

**Online Appendix of**

Group decision rules and group rationality under risk

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July 2015

**A. Robustness with respect to the clustering of standard errors and to the coding of choices for minority subjects**

The following three tables display alternative specifications for the regression reported for group vs. individual choices in Table 8, 9 and 10 respectively. The first row indicates whether we analyzed the choice made by the group in stage 2 of the M-treatment or the choice reported by each group member (a minority subject could indicate disagreement). The second row indicates whether standard errors were clustered at the individual participant level or at the group level.

**Table A1:** Alternative probit regressions for the NTSD tasks (Group vs. individual choices)

Choices in stage 2 for the M-treatment	group	reported	reported
Standard errors clustered by	groups	individuals	groups
<i>stage2</i>	.06*	.06	.06*
<i>stage3</i>	.13***	.13**	.13***
<i>majority</i>	-.09	-.09	-.09
<i>unanimity</i>	-.17	-.17*	-.17
<i>stage2*majority</i>	.02	.02	.02
<i>stage2*unanimity</i>	-.16	-.16	-.16
<i>stage3*majority</i>	-.02	-.02	-.02
<i>stage3*unanimity</i>	-.11	-.11	-.11
<i>majority*dominance_discussion</i>	.24**	.24**	.24**
<i>unanimity*dominance_discussion</i>	.12	.12	.12
<i>stage2*majority*dominance_discussion</i>	.44***	.44***	.44***

<i>stage2*unanimity*dominance_discussion</i>	.84***	.84***	.84***
<i>stage3*majority*dominance_discussion</i>	.34**	.34***	.34**
<i>stage3*unanimity*dominance_discussion</i>	.47***	.47***	.47***
<i>No. of observations</i>	2340	2340	2340
<i>Wald chi2</i>	255.73	149.69	255.73
<i>p-value</i>	0.00	0.00	0.00

*Note:* Reported numbers are the marginal effects at the means of covariates.

\* indicates significant at 10% (two-sided test)

\*\* indicates significant at 5% (two-sided test)

\*\*\* indicates significant at 1% (two-sided test)

**Table A2:** Alternative multinomial probit results on CC tasks

Choices in stage 2 for the M-treatment	group			reported			reported		
Errors clustered by	groups			individuals			groups		
Choice pattern	SS	RR	RS	SS	RR	RS	SS	RR	RS
<i>stage2</i>	0.02	0.08	-0.10**	0.02	0.08	-0.10*	0.02	0.08	-0.10**
<i>stage3</i>	0.06**	-0.01	-0.06	0.06**	-0.01	-0.06	0.06**	-0.01	-0.06
<i>majority</i>	-0.02	-0.04	0.07	-0.02	-0.04	0.07	-0.02	-0.04	0.07
<i>unanimity</i>	-0.04	-0.02	0.07	-0.04	-0.02	0.07	-0.04	-0.02	0.07
<i>stage2*majority</i>	-0.10*	0.03	0.07	-0.09**	0.05	0.03	-0.09*	0.05	0.03
<i>stage2*unanimity</i>	-0.29***	0.25***	0.04	-0.29***	0.25***	0.04	-0.29***	0.25***	0.04
<i>stage3*majority</i>	-0.05	0.00	0.05	-0.05	0.00	0.05	-0.05	0.00	0.05
<i>stage3*unanimity</i>	-0.05	-0.00	0.05	-0.04	-0.00	0.05	-0.05	-0.00	0.05
<i>No. of observations</i>		1481			1481			1481	
<i>Wald chi2</i>		79.40			90.12			85.04	
<i>p-value</i>		0.00			0.00			0.00	

*Note:* Reported numbers are the marginal effects at the means of covariates.

\* indicates significant at 10% (two-sided test)

\*\* indicates significant at 5% (two-sided test)

\*\*\* indicates significant at 1% (two-sided test)

