

Agent-Based Social Simulation Modelling: Cui Bono?

Introduction: Cui bono

- Who benefits? Who do you want to benefit?
- Has there been an impact on
 - social and economic policy?
 - business or commercial policy or strategy?
 - other social disciplines such as history, sociology, anthropology, archaeology?

Plan of my talk

- Social behaviour and complexity
- Simplicity (parsimony): a poor justification for model design
- Opinion dynamics: inheritance of bad modelling habits
- How general are the bad habits?
- Balancing evidence and theory in agent-based modelling
- How to benefit stakeholders (if you want to)
- A concluding (curmudgeonly) challenge

Evidence-based theory of social behaviour

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- **Cognitive dissonance**
 - **If an opinion or view is important, then finding that a close friend has a contrasting view results in either a change in the relationship or a change in one's view or, sometimes, both opinions changing to a compromise position**

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- **All heavy-tailed distributions of relative changes**

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 - The system is slowly driven so that new information or events leave most agents below their critical thresholds for change most of the time.

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- A few cases in ABSS (none in economics) where simplification is guided by evidence in designing a model

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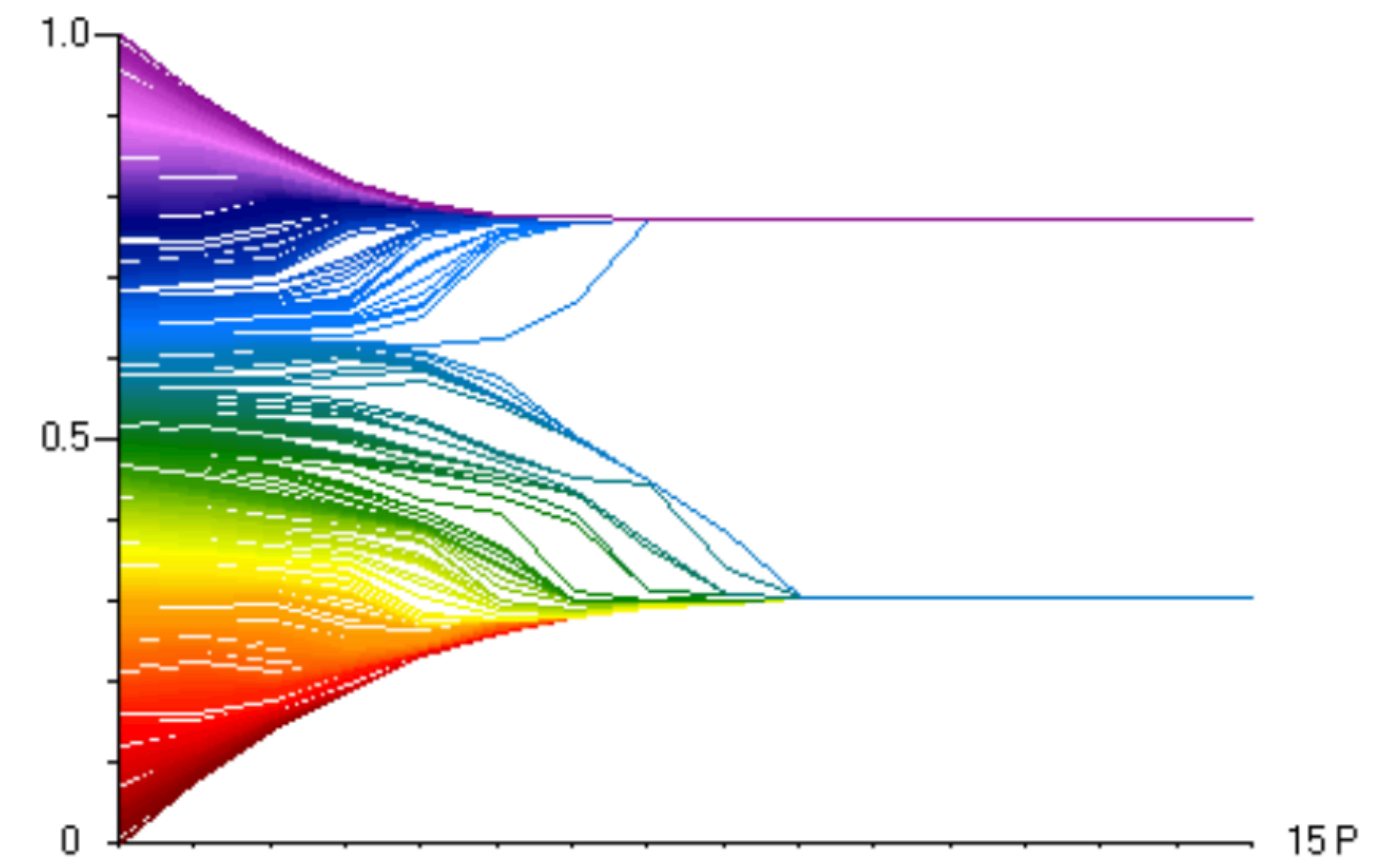
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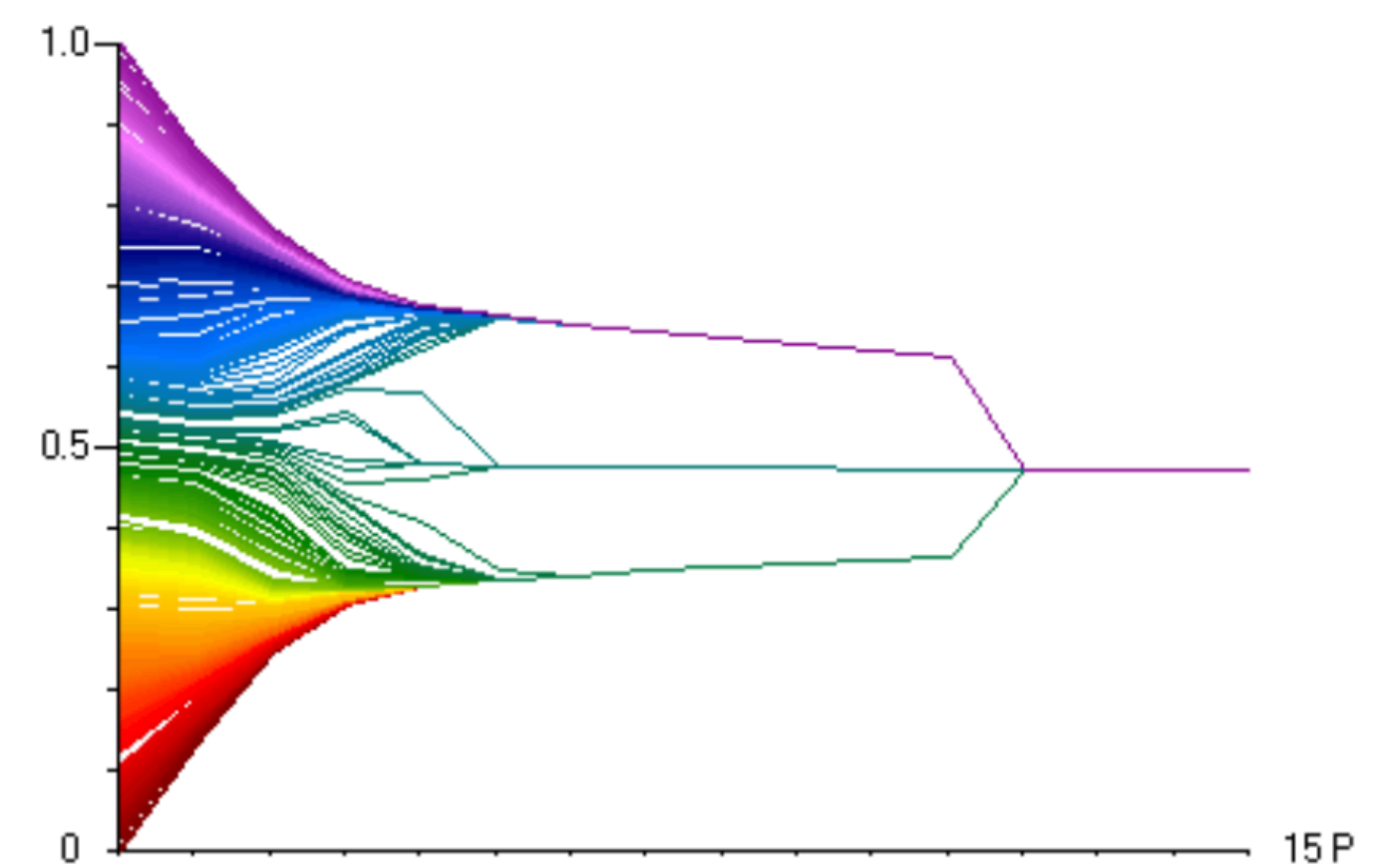
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 - Magnitude of opinion change determined by a modeller-set parameter in the unit interval

