

*BISS Bochum*

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# GeoInno: Types of proximities

Tom Broekel

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# Course Outline

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- 🌐 Knowledge & externalities
- 🌐 Knowledge transfer
- 🌐 Proximities
- 🌐 Agglomeration & scaling
- 🌐 Spin-offs & life cycle
- 🌐 Evolutionary economics
- 🌐 Relatedness & knowledge space & complexity
- 🌐 Knowledge networks
- 🌐 Political support for innovation, collaboration, networks

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# Session Outline

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## Types of proximities

-  Proximities

-  Cognitive proximity

-  Organisational proximity

-  Social proximity

-  Institutional proximity

-  Geographical proximity

-  Summary proximities

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# Types of proximity

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- 🌐 Spatial proximity argued to be crucial for knowledge transfer
  - 🌐 Local knowledge spillover
    - 🌐 Observation (local public good)
    - 🌐 Interactions by chance
    - 🌐 Spatial mobility
    - 🌐 Collaboration

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# Types of proximity

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- 🌐 Spatial proximity facilitates coordination of knowledge transfer
  - 🌐 Lower transport costs
  - 🌐 Easier initiation of contacts & interactions
  - 🌐 Quicker building of trust (identifies, shared values)
  - 🌐 Monitoring

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# Types of proximity

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## **However**

-  Not just spatial proximity with these features
-  Other types of proximity may matter as well
-  Proximity not always advantageous

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# Types of proximity

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- 🌐 Paper: *“Proximity and Innovation: A Critical Assessment”* by Ron Boschma
- 🌐 Journal: Regional Studies
- 🌐 Year: 2005
- 🌐 Google Scholar: 9,297 Citations
- 🌐 Review of literature on proximities and development of coherent framework

# Excursus: Ideas of man



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# Excursus: Ideas of man

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- Homo economicus
  - Individual as economic actor
  - Unlimited rationality
  - Maximisation of individual utility (consumers) and profit (producer)
  - Usually combined in neo-classical economics with assumptions of:
    - Complete information about all alternatives and their consequences
    - Unlimited and instant computational capacity

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# Excursus: Ideas of man

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## Homo sociologicus

-  Individual with primary social behaviour
-  Social embeddedness shapes norms, values, and expectations concerning behaviour
-  Individuals with low influence on social group, but group with strong influence on individual
-  Groups reward or sanction behaviour
-  Small groups with close connections have large relevance (“peer-groups”)

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# Excursus: Ideas of man

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- Bounded rationality (Nobel price 1978, Herbert Simon)
  - Individuum as “satisfizer”
  - Satisfizer don't maximise utility, seek to satisfy their aspiration level
  - Stop activity when aspiration level reached
  - Bounded rationality includes limited information processing capacity
  - Activities shaped by “routines”

# Excursus: Ideas of man

## 🌐 Routines

- 🌐 Decision-making rules and learned behaviour (in particular in unknown situations)
- 🌐 Represent usual and expected behaviour of individuals
- 🌐 Frequently paired with heuristics (unreflected, learned, behaviours)



# End Excursus: Ideas of man

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# Session Outline

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# Cognitive proximity

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- Bounded rational actors
- Cognitive limitations and routines prevent full rationality
- Search for new knowledge and solutions in cognitive proximity to own knowledge basis
- For instance:
  - Reliance on insights of own field of expertise
  - Higher trust in and knowledge of experts and knowledge sources from own field

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# Cognitive proximity

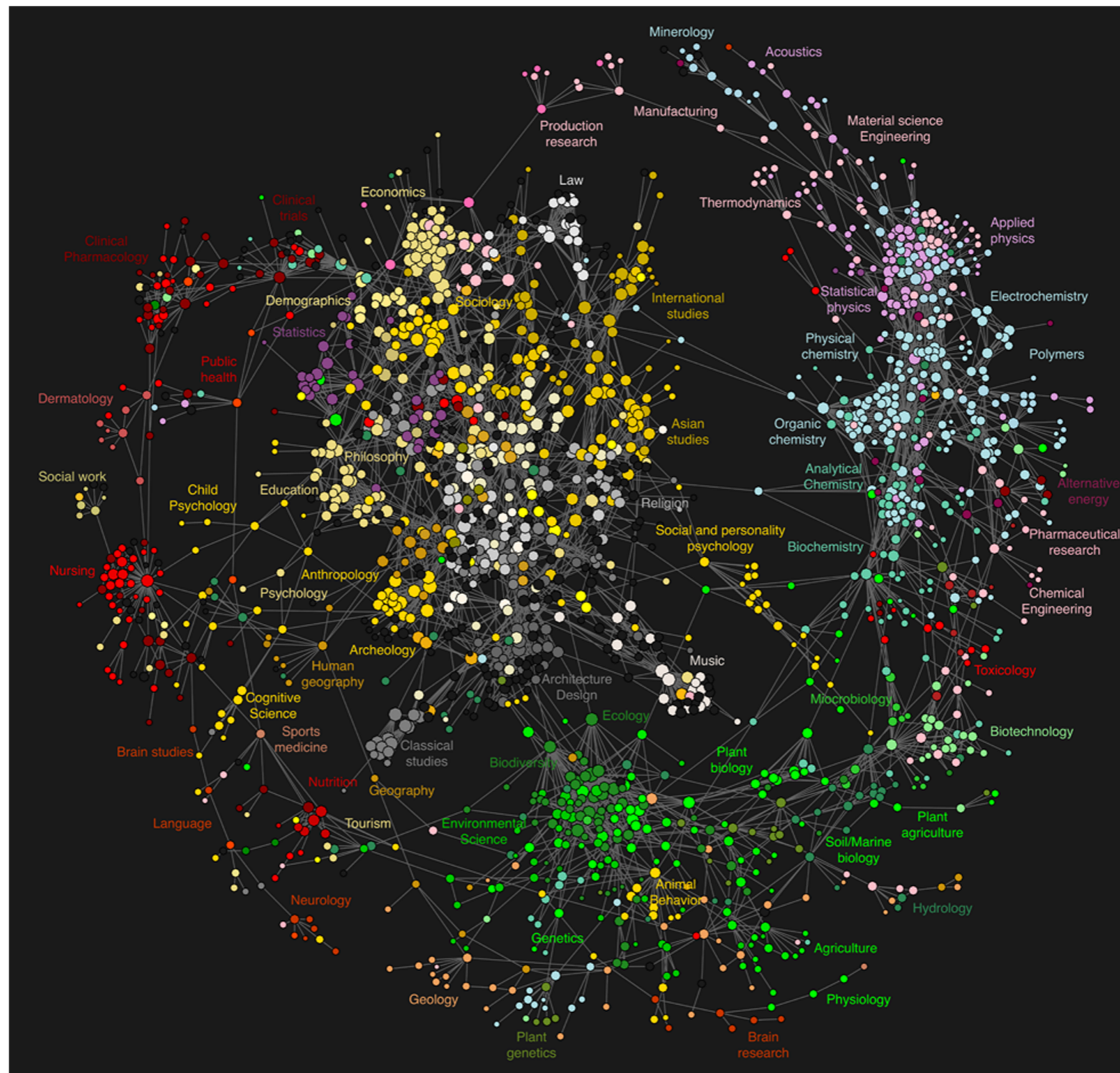
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## Knowledge of individual / organization

