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Emergence of the Social Contract

Karl Sigmund

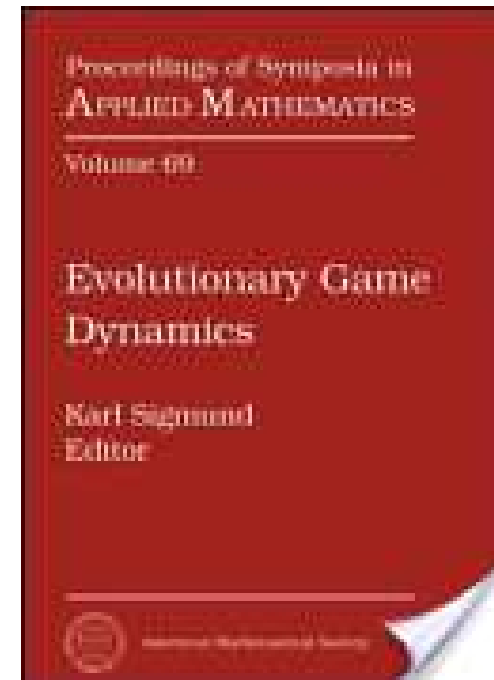
IIASA and University of Vienna



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Evolutionary Game Theory

- Population of players
(not necessarily rational)
- Subgroups meet and interact
- Strategies: Types of behaviour
- Successful strategies spread in population



Free Rider Problem

Jean-Jacques
Rousseau (1712-1778):

