Cooperation Under the Shadow of Political Inequality

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Introduction

- Political candidates and parties often need to coordinate on policy after elections in which they were adversaries
  - Benefits are typically divided according to political power (e.g., Krueger 1974)
  - Campaign spending influences voting (e.g., Grossman & Helpman 1996)
  - The interactions are typically repeated over time
- We study an indefinite sequence of cooperative and competitive stages
  1. Collective action: a decision to undertake a risky collective action with benefits proportional to political power
  2. Contest for power: how much of the earnings to spend to gain political power
- This paper: focus on the incumbency advantage
  - Candidates and/or parties in power do not need to spend as much
    - Complementarity between expenditure and current power

Environment

- Each round $t \in \{1, 2, \ldots\}$, n players face a collective-action and a contest
- Stage 1: player i chooses whether to cooperate in the production of a club good, $a_{i,t} \in \{0, 1\}$

$$\pi^1_{i,t} = R_0 + a_{i,t}\Big(w_{i,t}F(\bar{a}_t) - c\Big), \tag{1}$$

  - $F(\bar{a}_t) = b\frac{(\bar{a}_t)^\kappa}{(\bar{a}_t)^\kappa + (a_0)^\kappa}$ depends on average cooperation ($\bar{a}_t$), the maximum benefit to cooperation (b), and the proportion required to achieve $b/2$ (a_0)
  - i's share of production ($w_{i,t}$) depends on "power" ($f_{i,t}$): $w_{i,t} = \frac{f_{i,t-1}}{\sum_{i=1}^n a_{i,t} f_{i,t-1}}$

- Stage 2: player i chooses expenditure, $e_{i,t} \in [0, \pi^1_{i,t}]$, on power, $f_{i,t+1}$

$$f_{i,t+1} = \phi(e_t, f_t; \epsilon) \tag{2}$$

- Round payoff: $\pi_{i,t} = \pi^1_{i,t} - e_{i,t}$

Environment: Modeling Incumbency Advantage (ϵ)

$$f_{i,t+1} = \phi(e_t, f_t; \epsilon) = \frac{e_{i,t}(1 - \epsilon + \epsilon f_{i,t})}{\sum_{i=1}^{n} e_{i,t}(1 - \epsilon + \epsilon f_{i,t})} \tag{3}$$

- $\epsilon = 0 : f_{i,t+1} = e_{i,t} / \sum_{i=1}^{n} e_{i,t}$
- $\epsilon = 1 : f_{i,t+1} = f_{i,t} e_{i,t} / \sum_{i=1}^{n} f_{i,t} e_{i,t}$
  - *complementarity between expenditure and power*

Environment: 2-Player Example *(No Complementarity)*

- $n = 2$, $b = 109$, $a_0 = .812$, $R_0 = 60$, $c = 20.4$, $\kappa = 12$, $\delta = .75$, $e_{i,0} = 1/n \forall i$
- $t = 1$, Stage 1

	C	D
C	90, 90	40, 60
D	60, 40	60, 60

- $t = 1$, Stage 2

$$e_{1,1} = 10,\ e_{2,1} = 5$$

- $t = 2$, Stage 1

	C	D
C	107, 73	40, 60
D	60, 40	60, 60

- $t = 2$, Stage 2

$$\ldots$$

What We Do

- Derive theoretical predictions regarding the impact of incumbency advantage
- Run human-subject experiments and agent-based simulations to test the predictions and compare individuals vs groups
  - Treatments: $\{\epsilon = 0, \epsilon = 1\} \times \{\text{Individuals, Groups}\}$
    - groups may learn to cooperate by playing repeated-game strategies
    - groups may learn to exploit power by better understanding the dynamics
- Companion paper: role of game parameters (n,b,a_0), contest type (endogenous vs exogenous), beliefs, and norms

Related Literature

Related Literature: Experiments on Collective Action

- Coordination Games: Van Huyck, Battalio, and Beil (1990) Cooper, DeJong, Forsythe, and Ross (1990, 1992), Dal Bo, Frechette, and Kim (2021)
  - Strategic uncertainty is a critical factor for decisions in coordination games
  - Mixed evidence on inequality negatively impacts coordination (e.g., Chmura et al. 2005, Gueye et al. 2020)
- Common-pool Resources Games: Gardner, Ostrom, and Walker, 1990; Stoddard, Walker, and Williams, 2014; Vespa, 2020
  - Incorporate Power: Cox, Ostrom, Walker (2011)
- Public Good and Club Good Games: Swope (2002), Cadigan et al. (2011)
- Spillover in simultaneous public goods and contest: Savikhin and Sheremeta (2013)