-  Includes all knowledge immoderately accessible by individual (all data, Information, knowledge, routines ...)
-  Classification into different sections, e.g. by subjects (biology, geography, mathematics), sectors (agriculture, industries, universities), or occupations (secretary, manager, engineer, etc.)



# Cognitive proximity



Source: <https://indieresearch.net/2013/01/20/a-map-of-the-world-of-science/>

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# Cognitive proximity

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- Absorptive capacity: ability to learn new knowledge shaped by knowledge already learned (Cohen & Levinthal, 1990)
  - Large cognitive distances between knowledge sections imply expensive build-up of experiences, difficulty of learning, less usefulness of existing expertise
  - Example: Managers learning new knowledge in economics easier than them acquire new expertise in physics
  - Examples from Cohen & Levinthal (1990)
    - Students usually utilise example programs when learning how to program, their success depends on understanding of example code
    - Students with better knowledge of basic algebra learn higher math more easily

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# Cognitive proximity

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- 🌐 Search for new knowledge shaped & biased by existing knowledge
- 🌐 More similar knowledge (to own expertise) easier found and more efficiently absorbed
- 🌐 Three central implications
  - 🌐 Organisations with heterogenous knowledge bases (individual histories of search and learn processes)
  - 🌐 Similar knowledge easier learned
  - 🌐 Individuals / organisations tend to act within limited cognitive spaces (knowledge search, learning, inventions)

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# Cognitive proximity

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- Inventions (novel knowledge combinations): bringing together heterogenous knowledge segments
  - Individuals rarely with very heterogenous knowledge due to the working of absorptive capacity
  - Increasing levels of specialisation make individuals' knowledge more homogenous
- > Inventions increasingly require interactions of multiple individuals**

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# Cognitive proximity

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## Cognitive proximity

-  Helps in finding complementary knowledge
-  Eases knowledge transfer through effective communication (similar terminology, symbolic, language)
-  Increases likelihood of contact and knowledge transfer

