European Commission

Regional **Innovation** Scoreboard 2014

Enterprise and Industry

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Regional **Innovation** Scoreboard 2014

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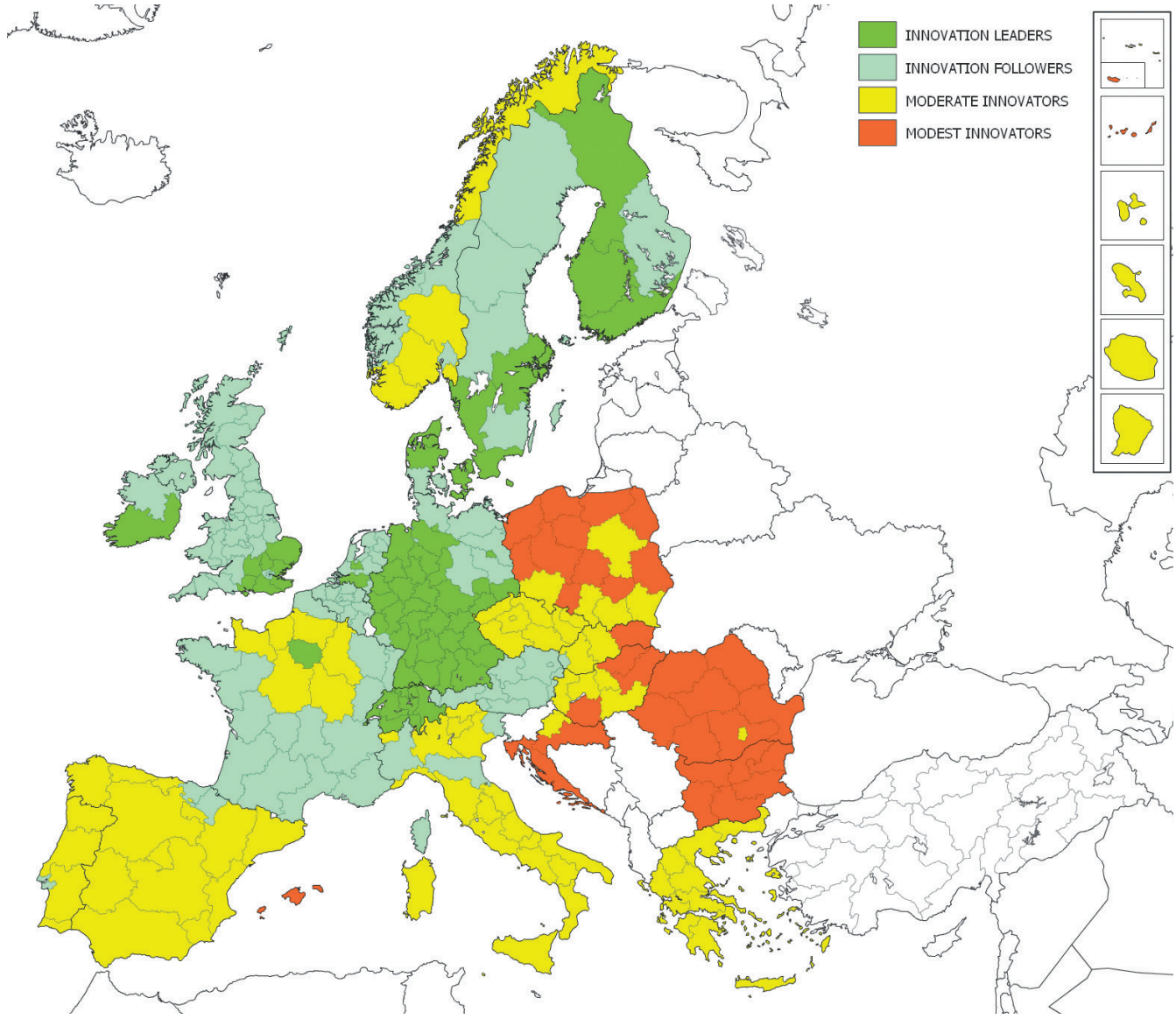
Executive summary

This 6th edition of the Regional Innovation Scoreboard (RIS) provides a comparative assessment of innovation performance across 190 regions of the European Union, Norway and Switzerland. The RIS accompanies the Innovation Union Scoreboard (IUS) which benchmarks innovation performance at the level of Member States.

Where the IUS provides an annual benchmark of Member States' innovation performance, regional innovation benchmarks are less frequent and less detailed due to a general lack of innovation data at the regional level. The Regional Innovation Scoreboard addresses this gap and provides statistical facts on regions' innovation performance. Previous RIS reports have been published in 2002, 2003, 2006, 2009 and 2012. The RIS 2014 provides both an update of the RIS 2012 but also introduces some changes in the measurement methodology.

Regional performance groups

Similar as in the IUS where countries are classified into 4 different innovation performance groups, Europe's regions have also been classified into Regional Innovation leaders (34 regions), Regional Innovation followers (57 regions), Regional Moderate innovators (68 regions) and Regional Modest innovators (31 regions).



Map created with Region Map Generator

The most innovative regions are typically in the most innovative countries

Despite the fact that there is variation in regional performance within countries, regional performance groups do match the corresponding IUS country performance groups quite well. Most of the regional innovation leaders and innovation followers are located in the IUS Innovation leaders and followers and most of the regional moderate and modest innovators are located in the IUS Moderate and Modest innovators.

However, 14 countries have regions in two performance groups and four Member states, France, Portugal, Slovakia and Spain, have regions in 3 different regional performance groups, which indicate more pronounced innovation performance differences within countries. Only Austria, Belgium, Bulgaria, Czech Republic, Greece and Switzerland show a relatively homogenous innovation performance as all regions in those countries are in the same performance group.

All the EU regional innovation leaders (27 regions) are located in only eight EU Member States: Denmark, Germany, Finland, France, Ireland, Netherlands, Sweden and United Kingdom. This indicates that innovation excellence is concentrated in relatively few areas in Europe.

For most regions innovation has improved over time

An analysis over the seven-year period 2004-2010 shows that innovation performance has improved for most regions (155 out of 190). For more than half of the regions (106) innovation has grown even more than the average of the EU. At the same time innovation performance worsened for 35 regions scattered across 15 countries. For 4 regions performance even declined at a very sharp rate of more than -10% on average per year.

Drivers of regional innovation

Additional analyses have explored the impact of potential drivers of regional innovation. Regions where people have a more positive attitude to new things and ideas (European Social Survey) have favourable conditions for both entrepreneurship and innovation. Regions with a well-developed system of public financial support for innovation with high shares of innovating companies receiving some form of public financial support are also more innovative than regions where fewer firms benefit from such support. With a lack of finance being one of the most important barriers to innovation this result shows in regions with a lack of private funding policies providing public funding can be successful in promoting innovation.

Regional research and innovation potential through EU funding

The analysis of the use of EU funding for research and innovation in the last programming period 2007-2013 distinguishes among 5 typologies of regions: Framework Programme leading absorbers (15.85%); Structural Funds (SFs) leading users targeting research and technological activities (3.66%); Structural Funds leading users prioritising services for business innovation and commercialisation (6.10%); Users of SF for both types of RTDI priorities with similar medium-to-high amounts of SF committed to projects targeting both of the above fields (3.66%); and regions with low use of Structural Funds, which make up the majority of regions included in the analysis (71%).

To understand the extent to which the EU funding is reflected in the innovation performance of the recipient regions, a cross-analysis of the region's absorption of EU funding and their results in the framework of the RIS 2014 was performed. The analysis shows that, while there are several regions that can be classified as pockets of excellence in terms of their FP participation and regional innovation capacity, only a few of the regions that are using EU funds for business innovation more intensely are above average innovation performers. The greatest majority of the EU regions in the analysed sample are low absorbers of FP funding and SFs and exhibit moderate to modest levels of innovation. These findings point to the fact that the "regional innovation paradox" continues to be a dominant feature of the European regional innovation landscape that calls for more policy attention in the future programming period.

