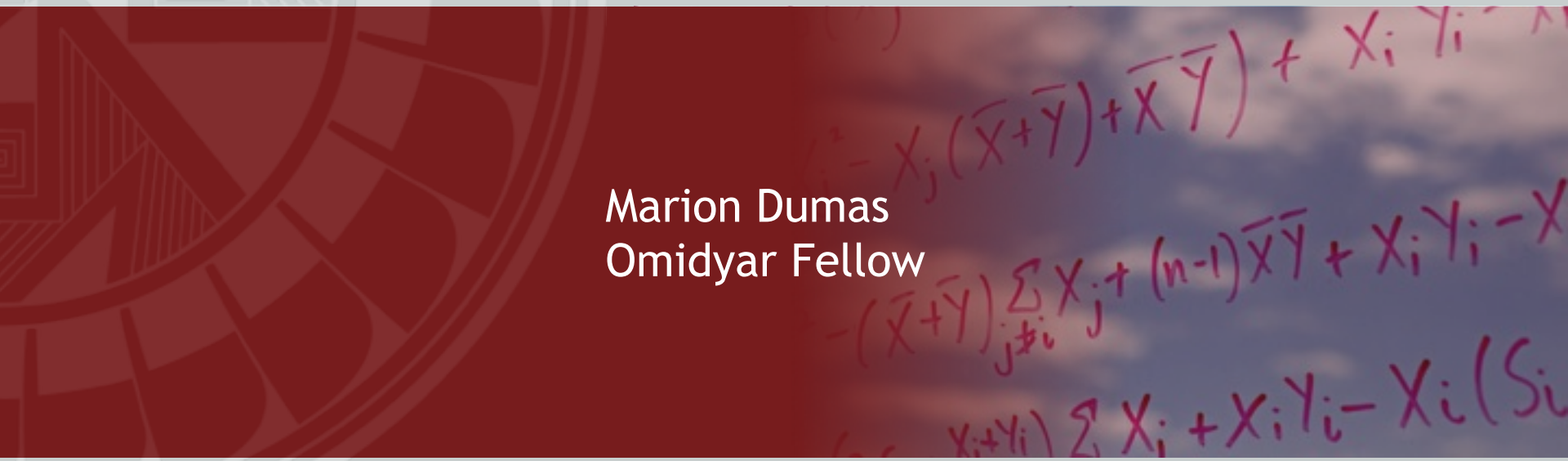
Cities and governance for sustainability II: catalysts for change?



Marion Dumas
Omidyar Fellow

Global city networks

- ICLEI, Local Governments for Sustainability: 1200 local governments since 1990.
- Cities for Climate Protection (part of ICLEI): cities commit to concrete actions for carbon reduction.
- C40 Cities Climate Leadership Group (C40): a network of cities created in 2005 by the London Mayor and the Clinton Foundation's climate change initiative.

Regional transnational networks

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Goals:
- voluntary commitments
- enhance local capacity
- push for more ambitious policy at higher levels of government

Kern, Bulkeley 2009

- Cities for Climate Protection
- Climate Alliance
- Energie-Cités


COMPACT of MAYORS
About
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Map data ©2016
Cities Committed to the Compact of Mayors


COMPACT of MAYORS
About
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Participate
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Partners
Contac
New York City, NY
United States
Total Emissions:
51,310,978
million Tonnes per year
Population: 8,440,000
Mayor: Bill de Blasio
Phases Completed:
Learn More about New York City, NY →
Nairobi
Kenya
Population: 3,138,369
Mayor: Evans Kidero
Phases Completed:
Learn More about Nairobi →
Map data ©2016
Cities Committed to the Compact of Mayors

Methods of governing

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Internally

- Communication: diffusion of best practices -> heuristics
- Cooperative bids for national or supra-national funding for projects
- Recognition, benchmarking, certification: attempt to create peer-pressure

Externally:

- Brokerage with key decision-makers at supra-national level (e.g. European commission)
- Observer status at COP; able to publicize what actions have been tried

1000 city officials at COP21

Issues raised: lifting some of the limits on cities

- Recall, urban governance can be a zero-sum game (because of competition and leakage)
- Non zero-sum strategies: 24 cities of C40 commit to purchases together to lower the price of electric buses
- Focus in COP21 put on bringing funds to the local level: Cities Climate Finance Leadership Alliance: bringing attention to $4.1-4.3 trillion dollar gap in urban climate finance
- Cities as place to build constituencies: make climate change more concrete to citizens and engage them

Paris Accord: a Universal and Pragmatic strategy

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- Strong market signal to invest (why strong? because unity and long-term)
- Increased ambition to a 1.5C limit, despite increasing difficulty of reaching it
- Common but differentiated responsibility
- Start with *voluntary* action plans by each nation
- Establishes a regular mandatory process for monitoring emissions and increasing ambitions
- $100 billion/year (non-legally binding) pledge by 2020

- Features of urban governance for sustainability
  - networks
  - information
  - voluntary commitments

} common to intl treaty as well

- Key question:
  - under what conditions can we expect these initiatives to exert influence on higher-level policy and broader outcomes?

Critical voices: it's only feel good politics

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« Fossil fuels continue to dominate new energy infrastructure. Maersk is not unveiling solar powered container ships. Boeing and Airbus appear content with the age of kerosene. Steel makers are sticking with coal. 20 million new cars are added to China's roads each year. Electric cars remain marginal everywhere: in Germany, where they wanted 1 million of them on the roads by 2020 and in America where Obama spoke of 1 million being on the roads by 2015. Despite what you may read, China is still opening roughly one new coal power plant each week. India plans to double its coal production by 2020. Green Germany just opened a new coal power plant last month. Britain announced a phase out of coal power plants, but plans to build a new fleet of gas power plants. » ***Robert Wilson, University of Strathclyde***

Moving the needle?

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The sum of all sub-national initiatives would stabilize US emissions to 2010 level by 2020

Energy Policy 36 (2008) 673–685

www.elsevier.com/locate/enpol

America's bottom-up climate change mitigation policy

Nicholas Lutsey*, Daniel Sperling[1]

For the most part, we do not yet know how these will translate into concrete ecological gain!

But we can reason about mechanisms by which cities can catalyze change:

- INNOVATION
- POLICY DIFFUSION
- CHANGING POLITICAL DYNAMICS

Cities and green innovation?

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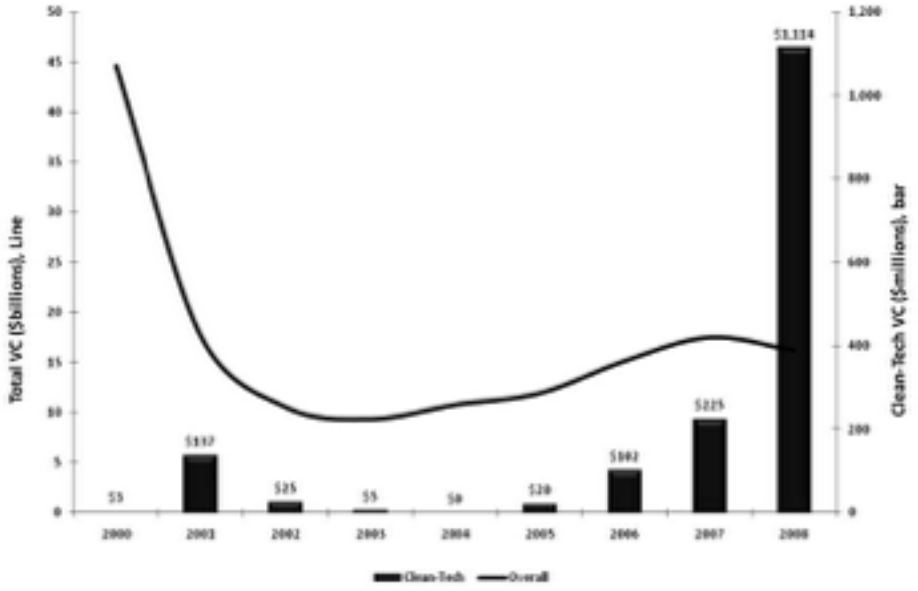
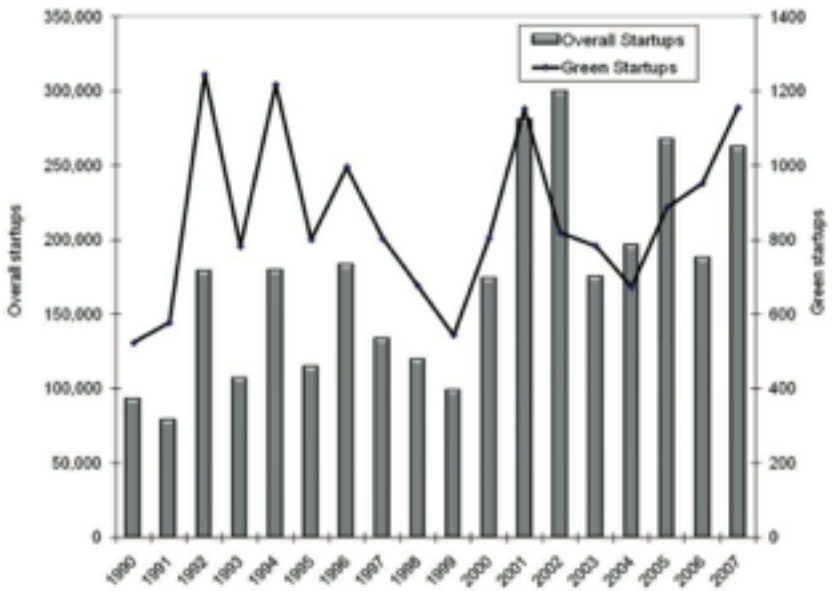
Clean-tech innovation in California: limited venture capital and start-up growth?





