Between solidarity and expediency: Uncovering framing-based mechanisms of prosocial behaviour through an empirical agent-based model

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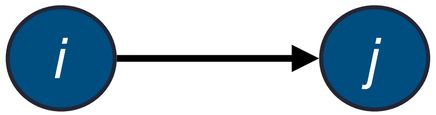
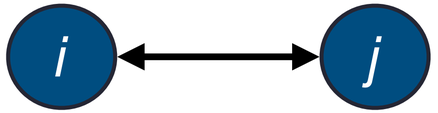
Prosocial behaviour and framing

- **Prosocial behaviour** (providing costly benefit to others) can underlie different motives (Simpson & Willer, 2015):
  - **instrumental:** long-term investment in a relationship (Axelrod, 1984; Coleman, 1991)
  - **solidarity:** compliance to a **normative** obligation (Lindenberg, 2015)
- **Cognitive framing**: Motives are **time-varying** within subjects and **context-dependent** (Lindenberg, 1998, 2006; Kroneberg, 2014; Esser & Kroneberg, 2015)
- **Macro-micro feedback:** expediency vs. solidarity framing depends on loose vs. close-knit networks (Coleman, 1988)
- Advice-seeking networks are usually found to be driven by direct reciprocation and transitive closure (e.g., Agneessens & Wittek, 2012)

One relational process - Two possible underlying mechanisms



$t = 0$



$t = 1$

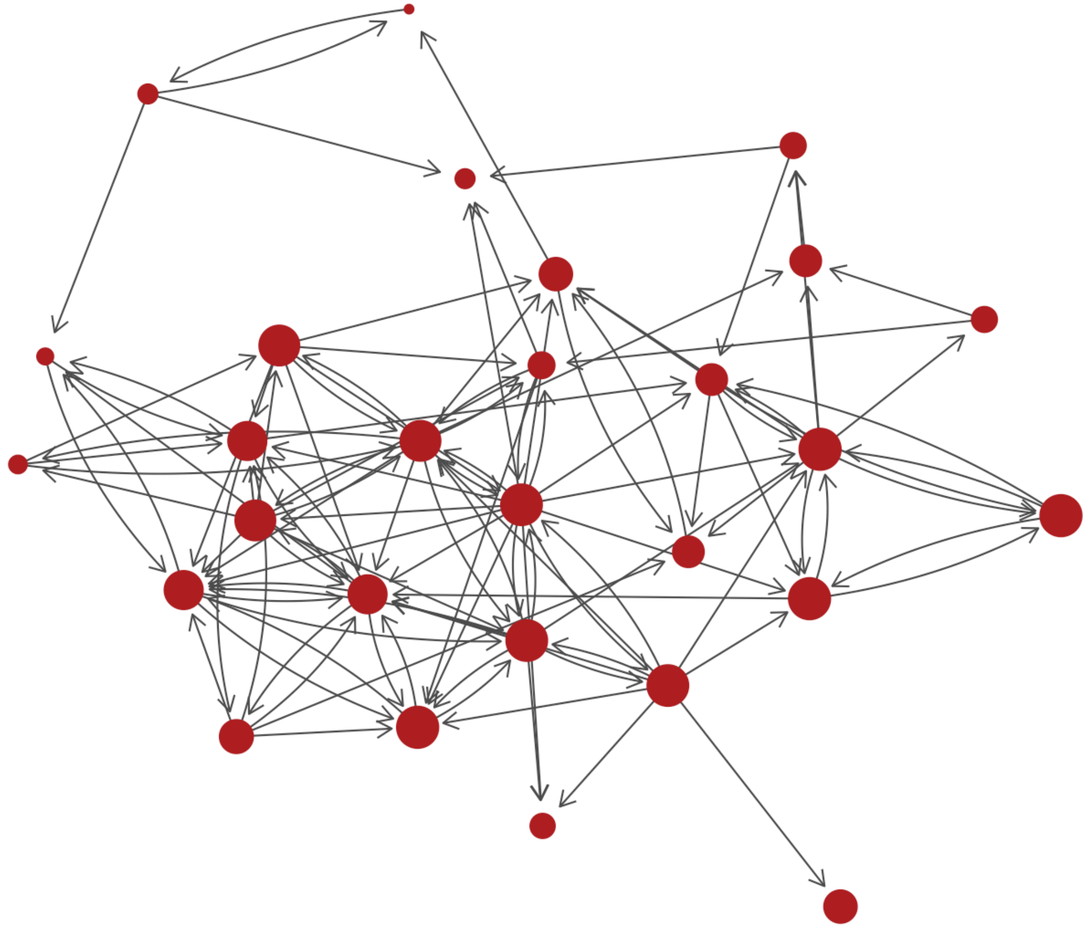
Strategically investing in a long-term relationship (Coleman, 1991)