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Equilibrium clustering



(b) $\epsilon_l = \epsilon_r = 0.15$

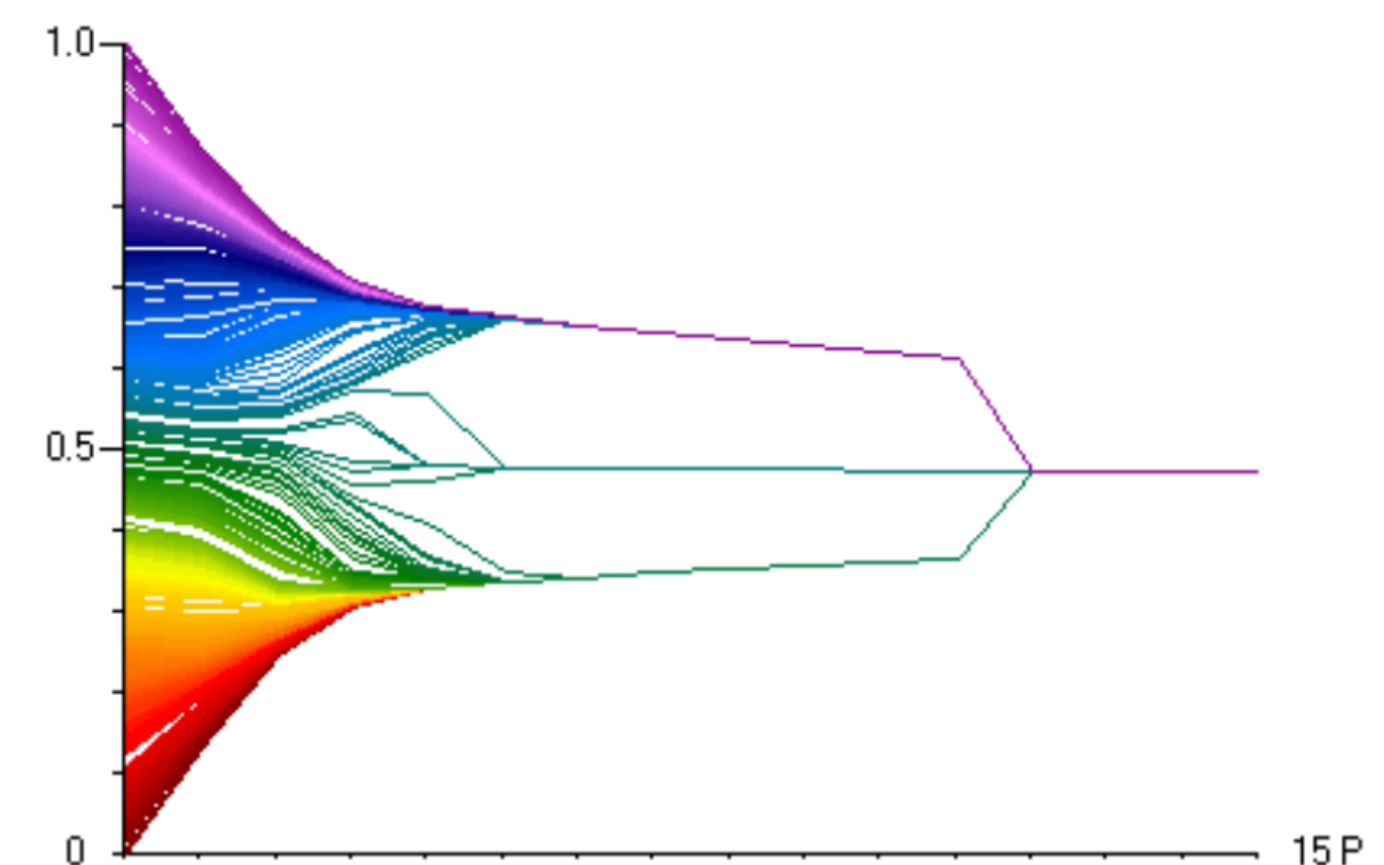
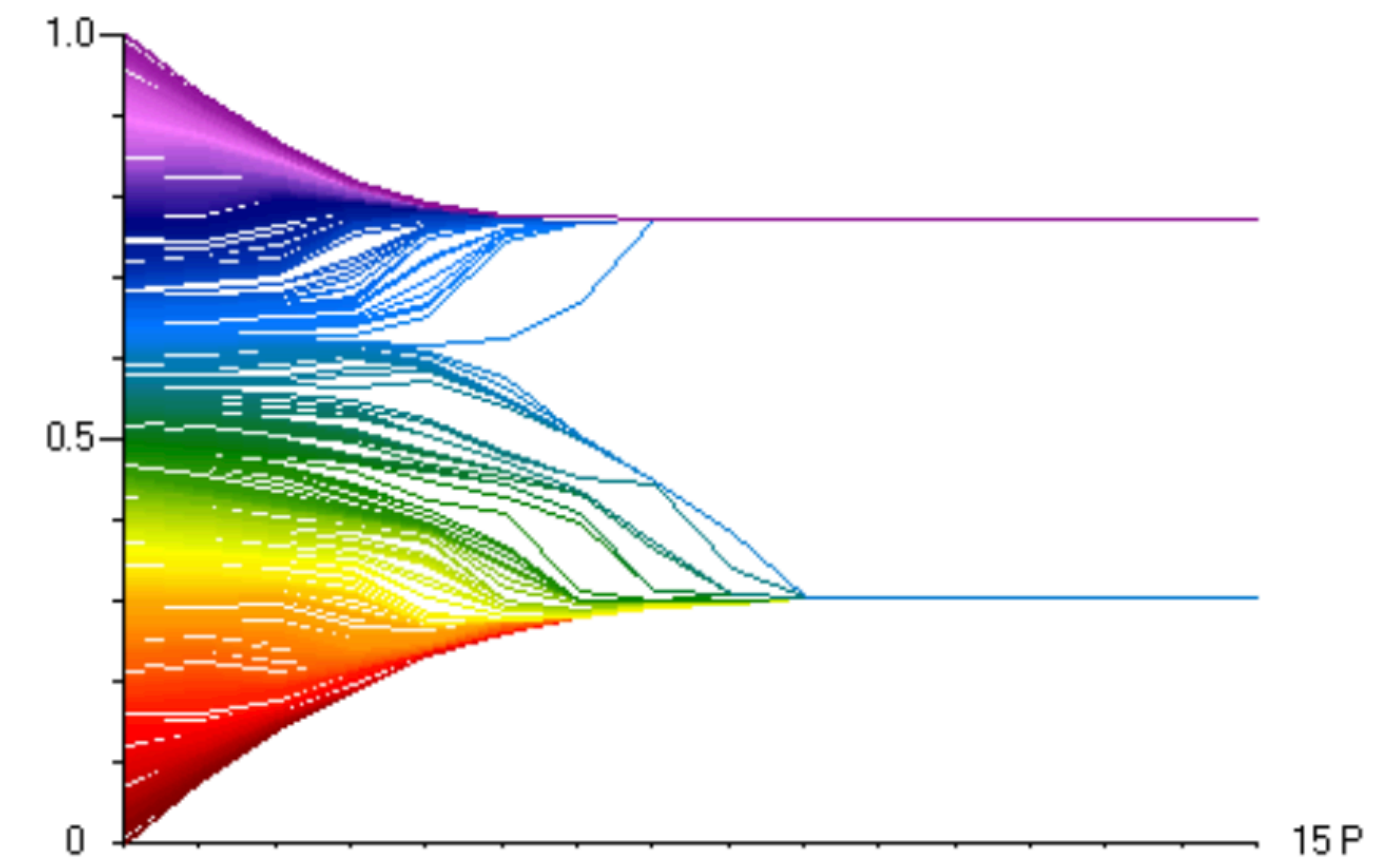