Chapple et al. 2011

Coordination: one of the challenges of green innovation

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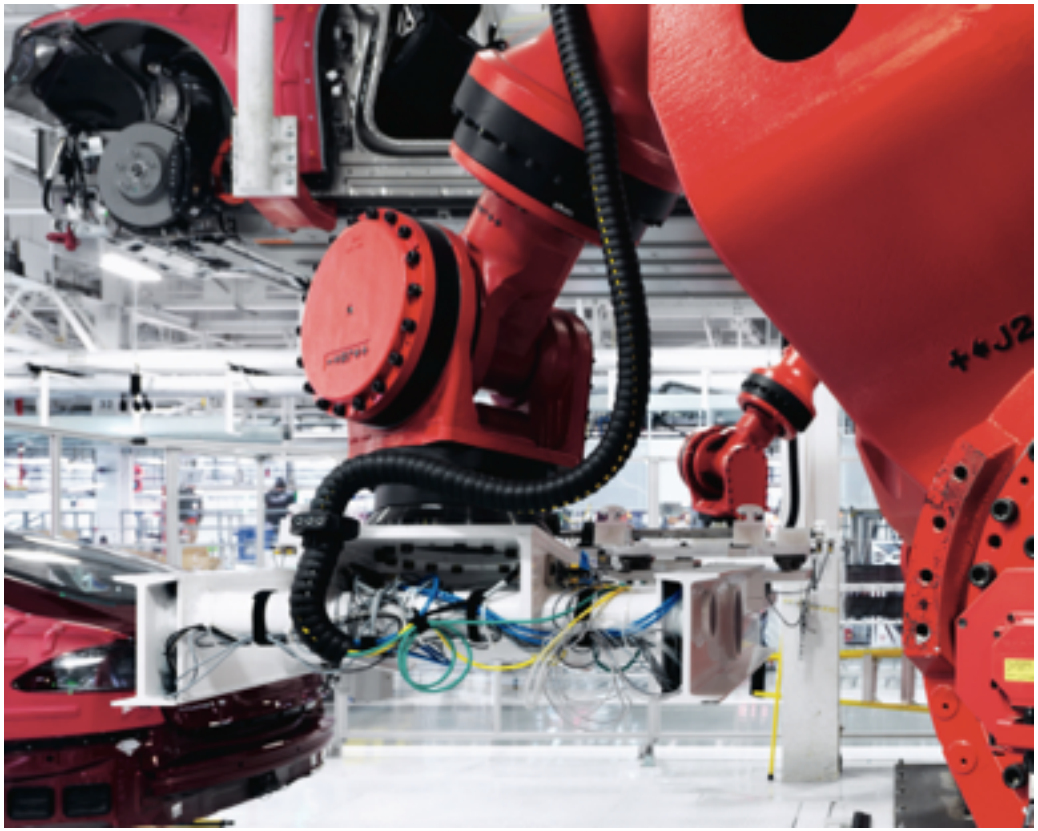
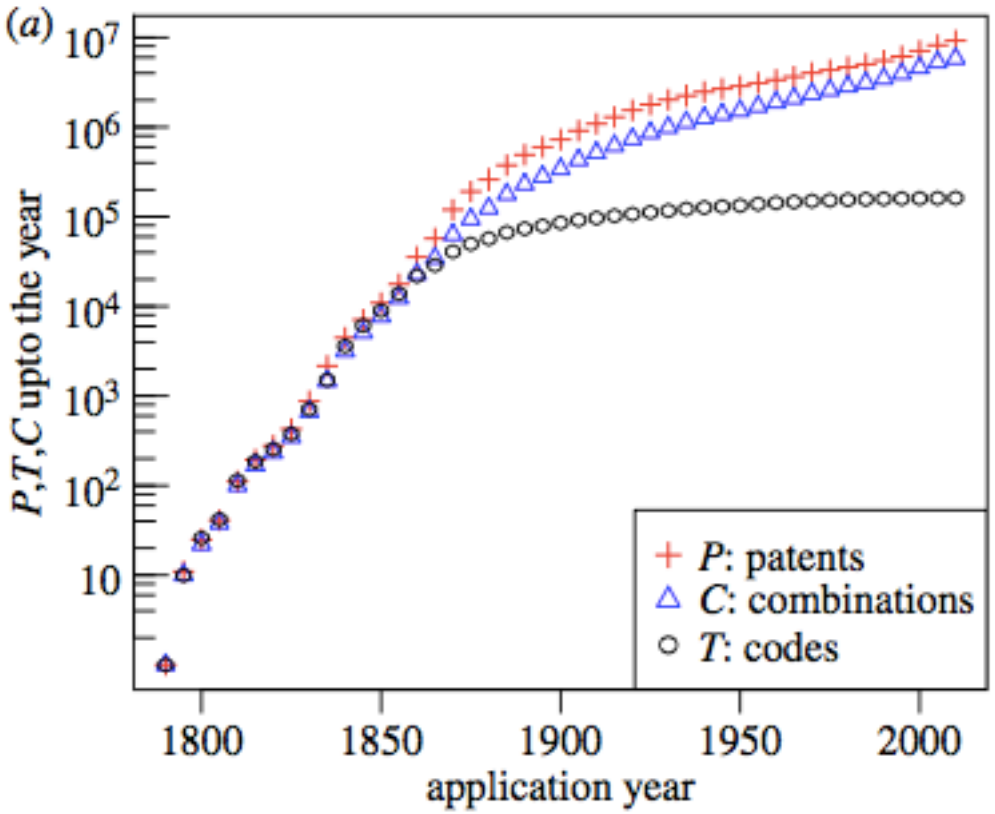
- Tesla's design is radically new
- Tesla's plant is fully vertically integrated (including IT functions)
- Initial attempts at dealing with a decentralized supplier base led to massive coordination problems (Dyer et al. 2015)



Technologies as systems

Most technologies involve multiple components. In fact, most innovation involves combinations of existing components.



Kim et al. 2015, Technological Novelty Profile and Inventions' Future Impact

Technologies as systems

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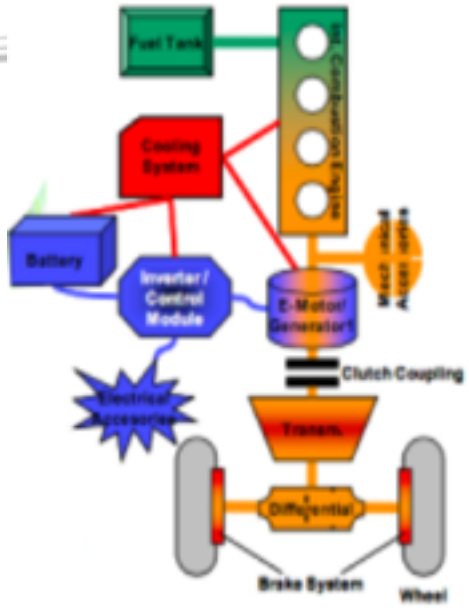

Design Structure Matrix

		1	2	4	5	11	13	18	21	22	23	24	26	27
1	Fuel Tank			1										
2	High Voltage Battery								1			1		
4	Internal Combustion Engine	1			1				1					1
5	E-Motor/Generator1			1				1	1			1		
11	Transmission						1	1						
13	Differential Gear					1				1				
18	Clutch Direct Coupling1				1	1								
21	Cooling System		1	1	1							1		
22	Wheels						1				1			
23	Brake-system									1				
24	Power Electronics/Inverter		1		1				1				1	
26	Additional Electric Accessories											1		
27	Mechanical Accessories			1										

Technological systems exhibit *epistasis*, the performance of one component depends on the characteristics of other components.

What about across a supply chain?

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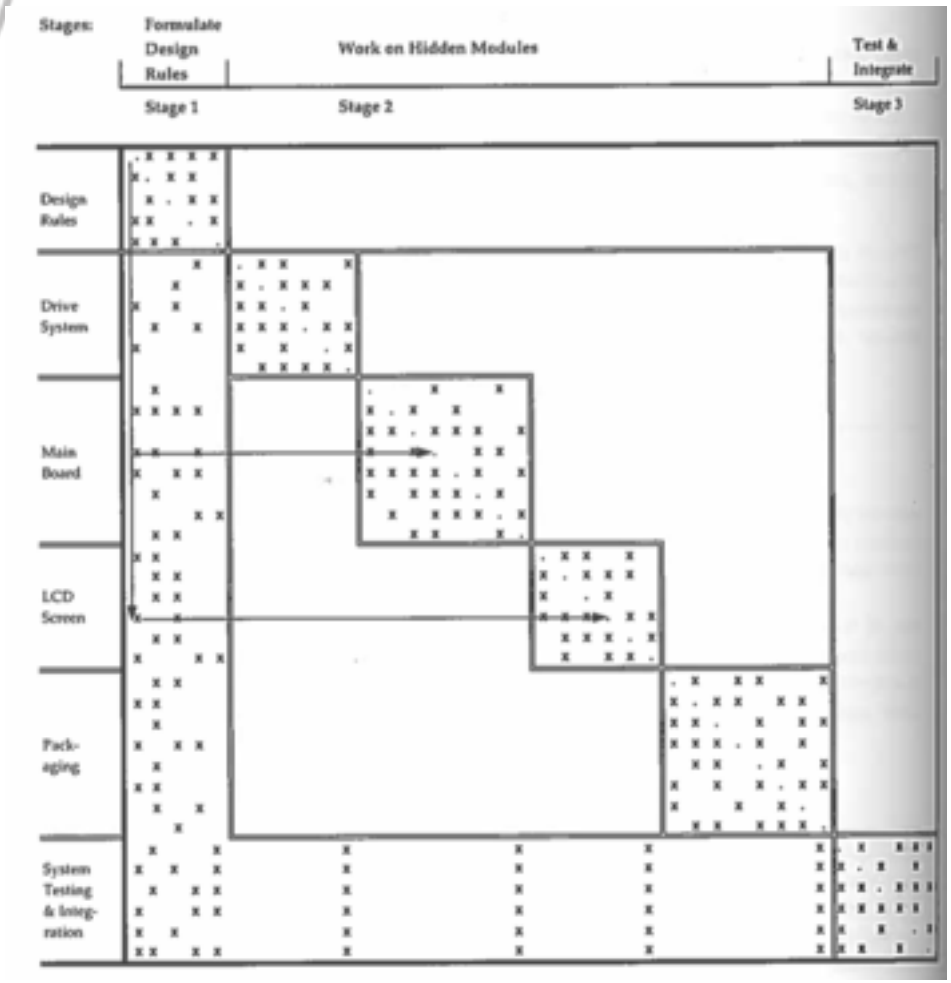
Innovation can be intense in modular engineering systems



Baldwin and Clark, 2000. Design Rules

What about across a supply chain?

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Innovation can be intense in modular engineering systems

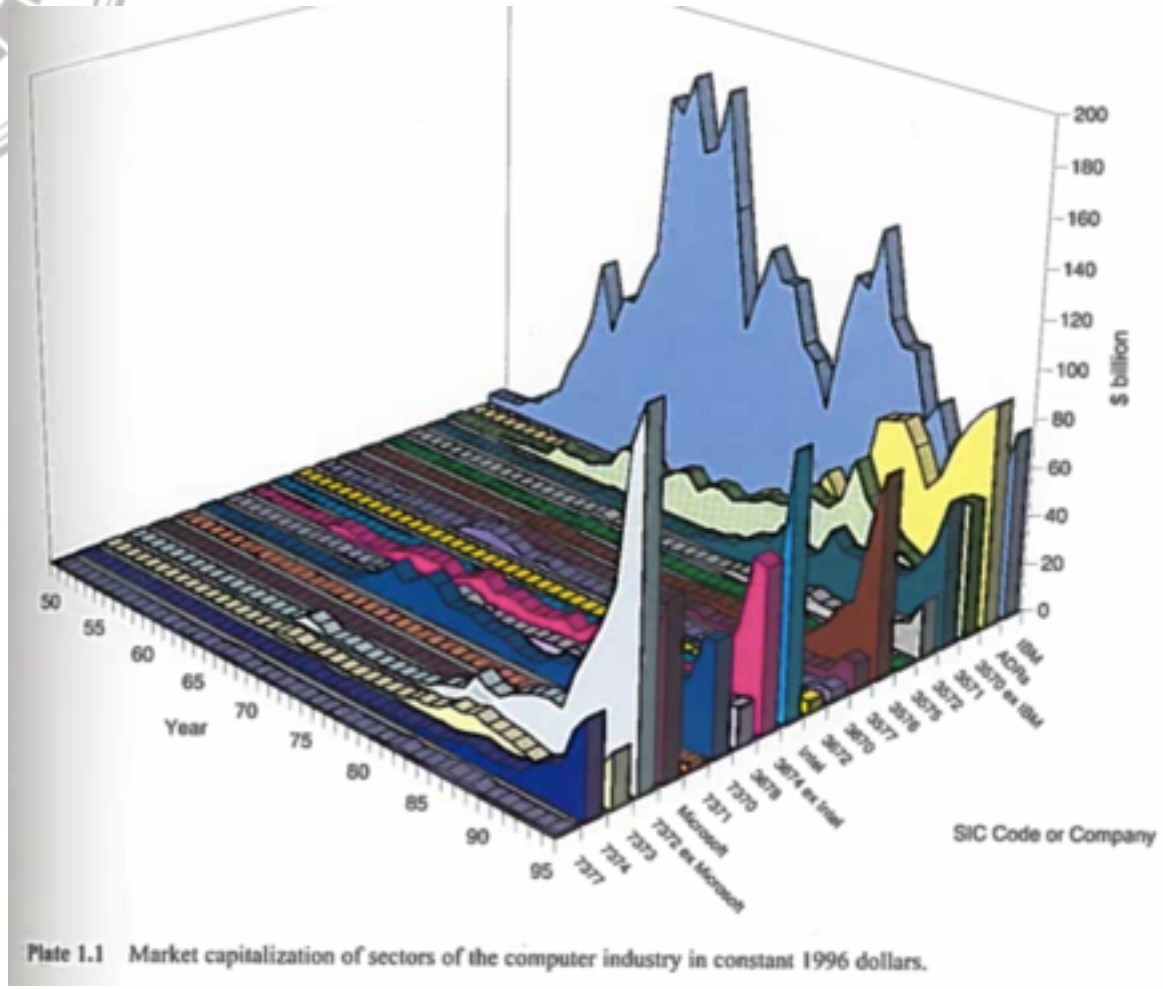

Plate 1.1 Market capitalization of sectors of the computer industry in constant 1996 dollars.

Baldwin and Clark, 2000. Design Rules

What about across a supply chain?

