Normative Conflict and Cooperation in Sequential Social Dilemmas

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Motivation

"Am I to write a blank cheque and sign away the livelihoods and sustainability of 1.2 billion Indians, without even knowing what the EU roadmap contains? ... We will never give up the principle of equity. "

-Indian environment minister Jayanthi Nataraja at Durban Climate Conference 2011

Motivation

What is the principle of equity in climate negotiations? (Lange et al., 2010)

- Equal per capita emissions?
- Equal percentage reduction?
- Equal ratio of abatement costs to emissions?
- Equal ratio of abatement costs to GDP?

$\Rightarrow$ Conflicting normative views of fairness exist for public good provision. Which normative principles are applied? By whom?

Motivation

Existing literature focuses on the destructive nature of normative conflict in public good games (e.g. Reuben and Riedl, 2013; Nikiforakis, Noussair and Wilkening, 2012)

⇒ Can we use knowledge about normative views of fairness to our advantage to design a mechanism which increases public good provision?

Motivation

Contributions to public good are often made sequentially, e.g., EU has regularly made advance commitments to increase emission reductions before next round of post-Kyoto negotiations.

$\Rightarrow$ What is the impact of normative conflict on sequential public good provision? In a voluntary contribution setting, how should we set up the sequence to get the highest contributions? Can we find both theoretical and experimental evidence?

Model

Linear Public Good game

$$\pi_i = w_i - c_i + \alpha \sum_k c_k$$

- n players
- Rich and poor agents $\Rightarrow$ Endowments w_h and w_l, $w_h > w_l$
- $\frac{1}{n} < \alpha < 1$ (social dilemma)

Model

Utility function

$$u_i(c_i, c_{-i}) = \pi_i(c_i, c_{-i}) - \frac{\beta}{2}\left(c_i - m^{k(i)}(c_{-i})\right)^2$$

- Normative principles
  1. Equality (equal absolute contribution): $m^{eqa}(c_{-i}) = \frac{c_{-i}}{n-1}$
  2. Equity (equal relative contribution): $m^{eqi}(c_{-i}) = \frac{c_{-i}}{w_{-i}} w_i$

Proposition

Rich players prefer equality, whereas poor players prefer equity.

Sequential contribution game

- Players separated into first- and second-movers
- Three possible sequences: Rich first, Poor first, Mixed
- First-movers know the endowments
- Second-movers know the endowments and the contributions of first-movers

Behavioral Assumptions

1. Poor first-movers contribute xw_l. Rich first-movers contribute either xw_h (weak wealth heterogeneity) or w_l (strong wealth heterogeneity).

   $x \in [0, 1]$: cooperativeness of a society

   $xw_h \leq w_l$: weak wealth heterogeneity

   $xw_h > w_l$: strong wealth heterogeneity

2. Second-movers contribute according to their preferred normative principle.

Predictions

Proposition

Under weak wealth heterogeneity,

(i) *SEQ with rich first-movers* **generates greater public good provision** *than alternative sequential move mechanisms.*

(ii) *SEQ with rich first-movers* **diminishes wealth inequality** *between rich and poor players more than alternative sequential move mechanisms.*

Predictions

Proposition

Under strong wealth heterogeneity,

the **relative performance** *of the sequential move mechanisms*

depends on the cooperativeness x *of a society.*

Proposition

With constant overall wealth, increasing wealth heterogeneity

decreases public good provision under all mechanisms.

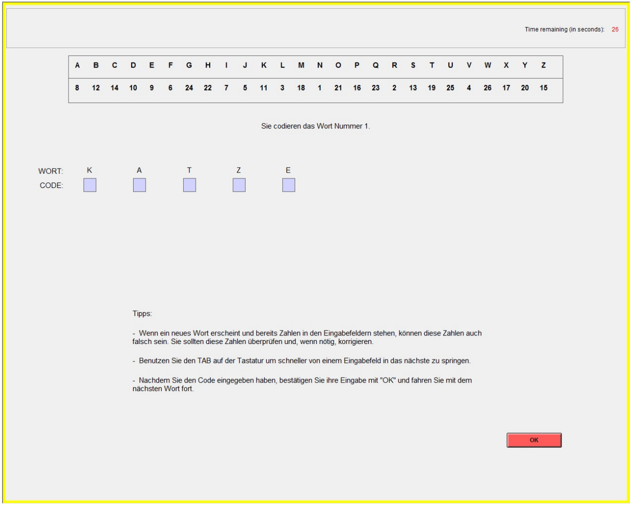
Experiment

1. Real-effort task
   - Encryption task (Erkal et al., 2011)
2. Sequential move linear Public Good game
   - 15 periods, partner matching
   - 6 treatments

