottery choice experiment under monetary incentives. We formed groups of three with varying gender composition and compared group choices to the individual choices of the group members. Our results show a clear and significant pattern that gender is important for choice

shifts. While we observe substantial risky shifts for male dominated groups, female dominated groups take less risk than individual group members on average.

The paper is organized as follows. The experimental design is presented in the next section. Section III formalizes our gender-specific hypothesis more precisely. Presentation of experimental results in Section IV is followed by a discussion in Section V. Section VI concludes.

II. Experimental Design

A. Participants and Procedure

The experiment was carried out in July 2015 at the student canteen of the University of Kiel, Germany. During three days 255 people participated in our study. The gender ratio was balanced (50.6% females) and average age was 23.95 (SD 4.61). Recruiters invited customers of the canteen to take part in an economic experiment. Potential participants were told that they will receive a €2 participation fee and could gain additional money by playing a lottery. Groups of three people were formed, discreetly varying the group's gender composition and requiring that group members were not familiar to each other. All other group characteristics were randomly allocated[2]. The sample size was chosen on the basis of previous studies that used the incentivized Eckel and Grossmann task (2008). In a meta-analysis Filippin and Crosetto (2016) find that the average gender effect size for this task is equal to Cohen's d=0.55 on the individual level. Assuming that the median voter is more likely to be female in female dominated groups and male in male dominated groups we aimed to collect data from 42 female and 42 male dominated groups in order to detect a medium sized gender effect in group choices (with β=0.80, α=0.05). We terminated data collection after we reached our targeted sample size and only started data analysis after that point. Overall, data from 22 purely female groups (further mentioned as FFF), 21 groups with two women and one man (FFM), 21 groups with one woman and two men (FMM) and 21 purely male groups (MMM) were collected; an overview is given in TABLE 1.

TABLE 1 GENDER COMPOSITION OF GROUPS

Gender composition	Nb of groups	Nb of participants
FFF	22	66 women
FFM	21	42 women; 21 men
FMM	21	21 women; 42 men
MMM	21	63 men[3]
Overall	85	255

[2] Randomization was successful and only small significant differences between groups were found, see **Table A 1** and **Table A 2** in the Appendix.

[3] One group member did not submit the individual decision and questionnaire.

As the groups were formed, it was explained to the participants that they had to take a risky decision as a group first, then had to fill out a questionnaire on their own and in the end had to reunite in their initial group to receive their payment. After the groups were formed a card showing six alternative lotteries was handed to them (see Figure 1). Participants were told that the group had to choose exactly one of these lotteries by consensus. There were no time constraints for discussion and reaching consensus (no group took longer than 5 minutes to reach a consensus). When participants within a group agreed on a lottery, they stated their choice to the experimenter and were handed the questionnaires, which had to be filled out in private. The questionnaire included an individual risk preference task (which equalled the group task with all amounts divided by three), basic demographic questions (gender, age, highest educational degree, amount of siblings), happiness (self-reported happiness on a five point Lickert scale), and questions on the Big Five personality traits. After filling out the questionnaires participants reunited in their groups. To determine the payoff a coin was flipped twice. The first coin flip indicated whether the group or the individual lottery choice would be relevant for payment. The second coin flip determined the outcome – high or low payoff - according to either the group or individual choice.

B. Methods

Risk preferences. - To elicit risk preferences, a well-established task developed by Eckel and Grossman (2002) was used. The groups had to choose by consensus exactly one out of six lotteries depicted in Figure 1. The lotteries were represented with coins that had two coloured sides indicating the size of a gain (in Euro) – orange (high gain) and pink (low gain). For all six lotteries, chances to win the high or low gain were equal (50% probability). The lotteries increased in risk and expected value starting from lottery 1 with a sure gain of €12 (or €4 for each group member) to lottery 5 with an expected value of €15 (€8 or €2 for each group member). Lottery 6 had the same expected value as lottery 5 but higher risk (€9 or €1 for each group member) and allows detecting risk loving attitudes. The number of the chosen lottery by the group will be referred to as group choice (GC) in the sequel. In general, the higher GC the lower is the degree of risk aversion of the given group. To control for individual risk preferences the questionnaire included the same lottery task, but with individual gains (i.e. group amount divided by 3). Responses to this task will be termed individual choice (IC). Again, a higher number of IC indicates a lower degree of risk aversion. The group shift is given by GC – IC where GC – IC > (< 0) indicates a risky (cautious) shift.

A critical feature of experimental designs to analyse group polarization is the order of elicitation of individual and group choices. Most of the previous studies elicited individual preferences first. We deliberately reversed this order but are aware that both procedures have their pros and cons. In general, if a subject has to make more than one evaluation, the former evaluations will serve as anchor which can bias the later ones (Ariely et al., 2003). This seems to favour the procedure of eliciting individual preferences first. Recent evidence shows, however, that also individual decisions are heavily influenced by the social context, in particular by the gender composition. Castillo et al. (2015) for instance let subjects make individual risk taking decisions while sitting in a room with other people. Although the decisions are fully private and not revealed to other subjects, the gender composition in the room has a systematic impact on individual preferences. Consequently, also in the case of group decisions the gender composition of the group might influence individual risk preferences. This effect is, however, at least reduced if subjects anchor on their individual decision they made before in private, i.e. without any influence of the social context. Harrison et al. (2013) show that the order between group and individual decisions has no influence on individual risk preferences. Based on this evidence and the fact that social context is an important determinant of group decisions motivated us to have the group decision first. We test whether the group composition has a systematic impact on the individual preferences elicited in the second step and found no significant effects (see Section 4).

