The territorial dimension of the knowledge economy in Europe: which innovation policies in an era of austerity?

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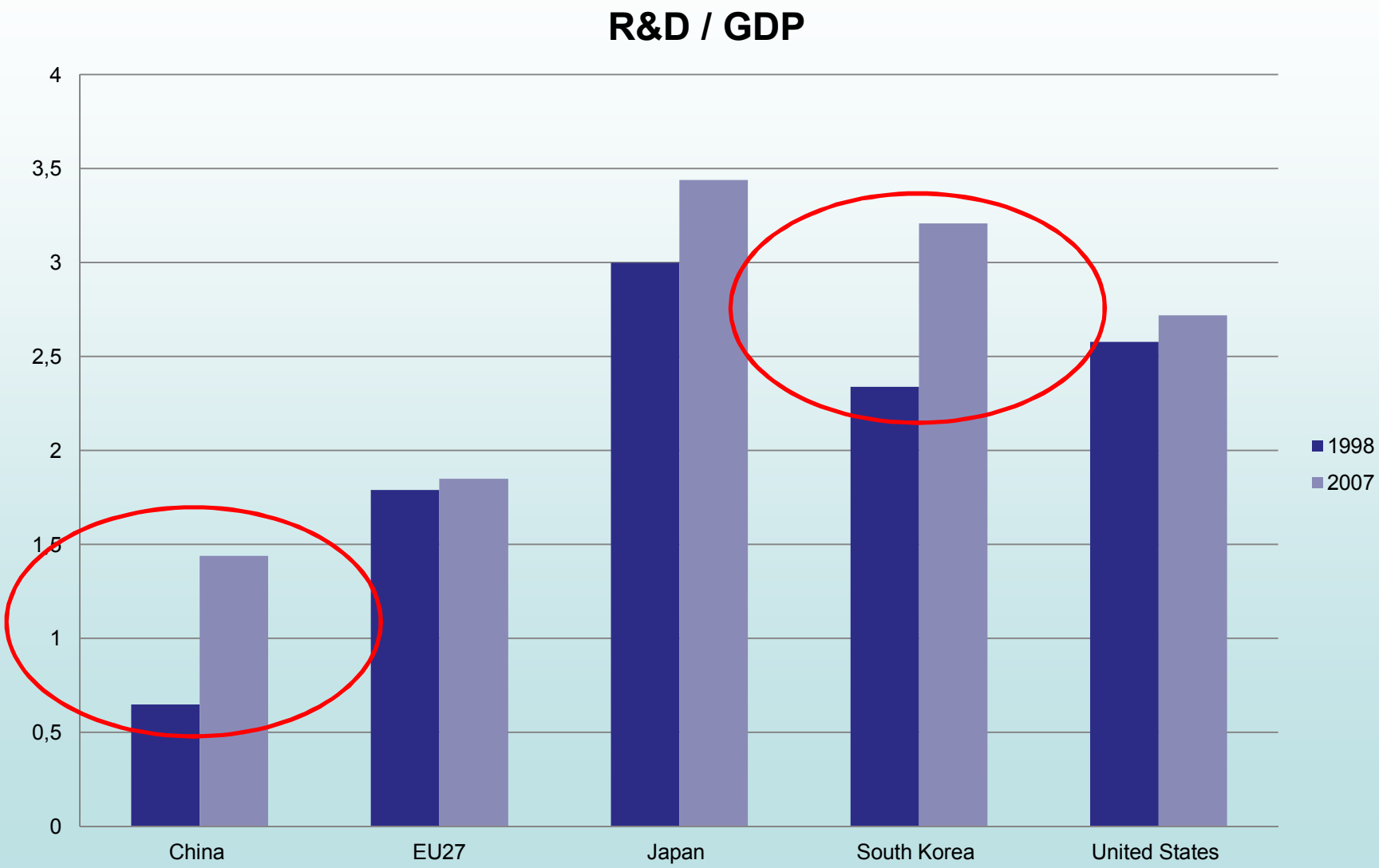
Stylized facts

Europe entered the crisis with a gap in innovation activities with respect to advanced and even emerging countries. The crisis did not allow Europe to regain competitiveness over the past years.

The debate in Europe revolves around two major questions:

- which innovation policies should be developed in Europe?
- how can innovation policies be justified in a period of austerity, when short-term policies seem more appropriate?

European pre-crisis R&D Gap

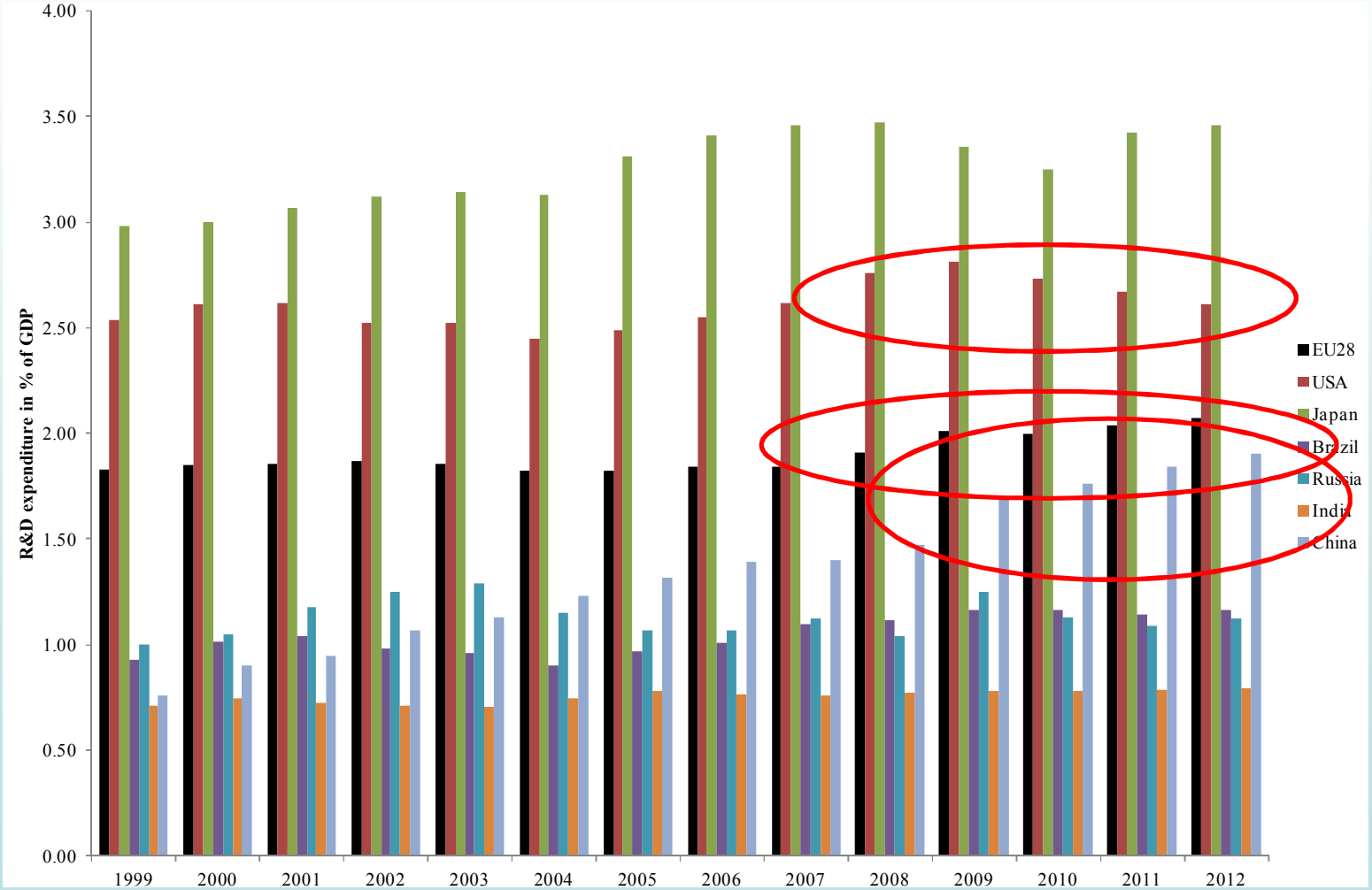


Source: World Bank and Eurostat

Average increase in R&D/GDP 1996-2007

Source: Knowledge, Network and Nations. The Royal Society

Increase in R&D/GDP 1999-2012



Source: Eurostat and World Bank

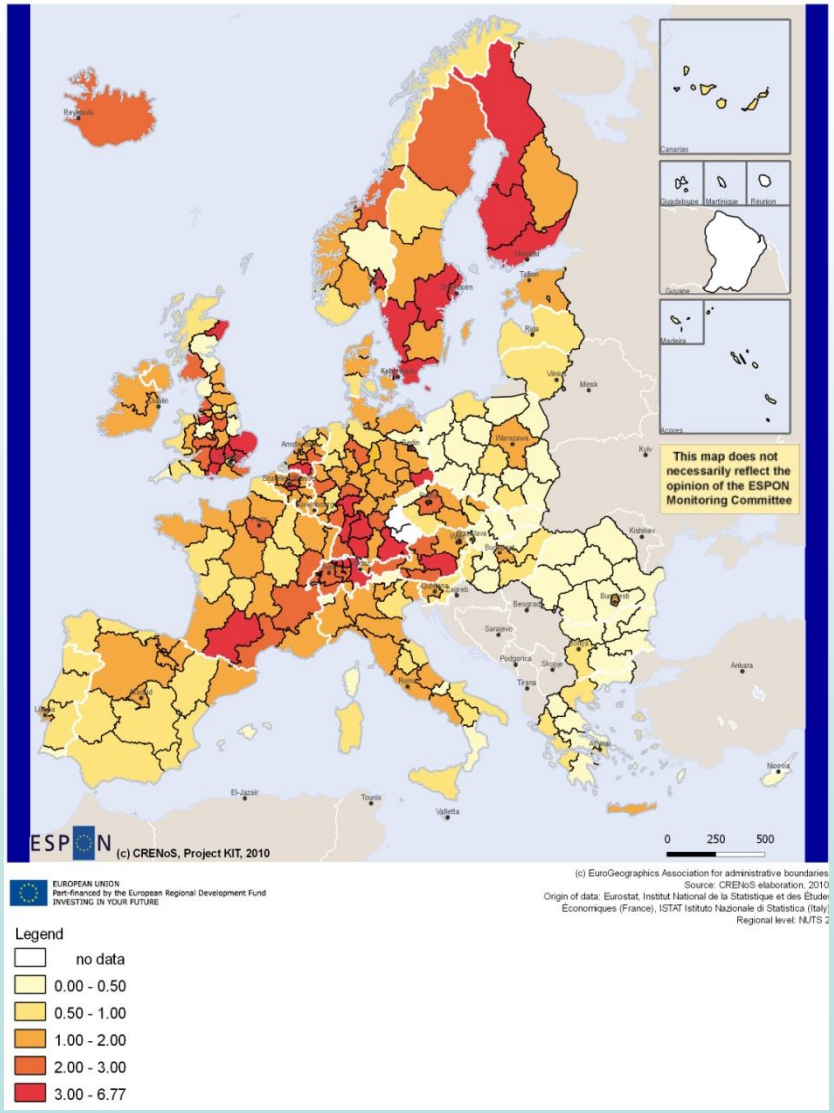
Pre-crisis policy recommendiations

Recommandations from the EU in the Lisbon agenda, reinforced by the Europe 2020 agenda: achievement of 3% of R&D/GDP in 2010.

