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Universities, social capital formation and smart specializations of regions

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Smart specialization

- Smart specialisation has been highlighted in the latest *Europe 2020 Growth Strategy* and *Cohesion Policy 2014-2020*.

- **bottom-up** approach in priority-setting for the region`s specialisation, in which the local dynamic cluster externalities, social capital and networks plays crucial role.

The aim of the presentation

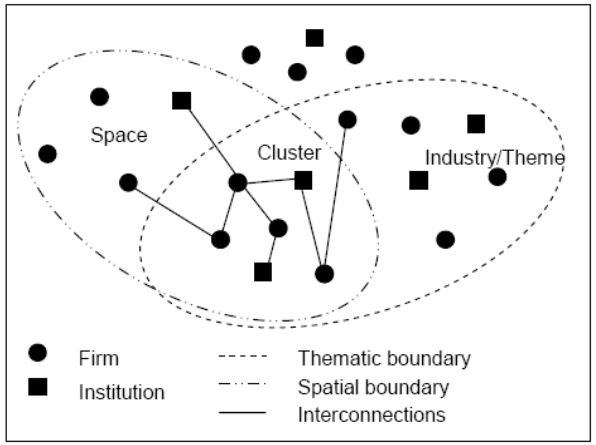
To show the ways in which co-location and proximity to universities enhances social capital formation, innovative capabilities and smart specialization development, taking the example of biotechnology sector in the period from 1997 up to the latest accessible data.

Social capital

- social capital is embedded in people`s social relationships, that are realized by individuals (Coleman, 1988).
- a set of social norms and civic attitudes supporting common actions and sharing interpersonal trust (Putnam, 2005).
- networks together with shared norms, values and understanding that facilitate cooperation within or among groups (OECD 2001).

Clusters and their role in social networking

- share the notion of clusters as localized networks of specialized organizations, whose production processes are closely linked through the exchange of goods, services and/or knowledge (Audresch, 1998)
- tacit knowledge, as opposed to information, which can only be transmitted informally and typically demands direct and repeated contacts (Johansson, 2005).
- to efficiently cooperate with one another, which leads to the increased generation of positive externalities



Dynamic externalities and industry life cycle

MAR (Marshall, 1890; Arrow, 1962; Romer, 1986): suggest that increased specialization in a particular industry within a specific geographic region (cluster) facilitates (intra-industry) knowledge spillovers (interaction between individuals) and diffusion of technologies, information, and knowledge.

Jacobs (1969) : **regarded inter-industry spillovers as the most important source of new knowledge creation and difussion process; local R&D monopoly harms innovation.**

Porter (1990): technological externalities occur within industry (favours) regional specialization and competition.

The impact of agglomeration effects on patent activity in the six high technology industries in EU regions

$Pij=a1 + a2HTKSij\ t\text{-}3 + a3Sij + a4COMPij + a5EKCit\text{-}3 + a6POPi + a7GDpi\ t\text{-}1 + a8GDKi\ t\text{-}1 + a9RDi + \varepsilon ij$

Where,
i– region; j- industry;
Pij stands for the average number of patent applications over the 1998-2007
MAR externalities:
$HTKS_{ij}$ regional production specialisation in *high-tech* knowledge intensive services 1998-2007
S_{ij} regional production specialisation in *high-tech* industry (j) 1998-2007
Jacobs externalities:
$GD^{K}\ i$ production diversity indicator of a region (in high-tech sector) in 1998-2007
GD^{P}_{i} innovation diversity indicator of a region (in high-tech sectors) in 1998-2007
Porter`s externalities:
$COMP_{ij\ t\text{-}3}$ competition index in a specific high-tech industry in region 1998-2007 of region i and sector j
Other variables:
RDi identifies the total R&D expenditure per capita in region *i* as PPP in 1998-2007
POPi is the average population size over the period 1998-2007 introduced as a size control variable;
eij denotes a random error.

