Economics and Policy of Innovation

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The Geography of Innovation
Regional Innovation Systems

(Chapter 11)

4 main issues

1. Why does location matter? ***Introductory key concepts***

2. What is a Regional Innovation System

3. Relation between Regional and National

4. Relation between Regional and Global

Is Location still important?

Two major features of the social and economic systems have characterised the last decades. Intense debate:

- The scope of all economic and firm activities has become increasingly global → **does location still matter?**

- Knowledge and technology increasingly central in all economic activities → knowledge generated and transmitted more efficiently with geographical proximity → **innovative clusters as drivers of economic growth**

Not only outstanding proliferation of "cluster models" as analytical concepts in economics, but also as key policy tools

Old theory of industrial location

- Marshall (1891):
  concentration of specialised industries in particular localities due to a triad of external economies:
  - local pool of specialised labour
  - growth of local provision of non-traded and intermediate inputs specific to an industry
  - maximum flow of information and new ideas

- Geographical proximity is the common element determining their being grouped together under the general heading of '***agglomeration economies***' advantages (Weber, Losch, Isard)

Location and industrial performance

There are two clear observations pointing towards the link between geographical location and industrial performance:

- economic and technological activities show a strong tendency to agglomerate in certain locations, giving rise to patterns of national and regional specialisation

- the performance and the growth of firms depend to a large extent on the conditions of the environment in which they operate, and particularly on those in the immediate proximity

Innovation and space

Characteristics of innovative processes:

- relations with information sources external to the firm strongly influenced by spatial proximity
- employment of informal channels for knowledge diffusion (tacit knowledge) spurs the tendency of innovation to be geographically polarised
- distribution of innovation across space not only dependent on purely economic factors but also on social and institutional characteristics
- innovative endogenous capabilities highly cumulative, distinct and geographically-specific

Knowledge externalities and agglomeration

Spillovers, information, knowledge: while the marginal cost of transmitting information across space is invariant because of the ICT revolution, the marginal cost of transmitting knowledge (especially tacit) increases with distance.

Missing this crucial distinction leads to maintain that "knowledge flows are invisible, they leave no paper trail by which they may be measured".

Empirical evidence suggests that location and proximity do have a significant impact in exploiting knowledge spillovers.

Knowledge externalities and agglomeration (2)

Knowledge spillovers (both inter-firm and inter-individual) as sources of innovative output and productivity growth of *all* firms.

Role of tacit knowledge higher during the early stages of industry life cycle (before the emergence of the "dominant design").

Intra-industry & inter-industry knowledge spillovers specialisation or diversification of geographical clusters.

Cultural and institutional differences shape spatial distribution of innovation as well as microeconomic linkages

The regional innovation system (RIS)

Definition still rather problematic:

- The notion of RSI emerged as a different perspective of analysis from the broader concept of NSI
- The highly uneven spatial pattern and geographical spread of innovation processes suggests that they could be better depicted by assuming subnational units of analysis, which can avoid the distortions and loss of information of hypothesising national systems as homogeneous entities
- Accordingly: RSI may be defined as 'the *localised* network of actors and institutions in the public and private sectors whose activities and interactions generate, import, modify and diffuse new technologies'

3 types of RIS (11.3.1)

1. Territorially embedded RIS

→ Networks of SMEs in industrial districts (Emilia-Romagna)

2. Regionally networked IS

→ Policy intervention, more structured R&D (Central-Northern European model)

3. Regionalised NIS

→ Science parks linked to National Innovation Strategies (France, Japan)

Relation between NIS and RIS (11.4)

National characteristics affect also local/ regional activities:

- Central/Northern Europe: **coordinated** market economy → "diversified quality production" → complexity and coordination (**public**-private) are relevant also regionally
- US/UK: liberal market economy → most competitive industries → science-based Innovation with strong **state** support to Innovation → IT and defence

The global-local nexus in the internationalisation of technology

- MNC locational choices for R&D depend upon: 1) number and characteristics of regional centres and relative position in a geographical hierarchy; 2) extent to which the MNC has developed a strategy for technological diversification through tapping into specific competences in different regional centres of excellence

- In the case of the EU, the globalisation of innovation through MNC networks has been comparatively stronger than in other economic areas. The degree of interdependency among geographically distinct units is relatively higher in Europe, where inter-firm networks and linkages between foreign affiliates and local firms turn out to be far more entrenched than in other areas of the world

The global-local nexus in the internationalisation of technology (2)

- Considerable sub-national differences exist across the major EU economies. Empirical evidence supports the hypothesis of a regional hierarchy within and across EU national boundaries: agglomeration economies underlie the importance of location in MNC internationally integrated networks for innovation

- Differences are found when looking at the degree of geographical concentration of technological activities by ownership

The global-local nexus in the internationalisation of technology (3)

- One similarity: even allowing for population and economic size, regions record relatively high concentrations of innovative activity. Very strong geographical agglomeration of patenting from MNC activity is found in the UK, Italy and France, whilst in Germany, although agglomeration of innovation is also recorded, it is spread across a greater number of regions

