The Choice of Institutions to Solve Cooperation Problems

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Based on two papers

- “The Choice of Institutions to Solve Cooperation Problems: A Survey of Experimental Research,” with Carlo Gallier (ZEW Mannheim), *Working Paper*
- “Tipping versus Cooperating to Supply a Public Good,” with Scott Barrett (Columbia University), *JEEA 2017*

Institutions to solve cooperation problems

- In many real-life cooperation problems, societies themselves determine the rules that govern the interactions of their members.
  - Government representatives negotiate and establish rules on how to prevent climate change.
  - Users of common pool resources develop rules how to harvest the resource.
  - Work teams establish rules on how to reward positive contributions to the common goal and how to punish free-riders.
- Observing institutions in the real world is not sufficient.
  - How do we know why some institutions are effective and others are not? How do we know why some institutions thrive and others do not?

Why use experiments to study institution formation?

- Experiments can identify causal effects and they can be replicated.
- Experiments are useful to study institutional choice because
  - they show how individuals and groups choose,
  - how they fare after having chosen an institution,
  - how behavior changes over time,
  - all of this free of confounding factors.

Cooperation games

- Prisoners' dilemma, public goods games, common-pool resource games, played by two or more players for a finite number of rounds. Dominant strategy is to behave non-cooperatively.
- In most but not all games players are symmetric.
- In most but not all experiments participants are students.
- Choice of institution is once-for-all or repeated. Choice typically is between the original cooperation game and a modified game. After choosing, players play the chosen game for one or more rounds.

Types of institutions

1. **Formal institutions** that are enforced exogenously
2. **Informal institutions** that must be enforced by the players themselves

Initial/unmodified payoffs			Modified payoffs		
	Other's action			Other's action	
Own action	C	D	Own action	C	D
C	50	10	C	50	10
D	60	40	D	48	40

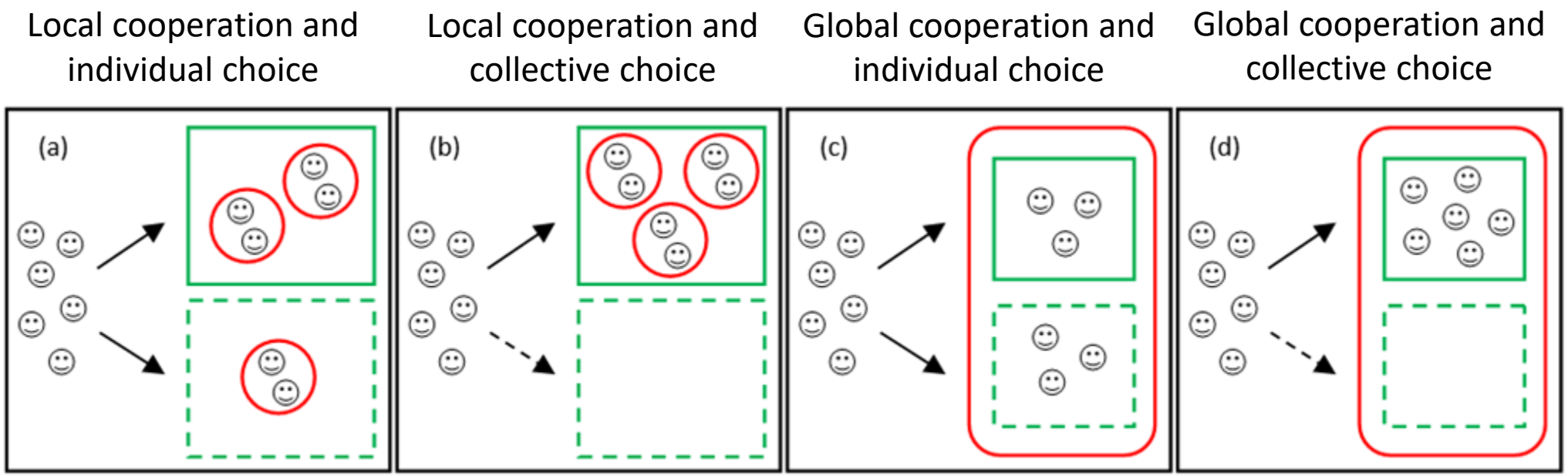
Example for type-1 institution from Dal Bó et al. (AER, 2010)

A metaphor

Effects of endogenous choice

- Institutional effect
  - The group that has chosen the whip has a whip.
- Selection effect
  - The group that has chosen the whip is different than the other one; they may be more ambitious, use the whip more wisely, etc.
- Information effect
  - Choosing the whip provides information about the co-players.
- Democracy effect
  - Choosing the whip may improve group identity and team spirit.

Framework



a) **Gürerk et al. (Science, 2006)** Individuals choose repeatedly between a PGG and a PGG with sanctioning option.