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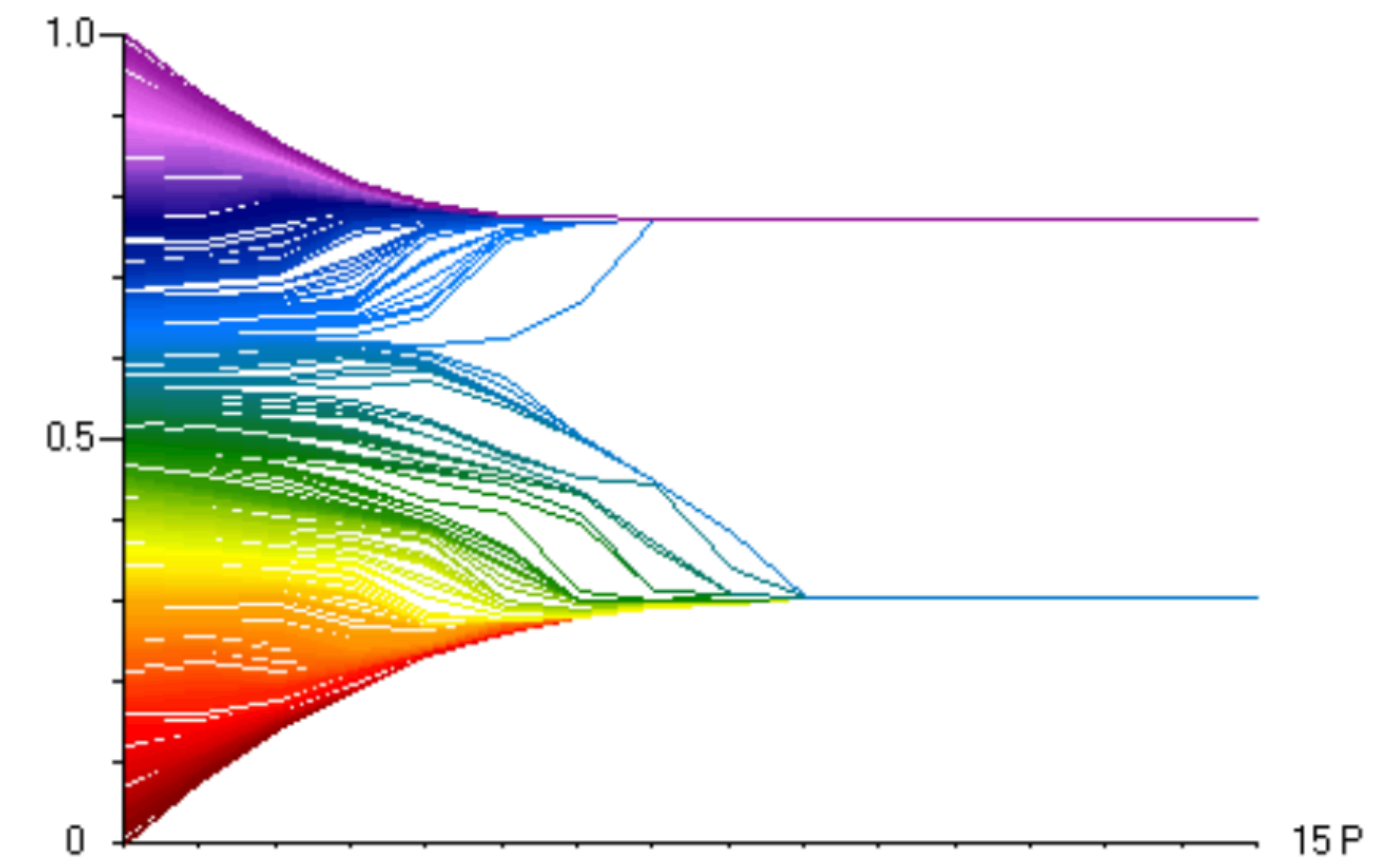
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