Supplementary Material

Ethics statement

Research involved human participants. All of them were adult volunteers giving informed consent. No medical patients or otherwise vulnerable groups were considered. None of the treatments involved physical interventions. The software used for recruitment and conducting of experiments assures confidentiality and protection of participants' personal data. The Research Ethics Committee at the Faculty of Economic Sciences offers a blanket consent for the type of studies we undertook in this project (laboratory or Internet-based experiments with voluntary participation of adults, involving no deception, no possibility of financial losses or physical harm and negligible probability of significant distress).

Part A. Statistical analysis

The results in Tables A1(a-e) report the results from the Mann-Whitney tests that assess if the differences in means computed at the partner-group level are statistically significant. To assess if differences in variables at the group level are significant, we regress dummies corresponding to different treatments on these variables, with no constant and error terms clustered at the partner-group level. Subsequently, we test whether the coefficients corresponding to different treatment dummies are significantly different from each other for each pair of treatments. We report corresponding F-statistics in the Table A2 below.

Table A1. Mann-Whitney U tests based on ranks with pairwise comparisons of medians of selected variables, by treatment

(a)	Treatments		z-statistics
Resources in the last period	Baseline	Inequality	0.26
	Baseline	Matching	-1.19
	Baseline	Matching[1]	-0.87
	Baseline	Vote	1.46
	Baseline	Inequality and vote	2.12**
	Baseline	Matching and vote	-0.10
	Matching	Matching and vote	0.67
	Matching[1]	Matching and vote	0.32
	Inequality	Inequality and vote	1.99**
	Vote	Matching and vote	-1.06
	Vote	Inequality and vote	1.25

(b)	Treatments		z-statistics
Mean harvests	Baseline	Inequality	-1.86*
	Baseline	Matching	-2.87***
	Baseline	Matching[1]	-2.69***
	Baseline	Vote	-0.4
	Baseline	Inequality and vote	-2.41**
	Baseline	Matching and vote	-1.73*
	Matching	Matching and vote	0.77
	Matching[1]	Matching and vote	0.42
	Inequality	Inequality and vote	-1.57
	Vote	Matching and vote	-1.93*
	Vote	Inequality and vote	-2.50**

(c)	Treatments		z-statistics
Mean fraction of harvested resources	Baseline	Inequality	0.34
	Baseline	Matching	-2.96***
	Baseline	Matching[1]	-2.79***
	Baseline	Vote	-0.84
	Baseline	Inequality and vote	-1.93*
	Baseline	Matching and vote	-1.64
	Matching	Matching and vote	0.67
	Matching[1]	Matching and vote	0.32
	Inequality	Inequality and vote	-1.40
	Vote	Matching and vote	-1.44
	Vote	Inequality and vote	-1.63

(d)	Treatments		z-statistics
Total donation	Baseline	Inequality	-0.49
	Baseline	Matching	-3.13***
	Baseline	Matching[1]	-3.18***
	Baseline	Vote	2.32**
	Baseline	Inequality and vote	1.80*
	Baseline	Matching and vote	-2.31**
	Matching	Matching and vote	0.67
	Matching[1]	Matching and vote	0.32
	Inequality	Inequality and vote	2.35**
	Vote	Matching and vote	-2.95***
	Vote	Inequality and vote	0.24

(e)	Treatments		z-statistics
Frequency of sharing	Baseline	Inequality	-0.61
	Baseline	Matching	-3.40***
	Baseline	Matching[1]	-3.27***
	Baseline	Vote	2.59***
	Baseline	Inequality and vote	2.49**
	Baseline	Matching and vote	-1.54
	Matching	Matching and vote	1.83*
	Matching[1]	Matching and vote	1.58
	Inequality	Inequality and vote	2.85***
	Vote	Matching and vote	-3.07***
	Vote	Inequality and vote	0.24

(f)	Treatments		z-statistics
the mean fraction of harvests sent to the outgroup by individuals	Baseline	Inequality	-0.72
	Baseline	Matching	-2.96***
	Baseline	Vote	1.68*
	Baseline	Inequality and vote	1.80*
	Baseline	Matching and vote	-2.89***
	Matching	Matching and vote	-0.48
	Inequality	Inequality and vote	2.26**
	Vote	Matching and vote	-3.15***
	Vote	Inequality and vote	0.24

[1] excluding the pair of successful groups

Note: *** indicates variables significant at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level

Table A2. F-statistics indicating whether differences in the frequency of resource exhaustion between pairs of treatments are statistically significant.

F(1,36)	Vote	Inequality	Inequality And Vote
Baseline	1.29	0.84	6.12**
Vote			1.47
Inequality			2.45

F(1,36)	Vote	Matching	Matching And Vote
Baseline	1.29	1.29	0.52
Vote			0.13
Matching			0.13

Figure A1 presents the mean fraction of harvested resources from 5 pre-experimental rounds, by treatments. There are statistically-significant differences in the variable according to the Mann-Whitney test between: the baseline and vote treatments ($z=2.1$, $p<0.05$); the baseline and matching treatments ($z=2.41$, $p<0.05$); the vote and 'matching and vote' treatments ($z=-2.48$, $p<0.05$); and the vote and 'inequality and vote' treatments ($z=-2.56$, $p<0.05$). During the rounds of training, subjects played against the computer. As a result, the differences in mean harvests between treatments could have been caused to the presence of stochastic factors.

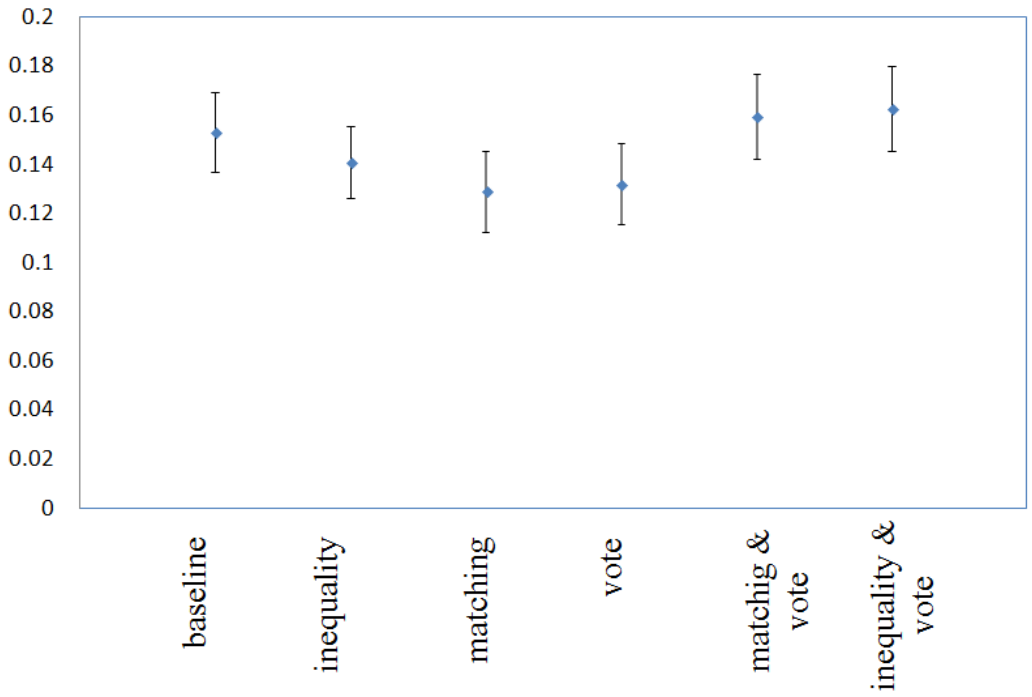
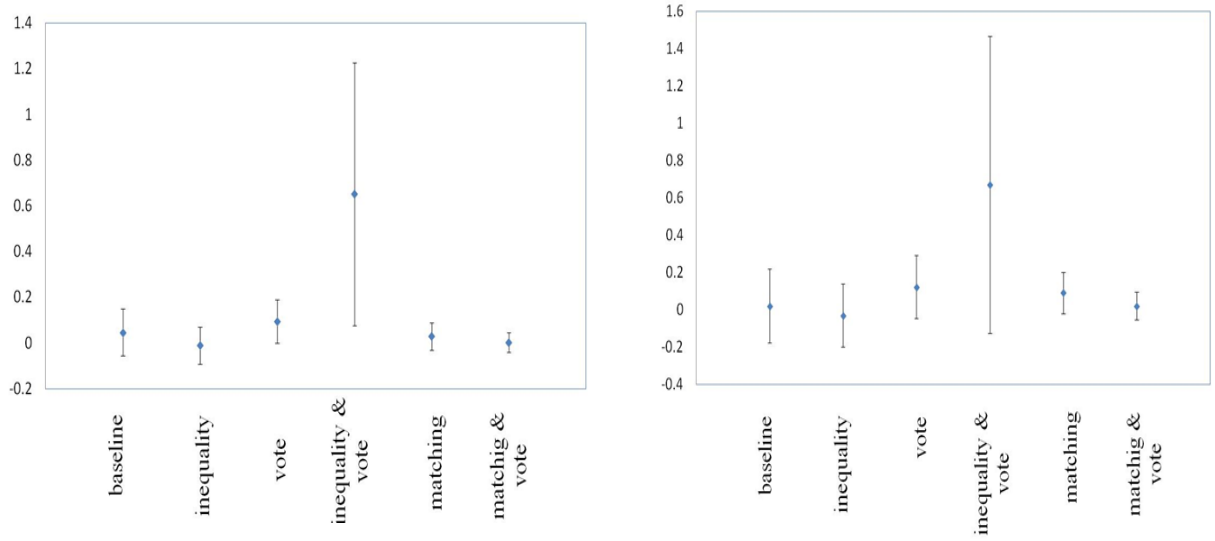


Figure A1. The mean fraction of resources harvested by subjects over 5 rounds of training, per treatment. *Note:* Bars correspond to 95% confidence intervals.

Figures A2 (a) and (b) show the coefficients related to advantageous inequalities of resources and harvests with the confidence intervals. Depicted patterns support that inequality aversion plays an important role in the 'inequality and vote' treatment. Here, the discussed coefficients are substantially larger compared to other treatments.



(a) Advantageous inequality in resources (b) Advantageous inequality in harvests

Figure A2. Inequality aversion per treatment
Note: Bars indicate confidence intervals at 95%.

Tables A3(a-f) present the results from the mixed-level logit panel regressions with the dependent variable taking a value of 1 if a subject shared some of her harvest with outgroup members in treatments, where individuals acted as the decision-makers (Table A3(a-c))), or voted for sharing in treatments with collective decision-making (Table A3(d-f)). The results from the 'matching and vote' treatment exclude a pair of successful group, where almost everyone donated resources to the outgroup each period, which inclusion prevented estimating the model in most cases.

Data at the individual level is nested within groups, and then within partner groups, and finally within sessions in the analysis. The sample includes only data in case the resources in the group and in the partner group are larger than 1. Most control variables are the same as in the regressions presented in Table 2 in the main text. We include as additional variables: the difference in harvests between groups

max(H1-H2,0) if the difference is positive; the difference in harvests between groups max(H2-H1,0) if the partner group extracted more resources than own group; and analogously calculated the difference in resources between own and partner group max(R1-R2,0) if the difference is positive, as well as the difference in resources between the recipient and the donor group if R2-R1>0 (max(R2-R1,0)).

We included also as an independent variable a donation from the outgroup in the past round. The coefficient corresponding to this variable captures reciprocity, i.e. whether subjects are willing to reciprocate a donation received in the past. To estimate the 'reciprocity' parameter β in each quadrant of Figure 3 in the main text, we conducted 4 regressions for every treatment (Models 1-4 in each table). In each regression, we added interaction terms between a received donation in the past period and the dummy corresponding to different quadrants. For instance, the interaction term corresponding to the Q1 quadrant captures the size of a donation received from the partner group in the past round, but only if a group has more resources and harvested more than the partner group at time t. In Models 1-4, we removed one interaction term at the time, in Model 1 corresponding to the Q1 quadrant, in Model 2 corresponding to Q2 etc. As a result, βs reported in the table capture the value of reciprocity in the quadrant, of which the corresponding interaction term was removed. The only exception concerns the 'inequality and vote' treatment, where we present the results without interaction terms (Table A3(f)). In this treatment, few subjects voted for sharing. As a result, the variation in the dependent variable was insufficient to estimate all model specifications.

Table A3(a). The results from the mixed-level logit panel regressions with the dependent variable taking 1 if a subject shared some of his/her harvest with outgroup members, and 0 otherwise. Data at the individual level is nested within groups, and then within partner groups, and finally within sessions in the analysis. The sample only includes data if resources in the group and the partner group are larger than 1.