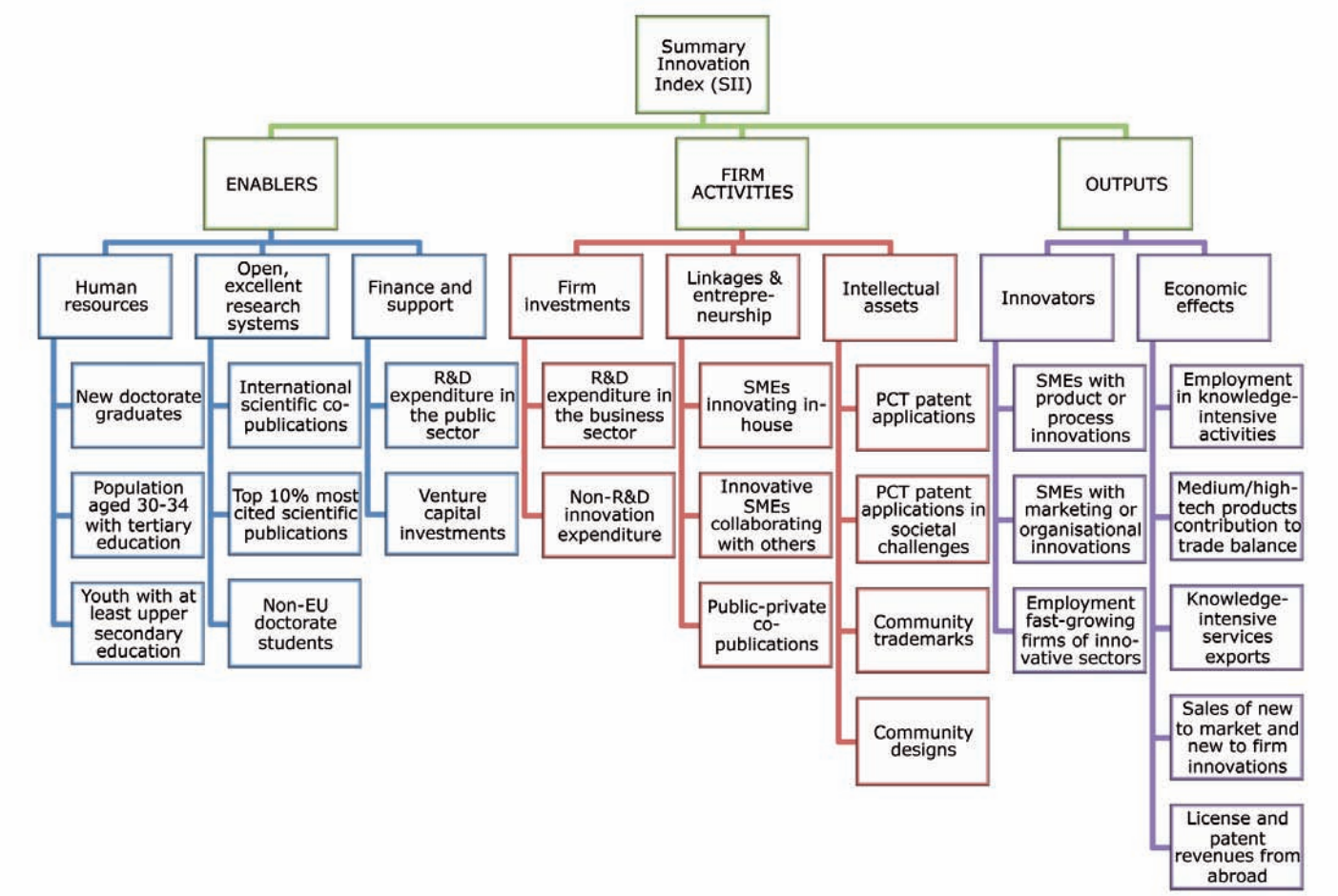
RIS methodology

The RIS 2014 replicates the IUS methodology used at national level to measure performance of the EU regional systems of innovation distinguishing between Enablers, Firm activities and Outputs. The RIS 2014 uses data for 11 of the 25 indicators used in the IUS for 190 regions across Europe (22 EU member states together with Norway and Switzerland).

1. Introduction

The Regional Innovation Scoreboard is a regional extension of the Innovation Union Scoreboard. The Innovation Union Scoreboard (IUS) gives a comparative assessment of the innovation performance at the country level of the EU Member States and other European countries. Innovation performance is measured using a composite indicator – the Summary Innovation Index – which summarizes the performance of a range of different indicators. IUS distinguishes between 3 main types of indicators – Enablers, Firm activities and Outputs – and 8 innovation dimensions, capturing in total 25 indicators. The measurement framework is presented in Figure 1.

Figure 1: Measurement framework of the Innovation Union Scoreboard



Innovation also plays an important role at the regional level as regions are important engines of economic development. Economic literature has identified three stylized facts: 1) innovation is not uniformly distributed across regions, 2) innovation tends to be spatially concentrated over time and 3) even regions with similar innovation capacity have different economic growth patterns. Regional Systems of Innovation (RSI) have become the focus of many academic studies and policy reports.[1] Attempts to monitor RSIs and region's innovation performance are severely hindered by a lack of regional innovation data.

The Regional Innovation Scoreboard (RIS) addresses this gap and provides statistical facts on regions' innovation performance. Following the revision of the European Innovation Scoreboard (EIS) into the Innovation Union Scoreboard in 2010, the RIS 2012 provided both an update of earlier RIS reports and it resembled the revised IUS measurement framework at the regional level. Regions were ranked in four groups of regions showing different levels of regional innovation performance. The RIS 2014 provides both an update of the RIS 2012 but also introduces some changes in the measurement methodology. First, the imputation techniques for estimating missing data have been modified with the aim to standardize the imputation techniques and make them more transparent. Secondly, group membership is not, as in the RIS 2012, determined by a statistical cluster analysis, but by applying the same method as used in the IUS by grouping regions based on their relative performance to the EU.

Section 2 discusses the availability of regional data, the indicators that are used for and the regions which are included in the RIS 2014. Section 3 presents results for the Regional Innovation Index and group membership in four distinct regional innovation performance groups. Section 3 also discusses performance trends over time. Section 4 provides a separate analysis on the relationship between the use of two main EU funding instruments and innovation performance: the 7th Framework Programme for Research and Technological Development (FP7) and the Structural Funds (SF). The results show that the "regional innovation paradox" continues, i.e. that the majority of regions receiving large amounts of FP and SF funds are less innovative. Section 5 discusses the full methodology for calculating the Regional Innovation Index and for imputing missing data.

The years used in the titles of the previous RIS reports refer to the years in which the individual editions were published, i.e. RIS 2012, RIS 2009 and RIS 2006. These dates do not refer to the reference years for data collection as the timeliness of regional data is lagging several years behind the date of publication of the RIS report. For the RIS 2014 most recent data are referring to 2012 for 1 indicator, 2011 for 1 indicator, 2010 for 8 indicators and 2008 for 1 indicator. A reference to the most recent performance year in this report should thus be interpreted as referring to the year 2010. The seven-year period used in the growth analyses refers to 2004-2010.

[1] *Annex 6 provides a more detailed discussion of Regional Systems of Innovation.*

2. RIS indicators, regions and data availability

This chapter discusses the indicators used in the Regional Innovation Scoreboard 2014, the regional coverage and regional data availability.

2.1 Indicators

Regional innovation performance ideally should be measured using regional data for the same indicators used in the Innovation Union Scoreboard (IUS), which measures innovation performance at the country level. However, for many indicators used in the IUS regional data are not available either because these data are not collected at the regional level for all countries or because they are not collected at all.

The Regional Innovation Scoreboard (RIS) is therefore limited to using regional data for 11 of the 25 indicators used in the IUS (Table 1). For several indicators slightly different definitions have been used as regional data would not be available if the definitions would be the same as in the IUS. For the 2 indicators using data from the Community Innovation Survey (CIS) – Non-R&D innovation expenditures and Sales share of new to market and new to firm innovations – the data refer to SMEs only and not to all companies.[2]

For the indicator measuring attainment in tertiary level education detailed regional data for the age group between 25 and 34 years of age are not available and instead the indicator uses data for the broader age group between 25 and 64 years of age. For the indicator on PCT patent applications no regional data are available and instead regional data on EPO patent applications are used. For the indicator on employment in knowledge-intensive activities no regional data are available and instead employment in medium-high and high-tech manufacturing and knowledge-intensive services is used. Compared to the RIS 2012 one indicator is no longer used as for public-private co-publications no new data have become available. The indicators are explained in more detail in Annex 1 and Annex 3 shows performance maps for each of the indicators. Section 2.3 presents a more detailed discussion of the availability of regional data for the indicators used in the RIS.

