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The complexities of social integration in a diverse society

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Andreas Flache

using material from collaboration with

Michael W. Macy
Michael Mäs
Karóly Takács
Tobias Stark
James Kitts
Steve Benard

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Increasing diversity: opportunities and risk

- Increasing ethnic and cultural diversity in western societes (in particular in Europe).
  - E.g. proportion non-western immigrants in NL doubled since 1975 (about 10% now)
- Opportunities
  - broader base of human capital
  - better social and economical integration accross societies
- Risks
  - increasing social and economic inequality
  - social segregation, lack of normative consensus, conflicts

Which policies can help to reduce segregation?

The answers are (sometimes) complex.

Example school segregation (NL)

› Half of all primary schools in 4 biggest cities are “black schools” (> 50% immigrant students)
› Current policy in NL: encourage “mixing”

Friendship segregation in ethnically mixed schools

› Considerable degree of “ethnic homophily” in mixed schools
› The larger the minority proportion (the more ‘mixing’), the stronger is observed ethnic segregation in friendship choices
  • US: e.g. Moody 2001, Quillian & Campbell 2003, Add Health Data
  • NL: e.g. Lubbers 2003

Modelling the dynamics of friendship networks

One explanation: opportunity for ingroup selection

› Larger minority, more opportunity for interethnic dyads
  • Feld & Carter 1998
› But: also more opportunity to "flock together" for minority
  ⇒ Minority size may increase segregation merely through opportunity given preference for ingroup choice.

Our approach (Flache & Stark 2008)
(arXiv:0901.2825v1 [physics.soc-ph])

• Model theoretically mechanism driving network dynamics.
  ⇒ Agent based computational model based on SIENA (Snijders et al).

The general model (based on SIENA, Snijders et al)

- N agents, p_{min} proportion minority, Nx(N-1) dyads.
- Dichotomous network ties: $y_{ij} \in \{0,1\}$.
- In every discrete time step:
  - Select randomly an agent *i*
  - Calculate for every dyad $ij_{i \neq j}$ the utility of the network that results when toggling y_{ij}
  - Select one action probabilistically: toggle dyad *ij* with

$$p_{ij}(o_j) = \frac{\exp(o_j)}{\sum_l \exp(o_l)}$$

o_j: objective function representing utility of resulting network

$\Rightarrow$Random utility model

Modeling utility: objective function

› Utility of network state $y = \sum_k \beta_k s_{ki}$

› S_{ki}: network statistic for i, β_k corresponding parameter

› Network statistics (in our model):

- Outdegree i: $s_{0i}(y) = \sum_{j \neq i} y_{ij}$
- Number of reciprocated ties i : $s_{1i}(y) = \sum_{j \neq i} y_{ij} y_{ji}$
- Number of ties to own group: $s_{2i}(y) = \sum_{j \neq i} y_{ij}(a_i a_j + (1 - a_i)(1 - a_j))$ (homophily or similarity effect)

Assumptions about preferences

- Agents prefer reciprocated ties $\beta_{1i}=+1$
- Agents prefer ingroup ties $\beta_{2i}=+1$
- *Attractiveness of additional tie declines in outdegree*
  - Declining marginal utility

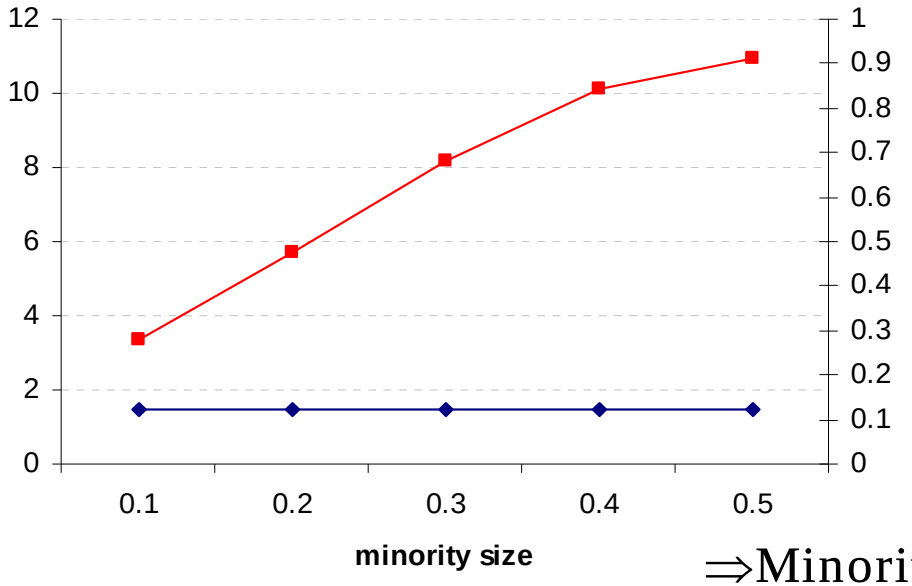
    $\Rightarrow$ Outdegree effect positive at zero, negatively sloped

$$\beta_0(s_{0i}(y)) = \beta_{0,0} + \beta_{0,1}s_{0i}(y), \quad \beta_{0,0} = 10, \beta_{0,1} = -0.5$$

