Network and Spatial Analyses

1. April 2020

Lecture:

Principle of Relatedness

- Related diversification of regions
- Relatedness and regional economic trajectories
- Applications in regional economic development

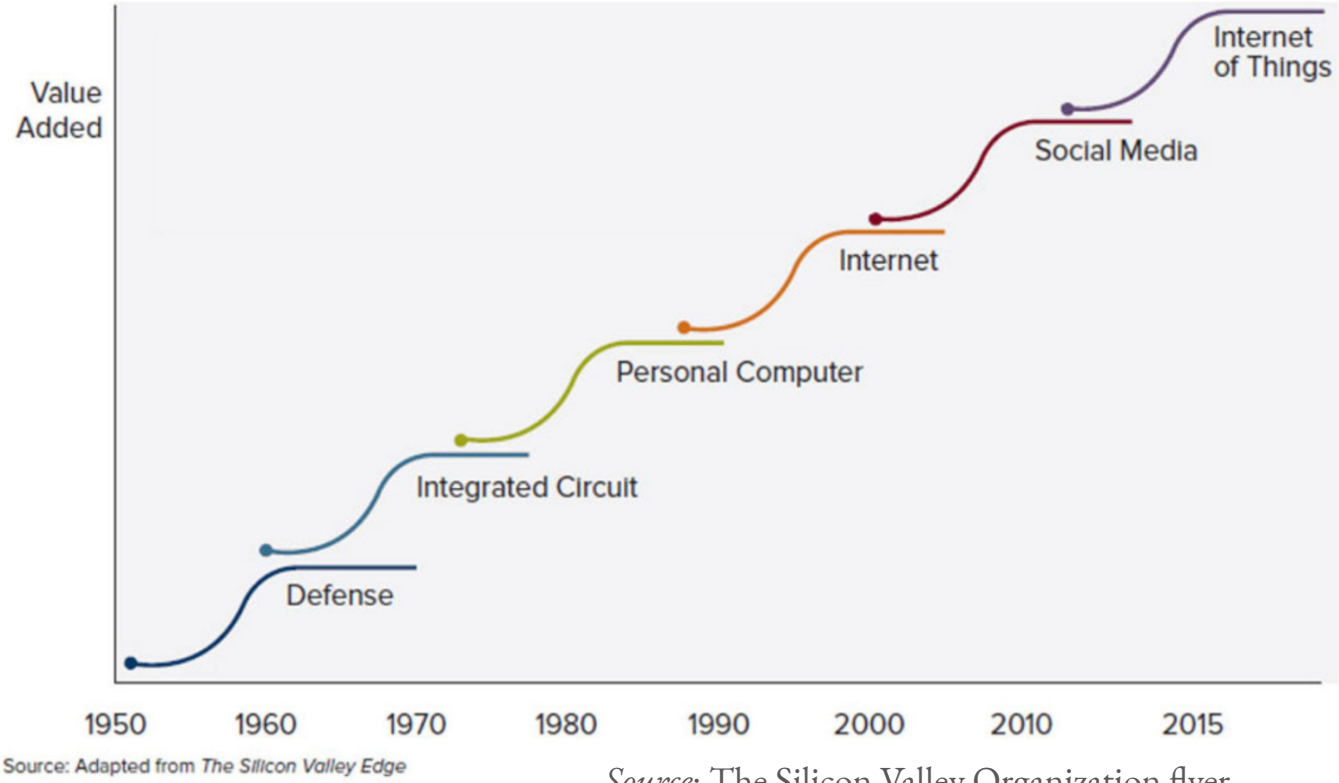
Seminar:

Netflix of regions

Course Github page: https://github.com/bokae/anet_course

Economic activities are more likely to enter (exit) regions with a more (less) related portfolio of existing economic activities.

Evolution of Silicon Valley 1950-2015



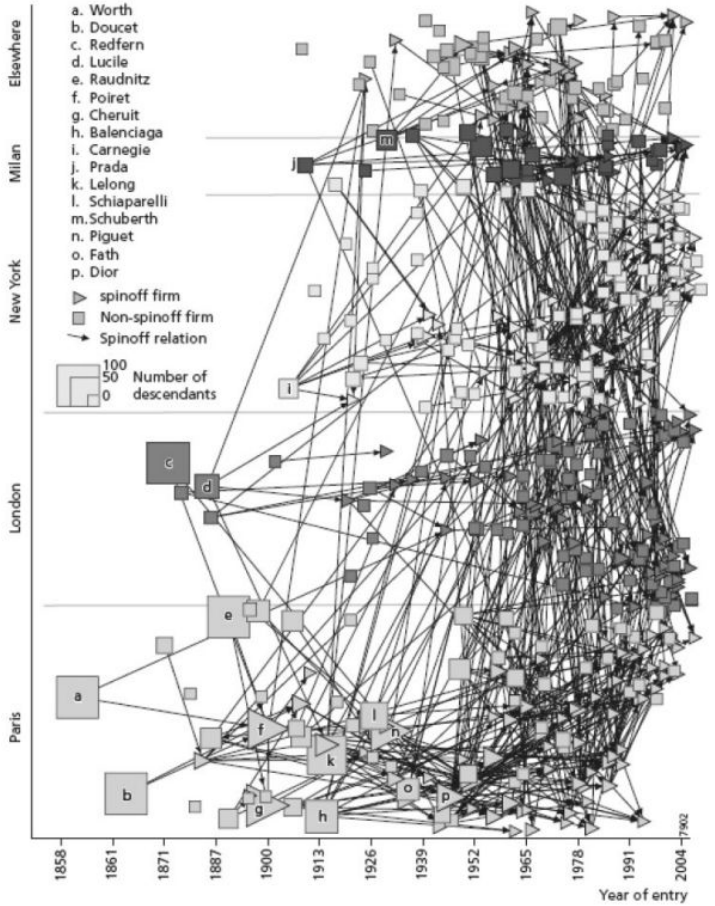
Source: The Silicon Valley Organization flyer

The birth of new industries

Connection to clusters and spinoffs

Experience in related industries helps firm formation and survival in new industries.

