Prosocial Risk Taking and Intergroup Competition

Evidence from a Volunteers' Dilemma Experiment

Florian Heine[1], Arjen van Witteloostuijn[1,2], Tse-Min Wang[3]

[1]Vrije Universiteit Amsterdam, [2]University of Antwerp, [3]National Taipei University

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Summary

- We use the volunteers' dilemma to investigate prosocial risk-taking and the effect of intergroup competition on cooperation.
  - Sequential moves allow us to identify the exact motivational effect of group competition while keeping the whole payoff structure intact for comparison.
- When producing public goods is risky, the volunteering rate drops.
- Intergroup competition can increase the volunteering rate and can sustain cooperation even when volunteering involves risk of failure.
- Risk aversion increases volunteering only when volunteering involves both risk-taking and intergroup competition.

Applications

- Assume tasks within a company / family / organisation with low compensation or promotability (Babcock, Recalde, Vesterlund, & Weingart, 2017)

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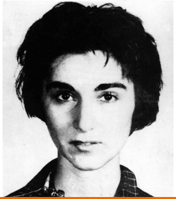
    - i.e. The murder of Kitty Genovese, 1964



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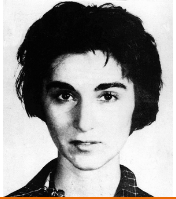
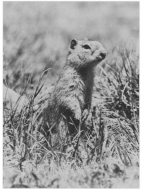
- Open-source software (Johnson, 2002)
- Whistle-blowing
- Bystander situations (Weesie, 1993)
  - i.e. The murder of Kitty Genovese, 1964
- Groups of vertebrates that rely on alarm calls as a defence against approaching predators (Archetti, 2009; Searcy & Nowicki, 2005)






Applications – Alarm Calls

Fig. 1. Belding's ground squirrel at Tioga Pass, Mono County, California.



- For animals, giving an alarm is costly to the individual, but invaluable to the survival of the group.

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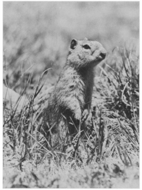

Fig. 1. Belding's ground squirrel at Tioga Pass, Mono County, California.

- For animals, giving an alarm is costly to the individual, but invaluable to the survival of the group.
- Of ground squirrels observed to give the terrestrial alarm, 13% (14 of 107) were chased or stalked by the predator, compared to only 5% (8 of 168) of those that did not alarm (Searcy & Nowicki, 2005).

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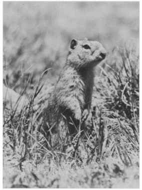


Fig. 1. Belding's ground squirrel at Tioga Pass, Mono County, California.

Table 2. The effects of proximity to cover and to a hawk on the frequency of alarm whistling. The proportion of ground squirrels that whistled is shown as a function of the distance between the animal's position when the hawk took off and both the bird's flight line (rows) and the closest burrow or bush (columns). Sample sizes are in parentheses

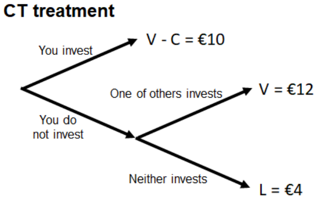
Distance to the hawk (m)	Distance to nearest burrow or bush (m)				
	0.0[a]	0.1–0.5	0.6–2.0	2.1–5.0	> 5.0
> 100	0% (8)	0% (13)	13% (15)	25% (4)	20% (5)
81–100	0% (5)	13% (8)	11% (9)	0% (3)	50% (4)
61–80	0% (4)	6% (17)	25% (12)	66% (3)	– (0)
41–60	6% (17)	9% (44)	32% (22)	22% (9)	75% (4)
21–40	18% (17)	9% (41)	45% (42)	50% (18)	71% (7)
6–20	18% (22)	33% (49)	58% (52)	79% (14)	100% (5)
0–5[b]	28% (18)	63% (51)	88% (26)	88% (8)	100% (7)

[a] These animals were partially in a burrow or bush when the hawk took off

- For animals, giving an alarm is costly to the individual, but invaluable to the survival of the group.
- Of ground squirrels observed to give the terrestrial alarm, 13% (14 of 107) were chased or stalked by the predator, compared to only 5% (8 of 168) of those that did not alarm (Searcy & Nowicki, 2005).
- Callers were animals that had the most to lose if whistling were dangerous and the most to gain if it increased their chances of escape (Sherman, 1985).
  - Creating predator-confusing pandemonium and a group in which to hide.

