

## **A Continuous Minimum Effort Game**

Ailin Leng, University of Queensland, 24 Mar 2015

### Extended Abstract

Most previous experiments have been conducted in the discrete time frame, where subjects make a single choice each round. The first continuous game is by Friedman and Oprea (2012). Their experiment allows subjects to switch strategies as many times as they want during one minute. They found that in a prisoners' dilemma game, subjects improved their cooperation level significantly compared with a discrete time frame. After their studies, a few experiments of continuous time frame on different types of games were conducted. (Oprea et al., 2014; Bigoni et al. , 2014)

In my paper, I conduct a continuous time frame experiment of the minimum effort game (also referred to as the weak-link game). In the minimum effort game, a subject's payoff is determined by the subjects' own effort and the minimum chosen by all players within the subject's group. The individual's payoff increases with the level of the group minimum and decreases with the player's deviation from the group minimum. In other words, the group performance is determined by the worst element (Camerer, 2003). For example, a meeting can only start once all board members have shown up. In continuous settings, effort for each player can be easily observed by others in the group and strategies can be adjusted accordingly quickly. Imagine several staff working on a project in a consulting firm, where every consultant uploads his latest progress using the online software Dropbox. The project is not completed until each staff member finishes his own part. In this situation, staff can check others' progress and change their own constantly.

I expect that the continuous time setting would improve group performance compared with previous discrete minimum game studies (e.g. Knez and Camerer (1994), Berninghaus and Ehrhart (2001), and Devetag, (2005)), in which coordination failure has been prevailing. The deviation cost from the group minimum in continuous time is reduced because the effort choice can be switched quickly. If one or two subjects have increased their effort but the other group members do not follow, these subjects can switch back to the minimum quickly without suffering much loss. If other players followed and the minimum is increased, nobody has incentives to deviate from it for the rest for period. The expected gain is large and cost is small. Therefore, subjects should take the risk of choosing the payoff-dominant option.

The experimental design is as follows. The payoff matrix is the same as used by the first minimum effort experiment of Van Huyck, Battalio, and Beil (1990). A group consists of six subjects. In the continuous treatments, subjects are able to observe the group minimum value and adjust their own chosen values as many times as necessary during each 90 second period. Payoffs equal the accumulated flow payoff. There are 10 periods in total. In the

discrete time control sessions, subjects are unable to observe the group minimum and the payoffs were determined by the values chosen at the end of the 90 seconds. Additional treatments will increase the information provided by giving subjects a list of values chosen by all subjects, in addition to the minimum value. It is expected that the full information treatment would further improve group performance. Further treatments will increase the group size to 12. It is expected that even under continuous time setting, coordination would fail in such large size group. The effect of continuity has its limit.

The experiment is currently in progress. Pilot sessions have been run. The data will be collected during March and April. I am confident that I can get all the results by July and present the whole paper in conference.

Key words: continuous time, minimum effort game, experiment

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