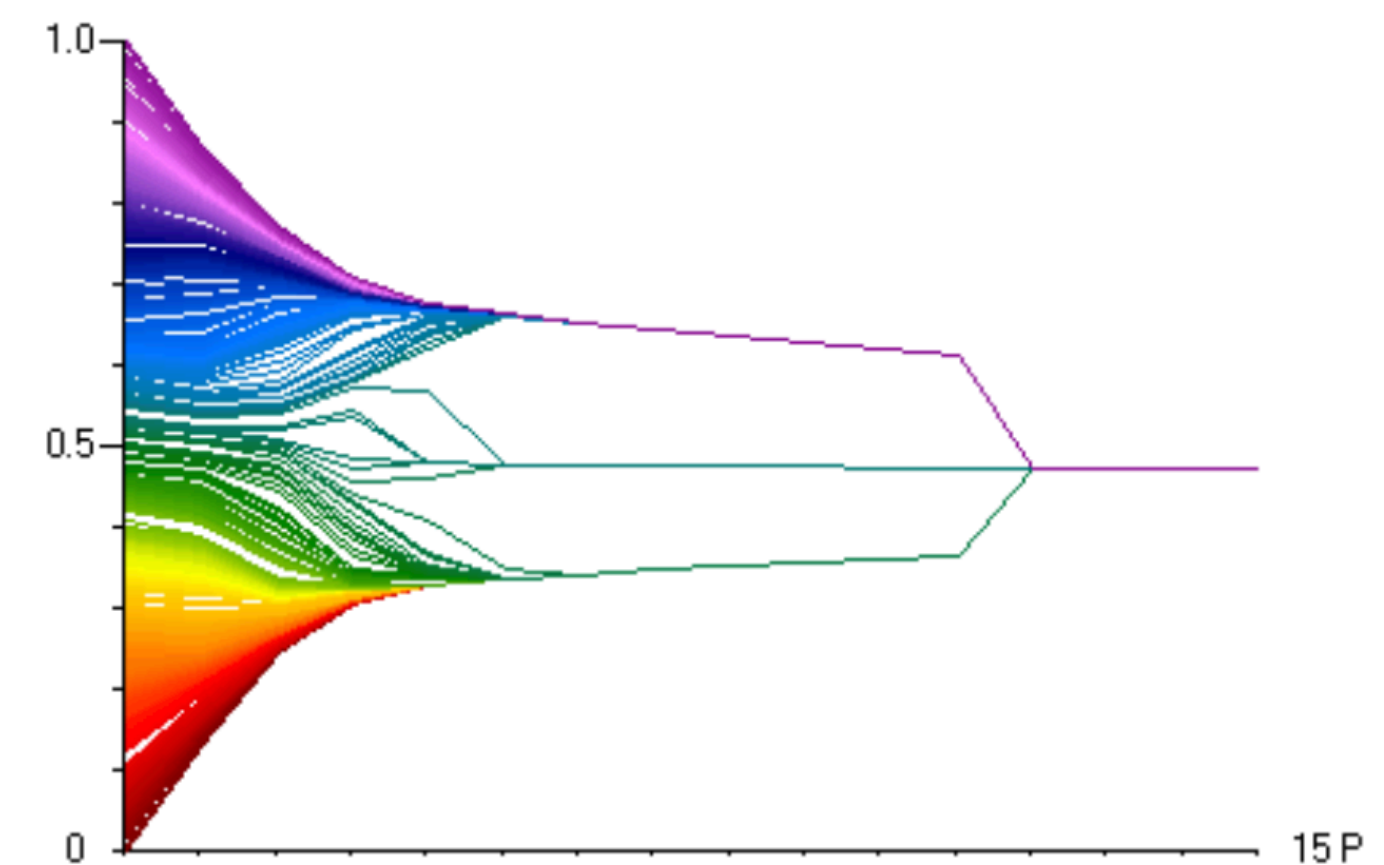
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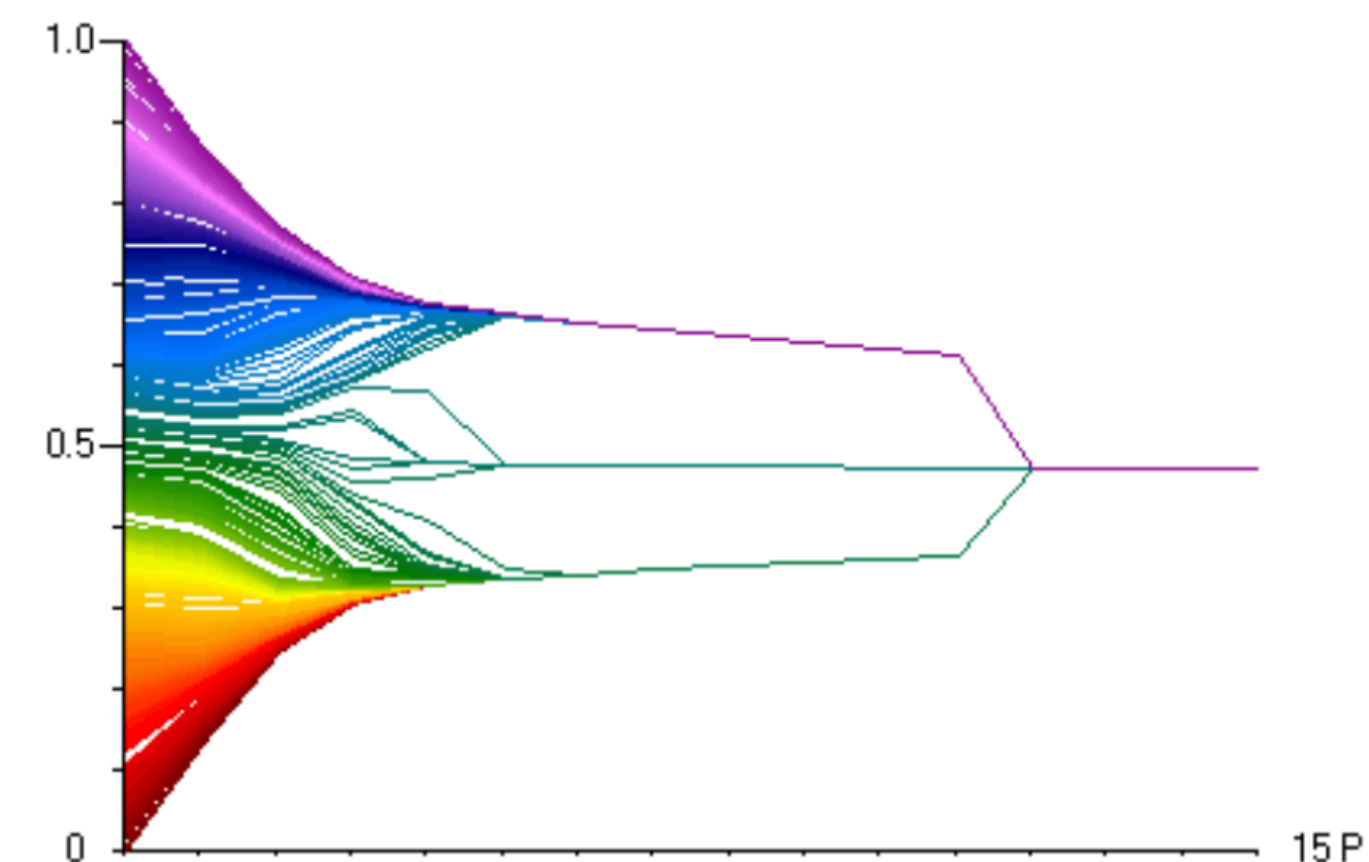
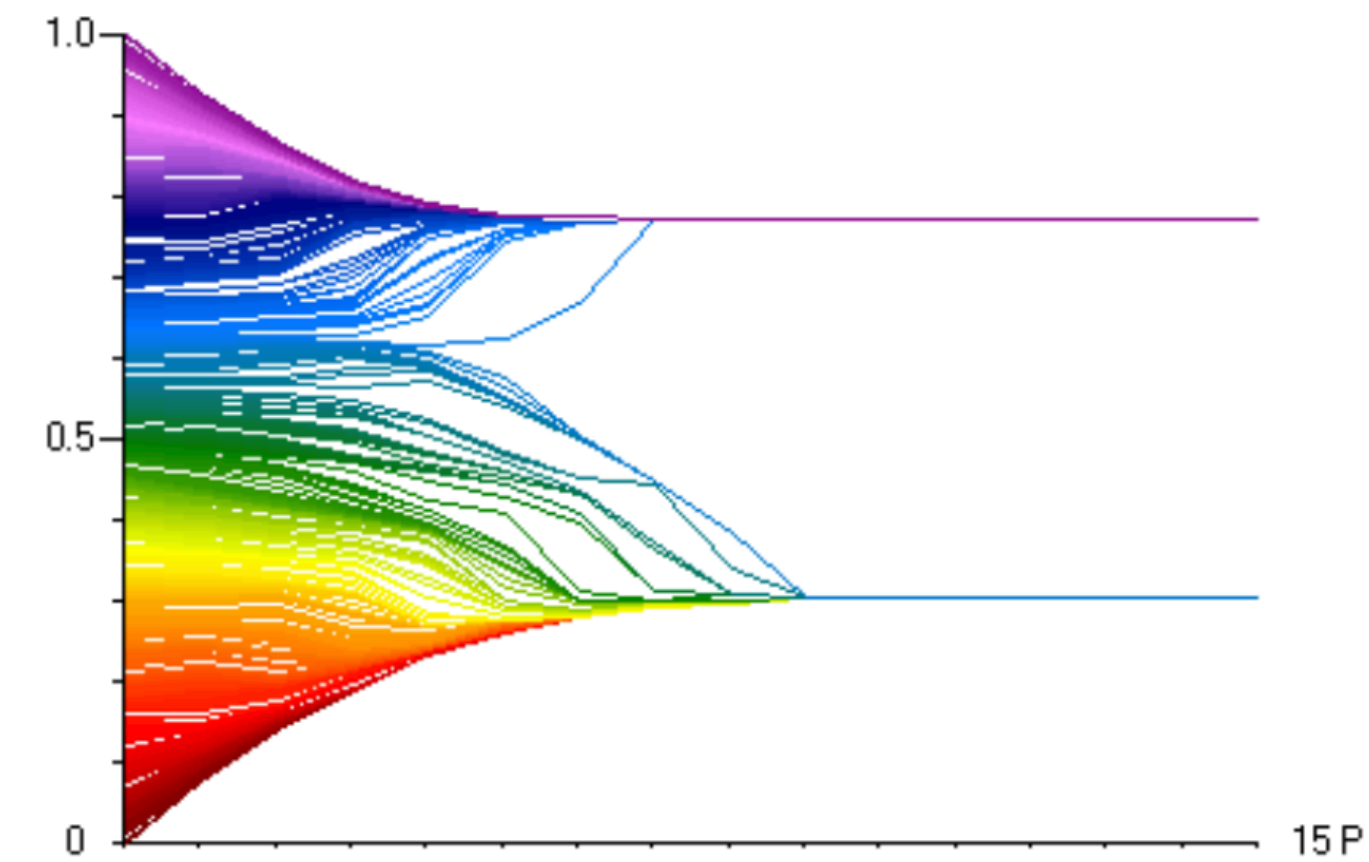


