OECD Regional Development Working Papers 2011/03

Categorisation of OECD Regions Using Innovation-Related Variables

Giulia Ajmone Marsan,

Karen Maguire

https://dx.doi.org/10.1787/5kg8bf42qv7k-en

OECD

OECD REGIONAL DEVELOPMENT WORKING PAPERS

This series is designed to make available to a wider readership selected studies on regional development issues prepared for use within the OECD. Authorship is usually collective, but principal authors are named.

The papers are generally available only in their original language English or French with a summary in the other if available.

The opinions expressed in these papers are the sole responsibility of the author(s) and do not necessarily reflect those of the OECD or the governments of its member countries.

Comment on the series is welcome, and should be sent to either gov.contact@oecd.org or the Public Governance and Territorial Development Directorate, 2, rue André Pascal, 75775 PARIS CEDEX 16, France.

OECD Regional Development Working Papers are published on

www.oecd.org/gov/regional/workingpapers

ABSTRACT

National policy makers have shown a growing interest in the regional dimension of innovation processes, and regional policy makers are seeking to promote their own competitiveness by supporting innovation. To advance the OECD quantitative research on regions and innovation, a categorisation of regions was developed using socio-demographic, economic, and innovation-related variables. Many different categorisations are possible depending on the purpose of the peer group comparisons. This categorisation was developed with the main goal of highlighting the diversity of regional profiles across OECD regions. Similar types of analysis have been performed with regions of the European Union. This analysis identifies eight groups of regions based on the similarity of their performance on the 12 variables used in the statistical cluster analysis. These eight groups were then classified into three macro categories based on relevance for policy recommendations. Possibilities for further research to develop different forms of regional peer groupings are discussed.

Les responsables politiques nationaux montrent un intérêt croissant envers la dimension régionale des processus d'innovation, et les responsables politiques régionaux cherchent à promouvoir leur propre compétitivité en soutenant l'innovation. Afin d'améliorer la recherche quantitative de l'OCDE sur les régions et l'innovation, une catégorisation des régions a été développée en utilisant des variables socio-démographiques, économiques et liées à l'innovation. De nombreuses catégorisations sont possibles en fonction de l'objectif des comparaisons entre « groupes de pairs ». La présente catégorisation a été développée avec l'objectif principal de mettre en évidence la diversité des profils régionaux au sein des régions de l'OCDE. Des types d'analyse similaires ont été réalisés avec les régions de l'Union européenne. Cette analyse identifie huit groupes de régions sur la base de la similitude de leur performance dans les 12 variables utilisées pour l'analyse statistique en « cluster ». Ces huit groupes ont ensuite été classés en trois macro-catégories suivant leur pertinence pour les recommandations politiques. Les possibilités de continuer les recherches pour développer différentes formes de groupes de pairs régionaux sont également abordées.

JEL classification: D2, L2, O2, O31, O32, R3, R5
Keywords: Regional Development; Innovation Policy; Regional Innovation Strategies; Regional Competitiveness; Economic Development; Cluster Analysis

FOREWORD

This working paper is one in a series of *OECD Regional Development Working Papers* of the OECD Public Governance and Territorial Development Directorate.

Funding for this research was provided by the Directorate General for Regional Policy of the European Commission. This paper served as a thematic contribution towards a larger project leading to the publication OECD (2011) *Regions and Innovation Policy*, OECD Reviews of Regional Innovation, OECD Publishing, Paris.

The authors thank Claire Nauwelaers and Annalisa Primi who, together with Karen Maguire, co-authored the aforementioned publication in which this categorisation of regions was used, for all the valuable comments and discussion that made the development of this analysis possible. We also thank Monica Brezzi and Vicente Ruiz for their valuable help regarding the statistical details and the variable selection process. Finally, we want to thank the delegates of the Working Party on Territorial Indicators for their suggestions during their December 2010 meetings.

Further enquiries about this paper and OECD work on regional innovation should be addressed to: Karen Maguire (karen.maguire@oecd.org) or Joaquim Oliveira Martins (joaquim.oliveira@oecd.org) of the Regional Development Policy Division in the OECD Public Governance and Territorial Development Directorate.

TABLE OF CONTENTS

Tables

Figures

Boxes

ACRONYMS AND ABBREVIATIONS

BERD	Business Enterprise Expenditure on Research & Development
EC	European Community
EU	European Union
EUR	Euro
GBOARD	Government Budget Appropriations or Outlays on Research and Development
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on Research and Development
GVA	Gross Value Added
HEI	Higher Education Institution
ISCED	International Standard Classification of Education
KIS	Knowledge-intensive Services
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
PCA	Principal Component Analysis
PCT	Patent Co-operation Treaty
PISA	Programme for International Student Assessment (OECD)
PPP	Purchasing Power Parity
R&D/ R&D&I	Research and Development/ Research and Development and Innovation
RIS	Regional Innovation System
SME	Small and Medium-sized Enterprise
S&T/ STI	Science and Technology/ Science and Technology and Innovation
TL	Territorial Level
UK	United Kingdom
US	United States
USD	United States Dollar

Introduction

In recent years, national policy makers have shown a growing interest in the regional dimension of innovation processes and policies. This increasing interest flows from both innovation policy and regional development policy trends. Regional policy makers are also seeking to promote their own competitiveness through support to innovation. By taking into account the specificities of different regional innovation systems and their trajectories, policy makers may therefore better target support measures to implement strategies both at regional and country level.

The OECD began to collect several innovation-related indicators with the goal of providing comparable measures across regions of OECD member countries. The *2009 Regions at a Glance* (OECD, 2009a) had a special focus on innovation and regions. The OECD Innovation Strategy's *Measuring Innovation: A New Perspective* (OECD, 2010) highlighted general trends in innovation, including evidence of "hot spots" for knowledge and the variations in regional performance.

To advance the OECD quantitative research on regions and innovation, a categorisation of regions was developed using socio-demographic, economic, and innovation-related variables. Peer groups of regions can provide benchmarks for comparing regional performance and growth. They may also support selection of peer regions for more systematic policy comparisons. Many different categorisations are possible depending on the purpose of the peer group comparison. This categorisation was developed with the main goal of highlighting the diversity of regional profiles across OECD regions as part of a larger research programme leading to the OECD publication *Regions and Innovation Policy* (OECD, 2011).

The goal of this paper is to enrich the existing literature on groupings of peer regions with respect to innovation, with a first attempt considering a sample with OECD regions. This paper first reviews previous categorisations, most of which have been applied to European regions. It then discusses the selection of variables from the OECD Regional Database, which has a less rich set of variables across its members than at the European Union (EU) level, but a wider range of regions in terms of geography and performance. The results of the analysis using statistical cluster techniques and the regional peer groups are examined. Finally, opportunities for future analyses are proposed for taking the work forward.

Methodological approach

Prior studies to develop innovation-related groupings of regions

Two main approaches for obtaining innovation-related regional groupings may be found in the literature, qualitative and quantitative (OECD, 2009b). The qualitative approach is generally based on in-depth case studies. These studies have the advantage of providing detailed analysis of the regional innovation system. Some characterisations focus on the nature and role of key actors in system, including the governance of the system, others on the region's integration into global networks, and yet others on the industrial structure/agglomeration characteristics (see Table 1). Nevertheless, individual case studies that focus on the specificities of the regions under consideration do not always lend themselves to comparable quantitative benchmarks of regions according to their innovation and economic performance.

Table 1. Qualitative categorisations of regional innovation systems

Cooke 1998[1]		Asheim 2007	Tödtling and Trippl (2005)
Governance	***Entrepreneurial Innovation***		
Grassroots	Localist	Territorially embedded	Metropolitan
Network	Interactive	Regional networked	Mature industrial
Interventionist	Globalised	Regionalised nationals	Peripheral

Note: 1. Based on these two dimensions, Cooke develops nine categories.

Source: As quoted in Navarro *et al.* (2008), *Pattern of Innovation in the EU-25 Regions: a Typology and Policy Recommendations*, Orkestra Working Papers Series in Territorial Competitiveness, Number 2008-04, Deusto Foundation, Donostia/San Sebastian.

Quantitative approaches generally take two forms: scoreboard indices and groupings developed with statistical cluster analyses. Analyses such as the *EU Regional Innovation Scoreboard* involve the collection and comparison of innovation-related indicators across regions in order to rank them. The overall ranking in this case groups regions into five categories: high, medium-high, average, medium-low and low innovators. Regions are also grouped according to three sub-categories: enablers, firm activities and outputs. Other ranking exercises based on composite indices exist. For example, the *Annual Report of Regional Innovation Capability of China* includes an overall index based on five composite indices for knowledge creation, knowledge attainment, enterprise innovation capacity, innovation environment and economic impact. The disadvantage of scoreboard-type approaches is that overall rankings tend to imply a single model to which all regions must conform—which requires having high values on the composite variables.

Beyond scoreboards, another form of quantitative analysis to group regions by innovation-related variables involves a statistical cluster analysis approach. Cluster analysis is a statistical method that uses a group of variables (in this case a selection of socio-economic, structural and innovation-related indicators) to obtain groups (or clusters) of regions that are most similar (see Box 1). The term cluster in this case refers to the grouping of regions based on their likeness on variables, and should not be confused with the term cluster used to commonly describe a group of co-located firms and institutions around a particular industry or part of a value chain. Statistical cluster analyses highlight the fact that, while regions are all different, there are meaningful commonalities that can be captured to group them. Such an analysis thus facilitates the development of peer groups and benchmarks among regions with the greatest degree of commonality. It overcomes a drawback of scoreboards, which imply a universal standard for all regions.

Box 1. Cluster analysis: statistical methods

Cluster analysis is a statistical methodology that enables the definition of groups in data. Given a set of observations, a cluster analysis assigns observations to different subsets (clusters), so that observations in the same cluster have common features. It is a technique used in many fields such as artificial intelligence, pattern recognition, marketing, medical research, economics and more. For an introduction to cluster analysis algorithms and methodologies, see Kaufman and Rousseeuw (2005).

The algorithm chosen for this analysis is Ward's minimum variance method. It aims at finding compact, spherical clusters. The word “compact” in this case means that the clusters are more distant as it assigns data to different groups maximising the distance between groups in the multidimensional plane.

The rationale behind Ward's approach can be illustrated most simply by considering univariate data. Suppose, for example, ten objects have scores (2, 6, 5, 6, 2, 2, 2, 2, 0, 0) on some particular variable. The loss of information that would result from treating the ten scores as one group with a mean of 2.5 is represented by the error sum of squares (ESS) given by,

$$ESS_{\text{One group}} = (2-2.5)^2 + (6-2.5)^2 + ... + (0-2.5)^2 = 50.5$$

On the other hand, if the ten objects are classified according to their scores into four sets,

{0,0,0}, {2,2,2,2}, {5}, {6,6}

The ESS of the total sample can be evaluated as the sum of squares of four separate error sums of squares:

$$ESS_{\text{One group}} = ESS_{\text{group1}} + ESS_{\text{group2}} + ESS_{\text{group3}} + ESS_{\text{group4}} = 0.0$$

Thus, clustering the ten scores into four clusters results in no loss of information.

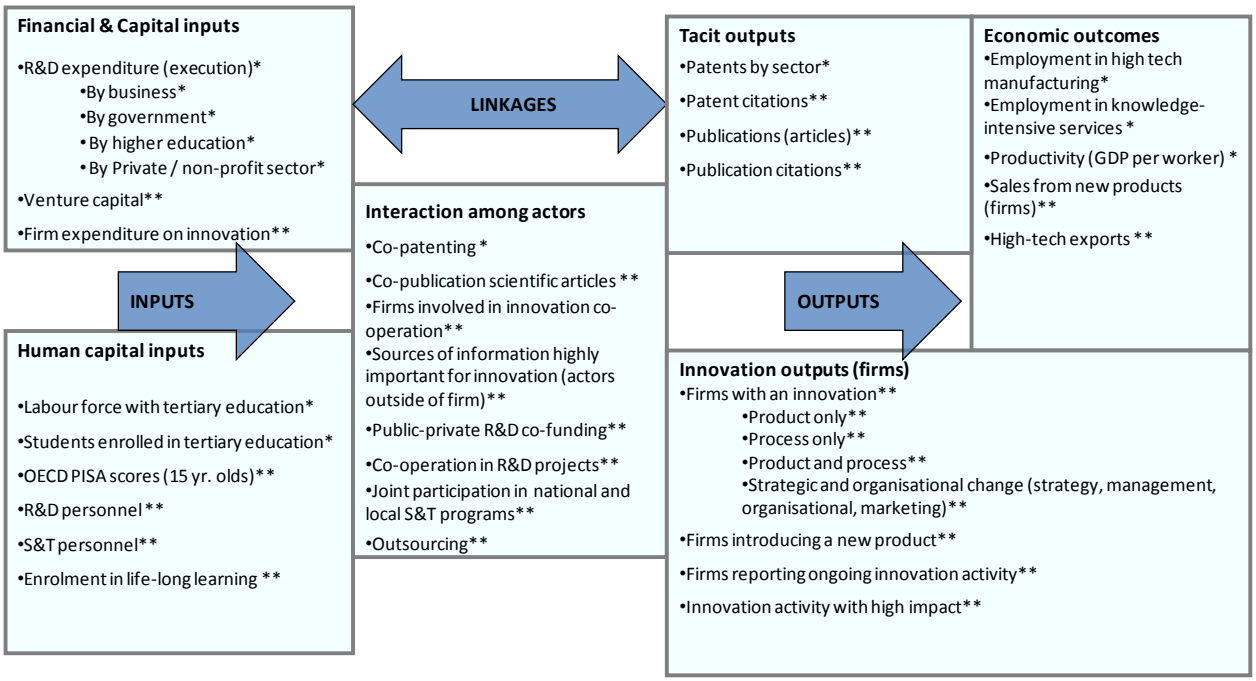
Source: Kaufman L. and J. Rousseeuw, (2005), *Finding Groups in Data. An Introduction to Cluster Analysis*, Wiley Ed, New York.

In the literature, there exist several examples of regional groupings using innovation-related variables based on cluster analyses methods, mostly considering European regions. A summary of the characteristics of several studies may be found in Table A.1 in Annex: Bruijn and Lagendijk (2005), Clarysse and Muldur (1999), ECOTEC (2005), Hollanders (2003, 2007), Martinez-Pellitero (2002), and Muller and Nauwelaers (2005). More recently, Navarro *at al.* (2008) derives a typology of innovative regions across the EU-25. They select 21 indicators that reflect the socio-economic characteristics of a region as well as its productive structure, population, education and human resources, R&D expenditure and patent intensity. By using these indicators they obtain seven groups of regions (see Box A.1 in Annex). Dunnewijk, Hollanders and Wintjes (2008) performed a comparative study across EU-27 regions. By selecting 13 indicators in three categories (four economic indicators, five knowledge/learning indicators, and four socio-demographic indicators), the authors obtain ten groups of European regions and discuss the associated relative strengths, weakness, opportunities and threats for each group. This analysis has been updated by Wintjes and Hollanders (2010), where the authors use seven indicators related to employment, three indicators related to human resources, three indicators related to the composition of the labour force (gender, education level, long-term unemployment), four indicators related to technology and three economy measures. By using these variables, they obtain seven regional groups within Europe, accenting knowledge absorption capacity, knowledge diffusion capacity, and accessibility to knowledge for these groups (see Box A.2 in Annex).

Range of variables often used for studying innovation and regions

Many of the variables used in the above mentioned studies are frequently referred to as "innovation indicators" even if they do not directly measure innovation per se (see Figure 1). The most tracked indicator in innovation-related analyses of regions is R&D intensity (R&D expenditure as a share of Gross Domestic Product). In many countries, the breakout of that spending by sector of performance (e.g., business, higher education institutions, government) is available. The share of R&D by sector of performance, combined with overall R&D expenditure levels, provides a sense of the relative weight of different actors in the innovation system for R&D investment. For example, if a region has no public research labs, then the levels and share of government-performed R&D are likely to be low. Furthermore, the distinction between higher education and government depends on the country context, as some countries have chosen to channel public research funds through universities while others through a separate public research system.

Figure 1. Traditional innovation-related indicators for analysis of regions



Notes:

* Available for most OECD countries at the regional (TL2 level).

** Not available for most OECD countries at regional level but available in some countries.

Human capital is a core innovation-related input, and an enabling factor for effective use of other innovation inputs. There are indicators regarding the education level of the population or workforce, by age cohort, or the presence of students in tertiary education in the region. Participation in lifelong learning is an indicator tracked in some countries that gives a sense of the efforts of the workforce to adapt itself to new skill needs. The OECD PISA results, based on internationally standardised tests of skill levels in different subjects of 15-year old students, are a measure of capacity for the future labour force and are available for some countries at regional level. The presence of R&D or S&T personnel is another human capital measure available in some regions. Increasingly, other forms of skills in terms of entrepreneurship and creativity are being considered in this assessment of human capital for innovation.