Stag Hunt Metapher

Social dilemmas



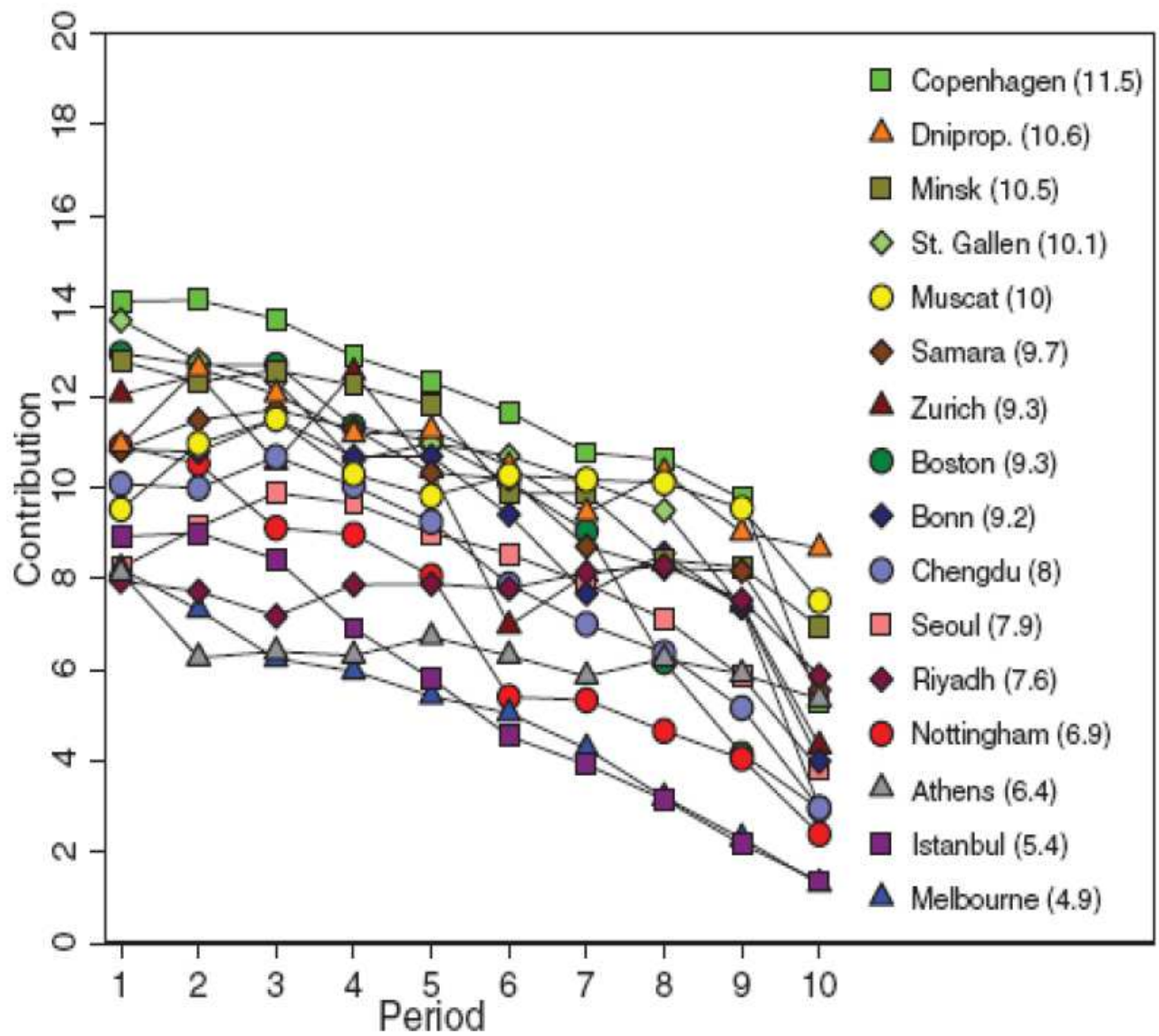
A 'Common Good' Game

4 players

may contribute up to 20 dollars to common pool

Experimenter doubles common pool

Divides it equally among the 4 players



Herrmann, Thöni,
Gächter (Nature 2009)

'Peer Punishment'

After each round, players can impose fines on each other

A punished player loses 3 dollars per fine

Punishers pay a fee of 1 dollar for each fine
(costly punishment)

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Sanctions provide incentives to contribute

But players can free-ride on sanctions provided by others

Opting out?

If game is voluntary,
players can abstain from joint enterprise.
Non-participants do something on their own.

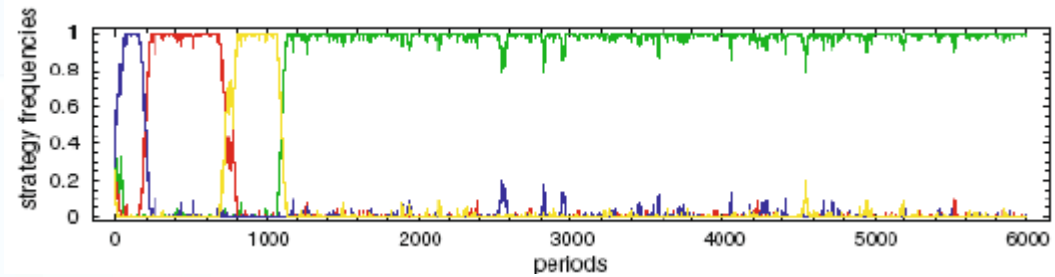
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Four strategies:

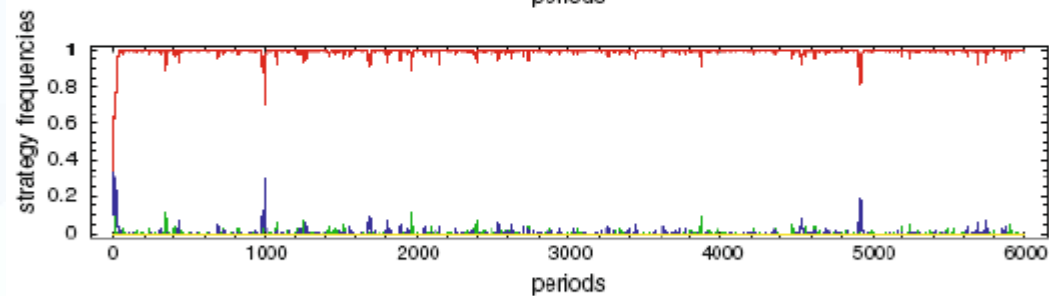
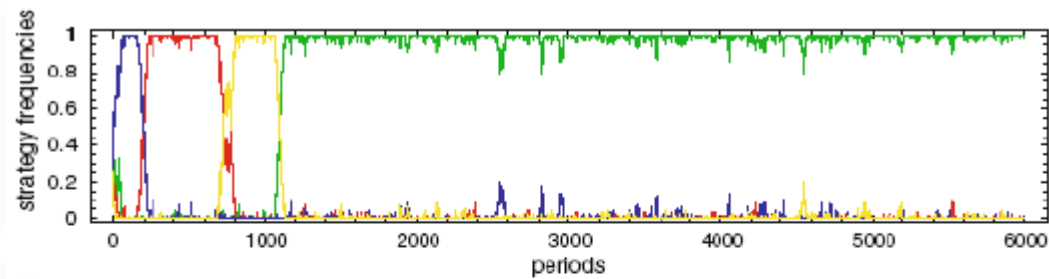
- (a) don't participate
- (b) participate, but do not contribute (free riders)
- (c) participate, contribute, but not to sanctions
(second order free riders)
- (d) participate, contribute, punish (pro-social)