- Yet, although MNC technological operations show a strong tendency to cluster in space, the extent of such a tendency may vary significantly and is rather context-specific

Cantwell & Iammarino (2003) find:

- ***Higher order*** **research locations:** e.g.: South East (UK), Lombardia (Italy), 6 Landers (Germany), Bassin Parisien & Île de France (France). Attract foreign-owned firms not because of existing technological specialisations of local counterparts, but for the wider technological competencies, infrastructural support and "business climate". Technological activity of foreign-owned and indigenous firms is typically broad ranging in nature and extends across a spectrum of sectors.
- ***Intermediate*** **research locations:** e.g. West Midlands & North-west (UK), Piemonte (Italy), Centre-Est (France). Attract innovative activities of foreign-owned firms more for specific set of specialised expertise in which MNCs tap into in order to upgrade their own capabilities (technological profiles of foreign-owned firms closely related to those of local counterparts; technological specialisation of both sectorally concentrated
- ***Lower order*** **regions:** technologically weak and backward areas, inadequate innovative base in order to compete and to be attractive

Regional breakdown of US patents to MNCs (1969-95), population and value added (1995)

REGIONS	*Percentage shares (%)*				
	US patents to large firms			Population	Value added
	Nationally-owned	Foreign-owned	Total large firms		
UK					
South East	40.2	60.8	47.1	30.6	35.7
West Midlands	16.4	3.6	12.1	9.1	8.1
North West	17.0	7.8	13.9	10.9	9.7
Others	26.4	27.8	26.9	49.4	46.4
Total UK	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
ITALY					
Lombardia	50.3	57.1	52.8	15.6	20.0
Piemonte	31.8	11.3	24.4	7.5	8.5
Others	17.9	31.6	22.8	76.9	71.5
Total Italy	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
GERMANY					
Nordrhein Westfalen	29.0	19.0	27.0	22.0	22.5
Bayern	25.0	14.0	23.0	15.0	18.8
Baden Württemberg	16.0	31.0	19.0	13.0	16.2
Hessen	13.0	14.0	13.0	7.0	11.2
Others	17.0	22.0	18.0	43.0	31.3
Total Germany	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
FRANCE					
Île de France	58.3	58.2	58.3	18.9	28.4
Bassin Parisien	8.4	14.0	9.8	18.0	16.4
Centre Est	17.4	6.9	14.7	11.9	11.2
Others	15.9	20.9	17.2	51.2	44.0
Total France	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Source: Cantwell and Iammarino (2003).

Another example of study on regional Research & Innovation

EU Horizon 2020 project: "The European regions network for Health Research and Innovation (RegHealth-RI)"

DEAMS-UNITS is partner in the project

Aim of the project is to **reduce gaps in Health Research and Innovation (R&I) across EU regions**

Motivation of the study

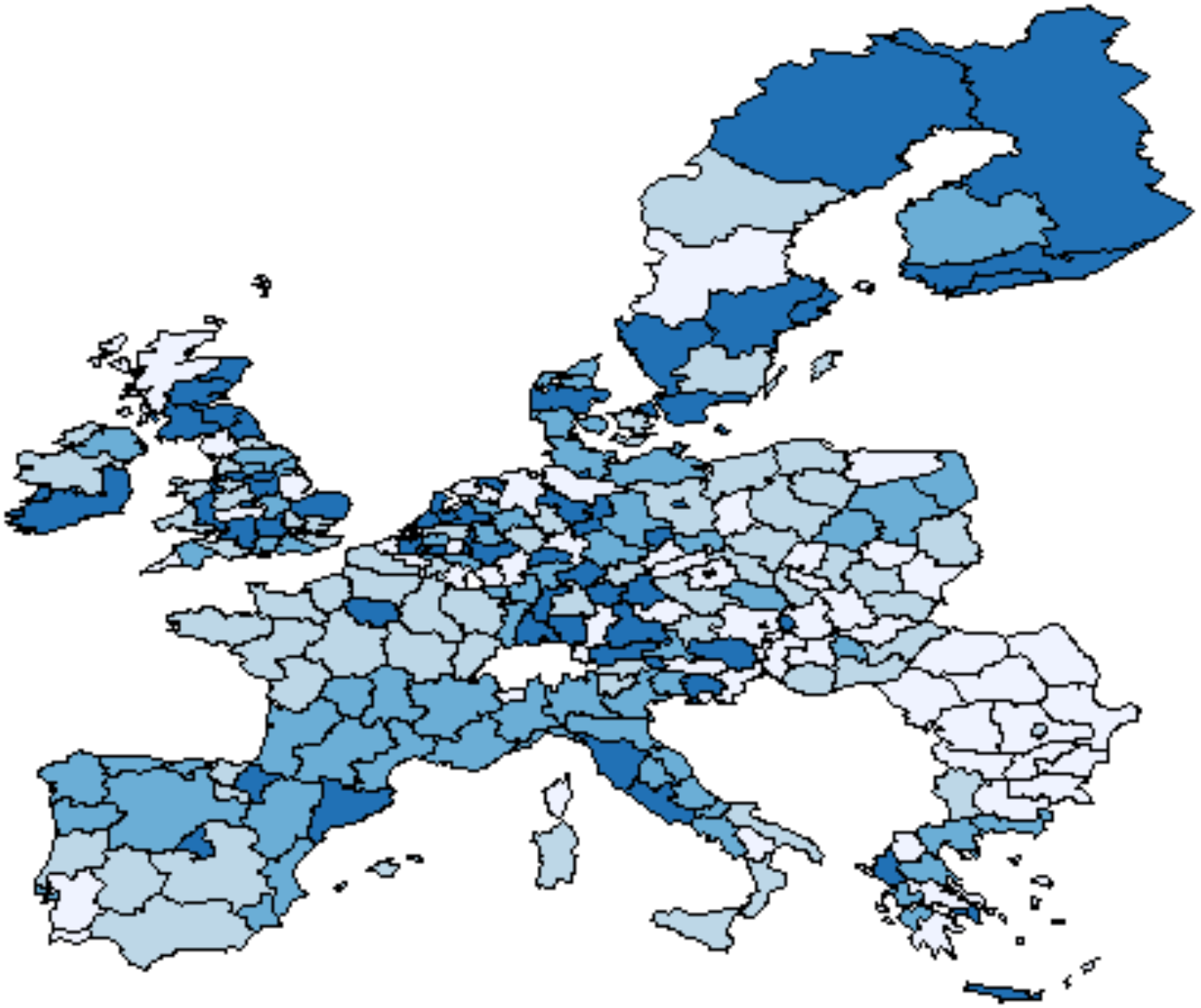
An agenda aimed at reducing **Health R&I gaps** requires a clear understanding of which may be the possible causes of the divide. It is usually measured with **synthetic indicators**.