Baseline	Model 1	Model 2	Model 3	Model 4
Donation from the outgroup (t-1)	0.50* (0.29)	0.05 (0.22)	-0.70 (1.95)	0.71 (0.56)
Dummy Q1* Donation from the outgroup (t-1)		0.44 (0.36)	1.20 (1.98)	-0.21 (0.60)
Dummy Q2* Donation from the outgroup (t-1)	-0.45 (0.36)		0.74 (1.96)	-0.66 (0.63)
Dummy Q3* Donation from the outgroup (t-1)	-1.60 (2.21)	-1.14 (2.19)		-1.79 (2.32)
Dummy Q4* Donation from the outgroup (t-1)	0.18 (0.60)	0.64 (0.63)	1.39 (2.01)	
Max(R1-R2,0)	0.05 (0.05)	0.05 (0.05)	0.05 (0.05)	0.05 (0.05)
Max(R2-R1,0)	0.02 (0.06)	0.02 (0.06)	0.02 (0.06)	0.02 (0.06)
Max(H1-H2,0)	0.02 (0.09)	0.02 (0.09)	0.02 (0.09)	0.02 (0.09)
Max(H2-H1,0)	0.07 (0.08)	0.07 (0.08)	0.07 (0.08)	0.07 (0.08)
Female	0.50 (0.42)	0.50 (0.42)	0.50 (0.42)	0.50 (0.42)
Age	0.03 (0.03)	0.03 (0.03)	0.03 (0.03)	0.03 (0.03)
Risk	-0.11 (0.12)	-0.11 (0.12)	-0.11 (0.12)	-0.11 (0.12)
Trust	0.06 (0.13)	0.06 (0.13)	0.06 (0.13)	0.06 (0.13)
Divide	-0.08 (0.11)	-0.08 (0.11)	-0.08 (0.11)	-0.08 (0.11)
Total IQ	0.12 (0.17)	0.12 (0.17)	0.12 (0.17)	0.12 (0.17)
Period	-0.06*** (0.02)	-0.06*** (0.02)	-0.06*** (0.02)	-0.06*** (0.02)
Mean fraction of harvested resources in the trial rounds	1.71 (2.09)	1.71 (2.09)	1.71 (2.09)	1.71 (2.09)
Constant	-3.88*** (1.16)	-3.87*** (1.17)	-3.89*** (1.17)	-3.88*** (1.17)
N obs	1392	1392	1392	1392
Wald statist Chi2(15)	41.03	40.97	40.81	41.20

Note: standard errors in parentheses; *** indicates variables significant at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level

Table A3(b). The results from the mixed-level logit panel regressions with the dependent variable taking 1 if a subject shared some of his/her harvest with outgroup members, and 0 otherwise. Data at the individual level is nested within groups, and then within partner groups, and finally within sessions in the analysis. The sample only includes data if resources in the group and the partner group are larger than 1.

Inequality	Model 1	Model 2	Model 3	Model 4
Donation from the outgroup (t-1)	0.13 (0.20)	0.26* (0.15)	0.14 (0.18)	0.39 (0.25)
Dummy Q1* Donation from the outgroup (t-1)		-0.13 (0.24)	-0.01 (0.26)	-0.26 (0.27)
Dummy Q2* Donation from the outgroup (t-1)	0.14 (0.24)		0.12 (0.19)	-0.12 (0.28)
Dummy Q3* Donation from the outgroup (t-1)	0.02 (0.26)	-0.12 (0.20)		-0.24 (0.30)
Dummy Q4* Donation from the outgroup (t-1)	0.27 (0.27)	0.14 (0.28)	0.26 (0.30)	
Max(R1-R2,0)	-0.01 (0.31)	-0.01 (0.31)	-0.01 (0.31)	-0.01 (0.04)
Max(R2-R1,0)	0.01 (0.04)	0.01 (0.04)	0.01 (0.04)	0.001 (0.04)
Max(H1-H2,0)	-0.03 (0.08)	-0.03 (0.08)	-0.03 (0.08)	-0.03 (0.08)
Max(H2-H1,0)	0.03 (0.08)	0.03 (0.08)	0.03 (0.08)	0.03 (0.07)
Female	0.08 (0.39)	0.08 (0.39)	0.08 (0.39)	0.08 (0.39)
Age	0.02 (0.05)	0.02 (0.05)	0.02 (0.05)	0.02 (0.05)
Risk	0.13 (0.15)	0.13 (0.15)	0.13 (0.15)	0.13 (0.15)
Trust	0.12 (0.11)	0.12 (0.11)	0.12 (0.11)	0.12 (0.11)
Divide	-0.02 (0.11)	-0.02 (0.11)	-0.02 (0.11)	-0.02 (0.11)
Total IQ	-0.69*** (0.17)	-0.69*** (0.17)	-0.69*** (0.17)	-0.69*** (0.17)
K	0.002 (0.03)	0.002 (0.03)	0.002 (0.03)	0.002 (0.03)
Period	-0.15*** (0.03)	-0.15*** (0.03)	-0.15*** (0.03)	-0.15*** (0.03)
Mean fraction of harvested resources in the trial rounds	4.07* (2.23)	4.07* (2.23)	4.07* (2.23)	4.07* (2.23)
Constant	-2.69 (2.94)	-2.69 (2.95)	-2.70 (2.94)	-2.69 (2.94)
N obs	1476	1476	1476	1476
Wald statist Chi2(15)	82.98	82.93	82.99	82.87

Note: standard errors in parentheses; *** indicates variables significant at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level

Table A3(c). The results from the mixed-level logit panel regressions with the dependent variable taking 1 if a subject shared some of his/her harvest with outgroup members, and 0 otherwise. Data at the individual level is nested within groups, and then within partner groups, and finally within sessions in the analysis. The sample only includes data if resources in the group and the partner group are larger than 1.

Matching (excludes the pair of successful groups)	Model 1	Model 2	Model 3	Model 4
Donation from the outgroup (t-1)	0.21*** (0.08)	0.62*** (0.14)	0.37*** (0.12)	0.35*** (0.12)
Dummy Q1* Donation from the outgroup (t-1)		-0.42*** (0.15)	-0.17 (0.14)	-0.15 (0.10)
Dummy Q2* Donation from the outgroup (t-1)	0.41*** (0.16)		0.26 (0.17)	0.27 (0.18)
Dummy Q3* Donation from the outgroup (t-1)	0.14 (0.14)	-0.27 (0.17)		-0.002 (0.14)
Dummy Q4* Donation from the outgroup (t-1)	0.14 (0.10)	-0.27 (0.17)	-0.02 (0.14)	
Max(R1-R2,0)	0.03 (0.03)	0.03 (0.03)	0.03 (0.03)	0.03 (0.03)
Max(R2-R1,0)	-0.01 (0.03)	-0.01 (0.03)	-0.01 (0.03)	-0.01 (0.03)
Max(H1-H2,0)	0.09* (0.06)	0.09* (0.06)	0.09* (0.06)	0.09* (0.06)
Max(H2-H1,0)	-0.02 (0.04)	-0.02 (0.04)	-0.02 (0.04)	-0.02 (0.04)
Female	-0.51*** (0.18)	-0.51*** (0.18)	-0.51*** (0.18)	-0.51*** (0.18)
Age	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)
Risk	-0.09 (0.07)	-0.09 (0.07)	-0.09 (0.07)	-0.09 (0.07)
Trust	-0.39*** (0.06)	-0.39*** (0.06)	-0.39*** (0.06)	-0.39*** (0.06)
Divide	0.49*** (0.07)	0.49*** (0.07)	0.49*** (0.07)	0.49*** (0.07)
Total IQ	-0.13 (0.10)	-0.13 (0.10)	-0.13 (0.10)	-0.13 (0.10)
Period	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)
Mean fraction of harvested resources in the trial rounds	-5.59*** (0.01)	-5.59*** (0.01)	-5.59*** (0.01)	-5.59*** (0.01)
Constant	0.95 (0.82)	0.93 (0.82)	0.94 (0.82)	0.94 (0.82)
N obs	1164	1164	1164	1164
Wald statist Chi2(15)	158.42	158.86	158.62	158.61

Note: standard errors in parentheses; *** indicates variables significant at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level

Table A3(d). The results from the mixed-level logit panel regressions with the dependent variable taking 1 if a subject shared some of his/her harvest with outgroup members, and 0 otherwise. Data at the individual level is nested within groups, and then within partner groups, and finally within sessions in the analysis. The sample only includes data if resources in the group and the partner group are larger than 1.

Vote	Model 1	Model 2	Model 3	Model 4
Donation from the outgroup (t-1)	0.39** (0.17)	0.73 (0.54)	1.14*** (0.40)	0.69** (0.32)
Dummy Q1* Donation from the outgroup (t-1)		-0.34 (0.55)	-0.75* (0.43)	-0.31 (0.37)
Dummy Q2* Donation from the outgroup (t-1)	0.34 (0.55)		-0.41 (0.67)	-0.03 (0.63)
Dummy Q3* Donation from the outgroup (t-1)	0.75* (0.43)	0.41 (0.67)		0.44 (0.47)
Dummy Q4* Donation from the outgroup (t-1)	0.31 (0.37)	-0.04 (0.63)	-0.44 (0.47)	
Max(R1-R2,0)	0.09** (0.05)	0.09** (0.05)	0.09** (0.05)	0.09** (0.05)
Max(R2-R1,0)	0.01 (0.04)	0.01 (0.04)	0.01 (0.04)	0.01 (0.04)
Max(H1-H2,0)	0.12 (0.08)	0.12 (0.08)	0.12 (0.08)	0.12 (0.08)
Max(H2-H1,0)	-0.10 (0.08)	-0.10 (0.08)	-0.10 (0.08)	-0.10 (0.08)
Female	-0.10 (0.33)	-0.10 (0.33)	-0.10 (0.33)	-0.10 (0.33)
Age	0.07** (0.03)	0.07** (0.03)	0.07** (0.03)	0.07** (0.03)
Risk	0.58*** (0.11)	0.58*** (0.11)	0.58*** (0.11)	0.58*** (0.11)
Trust	0.57*** (0.08)	0.57*** (0.08)	0.57*** (0.08)	0.57*** (0.08)
Divide	0.22 (0.13)	0.22 (0.13)	0.22 (0.13)	0.22 (0.13)
Total IQ	0.79*** (0.14)	0.79*** (0.14)	0.79*** (0.14)	0.79*** (0.14)
Period	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Mean fraction of harvested resources in the trial rounds	7.10*** (2.75)	7.10*** (2.75)	7.10*** (2.75)	7.10*** (2.75)
Constant	-10.56*** (1.40)	-10.56*** (1.41)	-10.56*** (1.40)	-10.56*** (1.40)
N obs	137.56	137.56	137.56	137.56
Wald statist Chi2(15)	1224	1224	1224	1224

Note: standard errors in parentheses; *** indicates variables significant at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level

Table A3(e). The results from the mixed-level logit panel regressions with the dependent variable taking 1 if a subject shared some of his/her harvest with outgroup members, and 0 otherwise. Data at the individual level is nested within groups, and then within partner groups, and finally within sessions in the analysis. The sample only includes data if resources in the group and the partner group are larger than 1.

Matching and Vote	Model 1	Model 2	Model 3	Model 4
Donation from the outgroup (t-1)	0.03 (0.06)	0.30** (0.13)	0.16* (0.09)	0.13* (0.07)
Dummy Q1* Donation from the outgroup (t-1)		-0.27** (0.14)	-0.14 (0.10)	-0.10 (0.07)
Dummy Q2* Donation from the outgroup (t-1)	0.25* (0.13)		0.12 (0.14)	0.15 (0.14)
Dummy Q3* Donation from the outgroup (t-1)	0.12 (0.10)	-0.15 (0.15)		0.02 (0.11)
Dummy Q4* Donation from the outgroup (t-1)	0.10 (0.07)	-0.18 (0.14)	-0.04 (0.11)	
Max(R1-R2,0)	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)
Max(R2-R1,0)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)
Max(H1-H2,0)	0.02 (0.04)	0.02 (0.04)	0.02 (0.04)	0.02 (0.04)
Max(H2-H1,0)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)
Female	-0.04 (0.21)	-0.04 (0.21)	-0.04 (0.21)	-0.04 (0.21)
Age	0.12*** (0.02)	0.12*** (0.02)	0.12*** (0.02)	0.12*** (0.02)
Risk	-0.08 (0.07)	-0.08 (0.07)	-0.08 (0.07)	-0.08 (0.07)
Trust	0.08 (0.06)	0.08 (0.06)	0.08 (0.06)	0.08 (0.06)
Divide	-0.31*** (0.10)	-0.31*** (0.10)	-0.31*** (0.10)	-0.31*** (0.10)
Total IQ	-0.03 (0.10)	-0.03 (0.10)	-0.03 (0.10)	-0.03 (0.10)
Period	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Mean fraction of harvested resources in the trial rounds	-4.21*** (1.56)	-4.21*** (1.56)	-4.21*** (1.56)	-4.21*** (1.56)
Constant	-2.14** (0.86)	-2.15** (0.86)	-2.14** (0.86)	-2.14** (0.86)
N obs	86.44	86.69	86.67	86.57
Wald statist Chi2(15)	1254	1254	1254	1254

Note: standard errors in parentheses; *** indicates variables significant at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level

Table A3(e). The results from the mixed-level logit panel regressions with the dependent variable taking 1 if a subject shared some of his/her harvest with outgroup members, and 0 otherwise. Data at the individual level is nested within groups, and then within partner groups, and finally within sessions in the analysis. The sample only includes data if resources in the group and the partner group are larger than 1.