[2] *Regional CIS data are not publicly available and have been made explicitly available for the Regional Innovation Scoreboard by national statistical offices. The CIS assigns the innovation activities of multi-establishment enterprises to the region where the head office is located. There is a risk that regions without head offices score lower on the CIS indicators as some of the activities in these regions are assigned to those regions with head offices. In order to minimize this risk the regional CIS data excludes large firms (who are more likely to have multiple establishments in different regions) and focuses on SMEs only. More details are available in the RIS 2014 Methodology report.*

Table 1: A comparison of the indicators included in IUS and RIS

Innovation Union Scoreboard	Regional Innovation Scoreboard
ENABLERS	
Human resources	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	Regional data not available
Percentage population aged 30-34 having completed tertiary education	Percentage population aged 25-64 having completed tertiary education
Percentage youth aged 20-24 having attained at least upper secondary level education	Regional data not available
Open, excellent and attractive research systems	
International scientific co-publications per million population	Regional data not available
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	Regional data not available
Non-EU doctorate students as a % of all doctorate students	Regional data not available
Finance and support	
R&D expenditure in the public sector as % of GDP	Identical
Venture capital (early stage, expansion and replacement) as % of GDP	Regional data not available
FIRM ACTIVITIES	
Firm investments	
R&D expenditure in the business sector as % of GDP	Identical
Non-R&D innovation expenditures as % of turnover	Similar (only for SMEs)
Linkages & entrepreneurship	
SMEs innovating in-house as % of SMEs	Identical
Innovative SMEs collaborating with others as % of SMEs	Identical
Public-private co-publications per million population	Regional data not available
Intellectual assets	
PCT patent applications per billion GDP (in PPS€)	EPO patent applications per billion regional GDP (PPS€)
PCT patent applications in societal challenges per billion GDP (in PPS€)	Regional data not available
Community trademarks per billion GDP (in PPS€)	Regional data not available
Community designs per billion GDP (in PPS€)	Regional data not available
OUTPUTS	
Innovators	
SMEs introducing product or process innovations as % of SMEs	Identical
SMEs introducing marketing or organisational innovations as % of SMEs	Identical
Employment in fast-growing firms of innovative sectors	*Regional data not available*
Economic effects	
Employment in knowledge-intensive activities (manufacturing and services) as % of total employment	Employment in medium-high/high-tech manufacturing and knowledge-intensive services as % of total workforce
Contribution of medium-high and high-tech product exports to the trade balance	Regional data not available
Knowledge-intensive services exports as % total service exports	Regional data not available
Sales of new to market and new to firm innovations as % of turnover	Similar (only for SMEs)
License and patent revenues from abroad as % of GDP	Regional data not available

2.2 Regional coverage

The RIS covers 190 regions for 22 EU Member States as well as Norway and Switzerland at different NUTS levels. The NUTS classification (Nomenclature of territorial units for statistics) is a hierarchical system for dividing up the economic territory of the EU and it distinguishes between 3 different levels: NUTS 1 captures major socio-economic regions, NUTS 2 captures basic regions for the application of regional policies and NUTS 3 captures small regions for specific diagnoses.[3]

Depending on differences in regional data availability the RIS covers 55 NUTS 1 level regions and 135 NUTS 2 level regions (Table 2). The EU Member States Cyprus, Estonia, Latvia, Lithuania, Luxembourg and Malta have not been included as the regional administrative level as such does not exist in these countries (NUTS 1 and NUTS 2 levels are identical with the country territory).

[3] *The current NUTS 2010 classification is valid from 1 January 2012 until 31 December 2014 and lists 97 regions at NUTS 1, 270 regions at NUTS 2 and 1294 regions at NUTS 3 level.*

Table 2: Regional coverage

	COUNTRY	NUTS		REGIONS
		1	2	
BE	Belgium	3		Région de Bruxelles-Capitale / Brussels Hoofdstedelijk Gewest (BE1), Vlaams Gewest (BE2), Région Wallonne (BE3)
BG	Bulgaria	2		Severna i iztochna Bulgaria (BG3), Yugozapadna i yuzhna tsentralna Bulgaria (BG4)
CZ	Czech Republic		8	Praha (CZ01), Střední Cechy (CZ02), Jihozápad (CZ03), Severozápad (CZ04), Severovýchod (CZ05), Jihovýchod (CZ06), Střední Morava (CZ07), Moravskoslezsko (CZ08)
DK	Denmark		5	Hovedstaden (DK01), Sjælland (DK02), Syddanmark (DK03), Midtjylland (DK04), Nordjylland (DK05)
DE	Germany	16		Baden-Württemberg (DE1), Bayern (DE2), Berlin (DE3), Brandenburg (DE4), Bremen (DE5), Hamburg (DE6), Hessen (DE7), Mecklenburg-Vorpommern (DE8), Niedersachsen (DE9), Nordrhein-Westfalen (DEA), Rheinland-Pfalz (DEB), Saarland (DEC), Sachsen (DED), Sachsen-Anhalt (DEE), Schleswig-Holstein (DEF), Thüringen (DEG)
IE	Ireland		2	Border, Midland and Western (IE01), Southern and Eastern (IE02)
EL	Greece	4		Voreia Ellada (GR1), Kentriki Ellada (GR2), Attiki (GR3), Nisia Aigaiou, Kriti (GR4)
ES	Spain	2	17	Galicia (ES11), Principado de Asturias (ES12), Cantabria (ES13), País Vasco (ES21), Comunidad Foral de Navarra (ES22), La Rioja (ES23), Aragón (ES24), Comunidad de Madrid (ES3), Castilla y León (ES41), Castilla-la Mancha (ES42), Extremadura (ES43), Cataluña (ES51), Comunidad Valenciana (ES52), Illes Balears (ES53), Andalucía (ES61), Región de Murcia (ES62), Ciudad Autónoma de Ceuta (ES) (ES63), Ciudad Autónoma de Melilla (ES) (ES64), Canarias (ES) (ES7)
FR	France	9		Île de France (FR1), Bassin Parisien (FR2), Nord - Pas-de-Calais (FR3), Est (FR) (FR4), Ouest (FR) (FR5), Sud-Ouest (FR) (FR6), Centre-Est (FR) (FR7), Méditerranée (FR8), French overseas departments (FR) (FR9)
HR	Croatia		3	Sjeverozapadna Hrvatska (HR01), Sredisnja i Istocna (Panonska) Hrvatska (HR02), Jadranska Hrvatska (HR03)
IT	Italy		21	Piemonte (ITC1), Valle d'Aosta/Vallée d'Aoste (ITC2), Liguria (ITC3), Lombardia (ITC4), Provincia Autonoma Bolzano/ Bozen (ITH1), Provincia Autonoma Trento (ITH2), Veneto (ITH3), Friuli-Venezia Giulia (ITH4), Emilia-Romagna (ITH), Toscana (ITI1), Umbria (ITI2), Marche (ITI3), Lazio (ITI4), Abruzzo (ITF1), Molise (ITF2), Campania (ITF3), Puglia (ITF4), Basilicata (ITF5), Calabria (ITF6), Sicilia (ITG1), Sardegna (ITG2)
HU	Hungary	1	6	Közép-Magyarország (HU1), Közép-Dunántúl (HU21), Nyugat-Dunántúl (HU22), Dél-Dunántúl (HU23), Észak-Magyarország (HU31), Észak-Alföld (HU32), Dél-Alföld (HU33)
NL	Netherlands		12	Groningen (NL11), Friesland (NL) (NL12), Drenthe (NL13), Overijssel (NL21), Gelderland (NL22), Flevoland (NL23), Utrecht (NL31), Noord-Holland (NL32), Zuid-Holland (NL33), Zeeland (NL34), Noord-Brabant (NL41), Limburg (NL) (NL42)
AT	Austria	3		Ostösterreich (AT1), Südösterreich (AT2), Westösterreich (AT3)
PL	Poland		16	Lódzkie (PL11), Mazowieckie (PL12), Malopolskie (PL21), Slaskie (PL22), Lubelskie (PL31), Podkarpackie (PL32), Swietokrzyskie (PL33), Podlaskie (PL34), Wielkopolskie (PL41), Zachodniopomorskie (PL42), Lubuskie (PL43), Dolnoslaskie (PL51), Opolskie (PL52), Kujawsko-Pomorskie (PL61), Warminsko-Mazurskie (PL62), Pomorskie (PL63)
PT	Portugal	2	5	Norte (PT11), Algarve (PT15), Centro (PT) (PT16), Lisboa (PT17), Alentejo (PT18), Região Autónoma dos Açores (PT) (PT2), Região Autónoma da Madeira (PT) (PT3)
RO	Romania		8	Nord-Vest (RO11), Centru (RO12), Nord-Est (RO21), Sud-Est (RO22), Sud - Muntenia (RO31), Bucuresti - Ilfov (RO32), Sud-Vest Oltenia (RO41), Vest (RO42)
SI	Slovenia		2	Vzhodna Slovenija (SI01), Zahodna Slovenija (SI02)
SK	Slovakia		4	Bratislavský kraj (SK01), Západné Slovensko (SK02), Stredné Slovensko (SK03), Východné Slovensko (SK04)
FI	Finland	1	4	Itä-Suomi (FI13), Etelä-Suomi (FI18), Länsi-Suomi (FI19), Pohjois-Suomi (FI1A), Åland (FI2)
SE	Sweden		8	Stockholm (SE11), Östra Mellansverige (SE12), Småland med öarna (SE21), Sydsverige (SE22), Västsverige (SE23), Norra Mellansverige (SE31), Mellersta Norrland (SE32), Övre Norrland (SE33)
UK	UK	12		North East (UK) (UKC), North West (UK) (UKD), Yorkshire and The Humber (UKE), East Midlands (UK) (UKF), West Midlands (UK) (UKG), East of England (UKH), London (UKI), South East (UK) (UKJ), South West (UK) (UKK), Wales (UKL), Scotland (UKM), Northern Ireland (UK) (UKN)
NO	Norway		7	Oslo og Akershus (NO01), Hedmark og Oppland (NO02), Sør-Østlandet (NO03), Agder og Rogaland (NO04), Vestlandet (NO05), Trøndelag (NO06), Nord-Norge (NO07)
CH	Switzerland		7	Région lémanique (CH01), Espace Mittelland (CH02), Nordwestschweiz (CH03), Zürich (CH04), Ostschweiz (CH05), Zentralschweiz (CH06), Ticino (CH07)