BUT

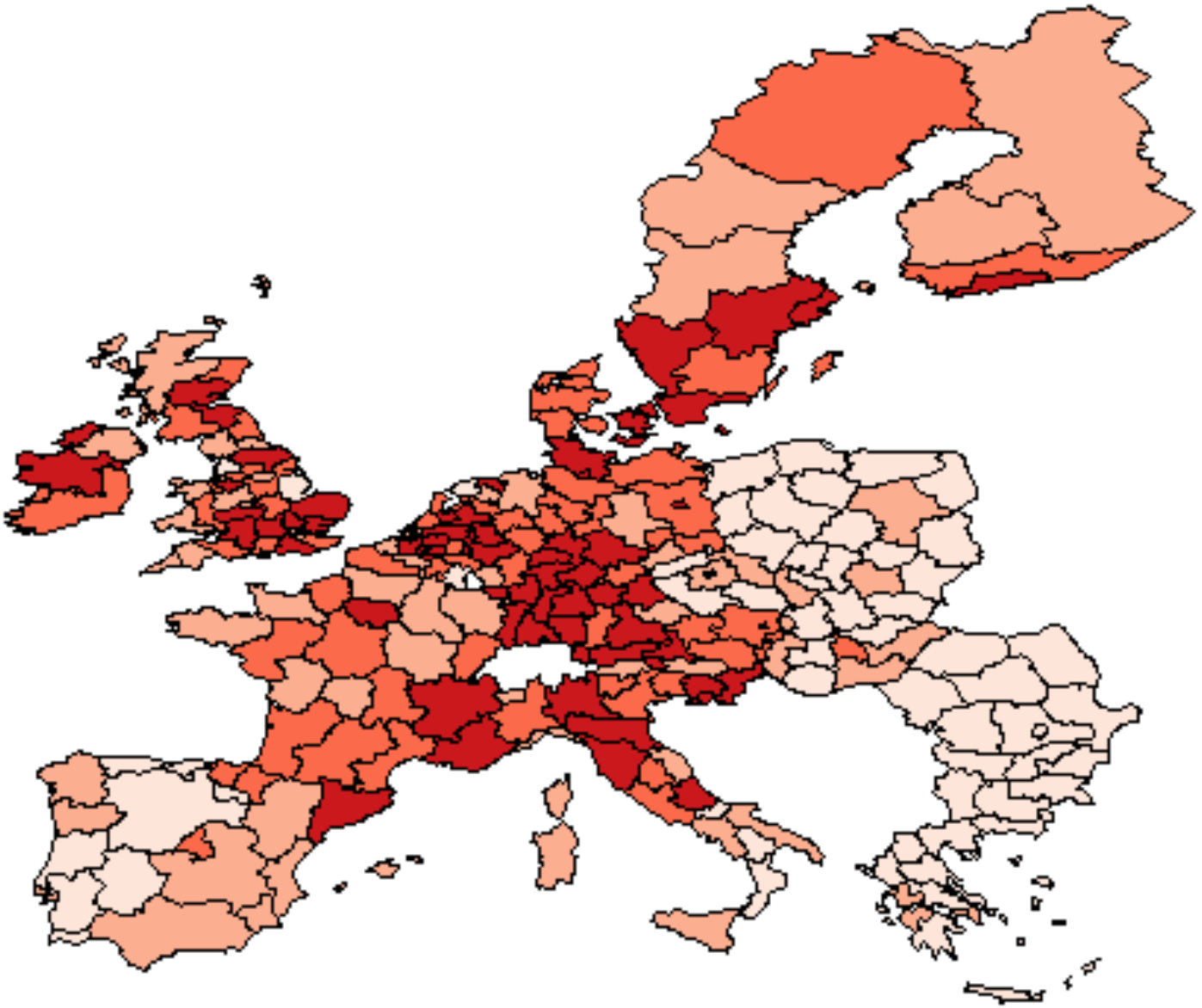
- ✓ to address specific policies **in favor of less performing regions** it is necessary to conduct a fine-tuned analysis (e.g. different regional R&I outcomes)

