# Framing effects in public good games: Choices or externalities?

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**Abstract**

We disentangle the effects of choice (give vs. take) and externality (positive vs. negative) framing of decisions in isomorphic and payoff-equivalent experimental public good games. We find that, at the aggregate level, neither frame affects group contributions. At the individual level, the Take choice frame leads to greater free-riding, and also to somewhat higher contributions, i.e., to more extreme contribution behaviour.

**Keywords**: isomorphic; public goods; experiment; cooperation; choice frame; externality frame

**JEL codes**: C72, C91, C92, D02, H41

## 1. Introduction

A large literature has looked at framing effects in public good games (see Cox and Stoddard 2015 for a review). The precise size, nature and cause of framing effects remain, however, an open question.

Andreoni (1995) argued that there is a *positive-negative externality framing effect*. This posits that contributions are higher if the positive externality of contributing to the group is emphasised rather than the negative externality of not contributing to the group. Follow up studies by Park (2000) and Fujimoto and Park (2010) support this view. The main body of literature, however, has focussed on a *give-take choice framing effect*. The 'consensus view' is that contributions are higher when individuals are asked to contribute to the group rather than given the opportunity to take away from the group (Cox 2015, Khadjavi and Lange 2015, Gächter, Kölle and Quercia 2017). Results, however, are mixed with many studies finding no significant effect on aggregate contributions (e.g. Cox and Stoddard 2015, Cox et al. 2018) and some the reverse effect (Fosgaard, Hansen and Wengström 2014).

Cartwright (2016) points out that the mixed results concerning a give-take choice effect may result from a confound with the positive-negative externality effect (see also Böhm and Theelen 2016). In particular, the externality and choice dimensions are distinct and so one can have give-positive, take-positive, give-negative and take-negative frames. Existing studies have not always controlled for this and so evidence of a choice effect may merely be picking up an externality effect, or vice-versa. In this paper we report on an experiment that explicitly separates choice and externality dimensions with the objective of disentangling these two framing effects. We find no evidence of a framing effect on overall contributions (with the possible exception of a choice effect in the negative externality domain) but evidence of a choice framing effect on the distribution of individual contributions.

## 2. Experiment design

We employed a between subject 2 × 2 design with give-positive, take-positive, give-negative and take-negative treatments. In all treatments subjects played a strategically identical, linear public good game with group size four and marginal per capita return of 0.5. Specifically, payoffs were

determined by the allocation of Tokens between Individual Projects and a Group Project. Each Token in a subject's Individual Project yielded payoff 1 to that subject alone. Each Token in the Group Project yielded a payoff of 0.5 to each of the four members of the group. Subjects were in fixed groups for 20 rounds and only exposed to one treatment.

In the give treatments subjects are given an endowment of 20 Tokens in an 'Individual Project' and told: 'The task of each group member is to decide how many Tokens, if any, they would like to move from their Individual Project and contribute to the Group Project.' (The full instructions are available in supplementary information.) In the take treatments subjects are given an endowment of 80 Tokens in the Group Project and told: 'The task of each group member is to decide how many Tokens, if any, they would like to withdraw from the initial Group Project and move to their Individual Project.' Here, the instructions emphasise the difference between contributing to (give) and extracting from (take) a public good.

In the positive treatments subjects were told: 'For each Token you contribute to [do not withdraw from] the Group Project, your earnings from the Group Project will increase by 0.5 Tokens. Each of the other three people in your group will also see an increase in earnings of 0.5 Tokens.' In the negative treatments subjects were told: 'For each Token you do not contribute to [withdraw from] the Group Project, your earnings from the Group Project will decrease by 0.5 Tokens. Each of the other three people in your group will also see a decrease in earnings of 0.5 Tokens.' We see here the distinction between instructions that emphasise the positive externality of Tokens in the Group Project versus the negative externality of Tokens in the Individual Project (Andreoni 1995).