2.3 Regional data availability

Regional innovation data for 5 indicators are directly available from Eurostat. For the share of population aged 25-64 having completed tertiary education, R&D expenditures in the public and business sector, EPO patent applications and employment in medium-high/high-tech manufacturing and knowledge-intensive services regional data can be extracted from Eurostat's online regional database.[4] For the 6 indicators using Community Innovation Survey (CIS) data however regional data are not directly available from Eurostat and a special data request had to be made to obtain regional CIS data.

Regional CIS data request

To collect regional CIS data, in 2012 data requests were made by Eurostat to most Member States excluding those countries for which NUTS 1 and NUTS 2 levels are identical with the country territory or countries for which national CIS samples are too small to allow them to deliver reliable regional level data (e.g. Germany). In august 2013, Eurostat shared regional CIS 2010 data with the project team for 17 countries (Austria, Belgium, Bulgaria, Croatia, Czech Republic, Finland, France, Hungary, Italy, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden) for the following indicators:

- Non-R&D innovation expenditure
- SMEs innovating in-house
- Innovative SMEs collaborating with others
- Product or process innovators
- Marketing or organisational innovators
- Sales of new-to-market and new-to-firm innovations
- Reduced labour costs being of high importance for developing product or process innovations
- Any public financial support for innovation activities from either local government, national government or the European Union.

The last 2 indicators are not included in the RIS for different reasons. The indicator measuring reduced labour costs was part of an indicator on resource efficiency used in the RIS 2009 but the indicator was no longer used in the RIS 2012 as the indicator on resource efficiency was removed from the list of indicators used in IUS. The resource efficiency indicator combined two indicators, the indicator on reduced labour costs and an indicator on reduced use of materials and energy. The latter was not included anymore in the CIS 2010 and was replaced by the indicator measuring public financial support. For this indicator no regional data from earlier CIS surveys are available and the indicator has therefore not been included in the current RIS.

Timeliness of regional data

The timeliness of regional data is lagging several years behind the date of publication of the RIS report. For the RIS 2014 most recent data are referring to 2012 for 1 indicator (tertiary education), 2011 for 1 indicator (employment in medium-high/high-tech manufacturing and knowledge-intensive services), 2010 for 8 indicators (all 6 indicators using CIS data and both indicators public and private R&D expenditures) and 2008 for 1 indicator (EPO patents). Following the availability of regional data for 4 waves of the CIS (CIS 2004, CIS 2006, CIS 2008 and CIS 2010), the RIS will present regional innovation results for 4 reference years: 2004, 2006, 2008 and 2010.

Data availability by indicator and country

The RIS database contains 8,360 data cells (190 regions, 11 indicators and 4 years) of which, due to missing data, at first 2,439 data cells (29.2%) are missing. Data availability particularly depends on the availability of regional CIS data. As shown in Table 3, data availability was below average for all indicators using CIS data. But also for R&D expenditures regional level data are not available for at least 1 out of 4 regions. Only for 2 indicators data availability is above 90%.

[4] http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/regional_statistics/data/database

Table 3: Data availability by indicator

	DATA AVAILABILITY
Population having completed tertiary education	94.9%
Employment in medium-high/high-tech manufacturing and knowledge-intensive services	91.8%
EPO patent applications	87.6%
R&D expenditure in the business sector	75.1%
R&D expenditure in the public sector	71.8%
All indicators	*70.8%*
Product or process innovators (CIS)	64.5%
Innovative SMEs collaborating with others (CIS)	64.2%
Marketing or organisational innovators (CIS)	63.3%
SMEs innovating in-house (CIS)	60.9%
Non-R&D innovation expenditure (CIS)	55.3%
Sales of new-to-market and new-to-firm innovations (CIS)	49.6%

There are also huge differences for regional data availability between countries. Data availability is very good at 95% or more for 7 countries (Belgium, Bulgaria, Czech Republic, Poland Romania, Slovakia and Slovenia) (Table 4), good (below 95% but above average) for 8 countries (Austria, Finland, France, Hungary, Norway, Portugal, Spain and Sweden), below average for 5 countries (Germany, Ireland, Italy, Netherlands and the UK) and far below average for 4 countries (Croatia, Denmark, Greece and Switzerland). To improve data availability several imputation techniques have been used to provide estimates for all missing data. Data availability after imputation improves to 98.9% and is at least 99% for almost all countries except Finland (96%) and the UK (91%). Chapter 5 provides more details on the imputation techniques and Annex 4 shows the database for all regions and indicators after imputation.

Table 4: Data availability by country

	COUNTRY	NUMBER OF REGIONS	DATA AVAILABILITY		COUNTRY	NUMBER OF REGIONS	DATA AVAILABILITY
BG	Bulgaria	2	100.0%	FR	France	9	72.5%
CZ	Czech Republic	8	100.0%	SE	Sweden	8	72.7%
SK	Slovakia	4	100.0%	NO	Norway	7	72.4%
RO	Romania	8	99.1%	IT	Italy	21	64.9%
SI	Slovenia	2	97.7%	UK	United Kingdom	12	56.8%
PL	Poland	16	95.7%	IE	Ireland	2	45.5%
BE	Belgium	3	95.5%	NL	Netherlands	12	44.9%
PT	Portugal	7	92.5%	DE	Germany	16	44.6%
ES	Spain	19	91.9%	EL	Greece	4	38.6%
HU	Hungary	7	86.4%	DK	Denmark	5	27.3%
AT	Austria	3	81.8%	HR	Croatia	3	28.8%
FI	Finland	5	74.5%	CH	Switzerland	7	18.2%

3. Regional innovation performance

3.1 Regional performance groups

Europe's regions are grouped into different and distinct innovation performance groups based on their relative performance on the Regional Innovation Index compared to that of the EU. The thresholds in relative performance are the same as those used in the Innovation Union Scoreboard. Regional Innovation leaders are those regions which perform 20% or more above the EU average. Regional Innovation followers are regions performing between 90% and 120% of the EU average. Regional Moderate innovators are regions performing between 50% and 90% of the EU average and regional modest innovators perform below 50% of the EU average.

Most regions are either an Innovation follower or Moderate innovator (Table 5) with about 2 out of 3 regions belonging to one of these groups (group membership for each region is shown in Annex 2). The number of regions included in the group of Innovation followers has increased since 2004, mostly by regions moving up from the group of Moderate innovators. The group of Innovation leaders is quite stable including 34 regions.

Table 5: Distribution of regional performance groups

	REGIONAL INNOVATION LEADERS	REGIONAL INNOVATION FOLLOWERS	REGIONAL MODERATE INNOVATORS	REGIONAL MODEST INNOVATORS
2004	34	50	79	27
2006	33	51	78	28
2008	31	55	76	28
2010	34	57	68	31

The Regional Innovation leaders have the highest performance in all indicators except the share of innovative SMEs collaborating with others (Table 6). In particular in R&D expenditures in the business sector, SMEs innovating in-house, EPO patent applications and Product or process innovators the Innovation leaders perform very well with average performance levels of 30% or more above the EU average. The Innovation leaders perform relatively weak on Non-R&D innovation expenditures and the share of SMEs with marketing or organisational innovations. There results confirm the result obtained in the IUS that business activity and higher education are key strengths of Innovation leaders.

The Regional Innovation followers perform close to average on most indicators except for Innovative SMEs collaborating with others and SMEs innovating in-house, where average performance is 35% resp. 18% above that of the EU average. The Innovation followers perform less well on indicators related to the performance of their business sector: performance on R&D expenditures in the business sector, Non-R&D expenditures and EPO patent applications is below 90% that of the EU.

