

# Network applications in economic systems

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## Networks

Broad and general concept

Used in myriad of settings:

- Social interactions
- Information technology and infrastructure
- Biological and ecological
- Cultural studies and Economics

Describes how things, **nodes**, connect and interact via **edges**

Reveals patterns in complex system:

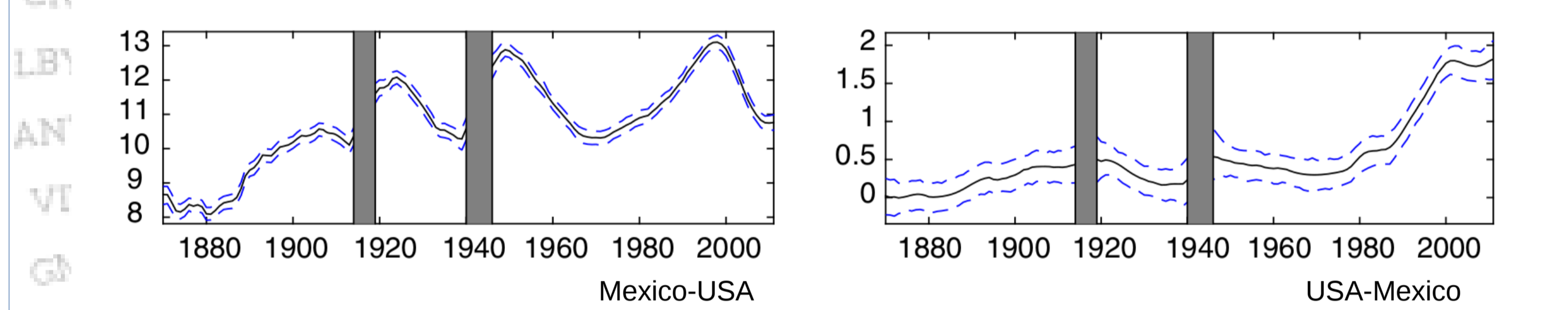
- Find most influential/central nodes
- Uncover community structures
- Dynamics on top of network
  - Information/disease spread
  - Routing

## Historical trade integration

How did the the world's trade patterns evolve?

- Globalization vs. regionalization
- Hegemony vs. colonies
- Impact of World Wars, USSR break-up

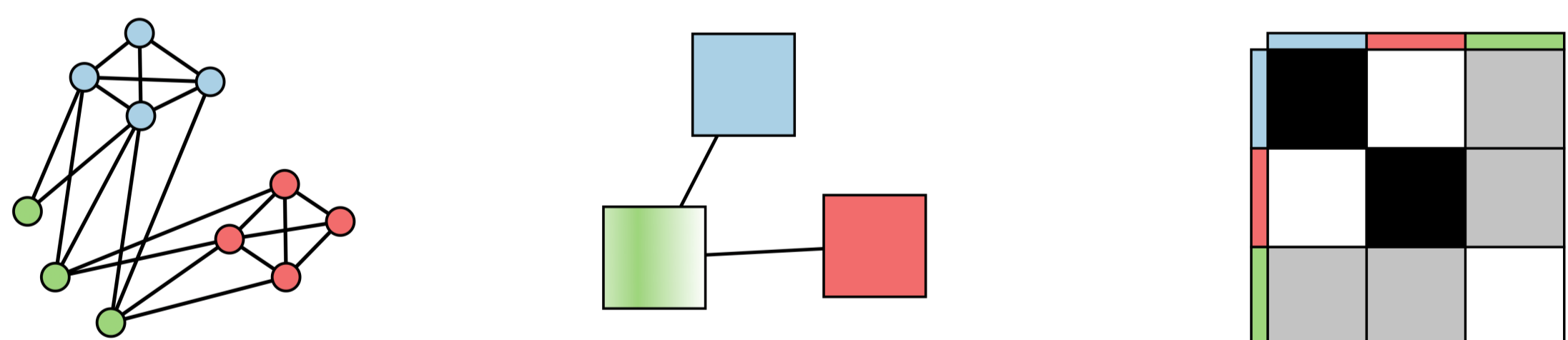
Develop bilateral index of historical trade integration:  
 “How important is country A for country B concerning trade?”



What is the **structure** of this network?

