Work in Progress

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The double edge of demographic faultlines
The neglected effects of crisscrossing on cohesion and performance in work teams.

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What effect does demographic diversity have on cohesion in work teams?

- Theorists expect a negative effect (see e.g. Williams and O'Reilly 1998)
- Empirical research produced unclear picture
- New idea by Lau and Murnighan (1998): effect is moderated by the strength of the demographic faultline

A faultline is the stronger the higher correlation between the demographic attributes is.

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Intuition 1: Lau and Murnighan's theory

- New teams go through a "sensemaking process of understanding each other and their task" (1998: 332)
- Two main mechanisms play a role
  - Homophily: Actors prefer to interact with similar team members
  - Social Influence based on Persuasive Arguments:
    "group members who support similar attitudinal positions will find that, as other members support that position using arguments different from their own, they each have more reason to become even more extreme than they were before" (1998: 332)
- In teams with strong faultlines the interplay of the two mechanisms can lead to group polarization.
  - Opposing opinions: formation of demographic subgroups that disagree
  - Little communication: members of different subgroups refuse to interact
  - Likely consequence: Low cohesion and bad performance
**Intuition 2: The Classical Sociological Argument**

- Focus on the integrating effects of cross cutting
  
  - "Take the case of a tension between blacks and whites. If the lines of cleavage cross, each opposition will weaken the other. But if, as sometimes happens, all the employers are white and all the employed are black men, then one antagonism reinforces the other and the rift in society is deeper than ever. So, paradoxical as it may sound, a society riven by a dozen oppositions along lines running in various directions may actually be in less danger of early break-up than one split along just one line. For each new cleavage narrows the cross cleft, indeed, you might say that the society is sewed together by its inner conflicts" (Ross 1920: 164-165)

- Different mechanism: Crisscrossing agents conciliate (e.g. Colson 1953)
  
  - Crisscrossing agents share at least one demographic attribute with members of the two mutually exclusive demographic subgroups
  
  - They interact with all team members and thus allow for indirect communication between the subgroups and opinion convergence.

- The number of crisscrossing agents decreases as faultlines become stronger. However there are always some of them if faultline strength is not maximal.

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- The number of crisscrossing agents decreases as faultlines become stronger. However there are always some of them if faultline strength is not maximal.
Both Faultline theory and the theory of crisscrossing agents predict that faultline strength hampers cohesion

However, faultline theory is challenged by the theory of crisscrossing agents.

Which effect is stronger: the polarization breeding interplay of homophily and social influence or the integrating function of crisscrossing agents?
The Model

- Agent based computational model of the opinion dynamics in work teams

- Each agent is described by:
  - Demographic attributes (fixed): \( a_{id}^{\text{fix}} \in \{-1;1\} \)
  - Opinions on issues (open to influence): \(-1 \leq a_{ik}^{\text{flex}} \leq 1\)
    - An agent’s opinion on a certain issue depends on the number of salient pro and con arguments. The more pro arguments an agent uses, the more positive his opinion will be.

- What happens in each simulation round?
  1. Random selection of an agent \( i \)
  2. Selection of an interaction partner \( j \) – based on homophily
  3. \( i \) adopts one of \( j \)'s arguments – based on persuasive arguments

Selection of an interaction partner \( j \):

- Computer calculates the similarity between \( i \) and his team mates

\[
sim_{i\cdot j} = \frac{1}{2 \cdot (D + K)} \left( \sum_{d=1}^{D} 2 - |a_{id}^{\text{flex}} - a_{jd}^{\text{flex}}| + \sum_{k=1}^{K} 2 - |a_{ik}^{\text{flex}} - a_{jk}^{\text{flex}}| \right)
\]

- The higher the similarity between \( i \) and \( j \), the more likely they will interact

\[
p_{j^*} = \frac{\left(\frac{\sim_{i\cdot j}}{\sim_{i\cdot j}}\right)^h}{\sum_{i\in j} \left(\frac{\sim_{i\cdot j}}{\sim_{i\cdot j}}\right)^h} \quad h: \text{strength of homophily}
\]