Notwithstanding the recommandations and efforts made, in 2009 in Europe R&D/GDP was equal to 1.8%. In 2012, it reached 1.9%.

Moreover, the ratio has strong national disparities: only Finland and Sweden have a R&D/GDP ratio higher than 3%.

R&D expenditures / GDP



In 2009 regions having reached 3% of R&D expenditures on GDP are 33 (11 per cent of the European NUTS2 regions) and concentrated in a few countries in the North of Europe. Moreover, a very high number of regions belongs to the lowest class, the one where R&D /GDP is lower than 0.5%.

Aim of the presentation

- To enter the regional innovation policy debate that is developed at the EU level in order to present the rationale for a regionalised conception, design and delivery of innovation policies, by:
  - describing the situation of the Knowledge Economy in European regions;
  - highlighting how the theoretical toolbox of knowledge and innovation and regional growth can interpret the situation.
- To find justifications for innovation strategies in a period of austerity, when short-term demand policies seem more appropriate.

Structure of the presentation

1. The geography of the knowledge economy in Europe
2. Theoretical achievements and new reflections in knowledge, innovation and regional growth
3. Innovation policy implications
4. Justification for regional innovation policies in an era of austerity

The geography of the knowledge economy in Europe

The Knowledge Economy in European regions (1)

Basic idea: *knowledge-based economy does not have a unique interpretative paradigm.*

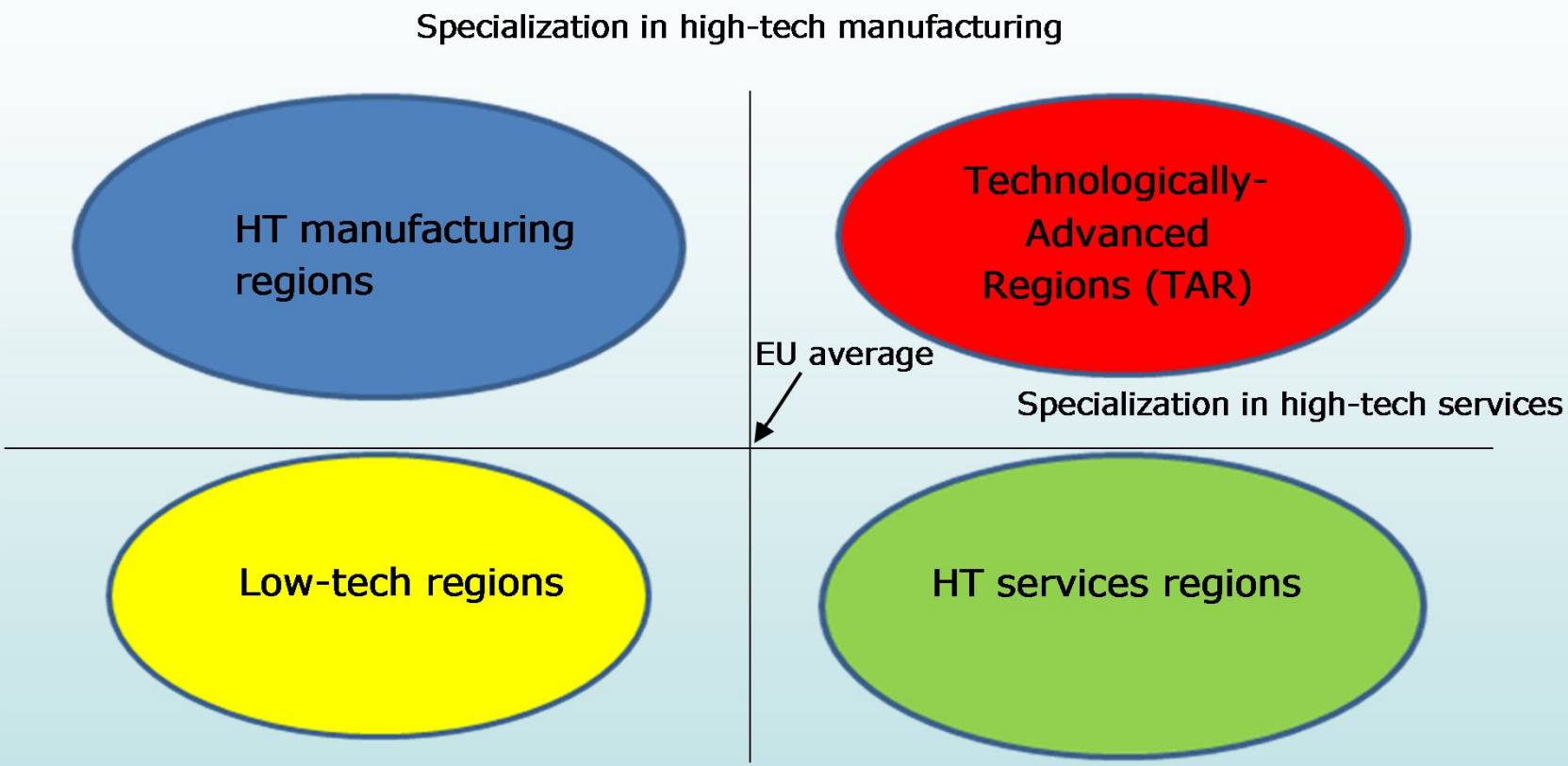
Different approaches are necessary:

A1. Sectoral approach (presence in the region of science-based, high-technology sectors).

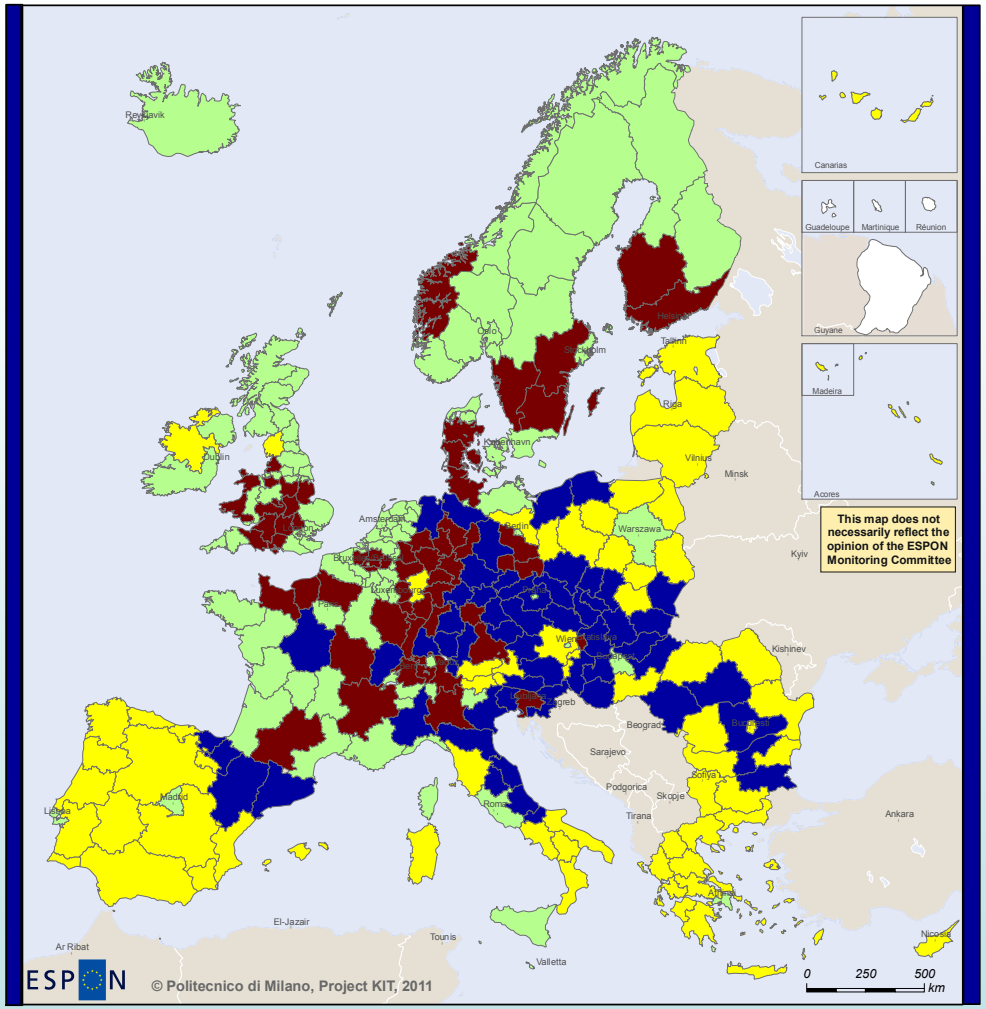
A2. Functional approach (presence in the region of functions like R&D, patents, human capital).

A3. Relation-based approach (presence in the region of interactive and collective learning processes).

Technologically Advanced Regions



Technologically Advanced Regions in EU



EUROPEAN UNION
Part-financed by the European Regional Development Fund
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Regional level: NUTS2
Source: Politecnico di Milano, 2011
Origin of data: EUROSTAT employment in high-tech sectors
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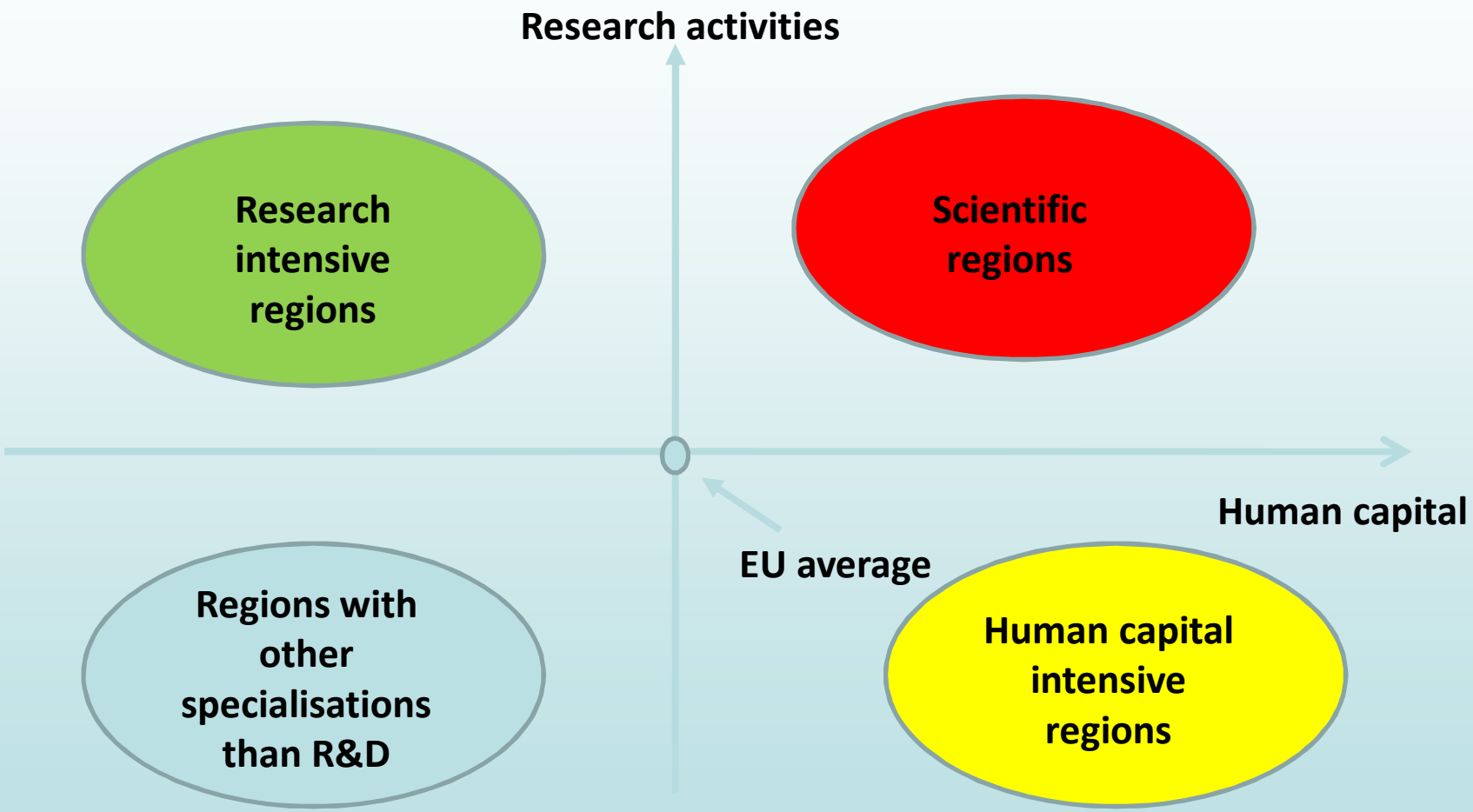
Technologically-advanced regions