- US and UK car manufacturing (Klepper 2007, Boschma-Wenting 2007)
- Dutch printing industry (Heebels-Boschma 2011)
- Global fashion industry (Wenting 2008)



Source: Wenting (2008)

The product space

Hidalgo et al. (2007)

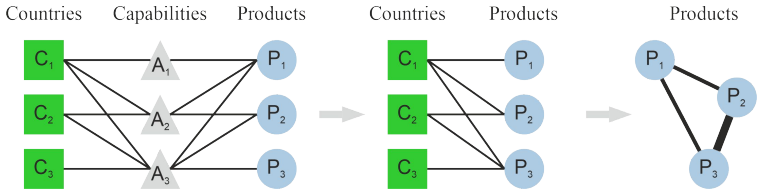
The question is how nations build comparative advantage in export products?

National capabilities condition which new export products are feasible.

Products require capabilities that partly overlapping capabilities.

Method

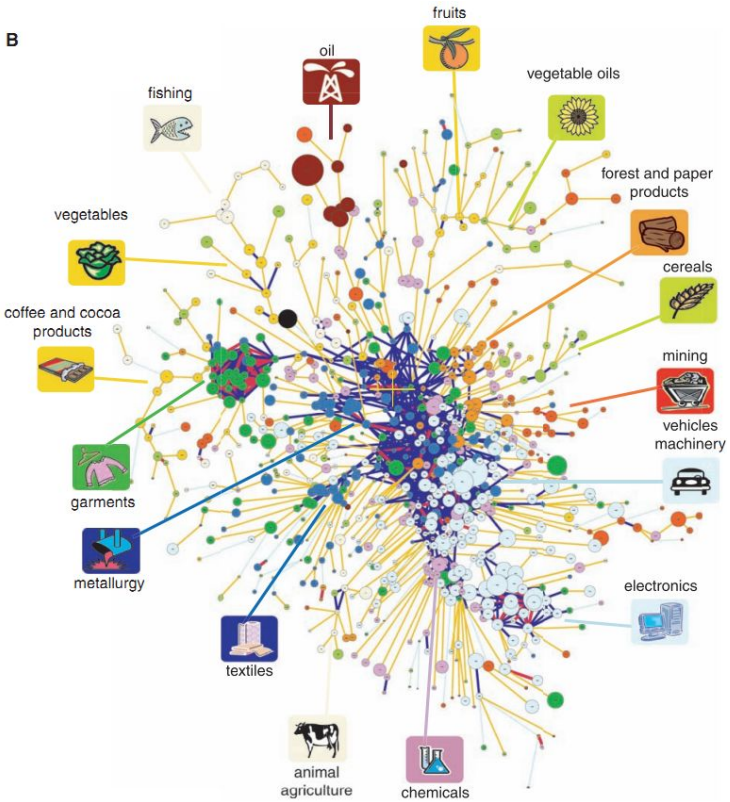
Relatedness (cognitive proximity) is established based on co-occurrence of products in country export baskets.



Source: adapted from Hidalgo – Hausmann (2009)

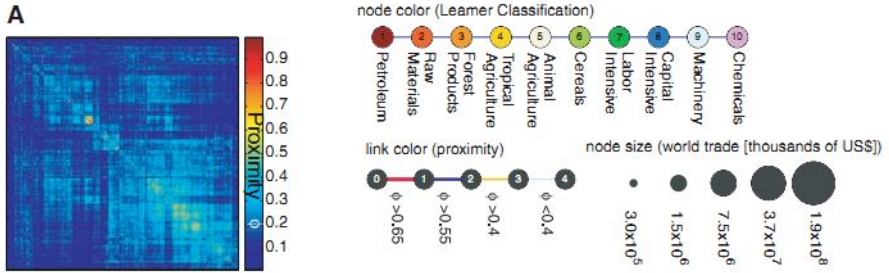
$$\varphi_{ij} = min\{P(RCA_i|RCA_j), P(RCA_j|RCA_i)\}$$

The product space



Countries are more likely to develop RCA in export products that are related to the existing export basket.

Less-developed countries are more likely to have RCA in more peripheral products.



Source: Hidalgo et al. (2007)

The industry space

Neffke et al. (2011)

Industrial diversification of 70 Swedish regions for 1969-2002.

Regional capabilities condition which new industries are feasible to develop.

