Teams Punish Less

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joint work with Carsten Schmidt, Gaute Torsvik, Marcel Thum

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Project: Non-cooperative Climate Policy under Uncertainty

Milan, March 13, 2014
Motivation

- Important decisions are made by teams rather than individuals
  - Unilateral actions in climate policy
  - Elimination of trade barriers
- Public good game is a central concept to analyse climate policy
- We are the first to combine team decisions and voting rules with a standard public good game with and without punishment
Research questions

1. Do teams decide more rationally/closer to game-theoretic predictions on the contribution to a public good and on punishment than individuals?

2. Does the decision making rule within a team have a decisive influence on the contribution and punishment levels?
Outline

1. Motivation
2. Literature
3. Hypotheses
4. Experimental Design
5. Results
6. Conclusions
Survey articles on teams vs. individuals

**Charness, Sutter (2012, JEP)**
- Teams behave more in line with game-theoretic predictions
- Why? (1) aggregation of knowledge, (2) deeper reasoning in strategic situations, and (3) stronger focus on payoffs

**Kugler, Kausel, Kocher (2012, CESifo WP)**
- Team members’ heterogeneity with respect to (1) rationality, (2) other-regarding preferences and (3) risk-taking behavior causes the difference of decisions
- Teams act closer to game-theoretic predictions and more competitive in strategic tasks
Hypotheses Teams vs. Individuals

“Teams are more rational/ more competitive than individuals”

H1: Teams contribute less.
H2: Teams punish less.

H3: Teams yield lower payoffs in absence of punishment but perform better in presence of punishment.
Hypotheses Majority vs. Unanimity

Majority rule can be formalized by median voter, but...

"Economic theory is surprisingly silent about decision making of unitary groups [...].” Kugler et al. (2012, 25)

H4: Teams deciding by majority rule achieve decisions faster than teams deciding by unanimity rule.

H5: Punishment is lower with majority rule.
   (aversion against punishing innocent bystanders)
Experimental design

Public good game with and without punishment stage

- 3 individuals form a team
- 4 teams/individuals jointly produce a public good
- 1 group provides 1 independent observation
- Integer contributions between 0 and 20
- Marginal per capita return (MPCR) 0.4
Experimental design

Public good game with and without punishment stage

Treatments

- IND: individual decision
- MAJ: team decision, majority rule
- UNA: team decision, unanimity rule

- 10 observations per treatment
Sequencing

**Part 1**: one-shot PGG, Treatment Group: IND, **no** feedback
Surprise restart

**Part 2**: 10-period PGG w/ feedback
  - Treatment Groups: MAJ, UNA
  - Control Groups: IND
Surprise restart

**Part 3**: 10-period PGG w/ feedback, w/ punishment
  - Treatment Groups: MAJ, UNA
  - Control Group: IND

Teams punish less
Part 2: 10-period PGG

Team composition:
- Random composition with fixed matching within part

Voting (MAJ/UNA):
1. Each team member proposes a contribution
2. All 3 proposals are displayed
3. If 2/3 of 3 proposals match => automatically set as decision
4. If there is no match => repetition after the 10th repetition => Default
   - contribution randomly chosen from other teams
   - zero pay-off for the team in this period

Teams punish less
Part 3: 10-period PGG w/ punishment

Team composition:
- random re-matching with fixed match during part 3

Voting (MAJ/UNA):
- Stage 1: PGG as in part 2
- Stage 2: punishment
  - Teams can decide on costly punishment (=destruction of another team’s payoff) [Fehr and Gächter, 2000, AER]
  - Voting in stage 2 on a punishment schedule following same rules as vote on contribution
  - Punishment technology: Destruction of 3 tokens costs 1 token [Gächter, Renner and Sefton, 2008, Science]
Implementation

- Experiment conducted in Exp. Lab of University of Mannheim, Oct-Nov/2012
- Implemented in z-tree
- Recruitment via ORSEE
- Subjects invited for 90 min
  - Avg. duration: IND 60 min, MAJ 75 min, UNA 90 min
- Subjects had to pass quiz for each part
- 280 subjects participated
  - 10 independent obs. for each treatment
- Avg. payoff: 11.04EUR
Results

