GOVERNANCE ROBUSTNESS & RESILIENCE

TALK DELIVERED AT THE INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS - IIASA, LAXENBURG, 12 DECEMBER 2017

DIMITRIS CHRISTOPOULOS,
MU VIENNA &
EDINBURGH BUSINESS SCHOOL, HERIOT-WATT UNIVERSITY

Theoretical background in
“Governance Networks in Politics” in
Hollstein, Matiaske & Schnapp (eds), 2017
Networked Governance, Springer

www.dimitriscc.wordpress.com
Can we predict how a policy impacts a governance system?

- Or framed in relational terms: is the probability of policy success/failure reflected in the structural properties of governance networks?

Governance process and outcomes can be associated to:

- The capacity of a political system to sustain *predictable* shocks – **structural core robustness**
- The capacity of a political system to sustain *low probability* shocks – **contingency robustness & integrity resilience**
- Systemic flexibility dealing with challenges of *change* across the policy cycle – **adaptive resilience**
**Relations & Political Networks**

Relational attributes of political entrepreneurs: a network perspective

Dimitrios C. Christopoulos

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**Political Agency & Institutional Structure**

Network Constraints in EU Banking Regulation: The Capital Requirements Directive

DIMITRIOS C. CHRISTOPOULOS Politics, University of the West of England
LUCIA QUAGLIA Politics and European Studies, Sussex University

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**Governance**

Governance Capacity and Regionalist Dynamics

DIMITRIOS C. CHRISTOPOULOS

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**Political entrepreneurs outsmart the EU Commission**

**Political brokers engineer a compromise facilitating the 2007 financial crisis**

**Economic development is associated to governance capacity**

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**CROSS SECTIONAL ANALYSIS**
Integrating structure and agency in environmental policy

Exceptional agents appear to oscillate between roles to suit

- the audience,
- the nature of the policy challenge and
- the shifting dynamics of the policy cycle (i.e. governance states).

Exceptional agents can be assumed to facilitate systemic resilience.

- Policy entrepreneurs are oscillating between centrality and brokerage roles
- Mixed methods design indicates centrality is linked to power when there is low contestation (i.e. issue salience determines whether centrality matters)
- Policy volatility is associated to the inability of political actors to estimate political influence in a clustered political space (linked to information asymmetry)
Altruistic economic behaviour entails political imperatives.

Political volatility a key concern for economic actors who recognise that they also have political agency.

- Actors who in pursuit of sustainable economic outcomes combine multidimensional agency:
  - Economic
  - Political
  - Civic/social
  - Semantic Network Analysis
Soci-ecological systems and political governance

Sustainability and systemic robustness
- Robustness to shock
- Viability under stress
- Resource flow disruptions
- Natural ecological disasters
- Challenges of collective action

Future Work:
- Inverse Tragedy of the Commons
- Prevalence of pro-social behavior
- Multiplexity & Complexity

Ecology of Games, Lubell, 2013
DEFINING ROBUSTNESS AND RESILIENCE I/III

- These are perceived as properties of systems of political governance
- We aim to assess the impact of shocks (whether internal or external)
- Ideally we should distinguish between systemic
  - process
  - state
  - outcome
- Shocks associated to:
  - Adaptation & anticipated change
  - Risk from unanticipated change
    - known-unknowns and
    - unknown-unknowns
DEFINING ROBUSTNESS AND RESILIENCE II/III

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**Robustness:** Systemic ability to withstand shock, i.e. how thick are the castle walls
- Linked to estimable risk
- Reflects structural integrity of a system in maintaining its core functions under duress
These are perceived as properties of systems of political governance.

We aim to assess the impact of shocks (whether internal or external).

Ideally we should distinguish between systemic:
- process
- state
- outcome

Shocks associated to:
- Adaptation & anticipated change
- Risk from unanticipated change
  - known-unknowns and
  - unknown-unknowns

**Defining Robustness and Resilience III/III**

**Resilience**: Systemic ability to deal with drastic failure/change as a result of shock, i.e. what happens after the collapse of the first line of defence.