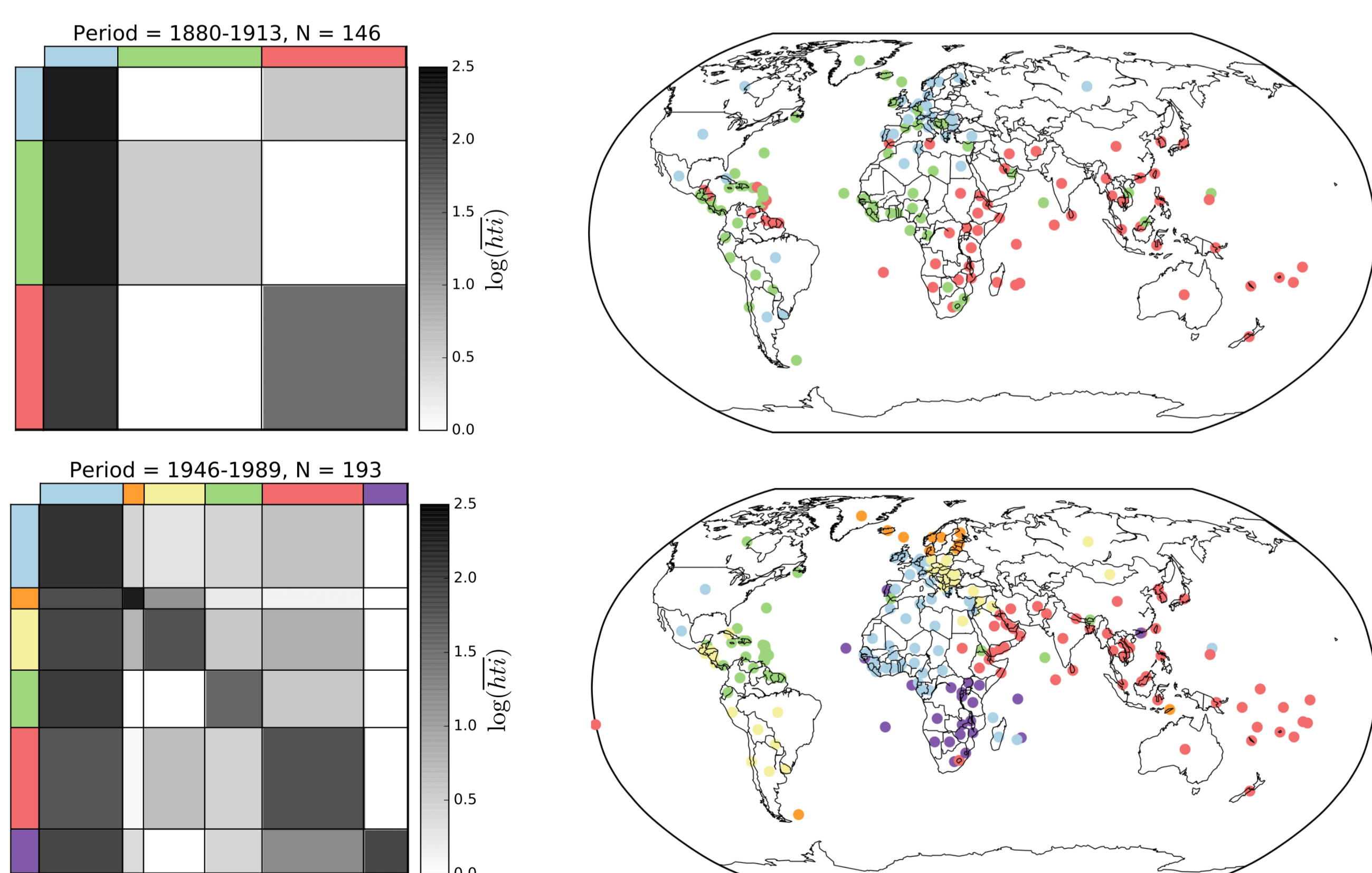
- Is the world flat?
- Are there trade blocks?
- Core and periphery of resp. developed and developing

**Stochastic Block Models** capture this structure



For example first wave of globalization vs second wave

- Core of developed countries
- Periphery with community structure
- inter-community integration increases

