

Proximity, networks and “Mode 2” knowledge production: the case of diabetes 2 in Europe

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Context

The changing nature of scientific knowledge production

innovation systems (Freeman 1987)
research systems in transition (Cozzens et al. 1990)
mode 1 versus mode 2 knowledge production (Gibbons et al. 1994)
triple helix (Leydesdorff and Etzkowitz 1996)
post modern research system (Rip and Van der Meulen 1996)
academic capitalism (Slaughter and Leslie 1997)
Pasteur's quadrant (Stokes 1997)
open innovation (Chesbrough 2003)
global pipelines and local buzz (Bathelt et al. 2004)
logics of interdisciplinarity (Barry et al. 2008)
search regimes (Bonaccorsi 2008)

Context

“The new production of knowledge”, Gibbons et al. (1994)

“The book sketches the emergence of a research system that is highly interactive and ‘socially distributed’. The basic argument is that, while knowledge production used to be located primarily in scientific institutions and structured by scientific disciplines, its locations, practices and principles are now much more heterogeneous.”

Hessels and Van Lente (2008), p. 740

“Mode 2” and proximity

Central idea : Mode 2 is reflected in low levels of *proximity* among actors:

- **Geographical proximity:** “... the diffusion over a wide range of potential sites of knowledge production ...” (Gibbons et al. 1994, p. 17)
- **Institutional proximity:** “... a closer integration of the process of discovery with that of fabrication” (p. 19) in which “... institutional differences between, say, universities and industry, seem to be less and less relevant” (Gibbons et al. 1994, p. 30).
- **Cognitive proximity:** “... a novel environment in which knowledge flows more easily across disciplinary boundaries...” (Gibbons et al. 1994, p. 20) in which “integration is not provided by disciplinary structures ... but is envisaged and provided from the outset in the context of usage, or application in the broad sense...” (Gibbons et al. 1994, p. 27)
- **Organizational proximity:** “... the organization of research more open and flexible” (Gibbons et al. 1994, p. 20)
- **Social proximity:** “... preference given to collaborative rather than individual performance and excellence judged by the ability of individuals to make a sustained contribution in open, flexible types of organization in which they may only work temporarily” (Gibbons et al. 1994, p. 30)

Theory - Mode 1” versus “Mode 2”

