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Regret, Warm-glow and bounded rationality in experiments on binary public goods

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Abstract

This paper presents two models to explain experimental data on binary public goods. While a Regret model and a Warm-glow model both fit the data better than the standard Bayesian model, the Warm-glow model fits best.

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Keywords: Binary public goods; Bayesian equilibrium; Regret theory; Warm-glow; Bounded rationality

1. Introduction

In standard economic theory, members of a group "free ride" when asked to provide funds for a public good. However, if all members try to free ride, the project cannot be carried out. This conflict is at the origin of the public goods provision problem.[1]

An interesting case involves a contribution threshold necessary for the production of the public good. The good is produced only when a threshold amount of resources has been contributed, but the quality and quantity of the good do not increase when contributions exceed the threshold. Such goods are known in the literature as "lumpy," "binary," "discrete"

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[1] An excellent survey can be found in Ledyard (1995).

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or "step-level" public goods.[2] Examples include bridges, railway tracks, roads, and public radio.

In this context, Rapoport introduced the notion of uncertain strategies that take into account each individual's opinion about whether the number of contributing members will reach the good's threshold. Palfrey and Rosenthal (1991) model this uncertainty by endowing each individual with one unit of the good, allowing him or her either to consume the good privately or to contribute it for production of the public good. Individuals vary in their assessments of the value of the good in private consumption. The assessments are private information, but the probability distribution of the assessments is common knowledge. To maximize expected gains, each agent forms beliefs regarding other players' probable behavior and makes a decision accordingly.

Palfrey and Rosenthal test the Nash Bayesian equilibrium predictions of this model using data from 33 experiments. However, the Nash Bayesian equilibrium concept does not fit the data quite well; the model performs worse at explaining individual behavior data than aggregate data. To improve the fit, the authors propose an added behavioral hypothesis, called "Hypothesis H". The idea is that individuals are Bayesian, but they are not completely rational in the sense that they overestimate the probability that other people will contribute. The authors show that Hypothesis H does improve the fit whereas risk aversion, cooperative game theory and prospect theory (Kahneman and Tversky, 1979) do not.

In this paper, we present two models designed to improve the fits of models used so far. The first model is a version of Regret theory (Loomes and Sugden, 1982, 1987). The second model modifies the Palfrey–Rosenthal model to include both a "Warm-glow" effect (Andreoni, 1990) and a bias effect, explained below. The first model improves upon the Palfrey–Rosenthal model, and the second improves the fit still more.

In Section 2, we review Palfrey and Rosenthal's benchmark and their Hypothesis H. Sections 3 and 4 introduce the two models mentioned earlier. In Section 5, we make a comparative study of the three models as applied to the Palfrey–Rosenthal data. Section 6 concludes.

2. The benchmark model and Hypothesis H

In the Palfrey and Rosenthal (1991) model, each of N members of a group is endowed with an indivisible amount of input that can either be assigned to the common project (*contribute*: C) or consumed privately (*not contribute*: NC). The project requires at least w units of input; that is, it requires that at least w individuals contribute. The value of the input for individual i is denoted by c_i and is private information. This value is what the individual gives up as a cost when he or she contributes. It is common knowledge that these costs c_i are independent draws from a uniform distribution over the interval $[0, \bar{c}]$, $\bar{c} > 0$. The value

[2] Some of the most relevant approaches for our purposes include Palfrey and Prisbey (1997), Palfrey and Rosenthal (1984, 1988, 1991), Rapoport (1985), Rapoport and Suleiman (1993) and Suleiman and Rapoport (1992).