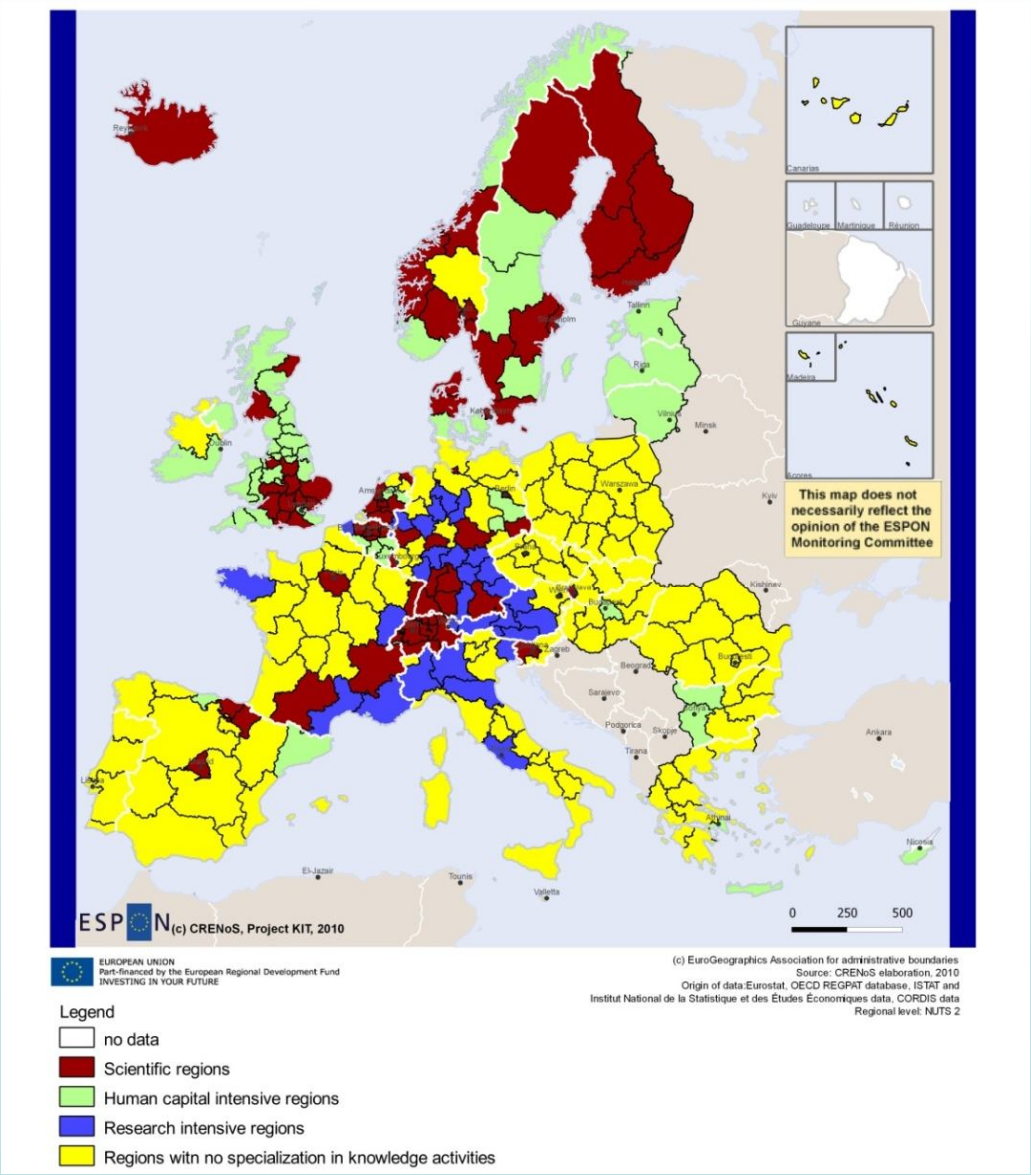
2007

- NA
- Low tech regions
- Advanced manufacturing regions
- Advanced services regions
- Technologically-advanced regions

