

Creativity, innovation and cluster policy (2)

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5. Regional systems and clusters

- Enforcing connectivity between actors:
 - Economic
 - Technological
 - Scientific
- Local environment and policies: causes and consequences of *clusters*

5.1 Global presentation

Innovation as collective process of creation

- Firms do not innovate in isolation.
- They belong to networks and systems with which they develop multiple interactions.
- There is a wide range of *actors and institutions* involved in such *innovation systems*:
 - firms
 - Large firms (MNF in particular) or SMEs (*Mittelstand* in particular)
 - Manufacturing and/or service-oriented
 - public research labs and education/training organisations
 - governance structures: local/regional administrations
- There are also *policies* and institutional settings that are part of the scene of innovation systems
 - e.g. Triple Helix model (Loet Leydesdorff, Henry Etzkowitz)

Innovation systems and policies

- *National, regional and sectoral* technology innovation systems have received much attention in literature
 - e.g. Lundvall, 1992; Edquist, 1997; Freeman, 1987; Malerba, 2002.
- The changing nature of the business environment, the advent of the knowledge society and the emergence of the *open innovation paradigm* raise new challenges for innovation systems.
- *Cluster policies* have become essential tools worldwide

Some definitions of NSI

- **Freeman 1987**
The network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies
- **Lundvall 1992**
The elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge (...) and are either located within or rooted inside the borders of nation states.
- **Nelson 1993**
The national institutions whose interactions determine the innovative performance (...) of national firms
- **Patel, Pavitt 1993**
The national institutions, their incentive structures, and their competencies, that determine the rate and direction of technological learning in a country.

Cluster analysis, cluster policy and related approaches

- ***Classical examples***

- ***Silicon Valley*** near Palo Alto, CA
(cf Rogers, Larsen, 1984)
- ***Route 128*** near MIT in Boston, MA
(cf Saxenian, 1994)

- ***Other realities/approaches***

BECATTINI, CAMAGNI

- ***Industrial Districts of “Third Italy”***

GREMI (Ph AYDALOT, R. CAMAGNI, D. MAILLAT, J-CI. PERRIN,...)

- ***Milieux innovateurs***

Richard FORIDA

- ***Learning Region***

- ***The reference***

Michael PORTER: ***Industrial Clusters***

***Critical mass of actors in interaction, in a given domain of activity,
on a limited geographical space***

5.2 Back to basics: economics of knowledge

The understanding of knowledge as an economic factor (1)

1. Knowledge regarded as a public good: Arrow (1962) and Nelson (1959)
it spills over, primarily, from universities and research labs, and it is freely available to firms
2. Knowledge as a quasi-proprietary good: (Nelson & Winter, 1982)
the firm regarded as the privileged locus of knowledge creation and accumulation.
firms can appropriate and protect a fraction of the knowledge it creates, by means of property rights

The understanding of knowledge as an economic factor (2)

3. Knowledge as a collective process.

knowledge generated by interactions among many economic agents (Griliches, 1992; David, 1993; Cooke, 2002)

from *learning by using* (Nathan Rosenberg) to *learning by interacting* (Bengt-Åke Lundvall)

Interrelation among firms, universities and public labs are considered vital for the *generation, dissemination* and *absorption* of new knowledge. The spillovers of knowledge generate positive externalities to firms by stimulating innovation activities and productivity.

4. Spatial dimension of knowledge networking and collective creativity

Concepts of national and regional innovation systems (NIS, RIS)

NIS: Nelson, 1993; (+Freeman, Pavitt, etc.)

RIS: Cooke et al., 1997; Braczyk et al., 1998

Triple Helix model (Etzkowitz, Leydesdorff, 2000)

Foundations: Alfred Marshall: *Principles of economics*(1890)

The *Industrial District* argument

- Increasing returns to **scale**, or *economies of scale*:
 - increased levels of output → lower average costs
- Economies of scale may also be **external** to the firm (*externalities*): an increase in industry-wide output **within a given geographical area** decreases average costs for the individual firm. There are 2 types of externalities:
- **(1) Pecuniary externalities** (transmitted by the market):
 - **asset-sharing: infrastructures, etc.**
 - **supply of specific goods and services by specialized suppliers**
 - **the creation of a local labour market pool**
- **(2) Knowledge externalities**
 - Knowledge created by one firm may spill over to other firms.**
 - Knowledge spillovers increase the stock of knowledge available for each individual firm**
 - It may positively affect the regionally residing firms' ability to innovate**
- Remark 1: Knowledge externalities are *dynamic* (more typically than pecuniary externalities)
- Remark 2: In order to benefit from knowledge externalities firms must work on similar things and use each others' research (Griliches, 1979) or personal skills.