Volunteers' Dilemma

A public good is produced iff a volunteer provides it



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- Asymmetric pure-strategy equilibrium
  - One person volunteers and the others do not

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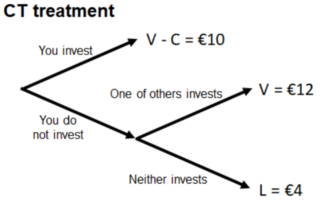

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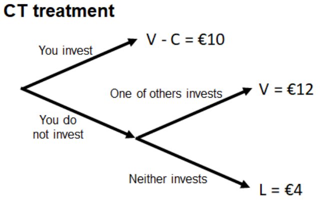
  - One person volunteers and the others do not
  - ⇒ Coordination needed
- Symmetric mixed-strategy equilibrium
  - Each person volunteers with a probability p
  - Diffusion of responsibility: p is decreasing in group size N; *no volunteering* outcome is increasing in group size



Prior Literature

Group Size Volunteering decreases with group size; probability of non-volunteering is increasing in the group size.

- *Uncertainty* about the number of potential volunteers increases cooperation (Hillenbrand & Winter, 2018).

Cost Asymmetry V. is positively correlated with other group members' costs (Healy & Pate, 2018).

- *Uncertainty* about cost to volunteer results in an increased volunteer rate (Healy & Pate, 2018).

Loss Aversion The possibility of large losses may result in a higher volunteer rate (Holt, 2007, Ch. 15).

Social Distance The probability of volunteering falls as social distance increased (Krueger, Ullrich, & Chen, 2016).

Why Volunteers Dilemma

- Cooperation among unrelated individuals is a universal and fundamental trait of (human) life.
  - Examples: Mutualistic symbioses, (indirect) reciprocity (Axelrod & Hamilton, 1981)

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- In VDG, however, free-riders and cooperators coexist in a stable equilibrium (Diekmann, 1985).
  - $\Rightarrow$ VDG's focus not on how cooperation is sustained, but *who* is willing to volunteer and how *situational factors* influence willingness to volunteer (Healy & Pate, 2018; Krueger et al., 2016).
- Risky production of public good & competition for resources – a winner-take-all, repeated one-shot game – resembles an environment in which parochial altruism could have evolved (Bowles, 2006; Choi & Bowles, 2007).

This Study: Two Dimensions of Treatments

	No intergroup competition		Intergroup competition		
			First movers	Second movers	
	No Risk	Risk	Risk	No Risk	Risk
Treatment acronym	*CT*	*RK*	*GC-Lead*	*GC-CT*	*GC-RK*

Section 2

The Model

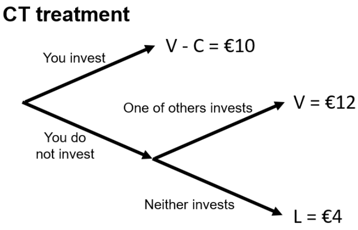
Treatments

Control Treatment (CT) Standard volunteer's dilemma in which players decide whether or not to incur a personal cost to provide a public good (Diekmann, 1985).

	No intergroup competition		
	No Risk		
Treatment acronym	CT		

The Control Treatment (*CT*) – The Baseline

- Public good is produced if and only if a volunteer provides it:
  - Each player decides whether or not to make a personal sacrifice C and volunteer to produce a public good.
  - Everyone receives a high payoff value of V if at least one player volunteers, and a lower payoff L otherwise.



The Control Treatment (CT) – Equilibrium Predictions

Asymmetric Pure-Strategy Equilibrium One person volunteers and the others do not, which needs coordination.

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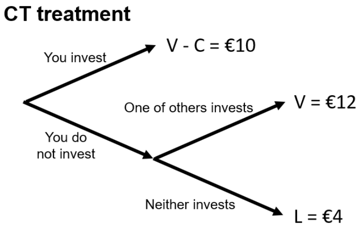
Symmetric Mixed-Strategy Equilibrium Each person volunteers with a probability p^{CT} such that each person is indifferent and therefore willing to randomise between volunteering and free-riding.

$$u(V - C) = u(V)\left[1 - (1-p)^{N-1}\right] + u(L)(1-p)^{N-1} \tag{1}$$



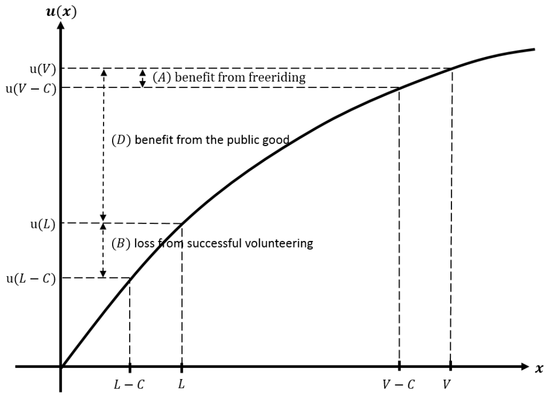
The Control Treatment (CT) – Equilibrium Predictions