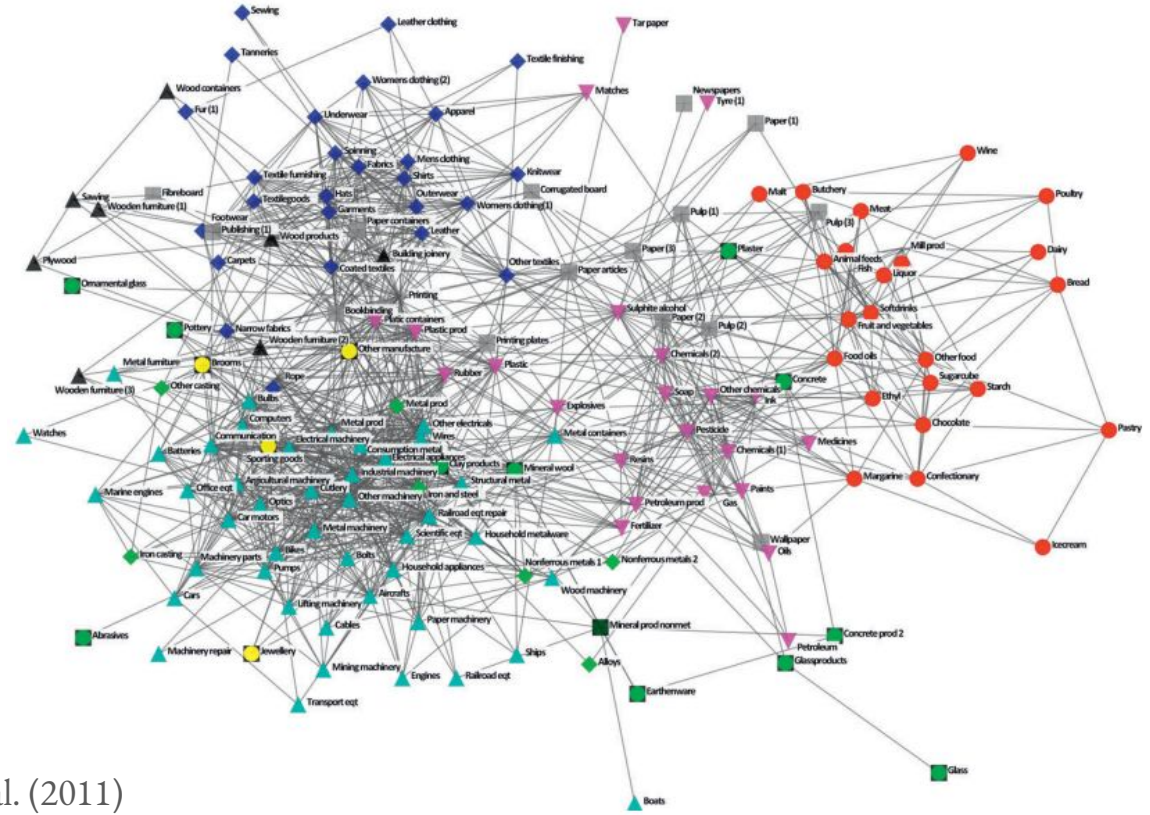
Production in multi-product plants requires partly overlapping capabilities.

Method

Relatedness based on product co-occurrence in plants due to economies of scope.

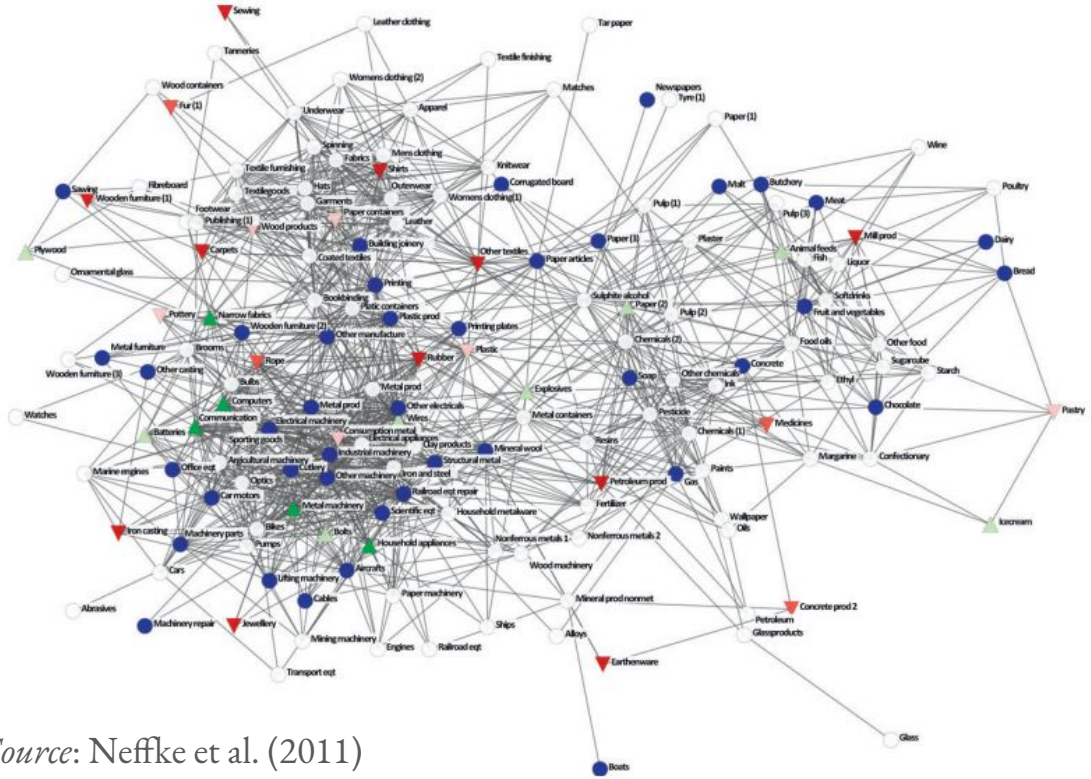
Average degree of relatedness between industries, controlling for profitability and size of industry.

The industry space



Source: Neffke et al. (2011)

The industry space



Source: Neffke et al. (2011)

Example

Swedish industry space localised for Linköping.

The regional industrial portfolio became more cohesive over time.

The region moved away from textile and woodwork, and closer to manufacturing specialisation.

The knowledge space

Rigby (2015)

Technological diversification of US metropolitan areas between 1975-2005.

Regional capabilities condition which technologies are feasible to develop.

Production of new pieces of knowledge requires partly overlapping knowledge domains

Method

Relatedness established based on co-occurrence of knowledge domains (technology classes) on patent documents.