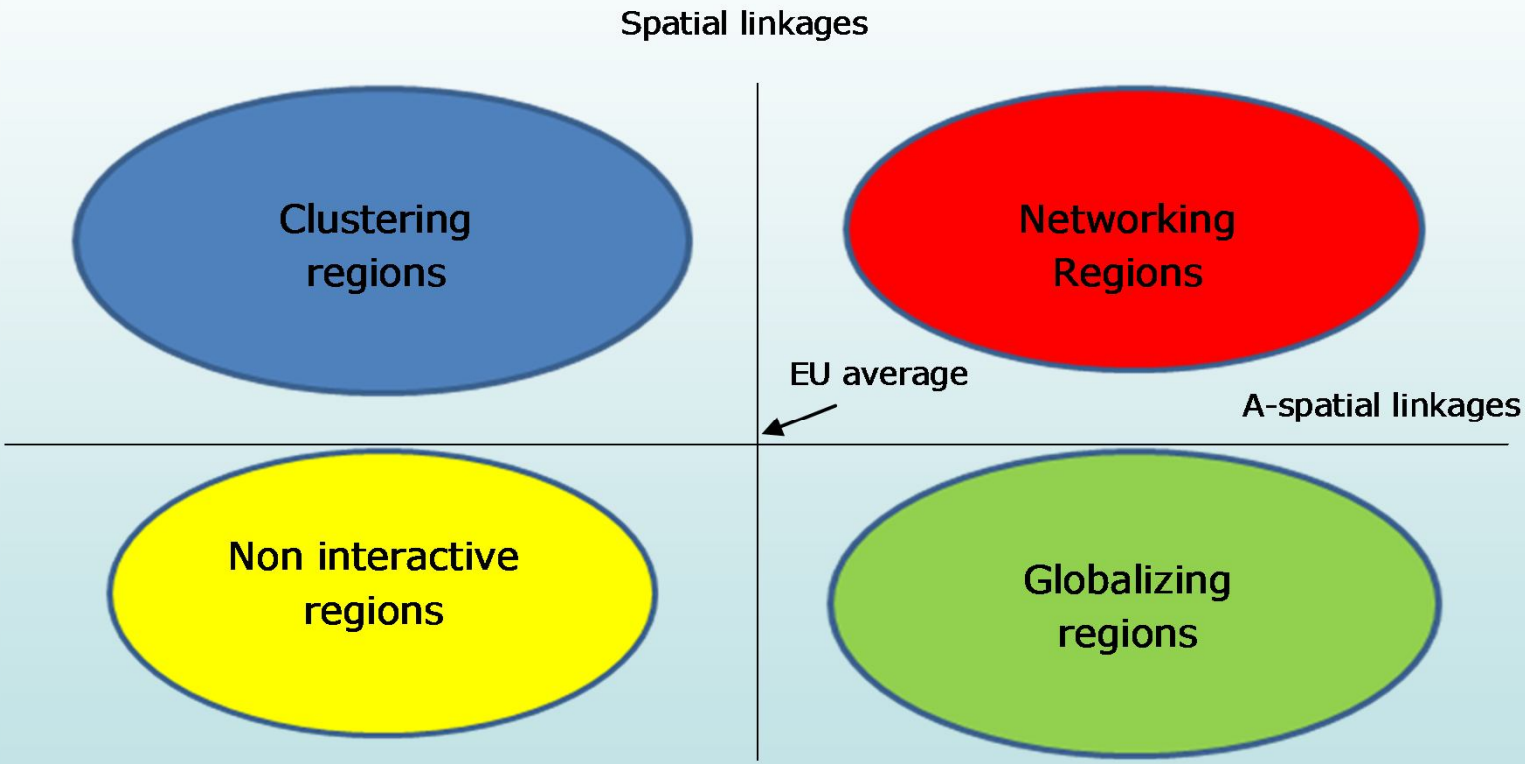
Scientific regions



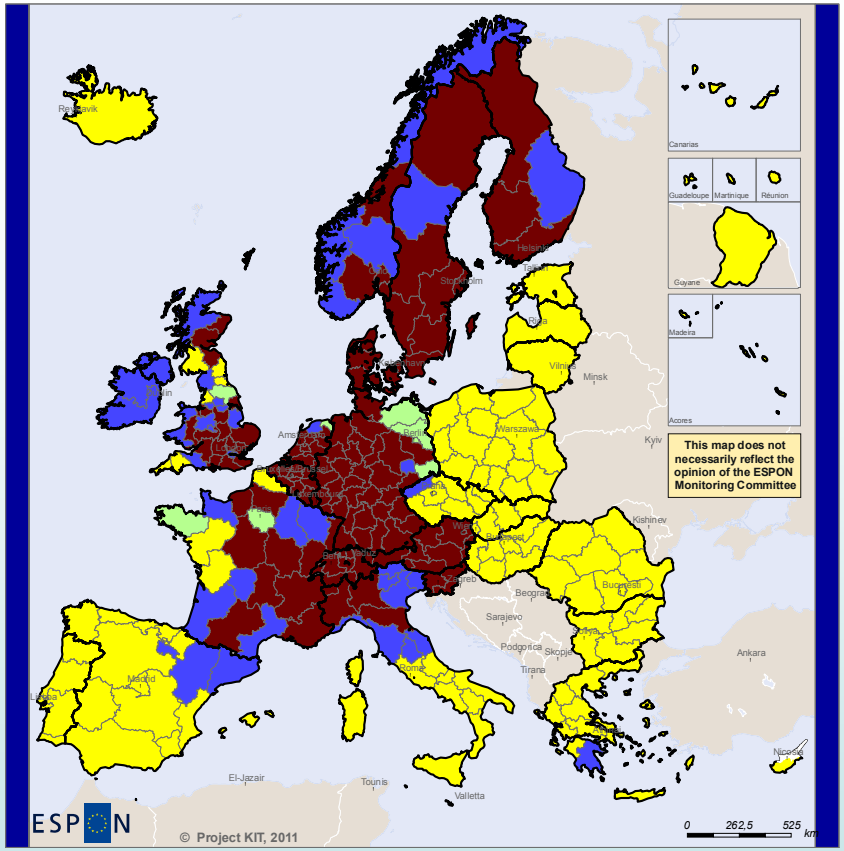
Scientific regions



Knowledge networking regions



Knowledge networking regions



EUROPEAN UNION
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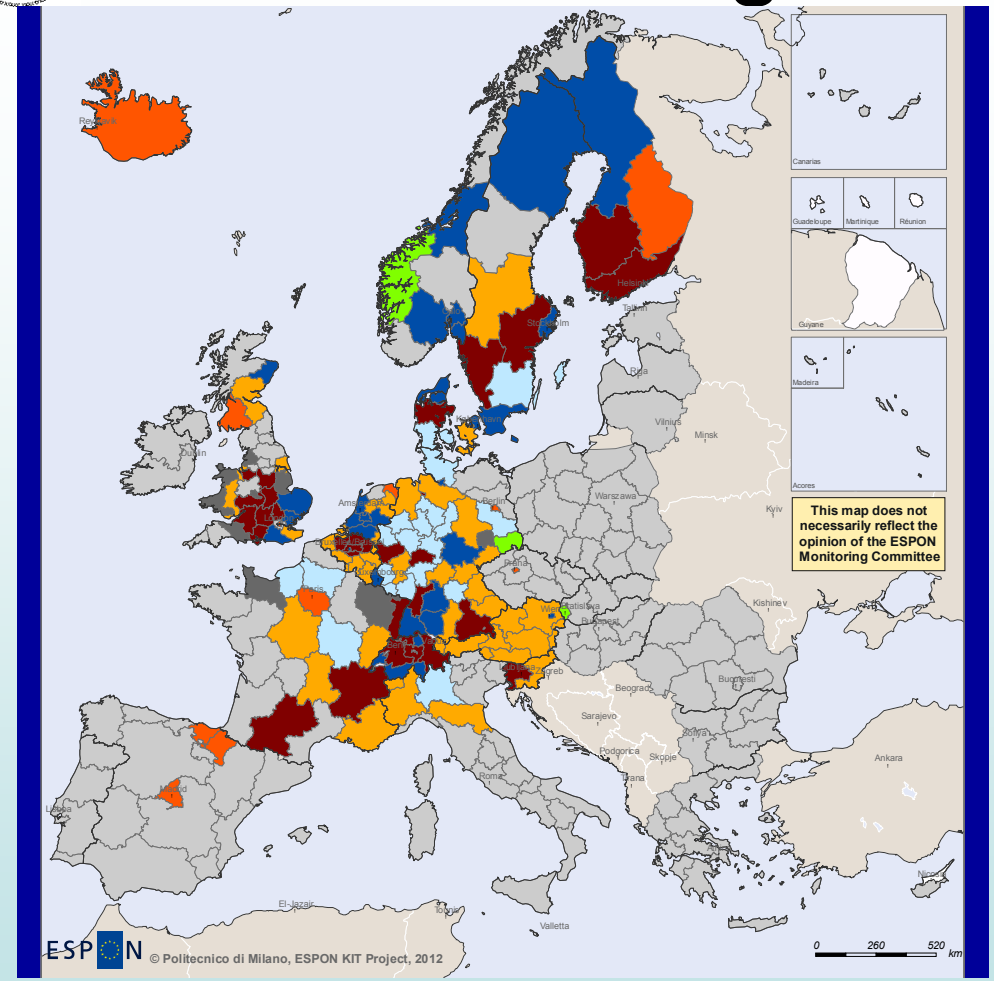
Regional level: NUTS 2
Source: AQR elaboration, 2011
Origin of data: OECD REGPAT Database, Cordis, EUROSTAT, ISTAT and Institute National de la Statistique et des Études Économiques data
© EuroGeographics Association for administrative boundaries

Category	Meaning	Specialization in spatial linkages	Specialization in a-spatial linkages
1	Non-interactive regions	No	No
2	Clustering regions	Yes	No
3	Globalizing regions	No	Yes
4	Networking regions	Yes	Yes

Knowledge networking regions

- Non-interactive regions
- Clustering regions
- Globalizing regions
- Networking regions

The Knowledge Economy in Europe

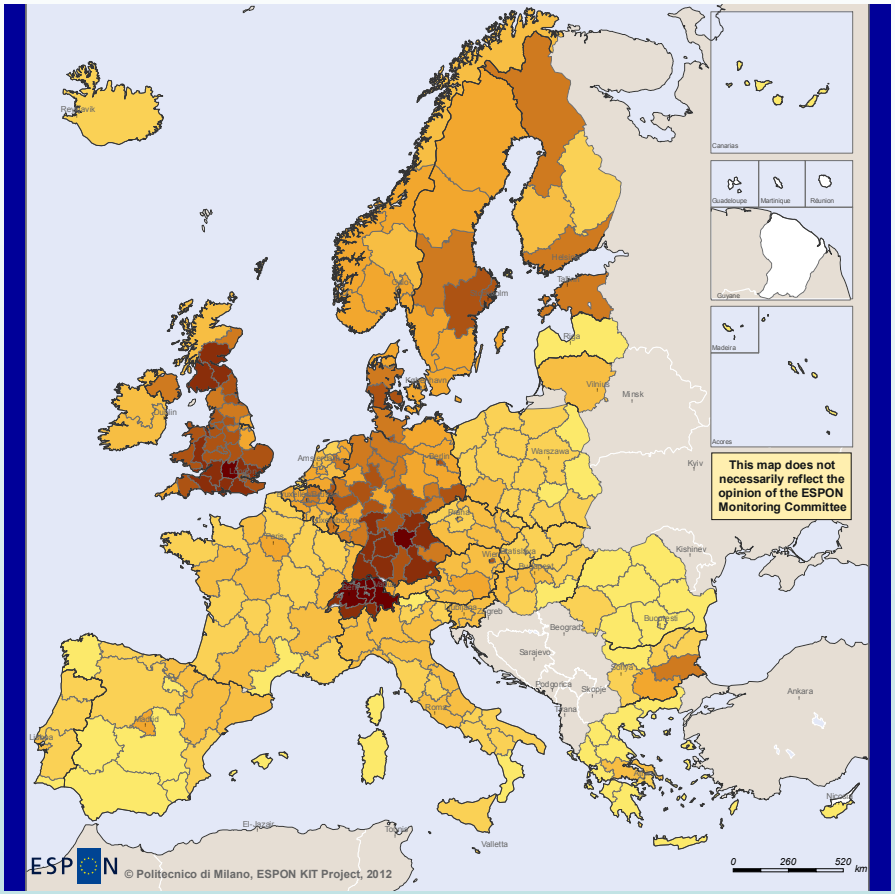


The Knowledge Economy in Europe is a very fragmented picture.

What is striking from this map is the high number of regions in which the knowledge economy is still in its infancy.

Spatial trends of innovation in Europe

Product innovation only



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Regional level: NUTS2
Source: Own elaboration, 2011
Origin of data: EUROSTAT - Community Innovation Survey, 2002-2004
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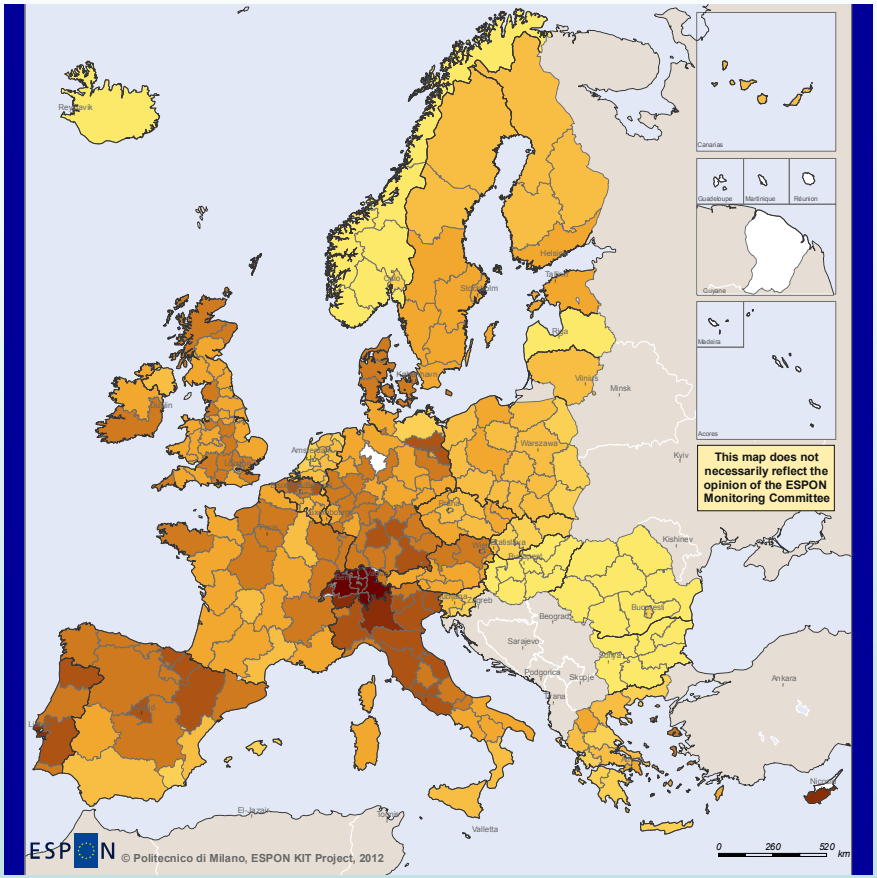
Legend

- No data
- < 3.26
- 3.27 - 5.92
- 5.93 - 9.12
- 9.13 - 12.80
- 12.81 - 17.30
- 17.31 - 23.43
- 23.44 - 33.45
- > 33.45

Switzerland: share of firms introducing product innovation
Iceland: CIS3 data
Latvia and Slovenija: CIS2006 data

Process innovation only



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INVESTING IN YOUR FUTURE

Regional level: NUTS2
Source: Own elaboration, 2011
Origin of data: EUROSTAT - Community Innovation Survey, 2002-2004
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Legend

- No data
- < 5.40
- 5.41 - 8.09
- 8.10 - 10.09
- 10.10 - 12.32
- 12.33 - 14.71
- 14.72 - 18.01
- 18.02 - 25.92
- 25.93 - 55.08

Switzerland: share of firms introducing process innovation
Iceland: CIS3 data
Latvia and Slovenija: CIS2006 data

Open issues

Knowledge and innovation do not always match at spatial level.

What is the state of the art in the theoretical explanation for this?

Which are sound innovation policies that can be developed based on an advanced theoretical interpretation of regional growth through knowledge and innovation?

