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# Modelling, estimating, simulating: formalizing attitudes towards inequality as a complex network

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# Introduction

- **Attitudes towards inequality**
  - A multidimensional construct (Janmaat, 2013):
    - ① **Perceptions** of existing inequality
    - ② **Beliefs** about fair inequality
    - ③ **Judgments** of existing inequality
  - Related topics:
    - ① **Wages** (Osberg & Smeeding, 2006)
    - ② **Taxes** (Berens & Gelepithis, 2019)
    - ③ **Redistribution** (Kenworthy & McCall, 2007)
- **Research questions**
  - ① How are **attitudes towards inequality structured** in Italy?
  - ② How does this structure **evolve**?

# Theory: network approach

- **Attitudes as complex system** composed of many evaluative reactions (Dalege et al., 2016).
- Focus on **causal relationships between entities**, rather than on single elements.
- **Rejection of latent variables models**

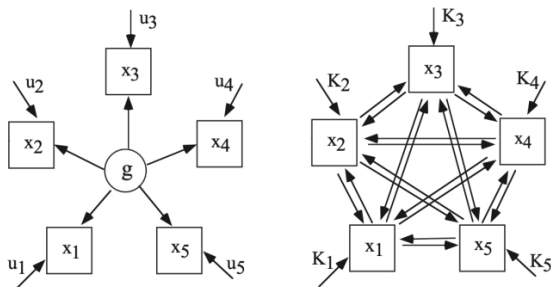


Figure: van der Maas HL et al., 2006

# Theory: network models

PMRF: **undirected and weighted** network models in which **nodes** are survey variables, and **edges** reflect their conditional associations.

- **mgm** (Haslbeck & Waldorp, 2015): Set of regularized **linear** regressions (LASSO); estimates are averaged to become edge weights.
- **Ising** (van Borkulo et al., 2014): Set of regularized **logit**; **state** of a node is determined by its *threshold*, states of the *neighbors*, overall *energy* configuration

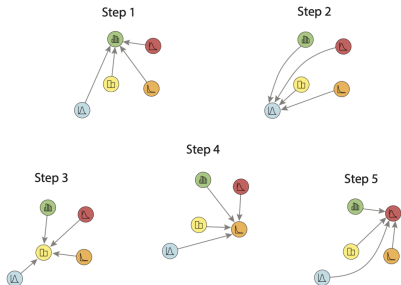


Figure: mgm process

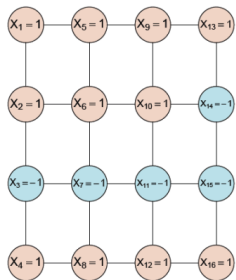


Figure: Ising network

# Theory

Scholars applying the **network approach to the study of attitudes** demonstrated that:

- They possess a **small world** structure (Dalege et al., 2017).
- **Community detection** on an attitude network outperforms factor analysis (Golino et al., 2020).
- Change in the states of a central nodes rather than peripheral ones are associated with wider **downstream effects** (Chambon et al., 2022).

# Methods

- **Data:** ISSP 2019 - Social Inequality Module, Italy (N=933).
- **Research design:**
  - ① **mgm** attitude network of full N, 23 variables
    - Network Comparison Test (Van Borkulo et al., 2022) between **mgm** networks estimated on samples obtained stratifying N by:
      - a. **Household income:** >2.000 Euro / <=2.000 Euro
      - b. **Educational level:** Complete secondary or more / Incomplete secondary or less
      - c. **Social class:** Non-manual / Manual
      - d. **Subjective social class:** Upper, upper middle, middle / lower middle, working, lower
      - e. **Subjective social mobility:** Upward, null / Downward
  - ② **Ising** attitude network of full N, 8 variables
    - Centrality simulation

