Etudier l'influence sociale dans un réseau par les modèles ALAAM

La diffusion d'une norme de punitivité au sein d'une communauté agropastorale sénégalaise

Julien Brailly

Outils statistiques pour analyser les données de réseaux

Analyse descriptive

Mesures centrées sur l'acteur

↓

Scores de centralité

Etude de la structure globale

↓

Modèles de blocs

Analyse stochastique

Etude d'une variable performance selon les attributs des acteurs et leurs relations

↓

Modèles ALAAM

Etude des effets d'attributs non structuraux sur l'existence d'un lien entre acteurs

↓

Modèles MRQAP

Etude de la structure globale par un positionnement à l'échelle du voisinage relationnel

↓

Modèles ERGM

Influence sociale et réseaux

Je suis végétarien

Approche individuelle

- Ethique
- Economique
- Santé
- Goût
- …

Approche structurale

Dans quelle mesure mes relations, et leur regime alimentaire, influence le mien ?

Influence sociale et réseaux

Etudier l'influence sociale :

- Comportements, attitudes
- Opinions
- Choix
- Jugements
- Actions

$\Rightarrow$ Ensemble des attributs individuels susceptibles de changer

Influence sociale et réseaux

L’attribut cherchant à être expliqué (DV), depend :

1. De caractéristiques individuelles
2. De la position des acteurs dans le réseau

Influence sociale et réseaux

Exemple : l'intention de vote Front National et relation de sociabilité

Attributs individuels : CSP, Origine géographique, Age,…

Position dans la structure :

1. Centralité : les individus les plus isolés socialement vote plus souvent FN, indépendamment du vote de leurs relations
2. Broker : les individus en position de broker vote moins souvent FN, indépendamment du vote de leurs relations

Influence sociale : Les individus en relation avec d'autres ayant l'intention de voter FN vote plus souvent FN

Influence sociale et réseaux

Exemple : l'intention de vote Front National et relation de sociabilité

Influence sociale et position dans la structure : Pression sociale plus forte groupe sociaux votant FN : les individus fortement insérer dans des triades impliquant des individus votant FN ont plus tendance à suivre le choix du groupe que pour les autres type de vote possible

Influence sociale et attributs : l'influence sociale est plus forte en campagne, surtout dans le cadre de relation réciproque

Les modèles ALAAM

Social influence (Robins et al., 2001)

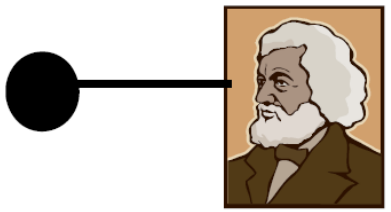
Network models can:

- Predict a binary variable from other individual level variables

BUT ALSO…..

- Network ties of varying configurations

- Attributes of alters & network ties



- Spatial

Social influence (Robins et al., 2001)

Here we regard the network as fixed, and treat the states of nodes (eg attitude, belief, behaviour) as (binary) variables

The node state variables are not assumed independent

Some potential effects (eg tendency for the state of an actor to depend on the state of a network partner) are assumed to be common across the system

The result is a model that can be estimated from an observation on the network and node state variables (and any covariates)

$$P(Y = y \mid X = x) = (1/\kappa) \exp\{\theta_p z_p(y,x)\}$$

where

- X = [X(i,j)] is a matrix of network tie variables, with realisations x=[x(i,j)]
- Y = [Y(i)] is a vector of binary node attribute variables, with realisations y =[y(i)]
- $z_p(y,x)$ is a network-attribute statistic (consistent with assumed dependence)
- θ_p is a corresponding parameter
- $\kappa(\theta) = \sum_y \exp\{\theta_p z_p(y,x)\}$ is a normalising quantity

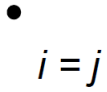
A model for the distribution of attributes, conditional on the observed network

Social influence (Robins et al., 2001)

Y(*i*) and *Y*(*j*) are conditionally independent unless:

Distance 0

D_0 : *i and j are the same node*



Logistic regression model

Distance 1

D_1 :*i* is directly connected to *j*

Autologistic regression – the model used here

We want a model for: $\Pr(\mathbf{Y} = \mathbf{y} \mid \mathbf{X} = \mathbf{x})$

Probability of observing graph **x** GIVEN observed attribute vector **y**

$$\Pr(\mathbf{Y}=\mathbf{y} \mid \mathbf{X}=\mathbf{x}) = \frac{1}{\kappa}\exp\left\{\sum_{Q}\lambda_Q z_Q(\mathbf{y}) + \sum_{R}\lambda_R z_R(\mathbf{x},\mathbf{y})\right\}$$

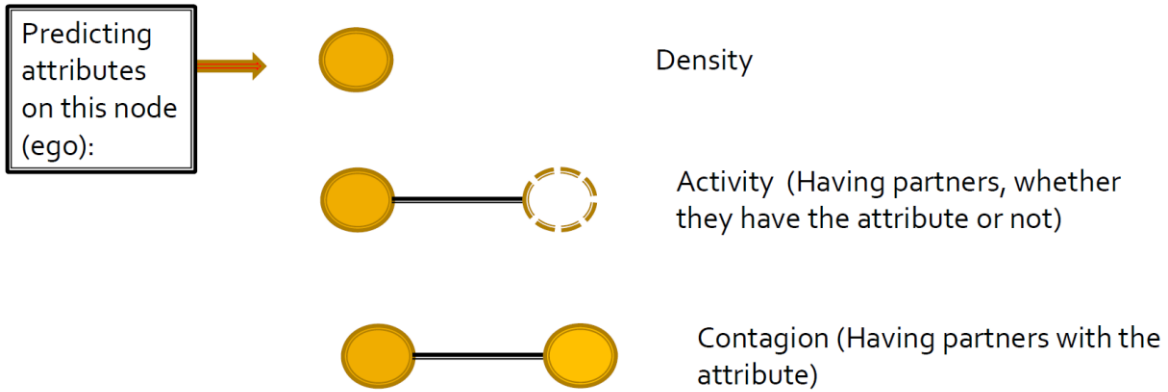
Attribute only effects

influence part – interaction of ties and attributes

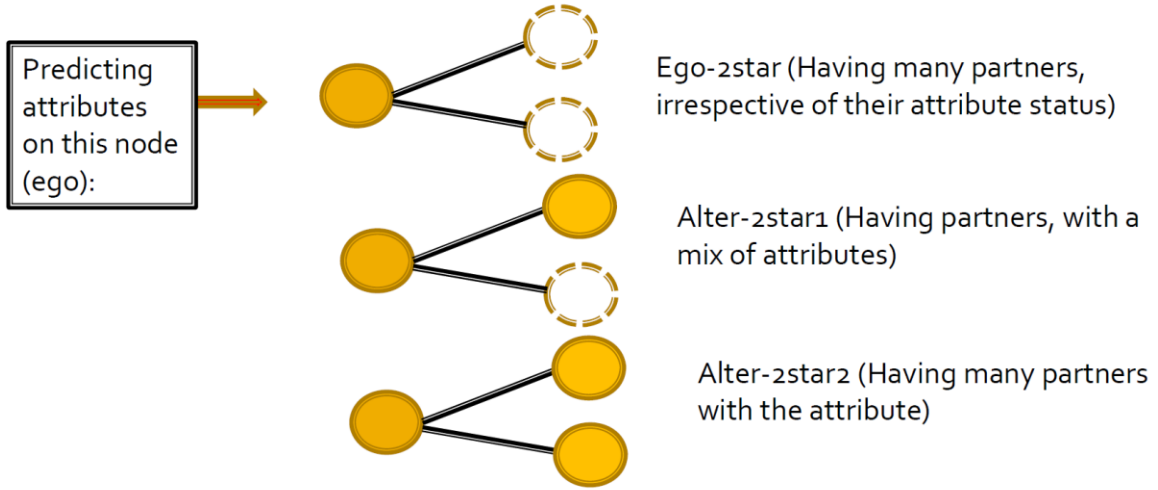
Second summation is over all influence configurations *R*