Symmetric Mixed-Strategy Equilibrium Each person volunteers with a probability p^{CT} such that each person is indifferent and therefore willing to randomise between volunteering and free-riding.

$$p^{CT} = 1 - \left[\frac{u(V) - u(V-C)}{u(V) - u(L)}\right]^{\frac{1}{N-1}} \tag{2}$$

- *Increases* in the added value of the public good $u(V) - u(L)$.
- *Decreases* in the cost of volunteering C and in the group size, N (diffusion of responsibility).
- *Increases* in the degree of risk aversion.
  - The collective risk of no volunteering (with probability $(1-p)^{N-1}$) would encourage risk averse individuals to volunteer more in order to secure a sure payoff $V - C$.

Utility Function Under Risk Aversion



$$p^{CT} = 1 - \left[\frac{u(V) - u(V-C)}{u(V) - u(L)}\right]^{\frac{1}{N-1}}$$

$$p^{CT} = 1 - \left[\frac{(A)}{(D)}\right]^{\frac{1}{N-1}}$$

Treatments

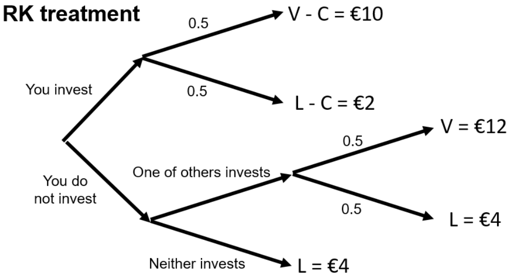
Control Treatment (CT) Standard volunteer's dilemma in which players decide whether or not to incur a personal cost to provide a public good (Diekmann, 1985).

Risk-Taking (RK) Risky production of public goods, a 50% chance of failure.

	No intergroup competition			
	No Risk	Risk		
Treatment acronym	CT	RK		

Risk Treatment (*RK*) – Risky Volunteering

- Similar to *CT* treatment except that there is a 50/50 chance of producing a public good with value V.
  - Volunteers need to take a risk that their contributions may not pay off.



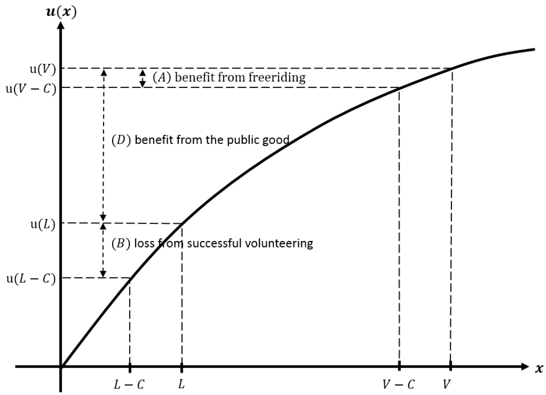
Risk Treatment (*RK*) – Equilibrium Predictions

- Symmetric Nash equilibrium probability of volunteering in the *RK* treatment is

$$p^{RK} = 1 - \left[\frac{u(V) + u(L) - u(V-C) - u(L-C)}{u(V) - u(L)} \right]^{\frac{1}{N-1}} . \tag{3}$$

  - $p^{CT} > p^{RK}$
  - *Increases* in the added value of the public good $u(V) - u(L)$.
  - *Decreases* in the cost of volunteering C and in the group size, N.

Utility Function Under Risk Aversion



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$$p^{RK} = 1 - \left[\frac{u(V) + u(L) - u(V-C) - u(L-C)}{u(V) - u(L)}\right]^{\frac{1}{N-1}}$$

$$p^{RK} = 1 - \left[\frac{(A)}{(D)} + \frac{(B)}{(D)}\right]^{\frac{1}{N-1}}$$

Risky Volunteering and Risk Aversion

Trade-off betwen two types of risk

Risk of No-Volunteering: Encourages risk averse players to volunteer more than risk neutral players in order to avoid the consequence of collective inaction.