# Methods

- **Variables:** 23 indicators

	<b>Evaluative reaction</b>	<b>Variable</b>
<b>Inequality</b>	Importance of... for getting ahead in life: <i>wealthy family, parental education, education, hard work, knowing the right people, having political connections, giving bribes, race, religion, sex.</i>	ib_weafam, ib_edupar, ib_edu, ib_work, ib_people, ib_pol, ib_bribes, ib_race, ib_relig, ib_sex
<b>Inequality</b>	Perception of inequality Anger towards inequality Unfairness of income distribution	ineq_per ineq_ang ineq_jud
<b>Wages</b>	How important should ... be, in deciding pay criteria: <i>responsability, education, need, merit.</i>	pay_resp, pay_edu, pay_need, pay_merit
<b>Taxes</b>	Perception of low taxation for the rich Belief on tax progressivity	tax_per tax_bel
<b>Redistribution</b>	Preference for public redistribution Preference for private redistribution Politicians' disinterest Government unsuccess	red_pub red_pri red_unca red_unsu

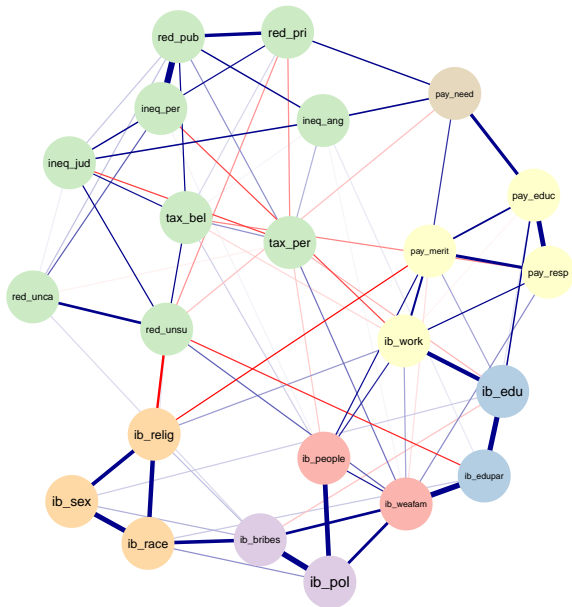


# Methods

## Hypoteses:

- **H1 (Modelling):**  
The network of attitudes towards inequality will show a **small-world structure**.
- **H2 (Estimating):**  
Network Comparison Test will show **significant structural differences** between networks estimated from **low and high socioeconomic groups**.
- **H3 (Simulating):**  
A **change in the thresholds of central nodes**, rather than peripheral ones, **will produce wider changes** in the overall configuration of the attitude towards inequality network.