Inequality and Vote	Model 1
Donation from the outgroup (t-1)	-0.16 (0.34)
Max(R1-R2,0)	0.65** (0.28)
Max(R2-R1,0)	-2.97** (1.35)
Max(H1-H2,0)	0.67** (0.39)
Max(H2-H1,0)	-0.03 (0.34)
Female	-2.24 (9.44)
Age	-1.54 (1.03)
Risk	44.08 (43/79)
Trust	-22.86 (23.01)
Divide	3.22 (4.33)
Total IQ	-3.33 (2.83)
K	0.04 (0.62)
Period	0.87*** (0.29)
Constant	-87.17 (98.90)
N obs	426
Wald statist Chi2(13)	10.47

Note: standard errors in parentheses; *** indicates variables significant at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level

Part B. Theoretical predictions

To derive theoretical predictions, we extend a formal model of common-pool resources proposed by Safarzynska (2017), which builds upon Antoniadou et al. (2013), by intergroup sharing.[1] We examine formally the conditions under which sending resources to the outgroup can be welfare-improving.

In each group, *n* individuals *i* decide simultaneously how much of the resource to harvest from the common-pool resource R_t. Individuals are allowed to harvest up to $x_{it} < R_t/n$, where x_i are harvests by individual *i*. The duration of the game is determined endogenously by collective decisions. In particular, the game ends in case resources become exhausted.

Total harvests X_t is defined as the sum of harvests by *n* individuals: $X_t = \sum_i x_{it} \leq R_t$.

Resource dynamics follow a logistic growth function:

$$R_{t+1} = R_t + rR_t(1 - R_t/K) - X_t + bf(\alpha_{it}X_{it}), \quad (1)$$

where $0<r<1$ is the intrinsic growth rate of resources; *K* is its carrying capacity; $\dot{R}_t = rR_t(1 - R_t/K)$ captures the natural growth or regeneration of resources.

After harvesting, subjects decide how many tokens to donate to the partner group to augment its resource stock. Sending resources to the outgroup constitutes a payoff loss, unless donations are being reciprocated. The expression $bf(\alpha_{it}X_{it})$ captures the amount of resources, which individuals expect to receive in return to their donation, where b=1 with the exception to treatments with matching donations, where $b=2$ to indicate that donations are being doubled.

The utility of individual *i* at time *t* depends on his/her harvests x_{it} and the fraction of harvests α_{it} sent to the outgroup:

$$u_{it}(x_{it}, y_{it}) = u(x_{it} - \alpha_{it}x_{it}). \quad (2)$$

Subjects maximize the cumulative payoffs over time:

$$V(R_t) = max_{x,R_{t+1}} \sum_{t=0}^{\infty} \theta^t u(x_{it} - \alpha_{it}x_{it}), \quad (3a)$$

$$\text{s.t. } R_{t+1} = R_t + rR_t(1 - R_t/K) - X_t + bf(\alpha_{it}x_{it}), \quad (3b)$$

given the initial level of resources R_0, where parameter θ is the discount rate.

To solve the social planner problem, equation 3(a) can be written as the Bellman equation with the state variable R_t, and the control variables X_{it} and α_{it}:

$$V(R_t) = u_{it}(X_{it}, \alpha_{it}) + p_t(R_t, X_t)\theta E[V(R_{t+1})], \quad (4)$$

$$\text{s.t. } R_{t+1} = R_t + rR_t(1 - R_t/K) - X_t + bf(\alpha_{it}X_{it}),$$

where $p_t(R_t, X_t)$ is the probability that the game will continue to the next period (resources will not fall below 1). This is motivated by the fact that in our experimental design, subjects lose all their payoffs

[1] The model of common pool resources by Safarzynska (2017) includes climatic shocks, which we ignore in the analysis, but does not include sharing in the equilibrium analysis.

accumulated up to the moment of resource exhaustion if a group runs out of resources ($R_t<1$). This creates a strong incentive to conserve resources.

The optimal solution to problem (4) satisfies the following first-order conditions:

$$u_\alpha(X_{it}, \alpha_{it}) = -u_x(X_{it}, \alpha_{it}) * bf'(\alpha_{it}) \quad (5a)$$

$$u_x(X_{it}, \alpha_{it}) = -\theta p_t E\left[\frac{\partial V(R_{t+1})}{\partial R_{t+1}}\right](-1 + f'(X_{it})) \quad (5b)$$

According to the Envelope Theorem, we different $V(R_{t+1})$ with respect to R_t, which yields:

$$V'(R_t) = u_{it}'(X_{it}, \alpha_{it})\frac{\partial(R_t + \dot{R}_t)}{\partial R_t}. \quad (6)$$

The model can be reduced to the system of equations:

$$u'(X_{it} - \alpha_{it}X_{it}) = u'(X_{it+1} - \alpha_{it+1}X_{it+1})\theta p_t\left(1 + r - 2r\frac{R_{t+1}}{K}\right), \quad (7a)$$

$$R_{t+1} = R_t + rR_t(1 - R_t/K) - X_t + bf(\alpha_{it}X_{it})). \quad (7b)$$

The equilibrium of the above system can be derived (we omit subscripts *t*), using conditions: $R_{t+1} = R_t, X_{t+1} = X_t,$ and $\alpha_{t+1} = \alpha_t$. To derive equilibrium prediction, we assume utility function $u_{it}(x_{it}, y_{it}) = ln(x_{it} - \alpha_{it}x_{it})$ and a linear 'donation' function $f(\alpha_{it}X_{it}) = \alpha_{it}X_{it}$, according to which a donation is reciprocated (or expected to be reciprocated) fully by the outgroup. This allows us to find three solutions to the problem in eqns. 5(a-c). In two solutions, individuals harvest nothing in the equilibrium. We are interested in the third solution, where:

$$X^* = \frac{-K(2\theta(2-b)+\theta^2(-2+b)^2(-1+r^2)-1)}{4\theta^2 r(-2+b)^3}, \quad (8a)$$

$$R^* = \frac{K(\theta(1+r)(-2+b)+1)}{2\theta r(-2+b)} \quad (8b),$$

$$\alpha^* = 1 - \frac{1}{b}. \quad (8c)$$

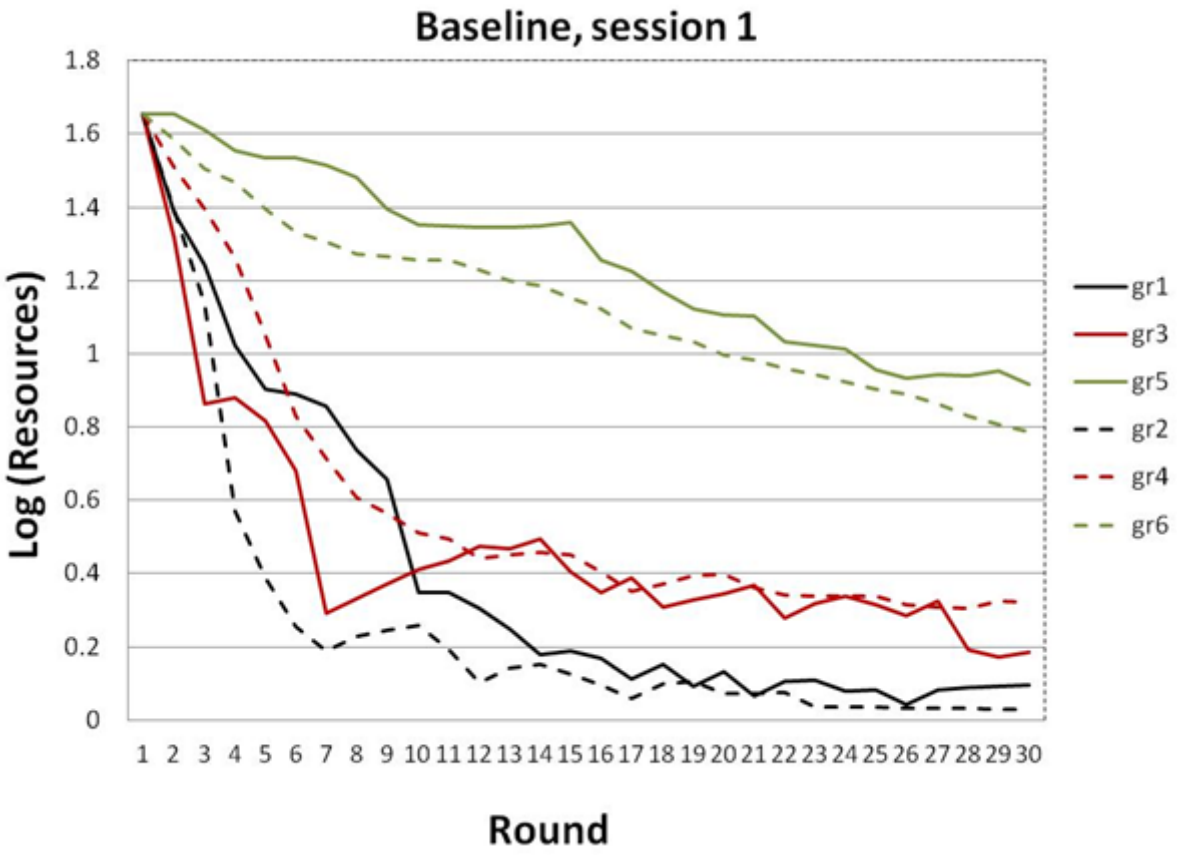
In the absence of intergroup sharing, the social optimum requires that the resource remains at half its capacity *K/2*, while group members consume the renewal rate of the resource ($X = \frac{rK}{4} = 2$). This translates into group members harvesting 2/3=0.67 tokens per person. Our model predicts the tragedy of commons. In particular, according to eqn. 8(a), in the absence of intergroup sharing, the total harvest is expected to be $X^* = 1.44$ tokens at the level of resources equal to $R^* = 18.95$. These numerical values are calculated using *K*, *r* as in the experiment, and for θ=0.95.

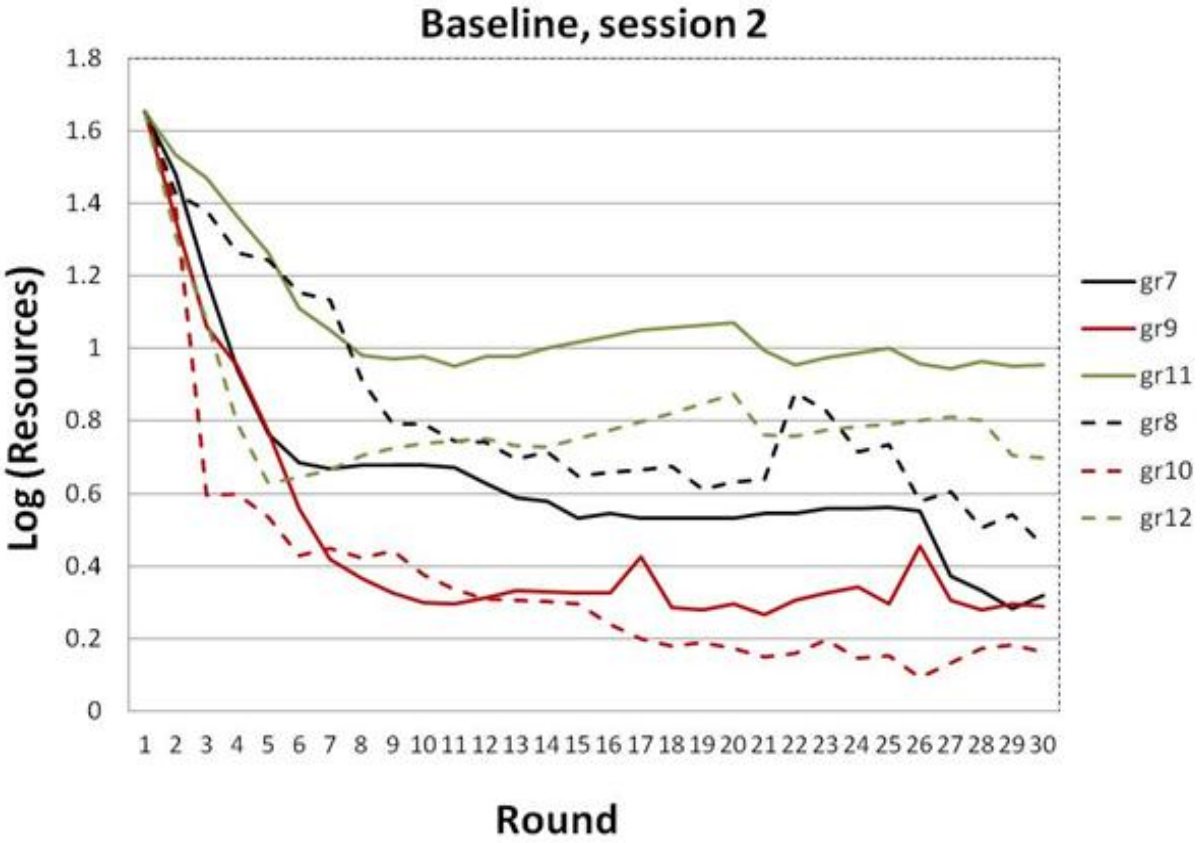
How does intergroup sharing affect these predictions? In case *b*=1, thus in the 'baseline', 'voting' and 'inequality' treatments, α=0, whereas $X^* = 1.44$ and $R^* = 18.95$, which is the same as the predictions as in the absence of intergroup sharing. In the presence of matching donations (b=2), α=0.5, whereas resources and harvests go to infinity in the equilibrium.