- Linked to risk that cannot be estimated
- Reflects structural effectiveness in maintaining systemic functions and
- Ability to adapt to change
<table>
<thead>
<tr>
<th>THOUGHT EXPERIMENT</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BACKGROUND</strong></td>
<td>Given a unified political system (a single net component) with evidence for the prevalence for a key network theoretical claim (i.e. brokerage, clustering etc) an external shock <strong>eliminates</strong> a non-trivial number of ties and/or nodes.</td>
</tr>
<tr>
<td><strong>OUTCOME</strong></td>
<td>Will the surviving network structure (i.e. largest component) be able to efficiently <strong>diffuse</strong> information and/or allow for the execution of coordination tasks? (i.e. level of fragmentation, path length etc)</td>
</tr>
</tbody>
</table>

**Comparing theories:** which are the best at identifying robust and resilient systems?
# Theorizing Political Governance Robustness and Resilience I/II

<table>
<thead>
<tr>
<th>Theory</th>
<th>Key network concept</th>
<th>Locus of Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1. Granovetter’s weak ties</td>
<td>➢ serendipitous access to information</td>
<td>o access to information</td>
</tr>
<tr>
<td>T2. Burt’s structural holes</td>
<td>➢ agents strategize to occupy advantageous positions</td>
<td>o brokers</td>
</tr>
<tr>
<td>T3. Eisenhardt’s principal-agent theory</td>
<td>➢ mediating political agents act in the name of the principal</td>
<td>o information asymmetry</td>
</tr>
<tr>
<td>T4. Ostrom’s collective action model (cf Lubel)</td>
<td>➢ agents may have diverging interests from principals</td>
<td>o agent roles</td>
</tr>
<tr>
<td>T5. Simmel’s cliques (cf Krackhardt)</td>
<td>➢ embedded transitive ties</td>
<td>o tertium gaudens</td>
</tr>
<tr>
<td>T6. Keyplayer</td>
<td>➢ network fragmentation contingent to elimination of certain nodes</td>
<td>o keynodes</td>
</tr>
</tbody>
</table>
## Theorizing Political Governance Resilience II/II

<table>
<thead>
<tr>
<th>Theory</th>
<th>Systemic Power Assumption</th>
<th>Governance Resilience</th>
<th>Governance Robustness</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1. weak ties</td>
<td>➢ mediators do not exact rents for valuable information</td>
<td>➢ in evidence of diffuse ties</td>
<td>➢ In ability to disrupt</td>
</tr>
<tr>
<td>T2. structural holes</td>
<td>➢ mediators exact rents and actively attempt to maintain structural holes</td>
<td>➢ measure of bridge decay</td>
<td>➢ on level of fragmentation</td>
</tr>
<tr>
<td>T3. principal agent</td>
<td>➢ mediators exploit principals by taking advantage of an information advantage</td>
<td>➢ uncertain</td>
<td>➢ evident in embeddedness</td>
</tr>
<tr>
<td>T4. collective action</td>
<td>➢ informed principals can optimise common resource use</td>
<td>➢ uncertain</td>
<td>➢ evident in cohesion</td>
</tr>
<tr>
<td>T5. cliques</td>
<td>➢ <em>tertium gaudens</em>, a mediator can benefit from the conflict of their alters</td>
<td>➢ path length</td>
<td>➢ clique overlap</td>
</tr>
<tr>
<td>T6. keyplayer</td>
<td>➢ maintaining cohesion</td>
<td>➢ ratio of fragmentation to distance attenuation</td>
<td>➢ fragmentation</td>
</tr>
</tbody>
</table>
STUDY DESIGN A: LONGITUDINAL
The Stability Risk Of Political Ecosystems

- **Key assumption:** resilience and robustness can be assessed through the persistence of systemic functions
  - but also via attrition in multi-modal ties
- **Theory:** Prevalence of Simmelian ties will impact robustness
- **Operationalisation:** Relations can be examined as multi-layered and combine:
  - Mandated, formal and directed networks
  - Affiliation and multi-mode relations
  - Affective and preference ties
  - Personal and organisational ties
- **Caveat:** Compatibility of underlying assumptions
- **Measure:**
  - bridge decay (agency),
  - oscillation bridge-bond (agency, resilience),
  - maximum path length does not increase (resilience)
  - Simmelian clique prevalence (robustness)

