REGIONS & CITIES | European Week Brussels 8-11 October 2018

The Evolution of Regional Knowledge Spaces

Policy Insights for Smart Specialization Strategies

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Technology Evolution in Regional Economies

ERC StG #715631 – TechEvo

EWRC Session – Global Linkages and Territorial Imbalances in Europe and Beyond – Brussels, Belgium, October 9th, 2018.

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*"Smart specialisation and societal innovation can only work if choices are based on **real knowledge of local potential** and if the **right actors** are involved."*

Markku Markkula (*Parliament Magazine*, October 2015, p.50)

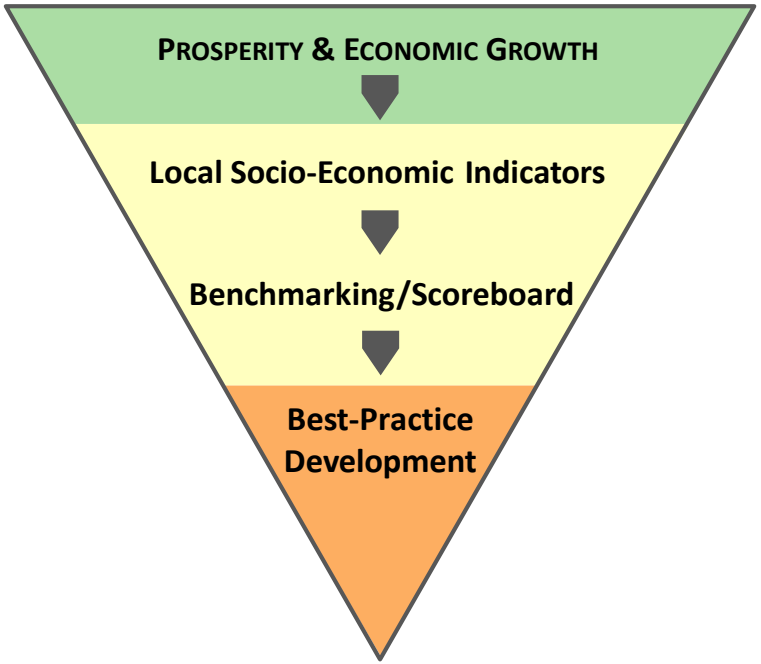
erc

GAP ➡TechEvo

Technology Evolution in Regional Economies
ERC StG #715631 – TechEvo

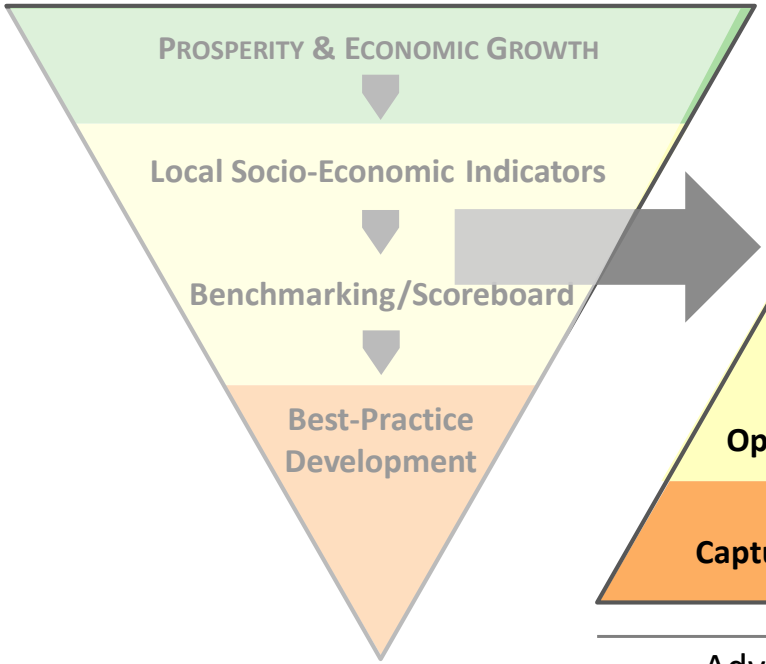
Local knowledge is the foundation for regional competitive advantage, but little attention has been given to the actual type of knowledge produced by the variety of actors within specific places…