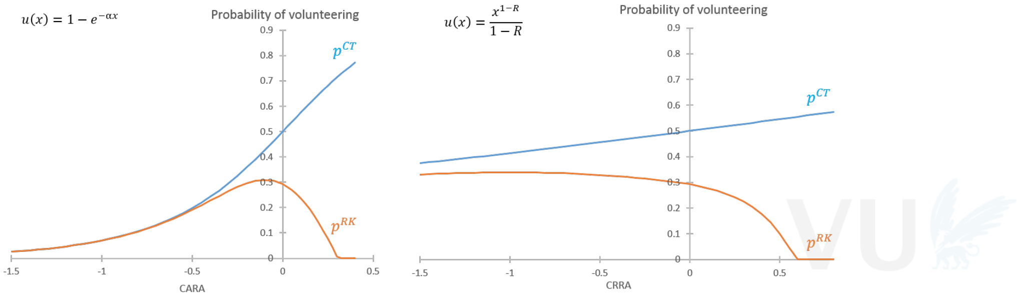
Risk of Unsuccessful-Volunteering: Induces risk averse players to *not* volunteer and secure their endowment.

⇒ This trade-off creates a non-monotonous relationship between risk aversion and risky volunteering.

⇒ Highly risk averse individuals would rather lose the chance to produce a public good than take the risk of unsuccessful volunteering.

Volunteering and Risk Attitudes

- Numerical simulation: $N = 3, V = 12, L = 4, C = 2$.
  - p^{CT} is increasing monotonically in the degree of risk aversion.
  - p^{RK} show an inverted U-shaped relationship.
    - $\Rightarrow$ Risk aversion discourages individuals to volunteer for fear of unsuccessful volunteering.



Treatments

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Risk-Taking (*RK*) Risky production of public goods, a 50% chance of failure.

Intergroup Competition (*GC*) Two groups compete for a public good sequentially.

- A group with one or more volunteers wins a public good against another group with no volunteer.
- A 50-50 chance of winning in case of a tie, when both groups have at least one volunteer.

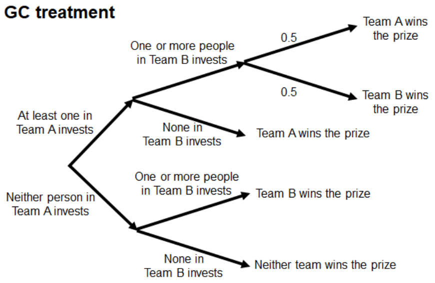
	No intergroup competition		Intergroup competition		
			First movers	Second movers	
	No Risk	Risk	Risk	No Risk	Risk
Treatment acronym	*CT*	*RK*	*GC-Lead*	*GC-CT*	*GC-RK*

Intergroup Competition Treatment (GC)

- Two groups (Team A and Team B) play volunteer's dilemma games within each group and compete for a winner-take-all prize, which gives the value of V to each member of the winning group.
- Probability of winning depends on whether at least one member volunteers.
  - One group can win the prize for sure if the group has at least one volunteer while the other group does not.
  - If both groups have at least one volunteer, then the winning chance is 50/50.

Intergroup Competition Treatment (*GC*) – Sequential Competition

- Members of Team *A* move first in Stage 1.
- In Stage 2, members of Team *B* then make decisions, contingent on the outcome of the Stage 1.
  - If no first mover volunteers, the subgame of the second movers (*GC-CT*) is identical to *CT*.
  - If at least one first mover volunteers, the subgame (*GC-RK*) is identical to *RK*.



Intergroup Competition Treatment (*GC*) – Equilibrium Predictions

Team B

If *nobody* from Team A volunteers $p_B^{GC-CT} = p^{CT}$

If *at least one member* from Team A volunteers $p_B^{GC-RK} = p^{RK}$

Intergroup Competition Treatment (*GC*) – Equilibrium Predictions

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If *nobody* from Team A volunteers $p_B^{GC-CT} = p^{CT}$

If *at least one member* from Team A volunteers $p_B^{GC-RK} = p^{RK}$

- Maintain intra-group structure of the social dilemma, keeping payoff structures identical between the two subgames of the *GC* treatment (*GC-CT* or *GC-RK*) and the corresponding single group treatments (*CT* or *RK* treatment).
  - Associated counterpart treatments face exactly identical game structure for Team B's contingent response.

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  - Associated counterpart treatments face exactly identical game structure for Team B's contingent response.

$\Rightarrow$ Identify the exact motivational effect of intergroup competition on self-sacrificial behaviour while keeping the general payoff structure intact.