- ✓ In the light of smart specialization strategies, it has to be considered a **more articulated definition of sectors** (e.g. Health as thematic priority)

Total Health publications fractional count 2008-2012 (by population): EU regions



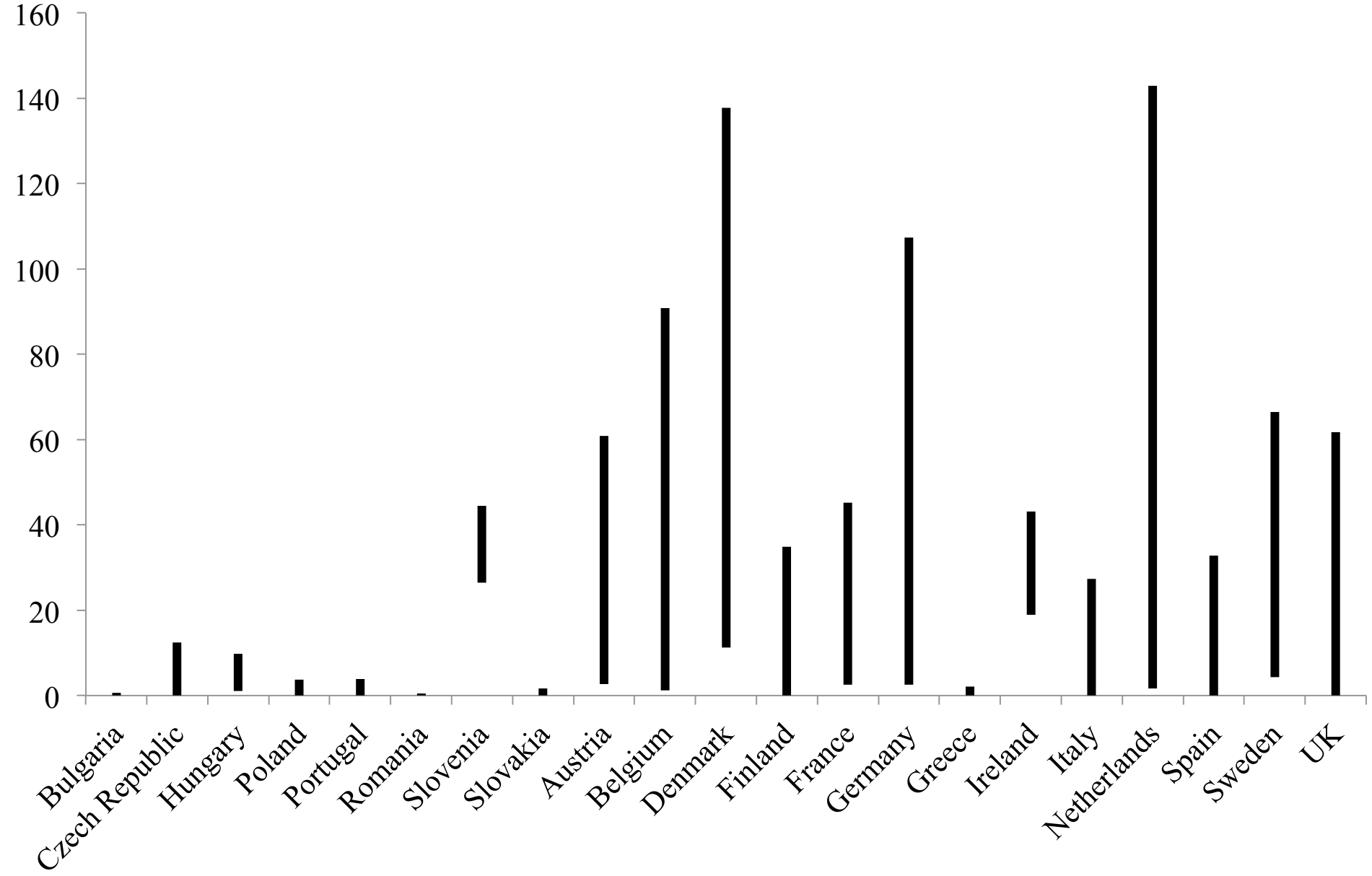
Total Health EPO patent applications 2008-2010 by region of inventor (by population)



