Evolutionary dynamics in club goods binary games

Gian Italo Bischi, Ugo Merlone, Eros Pruscini

PII: S0165-1889(18)30074-5
DOI: 10.1016/j.jedc.2018.02.005
Reference: DYNCON 3559

To appear in: *Journal of Economic Dynamics & Control*

Received date: 26 April 2017
Revised date: 26 November 2017
Accepted date: 5 February 2018

Please cite this article as: Gian Italo Bischi, Ugo Merlone, Eros Pruscini, Evolutionary dynamics in club goods binary games, *Journal of Economic Dynamics & Control* (2018), doi: 10.1016/j.jedc.2018.02.005

Evolutionary dynamics in club goods binary games

Gian Italo Bischi[1]
Università di Urbino Carlo Bo

Ugo Merlone
Università di Torino

Eros Pruscini
Università di Urbino Carlo Bo

Abstract

A dynamic adjustment mechanism, based on replicator dynamics in discrete time, is used to study the time evolution of a population of players facing a binary choice game with social influence, characterized by payoff curves that intersect at two interior points, also denoted as thresholds. So, besides the boundary equilibria where all players make the same choice, there are two further steady states where agents playing different strategies coexist and get identical payoffs. Such binary game can be interpreted as a club good game, in which players have to choose either joining or not the club in the presence of cost sharing, so that they can enjoy a good or a service provided that a "participation" threshold is reached. At the same time congestion occurs beyond a second higher threshold. These binary choice models, can be used (and indeed have been used in the literature) to represent several social and economic decisions, such as technology adoption, joining a commercial club, R&D investments, production delocalization, programs for environmental protection. Existence and stability of equilibrium points are studied, as well as the creation of more complex attractors (periodic or chaotic) related with overshooting effects. The study of some local and global dynamic properties of the evolutionary model proposed reveals that the presence of the "participation" threshold causes the creation of complex topological structures of the basins of coexisting attracting sets, so that a strong path dependence is observed. The dynamic effects of memory, both in the form of convex combination of a finite number of previous observation (moving average) and in the form of memory with increasing length and exponentially fading weights are investigated as well.

Keywords: Binary games, Social externalities, Club goods, Discrete Dynamical Systems, Replicator Dynamics, Global bifurcations

1 Introduction

Concepts like bounded rationality, social influence, evolution, imitation, underlay the recent developments of behavioral economics (for a review on behavioral economics the reader may

[1]Corresponding author. Email: gian.bischi@uniurb.it