Note

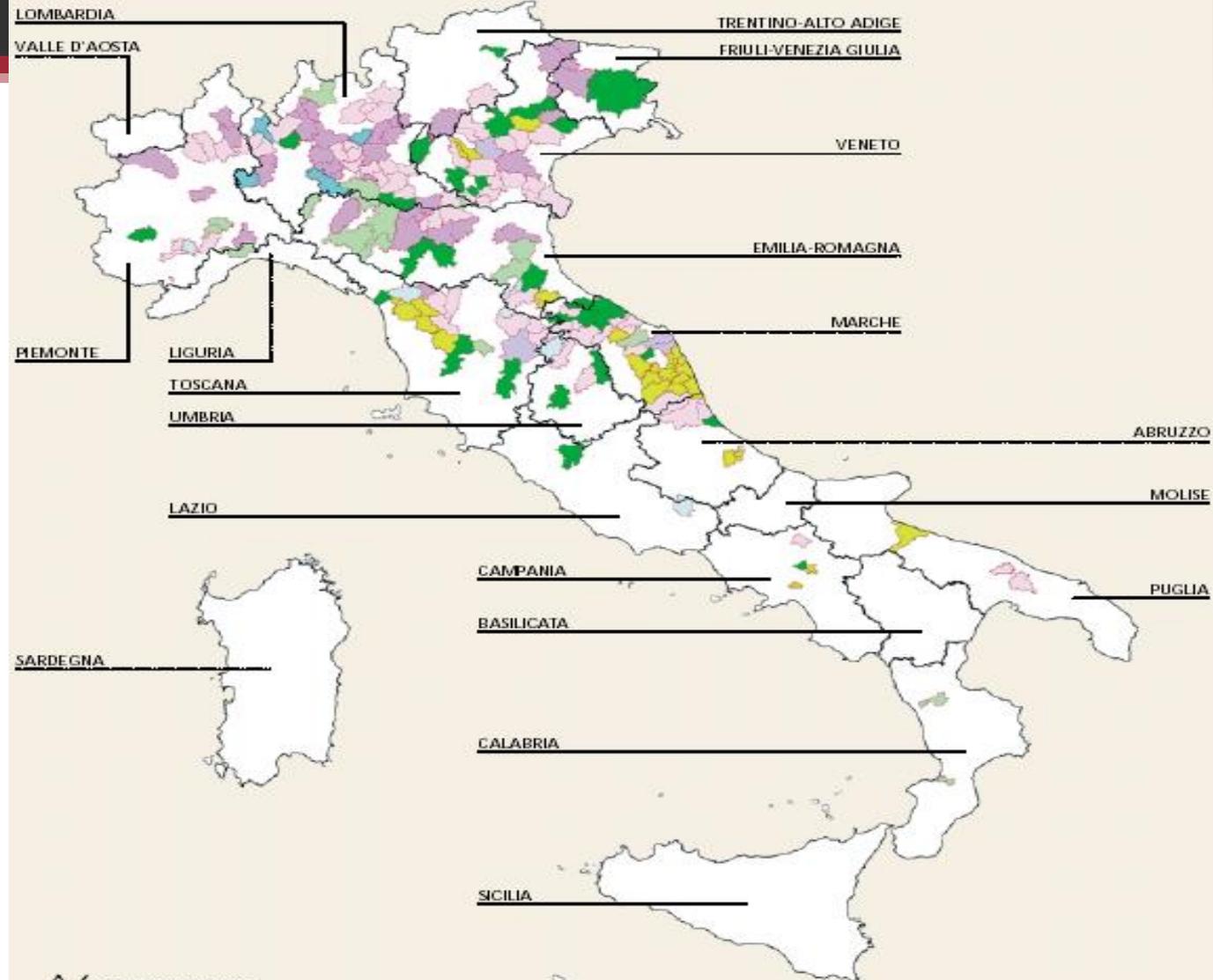
*“Industries tend to **cluster** in distinct geographic districts, with individual cities specializing in production of narrowly related set of goods”*

(Marshall, Principles)

After Marshall

mostly quoting G. van der Panne (2004)

- Most of this knowledge is tacit. *Tacit knowledge* is ill-documented, uncodified and can only be acquired through the process of social interaction. Hence, knowledge spillovers are geographically bounded to the region in which the new economic knowledge is created (Feldman and Audretsch, 1999)
- Question: do agglomeration economies arise between firms belonging to the same or to different industries. As put forward by Glaeser *et al.* (1992) as the **Marshall-Arrow-Romer (MAR)** model, knowledge is predominantly *industry-specific*.
- Knowledge spillovers may therefore arise between firms within the same industry and can only be supported by regional concentrations of a particular industry. These intra-industry spillovers are known as localization or '*specialization*' externalities.