Social influence (Robins et al., 2001)

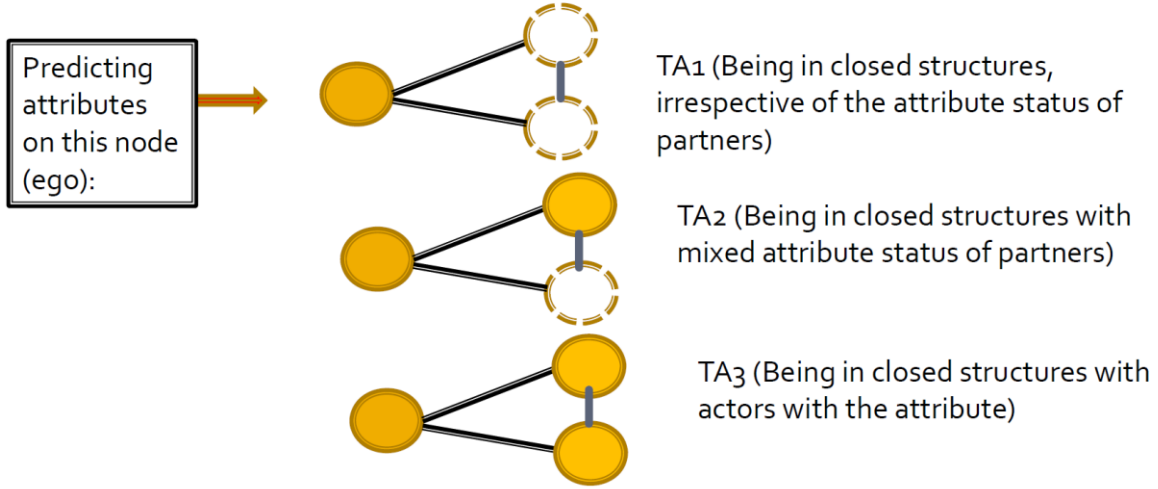
Simple configurations:



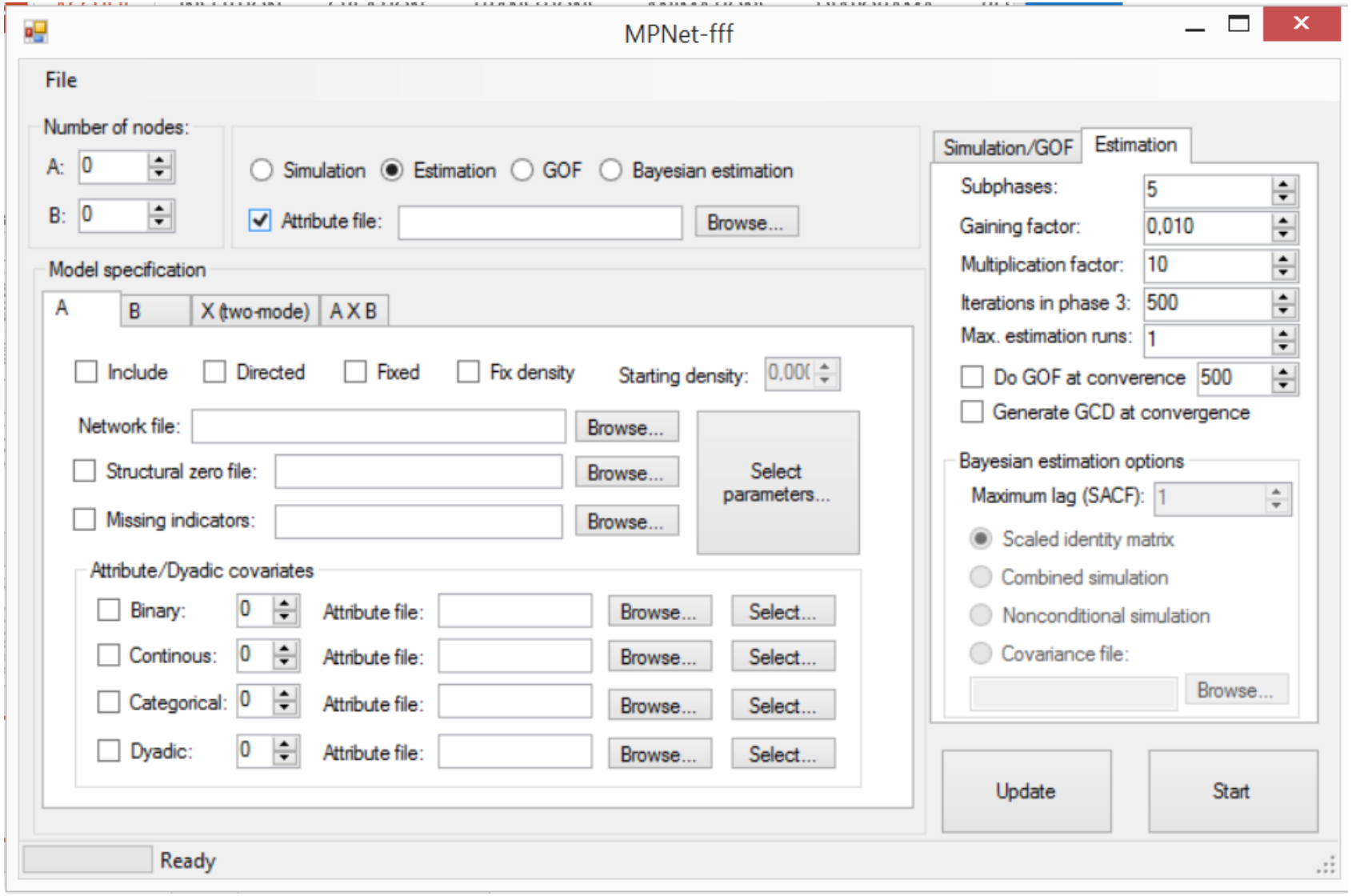
Star configurations:



Triangle configurations:



MPNet


MPNet-fff
File
Number of nodes:
A: 0
B: 0
Simulation
Estimation
GOF
Bayesian estimation
Attribute file:
Browse...
Model specification
A
B
X (two-mode)
A X B
Include
Directed
Fixed
Fix density
Starting density:
Network file:
Structural zero file:
Missing indicators:
Select parameters...
Attribute/Dyadic covariates
Binary:
Continous:
Categorical:
Dyadic:
Select...
Simulation/GOF
Estimation
Subphases: 5
Gaining factor: 0,010
Multiplication factor: 10
Iterations in phase 3: 500
Max. estimation runs: 1
Do GOF at converence 500
Generate GCD at convergence
Bayesian estimation options
Maximum lag (SACF): 1
Scaled identity matrix
Combined simulation
Nonconditional simulation
Covariance file:
Update
Start
Ready

La diffusion d‘une norme de punitivité

Common Pool Resources Institutions

Ostrom identified eight "design principles" of stable local common pool resource management:

- Clearly defined (clear definition of the contents of the common pool resource and effective exclusion of external un-entitled parties);
- The appropriation and provision of common resources that are adapted to local conditions;
- Collective-choice arrangements that allow most resource appropriators to participate in the decision-making process;
- Effective monitoring by monitors who are part of or accountable to the appropriators;
- A scale of graduated sanctions for resource appropriators who violate community rules;
- Mechanisms of conflict resolution that are cheap and of easy access;
- Self-determination of the community recognized by higher-level authorities; and
- In the case of larger common-pool resources, organization in the form of multiple layers of nested enterprises, with small local CPRs at the base level.

Common Pool Resources Institutions

Common Pool Resources Institutions

1. Distinction between public good (non exclusion/ non rivality) / common good (non exclusion/ rivality)
2. Hardin (1968) – The tragedy of commons: egoistic rationale choice lead to over exploitation of the resource
3. Olson (1965) – logical to have a free rider behavior
4. Solution: privatization or Leviathan

Collective action based solution: Institutional arrangements (Wade 1988; Ostrom 1990; Ostrom, 1999; Ostrom et al., 2008; Cox et al., 2009)

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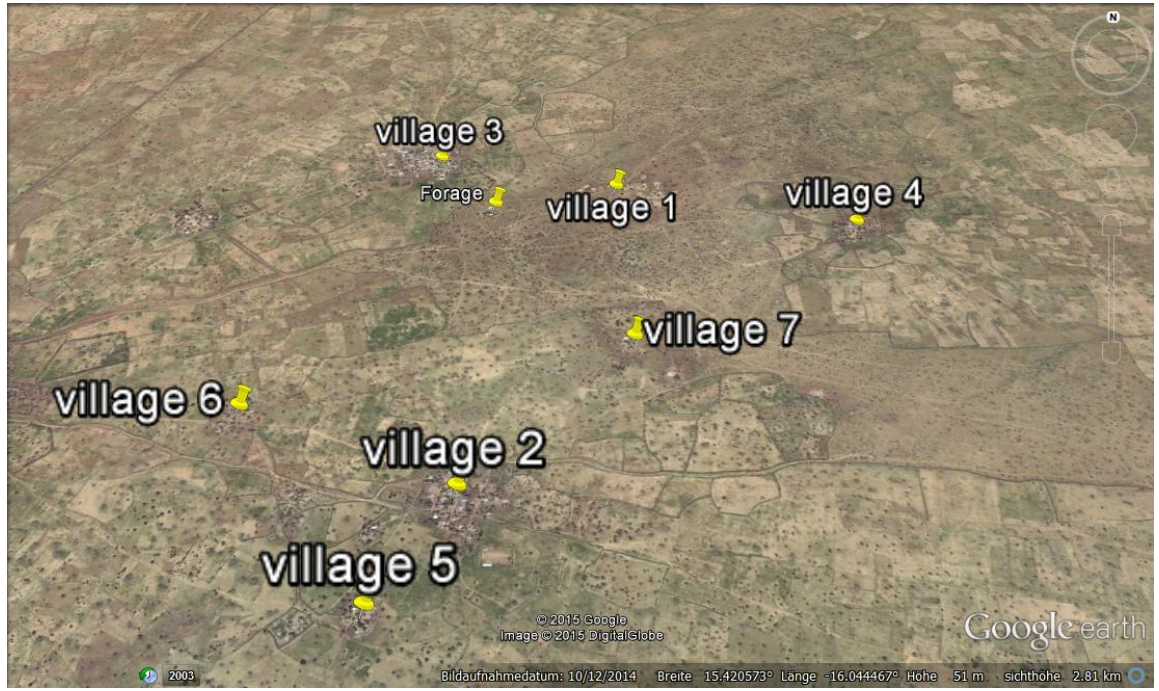
How social control is exercised to manage common pool resources in communities?