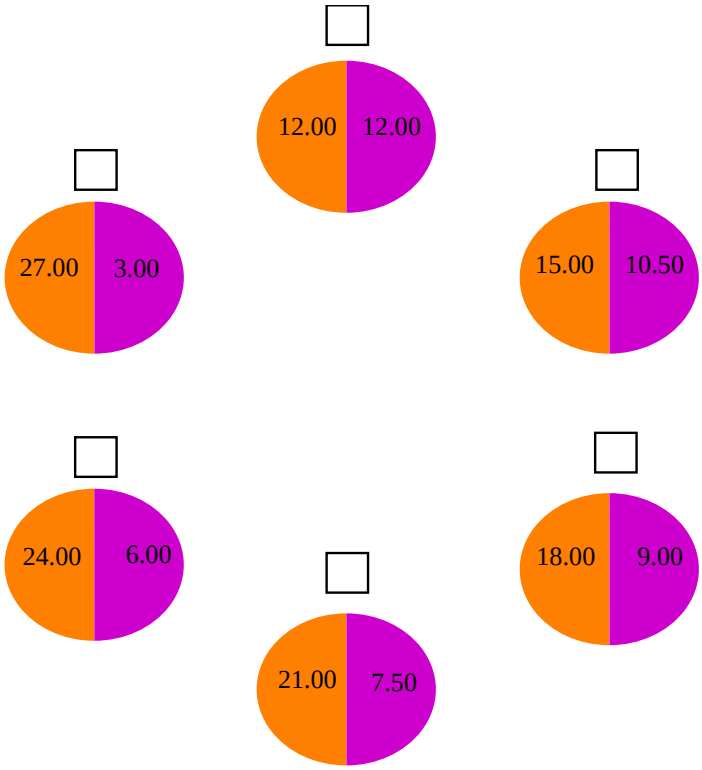

FIGURE 1 LOTTERIES FOR GROUP DECISION-MAKING

Personality traits. - To control for specific characteristics of participants, which might influence the consensus building process for the group decision, we included questions on the Big Five personality traits. These are aimed to reveal five dimensions of personality: extraversion, agreeableness, conscientiousness, neuroticism and openness to experience. They were measured by self-reports of the NEO Five-Factor Inventory using 60 items, i.e. 12 items per domain (McCrae and Costa, 2004 translated in German by von Borkenau and Ostendorf, 2008). These factors may appear influential while making a risky decision within the group or individually. For instance, it may happen that more extravert people tend to be very convincing during the group discussion (Zhang and Casari, 2012), whereas people who are very agreeable tend to let other people decide and easily agree with others' choices independently of their own preferences (Barry and Friedman, 1998; Müller and Schwieren, 2012). We could also expect that more conscious people will reveal more risk-aversion compared to those who have a lower level of conscientiousness (Zhang and Casari, 2012; Mayfield, Perdue, Wooten, 2008). Therefore, we found it useful to include the personality test to our questionnaire in order to control for each of those five characteristics in the empirical analysis.

III. Hypothesis

There exists abundant evidence that women are more risk averse than men in financial risk taking (Croson and Gneezy, 2009, Charness and Gneezy, 2012) although the effects are sometimes small and task-specific (Filippin and Crosetto, 2016). For the task employed in the present paper gender differences were consistently observed such that we expect to see them also reflected in individual choices.

Hypothesis 1: IC is higher for men than for women

In the group setting we did not give any instructions to subjects how they should come to the group decision. However, we assume as a benchmark in the decision process the outcome under majority voting. From the political economy literature it is well-known that the median voter determines the outcome of majority voting (Black, 1948). This has also been shown in experimental settings (Ambrus et al., 2015). Assuming that women are more risk averse than men, the median voter is more likely to be female in female dominated groups (FFF & FFM) and male in male dominated groups (FMM & MMM). From Hypothesis 1, we, therefore, get the next hypothesis.

Hypothesis 2: GC increases with the number of male group members.

The main focus of the present paper is to compare individual and group choices. As afore-mentioned, group decisions do not always reflect the individual preferences of its group members and there exists several explanations for that behaviour. The first one is the conformity hypothesis

(Cialdini & Goldstein, 2004; Jagau & Offermann, 2018), which states that people have the strong tendency to adapt their preferences to the majority preferences. This could lead in general to cautious or risky shifts in the groups setting depending on the majority. On the basis of Hypothesis 1 and 2 we would predict that in male (female) dominated groups these majority preferences would tend to be the preferences of the male (female) group members leading the women (men) to adapt their preferences resulting in a risky (cautious) shift as we assume that men are in general more risk taking than women.

The second potential explanation for choice shifts is based on the assumption of diffusion of responsibility in the group context which implies that when an individual makes a risky choice which fails to generate a successful outcome, she might feel responsible for her failure (Wallach et al, 1962, 1964). Eliaz et al. (2006) embedded this assumption into the framework of rank-dependent utility and show that in case the default in a group is the cautious decision, choice shifts tend to go in the cautious direction and vice versa. The default can thereby also be the majority preference. This would lead in our case to the same predictions as the afore-mentioned conformity hypothesis with cautious (risky) shifts in female (male) dominated groups.

An additional layer for choice shifts comes from the risk as value hypothesis (Vidmar, 1970; Bauer and Turner, 1974). This hypothesis proposes that (moderate) risk taking is a socially approved trait. When some subjects learn during the group decision process that they are more risk averse than others they question whether their intended choices are in line with the cultural norm. Therefore, the risky shift is caused by the more risk averse subjects revising their proposed choices to higher riskiness. This would predict a general risky shift which has not been observed in studies based on similar designs as ours. We assume in line with the experimental results of Daly and Wilson (2001) that particularly men change their individual preferences towards higher risk taking in group contexts. This is consistent with the risk as value hypothesis if risk taking is a cultural value mainly for men. It implies that the tendency to risky shifts increases when the median voter is a man. In line with all three theories we formalize the following gender-specific polarization hypothesis.

Hypothesis 3: GC – IC is higher in male than in female dominated groups

IV. Results

A. Individual Choice

The average individual choice is 3.56 (95% CI=[3.34, 3.77]) and in line with Hypothesis 1 we find that men take more risk (mean=4.06, 95% CI=[3.77, 4.36]) than women (mean=3.07, 95% CI=[2.78, 3.36]). In Table 2 the results of ordered Probit regressions with individual choice as dependent variable are depicted. The gender difference is highly statistically significant (at the 1% level). Risk taking also seems to increase with age in our sample. Personality characteristics play a role in the sense that more conscious participants take less risk on average. In order to test whether the group composition has an influence on the subsequent individual decision, we add a dummy variable for single-sex groups, turning one when the group is composed of only men or only women (Models 2-4) and include a variable for the group composition, namely the number of male participants (Model 5) into the regression. Both coefficients (single-sex and number of males) are insignificant and lead to the conclusion that there is no significant group composition effect on the individual choice. This is consistent with the results of Harrison et al. (2013) and allows us to compare group and individual choices in the next subsection.