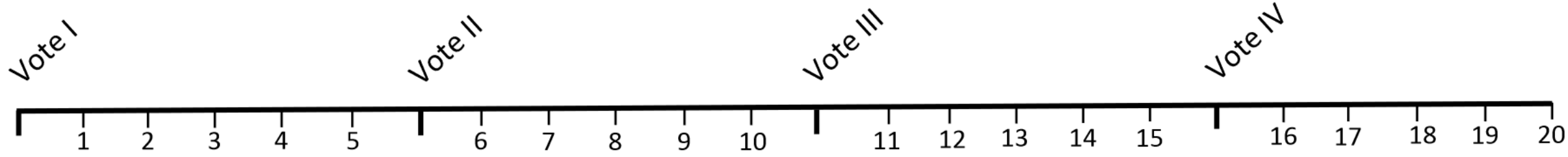
b) **Dal Bó et al. (AER, 2010)** Groups choose once between PD and coordination game that are subsequently played in pairs.

c) **Kosfeld et al. (AER, 2009)** Individuals choose repeatedly whether or not to join an agreement in which members are forced to cooperate; non-members are free in their choice and benefit from the public good.

d) **Sutter et al. (REStud, 2010)** Groups choose once between a PGG, a PGG with punishment option, or PGG with reward option.

Category (d) Barrett & Dannenberg (JEEA 2017)

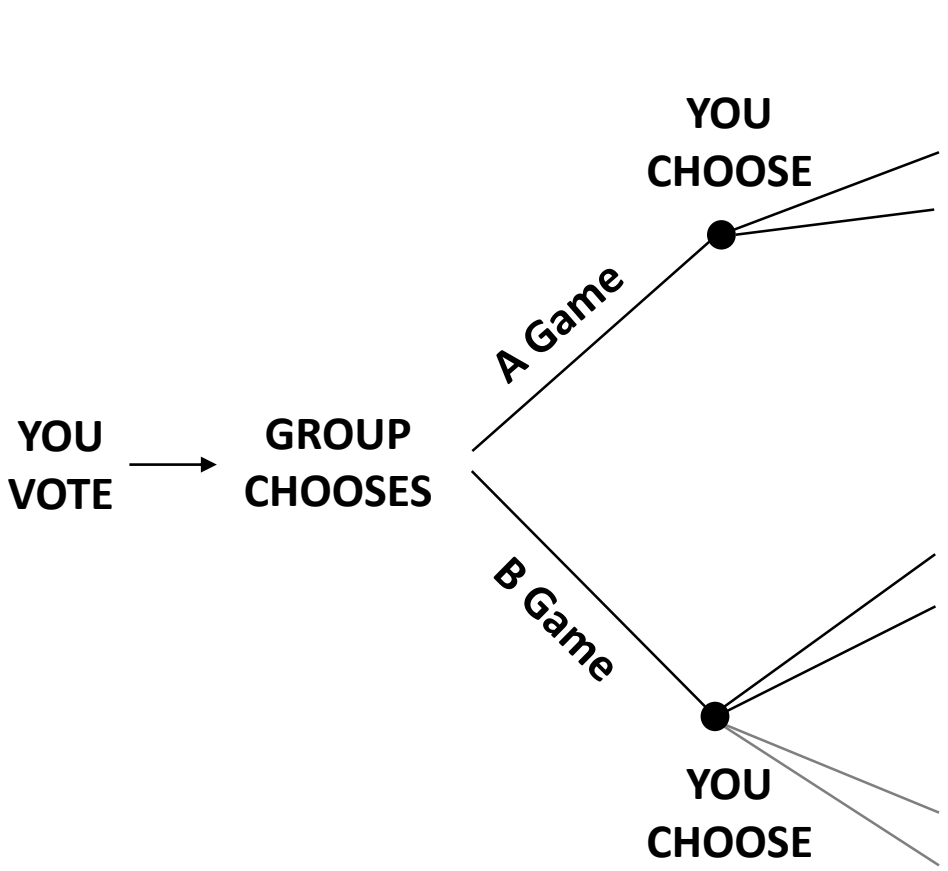
- 5 players per group.
- Individuals vote repeatedly between Game A or Game B, knowing that a majority carries.
- Game A is a PD. Game B is a coordination game.
- In each game individuals decide to hand in a Red card or a Black card. The Red card supplies a public good.
- In one treatment, there is an institutional cost to playing Game B.



Institutional costs

- Sometimes it is costly to implement an institution.
  - Police, courts, jail.
  - Costs of monitoring.
  - Sometimes technology standards are used which are not cost-effective but easy to monitor (e.g. gear regulation in fisheries, separated ballast tanks in oil tankers).