Compliance to a solidarity norm (Lindenberg, 2015)

Relational 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)
- **Prosocial behaviour (advice giving)**: *Who do you usually turn to for advice?* (reversed edges)
- Individual attributes: age, **seniority**, gender, education

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



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

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

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)

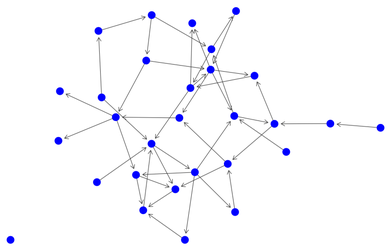
$$j \notin B_{i,t}$$

THEN

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

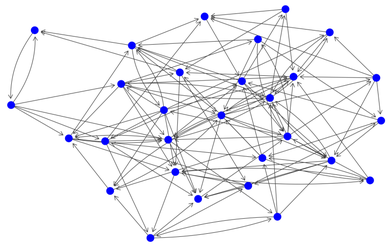
Framing switch

Density < threshold



Instrumental

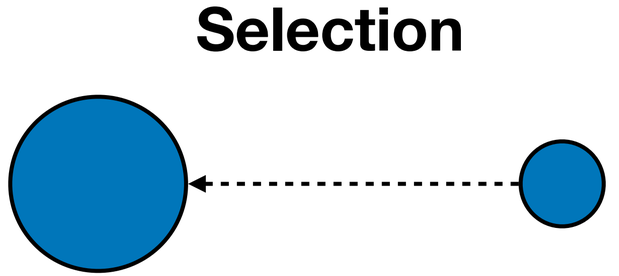
Density > threshold

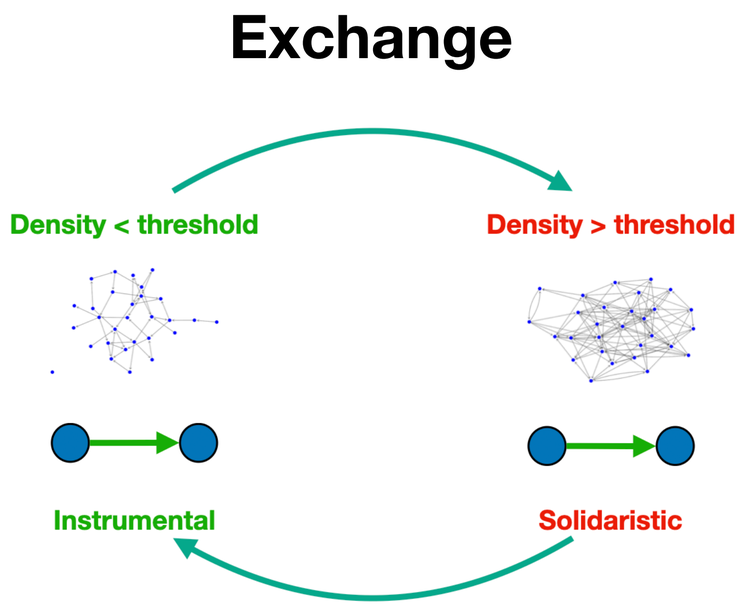


Solidaristic

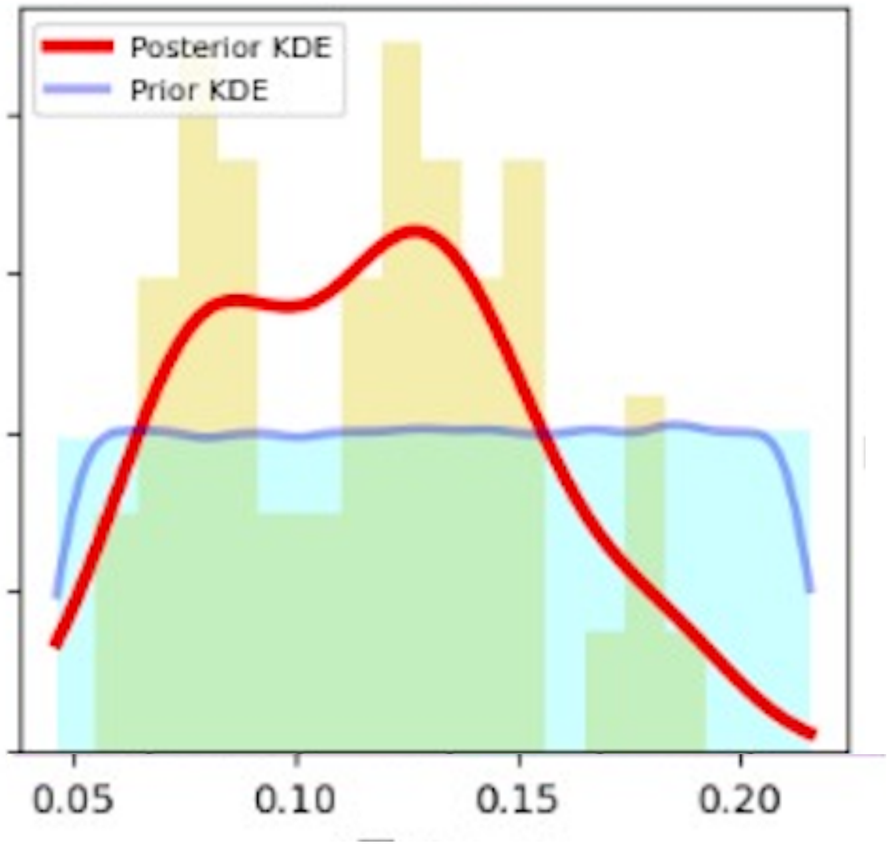
Agent-based model of network formation

- ABM of the network formation (Bianchi, 2023; Bianchi & Renzini, *forthcoming*)
- **Model** of coworkers' advice giving:
  - **Selection**: *ego*'s probability of **being asked** for advice by *alter* as a function of *ego*'s seniority
  - **Interaction**: *ego* sends an advice tie to asking *alter* according to their framing of the relationship
- **Estimating**:
  - **Likelihood of frame switching**
  - Density threshold for frame switching
- **Fitting:** Set of summary statistics