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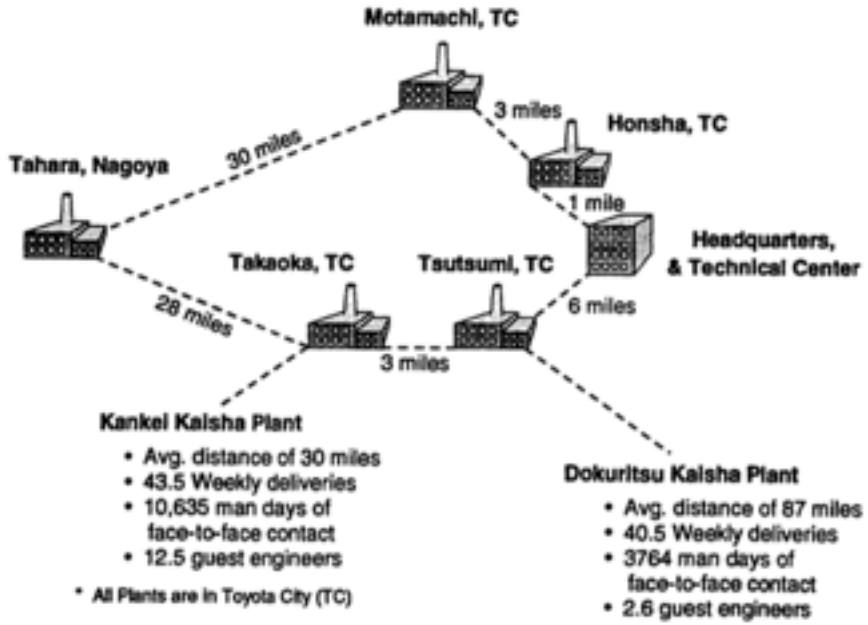
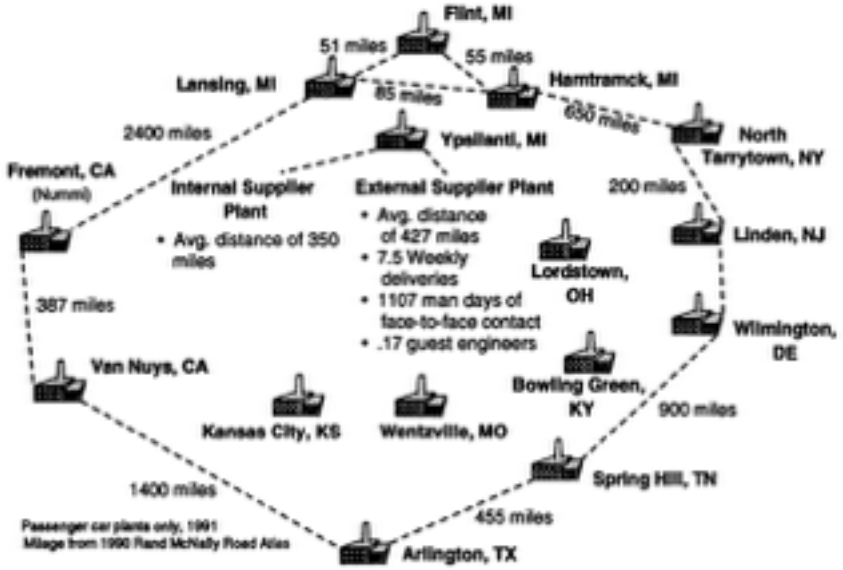
In highly interdependent systems, innovation is harder to achieve in a decentralized fashion

Toyota network in the 90's

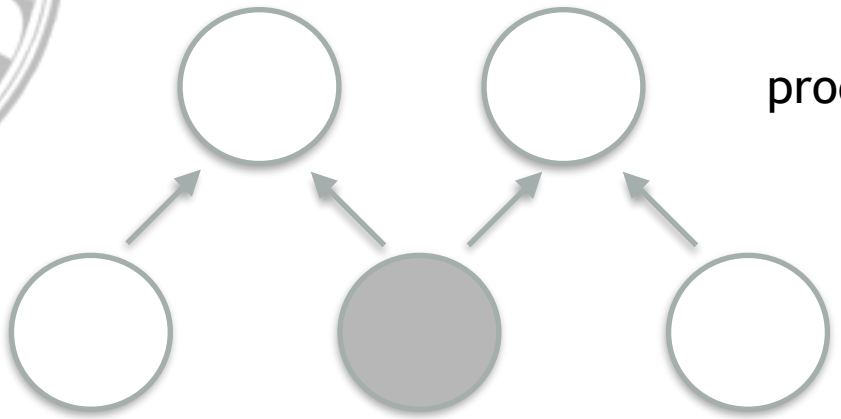


GM network in the 90's



Dyer 1996, Specialized Supplier Networks as a Source of Competitive Advantage

Coordination failures in innovation



producers in competition

complementary suppliers

- Coordination with suppliers is necessary for each producer

- Risk dominant solution: invest in « marginal » innovations

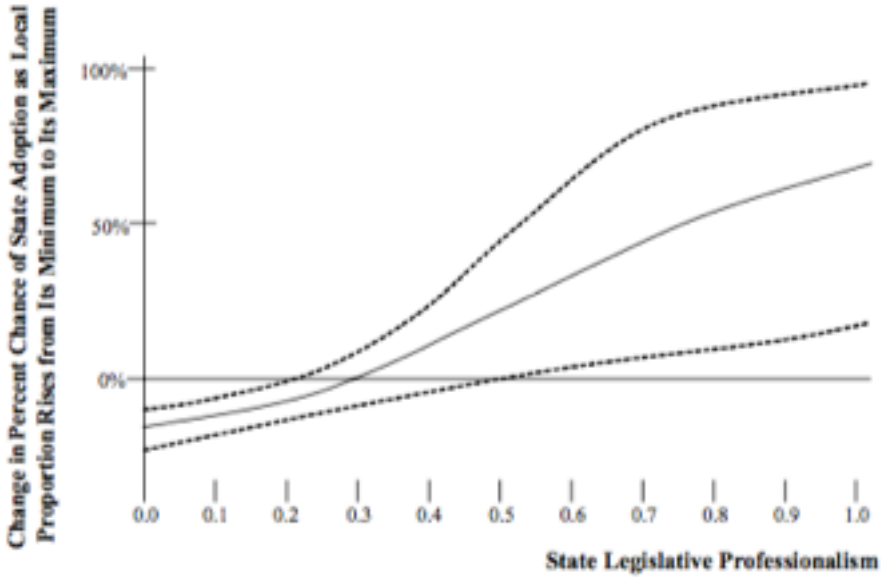
- Central supplier does not necessarily want to coordinate on radical innovation if there is uncertainty in how each producer will resolve uncertainty in the design

- Type of coordination failure not currently considered in research policy and that cities could address

Dumas, Dugoua, *In Prep*

Policy diffusion

- Lateral diffusion has been widely documented in many policy domains especially between states and countries
- Policies are reinvented and evolve as they spread
- Trickle-up diffusion (Volden Shipan, 2006)



Taking actions that change future power balances - Melbourne example

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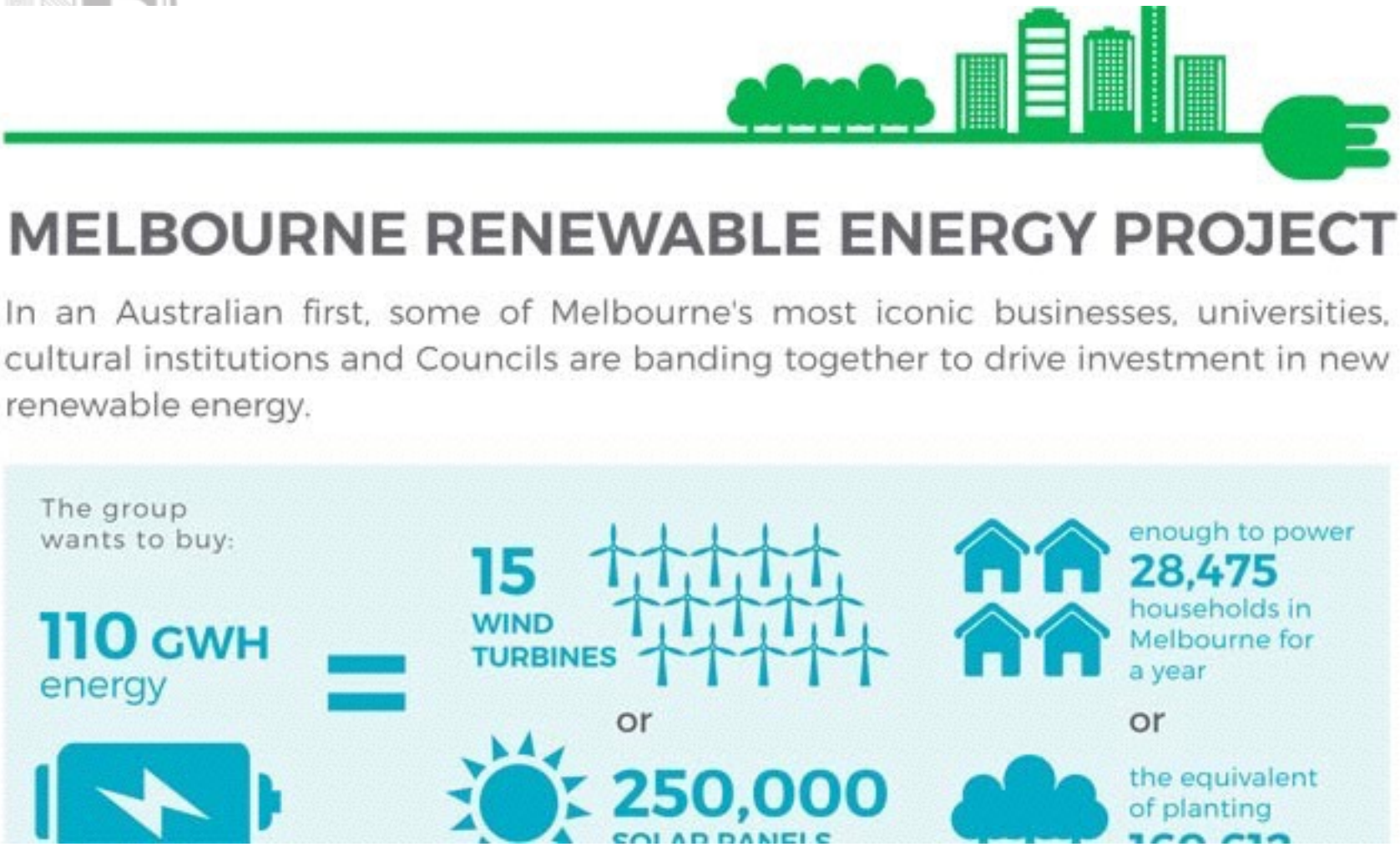

Feedback between policy and politics

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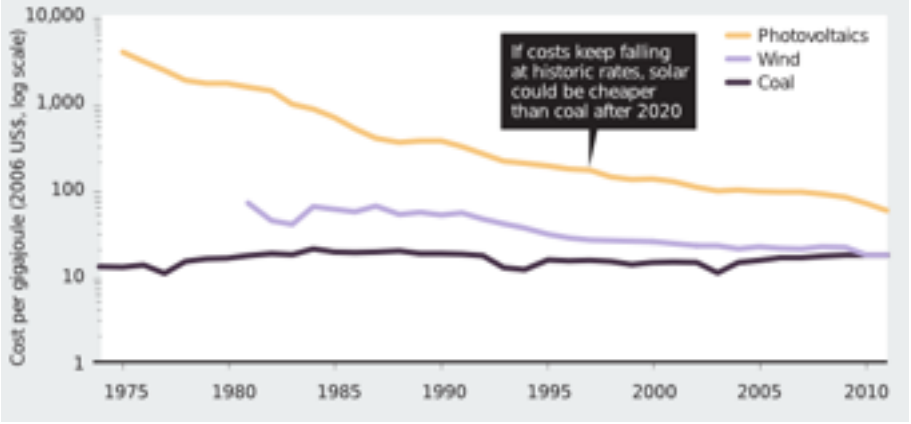
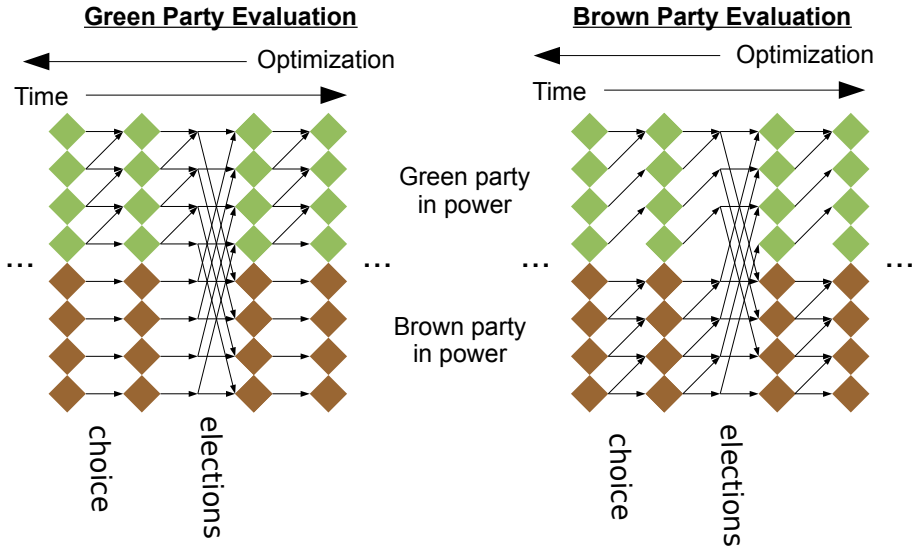
A model to determine how two competing parties with differing ideology about energy will invest in renewable power when they can lock-in future investments thanks to technological learning.