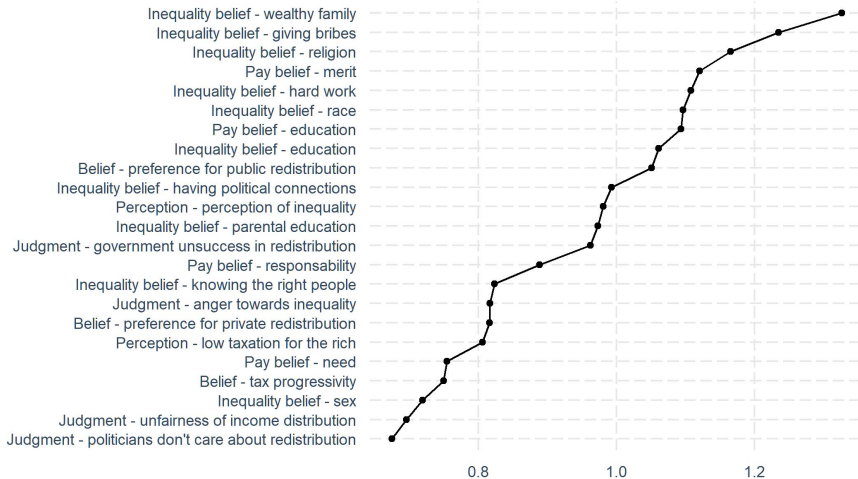
# Results



- **ib\_weafam:** Inequality belief – wealthy family
- **ib\_people:** Inequality belief – knowing the right people
- **ib\_edupar:** Inequality belief – parental education
- **ib\_edu:** Inequality belief – education
- **ineq\_per:** Perception – perception of inequality
- **ineq\_ang:** Judgment – anger towards inequality
- **ineq\_jud:** Judgment – unfairness of income redistribution
- **red\_pub:** Belief – preference for public redistribution
- **red\_pri:** Belief – preference for private redistribution
- **red\_unca:** Judgment – politicians don't care about redistribution
- **red\_unsu:** Judgment – government unsuccess in redistribution
- **tax\_bel:** Belief – tax progressivity
- **tax\_per:** Perception – low taxation for the rich
- **ib\_pol:** Inequality belief – having political connections
- **ib\_bribes:** Inequality belief – giving bribes
- **ib\_race:** Inequality belief – race
- **ib\_relig:** Inequality belief – religion
- **ib\_sex:** Inequality belief – sex
- **ib\_work:** Inequality belief – hard work
- **pay\_resp:** Pay belief – responsibility
- **pay\_educ:** Pay belief – education
- **pay\_merit:** Pay belief – merit
- **pay\_need:** Pay belief – need

# Results

## Strength



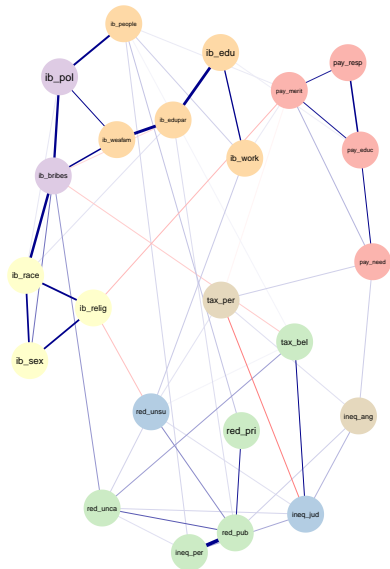
# Results

Table: Small world index

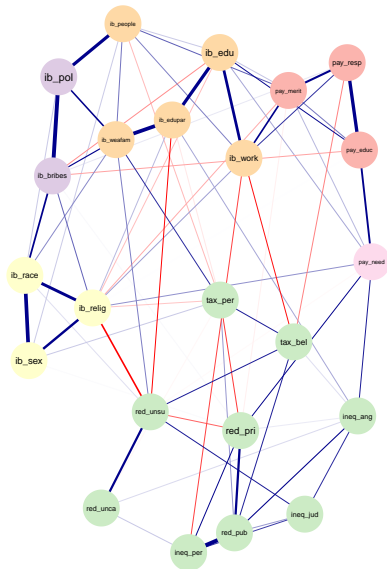
<b>Transitivity</b>	<b>ASPL</b>	<b>ASPL (weighted)</b>	<b>Small world</b>
0,47	1,58	16,03	1.04

# Results

Low education



High education



# Results

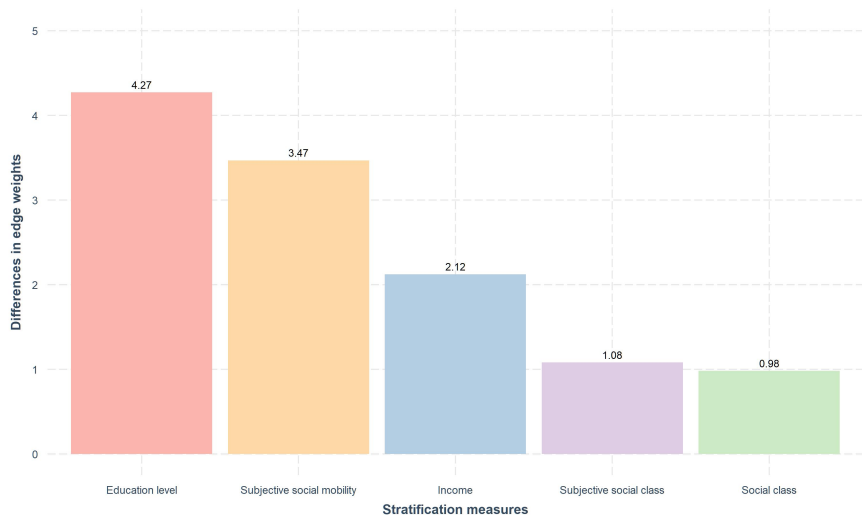


Figure: Differences in edge weights, according to stratification measures

# Results

Table: Number of communities in the stratified attitude networks

	<b>Income</b>	<b>Educational level</b>	<b>Social class</b>	<b>Subjective social class</b>	<b>Subjective social mobility</b>
<b>High</b>	10	6	6	5	5
<b>Low</b>	7	7	11	7	8