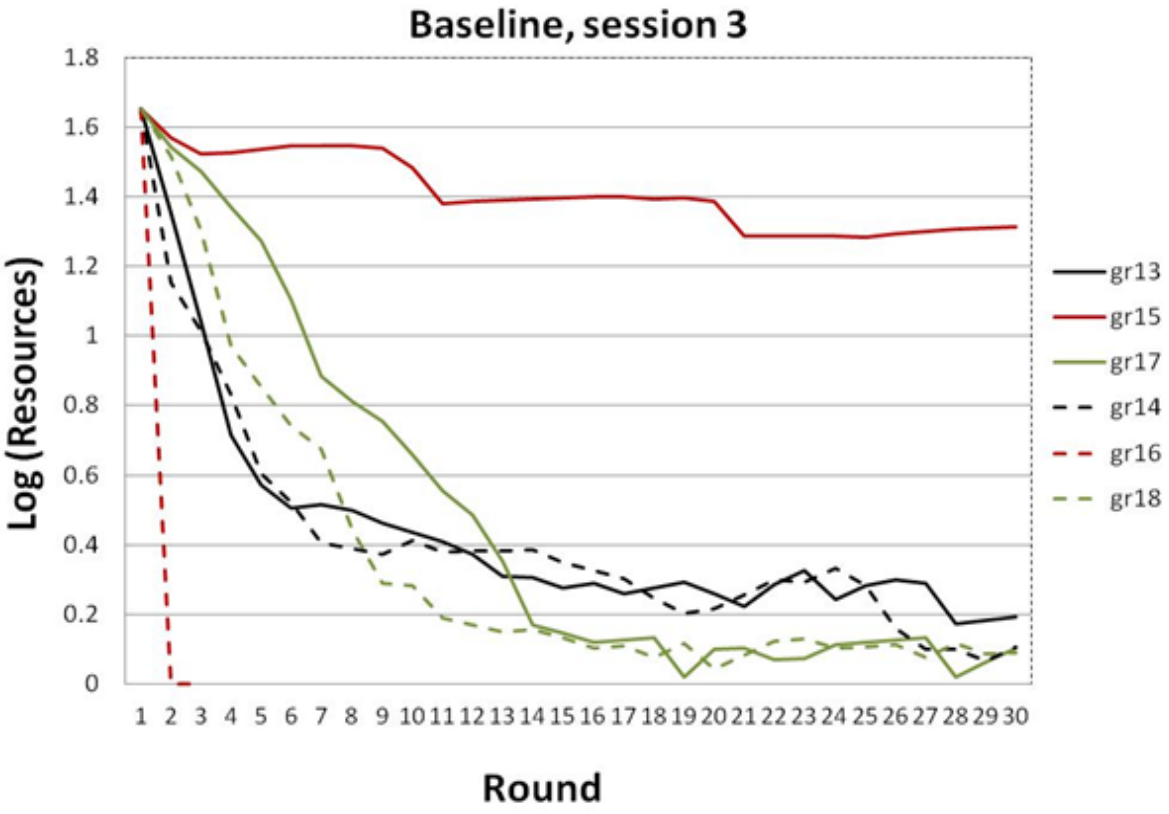
Part C. Resources by groups

Figures below present resources (in logarithm) by each group. Each figure corresponds to one session. Resources of partner groups are indicated by the same color, resources of one group are depicted by a dashed line, and of the second group by a solid line. The value of resources in logarithms equal to 0 corresponds to resources equal to 1 token. If a group exhausted resources, the line does not continue.