Voluntary games



- non participants
- 1st order free riders
- 2nd order free riders
- pro-social

Voluntary vs. compulsory games

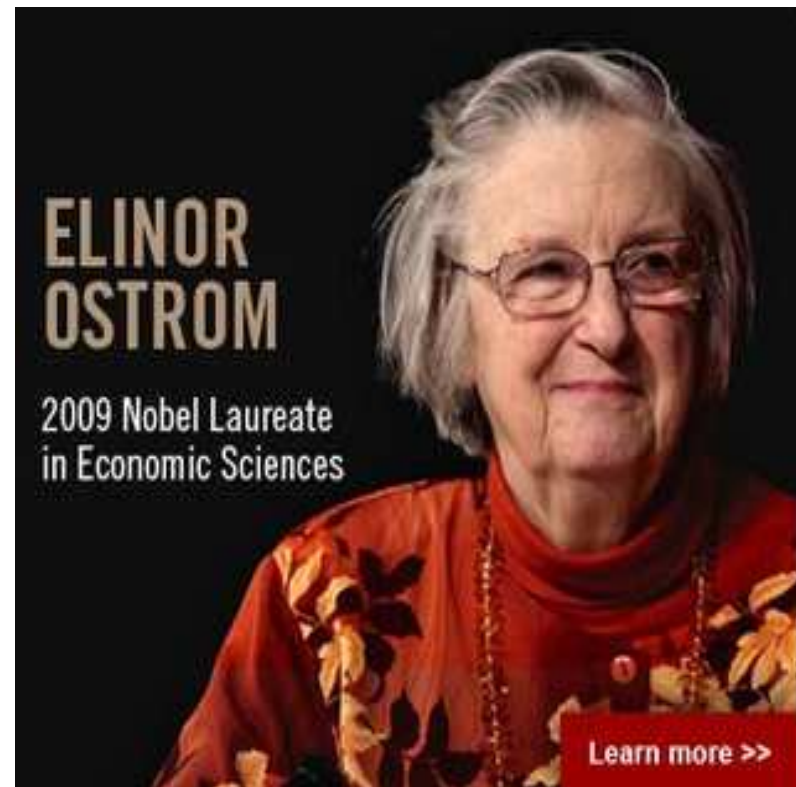


- non participants
- 1st order free riders
- 2nd order free riders
- pro-social

Hauert, Traulsen, Nowak,
Brandt, Sigmund (Science 2007)

„Governing the Commons“

„Institutions are tools that offer incentives to enable humans to overcome social dilemmas“



Pool punishment

Yamagishi (1986) etc:

Players contribute G to punishment funds
before the Public Good game

Free riders pay fine B

Again, emerges only if game is voluntary

(Sigmund, De Silva, Nowak, Traulsen, Hauert, Nature 2011)

Conclusion

Whether in conditions of anarchy
(peer punishment, i.e., self-justice)
or if institutions provide the sanctions,

voluntary participation promotes cooperation
(a social contract strengthens authorities)

No rational deliberation, just social learning

Social contract

Jean-Jacques
Rousseau:

„Man is born free,
and everywhere men
are in chains“