Industry	Aerospace	Communication	Computer	Biotechnology	Semicon-ductors	Lasers
Variables	patents	patents	patents	patents	patents	patents
gdk	7.706***	7.609***	7.580***	5.593***	1.728	2.510**
	(2.539)	(1.302)	(1.104)	(1.278)	(1.203)	(1.065)
gdp	0.188	-1.382	-1.629*	-2.246**	2.582***	1.264*
	(1.135)	(0.987)	(0.909)	(0.897)	(0.878)	(0.764)
htks	0.173	0.497	-0.0639	-0.231	0.970**	0.910
	(0.413)	(0.464)	(0.363)	(0.244)	(0.486)	(0.462)
ekc	3.94e-05**	-4.27e-06	1.49e-06	1.89e-05*	9.39e-06	-3.06e-06
	(1.56e-05)	(8.46e-06)	(7.03e-06)	(9.70e-06)	(9.50e-06)	(6.02e-06)
s	-0.146	-0.176	0.199*	0.0944	0.598***	0.0427
	(0.118)	(0.529)	(0.104)	(0.0861)	(0.174)	(0.0923)
CO	-0.000523	0.0173	-0.00511	0.129**	-0.0849	0.0141
	(0.0213)	(0.0799)	(0.00989)	(0.0612)	(0.0581)	(0.0513)
pop	-1.51e-07**	1.51e-07**	9.47e-08*	-1.88e-08	1.44e-08	-1.25e-07**
	(6.60e-08)	(6.09e-08)	(5.56e-08)	(6.77e-08)	(5.18e-08)	(4.88e-08)
rd	0.000761	-0.000844	-0.000444	0.000748	1.87e-05	-0.000409
	(0.000694)	(0.000605)	(0.000603)	(0.000602)	(0.000657)	(0.000493)
dummy	-0.198	1.518***	1.573***	1.228***	0.799**	0.597***
	(0.291)	(0.310)	(0.260)	(0.346)	(0.348)	(0.222)
Constant	-1.969	-1.011	-0.771	-0.0699	-1.530**	-2.102***
	(1.420)	(0.827)	(0.555)	(0.510)	(0.671)	(0.511)
(2)	-1.166***	0.739***	0.521***	1.001***	0.486***	-0.768**
lnalpha	(0.358)	(0.120)	(0.112)	(0.126)	(0.133)	(0.334)
Observations	27	142	142	149	120	156