Intergroup Competition and Intra-Group Cooperation

- Intergroup conflicts often involve individuals who voluntarily cooperate to make personal sacrifice and provide collective benefits (Hugh-Jones & Zultan, 2013; Olson, 1965).
  - Intergroup competition may make the natural selection act in favour of the readiness "to give aid to each other, and to sacrifice themselves for the common good" (Darwin, 1871).
  - Evolution of altruism can be explained by multi-level selection via intergroup competition (Bowles, 2006; Choi & Bowles, 2007).
- Laboratory evidence
  - Prisoners' dilemma game (Erev, Bornstein, & Galili, 1993; Bornstein & Ben-Yossef, 1994; Gunnthorsdottir & Rapoport, 2006; Halevy, Bornstein, & Sagiv, 2008)
  - Coordination game (Bornstein, Gneezy, & Nagel, 2002)
  - Public goods game (Rapoport & Bornstein, 1989; Sääksvuori, Mappes, & Puurtinen, 2011; Tan & Bolle, 2007; Puurtinen & Mappes, 2008; Cárdenas & Mantilla, 2015).

Mechanisms of the Intergroup Competition

Additional collective prize Alignment of interests (Tan & Bolle, 2007; Bornstein & Ben-Yossef, 1994).

Focal points Better coordination, making the group welfare more salient (Bornstein & Ben-Yossef, 1994; Bornstein et al., 2002).

Benchmarking Mere group comparison without monetary incentive can induce cooperation for strangers in the public good game (Tan & Bolle, 2007).

Threshold effect A prize competition creates a need to contribute more than a threshold that is set out by another group (Jordan, Jordan, & Rand, 2017).

Hypotheses

1. Risk *reduces* volunteering rate (*CT* vs. *RK*; *GC-CT* vs. *GC-RK*).
2. Intergroup competition *increases* volunteering rate (*CT* vs. *GC-CT*; *RK* vs. *GC-RK*).
3. p^{CT} *increases* monotonically in the degree of risk aversion.
4. p^{RK} shows an *inverted U-shaped* relationship.

Section 3

The Method

The Experimental Design

- We conducted the experiment using *z-Tree* in the CentERlab with 126 participants between September 2018 and November 2018.
  - 53.4 per cent female, average age 22.6 (sd = 3.20).

The Experimental Design

CentERlab at Tilburg University

The Experimental Design

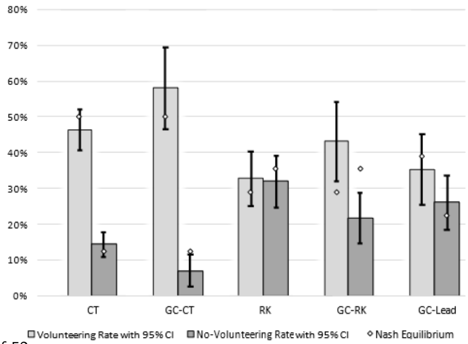
- We conducted the experiment using *z-Tree* in the CentERlab with 126 participants between September 2018 and November 2018.
  - 53.4 per cent female, average age 22.6 (sd = 3.20).
- 7 sessions, 4 parts.
  - 10-minute on-line survey regarding individual attitudes towards morality and public service.
  - Holt-Laury risk task: measure the risk aversion level (Holt & Laury, 2002)
  - *CT* treatment in 10 consecutive decision periods. Stranger matching.
  - *RK* or *GC* in 10 consecutive decision periods
    - 48 participants of 3 sessions played the *RK* treatment. Stranger matching.
    - 78 participants of 4 sessions played the *GC* treatment. Stranger matching with fixed roles (first/second movers). Strategy method for Team *B*.
- Duration 50 minutes (including instructions). Average earning about 12 euros, paid in cash.

Section 4

Results

Volunteering Rate Across Treatments

Treatment	*CT* (N=126)	*RK* (N=48)	*GC-CT* (N=39)	*GC-RK* (N=39)	GC-Lead (N=39)
Treatment	No-Risk, single group Production	No-Risk, intergroup competition	0.58 Risky, single group	Risky, intergroup competition	Leader, intergroup competition
Session	1, 2, 3, 4, 5, 6, 7	1, 4, 5	2, 3, 6, 7	2, 3, 6, 7	2, 3, 6, 7
Session Average	0.49, 0.38, 0.50, 0.58, 0.33, 0.53, 0.44	0.33, 0.33, 0.31	0.5, 0.58, 0.48, 0.76	0.44, 0.38, 0.42, 0.5	0.37, 0.38, 0.37, 0.28
Treatment Average	0.46	0.33	0.58	0.43	0.35
Treatment Std. Err.	0.029	0.038	0.056	0.054	0.049
Nash Equlibrium	0.5	0.29	0.5	0.29	0.51

