Between solidarity and expediency: Uncovering framing-based mechanisms of advice network formation through an empirical agent-based model

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Federico Bianchi & **Francesco Renzini**
Behave Lab, Department of Social and Political Sciences, University of Milan, Italy

Prosocial behaviour and framing

- We know much about cooperation and prosocial behaviour, less about **sustained cohesion** of contemporary societies —> **resilience** of **prosocial behaviour**
- Prosocial behaviour is driven by a mix of **instrumental expediency** and **normative** compliance with **solidaristic** obligations towards others (Simpson & Willer, 2015)
- **Motives** underlying prosocial behaviour are **time-varying** and **context-dependent** (Lindenberg, 1998, 2006; Kroneberg, 2014; Esser & Kroneberg, 2015) —> *ego*'s decision to provide *alter* with costly help may depend on *ego*'s **framing of the relationship as solidary or instrumental** (Fiske, 1991)
- *Ego*'s framing of their relationship with *alter* may vary over time as a **macro-micro feedback** of certain contextual features, such as the connectivity of the wider social network (Marwell et al., 1988; Coleman, 1988, 1991)

Instrumental framing

IF

High salience of costs: *Ego* will help (costly transfer of resources) *alter* ($x_{ij} = 1$) if perceived costs (i.e., # of currently helped people) do not exceed a certain individual threshold

$$c_{i,t} \leq \tau_i, \quad \tau_i = \text{max outdegree}_i$$

   AND

Conditional cooperation: *Ego* does not help an *alter* who belongs to *ego*'s "black books" (i.e., *alter* has refusde to help *ego* in the past) (*shadow of the future*: Axelrod, 1984; *credit slip theory*: Coleman, 1991)

$$j \notin B_{i,t}$$

THEN

$$\rightarrow x_{ij} = 1$$

Solidaristic framing

IF

Low salience of costs: *Ego* will help (costly transfer of resources) *alter* ($x_{ij} = 1$) if perceived costs (i.e., # of currently helped people) do not exceed a certain individual threshold

$$c_{i,t} \leq \boxed{s_i \cdot} \tau_i, \quad \tau_i = \text{max outdegree}_i$$

AND

Sanction of opportunism: *Ego* does not help an *alter* who belongs to *ego*'s "black books" (i.e., *alter* has refusde to help *ego* in the past) (*shadow of the future*: Axelrod, 1984; *credit slip theory*: Coleman, 1991)
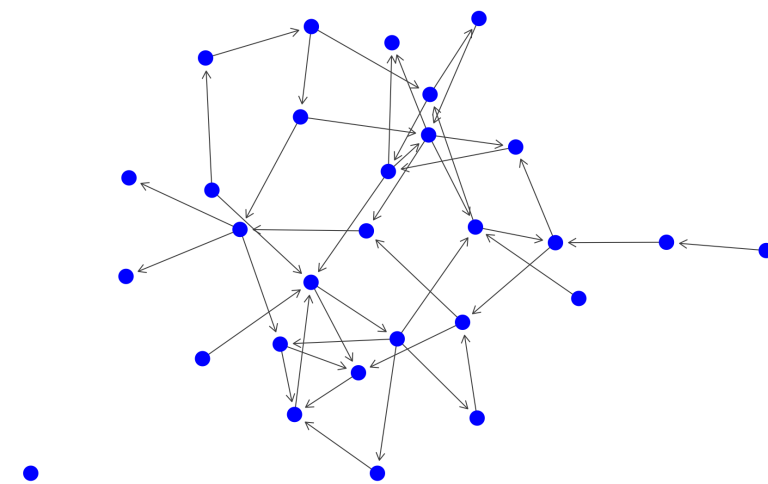
$$j \notin B_{i,t}$$
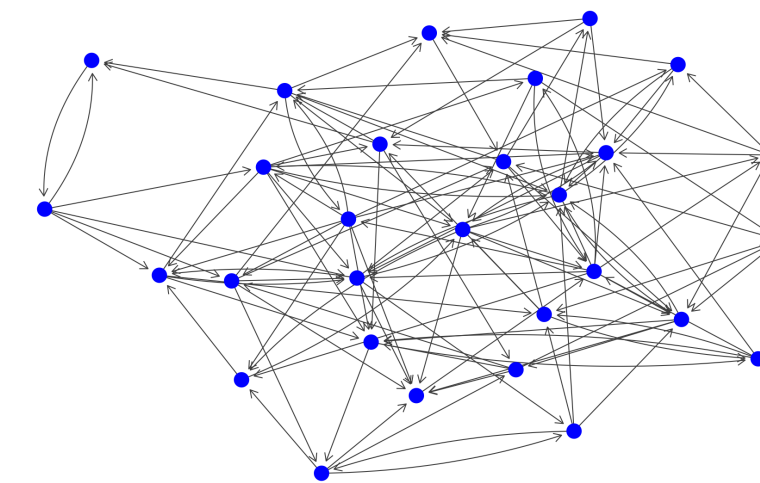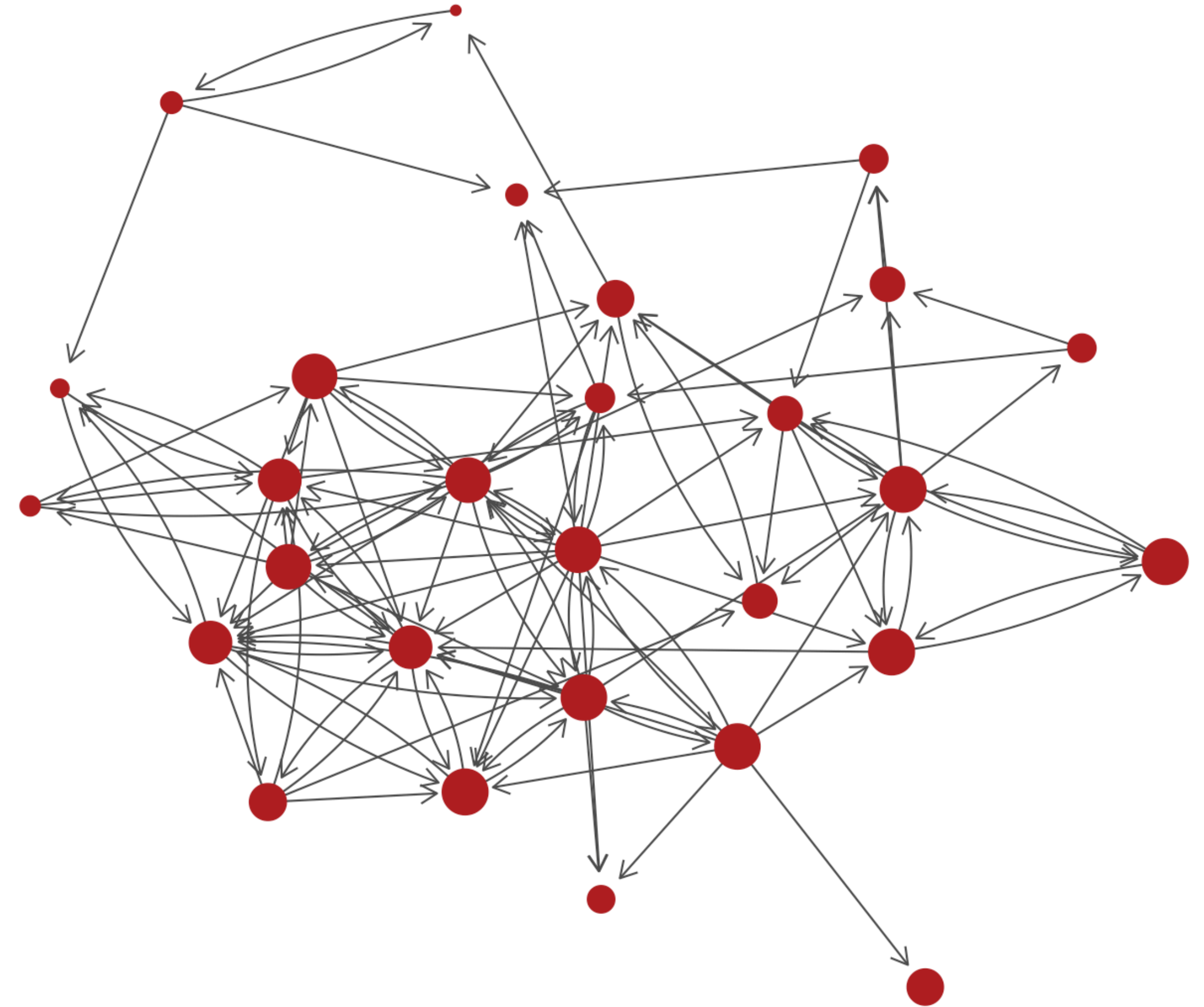
THEN