Theoretical achievements and new reflections in knowledge, innovation and regional growth

Theoretical achievements

	Innovation diffusion	Innovation creation	Knowledge creation		Knowledge diffusion	
			Functional approach	Cognitive approach	Spatial approach	Evolutionary approach
Aim of the theory	Identification of the spatial channels supporting innovation diffusion	Identification of the reasons for local innovation creation	Identification of the reasons for local knowledge creation		Identification of the reasons for local knowledge diffusion	
Knowledge-innovation linkage	Information-adoption short circuit	Invention-innovation short circuit	Spin-offs, spatial spillovers	Collective learning, local synergies Entrepreneur-ship	Spin-offs, spatial spillovers	Common cognitive codes
From innovation to performance	Adoption-performance linkage	Radical innovation, Schumpeteria n profits	Technological breakthrough, royalties on patents	Continuing innovation, productivity increases	Knowledge-performance linkage	
Location regions	Regions along the urban hierarchy	Advanced regions	Scientific regions	Milieux Learning regions	Networking regions	
Role of space	Barrier to information diffusion	Proximity economies, specialisatio n advantages	Agglomeratio n economies	Uncertainty reduction, relational capital	Proximity economies	
Period	End of the 1960s and 1970s	Middle of the 1980s	End of the 1980s and 1990s	End of the 1980s and 1990s	Middle of the 1990s onward	Middle of the 2000s
Key references	Hägerstrand, 1952; Griliches, 1957; Mansfield, 1961; Metcalfe, 1981; Camagni, 1985; Capello, 1988	Malecki, 1980; Saxenian, 1996	MacDonald, 1987; Massey et al. 1992; Monk et al., 1988; Storey and Tether, 1998	Camagni, 1991; Perrin, 1995; Keeble and Wilkinson, 1999; Capello 1999; Cappellin, 2003a; Lundvall and Johnson, 1994	Acs et al., 1994; Audretsch and Feldman, 1996; Anselin et al., 2000	Boschma, 2005; Rallet and Torre, 1995; Capello, 2009

Common features of existing approaches (1)

All these theories base their reflections on *one particular phase* of the innovation process, being either knowledge creation, innovation creation, innovation diffusion or knowledge diffusion.

Some theories even interpret knowledge and innovation as overlapping processes, taking for granted that if knowledge is locally created, this inevitably leads to innovation, and growth.

Common features of existing approaches (2)

However, factors that enhance the implementation of new knowledge can be quite different from factors which stimulate innovation.

The fax machine, first developed in Germany (first working machine) and the US (first commercially viable product), was turned into a worldwide successful product by Japanese companies.

Anti-lock braking system (ABS) was invented by US car makers but became prominent primarily due to German automotive suppliers.

A new approach (1)

A leap in interpreting regional innovation processes lies in the capacity to build a conceptual framework:

- interpreting *different modes of performing the different phases of the innovation process*, and
- highlighting the *context conditions* (internal and external to the region) that accompany each phase.

A new approach (2)

Two new elements with respect to previous theoretical paradigms:

- conceptual distinction **between knowledge and innovation**, treating them as two separate (and sub-sequent) phases;

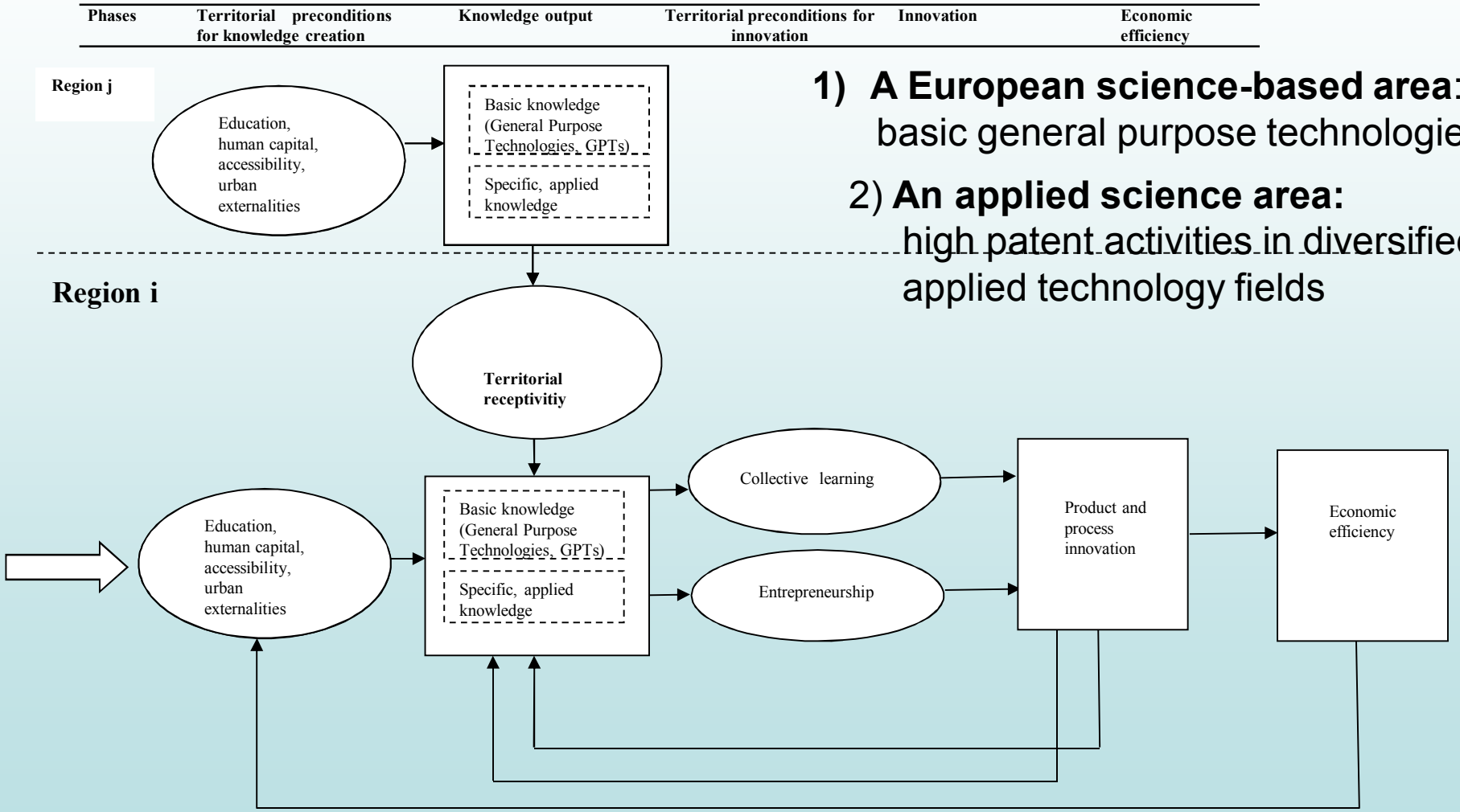
- identification of the **context conditions**, both internal and external to the region, that support the different innovation phases.

Territorial patterns of innovation

The concept of ***'Territorial Patterns of Innovation'*** represents

- a spatial breakdown of variants of the knowledge→invention→innovation→development logical path,
- built on the presence/absence of territorial preconditions for knowledge creation, knowledge attraction and innovation.

Innovative region taxonomy and a territorial approach (1)



1) **A European science-based area**: basic general purpose technologies

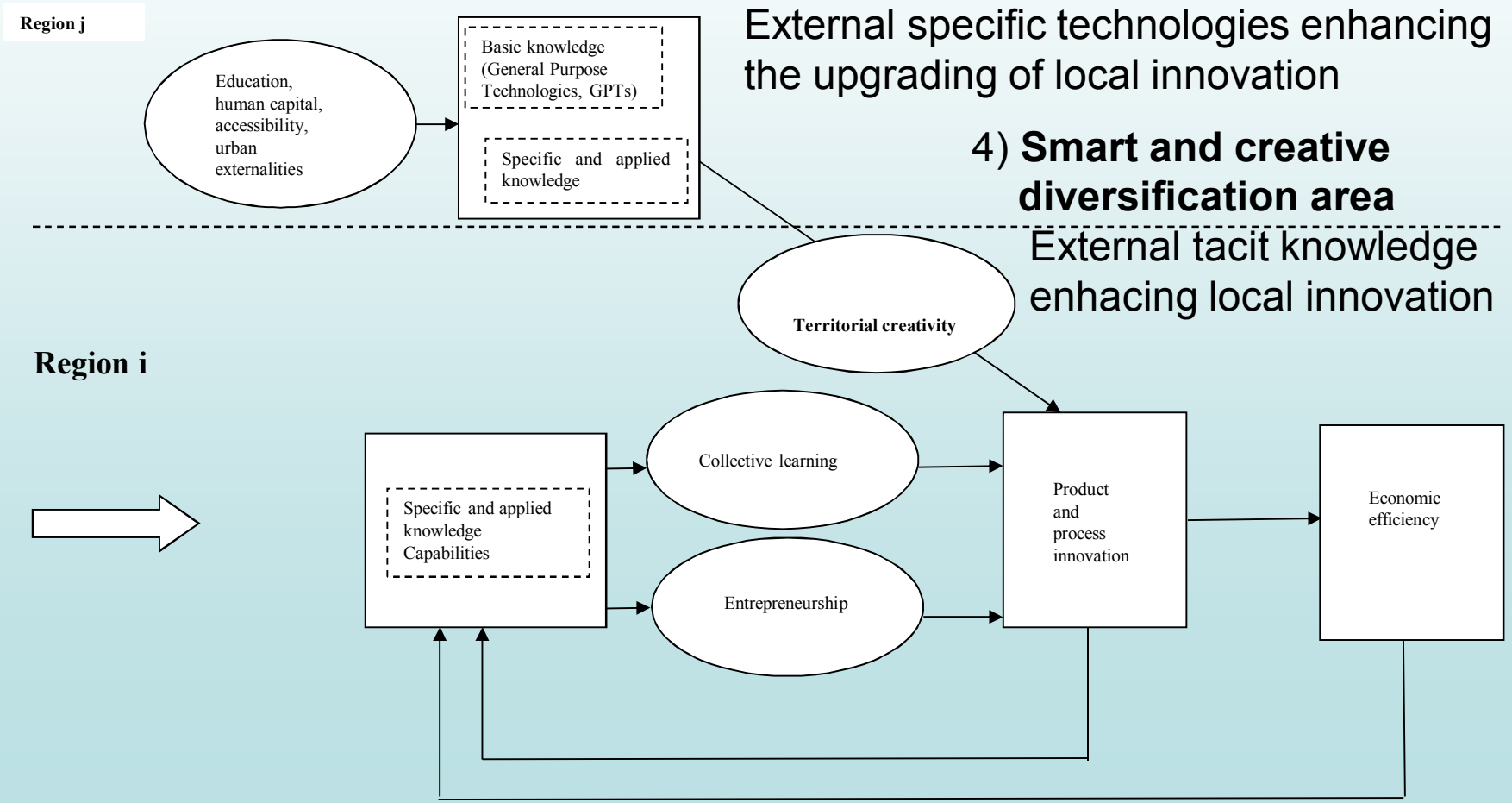
2) **An applied science area:** high patent activities in diversified applied technology fields

Innovative region taxonomy and a territorial approach (2)