- ~ Confine regionale
 ~ Confine distrettuale
- SPECIALIZZAZIONE PRODUTTIVA**
 ■ Alimentari
 ■ Carta e Poligrafiche
 ■ Chimica, Gomma, Plastica
 ■ Meccanica
 ■ Oreficeria, Strumenti musicali, Giocattoli
 ■ Pelli, Cuoi, Calzature
 ■ Prodotti per la casa
 ■ Tessile, Abbigliamento

Les districts italiens

5.3 The debates

Marshallian vs Jacobian districts:

Jane Jacobs: *The economy of cities* (1969)

- Contradictory to the Marshallian tradition, Jane Jacobs argues that knowledge may spill over between **complementary** rather than **similar** industries (ideas developed by one industry being applied in other industries).
- The exchange of complementary knowledge across diverse firms and economic agents **facilitates search and experimentation in innovation**. Therefore, a diversified local production structure leads to increasing returns and gives rise to urbanization or '*diversification*' *externalities*.
 - Jacobs and the analysis of **urban success**.
 - **Cities** seem to be natural generators of diversity (although not universally so); and creativity follows diversity
- My own comments:
 - distinction between **critical mass** and **critical diversity**
 - The specificity of large **urban** environments:
 - Cities as main creative environments?
 - Specialized clusters as a niche strategy for smaller towns and regions?

Summing up the debate

- Marshallian districts : from the first industrial revolution in England to the districts of the Third Italy
 - Firms of the **same specialization** tend to cluster in specific locations where they benefit from physical externalities like common infrastructures, but also knowledge externalities through manpower and other sources (“the secrets are in the air”)
- Jacobian districts and urban economics
 - Knowledge spills over between **different industries**, causing diversified production structures to be more innovative
- A whole empirical literature has been devoted to test those alternative hypotheses

Empirical results (1)

- G. van de Panne (2004) (the Dutch case)
 - *“The results show that the Marshallian specialization thesis holds, though more pronounced for R&D intensive and small firms”.*
 - *But: “Fierce local competition within an industry negatively affects innovativeness in that particular industry”*
- Globally:
 - *“The literature on innovation and agglomeration externalities remains inconclusive as to whether specialized or diversified local production structures favor local innovative activity”*
- My comment (about clusters):
 - The M. Porter model of *innovative cluster* considers competition “within” as a positive and even necessary condition.
 - The *Italian district* model implies specialization but with a mixed situation of cooperation/competition

Empirical results (2)

- Notable differences in the functioning of the local innovation systems
 - Particularly between the United States and Europe.
- Feldman and Audretsch (1999) find that there is no evidence of specialization externalities, whilst diversity externalities are at work in the case of **US metropolitan areas**
- Results disputed by several analyses based on European data (for example, Paci and Usai, 1999, 2000; Massard and Riou, 2002; Greunz, 2003; and Moreno et al., 2006)

What does really matter? other specificities of the territories

- Starting point: Knowledge spillovers are **geographically bounded**
Audretsch and Feldman, 1996; Acs et al., 2002)
- They are more generally affected by cognitive, social, organizational, and institutional **distance**
Torre and Rallet (2005), Boschma (2005).
- The active role of **territorial actors** (institutional approach)
 - Relevance of institutions among other actors: differences in economic behaviours and outcomes are primarily related to differences in institutions (
Hodgson, 1988, 1998; Whitley, 1992, 2003; Saxenian, 1994; Gertler, 1997.
- Relevance of **cultural attitudes** as well as cultural assets
 - *Hussler (2004)*

5.4 The specific influence of knowledge producers and knowledge diffusion

Higher education and research

Competitive advantage in the areas of education and R&D

- the role of universities in the process of knowledge spillovers
 - Jaffe, 1989; Anselin (1997); Audretsch and Feldman (1996)
- significant positive correlation between firms' concentration and university location
 - Varga (2000); Audretsch and Lehmann (2005).