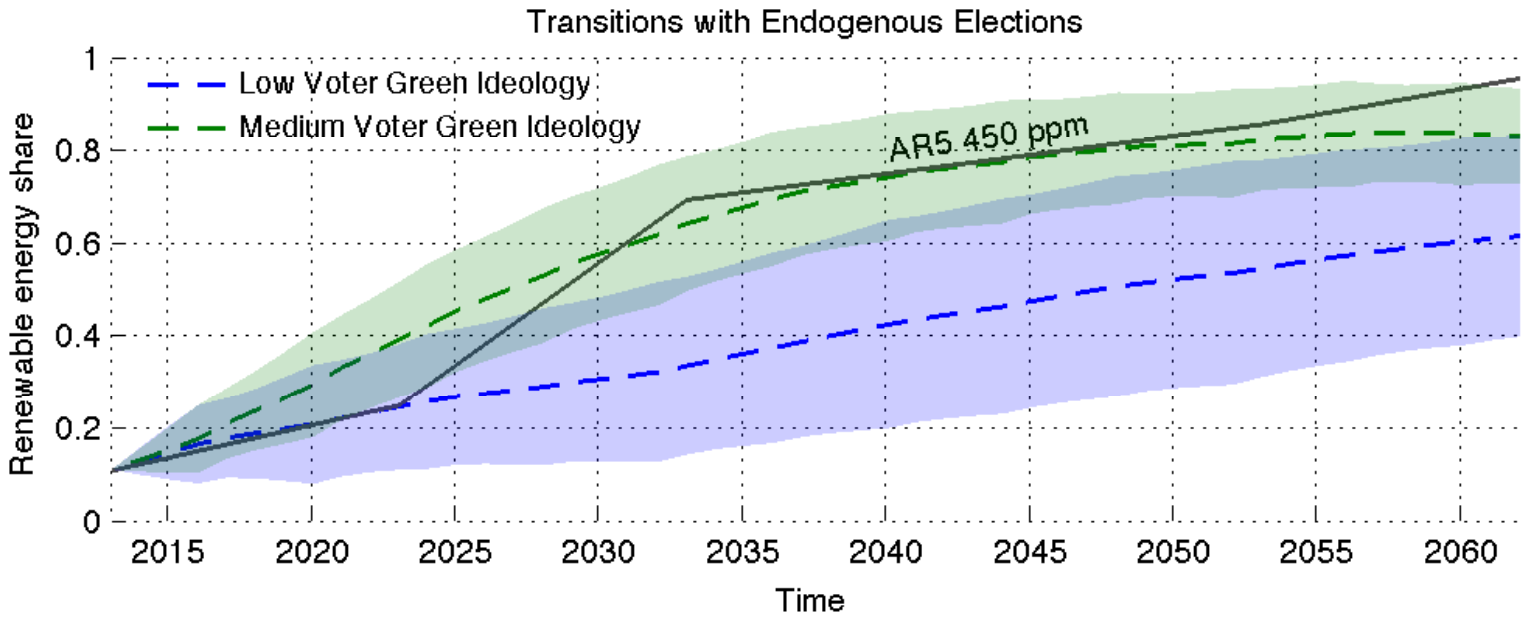
Technological learning (from Trancik, 2014)



Stochastic dynamic optimization by the two parties

Dumas et al. 2016

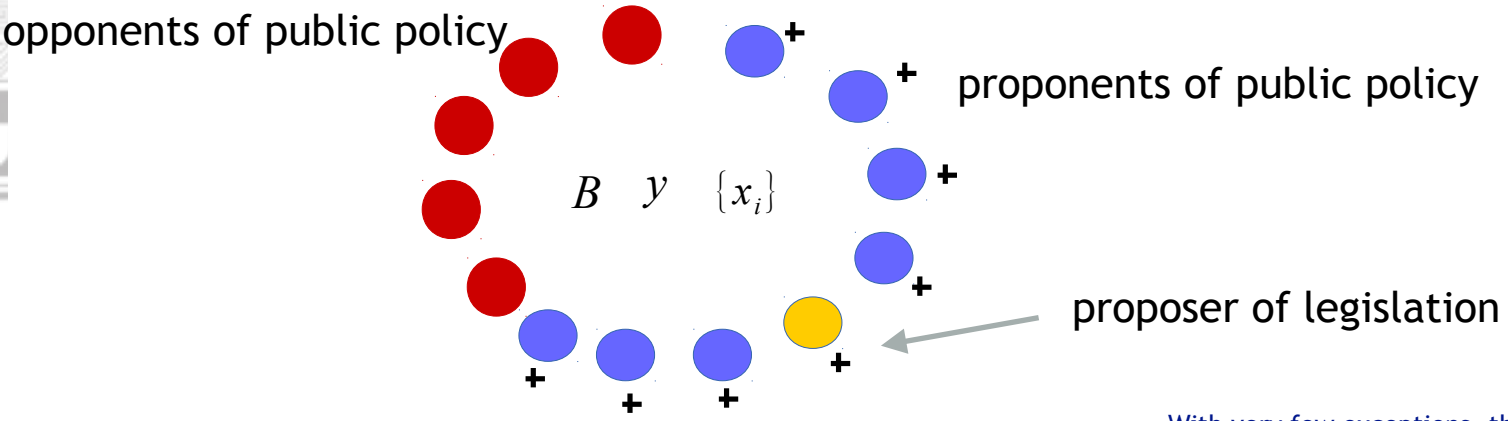
Uncertain transition paths



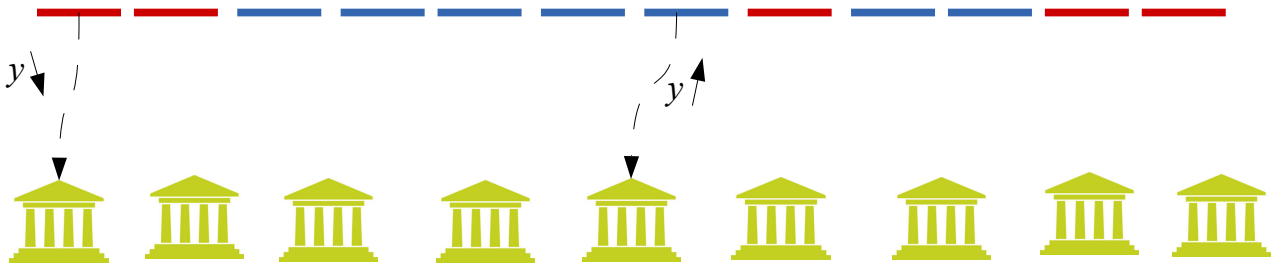
Local actions that affect national politics: the case of citizen suits

Local actions that affect national politics: the case of citizen suits

A model of citizen involvement in courts and effect on legislative decision-making

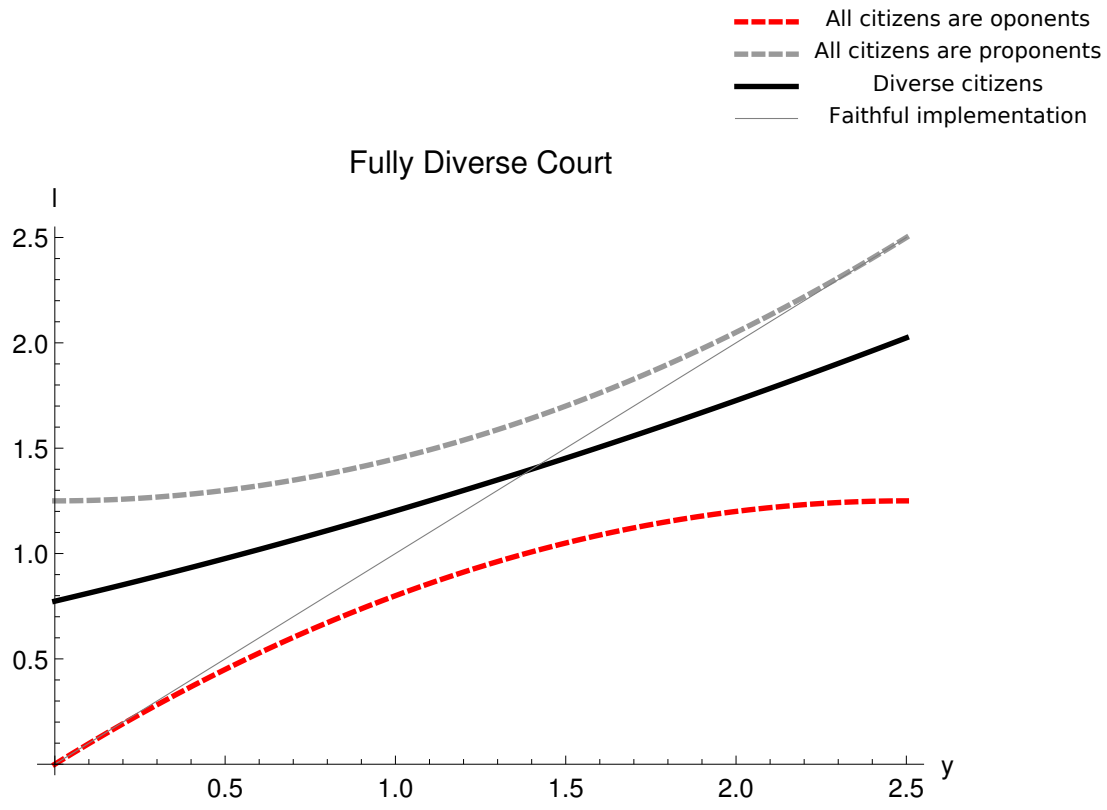


With very few exceptions, the enforcement of the laws depends upon individual citizens to initiate the legal process. By virtue of this dependence, an aggregation of individual citizens acting largely in their own interests strongly influences the form and extent of the implementation of public policy thereby the allocation of power and authority." Zemans, 1983