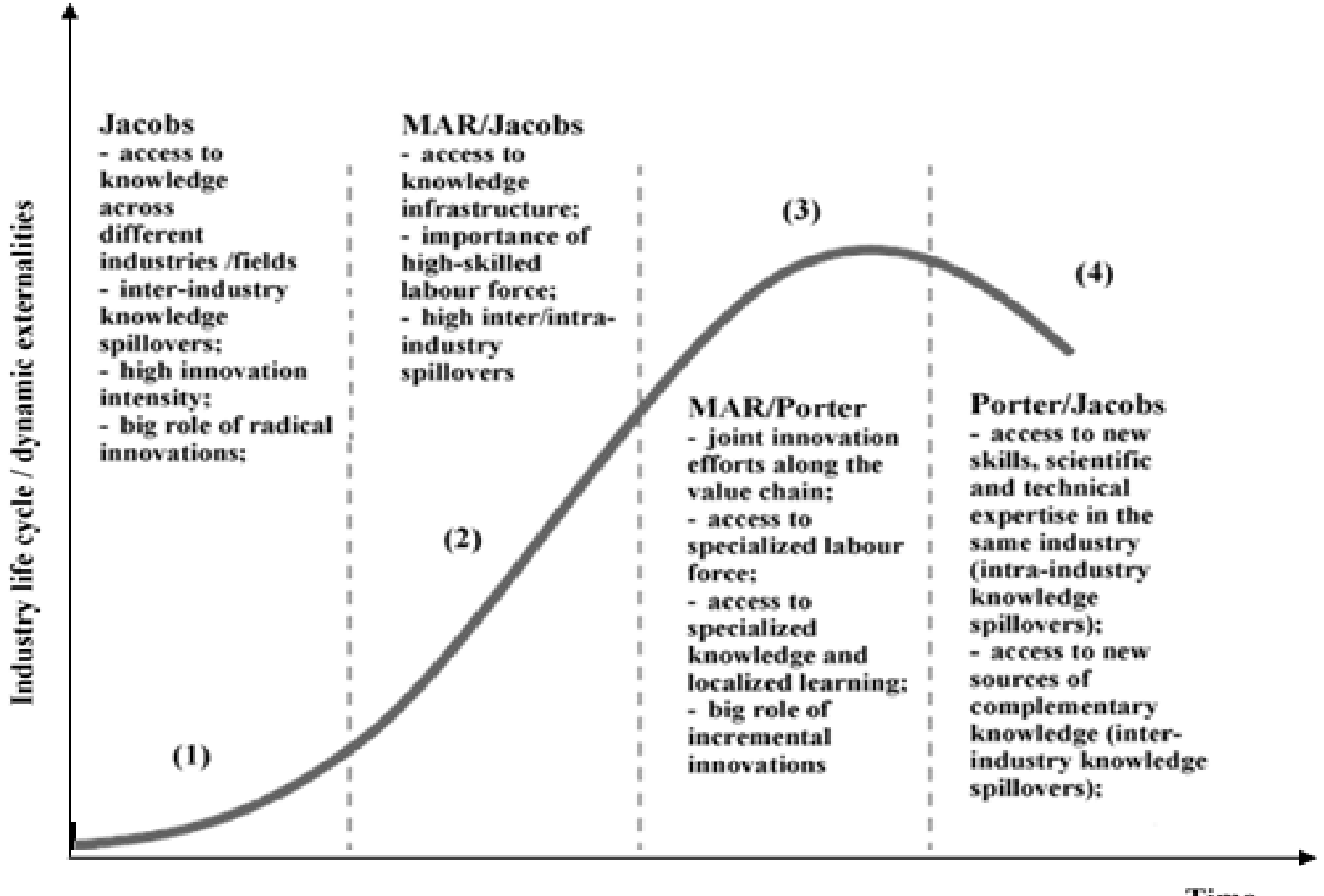
Results:

Jacobs-type externalities are present in the biotechnology and laser technologies industries , and in the case of the airline industry (important role of the development of other industries such as communications and computer).

MAR externalities are present in the case of a computer, and semiconductor industries. The high significance of HKIS services in semiconductors industry can mean the importance of „outsourcing” activity.

Porter-type effects are noticeable only in the case of the biotechnology industry!

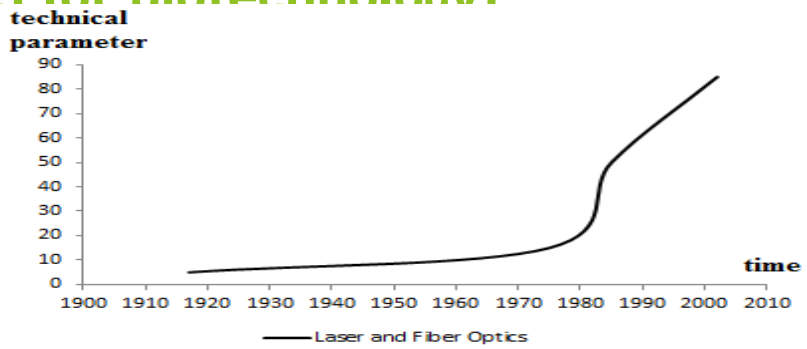
Dynamic externalities and technological life cycles