What supports the systemic aspect of the regional innovation system are the linkages or relationships among actors. Unfortunately, there are very few indicators available on this systemic aspect. Some analyses of regions have highlighted co-invention (co-patenting) activities and others co-publication of scientific articles since such information can be derived from global datasets.[1] Other indicators of cooperation in joint research or innovation activity have been used in region-specific analyses.

Tacit outcomes, while not necessarily leading to an innovation, are an outcome of different forms of investment into the innovation process. Patenting intensity (Patent Cooperation Treaty applications per million inhabitants) is an indicator that represents an invention that could potentially lead to an innovation. However, in some cases a patent is used to simply prevent others from developing a potential innovation. The interpretation of data based on patents involves a number of caveats relative to the sectoral composition of the region, intellectual property culture, firm strategies, etc. Other tacit outcomes include the generation of scientific knowledge, often measured by the quantity and quality of scientific

publications. Publications and patents may also be considered an input to the innovation process as well. Associated citations of both patents and scientific publications are further indicators of the relevance of such tacit outputs for potential innovations.

Innovation as an output itself is measured by firm-level surveys. Different forms of innovation in firms can be measured, including: product, process, marketing and organisational innovations (OECD, 2005). Such innovations may be new to the firm, new to the market/sector or new to the world. Those innovations are expected, at a minimum, to enable the firm to stay competitive and retain jobs, and at best become more profitable and create additional wealth in the region. The most common indicator is the share of innovation-active firms in a region. However the surveys contain a much richer set of questions regarding the development, type and impact of an innovation, such as the sales associated with new products.

Ultimately, regions are expecting to see that innovation in firms leads to broader outcomes such as increased productivity and economic growth. Additional outcome measures concerning the increasing technological sophistication of the economy include the share of employment in high-technology industries or knowledge-intensive services, as well as the technology level of exports. These variables are presumed to contribute to higher levels of productivity that would drive regional growth.

List of variables used for OECD analysis

Based on the theoretical approaches to regions and innovation, as well as the findings of previous categorisations of regions, a list of variables was selected from the OECD Regional Database (see Box 2). The goal was to select variables at the regional level across OECD countries able to capture the socio-economic and production structure of regions as well as other variables associated with innovation to allow for more analytically robust regional comparisons.[2] Such groupings identify different sectors where innovation may or may not be present as well as different types of actors (notably public vs. private) involved in the innovation process, at the regional level.

Box 2. OECD Regional Database

The OECD Regional Database is managed by the Directorate for Public Governance and Territorial Development (GOV) which collects statistics at the regional level through an annual questionnaire sent to the delegates of the Working Party on Territorial Indicators (WPTI), and through access to the websites of National Statistical Offices and Eurostat. The database provides a unique set of yearly time-series of statistics and indicators (around 40, including demography, economic accounts, labour market, innovation, and many more) covering about 2 000 regions at different territorial levels in OECD member countries and other economies. Regions have been classified according to two territorial levels (TL): the higher level (TL2) consists of bigger regions and they generally correspond to the NUTS2 classification in Europe. In the US, for example, a TL2 region would be a state. The lower level (TL3) consists of smaller regions and they generally correspond to the EU's NUTS3 classification. In this study, TL2 regions have been considered as most of the innovation-related variables are simply unavailable at TL3 level, with the exception of patents.

There are different possible approaches for developing such regional groupings. In this case, the selected variables mix regional socio-economic and industrial structure with some input and output indicators commonly associated with an innovation-friendly regional environment. Depending on the type of peer group analysis sought, different variables may be relevant. For this first analysis on OECD regions, it was deemed most appropriate to combine different structural, input and output factors so as to accent the diversity of regional profiles generally. Another option for future analysis is to consider only structural indicators, or only "input" indicators in a first step, and then to consider in a second step the ability of regions with such similar characteristics to generate particular outputs or outcomes related to innovation.

The following variables were ultimately included in this analysis (for 2007 or latest year available depending on the region and variable):

1. **Gross Domestic Product (GDP) *per capita*** (millions of USD PPP, current prices): the level of development and wealth of a region's economy.

2. **Population Density** (persons per square km): a measure of agglomeration and critical mass of human capital.[3]

3. **Unemployment Rate** (number of unemployed persons as a share of the labour force): the strength of the regional economy and its ability to absorb the region's labour force.

4. **Percentage of the Labour Force with Tertiary Education** (persons with tertiary education – ISCED 5 and 6 – as a percentage of the total labour force): to measure the relative share of highly educated workers in the labour force. It is a proxy for the region's knowledge absorption capacity. While it illustrates whether workers are highly skilled, it of course does not indicate whether they are rightly skilled for the regional economy's needs.

5. **Gross Domestic Expenditure on R&D (GERD) as share of GDP** (percentage points): a measure of the intensity of research and development expenditure in the region's economy. It is highly related to the sectoral composition of the regional economy, as some sectors such as biotech or other science- and technology-driven sectors are more R&D intensive than others. R&D intensity is the most commonly used variable for assessing the inputs to the innovation process. However, it should be noted that firms invest in innovation that takes place without R&D, and these investments are therefore not captured by R&D statistics.

6. **Business R&D Expenditure as a Share of Total R&D Expenditure** (percentage points): represents the share of total R&D expenditure performed by the business sector. R&D performed by business is generally considered more likely to lead to an innovation in firms than R&D expenditure by other types of actors. It provides an indication of the relative importance of firms in R&D activities, as opposed to other entities/institutions, notably public research centres and universities. It is different from business enterprise expenditure on R&D (BERD) as a share of GDP, which measures the intensity of business R&D investment in the economy.

7. **PCT Patent Applications per Million Inhabitants** (annual average over the last three years): patents are considered by many as a proxy of innovative activity. While the use of patenting data as an indicator is subject to debate, especially for regions with little patenting activity, most significant technology-based innovations are patented. Patenting trends are strongly associated with the sectoral composition of the economy, as is R&D. Furthermore, they represent firm strategies with respect to intellectual property. PCT (Patent Co-operation Treaty) patent applications are commonly used for OECD analysis given the global geographic scope of the data. Patent counts by priority date and by inventor (as opposed to owner) are used to more accurately reflect the timing and location of the inventive activity. The economic benefits to patent owners may accrue to another region (domestic or foreign) depending on where the owner (as opposed to the inventor if not the same) is located. Fractional counts of patents are used to reflect multiple co-inventors. The average over a three-year period are used to smooth out annual data fluctuations.[4]

8. **Share of Employment in the Primary Sector** (number of employees in Agriculture, Hunting, Forestry and Fishing as a share of total employment): this variable describes the relative importance in the region's labour force of primary sector activities as an indicator of economic structure. Such activities generally have lower gross value added and levels of technology than other sectors in the regional economy.

9. **Share of Employment in the Public Sector** (number of employees in Public Administration and Defence, Compulsory Social Security, Education, Health, and Social Work, Other Community, Social and Personal Service Activities, and Private Households with Employed Persons as a share of total employment): this variable gives a sense of the weight in the regional labour market of government relative to business/private companies. Note that some of the employment classified in this area may actually be performed by private entities. The types of innovation relevant for these sectors may require very different policy interventions.[5]

10. **Share of Employment in Manufacturing** (Manufacturing, Mining and Quarrying, Electricity, Gas and Water Supply employees as a share of total employment): this variable describes the level of employment in the manufacturing sector to depict the industrial character of the region.

11. **High and Medium-High Technology (HTM) Manufacturing as a Percent of Total Manufacturing** (number of persons employed in high and medium-high technology manufacturing sectors as a percentage of employment in the manufacturing sector): this variable indicates whether a regional economy's manufacturing sectors are more or less oriented towards higher-technology manufacturing activities that tend to have greater value added in the economy than lower technology sectors. Such sectors are also more likely to show higher levels of R&D investment and patenting activity.[6] It should be noted that high-technology activities may occur in low-technology manufacturing sectors, and vice versa.

12. **Knowledge-Intensive Services (KIS) as a Percentage of Total Services (**number of persons employed in knowledge-intensive service sectors as a percentage of employment in the service sector): this variable describes the level of employment in knowledge-intensive services that are more likely to generate value added for the region than other types of services. There are also documented positive spillovers between knowledge-intensive service activities and other sectors of the economy for innovation.[7]

In variable selection, there was a trade-off between the breadth of variables and the number of countries with available data. Unfortunately, several OECD countries were not possible to include due to the fact that they are not collecting key innovation-related variables at the regional level. For example, R&D at sub-national level is simply not available for several R&D-intensive countries (such as Japan and Switzerland) as well as some that are less intensive (such as Mexico or Turkey). Innovation-related data for some recently admitted OECD member countries was not yet available at the time of this analysis. The following OECD member countries are not included in the analysis for different data constraints: Australia, Chile, Estonia, Iceland, Israel, Japan, Mexico, New Zealand, Turkey, Slovenia, and Switzerland. In addition, a limited number of OECD regions in countries used in the analysis were dropped due to missing data.[8] The latest available year was selected for the analysis, generally 2007. In some cases, data for 2004, 2005 or 2006 was used depending on data availability for each variable so as to preserve the maximum number of regions possible for the analysis.

Results

Overall summary

Using the aforementioned variables and methodology, a set of eight clusters (regional groupings) was obtained. The analysis is based on 12 variables for 23 OECD countries covering 240 regions, which together account for 78% of total OECD GDP and 71% of OECD population.[9] See Figure 2 and Table 2 and, in Annex, Tables A.5 and A.6 with listings by regional grouping – cluster – and country. Table A.3 in Annex contains the average values for the selected list of variables to quantify the different features of each regional grouping (cluster).

After testing different numbers of regional groupings, eight clusters were developed and classified into three macro categories. The statistical approach to develop those clusters was the Ward method (see previous Box 2). This number (eight) served as the best trade-off between the need to highlight diversity within countries and the need for an appropriate number of groups to assess policy implications. Reducing the number of clusters resulted in maintaining the extremes and creating larger mid-range groups. Increasing the number of clusters added minimal further within-country variation. Other recent comparable analyses with EU regions had identified seven regional groupings (Wintjes and Hollanders, 2010; Navarro *et al.* 2008). The number of clusters present in a given country is at a minimum two, but is generally three or more (see Table A.4 in Annex). For example, Korean regions are found in five clusters, and UK and US regions are found in four clusters. Regions belonging to Austria or the Czech Republic are found in only two clusters, illustrating less within-country variation. The eight clusters were then classified into three macro categories based on an assessment of policy-relevant commonalities that could map peer group recommendations (see also OECD, 2011).

The **Knowledge hubs** account for around 30% of the total sample GDP and 25% of population. They are the regions with the highest wealth levels and best performance on science- and technology-based innovation-related indicators, such as R&D and patenting. They are likely to develop strategies that seek to build on their current advantages. This macro-category is composed of two regional groupings:

- ***Knowledge-intensive city/capital districts*** includes nine capital or city districts. Due partly to their regional boundaries, which are under-bounded relative to their associated functional economic areas, these regions have values distinctly different from other capital city or highly urbanised OECD regions. For example, GDP *per capita* values far surpass those of other regions with a smaller commuter effect.

- ***Knowledge and technology hubs*** display high levels of GDP *per capita* and are mainly located in top knowledge-intensive countries. Almost one third of them are located in the US, while Germany, Sweden, Finland, and the UK also account for a significant share of the 29 regions in the cluster.

The **Industrial production zones** cover around 60% of sample GDP and population. This category includes four clusters with different production characteristics that face specific challenges for restructuring and transformation to keep up with the moving innovation frontier:

- ***US states with average S&T performance***, responsible for approximately 30% of GDP and 25% of population in the sample, includes 38 US states, generally those that are not knowledge hubs. They are distinctive relative to regions in other OECD countries with respect to their higher wealth levels as well as R&D and patenting intensity. They also tend to be less densely populated with a lesser educated labour force than regions in other groups.

- ***Service and natural resource regions in knowledge-intensive countries*** account for around 5% of population and GDP in the sample. These regions are often second-tier hubs in knowledge-intensive countries. They are generally small geographically and/or less densely population, with high patent intensity and a high share of employment in knowledge-intensive services. They have well-developed absorption capacities due to a highly educated workforce, but they do not perform as global knowledge hubs.

- The cluster of ***Medium-tech manufacturing and service providers*** accounts for 20% of sample GDP and 23% of population. Regions in this cluster are characterised by a medium-low- and medium-high-technology industrial base. They have relatively high knowledge absorptive capacities, given the high share of the labour force with tertiary education.

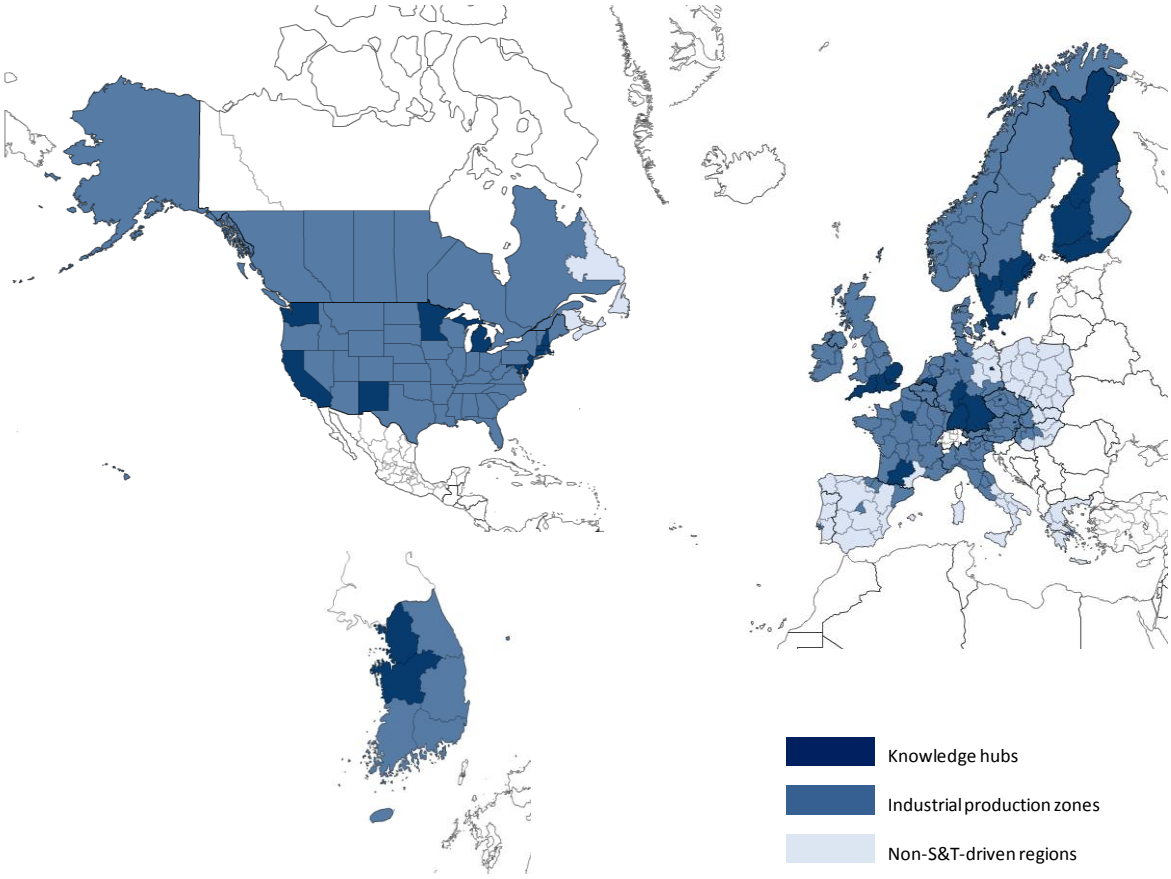
- The ***Traditional manufacturing regions*** cluster gathers 30 regions for 7% of sample population and 6% of GDP. This group includes regions mostly from Austria, Italy, the Czech Republic, and other Central or Eastern European countries. Average GDP *per capita* is medium-low relative to the overall regional sample. It includes regions specialized in traditional sectors with average R&D investments and patenting and a relatively low share of the labour force with tertiary education.

The third category groups the **Non-S&T-driven regions.** They account for 14% of sample population, but only 8% of sample GDP. This category includes regions that, in addition to sharing a peripheral location, will also need to build up knowledge absorption capacity and knowledge generation assets to catch up with more advanced OECD regions:

- The ***Structural inertia or de-industrialising regions*** cluster accounts for 9.4% of sample population and 5.9% of GDP. It includes regions with persistent "underdevelopment" traps, facing a process of structural inertia or de-industrialization. This group includes 38 regions from Spain, Italy, Germany, Canada, Hungary, France, Slovakia, and Poland.

- The cluster of ***Primary-sector-intensive regions*** includes 19 peripheral regions, from Poland, Portugal, Greece and Hungary. This cluster accounts for 5% of sample population but only 2.4% of GDP. Regions in this cluster tend to have a much higher share of the labour force specialised in primary sector activities and are generally rural areas. They lag behind all the other groups, including in terms of GDP *per capita* and innovation-related indicators.