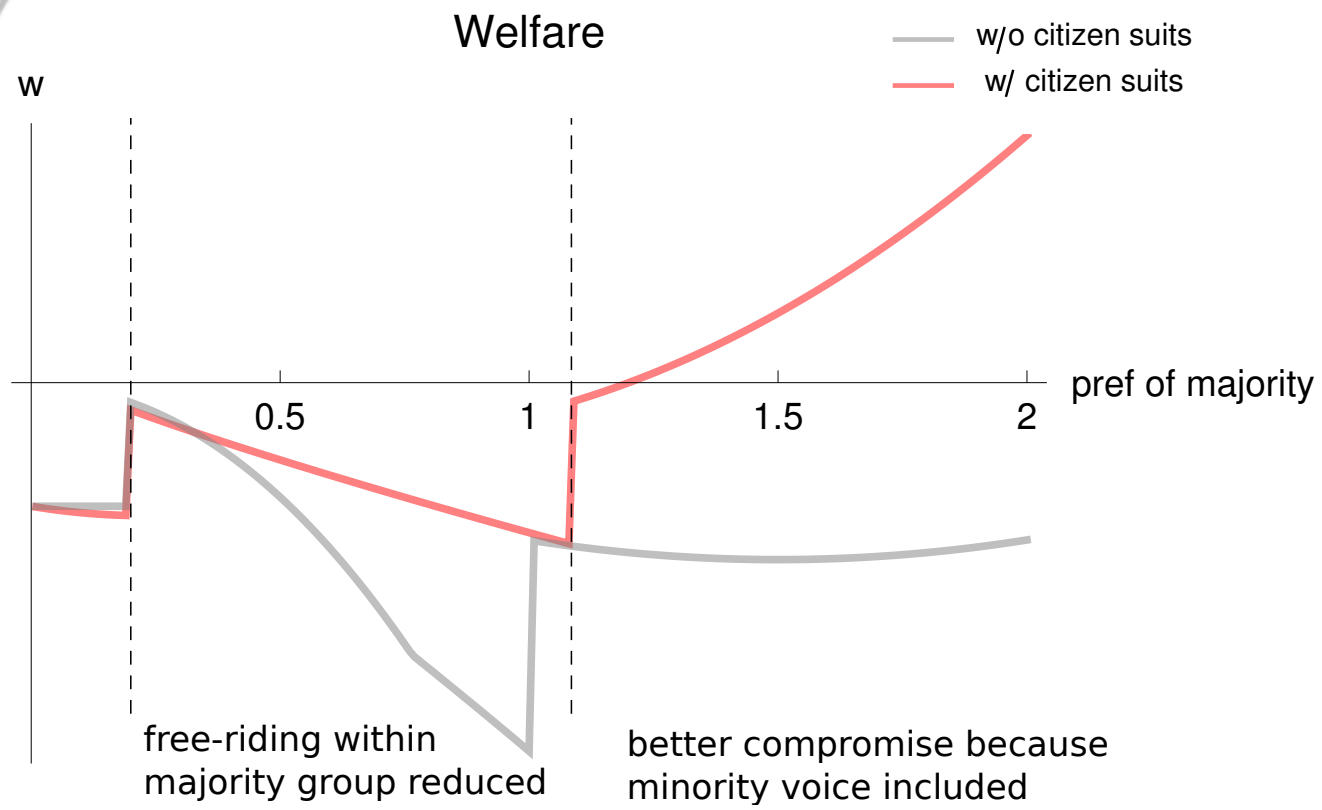


citizen suits affecting the implementation of the public policy

Scattered power in society builds a compromise



Involvement of citizens through courts can improve legislative decision-making



What are the dynamic properties of the law?

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Alternative Models of the Law

Rule of Law Model

Courts gain independent authority over the institutional evolution of society, if they maintain legitimacy by:

- adapting rules to contexts
- facilitating normative deliberation
- providing commitment

Legal change is autonomous from politics

Law as Beholden to Politics

Courts act strategically, given constraints by politicians

Legal change is driven by shifts in political alliances

Empirical analysis of the dynamics of legal rules

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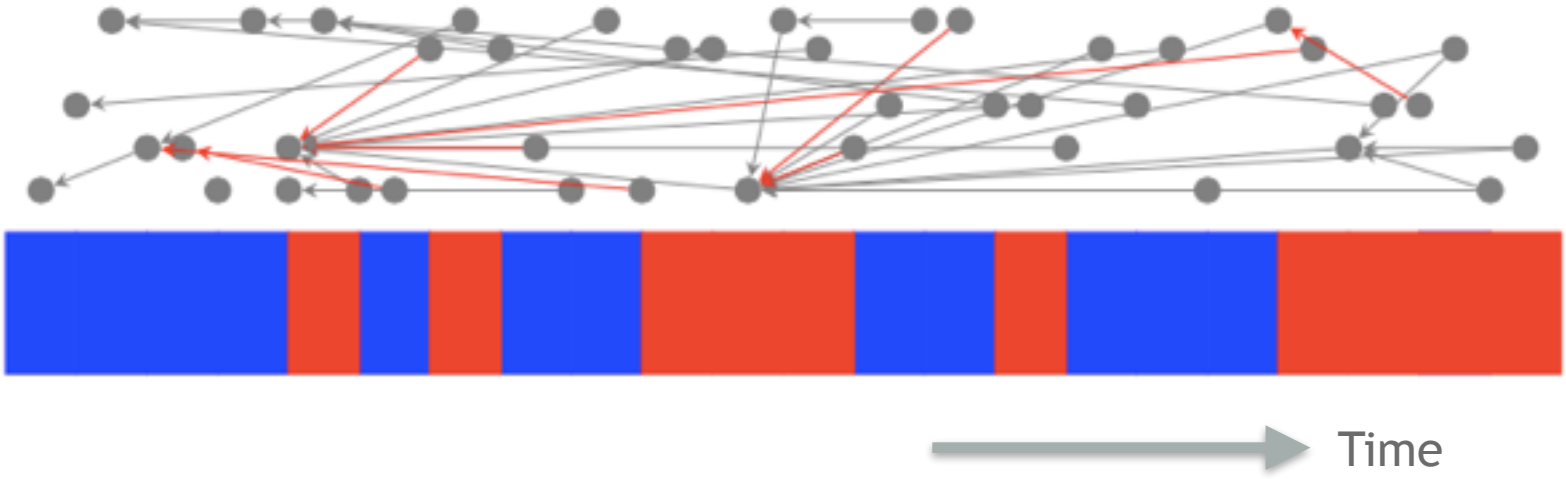
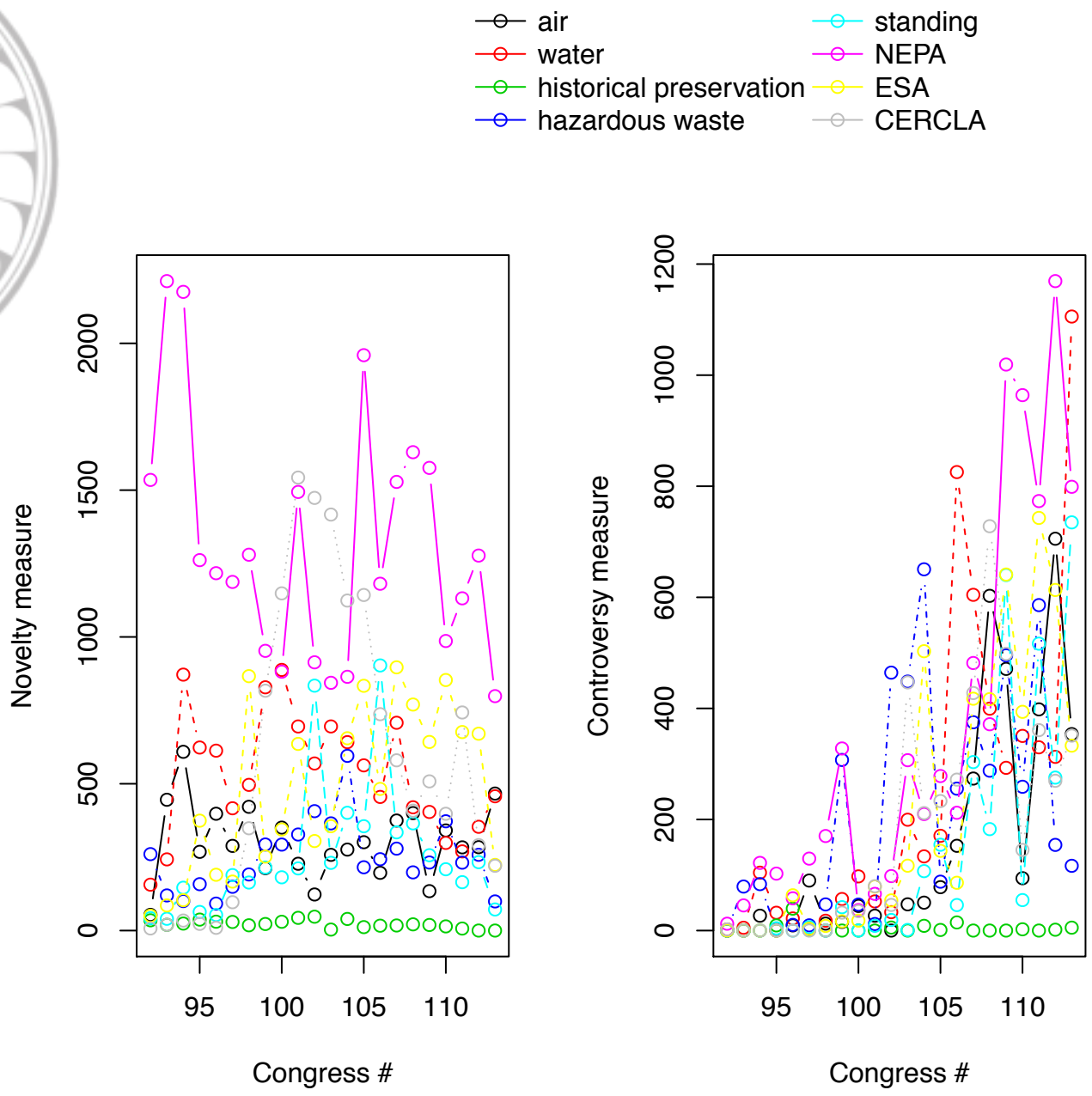
Measuring legal change:

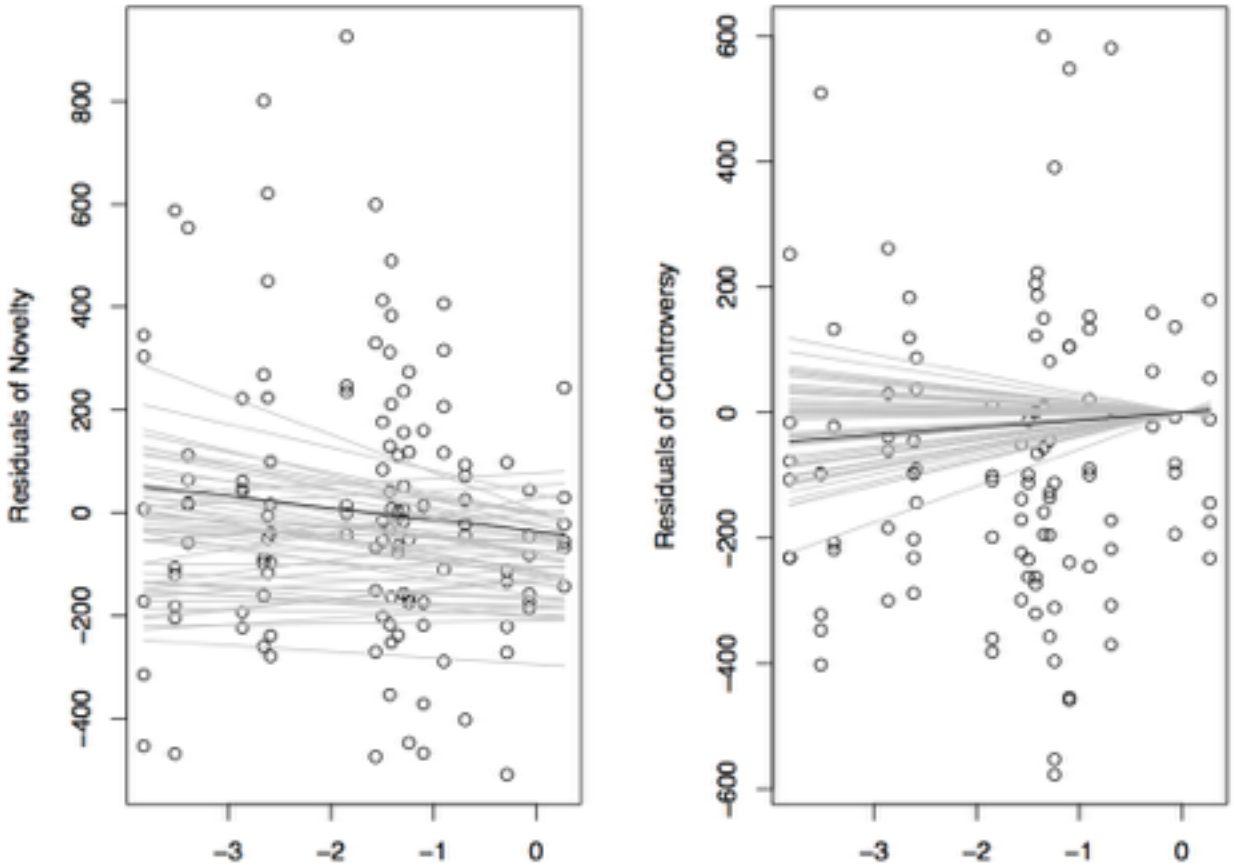
- A measure of *Novelty*: appearance of new, influential rules
- A measure of *Controversy*: overruling of past, influential rules
- A measure of *Directed Reinforcement*: changes in the frequency with which past rules are re-used and re-asserted




air
water
historical preservation
hazardous waste
standing
NEPA
ESA
CERCLA
Novelty measure
0
500
1000
1500
2000
95
100
105
110
Congress #
Controversy measure
0
200
400
600
800
1000
1200
95
100
105
110
Congress #