The Regional Moderate innovators perform below the EU average on all indicators. Relative strengths are in Non-R&D innovation expenditure and Sales of new-to-market and new-to-firm innovations. The Moderate innovators perform below average on several indicators related to business performance, in particular to R&D expenditures in the business sector and EPO patent applications where performance is about half that of the EU average. Low business R&D expenditures and high Non-R&D innovation expenditures indicate that companies in these regions innovate more by adopting technologies and innovation already developed elsewhere and less so by developing really new product or process innovations themselves.

The Regional Modest innovators perform below the EU average on all indicators and in particular on the indicators related to business performance. These regions are relatively well equipped with a well-educated population (72% of the EU average) but face weaknesses in most other domains of their regional innovation system.

Table 6: Performance characteristics of the regional performance groups

	REGIONAL INNOVATION LEADERS	REGIONAL INNOVATION FOLLOWERS	REGIONAL MODERATE INNOVATORS	REGIONAL MODEST INNOVATORS
Population having completed tertiary education	120	109	81	72
R&D expenditure in the public sector	120	100	69	40
R&D expenditure in the business sector	133	83	52	23
Non-R&D innovation expenditure	102	86	93	69
SMEs innovating in-house	131	118	70	24
Innovative SMEs collaborating with others	126	135	59	33
EPO patent applications	135	84	43	20
Product or process innovators	138	101	67	26
Marketing or organisational innovators	103	98	80	31
Employment in medium-high/high-tech manufacturing and knowledge-intensive services	121	94	86	62
Sales of new-to-market and new-to-firm innovations	115	94	91	45

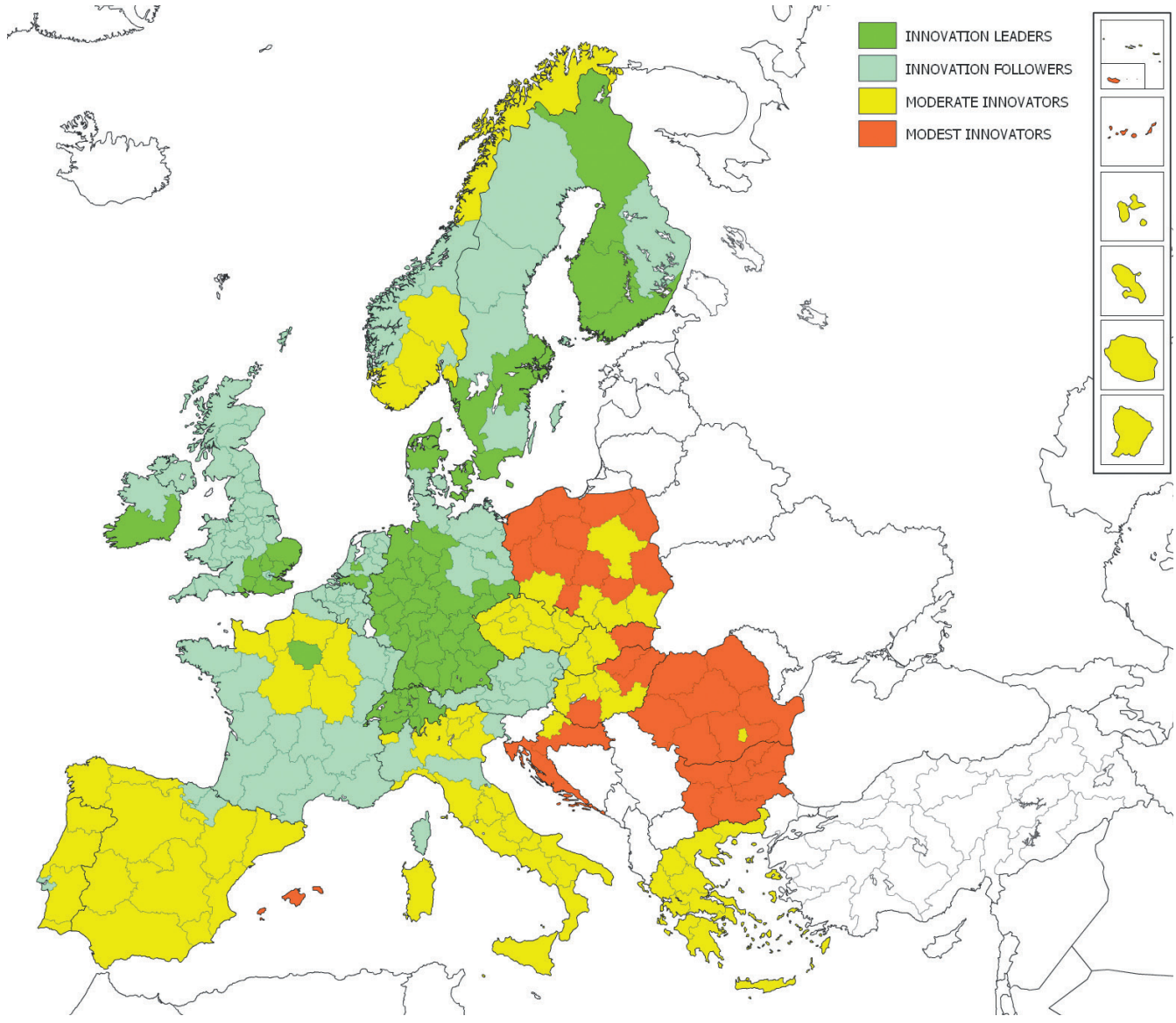
Average scores for each performance group relative to the EU average (=100)

A geographical map of the regional performance groups is shown in Figure 2. The map reveals that there is an innovation divide between Northern and Western European countries and those in the East and South. This innovation divide is similar to that observed in the IUS at country level.

Within countries there is variation in regional performance (Table 7). In 4 countries (France, Portugal, Slovakia and Spain) there are 3 different regional performance groups and in 14 countries are 2 different regional performance groups. Only in Austria, Belgium, Bulgaria, Czech Republic, Greece and Switzerland all regions are in the same performance group as the country at large.

Despite the variation in regional performance within countries, regional performance groups do match the corresponding IUS country performance groups quite well. Most of the Regional Innovation leaders are found in countries identified as Innovation leaders in the IUS, i.e. Denmark, Finland, Germany, Sweden and Switzerland. Some Regional Innovation leaders are found in IUS Innovation followers: Utrecht and Noord-Brabant in the Netherlands, East of England and South East in the UK, Southern and Eastern in Ireland and Île de France in France. All the EU Regional Innovation leaders (27 regions) are located in only eight EU Member States.

Figure 2: Regional performance groups RIS 2014



Map created with Region Map Generator

Most of the Regional Innovation followers are found in the IUS Innovation leaders and Innovation followers but there are also 10 Regional Innovation followers in IUS Moderate innovating countries: Oslo og Akershus, Vestlandet and Trøndelag in Norway, Piemonte, Friuli-Venezie Giulia and Emilia-Romagna in Italy, País Vasco and Comunidad Foral de Navarra in Spain, Lisboa in Portugal and Bratislavský kraj in Slovakia.

Almost all of the Regional Moderate innovators are found in IUS Moderate innovator countries, except for Bassin Parisien and Départements d'outre-mer (France), Zahodna Slovenija (Slovenia) and Bucuresti – Ilfov (Romania). All Regional Modest innovators are found in IUS Moderate innovating and Modest innovating countries.

The similarity between the distribution of regional performance groups and IUS country level performance groups shows that regional innovation systems are directly related to and depend on national innovation systems.

Table 7: Occurrence of regional performance groups by country

	PERFORMANCE GROUP INNOVATION UNION SCOREBOARD	REGIONAL INNOVATION LEADERS	REGIONAL INNOVATION FOLLOWERS	REGIONAL MODERATE INNOVATORS	REGIONAL MODEST INNOVATORS
		34	57	68	31
Switzerland	Innovation leader	7	0	0	0
Sweden	Innovation leader	4	4	0	0
Denmark	Innovation leader	4	1	0	0
Germany	Innovation leader	10	6	0	0
Finland	Innovation leader	3	2	0	0
Netherlands	Innovation follower	2	10	0	0
Belgium	Innovation follower	0	3	0	0
United Kingdom	Innovation follower	2	10	0	0
Ireland	Innovation follower	1	1	0	0
Austria	Innovation follower	0	3	0	0
France	Innovation follower	1	6	2	0
Slovenia	Innovation follower	0	1	1	0
Norway	Moderate innovator	0	3	4	0
Italy	Moderate innovator	0	3	18	0
Czech Republic	Moderate innovator	0	0	8	0
Spain	Moderate innovator	0	2	13	4
Portugal	Moderate innovator	0	1	5	1
Greece	Moderate innovator	0	0	4	0
Hungary	Moderate innovator	0	0	4	3
Slovakia	Moderate innovator	0	1	2	1
Croatia	Moderate innovator	0	0	1	2
Poland	Moderate innovator	0	0	5	11
Romania	Modest innovator	0	0	1	7
Bulgaria	Modest innovator	0	0	0	2

Countries ordered by the performance score in the Innovation Union Scoreboard 2014.