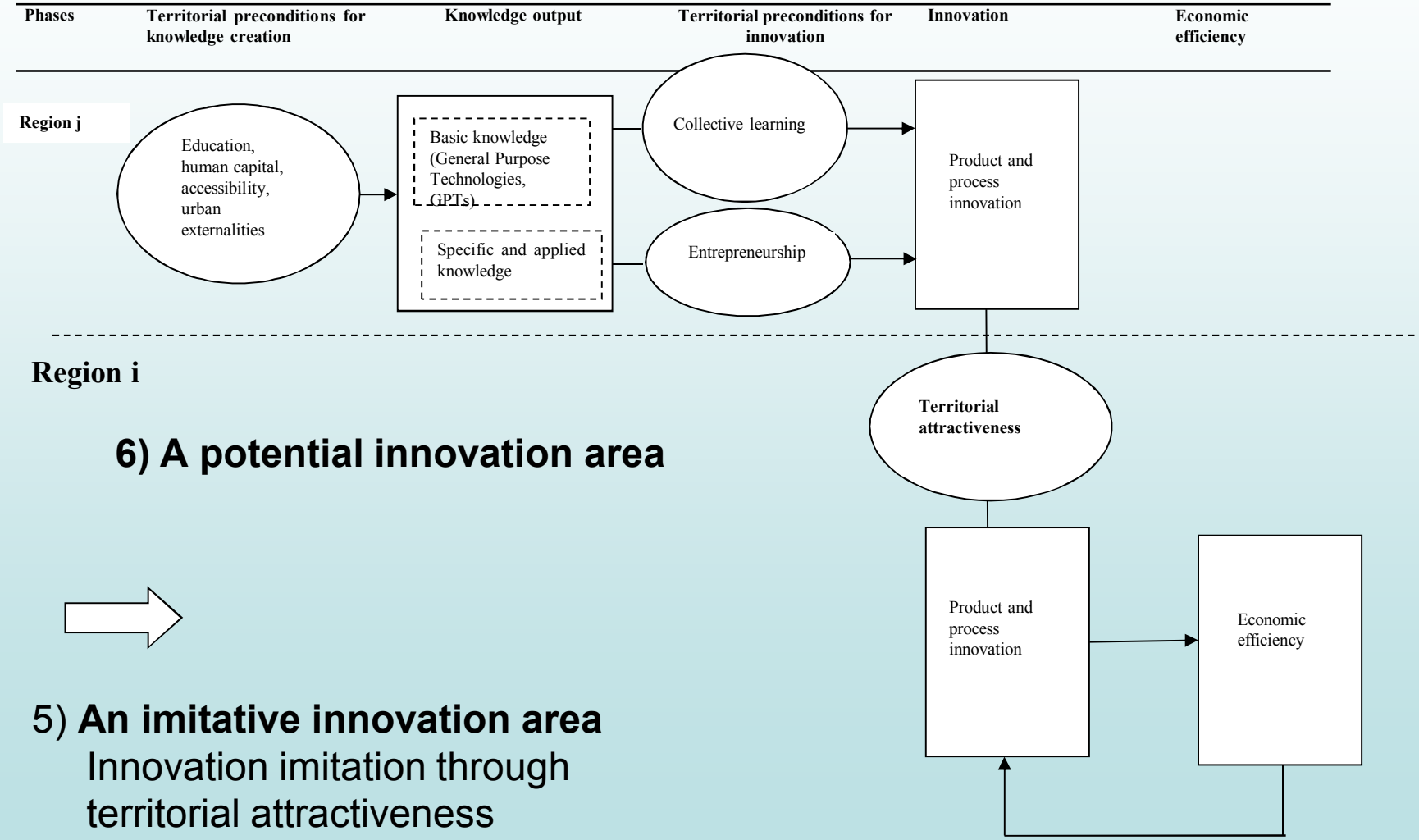
Phases	Territorial preconditions for knowledge creation	Knowledge output	Territorial preconditions for innovation	Innovation	Economic efficiency

3) A **smart technological application area**
External specific technologies enhancing the upgrading of local innovation

4) **Smart and creative diversification area**
External tacit knowledge enhacing local innovation



Innovative region taxonomy and a territorial approach (3)

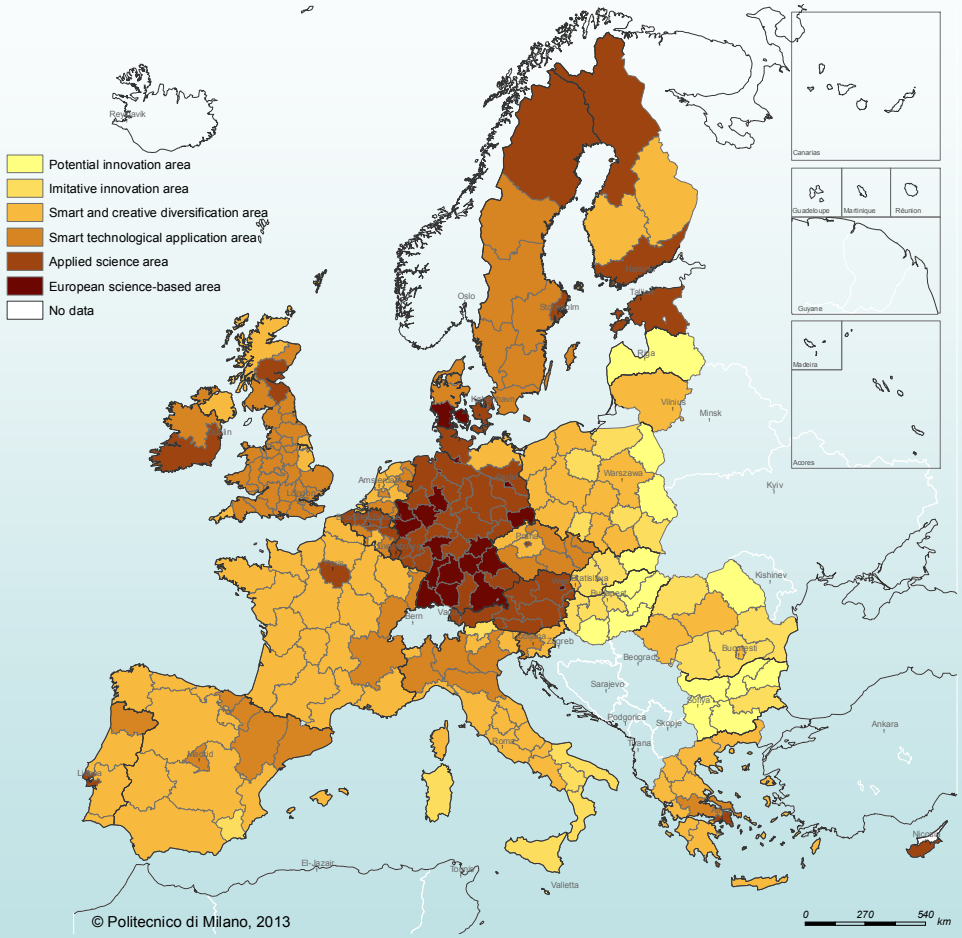


6) A potential innovation area

5) **An imitative innovation area**
Innovation imitation through territorial attractiveness

Territorial patterns of innovation in Europe

Territorial patterns of innovation in Europe



a **European science-based area (ESBA)**;

an **applied science area (ASA)**;

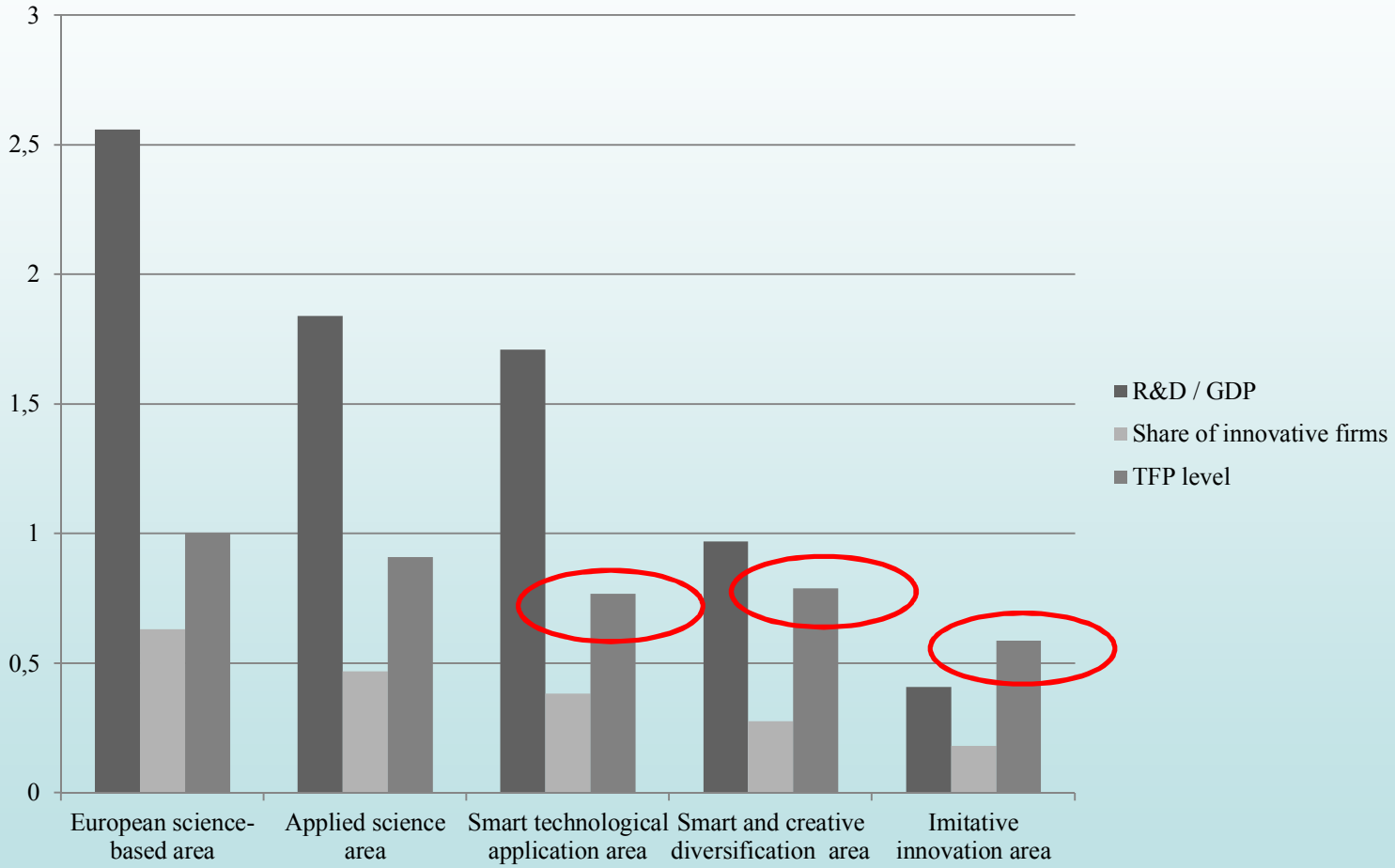
a **smart technological application area (STAA)**;

a **smart and creative diversification area (SCDA)**;