The knowledge space

Colours

Black = Chemicals

Green = Computers and Communications

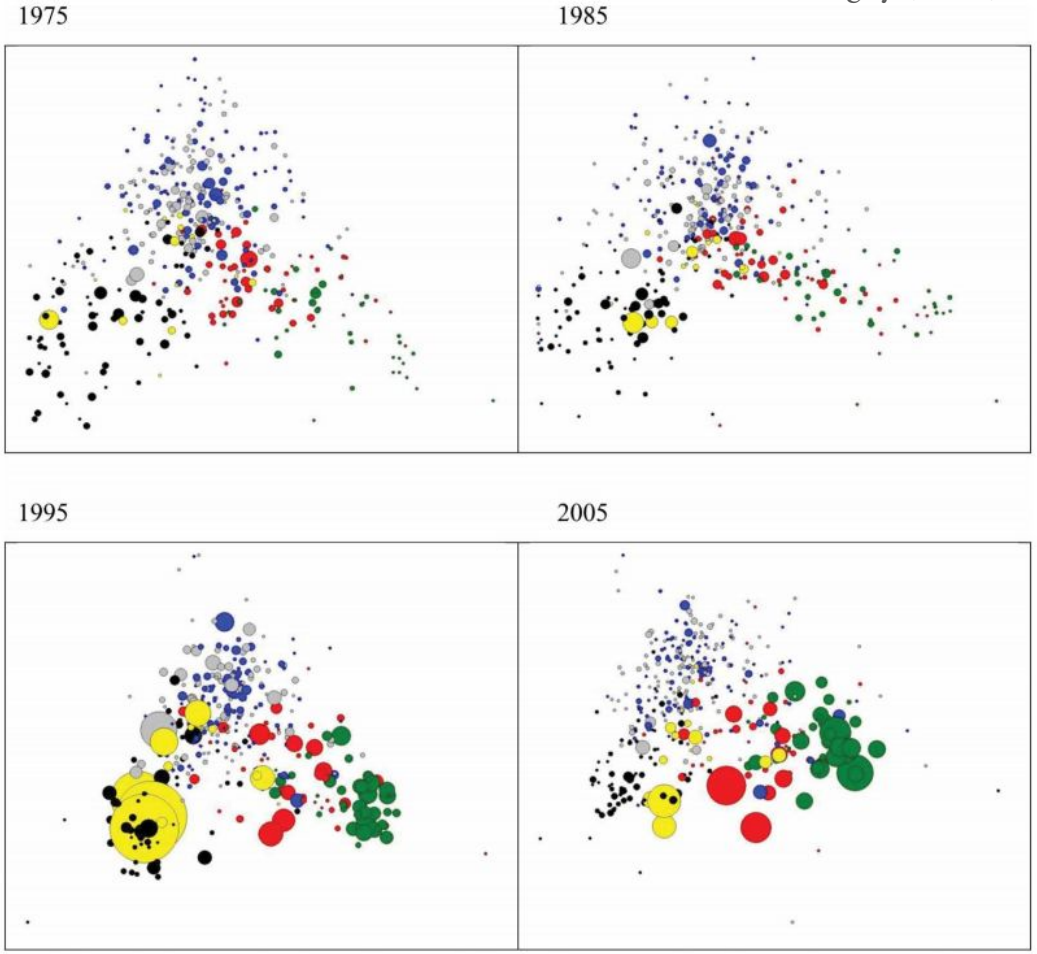
Yellow = Drugs and Medical

Red = Electronics

Blue = Mechanical

Grey = Miscellaneous

Source: Rigby (2015)