Figure 2. Categorisation of OECD regions: map of three macro categories



Source: OECD calculations using the OECD Regional Database displayed using the OECD eXplorer. This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map. Maps may be cropped and repositioned for ease of display.

Table 2. Categorisation of OECD regions: summary table

Regional grouping (cluster)	Main characteristics	Population	GDP	Average GDP *per capita*
		(% sample)		PPP 2000 USD, constant prices
KNOWLEDGE HUBS		**25.2**	**29.6**	
Knowledge-intensive city/capital districts **9 regions**: Vienna, Brussels, Prague, Berlin, Bremen, Hamburg, London, Washington, D.C., Korea Capital Region	These densely populated capital or city districts have high R&D and patenting intensity. The high share of services in knowledge-intensive sectors is attributable to the highly educated workforce. Due in part to small geographic size and commuting, these regions have on average very high GDP *per capita*. They also have a relatively high unemployment rate.	4.9	5.1	51 065
Knowledge and technology hubs **29 regions**: 3 Germany, 1 Denmark, 3 Finland, 2 France (including the Ile-de-France – Paris – region), 1 Korea, 1 Netherlands, 4 Sweden (including Stockholm), 3 UK, 11 US (including California, Massachusetts, Michigan, New Jersey	These are the top knowledge and technology regions in the OECD. They have, by far, the highest average levels of R&D and patenting intensity, as well as the share of R&D conducted by business. The industrial structure includes a significant share of manufacturing in high-technology sectors.	20.3	24.5	35 729
INDUSTRIAL PRODUCTION ZONES		**60.4**	**62.1**	
US states with average S&T performance **38 regions:** 38 US	This group covers 38 US states, generally those which are not Knowledge Hubs. They are distinctive relative to regions in other OECD countries given their high wealth levels and above average R&D and patenting intensity. They also have a generally strong share of manufacturing in high- and medium-high-technology sectors, and services in knowledge-intensive sectors. These states tend to be less densely populated with a lesser educated workforce than most other Industrial Production Zone groups.	25.3	30.2	35 791
Service and natural resource regions in knowledge-intensive countries **28 regions**: 4 Canada, 4 Denmark, 1 Finland, 2 Korea, 1 Luxembourg, 3 Netherlands, 7 Norway (including Oslo), 4 Sweden, 1 Slovakia (Bratislava region), 1 UK	These regions are often a second-tier in knowledge-intensive countries. They are generally of small geographic scale and/or less densely populated but with a highly educated labour force. They may derive wealth in part from the high share of employment in knowledge-intensive services, or natural resources, in addition to the more limited manufacturing which is in sectors of lower technology level than other Industrial Production Zones.	5.1	5.6	33 187
Medium-tech manufacturing and service providers **49 regions:** 2 Belgium, 2 Canada, 7 Germany, 4 Spain (Madrid, Catalonia, Basque Country and Navarre), 18 France, 1 Greece, 1 Hungary, 2 Ireland, 2 Italy, 2 Korea, 1 Portugal (Lisbon), 7 UK	These are industrial production regions (manufacturing and services) and some capital regions of middle income countries. While not the global high-technology hubs, they do have a strong medium-low- and medium-high-technology industrial base. They also have relatively high knowledge absorptive capacities, including a significant share of the labour force with tertiary education.	23.1	20.1	25 565

Regional grouping (cluster)	Main characteristics	Population	GDP	Average GDP *per capita*
		(% sample)		PPP 2000 USD, constant prices
Traditional manufacturing regions **30 regions:** 8 Austria**,** 7 Czech Republic, 2 Hungary, 10 Italy, 1 Korea, 1 Slovakia, 1 US	These regions have the highest share of employment in manufacturing, generally in medium-low- and low-technology (traditional) sectors. Business accounts for the bulk of R&D investment. This group is also distinctive for the relatively lower-skilled labour force (lowest share with tertiary education of any group).	7.0	6.2	25 686
NON-S&T-DRIVEN REGIONS		**14.4**	**8.3**	
Structural inertia or de-industrialising regions **38 regions**: 4 Canada, 3 Germany, 13 Spain, 1 France, 3 Hungary, 8 Italy, 4 Poland, 2 Slovakia	These regions with persistent "underdevelopment" traps face a process of de-industrialisation or experience structural inertia. They have considerably lower GDP *per capita* than other groups and the highest average unemployment rate. Values on S&T-related indicators are low.	9.4	5.9	19 458
Primary-sector-intensive regions **19 regions**: 3 Greece, 1 Hungary, 12 Poland, 3 Portugal	These Southern and Eastern European regions with low population density have a significant share of their economy in primary sector activities or low-technology manufacturing. They have, on average, the lowest values on S&T-related indicators (R&D, patenting, share of R&D by business).	5.0	2.4	13 880

To some extent, the results of the analysis confirm some trends already obtained by the aforementioned prior studies (See Boxes A.1 and A.2 for a comprehensive list of their results). Nevertheless, these previous studies were restricted to European regions. The Metropolitan KIS regions cluster (Wintjes and Hollanders, 2010) as well as the Innovative capital regions cluster (Navarro *et al*., 2008) may be compared to the Knowledge-intensive city/capital districts obtained in this analysis. The OECD Knowledge and technology hubs regions may correspond to Innovative regions with a high level of economic and technological development (Navarro *et al.*, 2008) or to High-tech regions (Wintjes and Hollanders 2010). The Traditional southern regions (Wintjes and Hollanders 2010) or Restructuring industrial regions with strong weaknesses (Navarro *et al*. 2008) may be compared to the OECD clusters of Structural inertia or de-industrialising regions and Primary-sector-intensive regions.

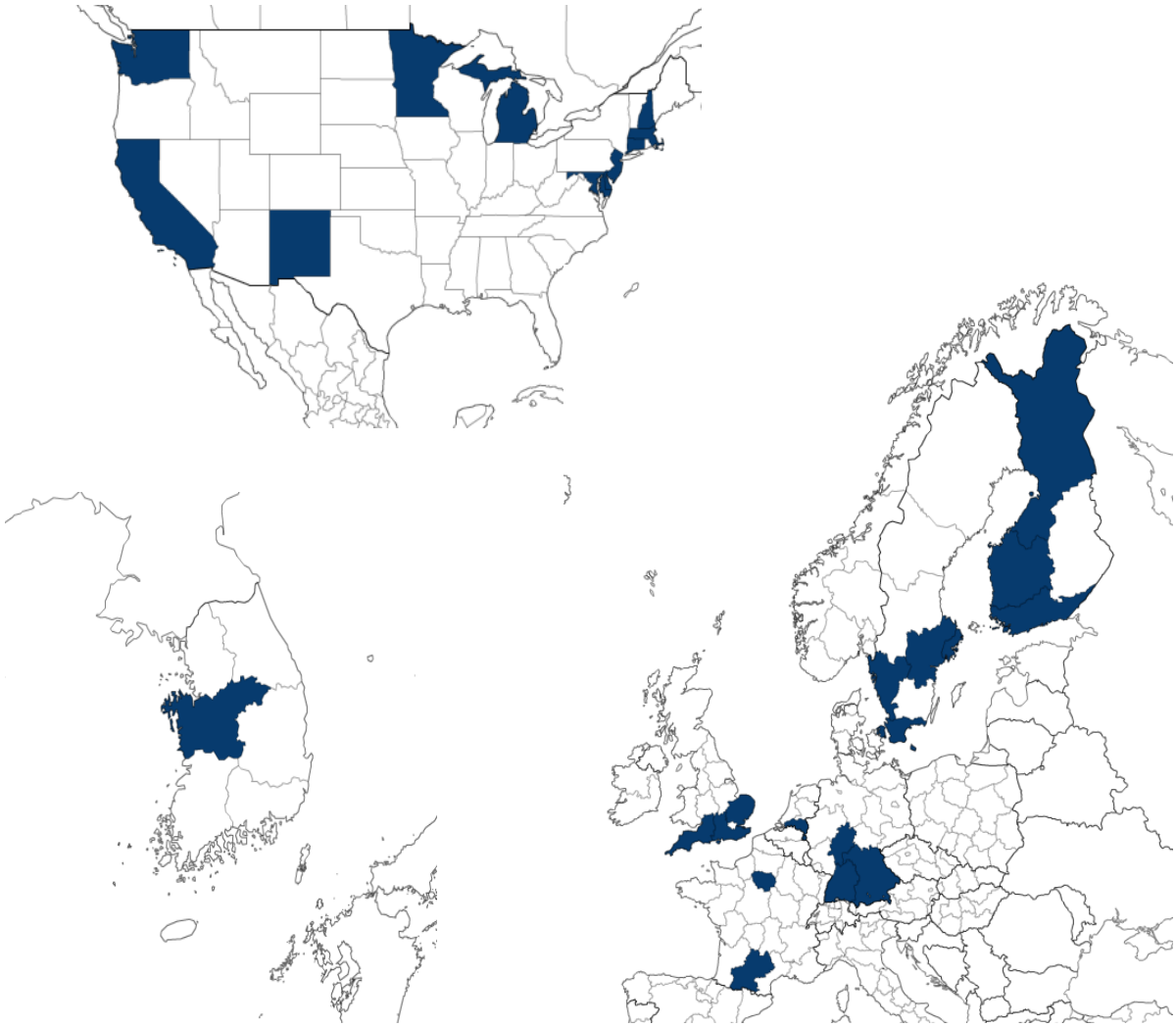
Knowledge hub regions (two regional peer groups)

Figure 3. Knowledge-intensive city/capital districts

Source: OECD calculations using the OECD Regional Database displayed using the OECD eXplorer. This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map. Maps may be cropped and repositioned for ease of display.

Knowledge-intensive city/capital districts. This cluster has the highest *per capita* GDP of all clusters. It contains only nine administrative capitals or cities: Vienna (Austria); Brussels (Belgium); Prague (Czech Republic); Berlin, Bremen, and Hamburg (Germany), London (UK), Korea Capital Region and Washington, D.C. (US). These capital or district regions are extremely densely populated: the population density of this cluster is more than ten times higher when compared to other clusters. They are also under-bounded in terms of regional borders relative to the functional economic areas that they drive. The share of employment in public sector activities is one of the highest of all clusters. These regions also show a high share of employment in service sectors that are knowledge intensive as well as a high share of the labour force with tertiary education and high R&D and patenting intensity. The unemployment rate is also high, as unemployment is often concentrated in metropolitan areas. While all these regions have GDP *per capita* levels above their respective national averages, examples of GDP *per capita* growth rates above and below national averages are observed.

Figure 4. Knowledge and technology hubs

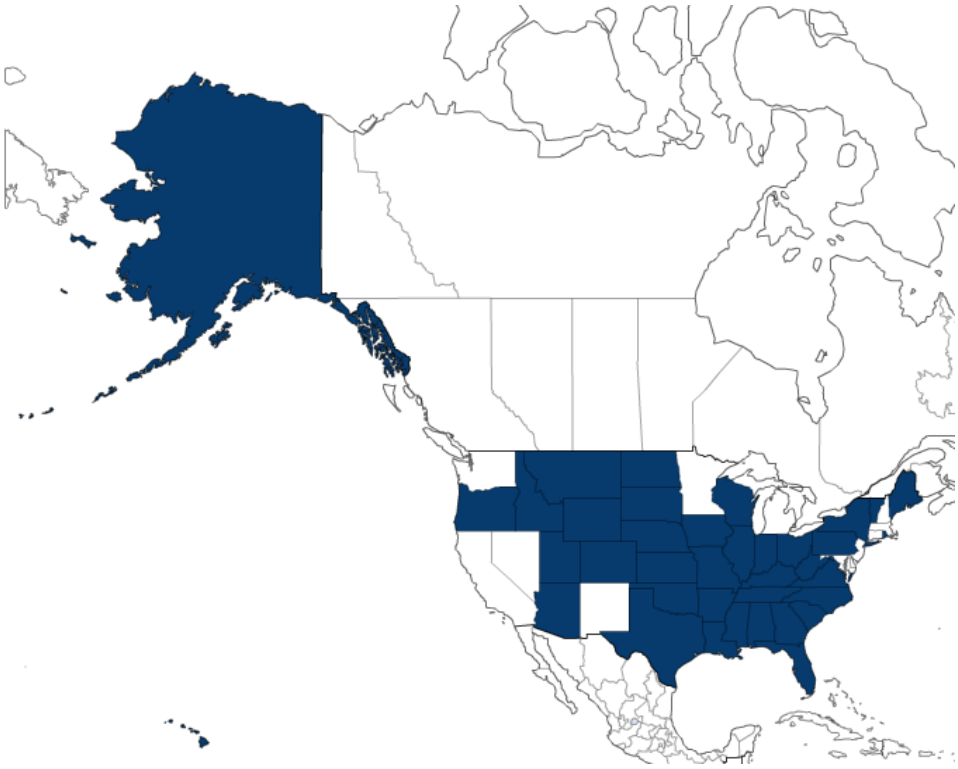


Source: OECD calculations using the OECD Regional Database displayed using the OECD eXplorer. This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map. Maps may be cropped and repositioned for ease of display.

Knowledge and technology hubs. This cluster contains 29 regions, accounting for 24.5% of sample GDP and 20% of population. This cluster contains rich and high-performing innovative regions. These regions are mainly found in the US (11 regions including California, Massachusetts, Michigan, and New Jersey), Asia (including Chungcheong region in Korea) and Central and Northern European. In Europe, this group includes three German regions: Baden-Württemberg, Bavaria and Hessen, four Swedish regions including Stockholm, three Finnish regions, three UK regions (East, South West and South East), two French regions including Ile-de-France (Paris), one Dutch region (Southern Netherlands), and one Danish region (Capital Region that contains Copenhagen). R&D and patenting intensity are on average more than double the values for other clusters. These regions have high population density, a low unemployment rate, and an above average educated labour force. GDP *per capita* growth rates are generally above or just below respective national averages.

Industrial production zones (four regional peer groups)

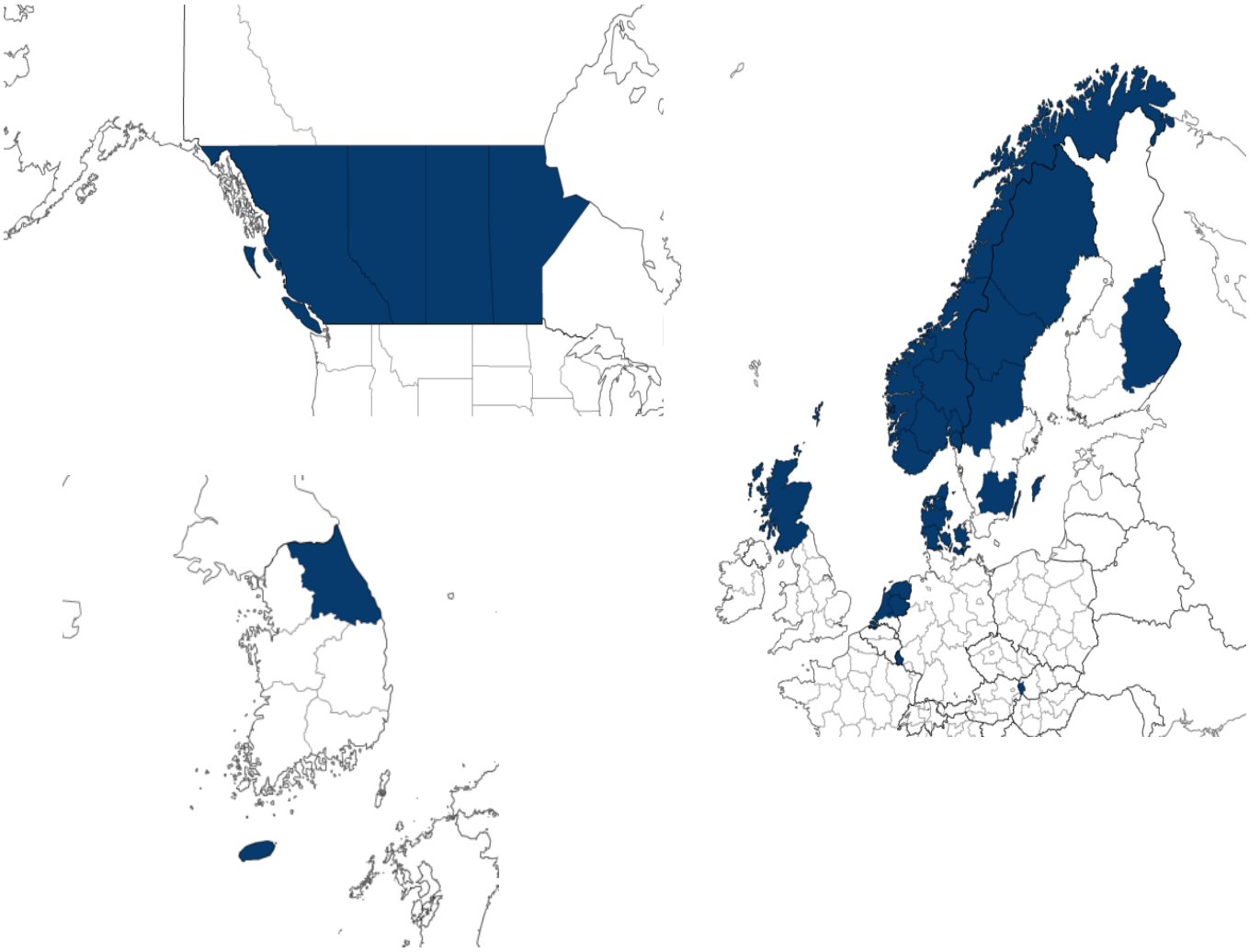
Figure 5. US states with average S&T performance



Source: OECD calculations using the OECD Regional Database displayed using the OECD eXplorer. This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map. Maps may be cropped and repositioned for ease of display.