B. Group Choice

The average group choice is 3.55 (95% CI = [3.17, 3.94] and in a first step we compare the average group decisions between group types. Figure 2 shows that risk-taking of groups increases with the number of male group members, which is in line with our second hypothesis. A regression analysis with the group choice as dependent variable and number of male group members as independent variable (see Appendix, Table A 3) confirms that the coefficient is highly significant which confirms that risk taking of the group increases with the number of men in the group. This finding supports previous results by Bogan et al. (2013) and particularly by Nieboer (2015).

Purely female groups (FFF) thereby have the lowest mean with 2.68 (95% CI = [2.04, 3.33]) and purely male groups (MMM) have the highest mean with 4.24 (95% CI = [3.61, 4.87]). A pairwise comparison of the means with a two-sample Wilcoxon rank-sum test shows that there is a significant difference between purely male (MMM) and purely female groups (FFF) (z=-3.13, p=0.002) and also between male dominated (FMM) and female dominated groups (FFM) (z=-1.86, p=0.063). The differences between purely female (male) and female (male) dominated groups is however not statistically significant. This pattern is in line with the median voter theorem. If men are consistently more risk tolerant than women, the median voter theorem implies a strong difference between FFM and FMM, but no differences between FFF and FFM or FMM and MMM.

TABLE 2 ORDERED PROBIT REGRESSIONS WITH INDIVIDUAL CHOICE AS DEPENDENT VARIABLE

	Model 1	Model 2	Model 3 Women only	Model 4 Men only	Model 5 Group types
Female	-0.611***	-0.604***			-0.523***
	(0.15)	(0.15)			(0.20)
Age (in years)	0.068**	0.064**	0.075*	0.042	0.063**
	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)
Singlesex		-0.227	-0.331	-0.142	
		(0.17)	(0.23)	(0.23)	
Male=0 (FFF)					Reference group
Male=1 (FFM)					0.290
					(0.24)
Male=2 (FMM)					0.308
					(0.29)
Male=3 (MMM)					0.151
					(0.31)
Neuroticism	-0.003	-0.004	-0.013	0.002	-0.004
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Extraversion	0.015	0.015	0.013	0.016	0.015
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Openness	-0.002	-0.002	0.000	-0.002	-0.002
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Agreeableness	-0.001	-0.002	-0.012	0.006	-0.002
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Consciousness	-0.021***	-0.022***	-0.026**	-0.020*	-0.022***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	1.628	1.261	0.884	1.677	1.540
	(1.10)	(1.18)	(1.61)	(1.65)	(1.11)
No. of Obs.	240	240	127	113	240
Pseudo R2	0.045	0.048	0.042	0.018	0.049
Prob > chi2/F	0.000	0.000	0.015	0.422	0.000

Notes: Standard errors are clustered at the group level and are given in parenthesis,

Significance level: * p<0.10, ** p<0.05, *** p<0.010.

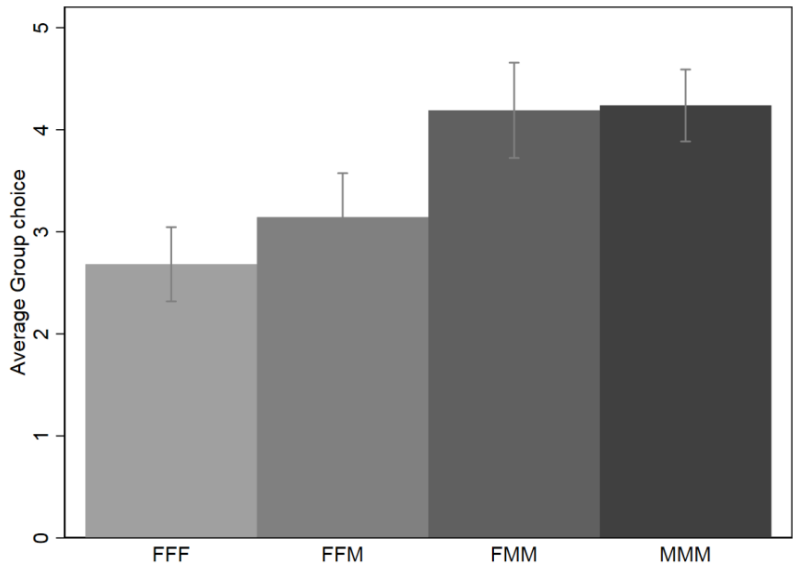

FIGURE 2 AVERAGE GROUP CHOICES BY GROUP TYPES.

Notes: The grey whiskers indicate the 95% confidence interval.

In the following we continue with our analysis by comparing female dominated (FFF and FFM) and male dominated groups (FMM and MMM). Figure 3 depicts the average group choice by female and male dominated groups and shows that male dominated groups take significantly more risk. The average difference between the groups is more than one step in our lottery choice task (male dominated 4.21, 95% CI=[3.70, 4.74] and female dominated 2.91, 95% CI=[2.40, 3.41]) and are significantly different (Two-sample Wilcoxon rank-sum test ($z = -3.494$, $p<0.001$)).

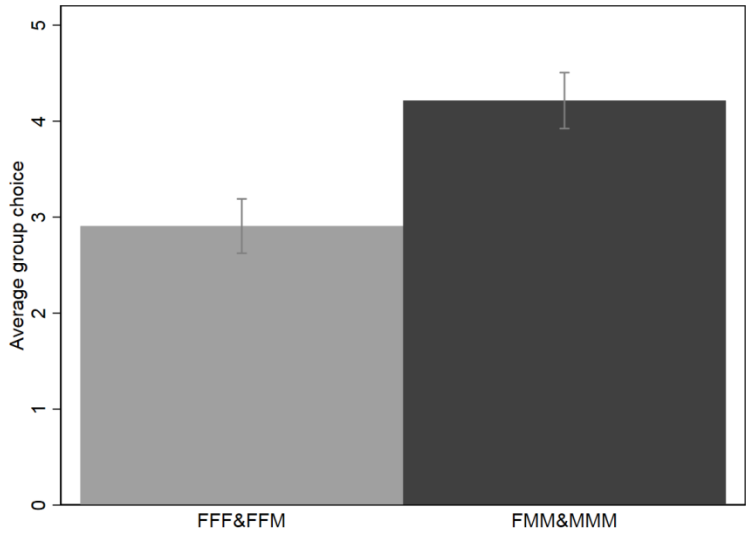

FIGURE 3 AVERAGE GROUP CHOICES BY FEMALE/MALE DOMINATED GROUPS.

Notes: The grey whiskers indicate the 95% confidence interval.