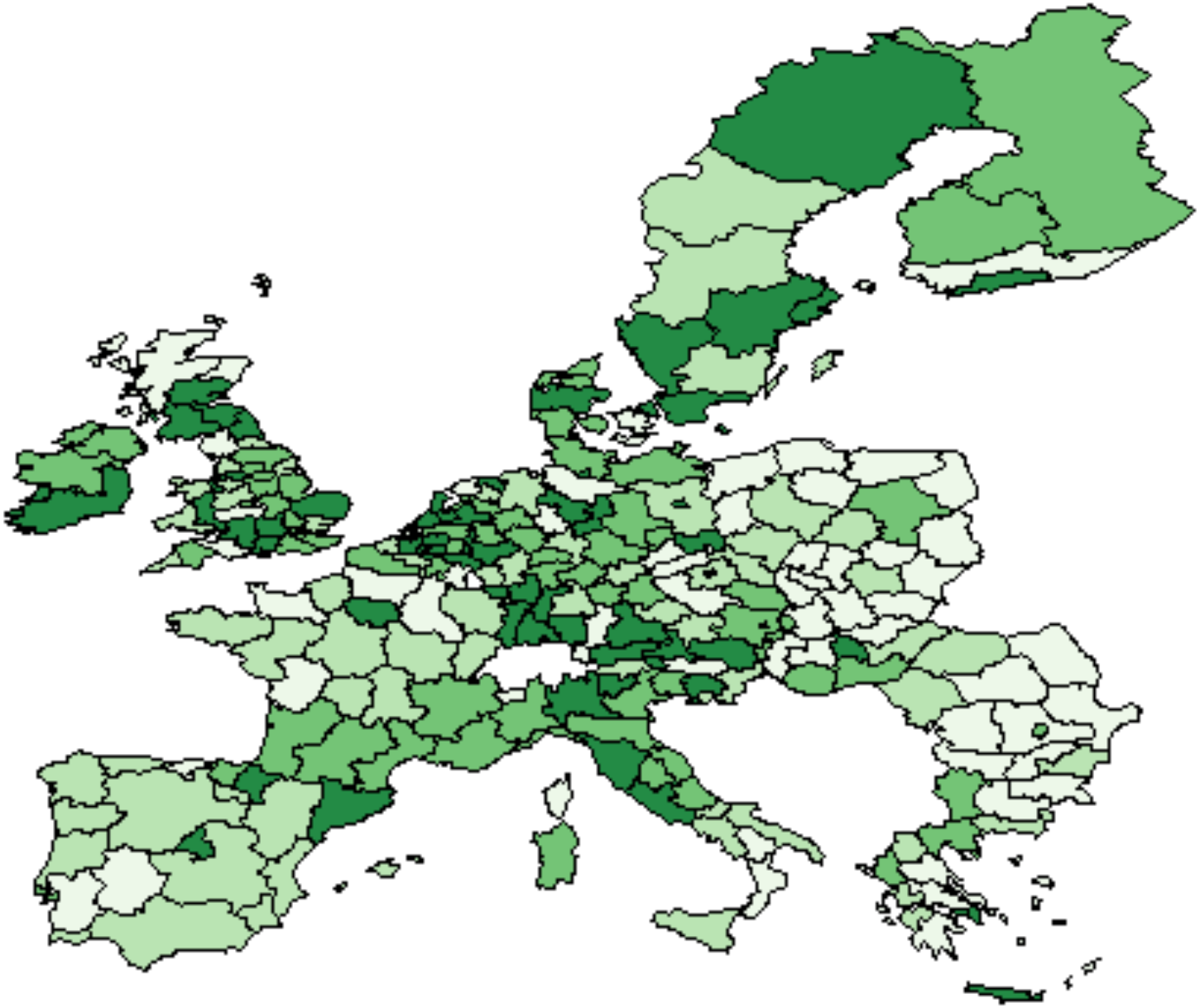
COUNTRY (W=Widening)	PUBLICATIONS Regions in the last quartile	% on total country regions	PATENTS Regions in the last quartile	% on total country regions
Bulgaria (W)	**Severen tsentralen; Yugoiztochen; Severozapaden;Yuzhen tsentralen**;Severoiztochen	83%	**Severozapaden;Severen tsentralen;Severoiztochen; Yugoiztochen;Yuzhen tsentralen**; Yugozapaden;	100%
Czech Republic (W)	**Severozápad;Strední Cechy; Moravskoslezsko**	38%	**Severozápad; Jihozápad; Moravskoslezsko;** Jihovýchod;	50%
Hungary (W)	**Észak-Magyarország; Közép-Dunántúl**; Nyugat-Dunántúl	43%	**Észak-Magyarország; Közép-Dunántúl**; Dél-Dunántúl	43%
Poland (W)	**Lubuskie; Opolskie; Podkarpackie**; **Swietokrzyskie; Warminsko-Mazurskie**	31%	**Warminsko-Mazurskie; Opolskie; Podlaskie;** Podkarpackie; **Swietokrzyskie;** Zachodniopomorskie; Kujawsko-Pomorskie; Slaskie; **Lubelskie**; Lódzkie; Pomorskie; Lubuskie; Wielkopolskie; Dolnoslaskie	88%
Romania (W)	**Sud – Muntenia; Sud-Est; Centru; Sud-Vest Oltenia; Nord-Est; Vest; Nord-Vest**	88%	**Nord-Vest; Centru; Sud-Est; Sud – Muntenia; Sud-Vest Oltenia; Vest; Nord-Est;** Bucuresti – Ilfov;	100%
Slovakia (W)	**Západné Slovensko; Stredné Slovensko**	50%	Východné Slovensko; **Stredné Slovensko; Západné Slovensko**	75%
Slovenia (W)	Vzhodna Slovenija	50%		