## However

-  **Cognitive proximity with negative effects too**

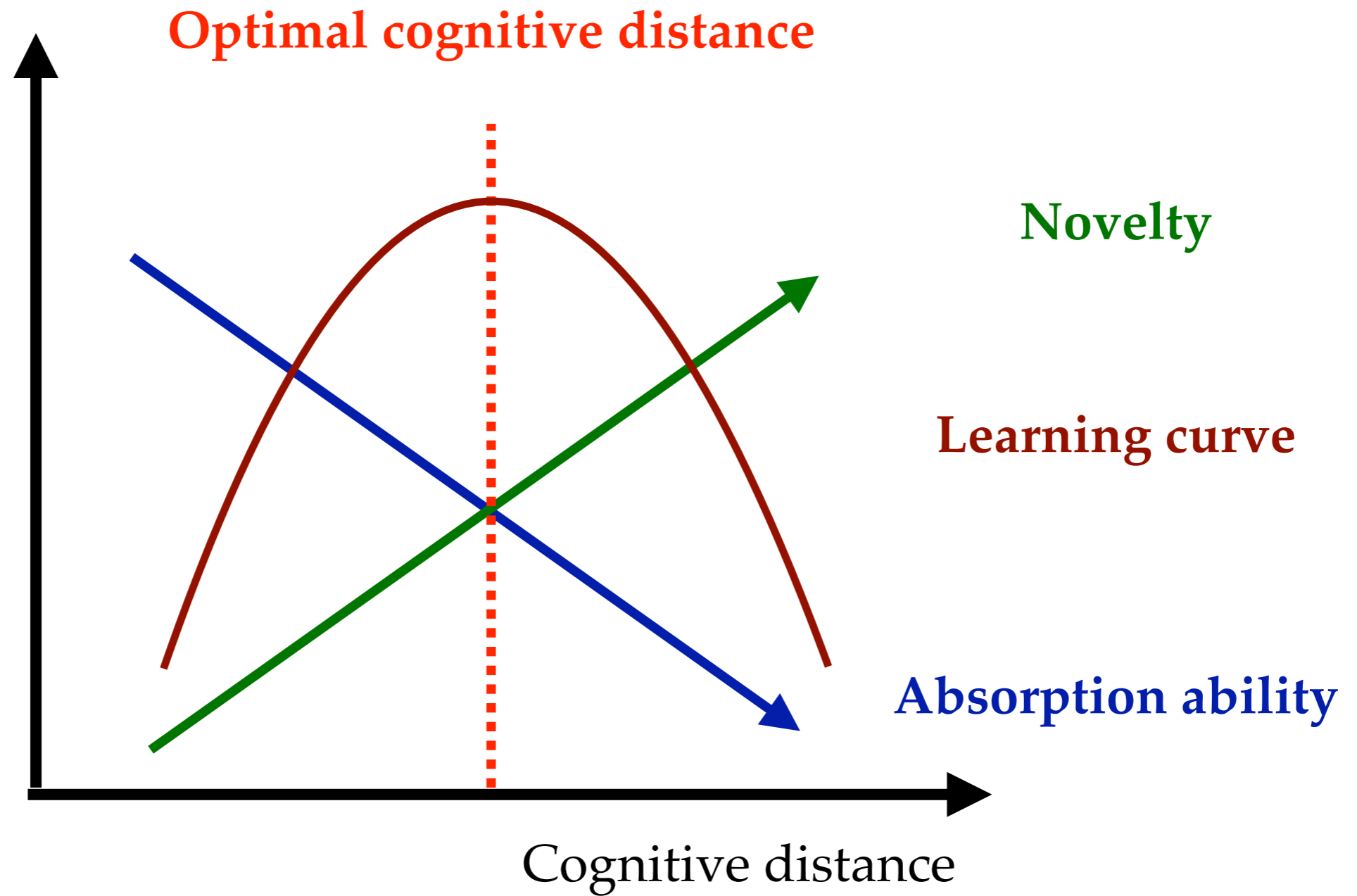
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# Cognitive proximity

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- 🌐 Negative effects of cognitive proximity
  - 🌐 Cognitively distant knowledge sources facilitate new ideas and creativity
  - 🌐 Cognitively distant knowledge sources prevent potential “lock-in”
    - 🌐 Fixed routines prevent appreciation and openness to newness and foreigners, rejection of alternatives, “organisational blindness”, “cooking in own juice”
    - 🌐 “Competency trap”: difficulty to change behaviour that was successful in the past although it might have become redundant
  - 🌐 Increased likelihood of involuntarily knowledge sharing
  - 🌐 Cognitive proximity reduces excludability of knowledge

# Cognitive proximity



Source: Nooteboom et al. (2007, p. 1018)

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# Cognitive proximity

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- *“In sum, actors need cognitive proximity in terms of a shared knowledge base in order to communicate, understand, absorb and process new information successfully. However, too much cognitive proximity may be detrimental to interactive learning. It not only decreases the potential for learning, but also it increases the risk of lock-in and the problem of undesirable spillovers to competitors.” (Boschma, 2005, S. 64)*



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# Organisational proximity

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- ① Ability to coordinate interactive learning essential
  - ① Eases communication
  - ① Allows for benefits of specialisations
  - ① Facilitates finding of data and experts

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# Organisational proximity

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- Describes organisational arrangement between actors in terms of power and control within and between organisations
- Continuous classification from a transaction cost perspective
  - Markets (uncoordinated)
  - Networks (partly coordinated)
    - E.g., social sanctions and rewards
  - Firms (“absolute” control)

# Excursus transaction costs

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# Excursus transaction costs

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## Transaction costs (nobel price 1992, Ronald Coase)

- Costs associated to the transfer of goods and services from one economic entity to another
- Costs of transaction initiation, agreement, transfer, control, adaption, enforcement

## Coase (1937)

- Investition of efficiency of different types of transaction forms (within firms and on the market)
- High transaction costs as reason for the existence of firms
  - Many economic transactions subject to high transaction costs such that they may not be completed on a free market (kind of market failure)
  - Embedding in transaction into shared organisation (firm) solves transaction problem

# End excursus transaction costs

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# Organisational proximity

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- Advantages of organisational proximity
  - Control reduces risks and uncertainties related to knowledge transfer (moral hazard)
  - Control solves issues of potential unintended knowledge spillover (keeps incentives to innovate)
  - Setting up complete and reliable contracts difficult in case of hard to describe content like knowledge
  - Organisation of feedback much easier

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# Organisational proximity

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- Disadvantages of organisational proximity
  - Lock-in on the same (repeating) interactions
  - Asymmetrical power relations create dependencies and high specific investments
    - Example: subsidiaries focus on keeping mother company happy and don't do what would actually be best for their performance (e.g., initiate new contacts)
  - Bureaucratic systems tend to reject change and innovation
    - Lack of feedback and criticism
    - Endangerment of power positions



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# Organisational proximity

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- *“In sum, while too much organizational proximity is accompanied by a lack of flexibility, too little organizational proximity goes along with a lack of control increasing the danger of opportunism” (Boschma, 2005, p. 65)*
- Loosely connected system (network) probably optimal
  - Offers some organisational framework and certainty (feedback, social pressure, reputation)
  - High flexibility and adaptability t
- **However:** hierarchical systems can be quick in adapting if central actor is willing

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# Social proximity

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## Insights of sociology

-  Economic activities always embedded into social context
-  Social relations impact economic results
-  Examples: mafia, family businesses, sharing economy, ...