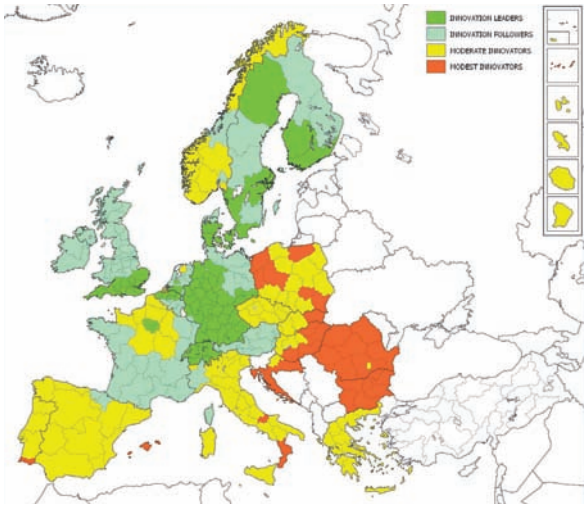
3.2 Performance changes over time

3.2.1 Divergence in regional innovation performance

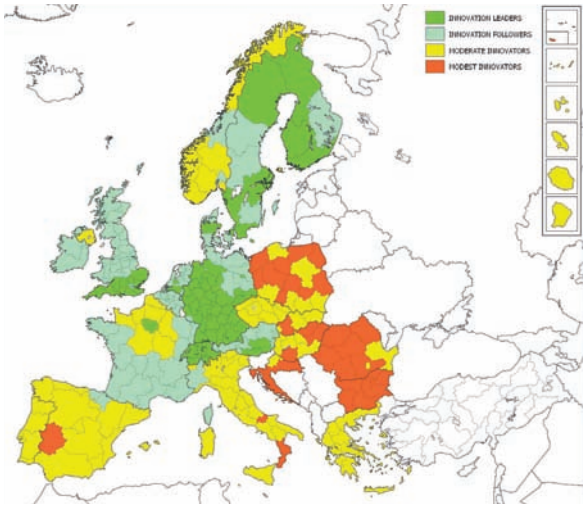
There are changes in the composition of the regional performance groups over time as the number of regional Innovation leaders, Innovation followers, Moderate innovators and modest innovators is not stable over time – see Table 5 –. Between 2004 and 2010 in total 77 changes in group membership have taken place of which 40 to a higher performance group and 37 to a lower performance group (cf. Figure 3 and the regional group memberships over time in Annex 2).

Figure 3: Regional performance groups over time

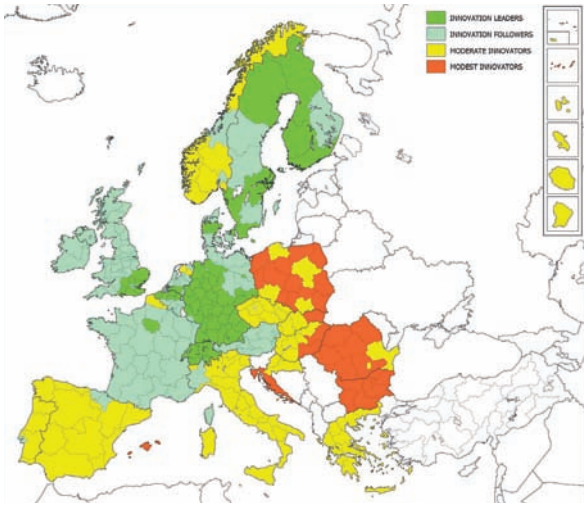
2004



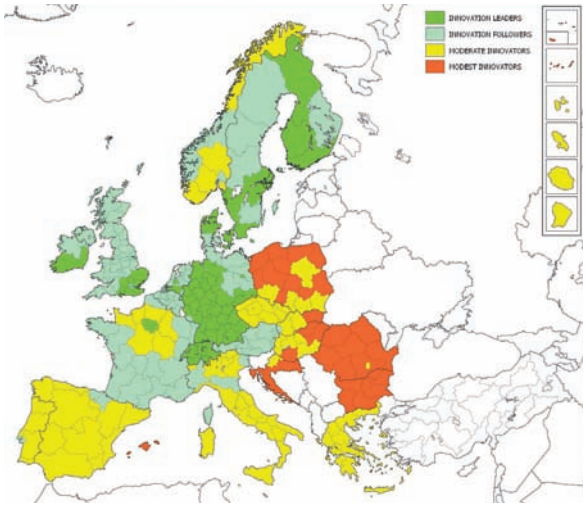
2006



2008



2010



Map created with Region Map Generator

Most changes in performance groups took place in a limited number of regions. Five regions changed performance group 3 times[5] and 17 regions changed performance group twice[6]. None of these regions managed to consistently improve their performance. Regions either moved down to a lower performance group and then moved up again or they moved up to a higher performance group and then moved down again.

There is no relation between the relative number of changes in group membership and the innovation performance of the country (Table 8). Most changes in performance groups are observed in Slovakia, Belgium and Hungary. For Bulgaria, Greece, Slovenia and Switzerland no region moved between groups.

Table 8: Changes in regional performance groups by country

Slovakia	41.7%	Austria	22.2%	France	11.1%	Germany	4.2%
Belgium	33.3%	Croatia	22.2%	United Kingdom	11.1%	Sweden	4.2%
Hungary	33.3%	Netherlands	22.2%	Romania	8.3%	Bulgaria	0%
Denmark	26.7%	Finland	20.0%	Italy	6.3%	Greece	0%
Portugal	23.8%	Ireland	16.7%	Norway	4.8%	Slovenia	0%
Poland	22.9%	Spain	14.0%	Czech Republic	4.2%	Switzerland	0%

Average performance for the Innovation leaders, Innovation followers and Moderate innovators has been improving over time (Table 9) with the Innovation followers growing fastest with an average annual growth rate of 3.9%. For the Modest innovators performance has declined between 2004 and 2010 At the level of regional performance groups the Innovation leaders and Innovation followers, on average, are growing faster than both the Moderate innovators and Modest innovators indicating that at regional level there is no convergence of innovation performance: performance differences between regions seem to become larger not smaller.

Table 9: Performance changes regional performance groups

	REGIONAL INNOVATION LEADERS	REGIONAL INNOVATION FOLLOWERS	REGIONAL MODERATE INNOVATORS	REGIONAL MODEST INNOVATORS
2004	0.541	0.420	0.316	0.213
2006	0.539	0.439	0.331	0.232
2008	0.552	0.450	0.339	0.221
2010	0.562	0.475	0.333	0.199
Average annual growth rate 2004-2010	1.3%	3.9%	1.8%	-2.2%

Regional Innovation Index scores

A comparison of the initial performance levels in 2004 and the change in performance between 2004 and 2010 for all 190 regions confirms that there is no process of catching-up with less innovative regions growing at a higher rate than more innovative regions.