**Table A3:** Alternative multinomial probit results on CR tasks

Choices in stage 2 for the M-treatment	group			reported			reported		
Errors clustered by	groups			individuals			groups		
Choice pattern	SS	RR	SR	SS	RR	SR	SS	RR	SR
<i>stage2</i>	-0.04	0.05	-0.01	-0.04	0.05	-0.01	-0.04	0.05	-0.01
<i>stage3</i>	-0.00	0.05	-0.05	-0.00	0.05	-0.05	-0.00	0.05	-0.05
<i>majority</i>	-0.07	0.05	0.02	-0.07	0.05	0.02	-0.07	0.05	0.02
<i>unanimity</i>	-0.10	0.03	0.07	-0.10*	0.04	0.07	-0.10	0.03	0.07
<i>stage2*majority</i>	-0.19**	0.03	0.16*	-0.15***	0.03	0.12*	-0.15***	0.03	0.12*
<i>stage2*unanimity</i>	-0.19**	0.04	0.14*	-0.19***	0.04	0.15*	-0.19**	0.04	0.15*
<i>stage3*majority</i>	-0.08	0.01	0.07	-0.08	0.01	0.07	-0.08	0.01	0.07
<i>stage3*unanimity</i>	-0.10*	0.02	0.09	-0.10*	0.02	0.09	-0.10*	0.02	0.09
<i>No. of observations</i>		2202			2197			2197	
Wald chi2		41.52			54.74			41.52	
<i>p-value</i>		0.00			0.00			0.00	

*Note:* Reported numbers are the marginal effects at the means of covariates.

\* indicates significant at 10% (two-sided test)

\*\* indicates significant at 5% (two-sided test)

\*\*\* indicates significant at 1% (two-sided test)

**B. Logit regressions**

The following three tables are the logit equivalents of Tables 8, 9, and 10.

**Table B1:** Logit regressions for the NTSD tasks

	Group vs. individual choices	Group vs. simulated choices
<i>stage2</i>	.06 (.04)	.14** (.07)
<i>stage3</i>	.13** (.06)	
<i>majority</i>	-.09 (.09)	-.05 (.17)
<i>unanimity</i>	-.17* (.10)	-.18 (.18)
<i>stage2*majority</i>	.02 (.07)	.01 (.12)
<i>stage2*unanimity</i>	-.16 (.11)	-.14 (.15)
<i>stage3*majority</i>	-.02 (.08)	
<i>stage3*unanimity</i>	-.10 (.09)	
<i>majority*dominance_discussion</i>	.24** (.11)	.35* (.18)
<i>unanimity*dominance_discussion</i>	.12 (.12)	.08 (.19)
<i>stage2*majority*dominance_discussion</i>	.50*** (.17)	.64** (.31)
<i>stage2*unanimity*dominance_discussion</i>	.92*** (.18)	.96*** (.26)
<i>stage3*majority*dominance_discussion</i>	.38*** (.15)	
<i>stage3*unanimity*dominance_discussion</i>	.48*** (.14)	
<i>No. of observations</i>	2340	520
<i>Wald chi2</i>	119.87	55.19
<i>p-value</i>	0.00	0.00

*Note:* Reported numbers are the marginal effects at the means of covariates, followed by significance and clustered standard errors between brackets. The standard errors in the left column are clustered at the individual level, and those in the right column are clustered at the group level.

\* indicates significant at 10% (two-sided test)

\*\* indicates significant at 5% (two-sided test)

\*\*\* indicates significant at 1% (two-sided test)

**Table B2:** Multinomial logit regressions for the CC tasks

Choice pattern	Group vs. individual choices			Group vs. simulated choices		
	SS	RR	RS	SS	RR	RS
<i>stage2</i>	.02 (.02)	.08 (.05)	-.11* (.05)	.02 (.03)	.12 (.10)	-.13 (.11)
<i>stage3</i>	.06** (.03)	-.01 (.06)	-.05 (.06)			
<i>majority</i>	-.02 (.06)	-.05 (.07)	.07 (.07)	-.01 (.08)	-.03 (.13)	.04 (.12)
<i>unanimity</i>	-.04 (.06)	-.02 (.07)	.07 (.08)	-.16 (.11)	.04 (.13)	.12 (.13)
<i>stage2*majority</i>	-.10** (.05)	.03 (.07)	.07 (.08)	-.06 (.06)	.02 (.14)	.04 (.14)
<i>stage2*unanimity</i>	-.34 *** (.08)	.26 *** (.08)	.08 (.08)	-.09 (.06)	.17 (.13)	-.08 (.13)
<i>stage3*majority</i>	-.05 (.04)	-.00 (.07)	.05 (.07)			
<i>stage3*unanimity</i>	-.04 (.06)	-.01 (.08)	.05 (.08)			
<i>No. of observations</i>		1481			350	
<i>Wald chi2</i>		74.07			30.14	
<i>p-value</i>		0.00			0.00	

*Note:* Reported numbers are the marginal effects at the means of covariates, followed by significance and clustered standard errors between brackets. The standard errors in the left three columns are clustered at the individual level, and those in the right three columns are clustered at the group level.