Environmental law has evolved autonomously from partisan shifts in power

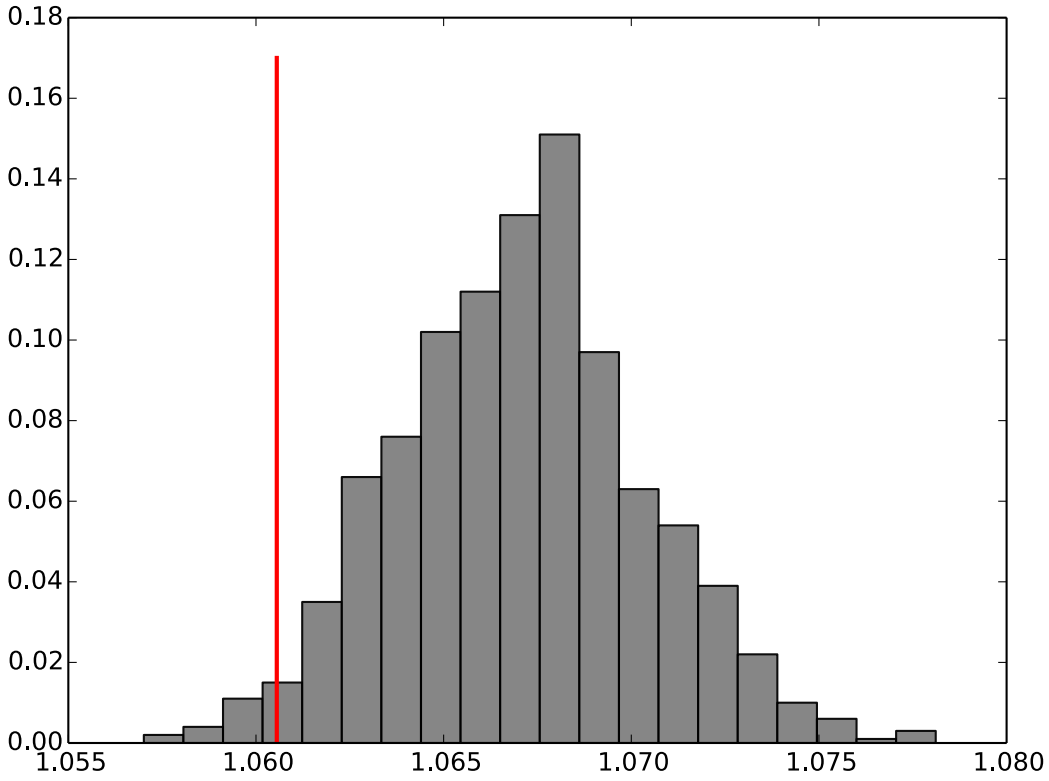
Shifts in political preferences of elected officials does not affect novelty and controversy in the law



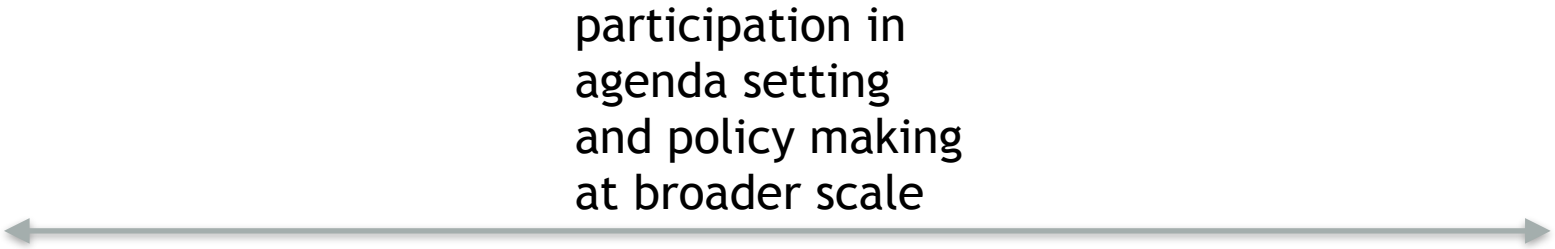
log(shift in pol preferences)

Environmental law has evolved autonomously from partisan shifts in power

Absence of directed reinforcement



Feedback between policy and politics




responsibility
to implement
participation in
agenda setting
and policy making
at broader scale
agency function
autonomy and influence
from expertise and on
the ground action
self-governance
experiments
knowledge
solutions

Formal versus Real Authority: the key role of information

- The more cities, citizens, NGOs can acquire information about how to effect outcomes, the more real authority they have relative to formal policy-makers (Aghion, Tirole 1997)
- If the latter accept to rescind some control, these actors will be motivated to act and will affect outcomes (Fehr, 2010)
- Supra-national decision-makers have reasons to support these actors : they are a channel to affect reality on the ground without passing through national politics

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How can we study complex policy systems such as city networks?

Types of network datasets

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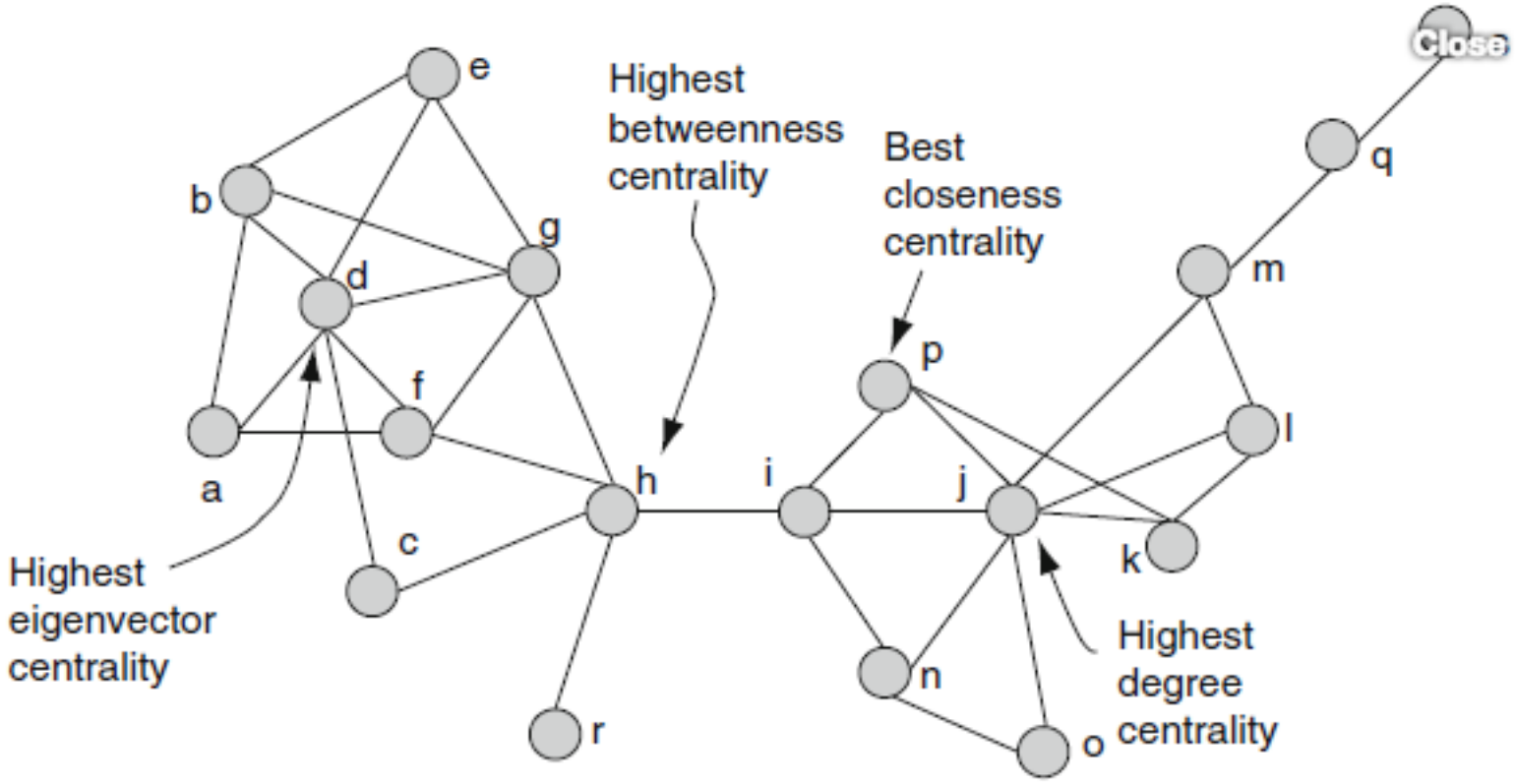
- Nodes may have attributes and ties may have weights
- Directed/undirected tie
- Unidimensional/multiplex: multiple types of ties
- Unipartite/multipartite: multiple types of nodes and relationships between them
- Dynamic: longitudinal analysis