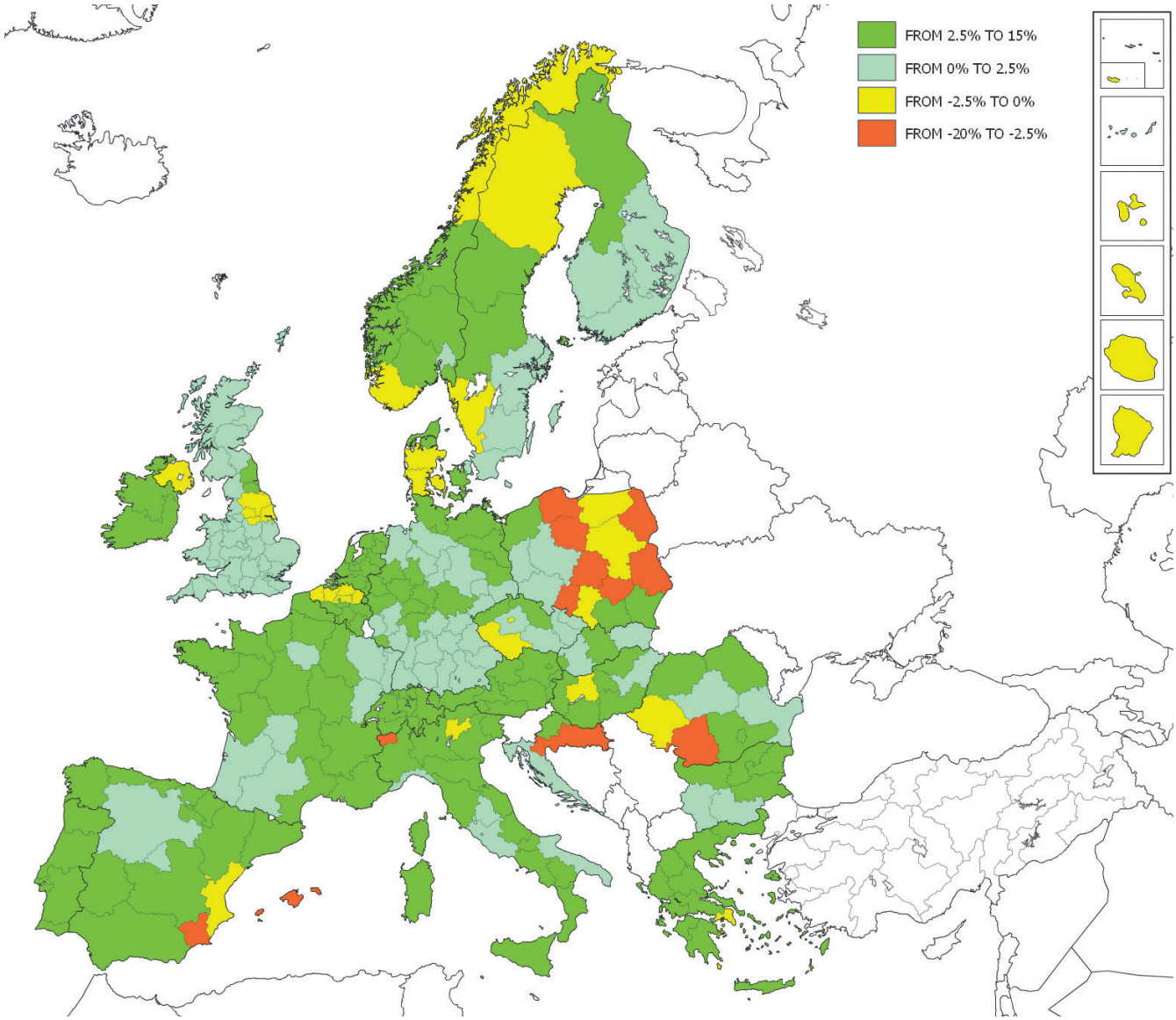
[5] *BE2, HU33, NL12, PL32, PT3*

[6] *DK02, ES43, ES53, ES7, FR2, HU23, HU31, NL13, NL31, AT2, PL22, RO22, SK02, SK04, FI2, UKN, HR02*

3.2.2 Individual performance changes

Similar to the variation in regional innovation performance levels within countries, also growth performance for individual regions can be quite different from that of other regions in the same country or the country at large. Where the IUS 2014 shows that all Member States, Norway and Switzerland have improved their performance over time, at the regional level results are different. Where innovation has improved for the majority of European regions (for 155 regions performance improved between 2004 and 2010) performance worsened for 35 regions (Figure 4).

Figure 4: Regional innovation growth performance



Map created with Region Map Generator

In 14 countries for at least one region innovation has become worse. Average annual growth has been strongly negative (below -2.5%) for 14 regions of which 7 Polish regions, 4 Spanish regions and 1 region in Croatia, Italy and Romania (see Figure 5). Growth has been below -10% in Ciudad Autónoma de Ceuta (ES), Ciudad Autónoma de Melilla (ES), Podlaskie (PL) and Kujawsko-Pomorskie (PL). Less negative growth between -2.5 and 0% is observed for 21 regions of which 3 regions in Poland, 2 regions in Czech Republic, Denmark, Norway, Sweden and the UK and 1 region in Belgium, France, Greece, Hungary, Italy, Portugal, Romania and Spain.

Positive growth between 0% and 2.5%, the average for the EU, is observed for 49 regions of which 9 regions in the UK, 6 in Germany, 4 in Czech Republic, Italy and Sweden and 3 in Finland, France, Poland, Spain and Sweden.

The majority of regions, 106 in total, have grown at a higher rate than the EU average. At least one region in every country has grown at a higher rate than the EU average and all regions in Austria, Ireland, Netherlands and Switzerland have grown at a higher rate than the EU average.

3.3 Barriers and drivers to regional innovation

This section makes a comparison between regional indicators either measuring framework conditions for regional innovation or the impact of innovation on economic performance and the Regional Innovation Index. This comparison is fruitful as more indicators become available at the regional level that might have an influence on the innovation performance of specific regions.

Educational attainment, ICT infrastructure, the availability of finance, an environment conducive to new innovative activities and strong clusters are some of the potential drivers of business innovation. First a brief discussion of these indicators and the rationale for considering them is provided. The full definitions and data availability of these indicators can be found in the RIS 2014 Methodology Report. Secondly a correlation analysis is carried out to find empirical evidence for the existence of a possible relationship between these indicators and regional innovation performance.

Indicators used in the analysis

Educational attainment is already partly covered in the RIS but the indicator on tertiary education only captures formal training but not the training people received after completing their formal education. The indicator **Participation in life-long learning** per 100 population aged 25-64 captures this aspect of educational attainment. The rationale for including this indicator is that a central characteristic of a knowledge economy is continual technical development and innovation. Individuals need to continually learn new ideas and skills or to participate in life-long learning. All types of learning are valuable, since it prepares people for "learning to learn". The ability to learn can then be applied to new tasks with social and economic benefits.

Broadband access is a proxy for the existence of a well-developed ICT infrastructure. Although in many EU regions broadband access is widely spread variation in the levels across regions is still high. Therefore realising Europe's full e-potential depends on creating the conditions for electronic commerce and the Internet to flourish across all EU regions. This indicator captures the relative use of this e-potential by the number of households that have access to broadband.

It is important to improve the framework conditions for innovation. The 2006 Aho Group Report on "Creating an Innovative Europe" recommended "the need for Europe to provide an innovation friendly market for its businesses".[7] Rather than stressing innovation inputs such as R&D, the report stresses innovation demand and the myriad of socio-cultural factors that encourage innovation. Social attitudes towards innovation can be defined as consumers' receptiveness to try and adopt innovative products and services.[8] **Attitudes towards innovation** captures positive attitudes to people's

[7] http://ec.europa.eu/invest-in-research/action/2006_ahogroup_en.htm

[8] *Buligescu, B., Hollanders, H. and Saebi, T. (2012), "Social attitudes to innovation and entrepreneurship". PRO INNO Europe: INNO Grips II report, Brussels: European Commission, DG Enterprise and Industry (http://ec.europa.eu/enterprise/policies/innovation/files/proinno/innovation-intelligence-study-4_en.pdf).*

receptiveness to new innovations. The indicator measures the share of people who either think it is very important "to think new ideas and be creative" or "to try new and different things".[9] One can for instance argue that a region with a population that finds it important to be creative and to start up business is a favourable environment for knowledge creation. This favourable condition should then positively influence the regional innovation performance.

Companies innovate in collaboration with other private and public partners. The proximity of strong collaboration partners can benefit companies' innovation performance. Proximity and interaction of partners is captured by clusters. A cluster can be defined at the geographic concentration of interconnected businesses, suppliers and associated institutions. The relative presence of clusters is measured by an indicator on **Employment in strong clusters**, which is measured by looking at employment in 2-star and 3-star clusters as defined by the European Cluster Observatory.[10] The 2-star and 3-star cluster regions are more specialised in a specific industry than the overall economy across all regions. According to the Cluster Observatory, this is likely to be an indication that this region attracts economic activity leading to (stronger) spill-over effects and linkages.[11]

Companies face a range of diverse factors preventing them to innovate or hindering their innovation activities. Results from the CIS 2010 show that for 22% of all companies[12] the lack of finance from sources outside the company was a highly important factor hampering innovation activities. Finance from outside the company can include finance from private and public sources. The availability of public financial support could thus help companies to innovate and it is measured by the **Share of innovators receiving any type of public funding**. For constructing the indicator regional CIS 2010 data is used on the share of innovating companies responding positively to the question if the company received any public financial support[13] for innovation activities from either local or regional authorities, central government or the European Union. As data are available for only 82 regions, additional data have been estimated using the CIS imputation technique also used for estimating missing CIS data in the RIS.