Some **limitations** with studying governance networks:
- Distinct state and process dynamics
- Distinct process and outcome drivers
- A system of agents
  - Subject to state transitions: i.e. a punctuated equilibrium system:
  - Each is unique
    - Case study
  - Power unequally distributed among agents
  - Power is often latent
  - Actors often hierarchically constrained
STUDY DESIGN A: LONGITUDINAL
The Stability Risk Of Political Eco-systems

- Key assumption: resilience and robustness can be assessed through the persistence of systemic functions
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- Caveat: Compatibility of underlying assumptions
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  - bridge decay (agency),
  - oscillation bridge-bond (agency, resilience),
  - maximum path length does not increase (resilience)
  - Simmelian clique survival (robustness)

AIM is to optimise network structure towards robust and/or resilient governance

- path redundancy
- power-law distribution of ties
- scale-free networks (cf. self-healing nets)
Hypotheses:

[Assuming evidence of a shock]

- Systemic robustness evident in level of fragmentation
- Systemic resilience evident in degree to which fragmentation and distance is concentrated on the same actors
Keynode is optimising a network fragmentation statistic and calculating the value of each node to overall cohesion (Everett and Borgatti, 1999; Borgatti, 2006)

Implemented in R by An and Liu (2016) as an iterative algorithm optimized for group centrality

Herfindahl index: $H = 1 - \sum_k \left( \frac{s_k}{n} \right)^2$

Information entropy: $E = -\sum_k \frac{s_k}{n} \ln \left( \frac{s_k}{n} \right)$
STUDY DESIGN B: CLUSTER ANALYSIS & KEYNODE DETECTION COMBINED

PHASE I: AUSTRIAN FLOOD POLICY

JRC-EC FUND TO CEDDIA, & CHRISTOPOULOS 2015-2016
HERNANDEZ-GONZALEZ ET AL, 2016 & CEDIA ET AL 2017 ENVIRONMENTAL SCIENCE & POLICY

Clustering

<table>
<thead>
<tr>
<th>Groups</th>
<th>Actors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>1, 2, 8, 9, 11, 13, 16</td>
</tr>
<tr>
<td>Group 2</td>
<td>3, 4, 7, 10, 14, 29</td>
</tr>
<tr>
<td>Group 3</td>
<td>5, 6, 12, 15, 32</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Density</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>0.48</td>
<td>0.10</td>
<td>0.06</td>
</tr>
<tr>
<td>Group 2</td>
<td>0.12</td>
<td>0.27</td>
<td>0.00</td>
</tr>
<tr>
<td>Group 3</td>
<td>0.20</td>
<td>0.07</td>
<td>0.25</td>
</tr>
</tbody>
</table>

CLIQUES: Hierarchical Clustering of Overlap Matrix (16)

Keynode detection by combining cluster analysis, with alpha and beta ranked actors
1,2,4,5 alpha - distance
1,9,12,15 beta - fragmentation
STUDY DESIGN B: RESEARCH DESIGN

Research design for a longitudinal field-experiment:

\[ G_{t1} - G_{t2} - \text{SHOCK} - G_{t3} \]

**Effect of shock:** \( G_{t3} - G_{t2} = E \)

Control for network stability rate:

\[ G_{t2} - G_{t1} = \text{ST}_{t2-t1} \]

F: subset of ranked alpha fragmentation nodes
D: subset of ranked beta distance nodes

**HYPOTHESES**

**Robustness** \( E_B \)

\[
\max(E_B) \leftrightarrow F_{t2} - F_{t1} \approx 0
\]
i.e. robust structure evident in small change of fragmentation metric

**Resilience** \( E_S \)

\[
\max(E_S) \leftrightarrow \{F_{t2} \land D_{t2}\} = \{F_{t1} \land D_{t1}\}
\]
i.e. resilient structure evident when intersection of top ranked nodes in alpha and beta, is stable across time
Governance as the *product* of political exchange is associated to the *quality of interaction* between political agents. Jones et al. (1997) and Robins et al. (2011) term this to be governance embeddedness.