To provide further insight into the group choice we conducted ordered Probit regressions with the group choice as dependent variable and male dominated as independent variable (Table 3, Model 1). The coefficient is highly significant and confirms that risk taking of the group is higher in male dominated groups. This effect remains significant when controlling for the average of the group member's individual choices (Model 2) and the group median (Model 4). The positive coefficient for the average individual choice and group median shows, as expected, that the groups' risk taking increases with the individual choices of the group members. The fact that the adjusted R2 increases substantially from Model 1 to Model 2 (Model 4) and Model 3 (Model 5) further shows that the average (median) individual choice explains a rather large proportion of variation in the group choice. All other control variables added (group averages of highest degree, age, happiness, number of siblings – Model 3) do not alter the results and turn out to be statistically insignificant.

C. Choice Shifts and Polarization

The main focus of our paper relies on the impact of the group composition on choice shifts. When comparing the average group choice (3.55, 95% CI = [3.17, 3.94]) to the average individual choice (3.56, 95% CI=[3.34, 3.77]) in Table 4, we find no significant differences and therefore no general risky or cautious shift in our data. However, when differentiating between group types we find that, in line with Hypothesis 3, the difference between group and individual choice (GC – IC) is substantially higher in male than in female dominated groups (Table 5, Rows 2 and 3). A Wilcoxon test confirms that this pattern is significant at the 5%-level (z = -2.05). It is important to note that while the difference (GC-IC) is negative in female dominated groups, implying that the group choice is on average more risk averse than the average individual choice, it is positive for male dominated groups, implying that group members in male dominated groups are willing to take more risk in the group than they would be willing individually on average. Rows 4 to 7 show that this pattern is consistent over all group compositions separately, i.e. negative difference for FFF and FFM and positive difference for FMM and MMM.

TABLE 3 ORDERED PROBIT REGRESSIONS WITH GROUP CHOICE AS DEPENDENT VARIABLE AND MALE DOMINATED AS INDEPENDENT VARIABLE PLUS CONTROLS.

	Model 1	Model 2	Model 3	Model 4	Model 5
Male dominated groups (FMM & MMM)	0.852*** (0.24)	0.588** (0.25)	0.537** (0.25)	0.583** (0.25)	0.552** (0.25)
IC		0.560***	0.616***		
(group mean)		(0.11)	(0.12)		
IC				0.461***	0.489***
(group median)				(0.09)	(0.10)
Age			-0.071		-0.047
(group mean)			(0.05)		(0.05)
Degree			-0.087		-0.152
(group mean)			(0.27)		(0.27)
Happiness			-0.199		-0.163
(group mean)			(0.18)		(0.18)
Siblings			-0.139		-0.141
(group mean)			(0.19)		(0.18)
No. of Obs.	85	85	85	85	85
Psd. R2	0.045	0.133	0.150	0.135	0.147
Prob > chi2/F	0.000	0.000	0.000	0.000	0.000

Notes: Regressions at the group level, Standard errors in parenthesis, Significance level: * p<0.10, ** p<0.05, *** p<0.010

In Table 2 it was shown that IC is not significantly influenced by the gender composition of the group a subject was assigned to. In order to reconfirm that the pattern we observe is not caused by biased measurement of IC we report in the fourth column of Table 4 hypothetical values of IC. These were constructed as follows: We took average values of IC for men and women over all groups. These averages obviously cannot be biased by group membership. Hypothetical IC for each group can now be calculated by taking the weighted sum of the average of females (3.07) and males (4.06) according to the respective group composition. It turns out that the pattern we observed with IC is rather similar to those which would be obtained by Hypothetical IC. In all cases there is a cautious shift for female dominated groups and a risky shift for male dominated ones.

These trends we observe, when comparing the means, is also visible when we look in Table 5 at the general frequencies and the sizes of choice shifts. Although we find no differences between average GC and IC, we find that a large share (ca. 78 percent) of the groups exhibits choice shifts when comparing the GC to the average IC. 38.82 percent of the groups hereby show risky shifts and 40 percent cautious shifts. The average size of the shifts is more than one step in our lottery task. When differentiating between male and female dominated groups the dominant pattern we consistently observe is, that male dominated groups far more often exhibit risky shifts, while female dominated groups more often exhibit cautions shifts.

TABLE 4 COMPARING GROUP AND INDIVIDUAL CHOICE

	Group type	GC	IC	GC – IC	Hypothetical IC	GC – Hypo. IC	N
1	All	3.55 [3.17, 3.94]	3.56 [3.34, 3.77]	0	3.55	0	254
2	Female dom. (FFF & FFM)	2.91 [2.41, 3.41]	3.18 [2.89, 3.46]	- 0.27	3.23	-0.32	129
3	Male dom. (FMM & MMM)	4.21 [3.70, 4.73]	3.95 [3.64, 4.26]	0.26	3.89	0.32	125
4	FFF	2.68 [2.04, 3.33]	2.82 [2.44, 3.20]	- 0.14	3.07	-0.39	66
5	FFM	3.14 [2.38, 3.91]	3.56 [3.15, 3.96]	- 0.42	3.40	-0.26	63
6	FMM	4.19 [3.36, 5.02]	4.02 [3.56, 4.48]	0.17	3.73	0.46	63
7	MMM	4.24 [3.61, 4.87]	3.89 [3.47, 4.30]	0.35	4.06	0.18	62

Notes: 95% confidence intervals in parenthesis.

TABLE 5 FREQUENCY AND SIZE OF CHOICE SHIFTS

	Group type	Aggregation form	Cautious shift		No choice shift	Risky shift	
			Freq.	Size	Freq.	Freq.	Size
1	All	Mean	34 (40%)	-1.28	18 (21.18%)	33 (38.82%)	1.32
		Median	16 (18.82 %)	-2.19	51 (60 %)	18 (21.18%)	1.92
2	Female dom. (FFF & FFM)	Mean	22 (51.16%)	-1.26	8 (18.60%)	13 (30.23%)	1.23
		Median	10 (23.26%)	-2.2	25 (58.14%)	8 (18.60%)	1.75
3	Male dom. (FMM & MMM)	Mean	12 (18.57%)	-1.33	10 (23.81%)	20 (47.62%)	1.38
		Median	6 (14.29%)	-2.17	26 (61.90%)	10 (23.81%)	2.05