B-10 treatment

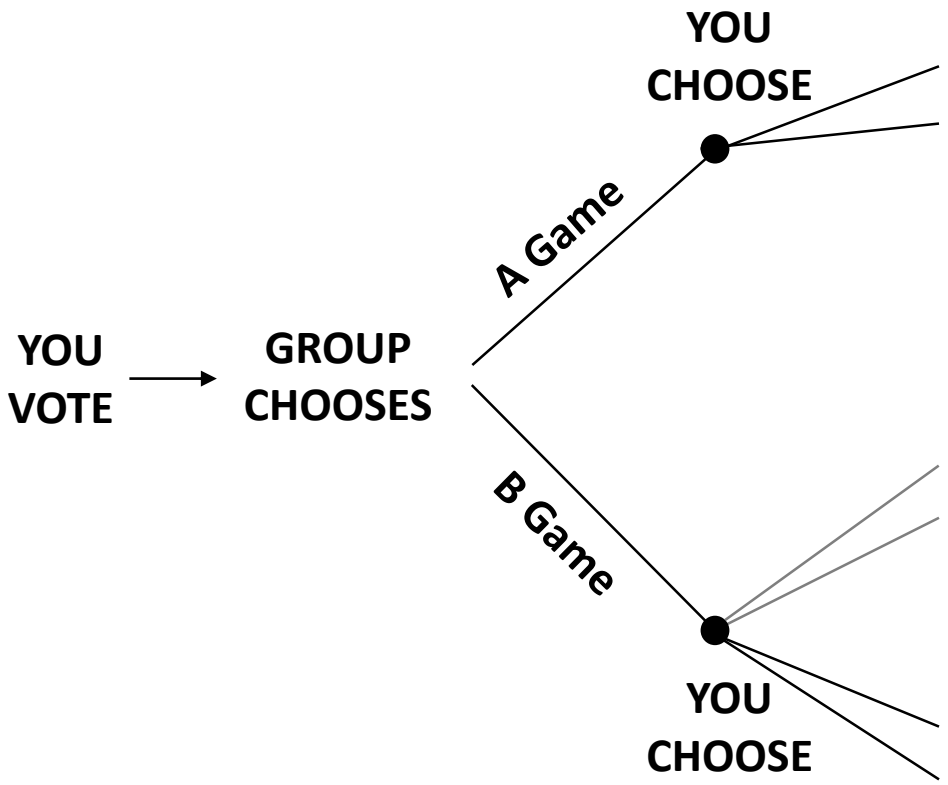


A	Number of red cards handed in by your co-players				
	0	1	2	3	4
Red	2	4	6	8	10
Black	5	7	9	11	13

B-10	Number of red cards handed in by your co-players				
	0	1	2	3	4
Red	2	4	6	8	10
Black	5	5	5	5	5

B-8	Number of red cards handed in by your co-players				
	0	1	2	3	4
Red	0	2	4	6	8
Black	5	5	5	5	5

B-8 treatment



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	0	1	2	3	4
Red	2	4	6	8	10
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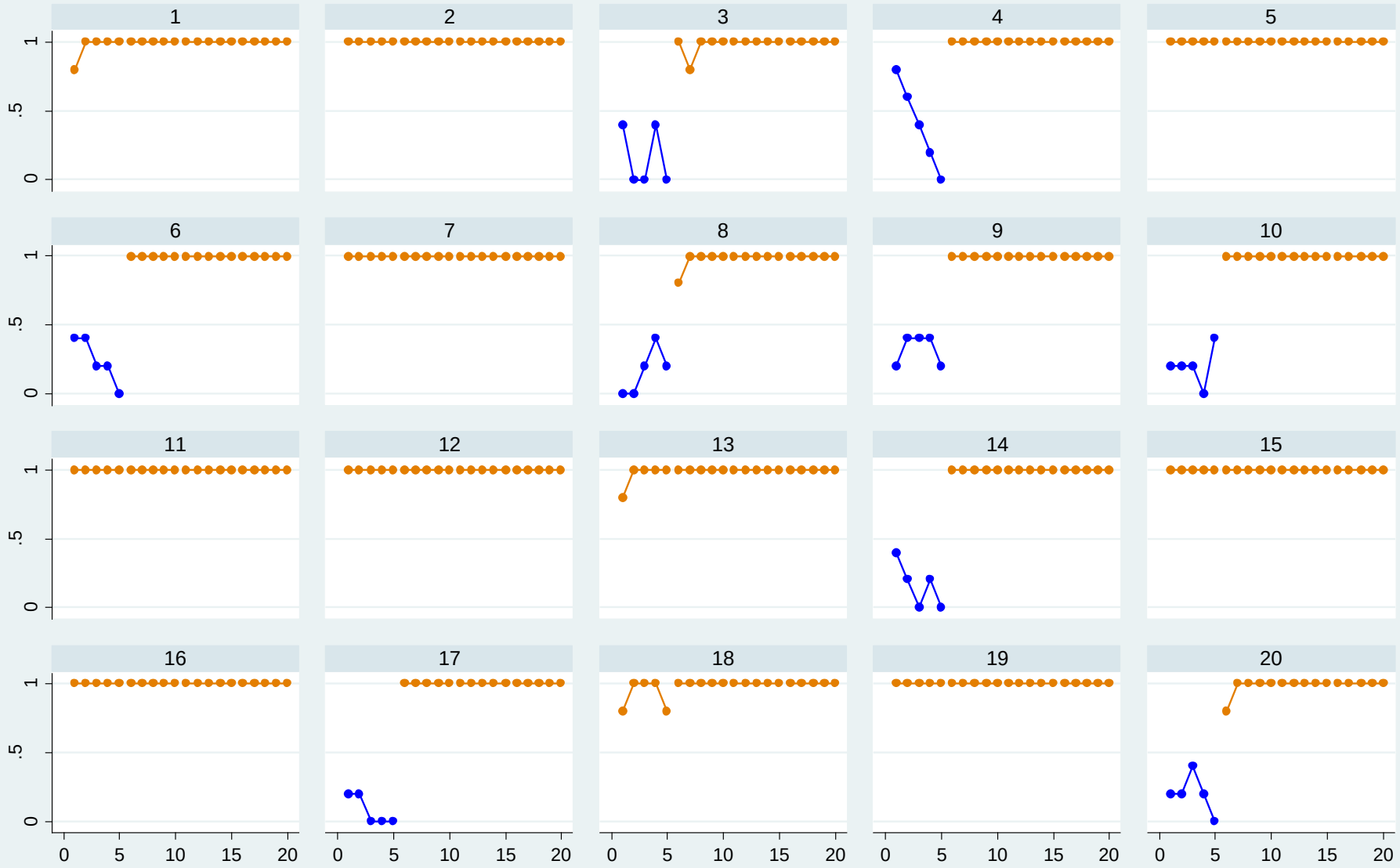
B-10	Number of red cards handed in by your co-players				
	0	1	2	3	4
Red	2	4	6	8	10
Black	5	5	5	5	5