Case study and collected data

Field description

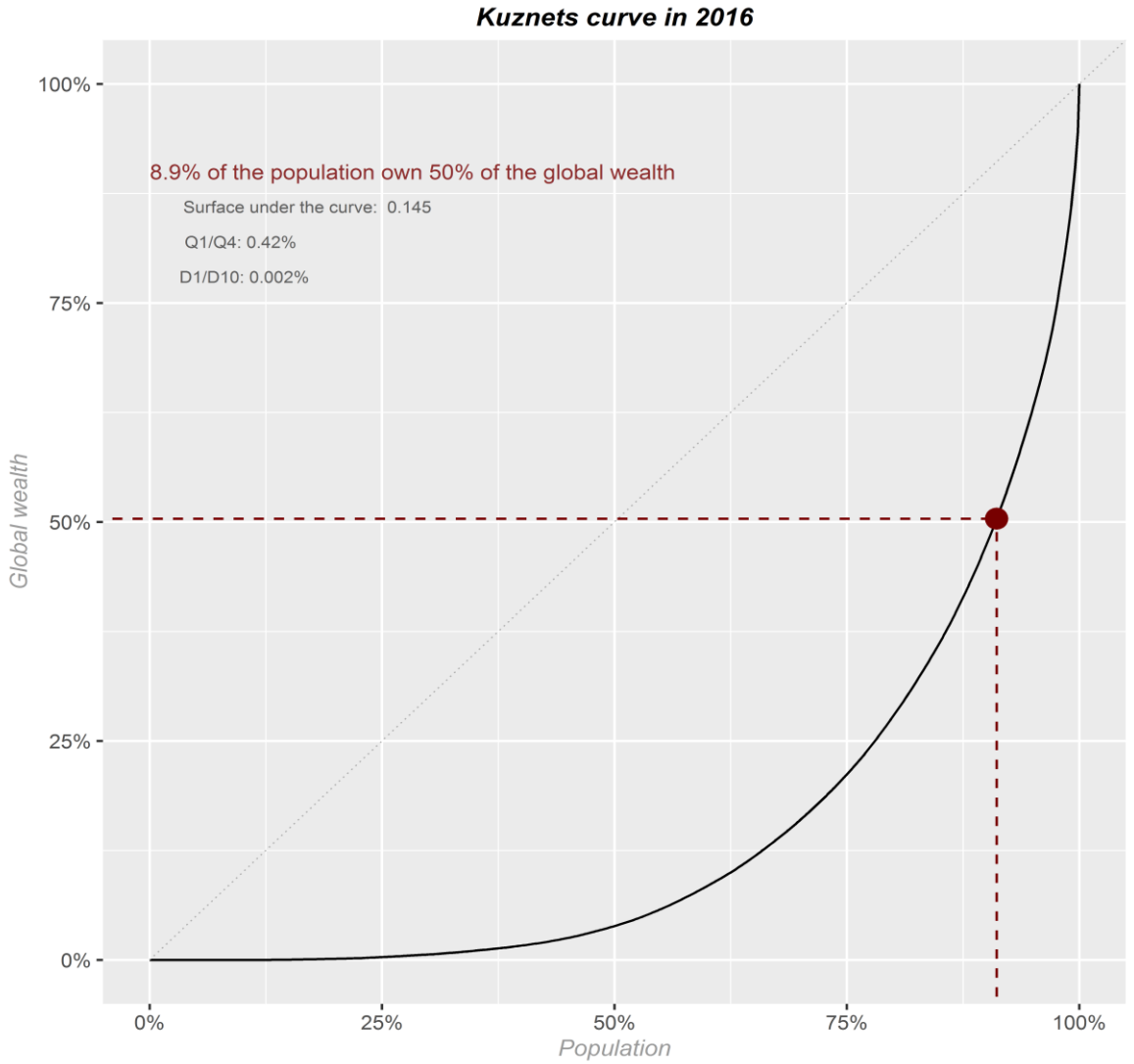


Common-Pool Resource: water

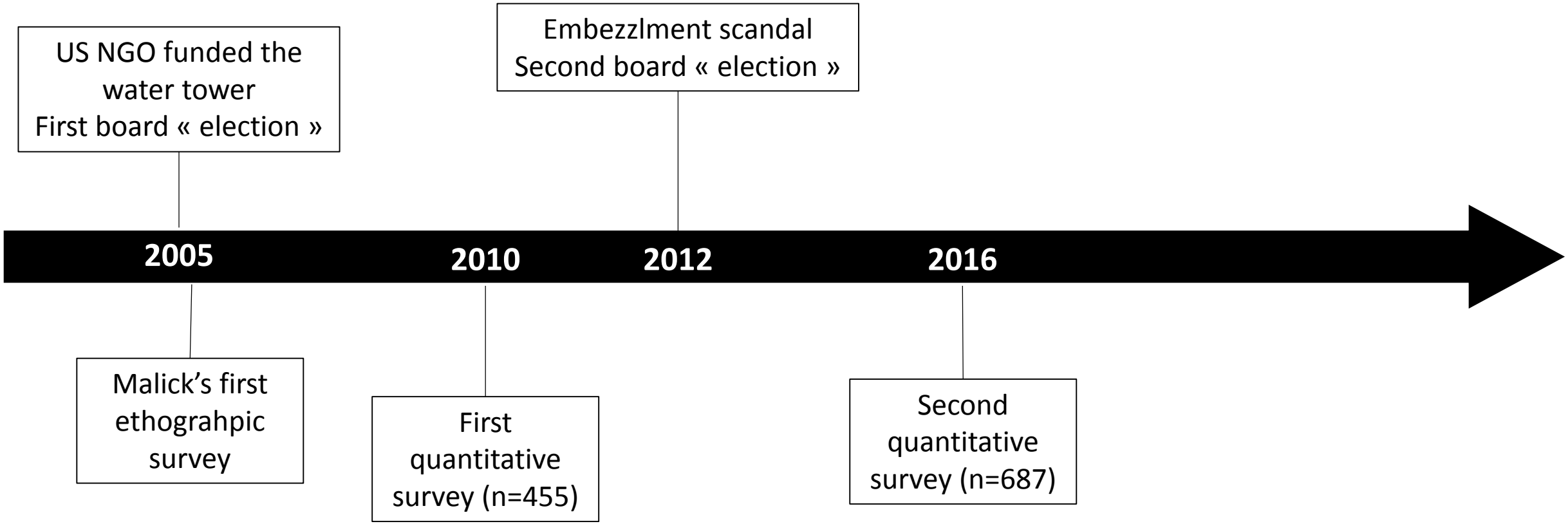
Fieldwork characteristics

Agropastoralist comunity:

- 2 ethnic groups in latent conflicts about water using and land ownership
- 7 villages, 5 inhabited by Wolof peasants and 2 by Fulani pastoralists
- Strong gender inequalities
- Importance of kinship to understand social relationships
- 3 sort of status: economical, political and sociological



Fieldwork Timeline: shocks and waves



Data structure: attribute data

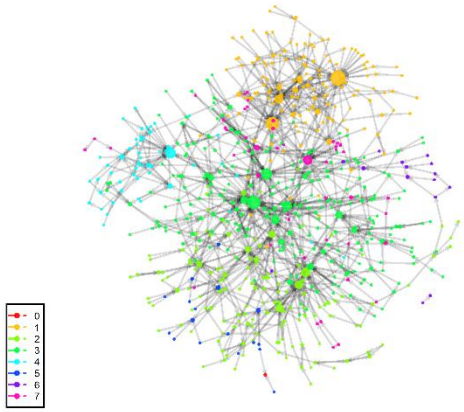
Socioeconomic data

- Geographic: village location, household, geodata (distance)
- Economic: activity, harvests, livestock, agricultural equipment & fields
- Sociodemographic: place of birth, age, gender, language, lineage, board members
- Kinship: for every observed relationships and with partner, village genealogies.

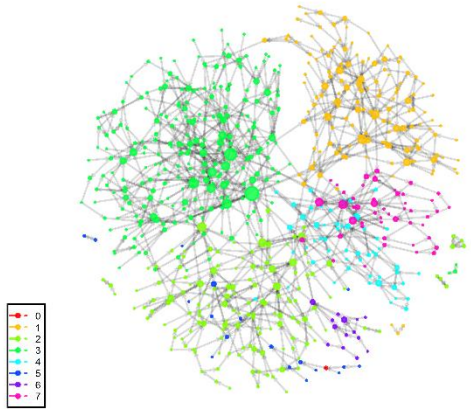
Institutional work

- For both waves: satisfaction about water supply management, common needs on the resource, interest in and evaluation of institutional work
- Only for 2016 wave: election of future board, punitivity (against free-riders), social justice, water consumption