The role of human capital on productivity level and growth

- Solow (1957)
- Mankiw et al. (1992) extended the Solow growth model by explicitly introducing human capital as an ordinary input in the production function.
- Endogenous growth models (Lucas, 1988; Romer, 1989) directly related human capital to the adoption of technology and underlined the positive interaction between knowledge, capabilities and innovative ability.

Human capital and absorptive capacities

- Seminal paper by Cohen and Levinthal (1990) : on the firm's absorptive capacity
- Gave rise to a strand of the literature aimed at understanding key characteristics of firms, regions and countries that make it easier to understand and absorb external knowledge in an economically efficient manner.
- In this line of reasoning, human capital is not just a precondition for enhancing the growth capabilities of regions or countries, but rather provides the stock of accumulated knowledge that allow a region to identify and utilize proper knowledge from outside.

Regional case studies

- A wide body of empirical literature have been developed in order to verify these theoretical predictions at the regional level of analysis.
- For example, Rauch (1993) found that at the regional level a higher availability of well educated labour forces represents an advantage for the localization of innovative firms thus promoting local productivity.
 - Bronzini and Piselli (2009) assess the role of the technological knowledge, as measured by the stock of R&D capital, the human capital, and the stock of public infrastructure, in enhancing the levels of Total Factor Productivity (TFP) of Italian regions over the period 1980-2001. They shows that there exists a long-run equilibrium between productivity level and the three kinds of capital; among them, human capital turns out to have the strongest impact on productivity.
 - Dettori et al. (2010) investigate the determinants of the TFP levels by analyzing the role played by intangible factors like human capital, social capital and technological capital for a sample of 199 European regions over the period 1985-2006. They provide robust evidence on the role played by intangible capital in enhancing economic growth and social cohesion.

Conclusion: knowledge externalities within the territory (cluster)

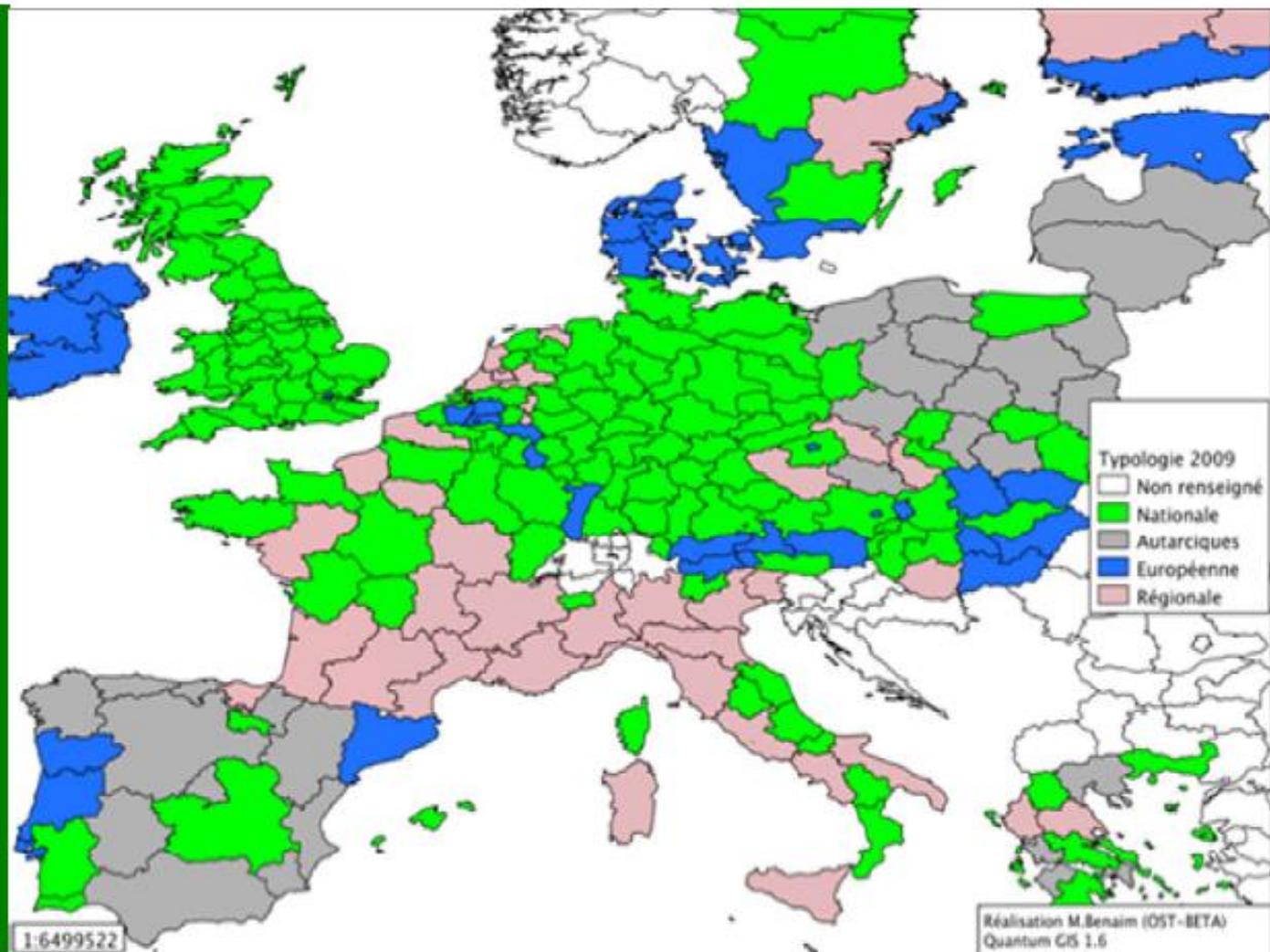
- **Knowledge externalities between public and private research, but also within private research**
 - It is important to have both types of research on the same territory but it is not always sufficient: how to encourage connectivity and cooperation?
- **Knowledge externalities not only among research activities but also at the articulation between research capacities and regional production system**
 - Innovation needs various connex activities : financing, logistics, marketing services, legal advices...