US states with average S&T performance. This cluster contains 38 US states that account for approximately 30% of the sample GDP and 25% of the sample population. The US states covered by this cluster are not Knowledge hubs but are distinctive with respect to other OECD regions in terms of high wealth levels and above average R&D intensity. Population density and unemployment rates are low as well, as is the percentage of the labour force with a tertiary education. This cluster has the lowest average value of employment in manufacturing activities, however, the level of employment in knowledge-intensive services and in the public sector are among the highest.

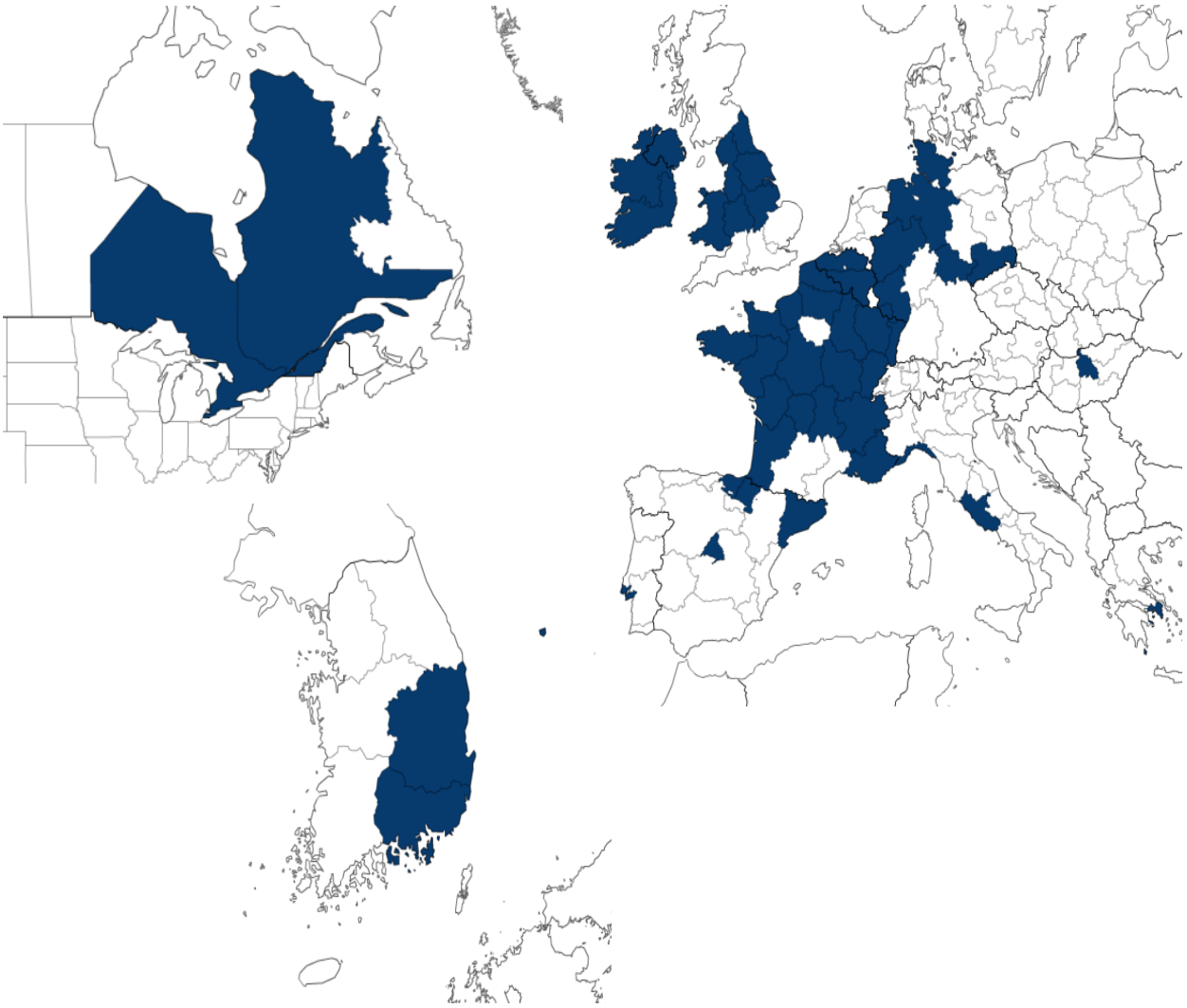
Figure 6. Service and natural resource regions in knowledge-intensive countries



Source: OECD calculations using the OECD Regional Database displayed using the OECD eXplorer. This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map. Maps may be cropped and repositioned for ease of display.

Service and natural resource regions in knowledge-intensive countries. This cluster contains 28 regions, accounting for 5% of the sample population and 5.6% of the sample GDP. They may generally be considered second-tier hubs in their countries. These regions are located in Northern Europe (four regions in Denmark, three in the Netherlands, one in Finland, seven in Norway, four in Sweden, one UK), Asia (two Korean regions), Canada (4 regions) and Central or Eastern Europe (Luxembourg and Bratislava region). Patenting and R&D intensity are medium to high and the average share of employment in knowledge-intensive services is among the highest of all clusters. The unemployment rate is the lowest on average among the clusters.

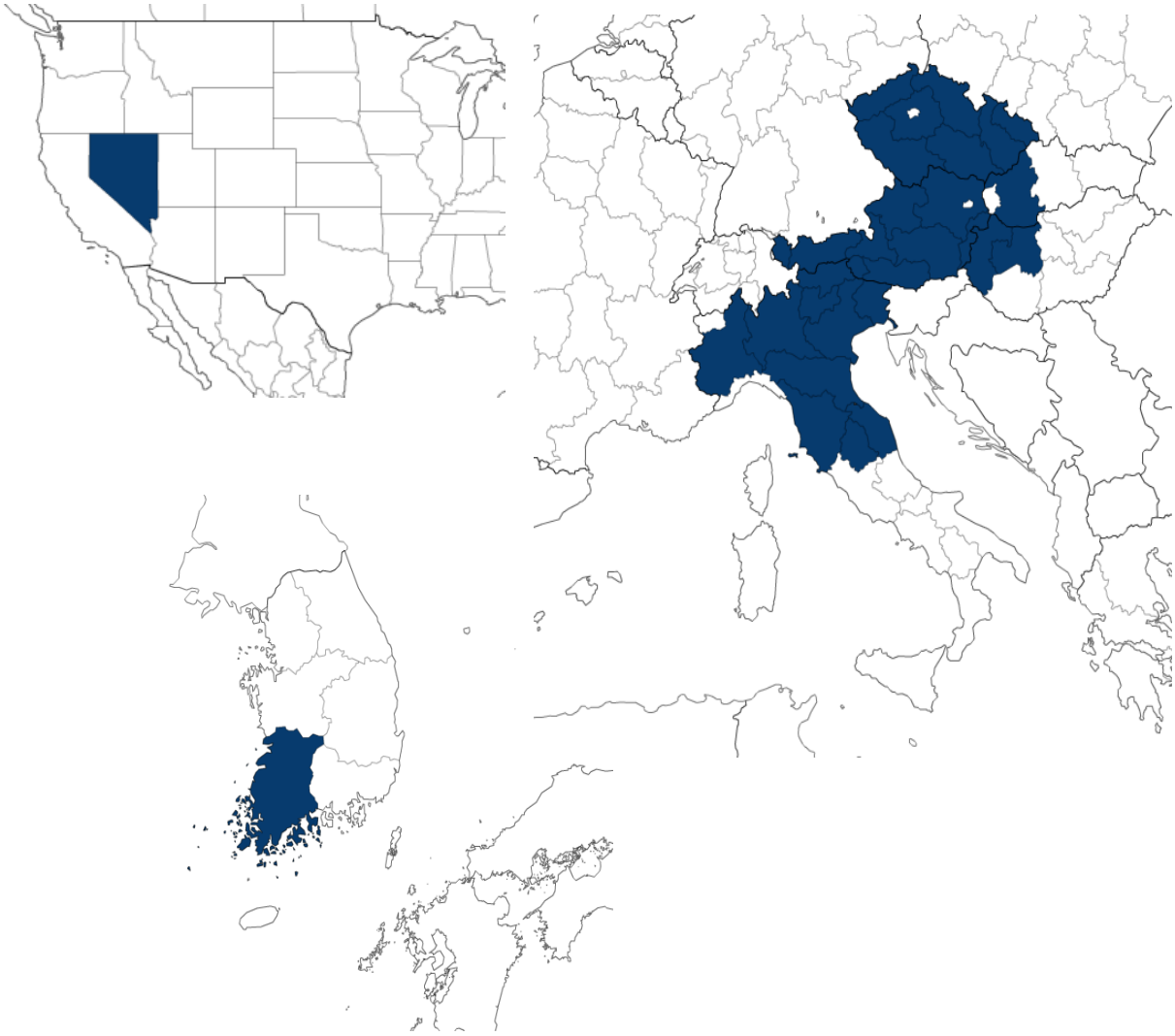
Figure 7. Medium-tech manufacturing and service providers



Source: OECD calculations using the OECD Regional Database displayed using the OECD eXplorer. This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map. Maps may be cropped and repositioned for ease of display.

Medium-tech manufacturing and service providers. This cluster contains 49 generally densely populated regions, and accounts for approximately 23% of sample population and 20% of GDP. This cluster contains average to high performing industrial production regions in Western Europe (such as Central/Northern UK, Irish, Italian, French, German, and Belgian regions), as well as more advanced Canadian (Quebec and Ontario), Korean (Gyeongnam and Gyeonbuk) and Spanish (Madrid, Catalonia, the Basque Country, Navarre) and some capital regions of less knowledge-intensive countries such as Lisbon (Portugal), Attiki (Greece) and Central Hungary. The knowledge absorption capacities of these regions are relatively high given the skilled labour force. Employment in the manufacturing sector is below average whereas employment in knowledge-intensive services is above average.

Figure 8. Traditional manufacturing regions

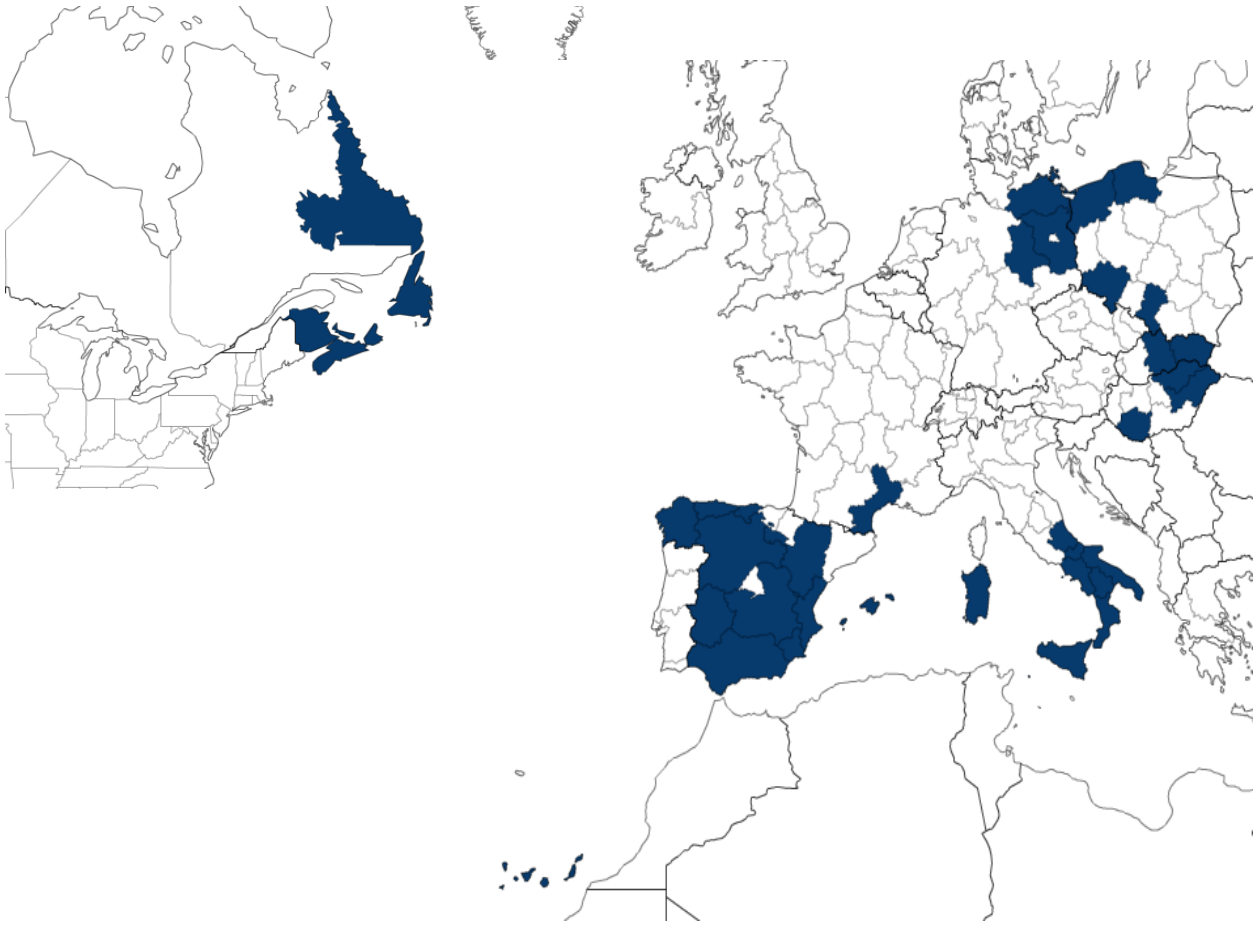


Source: OECD calculations using the OECD Regional Database displayed using the OECD eXplorer. This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map. Maps may be cropped and repositioned for ease of display.

Traditional manufacturing regions. This cluster contains 30 regions and it accounts for approximately 7% of sample population and 6% of GDP. This cluster contains average performing European regions, in Western (ten Northern Italian regions, eight Austrian regions) and Eastern Europe (seven Czech regions, two Hungarian regions, and one Slovakian region), in Asia (one Korean region) and the US (Nevada). R&D expenditure and patenting intensity are below the sample averages. The share of employment in the manufacturing sector is the highest and the share of employment in the public sector is the lowest across all clusters. The unemployment rate is average/low and the share of the labour force with tertiary education is the lowest of all clusters.

Non-S&T-driven regions (two regional peer groups)

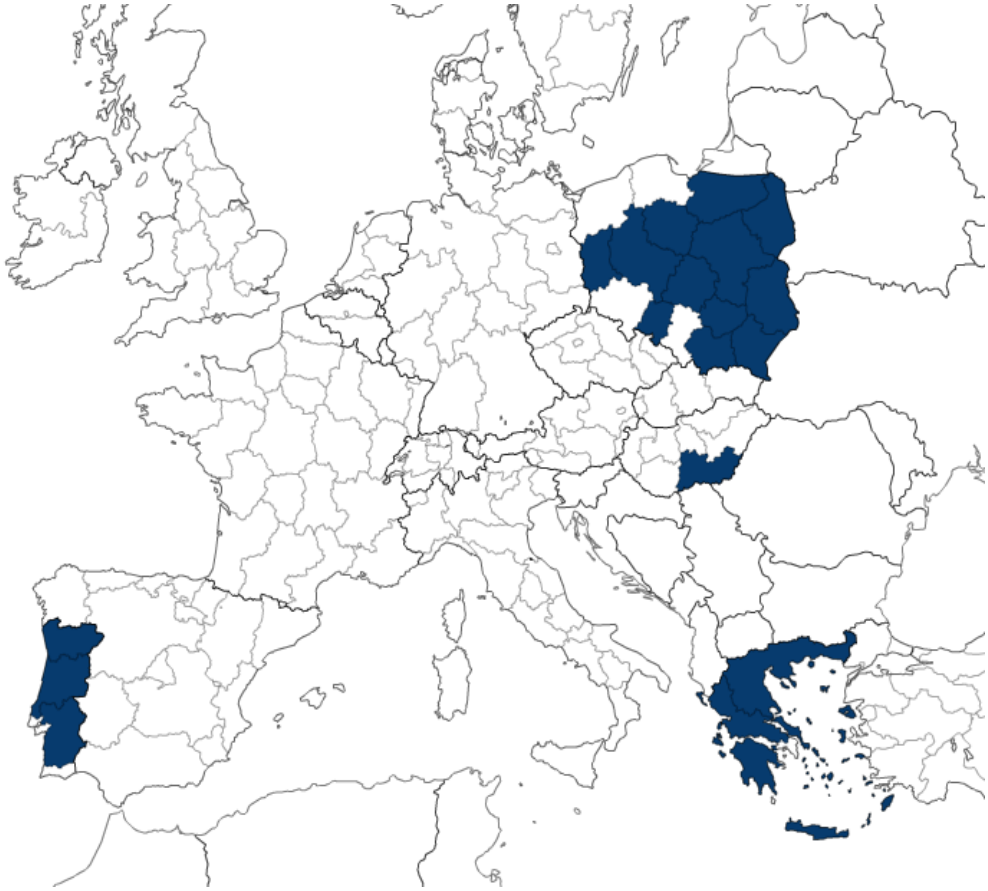
Figure 9. Structural inertia or de-industrialising regions



Source: OECD calculations using the OECD Regional Database displayed using the OECD eXplorer. This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map. Maps may be cropped and repositioned for ease of display.