- \( i \) adopts one of \( j \)'s arguments:
  - Computer randomly selects an issue to update
  - Computer randomly selects one of \( j \)'s arguments to be adopted by \( i \)
  - If the argument is new for \( i \) then one of his initial arguments will not be salient anymore.
The Model

- Example of the updating process

\[ \begin{bmatrix} +1 & +1 & +1 & +1 \\ +1 & +1 & +1 & +1 \\ +1 & +1 & +1 & +1 \\ -1 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 \end{bmatrix} \]

Arguments

\[ \begin{bmatrix} 0 & 3 & 0 & 1 \\ 1 & 2 & 0 & 0 \\ 1 & 2 & 0 & 0 \\ 0 & 0 & 3 & 0 \\ 0 & 0 & 3 & 0 \end{bmatrix} \]

Saliency, \( i \)

\[ \begin{bmatrix} 0 & 1 & 0 & 3 \\ 1 & 3 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 3 & 2 & 0 & 0 \end{bmatrix} \]

Saliency, \( f \)

\[ \begin{bmatrix} 0 & 1 & 0 & 3 \\ 1 & 3 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 2 & 0 & 2 & 1 \end{bmatrix} \]

The Simulation Experiments

- Parameters
  - 20 team members
  - One issue (\( K=1 \))
  - Three demographic attributes (\( D=3 \))
  - There are 10 pro and 10 con arguments (\( P=C=10 \)) and agents base their opinion on 4 of them (\( S=4 \))

- We varied
  - Faultline strength (\( f \)) between 0 and 1 in steps of .2 (see table)
  - Strength of homophily (\( h \)) between 1 and 5 in steps of 1
  - Initial correlation between opinion and the first demographic attribute (\( w \)) between no correlation (\( w=.5 \)) and perfect correlation (\( w=1 \)) in steps of .1

  - 500 runs (teams) per condition
What do we expect?

- Faultline strength results in group splits
- Splits only in the short run
- Opinions converge in the long run if faultline strength is not maximal.

Polarization is measured as the variance of pairwise opinion agreement across all pairs of agents in the population.
1. Maximal Faultline strength ($f=1$): a typical run

The higher $w$ and $h$ the more likely are group splits.

The higher $w$ and $h$ the more likely are group splits.
2. Teams with crisscrossing agents ($f<1$): a typical run

In the long run all runs with $f<1$ ended in consensus.

The stronger the faultline the stronger the tendency to split up (in the short run).
2. Teams with crisscrossing agents ($f<1$): maximal value of polarization

The stronger homophily the stronger the tendency to split up (in the short run)

2. Teams with crisscrossing agents ($f<1$): length of the split

The stronger the faultline and homophily the longer groups remain split up
The Problem

The Model

Results I: Long vs. Short Term

Results II: Positive Effects

The stronger the faultline and the stronger homophily the “faster” consensus is reached

2. Teams with crisscrossing agents (<1): length of the runs

The stronger the faultline and the stronger homophily the “faster” consensus is reached
Results II: Positive Effects

Groups with strong faultlines are faster at the end of the convergence process.

Interaction network: strong faultlines ($f=.8$), strong homophily ($h=5$)
Results II:
Positive Effects

Interaction network: stronger faultlines ($f=.2$), strong homophily ($h=5$)

- Consistency test of Lau and Murnighan's theory:
  - In teams with max. strong faultlines their mechanisms can predict group splits (only if strong homophily and initial correlation between opinion and demographic attributes)
  - Note that this is the only theory (we know) that can produce increasing opinion differences between subgroups that does not assume repulsion (tendency to increase opinion differences to dissimilar agents)
  - Also in teams with less strong faultlines groups may split up. But this happens only in the short run.

- Implications:
  - Also groups with strong faultlines will be cohesive in the long run (perhaps even faster).
  - However, in the short run their may be conflicts and low cohesion.
  - Managers have to make sure that in this phase there are no exogenous factors hindering crisscrossing agents from conciliating.
Thank You!