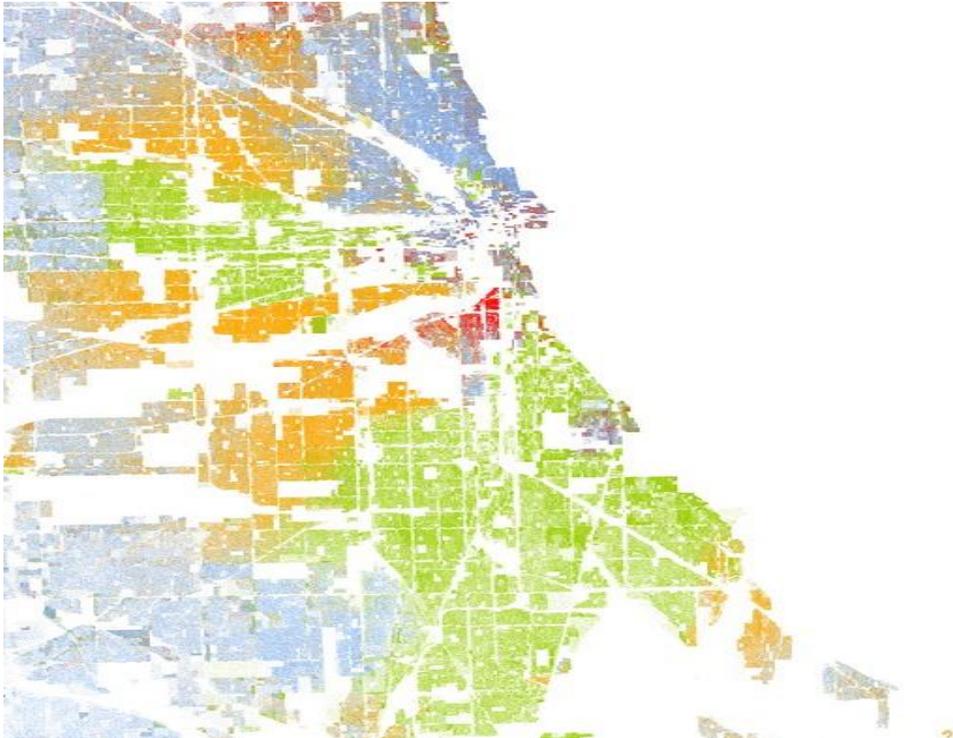


# IP As Complex Adaptive System

Girish Somwarpet Nagaraj

# Why Complex Adaptive System ?



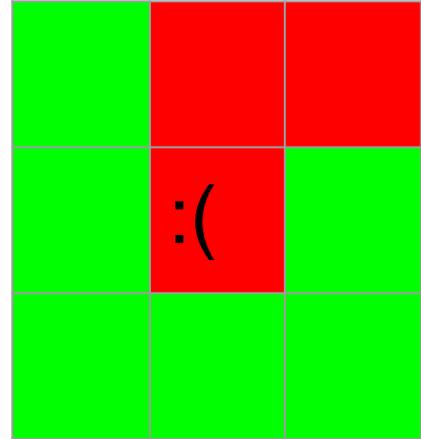
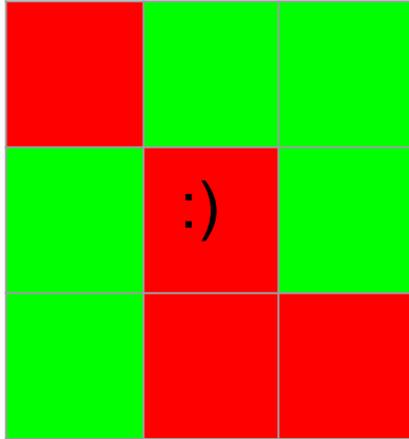
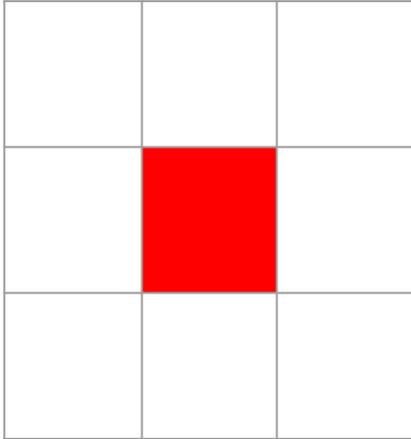
Blue: White  
Green: Black  
Orange:Hispanics  
Red :Asian