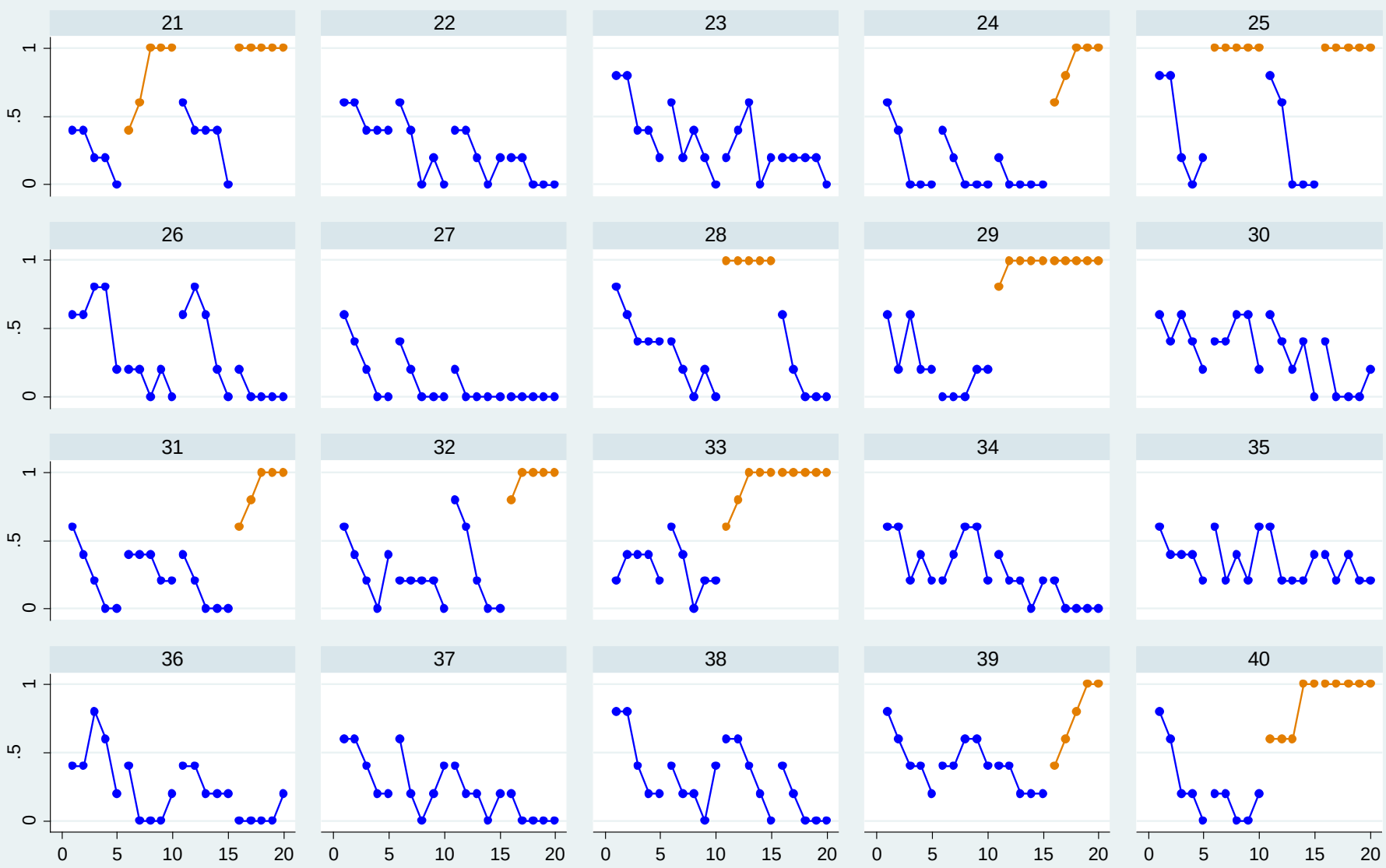
B-8	Number of red cards handed in by your co-players				
	0	1	2	3	4
Red	0	2	4	6	8
Black	5	5	5	5	5