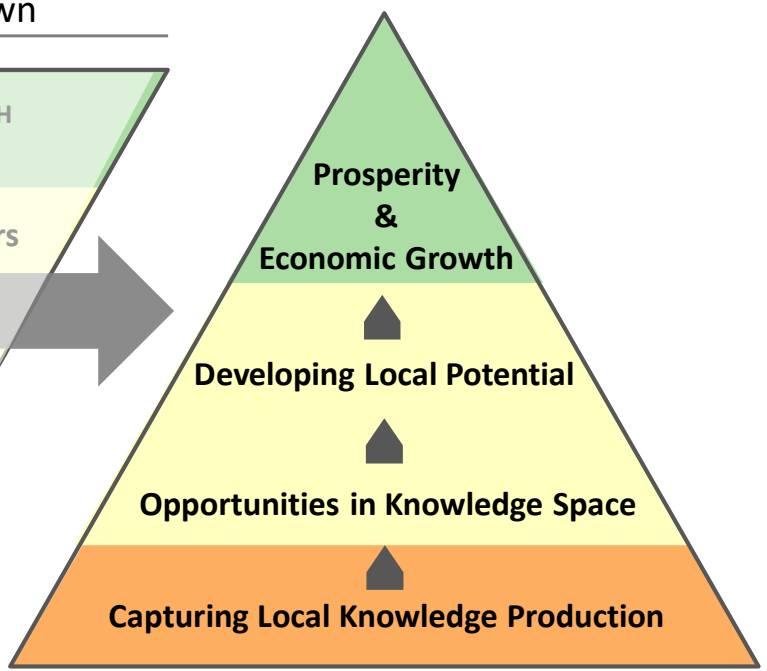
Current Approach | Top Down



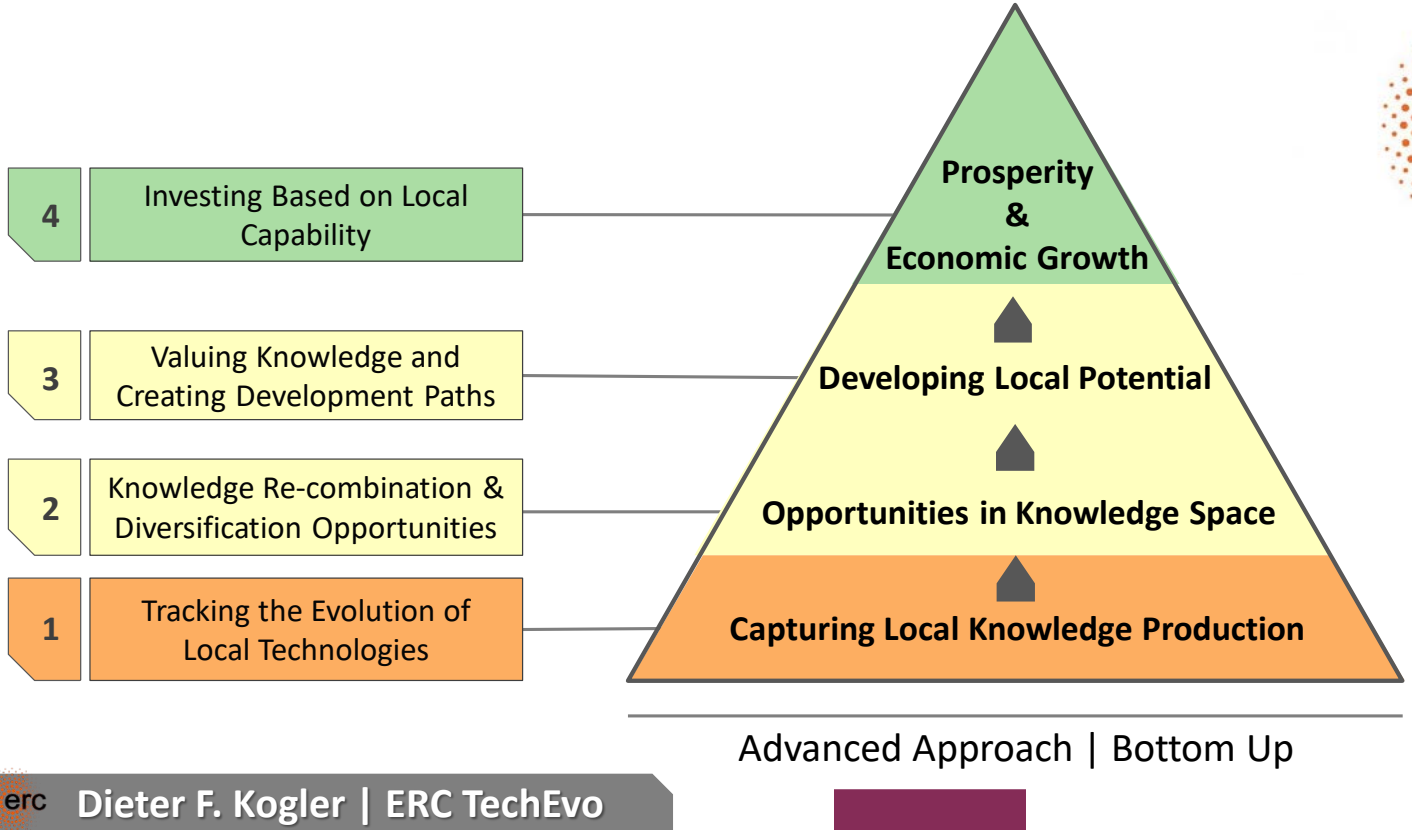
…universal best-practice prescribed to unique regional settings…

Current Approach | Top Down





Advanced Approach | Bottom Up



European Research Council

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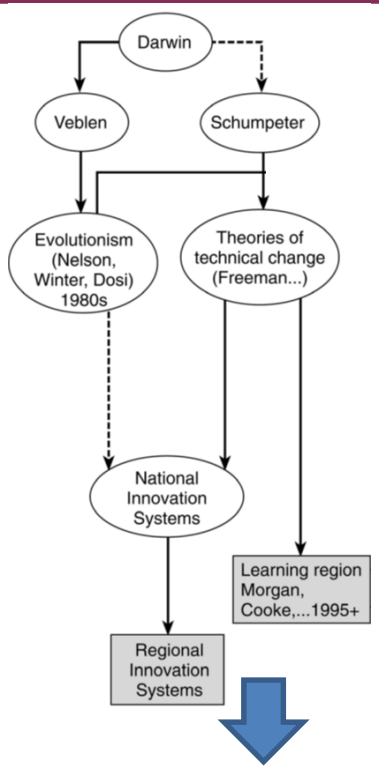
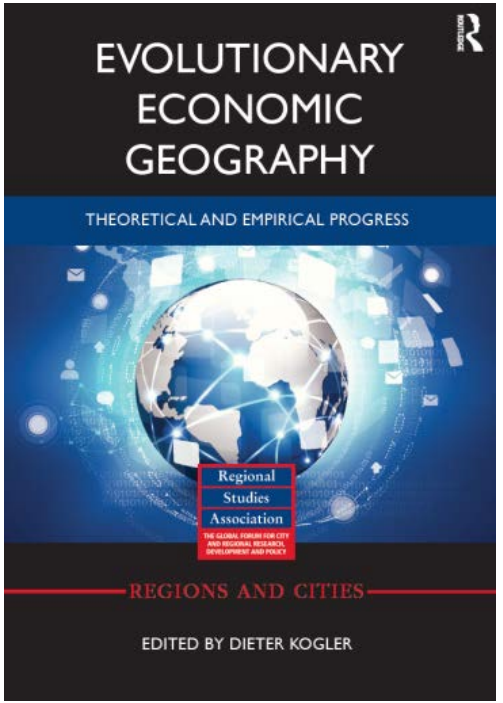
University College Dublin
Ireland's Global University



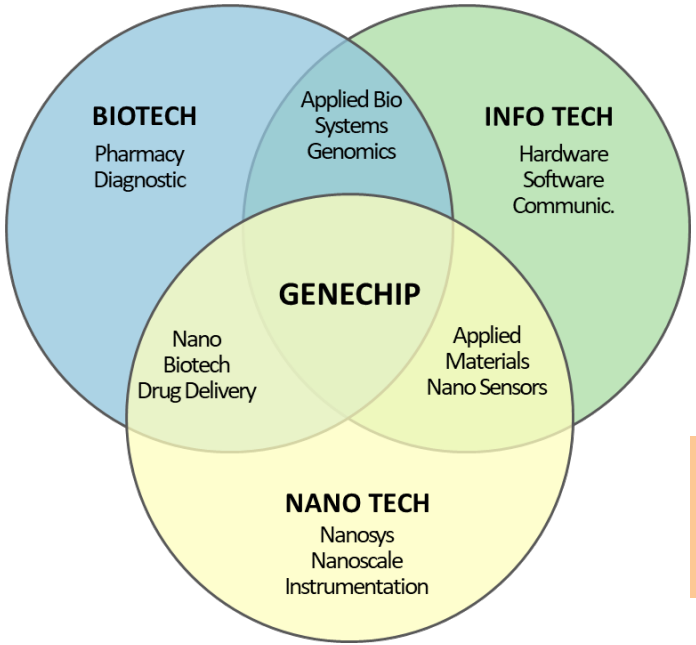
Evolutionary Economic Geography

- **Knowledge production is a**
  - cumulative,
  - path-dependent, and
  - interactive process.
- **Knowledge [in] space**
  - Knowledge accumulates
  - Knowledge relatedness
- **Knowledge in the past**
  - Provides opportunities, and sets limits
  - Entry, exit, selection