Structural inertia or de-industrialising regions. This cluster is composed of 38 European regions, mainly in Southern and Eastern Europe, and Atlantic Canada provinces: 13 Spanish, four Canadian, three German, eight Southern Italian, one French, three Hungarian, two Slovakian, and four Polish regions. These regions are not highly developed within OECD benchmarks and have the second lowest GDP *per capita* average. They also have low values of R&D and patenting intensity. This cluster has the highest unemployment rate, suggesting major structural adjustment challenges. The labour force with tertiary education is about average. These regions are characterized by persistent "underdevelopment" traps, and may face a process of de-industrialisation or structural inertia.

Figure 10. Primary-sector-intensive regions



Source: OECD calculations using the OECD Regional Database displayed using the OECD eXplorer. This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map. Maps may be cropped and repositioned for ease of display.

Primary-sector-intensive regions. This cluster contains only European regions. It contains 19 regions in Eastern and Southern Europe: 12 Polish, three Portuguese, three Greek, and one Hungarian region. This cluster is characterised by the lowest values on most variables, such as GDP *per capita*, R&D and patenting intensity, share of manufacturing in medium-high and high-technology sectors, and the third lowest percentage of labour force with tertiary education. It has the highest share of employment in the primary sector (considerably higher than the other clusters). With respect to the European regions in the previous cluster, this group of regions seems to capture a European outer periphery, as opposed to the European inner periphery contained in the Structural inertia or de-industrialising regions cluster.

Conclusions and future perspectives

This analysis provides robust quantitative evidence relevant for regional, national and in some cases supra-national policy makers seeking to support innovation, regional development and growth. It offers one set of peer groups for more targeted comparisons of regional strategies and the policies to support them. Among the most important findings are:

- ***Significant within-country differences call for diversity in policy approaches.*** Many different regional typologies co-exist within the same country. This is in part due to country size, in terms of the number of regions, but not always. Countries with regions contained in a larger number of clusters are less well suited to national policy approaches that ignore those distinctions, particularly when policy making and resources are centralised. For example, the US, the UK, Germany and Hungary all have regions in four of the eight clusters in this categorisation. Korea is the country with the highest inter-regional diversity, with regions contained in five different clusters. However, regions in countries with greater STI policy competences and resources to develop strategies more tailored to their individual needs are better able to address these differences (such as in the US or Germany) relative to some of their counterparts in other countries with fewer competences (such as the UK, Hungary or Korea) .

- ***Common strategic challenges for similar regions across countries.*** There are groups of more advanced, leading OECD regions (such as those in the Knowledge hubs category) that reflect both high wealth levels and strong performance on innovation-related variables. These regions will need to continue to build on their current advantages for future growth. Industrial production zones (accounting for around 60% of sample GDP and population) confront a wider set of challenges but share the need to support some form of socio-economic transformation (either reconversion or identification of a new frontier). And Non-S&T-driven regions (all with poor performance on innovation-related variables) need to support the catching-up process in terms of building knowledge generation and absorption capacity to increase wealth levels and/or build conditions for more knowledge-driven growth (OECD, 2011).

- ***Different growth patterns observed in the same cluster.*** When considering the region's GDP *per capita* levels and growth rates, there is a range of performance in each category of regions. For example, while Knowledge hub regions are all around or above national average GDP *per capita* levels, there are examples of regions in the same group (cluster) with both above and below national average GDP *per capita* growth rates. Among the Non-S&T-driven regions, with one exception, these regions are below national GDP *per capita* levels, but there are some that are growing above national averages and others below. This confirms other OECD work that there are many different growth patterns, even among regions with similar characteristics (OECD 2009c).

- ***Geography matters, but so does investment in knowledge.*** Among the least advanced OECD regions in the sample, it is possible to identify an inner European periphery (the cluster of Structural inertia or de-industrialising regions) and an external European periphery (the cluster of Primary-sector-intensive regions). But there are different concepts of "peripherality" in the OECD sample, as in the US context, this may mean being located in the middle and far from coastal hubs. And some regions may have a peripheral location in terms of geography but be nevertheless high income due to natural resources or policies that have promoted knowledge-intensive growth models.

- ***Consistent with prior regional categorisations.*** There are some common findings across different quantitative groupings of regions and innovation using a cluster analysis approach. Capital cities, knowledge and technology hubs, and peripheral regions are consistently found in these studies. Such findings give additional credence to the need for developing policy recommendations that can be tailored somewhat to meet the distinct needs of such groups. It is interesting to note that the analysis developed in this paper is very much consistent with the findings included in the Regional Innovation Monitor (RIM) Annual Report (2011), where a cluster analysis is developed by also taking into account indicators measuring non-technological innovation. In particular, the regions contained in the cluster *Primary-sector-intensive regions* are also grouped together in that analysis, even with the additional variables used in the RIM report that those regions might be specialised in non-technological innovation.

Future regional groupings using statistical cluster analyses for OECD regions could involve several scenarios to enrich our understanding of regional performance.

- ***Dynamic dimension.*** One approach is to conduct the analysis in two periods of time, so as to understand the persistent or dynamic nature of these regional groupings. Do some regions change relative to their peers? What strategies, or lack of strategies, account for this change?

- ***Different peer groups for different purposes.*** This peer group was developed with the goal of highlighting the diversity of regional profiles in a general sense within and across OECD member countries. However, depending on the type of peer group being sought, other groupings could be developed. For example, one approach would be to group regions based on structural characteristics and then to analyse their efficiency at transforming innovation inputs into outputs or outcomes. Another type of peer analysis may seek to group regions by their economic growth and identify the role of innovation-related variables. And yet another may seek to include institutional or policy variables that relate the regional competencies in innovation policy or the type of policy mix with success in innovation-related variables and economic growth. There are numerous important research questions for which such peer groupings could be useful in helping to identify regions for more in-depth policy comparisons.

- ***Additional variables.*** A future analysis could add new indicators collected or developed by the OECD. The Regional Database reflects data availability in OECD countries, and unfortunately many of them lack basic indicators relevant for innovation-related analysis, including those being developed to capture non-technological innovation, entrepreneurship and other related concepts like creativity. A region's ability to attract high-skilled labour is yet another theme of increasing interest among OECD regions. In addition to adding variables that the OECD may collect from member countries in the future, there are some variables that may be generated by the OECD. Data on scientific publications could be obtained through regionalisation of existing OECD databases. The connectivity of regions in global networks is another critical area for further research. Statistics on co-invention and co-publication networks could be used to characterise these global linkages.

NOTES

1. The OECD Regional Database does not contain indicators that could be used to describe the systemic aspects (inter-linkages) of a regional innovation "system." In order to capture some level of interaction

2. Unfortunately, a number of variables commonly used in other analyses of EU regions are not available for many OECD member countries. They include, for example, additional variables of human capital (such as life-long learning, human resources in science and technology) and measures of innovation activity strictly speaking (based on innovation survey data).

3. Population density was used but is not the ideal measure for capturing agglomeration. The share of the region's population living in urban communities would better capture the degree of population agglomeration. This is particularly true for many vast regions such as in the US, Australia, or Canada, for example, where most of the population is in fact in urban areas but a large share of the land mass has minimal settlement. The information to calculate this variable is not available for some OECD regions, for which population information is drawn from Eurostat. As an alternative, we tested a variable measuring the *Degree of Rurality*. It captures the percentage of a region's population living in rural communities (i.e. those with a population density below 150). Moreover, while the Degree of Rurality appears to be an accurate measure for regions with municipalities that are not too large, the case in European and Canadian TL2 regions, it is less accurate for many Western US states (TL2 regions) where the calculations result in several states having 100% of the population living in rural communities when in reality the vast majority of the population lives in urban settings. In the analysis, using the Degree of Rurality instead of population density also resulted in some changes in regional groupings that went against the interest of the analysis of finding relevant groups for policy recommendations. For these reasons, population density was used in the final selection.

4. The OECD Regional Database uses regionalised patent data of the REGPAT database which is derived from the European Patent Office. For more information see Maraut *et al.* (2008).

5. In one of the progressive trials, the Share of Employment in the Public Sector was excluded to reduce the number of variables related to the regional employment structure so as to better balance the variables capturing different dimensions of the region (structure, inputs, outputs). However, this variable appeared to add a significant contribution in terms of inter-regional diversity within countries which is highly relevant for national and regional policy recommendations concerning innovation support. Therefore, this variable was maintained in the final selection.

6 . Employment in high-technology manufacturing (which includes both high and medium-high technology sectors) corresponds to the following ISIC Divisions/ Groups/Classes: 2423 Manufacture of pharmaceuticals, medicinal chemicals and botanical products; 30 Manufacture of office machinery and computers; 32 Manufacture of radio, television and communication equipment and apparatus; 33 Manufacture of medical, precision and optical instruments, watches and clocks; 353 Manufacture of aircraft and spacecraft.

7. Employment in knowledge-intensive services includes employment in the following ISIC divisions: 61 Water transport, 62 Air transport, 64 Post and telecommunications, 65 Financial intermediation, except insurance and pension funding, 66 Insurance and pension funding, except compulsory social security, 67 Activities auxiliary to financial intermediation, 70 Real estate activities, 71 Renting of machinery and equipment without operator and of personal and household goods, 72 Computer and related activities, 73 Research and development, 74 Other business activities, 80 Education, 85 Health and social work and 92 Recreational, cultural and sporting activities.

8. They include: Yukon Territory, Northwest Territories and Nunavut (Canada), Ceuta and Melilla (Spain), Aland (Finland), Corsica (France), Valle d'Aosta (Italy), Algarve, the Azores and Madeira (Portugal).

9. Calculation of sample shares for regions in countries that were members of the OECD as of January 2010.

ANNEX A

Table A.1. **Summary of approaches for other innovation-related groupings of regions**

Authors	Considered regions	Statistical technique	Data source	Considered variables	Obtained typology
Clarysse and Muldur (1999)	EU-15: NUTS 1 (BE, DE, UK) and NUTS 2 (rest)	Factorial and cluster	Eurostat Regions	GDP *per capita*, agricultural employment, total R&D, patents, GDP variation, patents variation, unemployment variation	6 groups: industry leaders, clampers-on, slow grower, economic catcher-up, laggers behind
ECOTEC (2005)	EU-27: NUTS 2 (most) and NUTS 1 (if NUTS 2 not available)	Two different methods: *i*) Z-score analysis; *ii*) three cluster analyses: rescaled data for four individuals, two compound indicators and average of the six indicators	Eurostat Regions (supplemented with contacts at national statistics agencies)	3 indicators of R&D: R&D expenditure, R&D staff, HRST core. And three indicators of innovation: employment medium- and high-tech manufacturing, employment in knowledge-intensive services, population with tertiary education	*i*) Z-score analysis: five types of areas: lack of capacity, average capacity, rich innovation, rich R&D and knowledge centres. *ii*) Cluster analysis: five clusters in each of the three analyses
Hollanders (2003)	EU-15: 171 regions (NUTS 1 and 2)	Cluster	Eurostat Regions and CIS II innovation survey	14 variables: tertiary education, life-long learning, medium- and high-tech manufacturing employment, employment in knowledge-intensive services, public R&D expenditure, business R&D expenditure, patents, high-tech patents, innovative companies in manufacturing, innovative companies in services, innovation costs in manufacturing, innovation costs in services, sales of products new to the firm in manufacturing and *per capita* GDP	6 groups: 2 high-tech groups with three regions each; and four others with a much higher number of regions, especially those located close to the EU average or below
Brujin and Lagendijk (2005)	EU-15: NUTS 2	Factorial and cluster	Eurostat Regions	Level and variation of: *per capita* GDP, GDP per employee, workforce with tertiary education, students of tertiary education, R&D expenditure, employment in high-tech manufacturing, employment in technology-intensive services, employment in life-long learning, patents	6 groups: with a very strong diversified position, with a strong position in knowledge-intensive services, with strong growth in knowledge-intensive services, with a strong position in high-tech sectors, with strong growth in high-tech sectors and those who stay behind

Table A.1. **Summary of approaches for other innovation-related groupings of regions** (*cont*.)

Authors	Considered regions	Statistical technique	Data source	Considered variables	Obtained typology
Muller and Nauwelaers (2005)	EU-12 (enlargement)	Double factorial: *i*) with five variables included in knowledge creation; *ii*) with the factor of knowledge creation and the 20 remaining variables	Eurostat Regions; PATDPA own holdings, SCI, eEuropesources by Fraunhofer ISI; and Merit	25 variables arranged in five groups: knowledge creation, knowledge absorption, diffusion of knowledge, demand of knowledge and governance	5 groups: capitals, with tertiary growth potential, qualified manufacturing platforms, with industrial challenges, agricultural laggards
Hollanders (2007)	EU-25: 206 regions NUTS 1 and 2	Hierarchical clustering	Eurostat Regions	6 indicators: HRST, life-long learning, public R&D expenditure, business R&D expenditure, employment in medium- and high-tech manufacturing, employment in high-tech services, patents	12 groups for innovation performance
Martinez-Pellitero (2007)	EU-15: NUTS 1 and 2	Factorial and cluster	IAIF-RIS (EU) base made from Eurostat Regions (with estimates of missing values), supplemented by Infostate and Economic Freedom	25 variables, grouped into six factors: national environment, regional environment, innovative companies, universities, public administration and demand	ten groups, grouped in turn by the author into three categories: atypical (for highlighting positively in some of the factors), intermediate and least developed

Source: Navarro M., J. J. Gibaja., R. Aguado, and B. Bilbao (2008) *Pattern of Innovation in the EU-25 Regions: a Typology and Policy Recommendation*s, Orkestra Working Papers Series in Territorial Competitiveness, Number 2008-04, Deusto Foundation, Donostia/San Sebastian.Navarro *et al*. 2008, Orkestra working paper.

Box A.1. **Innovation-related typology of European regions (Navarro *et al.*, 2008)**

- **Restructuring industrial regions with strong weaknesses:** 31 regions with low levels of income, high weight of the manufacturing sector, low levels of tertiary education, life-long learning, accessibility to knowledge, human resources in science and technology and expenditure on R&D.

- **Regions with a weak economic and technological development:** 38 regions with low level of economic and technological development. The *per capita* income, R&D intensity, tertiary education, employment rate, life-long learning, and human resources in science and technology are lower than the EU-25 average. Besides, these regions have a low population density and low accessibility to knowledge. With some exceptions, the least developed EU-25 regions are in this group. The weight of industry is very light for this group: some regions rely on the service sector (mainly tourism) while others rely on agriculture.

- **Regions with average economic and technological performance:** 45 regions with economic and technological development close to the average values of EU-25. However, the performance of these regions is heterogeneous, including a wider variability among regional production structures. Some regions are specialised in industry while others in services or in advanced agriculture.

- **Advanced regions, with a certain industrial specialisation:** 33 regions with a good performance in economic development and a certain industrial specialisation. Many regions in this group have traditionally had a strong industrial sector. These regions have an industrial base in medium-high and high-tech manufacturing, with strong development in R&D activities. Alternatively, other regions have shifted their industrial activities towards new growing sectors. On average, these regions have a high level of accessibility to knowledge, high population density and high R&D expenditures, shared by all agents of their RIS.

- **Innovative regions, with a high level of economic and technological development:** ten regions of Northern Europe. The main feature of this group is its high level of economic and technological development, which locates them at the European vanguard in spite of their geographical position, very far from the centre of Europe. These regions have high educational levels and life-long learning is widespread. Expenditures on R&D are high, as is patent creation. On average, the RIS is well balanced between its main agents or components (firms, universities and public administration).