COUNTRY	**PUBLICATIONS** Regions in the last quartile	% on total country regions	**PATENTS** Regions in the last quartile	% on total country regions
Austria	Burgenland (A); Niederösterreich; Kärnten; Vorarlberg	44%		
Belgium	**Prov. Luxembourg (B)**; Prov. West-Vlaanderen; Prov. Hainaut; Prov. Limburg (B)	36%	**Prov. Luxembourg (B)**	9%
Finland	Åland	20%		
France	Corse	5%		
Germany	Lüneburg; Chemnitz; Niederbayern; Koblenz; Schwaben: Weser-Ems; Kassel; Trier	21%		
Greece	**Dytiki Makedonia; Peloponnisos; Sterea Ellada; Voreio Aigaio; Ionia Nisia; Notio Aigaio**	46%	**Dytiki Makedonia;** Ipeiros; **Ionia Nisia;** **Sterea Ellada;** **Voreio Aigaio;** **Notio Aigaio;** Kentriki Makedonia; Thessalia; **Peloponnisos;** Anatoliki Makedonia, hraki;Kriti	85%
Italy	**Basilicata**; Valle d'Aosta/Vallée d'Aoste	10%	Calabria; Molise; **Basilicata**	14%
Netherlands	Zeeland; Drenthe; **Friesland (NL)**; Flevoland	33%	**Friesland (NL)**	8%
Portugal	**Alentejo; Algarve**	40%	**Alentejo;** Centro (P); **Algarve**	60%
Spain			Cantabria; La Rioja; Extremadura; Castilla y León; Principado de Asturias	31%
Sweden	Norra Mellansverige	13%		
United Kingdom	Cumbria; Herefordshire, Worcestershire and Warwickshire; Highlands and Islands; **Lincolnshire**; Cornwall and Isles of Scilly	14%	**Lincolnshire; Lancashire**	5%

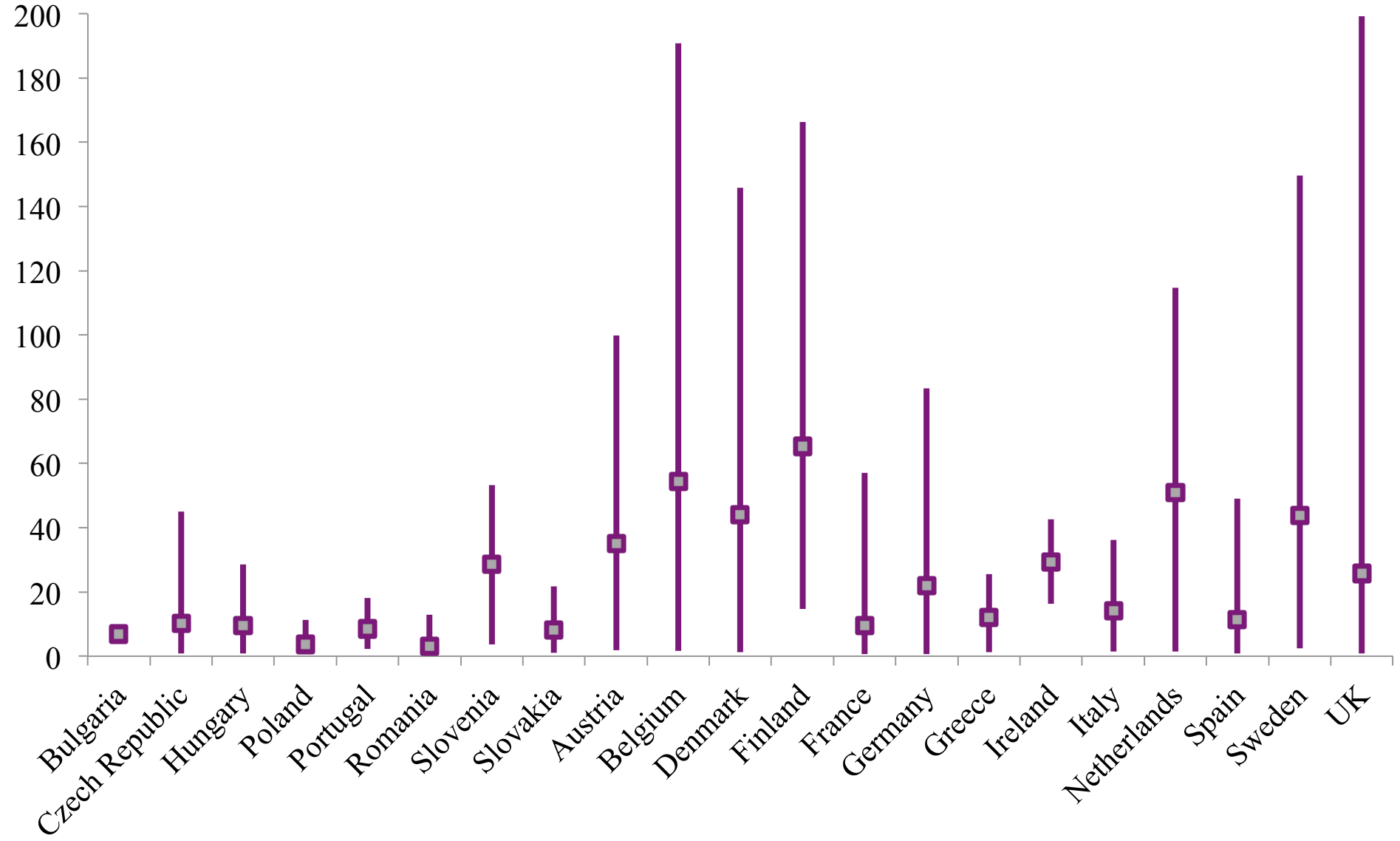
Total Health intra-domestic co-patents 2008-2010, by region of inventor (Min-Max)