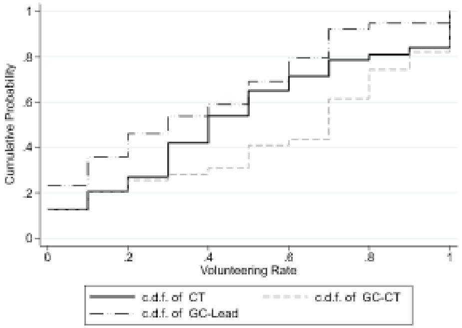


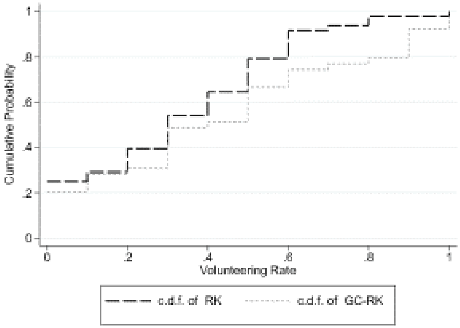
NE Volunteering Rate Treatment average of volunteering (p^{CT} or p^{RK}).

NE *No*-Volunteering Rate Rate of no volunteers in own group $(1-p)^N$.

Cumulative Distribution of Volunteering Rate

Intergroup competition shifts the CDF of the *CT* and *RK* treatment to the right, particularly increasing the median of safe volunteering and the upper quartile of risky volunteering.





Risk Preferences – Measurement

Holt-Laury task (Holt & Laury, 2002)

- Participants make 10 choices subject to varying degrees of risk. The actual number of safe choices allows to draw an implication of their risk preference.

	Option A	Option B
Decision 1:	10% chance of €3 and 90% chance of €2	10% chance of €5 and 90% chance of €1
Decision 2:	20% chance of €3 and 80% chance of €2	20% chance of €5 and 80% chance of €1
Decision 3:	30% chance of €3 and 70% chance of €2	30% chance of €5 and 70% chance of €1
Decision 4:	40% chance of €3 and 60% chance of €2	40% chance of €5 and 60% chance of €1
Decision 5:	50% chance of €3 and 50% chance of €2	50% chance of €5 and 50% chance of €1
Decision 6:	60% chance of €3 and 40% chance of €2	60% chance of €5 and 40% chance of €1
Decision 7:	70% chance of €3 and 30% chance of €2	70% chance of €5 and 30% chance of €1
Decision 8:	80% chance of €3 and 20% chance of €2	80% chance of €5 and 20% chance of €1
Decision 9:	90% chance of €3 and 10% chance of €2	90% chance of €5 and 10% chance of €1
Decision 10:	100% chance of €3 and 0% chance of €2	100% chance of €5 and 0% chance of €1

Risk Preferences

# of Safe Choice	Implied CRRA	Implied CARA	Risk Preference	Percent
0	r<-1.54	r<-0.58	extremely risk seeking	6.35
1	-1.54<r<-0.70	-0.58<r<-0.27	highky risk seeking	1.59
2	-0.70<r<-0.15	-0.27<r<-0.16	risk seeking	3.17
3	-0.15<r<0.29	-0.06<r<0.12	risk neutral	13.49
4	0.29<r<0.70	0.12<r<0.28	risk averse	22.2
5	0.70<r<1.01	0.28<r<0.45	very risk averse	19.84
6	1.01<r<1.54	0.45<r<0.64	highly risk averse	15.87
7	1.54<r<2.06	0.64<r<0.87	extremely risk averse	8.73
8	2.06<r<2.85	0.87<r<1.23	extremely risk averse	3.17
9, 10	2.85<r	r>1.23	extremely risk averse	5.56

Regression Analysis

- Strictly speaking, we only have 7 (CT treatment), 3 (RK treatment), and 4 (GC treatment) independent observations, since all participants in one session were connected.
- Mixed-effects (ME) linear model with repeated measures.
  - The 2×2 treatment effect are modeled as binary fixed effects
  - Sessions and the participants within each sessions are modeled as random effects.
  - The error structure included heteroskedastic variances across individuals and sessions