Additional point of view: inter-regional knowledge creation

- Regions are absolutely not *closed systems*
- It is therefore interesting to consider information flows and knowledge interaction between regions
- Furthermore, it is possible to characterize regional characteristics in terms of such external relationships
- Relatively easy measurement in the case of science

Carte 1:
carte des régions européennes selon leur type de connectivité scientifique

Source :
QGis 1.6, réalisation
Mi.ckael Benaim
(OST-BETA)



Source: Benaim, Héraud, Mérindol, Villette (2013)

4 types de comportements de coopération scientifique

5.4 The catalytic role of KIBS

- Some *business services* play an important role within territories, by connecting actors directly or indirectly
- The concept of KIBS (Knowledge Intensive Business Services)
 - Ian Miles, Emmanuel Muller, Simone Strambach
 - 1995 report to the European Commission
"*Knowledge-Intensive Business Services: Users, Carriers and Sources of Innovation*"

Two types of KIBS

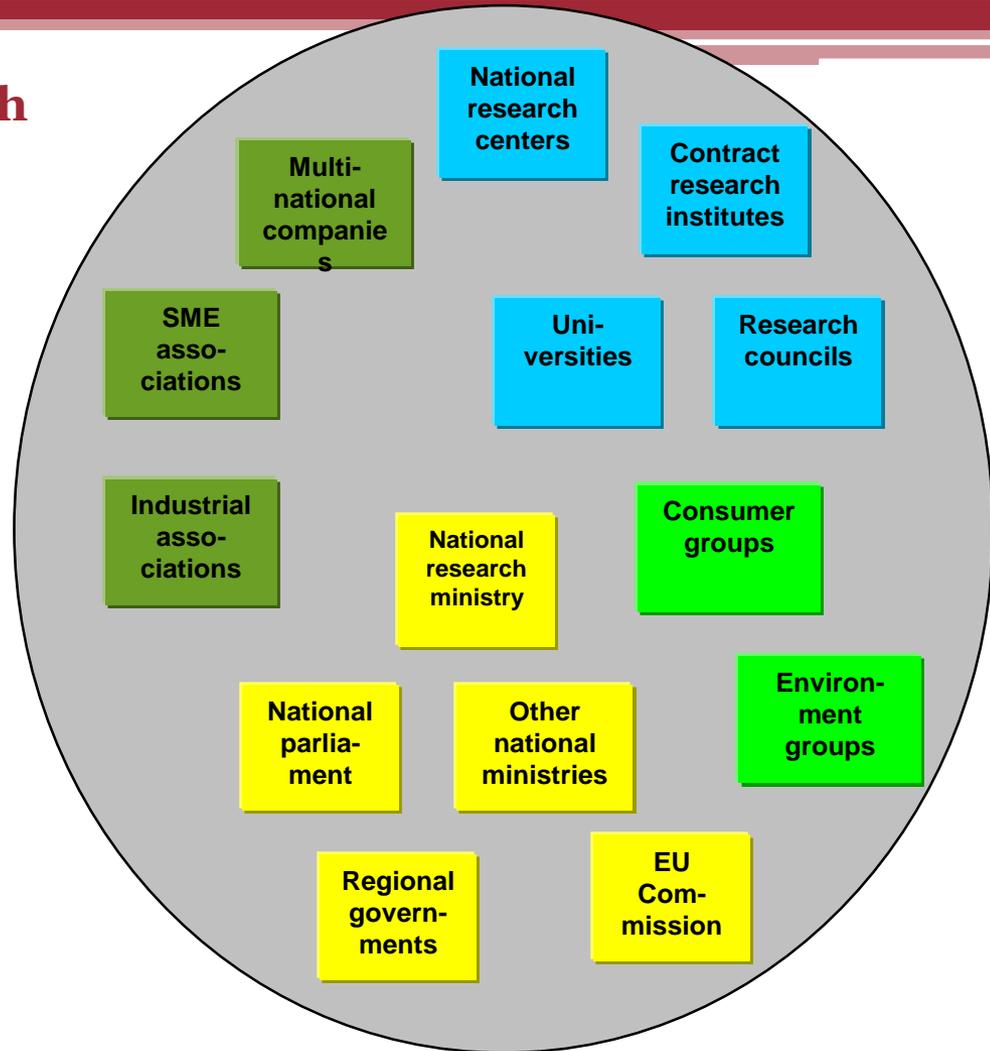
- **T-KIBS:**
 - high use of scientific and technological knowledge: R&D services, engineering services, computer services, etc.
- **P-KIBS:**
 - More traditional professional services: legal consultancy , accountancy, management and marketing services, etc.

5.5 Introducing more complexity in the representation

A socio-political approach of innovation systems:

Public research and innovation policy stakeholders' arena

- Differing interests, perspectives and values
- No dominant player?
- Contested policies
- Need for consensus?



Source: Stefan KUHLMANN, Fraunhofer ISI,,Karlsruhe, & Univ. Utrecht

PRIME Conference, Manchester, Jan. 2005

A case study as a conclusion: cluster policy in Alsace

The case of Alsace (i)

official definitions and list of clusters