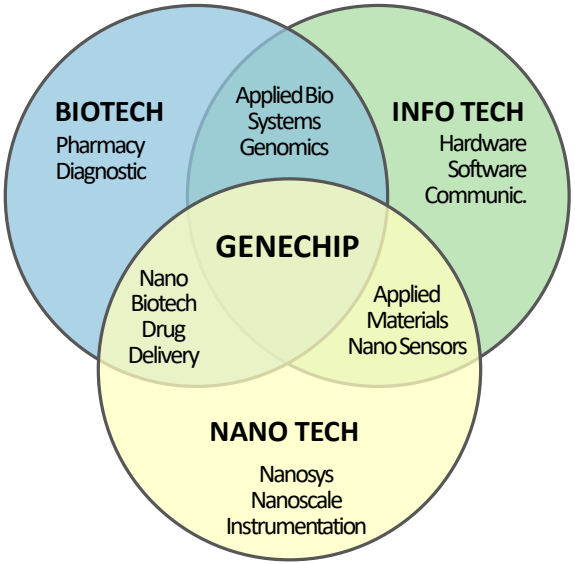
The Knowledge Space

Domain & Connectedness

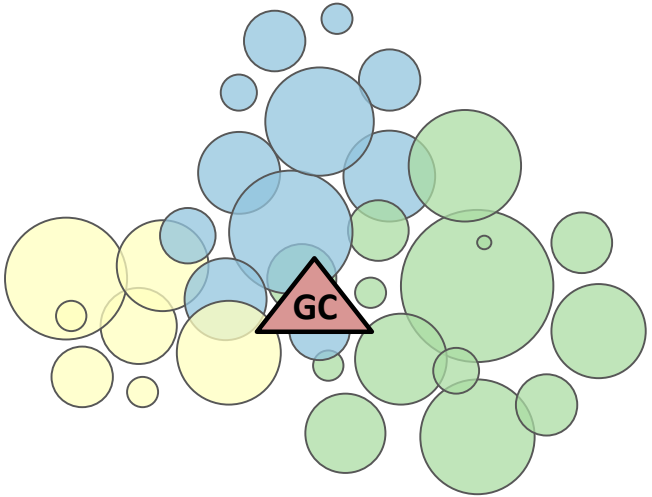


Kogler D. F., Rigby D. L. & Tucker I. (2013) Mapping Knowledge Space and Technological Relatedness in US Cities, *European Planning Studies* 21(9), 1374-1391.

Economic Reality



Knowledge Space



Patent Classification

Inventor(s)

Priority Date

Applicant

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European Patent Office
Office européen des brevets

(11) EP 2 711 947 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
26.03.2014 Bulletin 2014/13

(51) Int Cl.:
H01F 38/18 *(2006.01)* ***F03D 11/00*** *(2006.01)*
F03B 13/10 *(2006.01)* ***F03B 13/26*** *(2006.01)*

(21) Application number: **13182981.4**

(22) Date of filing: **04.09.2013**

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Designated Extension States:
BA ME

(30) Priority: **24.09.2012 GB 201216961**
24.09.2012 GB 201216963

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(74) Representative: **Hartley, Andrew Colin et al**
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(54) A power transfer device

(57) Described is an electrical power transfer device for transferring power between two coaxial relatively rotatable components, comprising: an outer core having a magnetic flux guide, an outer electrical winding and a cavity for receiving an inner core; an inner core located at least partially within the cavity, the inner core having a magnetic flux guide and an inner winding, wherein the inner and outer core are arranged to be movable between a first configuration in which the magnetic flux guides of the inner and outer cores separated by a first distance in which power is transferred in use, and a second configuration in which the inner and outer cores are separated by a second distance, in which relative rotation of the inner and outer cores is possible in the second configuration, wherein in the first configuration the magnetic flux guides of the inner and outer cores abut one another.

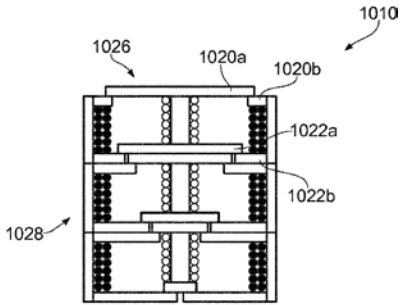
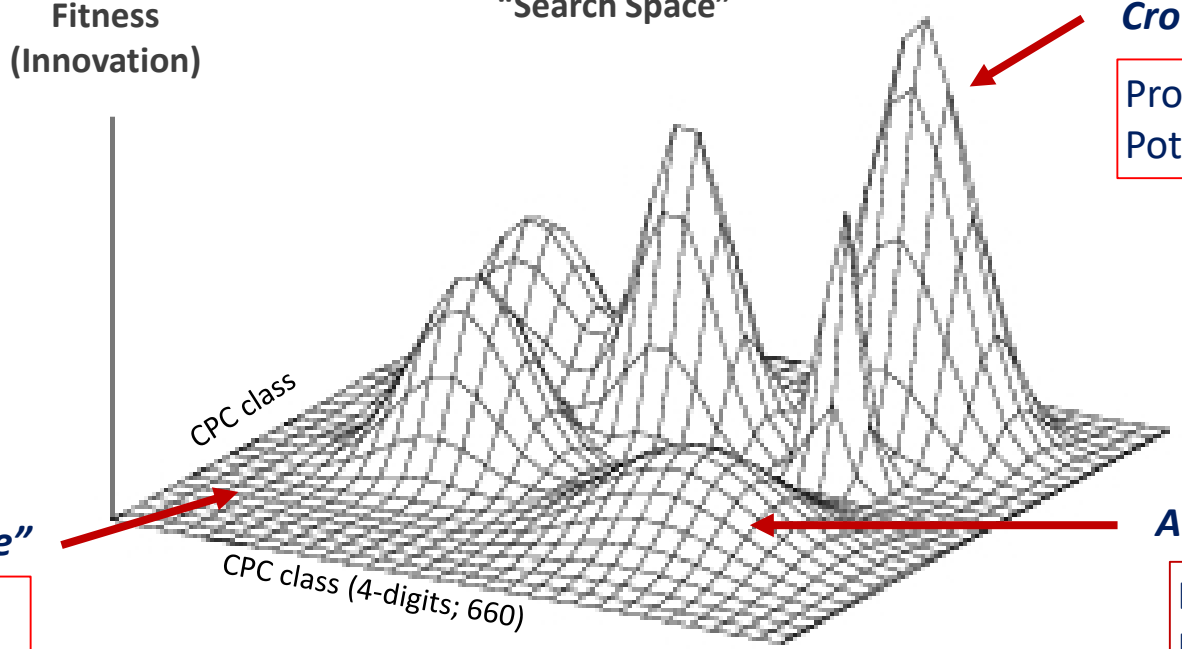


FIG. 10

Technology Recombination
"Search Space"



Crowded Space

Productivity ↑
Potential ↓

"Crazy Space"

Potential ↑
Risk ↑

Breakthrough/Disruptive Innovation?

Adventurous Space

Diffusion ↑
Risk/Potential ≈

Incremental Innovation?

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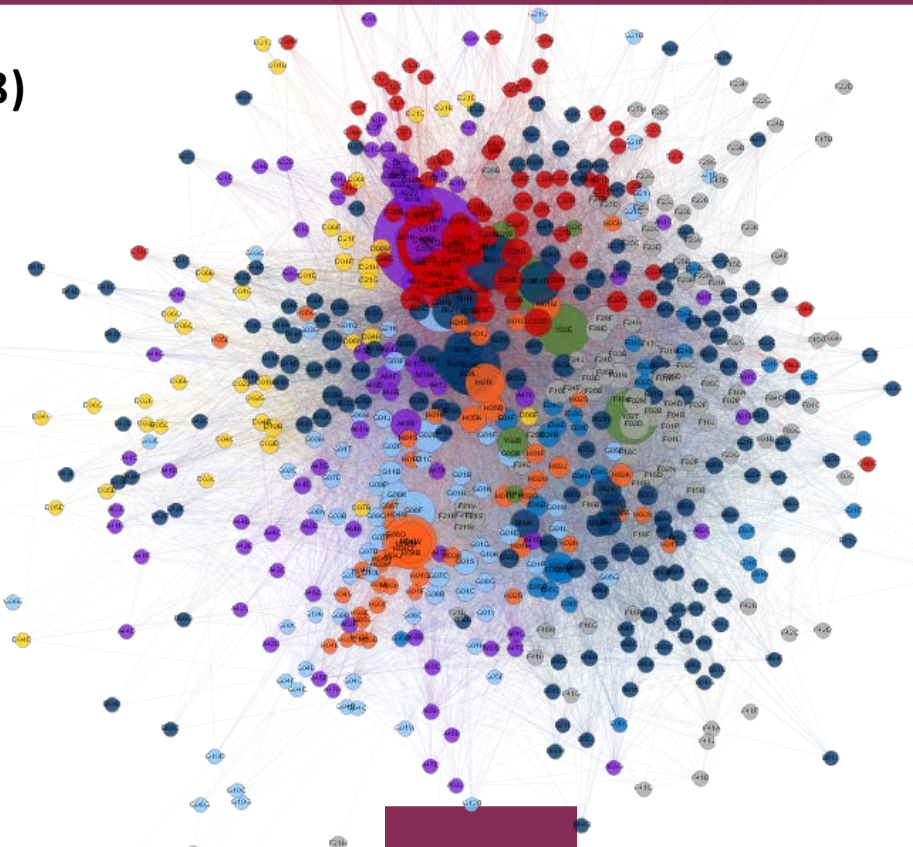
The European (EU28) Knowledge Space