\* indicates significant at 10% (two-sided test)  
\*\* indicates significant at 5% (two-sided test)  
\*\*\* indicates significant at 1% (two-sided test)

**Table B3:** Multinomial logit regressions for the CR tasks

Choice pattern	Group vs. individual choices			Group vs. simulated choices		
	SS	RR	SR	SS	RR	SR
<i>stage2</i>	-.04 (.03)	.05 (.04)	-.02 (.06)	-.03 (.04)	.03 (.06)	-.00 (.10)
<i>stage3</i>	-.00 (.03)	.05 (.05)	-.05 (.05)			
<i>majority</i>	-.06 (.06)	.05 (.08)	.01 (.08)	-.06 (.09)	.03 (.12)	.03 (.13)
<i>unanimity</i>	-.10* (.06)	.03 (.08)	.06 (.08)	-.08 (.09)	-.07 (.12)	.16 (.13)
<i>stage2*majority</i>	-.20 *** (.07)	.03 (.06)	.17** (.08)	-.11 (.09)	.06 (.08)	.05 (.13)
<i>stage2*unanimity</i>	-.20*** (.07)	.05 (.07)	.16** (.08)	-.12 (.09)	.15* (.09)	-.03 (.12)
<i>stage3*majority</i>	-.08 (.06)	.01 (.06)	.07 (.08)			
<i>stage3*unanimity</i>	-.11* (.06)	.02 (.06)	.09 (.08)			
<i>No. of observations</i>		2202			505	
<i>Wald chi2</i>		47.69			23.11	
<i>p-value</i>		0.00			0.01	

*Note:* Reported numbers are the marginal effects at the means of covariates, followed by significance and clustered standard errors between brackets. The standard errors in the left three columns are clustered at the individual level, and those in the right three columns are clustered at the group level.

\* indicates significant at 10% (two-sided test)  
\*\* indicates significant at 5% (two-sided test)  
\*\*\* indicates significant at 1% (two-sided test)

**C. Multinomial regressions including rare patterns**

The following two tables report the results of multinomial probit regressions as in Tables 9 and 10, but including also the rare choice patterns (SR in the CC tasks and RS in the CR tasks). Scarce choice patterns made it impossible to compute the Wald statistics and to estimate the coefficients in one of the regressions. In all other cases, the results remain very similar to those reported in Tables 9 and 10.

**Table C1: Multinomial probit regressions for the CC tasks**

Choice pattern	Group vs. individual choices			Group vs. simulated choices		
	SS	RR	RS	SS	RR	RS
<i>stage2</i>	.02 (.02)	.08 (.05)	-.10* (.05)	.02 (.03)	.13 (.10)	-.11 (.10)
<i>stage3</i>	.07** (.03)	.00 (.05)	-.04 (.05)			
<i>majority</i>	-.02 (.06)	-.04 (.07)	.07 (.07)	-.00 (.08)	-.00 (.12)	.07 (.12)
<i>unanimity</i>	-.04 (.06)	-.03 (.07)	.06 (.07)	-.14 (.09)	.04 (.12)	.12 (.12)
<i>stage2*majority</i>	-.10** (.05)	.02 (.07)	.05 (.08)	-.07 (.06)	-.01 (.13)	-.01 (.14)
<i>stage2*unanimity</i>	-.27 *** (.06)	.26 *** (.08)	.05 (.08)	-.08 (.05)	.17 (.13)	-.10 (.12)
<i>stage3*majority</i>	-.06 (.04)	-.02 (.07)	.02 (.07)			
<i>stage3*unanimity</i>	-.05 (.05)	-.02 (.07)	.03 (.07)			
<i>No. of observations</i>		1557			364	
<i>Wald chi2</i>		-			-	
<i>p-value</i>		-			-	

*Note:* Reported numbers are the marginal effects at the means of covariates, followed by significance and clustered standard errors between brackets. The standard errors in the left three columns are clustered at the individual level, and those in the right three columns are clustered at the group level.