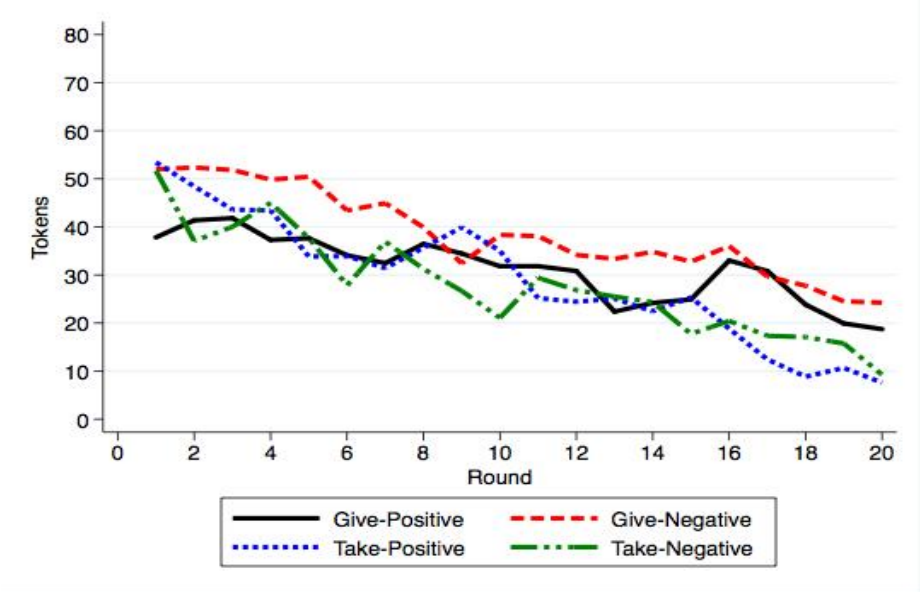
Based on the previous literature we expected to observe an externality effect on overall contributions (Andreoni 1995, Park 2000). So, contributions to be higher in give-positive than give negative and in take-positive than take-negative. We did not expect to see a choice effect on overall contributions (Cox and Stoddard 2015, Cartwright 2016). So, average contributions to be similar in give-positive and take-positive and in give-negative and take-negative. But we could expect to observe a choice effect on the distribution of contributions with more extreme behaviour in the take treatments (Cox and Stoddard 2015, Gächter et al. 2017).

The experiment was run at the University of Essex using z-Tree (Fischbacher 2007). A total of 188 subjects took part in the experiment with 11 groups in the give-positive treatment and 12 groups in each of the other three treatments. Subjects were paid their total earnings from all 20 rounds (60 Tokens = £1) at the end of the session plus a £2 show-up fee. A session lasted about 45 minutes on average, and the average payment was £11.69.

## 3. Results

Figure 1 plots average group contributions by treatment and round. In all treatments, we observe the usual decline in contributions over time. Table 1 provides the average group contribution by treatment. A Kruskal Wallis test for differences in distribution of group contributions across treatments shows no significant difference ($p = 0.22$). The only marginally significant pairwise differences using a two-sided rank sum test are give-negative is higher than take-positive ($p = 0.065$) and take-negative ($p = 0.083$).[1] In Appendix B1, we report panel random effects regressions of group contributions that control for time trends. The regression results support the results reported here. We see, therefore, no compelling evidence of any framing effect in overall group contributions (with the possible exception of a choice framing effect in the negative domain).

**Figure 1. Average group contributions over time**




[1] The unit of observation is a group's total contribution averaged over all 20 rounds.