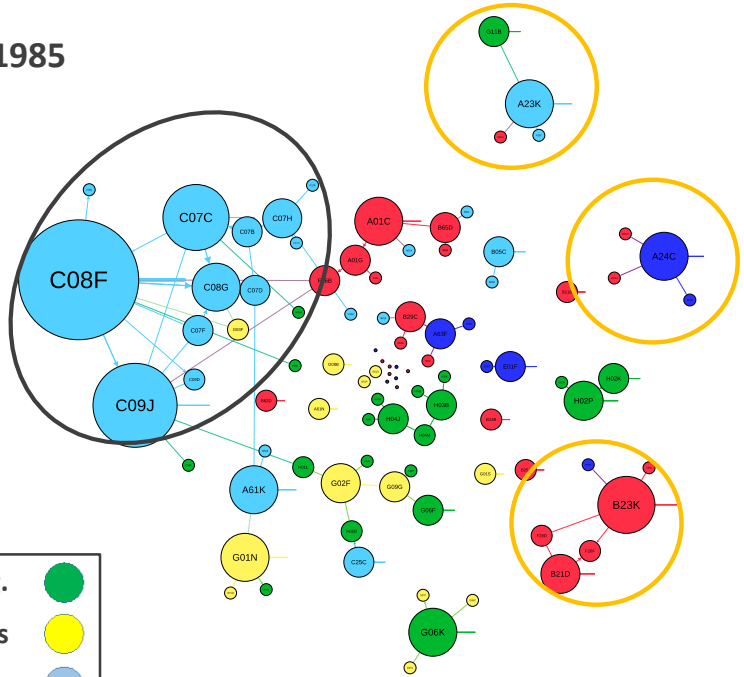
(2000-2004)



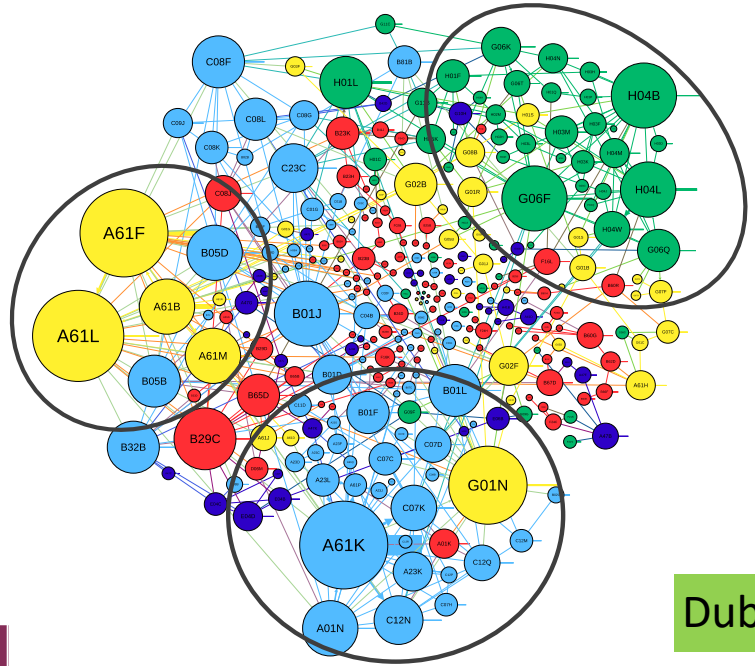
Node	645
Edge	25,863
Network Density	0.882
Ave. CC	0.371
Ave. Path length	1.99

- Chemistry and Metallurgy
- Electricity
- Textiles, Paper
- New, Cross-over Technologies
- Construction
- Physics
- Transport and Operations
- Consumer goods
- Mechanical Engineering