Teams punish less
<table>
<thead>
<tr>
<th>Table 1: Summary Statistics: average Contributions, Punishment, and Net Profits in the Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Part 1</strong></td>
</tr>
<tr>
<td>Periods</td>
</tr>
<tr>
<td>Feedback</td>
</tr>
<tr>
<td>Punishment</td>
</tr>
<tr>
<td>N Particip.</td>
</tr>
<tr>
<td>(1)</td>
</tr>
<tr>
<td>Unanimity</td>
</tr>
<tr>
<td>Majority</td>
</tr>
<tr>
<td>Individual</td>
</tr>
<tr>
<td>Teams&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Average number of assigned punishment points; equals the average cost of punishment

<sup>b</sup> “Teams” consists of the MAJ and UNA treatments.
Teams vs. individuals

(we pool majority and unanimity in this section)
Figure 1: Average contributions

Teams punish less
Figure 2: Teams punish less
Figure 3: Average profits

Teams punish less
Table 2:  Linear regression with correlated panels corrected standard errors (PCSEs), column (4) Tobit regression, marginal effects

<table>
<thead>
<tr>
<th></th>
<th>Part 2</th>
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<th>Part 3</th>
<th></th>
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<tbody>
<tr>
<td>Periods</td>
<td>10</td>
<td>Feedback</td>
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<tr>
<td>Feedback</td>
<td>Yes</td>
<td>Punishment</td>
<td>Yes</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>contribution</td>
<td></td>
<td>profit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td></td>
<td>(2)</td>
<td></td>
<td>(3)</td>
</tr>
<tr>
<td>Team</td>
<td>1.499***</td>
<td>0.586**</td>
<td>0.452**</td>
<td>-0.692**</td>
</tr>
<tr>
<td></td>
<td>(0.374)</td>
<td>(0.205)</td>
<td>(0.153)</td>
<td>(0.225)</td>
</tr>
<tr>
<td>Part 1</td>
<td></td>
<td>contributiona</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4)</td>
<td></td>
<td>(5)</td>
</tr>
<tr>
<td>contributiona</td>
<td>0.795***</td>
<td>0.473***</td>
<td>0.639***</td>
<td>-0.0944*</td>
</tr>
<tr>
<td></td>
<td>(0.0504)</td>
<td>(0.0380)</td>
<td>(0.0630)</td>
<td>(0.0435)</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.444</td>
<td>20.31***</td>
<td>9.169***</td>
<td>1.424***</td>
</tr>
<tr>
<td></td>
<td>(0.871)</td>
<td>(0.516)</td>
<td>(0.905)</td>
<td>(0.422)</td>
</tr>
<tr>
<td>N</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>R²</td>
<td>0.201</td>
<td>0.159</td>
<td>0.080</td>
<td>0.018</td>
</tr>
</tbody>
</table>

+ p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001, Standard errors in parentheses
a Group average based on part 2 composition
b Profits net of punishment costs and punishment received
Table 3: Tobit regression, marginal effects, controlling for contributions

<table>
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<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Punishment</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>punishment costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team</td>
<td>-0.676*</td>
<td>(0.218)</td>
<td></td>
</tr>
<tr>
<td>Contribution</td>
<td>-0.092***</td>
<td>(0.019)</td>
<td></td>
</tr>
<tr>
<td>Part 1 contribution^a</td>
<td>-0.036</td>
<td>(0.044)</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>2.287***</td>
<td>(0.442)</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.044</td>
<td></td>
<td></td>
</tr>
</tbody>
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+ p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001, Standard errors in parentheses

^a Group average based on part 2 composition

b Profits net of punishment costs and punishment received
Hypotheses Teams vs. Individuals

“Teams are more rational than individuals”

H1: Teams contribute less.
Teams contribute 20% (part 2) and 3% (part 3) more than individuals.

H2: Teams punish less.
Teams punish about 60% less.

H3: Teams yield lower payoffs in absence of punishment but perform better in presence of punishment (9%).
Unanimity vs. majority voting

Teams punish less
Are there differences between UNA and MAJ?