Real-effort task

- Encryption task as introduced by Erkal et al. (2011)
- Goal: Encode as many words as possible in 10 minutes
- Predetermined equal sequence of words for all players
- Two most productive subjects get w_h, the other two get w_l

Real-effort task



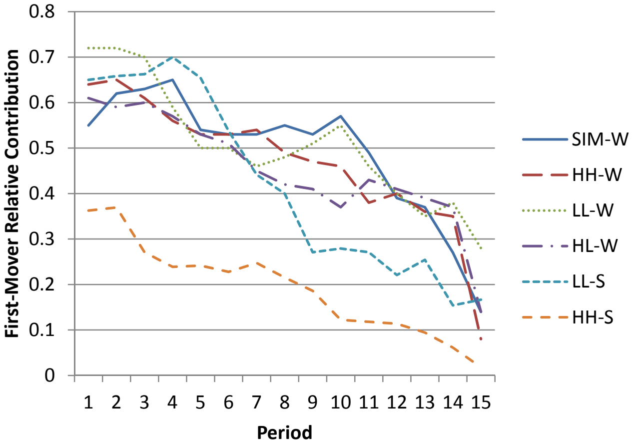
Linear Public Good game - Treatments

Treatment	w_h	w_l	Sequential order	Number of groups
SIM-W	25	15	Simultaneous	12
HH-W	25	15	Rich first	12
LL-W	25	15	Poor first	12
HL-W	25	15	Mixed sequence	12
HH-S	30	10	Rich first	12
LL-S	30	10	Poor first	12

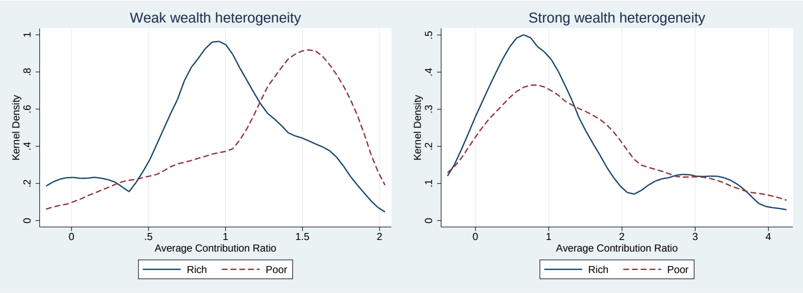
Experimental Procedure

- 288 total students from University of Hamburg
- Exchange rate 1 ECU = 0.40 Euro, random payment round, average earnings 12.65 Euro
- Duration approx. 75 minutes