## Definition social proximity

-  Social relations between actors at the micro level (individuals)
-  Includes trust, friendship, family relations, reputation, experiences ...

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# Social proximity

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- Social proximity  $\neq$  cultural proximity (rather macro-level)
- Positive effects on interactive learning and knowledge transfer
  - Improves communication through openness, commitment and willingness to invest efforts
  - Reduces transaction costs (monitoring, moral hazard)

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# Social proximity

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- 🌐 Negative effects on interactive learning and knowledge transfer
  - 🌐 (Too) strong focus on existing social relations - ignoring of potential for new connections and contacts
  - 🌐 Lock-in on socially embedded relationships - fortification of existing networks
  - 🌐 Exclusion of new or non-embedded persons, e.g., entrepreneurs, migrants, etc.

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# Social proximity

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- *“Investments in the stability of interfirm relations and mutual adaptations promised to reduce transaction costs. The close intraregional relations embedded in long-standing personal connections resulted in serious shortcomings in so-called boundary-spanning functions, which are of utmost importance in scanning the economic environment and in making external information relevant for the firms” (Grabher, 1993, p. 260).*

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# Social proximity

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## Summary social proximity

-  Sufficient social proximity between organisations crucial for trust, reliability, and reduction of uncertainty in knowledge-related interactions
-  **However:** Stickiness of existing social relations may prevent openness to and exploration of new contacts and knowledge

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# Session Outline

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# Institutional proximity

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- Institutional proximity (incl. most of cultural proximity)
  - Relationships between actors at the institutional (macro-) level
    - Includes norms, values, shared habits, formalised routines and laws shaping the (joint) living of actors
    - Includes relations between different levels (micro <-> macro)
    - Formal (more) and informal (less) rules of society

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# Institutional proximity

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- Positive effects of institutional proximity on knowledge transfer and innovation
  - Defines framework of interaction and thereby reduces uncertainty
  - Shared understanding (and being subject to) of rules, laws, and routines reduces uncertainty
  - Supports interaction, coordination, and reduces transaction costs

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# Institutional proximity

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- 🌐 Negative effects of institutional proximity on knowledge transfer and innovation
  - 🌐 Institutions frequently interdependent and complementary -> one institution enables or strengthens other institutions (bureaucracy, social complexity)
  - 🌐 Innovation requires change of habits, routines and rules
  - 🌐 Interdependent system of rules with greater resistance to change than less interdependent one
  - 🌐 Limited flexibility and changeability of formal rules
  - 🌐 Slow adaptation of rule system

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# Institutional proximity

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- Summary institutional proximity

- Institutional proximity reduces transaction costs and thereby facilitates knowledge transfer and learning

- Rigid and fixed institutional system prevents change, newness as well as openness

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# Geographical proximity

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- 🌐 Def: Physical distance between economic actors
- 🌐 What role does geographical proximity play for knowledge transfer and innovation when considering other proximities?

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# Geographical proximity

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- 🌐 Positive effects of geographical proximity on knowledge transfer and innovation
  - 🌐 Local buzz: informal information, local news, rumours, observations, ...
  - 🌐 Reduces transport costs
  - 🌐 Increases probability of meetings by chance
  - 🌐 **Spatial bias in knowledge search**

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# Geographical proximity

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- 🌐 Spatial bias in knowledge search (Broekel & Binder 2007)
  - 🌐 Individuals behaviour shaped by incomplete information and heuristics
  - 🌐 Familiarity, timeliness, availability heuristics (Kahneman & Tversky 1972, 1973, 1974)
    - 🌐 More recent, more frequent, and more familiar aspects are more prominent & more attractive in our mind
    - 🌐 Regional knowledge sources most likely more frequently, more recently experienced as well as more familiar (strengthened by identity, social relations)
    - 🌐 Actors (unconsciously) drawn towards spatially proximate knowledge sources



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# Geographical proximity

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- Negative effects of geographical proximity on innovation and knowledge transfer
  - Limited geographical openness
  - Spatial lock-ins: focus on own region and rejecting of outside influences, e.g., Ruhr area in 1970-1980s (Grabher, 1993)