In a next step we proceed by analysing the difference between group and individual choice in more detail. We conduct OLS regressions and first take the difference between GC and mean IC (median IC) as the dependent variable. In Model 1 (Model 3) we analyse the shift from individual to the group decision at the group level and find that switching from female to male dominated groups significantly increases the difference between group choice and individual choice, thereby confirming Hypothesis 3. Consequently, a risky shift is more likely in male dominated groups. We control in Model 1 (Model 3) also for the mean (median) individual choice of the group and find a negative correlation (significant negative for the median IC). In case of general polarization one would expect a cautious shift for groups with a low mean IC and a risky shift for groups with a high mean IC. Consequently, the coefficient for mean IC should be significantly positive. Since this is not the case we can conclude that there is no general pattern of polarization in our data

Table 6 OLS regressions with group shift as dependent variable

	Model 1 GC – mean(IC)	Model 2 GC – IC	Model 3 GC – median(IC)	Model 4 GC – IC
Male dominated groups	0.740**	1.314***	0.729**	1.256***
(FMM & MMM)	(0.32)	(0.41)	(0.32)	(0.42)
IC	-0.255*	-0.254		
(Group mean)	(0.13)	(0.16)		
IC			-0.386***	-0.140
(Group median)			(0.11)	(0.14)
Female		0.738**		0.756**
		(0.30)		(0.30)
Age		-0.068		-0.075
		(0.06)		(0.06)
Degree		-0.044		-0.043
		(0.16)		(0.16)
Siblings		-0.119		-0.127
		(0.08)		(0.08)
Happiness		-0.166		-0.162
		(0.13)		(0.13)
Consciousness		0.020*		0.022*
		(0.01)		(0.01)
Constant	0.540	1.468	1.008**	1.152
	(0.47)	(1.35)	(0.39)	(1.35)
No. of Obs.	85	240	85	240
Adj. R2	0.056	0.089	0.132	0.076
Prob > chi2/F	0.035	0.005	0.001	0.007

Notes: Model 1 and Model 3 - Regression at the group level, Model 2 and Model 4– Regression at the individual level and clustered at the group level, Standard errors are given in parenthesis, Significance level: * p<0.10, ** p<0.05, *** p<0.010

We further investigate the determinants of the observed difference between group and individual decision at the individual level (Model 2 and Model 4). Here we take the difference between the group and the individual choice as the dependent variable. Also this regression confirms a significant increase in GC-IC when switching from female to male dominated groups, indicating a gender-specific polarization. We further find that two other variables influence the difference between group and individual choice significantly, female and consciousness. From Table 2 we know that females and more conscious subjects have lower values of IC which leads to higher values of GC-IC and explains the sign of the coefficient.

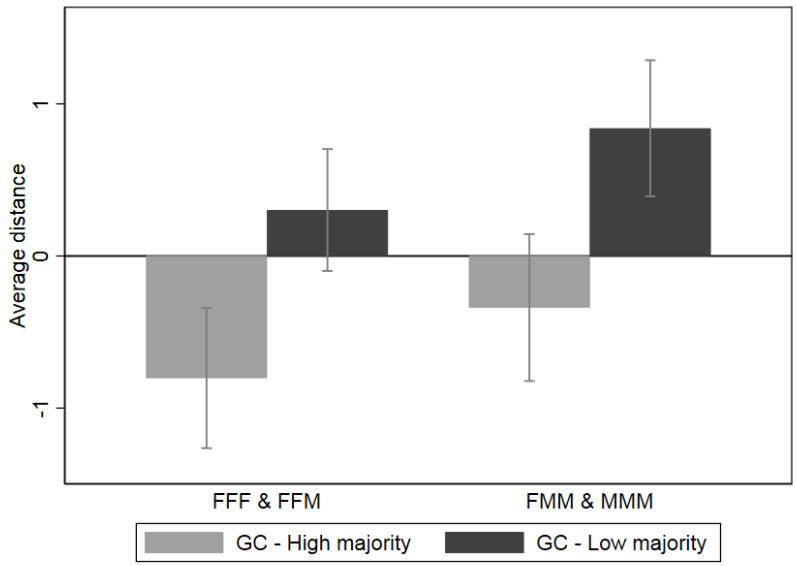

FIGURE 4 AVERAGE DISTANCE BETWEEN HIGH (LOW) MAJORITY AND THE GC.

Notes: The grey whiskers indicate the 95% confidence interval.

To gain further insights, Figure 4 shows the average distance between the group choice and the potential majorities in the group for male (female) dominated groups. Majorities in general are the median voter and one other group member, which could have in general higher or lower risk preferences. By comparing the distances we can examine whether and which majority is driving the group decision in male (female) dominated groups and we find that in female dominated groups the distance between GC and low majority is smaller and in male dominated groups the distance between GC and high majority is smaller. This indicates that in male dominated groups the more risk seeking group members drive the decision while in female dominated groups the opposite is the case. These results are in line with the theories discussed in Section 2. The conformity and the responsibility hypothesis state that group members conform towards the majority preferences. We can show that these majorities are different in male and female dominated groups and therefore they exhibit different choice shifts. The results also give support for our assumption that particularly men revise their proposed choices to higher riskiness.

V. Discussion

Our study has shown that the gender composition of groups has a systematic impact on their choice behaviour between risky options and the pattern of choice shifts. The fact that women are more risk averse than men for our elicitation method is reflected also in group choices as a lower fraction of female group members leads to increased risk taking. This result is in line with previous findings by Nieboer (2015). Overall, we do not observe differences between individual and group decisions. Both make on average equally risky choices. However, we do find choice shifts when we

take account of the group composition. Here a clear pattern emerges: while male dominated groups shift to higher riskiness the opposite is true for female dominated ones. This pattern supports our gender-specific polarization hypothesis.

While our evidence is rather clear-cut, it may, nevertheless, be sensitive with respect to the elicitation method. Filippin and Crosetto (2016) showed that gender differences in risk taking are particularly pronounced for elicitation methods which involve, as ours, a safe option. In the absence of such an option gender differences are minor which should also reduce the effects of group composition. Also the direction of group shifts seems to depend on the elicitation method. While we do not observe a general shift in our data other studies which also employ monetary incentives did. Pairwise choice, elicitation of willingness-to-pay, and the Holt-Laury method generated a cautious shift in previous studies (Masclet et al., 2009; Baker et al. 2008; Shupp and Williams, 2008; Pahlke et al., 2012). In contrast, for the investment game of Gneezy and Potters (1997) risky shifts were observed (Sutter, 2009; Nieboer, 2015). It is an open question for future research which impact gender composition will have under these alternative elicitation methods. An open question is also the behaviour of gender-balanced groups which were not taken into account by our study.