First-mover behavior



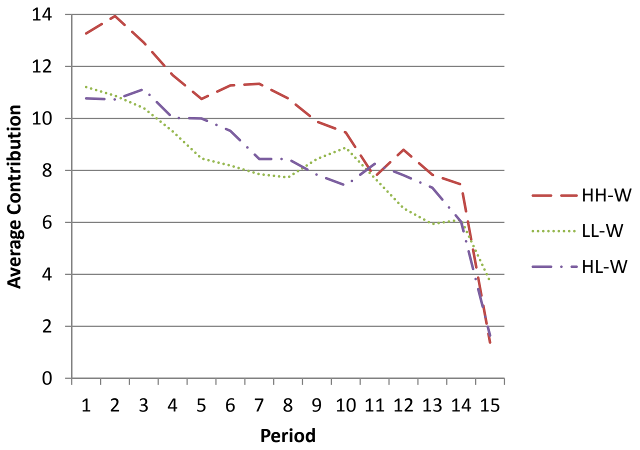
Second-mover behavior



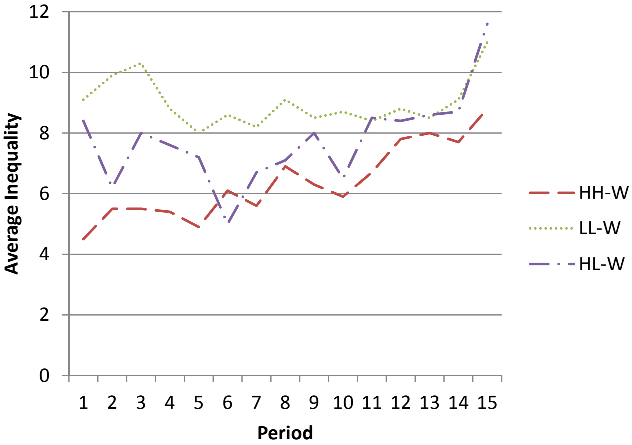
Contribution Ratio = Rich contribution / Poor contribution

Ratio = 1 ⇒ Equality —— Ratio = 1.66 (3) ⇒ Equity

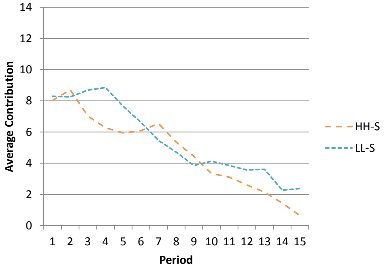
Average Contributions

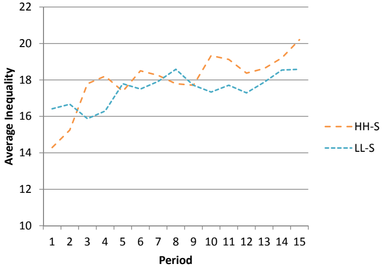


Income inequality

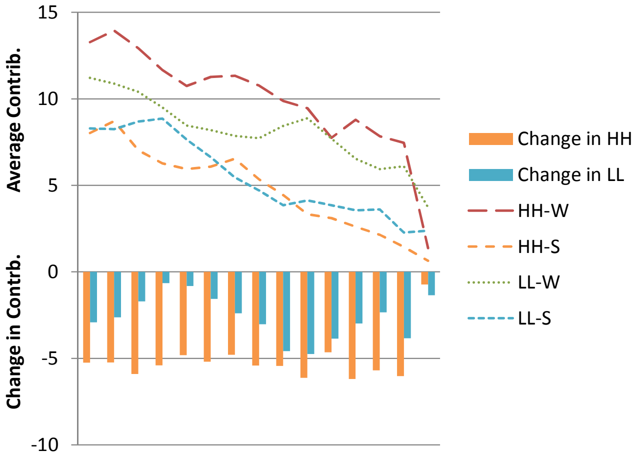


Strong wealth heterogeneity





From Weak to Strong



Conclusion

- We provide a positive approach to the problem of conflicting normative principles for public good provision
- Theoretical and empirical evidence for rich-first mechanism to ensure high levels of contributions if inequality is low $\Rightarrow$ policy implications for fund-raising campaigns
- With high inequality, the model seems to be wrong
- Higher inequality lowers the total amount of the provided public good

Thank you for your attention!

Relative Contribution	Periods 1-15	Periods 1-8	Periods 9-15
SIM-W	0.0371	0.0220	0.0545
	(0.0703)	(0.0746)	(0.0760)
LL-W	-0.00135	-0.0220	0.0223
	(0.0897)	(0.0860)	(0.102)
HL-W	0.00675	-0.00300	0.0179
	(0.0855)	(0.0868)	(0.0940)
HH-S	-0.294***	-0.317***	-0.268***
	(0.0635)	(0.0703)	(0.0674)
LL-S	-0.0319	0.0372	-0.111
	(0.0800)	(0.0825)	(0.0980)
Period	-0.0296***	-0.0264***	-0.0443***
	(0.00232)	(0.00474)	(0.00463)
Constant	0.731***	0.715***	0.908***
	(0.142)	(0.143)	(0.175)
Controls	Yes	Yes	Yes
Observations	2340	1248	1092
χ^2	308.1	124.8	135.6
$Prob > \chi^2$	0.000	0.000	0.000