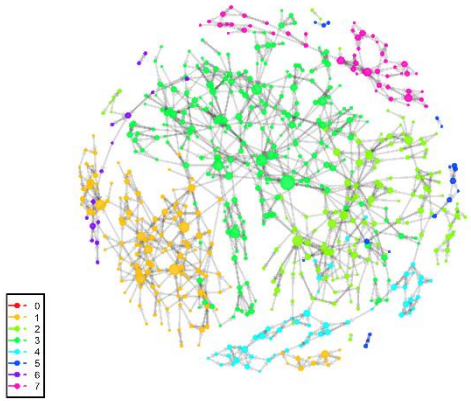
MONEY VILLAGE



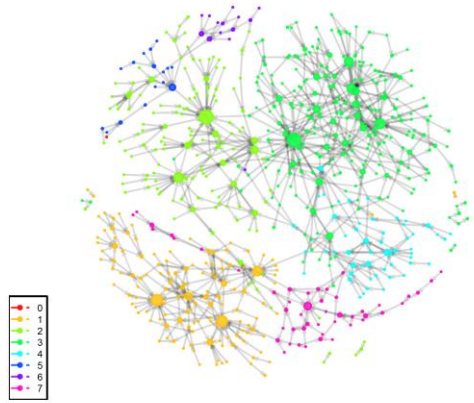
ADVICE VILLAGE



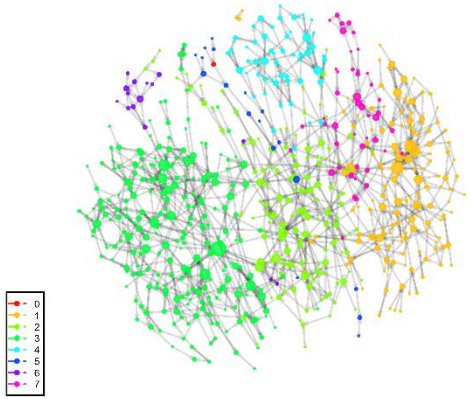
HELP VILLAGE



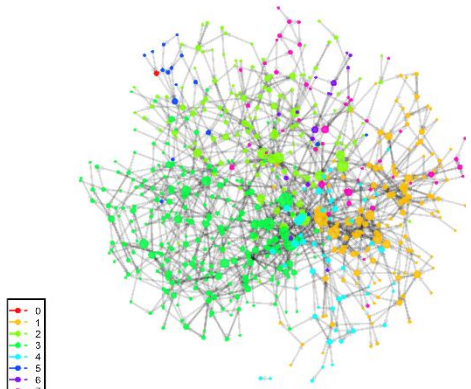
DISPUTE VILLAGE



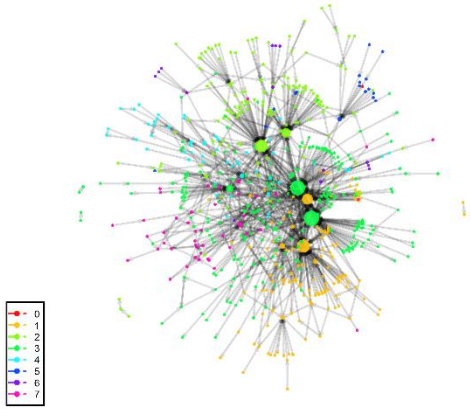
DISCUSSION VILLAGE



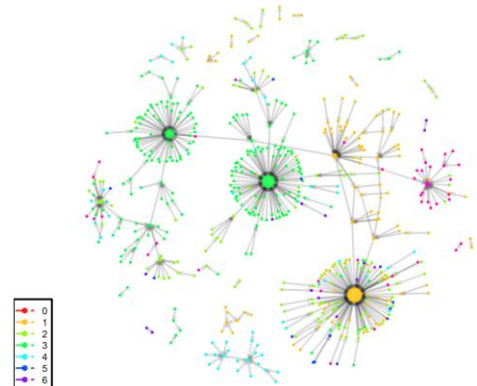
VISIT VILLAGE



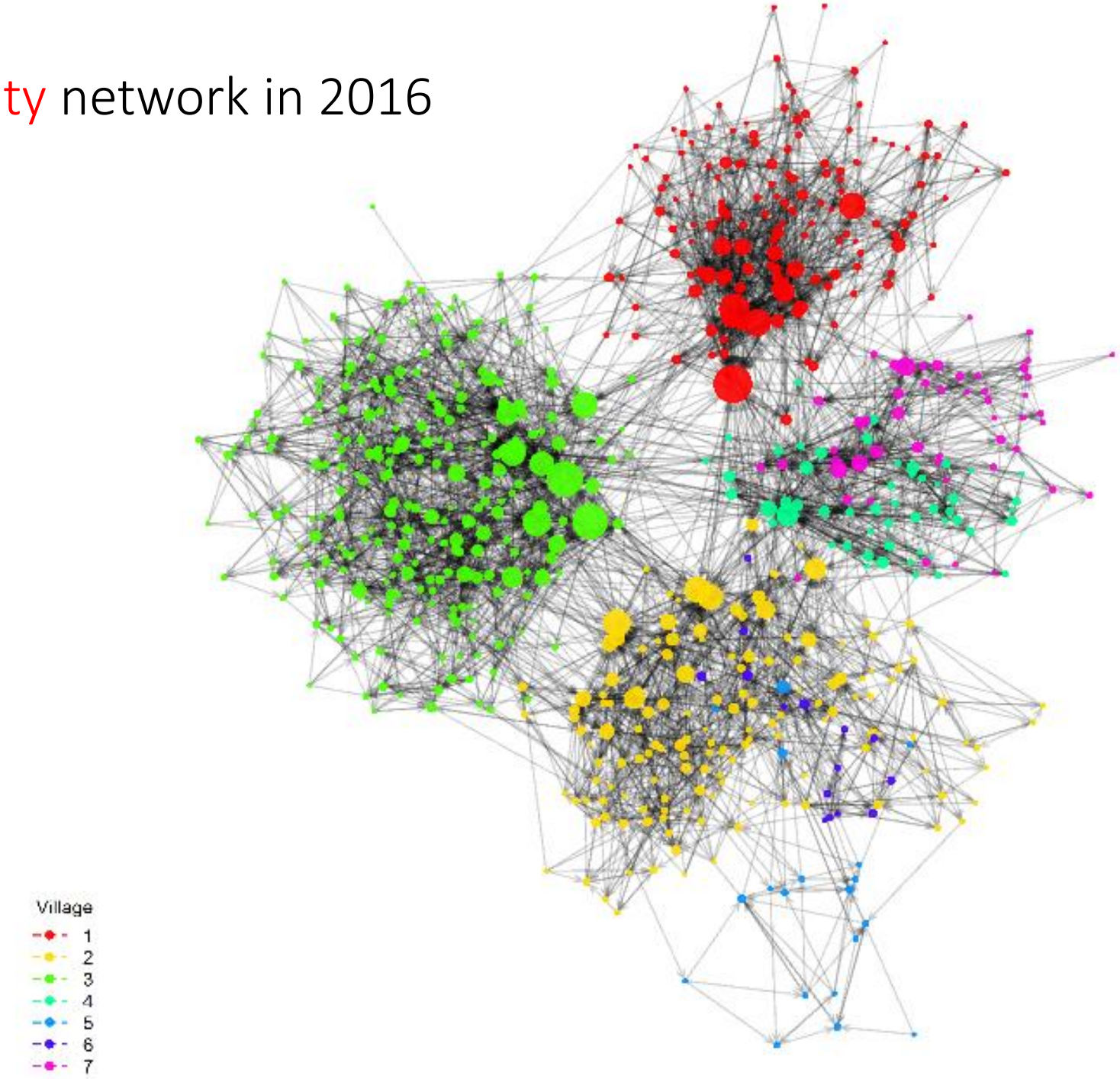
RESOURCE VILLAGE



NEW_PRESIDENT VILLAGE



The overall sociability network in 2016 (n=687)



Data structure: response rate

Population characteristics:

1. High emigration rate
2. High proportion of people under 15 years old
3. Seasonal migration for livestock farmers (transhumance)

	2016	2010
Respondants	**687 (84 %)**	**455 (69 %)**
Non-respondants	**130 (15 %)**	**201 (30 %)**
Away during data collection	21 (2 %)	
Other	10 (1 %)	51 (7 %)
Transhumance	99 (12 %)	150 (22 %)
Total	*817 (100 %)*	*656 (100 %)*
Emigrated	135 (14 %)	172 (20 %)

Population overlap between both waves: 392 individuals

Who is punitive?