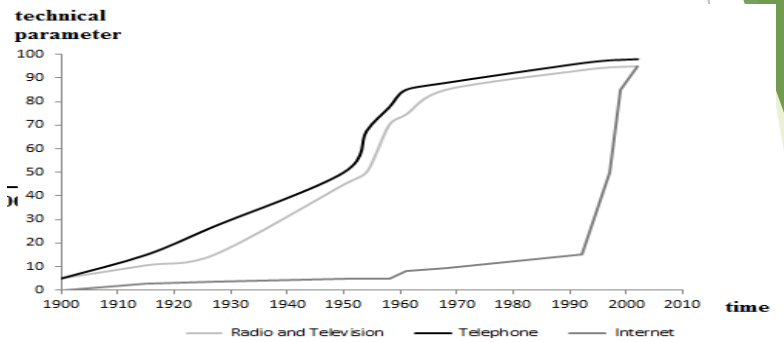


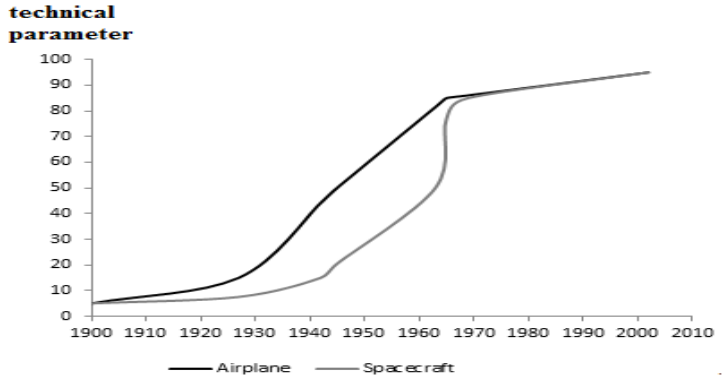
Technological maturity of six high-tech industries: tracking the intensity of high-tech patent applications

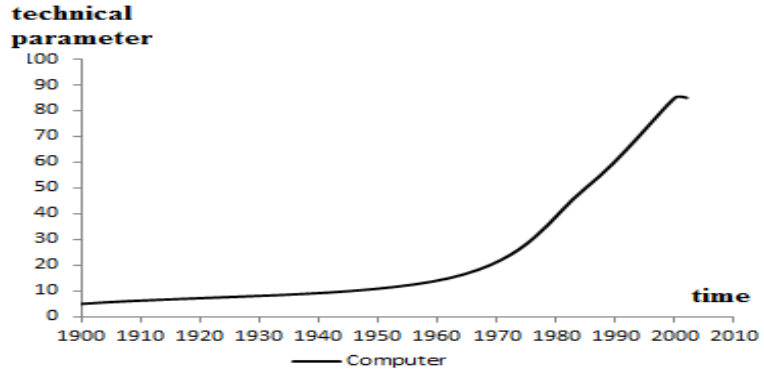
- Based on the Fisher and Pry (1971) index. It is based on the **technological difussion and substitution model**
- At the ***emerging*** and ***growth*** **stages**, the indicator of the number of patent applications is typically higher. Then, after technological and market uncertainties have vanished, innovations become less radical. In the following phase of ***maturity***, the number of patent applications (typically incremental innovations) remains constant; when the technological potential for new product innovations decreases, annual patent applications decreases (***decline*** stage begins).

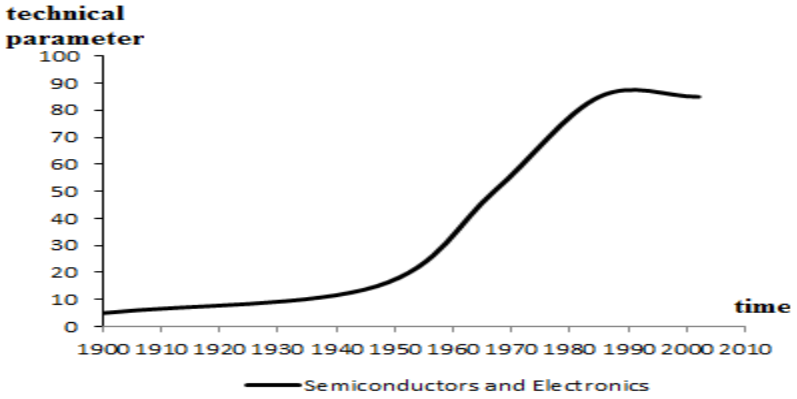
Industry life cycle maturity and technology diffusion in high-tech industries (Wunderlich and Khalil (2002); Utterback and Abernathy, 1975 for biotechnology)