Node-level characteristics



Communities and modularity

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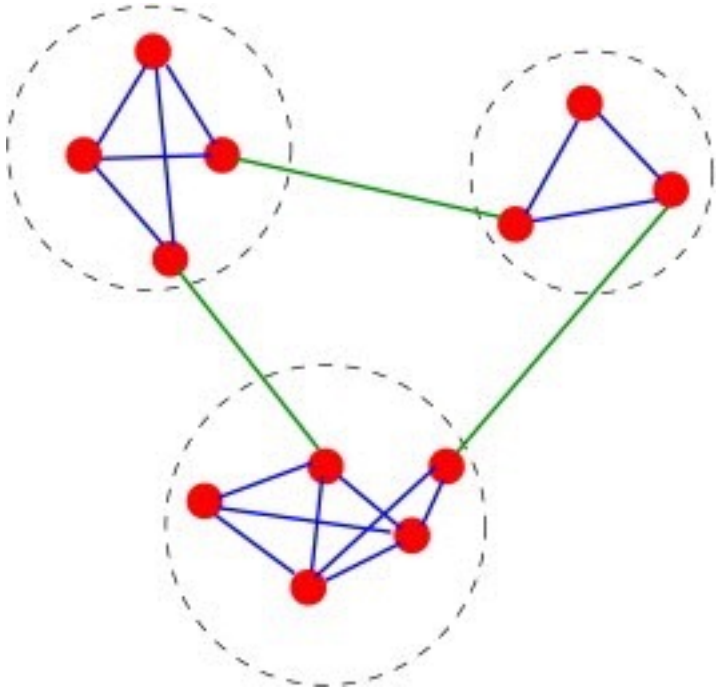
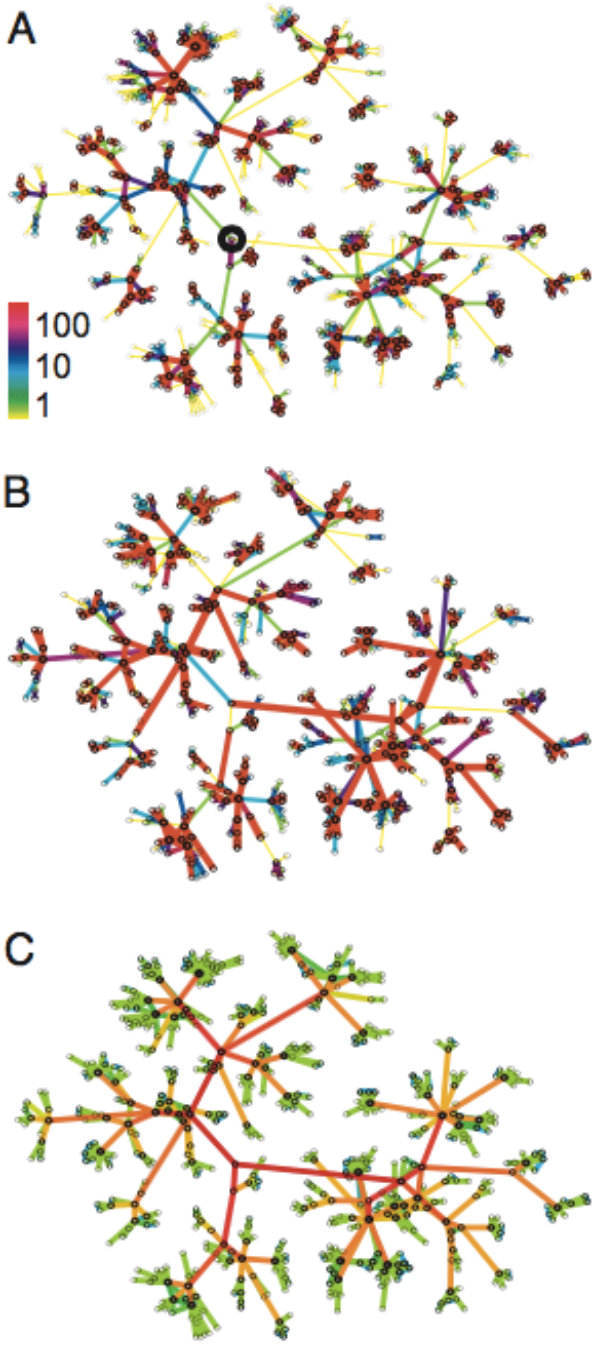
Typically, the distribution of edges is inhomogeneous, leading to community structure. Goal: find group of nodes with denser within-group connections than between-group connections.

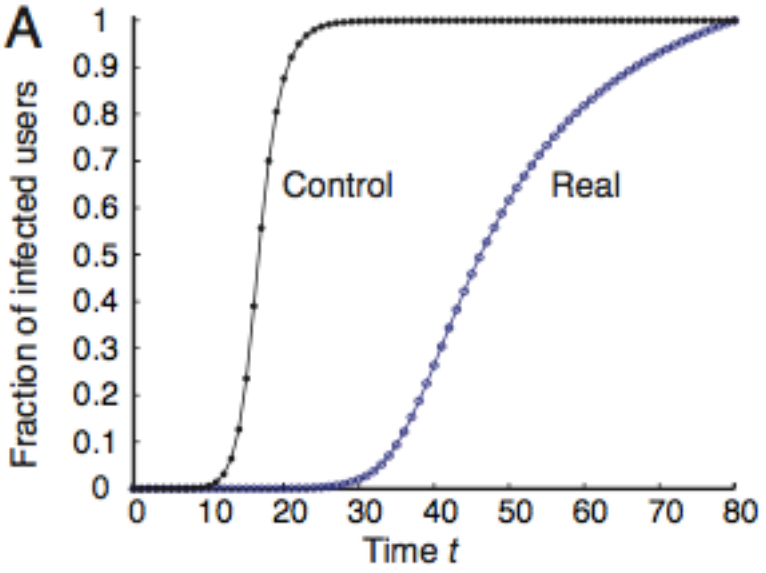


Network-level properties & information

- Centralization (Sandstrom, 2008)
  - coordination
  - leadership
- Modularity :
  - Specialization of knowledge (Ghimire et al. 2004)
  - Robustness again synchronization
- Networks support cooperation by:
  - spreading information on behavior (requires dense networks)
  - allowing clustering of cooperative individuals and exclusion of uncooperative individuals



Communication networks



Onnela et al. 2007

Coordination and cooperation

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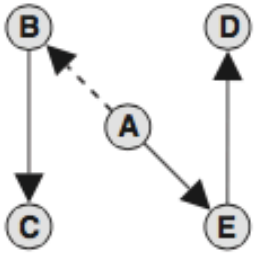
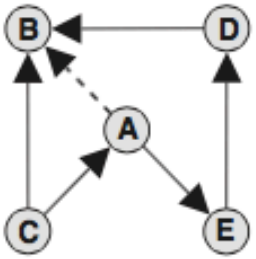
FIGURE 1 Network Structures for Coordination and Cooperation



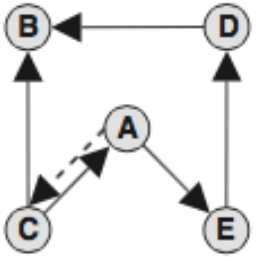
A. Coordination through Open Two-Paths

$$s_{i1}(x) = \#\{j \mid x_{ij} = 0, \max_h(x_{ih}x_{hj}) > 0\}$$



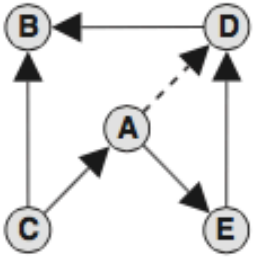
B. Coordination through Popular Alters

$$s_{i2}(x) = x_{ij}\sum_{.h} x_{hj}$$



C. Cooperation through Reciprocity

$$s_{i3}(x) = \sum_j x_{ij}x_{ji}$$



D. Cooperation through Transitive Triads

$$s_{i4}(x) = \sum_{j,h} x_{ij}x_{ih}x_{jh}$$

Statistical models of networks

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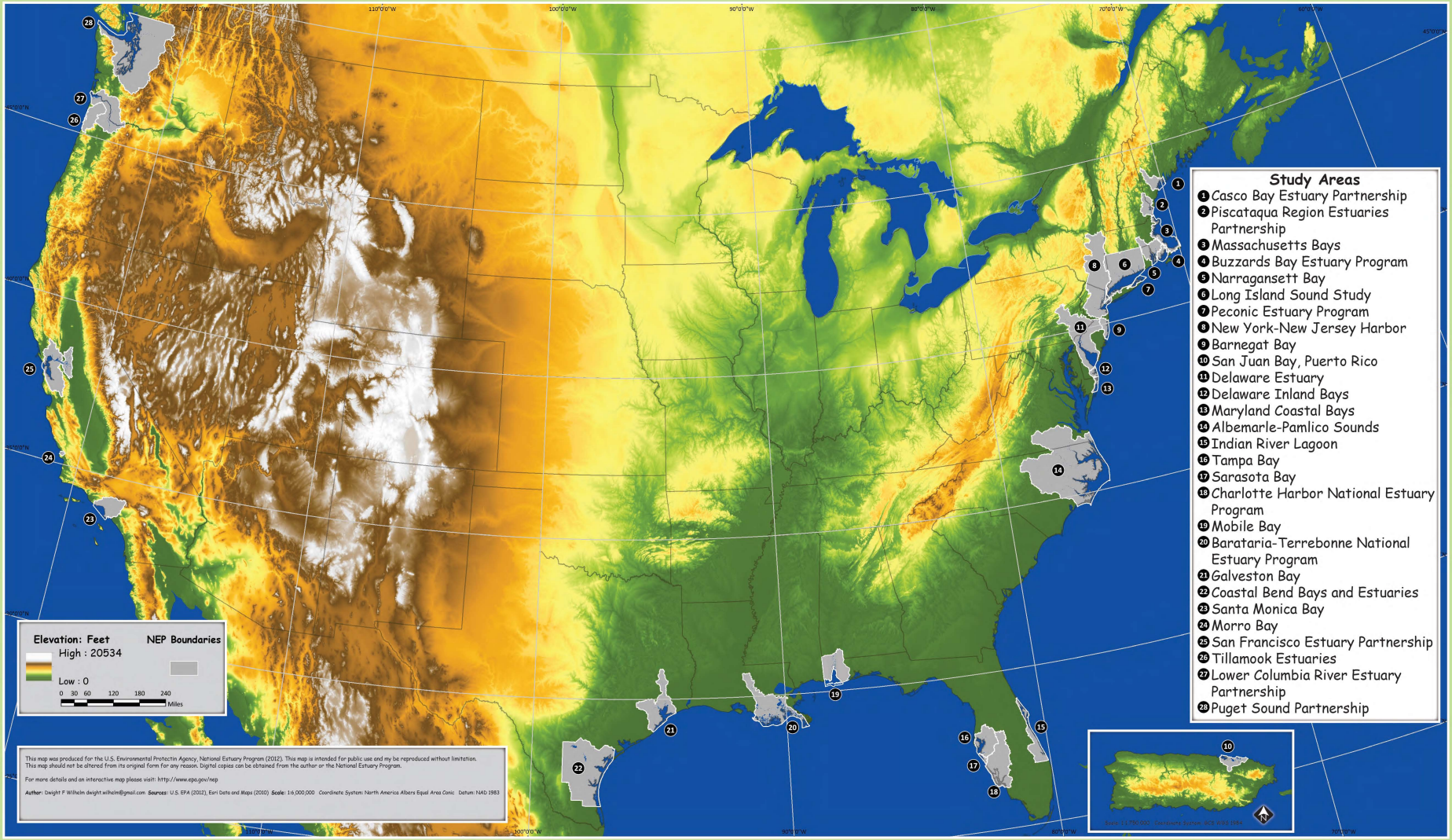
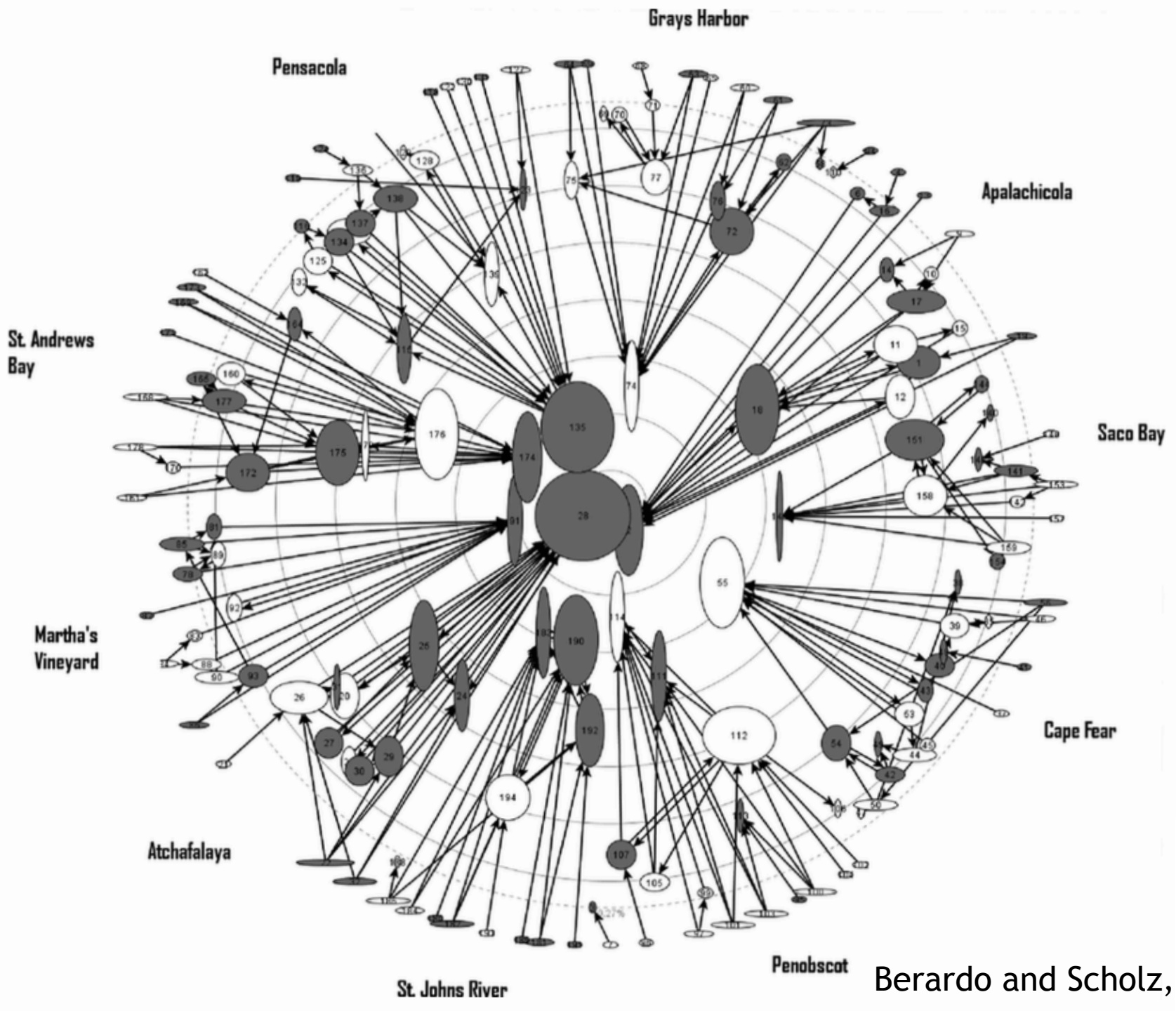
	Exponential random graph model	Quadratic assignment procedures	Stochastic actor-oriented model
Method	Estimates the prevalence of specific configurations relative to random assembly: *tendency toward centralization* (k-stars), *closure* (k-triangles), *multiple connectivity* (k-2paths) + attribute effects (e.g. homophily)	statistical test of whether 2 matrices are correlated using bootstrapping procedure	longitudinal data jointly estimate *partner selection function* (based on structure and actor attributes) and *behavior function* (social influence)
Questions	are policy actors seeking network closure? are policy actors seeking new sources of information or on the contrary to form coalitions with like-minded individuals?	do information networks of communication correspond to formal hierarchy? Do governments share policy entrepreneurs and does that explain common policy adoption?	do actors that bridge communities become more central over time? how often do actors update their policy network? are cities influenced by each others' policies?