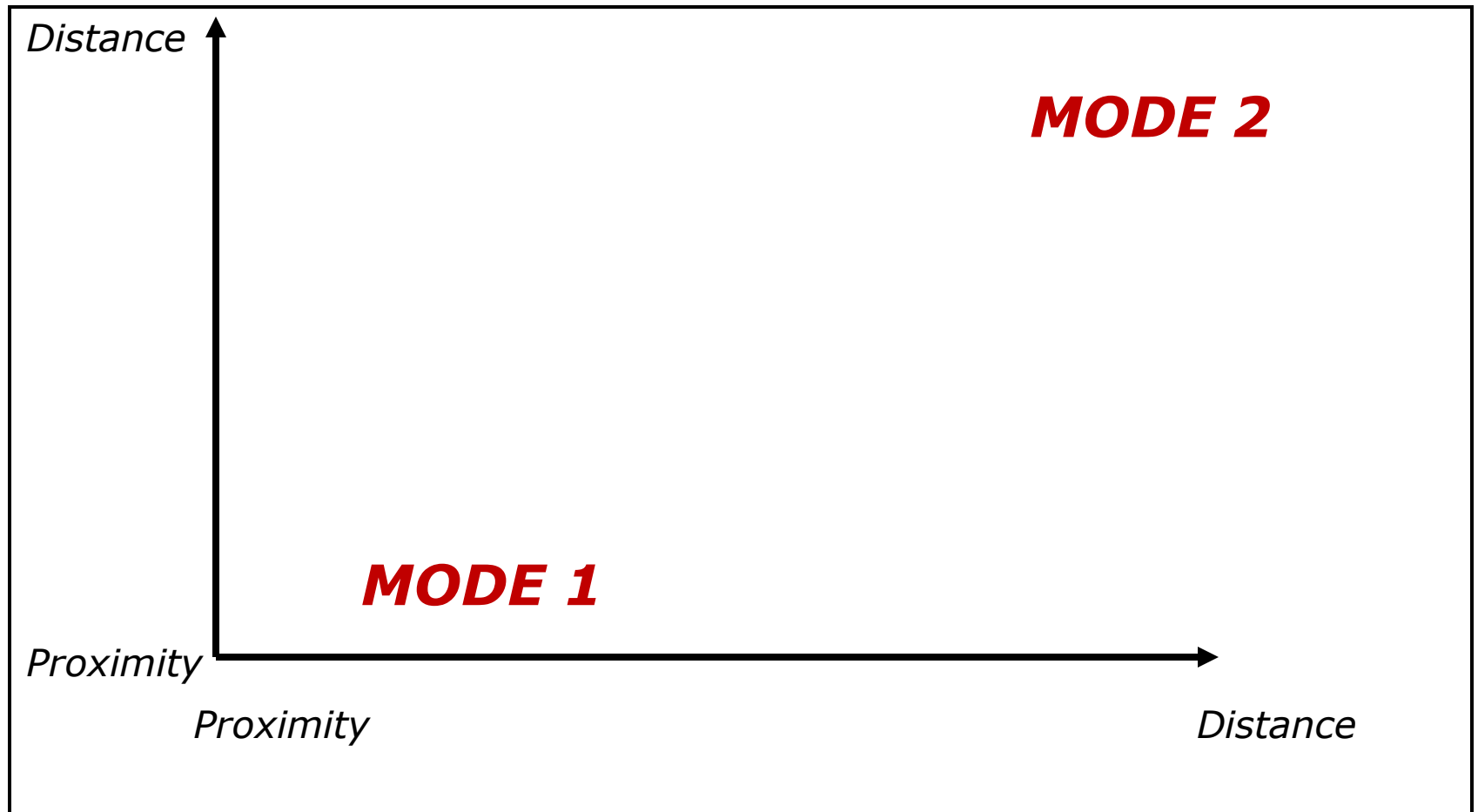
Extreme Mode 1 knowledge production

Disciplinary	• Cognitive proximity
Within university department	• Organizational proximity
In personal networks	• Social proximity
Under strict academic norms	• Institutional proximity
Within the laboratory site	• Geographical proximity

Extreme Mode 2 knowledge production

Transdisciplinary	• Cognitive distance
Cross-organizational	• Organizational distance
Temporary open networks	• Social distance
With potential conflicting goals	• Institutional distance
Crossing national borders	• Geographical distance

Mode 1” versus “Mode 2



Research questions

RQ1: How can one operationalise Mode 2 bibliometrically using the proximity concept?

RQ2: Is there any evidence for Mode 2?

RQ3: How does scientific knowledge production differ across European countries in terms of “Mode-2-ness”?

Data – Non-pharmaceutical diabetes type 2

- Publications extracted from Web of Science with query:
 - diabetes (type 2 OR mellitus or NIDDM or adult-onset) AND diet
 - diabetes (type 2 OR mellitus or NIDDM or adult-onset) AND education
 - diabetes (type 2 OR mellitus or NIDDM or adult-onset) AND exercise
 - diabetes (type 2 OR mellitus or NIDDM or adult-onset) AND training
 - diabetes (type 2 OR mellitus or NIDDM or adult-onset) AND behaviour
 - diabetes (type 2 OR mellitus or NIDDM or adult-onset) AND behavior
- Geographical coverage: all publications with at least one organization from Europe during the period 2002-2007
- Dependent variable: number of collaborations between each pair of organisations

Method – dependent variable

Network of co-publications on non-pharmaceutical diabetes-2, where:

Nodes are organizations

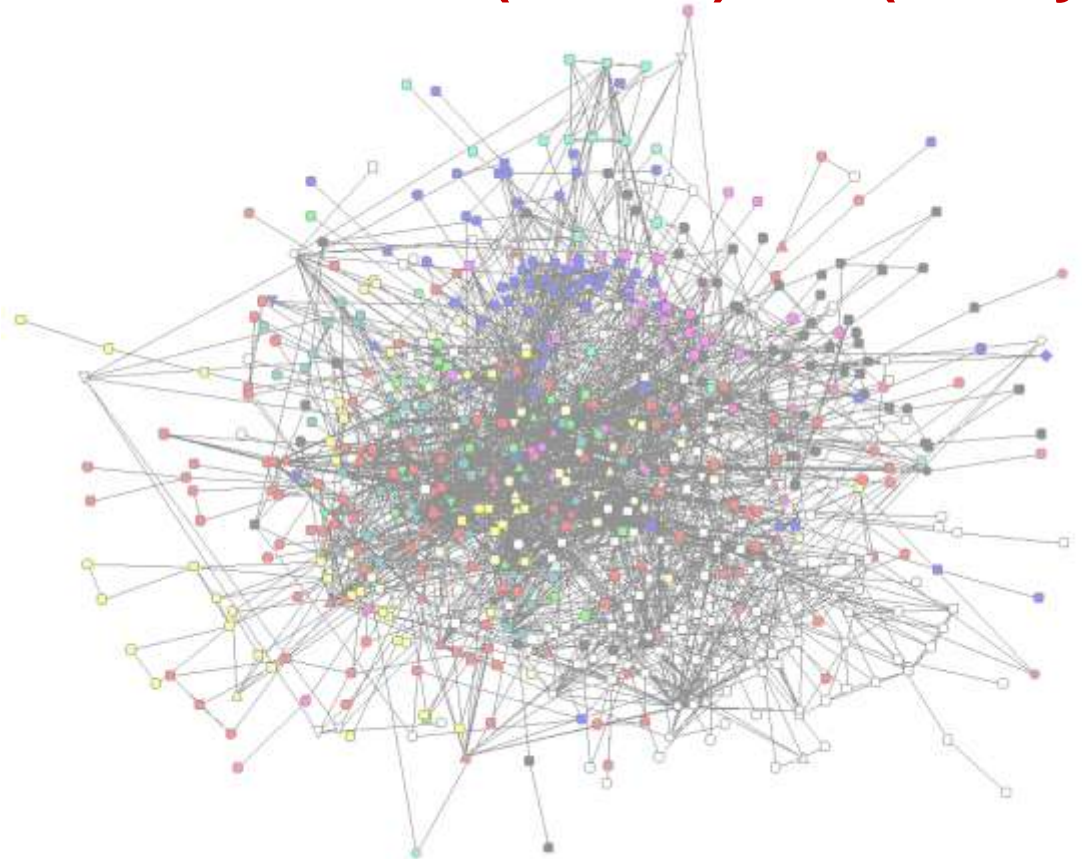
Links denote the number of publications on which two affiliations co-occur