- **Capital regions, with a certain specialisation in high value-added services:** 16 regions that encompass mainly national capitals. They have a great importance culturally, politically and economically and act as attractors of young qualified professionals from the rest of the country and even from the rest of the world.

- **Innovative capital-regions, specialised in high value-added services:** this group contains the most developed capital-regions in the EU-25 and regions that have turned into “knowledge hubs” or “national service hubs”. On average, these regions have high levels of income, tertiary education, life-long learning, accessibility to knowledge, population density and patents. At the same time, R&D expenditures are very high, concentrated mainly in the university and the public sector. Their sector specialisation is in high-tech services and financial and business services.

Source: Navarro M., J. J. Gibaja., R. Aguado, and B. Bilbao (2008) *Pattern of Innovation in the EU-25 Regions: a Typology and Policy Recommendation*s, Orkestra Working Papers Series in Territorial Competitiveness, Number 2008-04, Deusto Foundation, Donostia/San Sebastian.

Box A.2. **Innovation-related typology of European regions (Wintjes and Hollanders, 2010)**

- **Metropolitan knowledge-intensive services (KIS) regions:** 23 regions in densely populated metropolitan areas in Western Europe. These regions perform above average on absorption capability and average on both diffusion capacity and accessibility to knowledge. These regions show high rates of urbanisation and their level of economic performance is highest of all regions. Many regions serve as their country's capital region.

- **Knowledge absorbing regions:** 76 regions mostly in France, British Isles, Benelux and Northern Spain. These regions show average performance on absorption capability, diffusion capacity and accessibility to knowledge. Their level of economic performance is just above average.

- **Public knowledge centres:** 16 regions, mostly in Eastern Germany and metropolitan areas in Eastern Europe. These regions show average performance on both absorption capability and diffusion capacity and above average on accessibility to knowledge. Their level of economic performance is close to average and economic growth has been strong.

- **Skilled industrial Eastern EU regions:** 44 regions in Eastern Europe. These regions perform below average on both absorption capability and diffusion capacity and average on accessibility to knowledge. They are rapidly catching-up from low levels of economic performance.

- **High-tech regions:** 17 R&D-intensive regions in Germany, Finland, Sweden and the Netherlands. These regions perform above average on absorption capability, diffusion capacity and accessibility to knowledge. Their level of economic performance is above average.

- **Skilled technology regions:** 38 regions in Germany, Northern Italy and Austria. These regions perform average on absorption capability, diffusion capacity and accessibility to knowledge. Their level of economic performance is above average but their growth record has been below average.

- **Traditional Southern regions:** 39 regions in Southern Europe (Portugal, Italy, Greece and Spain). These regions perform below average on absorption capability, diffusion capacity and accessibility to knowledge. Their level of economic development is below average and many regions rely on agricultural and tourism activities.

Source: Wintjes R. and H. Hollanders, (2010) *The Regional Impact of Technological Change in 2020*, Report to the European Commission, Directorate General for Regional Policy, on behalf of the network for European Techno-Economic Policy Support (ETEPS AISBL) http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/2010_technological_change.pdf.

Table A.2. **Spearman rank correlation among cluster analysis variables**

	GDP *per capita*	Popula-tion density	Gross domestic R&D expenditure (as % of GDP)	Business R&D expenditure (as share of total R&D expenditure)	Unem ploym ent rate	PCT applica -tions per million inhabi-tants	% of employ-ment in primary sector	% of employ-ment in public sector	High & medium-high-tech manufact. (as % of total manufact.)	Knowledge -intensive services (as % of total services)	Tertiary education (as % of labour force)	% of employ-ment in manu-facturing
GDP *per capita*	1.00	(0.09)	0.51	0.27	(0.43)	0.66	(0.52)	0.47	0.42	0.61	0.22	(0.54)
Population density	(0.09)	1.00	0.13	0.04	0.08	0.07	(0.46)	(0.26)	0.07	(0.08)	0.14	0.16
Gross domestic R&D expenditure (as % of GDP)	0.51	0.13	1.00	0.50	(0.23)	0.80	(0.49)	0.37	0.48	0.51	0.36	(0.27)
Business R&D expenditure (as share of total R&D expenditure)	0.27	0.04	0.50	1.00	(0.27)	0.58	(0.28)	0.06	0.45	0.26	0.00	0.13
Unemployment rate	(0.43)	0.08	(0.23)	(0.27)	1.00	(0.36)	0.19	(0.06)	(0.17)	(0.24)	0.03	0.09
PCT applications per million inhabitants	0.66	0.07	0.80	0.58	(0.36)	1.00	(0.53)	0.42	0.52	0.61	0.31	(0.25)
% of employment in primary sector	(0.52)	(0.46)	(0.49)	(0.28)	0.19	(0.53)	1.00	(0.35)	(0.40)	(0.40)	(0.30)	0.33
% of employment in public sector	0.47	(0.26)	0.37	0.06	(0.06)	0.42	(0.35)	1.00	0.34	0.61	0.17	(0.66)
High & medium-high-tech manufact. (as % of total manufact.)	0.42	0.07	0.48	0.45	(0.17)	0.52	(0.40)	0.34	1.00	0.48	(0.07)	(0.12)
Knowledge-intensive services (as % of total services)	0.61	(0.08)	0.51	0.26	(0.24)	0.61	(0.40)	0.61	0.48	1.00	0.29	(0.35)
Tertiary education (as % of labor force)	0.22	0.14	0.36	0.00	0.03	0.31	(0.30)	0.17	(0.07)	0.29	1.00	(0.19)
% of employment in manufacturing	(0.54)	0.16	(0.27)	0.13	0.09	(0.25)	0.33	(0.66)	(0.12)	(0.35)	(0.19)	1.00

Notes: Highlighted cells are those with a value of greater than the 0.40 or less than -0.40. List of variables: Employment in High and Medium-High-Technology Manufacturing (HTM) as a Percentage of Total Manufacturing; Employment in Knowledge-intensive Services (KIS) as a Percentage of Total Services; *Per capita* GDP (millions of USD current PPP); Population Density; Business R&D Expenditure as a Share of Total R&D Expenditure; Gross Domestic R&D Expenditure as Percentage of GDP; Unemployment Rate; PCT Patent Applications per Million Inhabitants; Tertiary Education of the Labour Force (ISCED 5 and 6, %); Share of Employment in the Primary Sector: Agriculture, Hunting and Fishing; Share of Employment in the Public Sector: Public Administration and Defence, Compulsory Social Security, Education, Health, and Social Work, Other Community, Social and Personal Service Activities, Private Households with Employed Persons; Share of Employment in Manufacturing: Mining and Quarrying, Manufacturing, Electricity, Gas and Water Supply.

Table A.3. OECD regional categorisation: group averages by variable

Category	Regions	High & medium high-tech manufact. (as % of total manufact.)	Knowledge-intensive services (as % of total services)	GDP *per capita*	Population density	Business R&D expenditure (as % of total R&D expenditure)	Gross domestic R&D expenditure (as % of GDP)	Unemployment rate	PCT applications per million inhabitants	Tertiary education (as % of labour force)	% of employment in primary sector	% of employment in public sector	% of employment in manufacturing
SAMPLE AVERAGE	240	36.2	49.4	34 320	**272**	54.96	**1.65**	6.5	**95**	23.58	**5.03**	32.52	16.42
KNOWLEDGE HUBS													
Knowledge-intensive city/capital districts	9	40.2	54.9	**60 966**	3 494	48.08	2.73	**8.3**	126	32.85	0.00	34.14	**10.16**
Knowledge and technology hubs	29	49.1	56.0	42 559	**225**	74.44	4.14	5.4	292	26.97	2.18	35.72	13.71
INDUSTRIAL PRODUCTION ZONES													
US states with average S&T performance	38	43.1	54.0	43 799	**51**	58.75	1.60	5.2	**97**	17.79	3.16	39.47	9.57
Service and natural resource regions in knowledge-intensive countries	28	30.0	56.0	41 174	**112**	50.09	1.32	3.8	**101**	29.54	**3.80**	36.57	14.17
Medium-tech manufacturing and service providers	49	39.7	49.2	30 770	**245**	62.94	1.54	6.9	**77**	26.90	**3.08**	32.82	17.46
Traditional manufacturing regions	30	35.3	43.7	30 074	**131**	65.31	**1.21**	4.2	**69**	14.77	**4.79**	24.62	24.89
NON-S&T-DRIVEN REGIONS													
Structural inertia or de-industrialising regions	38	27.3	42.9	24 070	**111**	35.04	**0.83**	11.0	**22**	23.88	**6.67**	29.82	17.25
Primary-sector intensive regions	19	20.0	41.0	16 429	**99**	33.24	**0.53**	7.5	**4**	18.59	19.09	23.58	20.26

Notes: Bolded values have very large standard deviations. Latest available year used (generally 2007, but in some cases 2004, 2005 or 2006 depending on data availability). Because of data unavailability regions belonging to the following countries: Australia, Switzerland, Iceland, Japan, Mexico, New Zealand, Turkey, Israel, Chile, Estonia and Slovenia have been dropped. In addition, some OECD regions in countries used in the analysis were dropped due to missing data. They include Yukon Territory, Northwest Territories and Nunavut (Canada), Ceuta and Melilla (Spain), Aland (Finland), Corsica (France), Valle d'Aosta (Italia), Algarve, the Azores and Madeira (Portugal).

List of variables: Employment in High and Medium-High-Technology Manufacturing (HTM) as a Percentage of Total Manufacturing; Employment in Knowledge-intensive Services (KIS) as a Percentage of Total Services; *Per capita* GDP (millions of USD current PPP); Population Density; Business R&D Expenditure as a Share of Total R&D Expenditure; Gross Domestic R&D Expenditure as Percentage of GDP; Unemployment Rate; PCT Patent Applications per Million Inhabitants; Tertiary Education of the Labour Force (ISCED 5 and 6, %); Share of Employment in the Primary Sector: Agriculture, Hunting and Fishing; Share of Employment in the Public Sector: Public Administration and Defence, Compulsory Social Security, Education, Health, and Social Work, Other Community, Social and Personal Service Activities, Private Households with Employed Persons; Share of Employment in Manufacturing: Mining and Quarrying, Manufacturing, Electricity, Gas and Water Supply.

Source: OECD calculations based on OECD Regional Database.

Table A.4. **Number of groups present per country**

Country	Number of groups (clusters) in country	Country	Number of groups (clusters) in country
Austria	2	Korea	5
Belgium	2	Luxembourg	1
Canada	3	Norway	1
Czech Republic	2	Poland	2
Denmark	2	Portugal	2
Finland	2	Slovakia	3
France	3	Spain	2
Germany	4	Sweden	2
Greece	2	The Netherlands	2
Hungary	4	UK	4
Ireland	1	US	4
Italy	3		

Table A.5**. List of regions by group (cluster)**

Country Name	Regional Code	Region Name	Cluster
Knowledge hubs			
Austria	AT13	Vienna, Capital City	Knowledge-intensive city/capital districts
Belgium	BE1	Brussels Capital Region	Knowledge-intensive city/capital districts
Czech Republic	CZ01	Prague	Knowledge-intensive city/capital districts
Germany	DE3	Berlin	Knowledge-intensive city/capital districts
Germany	DE5	Bremen	Knowledge-intensive city/capital districts
Germany	DE6	Hamburg	Knowledge-intensive city/capital districts
Korea	KR01	Capital Region	Knowledge-intensive city/capital districts
United Kingdom	UKI	London	Knowledge-intensive city/capital districts
United States	US11	Washington, D.C.	Knowledge-intensive city/capital districts
Germany	DE1	Baden-Württemberg	Knowledge and technology hubs
Germany	DE2	Bavaria	Knowledge and technology hubs
Germany	DE7	Hesse	Knowledge and technology hubs
Denmark	DK01	Capital Region	Knowledge and technology hubs
Finland	FI18	Southern Finland	Knowledge and technology hubs
Finland	FI19	Western Finland	Knowledge and technology hubs
Finland	FI1A	Northern Finland	Knowledge and technology hubs
France	FR10	Ile-de-France	Knowledge and technology hubs
France	FR62	Midi-Pyrénées	Knowledge and technology hubs
Korea	KR05	Chungcheong Region	Knowledge and technology hubs
Netherlands	NL4	Southern Netherlands	Knowledge and technology hubs
Sweden	SE11	Stockholm	Knowledge and technology hubs
Sweden	SE12	East middle Sweden	Knowledge and technology hubs
Sweden	SE22	South Sweden	Knowledge and technology hubs
Sweden	SE23	West Sweden	Knowledge and technology hubs

Country Name	Regional Code	Region Name	Cluster
United Kingdom	UKH	Eastern	Knowledge and technology hubs
United Kingdom	UKJ	South East	Knowledge and technology hubs
United Kingdom	UKK	South West	Knowledge and technology hubs
United States	US06	California	Knowledge and technology hubs
United States	US09	Connecticut	Knowledge and technology hubs
United States	US10	Delaware	Knowledge and technology hubs
United States	US24	Maryland	Knowledge and technology hubs
United States	US25	Massachusetts	Knowledge and technology hubs
United States	US26	Michigan	Knowledge and technology hubs
United States	US27	Minnesota	Knowledge and technology hubs
United States	US33	New Hampshire	Knowledge and technology hubs
United States	US34	New Jersey	Knowledge and technology hubs
United States	US35	New Mexico	Knowledge and technology hubs
United States	US53	Washington	Knowledge and technology hubs
Industrial production zones			
United States	US01	Alabama	US states with average S&T performance
United States	US02	Alaska	US states with average S&T performance
United States	US04	Arizona	US states with average S&T performance
United States	US05	Arkansas	US states with average S&T performance
United States	US08	Colorado	US states with average S&T performance
United States	US12	Florida	US states with average S&T performance
United States	US13	Georgia	US states with average S&T performance
United States	US15	Hawaii	US states with average S&T performance
United States	US16	Idaho	US states with average S&T performance
United States	US17	Illinois	US states with average S&T performance
United States	US18	Indiana	US states with average S&T performance
United States	US19	Iowa	US states with average S&T performance
United States	US20	Kansas	US states with average S&T performance
United States	US21	Kentucky	US states with average S&T performance
United States	US22	Louisiana	US states with average S&T performance
United States	US23	Maine	US states with average S&T performance
United States	US28	Mississippi	US states with average S&T performance
United States	US29	Missouri	US states with average S&T performance
United States	US30	Montana	US states with average S&T performance
United States	US31	Nebraska	US states with average S&T performance
United States	US36	New York	US states with average S&T performance
United States	US 37	North Carolina	US states with average S&T performance
United States	US38	North Dakota	US states with average S&T performance
United States	US39	Ohio	US states with average S&T performance
United States	US40	Oklahoma	US states with average S&T performance
United States	US41	Oregon	US states with average S&T performance
United States	US42	Pennsylvania	US states with average S&T performance
United States	US44	Rhode Island	US states with average S&T performance
United States	US45	South Carolina	US states with average S&T performance
United States	US46	South Dakota	US states with average S&T performance

Country Name	Regional Code	Region Name	Cluster
United States	US47	Tennessee	US states with average S&T performance
United States	US48	Texas	US states with average S&T performance
United States	US49	Utah	US states with average S&T performance
United States	US50	Vermont	US states with average S&T performance
United States	US51	Virginia	US states with average S&T performance
United States	US54	West Virginia	US states with average S&T performance
United States	US55	Wisconsin	US states with average S&T performance
United States	US56	Wyoming	US states with average S&T performance
Canada	CA46	Manitoba	Service and natural resource regions in knowledge-intensive countries
Canada	CA47	Saskatchewan	Service and natural resource regions in knowledge-intensive countries
Canada	CA48	Alberta	Service and natural resource regions in knowledge-intensive countries
Canada	CA59	British Columbia	Service and natural resource regions in knowledge-intensive countries
Denmark	DK02	Zealand	Service and natural resource regions in knowledge-intensive countries
Denmark	DK03	Region of Southern Denmark	Service and natural resource regions in knowledge-intensive countries
Denmark	DK04	Region of Central Denmark	Service and natural resource regions in knowledge-intensive countries
Denmark	DK05	North Denmark Region	Service and natural resource regions in knowledge-intensive countries
Finland	FI13	Eastern Finland	Service and natural resource regions in knowledge-intensive countries
Korea	KR06	Gangwon Region	Service and natural resource regions in knowledge-intensive countries
Korea	KR07	Jeju Region	Service and natural resource regions in knowledge-intensive countries
Luxembourg	LU00	Luxembourg	Service and natural resource regions in knowledge-intensive countries
Netherlands	NL1	Northern Netherlands	Service and natural resource regions in knowledge-intensive countries
Netherlands	NL2	Eastern Netherlands	Service and natural resource regions in knowledge-intensive countries
Netherlands	NL3	Western Netherlands	Service and natural resource regions in knowledge-intensive countries
Norway	NO01	Oslo and Akershus	Service and natural resource regions in knowledge-intensive countries
Norway	NO02	Hedmark and Oppland	Service and natural resource regions in knowledge-intensive countries
Norway	NO03	Sør-Østlandet	Service and natural resource regions in knowledge-intensive countries
Norway	NO04	Agder Og Rogaland	Service and natural resource regions in knowledge-intensive countries
Norway	NO05	Western Norway	Service and natural resource regions in knowledge-intensive countries
Norway	NO06	Trøndelag	Service and natural resource regions in knowledge-intensive countries
Norway	NO07	Northern Norway	Service and natural resource regions in knowledge-intensive countries
Sweden	SE21	Smaland and the Islands	Service and natural resource regions in knowledge-intensive countries
Sweden	SE31	North Middle Sweden	Service and natural resource regions in knowledge-intensive countries
Sweden	SE32	Middle Norrland	Service and natural resource regions in knowledge-intensive countries
Sweden	SE33	Upper Norrland	Service and natural resource regions in knowledge-intensive countries
Slovakia	SK01	Bratislava Region	Service and natural resource regions in knowledge-intensive countries