NATIONAL ESTUARY PROGRAM STUDY AREAS





Berardo and Scholz, 2010

Variables	Longitudinal Model (Coefficients)
PARTNER SELECTION	
Average Choices per Actor	4.85**
	(0.51)
Network Structures	
Outdegree	−2.20**
	(0.12)
Low-Risk Coordination	
Popularity of Alter	0.21**
	(0.02)
High-Risk Cooperation	
Reciprocity	0.66**
	(0.24)
Transitive Triplets	0.12
	(0.07)
INFLUENCE EFFECT ON TRUST	
Average Choices per Actor	7.05**
	(1.80)
Ego's Effects	
Trust Tendency	0.01
	(0.05)
Effect of Trust Measured in 1999	−0.00
	(0.02)
Effect of Government Type	0.11
	(0.10)
Effect of Prodevelopment Beliefs	−0.27
Measured in 1999	(0.33)
Alters' Effects	
Influence of Alters' Trust	4.78**
	(1.62)

Endogenous policy networks, in early stages:

- actors seek central partners that expand their bridging capital in order to discover collaborative possibilities and resolve relatively simple, low-risk dilemmas.
- they also seek reciprocal relationships to provide credibility for smaller projects and quickly learn to trust or distrust those they rely on.

Transportation and land-use planning networks

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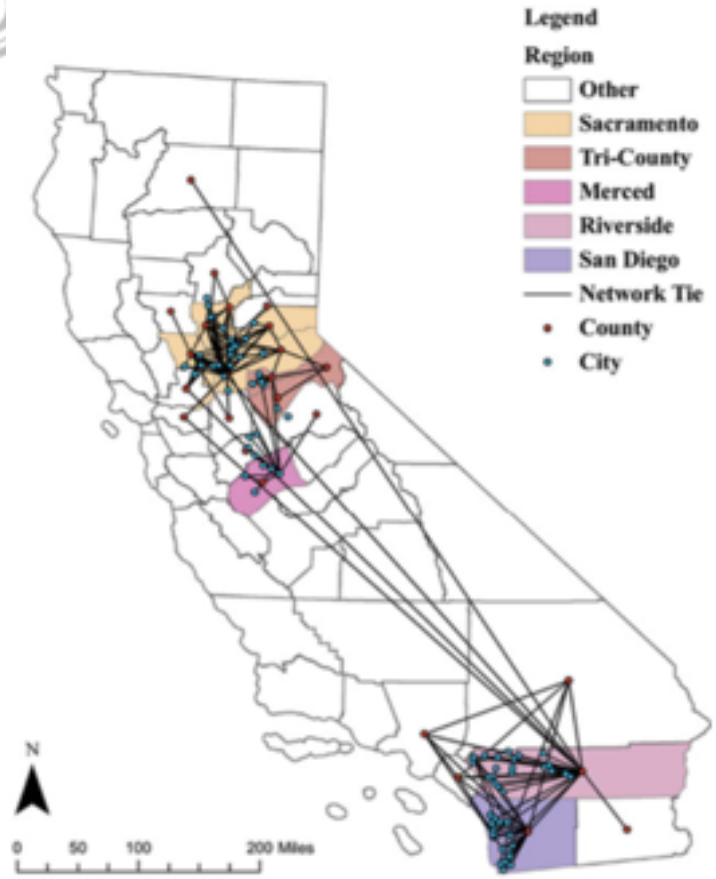
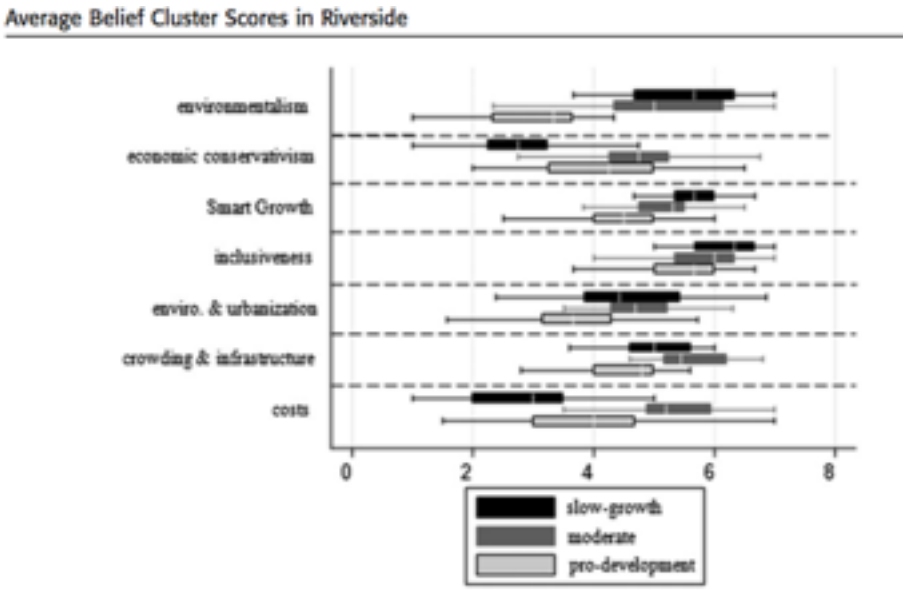
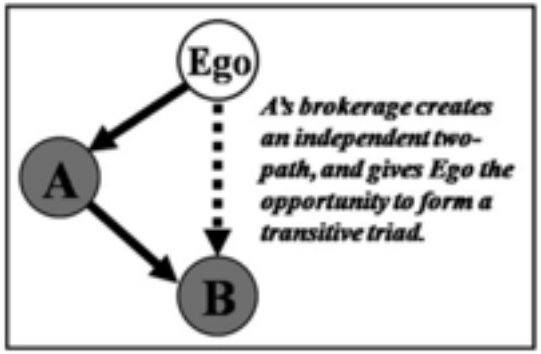
- Are actors in metropolitan transportation planning networks split into belief systems?





Coalition politics



	Merced		Riverside		San Diego		Sacramento	
Ideological distance								
Aggregated belief distance		−0.27* (0.11)		−0.21* (0.10)		−0.22* (0.11)		−0.28* (0.07)
Environmentalism	−0.10 (0.08)		−0.08 (0.08)		−0.10 (0.07)		−0.08 (0.04)	
Economic conservativism	−0.28* (0.07)		−0.05 (0.09)		0.03 (0.08)		−0.16* (0.04)	
Inclusiveness	−0.02 (0.11)		0.02 (0.14)		0.18 (0.10)		−0.07 (0.07)	
Smart Growth	−0.22* (0.11)		0.06 (0.13)		−0.02 (0.09)		0.06 (0.06)	
Environment and urbanization	−0.10 (0.10)		−0.09 (0.10)		−0.08 (0.08)		0.01 (0.04)	
Crowding and infrastructure	−0.04 (0.13)		0.01 (0.10)		0.10 (0.08)		0.02 (0.05)	
Costs	0.06 (0.08)		−0.09 (0.08)		−0.14* (0.06)		−0.10 (0.06)	
Social capital								
Reciprocity	0.17 (0.28)	0.33 (0.30)	−0.86* (0.23)	−0.83* (0.24)	−0.71* (0.22)	−0.66* (0.22)	−0.76* (0.13)	−0.77* (0.12)
Transitivity	0.14 (0.01)	0.13* (0.01)	0.14* (0.01)	0.14* (0.01)	0.10* (0.01)	0.10* (0.01)	0.06* (0.00)	0.06* (0.00)
Three-cycles	−0.15* (0.05)	−0.14* (0.05)	−0.16* (0.03)	−0.16* (0.03)	−0.10* (0.03)	−0.10* (0.03)	−0.04* (0.01)	−0.04* (0.01)
Two-paths	−0.02 (0.02)	−0.02 (0.03)	−0.02* (0.01)	−0.02 (0.01)	−0.02* (0.01)	−0.02* (0.01)	−0.02* (0.00)	−0.02* (0.00)

Regional politics and policy brokers

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Collaborations also assort by political similarity

Variable	ERG Model 1	ERG Model 2	ERG Model 3
Political Distance			
Party Registration	−.026***	−.019**	−.016*
	(.008)	(.009)	(.009)
Socioeconomic Distance			
Percent Latino		−.018***	−.020**
		(.006)	(.008)
Median HH Income		−.018**	−.021**
		(.007)	(.009)

Brokers are highly diverse and can help bridge communities

	Merced	Riverside	San Diego	SACOG
1.	Staff: County of Merced	Staff: County of Riverside	US Fish and Wildlife	Neighborhood Organizations (3)
2.	Elected/Appointed: County of Merced	Environmental Organizations (3)	Neighborhood Organizations (3)	Regional Water Quality Control Board (2)
3.	Developer/Real Estate	Council of Governments (3)	Metropolitan Planning Organization/ Regional Transportation Planning Agency (2)	California Department of Transportation (3)
4.	Council of Governments (3)	Special Services District (3)	Environmental Organizations (3)	Special Services District (3)
5.	State Department Fish and Game (3)	State Department Fish and Game (3)	California Department of Transportation (3)	State Department Fish and Game (3)
6.	Farming/Ranching	Metropolitan Planning Organization/ Regional Transportation Planning Agency (2)	Staff: County of San Diego	State Department Water Resources
7.	Private Consultant (2)	School District (2)	School District (2)	Local Agency Formation Commission
8.	Staff: City of Merced	Elected/Appointed: County of Riverside	Council of Governments (3)	Environmental Organizations (3)
9.	California Department of Transportation (3)	Neighborhood Organizations (3)	Regional Water Quality Control Board (2)	Private Consultant (2)
10.	Elected/Appointed: City of Merced	Social/Philanthropic Organizations	Special Services District (3)	State Water Resources Control Board

Conclusion

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- Policy change can arise at small scale and catalyze larger scale change
- Collaborative policy networks to facilitate cooperation, coordination and diffusion of ideas are proliferating

BUT

- Need for powerful brokers able to bridge arenas
- Information and learning are important, but these are still political battles
- Little is known about city networks for sustainability and their policy outputs but tools exist to study them!