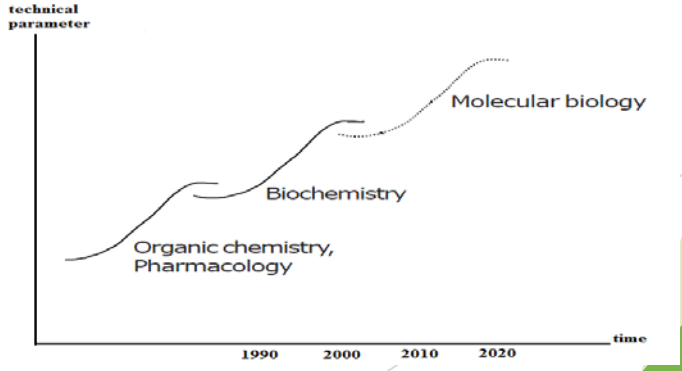




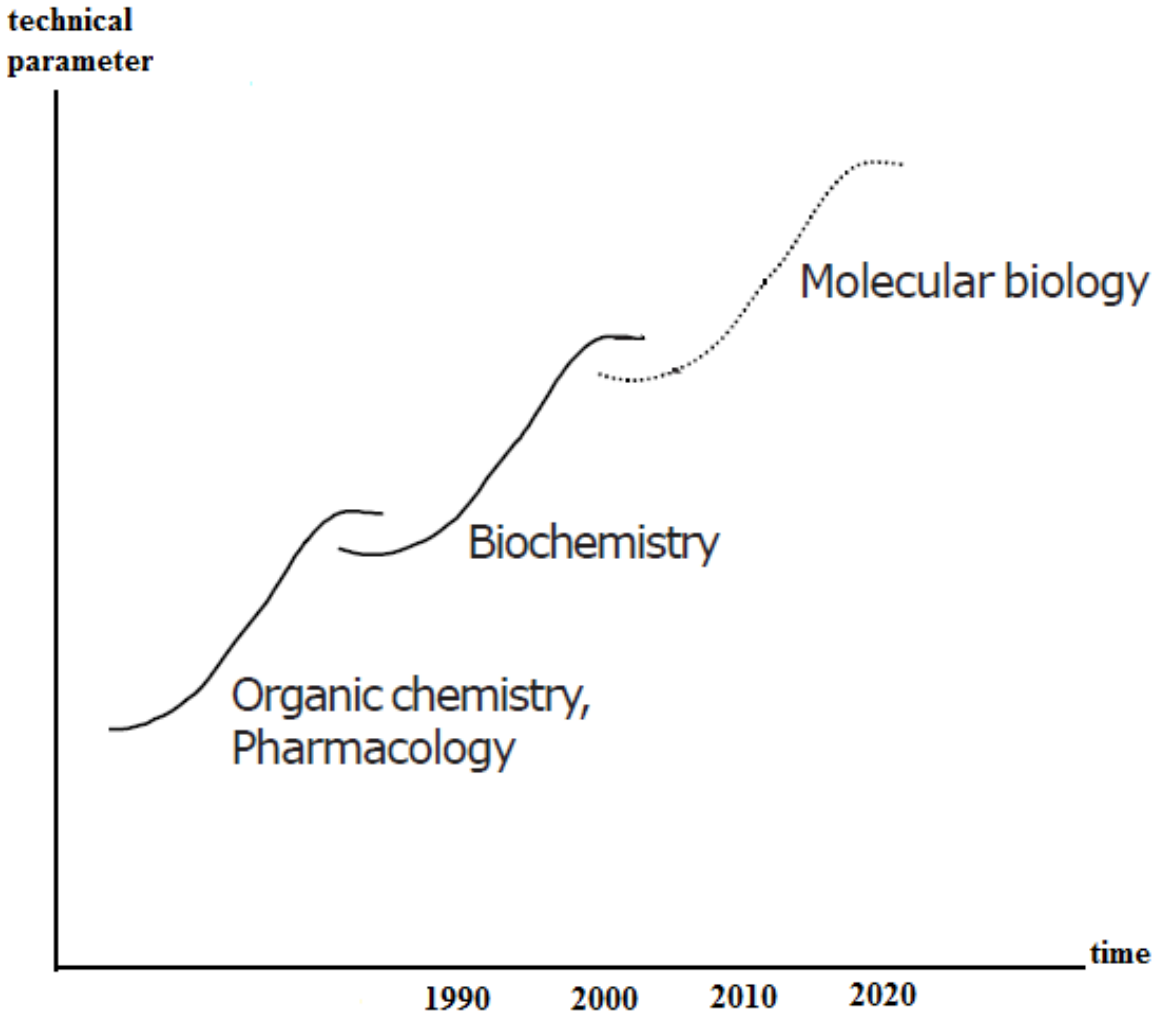








Biotechnology industry life cycles and drivers of development

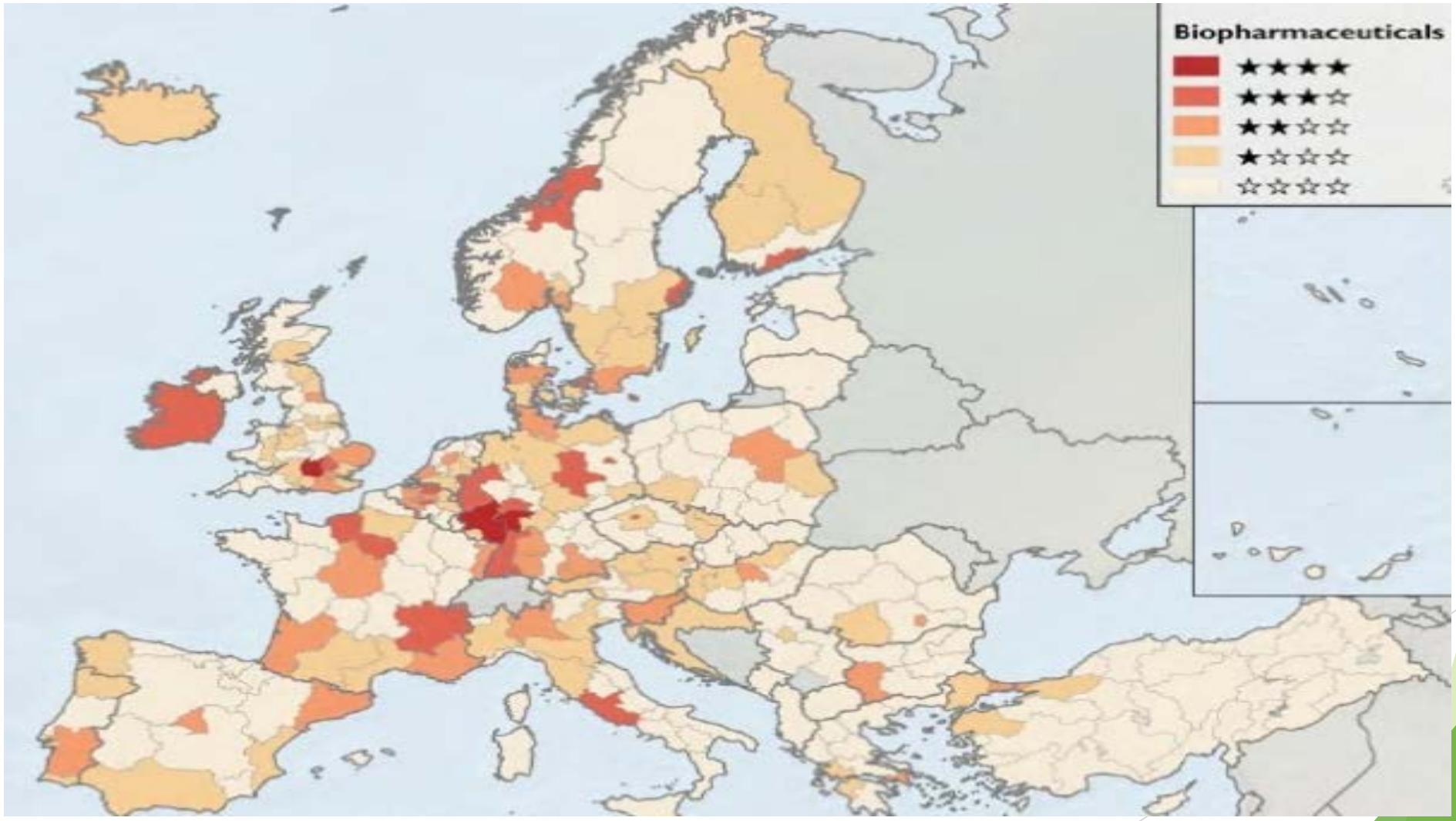


Dynamic externalities in biotechnology clusters

- The urbanization economies (Jacob's externalities) are expected to play an important role **in the early phases of an industry's life-cycle**, while localization economies (Marshallian externalities) exert their positive effects on industries when they are in the growth and maturity phase.

- Agglomeration externalities in the sense of Jacobs's are also predominant in the high-tech industries where technological advances converge with the expansion of other industries, thus for importance of interaction with other industries and access to universities labs (especially in the case of biotechnology).

Biotechnology clusters 2016



Knowledge spillovers

- 1) proximity to universities is important for tacit knowledge, sharing opportunities offered by the R&D institutions and personal acquaintance with the scientists.
- 2) the discovering scientists ('superstars') tend to enter into contractual arrangements with existing firms (contract or ownership) or start their own firm in order to extract the supra-normal returns from the fruits of their intellectual human capital.