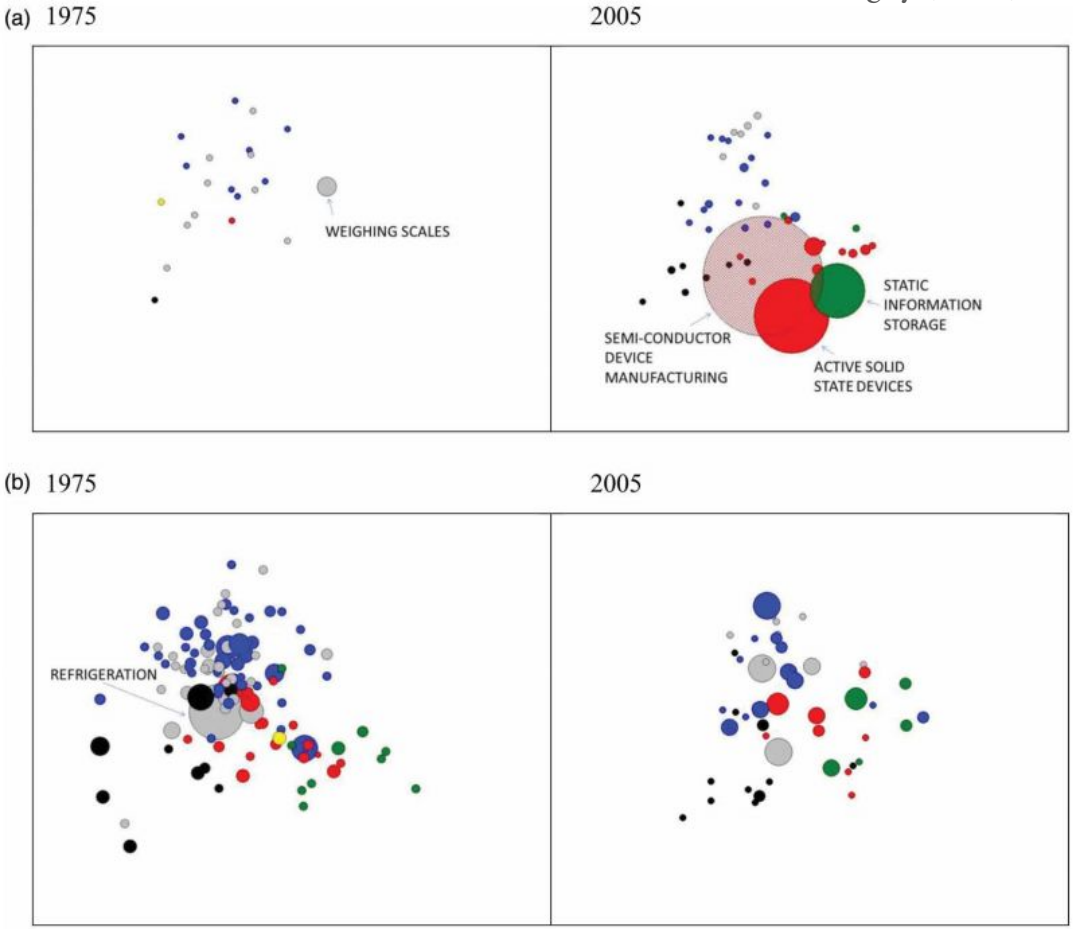
The knowledge space

Examples

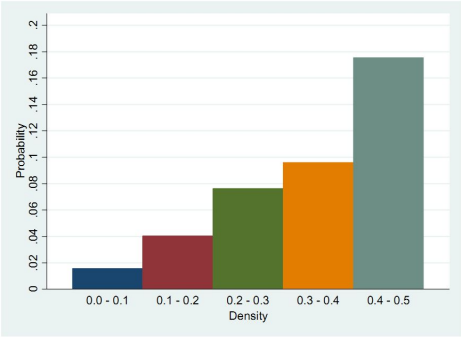
(a) Boise, Idaho

(b) Dayton, Ohio

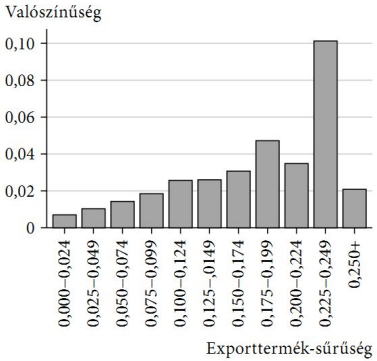
Source: Rigby (2015)



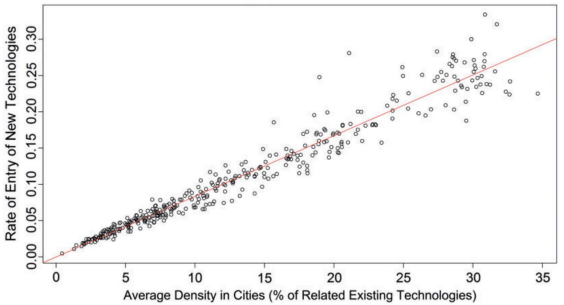
The principle of relatedness



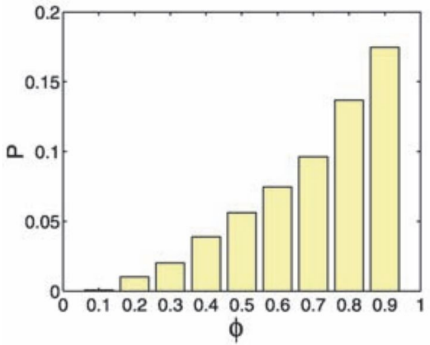
Source: Boschma et al. (2013)



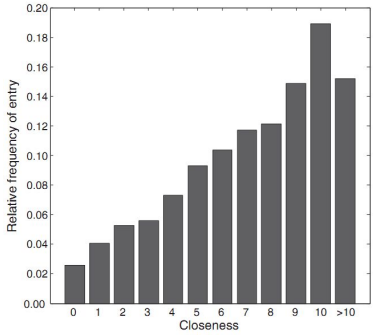
Source: Elekes-Lengyel (2020)



Source: Boschma et al. (2015)



Source: Hidalgo et al. (2007)



Source: Neffke et al. (2011)

Relatedness conditions a regions ability to develop new growth paths and withstand shocks

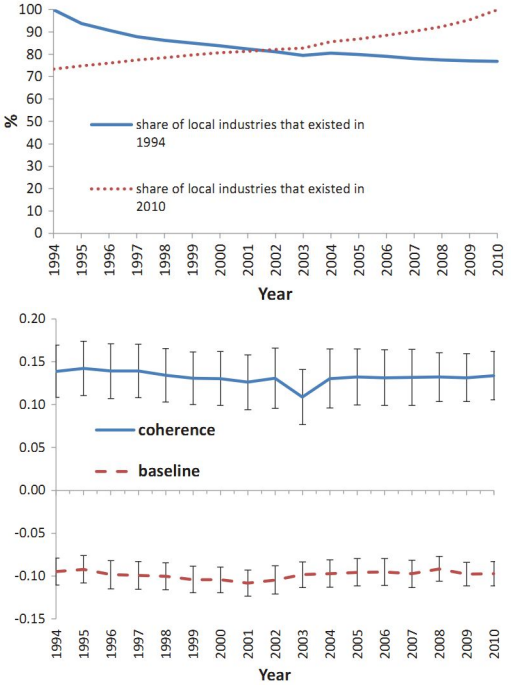
Regional capability base

Structural change

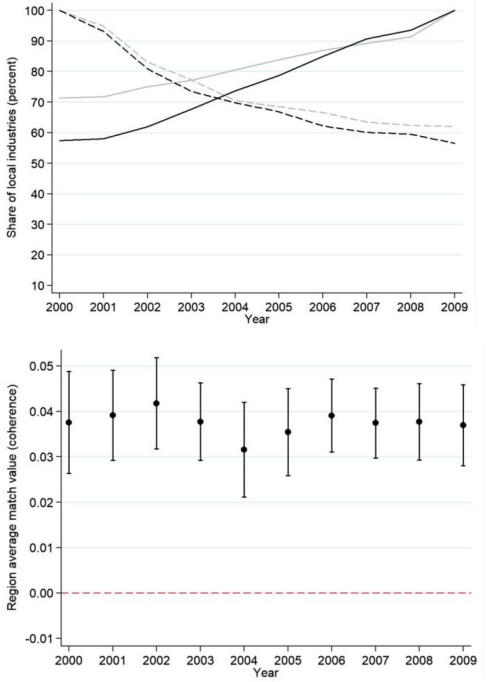
The industry mix has a relatively high turnover.

The regional capability base seems to be more stable over time.

Who induces structural change in regions?



