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Evolutionary dynamics of social dilemmas with asymmetry

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Abstract:

Asymmetric phenomenon is ubiquitous in human and animal societies. Based on this fact, we construct an asymmetric way to investigate the evolution of cooperation. In detail, the structured populations are classified into two types: players of type *A* (strong player) possess higher fitness, while players of type *B* (weak player) possess fitness equaling their payoffs. Through numerical simulation, we find that our asymmetric setup can promote the evolution of cooperation, which is related to the leader role of the players of type *A*. It is worth mentioning that the larger the value of ω, namely, the degree of asymmetric becomes more large, the higher the level of cooperation. Besides, the higher degree of asymmetric will lead to a long relaxation time reaching stationary state and less striking promoting effect. Lastly, in order to test the robustness of mechanism, we explore the evolution of cooperation on different topologies.

Keywords: Cooperation; Asymmetric; Evolutionary dynamics

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