

Selfishness or Cooperation?

Luís Moniz Pereira

Universidade Nova de Lisboa

Selfishness

- 'Selfishness' concerns the logic behind the ceaseless give-and-take pervading our social lives
- It does not mean blind greed, but enlightened self-interest
- One needs Evolutionary Game Theory (EGT) to understand why and how self-interested agents cooperate for their common good

Cooperation

- In the *New Year 2000* edition of *Science*, the editors listed “The evolution of cooperation” as one of the most challenging problems of the century
- In the EGT approach, more successful strategies become more frequent in the population
- Family ties, neighbourhood relations, and individual differences, may or might not be taken into account
- Cognitive abilities, event history, and sophisticated learning, are conspicuous for their absence

Evolutionary Game Theory - 1

- Thinkers throughout the ages have been fascinated by the topic of self-regarding versus other-regarding behaviour, but the use of formal models and experimental games is relatively recent
- Ever since Robert Trivers introduced an evolutionary approach to reciprocity, games have served as models to explore the issue
- The most gratifying development is the close connection between theoretical and experimental progress

Evolutionary Game Theory - 2

- EGT stresses deterministic dynamics and stochastic processes
- Repeated interactions allow exploration of direct reciprocity between two players
- In indirect reciprocity players interact at most once, but are aware of past behaviour of partners
- This introduces moral judgement and concern for reputation

Evolutionary Game Theory - 3

- Strategies based on the assessment of interactions between third parties allow the emergence of types of cooperation immune to exploitation, because channeled to cooperators only
- **Issues of fairness and trust, with their negative (punishment) and positive (help) incentives, are paramount in games with large diversified groups**
- Coercion emerges more easily if participation in group effort is voluntary rather than compulsory

The social animal

- Today we know the parallels between human communities and insect states does not reach far
- The degree of cooperation in social insects is essentially due to strong family ties
- Humans by contrast collaborate with non-related partners
- Cooperation among close relatives is explained by *kin selection*, which goes a long way to explain collaboration, in virtue of the common genes

EGT and Cognition

- While humans have been selected for living in groups —for 30 M years now— our actions are not as coordinated as those of cells of an organ, nor as hard-wired as those of social insects
- Human cooperation is mostly based on individual decisions guided by personal interests. Communities are no super-organisms with a common goal
- Explaining collective phenomena bottom-up needs EGT combined with individual cognition and strategy

Artificial Societies - 1

- Individual-based modelling of artificial societies greatly expanded the scope of game theory. The societies consist of fictitious individuals, each equipped with a strategy specified by a program
- Individuals meet randomly pairwise, in an iterated game with the many. Comparative accumulated payoffs are used to update the population: more successful individuals produce more offspring, which inherit their strategy

Artificial Societies - 2

- Alternatively, instead of inheriting strategies, new individuals can adapt by copying strategies, preferably from acquaintances that did better
- In both cases, frequency of strategies change in time, and may evolve towards a stable state
- One can also introduce mutant small minorities with new strategies, and study how they spread
- Consideration of cognitive strategy change, e.g. by means intention recognition, is still incipient

Mutual Understanding

- Psychological and economic tests evidence shows that humans champion direct and indirect reciprocity, employing trust, reputation, incentive, punishment, withdrawal, revenge, and forgiveness
- Brain imaging shows our cortex specializes to deal with endless computations to keep count of credits and debits, responding emotionally to imbalances
- We have a propensity to imitate another's acts, and to understand the intentions behind them

eBay

- Subscribers to eBay auctions state, after each transaction, whether they were satisfied with their trading partner. Ratings of eBay members over 12 months are public knowledge
- **This assessment seems to suffice for reputation building, and as reasonable proof against manipulation**
- In large communities, individuals rely on third party knowledge and gossip. Language and a moral sense may well have co-evolved

Morality - 1

- The role of moral judgments in every day economic decisions was understood by Adam Smith. Later economists tended to ignore moral emotions, but today it is generally recognized that our propensity to exchange requires, first and foremost, trust
- A firm moral basis for economic interactions, and a consensual “rule of law”, are major indicators for the wealth of nations, more important than population size or mineral resources

Morality - 2

- Economists and sociologists are increasingly interested in indirect reciprocity, because of one-shot interactions between far-off partners
- Evolutionary biologists are keen on the emergence of human communities, where cooperation is founded on moralistic emotions
- Direct and third parties' interactions are of interest to individual actions, which are performed according to moral norms

Morality - 3

- Moral norms are to a large extent culture specific, but the capacity for (fair) moral norms is a human universal, for which there is little evidence in other species
- EGT and computational models of moral reasoning need to be wed together for a better modelling of moral institutions' emergence

References: Karl Sigmund, "The calculus of selfishness", Princeton UP, 2010.

L. M. Pereira and A. Saptawijaya, "Modelling Morality with Prospective Logic", Intl. Journal of Reasoning-based Intelligent Systems (IJRIS), 1(3/4):209-221, 2009.

Thank you!

Questions?