## 2010 Census Block Data

1 Dot = 1 Person

- White
- Black
- Asian
- Hispanic
- Other Race / Native American / Multi-racial

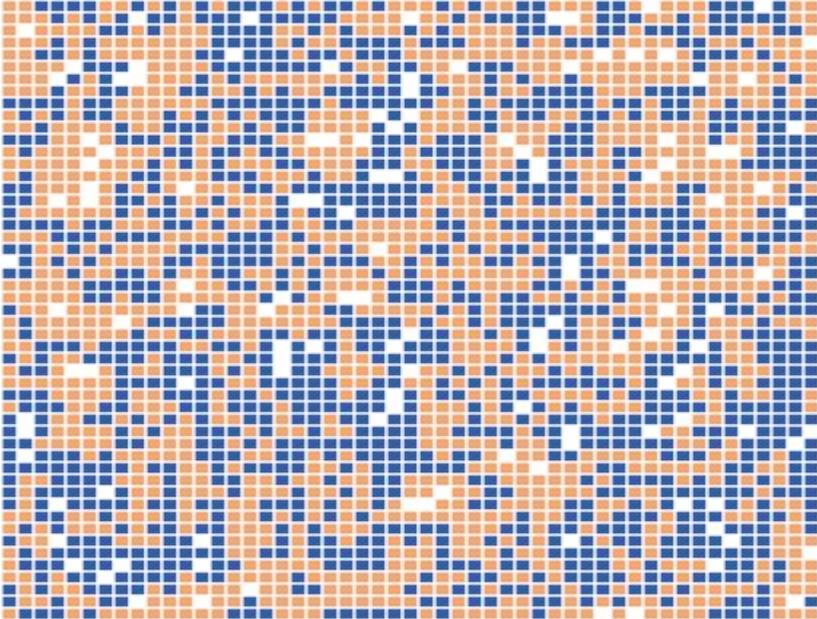
# Conditions



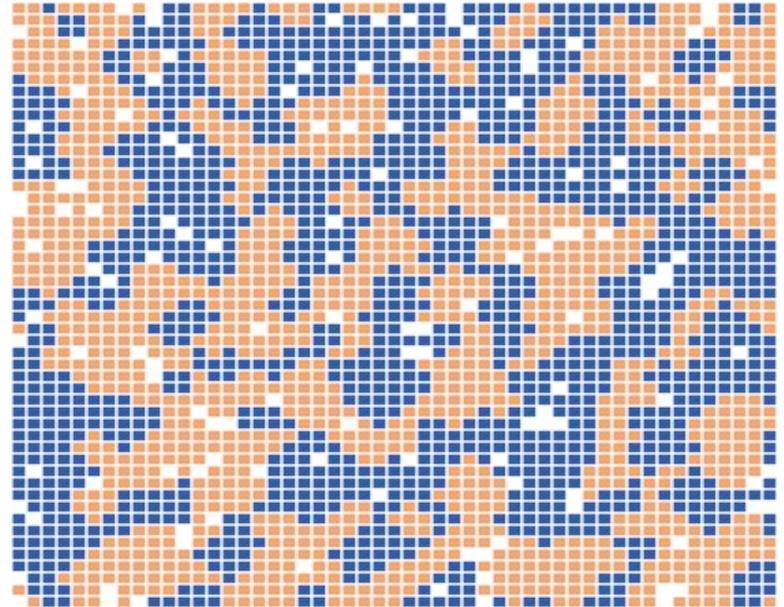
# Segregation

Schellings Algorithm; Netlogo Model demonstration.

*Similar wanted 25%*



*Similar wanted 30%*



# What is CAS ?

*“Complex System is in an approach to study science, which studies how the interactions between the parts gives rise to collective behaviour and how the relationships are formed and the system interacts”.* (A simplistic definition)

Eg : Forest Fires; Ant colonies, Neurons.

# Properties of Complex Adaptive System

- Emergence: “You can’t see the forest for the trees” . A reductionist thinking forces us to see the trees and not fail to recognise the emerging properties of the forest.