$$\rightarrow x_{ij} = 1$$

Frame switch cycles

Data

- **Data collection**: 2016 face-to-face questionnaire administration
- **Context**: freelance workers sharing a coworking space in Brescia, Italy (no shared collective identity, frequent business collaborations —> see Bianchi et al., 2018)
- **Advice giving**: Who do you usually turn to for advice? (Reversed edges)
- Individual attributes: **seniority**

- # individuals (nodes) = 29
- # ties = 120
- density = 0.15
- avg. degree = 4.10 (SD = 3.57)
- avg. seniority (months) = 29.34 (SD 14.26)

Agent-based model of network formation

- ABM of the network formation (Bianchi, 2023; Bianchi & Renzini, *forthcoming*)

- **Model** of coworkers' advice exchange:

  - **Selection**: *ego*'s probability of **being asked** for advice by *alter* as a function of *ego*'s seniority

  - **Exchange**: *ego* sends an advice tie to *alter* according to their framing of the relationship

- **Estimating**:

  - **Likelihood of frame switching**

  - Density threshold for frame switching

- **Fitting:** Set of summary statistics

Selection

Exchange

Density < threshold   Density > threshold
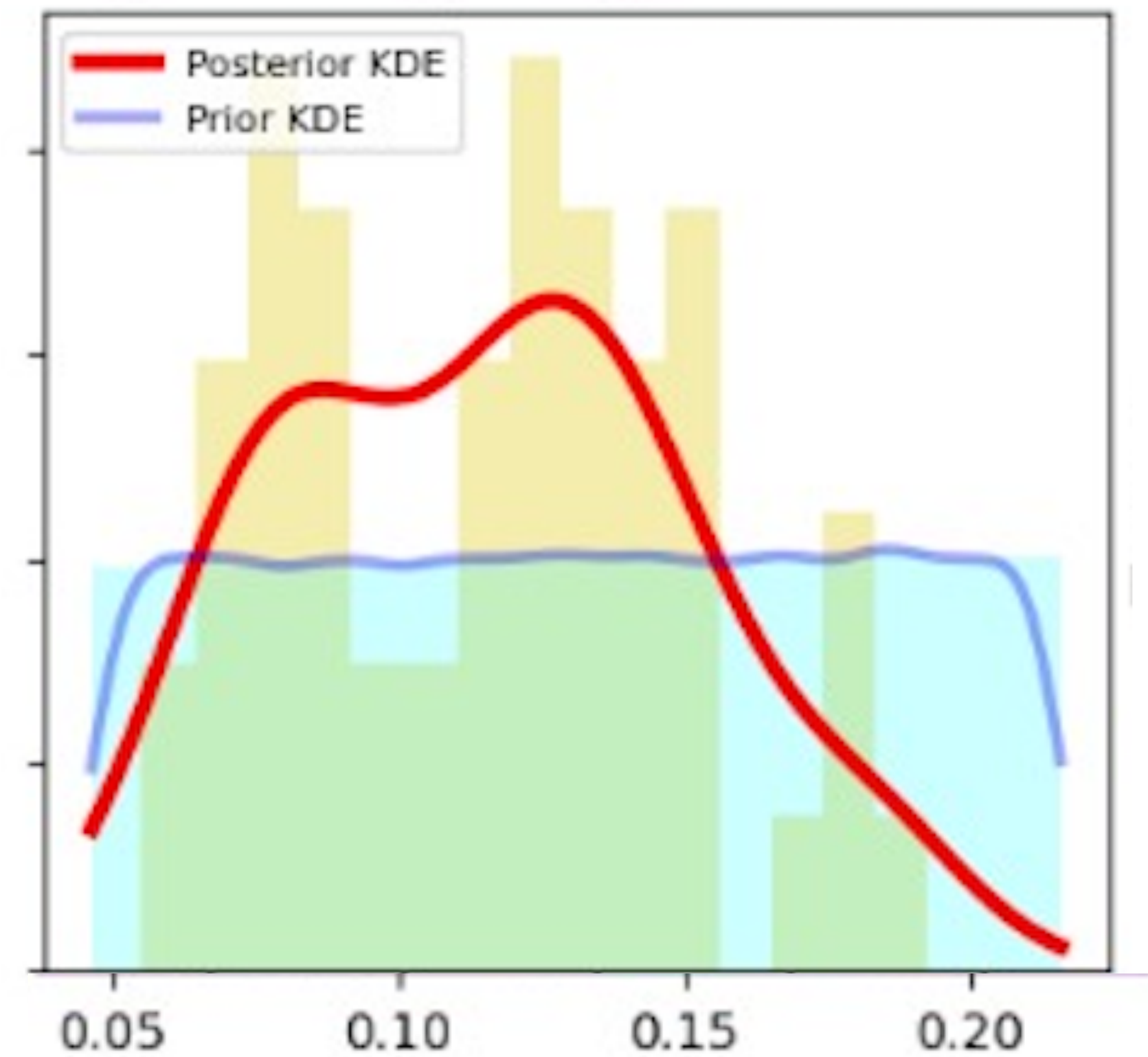
Instrumental   Solidaristic