**Table 1. Summary statistics on contributions and the proportion of free-riders and full cooperators**

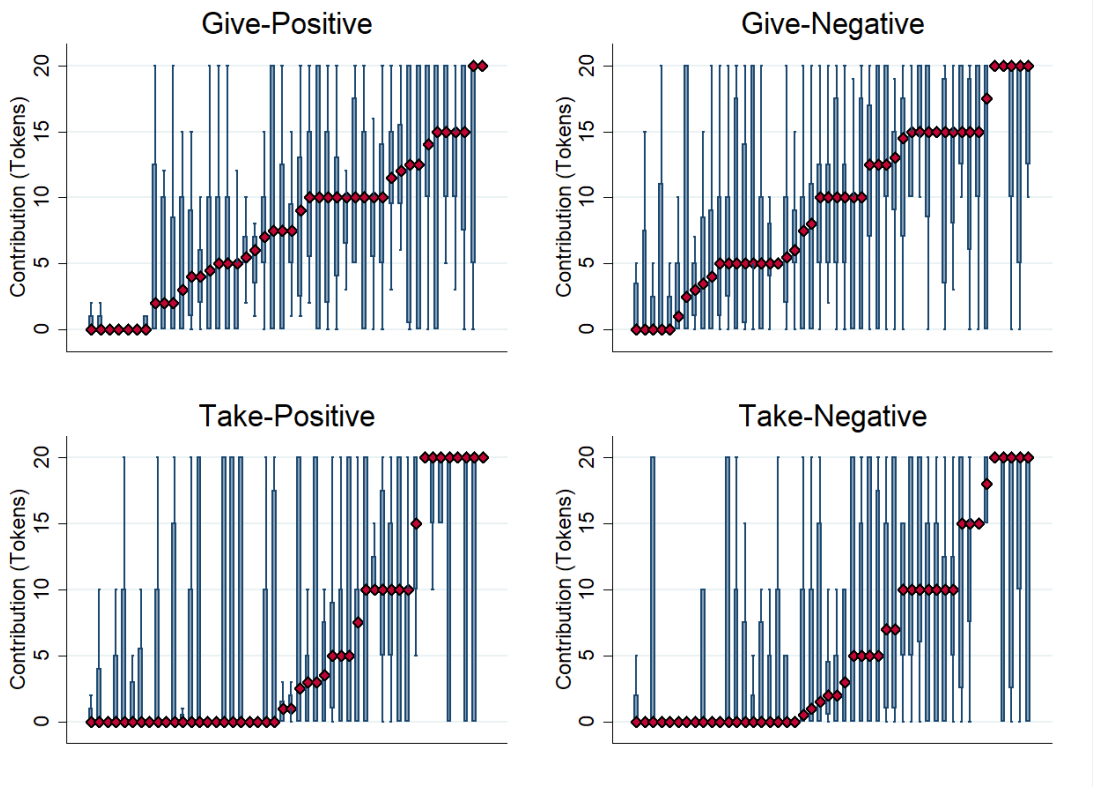
| | | | Proportion of | |
|---|---|---|---|---|
| **Treatment** | **Obs.** | **Group contributions** | **Free-riders** | **Full cooperators** |
| **Give - Positive** | **11** | 31.28 | 0.28 | 0.15 |
| | | (15.51) | (0.25) | (0.19) |
| **Give-Negative** | **12** | 38.54 | 0.23 | 0.22 |
| | | (14.26) | (0.16) | (0.19) |
| **Take-Positive** | **12** | 28.97 | 0.49 | 0.27 |
| | | (11.91) | (0.14) | (0.16) |
| **Take-Negative** | **12** | 27.94 | 0.48 | 0.19 |
| | | (16.18) | (0.23) | (0.18) |

Figures in parentheses are standard deviations.

Figure 2 plots the distribution of individual contributions by treatment. Figure 2 suggests that there are more individuals with median contributions of zero in the Take treatments than in the Give treatments. Figure 3 (a) provides more evidence by plotting the average proportion of subjects in a group contributing zero by treatment and round. Table 1 presents summary statistics on the proportion of free-riders in groups. The differences across treatments are significant (Kruskal Wallis test on proportion of free-riders in the group, $p = 0.0021$). Pairwise, we find no difference between the two Give treatments ($p = 0.76$) or Take treatments ($p = 0.73$) and so no evidence of an externality effect. We do find a difference between the two positive treatments (Give-Pos vs. Take-Pos: $p = 0.0106$) and negative treatments (Give-Neg vs. Take-Neg; $p = 0.0086$). So, there is evidence of a choice framing effect.[2]

**Figure 2. Distributions/spread of individual contributions**

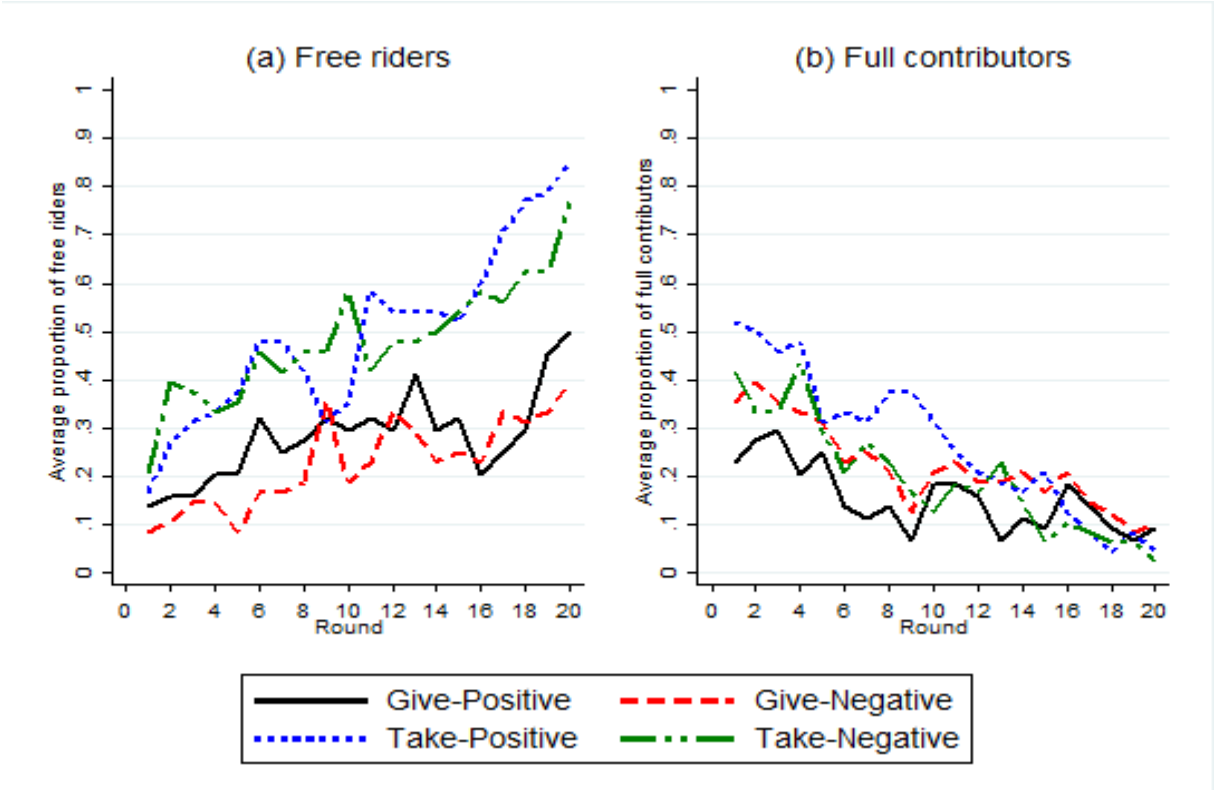
[2] Probit and logit regressions (reported in Appendix B) provide additional support for these findings.