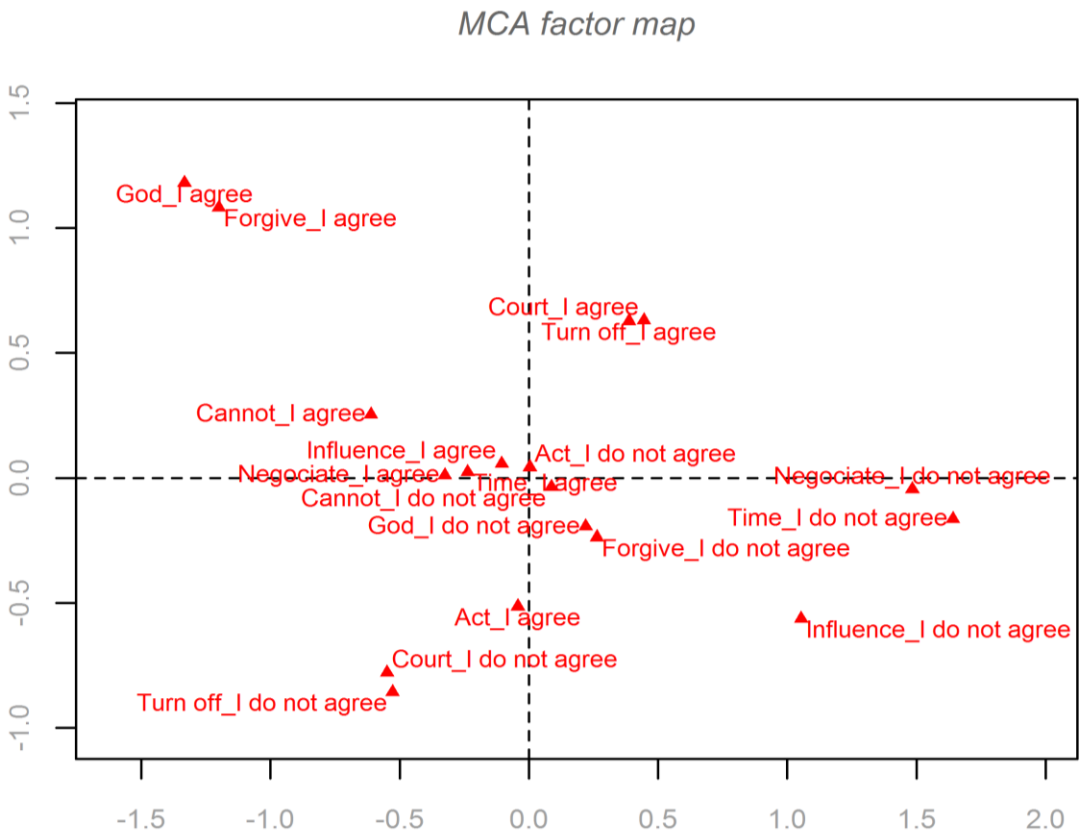
The punitivity question

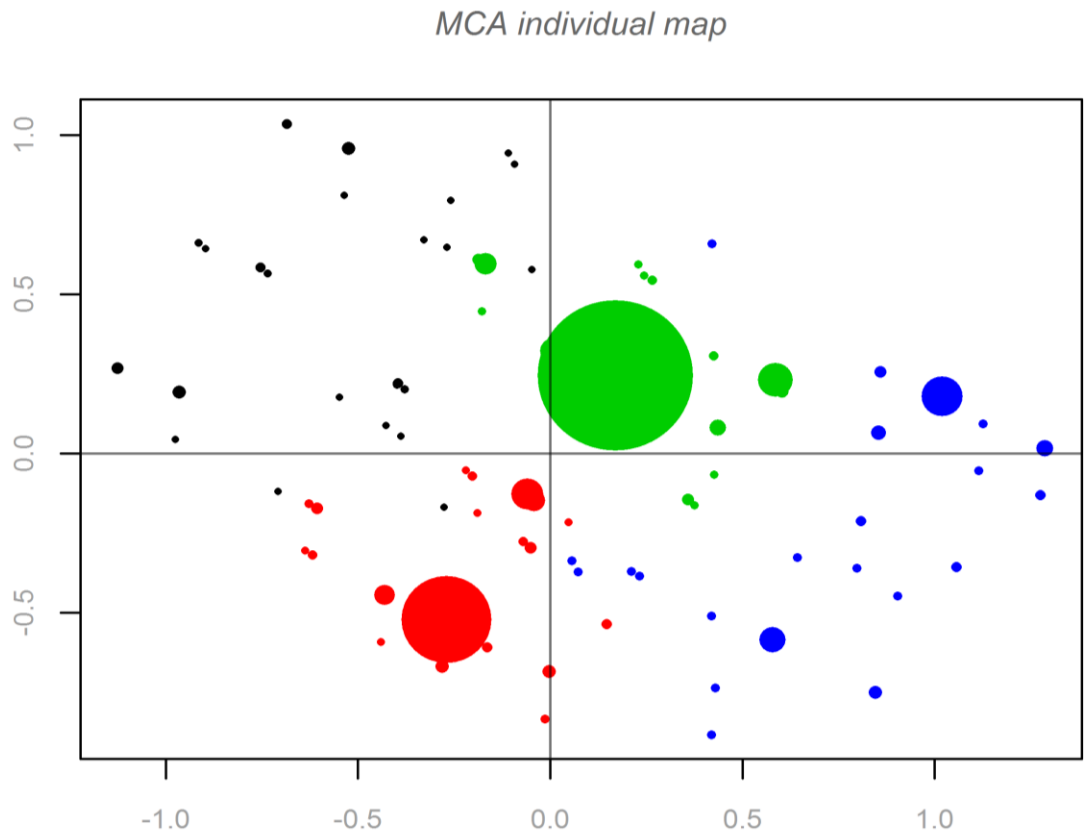
« If some villagers drink/use water but don’t pay the bill, what are for you the appropriate sanction in this case…

- … you do the same (SAME in the graphs)
- … “let them with God” (GOD)
- … forgive them (FORGIVE)
- … « who cannot cannot, and who wan’t wan’t» (CANNOT)
- … give them more time (TIME)
- … negociate with them (NEGOTIATE)
- … ask someone to speak with them (INFLUENCE)
- … Turn off water access (TURN OFF)
- … pursue them in court » (COURT)

The punitivity question

Factorial analysis on responses at that question:



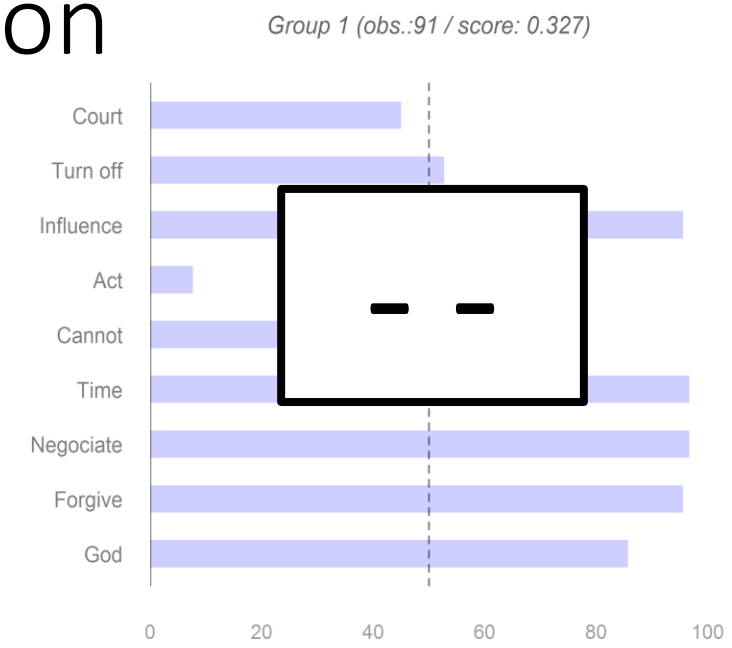


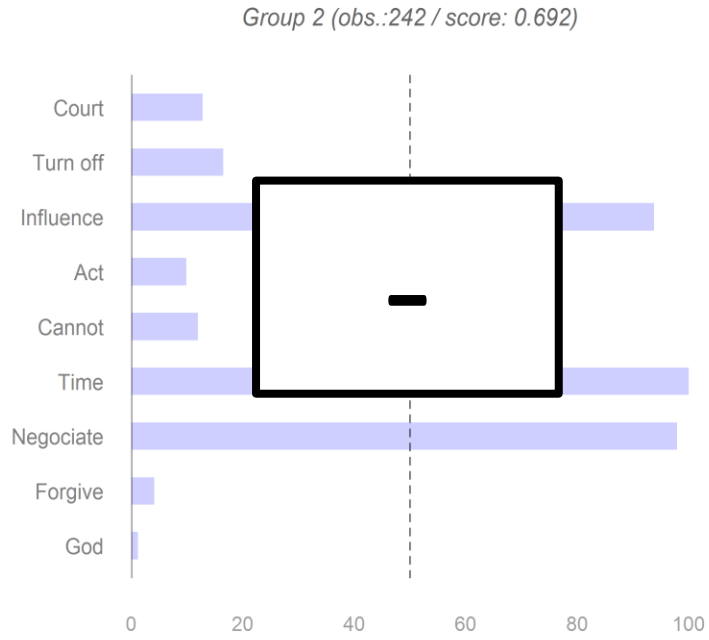
⇒ More punitive individuals are mostly males, cumulating multiple forms of status, highly popular in sociability and influence networks, and are more likely guardians. These results underline a correlation between status and punitivity.

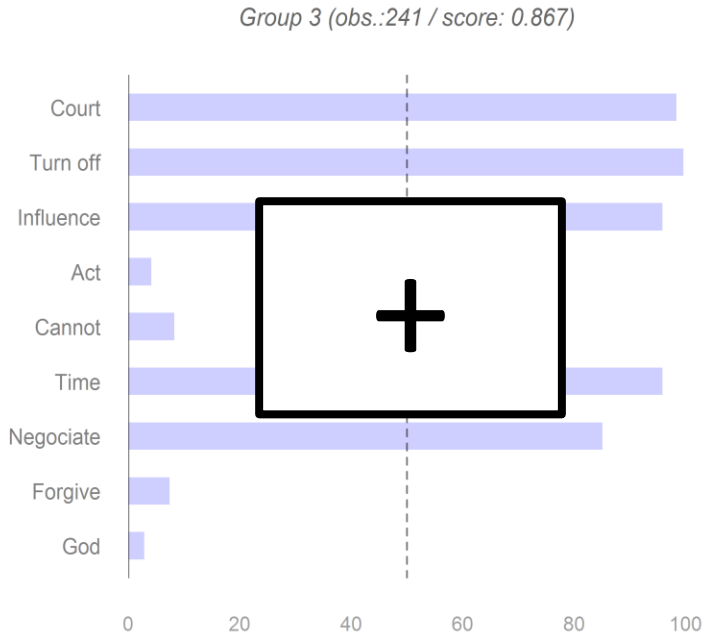
The punitivity question

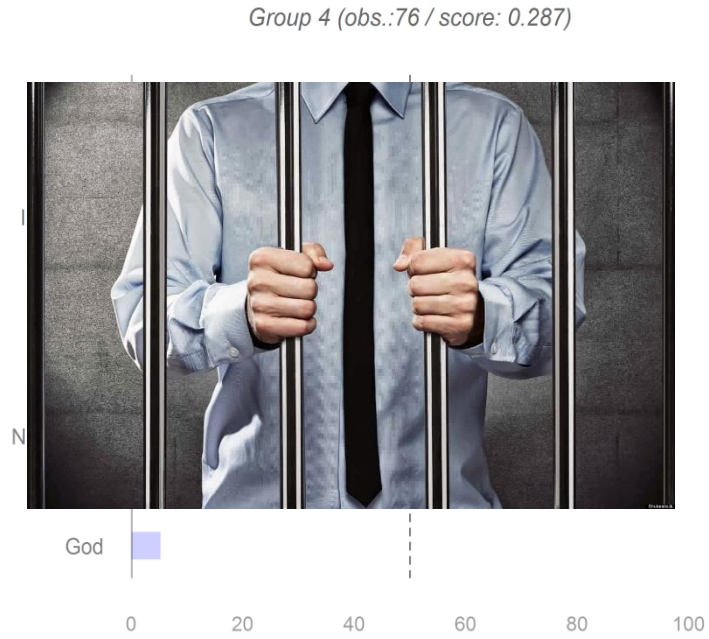
Population was divided in four groups (based on a hierarchical clustering analysis).

- Group 1: called the *forgive* group. 91 individuals are in this group.
- Group 2: called the *negotiate* group. 242 individuals are in this group.
- Group 3: called the *negotiate and court* group. 241 individuals are in this group.
- Group 4: after the *court* group. 76 individuals are in this group.