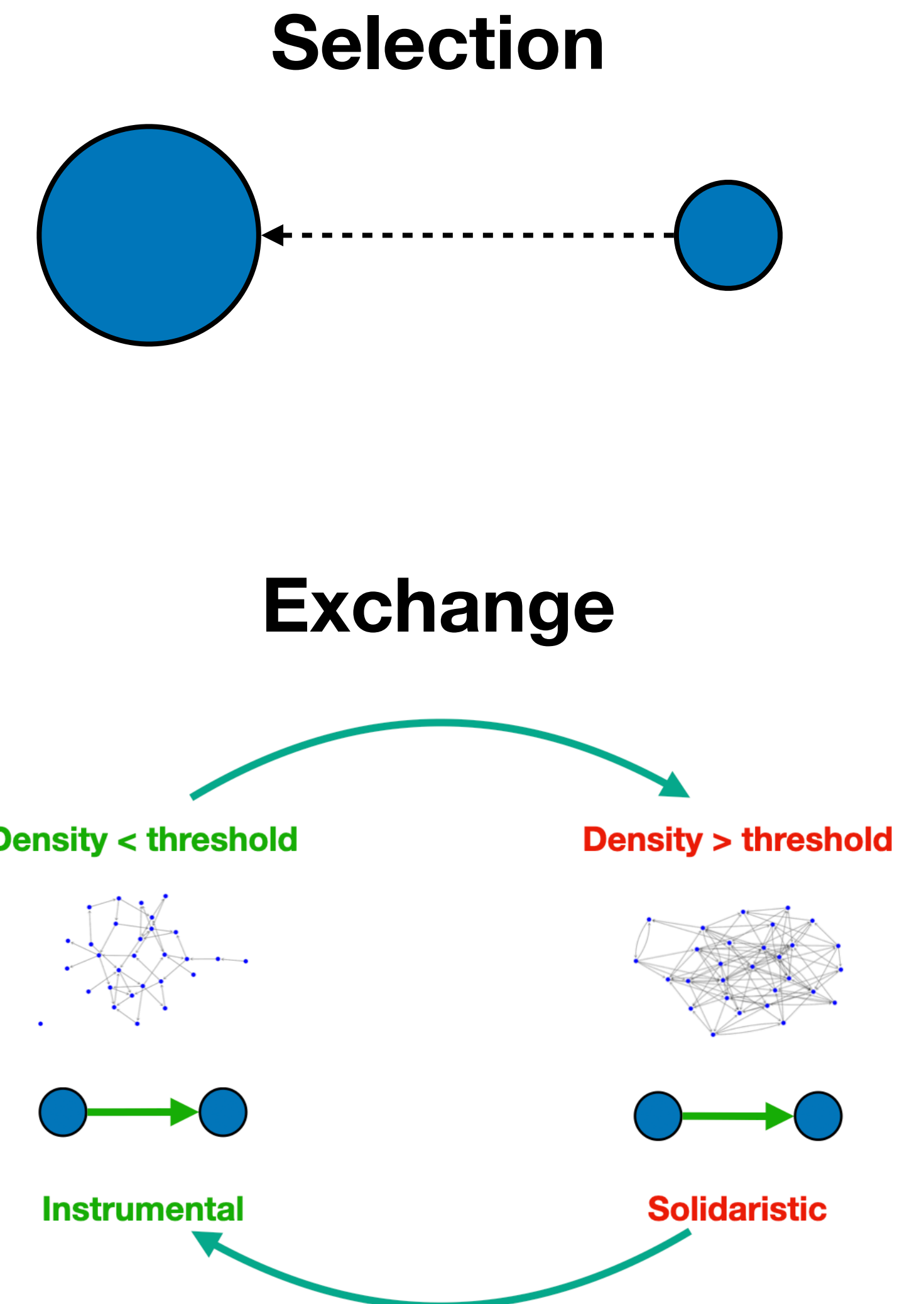
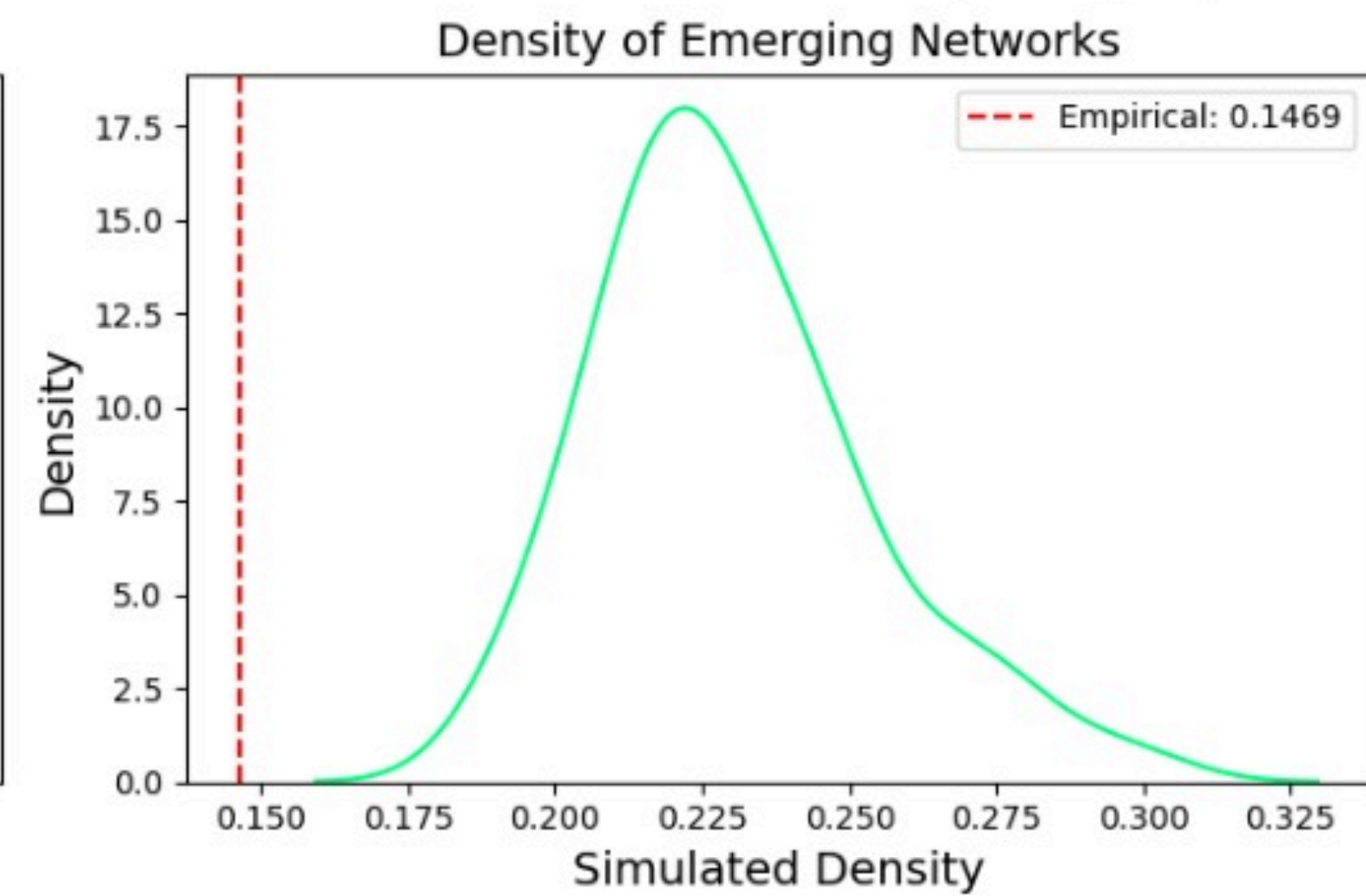# Results:
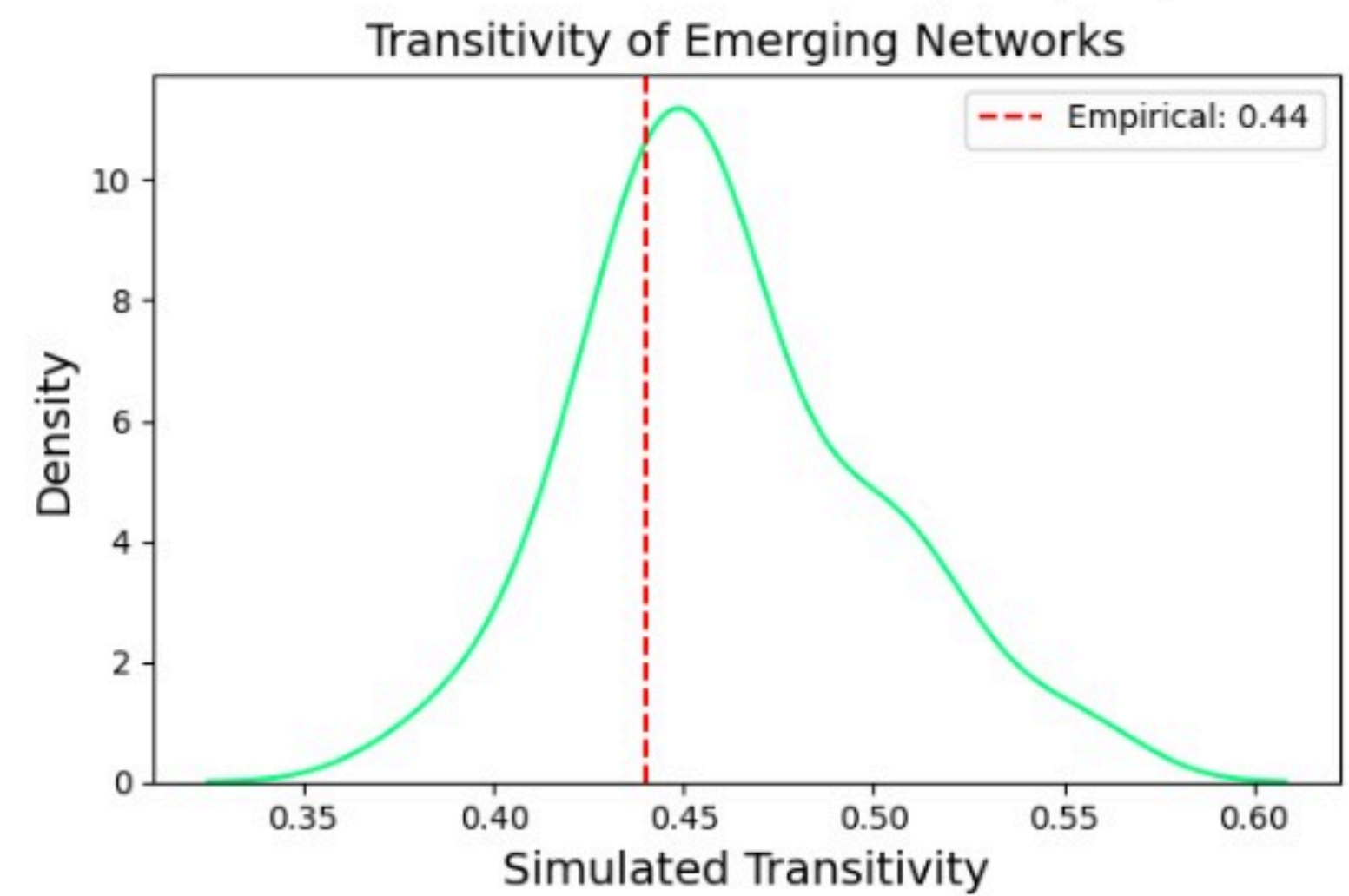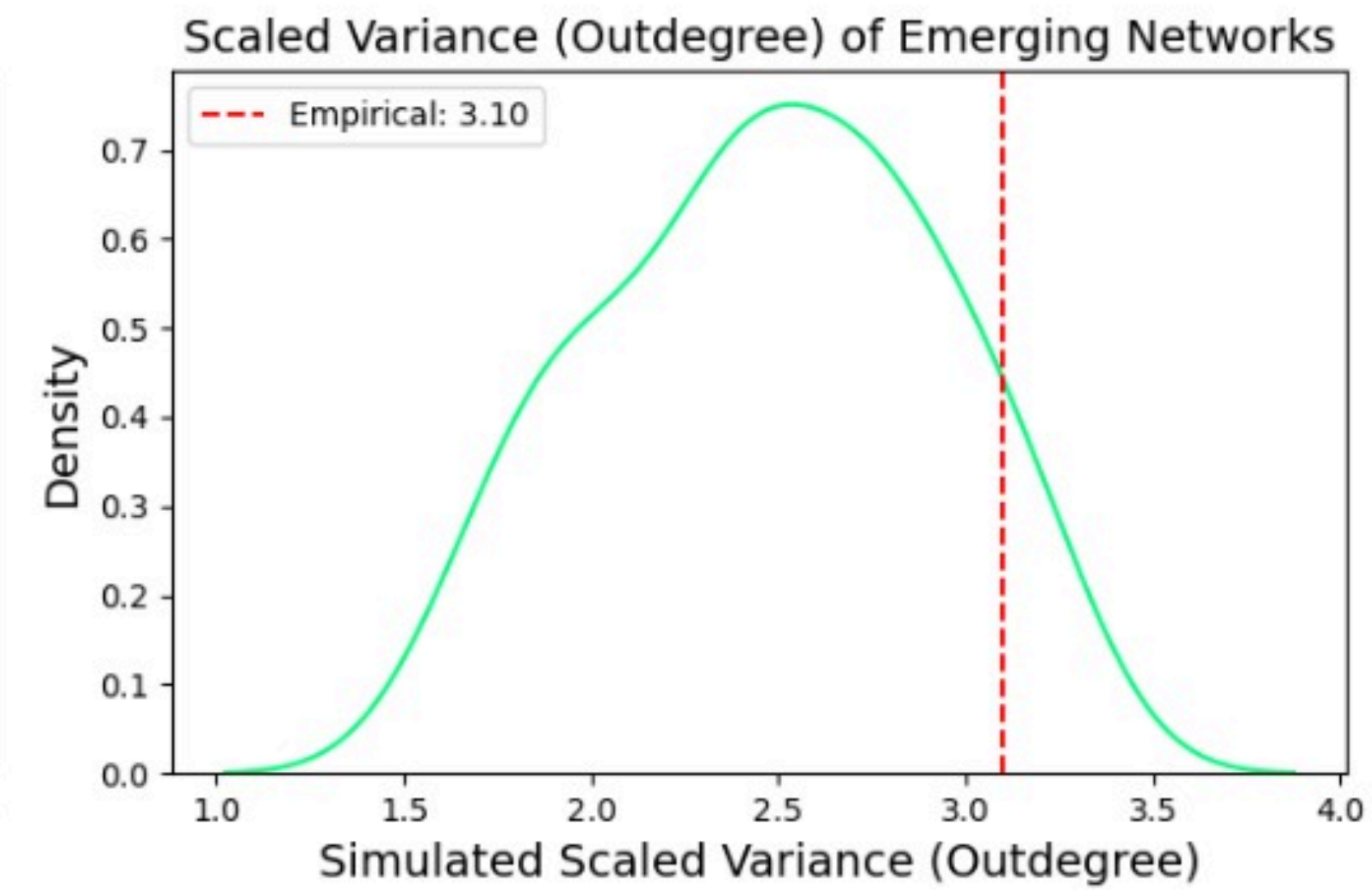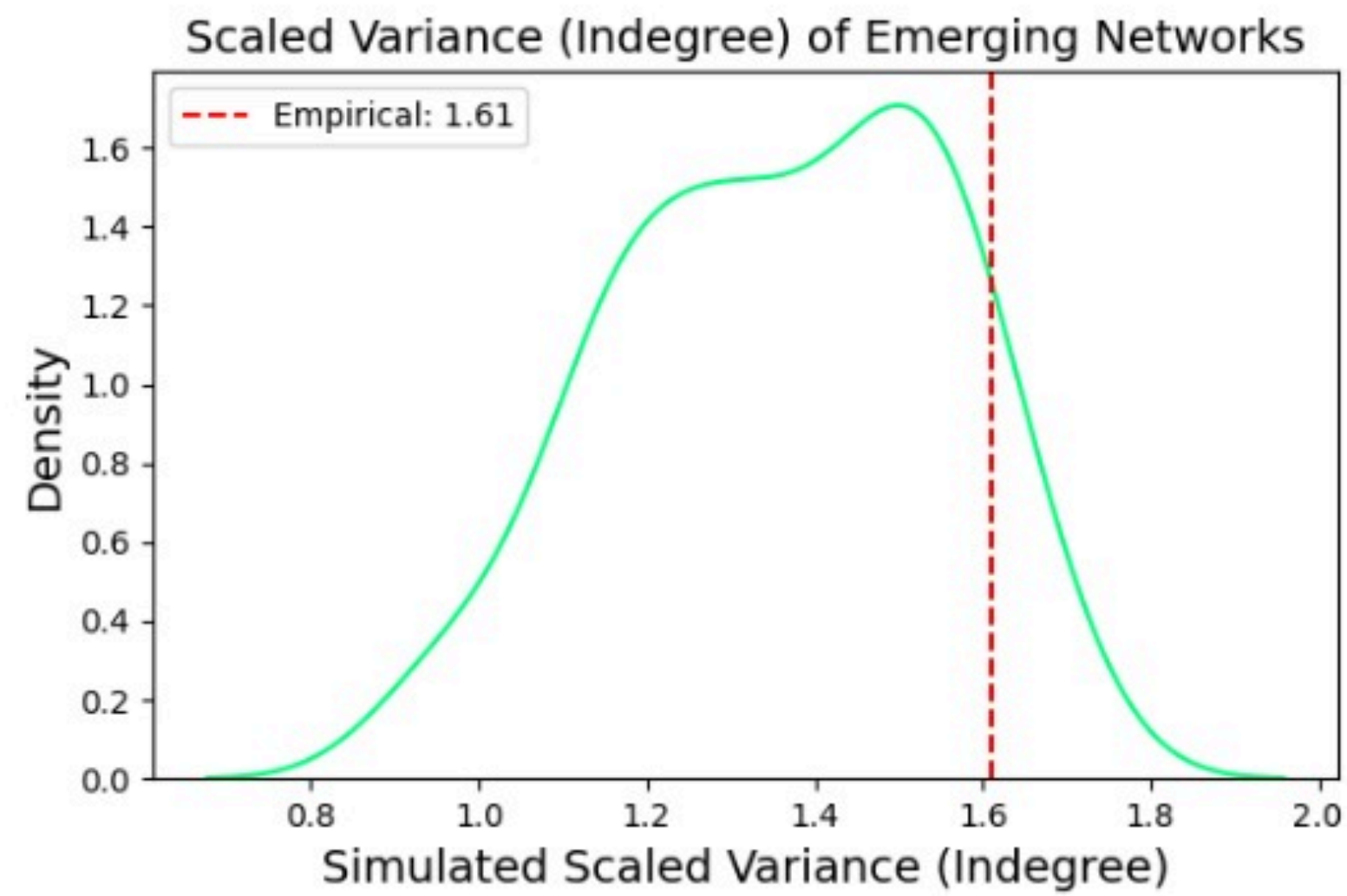## prior vs. posterior parameter distributions
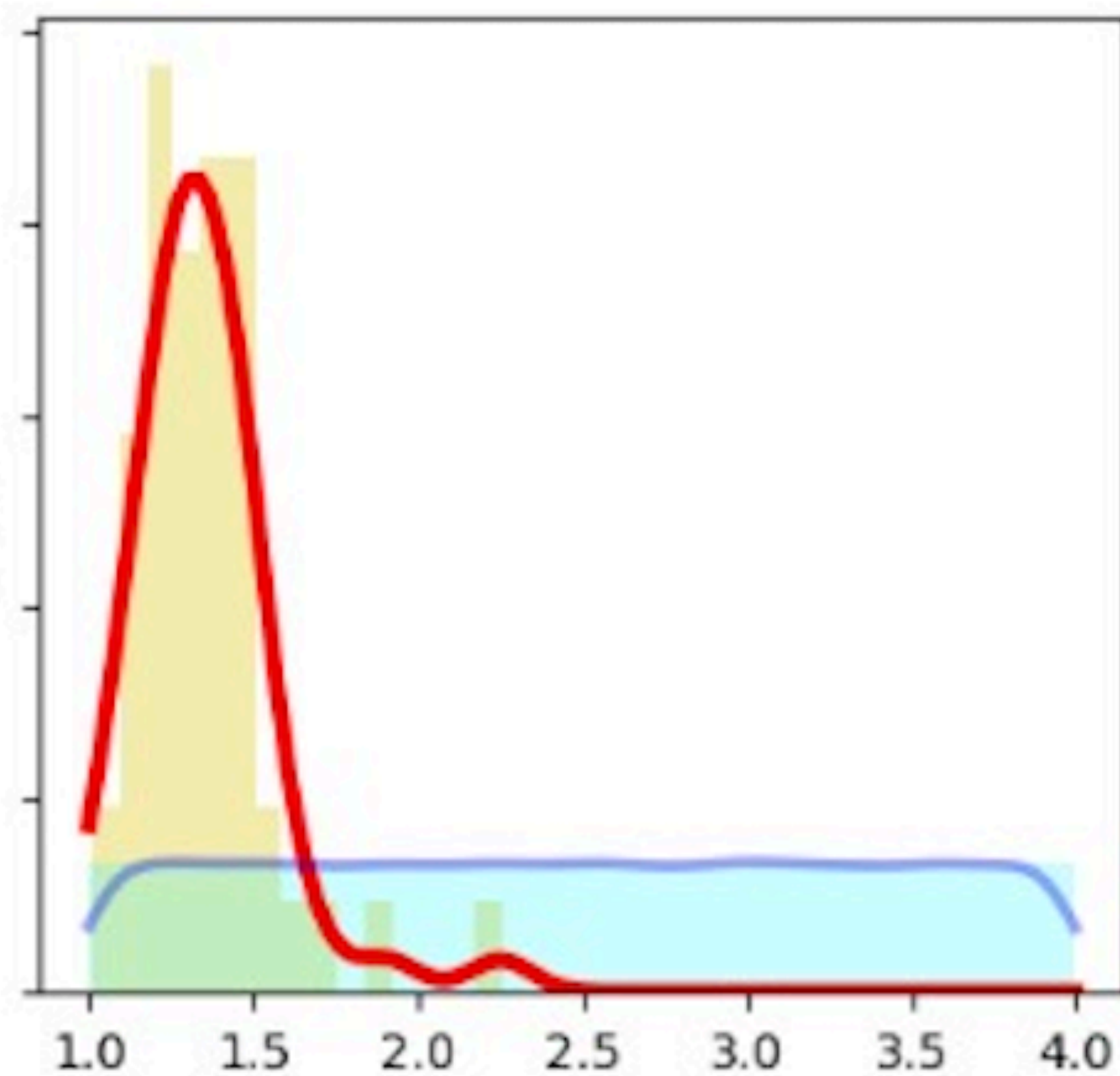
Cost threshold