Regression Analysis

Table 4: Regression Results: Treatment Effect

Dependent Variable:	Decision(s) to volunteer			
	(1)	(2)	(3)	(4)
Unit of observation:	Treatment average	Decision per round		
	ML linear	ML linear	ML linear	ML linear
Treatment (*CT* as the baseline)				
GC-CT	0.132***	0.154***	0.133***	0.132***
	(0.051)	(0.032)	(0.039)	(0.039)
RK	−0.136***	−0.132***	−0.197***	−0.192***
	(0.047)	(0.029)	(0.037)	(0.041)
GC-RK	−0.017	0.023	−0.002	−0.002
	(0.051)	(0.032)	(0.039)	(0.039)
Risk aversion	0.014	0.011	0.002	−0.001
	(0.011)	(0.012)	(0.012)	(0.017)
× *GC-CT*			0.012	0.064***
			(0.014)	(0.025)
× *RK*			0.038***	0.041**
			(0.014)	(0.017)
× *GC-RK*			0.014	0.014
			(0.014)	(0.025)
Risk aversion squared				0.001
				(0.004)
× *GC-CT*				−0.011**
				(0.004)
× *RK*				−0.001
				(0.005)
× *GC-RK*				0.000
				(0.004)
Gender (male= 1)	−0.082*	−0.083*	−0.080	−0.081
	(0.048)	(0.050)	(0.050)	(0.051)
Experience (Round)		−0.002	−0.002	−0.002
		(0.003)	(0.003)	(0.003)
Previous win		−0.022	−0.024	−0.024
		(0.021)	(0.021)	(0.021)
Constant	0.473***	0.497***	0.513***	0.512***
	(0.042)	(0.050)	(0.051)	(0.050)
Observations	251	2259	2259	2259
Obs per subject	1,2,3	9,18,27	9,18,27	9,18,27
Logliklihood	−55.917	−1393.174	−1388.948	−1384.852
Wald statistic	24.392	57.520	66.193	74.652
Test statistic on $\beta^{GC-RK} > \beta^{RK}$	3.504*	14.594***	14.111***	12.050***

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

Note: Standard errors are clustered at the session and individual level. Risk aversion is centered at 3. Previous win = 1 if group won or successfully produced a public good in previous round and = 0 if otherwise.

Model 1 Average volunteering rate across ten rounds.

Models 2-4 Binary volunteering decision in each round.

- Control for experience and previous win.

- All Models control for gender, risk aversion (# of safe choices in H-L centred at three).
- Models 3 and 4 employ heterogeneous effects of risk aversion across treatments.

Regression Analysis

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× *GC-RK*			0.014	0.014
			(0.014)	(0.025)
Risk aversion squared				0.001
				(0.004)
× *GC-CT*				−0.011**
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× *RK*				−0.001
				(0.005)

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Regression Analysis

× *GC-RK*				0.000
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Gender (male= 1)	−0.082*	−0.083*	−0.080	−0.081
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- Group Competition +
- Risky production -
  - In line with theoretical prediction
- Baseline volunteering rate about 50%

Models (1)-(3) No robust effect of risk aversion, only if risky production, then it has an effect.

Model (4) Inverted-U shape relationship between risk aversion and volunteering in $GC - CT$, sign. positive relationship in RK.

Regression Analysis

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Models (1)-(

Regression Analysis

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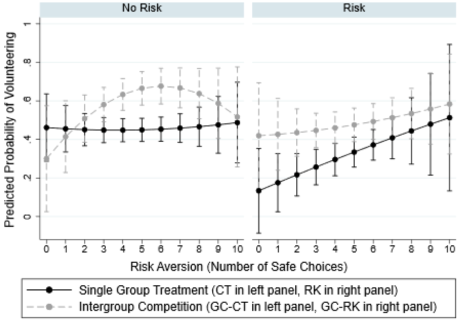
Mode

Hypotheses

1. Risk *reduces* volunteering rate (*CT* vs. *RK*; *GC-CT* vs. *GC-RK*). ✓
2. Intergroup competition *increases* volunteering rate (*CT* vs. *GC-CT*; *RK* vs. *GC-RK*). ✓
3. p^{CT} *increases* monotonically in the degree of risk aversion.
4. p^{RK} shows an *inverted U-shaped* relationship.

Risk Aversion

- No robust evidence for relationship between risk aversion and volunteering (Models 1 and 2), unless volunteering involves risky production (Model 3).
- Include Squared term for risk aversion to test "inverted-U shape hypothesis" (Model 4).



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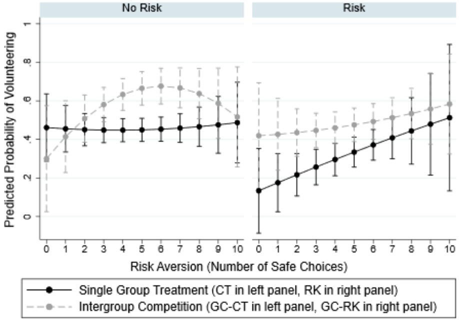
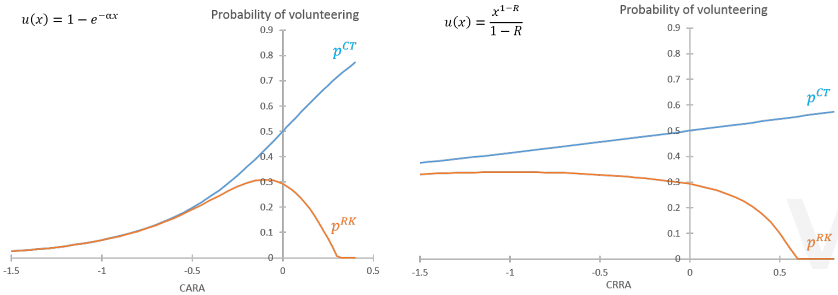