# Interdependence



Interdependence: Interactions between the parts. CAS is study of interactions and the effects between the parts. (Eg : A metal, a tree, a sheep)

# Patterns

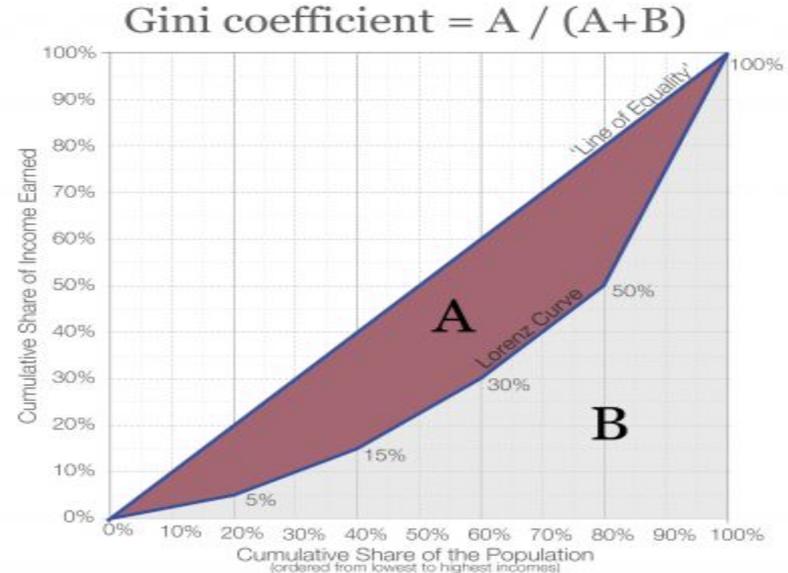
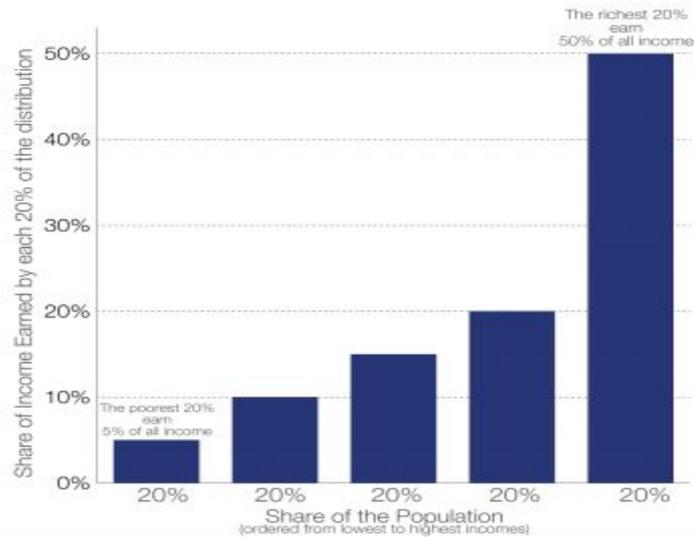
- Patterns : Certain patterns are created due to collective behaviour. Local activation and long range inhibition. (Fractal patterns formed due to collective)



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# Measuring Resource Concentration: Gini Coefficient