# Results

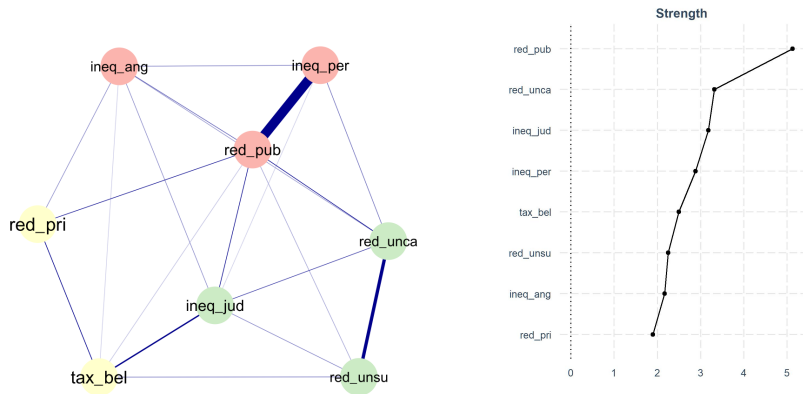


Figure: Ising reduced network and centrality table

*ineq\_per* = Perception - perception of inequality; *ineq\_ang* = Judgment - anger towards inequality; *ineq\_jud* = Judgment - unfairness of income distribution; *tax\_bel* = Belief - tax progressivity. *red\_pub* = Belief - preference for public redistribution. *red\_pri* = Belief - preference for private redistribution; *red\_unca* = Judgment - politicians don't care about redistribution; *red\_unsu* = Judgment - government success in redistribution.



# Results

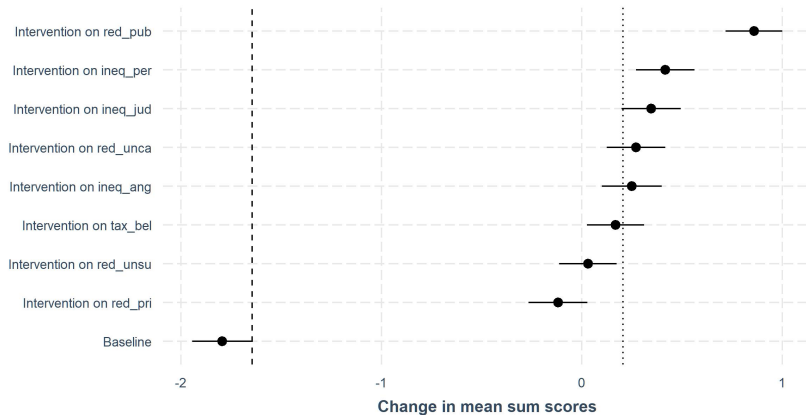


Figure: Changes in mean sum scores of simulated networks. *Baseline*: no intervention, all nodes with weakly negative thresholds. *Intervention*: Simulation of a persuasion attempt targeting a single node; other nodes retain weakly negative thresholds.

# Conclusions

- **Summary**

- ① **Modelling:** Attitudes towards inequality in Italy are characterized by **high clustering and high connectivity**.
- ② **Estimating: Educational level and subjective social mobility** are the socioeconomic measures producing the highest structural differences.
- ③ **Simulating:**
  - a. **Changes in central nodes** produce wider downstream effects.
  - b. **Preference for public redistribution and perception of inequality** are the most important variables explaining how people understand inequality in Italy.

- **Limitations**

- ① **Direction of causality:** we relied on simulated data rather than experiment or panel data.

- **Contributions**

- ① **Holistic comprehension** of how people understand inequality.
- ② A step toward a **formalized account** of attitudes structure and dynamic.

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