- **Scenario for simulation experiment** (initial conditions)
  - Initial network empty
  - N=100, minority size varied across 0.1, 0.2 ...0.5

Results computational experiment

› Mean density and gross segregation
(100 replications, means after 20.000 iterations)



$$\text{gross segregation} = \frac{\text{odds in-group tie}}{\text{odds between-group tie}}$$

⇒Minority size increases segregation

⇒No effect on density

Adding social influence (to homophily)

- **Social influence**
  - a fundamental tendency of people to adapt in social contacts their opinions towards others.
- Can social influence overcome segregation?

  Previous formal social influence models:

  (French, Abelson, Harary...):

  In connected network all agents gradually move towards emergent *consensus*

  ⇒ but they do not assume homophily. What if we add this?

  ⇒we integrated homophily

  (Flache, Macy, 2006, arXiv:physics/0604201).

Combining homophily and social influence

› Like earlier models (French etc) we use *Social Influence*:

Move towards average opinion of influential neighbors (gradual convergence possible)

$$q_{iF,t+1} = q_{iF,t} + \frac{1}{C} \sum_{j \in neigh} w_{ijt} (q_{jF,t} - q_{iF,t})$$

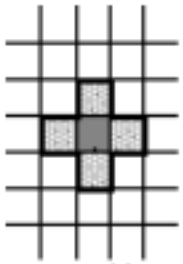
Unlike these earlier models, we assume *Homophily*:

The more overlap *i-j*, the more influence does *j* have

$$w_{ij,t+1} = 1 - \frac{\sum_{f=1}^{F} \left| q_{ift} - q_{jft} \right|}{\text{MaxDist}}, \quad 0 \le w \le 1$$

Embedding social influence and homophily in a spatial framework

- Agents are embedded in spatial grid
- Every agent is influenced only by local neighbours
  - *Repeat in random sequence*:
    1. Select some *agent* for a possible interaction.
    2. Selected agent adapts opinion



(a)
von Neumann neighbourhood

This is similar to the well known *Axelrod (1997)* model of cultural dissemination, but differs in two crucial ways:

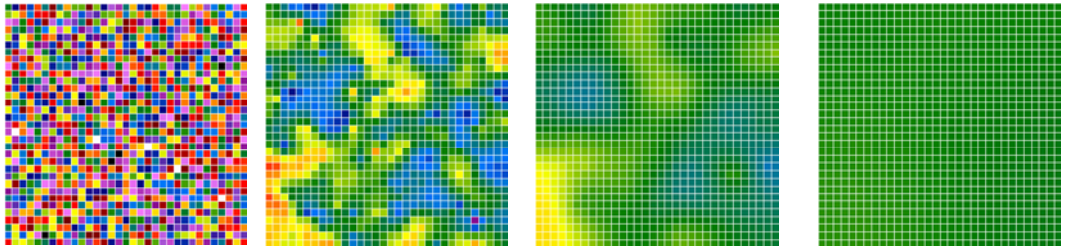
- we allow for gradual convergence (continuous features)
- social influence is occurs by all neighbors simultaneously

How social influence overcomes segregation – despite homophily

The mechanism:

- As long as their distance is not maximal, two agents remain connected and thus influence each other.
- Maximal distance is very unlikely from random start

⇒ Segregation in short run, emergent consensus *in long run in connected network*



initial | *t*=5 000 | *t*=20 000 | t = 500 000

F=1, Q=10.000,

N=32x32, rad 1

However: evidence for persistent social diversity empirical examples (1)

Political and social views in the US

› Glaeser & Ward (2007) analyzed data from PEW 1987–2003 Values Survey (≈ 2500 respondents) and concluded

"America is a country with remarkable geographic diversity in its habits and beliefs. People in different states have wildly different views about religion, homosexuality, AIDS, and military policy, as well as wildly different consumption patterns...The extent and permanence of cultural divisions across space is one of America's most remarkable features."

Quoted from Glaeser, Edward L. and Bryce A. Ward. 2006. "Myths and Realities of American Political Geography", *Journal of Economic Perspectives* 20(2), pp. 119-144.