Source: Neffke et al. (2018)



Source: Elekes et al. (2019)

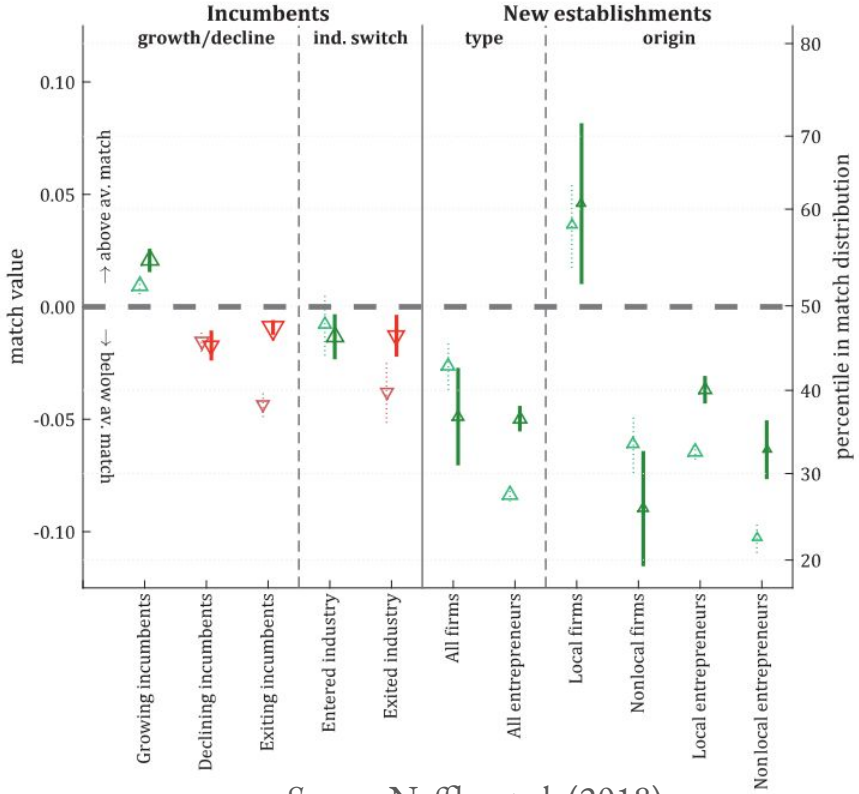
Who induces structural change in regions?

Agents of structural change

Economic agents from outside the region tend to introduce more unrelated activities.

Entrepreneurs tend to introduce more unrelated activities.

Foreign-owned firms tend to introduce more unrelated activities.



Source: Neffke et al. (2018)

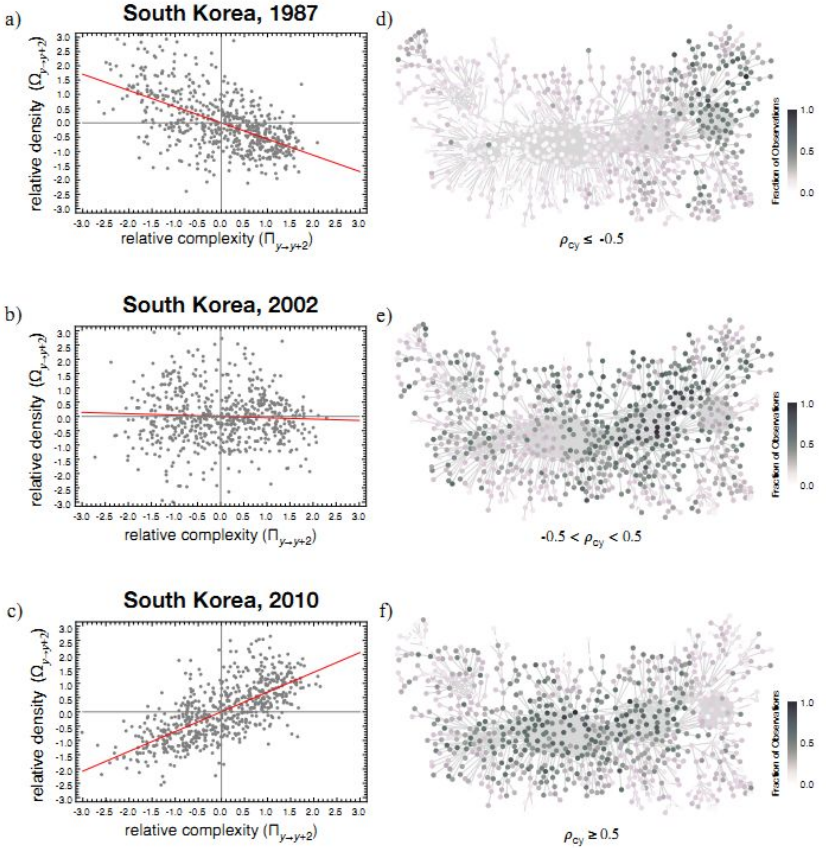
Unrelated diversification

Why care about unrelated diversification?

Unrelated variety fosters economic growth in the long-run (Saviotti-Frenken 2008).

Unrelated variety contributes to upgrading to more complex, valuable activities (Pinheiro et al. 2018).

Unrelated variety contributes to the resilience of regions (Frenken et al. 2007).



Source: Pinheiro et al. (2018)

Crisis and resilience

Regional resilience

The ability of regions to withstand shocks and develop new growth paths.

Is there a tradeoff between exploiting the current economic structure and being able to adapt to a crisis?

Relatedness in times of crisis

In the case of US metro areas patenting activities, more options for related diversification decreases the likelihood of entering a crisis, and decreasing the intensity and length of the crisis (Balland et al. 2015).

What is the role of institutions in diversification?

National institutions

Liberal market economies favour more unrelated diversification, coordinated market economies favour more related diversification (Boschma-Capone 2015).