Time: 2002-2007

624 nodes

**4623 links
(valued)**

**1993 links
(binary)**



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<p>Organizational proximity</p>	<p>Binary measure that is 1 if one conditions is satisfied</p> <ul style="list-style-type: none"> - One organization at multiple locations - A university with its associated academic hospital

Regression method

Dependent variable:	tie strength s_{ij}
Independent variables:	five proximity measures
Control:	sum of collaborations of i and of j
Method:	negative binomial regression (NEGBIN)
Interpretation:	positive sign: “Mode 1” insignificant or negative sign: “Mode 2”

Results (NEGBIN) – Europe

tie strength	Europe
geographical proximity	5.583 [0.094]***
cognitive proximity	0.032 [0.001]***
social proximity	2.057 [0.116]***
institutional proximity	0.445 [0.050]***
organizational proximity	1.122 [0.474]**
Constant	-6.791 [0.055]***
Observations	194376
Log likelihood	-8714,697
Pseudo R2	0.216

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Results (NEGBIN) – country-level

tie strength	AT	DK	FI	FR	DE	GR	IT
geographical proximity	3.344 [1.043]***	1.282 [0.413]***	1.72 [0.297]***	2.172 [0.302]***	2.683 [0.817]***	0.783 [0.704]	3.899 [0.353]***
cognitive proximity	-0.12 [0.206]	0.014 [0.007]*	-0.012 [0.004]***	0 [0.014]	-0.021 [0.024]	0.048 [0.110]	-0.01 [0.009]
social proximity	1.897 [2.022]	0.943 [0.344]***	1.786 [0.249]***	0.917 [0.418]**	0.621 [0.959]	-1.276 [1.705]	1.902 [0.371]***
institutional proximity	1.109 [0.621]*	0.242 [0.208]	-0.129 [0.156]	0.505 [0.180]***	0.415 [0.272]	-0.098 [0.517]	0.453 [0.182]**
organizational proximity	1.148 [1.260]	-0.268 [0.707]	-0.933 [0.653]	-19.391 [15.330.500]	-0.702 [2.127]	-21.344 [35.384.467]	-0.013 [1.026]
Constant	-6.072 [1.242]***	-3.158 [0.345]***	-2.244 [0.237]***	-4.653 [0.231]***	-5.531 [0.428]***	-3.331 [0.701]***	-5.975 [0.260]***
Observations	78	325	253	2080	2775	153	3081
Log likelihood	-40,504	-291,486	-402,912	-632,823	-461,846	-121,225	-813,361
Pseudo R2	0.343	0.212	0.237	0.163	0.105	0.125	0.169

Standard errors in brackets

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Results (NEGBIN) – country-level (*cont.*)

tie strength	NL	NO	ES	SE	CH	UK
geographical proximity	3.113 [0.796]***	2.459 [0.755]***	3.361 [0.517]***	4.32 [0.837]***	0.231 [1.745]	3.539 [0.390]***
cognitive proximity	-0.003 [0.009]	0.123 [0.105]	0.03 [0.028]	0.004 [0.008]	-0.003 [0.056]	-0.008 [0.010]
social proximity	0.653 [0.473]	-1.057 [1.405]	1.878 [0.715]***	0.13 [0.525]	-55.255 [8.187.554]	0.498 [0.495]
institutional proximity	-0.248 [0.292]	-0.198 [0.539]	0.084 [0.322]	0.668 [0.319]**	2.733 [0.659]***	0.249 [0.169]
organizational proximity	-1.925 [1.651]	0.343 [1.788]	1.662 [1.398]	-15.6 [3.642.144]	-18.356 [21.196.558]	-16.422 [3.460.443]
Constant	-4.717 [0.573]***	-2.519 [0.735]***	-5.282 [0.365]***	-4.67 [0.469]***	-5.169 [1.231]***	-5.903 [0.254]***
Observations	435	91	1378	496	153	6903
Log likelihood	-379,698	-84,667	-355,538	-281,975	-38,018	-1161,198
Pseudo R2	0.129	0.12	0.174	0.156	0.399	0.086

Standard errors in brackets

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Further steps

Near future

- Repeat the analysis for interdisciplinary journals only
- Repeat the analysis for applied journals only
- Introduce country-level controls
- Zero-inflated NEGBIN

Distant future

- Repeat the analysis for many other fields

Conclusion and discussion

- Evidence for mode 2 is weak both at the European level
- Countries differ substantially in the way in which the collaborative production of knowledge (on diabetes 2) is organized