Game theory and human evolution: A critique of some recent interpretations of experimental games

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Agenda

I. Motivation
II. Implicit cognitive models
III. Experimental findings
IV. Concluding remarks
Motivation

- Evolutionary stable strategy (ESS) models of cooperation are used in evolutionary biology to describe survival strategies with natural selection → A concept closely related to the Nash equilibrium (but “evolutionary” stable)

- Experiments show: humans often do not conform Nash equilibrium predictions → Casts doubt on the ESS models as well → This is especially interesting in the context of anonymous one-shot games, such as the *ultimatum game* - how to explain altruistic behavior in such games?

- The implicit view of cognition in economic theory suggests *cultural group selection* to explain the deviation in such games → Approach is not consistent with the implicit view of cognition in evolutionary biology and is hereby critically reviewed
Implicit cognitive models

Economists view

- Optimizing engine: Human brain

- Assumptions
  1. People are rational decision makers that seek to maximize utility
  2. Utility is defined in terms of individual benefit

  → People have optimizing engine at disposal do deal with novel situations

- Approximation of poorly understood cognitive processes
Implicit cognitive models

Retain (1) and modify (2)
→ Yields other regarding utility function, (Fehr and Schmitt, 1999)
→ Explanation by cultural group selection

Cultural Group Selection

• Social learning strategies applied when individual learning is costly
  (conformist/prestige-biased transmission)

• Within-group altruism is favored in between-group competition
Implicit cognitive models

Economists view
- Optimizing engine: Human brain

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Biologists view
- Optimizing engine: Natural selection

- Assumptions
  - Utility maximization is external to the individual
  - Brain is an assemblage of evolved, specialized mechanisms

  → Information cues trigger behavioral patterns to solve fitness-relevant problems

- Sufficient information necessary to determine the strategic context
Implicit cognitive models

Retain (1) and modify (2)
→ Yields other regarding utility function, (Fehr and Schmitt, 1999)
→ Explanation by cultural group selection

Consider (1) is flawed → no rationality
→ Humans are not evolved to solve one-shot encounters
→ Mismatch hypothesis

The Mismatch Hypothesis
i) Misapprehension hypothesis
→ Misapprehend situation but act consistently

ii) Malfunction hypothesis
→ psychological machinery malfunctions irrationality is possible

Cultural Group Selection
• Social learning strategies applied when individual learning is costly (conformist/prestige-biased transmission)
• Within-group altruism is favored in between-group competition
Implicit cognitive models

Questions raised

• Are humans adopted to one-shot encounters?
  → It is hard to deny the possibility of additional future encounters
If yes, how to trigger responses for one-shot encounters?
  → In most experiments fellow participants are from the same school/town/classes etc.
What are the predictions for one-shot encounters considering cultural group selection?
  → Altruism in one-shot games is not evidence for group selected strong reciprocity

• Are humans adopted to anonymous interactions?
  → Reputation usually taken into account, games reflect personal interactions
Can experimental games be truly anonymous?
  → Participants questioned about awareness of anonymity and one-shot character
Experimental findings

Explicit features: instructions, rules and features of the game
• High impact on game play in ways predicted by rational choice theory

Implicit features: subtle cues, independent of formal structure
• Implicit cues can determine game play and extent of cooperation

Importance of culture: reflects social and economic institutions
• Information, which is not specified in the structures or instructions of the game, is used

Emotions: “hot” cognition ↔ “cold” cognition (rationality)
• Emotions play a central role when it comes to punishment and retaliation

Variation in game play: “independent” of the first 4 features
• Individual variation of game play exists in all cultures and societies
Concluding Remarks

Approach: concept of *frames*

- Knowledge structures/conceptual abstractions used to interpret complex realities
  - Individuals gather informational cues to interpret situations and behave accordingly
  - Same facts can be interpreted differently dependent on the framing

Issue: Economic experiments lack contextualization, but are rich in social cues

- Hence the behavior of participants is *i)* hard to predict *ii)* hard to comprehend
- Context of the game? Are players allies or enemies? Friends or competitors? In-group or out-group members? Is the game a test of intelligence, skill or personality? A transaction, competition or a collective effort?

- Economists models idealize humans, attributing computational abilities and consistent preferences
- Evolutionary biologists models are unrealistic in their lack of explanation of humans dealing with novel situations
Thank you for your attention!
Appendix

Evolutionary stable strategies (ESS) model specifications

- $x$ and $y$ are strategies
- $E(x,y)$ is the success of strategy $x$ in an environment of strategy $y$

$x$ is an ESS if for all $x \neq y$ if

1. $E(x,x) > E(y,x)$ \textbf{or}\ 
   \textit{strict Nash equilibrium}

2. $E(x,x) = E(y,x)$ \textit{and} $E(x,y) > E(y,y)$ \textit{Maynard Smith's second condition}
Appendix

Other regarding utility function, proposed by Fehr and Schmitt (1999)

- $x_i$ - Payoff of player $i$
- $x_j$ - Payoff of player $j$

$$U_i(x_i, x_j) = x_i - \alpha \max(x_j - x_i, 0) - \beta \max(x_i - x_j, 0)$$

with $0 \leq \beta < 1$ and $\alpha > \beta$