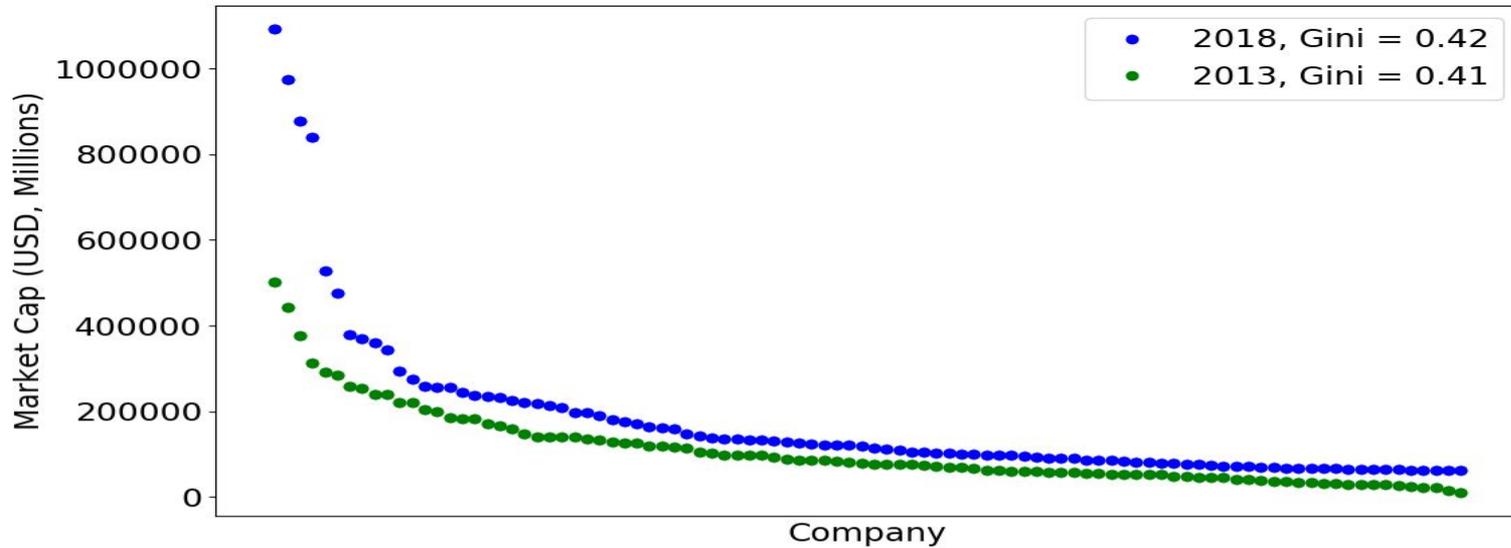


This visualization is available at [OurWorldinData.org](https://ourworldindata.org). There you find research, visualisations and more visualizations on this topic.  
Licensed under CC-BY-SA by the author Max Roser.

Average Gini for income inequality, OECD countries, mid-2000s:  
Slovenia: 0.25, U.S.: 0.38, Mexico: 0.48

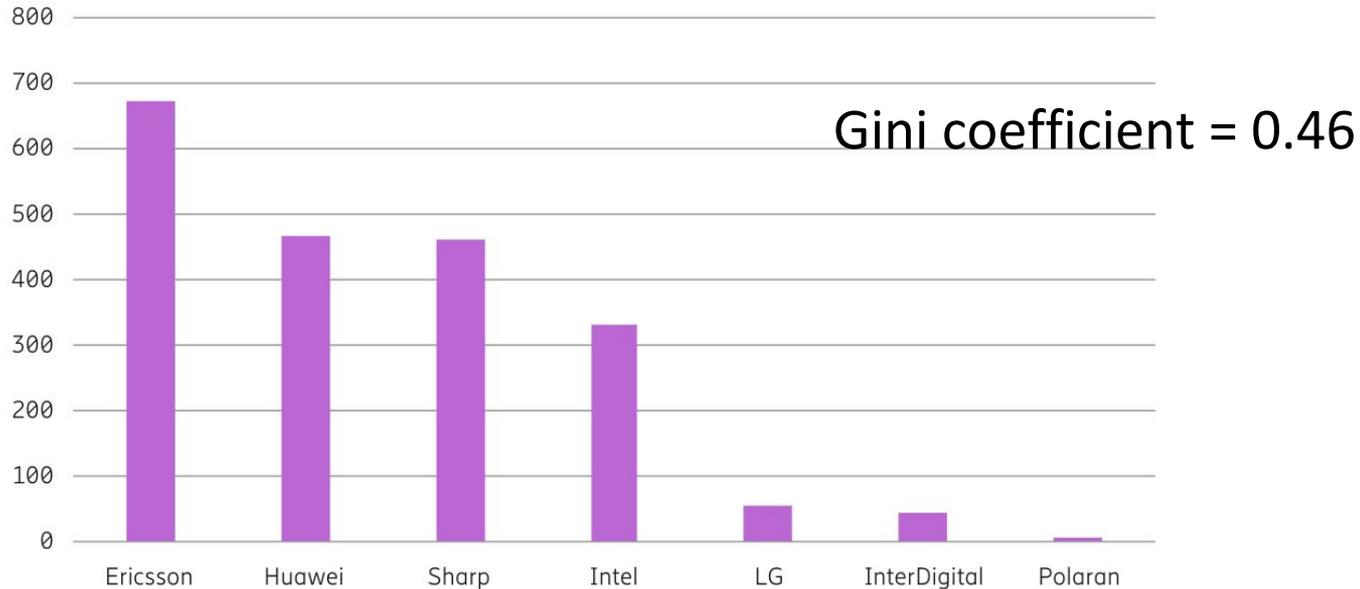
# Concentration in U.S. stock market

Market capitalization of top 100 companies (S&P500)



# Concentration in 5G patent market

Figure 1: Publicly available patent families associated with 5G declarations by June 2018