FP7 Health project participants by population:
regional distribution

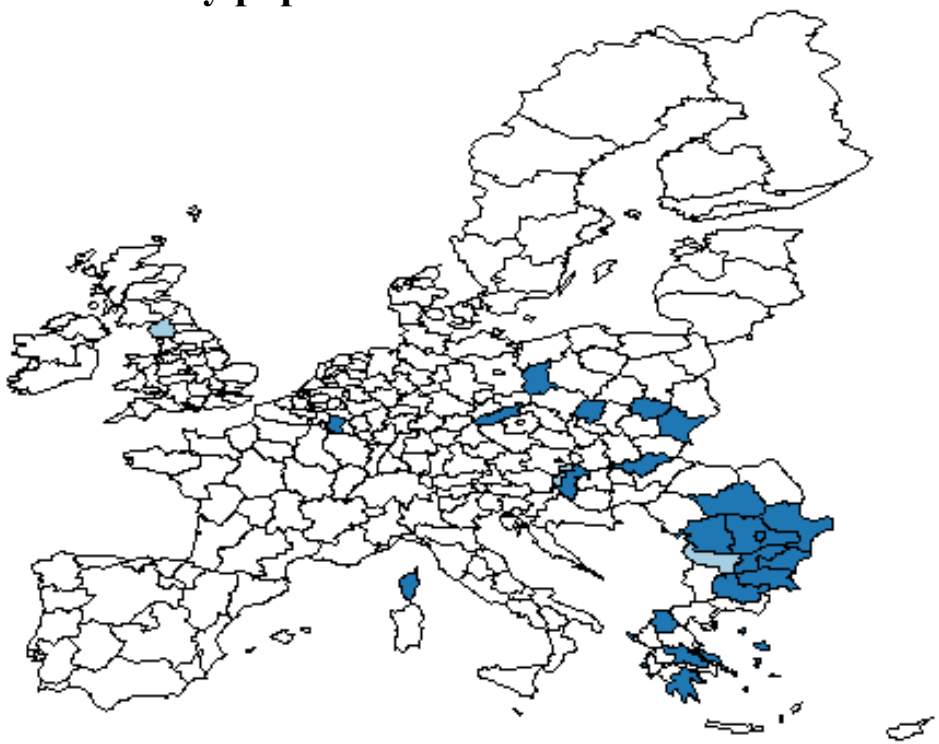


FP7 Health projects participation, per million population:
regional dispersion

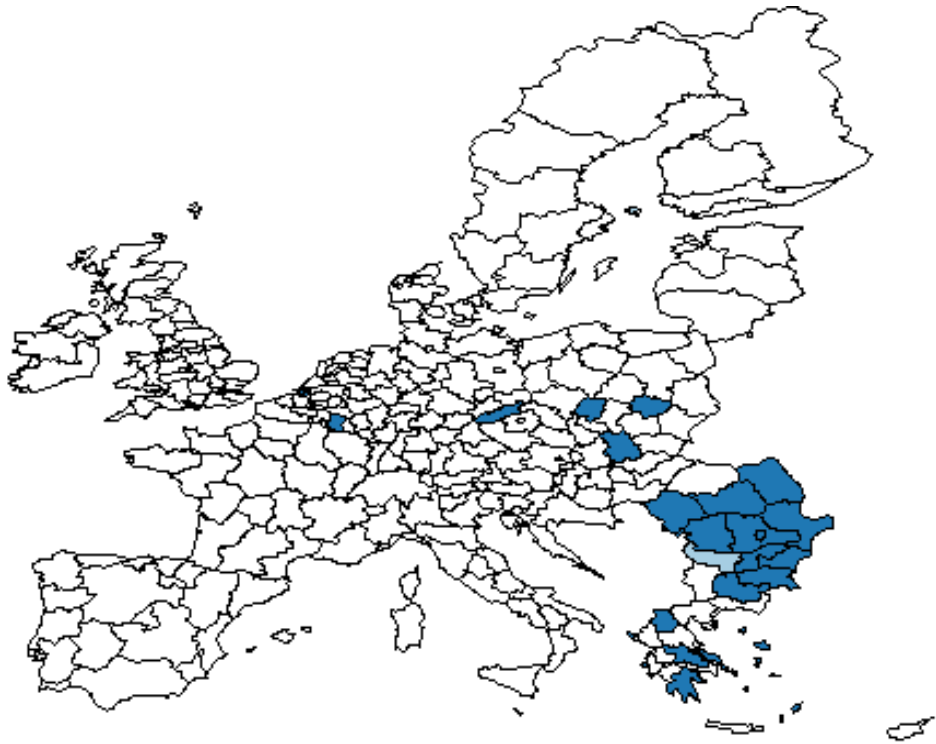


Which are the less performing Regions?

Health Publications
By population



Health Patents
By population



Own elaboration EC DG-RTD (Framework contract)

Empirical Methodology

Model: Linear regression (OLS)

Dependent variables: Regional Health patents; Regional Health publications in ln terms

Independent variables: R&D expenditures; Health knowledge collaboration and networking, quality of human resources/absorptive capacity; existing Health knowledge experiences; regional Health infrastructures; composition of the industry; quality of regional system

Control variables: country effect (widening/no widening); size (population, potential market), specialization in the sector

Linear regression model (OLS)	**Health Patents propensity**		**Health Publications propensity**	
	All regional effects Model A (I)	**Widening effect** Model A (II)	**All regional effects** Model B (I)	**Widening effect** Model B (II)
Experience in Health patents			**0.198*** **	**0.187*** **
			[0.054]	[0.057]
Ongoing clinical trials	-0.032	0.011	**0.277*** **	**0.285*** **
	[0.085]	[0.089]	[0.057]	[0.059]
FP7 project participation	0.002	0.002*	**0.003*** **	**0.003*** **
	[0.001]	[0.001]	[0.001]	[0.001]
Health International tech collaboration	**0.438*** **	**0.415*** **	-0.018	-0.018
	[0.071]	[0.068]	[0.042]	[0.042]
EFPIA participation in FP7 projects	-0.001	-0.001	**-0.007** **	**-0.007** **
	[0.006]	[0.006]	[0.003]	[0.003]
Firms participation in FP7 projects	**0.009*** **	**0.008** **	**-0.012*** **	**-0.012*** **
	[0.003]	[0.003]	[0.002]	[0.002]
Biopharmaceutical top cluster	**0.379*** **	**0.375*** **	-0.052	-0.048
	[0.144]	[0.140]	[0.100]	[0.100]
Medical Devices top cluster	**0.677*** **	**0.652*** **	-0.070	-0.070