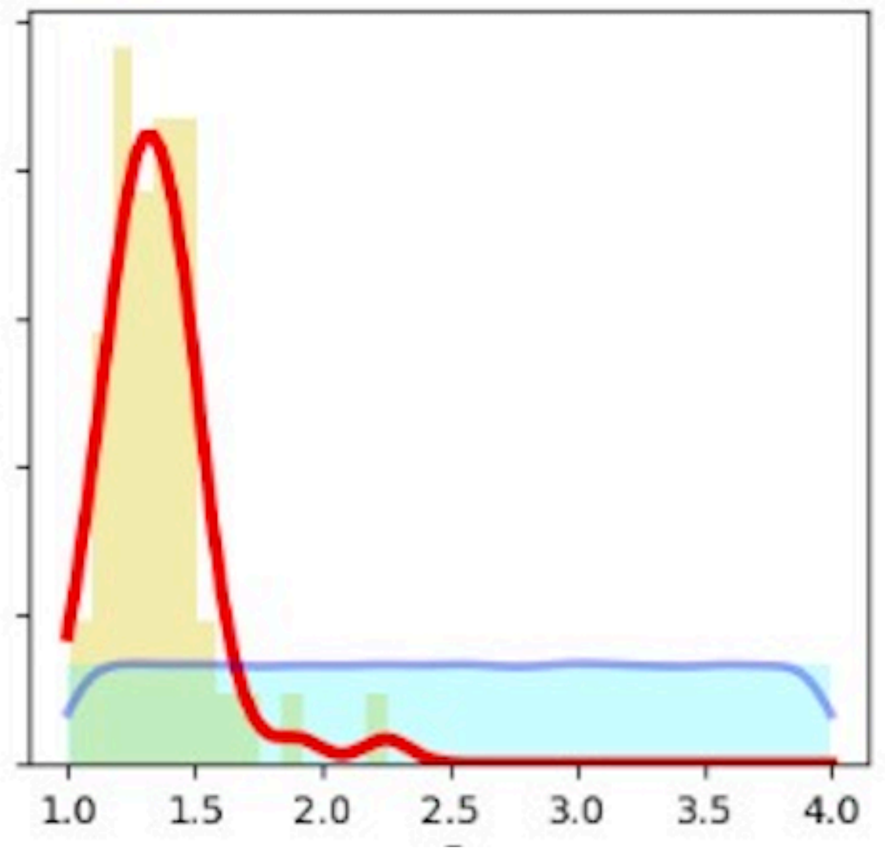




Preliminary estimates: prior vs. posterior parameter distributions

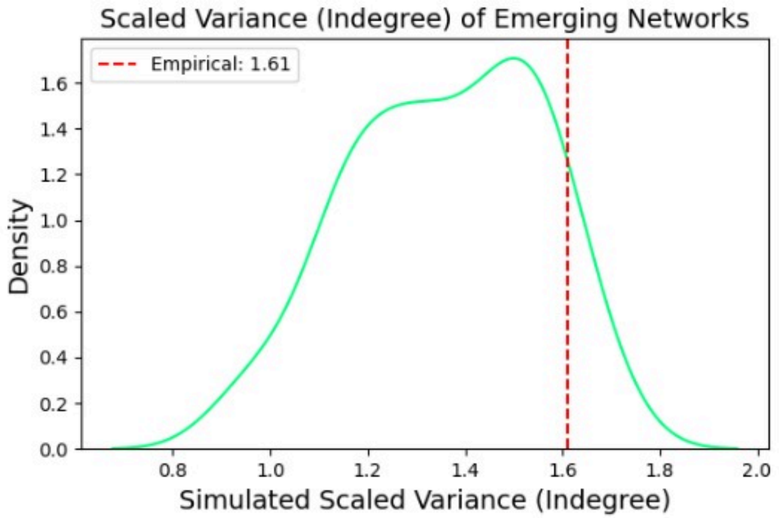


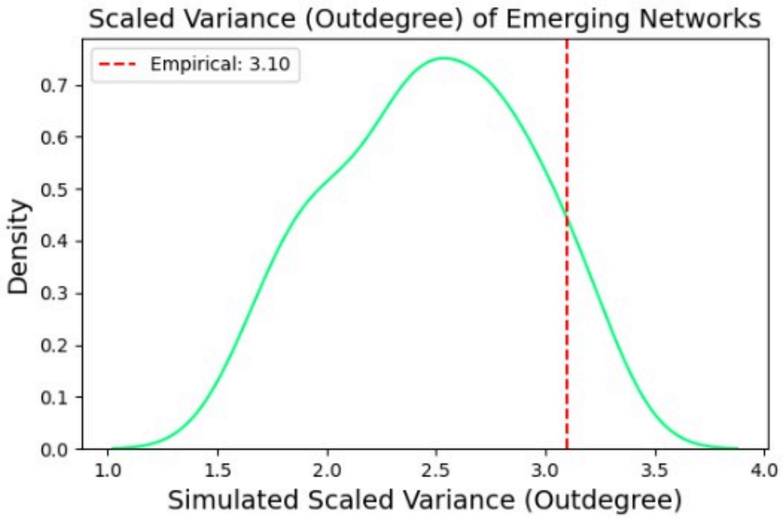
Density threshold for frame switching

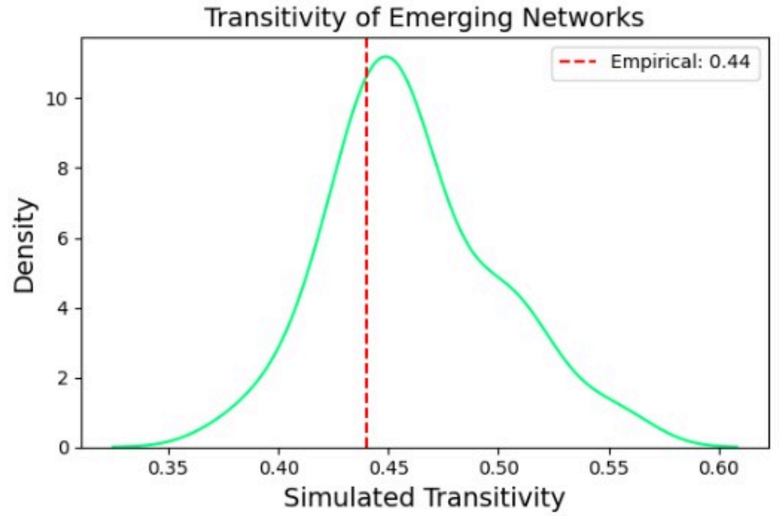


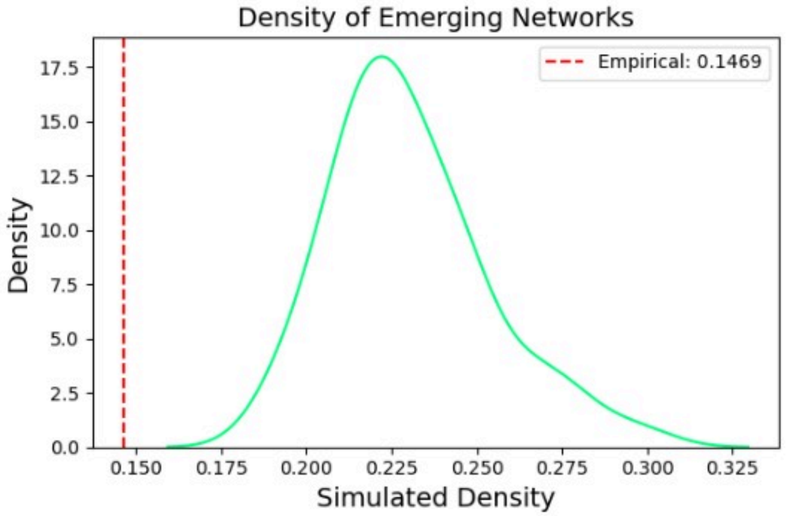
Weight of outdegree cap in solidaristic framing

Model fit


Scaled Variance (Indegree) of Emerging Networks
Empirical: 1.61
Density
Simulated Scaled Variance (Indegree)


Scaled Variance (Outdegree) of Emerging Networks
Empirical: 3.10
Density
Simulated Scaled Variance (Outdegree)