- un **pôle de compétitivité** est, sur un territoire donné, l'association d'entreprises, de centres de recherche et d'organismes de formation engagés dans une démarche partenariale pour mettre en œuvre une stratégie commune de développement. En Alsace :
 - Pôle Véhicule du Futur
 - Alsace Biovalley (*innovations thérapeuthiques*)
 - Pôle Fibres
 - Hydreos (*qualité et gestion de l'eau*)
 - Alsace Energivie
- un **cluster** se définit comme un pôle de compétitivité, à la différence qu'il n'a pas été labellisé par l'Etat. C'est une concentration, sur un espace donné, d'un groupe d'acteurs innovants et interconnectés appartenant au monde économique, de la recherche et de la formation et opérant dans un domaine commun. En Alsace, quatre structures ont vocation à devenir des clusters sur le territoire mais n'en ont pas encore toutes les qualités (*initiative-clusters*) :
 - le Pôle textile Alsace,
 - Alsace Vitae (*agronomie, viticulture*)
 - le Pôle Matériaux et nano-sciences
 - Réseau des Ecoentreprises d'Alsace

Ref: décision CR septembre 2012

The case of Alsace (ii)

J-A Héraud 2014

official definitions and list of clusters

- une **grappe d'entreprises** est un groupement d'entreprises ancrées sur le territoire et travaillant dans un même secteur d'activité. Une grappe d'entreprises peut également associer des acteurs de la formation, de la recherche et de l'innovation. En Alsace:
 - Association Régionale des Industries Alimentaires d'Alsace (ARIA),
 - Rhénatic (*technologies de l'information et de la communication*)
 - Pôle Aménagement de la Maison en Alsace.
- Il existe également deux *initiatives grappes*:
 - l'une développée par le Comité Mécanique,
 - l'autre en cours de définition au sein de l'Agence Culturelle d'Alsace, autour des métiers de l'image et de la créativité.

References

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