- \* indicates significant at 10% (two-sided test)
- \*\* indicates significant at 5% (two-sided test)
- \*\*\* indicates significant at 1% (two-sided test)

The number of observations in the left columns is  $(4+3+3)*156 - 3$  (missing value)=1557; the number of observations in the right columns is  $(4+3)*52=364$ . The three



missing values did not influence the simulated result because two of the three missing values did not affect the majority choice (the other two agree) and the third missing value occurred in stage 3 (not analyzed).

**Table C2:** Multinomial probit regressions for the CR tasks

Choice pattern	Group vs. individual choices			Group vs. simulated choices		
	SS	RR	SR	SS	RR	SR
<i>stage2</i>	-.03 (.03)	.05 (.04)	-.01 (.05)	.	.	.
<i>stage3</i>	-.01 (.03)	.04 (.05)	-.05 (.05)	.	.	.
<i>majority</i>	-.08 (.06)	.04 (.07)	-.01 (.07)	.	.	.
<i>unanimity</i>	-.10* (.06)	.03 (.07)	.05 (.07)	.	.	.
<i>stage2*majority</i>	-.16*** (.06)	.05 (.06)	.19** (.08)	.	.	.
<i>stage2*unanimity</i>	-.16*** (.06)	.05 (.07)	.16** (.07)	.	.	.
<i>stage3*majority</i>	-.06 (.05)	.02 (.06)	.09 (.07)	.	.	.
<i>stage3*unanimity</i>	-.09* (.05)	.03 (.06)	.10 (.07)	.	.	.
<i>No. of observations</i>		2336			519	
<i>Wald chi2</i>		97.02			-	
<i>p-value</i>		0.00			-	

*Note:* Reported numbers are the marginal effects at the means of covariates, followed by significance and clustered standard errors between brackets. The standard errors in the left three columns are clustered at the individual level, and those in the right three columns are clustered at the group level.

\* indicates significant at 10% (two-sided test)

\*\* indicates significant at 5% (two-sided test)

\*\*\* indicates significant at 1% (two-sided test)

The number of observations in the left columns is  $5 \times 3 \times 156 - 4$  (missing value)=2336; the number of observations in the right columns is  $5 \times 2 \times 52 - 1 = 519$ . The three out of four missing values in the individual answers did not influence the simulated result because the other two members in the given sessions agreed on one choice and therefore determined the majority choice.

## D. Examples of instructions and decision sheets

### D1. Instruction – stage 1 (for all treatments)

Welcome to this experiment. This is an economics experiment that explores how people make decisions under risk. You will be asked to choose between pairs of lotteries. Your payment for participating consists of a sure amount of €5 and additional money that depends on your choices. At the end of the entire experiment, we will randomly draw one of the questions you answered, and play it for real to determine the additional money. Your extra winnings range between €0 and €50 with an average of €10. Each of the questions that you answer in the experiment is equally likely to be drawn and played for real.

You are asked to choose between pairs of lotteries, Lottery A and Lottery B, which are presented as follows.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€10					€0															
Lottery B	€0																€14				

The lotteries are resolved by throwing a 20-sided die with each number between 1 and 20 equally likely to come up. Lottery A pays €10 if a number between 1 and 5 comes up and nothing otherwise. Lottery B pays €14 if a number between 17 and 20 comes up and nothing otherwise.



To indicate your choice, please mark the corresponding blank box at the end of the row.

There are no right or wrong answers. We are interested in your personal preferences, so please choose according to your preferences. Keep in mind that every choice could be played out for real at the end of the experiment, and determines the money you will receive. It is therefore in your best interest to always choose the lottery you prefer. Before we start, please answer the following training questions that help you become familiar with the experimental task.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€13																				
Lottery B	€18																€0				

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€8								€0												
Lottery B	€0																€25				

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€0												€45				€30	€8			
Lottery B	€8	€15		€45				€0													

The following are the decision questions for you to answer. **Please DO NOT talk with each other.** If you have any question during the experiment, then please raise your hand. Good luck!

**D2. Instruction – stage 2 (control treatment)**

You will be asked similar questions as you answered previously. Let us repeat that all of the questions you answer are equally likely to be drawn and be played for real.

You are going to make decisions between pairs of lotteries, Lottery A and Lottery B, which are presented in tables as follows.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€10					€0															
Lottery B	€0															€14					

The following are the decision questions for you to answer. ***Please DO NOT talk with each other.*** If you have any question during the experiment, then please raise your hand. Good luck!