Country Name	Regional Code	Region Name	Cluster
United Kingdom	UKM	Scotland	Service and natural resource regions in knowledge-intensive countries
Belgium	BE2	Flanders	Medium-tech manufacturing and service providers
Belgium	BE3	Wallonia	Medium-tech manufacturing and service providers
Canada	CA24	Quebec	Medium-tech manufacturing and service providers
Canada	CA35	Ontario	Medium-tech manufacturing and service providers
Germany	DE9	Lower Saxony	Medium-tech manufacturing and service providers
Germany	DEA	North Rhine-Westphalia	Medium-tech manufacturing and service providers
Germany	DEB	Rhineland-Palatinate	Medium-tech manufacturing and service providers
Germany	DEC	Saarland	Medium-tech manufacturing and service providers
Germany	DED	Saxony	Medium-tech manufacturing and service providers
Germany	DEF	Schleswig-Holstein	Medium-tech manufacturing and service providers
Germany	DEG	Thuringia	Medium-tech manufacturing and service providers
Spain	ES21	Basque Country	Medium-tech manufacturing and service providers
Spain	ES22	Navarre	Medium-tech manufacturing and service providers
Spain	ES30	Madrid	Medium-tech manufacturing and service providers
Spain	ES51	Catalonia	Medium-tech manufacturing and service providers
France	FR21	Champagne-Ardenne	Medium-tech manufacturing and service providers
France	FR22	Picardy	Medium-tech manufacturing and service providers
France	FR23	Upper Normandy	Medium-tech manufacturing and service providers
France	FR24	Centre	Medium-tech manufacturing and service providers
France	FR25	Lower Normandy	Medium-tech manufacturing and service providers
France	FR26	Burgundy	Medium-tech manufacturing and service providers
France	FR30	Nord-Pas-de-Calais	Medium-tech manufacturing and service providers
France	FR41	Lorraine	Medium-tech manufacturing and service providers
France	FR42	Alsace	Medium-tech manufacturing and service providers
France	FR43	Franche-Comté	Medium-tech manufacturing and service providers
France	FR51	Pays de la Loire	Medium-tech manufacturing and service providers
France	FR52	Brittany	Medium-tech manufacturing and service providers
France	FR53	Poitou-Charentes	Medium-tech manufacturing and service providers
France	FR61	Aquitaine	Medium-tech manufacturing and service providers
France	FR63	Limousin	Medium-tech manufacturing and service providers
France	FR71	Rhône-Alpes	Medium-tech manufacturing and service providers
France	FR72	Auvergne	Medium-tech manufacturing and service providers
France	FR82	Provence-Alpes-Côte d'Azur	Medium-tech manufacturing and service providers
Greece	GR3	Attica	Medium-tech manufacturing and service providers
Hungary	HU10	Central Hungary	Medium-tech manufacturing and service providers
Ireland	IE01	Border - Midlands And Western	Medium-tech manufacturing and service providers
Ireland	IE02	Southern and Eastern	Medium-tech manufacturing and service providers
Italy	ITC3	Liguria	Medium-tech manufacturing and service providers
Italy	ITE4	Lazio	Medium-tech manufacturing and service providers
Korea	KR02	Gyeongnam Region	Medium-tech manufacturing and service providers
Korea	KR03	Gyeonbuk Region	Medium-tech manufacturing and service providers
Portugal	PT17	Lisbon	Medium-tech manufacturing and service providers
United Kingdom	UKC	North East	Medium-tech manufacturing and service providers
United	UKD	North West (Including	Medium-tech manufacturing and service providers

Country Name	Regional Code	Region Name	Cluster
Kingdom		Merseyside)	
United Kingdom	UKE	Yorkshire and Humberside	Medium-tech manufacturing and service providers
United Kingdom	UKF	East Midlands	Medium-tech manufacturing and service providers
United Kingdom	UKG	West Midlands	Medium-tech manufacturing and service providers
United Kingdom	UKL	Wales	Medium-tech manufacturing and service providers
United Kingdom	UKN	Northern Ireland	Medium-tech manufacturing and service providers
Austria	AT11	Burgenland	Traditional manufacturing regions
Austria	AT12	Lower Austria	Traditional manufacturing regions
Austria	AT21	Carinthia	Traditional manufacturing regions
Austria	AT22	Styria	Traditional manufacturing regions
Austria	AT31	Upper Austria	Traditional manufacturing regions
Austria	AT32	Salzburg	Traditional manufacturing regions
Austria	AT33	Tyrol	Traditional manufacturing regions
Austria	AT34	Vorarlberg	Traditional manufacturing regions
Czech Republic	CZ02	Central Bohemian Region	Traditional manufacturing regions
Czech Republic	CZ03	Southwest	Traditional manufacturing regions
Czech Republic	CZ04	Northwest	Traditional manufacturing regions
Czech Republic	CZ05	Northeast	Traditional manufacturing regions
Czech Republic	CZ06	Southeast	Traditional manufacturing regions
Czech Republic	CZ07	Central Moravia	Traditional manufacturing regions
Czech Republic	CZ08	Moravskoslezko	Traditional manufacturing regions
Hungary	HU21	Central Transdanubia	Traditional manufacturing regions
Hungary	HU22	Western Transdanubia	Traditional manufacturing regions
Italy	ITC1	Piedmont	Traditional manufacturing regions
Italy	ITC4	Lombardy	Traditional manufacturing regions
Italy	ITD1	Province of Bolzano-Bozen	Traditional manufacturing regions
Italy	ITD2	Province of Trento	Traditional manufacturing regions
Italy	ITD3	Veneto	Traditional manufacturing regions
Italy	ITD4	Friuli-Venezia Giulia	Traditional manufacturing regions
Italy	ITD5	Emilia–Romagna	Traditional manufacturing regions
Italy	ITE1	Tuscany	Traditional manufacturing regions
Italy	ITE2	Umbria	Traditional manufacturing regions
Italy	ITE3	Marche	Traditional manufacturing regions
Korea	KR04	Jeolla Region	Traditional manufacturing regions
Slovakia	SK02	West Slovakia	Traditional manufacturing regions
United States	US32	Nevada	Traditional manufacturing regions
Non S&T driven regions			
Canada	CA10	Newfoundland and Labrador	Structural inertia or de-industrialising regions
Canada	CA11	Prince Edward Island	Structural inertia or de-industrialising regions
Canada	CA12	Nova Scotia	Structural inertia or de-industrialising regions

Country Name	Regional Code	Region Name	Cluster
Canada	CA13	New Brunswick	Structural inertia or de-industrialising regions
Germany	DE4	Brandenburg	Structural inertia or de-industrialising regions
Germany	DE8	Mecklenburg-Western Pomerania	Structural inertia or de-industrialising regions
Germany	DEE	Saxony-Anhalt	Structural inertia or de-industrialising regions
Spain	ES11	Galicia	Structural inertia or de-industrialising regions
Spain	ES12	Asturias	Structural inertia or de-industrialising regions
Spain	ES13	Cantabria	Structural inertia or de-industrialising regions
Spain	ES23	La Rioja	Structural inertia or de-industrialising regions
Spain	ES24	Aragon	Structural inertia or de-industrialising regions
Spain	ES41	Castile and León	Structural inertia or de-industrialising regions
Spain	ES42	Castile-La Mancha	Structural inertia or de-industrialising regions
Spain	ES43	Extremadura	Structural inertia or de-industrialising regions
Spain	ES52	Valencia	Structural inertia or de-industrialising regions
Spain	ES53	Balearic Islands	Structural inertia or de-industrialising regions
Spain	ES61	Andalusia	Structural inertia or de-industrialising regions
Spain	ES62	Murcia	Structural inertia or de-industrialising regions
Spain	ES70	Canary Islands	Structural inertia or de-industrialising regions
France	FR41	Languedoc-Roussillon	Structural inertia or de-industrialising regions
Hungary	HU23	Southern Transdanubia	Structural inertia or de-industrialising regions
Hungary	HU31	Northern Hungary	Structural inertia or de-industrialising regions
Hungary	HU32	Northern Great Plain	Structural inertia or de-industrialising regions
Italy	ITF1	Abruzzo	Structural inertia or de-industrialising regions
Italy	ITF2	Molise	Structural inertia or de-industrialising regions
Italy	ITF3	Campania	Structural inertia or de-industrialising regions
Italy	ITF4	Apulia	Structural inertia or de-industrialising regions
Italy	ITF5	Basilicata	Structural inertia or de-industrialising regions
Italy	ITF6	Calabria	Structural inertia or de-industrialising regions
Italy	ITG1	Sicily	Structural inertia or de-industrialising regions
Italy	ITG2	Sardinia	Structural inertia or de-industrialising regions
Poland	PL22	Silesia	Structural inertia or de-industrialising regions
Poland	PL42	Western Pomerania	Structural inertia or de-industrialising regions
Poland	PL51	Lower Silesia	Structural inertia or de-industrialising regions
Poland	Pl63	Pomerania	Structural inertia or de-industrialising regions
Slovakia	SK03	Central Slovakia	Structural inertia or de-industrialising regions
Slovakia	SK04	East Slovakia	Structural inertia or de-industrialising regions
Greece	GR1	Northern Greece	Primary-sector-intensive regions
Greece	GR2	Central Greece	Primary-sector-intensive regions
Greece	GR4	Nisia Aigaiou - Kriti	Primary-sector-intensive regions
Hungary	HU33	Southern Great Plain	Primary-sector-intensive regions
Poland	PL11	Lodz Province	Primary-sector-intensive regions
Poland	PL12	Mazovia Province	Primary-sector-intensive regions
Poland	PL21	Lesser Poland Province	Primary-sector-intensive regions
Poland	PL31	Lublin Province	Primary-sector-intensive regions
Poland	PL32	Subcarpathian Province	Primary-sector-intensive regions
Poland	PL33	Swietokrzyskie	Primary-sector-intensive regions
Poland	PL34	Podlaskie	Primary-sector-intensive regions

Country Name	Regional Code	Region Name	Cluster
Poland	PL41	Greater Poland	Primary-sector-intensive regions
Poland	PL43	Lubuskie	Primary-sector-intensive regions
Poland	PL52	Opole Province	Primary-sector-intensive regions
Poland	PL61	Kuyavian-Pomeranian Province	Primary-sector-intensive regions
Poland	PL62	Warmian-Masurian Province	Primary-sector-intensive regions
Portugal	PT11	Northern Region	Primary-sector-intensive regions
Portugal	PT16	Central Region	Primary-sector-intensive regions
Portugal	PT18	Alentejo	Primary-sector-intensive regions

Table A.6. **List of regions by country**

Country Name	Region Code	Region Name	Cluster
Austria	AT11	Burgenland	Traditional manufacturing regions
Austria	AT12	Lower Austria	Traditional manufacturing regions
Austria	AT13	Vienna, Capital City	Knowledge-intensive city/capital districts
Austria	AT21	Carinthia	Traditional manufacturing regions
Austria	AT22	Styria	Traditional manufacturing regions
Austria	AT31	Upper Austria	Traditional manufacturing regions
Austria	AT32	Salzburg	Traditional manufacturing regions
Austria	AT33	Tyrol	Traditional manufacturing regions
Austria	AT34	Vorarlberg	Traditional manufacturing regions
Belgium	BE1	Brussels Capital Region	Knowledge-intensive city/capital districts
Belgium	BE2	Flanders	Medium-tech manufacturing and service providers
Belgium	BE3	Wallonia	Medium-tech manufacturing and service providers
Canada	CA10	Newfoundland and Labrador	Structural inertia or de-industrialising regions
Canada	CA11	Prince Edward Island	Structural inertia or de-industrialising regions
Canada	CA12	Nova Scotia	Structural inertia or de-industrialising regions
Canada	CA13	New Brunswick	Structural inertia or de-industrialising regions
Canada	CA24	Quebec	Medium-tech manufacturing and service providers
Canada	CA35	Ontario	Medium-tech manufacturing and service providers
Canada	CA46	Manitoba	Service and natural resource regions in knowledge-intensive countries
Canada	CA47	Saskatchewan	Service and natural resource regions in knowledge-intensive countries
Canada	CA48	Alberta	Service and natural resource regions in knowledge-intensive countries
Canada	CA59	British Columbia	Service and natural resource regions in knowledge-intensive countries
Czech Republic	CZ01	Prague	Knowledge-intensive city/capital districts
Czech Republic	CZ02	Central Bohemian Region	Traditional manufacturing regions
Czech Republic	CZ03	Southwest	Traditional manufacturing regions
Czech Republic	CZ04	Northwest	Traditional manufacturing regions
Czech Republic	CZ05	Northeast	Traditional manufacturing regions

Country Name	Region Code	Region Name	Cluster
Czech Republic	CZ06	Southeast	Traditional manufacturing regions
Czech Republic	CZ07	Central Moravia	Traditional manufacturing regions
Czech Republic	CZ08	Moravskoslezko	Traditional manufacturing regions
Denmark	DK01	Capital Region	Knowledge and technology hubs
Denmark	DK02	Zealand	Service and natural resource regions in knowledge-intensive countries
Denmark	DK03	Region of Southern Denmark	Service and natural resource regions in knowledge-intensive countries
Denmark	DK04	Region of Central Denmark	Service and natural resource regions in knowledge-intensive countries
Denmark	DK05	North Denmark Region	Service and natural resource regions in knowledge-intensive countries
Finland	FI13	Eastern Finland	Service and natural resource regions in knowledge-intensive countries
Finland	FI18	Southern Finland	Knowledge and technology hubs
Finland	FI19	Western Finland	Knowledge and technology hubs
Finland	FI1A	Northern Finland	Knowledge and technology hubs
France	FR10	Ile-de-France	Knowledge and technology hubs
France	FR21	Champagne-Ardenne	Medium-tech manufacturing and service providers
France	FR22	Picardy	Medium-tech manufacturing and service providers
France	FR23	Upper Normandy	Medium-tech manufacturing and service providers
France	FR24	Centre	Medium-tech manufacturing and service providers
France	FR25	Lower Normandy	Medium-tech manufacturing and service providers
France	FR26	Burgundy	Medium-tech manufacturing and service providers
France	FR30	Nord-Pas-de-Calais	Medium-tech manufacturing and service providers
France	FR41	Lorraine	Medium-tech manufacturing and service providers
France	FR42	Alsace	Medium-tech manufacturing and service providers
France	FR43	Franche-Comté	Medium-tech manufacturing and service providers
France	FR51	Pays de la Loire	Medium-tech manufacturing and service providers
France	FR52	Brittany	Medium-tech manufacturing and service providers
France	FR53	Poitou-Charentes	Medium-tech manufacturing and service providers
France	FR61	Aquitaine	Medium-tech manufacturing and service providers
France	FR62	Midi-Pyrénées	Knowledge and technology hubs
France	FR63	Limousin	Medium-tech manufacturing and service providers
France	FR71	Rhône-Alpes	Medium-tech manufacturing and service providers
France	FR72	Auvergne	Medium-tech manufacturing and service providers
France	FR81	Languedoc-Roussillon	Structural inertia/ de-industrialising regions
France	FR82	Provence-Alpes-Côte d'Azur	Medium-tech manufacturing and service providers
Germany	DE1	Baden-Württemberg	Knowledge and technology hubs
Germany	DE2	Bavaria	Knowledge and technology hubs
Germany	DE3	Berlin	Knowledge-intensive city/capital districts
Germany	DE4	Brandenburg	Structural inertia/ de-industrialising regions
Germany	DE5	Bremen	Knowledge-intensive city/capital districts
Germany	DE6	Hamburg	Knowledge-intensive city/capital districts
Germany	DE7	Hesse	Knowledge and technology hubs