Source: Estimating the Future 5G Patent Landscape, 2018, Ericksson

# Power Law : Published AI patent applications

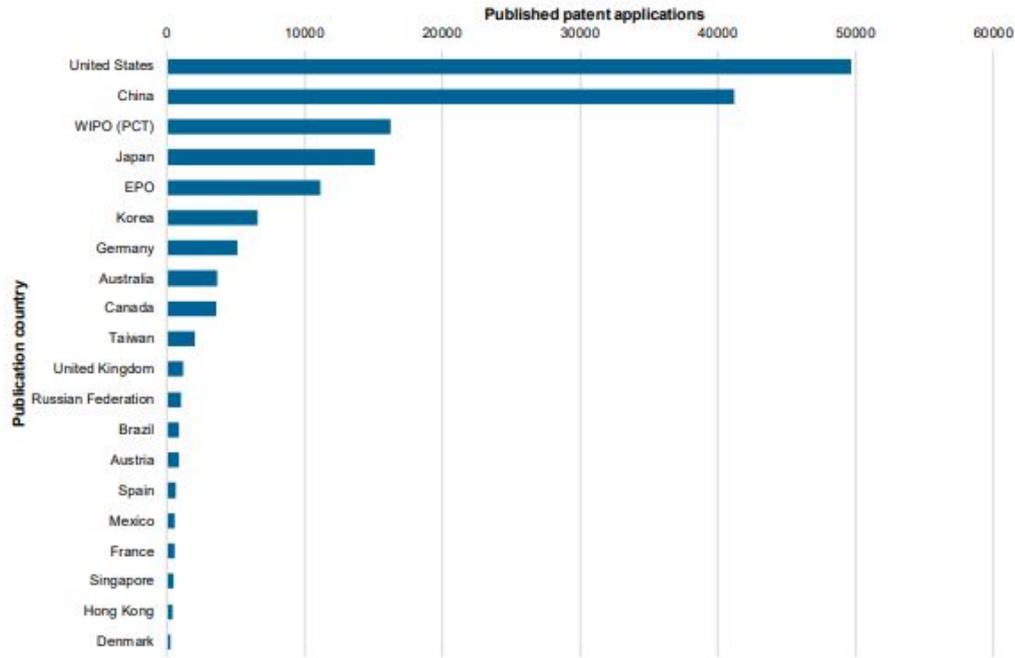
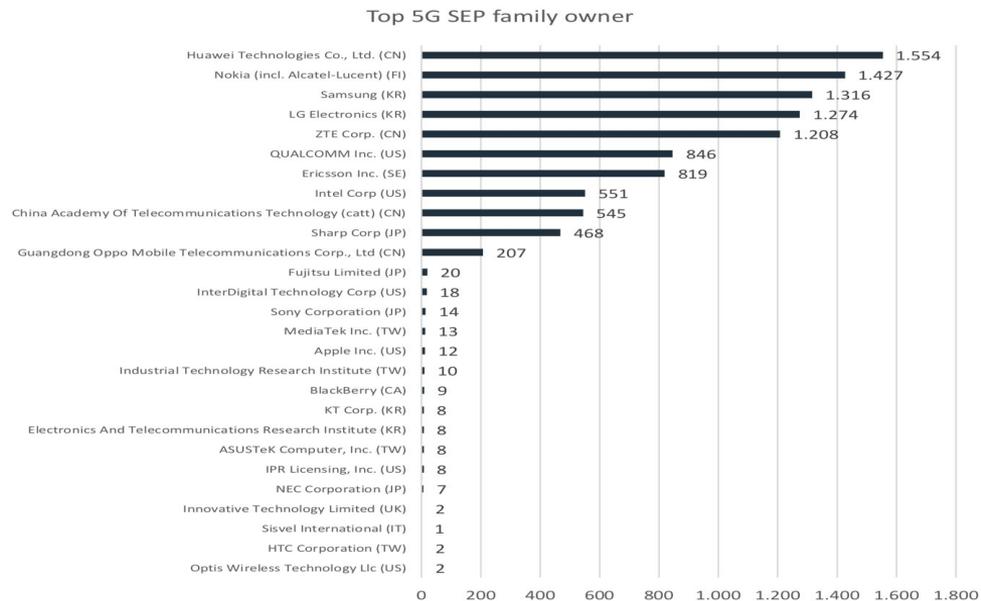


Figure 2: AI patent applications by publication country, 1998-2017

# Power Law

Table 2: Top 5G standard essential patent owner as to the number of patent families



# NETWORKS - WH questions

*Where?*

Nervous system, individuals friends linked, knowledge flows, network cables.