- Figure plots linear prediction of Model 4 with 95% confidence intervals across different levels of risk aversion.
- Findings are inconsistent with expected utility theory.
  - Risk-averse individuals more likely to volunteer in *RK*.
  - Extreme risk aversion reduces rate of volunteering in *GC-CT*.
  - Neither quadratic nor linear relationship in *CT* or *GC-RK*.

Volunteering and Risk Attitudes

- Numerical simulation: $N = 3, V = 12, L = 4, C = 2$.
  - p^{CT} is increasing monotonically in the degree of risk aversion.
  - p^{RK} show an inverted U-shaped relationship.
    - $\Rightarrow$ Risk aversion discourages individuals to volunteer for fear of unsuccessful volunteering.



Discussion

- Intergroup competition can increase the volunteering rate and can sustain cooperation when volunteering involves risk of failure.

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- Intergroup competition can increase the volunteering rate and can sustain cooperation when volunteering involves risk of failure.
  - We can rule out effects from benchmarking or threshold effects and we maintain the same payoff structure between the experiments.
  - Intergroup rivalry may enhance the salience of a collective social identity, motivating individuals to allocate greater weight to the joint welfare over individual gains alone (Tan & Bolle, 2007; Brewer & Kramer, 1986).

⇒ Evidence of parochial altruism.

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Discussion

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  ⇒ Evidence of parochial altruism.
- In many real-life settings, volunteers' efforts bear the risk of turning out to be a useless sacrifice.
  - Like the ground squirrels, human participants in our experiment volunteer *less* in a risky situation.

  ⇒ A way to counteract this negative effect could be a competitive situation between groups.

Discussion

- Results inconsistent with expected utility theory concerning risk aversion.

Discussion

- Results inconsistent with expected utility theory concerning risk aversion.
  - I.e. positive relationship between risk aversion and risky volunteering.
  - Brewer and Kramer (1986): Risk-averse individuals more sensitive to *collective* risk, whereas risk-seekers respond more to the risk associated with *self-interested behaviour*.
  - Bias towards attending to the collective risk could mitigate the negative effect from the risk of failure, and hence increase the tendency to take a risk and volunteer.

⇒ Cannot account for entire relationship between volunteering and risk attitudes across all treatments (i.e. inverse-U shaped *GC-CT*).

Discussion

- Over-volunteering is socially inefficient.
  - Outgroup threat may trigger a strong motive for ingroup cohesion, and thus trigger over-volunteering.
  - Parochial altruism may be inefficient in some contexts. Lower fitness of altruists could be compensated with higher survival of more altruistic groups, if human ancestors have faced high levels of lethal intergroup conflicts, which resemble a winner-take-all, repeated one-shot game (Bowles, 2006; Choi & Bowles, 2007)

Discussion

- Over-volunteering is socially inefficient.
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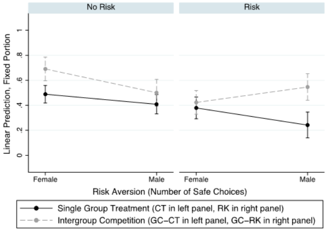
⇒ Parochial altruism may have served specific survival functions in the ancestral environment, but might cause "human errors" in current environments.

Extra: Gender Effect

⇒ Males volunteer more than females under group competition & Risk

⇒ Females volunteer more in other treatments



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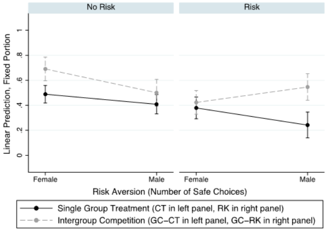
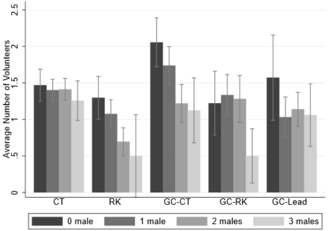


⇒ Group with more females has significantly more volunteers in the RK and GC-CT treatments, but not in GC-RK



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