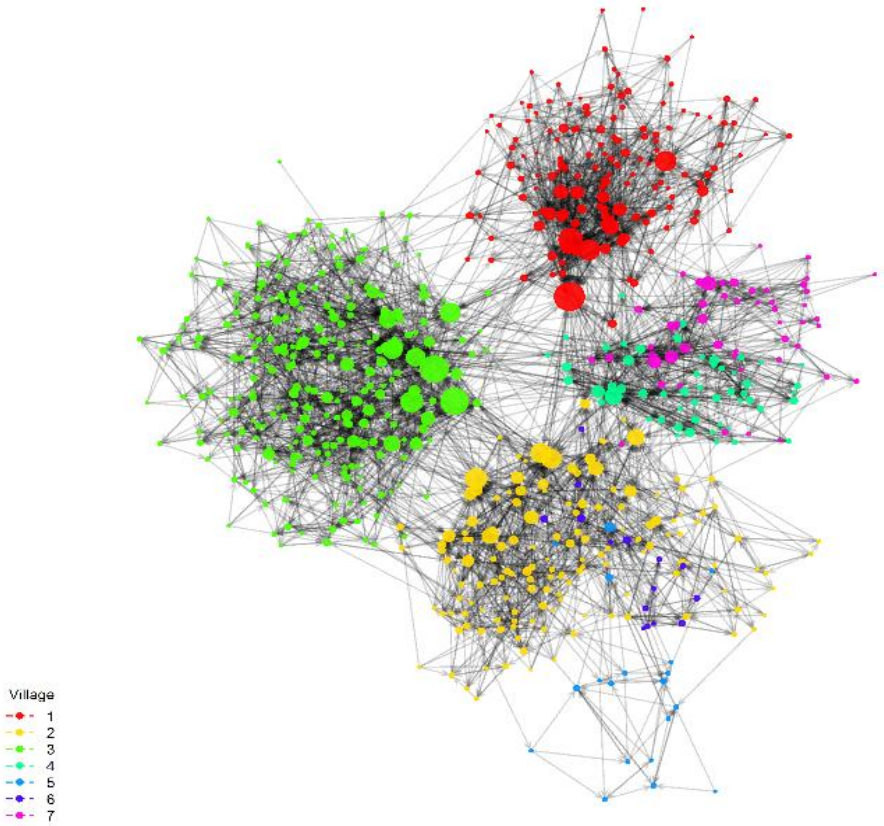


The raising of social norms

How an opinion is explained by individuals' attributes but also by their relationships? How opinion of people I am in relationship influence my opinion?

Because of MPNet for ALAAM needs a binary attribute, I binarized punitivity group affiliation: for people in groups 1 and 2 (less punitive people), the value is 0: for those ones in groups 3 and 4, the more punitive, value is 1.

⇒ How strong punitivity spreads out the "sociability" network?



ALAAM on punitivity

- Social influence effect (contagion): the more I am in relationship with strongly punitive, the more am I.
- Social justice : impact of egalitarian views on social justice (weather or bigger household have to pay less) is no significant.
- Board members : the representatives of the community are more punitive than the rest of the population.
- Influence network: the more an individual is named for the influence question, the more he/she is punitive.
- Also male, Wolof and family chief are more punitive.

	Effects	**M1**
Structural effects	Intercept	-0,849 (0,421) *
	Sender	0,045 (0,037)
	Contagion	0,055 (0,025) *
Control effects	Redistribution social justice	-0,100 (0,182)
	Interest in board work	-0,228 (0,179)
Socioeconomic effects	Family chief	0,741 (0,296) *
	Female	-0,612 (0,278) *
	Age	-0,003 (0,005)
	Farmer	0,155 (0,216)
	Livestock farmer	-0,084 (0,255)
	Merchant	0,123 (0,287)
	Peul	0,593 (0,225) *
Status effects	Lineage	0,075 (0,184)
	Rich	0,194 (0,297)
	Board members	1,315 (0,584) *
Guardian effect	Influence popularity	0,092 (0,045) *

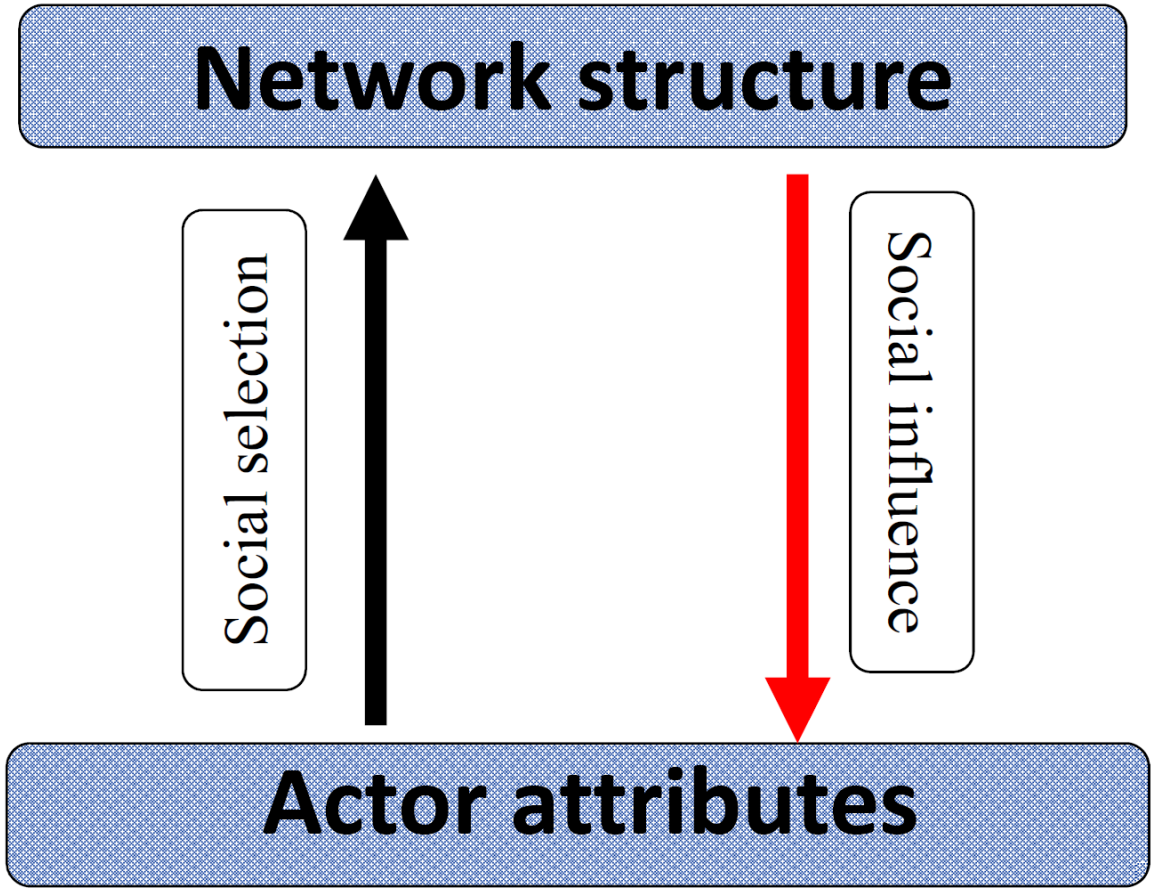
Conclusion

Social dynamics

Network structure influences actor attributes at the same time as actors shape the structure of their behavior (smoking behaviour, friendship)

PNet: ERGMs and ALAAM

SIENA: stochastic actor oriented models (SAOM)General logic of a statistical test



ERGMs versus ALAAMs

ERGM is a tie-based model

- Predicting ties
- Social selection
- Number of data points

is the number of possible ties: n(n-1)

- ALAAM is a nodebased model
- Predicting behaviour
- Social influence
- Number of data points

is the number of actors: n

Snijders et al (2006) SAOM can do both simultaneously
But only with longitudinal data

Thank you for your attention…