More developed economies (EU27) tend to diversify into more unrelated export products, compared with less developed economies (European Neighborhood Policy) (Boschma-Capone 2016).

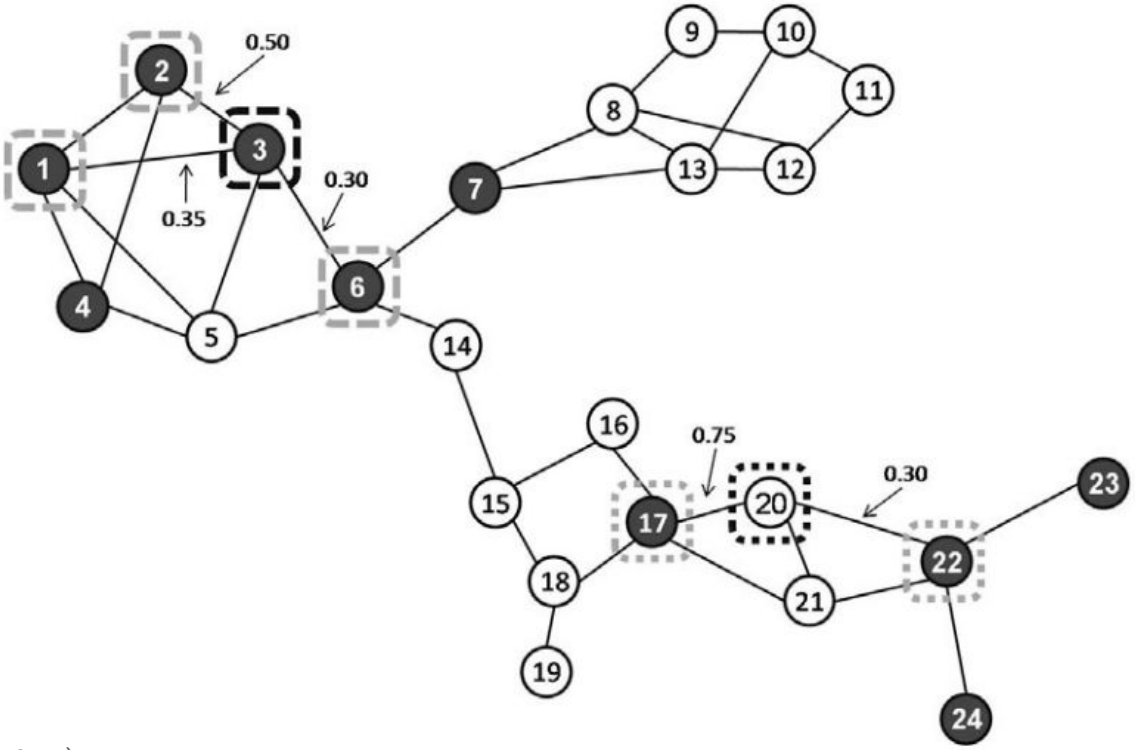
Regional institutions

Bridging social capital helps the industrial diversification of EU regions, bonding social capital not so much.

Especially when quality of government in a region is low (Cortinovis et al. 2017).

Relatedness is applied to inform place-based policymaking

Illustration of using an industry-space for policy



Source: Neffke et al. (2011)

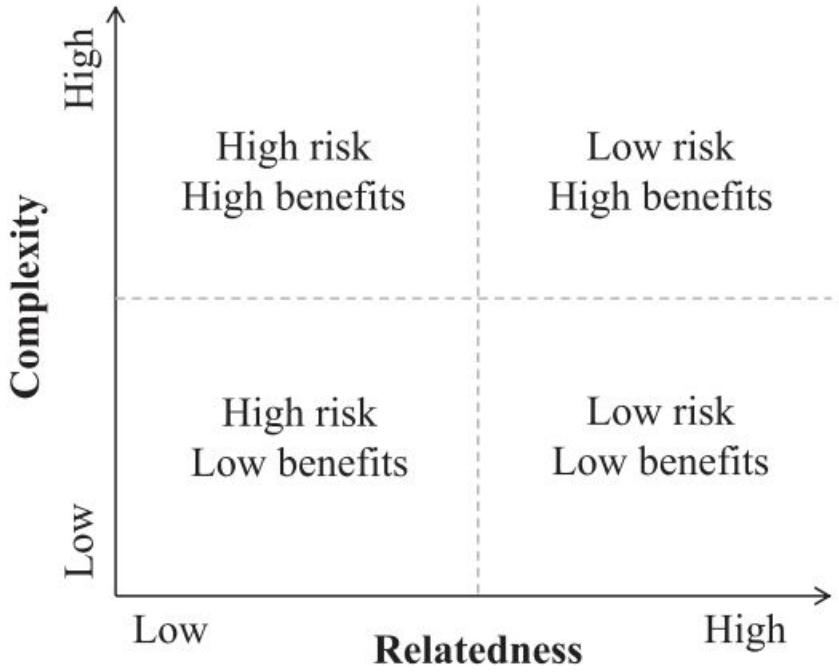
Framework for smart specialisation

Smart specialisation policy

Influential place-based approach to regional economic development focusing on endogenous regional capability development.

Rooted partly in research on relatedness.

Complexity here has an operational definition, and correlates with economic value.



