

State Of The Art Analysis

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Topic choice: Tragedy of the Commons

1 CPR Introduction

Practically speaking, resources are invariably finite. Even regenerative resources must be used in moderation. All societies must navigate this dilemma and are thus faced with The Tragedy of the Commons. Out of self-interest, individuals tend to abuse Common Resource Pools (CPR) because not doing so would put them at a disadvantage to those that will. In this sense, the environmental detriment is the same whether one is greedy with resources or not. However, historically humans have frequently achieved a sustainable equilibrium with their individual needs and the environment. Hardin 1968 was the first to properly introduce this problem, and further elaborates on this problem in his paper.

A corresponding state-of-the-art paper for this topic models different types of fairness in CPR dilemmas (Lu et al. 2019). This paper is summarised in the sections below.

2 Problem

When agents must learn to share in a Common Resource Pool (CPR) environment, individuals are not always motivated to cooperate, even though forming a coalition is best for the longevity of both the resource and the individuals. Free-riders (those abusing the system without concern for the community) threaten the stability of the coalition. The problem is, how can individuals be encouraged to respect resource management, even when they gain the most personal short-term benefit by rapidly depleting a shared commodity? In this paper, willingness to cooperate is defined by the Social Value Orientation spectrum, ranging from pro-self to pro-social, where the prior only cooperates when given enough time to identify long-term personal gain, and the latter always behaves

in accordance to the collective good. Thus the research problem becomes: For different Social Value Orientations, how is individual behaviour influenced by deliberation time, and how does this affect the system outcome?

3 State Of The Art

De Kwaadsteniet et al. 2006 showed that the best strategy for individuals in a common resource dilemma is to follow the equality rule, where each individual gets an equal amount of the shared resource. The willingness to follow this rule may be a result of an intuitive or deliberate choice. Balliet and Joireman 2010 showed consistent findings that the intuitive choice of individuals may vary depending on their Social Value Orientation. In this regard *strategic fairness* is defined as an individual only following the equality rule when given enough deliberation time, whereas *true fairness* is defined as an individual always following the equality rule regardless of whether their choice was made intuitively or deliberately.

Although many prior studies have explored intuition/deliberation in decision contexts, they did not use situations where there was any self-interest for individuals to cooperate. Therefore this paper aims to fill in the gap by comparing pro-social and pro-self individuals in a one-shot resource dilemma.

4 New Idea

This paper examines the difference in behaviour that pro-socials and pro-selves emit when faced with a common resource dilemma. This is different from other studies of social value orientation in relation to deliberation/intuition, as these studies never use a scenario where cooperation is needed for an individual to survive.

To examine this, the paper designed a CPR scenario and used multiple ways to make the subjects' decision process more intuitive or deliberative. This was done by means of cognitive interference, cognitive load, and by flat out asking the participants to make a deliberative or intuitive decision.

5 Results

The ego depletion experiment (cognitive interference) showed significant proof that pro-self subjects requested more money in the common resource dilemma under higher ego depletion, while pro-social subjects did not show any significant difference in the amount of money requested. Additionally, the second experiment showed that under high cognitive load pro-self subjects were inclined to request more money compared to pro-self subjects under low cognitive load. Again pro-social subjects did not request significantly different amounts of money between high and low cognitive load. Experiment 3 showed that when told to intuitively determine the amount of money to receive, pro-self subjects

would request significantly more money than pro-social subjects under the same circumstances. They would also request significantly more money than pro-self subjects who were instructed to determine their request deliberately. Furthermore, this experiment showed no significant difference between the amount of money requested by pro-socials in both conditions.

Therefore this paper confirms *strategic fairness* in pro-self individuals, and *true fairness* in pro-social individuals.

6 Relevance

The paper’s relevance to real world application is focused on solving a resource dilemma. The resource in question can be arbitrary, but it is usually considered lucrative in the eyes of an agent. With the help of multi-agent system models, and having the ability to manipulate an agent’s behaviour, the research is able to model people’s actions when facing a resource dilemma. With the result this paper provides, it is possible to apply the methodology to your next resource dilemma. The theories the paper includes are: how a resource is distributed amongst individuals, which social value orientation reaps what amount of a resource, are the individuals able to efficiently allocate the resource, and do individuals respect their behaviours? Examples of applying the theory to groups of people in the real world are: figuring out how a plot of land should be divided amongst farmers, distributing profitable resources amongst countries, and hunting for food for your village. These resource dilemmas can have their models based on the ground work of this research.

References

- Balliet, Daniel and Jeff Joireman (2010). “Ego depletion reduces prosocials’ concern with the well-being of others”. In: *Group Processes & Intergroup Relations* 13.2, pp. 227–239.
- De Kwaadsteniet, Erik W et al. (2006). “Social dilemmas as strong versus weak situations: Social value orientations and tacit coordination under resource size uncertainty”. In: *Journal of Experimental Social Psychology* 42.4, pp. 509–516.
- Hardin, Garrett (1968). “The Tragedy of the Commons”. In: *Science* 162.3859, pp. 1243–1248. ISSN: 0036-8075. DOI: 10.1126/science.162.3859.1243. eprint: <https://science.sciencemag.org/content/162/3859/1243.full.pdf>. URL: <https://science.sciencemag.org/content/162/3859/1243>.
- Lu, Su et al. (2019). “True versus strategic fairness in a common resource dilemma: Evidence from the dual-process perspective”. In: *Journal of Behavioral Decision Making* 32.3, pp. 255–265. DOI: 10.1002/bdm.2111.