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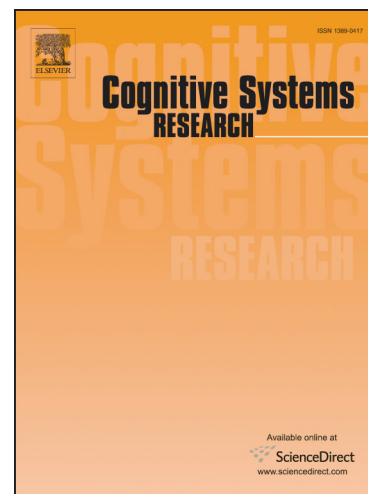
Modelling Enduring Institutions: The Complementarity of Evolutionary and Agent-based Approaches

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# Modelling Enduring Institutions: The Complementarity of Evolutionary and Agent-based Approaches

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## Abstract

Empirical work has shown that societies can sometimes avoid antisocial outcomes, such as the Tragedy of the Commons, by establishing institutional rules that govern their interactions. Moreover, groups are more likely to avoid antisocial outcomes when they design and enforce their own rules. But this raises the question: when will group members put effort into maintaining their institution so that it continues to provide socially beneficial outcomes? Ostrom derived a set of empirical principles that predict when institutions will endure, which have subsequently been formalised in agent-based models that are based on an executable description of the content of an individual's behaviour. Here we show how these models can be complemented by evolutionary game theory, which focuses on the value or payoff of different behaviours, rather than on the mechanistic content of the behaviour. Using such a value-based model, we determine exactly when individuals will be incentivised to maintain their institution and enforce its rules, including the critical amount that a group must invest into incentivising agents to monitor rule compliance. We highlight the complementarity of content-based and value-based modelling approaches, and therefore provide a step towards unifying theoretical and empirical approaches to understanding enduring institutions and other social phenomena.

*Keywords:* institutions, evolutionary game theory, agent-based modelling

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