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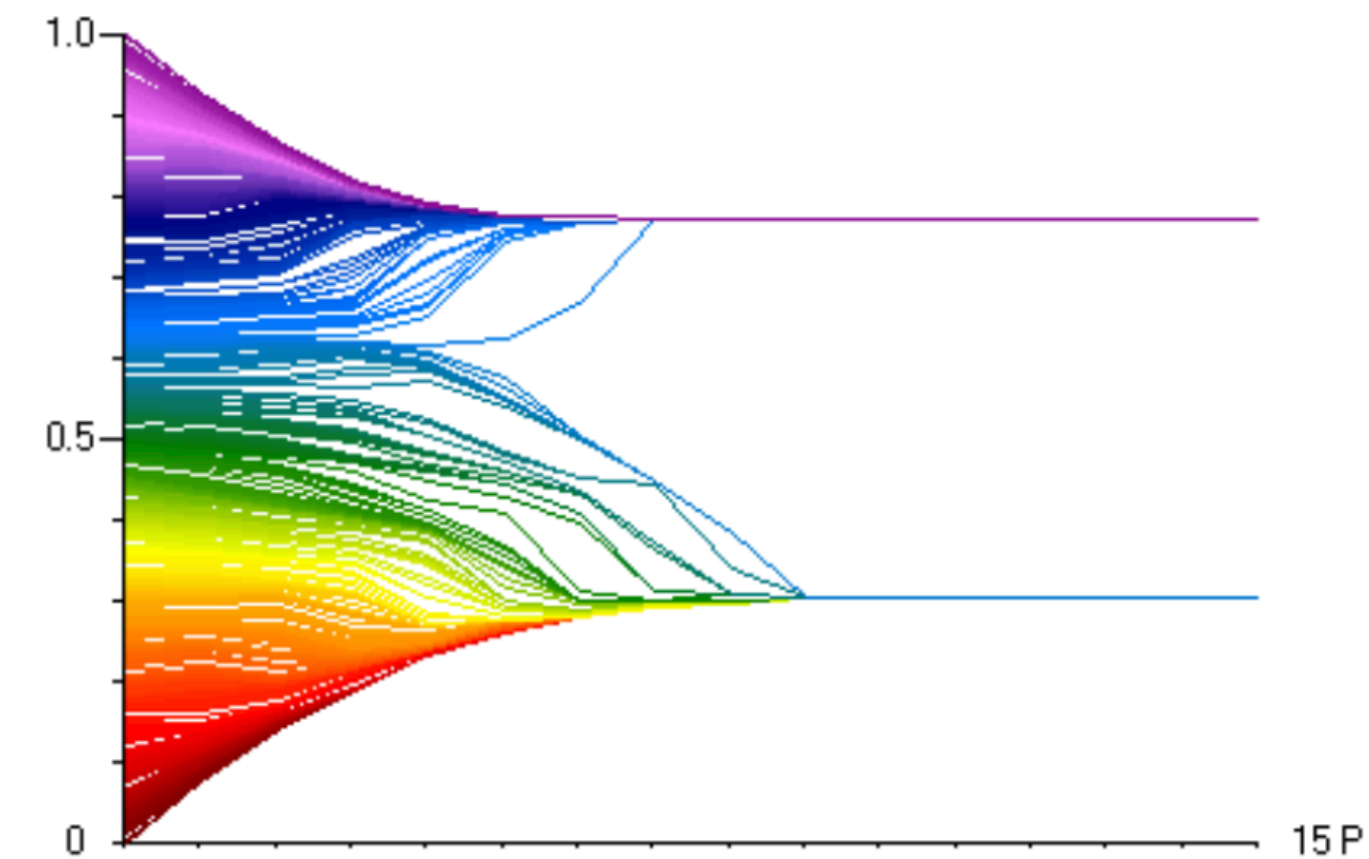
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