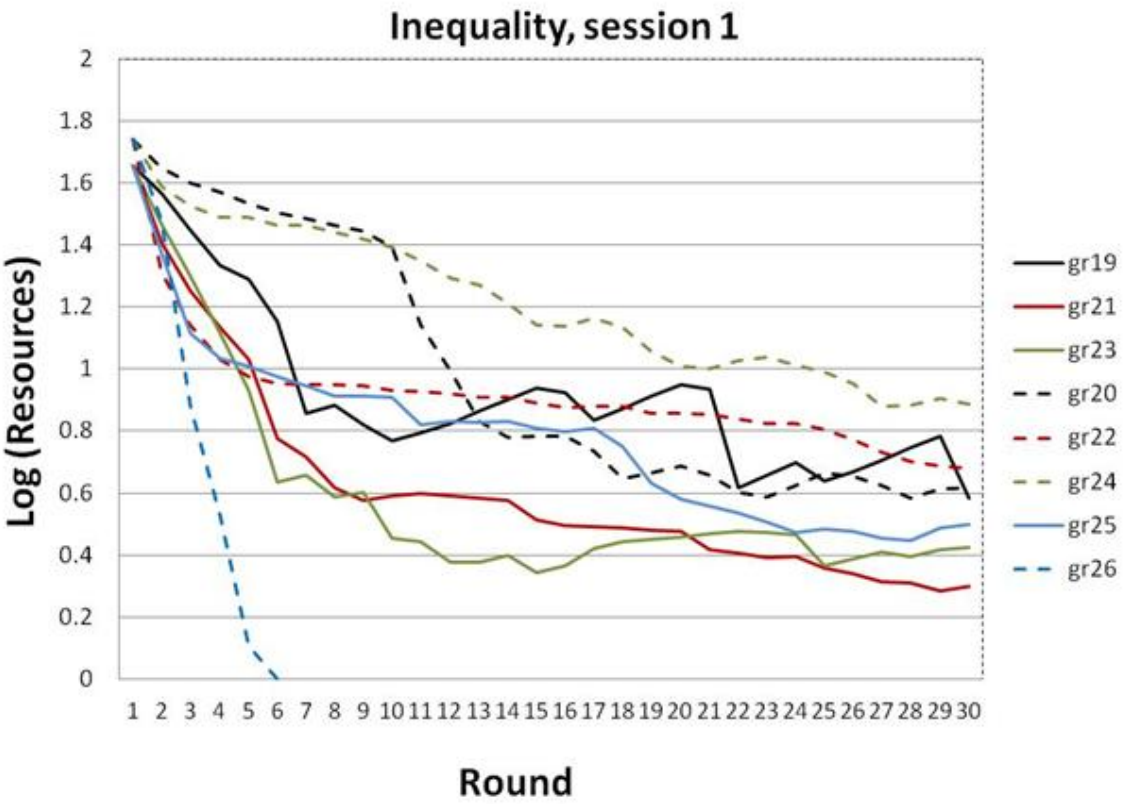
C.1 Baseline

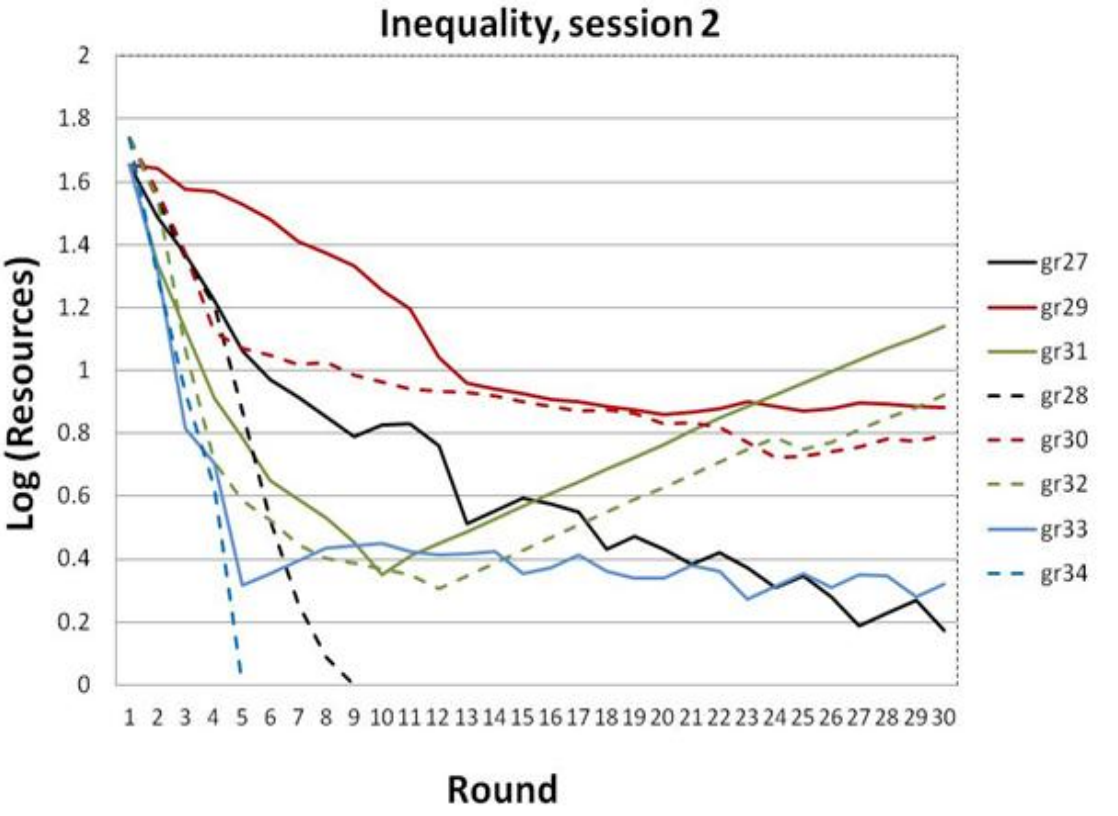


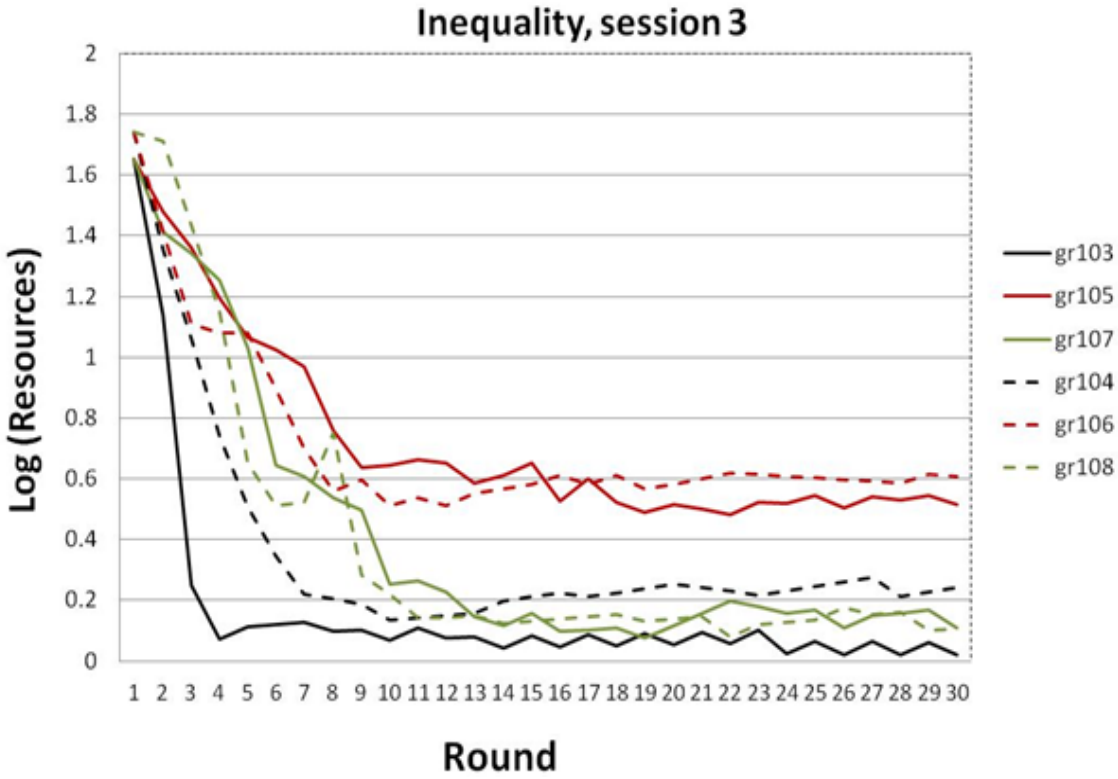

Baseline, session 2
Log (Resources)
Round
gr7
gr9
gr11
gr8
gr10
gr12


Baseline, session 3
Log (Resources)
Round
gr13
gr15
gr17
gr14
gr16
gr18

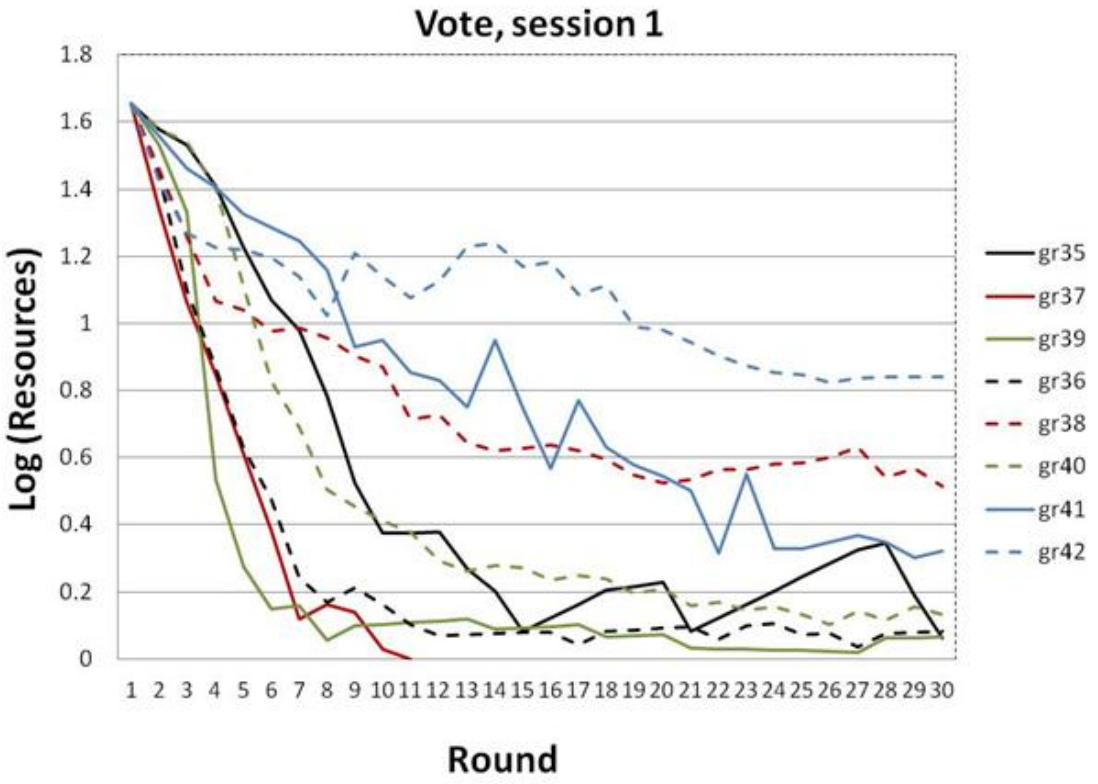
C.2. Inequality

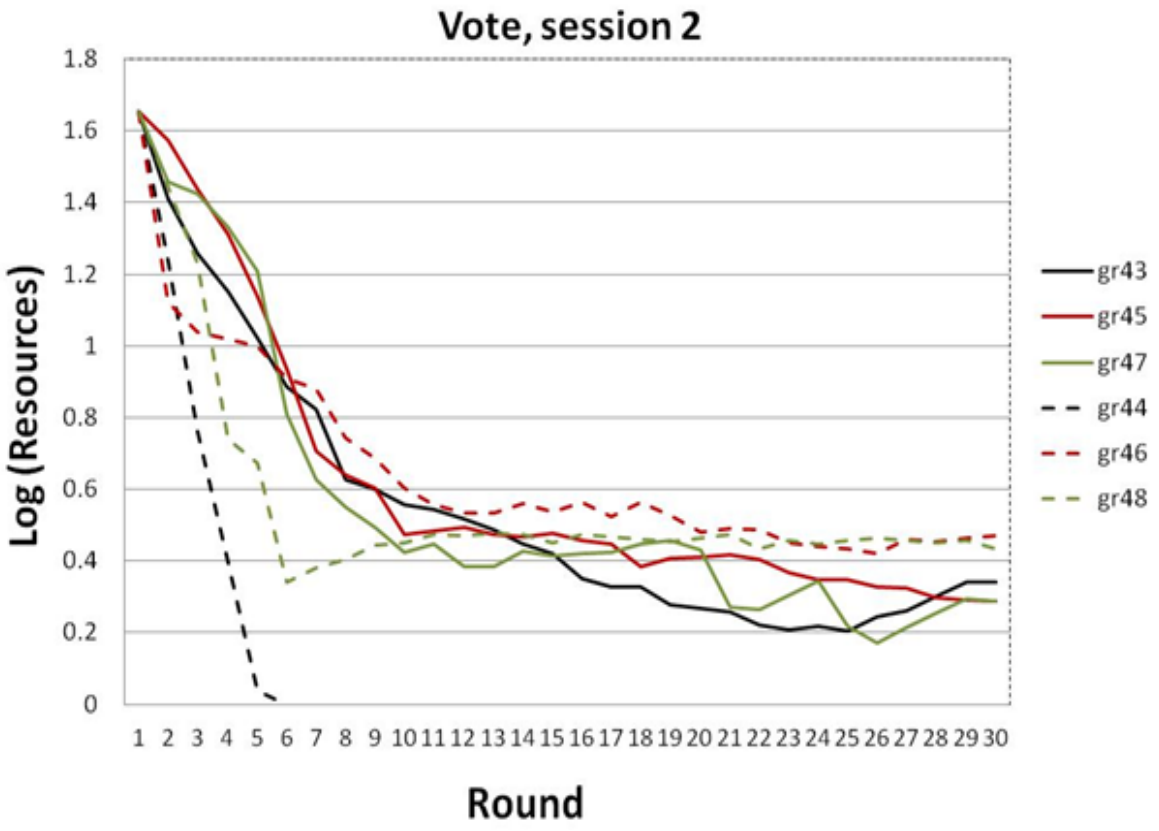


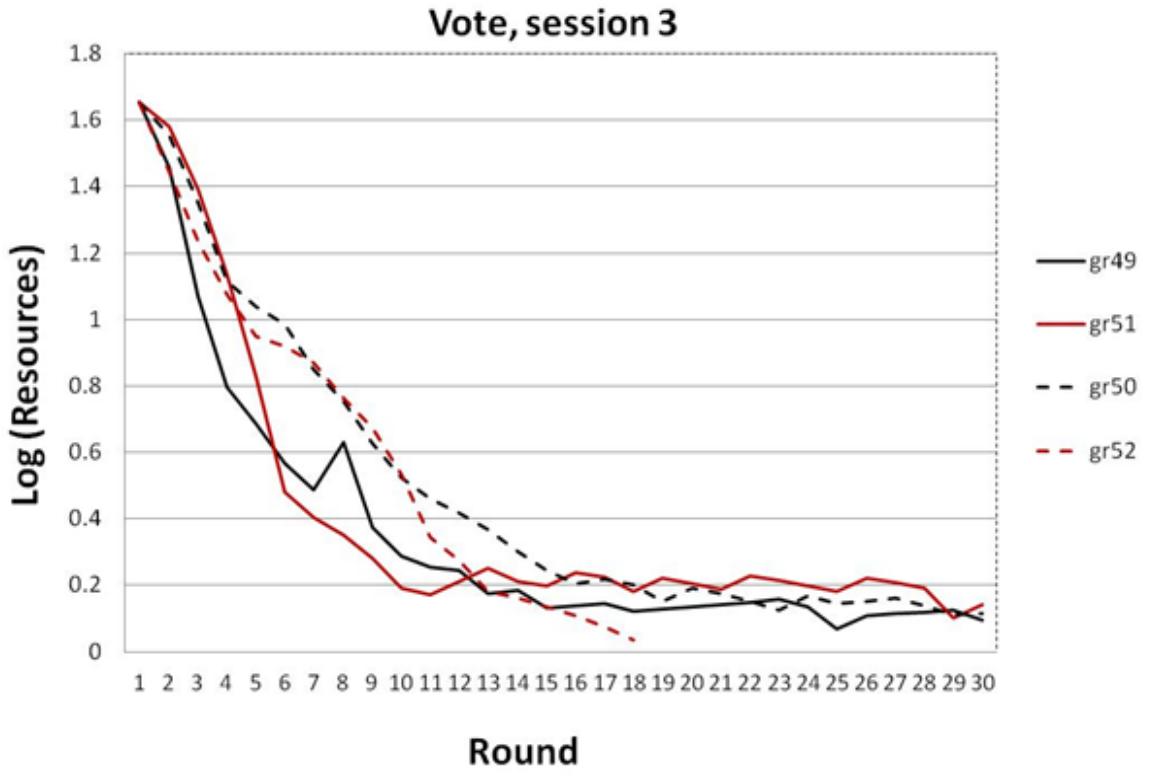

Inequality, session 2
Log (Resources)
Round
gr27
gr29
gr31
gr28
gr30
gr32
gr33
gr34