Institutional cost

Vote-First-B-10



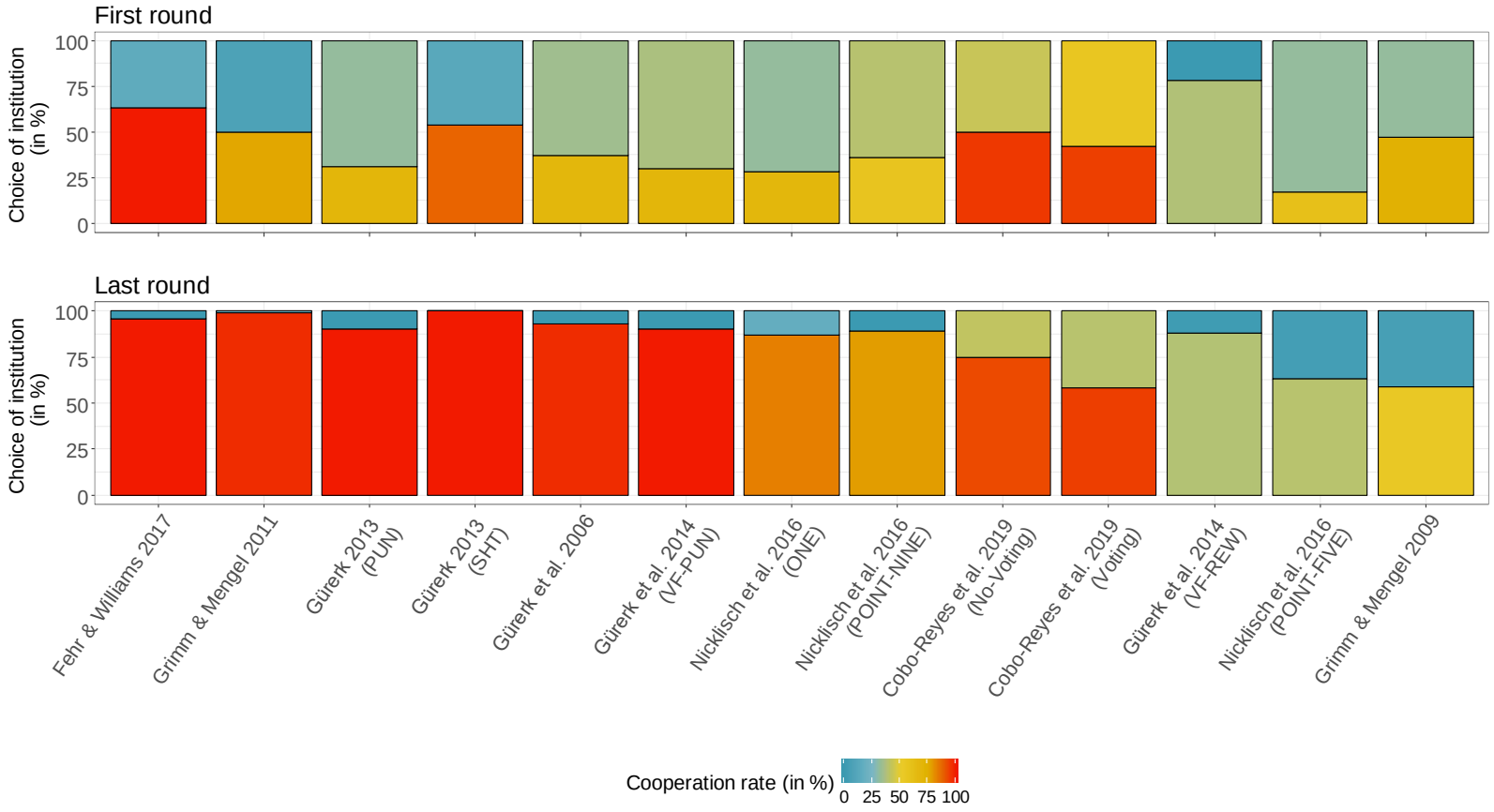
Blue = A Orange = B


Vote-First-B-8
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
0
.5
1
0
5
10
15
20
Round
Blue = A Orange = B

Other results from the literature

- Do the players who choose the institution perform better than the ones that do not choose the institution? Yes – almost always!
  - Difference is particularly large when the institution makes cooperation one or the unique equilibrium of the game.
- How many players choose the institution? It depends.
  - Opportunity to learn through repeated voting and information about others
  - Institutional cost
  - Remaining free-riding possibilities
- Do players who choose the institution differ from the ones that do not choose the institution? Yes!
  - Cooperativeness
  - Beliefs