1981 – 1985



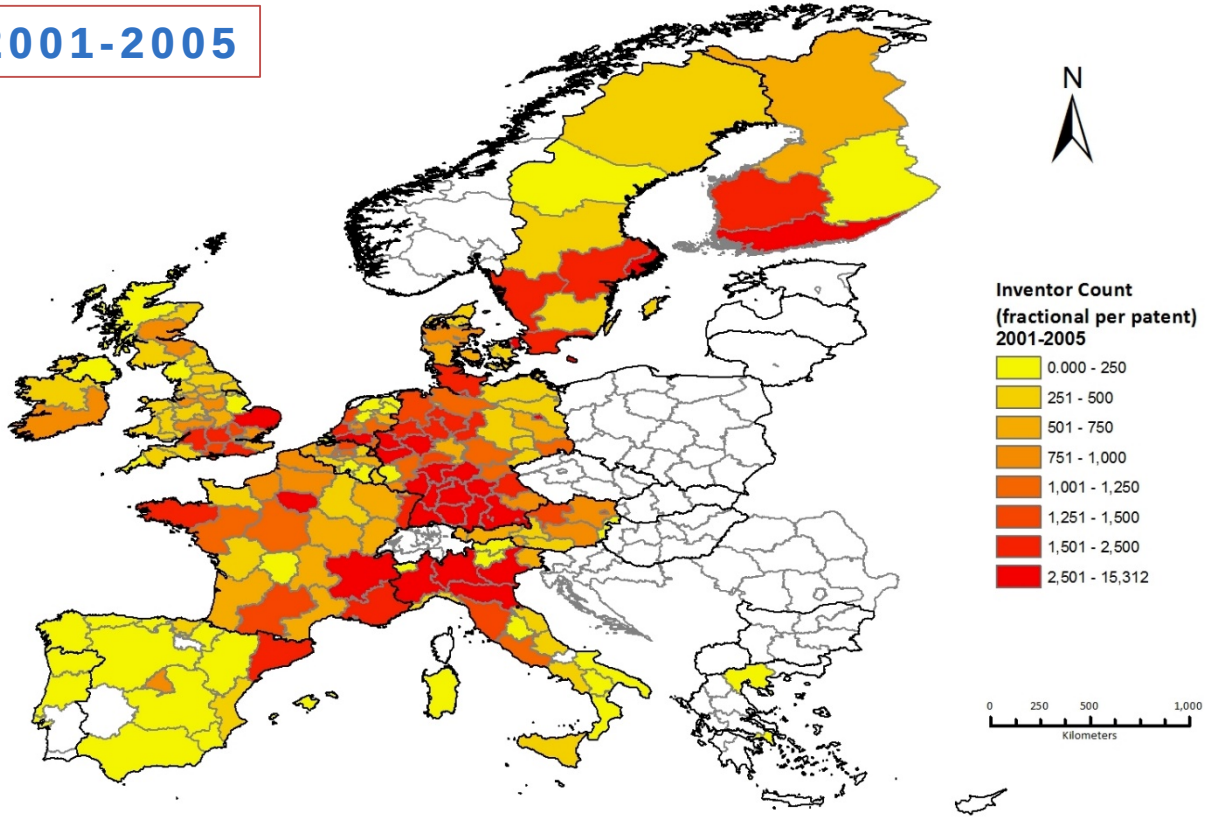
2001– 2005



Electrical Eng.
Instruments
Chemicals
Mechanical Eng.
Other

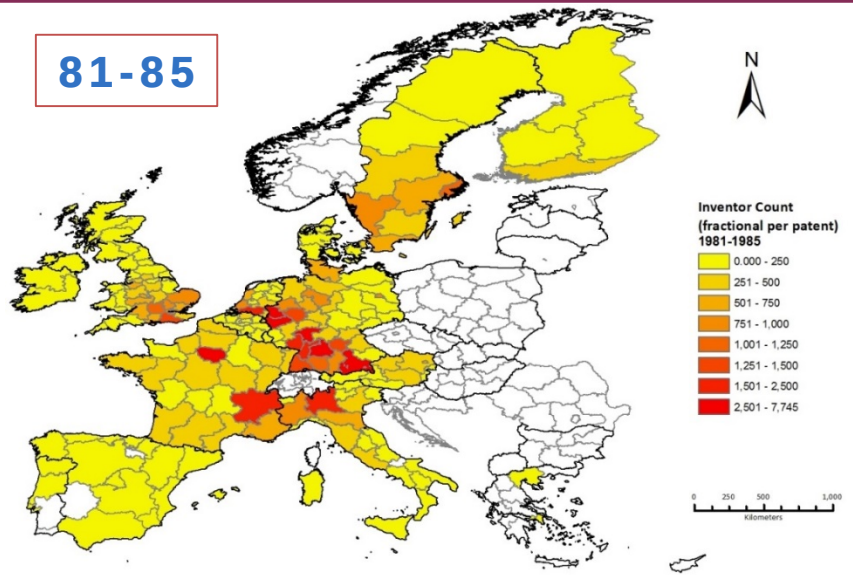
Dublin, IE

2001-2005



	NUTS 2 Region		01-05
1	FR10	Ile de France	15,312
2	DE11	Stuttgart	13,050
3	DE21	Oberbayern	12,198
4	NL41	Noord-Brabant	9,749
5	DE71	Darmstadt	7,361
6	DEA2	Koln	7,315
7	ITC4	Lombardia	7,032
8	DEA1	Dusseldorf	6,961
9	DE12	Karlsruhe	6,768
10	FR71	Rhone-Alpes	6,510
11	DE13	Freiburg	4,908
12	DE14	Tubingen	4,387
13	DEB3	Rheinhessen-Pfalz	4,211
14	FI18	Etela-Suomi	4,021
15	DE25	Mittelfranken	3,956
16	ITD5	Emilia-Romagna	3,607
17	DEA5	Arnsberg	3,483
18	SE11	Stockholm	3,055
19	DE30	Berlin	2,982
20	DK01	Hovedstaden	2,860

81-85



…the **correlation** coefficient between patent counts by region for the two periods is **0.93**

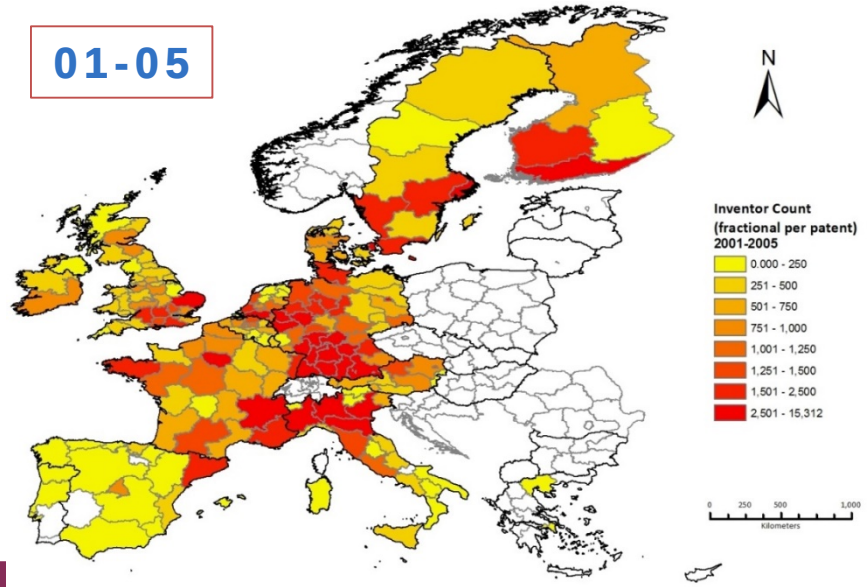
…the **median** number of patents produced across EU15 regions **increased from 161 to 521**

…the coefficient of **variation** has **declined from 2.07 to 1.73** between the two time periods

…the regions that **dropped** the most are all located within the UK

…regions that **moved up** in rankings most sharply, incl. West Finland, Catalonia, Thüringen, Dresden and Brandenburg