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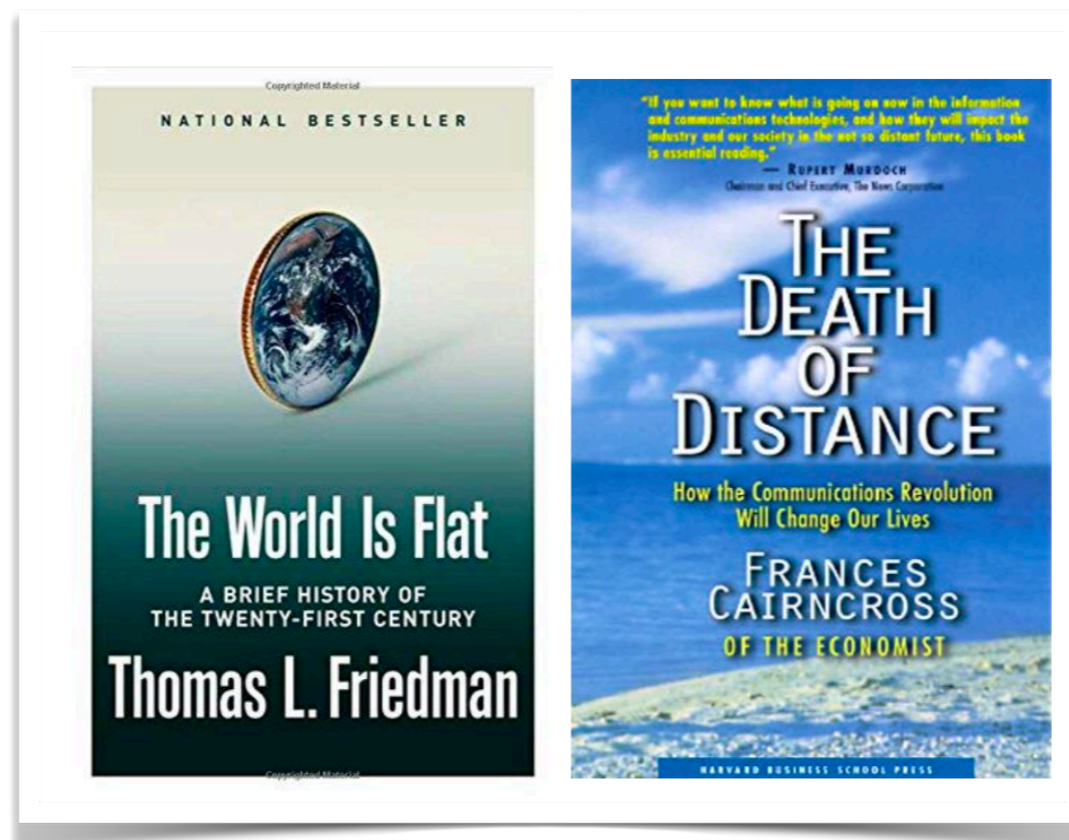
# Geographical proximity

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- *“The close intraregional interdependence, which is what constituted the coal, iron, and steel complex, had disastrous long-term consequences for the regions’ adaptability” (Grabher, 1993, p. 260)*
- *“The close intraregional relations embedded in long-standing personal connections resulted in serious shortcomings in so-called boundary-spanning functions, which are of utmost importance in scanning the economic environment and in making external information relevant for the firm” (Grabher, 1993, p. 260)*
- Empirical support in Broekel (2012) & Broekel et al. (2015)