Transitivity of Emerging Networks
Empirical: 0.44
Density
Simulated Transitivity

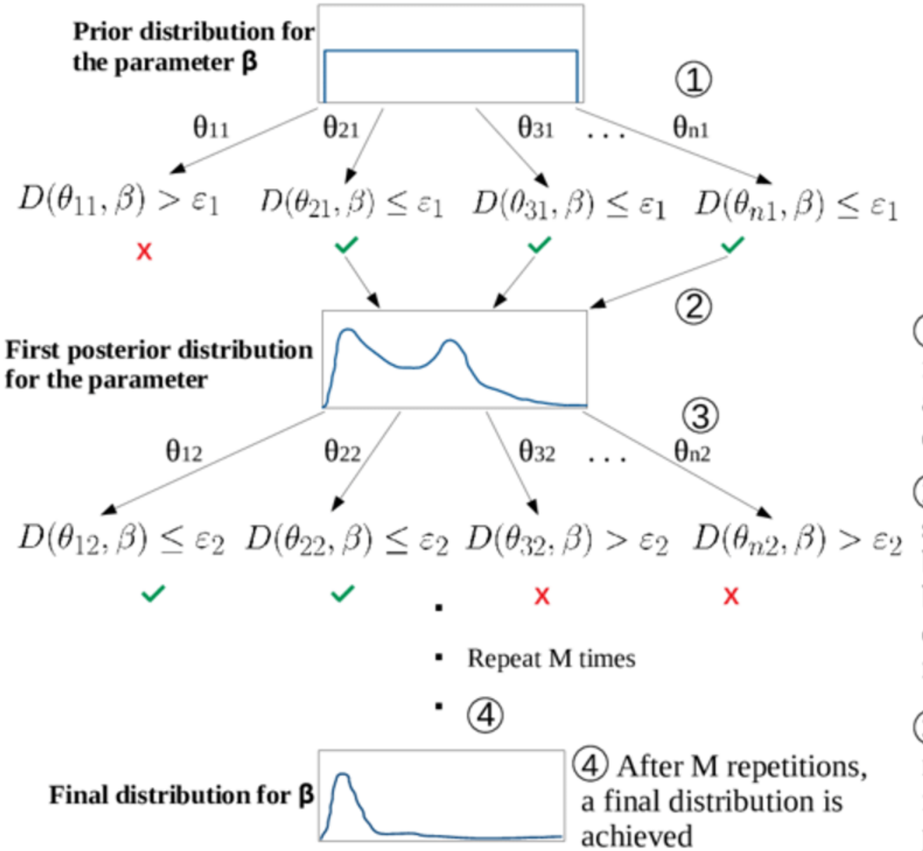

Density of Emerging Networks
Empirical: 0.1469
Density
Simulated Density

Estimation method

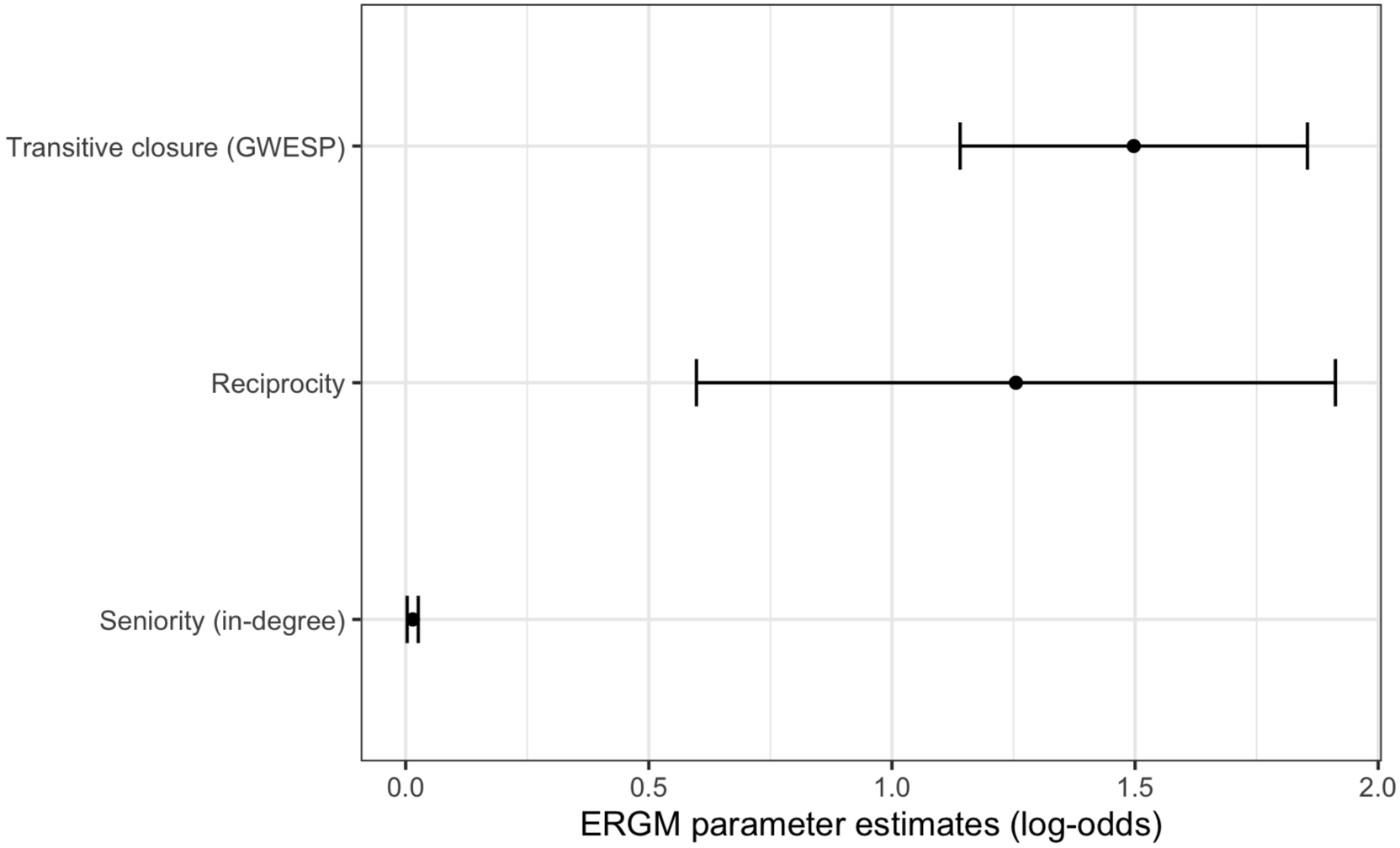
Approximate Bayesian Computation (Hartig et al., 2011)

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]



Evidence of reciprocation - what mechanism?



Discussion points

- Assume more complex selection processes (based on other node attributes, e.g. gender) to improve fitness on density and clustering
- Compare results to stationary SAOM
- **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
- Analysis based on standard statistical models of network data (ERGM or SAOM):
  - not able to disentangle mechanisms underlying reciprocity
  - might lead to unsupported micro-level inference on transitive closure

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