01-05

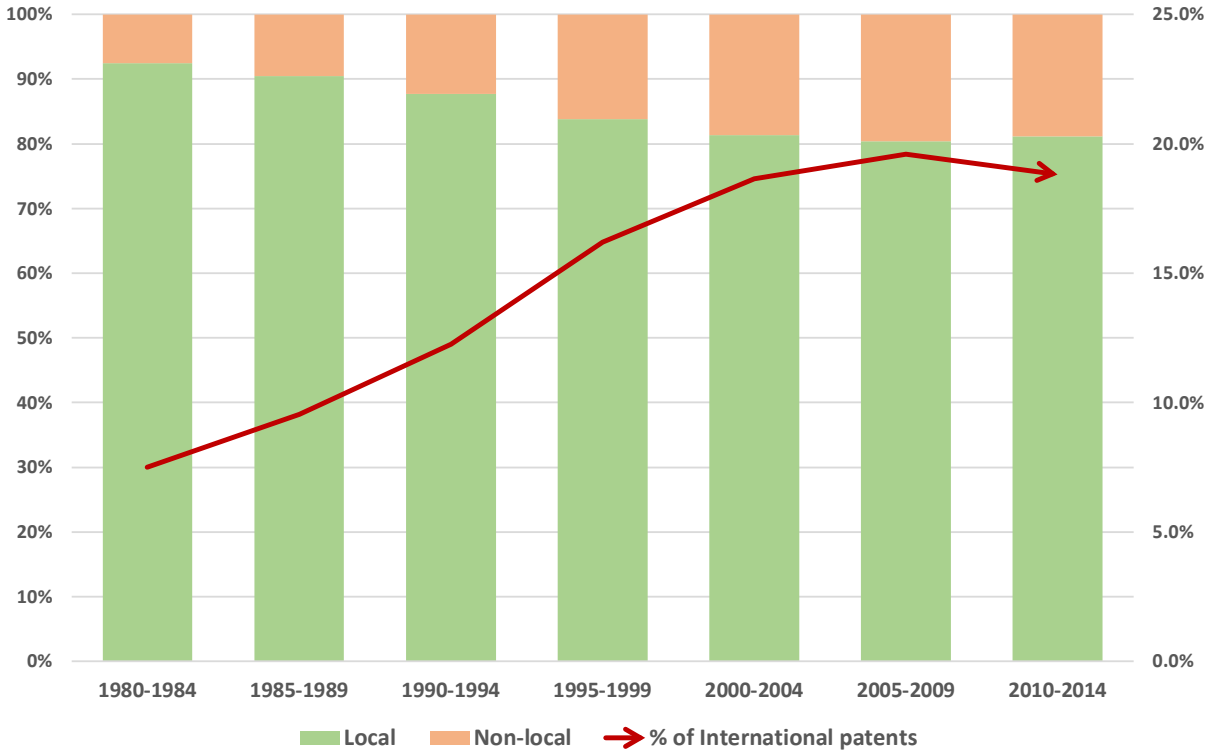


International Collaborations

Local = Patents developed by inventors residing in one country

Non-local = Patents developed by inventors residing in two or more countries

Period	Local	Non-local	% of Intern. Patents
1980-1984	33,671	2,728	7.5%
1985-1989	55,707	5,883	9.6%
1990-1994	70,435	9,836	12.3%
1995-1999	112,678	21,786	16.2%
2000-2004	168,037	38,505	18.6%
2005-2009	213,413	52,039	19.6%
2010-2014	218,198	50,551	18.8%

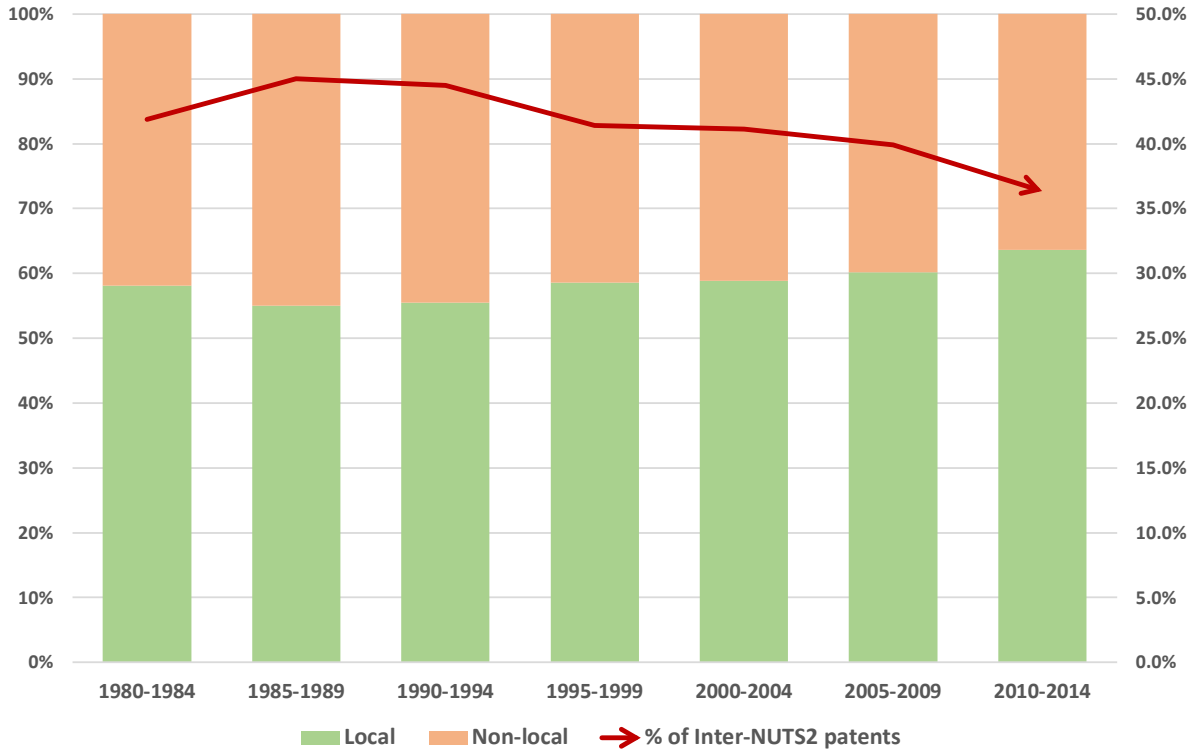


Inter-Regional Collaborations

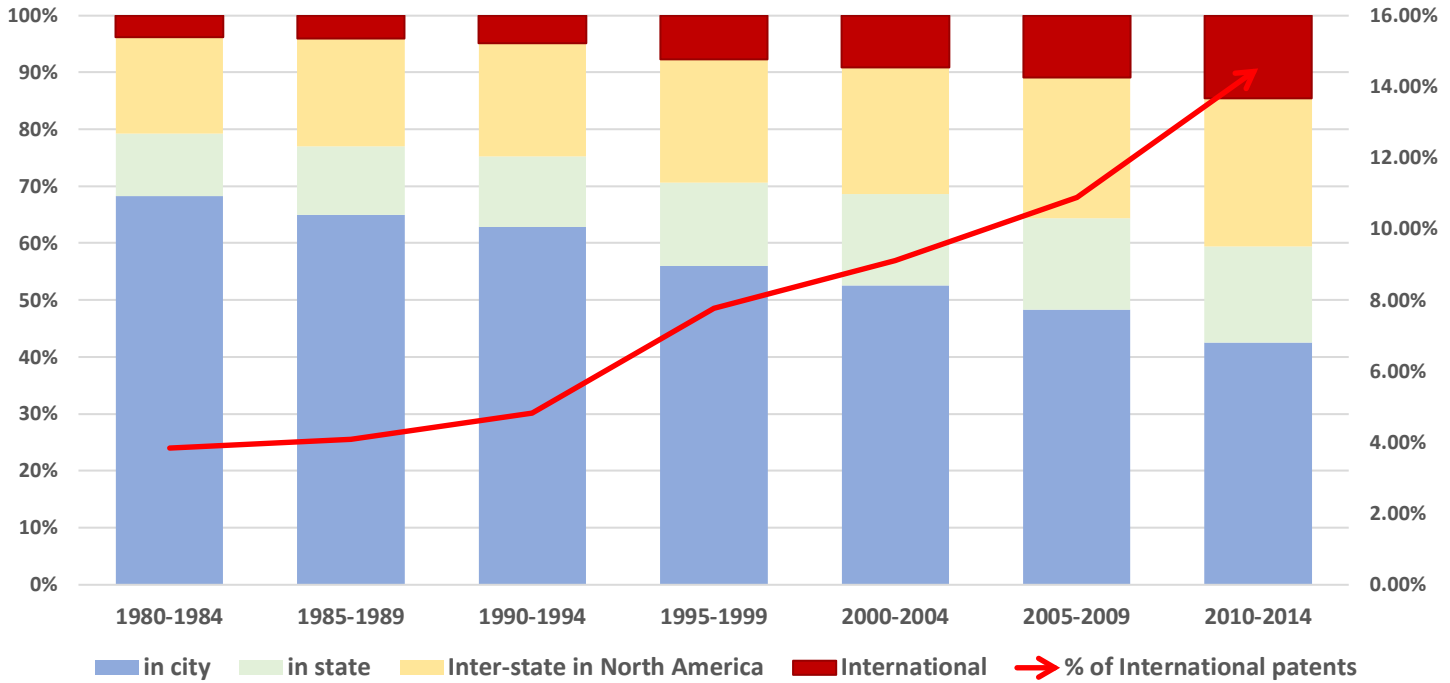
Local = Patents developed by inventors residing in one single NUTS2 region