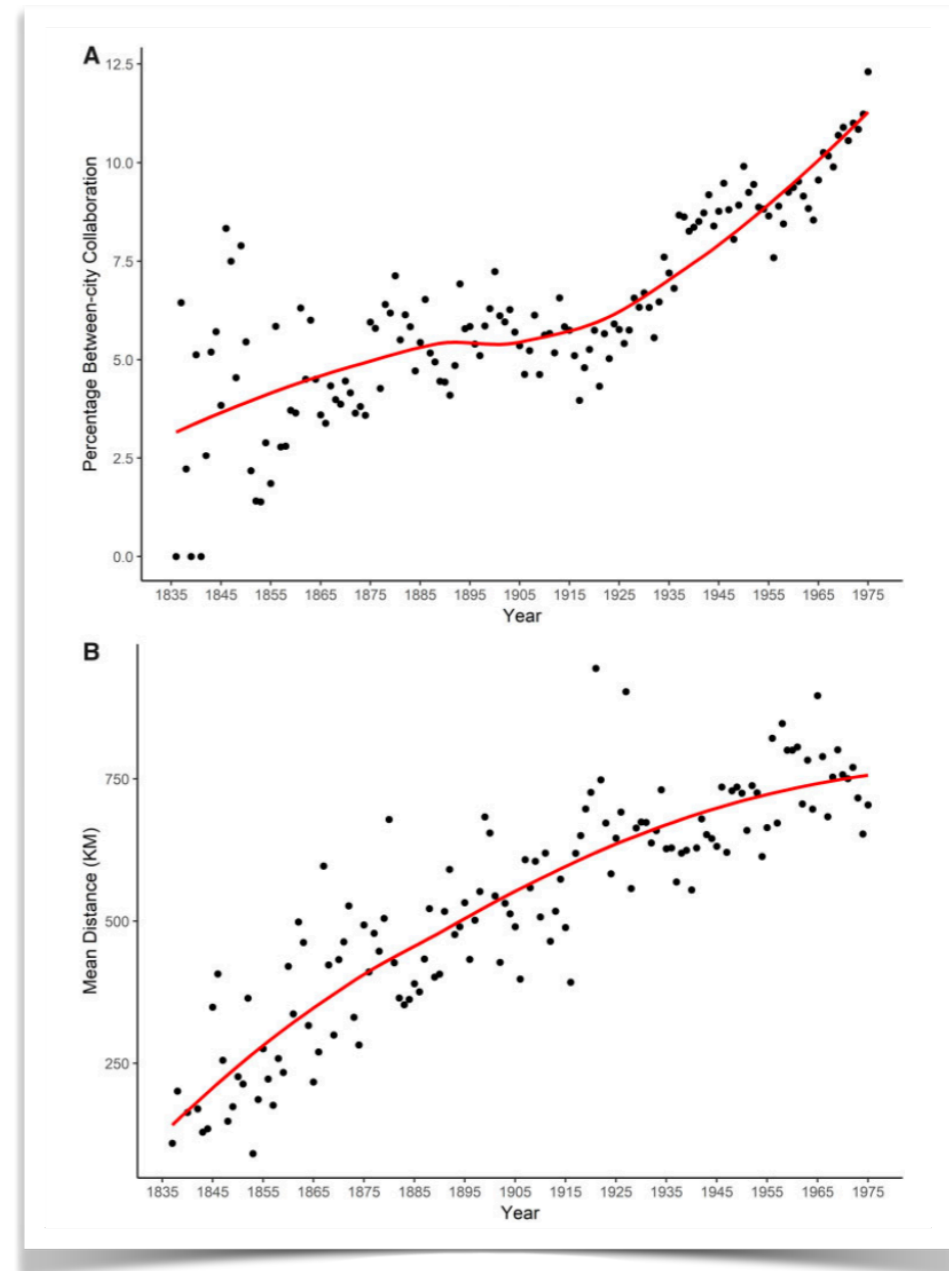
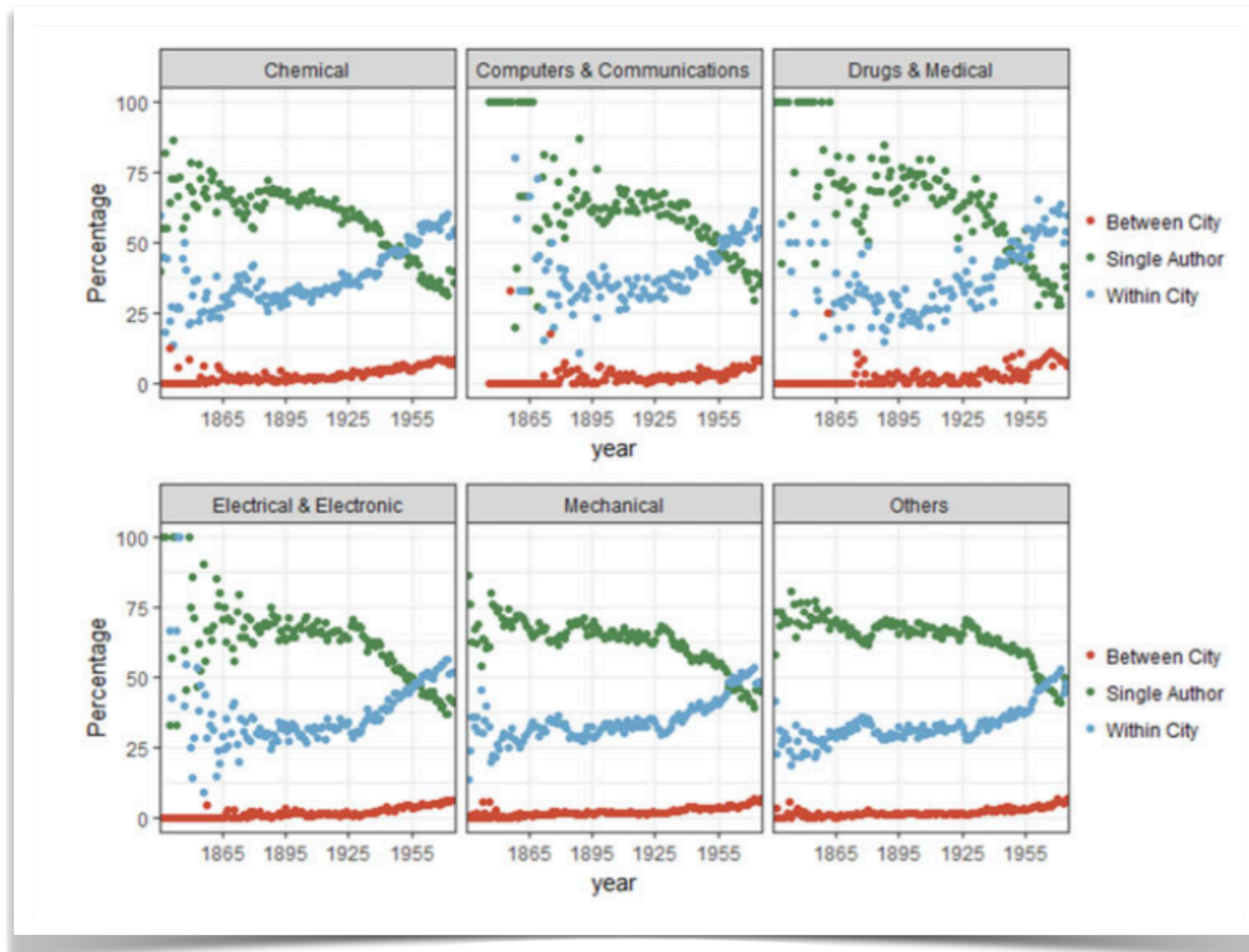
# Geographical proximity

- Geographic proximity
  - Supports knowledge transfer and innovation
  - Much of its influence due to correlation with other types of proximity
  - Independent influence hard to empirically isolate
- However: Frequently importance challenged (due to ICT)