**D3. Instruction – stage 2 (majority treatment)**

You will be asked similar questions as you answered previously. Let us repeat that all of the questions you answer are equally likely to be drawn and be played for real.

You are going to make decisions between pairs of lotteries, Lottery A and Lottery B, which are presented in tables as follows.

										0	1	2	3	4	5	6	7	8	9	0		
Lottery A	€8.5					€0																
Lottery B	€0																€11.25					

To indicate your choice, please mark the corresponding blank box at the end of the row.

Please write the mark that indicates your own choice on the sheet, as in the following example. The lottery chosen by the majority of you, two or three of you, is the group choice.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€7					€0															X
Lottery B	€0																€9.25	△			

**If one of the questions of this kind, which you three answer together, was drawn at the end of the experiment, this drawn question will be played for real for all of you and will determine your payoffs.** For example, in the above example the group choice is Lottery A. If the number on the die is between 1 and 5 each of you will receive €7, otherwise each of you receives nothing.

The following are the decision questions for you to answer. *Please feel free to discuss with your group members when making the decisions within this part.* If you have any question during the experiment, then please raise your hand. Good luck!

**D4. Instruction – stage 2 (unanimity treatment)**

You will be asked similar questions as you answered previously. Let us repeat that all of the questions you answer are equally likely to be drawn and be played for real.

You are going to make decisions between pairs of lotteries, Lottery A and Lottery B, which are presented in tables as follows.

									0	1	2	3	4	5	6	7	8	9	0		
Lottery A	€8.5					€0															
Lottery B	€0															€11.25					

To indicate your choice, please mark the corresponding blank box at the end of the row.

Please write the mark that indicates your own choice on the sheet, as in the following example.

**You need to reach full agreement on your group choices. A choice without all three marks agreeing on it will not be seen as a valid one and will not be paid.** The following example shows a valid group choice of Lottery A.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€7					€0															X A
Lottery B	€0															€9.25					

**If one of the questions of this kind, which you three answer together, was drawn at the end of the experiment, this drawn question will be played for real for all of you and will determine your payoffs.** For example, in the above example the group choice is Lottery A. If the number on the die is between 1 and 5 each of you will receive €7, otherwise each of you receives nothing.

The following are the decision questions for you to answer. *Please feel free to discuss with your group members when making the decisions within this part.* If you have any question during the experiment, then please raise your hand. Good luck!

### **D5. Instruction – stage 3 (for all treatments)**

You will be asked similar questions as you answered previously. Let us repeat that all of the questions you answer are equally likely to be drawn and be played for real.

The following are the decision questions for you to answer. ***Please DO NOT talk with each other.*** If you have any question during the experiment, then please raise your hand. Good luck!

**D6. Decision sheet for one stage (1-3)**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€0										€40						€28	€5			
Lottery B	€5	€12		€40				€0													

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€13																				
Lottery B	€18															€0					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€10																				
Lottery B	€10					€0										€45					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€10																				
Lottery B	€14															€0					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€10																				
Lottery B	€0			€10										€40							

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€15.5																				
Lottery B	€21.5															€0					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€15.5					€0															
Lottery B	€0															€21.5					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€8								€0												
Lottery B	€0															€20					

Online Appendix

(2-3)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€10																				
Lottery B	€0					€10										€40					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€13					€0															
Lottery B	€0															€18					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€10										€0										
Lottery B	€0															€45					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€10					€0															
Lottery B	€0															€14					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€17.5																				
Lottery B	€24															€0					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
Lottery A	€0										€45					€30	€8					
Lottery B	€8	€15		€45				€0														

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€10								€0												
Lottery B	€0															€40					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€10										€0										
Lottery B	€0															€40					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
Lottery A	€0										€45					€25	€10					
Lottery B	€10	€15		€45				€0														



Online Appendix

(3-3)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€8										€0										
Lottery B	€0															€20					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€8																				
Lottery B	€0					€8										€20					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€8																				
Lottery B	€8						€0										€20				

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€0												€40				€25	€5			
Lottery B	€5	€10		€40				€0													

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€19					€0															
Lottery B	€0															€25					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€19																				
Lottery B	€25															€0					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€17.5					€0															
Lottery B	€0															€24					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Lottery A	€0												€35				€30	€8			
Lottery B	€8	€12		€35				€0													