	[0.181]	[0.181]	[0.095]	[0.095]
Advanced manufacturing region	0.404	0.422	**-0.404*** **	**-0.394*** **
	[0.281]	[0.270]	[0.154]	[0.150]
Technologically advanced region	**0.509** **	0.421	-0.148	-0.162
	[0.251]	[0.262]	[0.167]	[0.170]
Government effectiveness	**0.281*** **	**0.207** **	-0.090	-0.102*
	[0.091]	[0.100]	[0.054]	[0.054]
Widening effect		**-0.492** **		-0.101
		[0.224]		[0.148]

Conclusions of the study

- Regional R&D expenditure remains fundamental for sustaining R&I
- For increasing patents capacity more that disposing of a good pool of knowledge workers in the region, it is important to have a vital industrial structure, that is not only dominated by few large firms
- Patents depends on international cooperation (mainly of technological nature) but this remain a prerogative of regions with certain minimum level of absorptive capacity
- More path dependent nature of patenting performances from the existence of favorable organizational and institutional preconditions

Conclusions of the study (2)

- Good performances in publications can be found also in regions belonging to Widening countries or that are considered peripheral
- Publishing, which remains an activity more directly related to the production of science, is less bounded to territorial aspects
- For sustaining scientific outcomes there should be a certain distance from the influence of local market logics (industry may absorb and snatch resources from public research activities)

Conclusions of the study (3)

- ✓ The development of a good industrial structure is a priority for innovation in the Health sector and may call for policies supporting more private-driven initiatives that generic R&D investments
- ✓ May be wise to invest in increasing the quality of research infrastructures and education in regions in Widening countries with potential in this sector (reducing also the strong process of brain drain)
- ✓ Supporting initiatives for different typologies of international networks