Note: Each vertical line presents an individual's contributions. Diamonds indicate the median contribution for each individual. The thicker portions of each bar indicates the inter-quartile range of that individual's contributions. Individuals are arranged in ascending order of median contributions. Individuals are *not* grouped.

If we observe no choice framing effect on average contributions and yet do see an effect on free-riding then there must be a counter-weighting effect on higher contributions. In other words the distribution of contributions becomes more extreme in the Take treatments (Cox and Stoddard 2015). Figure 2 also suggests that there are more individuals with median contribution of 20 Tokens in Take-Positive than in Give-Positive. Figure 3 (b) presents the average proportion of full contributors in a group by treatment and round. Table 1 presents summary statistics on the proportion of full contributors in groups. The differences across treatments are not significant (Kruskal Wallis test on proportion of full contributors in the group, $p = 0.1101$). We see a statistically significant increase in the average proportion of subjects with contributions of 20 Tokens in the Take choice frame in the positive treatments (Give-Pos vs. Take-Pos: $p = 0.0266$), but do not find a significant difference between choice frames in the negative treatments (Give-Neg vs. Take-Neg: $p > 0.10$).

**Figure 3. Average proportion of free riders (contribute 0) and full contributors (contribute 20) in group**




## 4. Conclusion

We report on an experiment designed to disentangle externality and choice framing effects in repeated public good games. We find no compelling evidence of a framing effect on overall contributions. There is evidence of a choice framing effect in terms of the distribution of contributions, with more extreme behavior in the take treatments.

Our results are relatively easy to interpret in terms of the choice dimension. In particular, our results are consistent with recent studies showing that a give-take framing effect influences the distribution of contributions without having any significant effect on overall contributions (Cox and Stoddard 2015, Cox et al. 2018). Gachter, Kölle and Quercia (2017) argue there is a give-take framing effect on overall contributions but random variation means this effect does not always show up. Our results support this view to some extent in that we see a significant increase in free-

riding, in the take treatments, but a weaker increase in full cooperation. Even so, the accumulated evidence appears to suggest that if a give-take framing effect exists then it is small.

The more surprising result is the fact we do not observe an externality framing effect. This is inconsistent with Cartwright (2016) and would seem to go against the results of Andreoni (1995) and Park (2000). We suggest, therefore, that this is an area which warrants further study. Our instructions repeatedly emphasised the positive versus negative externality and so it would seem hard to argue our framing approach was simply too subtle. Instead, it seems that subjects did not respond to the difference in framing. One plausible reason is that our instructions were long and detailed enough to improve comprehension (Fosgaard, Hansen and Wengström 2017, Freeman et al. 2018, Ramalingam, Morales and Walker 2018) and thus influence the 'gut' instinct that drives warm glow versus cold prickle. Another possibility is that the externality effect only shows up in certain contexts. For instance, Böhm and Theelen (2016) observe an externality effect, but only in a setting with negative outcome valence and not (similar to us) in a setting with positive outcome valence.

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