VI. Conclusion

The introduction of gender quotas in many countries motivated studies on the economic impact of gender quotas and the question how a rising share of women in committees will impact their decision making. In this paper we focus on the impact of changing gender composition of groups on one main characteristic of many firm decisions, the fact that they involve risk. By using a simple lottery choice experiment under monetary incentives, we find that risk taking increases with an increasing share of male group members and is therefore higher in male than in female dominated groups. Additionally, we observe risky shifts for male dominated groups, while female dominated groups take less risk than individual group members.

These results are important in several ways. First, we contribute to the literature on group decision making as we show that the gender composition of a group has an impact on group decision making under risk. Second we contribute to the literature on choice shifts by showing that gender is one important determinant for choice shifts. The differences between groups of varying gender composition might help to explain the mixed evidence on choice shifts found in the literature. Finally, our results are important for policy makers as the systematic impact of gender composition on group decision making points into the direction that gender quotas can well be expected to change decision making under risk in the group context. In our simple design with groups of three subjects an increasing share of women decreases risk taking of groups. However a

majority of females was necessary to reduce risk taking of groups significantly and to prevent risky shifts. Risky shifts may be regarded as excessive risk taking as a group decides to take more risk than the group members would have done individually, thereby creating a potentially undesired bias towards higher risk taking.

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APPENDIX

TABLE A 1: RANDOMIZATION FEMALES

Variable	Group type			T-Test (two-sided)		
	FFF	FFM	FMM	FFF vs. FFM	FFF vs. FMM	FMM vs. FFM
Individual choice	2.82 (SD 1.58)	3.36 (SD 1.67)	3.29 (SD 1.98)	0.09*	0.27	0.88
Age	23.36 (SD 3.2)	25.6 (SD 8.36)	24.57 (SD 2.64)	0.05*	0.12	0.59
Degree	1.44 (SD .98)	1.6 (SD 1.11)	1.91 (SD 1.09)	0.45	0.07*	0.3
Happiness	3.96 (SD 1.04)	3.48 (SD 1.25)	3.71 (SD 1.35)	0.03**	0.4	0.49
Happiness today	3.61 (SD 1.14)	3.38 (SD 1.32)	3.62 (SD 1.36)	0.35	0.97	0.51
No. Siblings	1.46 (SD 1.23)	1.74 (SD 1.53)	1.52 (SD 1.12)	0.29	0.82	0.57
Neuroticism (NStd)	48.26 (SD 9.12)	48.8 (SD 9.57)	50.29 (SD 8.71)	0.77	0.37	0.56
Extraversion (Estd)	49.02 (SD 9.26)	50.7 (SD 10.26)	49.95 (SD 7.02)	0.39	0.67	0.77
Openness (Ostd)	46.02 (SD 11.86)	48.45 (SD 11.31)	46.67 (SD 7.95)	0.3	0.82	0.52
Agreeableness (VStd)	52.36 (SD 9.71)	55.18 (SD 11.27)	54.67 (SD 8.21)	0.18	0.33	0.86
Consciousness (GStd)	51.5 (SD 8.72)	52.18 (SD 11.69)	55.67 (SD 9.13)	0.74	0.06*	0.24

Notes: Significance level: * p<0.10, ** p<0.05, *** p<0.010.

TABLE A 2: **RANDOMIZATION MALES**

Variable	Group type			T-Test(two-sided)		
	MMM	FMM	FFM	MMM vs. FMM	MMM vs. FFM	FMM vs. FFM
Individual choice	3.89 (SD 1.67)	4.38 (SD 1.7)	3.95 (SD 1.57)	0.15	0.88	0.34
Age	23.19 (SD 3.58)	24.07 (SD 3.6)	23.91 (SD 3.38)	0.22	0.43	0.86
Degree	1.37 (SD 0 .95)	1.45 (SD 0.97)	1.1 (SD 0.63)	0.67	0.22	0.13
Happiness	3.84 (SD 1.04)	3.83 (SD 1.17)	3.95 (SD 1.20)	0.98	0.68	0.71
Happiness today	3.69 (SD 0.99)	3.64 (SD 1.21)	3.62 (SD 0.97)	0.82	0.77	0.94
No. Siblings	1.42 (SD 1.18)	1.31 (SD 1.05)	1.43 (SD 1.29)	0.63	0.98	0.7
Neuroticism (NStd)	48.26 (SD 9.38)	47.33 (SD 10.89)	48.05 (SD 7.09)	0.65	0.93	0.79
Extraversion (Estd)	51.84 (SD 8.28)	51.83 (SD 9.75)	50.48 (SD 10.92)	0.998	0.55	0.62
Openness (Ostd)	48.87 (SD 8.35)	48.52 (SD 10.50)	48.67 (SD 11.35)	0.85	0.93	0.96
Agreeableness (VStd)	50.23 (SD 10.40)	51.36 (SD 10.34)	52.57 (SD 11.04)	0.59	0.38	0.67
Consciousness (GStd)	51.35 (SD 9.75)	52.16 (SD 10.99)	48.28 (SD 9.99)	0.71	0.25	0.21

Notes: Significance level: * p<0.10, ** p<0.05, *** p<0.010.

TABLE A 3: ORDERED PROBIT REGRESSIONS WITH GROUP CHOICE AS DEPENDENT VARIABLE AND NUMBER OF MALE GROUP MEMBERS AS INDEPENDENT VARIABLE PLUS CONTROLS

	Model 1	Model 2	Model 3
Nb. of male group	0.370***	0.237**	0.215*
Members	(0.10)	(0.11)	(0.11)
IC		0.558***	0.616***
(group mean)		(0.11)	(0.12)
Degree			-0.047
(group mean)			(0.27)
Age			-0.077
(group mean)			(0.05)
Happiness			-0.180
(group mean)			(0.18)
Siblings			-0.147
(group mean)			(0.19)
Constant	1.374***	3.331***	0.719
	(0.23)	(0.47)	(1.30)
No. of Obs.	85	85	85
Pseudo R2	0.043	0.130	0.147
Prob > chi2/F	0.000	0.000	0.000

Notes: Regressions at the group level, Standard errors in parenthesis, Significance level: * p<0.10, ** p<0.05, *** p<0.010

TABLE A 4: ORDERED PROBIT REGRESSIONS WITH GROUP CHOICE AS DEPENDENT VARIABLE AND GENDER DOMINATION AS INDEPENDENT VARIABLE PLUS CONTROLS (IC GROUP MEDIAN).

