Club Dynamics and Non-Rival Resources

Jaimie W. Lien[1]; Anning Xie[2]; Jie Zheng[1]

[1]Shandong University, [2]The Chinese University of Hong Kong

Introduction

We consider a dynamic Club Goods Game in which each player can include and/or exclude other players into their personal club, and potentially make contributions to their club which will benefit all members. To understand the direct and indirect reciprocity dynamics behind club membership and contributions, we implement **four** experimental treatments which vary based on whether club members can be **invited, excluded, both or neither**. We find that contributions are highest, and club size is most stable, under the most flexible membership determination procedure. The ability to exclude members from one's club induces the greatest direct and indirect reciprocal behavior among players, which is in turn found to be a key determinant of contributions. Furthermore, we examine how prior experience in the Club Goods Game affects subsequent contributions in a standard Public Goods Game. Experience in the flexible membership Club Goods Game treatment leads to the highest contributions in the Public Goods game, while inflexible membership produces the lowest contributions. Altogether, our study helps pinpoint the group and individual level dynamics for effective provision of non-rival resources.

Experimental Design

We design a club good game which is played within a group of 4 players for 10 rounds. The group members remain fixed across the 10 rounds. Each round of the club good game consists of two stages.

Stage 1: Club Members Selection. At the beginning of Stage 1, each player owns a club and needs to select club members from their group of 4 players. Our experimental treatments differ in terms of the specific procedures allowed in selecting club members. In each round, subjects need to decide on their club members again. Each time a club owner makes invitation decisions, they have access to the complete history of individual invitations made by each player in the group in the previous round.
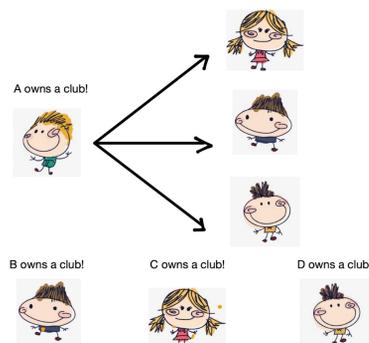
Table 1. Experimental Treatments.

Treatment	Total subjects	Initial members	Club good game
CG	24	0	Inviting and excluding
CGI	24	0	**I**nviting
CGE	28	4	**E**xcluding
CGF	24	4	**F**ixed

Stage 2: Club Good Contribution. Each player is endowed with 20 tokens to be allocated between their private account and their club account. One token contributed to the club account provides 0.4 tokens to each of the club members including the club owner himself.

For all treatments, a 10-round **public good game** is implemented after the second phase of club goods games, for comparison purposes.

Implementation

We conduct one session for each treatment and all four sessions were conducted in May 2021 at Tsinghua University's Economics Science and Policy Experimental Laboratory (ESPEL). 100 subjects were recruited mainly from the undergraduate student body. 24-28 subjects participated in each session.

Each session consists of 30 rounds in total, divided into 3 phases.
- **In Phase 1**, subjects play the club good game for 10 rounds with fixed matching.
- **In Phase 2**, at the beginning, subjects are then randomly rematched to form new independent groups and they play the same club good game for 10 rounds again.
- **In Phase 3**, subjects maintain the same grouping as the second phase, and play the standard public goods game.

Results

Result 1 (Club good game contribution): Among the club good games, the CG treatment yields the highest contributions while the CGF treatment yields the lowest contributions. The contribution levels in the CGI and CGE treatments are between those in the CG and CGF treatments.