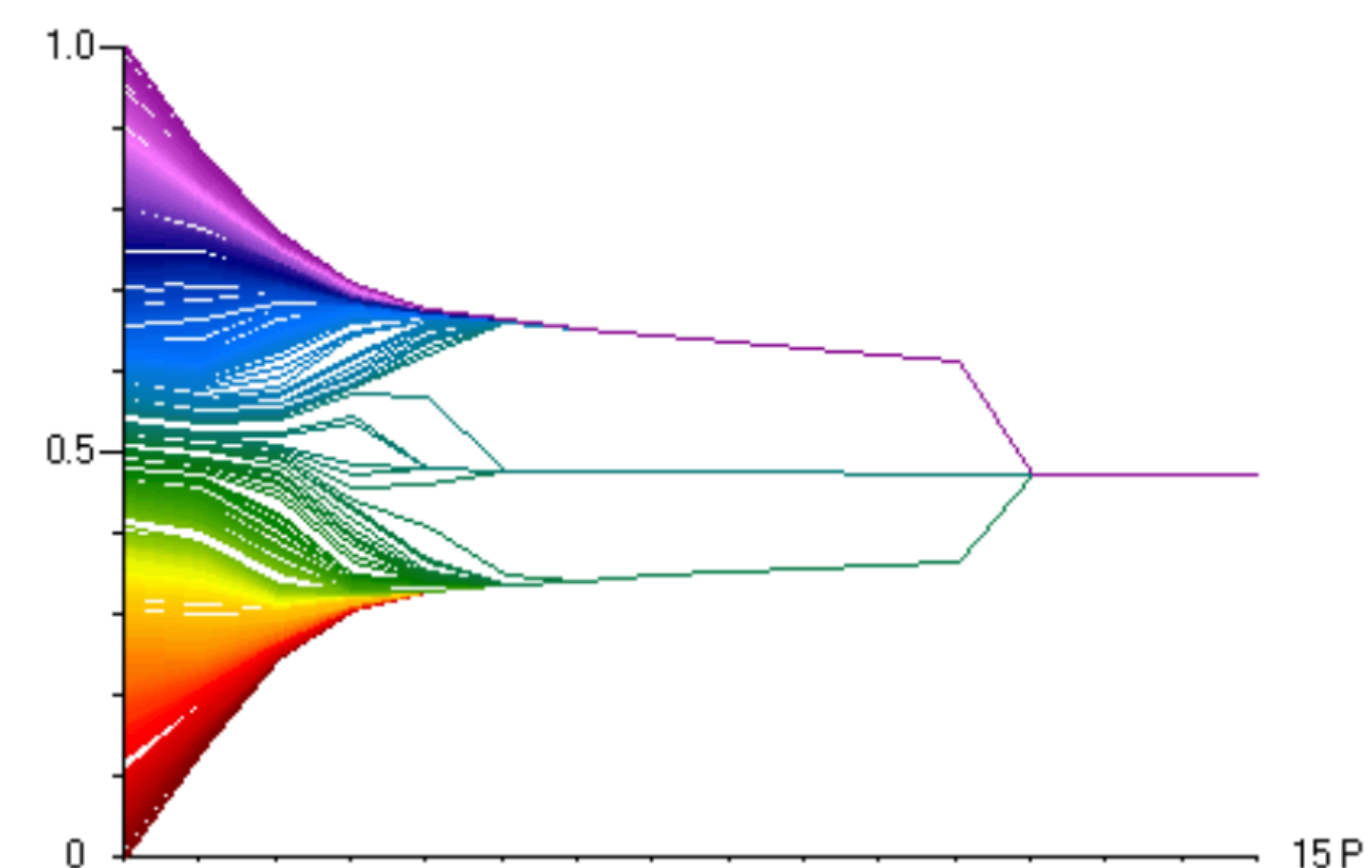
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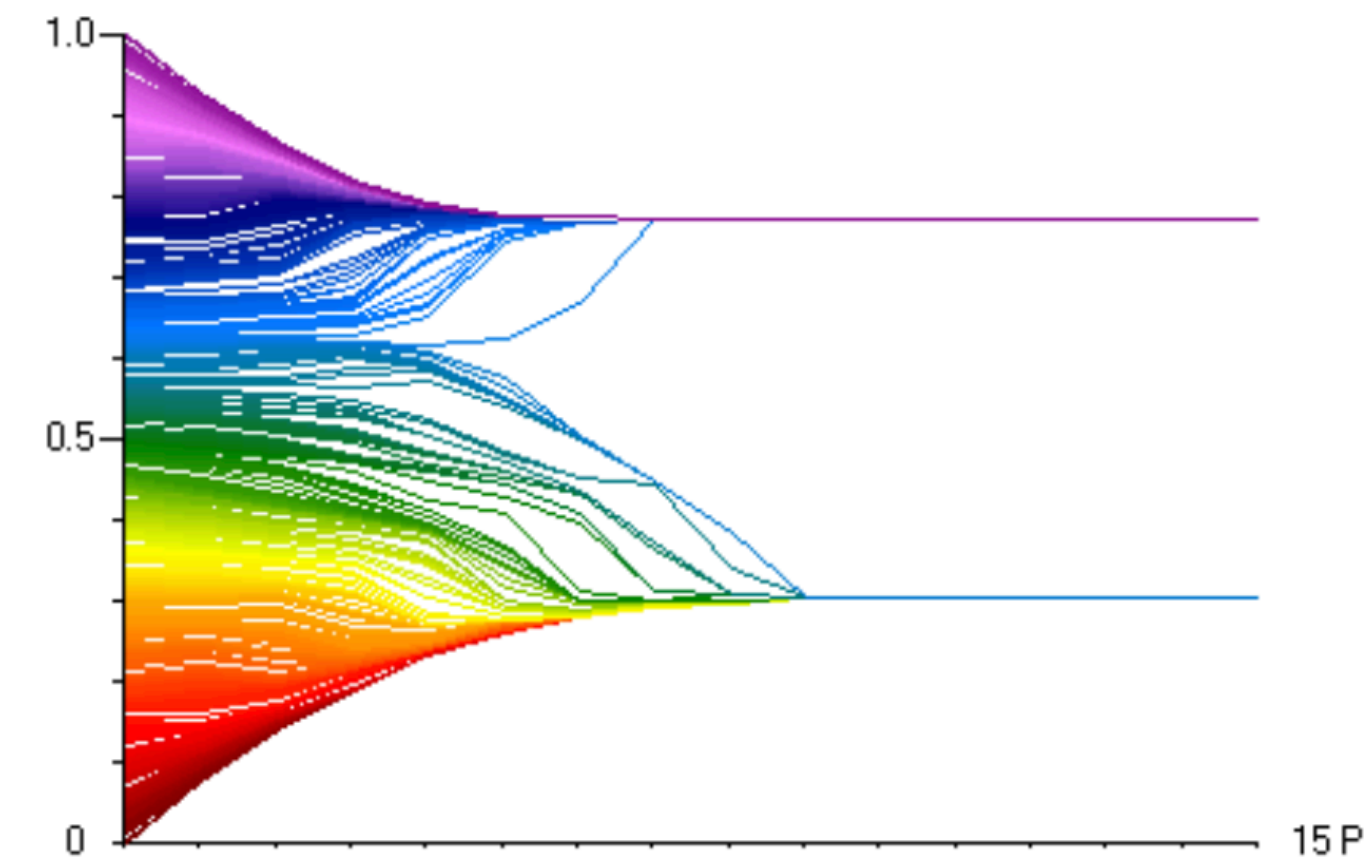