*Why?*

1. to measure, describe, and categorize network structure and the patterns of relationships between network nodes
2. to understand network evolution and growth and its relationship to the network structure
3. to understand how the collective behavior of entities connected in a network depends on and derives from the network's structure.

# Networks

HOW ?

Nodes and Links: Node : An individual ::Link: (friendship,, kinship, business association, sexual involvement); Airport:Flight connections; Patents: Patent citation.

Power law distributions: One node is highly connected, Fat tails.

# Examples of Network

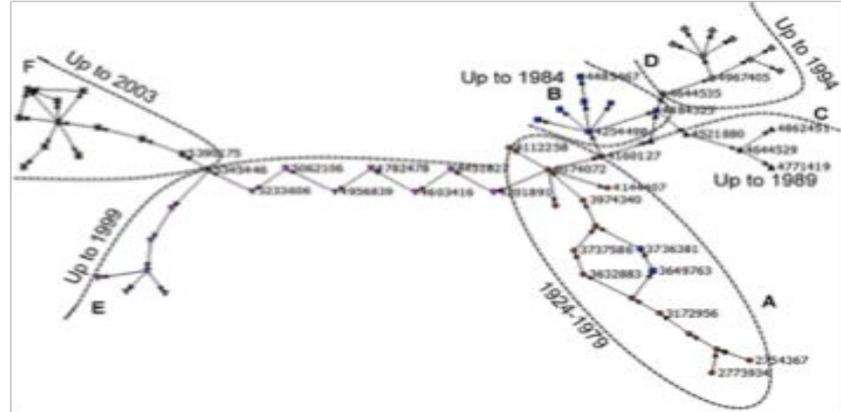


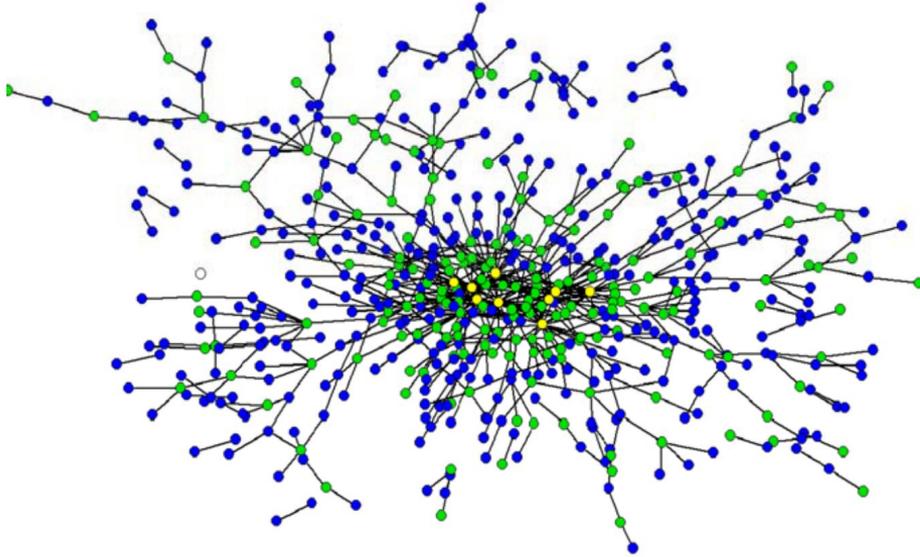
Fig. 4. Union of the top main paths calculated on a nested subsample.

Martinelli A, 'An Emerging Paradigm or Just Another Trajectory? Understanding the Nature of Technological Changes Using Engineering Heuristics in the Telecommunications Switching Industry' (2012) 41 Research Policy 414.

Strandburg K and others, *Law and the Science of Networks: An Overview and an Application to the 'Patent Explosion'*, vol 21 (2007)

# Examples

Figure 3. The Emergent Federal Judicial Social Structure



Thank you

## Bibliography

1. Strandburg KJ, ‘Law and the Science of Networks: An Overview and an Application to the “Patent Explosion”’ (2006) 21 Ssrn
2. Schelling TC, *Micromotives and Macrobehavior : With a New Preface and the Nobel Lecture* (W W Norton and Company 2006)