Disagreements (Default)

- **MAJ**: none
- **UNA**: 15 out of 1,600 contribution decisions
  8 out of 800 punishment decisions

- Differences in outcome not driven by coordination failures
H4: Teams deciding by majority rule achieve decisions faster than teams deciding by unanimity rule.

Figure 4: Average number of proposals until decision is reached
H5: Punishment is lower with majority rule.

- aversion against punishing innocent bystanders

*Figure 5: Average Punishment Costs*
Teams vs. individuals

- Teams contribute more

What explains the different behavior?
What explains the difference in contributions?

- Decision making in majority treatment can be analyzed using the median voter theorem
- No obvious framework for unanimity, where every team member has veto power
- Hypotheses on why teams contribute more:
  1. Social approval may drive up contributions in teams (ethical voter) (MAJ, UNA)
  2. Skewed distribution of preferences of the team members (median vs. average of individuals) (MAJ)
  3. Elimination of extreme preferences (MAJ)
Social approval may drive up contributions in teams

- Desire for social approval can increase cooperation among strangers \[\text{[Rege and Telle 2004]}\]
- Identity of the player is not revealed to the others => maybe weak incentive
- Individual costs of social action (here: high proposal) are the overall consequences (here: final decision on contribution) => the lower the costs the higher the incentive for social behavior
  => the weaker the link between proposals and final decision, the more likely is behavior according to social norms (e.g., “the ethical voter”).

Teams punish less
... this suggests, that initial proposals decrease with the individual influence on outcomes (IND < MAJ < UNA).

Table 4: First Proposals in the Contribution Stage

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<td>Yes</td>
</tr>
<tr>
<td>Punishment</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th></th>
<th>N Participants</th>
<th>avg. 1st Proposal for Contributions</th>
<th>avg. 1st Proposal for Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual (IND)</td>
<td>40</td>
<td>11.10</td>
<td>11.93</td>
</tr>
<tr>
<td>Majority (MAJ)</td>
<td>120</td>
<td>11.82</td>
<td>12.33</td>
</tr>
<tr>
<td>Unanimity (UNA)</td>
<td>120</td>
<td>12.74</td>
<td>12.38</td>
</tr>
</tbody>
</table>

Two-samples t-test IND- MAJ: p<0.298
Two-samples t-test IND-UNA: p<0.098
The distribution of preferences of the team members may be skewed.

- **Skewness:** the average preference differs from the median preference.
- **Example**

<table>
<thead>
<tr>
<th></th>
<th>Ø</th>
<th>10</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

- slight skewness as the median contribution is 10 while the average is 9.
- proxy for preferences are the first proposals in each round (MAJ only).
Table 5: Skewness of Preferences (First Proposals in the First Round)

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<td>Yes</td>
</tr>
<tr>
<td>Punishment</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>1st Proposals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>for Contributions</td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Maximum – Median</td>
<td>3.450</td>
<td>3.125</td>
</tr>
<tr>
<td>Median – Minimum</td>
<td>4.450</td>
<td>4.600</td>
</tr>
<tr>
<td>Difference</td>
<td>–1.000</td>
<td>–1.475</td>
</tr>
<tr>
<td>p value</td>
<td>0.542</td>
<td>0.364</td>
</tr>
</tbody>
</table>

Note: Majority treatments only (n=40), p value: two-sided p-test.
What explains the different behavior of teams?

- Hypotheses on why teams decide differently:
  1. Social approval may drive up contributions in teams (ethical voter). (MAJ, UNA)
  2. Skewed distribution of preferences of the team members (median vs. average of individuals). (MAJ)
  3. Elimination of extreme preferences (MAJ)
  4. ...

Teams punish less
Conclusions

Teams vs. individuals

- **Teams punish less**, regardless of decision rule $\rightarrow$ rational
- Teams contribute more $\rightarrow$ conditional cooperation
- Teams punish less and cooperate more $\rightarrow$ thus **teams earn higher payoffs**

Majority vs. unanimity voting

- Teams deciding under the unanimity rule need more time to decide
- No difference in punishment behavior
Teams Punish Less

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