Inequality, session 3
Log (Resources)
Round
gr103
gr105
gr107
gr104
gr106
gr108

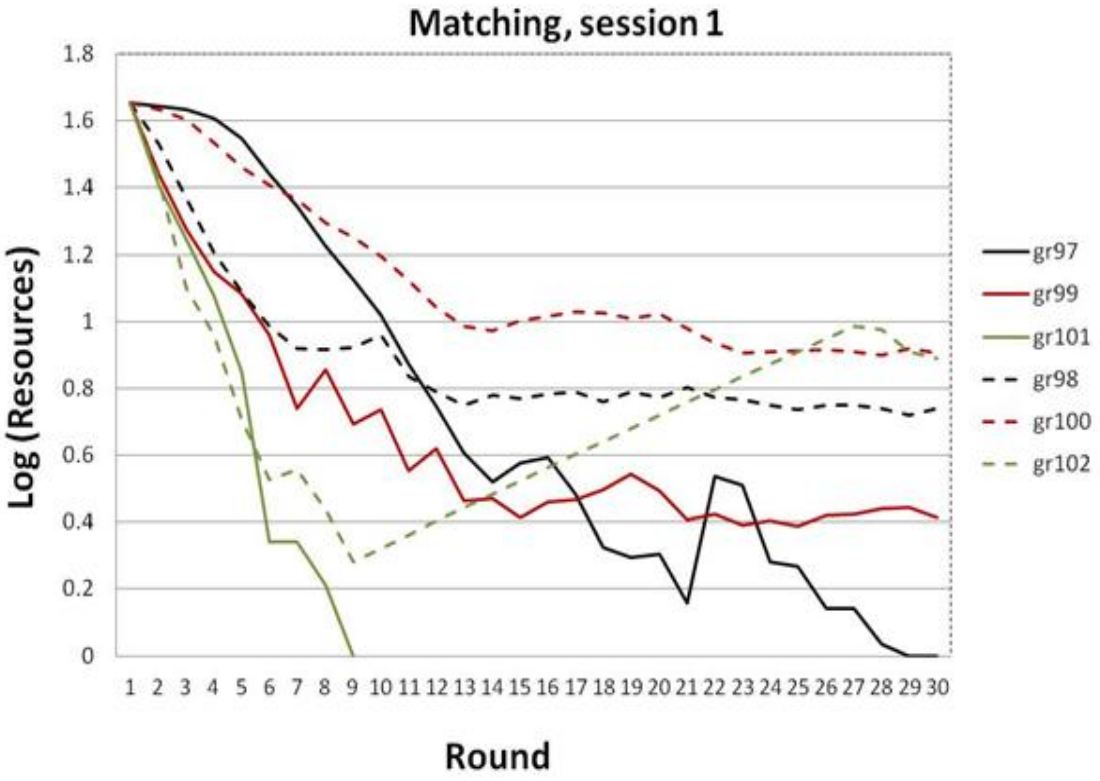
C3. Vote

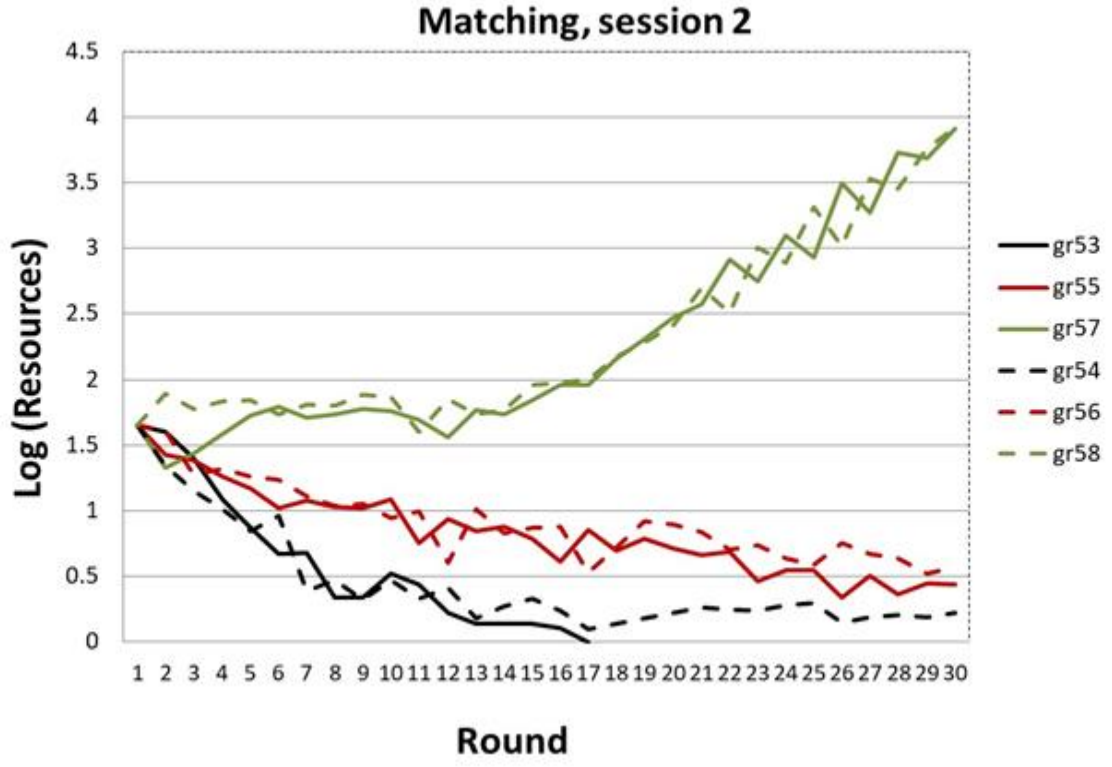

Vote, session 1
Log (Resources)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Round
gr35
gr37
gr39
gr36
gr38
gr40
gr41
gr42

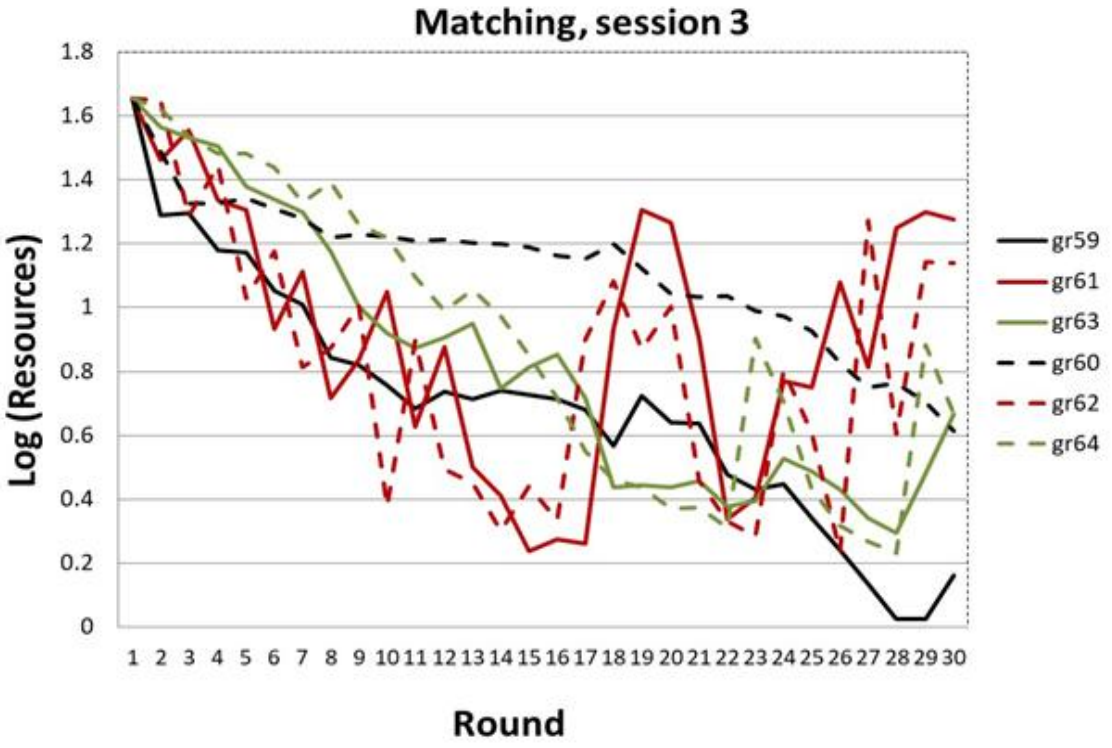

Vote, session 2
Log (Resources)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Round
gr43
gr45
gr47
gr44
gr46
gr48


Vote, session 3
Log (Resources)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Round
gr49
gr51
gr50
gr52

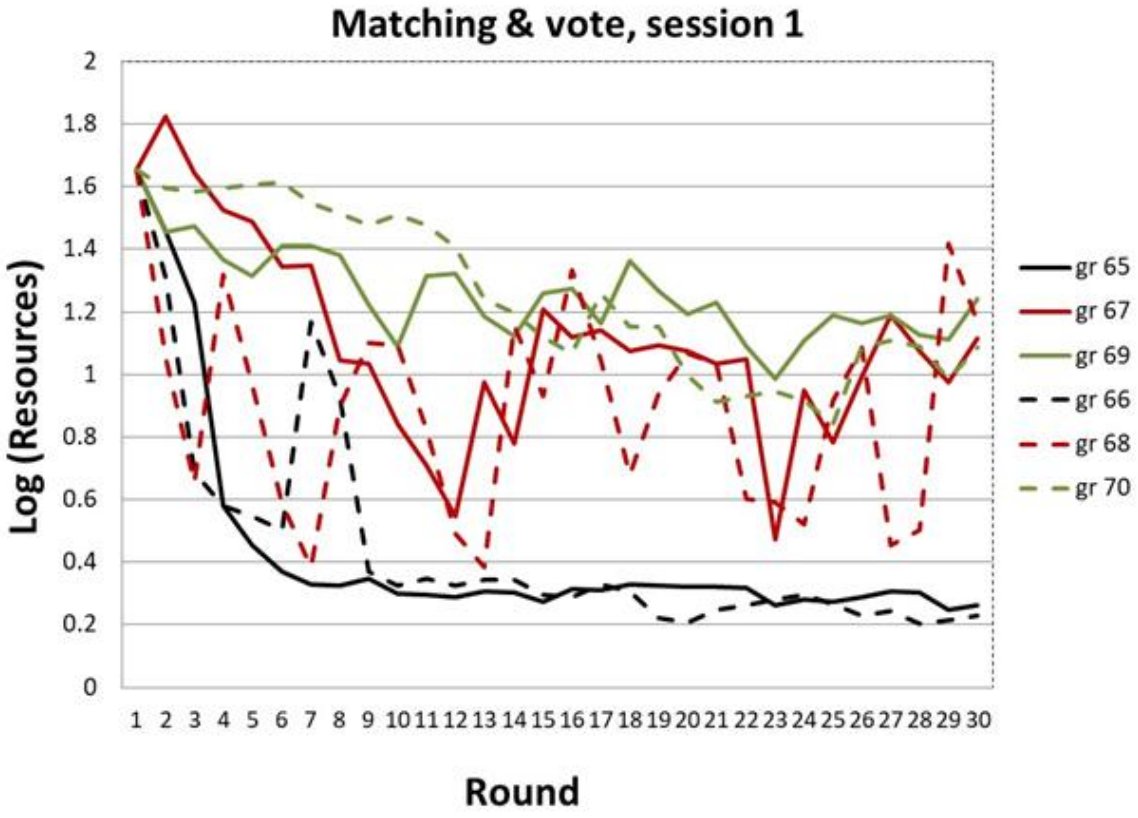
C4. Matching

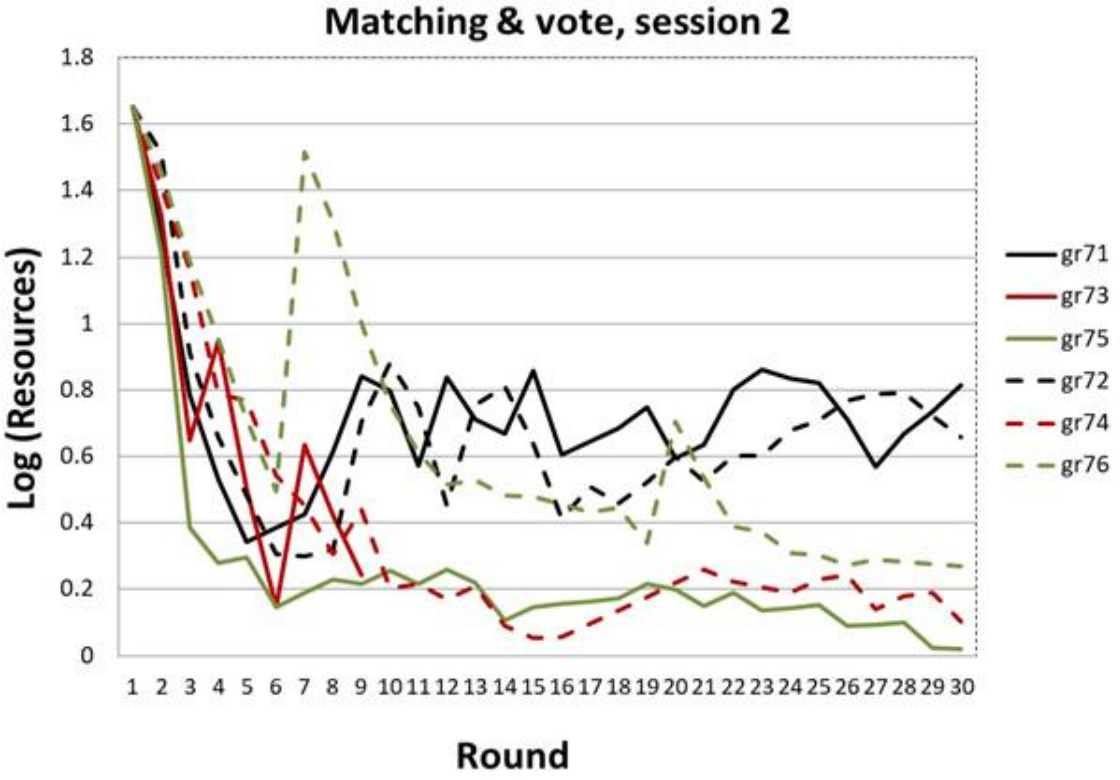

Matching, session 1
Log (Resources)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Round
gr97
gr99
gr101
gr98
gr100
gr102