Non-local = Patents developed by inventors residing in two or more NUTS2 regions

Period	Local	Non-local	% of Inter-NUTS2 Patents
1980-1984	21,149	15,250	41.9%
1985-1989	33,859	27,731	45.0%
1990-1994	44,541	35,730	44.5%
1995-1999	78,782	55,682	41.4%
2000-2004	121,555	84,987	41.1%
2005-2009	159,577	105,875	39.9%
2010-2014	171,043	97,706	36.4%



Large Metropolitan Areas (MSA/CMA)

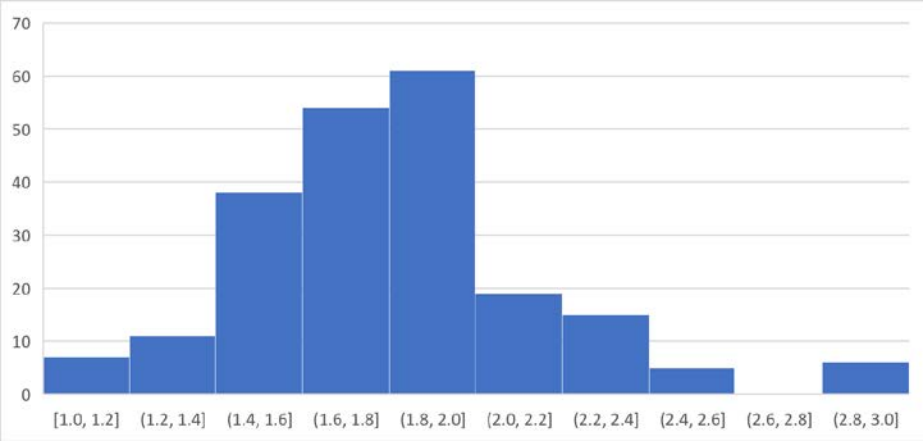


***Source**:* USPTO, Authors' own calculation.

***Note**:* Sample is restricted to the patents having two or more collaborators and at least one inventor who resided in a Metropolitan Statistical Area (MSA) in the US or a Census Metropolitan Area (CMA) in Canada at the time of invention.

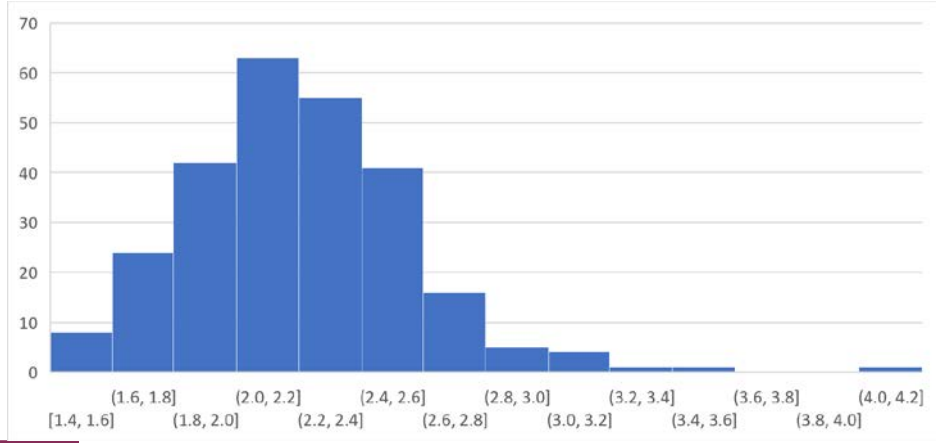
Inter-regional collaborations in the development of novel products and processes

80-84

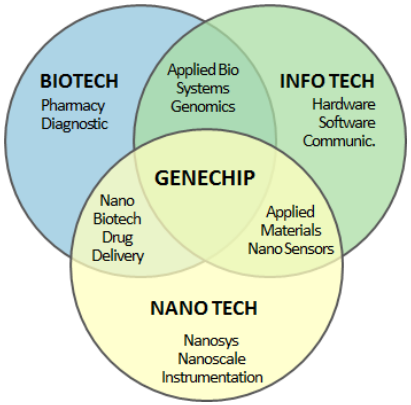


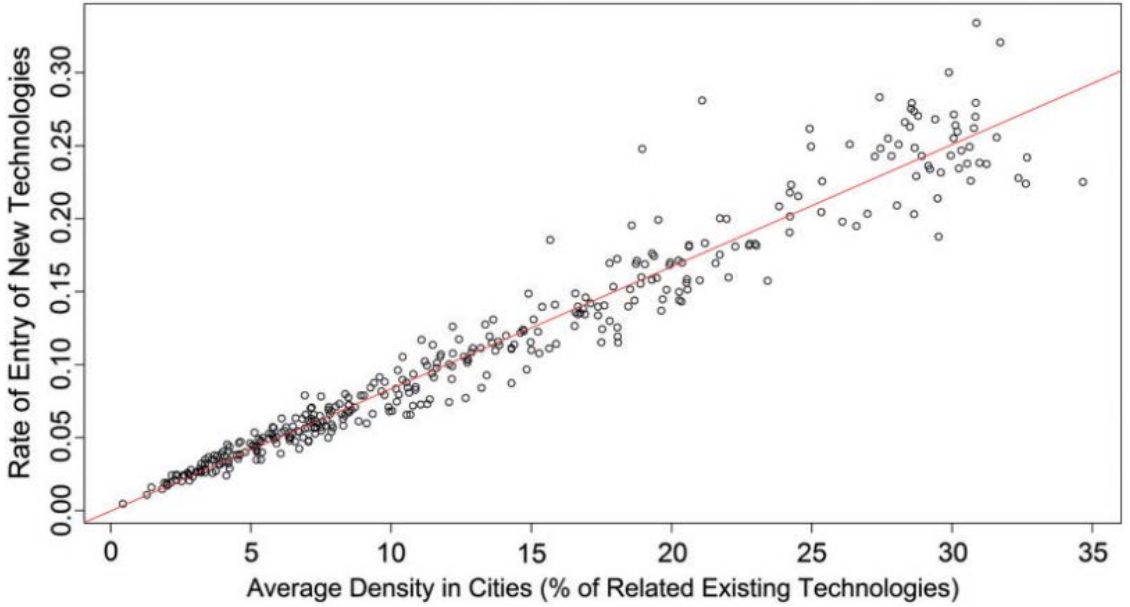
Average number NUTS2 regions in the portfolio of regions' patents in two time periods