Overview of results for (a) local cooperation and individual choice

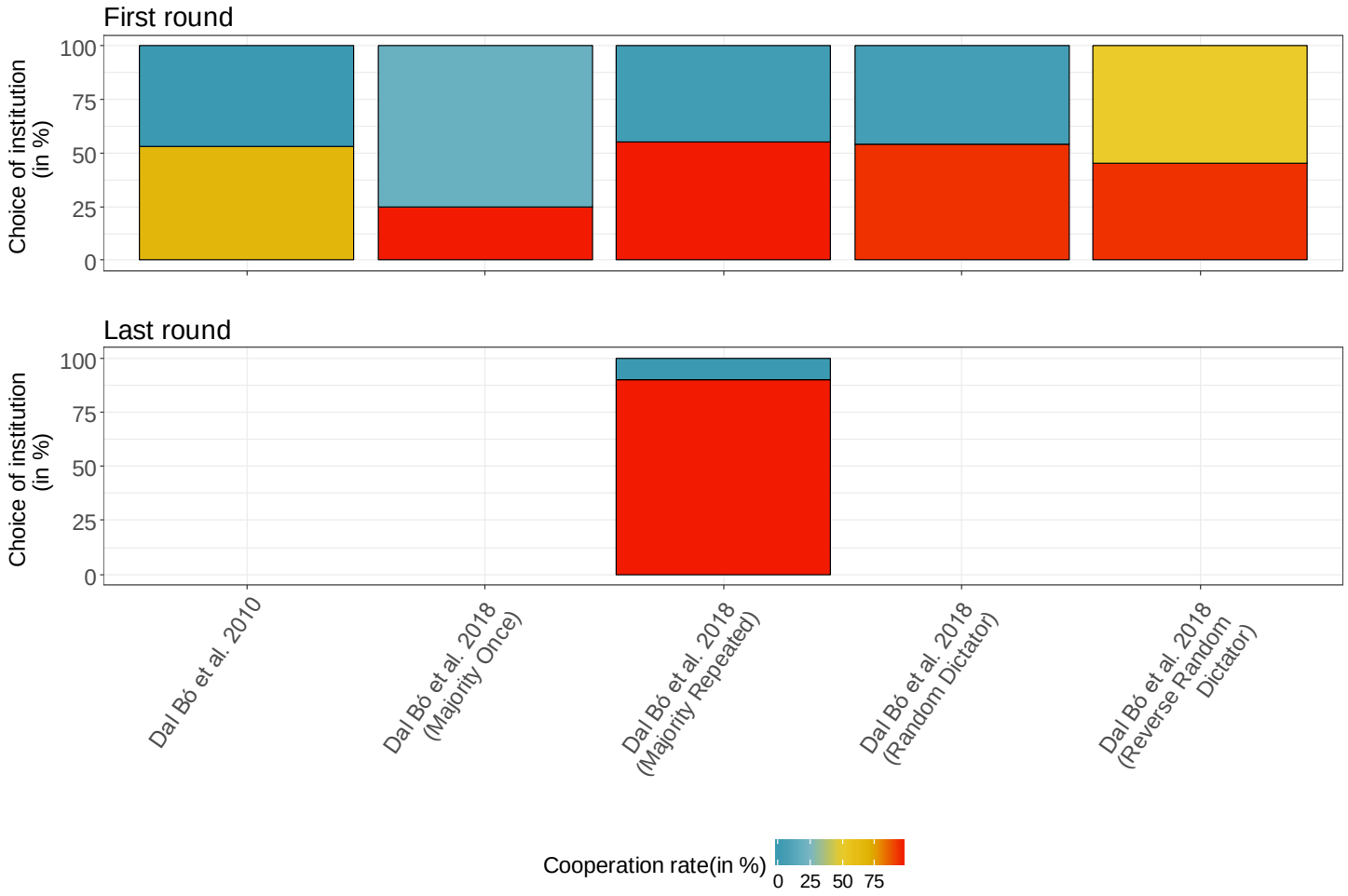


Bars represent experimental treatments with the lower (upper) part of each bar showing the share of individuals inside (outside) the institution. Colors indicate achieved cooperation rates.

- Cooperation inside > cooperation outside institution in both first round and last round (P<0.01 each).
- Participation in institution increases over time (P<0.01).
- Cooperation inside institution increases over time (P<0.05) and cooperation outside institution decreases (P<0.01).