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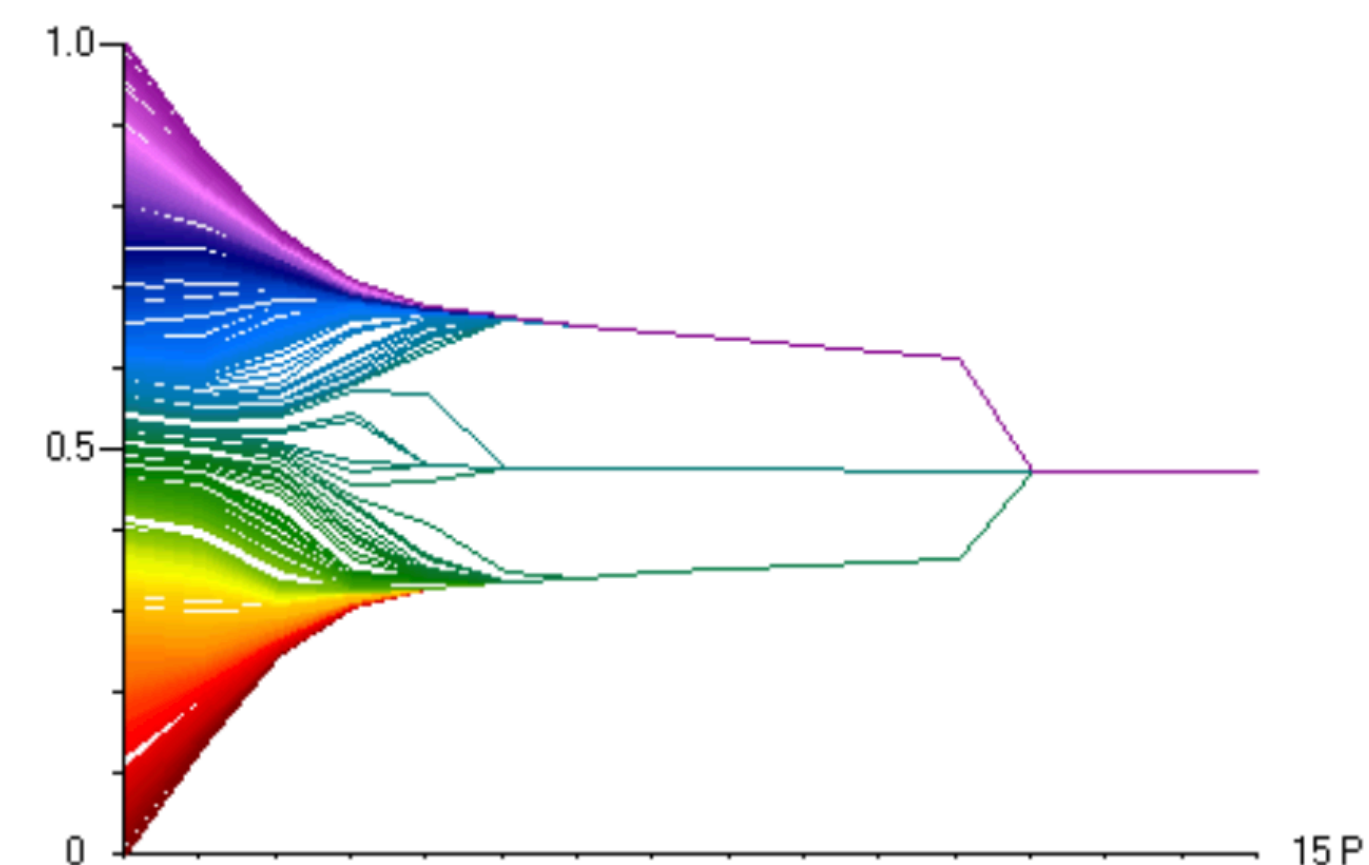
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- NG found paper with slow-driving information: volatility was exhibited (“On the Robustness of Democratic Electoral Processes to Computational Propaganda”)
- Paper by Meyer and Edmonds on Austrian politics