Contribution	(1)	(2)	(3)	(4)
LL-W	-2.337**	-3.754***	-3.367***	-3.754**
	(1.097)	(1.215)	(1.154)	(1.882)
HL-W	-1.525	-2.390*	-2.340*	-2.390
	(1.074)	(1.376)	(1.298)	(2.182)
Period		-0.607***	-0.480***	-0.607***
		(0.0627)	(0.0675)	(0.0952)
LL-W $\times$ Period		0.177*	0.0994	0.177
		(0.0935)	(0.105)	(0.145)
HL-W $\times$ Period		0.108	0.0977	0.108
		(0.0917)	(0.102)	(0.136)
Constant	9.110***	13.97***	13.28***	13.97***
	(2.415)	(2.485)	(2.595)	(2.648)
Controls	Yes	Yes	Yes	Yes
Observations	2700	2700	2520	2700
χ^2	24.34	245.1	151.1	178.3
$Prob > \chi^2$	0.001	0.000	0.000	0.000

	Difference in income		Income	
	(1)	(2)	Rich	Poor
LL-W	3.233***	5.125***	0.424	-5.116***
	(0.675)	(0.875)	(1.094)	(1.543)
HL-W	1.772***	2.147**	-0.354	-2.868*
	(0.638)	(0.992)	(1.110)	(1.680)
Period		0.237***	-0.221***	-0.496***
		(0.0443)	(0.0618)	(0.0715)
LL-W $\times$ Period		-0.237***	-0.0150	0.245**
		(0.0617)	(0.0989)	(0.0988)
HL-W $\times$ Period		-0.0468	0.0391	0.129
		(0.0817)	(0.0910)	(0.114)
Constant	4.974***	3.076*	24.78***	32.92***
	(1.861)	(1.847)	(2.559)	(3.541)
Controls	Yes	Yes	Yes	Yes
Observations	2700	2700	1395	1305
χ^2	36.74	88.26	49.80	118.6
$Prob > \chi^2$	0.000	0.000	0.000	0.000

	Contribution	Diff. in income
LL-S	0.126	0.505
	(1.446)	(1.246)
Period	-0.551***	0.272***
	(0.0846)	(0.0609)
LL-S $\times$ Period	0.0579	-0.119
	(0.110)	(0.0886)
Constant	12.67***	12.96***
	(4.473)	(3.837)
Controls	Yes	Yes
Observations	1350	1350
χ^2	105.0	32.66
$Prob > \chi^2$	0.000	0.000

Contribution	HH	LL
STRONG	-6.069***	-2.335
	(1.451)	(1.497)
Period	-0.660***	-0.430***
	(0.0758)	(0.0696)
STRONG $\times$ Period	0.108	-0.0633
	(0.114)	(0.0984)
Constant	22.58***	16.40***
	(4.654)	(5.706)
Controls	Yes	Yes
Observations	1380	1335
χ^2	200.0	107.7
$Prob > \chi^2$	0.000	0.000

	Contribution		Relative Contribution	
	(1)	(2)	(3)	(4)
Rich	2.585**	3.671***	-0.101*	-0.230***
	(1.244)	(1.334)	(0.0607)	(0.0664)
STRONG	-3.985***	-3.985***	-0.120**	-0.120**
	(0.794)	(0.794)	(0.0562)	(0.0563)
Rich $\times$ STRONG	-0.183	-0.183	-0.0914	-0.0914
	(1.638)	(1.639)	(0.0773)	(0.0774)
Period		-0.464***		-0.0380***
		(0.0410)		(0.00340)
Rich $\times$ Period		-0.136*		0.0161***
		(0.0742)		(0.00408)
Constant	13.81***	17.53***	0.834***	1.139***
	(3.432)	(3.437)	(0.163)	(0.163)
Controls	Yes	Yes	Yes	Yes
Observations	2715	2715	2715	2715
χ^2	51.31	304.3	51.88	322.7
$Prob > \chi^2$	0.000	0.000	0.000	0.000