Governance as a *process* is associated to changes in the *patterns of interaction* between political agents. For instance, the degree to which there are changes in core-periphery, the multiplicity of clusters, the persistence of cliques, prevalence of brokers or the skewness in the distribution of ties. All these relational properties affect the agency of political actors (Christopoulos and Ingold, 2015). This is the focus of governance robustness and resilience as examined here.

Furthermore, governance research designs should ideally capture the multiple dimensions of political agency with a contingent capture of (meso-level) structure. This can be achieved with dynamic, multi-level and multi-mode analysis (Knoke, Diani & Christopoulos, forthcoming, CUP).

Research design decision: agents, systems or both?
Estimating governance resilience and robustness can be instrumental in identifying:

- the effectiveness & efficiency of governance systems
- the risk of process failure
- the risk of outcome failure
- & the capacity of systems to adapt

Ultimately this is associated to the study of policy governance & political risk.
Thank you for your attention.

Look forward to your questions….

dimitriscc@gmail.com
ERGMs are Monte Carlo Markov Chain simulations that allow model testing that combine network structural characteristics (i.e. reciprocity) with attributes of nodes (i.e. leadership) with variables associated to tie formation at the dyadic level (i.e. reputation).
CROSS-BORDER POLICY NETWORKS
SOHN, CHRISTOPOULOS & KOSKINEN

METRONET PROJECT, funded by the Luxembourg National Fund for Research.

Five case studies in Europe.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Lille Estimates (SEs)</th>
<th>Basel Estimates (SEs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arc</td>
<td>1.928* (0.703)</td>
<td>-</td>
</tr>
<tr>
<td>Reciprocity</td>
<td>1.069* (0.292)</td>
<td>-</td>
</tr>
<tr>
<td>In2Star</td>
<td>0.023* (0.116)</td>
<td>0.000* (0.120)</td>
</tr>
<tr>
<td>Out2Star</td>
<td>0.000* (0.116)</td>
<td>0.016* (0.120)</td>
</tr>
<tr>
<td>In3Star</td>
<td>0.011* (0.001)</td>
<td>0.002* (0.001)</td>
</tr>
<tr>
<td>Out3Star</td>
<td>0.000* (0.001)</td>
<td>0.000* (0.001)</td>
</tr>
<tr>
<td>Transitive-Triad</td>
<td>0.210* (0.044)</td>
<td>0.269* (0.054)</td>
</tr>
<tr>
<td>Cyclic-Triad</td>
<td>0.269* (0.054)</td>
<td>0.269* (0.054)</td>
</tr>
<tr>
<td>Important actors Sender</td>
<td>0.536* (0.299)</td>
<td>0.807* (0.352)</td>
</tr>
<tr>
<td>Important actors Receiver</td>
<td>1.063* (0.37)</td>
<td>0.346 (0.249)</td>
</tr>
<tr>
<td>Important actors Interaction</td>
<td>-0.517 (0.428)</td>
<td>0.342 (0.422)</td>
</tr>
<tr>
<td>Cross-border cooperation</td>
<td>-0.327 (0.164)</td>
<td>-0.164 (0.210)</td>
</tr>
<tr>
<td>Distance</td>
<td>0.198* (0.064)</td>
<td>0.121* (0.053)</td>
</tr>
<tr>
<td>Territorial border</td>
<td>-0.499* (0.193)</td>
<td>-0.27* (0.278)</td>
</tr>
</tbody>
</table>

Geography has a U shaped effect on the creation and maintenance of a tie.

Administrative borders sometimes act as catalysts to Policy Networks.
Centralities are a widely studied phenomenon in network science. In policy networks, central actors are of interest because they are assumed to control information flows, to link opposing coalitions and, finally, to directly impact upon decision-making. We study what type of actor (e.g. state representative; interest group) is able to occupy central positions in the highly institutionalized context of a policy network. We then ask whether bonding or bridging centralities are more stable over time, and how these types of centrality influence actors’ positions in the network over time. We therefore adopt a longitudinal perspective and run Exponential Random Graph Models, including lagged central network positions at t1 as the main independent variable for actors’ activity and popularity at t2. Results confirm that only very few actors are able to maintain central positions over time.