a **imitative innovation area (IIA);**

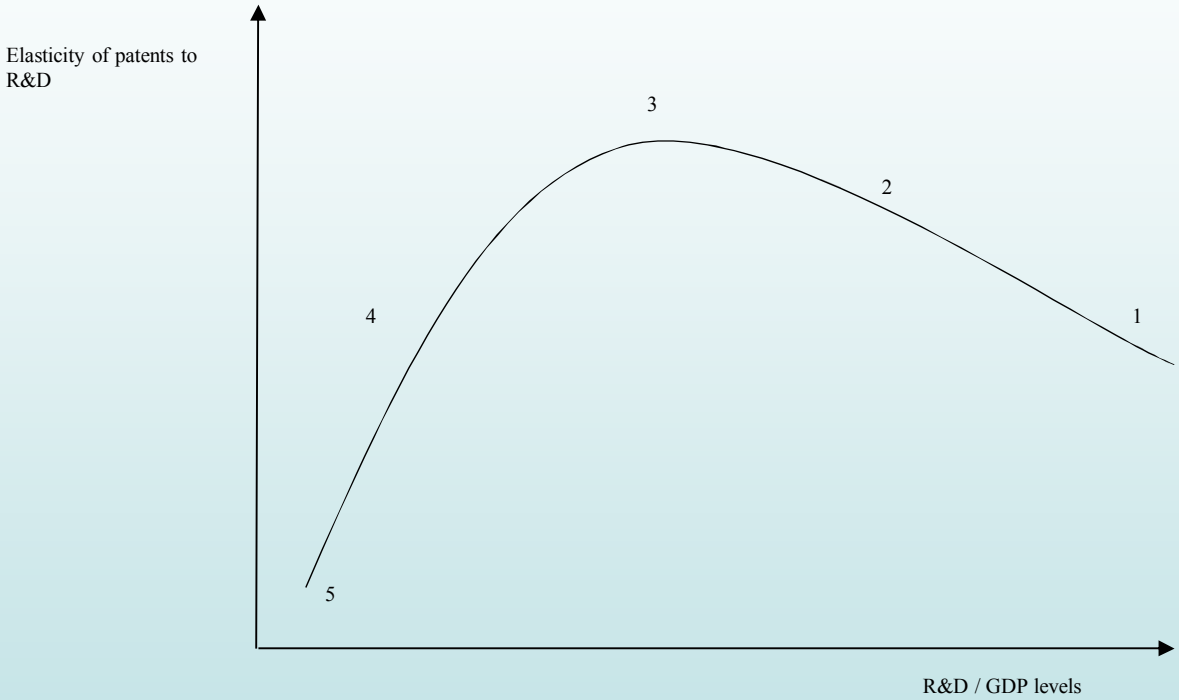
a **potential innovation area (PIA)**.

Economic efficiency of the different territorial patterns



Policy lession: each pattern of innovation has its economic efficiency.

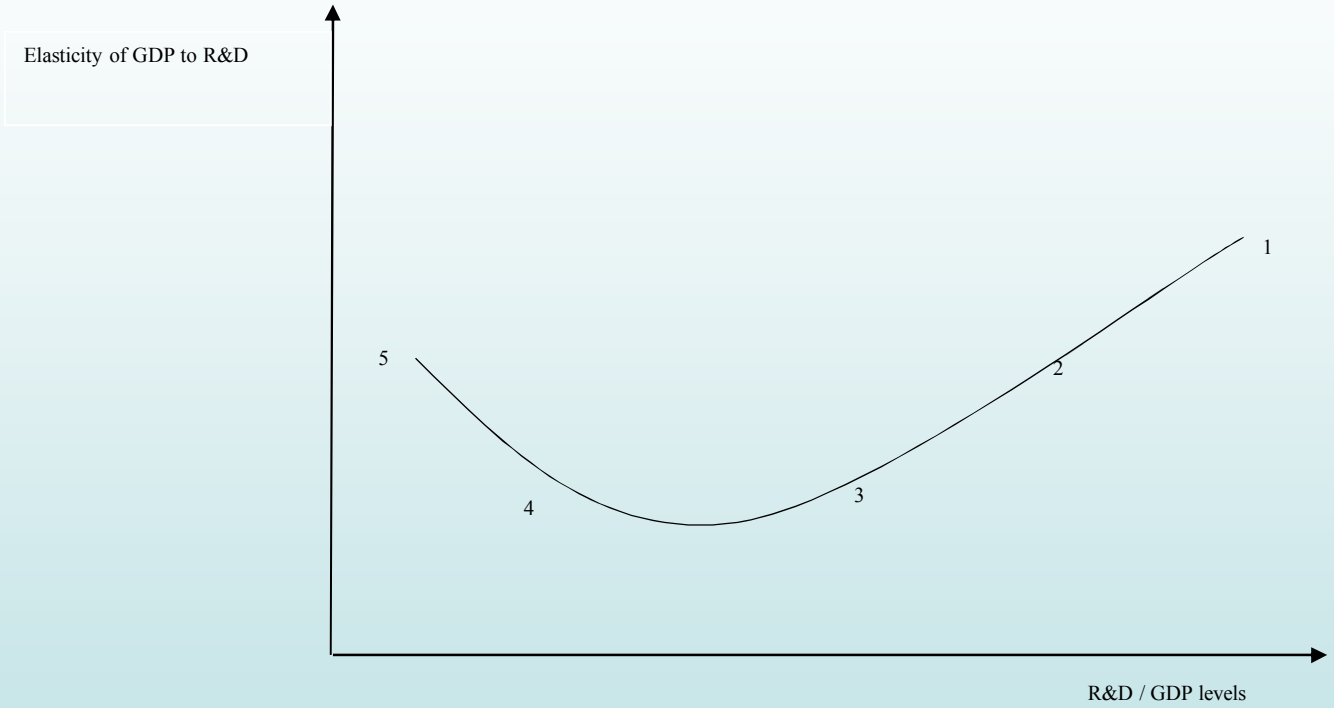
Elasticity of knowledge to R&D



Legend:
1 = European science-based area; 2 = Applied science area; 3 = Smart technological application area;
4 = Smart and creative diversification area; 5 = Imitative innovation area

Policy lession: knowledge suffers from decreasing returns, as all economic resources.

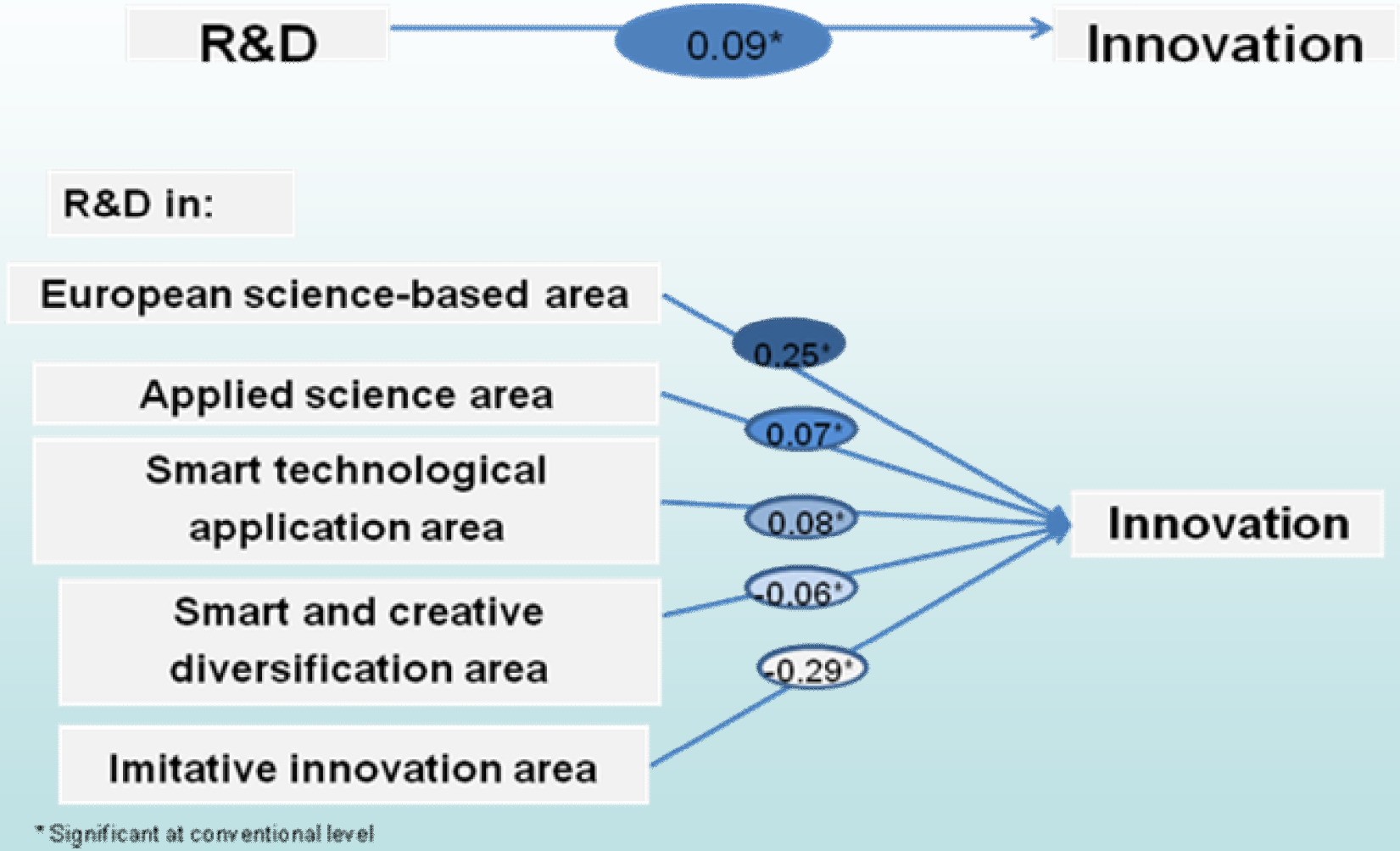
Elasticity of GDP to R&D



Legend:
1 = European science-based area; 2 = Applied science area; 3 = Smart technological application area;
4 = Smart and creative diversification area; 5 = Imitative innovation area

Policy lesson: R&D requires a critical mass to have an effect on GDP.

Elasticity of innovation to R&D



Policy lesson: R&D has not always a positive effect on innovation.

Regional Innovation Policy Implications

Where do we stand with regional innovation policy debate?

There is general consensus about the need to avoid one unique innovation policy for all regions.

This view is fully coherent with the '*smart specialization'* strategy (S3), which advocates differentiated policies:

- in the first phase: between 'core' and 'periphery' regions (Foray et al., 2009);
- in the second phase: for each region according to single specificities (McCann and Ortega-Argìles, 2014; Coffano and Foray, 2014; Boschma, 2014).

Our idea is that innovation policies have to be developed for regions with similar innovation patterns.

Smart innovation policies

‘Smart innovation’ policies may be defined as those policies able to increase the innovation capability of an area by

- boosting the effectiveness of accumulated knowledge and
- fostering territorial applications and diversification,

  on the basis of local specificities and the characteristics of already established innovation patterns in each region.

	Territorial patterns of innovation				
Policy aspects	**European science-based area (Pattern 1)**	**Applied science area (Pattern 2)**	**Smart technological application area (Pattern 3)**	**Smart and creative diversification area (Pattern 4)**	**Imitative innovation area (Pattern 5)**
Policy goals	Maximum return to R&D investments		Maximum return to applications and co-operation in applications		Maximum return to imitation
Policy actions for local knowledge generation (Embeddedness)	Support to R&D in:		Support to creative application, shifting capacity from old to new uses, improving productivity in existing uses, through:		Fast diffusion of existing innovation Enhancing receptivity of existing innovation
	New basic fields General Purpose Technologies	Specialized technological fields Variety in applications	Incentives to technological development and upgrading Variety creation	Identification of international best practices Support to search in product/market diversification Support to entrepreneurial creativity	Support to local firms for complementary projects with MNCs Support to local firms for specialized subcontracting

	Territorial patterns of innovation				
Policy aspects	**European science-based area (Pattern 1)**	**Applied science area (Pattern 2)**	**Smart technological application area (Pattern 3)**	**Smart and creative diversification area (Pattern 4)**	**Imitative innovation area (Pattern 5)**
Policy actions for exploitation of knowledge spillovers (Connectedness)	Incentives to inventors attraction and mobility Support of research cooperation in:		Incentives for creative applications through:		Incentives for MNCs attraction
	GPT and trans-territorial projects (ERA)	specific technologies and trans-territorial projects (ERA), in related sectors/domains Encouraging of labour mobility among related sectors/domains	Co-operative research activities among related sectors Co-operative search for new technological solutions	Participation of local actors to specialized international fairs Attraction of "star" researchers even for short periods Work experience in best practice Knowledge creation firms of the same domains	Bargaining on innovative 'local content' procurement by MNCs

Justification for Regional Innovation Policies in an Era of Austerity

Macroeconomic conditions and regional disparities (1)

Demand-side, macroeconomic elements – at first glance – are not expected to generate asymmetric effects at regional level.