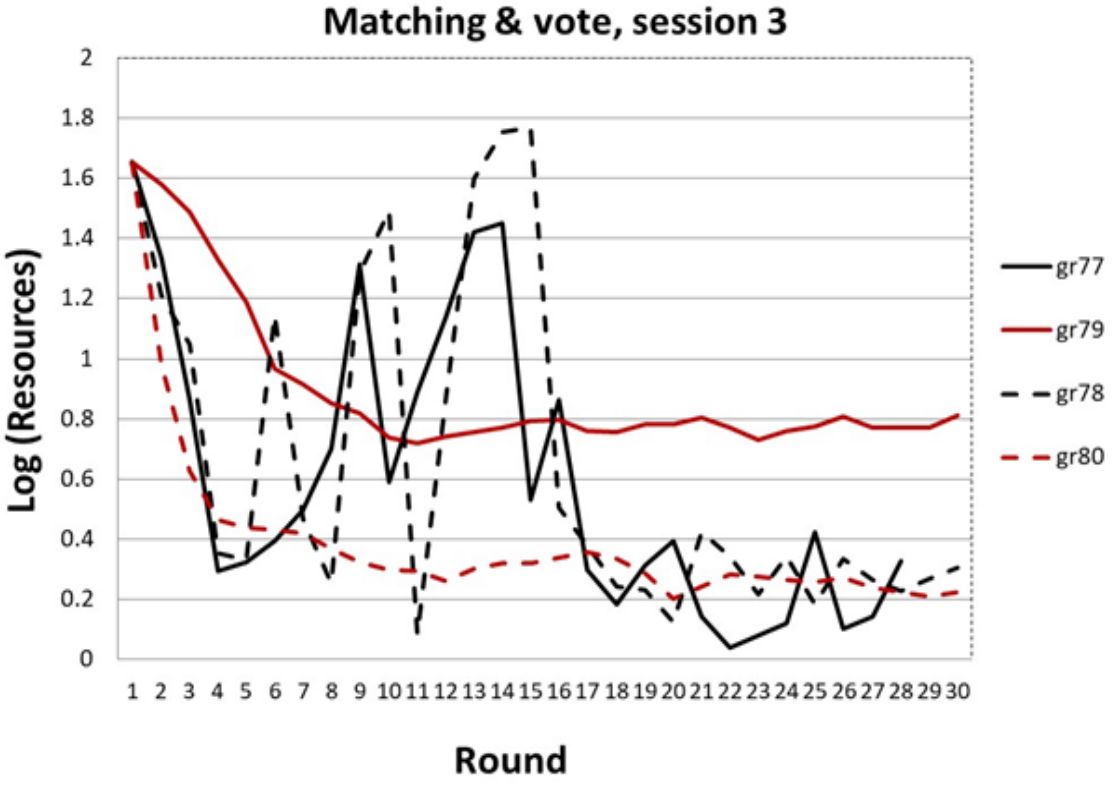

Matching, session 2
Log (Resources)
Round
gr53
gr55
gr57
gr54
gr56
gr58


Matching, session 3
Log (Resources)
Round
gr59
gr61
gr63
gr60
gr62
gr64

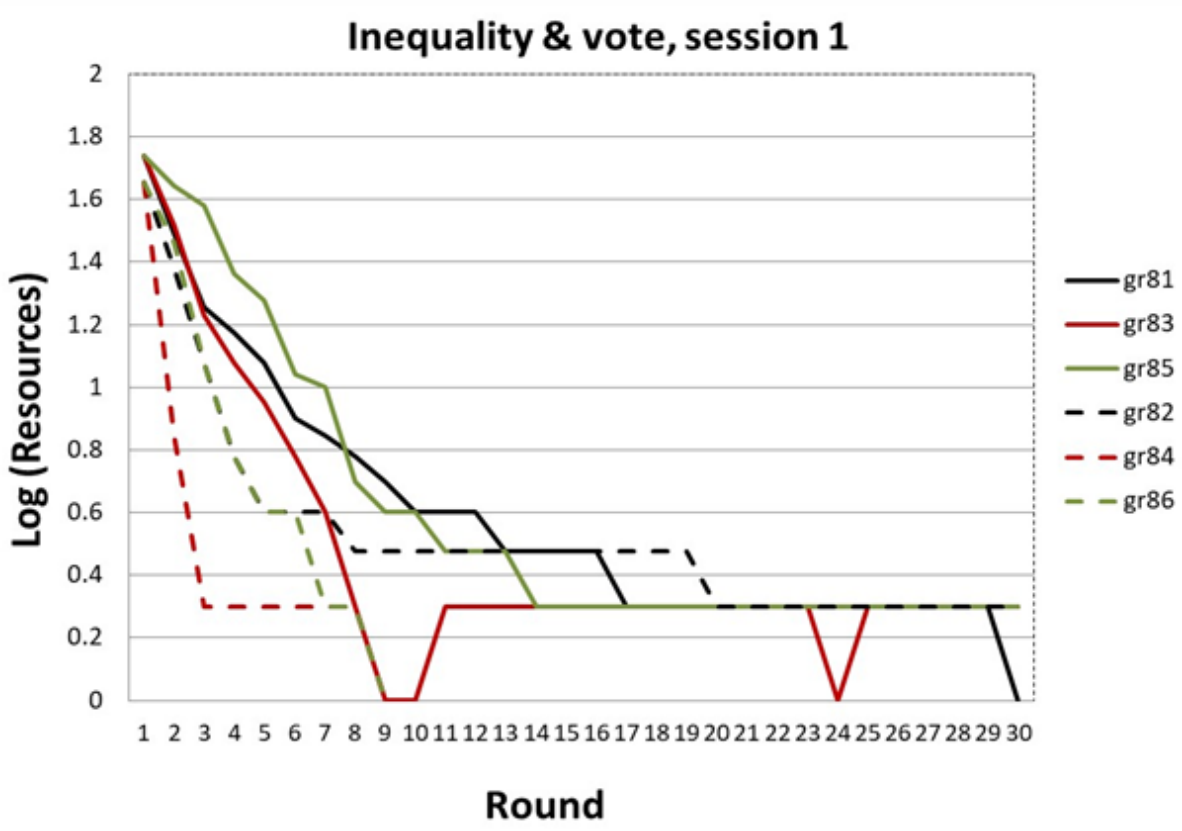
C5. 'Matching and vote' treatment

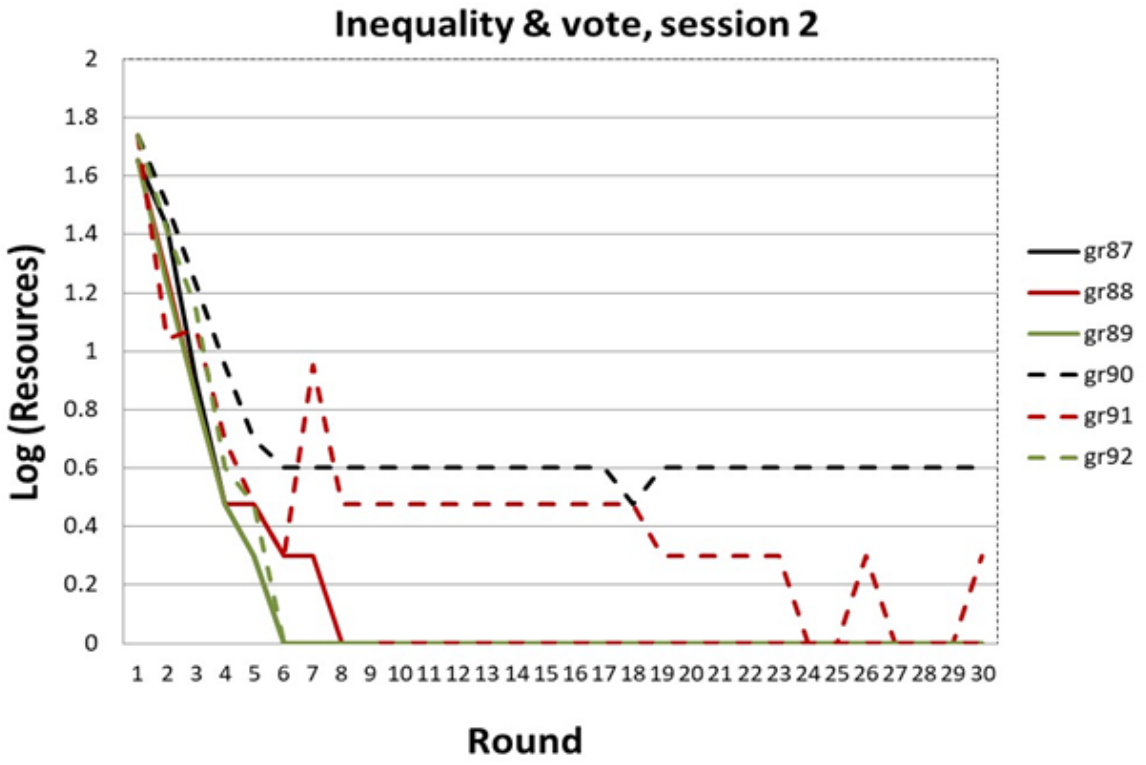


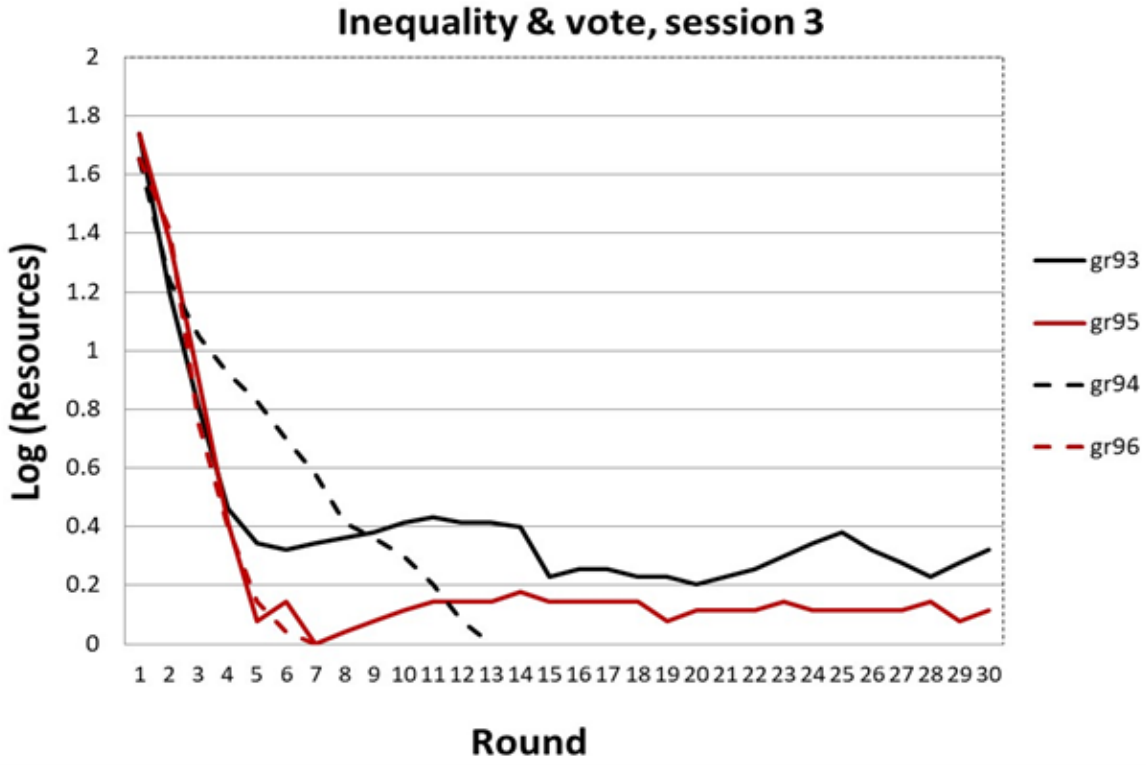

Matching & vote, session 2
Log (Resources)
Round
gr71
gr73
gr75
gr72
gr74
gr76


Matching & vote, session 3
Log (Resources)
Round
gr77
gr79
gr78
gr80

C6. 'Inequality and vote' treatment




Inequality & vote, session 2
Log (Resources)
Round
gr87
gr88
gr89
gr90
gr91
gr92


Inequality & vote, session 3
Log (Resources)
Round
gr93
gr95
gr94
gr96

Part D. Instructions

All

Welcome

You are now taking part in a decision-making experiment. Depending on your decisions and decisions made by others, you may be able to earn a substantial amount of money.

The experiment consists of three parts. In the first part, we will ask you to answer questions which will appear on your screen. Once everybody has answered them, we will distribute a set of instructions. Afterwards, the second part of the experiment will start, during which you can learn dynamics of the game. The third part - of the actual experiment - will follow afterwards with some additional elements. This part will last much longer than the second part. We will distribute instructions for this part prior to its beginning.

All

Part 2

During this part of the experiment, you will have a chance to learn dynamics of the game. In this part of this experiment, you will play with two other "persons", whose decisions will be taken by a computer. In the next part of the experiment, you will play with two participants of this experiment. Each group members will be asked to collect tokens from the common pool of tokens. Your group starts with the common pool of 45 tokens.