Result 2 (Club size): In Phase 1, the CGI treatment has a significantly larger average club size than in either the CG or CGE treatments, while the CGE treatment has the smallest eventual club size. In Phase 2, there is no statistically significant difference in average club size between the CG, CGI and CGE treatments.
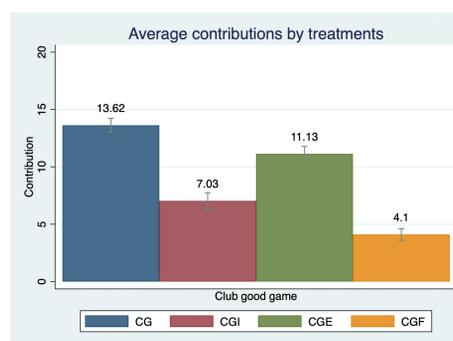
Figure 1. Average contribution levels, by treatment.
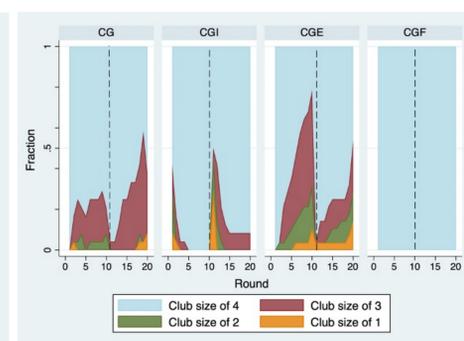
Figure 2. Fraction of different club sizes over rounds.

Result 3 (Ordering of observed reciprocity across treatments): Players are significantly reciprocal to other players in their club membership and contribution decisions. The possibility of being excluded from a club in the future is a significant dynamic incentive in the club goods game, while permanent inclusion into a club has an adverse incentive effect. Flexible club membership rules produce the best contribution results in response to first inclusions and exclusions, due to the dynamic incentive effect.
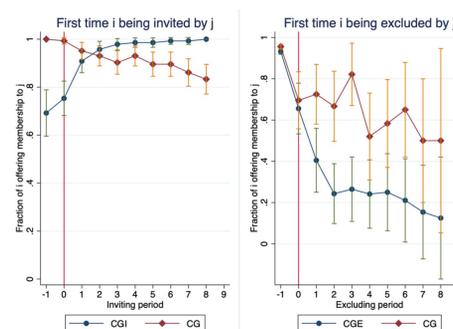
Figure 3. Exclusion, invitation and membership.
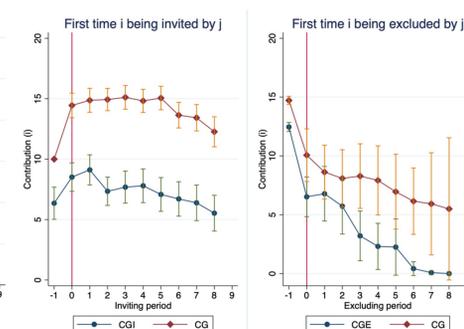
Figure 4. Exclusion, invitation and contribution.

Result 4 (Public good game contribution): In the public goods game in Phase 3, the CG treatment has the highest contribution rate, while the CGF treatment has the lowest contribution rate. The contribution levels of the CGI and CGE treatments lie in between the CG and CGF treatments.
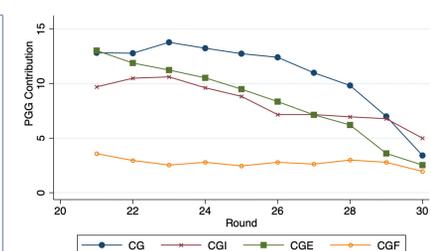
Figure 5. Public good game contribution.

Further Discussions

We asked subjects about their own motivations and their understanding about the motivations of other players in the **post-experiment questionnaire** administered to all participants. Their replies were influenced by their actual experiences in the club goods treatments. We also implemented **an online survey** on respondents from the same general subject pool.

First, subjects with real experience tend to discount the importance of actual contributions made as compared to other factors, in particular, invitation behavior. **Second**, actual experience in the game creates dispersions across treatments in the contribution thresholds perceived and required by subjects for having members in their personal clubs, whereas such differences across treatments are minimal among respondents who did not actually play the game.

Contact

Jaimie W. Lien
Email: jaimie.academic@gmail.com
Website: https://jaimielien.weebly.com/

Anning Xie*
Email: anningxie@link.cuhk.edu.hk
Website: https://anningxie.github.io/

Jie Zheng
Email: jie.academic@gmail.com
Website: https://jzheng.weebly.com/