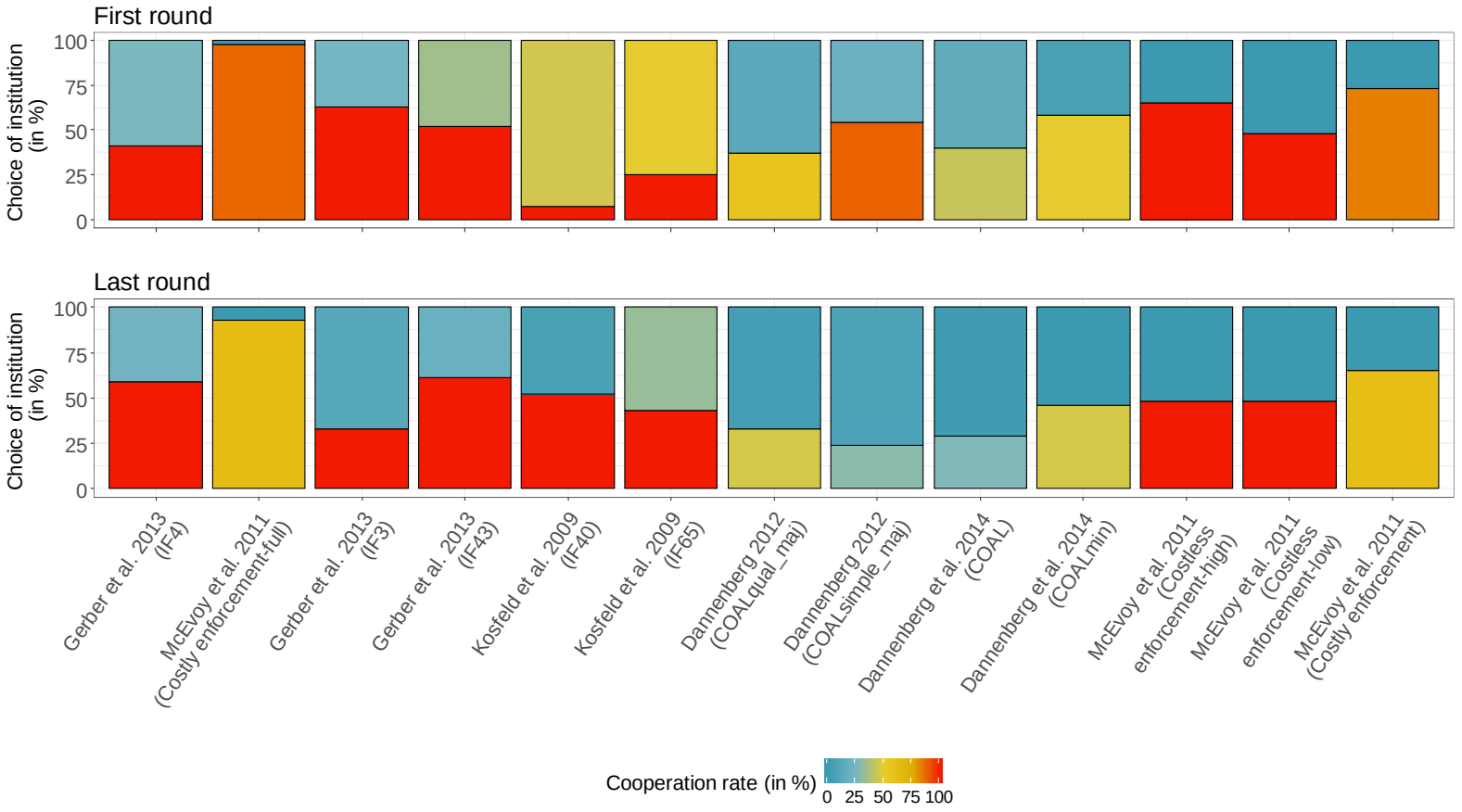
Remaining free-riding possibilities

Overview of results for (b) local cooperation and collective choice



- Cooperation inside > cooperation outside institution in first round ($P<0.1$).
- Only one observation with repeated choice.

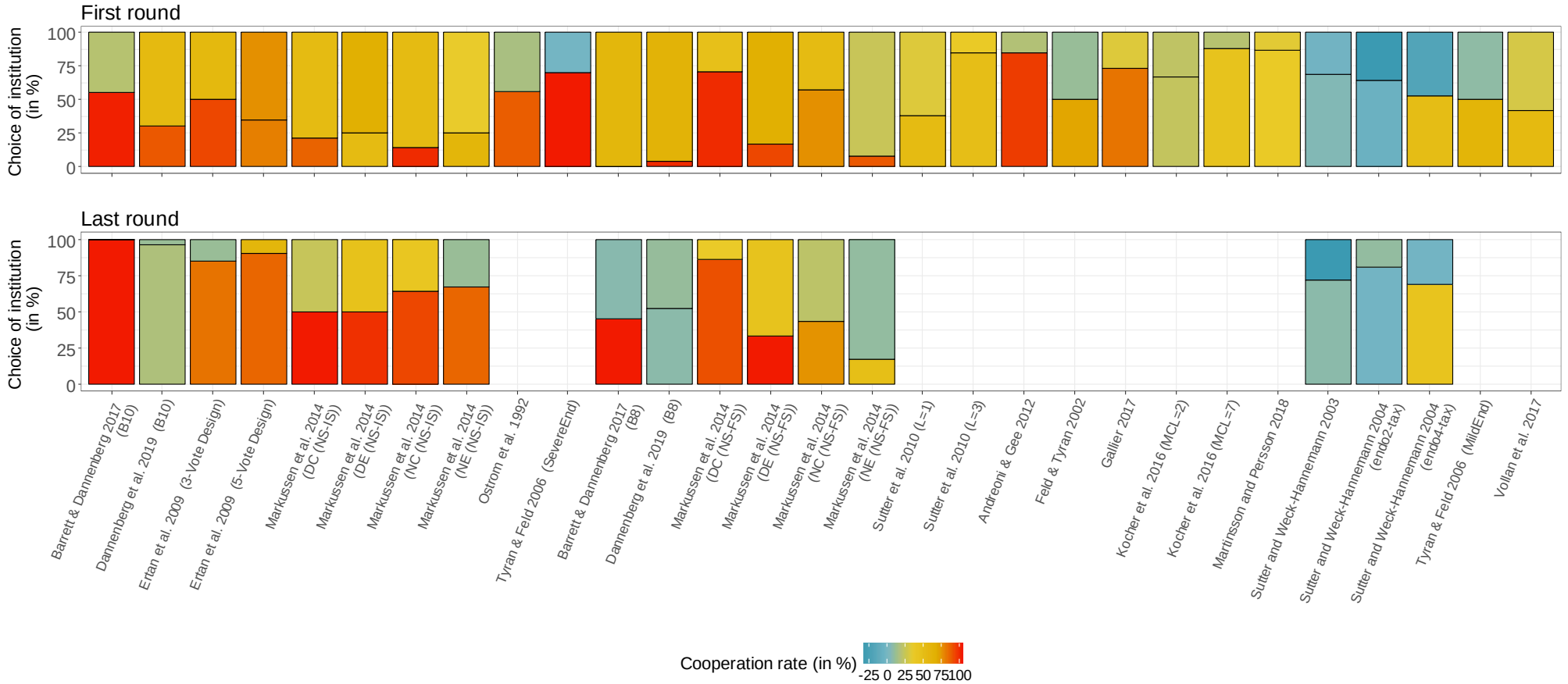
Overview of results for (c) global cooperation and individual choice