What else could explain persistent diversity? Heterophobia and negative influence

- Previous models assume that agents never change opinions to *increase* similarity
- But: agents may also distance themselves from disliked others
  - social balance theory, cognitive dissonance theory, optimal distinctiveness theory, and
  - empirical evidence for “negative referents”, “profiling”

We included heterophobia and negative influence

(Macy, Kitts, Flache, Benard 2003, Flache & Mäs 2008a,b, see also Mark 2oo3, Jager & Amblard 2004, Baldassari & Bearman 2007)

- Heterophobia
  - if difference too large, relations become negative
- Negative influence
  - If relations are negative, agents increase distance

Heterophobia and negative influence included in the model.

Positive and negative social influence:

Influential neighbors "pull" or "push" depending on weight i-j:

$$q_{if,t+1} = q_{if,t} + \frac{1}{C}\sum_{j \in neigh} w_{ijt}(q_{jf,t} - q_{if,t}), \quad -1 \le w_{ijt} \le +1$$

Homophily and heterophobia:

Low overlap *i-j*: negative weight, high overlap: positive weight

$$w_{ij,t+1} = 1 - \frac{2\sum_{f=1}^{F}\left|q_{ift} - q_{jft}\right|}{\text{MaxDist}}, \quad -1 \le w_{ijt} \le 1$$

How heterophobia and negative influence generate persistent "true" polarization

› Ceteris paribus replication of previous experiment (N=32x32, F=1, Q=10.000, radius 6, no interaction threshold)

⇒ Without heterophobia and negative influence: monoculture

⇒ With these assumptions: Polarization is likely equilibrium outcome, but only two extreme opinions survive

› Explanation

- Agents who disagree initially with many others move away from their "enemies" towards extreme end of opinion scale
- Their "friends" follow them, their enemies move in opposite direction: emergent polarization.
- More features, more opinions survive (replication with F=2) ►|

A strategy to avoid polarization?

The timing of structure in strong faultline settings (Flache & Mäs 2008a,b)

- We assume that overlap i-j depends on both demographic and opinion (dis)similarity

$$w_{ij,t+1} = 1 - \frac{2\left(\sum_{d=1}^{D}\left|q_{idt} - q_{jdt}\right| + \sum_{f=1}^{F}\left|q_{ift} - q_{jft}\right|\right)}{\text{MaxDist}}, \quad -1 \le w_{ijt} \le 1$$

D fixed demographic features,

F changing opinion features

- Higher demographic dissimilarity

  $\Rightarrow$ higher likelihood of negative relation

- To avoid polarization, initially keep highly dissimilar actors apart!

But is negative influence really the problem? Experiments (Takács, Flache, in progress)

We conducted a series of 4 experiments with in total 443 subjects.

Overall design:

We asked subjects' opinions on range of pre-selected issues, numerically scaled.

› E.g. "0..100 percent of immigrants who come to the Netherlands for economic reason should receive a residence permit. "

› We paired subjects systematically varying distance on opinions and other characteristics.

› Subjects were repeatedly exposed to others' opinions, could exchange messages to influence each other, and could then change their opinions.

› Attractions were also measured repeatedly

› In some conditions, we manipulated initial attraction

- E.g. dictator games, football support, different moral positions

Results

- Homophily + heterophobia
  - Higher opinion distance decreases liking and induces disliking. Supported.
- Positive + negative social influence
  - The more liking, the more opinions converge. If liking, opinion distances decrease. If disliking, opinion distances increase.

    Not supported.
  - Instead: when subjects interact, opinion distances decrease (almost) always!
- Is negative influence irrelevant for polarization?
  - Premature. But: it remains a challenge to study "us vs them" dynamics in controlled lab conditions.
  - And it remains the challenge to identify its empirical conditions.

And there are more mechanisms that play a role

- **Bounded confidence** *(Deffuant, Weisbuch, Hegselmann, Krause)*
- **Persuasive argument theory**

  (Mäs, Flache, Takács, Jehn, under review)

  Opinions are shaped by arguments, arguments are exchanged in interaction.
  - The more similar agents are, the more they interact.

    ⇒Interaction with similar others reinforces existing opinion tendencies, which reinforces interaction between similar others, ...
    ⇒ polarization...,
- **Stubborn extremists** *(Deffuant, Amblard,Weisbuch,Faure, 2002)*
  - Extremists are not open to influence, but moderates are...
- **Social identity theory**: "optimal distinctiveness"

  (e.g. Salzarulo 2006).

Finally

- Polarization may be tempered and integration be fostered by social policies that support 'optimal' interaction structures, but...
- which structure might be optimal is strongly dependent on the mechanism that underlies societal diversity.
- A range of mechanisms have been proposed
  - How do the mechanisms relate to each other, how do they differ in the conditions under which integration or polarization is predicted? ⇒ Theoretical quest continues
  - Which mechanism applies under which conditions in the real world? ⇒ (More) high quality, longitudinal data on influence and attraction dynamics are needed (both lab and field).