And yet, they do, both at the inter-national and intra-national level.

Macroeconomic conditions and regional disparities (2)

Example of spatially differentiated impacts: the EU **austerity measures** and the increase in the **spread** with respect to the interest on German bonds following the international financial crisis implied:

- a strong **control on national public expenditure**, especially in countries with relevant public deficits and/or debts. The effects are expected to be stronger in regions more dependent on public demand or on internal demand, being generally the poorest and least competitive ones;

- an **increase in interest rates**, generating a reduction of private investments, particularly in industrial regions;

- a **credit crunch** as a consequence of the financial intermediaries' decision to prefer financing public debts instead of the private sector, when guarantees existed on sovereign default; industrial regions, mainly hosting SMEs were once again penalized more than others.

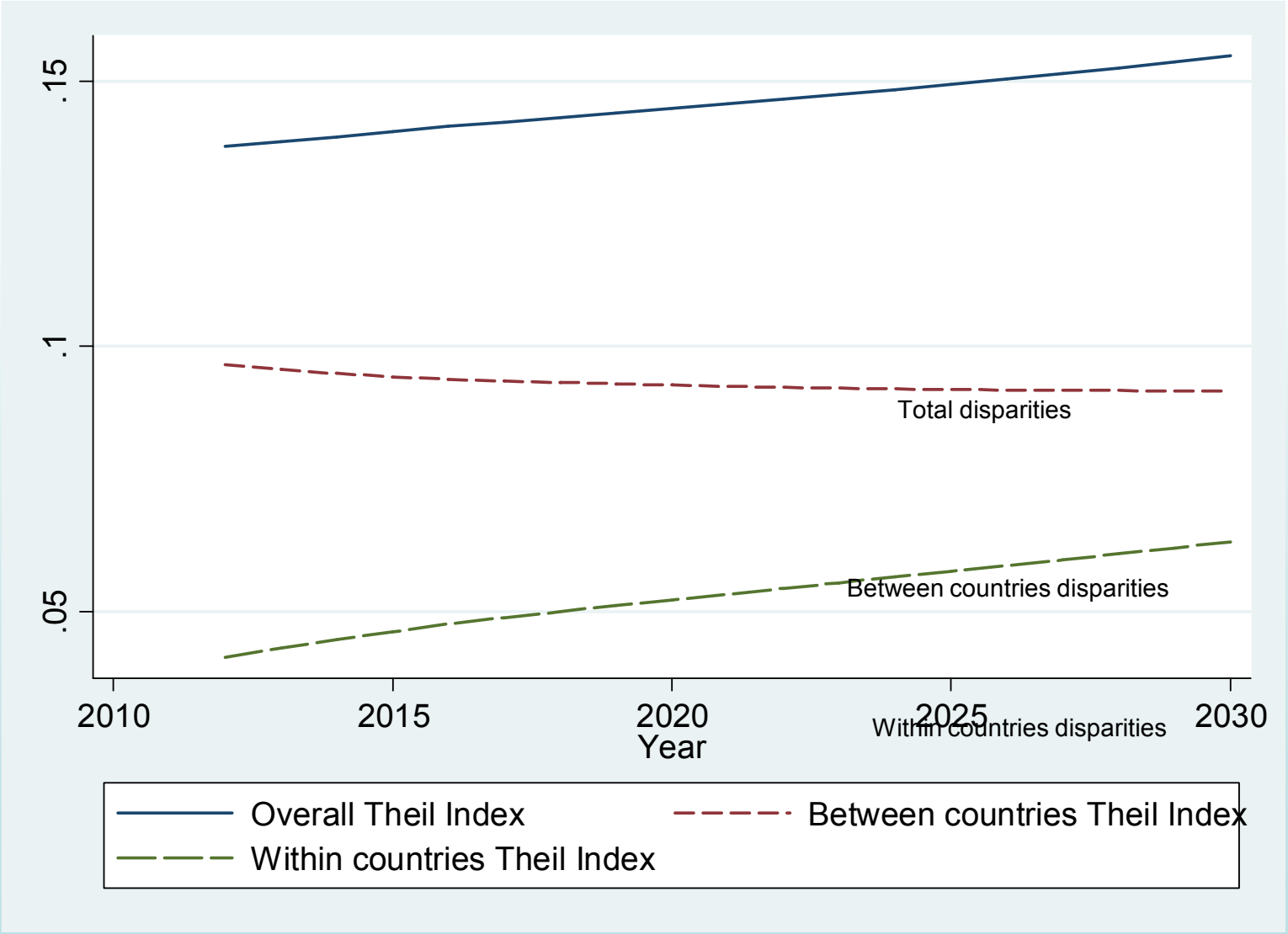
A recent simulation exercise

Our MASST3 model allows a simulation exercise on the effects of macroeconomic changes on regional growth.

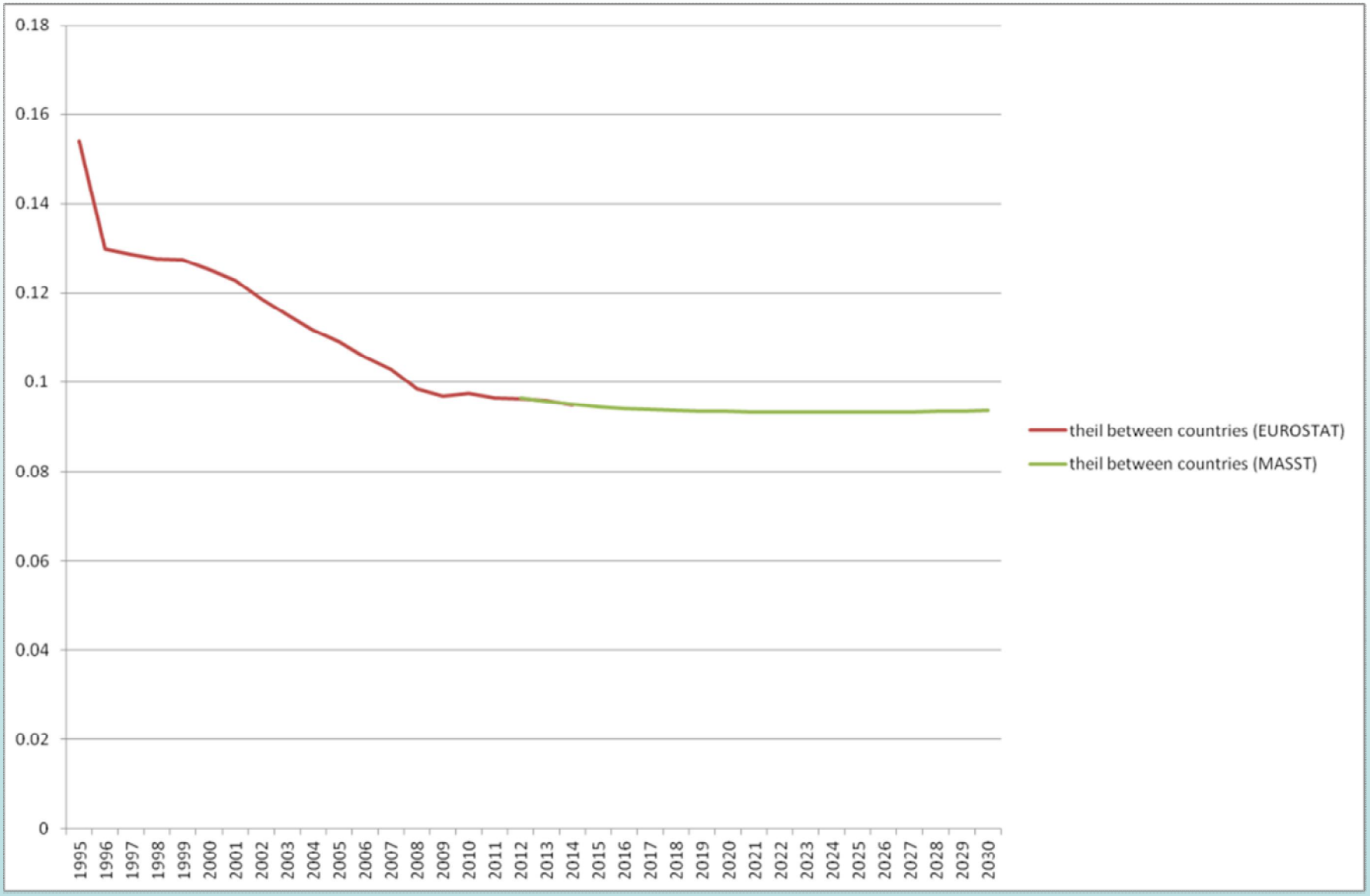
A Baseline scenario for 2030 was built (see ESPON ET2050 project), defined as a scenario with

- no change in policies and in cohesion budget,
- a general slow economic recovery starting in 2016.

Convergence trends interrupted



Convergence trends interrupted



Consequences for Cohesion Policies

Regional cohesion policies have a reason to be launched even in an era of economic downturn, when demand policies would be more natural.

They even have to be reinforced: their present intensity is not sufficient to engender a decrease in regional disparities.

They are therefore necessary in order to correct for the regional imbalances caused by the restrictive macroeconomic policies imposed by the austerity measures.

All this and much more can be found in

Camagni R. and Capello R. (2013), «Regional Innovation Patterns and the EU Regional Policy Reform: Towards Smart Innovation Policies», *Growth and Change*, 44(2), 355-389

Capello R. and Lenzi C. (eds.) (2013), *Territorial patterns of innovation. An Inquiry on the Knowledge Economy in European Regions,* Routledge, London

Capello R. and Lenzi C. (2013), «Knowledge, Innovation and Regional Growth Nexus: Spatial Heterogeneity in European Regions», *Journal of Regional Science,* DOI: 10.1111/jors.12074

Camagni R. and Capello R. (2014), «Rationale and design of EU cohesion policies in a period of austerity», *Regional Science Policy and Practice,* doi: 10.1111/rsp3.12047

Capello R., Caragliu A. and Fratesi U. (2014), «Modelling Regional Growth between Competitiveness and Austerity Measures: the MASST3 Model», *International Regional Science Review*, DOI: 10.1177/0160017614543850

Capello R. and Lenzi C. (2014), «Knowledge, Innovation and Productivity Gains across European Regions», *Regional Studies*, DOI: 10.1080/00343404.2014.917167

Capello R., Caragliu A. and Fratesi U. (2014), «The Costs of the Economic Crisis: Which Scenario for the European Regions?», *Environment and Planning C*

THANK YOU VERY MUCH FOR YOUR ATTENTION!