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- The process of changing opinions starts with some new information or some event.
 - Unless it is an extreme event like a revolution, the new information or event constitutes a slow driver and completes the conditions for self-organised criticality
 - For example, an appeal for saving water rather than the French Revolution

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 - My own work in water demand and climate change, post-Soviet Russian economy, markets for fast-moving consumer goods, London housing strategy, HIV-AIDS in rural South Africa

Evidence-based modelling

Simplification

- The evidence guides simplifications
 - Domain experts (stakeholders or academics) indicate what is important to model explicitly
 - If results turn out to be sensitive to some artificial simplification, domain experts can indicate how to elaborate that element

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 - **The model should not appear to be some kind of hocus-pocus:** transparency is crucial
 - Link outputs to model design and behavioural specifications and then to evidence for design and specifications

A demonstrator: OCOPOMO

The OCOPOMO interface is divided into four main sections:

- Document Viewer:** Displays background documents. A text phrase "which proves in how far the house is insulated and what changes are most needed" is highlighted.
- CCD Viewer:** Shows linked CCD elements, including actors (Household, Headproducer, HouseholdAssociation, Distributor, RegulatoryOffice, Government) and objects (City, Building, HeatingSystem, Helpers, Region, BuildingComponent, Resource, Energy, Agreement, ResourceConsumer, CO2Emission, HouseholdHeatingSystem, State, MeetingOfHousehold, HouseholdVote, actions like "calculate the resource", "set the willingness", "involve the heating", "investment into", "invest into the renovation", "check the availability", "calculate the energy", "calculate the heat", "calculate the heating price", "more than a renovation", "renovation interruption", "renovation decision", "possible solution", "partial energy", "energy information").
- Trace Graph Visualisation:** A central graph showing the flow of information and actions. It includes a "Zoom and Filter Control" panel with "orig.", "from tick: -1", "to tick: 1", "Apply", and "Reset" buttons. A "Derived Fact with Template Trace Tag" is shown as a yellow oval. A "Rule with Trace Tag" is shown as a blue rectangle. An "Initial Fact with Template and Instance Trace Tag" is shown as a green oval.
- Simulation Log:** A list of log entries, such as "1.0:0 [H_RB1_12.calculate the income]", "1.0:0 [H_RB2_12.calculate the income]", "1.0:0 [H_RB2_9.calculate the income]", "1.0:0 [H_RB2_8.calculate the income]", "1.0:0 [H_RB1_4.calculate the income]", "1.0:0 [H_RB1_10.calculate the income]", "1.0:0 [H_RB1_11.calculate the income]", "1.0:0 [H_RB3_5.calculate the income]", "1.0:0 [H_RB1_5.calculate the income]", "1.0:0 [H_RB1_8.calculate the income]", "1.0:0 [H_RB3_10.calculate the income]", "1.0:0 [H_RB2_1.calculate the income]", "1.0:0 [H_RB2_6.calculate the income]", "1.0:0 [H_RB1_1.calculate the income]", "1.0:0 [H_RB1_3.calculate the household heat demand]", "1.0:0 [H_RB1_3.calculate the household heat demand]", "1.0:0 [H_RB3_7.calculate the household heat demand]", "1.0:0 [H_RB3_7.calculate the household heat demand]", "1.0:0 [H_OFH2_1.calculate the household heat demand]", "1.0:0 [H_OFH2_1.calculate the household heat demand]", "1.0:0 [H_RB1_14.calculate the household heat demand]", "1.0:0 [H_RB1_14.calculate the household heat demand]", "1.0:0 [H_RB2_10.calculate the household heat demand]", "1.0:0 [H_RB2_10.calculate the household heat demand]", "1.0:0 [H_RB3_14.calculate the household heat demand]", "1.0:0 [H_RB3_14.calculate the household heat demand]", "1.0:0 [H_RB3_14.calculate the household heat demand]", "1.0:0 [H_RB2_5.calculate the household heat demand]", "1.0:0 [H_RB2_5.calculate the household heat demand]", "1.0:0 [H_RB3_3.calculate the household heat demand]", "1.0:0 [H_RB3_3.calculate the household heat demand]", "1.0:0 [H_RB3_9.calculate the household heat demand]", "1.0:0 [H_RB3_9.calculate the household heat demand]", "1.0:0 [H_RB1_2.calculate the household heat demand]", "1.0:0 [H_RB1_2.calculate the household heat demand]", "1.0:0 [H_RB3_4.calculate the household heat demand]", "1.0:0 [H_RB3_4.calculate the household heat demand]", "1.0:0 [H_RB2_13.calculate the household heat demand]".

Figure 2: The OCOPOMO interface

A demonstrator: OCOPOMO

The OCOPOMO interface is divided into four main sections:

- Document Viewer:** Displays background documents. A text phrase "which proves in how far the house is insulated and what changes are most needed" is highlighted.
- CCD Viewer:** Shows linked CCD elements, including actors (Household, HeatingSystem, etc.) and objects (Building, HeatingSystem, etc.).
- Trace Graph Visualisation:** A central graph showing the flow of information and actions. It includes controls for zooming and filtering, and displays various trace tags like "Derived Fact with Template Trace Tag" and "Rule with Trace Tag".
- Simulation Log:** A list of simulation events, such as "[H_RB1_12.calculate the inc...]" and "[H_RB3_14.calculate the ho...]", with one entry selected.

Figure 2: The OCOPOMO interface

Evidence-based modelling

The costs

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 - If volume rather than usefulness a determinant of promotion tenure, ...
- Restricted sources of public funding
 - OCOPOMO in top 4 of projects for funding in computer science programme
 - Proposal using OCOPOMO ranked 25th for funding in social science programme

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 - Guides what can be excluded, represented by numbers, activated by random numbers, *etc.*
- Facilitates stakeholder communication
 - **But** stakeholders committed to the outcome rather than the reasons will probably dismiss anything that undermines their objectives
 - Precision avoids verbal fudges and could lead to conflict rather than compromise?

Cui bono?

Cui bono?

Modellers?

Cui bono?

Modellers?

Society?

Cui bono?

Modellers?

Society?

Both?

Cui bono?

Modellers?

Society?

Both?

The choice and the future are yours

Final thoughts

- Diversity and good fellowship characterised social simulation from the beginning
 - Some policy models
 - Lots of abstract models produced by physicists and engineers
 - Model and modelling languages based on logical formalisms
 -
- Scant impact on policy or strategy in the real world
- Policy makers seek endorsement of their aims
 - Ideology dominates evidence
- Evidence-based, agent-based social simulation could make a difference but we have to make the case
- This would require a cohesive and public effort to point out where our models would have made a difference to outcomes
- ESSA well placed to organise and oversee a campaign to make ABSS a key feature of policy formation