# Geographical proximity

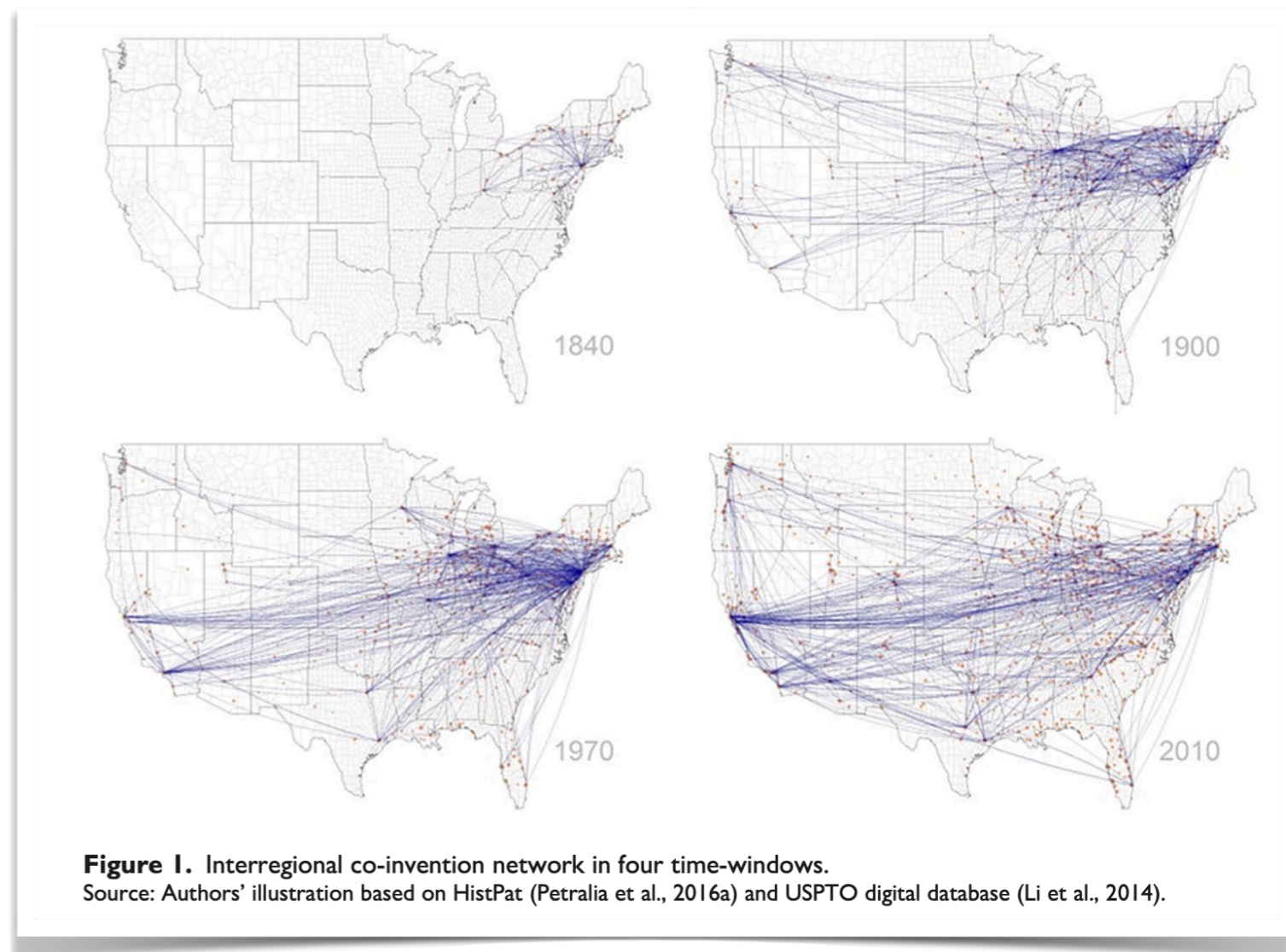
## US patent data (co-invention) between 1830-1975



Wouden, F. Van Der. (2019). A history of collaboration in US invention : changing patterns of co-invention , complexity and geography. 1–21. <https://doi.org/10.1093/icc/dtz058>

# Geographical proximity

- Explaining likelihood of interregional co-invention with geographic distance & controls
- US patent data (interregional co-invention) between 1840-2010
- 4,145 technology- and time-specific regressions
- Distance reduces interactions (always has and still is)**



Abbasiharofteh et al. (2024). The role of geographic distance and technological complexity in U.S. interregional co-patenting over almost two centuries

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# Summary proximities

- 🌐 Different types of proximity: cognitive, organisational, institutional, social and geographical
- 🌐 All types of proximity facilitate knowledge transfer (positive effects on interaction probability and learning efficiency)

	Key dimension	Too little proximity	Too much proximity	Possible solutions
1. Cognitive	Knowledge gap	Misunderstanding	Lack of sources of novelty	Common knowledge base with diverse but complementary capabilities
2. Organizational	Control	Opportunism	Bureaucracy	Loosely coupled system
3. Social	Trust (based on social relations)	Opportunism	No economic rationale	Mixture of embedded and market relations
4. Institutional	Trust (based on common institutions)	Opportunism	Lock-in and inertia	Institutional checks and balances
5. Geographical	Distance	No spatial externalities	Lack of geographical openness	Mix of local 'buzz' and extra-local linkages



Source: Boschma (2005, p. 71)

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# Summary proximities

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## However!