Source: Balland et al. (2019)

Framework for smart specialisation

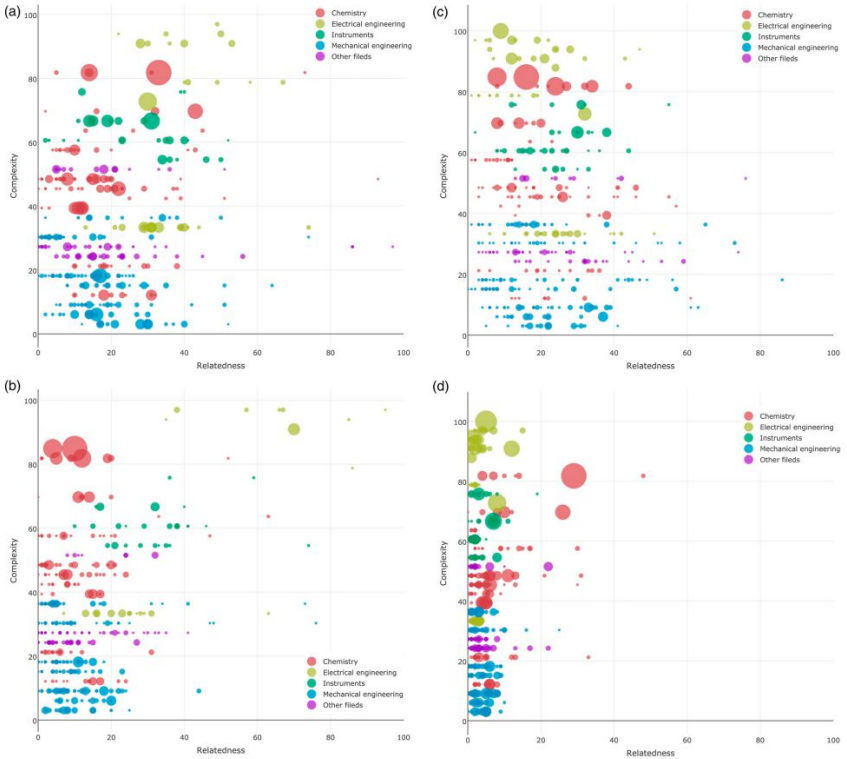
Examples

(a) Île-de-France (France, FR10): core leading region

(b) Noord-Brabant (the Netherlands, NL41): high-tech region

(c) Lancashire (UK, UKD4): old industrial region

(d) Extremadura (Spain, ES43): lagging peripheral region



Source: Balland et al. (2019)

Case of Västernorrland County in Sweden

Description

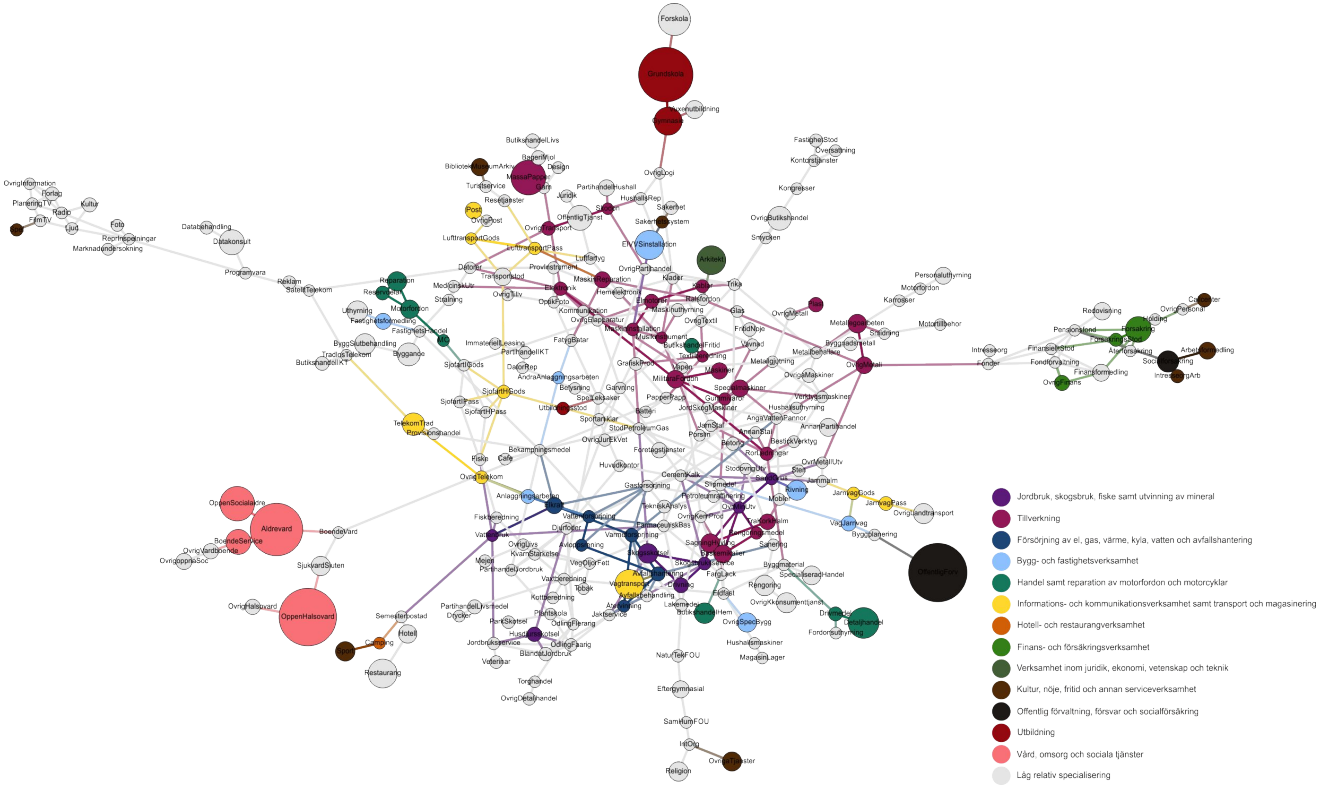
Local development agency approached us with questions on a number of specific industries.

Explored the relatedness density of these industries, as well as explored industries with high/low relatedness density.

Departed from a Swedish skill-relatedness network.

Source: Wikipedia

Industry space of Västernorrland



Source: Elekes-Eriksson (2019)

Related Seminar

Questions

How related are the focal industries to the local economy?

What diversification options could we recommend?

Tools (Netflix for Regions)

Constructing simple tools in R to advise Västernorrland region of Sweden on smart specialisation.

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