

Introduction

Opinions are often coupled with actions which may involve some cost for agents (economic, behavioural, etc.). The cost has been conjectured as required for understanding the dynamics of public attention [1].

The question

- What is the role of idiosyncratic levels of confidence of agents on the formation of consensus in the society?
- When opinions are coupled to actions, what is the influence of the potential cost of an opinion change on the dynamics?

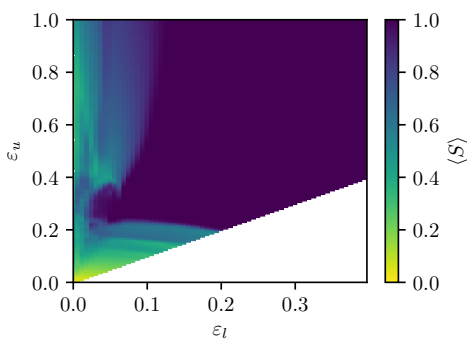
Our contribution

- Phase diagram of the fully heterogeneous bounded confidence model
- Study of the role of behavioural cost

Heterogeneity affects consensus [2]

- confidence distributed uniformly in $[\varepsilon_l, \varepsilon_u]$
- $\langle S \rangle$ mean fraction of agents with most popular final opinion
- $\langle S \rangle \rightarrow 1 \Leftrightarrow$ consensus

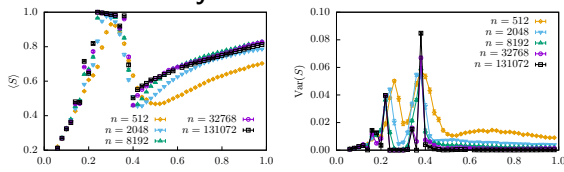
Systematic study of the phase diagram



8224 points, each averaged over 1000 samples, $n = 16384$

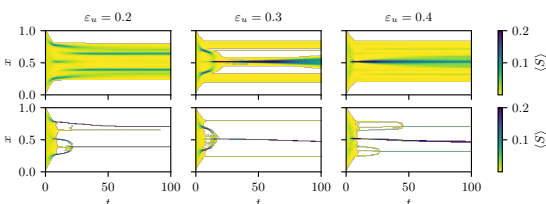
- more open mindedness generally enhances consensus
- if closed minded agents (low ε_l) are present, introducing too many open minded ones (high ε_l) destroys consensus!

Finite-size analysis



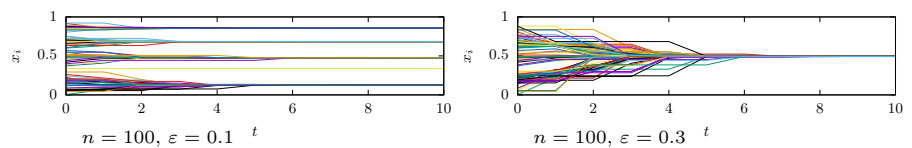
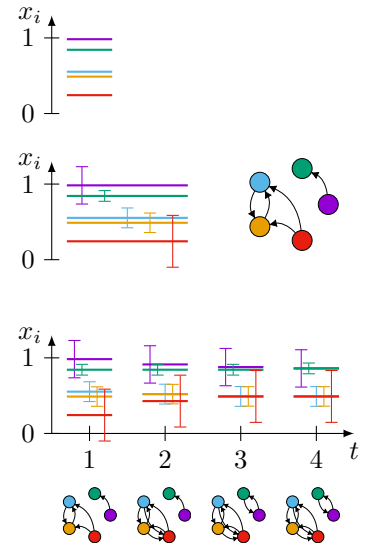
Time evolution

Open minded agents reach majority opinion too fast and leave closed minded agents behind



Hegselmann-Krause model

- n agents i with opinion x_i
- $x_i \in [0, 1]$ continuous variable
- agents have idiosyncratic confidence ε_i
- agents can only be influenced by others with a similar opinion, depending on their confidence (small $\varepsilon_i \rightarrow$ closed minded, large $\varepsilon_i \rightarrow$ open minded)
- compromise at each time step t : take average opinion of the influencing agents
- interactions are not symmetric
- interaction network changes with time
- after some time either consensus is reached or different opinions coexist



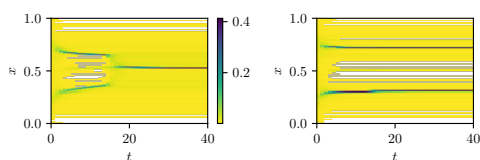
The influence of cost

Model

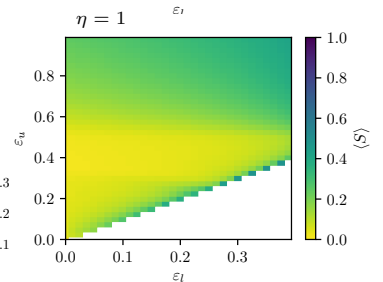
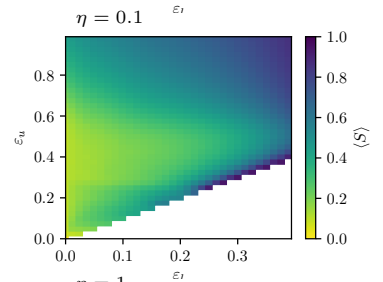
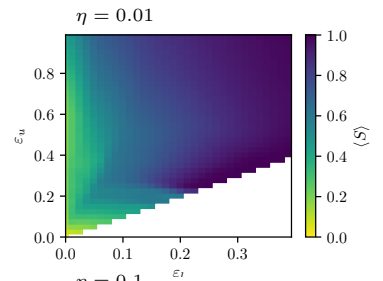
- each agent has a finite amount of personal resources c_i
- $c_i(0) \in [0, 0.5]$ uniformly
- η is the magnitude of the cost
- agents have to pay a cost for each opinion change
 $c_i(t+1) = c_i(t) - \eta |x(t+1) - x(t)|$
- agents without resources can not change their opinion anymore, but they can still influence others

Results

- structures observed at zero costs are lost
- homogeneous case (diagonal) only influenced for very large costs
- consensus in heterogeneous case is strongly suppressed: slower convergence \rightarrow agents 'freezing' \rightarrow fragmentation



two different samples
 $n = 1024, \eta = 1, \varepsilon_l = 0.2, \varepsilon_u = 0.3$



1024 points, 1000 samples, $n = 1024$

Bibliography

- [1] Downs "Up and Down with Ecology: The Issue-Attention Cycle." The politics of American economic policy making 48 (1996).
- [2] Schawe, Hernández "When open mindedness hinders consensus." arXiv:2001.06877 (2020)