	Model 1	Model 2	Model 3
Male dominated groups	0.852***	0.583**	0.552**
(FMM & MMM)	(0.24)	(0.25)	(0.25)
IC		0.461***	0.489***
(group median)		(0.09)	(0.10)
Degree			-0.047
(group mean)			(0.05)
Age			-0.152
(group mean)			(0.27)
Happiness			-0.163
(group mean)			(0.18)
Siblings			-0.141
(group mean)			(0.18)
Constant	1.246***	2.932***	0.848
	(0.21)	(0.41)	(1.31)
No. of Obs.	85	85	85
Pseudo R2	0.045	0.135	0.147
Prob > chi2/F	0.000	0.000	0.000

Notes: Regressions at the group level, Standard errors in parenthesis, Significance level: * p<0.10, ** p<0.05, *** p<0.010

TABLE A 5: OLS REGRESSIONS WITH GROUP SHIFT AS DEPENDENT VARIABLE

	Model 1 GC – mean(IC)	Model 2 GC - IC
Male dominated groups	0.659**	1.256***
(FMM & MMM)	(0.33)	(0.42)
IC	-0.121	-0.140
(Group median)	(0.11)	(0.14)
Gender		0.756**
		(0.30)
Age		-0.075
		(0.06)
Degree		-0.043
		(0.16)
Siblings		-0.127
		(0.08)
Happiness		-0.162
		(0.13)
Consciousness		0.022*
		(0.01)
Constant	0.103	1.152
	(0.40)	(1.35)
No. of Obs.	85	240
Adj. R2	0.027	0.076
Prob > chi2/F	0.121	0.007

Notes: Model 1 - Regression at the group level, Model 2 – Regression at the individual level and clustered at the group level, Standard errors are given in parenthesis, Significance level: * p<0.10, ** p<0.05, *** p<0.010.

Supplemental material for referees

Group decision: Instruction first round

The following text was read to each group of three:

Das ist eine ökonomische Studie, in der du die Chance hast, durchschnittlich €6,50 zu gewinnen und auf jeden Fall €2 erhältst. Es werden zwei Runden gespielt, in denen du Entscheidungen treffen musst. Am Ende der Studie wird eine der beiden Runden zufällig ausgelost und du wirst nur für die Entscheidung in dieser Runde ausbezahlt. Beide Runden haben die gleiche Wahrscheinlichkeit ausgelost und somit für deine Auszahlung relevant zu werden, also überlege dir deine Entscheidung bitte in beiden Runden sorgfältig.

In der ersten Runde wirst du zufällig einer Gruppe von 3 Leuten zugewiesen. Ihr müsst zu einer einstimmigen Entscheidung kommen. Eure Gruppe muss sich über die Lotterie einig werden, die ihr spielen wollt.

Ihr bekommt die Möglichkeit aus 6 Lotterien genau eine auszuwählen. Die Lotterien sind dargestellt mit Münzen und jede Münze hat zwei Seiten – orange und pink – auf denen Euro Beträge abgebildet sind. Egal für welche Münze du dich entscheidest, du hast immer eine 50% Chance, die orangene Seite ausbezahlt zu bekommen, und eine 50% Chance die pinke Seite ausbezahlt zu bekommen. Falls diese Runde zufällig für die Auszahlung relevant wird, werdet ihr entsprechend euerer Gruppenentscheidung ausbezahlt. Eine Münze wird geworfen und je nachdem, welche Seite nach oben zeigt, erhält die Gruppe den Betrag (in Euro), der auf der Münze angezeigt wird. Dieser Betrag wird gleichmäßig unter den Gruppenmitgliedern aufgeteilt.

Trefft jetzt bitte eure Gruppenentscheidung und sucht eine der Münzen aus.

Translation:

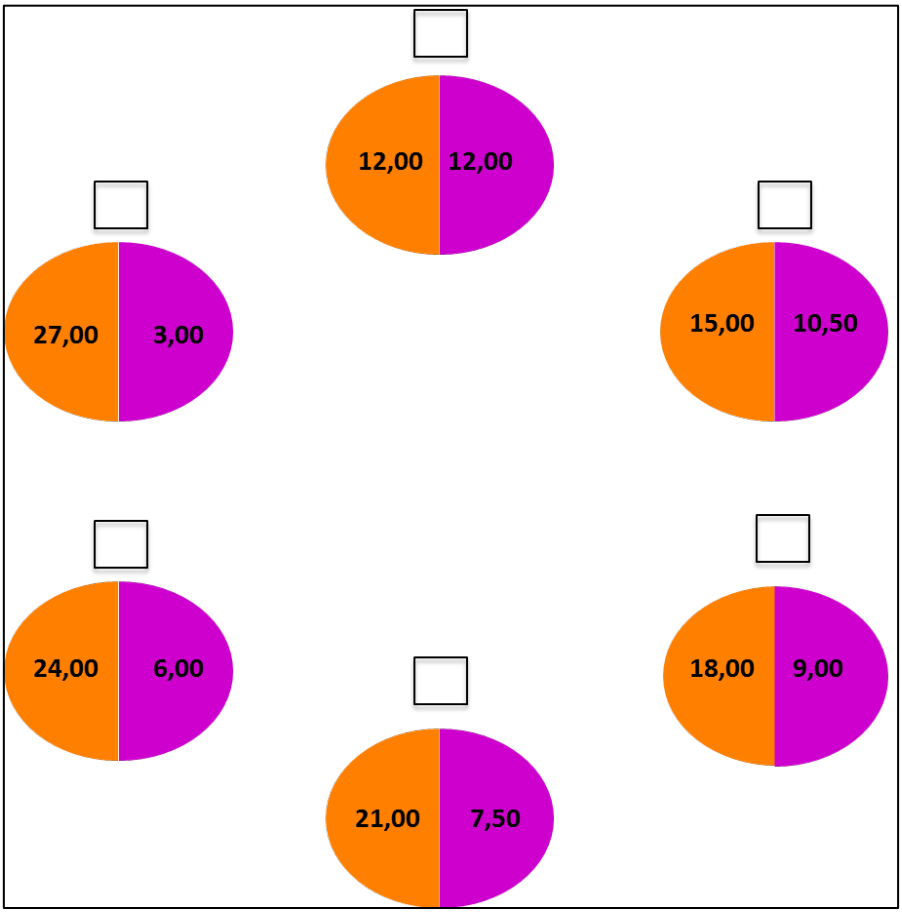
This is an economic study in which you have the chance to win on average €6.50 and in any case you will receive €2. There will be two rounds in which you have to make choices. At the end of the study one of the two rounds will be randomly drawn and you will be paid according to your choice in that round. The rounds are equally likely to be drawn, so please make your choices carefully in both rounds.