Theoretical Predictions

Predictions

- Cooperation can be supported as SPE
  - *grim-trigger-like strategy that cooperates and spends 0 unless someone has deviated*

Myopic Best-Response

- Kandori, Mailath, and Rob, 1993; Young, 1993; Kandori and Rob, 1995; Hopkins, 1999;
- Smith, 1982; Matsui, 1992; Sandholm, 1998; Alos-Ferrer, 2003; Roca, Cuesta, and Sanchez, 2009; Szolnoki and Perc, 2014; Tverskoi, Senthilnathan, and Gavrilets, 2021; Houle, Ruck, Bentley, and Gavrilets, 2022
- Experimental Evidence in Repeated Coordination Games: Mas and Nax (2016)

Myopic Best-Response

- Period t, stage 2:

$$(a_{i,t+1}, e_{i,t}) = BR_i^{a,e}(a_t, e_{t-1}, f_t) \tag{4}$$

Definition

A strategy profile (a^*, e^*) is a myopic-best-response equilibrium in the model if

$$(a_i^*, e_i^*) = BR_i^{a,e}(a^*, e^*, \hat{f}), \forall i \in I, \tag{5}$$

where

$$\hat{f}_i = \phi_i(e^*, \hat{f}), \forall i \in I. \tag{6}$$

Experiment Details

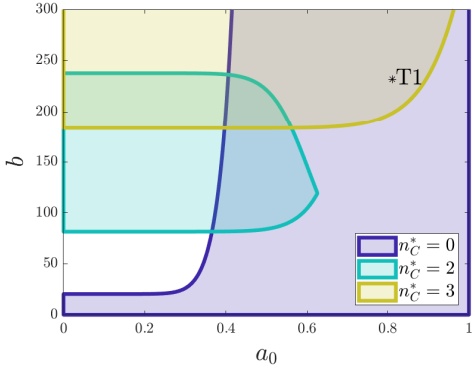
Experiment

- Treatments: $\{\epsilon = 0, \epsilon = 1\} \times \{\text{Individuals, Groups}\}$
  - groups may learn to cooperate by playing repeated-game strategies
  - groups may learn to exploit power by better understanding the dynamics
- Parameters: $n = 3$, $b = 232$, $a_0 = 0.812$, $\delta = .875$

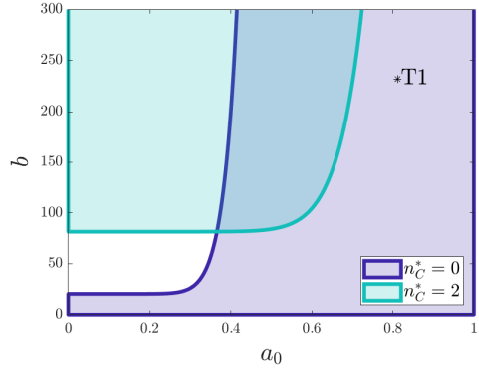
	0	1	2
C	40	50	110
D	60	60	60

  - Columns denote how many other players choose C (out of $n - 1$).
- Administration: 4 sessions per treatment (12 decision-makers per session)
  - 288 subjects: 48 per individual treatment; 96 per group treatment

Myopic Best-Response Equilibria



(a) No Incumbency Advantage



(b) With Incumbency Advantage

Design: Stage 1 Screenshot

Match #1

Time left: **0:53**

ID	Round 1 Calculator					Calculator Hide Reset					
	Current Shares	Choice	Earn	Spend	Payoff	Current Shares	Stage 1 Choice	Stage 1 Earn	Stage 2 Spend	Round Payoff	New Shares import
1	**33**	?				**33**	X Y				
2	33					33	X Y				
3	33					33	X Y				

Dice Roll

Stage 1 : Please select your choice for Round **1** of Match #1

Your choice: X Y

Teammate's choice: X Y

Your teammate has chosen X. You and your teammate need to agree on the decision.