Country Name	Region Code	Region Name	Cluster
Germany	DE8	Mecklenburg-Western Pomerania	Structural inertia/ de-industrialising regions
Germany	DE9	Lower Saxony	Medium-tech manufacturing and service providers
Germany	DEA	North Rhine-Westphalia	Medium-tech manufacturing and service providers
Germany	DEB	Rhineland-Palatinate	Medium-tech manufacturing and service providers
Germany	DEC	Saarland	Medium-tech manufacturing and service providers
Germany	DED	Saxony	Medium-tech manufacturing and service providers
Germany	DEE	Saxony-Anhalt	Structural inertia/ de-industrialising regions
Germany	DEF	Schleswig-Holstein	Medium-tech manufacturing and service providers
Germany	DEG	Thuringia	Medium-tech manufacturing and service providers
Greece	GR1	Northern Greece	Primary-sector-intensive regions
Greece	GR2	Central Greece	Primary-sector-intensive regions
Greece	GR3	Attica	Medium-tech manufacturing and service providers
Greece	GR4	Nisia Aigaiou - Kriti	Primary-sector-intensive regions
Hungary	HU10	Central Hungary	Medium-tech manufacturing and service providers
Hungary	HU21	Central Transdanubia	Traditional manufacturing regions
Hungary	HU22	Western Transdanubia	Traditional manufacturing regions
Hungary	HU23	Southern Transdanubia	Structural inertia/ de-industrialising regions
Hungary	HU31	Northern Hungary	Structural inertia/ de-industrialising regions
Hungary	HU32	Northern Great Plain	Structural inertia/ de-industrialising regions
Hungary	HU33	Southern Great Plain	Primary-sector-intensive regions
Ireland	IE01	Border - Midlands and Western	Medium-tech manufacturing and service providers
Ireland	IE02	Southern and Eastern	Medium-tech manufacturing and service providers
Italy	ITC1	Piedmont	Traditional manufacturing regions
Italy	ITC3	Liguria	Medium-tech manufacturing and service providers
Italy	ITC4	Lombardy	Traditional manufacturing regions
Italy	ITD1	Province of Bolzano-Bozen	Traditional manufacturing regions
Italy	ITD2	Province of Trento	Traditional manufacturing regions
Italy	ITD3	Veneto	Traditional manufacturing regions
Italy	ITD4	Friuli-Venezia Giulia	Traditional manufacturing regions
Italy	ITD5	Emilia–Romagna	Traditional manufacturing regions
Italy	ITE1	Tuscany	Traditional manufacturing regions
Italy	ITE2	Umbria	Traditional manufacturing regions
Italy	ITE3	Marche	Traditional manufacturing regions
Italy	ITE4	Lazio	Medium-tech manufacturing and service providers
Italy	ITF1	Abruzzo	Structural inertia/ de-industrialising regions
Italy	ITF2	Molise	Structural inertia/ de-industrialising regions
Italy	ITF3	Campania	Structural inertia/ de-industrialising regions
Italy	ITF4	Apulia	Structural inertia/ de-industrialising regions
Italy	ITF5	Basilicata	Structural inertia/ de-industrialising regions
Italy	ITF6	Calabria	Structural inertia/ de-industrialising regions
Italy	ITG1	Sicily	Structural inertia/ de-industrialising regions
Italy	ITG2	Sardinia	Structural inertia/ de-industrialising regions

Country Name	Region Code	Region Name	Cluster
Korea	KR01	Capital Region	Knowledge-intensive city/capital districts
Korea	KR02	Gyeongnam Region	Medium-tech manufacturing and service providers
Korea	KR03	Gyeonbuk Region	Medium-tech manufacturing and service providers
Korea	KR04	Jeolla Region	Traditional manufacturing regions
Korea	KR05	Chungcheong Region	Knowledge and technology hubs
Korea	KR06	Gangwon Region	Service and natural resource regions in knowledge-intensive countries
Korea	KR07	Jeju Region	Service and natural resource regions in knowledge-intensive countries
Norway	NO01	Oslo and Akershus	Service and natural resource regions in knowledge-intensive countries
Norway	NO02	Hedmark and Oppland	Service and natural resource regions in knowledge-intensive countries
Norway	NO03	Sør-Østlandet	Service and natural resource regions in knowledge-intensive countries
Norway	NO04	Agder Og Rogaland	Service and natural resource regions in knowledge-intensive countries
Norway	NO05	Vestlandet	Service and natural resource regions in knowledge-intensive countries
Norway	NO06	Trøndelag	Service and natural resource regions in knowledge-intensive countries
Norway	NO07	Nord-Norge	Service and natural resource regions in knowledge-intensive countries
Poland	PL11	Lodz Province	Primary-sector-intensive regions
Poland	PL12	Masovia Province	Primary-sector-intensive regions
Poland	PL21	Lesser Poland Province	Primary-sector-intensive regions
Poland	PL22	Silesia	Structural inertia/ de-industrialising regions
Poland	PL31	Lublin Province	Primary-sector-intensive regions
Poland	PL32	Subcarpathian Province	Primary-sector-intensive regions
Poland	PL33	Swietokrzyskie	Primary-sector-intensive regions
Poland	PL34	Podlasie	Primary-sector-intensive regions
Poland	PL41	Greater Poland	Primary-sector-intensive regions
Poland	PL42	Western Pomerania	Structural inertia/ de-industrialising regions
Poland	PL43	Lubuskie	Primary-sector-intensive regions
Poland	PL51	Lower Silesia	Structural inertia/ de-industrialising regions
Poland	PL52	Opole Province	Primary-sector-intensive regions
Poland	PL61	Kuyavian-Pomeranian Province	Primary-sector-intensive regions
Poland	PL62	Warmian-Masurian Province	Primary-sector-intensive regions
Poland	PL63	Pomeranian Province	Structural inertia/ de-industrialising regions
Portugal	PT11	Northern Region	Primary-sector-intensive regions
Portugal	PT16	Central Region	Primary-sector-intensive regions
Portugal	PT17	Lisbon	Medium-tech manufacturing and service providers
Portugal	PT18	Alentejo	Primary-sector-intensive regions
Slovakia	SK01	Bratislava Region	Service and natural resource regions in knowledge-intensive countries
Slovakia	SK02	West Slovakia	Traditional manufacturing regions
Slovakia	SK03	Central Slovakia	Structural inertia/ de-industrialising regions
Slovakia	SK04	East Slovakia	Structural inertia/ de-industrialising regions

Country Name	Region Code	Region Name	Cluster
Spain	ES11	Galicia	Structural inertia/ de-industrialising regions
Spain	ES12	Asturias	Structural inertia/ de-industrialising regions
Spain	ES13	Cantabria	Structural inertia/ de-industrialising regions
Spain	ES21	Basque Country	Medium-tech manufacturing and service providers
Spain	ES22	Navarre	Medium-tech manufacturing and service providers
Spain	ES23	La Rioja	Structural inertia/ de-industrialising regions
Spain	ES24	Aragon	Structural inertia/ de-industrialising regions
Spain	ES30	Madrid	Medium-tech manufacturing and service providers
Spain	ES41	Castile and León	Structural inertia/ de-industrialising regions
Spain	ES42	Castile-La Mancha	Structural inertia/ de-industrialising regions
Spain	ES43	Extremadura	Structural inertia/ de-industrialising regions
Spain	ES51	Catalonia	Medium-tech manufacturing and service providers
Spain	ES52	Valencia	Structural inertia/ de-industrialising regions
Spain	ES53	Balearic Islands	Structural inertia/ de-industrialising regions
Spain	ES61	Andalusia	Structural inertia/ de-industrialising regions
Spain	ES62	Murcia	Structural inertia/ de-industrialising regions
Spain	ES70	Canary Islands	Structural inertia/ de-industrialising regions
Sweden	SE11	Stockholm	Knowledge and technology hubs
Sweden	SE12	East Middle Sweden	Knowledge and technology hubs
Sweden	SE21	Smaland and the Islands	Service and natural resource regions in knowledge-intensive countries
Sweden	SE22	South Sweden	Knowledge and technology hubs
Sweden	SE23	West Sweden	Knowledge and technology hubs
Sweden	SE31	North Middle Sweden	Service and natural resource regions in knowledge-intensive countries
Sweden	SE32	Middle Norrland	Service and natural resource regions in knowledge-intensive countries
Sweden	SE33	Upper Norrland	Service and natural resource regions in knowledge-intensive countries
The Netherlands	NL1	Northern Netherlands	Service and natural resource regions in knowledge-intensive countries
The Netherlands	NL2	Eastern Netherlands	Service and natural resource regions in knowledge-intensive countries
The Netherlands	NL3	Western Netherlands	Service and natural resource regions in knowledge-intensive countries
The Netherlands	NL4	Southern Netherlands	Knowledge and technology hubs
United Kingdom	UKC	North East	Medium-tech manufacturing and service providers
United Kingdom	UKD	North West (Including Merseyside)	Medium-tech manufacturing and service providers
United Kingdom	UKE	Yorkshire and Humberside	Medium-tech manufacturing and service providers
United Kingdom	UKF	East Midlands	Medium-tech manufacturing and service providers
United Kingdom	UKG	West Midlands	Medium-tech manufacturing and service providers
United Kingdom	UKH	Eastern	Knowledge and technology hubs
United Kingdom	UKI	London	Knowledge-intensive city/capital districts
United Kingdom	UKJ	South East	Knowledge and technology hubs

Country Name	Region Code	Region Name	Cluster
United Kingdom	UKK	South West	Knowledge and technology hubs
United Kingdom	UKL	Wales	Medium-tech manufacturing and service providers
United Kingdom	UKM	Scotland	Service and natural resource regions in knowledge-intensive countries
United Kingdom	UKN	Northern Ireland	Medium-tech manufacturing and service providers
United States	US01	Alabama	US states with average S&T performance
United States	US02	Alaska	US states with average S&T performance
United States	US04	Arizona	US states with average S&T performance
United States	US05	Arkansas	US states with average S&T performance
United States	US06	California	Knowledge and technology hubs
United States	US08	Colorado	US states with average S&T performance
United States	US09	Connecticut	Knowledge and technology hubs
United States	US10	Delaware	Knowledge and technology hubs
United States	US11	Washington, D.C.	Knowledge-intensive city/capital districts
United States	US12	Florida	US states with average S&T performance
United States	US13	Georgia	US states with average S&T performance
United States	US15	Hawaii	US states with average S&T performance
United States	US16	Idaho	US states with average S&T performance
United States	US17	Illinois	US states with average S&T performance
United States	US18	Indiana	US states with average S&T performance
United States	US19	Iowa	US states with average S&T performance
United States	US20	Kansas	US states with average S&T performance
United States	US21	Kentucky	US states with average S&T performance
United States	US22	Louisiana	US states with average S&T performance
United States	US23	Maine	US states with average S&T performance
United States	US24	Maryland	Knowledge and technology hubs
United States	US25	Massachusetts	Knowledge and technology hubs
United States	US26	Michigan	Knowledge and technology hubs
United States	US27	Minnesota	Knowledge and technology hubs
United States	US28	Mississippi	US states with average S&T performance
United States	US29	Missouri	US states with average S&T performance
United States	US30	Montana	US states with average S&T performance
United States	US31	Nebraska	US states with average S&T performance
United States	US32	Nevada	Traditional manufacturing regions
United States	US33	New Hampshire	Knowledge and technology hubs
United States	US34	New Jersey	Knowledge and technology hubs
United States	US35	New Mexico	Knowledge and technology hubs
United States	US36	New York	US states with average S&T performance
United States	US37	North Carolina	US states with average S&T performance
United States	US38	North Dakota	US states with average S&T performance
United States	US39	Ohio	US states with average S&T performance
United States	US40	Oklahoma	US states with average S&T performance
United States	US41	Oregon	US states with average S&T performance
United States	US42	Pennsylvania	US states with average S&T performance
United States	US44	Rhode Island	US states with average S&T performance
United States	US45	South Carolina	US states with average S&T performance

Country Name	Region Code	Region Name	Cluster
United States	US46	South Dakota	US states with average S&T performance
United States	US47	Tennessee	US states with average S&T performance
United States	US48	Texas	US states with average S&T performance
United States	US49	Utah	US states with average S&T performance
United States	US50	Vermont	US states with average S&T performance
United States	US51	Virginia	US states with average S&T performance
United States	US53	Washington	Knowledge and technology hubs
United States	US54	West Virginia	US states with average S&T performance
United States	US55	Wisconsin	US states with average S&T performance
United States	US56	Wyoming	US states with average S&T performance

REFERENCES

Asheim, B. (2007), Sistemas regionales de innovación y bases de conocimiento diferenciadas: un marco teórico analítico (pp. 65-89). In Buesa, M. and Heijs, J. (coord.) *Sistemas regionales de innovación: nuevas formas de análisis y medición*. Madrid: Fundación de las Cajas de Ahorros.

Bruijn P., A. Lagendijk (2005), "Regional Innovation Systems in the Lisbon Strategy", *European Planning Studies*, 13(8): 1153-1172.

Clarysse B., U. Muldur (1999), *Regional Cohesion in Europe? An analysis of How EU Public RTD Support Influences the Techno-Economic Regional Landscape,* European Commission, Directorate General for Science, Research and Development, Working Paper N. 1, January.

Cooke, P. (1998), "Introduction: origins of the concept" in Braczyk, H.J. et al. *Regional Innovation Systems. The role of governances in a globalised world.* London: UCL Press, pp. 2-25.

Dunnewijk T., H. Hollanders and R. Wintjes, (2008), "Benchmarking Regions in the Enlarged Europe: Diversity in Knowledge Potential and Policy Options", in C. Nauwelaers and R. Wintjes (eds), *Innovation Policy in Europe: Measurement and Strategy*, Edward Elgar Publishing, Cheltenham.

ECOTEC (2005), *The Territorial Impact of EU Research and Development Policies*, ESPON 2.1.12, available online: *http://www.espon.eu/export/sites/default/Documents/Projects/ESPON2006Projects/PolicyImpactProjects/RDPolicyImpact/2.ir_2.1.2.pdf.*

Hollanders H. (2007) *2006 European Regional Innovation Scoreboard (2006 RIS*) Maastricht Economic Research Institute of Innovation and Technology, Maastricht, the Netherlands.

Hollanders, H., S. Tarantola S. and A. Loschky, (2009) *Regional Innovation Scoreboard (RIS) (2009)*, Pro Inno Europe, Bruxelles.

Hollanders, H., S. Tarantola S. and A. Loschky, (2009) *Regional Innovation Scoreboard (RIS) (2009) – Methodology Report*, Pro Inno Europe, Bruxelles.

Kaufman L. and J. Rousseeuw, (2005), *Finding Groups in Data. An Introduction to Cluster Analysis*, Wiley Ed, New York.

Maraut, S., H. Dernis, C. Webb, V. Spieza, and D. Guellec (2008), "The OECD REGPAT Database: A Presentation", *STI Working Paper,* 2008/2, OECD Publishing.

Martinez-Pellitero, M. (2002), *Recursos y Resultados de los Sistemas de Innovación : Elaboración de una Tipología de sistemas Regionales de Innovación en Espana*. IAIF working paper n. 34.

Muller E., C. Nauwelaers (2005), *Enlarging the ERA: Identifying Priorities for Regional Policy Focusing on research and Technological Development in the New Member States and Candidate Countries*, Final report COP6-CT.2004. 00001.

Navarro M., J. J. Gibaja, R. Aguado, and B. Bilbao (2008) *Patterns of Innovation in the EU-25 Regions: a Typology and Policy Recommendations*, Orkestra Working Papers Series in Territorial Competitiveness, Number 2008-04, Deusto Foundation, Donostia/San Sebastian.

OECD (2005) *The Measurement of Scientific and Technological Activities: Oslo Manual, Guidelines for Collecting and Interpreting Innovation Data*, Third edition, a joint publication of OECD and Eurostat, OECD Publishing, Paris.

OECD (2009a), *2009 Regions at a Glance*, OECD Publishing, Paris.

OECD (2009b), Statistical Indicators of Regional Innovation: Challenges for Future Analysis, GOV/TDPC/RD(2009)4.

OECD (2009c), Growing Lagging Regions, GOV/TDPC/TI(2009)2.

OECD (2010), *Measuring Innovation: A New Perspective*, OECD Publishing, Paris.

OECD (2011), *Regions and Innovation Policy*, OECD Reviews of Regional Innovation, OECD Publishing, Paris.

Regional Innovation Monitor (RIM) (2011), *2010 Annual Report*, jointly prepared by Technopolis Group Belgium, Fraunhofer ISI and UNU-MERIT to the European Commission Enterprise and Industry Directorate-General, available online at *http://www.rim-europa.eu/index.cfm?q=p.file&r=d4e298554498e9f8989647745d4492f9*.

Tödtling, F. and M. Trippl (2005). "One size fits all? Towards a differentiated regional innovation policy approach" *Research Policy*, 34: 1203-1219.

Wintjes R. and H. Hollanders, (2010) *The Regional Impact of Technological Change in 2020*, Report to the European Commission, Directorate General for Regional Policy, on behalf of the network for European Techno-Economic Policy Support (ETEPS AISBL), *http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/2010_technological_change.pdf*.