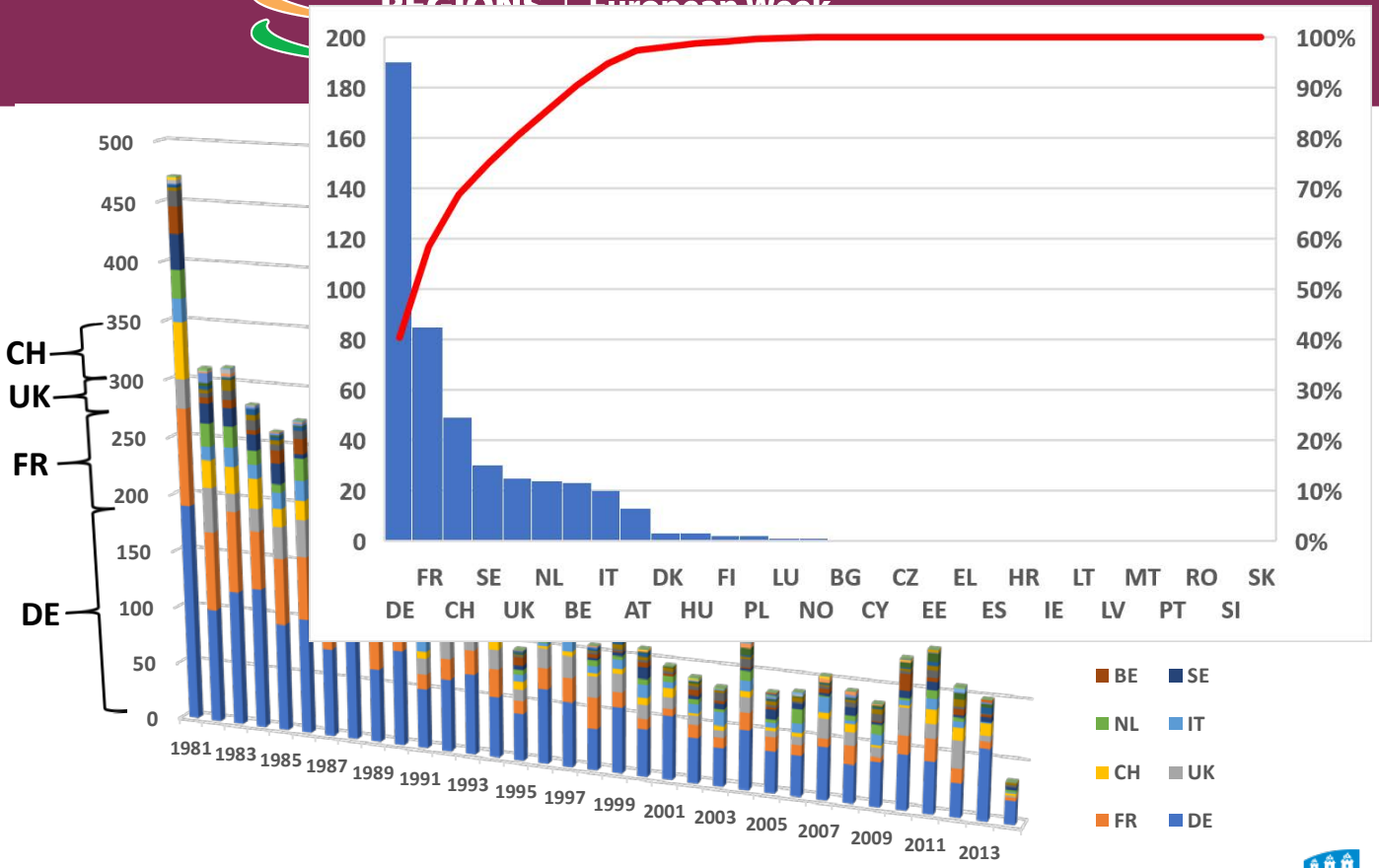
10-14



Is it possible to "predict" the regional technological future (fortune)?



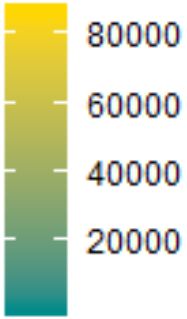



200
180
160
140
120
100
80
60
40
20
0
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
FR SE NL IT DK FI LU BG CZ EL HR LT MT RO SK
DE CH UK BE AT HU PL NO CY EE ES IE LV PT SI
500
450
400
350
300
250
200
150
100
50
0
CH
UK
FR
DE
1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013
BE SE
NL IT
CH UK
FR DE

Area

RCA in
New Recombination

Number of Patents



80-84

90-94

00-04

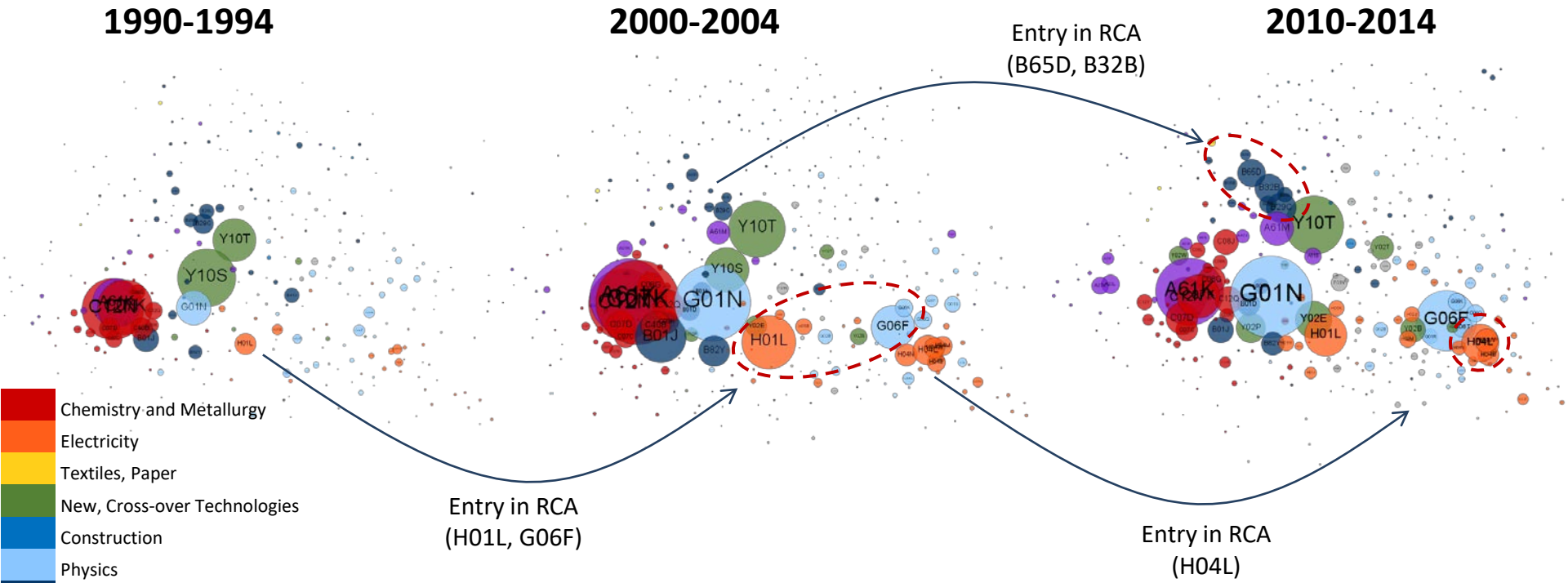
10-14

Policy Insights for Smart Specialization Strategies

"The proposed [**knowledge space**] methodology that allows mapping and analyzing regional knowledge spaces provides the opportunity to identify the science and technology domains that are present in a place or even in firms, and then to analyze their properties in terms of size and connectedness as suggested in the smart specialization literature."

(Kogler *et al*., 2017: 369)

Kogler D. F., Rigby D. L. & Essletzbichler J. (2017) The Evolution of Specialization in the EU15 Knowledge Space, *Journal of Economic Geography 17*, 345-373.



Cambridge, UK

Policy Insights for Smart Specialization Strategies

"This in turn opens up the opportunity to engage in direct planning initiatives where domains that display a high connectivity level can be attributed special support, or investments are made aiming at the addition of new domains. In this regard, the present study provides unique insights into the evolutionary patterns of regional knowledge production and provides a new window into the 'black box' of innovation and technological change." (Kogler *et al.*, 2017: 369)

Kogler D. F., Rigby D. L. & Essletzbichler J. (2017) The Evolution of Specialization in the EU15 Knowledge Space, *Journal of Economic Geography 17*, 345-373.

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ERC TechEvo
Database Architecture