Remaining free-riding possibilities

- Cooperation inside > cooperation outside institution in both first round and last round (P<0.01 each), but this is *mainly by design*.
- Cooperation inside and outside the institution does not change much over time, also *mainly by design*.
- More important: Participation in the institution does not increase over time (P=0.6659).

Overview of results for (d) global cooperation and collective choice



- Cooperation inside > cooperation outside institution in both first round and last round (P<0.01 each).
- Participation in the institution increases over time (P<0.01).
- Cooperation inside institution does not change much over time (P=0.4076), cooperation outside institution decreases (P<0.01).

Remaining free-riding possibilities or institutional cost

Endogenous vs. exogenous institutional choice

Endogenous choice – difference between groups with and without institution	**Exogenous choice –** difference between groups with and without institution
Institution effect	Institution effect
Selection effect	
Information effect	
Democracy effect	

- In many studies, the institution effect is the largest one.
- Institution effect is larger for strong institutions.
- Selection effect, information effect, democracy effect are larger for weak institutions.

Comparison 1. Players who have endogenously implemented the institution and players who act under the same but exogenously imposed institution		
Higher cooperation in the endogenous case	Only slightly higher cooperation in the endogenous case or no difference	Lower cooperation in the endogenous case
12 treatments	13 treatments	1 treatment
Comparison 2. Players who have decided against the institution and players who are exogenously put into the game without the institution		
Higher cooperation in the endogenous case	Only slightly higher cooperation in the endogenous case or no difference	Lower cooperation in the endogenous case
	5 treatments	8 treatments
Comparison 3. Aggregated comparison between players who decide endogenously and players who act under the exogenously imposed institution		
Higher cooperation in the endogenous case	Only slightly higher cooperation in the endogenous case or no difference	Lower cooperation in the endogenous case
2 treatments	6 treatments	9 treatments

Endogenous vs. exogenous institutional choice

- Comparison 1: Do players who have chosen the institution perform better than players who are forced to play with institution? Yes, quite often.
- Comparison 2: Do players who have decided against the institutions perform better than players who are forced to play without institution? No, quite often they perform worse.

Endogenous choice – difference between groups with and without institution	**Exogenous choice –** difference between groups with and without institution
Institution effect	Institution effect
Selection effect	
Information effect	
Democracy effect	

- Positive for the players who have decided in favor of the institution.
- Negative for the players who have decided against the institution.

Endogenous vs. exogenous institutional choice

Comparison 3:

- If a regulator has the power to either implement an institution or leave the decision to the constituency, what is better? That's not obvious because we know that some players fail to implement the institution and perform poorly.
- Elinor Ostrom argued that it is better to leave it to the constituency, partly because the regulator has less information and may make mistakes—something that is not covered in the experiments here.
- Only 2 out of 17 treatments find that letting players choose is beneficial while all other studies find either no significant effect or a negative effect.

Summary

- There is a growing experimental literature on endogenous choice of institutions. About 38 studies since the year 2000 (an early exception is Ostrom et al. 1992).
- Almost all institutions improve cooperation if they are implemented, but they are not always implemented by the players.
- The scale of the cooperation problem, institutional costs, remaining free-riding possibilities, and learning opportunities are important determinants of institutional choice.
- We can distinguish between institution effect, selection effect, information effect, democracy effect, with the institution effect being the most important one.
- Letting players choose is not necessarily better than enforcing institutions from outside. The reason for this is that a significant share of players fail to implement the institution and they often perform poorly.