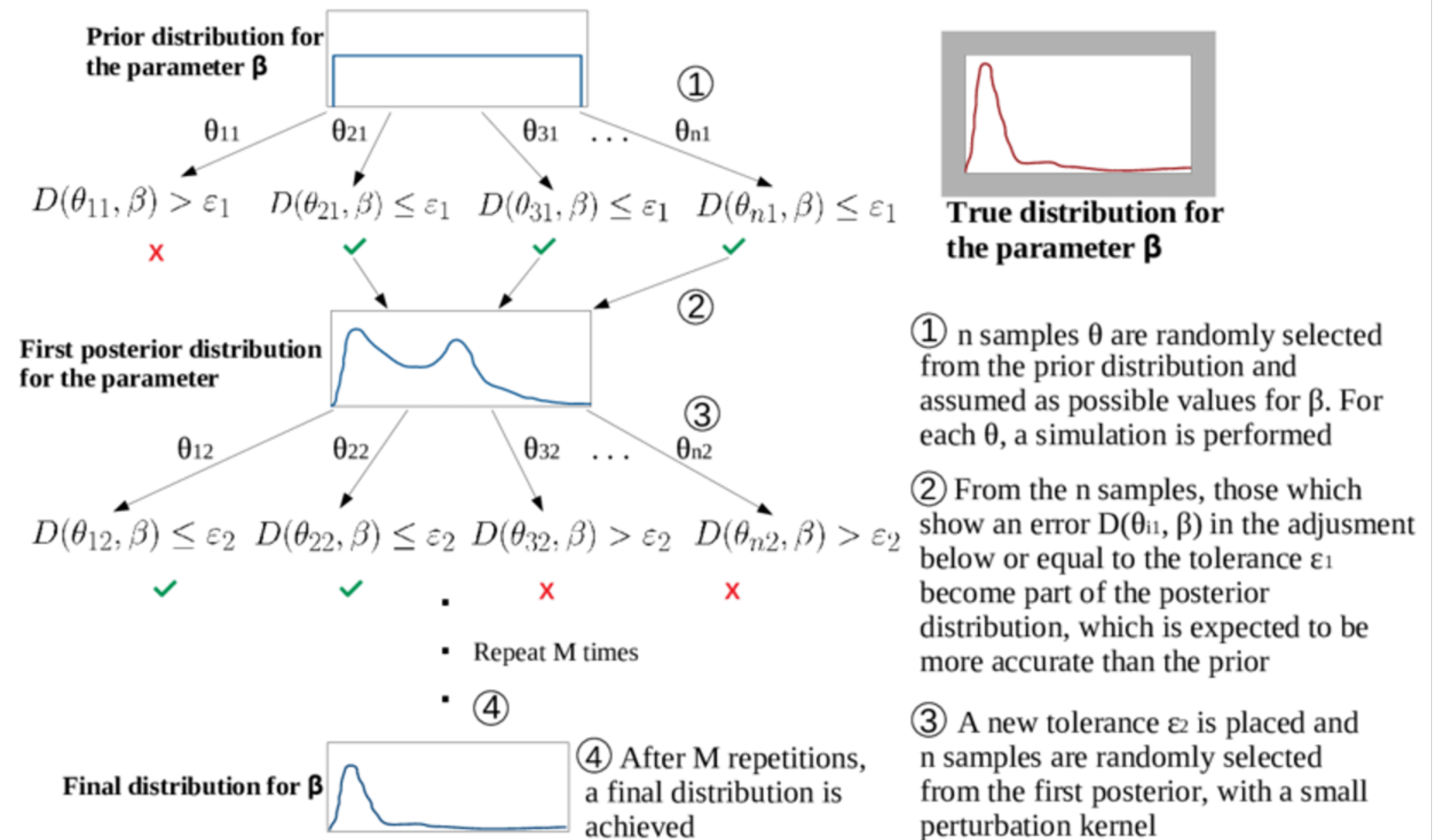Density threshold for frame switching

Model fit

Estimation method

Approximate Bayesian Computation (Hartig et al., 2011)

Weakly informative priors (tested with predictive checks)

- Baseline: uniform [-3, 0]

- Threshold: {2, 3, 4, 5}

- Positive influence: uniform [0, 2.5]

- Negative influence: uniform [-2, 0]

Prior distribution for the parameter β

θ_{11} $\quad$ θ_{21} $\quad$ θ_{31} $\quad$ ... $\quad$ θ_{n1}

$D(\theta_{11}, \beta) > \varepsilon_1$ $\quad$ $D(\theta_{21}, \beta) \leq \varepsilon_1$ $\quad$ $D(\theta_{31}, \beta) \leq \varepsilon_1$ $\quad$ $D(\theta_{n1}, \beta) \leq \varepsilon_1$

First posterior distribution for the parameter

θ_{12} $\quad$ θ_{22} $\quad$ θ_{32} $\quad$ ... $\quad$ θ_{n2}

$D(\theta_{12}, \beta) \leq \varepsilon_2$ $\quad$ $D(\theta_{22}, \beta) \leq \varepsilon_2$ $\quad$ $D(\theta_{32}, \beta) > \varepsilon_2$ $\quad$ $D(\theta_{n2}, \beta) > \varepsilon_2$

- Repeat M times

Final distribution for β

True distribution for the parameter β

① n samples θ are randomly selected from the prior distribution and assumed as possible values for β. For each θ, a simulation is performed

② From the n samples, those which show an error $D(\theta_{i1}, \beta)$ in the adjustment below or equal to the tolerance ε_1 become part of the posterior distribution, which is expected to be more accurate than the prior

③ A new tolerance ε_2 is placed and n samples are randomly selected from the first posterior, with a small perturbation kernel

④ After M repetitions, a final distribution is achieved

Limitations and future work

- Assume more complex selection processes (based on other node attributes, e.g. gender) to improve fitness on density and clustering

- Compare results to ERGM and stationary SAOM

- Fitting at observed density (simulation stopping condition) instead of equilibrium —> is it even safe to assume that we observed network in equilibrium states? ERGM needs it but bayesian estimates of an ABM doesnt't

Conclusions

- Preliminary evidence for **within-individual, time-varying framing** dynamics in explaining **prosocial behaviour** in a small social system

- **Cognition matters**! Mechanism models ignoring context-dependent motives underlying behaviour might fail to adequately explain cooperation

- **Empirical agent-based models** can estimate the likelihood of (unobserved) cognitive components of social mechanisms

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Website   https://federico-bianchi.github.io/
Mail   federico.bianchi1@unimi.it
BlueSky   @federicobianchi.bsky.social