- 3)the scientist work with or create a new firm within commuting distance of home or university (where they tend to retain affiliation) thus creating localised effects of university research.

Networks and collaborations

Character of networks

- 1) interactions and cooperation among different types of agents commanding complementary resources and competencies.
- 2) links between distinct clusters in the network.
- 3) social networking and informal contacts seem to be a more important at the early stage of R&D process whereas in terms of further knowledge sharing experts emphasized the importance of IP protection and secrecy.
- 4) formal network is noticeably less clustered than the informal network.

Networks and collaborations

Degree of diversity

- Networks are characterized by sparser, more specialized and upstream relationships among a limited set of organizational participants located in national clusters.
- network tends to consolidate around a rather stable core of companies, composed by large incumbents and early entrants in the network.
- The advantage of FPs: EU level cooperation occurs on a regular basis and it enables the creation of long-term partnerships [*may be difficult for new partners to enter to new project consortiums for less experienced partners].*

Networks and collaborations

Geographical dimension of networks

- 1) networks have a strong geographical dimension and usually span well beyond the boundaries of the geographical location.
- 2) openness to geographical distant nodes: increasing number of collaborations and a decreasing proportion of local connections (companies!).
- 3)better performing and growing firms rely increasingly less on local sources of knowledge.
- 4) inter-organizational collaboration follows the accumulative advantage based on the overlapping specialisation, and multi-connectivity.

Policy recommendations

- encourage EU Member States to consider the role of universities and social capital in innovation systems, especially on local level, when drafting smart specialisation strategies.
- Analyse how universities are being involved in smart specialisation, including sharing experiences of university-regional engagement across Europe as part of a capacity building process.
- Match the specialisations of local universities with the economic priorities of the regions based on their current dynamic externalities
- Survey the existing relationships between the university as well as individual academics and other regional actors to ‘nourish’ the partnership.
- Understand the specific obstacles and challenges that are preventing a greater level of engagement between local universities and the region.

Thank you.

Questions and Comments.