In the first round you will be randomly assigned to a group of 3 people. You will have to reach a consensus. Your group has to agree on a lottery that you want to play.

You will have the possibility to choose one out of 6 lotteries. The lotteries are represented by coins and each coin has two sides - orange and pink - on which Euro amounts are shown. No matter which coin you choose, there is always a 50 % chance of the orange side to be drawn, and a 50 % chance of the pink side to be drawn. If this round is randomly chosen for payoff, you will be paid according to your groups' decision. A coin will be flipped and depending on which side is facing up you will receive the amount (in Euros) displayed on the coin. This amount will be split evenly among the group members.

Please, make your group decision now and select one coin.

Subsequently, the group was given a laminated card with the following illustration. On the basis of this card the group was supposed to come to a consensus on the decision



After the group had communicated their decision to the experimenter, each group member was handed the following questionnaire with the request to fill it out privately.

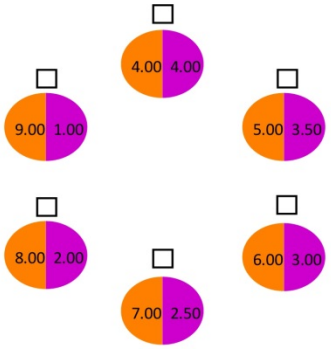
Individual decision: Instruction second round

Participant ID_____

Individuelle Runde und Fragebogen

In der zweiten Runde triffst du eine individuelle Entscheidung: Du sollst wieder genau eine der 6 Lotterien auswählen. Du darfst in dieser Runde nicht mit anderen Teilnehmern sprechen. Falls diese Runde zufällig für die Auszahlung relevant wird, wirst du entsprechend deiner individuellen Entscheidung ausbezahlt. Wie in der ersten Runde wird eine Münze geworfen, die die Auszahlung aller Gruppenmitglieder gemäß der individuell gewählten Lotterien determiniert. Die endgültige Auszahlung erhältst du in einem Briefumschlag, sodass die anderen Gruppenmitglieder deine ausbezahlte Summe nicht sehen können.

Triff jetzt bitte deine Entscheidung und suche eine der Münzen aus.



Fragebogen

Bitte beantworte die folgenden Fragen.

1. Geschlecht: □ Männlich □ Weiblich

2. Alter: _____

3. Höchster akademischer Abschluss: _____

4. Wie viele Geschwister hast du, mit denen du zusammen aufgewachsen bist? _____

5. Hast du… □ keine Geschwister □ keine Geschwister mit denen ich aufgewachsen bin
□ nur jüngere Geschwister □ ältere und jüngere Geschwister □nur ältere Geschwister

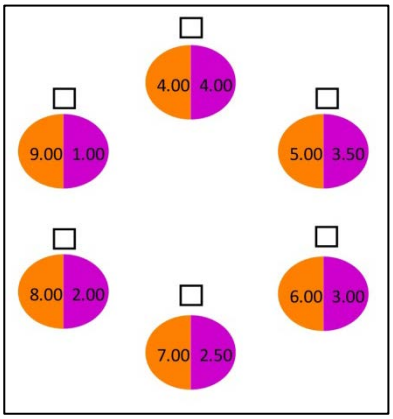
	1=Ich stimme gar nicht zu	2	3	4	5=Ich stimme voll und ganz zu
6. Mein Leben läuft gut.	□	□	□	□	□
7. Meine Leben ist besser als das der anderen meines Alters.	□	□	□	□	□
8. Heute bin ich glücklich.	□	□	□	□	□
9. Ich bin zufrieden mit der Gruppenentscheidung.	□	□	□	□	□

Auf den nächsten Seiten findest du einen Fragebogen mit Fragen zu deiner Persönlichkeit. Der Persönlichkeitsfragebogen umfasst 60 Aussagen, welche sich zur Beschreibung deiner eigenen Person eignen könnten. Lies bitte jede dieser Aussagen aufmerksam durch und überleg dir, ob diese Aussage auf dich persönlich zutrifft oder nicht. Zur Bewertung jeder der 60 Aussagen stehen dir eine fünffach abgestufte Skala zu Verfügung. Kreuze bitte an.
Es gibt bei diesem Fragebogen keine richtigen oder falschen Antworten, und du musst kein Experte (keine Expertin) sein, um den Fragebogen angemessen beantworten zu können. Du erfüllst den Zweck der Befragung am besten, wenn du die Fragen so wahrheitsgemäß wie möglich beantwortest.

Translation:

In the second round, you will make an individual decision: Again you should choose one of the 6 lotteries. You cannot talk to the other participants in this round. If this round is randomly chosen for payoff you will be paid according to your individual decision. As in the first round a coin will be flipped, which will determine the payoff of all group members according to their individually selected lotteries. You will receive your final pay out in an envelope, so the other group members cannot see your payoff.

Please make your decision now and select one of the coins.



Questionnaire

Please answer the following questions.

1. Sex: □ Male □ Female

2. Age: _____

3. Highest academic degree: _____

4. How many siblings do you with whom you have grown up with? _____

5. Do you have… □ no siblings □ no siblings with whom I grew up □ only younger siblings □ older and younger siblings □ only older siblings

	1=I agree not at all	**2**	**3**	**4**	**5=I fully agree**
6. My life is going well.	□	□	□	□	□
7. My life is better than that of others of my age.	□	□	□	□	□
8. Today I am happy.	□	□	□	□	□
9. I am satisfied with the group decision.	□	□	□	□	□

On the following pages you will find a questionnaire with questions about your personality. The personality questionnaire includes 60 statements that could be used to describe your own person. Please read each of these statements carefully and consider whether this statement applies to you personally or not. To evaluate each of the 60 statements, you have a five-tier graduated scale. Please tick. There are no right or wrong answers to this questionnaire and you do not have to be an expert to answer the questionnaire appropriately. You best fulfil the purpose of the survey, if you answer the questions as truthfully as possible.