-  All types of proximity closely related and correlated with each other
-  “The close intraregional relations embedded in long-standing personal connections resulted in serious shortcomings in so-called boundary-spanning functions, which are of utmost importance in scanning the economic environment and in making external information relevant for the firm.” (Grabher, 1993, p. 260)



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# Summary proximities

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- 🌐 All types of proximity related and correlated (Balland et al. 2015, Broekel 2015)
  - 🌐 Social proximity more frequent between geographically proximate actors
  - 🌐 Cognitive proximity more frequent between persons with close social relations
  - 🌐 Cognitive proximity more frequent between actors within same institutional framework
  - 🌐 Organisational proximity closely linked to institutional proximity
- 🌐 Types of proximity *"Thus, the proximity dimensions are analytically orthogonal even though many dimensions of proximity may empirically turn out to be correlated"* (Boschma & Martin, 2010)

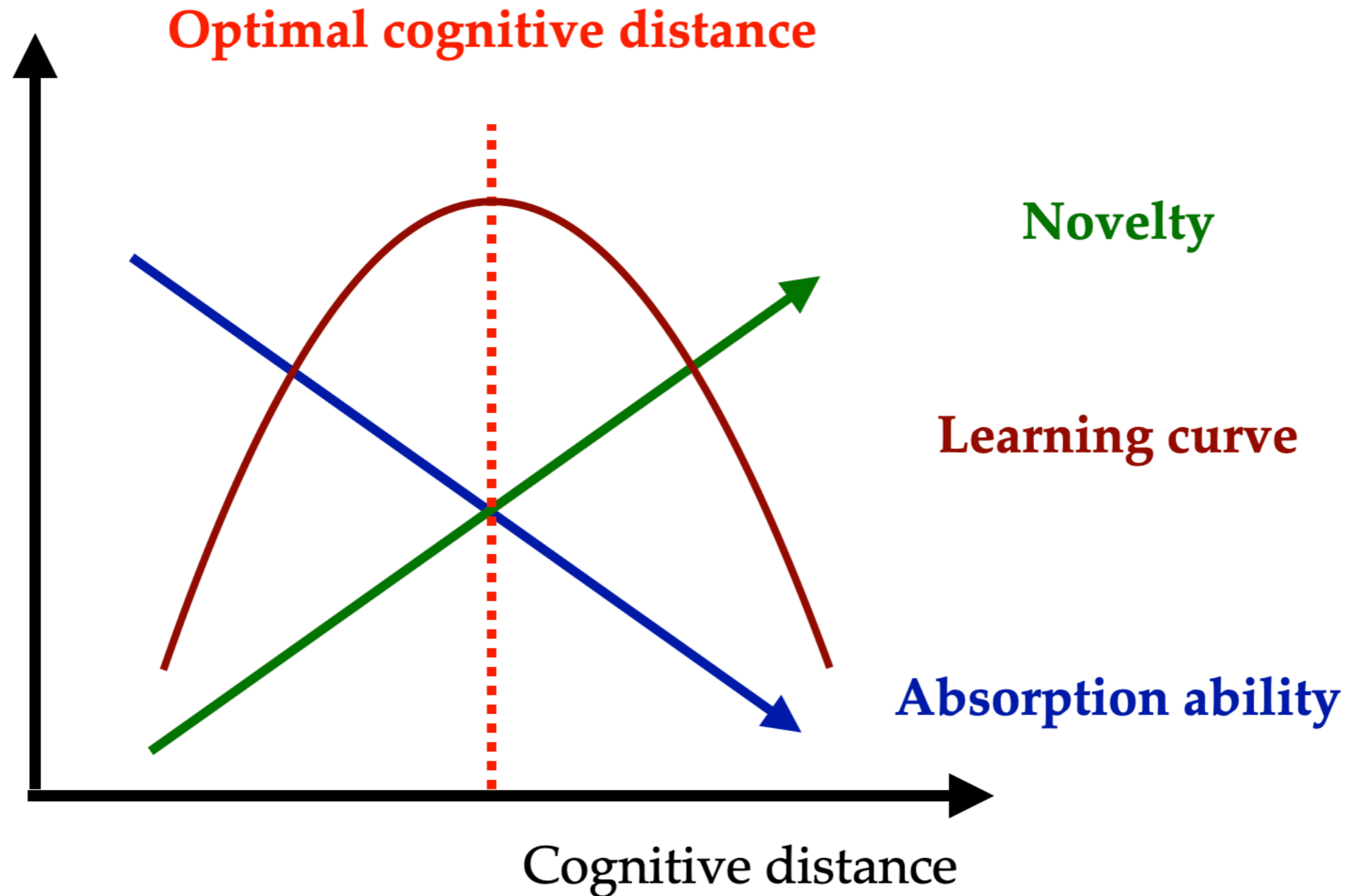
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# Summary proximities

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- 🌐 Cognitive proximity with special role
  - 🌐 Influences probability and efficiency of knowledge exchange and efficiency of knowledge transfer
  - 🌐 Knowledge transfer always requires certain level of cognitive proximity (absorptive capacity)
  - 🌐 Defines the potential of learning and novelty

# Summary proximities



Source: Nooteboom et al. (2007, p. 1018)

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# Summary proximities

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- “*Proximity Paradox*” (Boschma & Frenken 2009, Broekel & Boschma 2012)
  - Proximity facilitates knowledge transfer
  - Too much proximity reduces learning (esp. cognitive proximity)
  - Firms tend to collaborate cognitively too proximate (due to combined effect of all correlated proximities)
    - Firms collaborate with other regional Organization of the same industry based on long-term (individual) relations
  - Proximity paradox: Proximities facilitate interactions, but utility of interactions below optimum due to proximities

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