Send

Recap

- *As a team you will make decisions jointly. You should use this chat box to discuss what to do and come to an agreement regarding what choice to make.*
- *Please coordinate your choice with your teammate once you have reached an agreement as a round ends after all teams have made their choices.*
- *If you and your teammate have not coordinated your choices within the allocated time, then:*

Design: Stage 2 Screenshot

Match #1

Time left: **0:42**

ID	Round 1 Calculator					Calculator Hide Reset					
	Current Shares	Choice	Earn	Spend	Payoff	Current Shares	Stage 1 Choice	Stage 1 Earn	Stage 2 Spend	Round Payoff	New Shares import
1	**33**	**X**	**60**	**?**		**33**	X Y				
2	33	X	60			33	X Y				
3	33	X	60			33	X Y				

Dice Roll

In Stage 1 of this round, you earned 60 points.

Please enter your choice for Stage 2

Your choice:

Submit

Teammate's choice: 5

Your teammate has chosen 5. You and your teammate need to agree on the decision.

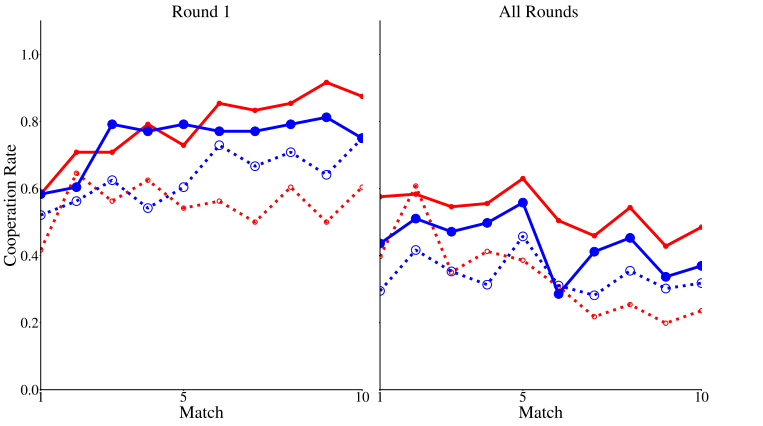
Send

Recap

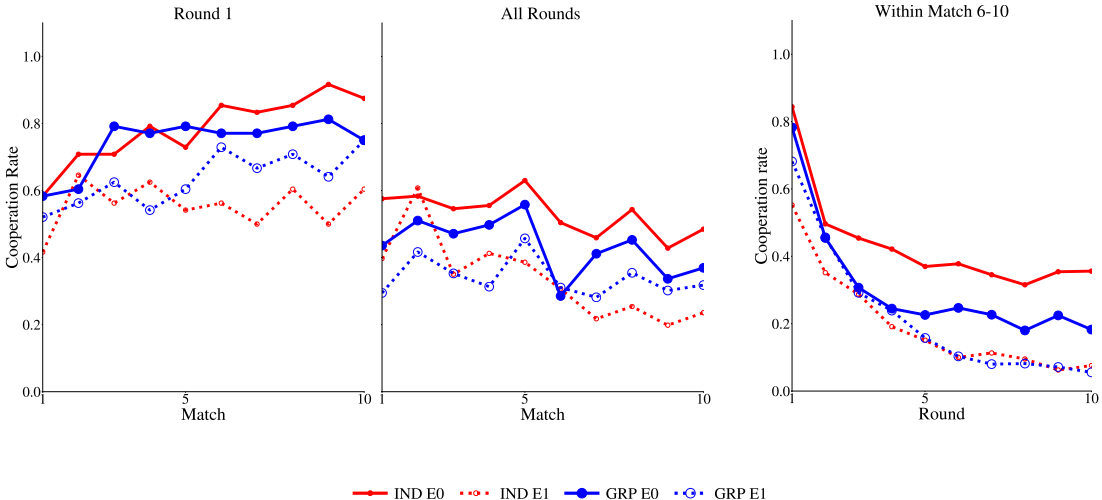
- *As a team you will make decisions jointly. You should use this chat box to discuss what to do and come to an agreement regarding what choice to make.*
- *Please coordinate your choice with your teammate once you have reached an agreement as a round ends after all teams have made their choices.*
- *If you and your teammate have not coordinated your choices within the allocated time, then:*