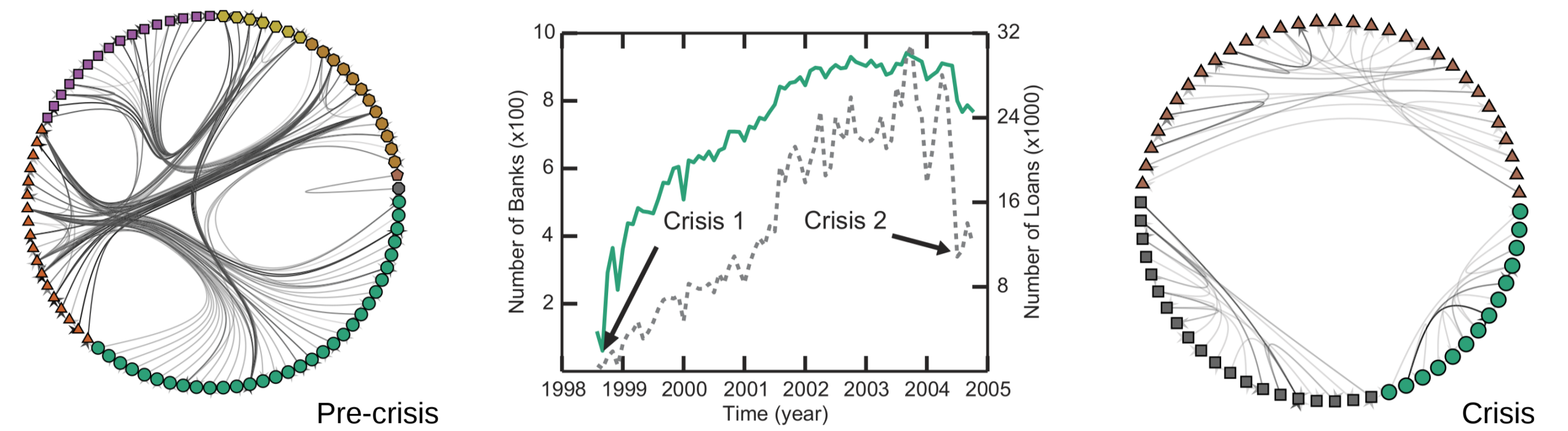


## Interbank lending

Russian data on interbank lending 1998-2004

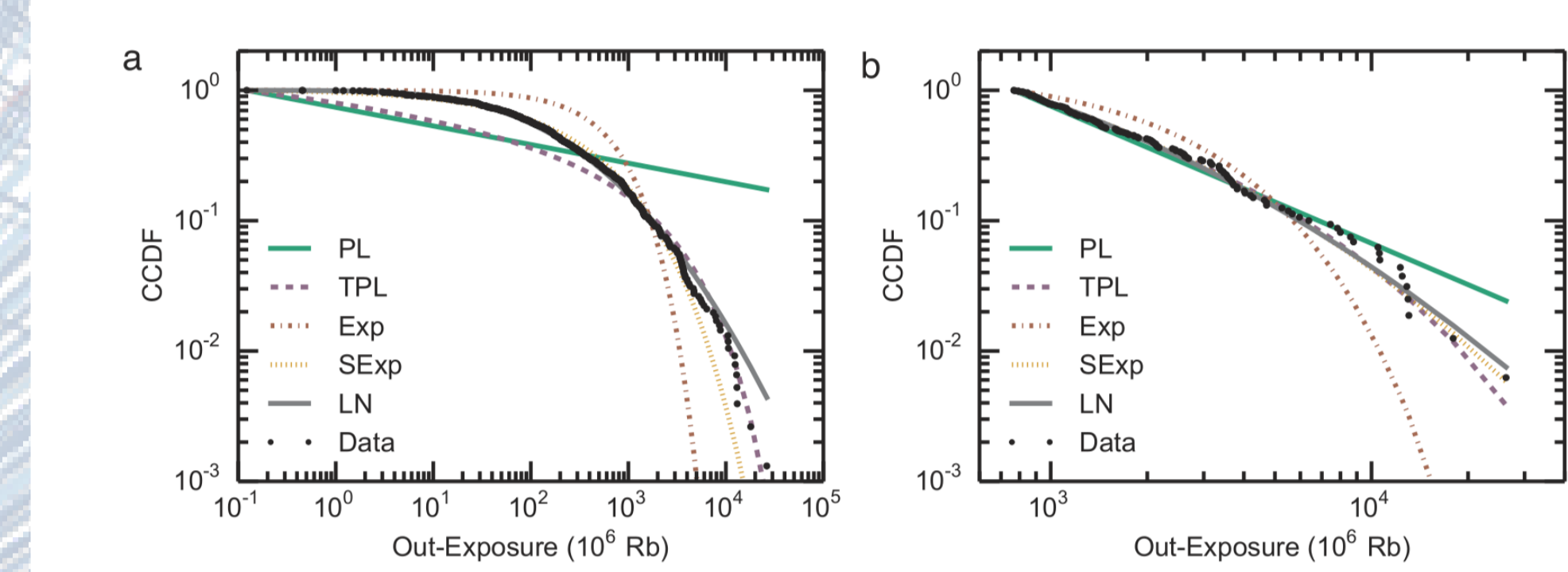
Growing network with two crises.

What was **impact of crises on structure**?



Gather stylized facts on network characteristics

→ useful for stress test simulations



## Current projects of the group

### Game as economic laboratory



Study economy of MMOG

- test economic theories
- relate to real world

High-quality data on 500.000 players, 10 years

- Trade and transportation
- Wealth and conflicts
- Social structures and politics
- Currencies and commodity prices

e.g. Resource Curse: Is living in an environment rich in resources a blessing or a curse? Casual observations of game dynamics reveal that high-resource systems are often the focus of conflicts. But are those conflicts more expensive than the increased income from the resources. To what degree are resources responsible for the existence and also the location of conflicts?

### Social network

Study the effect of a person's social network on her depositor loyalty

Social network (2<sup>nd</sup> order) of 10.000 clients

### Financial transaction network

Study a person's financial payment “eco-system”

Data on 2.000.000 people, 10 years

What is the impact of a person's payment environment on her depositor and investor behavior?

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