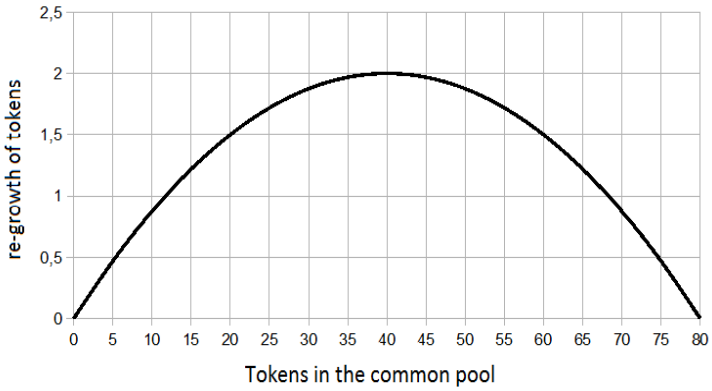
You will not know who is who in your group during or after the experiment. Every member of your group, including you, will decide simultaneously on the number of tokens to collect. The number of tokens collected by each person cannot exceed 33% of all tokens available to the group. You will be informed about how many tokens were collected by others in your group. The decisions of group members will be displayed in a random order every period - it will not be possible to determine who collected how many tokens.

The total number of tokens collected by the group will be subtracted from the common pool of tokens. Then, depending on the number of tokens left in the common pool, there will be a re-growth in the number of tokens (RG), according to:

$$RG=0.1*TC*(1-TC/80),$$

where TC is the number of tokens in the pool, and 80 is the maximum carrying capacity of the pool of tokens, i.e. beyond which the number of tokens will not increase further.

The graph below illustrates an increase in the number of tokens (RG) in the common pool, depending on the number of tokens in the common pool (TC):



For instance, if the number of tokens in the common pool is 40, then the expected re-growth of tokens is 2, and there will be 42 tokens available to your group in the next period.

You will be asked to collect tokens for some periods. However, this part of the experiment may also end if the number of tokens in the common pool of tokens goes below 1 [one]. In this case, everyone is your group looses all their tokens.

Your Earnings:

The aim of this part of the experiment is to give you the opportunity to learn dynamics of the game. You will not earn money.

Timing:

There is another important note. You will have a limited but a sufficient amount of time (some seconds) to decide how many tokens to collect. If you exceed this time, the decision will be taken for you.

Before starting:

In order to check if you understand these instructions, please answer questions which will appear on your screen.

The baseline treatment

Part 3

During this (last) part of the experiment, you will be asked to collect tokens for many periods - just as you did before. You will be randomly matched with 2 participants, but you will not be informed about their identity.

In this part of the experiment, your group will be matched with another group in the room. We will refer to this group as a "partner group". During the experiment, you can observe choices made by others in your group and also choices made by others in the partner group. Members of the partner group will collect tokens from their own common pool of tokens.

After collecting decisions take place, you can decide whether you want your group to share some tokens from your total tokens (tokens which you collected up to this time) with the partner group.

Sharing

After everyone has decided how many tokens to collect, you will be asked to indicate how many tokens you would like to share with the partner group.

Precisely, you will be asked to indicate how many tokens from your total tokens you would like to send to the partner group. If you do not wish to share tokens write 0. The amount of tokens taken from you will be added to the pool of tokens of the partner group. These tokens will be subtracted from your total tokens.

Members of the partner group will be also asked whether they would like to share some of their tokens with your group.

Your Earnings:

Your earnings will be equal to the number of tokens, which you collected. Each token is worth 1.5 PLN. There is, nevertheless, an exception: if the number of tokens in the common pool goes below 1 [one], everyone in your group will lose all their tokens. In this case, your earnings will be zero in this part of the experiment.

The inequality treatment

Part 3

During this (last) part of the experiment, you will be asked to collect tokens for many periods - just as you did before. You will be randomly matched with 2 participants, but you will not be informed about their identity.

In this part of the experiment, your group will be matched with another group in the room. We will refer to this group as a "partner group". During the experiment, you can observe choices made by others in your group and also choices made by others in the partner group. Members of the partner group will collect tokens from their own common pool of tokens.

After collecting decisions take place, you can decide whether you want your group to share some tokens from your total tokens (tokens which you collected up to this time) with the partner group. Your group and the partner group will have access to unequal number of tokens in the common pool in the first round: one group will start with 55 tokens, and another with 45.

Sharing

After everyone has decided how many tokens to collect, you will be asked to indicate how many tokens you would like to share with the partner group.

Precisely, you will be asked to indicate how many tokens from your total tokens you would like to send to the partner group. If you do not wish to share tokens write 0. The amount of tokens taken from you will be added to the pool of tokens of the partner group. These tokens will be subtracted from your total tokens.

Members of the partner group will be also asked whether they would like to share some of their tokens with your group.

Your Earnings:

Your earnings will be equal to the number of tokens, which you collected. Each token is worth 1.5 PLN. There is, nevertheless, an exception: if the number of tokens in the common pool goes below 1 [one], everyone in your group will lose all their tokens. In this case, your earnings will be zero in this part of the experiment.

The matching treatment

Part 3

During this (last) part of the experiment, you will be asked to collect tokens for many periods - just as you did before. You will be randomly matched with 2 participants, but you will not be informed about their identity.

In this part of the experiment, your group will be matched with another group in the room. We will refer to this group as a "partner group". During the experiment, you can observe choices made by others in your group and also choices made by others in the partner group. Members of the partner group will collect tokens from their own common pool of tokens.

After collecting decisions take place, you can decide whether you want your group to share some tokens from your total tokens (tokens which you collected up to this time) with the partner group. The amount of tokens, which you will decide to send to the partner group, will be doubled. For instance, if you decide to give one token, the amount of tokens in the common pool of the partner group will be augmented by 2 tokens.

Sharing

After everyone has decided how many tokens to collect, you will be asked to indicate how many tokens you would like to share with the partner group.

Precisely, you will be asked to indicate how many tokens from your total tokens you would like to send to the partner group. If you do not wish to share tokens write 0. The amount of tokens taken from you will be added to the pool of tokens of the partner group. These tokens will be subtracted from your total tokens.

Members of the partner group will be also asked whether they would like to share some of their tokens with your group.

Your Earnings:

Your earnings will be equal to the number of tokens, which you collected. Each token is worth 1.5 PLN. There is, nevertheless, an exception: if the number of tokens in the common pool goes below 1 [one], everyone in your group will lose all their tokens. In this case, your earnings will be zero in this part of the experiment.

The vote treatment

Part 3

During this (last) part of the experiment, you will be asked to collect tokens for many periods - just as you did before. You will be randomly matched with 2 participants, but you will not be informed about their identity.

In this part of the experiment, your group will be matched with another group in the room. We will refer to this group as a "partner group". During the experiment, you can observe choices made by others in your group and also choices made by others in the partner group. Members of the partner group will collect tokens from their own common pool of tokens.

After collecting decisions take place, you will be asked whether you want that everyone in your group gives some of your harvests to increase the number of tokens in the common pool of the partner group.

Sharing

Everyone in your group will be asked if she/he wants to share some of their harvests with the outgroup. If the majority says yes, you will be asked to indicate how many tokens everyone in your group (including you) should give to the partner group. After everyone answers this question, the computer will draw one answer randomly. The amount of tokens indicated in the selected vote will be subtracted from your tokens (and tokens of other group members) and added to the common pool of tokens of the partner group.

Members of the partner group will be also asked whether they would like to share some of their tokens with your group.

Your Earnings:

Your earnings will be equal to the number of tokens, which you collected. Each token is worth 1.5 PLN. There is, nevertheless, an exception: if the number of tokens in the common pool goes below 1 [one], everyone in your group will lose all their tokens. In this case, your earnings will be zero in this part of the experiment.

The 'vote and matching' treatment

Part 3

During this (last) part of the experiment, you will be asked to collect tokens for many periods - just as you did before. You will be randomly matched with 2 participants, but you will not be informed about their identity.

In this part of the experiment, your group will be matched with another group in the room. We will refer to this group as a "partner group". During the experiment, you can observe choices made by others in your group and also choices made by others in the partner group. Members of the partner group will collect tokens from their own common pool of tokens.

After collecting decisions take place, you can decide whether you want your group to share some tokens from your total tokens (tokens which you collected up to this time) with the partner group. The amount of tokens, which you will decide to send to the partner group, will be doubled. For instance, if you decide to give one token, the amount of tokens in the common pool of the partner groups will be augmented by 2 tokens.

Sharing

Everyone in your group will be asked if she/he wants to share some of their harvests with the outgroup. If the majority says yes, you will be asked to indicate how many tokens everyone in your group (including you) should give to the partner group. After everyone answers this question, the computer will draw one answer randomly. The amount of tokens, according to the drawn vote, will be subtracted from your tokens (and tokens of other group members) and twice as much will be added to the common pool of tokens of the partner group. For instance, if your group will decide that everyone should give 1 token to the partner group (thus 3 tokens in total), the amount of tokens in the partner group will increase by 6 tokens.

Members of the partner group will be also asked whether they would like to share some of their tokens with your group.

Your Earnings:

Your earnings will be equal to the number of tokens, which you collected. Each token is worth 1.5 PLN. There is, nevertheless, an exception: if the number of tokens in the common pool goes below 1 [one], everyone in your group will lose all their tokens. In this case, your earnings will be zero in this part of the experiment.

The 'inequality + vote' treatment

Part 3

During this (last) part of the experiment, you will be asked to collect tokens for many periods - just as you did before. You will be randomly matched with 2 participants, but you will not be informed about their identity.

In this part of the experiment, your group will be matched with another group in the room. We will refer to this group as a "partner group". During the experiment, you can observe choices made by others in your group and also choices made by others in the partner group. Members of the partner group will collect tokens from their own common pool of tokens.

After collecting decisions take place, you can decide whether you want your group to share some tokens from your total tokens (tokens which you collected up to this time) with the partner group. Your group and the partner group will have access to unequal number of tokens in the common pool in the first round: one group will start with 55 tokens, and another with 45.

Sharing

Everyone in your group will be asked if she/he wants to share some of their harvests with the outgroup. If the majority says yes, you will be asked to indicate how many tokens everyone in your group (including you) should give to the partner group. After everyone answers this question, the computer will draw one answer randomly. The amount of tokens, according to the drawn vote, will be subtracted from your tokens (and tokens of other group members) and twice as much will be added to the common pool of tokens of the partner group. For instance, if your group will decide that everyone should give 1 token to the partner group (thus 3 tokens in total), the amount of tokens in the partner group will increase by 6 tokens.

Members of the partner group will be also asked whether they would like to share some of their tokens with your group.

Your Earnings:

Your earnings will be equal to the number of tokens, which you collected. Each token is worth 1.5 PLN. There is, nevertheless, an exception: if the number of tokens in the common pool goes below 1 [one], everyone in your group will lose all their tokens. In this case, your earnings will be zero in this part of the experiment.

Part E. Measurements of other-regarding preferences, IQ and risk aversion

PRE-EXPERIMENT QUESTIONS

DICTATOR GAME

Imagine that you are matched with a person in this room. You have 1 Euro.

How many cents would you like to share with this person?

TRUST GAME

Imagine that you are matched with another (different) person. You have 1 Euro. How many cents would you like to send him/her knowing that for every cent you send, the person would receive a double value of this amount, and He or She would be asked to send you some money back (as he or she wishes), keeping the rest for himself.

RISK-LOVING

You have 1 Euro. You have the possibility of investing some cents in a project. The project has 40% of probabilities of being successful. If the project is successful, you will receive the invested amount multiplied by 3. You will also keep cents which you have invested. If the project fails, you only keep cents, which you have not invested. How many cents would you like to invest in the project?

COGNITIVE SKILLS (IQ)

You have 20 seconds to respond to the following questions. For each correct answer you earn 25 cents.

a) Which number comes next?

3, 5, 8, 13, 21, …

b) Which number is missing?

1	4	3
5	9	4
4	5	…

c) Which number comes next?

4, 54, 654, …

b) Which number is missing?

17	8	5	4

13	7	5	4
10	6	4	...

POST-EXPERIMENT QUESTIONNAIRE

1. Are you: (Male /Female)
2. Age
3. Which is your major: (Economics / Psychology / Others)
4. How would you describe your political preferences from 1 to 7 where 1 = very right-wing and 7 = very left-wing?
5. Before the experiment, how long did you expect that the experiment to last?
6. Before the experiment, I expected that others would collect on average per person:
7. Before the experiment, I expected that if my group had few resources in the common pool, the partner group would send us some harvests [Indicate: 0 - I do not agree – 4 agree strongly]