Results

Results: Cooperation



Results: Cooperation



Results: Cooperation

	(1)	(2)	(3)	(4)	(5)	(6)
	Round 1		Round 5+		All Rounds	
E = 1	-0.31***	-0.29***	-0.31***	-0.29***	-0.28***	-0.26***
	(0.07)	(0.08)	(0.05)	(0.06)	(0.05)	(0.06)
Being in a GRP	-0.08	-0.08	-0.19**	-0.18**	-0.15*	-0.15*
	(0.08)	(0.07)	(0.08)	(0.08)	(0.08)	(0.08)
E = 1 * GRP	0.23	0.22	0.20*	0.19	0.19	0.18
	(0.14)	(0.13)	(0.11)	(0.12)	(0.12)	(0.12)
Own round 1 coop in match 1		0.14**		0.01		0.03
		(0.06)		(0.02)		(0.03)
Others' round 1 coop in match 1		-0.02		0.10*		0.07*
		(0.02)		(0.06)		(0.04)
Length of match t-1 / 100		-0.45***		0.02		0.17
		(0.17)		(0.20)		(0.17)
Match number / 10		0.12		0.02		-0.00
		(0.10)		(0.10)		(0.15)

Results

R1 Cooperation is decreasing in ϵ

R2 Cooperation is lower for groups when $\epsilon = 0$

Results: Spending

	(1)	(2)	(3)	(4)	(5)	(6)
	Round 1		Round 5+		All Rounds	
E = 1	-2.83	3.77	-4.13	1.22	-3.43	2.29
	(6.95)	(5.79)	(3.20)	(2.41)	(3.66)	(2.91)
Being in a GRP	-8.27	-6.53	-4.70*	-2.91	-5.30*	-3.30
	(6.13)	(5.65)	(2.83)	(2.28)	(3.16)	(2.51)
E = 1 * GRP	8.23	3.11	1.19	-2.74	2.97	-1.93
	(9.29)	(7.98)	(3.89)	(3.14)	(4.73)	(3.49)
Pay from Cooperation		0.29***		0.20***		0.24***
		(0.05)		(0.06)		(0.05)
Standardized group power variance / 100				-7.14***		-10.68***
				(1.86)		(1.47)
Own power in current round				-0.60		-1.74*
				(0.91)		(0.95)
Length of match t-1 / 100		-3.17		11.51*		9.64*
		(10.04)		(6.67)		(5.85)
Match Number / 10		-12.08**		-9.29**		-8.56**
		(6.01)		(4.64)		(4.18)

Results: Payoffs

	(1)	(2)	(3)	(4)	(5)	(6)
	Round 1		Round 5+		All Rounds	
E = 1	-20.67***	-18.68***	-6.96*	-1.59	-7.36***	-3.14
	(1.89)	(1.83)	(3.56)	(3.76)	(2.83)	(3.47)
Being in a GRP	1.60	1.73	0.89	3.95*	2.45	3.81*
	(9.31)	(8.79)	(3.03)	(2.12)	(2.82)	(1.96)
E = 1 * GRP	9.58	8.64	6.21	2.66	5.55	3.44
	(9.48)	(9.13)	(4.19)	(3.86)	(3.76)	(3.54)
Own round 1 coop in Match 1		5.01*		0.15		1.12
		(2.69)		(0.97)		(1.04)
Others' round 1 coop in Match 1		6.95*		0.29		0.40
		(4.21)		(1.87)		(1.76)
Standardized group power variance				-0.02		-0.01
				(0.02)		(0.02)
Own power in current round				4.41*		5.18**
				(2.49)		(2.32)
Others' coop in previous round				15.16***		8.01***
				(3.04)		(2.30)
Length of match t-1 / 100		-24.63		-13.17		-15.45
		(18.68)		(9.50)		(10.49)
Match Number / 10		16.15**		7.18		6.16
		(7.94)		(4.50)		(4.99)

Current Work and Next Steps

- Agent-based model of group decision making
- Chat analysis
- Design institutions to promote cooperation
- Add a stochastic component of the collective action

Thank You!

Questions? Comments?