Linkages between possible drivers to innovation and innovation performance

Correlation analysis is used to analyse the link between these indicators and the RIS regional performance indexes. The correlation analysis is conducted by constructing variables that combine data for four periods in time, using, for each indicator, the most recent data available and data which are 2, 4 and 6 years less recent. With 190 regions included for every time period, a maximum of 760 observations are possible to calculate correlations. This maximum is only obtained in the correlation analysis for Participation in life-long learning as for the other indicators data is missing and for the Share of Share of innovators receiving any type of public funding data are available for one period only.

Results from the correlation analysis are shown in Table 10. The Regional Innovation Index is positively and significantly correlated with the indicator Participation in life-long learning. This implies that regions with a higher share of population that participates in continuous training and learning activities are more innovative. If the population in a specific region has a high share of people investing in their human capital by continuously learning and developing technical skills then this will eventually lead to new applications, spillovers, attracting investments and setting examples for future generations. All these factors are influential for the business environment and the innovative performance of a region. The results thus show that it is important to continuously upgrade skills after the completion of formal education.

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[9] *Data are taken from the European Social Survey. The RIS 2014 Methodology report provides more details.*

[10] *The European Cluster Observatory assigns 0, 1, 2 or 3 stars depending 1) if employment reaches a sufficient share of total European employment, 2) if a region is more specialised in a specific cluster category than the overall economy across all regions, 3) if a cluster accounts for a larger share of a region's overall employment. Full details about the methodology used by the European Cluster Observatory are available at http://www.clusterobservatory.eu/index.html*

[11] *The Regional Competitiveness Report 2013 uses a similar indicator on the share of employees in strong clusters among high-tech clusters to measure regions innovation performance (http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/6th_report/rci_2013_report_final.pdf).*

[12] *Both innovating companies (23%) and non-innovating companies (21%) equally report that the lack of external sources of finance is hampering their innovation activities.*

[13] *Financial support can include tax credits or deductions, grants, subsidised loans, and loan guarantees. Research and other innovation activities conducted entirely for the public sector under contract are excluded.*

Table 10: Regional innovation and potential drivers of innovation: correlation coefficients

		REGIONAL INNOVATION INDEX
Life-long learning	Pearson Correlation	0.727**
	Number of observations	760
Broadband access	Pearson Correlation	0.581**
	Number of observations	732
Attitudes to innovation	Pearson Correlation	0.126**
	Number of observations	668
Employment in strong clusters	Pearson Correlation	-0.313**
	Number of observations	732
Share of innovators receiving any type of public funding	Pearson Correlation	0.543*
	Number of observations	82
Share of innovators receiving any type of public funding	Pearson Correlation	0.844**
	Number of observations	139

*** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).*

Regional Innovation Index is also positively correlated with Broadband access. This implies that regions in Europe with a high share of households that have broadband access are more innovative. The relationship is however not that strong as with Participation in lifelong learning. This result suggests that a necessary condition for improving a region's innovative performance is a well-developed ICT infrastructure. Such an infrastructure will help spread information on new innovative products thereby facilitating the creation of a market for such products and will also help in spreading new ideas and new technologies.

Attitudes towards innovation are significantly and positively correlated with regional innovation performance but the explanatory power of this indicator is weak based on low value for the correlation coefficient. This implies that there is a positive relationship between the attitudes of the population in a specific region but the influence of this on the innovation performance of a region is small. A reason for this could be that the willingness of the population to be creative and open for new ideas is not sufficient to perform better on innovation. Other factors such as institutional and infrastructural conditions are likely to be of more importance in explaining the innovation performance of a region.

The relationship between the Regional Innovation Index and Employment in strong clusters is significantly negative and weak. This implies that the share of employment in strong clusters does not influence the innovation performance of a region. Furthermore, regions with a higher share of employment in strong clusters perform worse than regions which have low shares of employment in strong clusters. A possible explanation of this counter-intuitive result is that for many regions the indicator does not measure employment in strong clusters in more innovative sectors but rather employment in strong clusters in less innovative sectors.

The Regional Innovation Index is positively correlated with the Share of innovators receiving public funding. But the result for the smaller sample using real regional CIS data is not very significant. Adding estimates for 57 more regions improves the strength of the relationship between regional innovation and the availability of public funds for innovation. Regions with higher shares of innovating companies receiving some form of public financial support are more innovative than regions where fewer firms receive such support. Public financial support for innovation has a positive impact on regions' innovation performance. The availability of public funds, in particular funds coming from participation in Framework Programmes or from receiving Structural Funds, is discussed in more detail in Chapter 5.

4. Regional research and innovation potential through EU funding

4.1 Introduction

This chapter aims to provide evidence to contribute to a better understanding of the relationship between EU funding instruments such as the Structural Funds (SFs) and the Framework Programme for Research and Technological Development (FP7) and regions' innovation performance.

Firstly, the chapter presents a categorisation of regions based on their extent of using and leveraging SFs to invest in the fields of research, technological development and innovation (RTDI) and of their participation in FP7. This provides the landscape of how European regions have been benefitting from EU support in this specific domain. The chapter also gives an overview of the absorption capacity of regions regarding the use of SFs with the most updated available data on committed projects by the end of 2012.

Secondly, this chapter analyses the extent to which the absorption of EU funds is reflected in regions' innovation performance. The analysis will focus on identifying whether regional investments in RTDI measures are matched by regions' innovation performance. In other words, are regions with high public investments in RTDI more likely to be innovation leaders? Or are regions with low capacity to leverage funds for innovation also lagging behind in terms of innovation performance?

Similar to the analysis performed in the RIS 2012, this chapter aims to contribute to investigating the variety of forms that the "regional innovation paradox" takes in Europe, or the idea that lagging regions with greater needs for support are prone to low absorption of European funds and lack prioritisation of available resources towards support for innovation.

Section 4.2 presents an overview of the instruments provided at European level in support of regional research and innovation activities. Section 4.3 gives an overview of the data used and presents the cluster analysis and cross-analysis methodologies. Section 4.4 describes the groups of EU regions based on their use of EU funds, and the results achieved when intersecting the regions' type of absorption of EU funds with their innovation performance. Section 4.5 concludes.

4.2 EU funding instruments for increasing regional research and innovation capacity

4.2.1 Structural Funds

Innovation is at the heart of Europe 2020 policy objectives, yet there are significant differences in research and innovation capacity among the regions of Europe. The Structural Funds (SFs) are an instrument of the EU's cohesion policy that aim to counterbalance these disparities by investing especially in those regions that lag behind in performance. For this reason the EU cohesion policy introduced two types of regional funding objectives. The SF Convergence objective (CON) covers the regions that have GDP per capita below 75% of the EU average and aim to accelerate the economic development in these regions. The Regional Competitiveness and Employment objective (RCE) comprises all other regions above this threshold and seek to reinforce competitiveness, employment and attractiveness of these regions[14].

In the period 2000-2006 the SF investment in research and innovation reached €17.9 billion or 10% of the total SF budget. The committed SF funding[15] under RTDI priorities in the EU27 for the period 2007-2013 amounted to €42.6 billion, constituting 16.3% of all available funds[16]. It is important to point out that Convergence regions increased their share of research and innovation in SF budgets on average by 12%

[14] http://ec.europa.eu/regional_policy/
[15] *Funding for selected projects (either already spent or earmarked for spending).*
[16] *Croatia is excluded in this calculation to enable better comparability between the periods.*

compared to about 8% for RCE regions between both periods[17]. Taking into account the fact that in absolute figures the largest amount of funding has been allocated to Convergence regions, SFs can be regarded as a major financial input to narrow the innovation gap between advanced and less developed regions.

While the SF is part of the EU budget, the spending of this funding is based on the system of shared responsibility between regions, national governments and the European Commission. The funds are channelled through Operational Programmes (OPs) that cover the policy priorities selected by respective countries and/or regions.[18] Depending on the country's specific administrative structure and the degree of centralisation of regional policy-mak ing, the OPs can be formulated at the level of NUTS 1 or NUTS 2 regions, or also at country level. Table 11 summarises the territorial coverage of Operational Programmes 2007-2013 in all EU Member States.[19]

Table 11: Territorial coverage of Operational Programmes in EU Member States

LEVEL	COUNTRIES
NUTS 1	Belgium, Germany, Greece[20], Netherlands, United Kingdom
NUTS 2	Austria, Spain, Finland, France, Hungary, Ireland, Italy, Poland, Portugal, Sweden
Country level (OPs organised by policy priorities not specific regions)	Bulgaria, Croatia, Czech Republic, Denmark, Romania, Slovakia
Country level (the countries are not split in regions)	Estonia, Cyprus, Latvia, Lithuania, Malta, Slovenia

Source: Technopolis Group based on the DG REGIO Data Warehouse

[17] *Regional Innovation Scoreboard 2012*

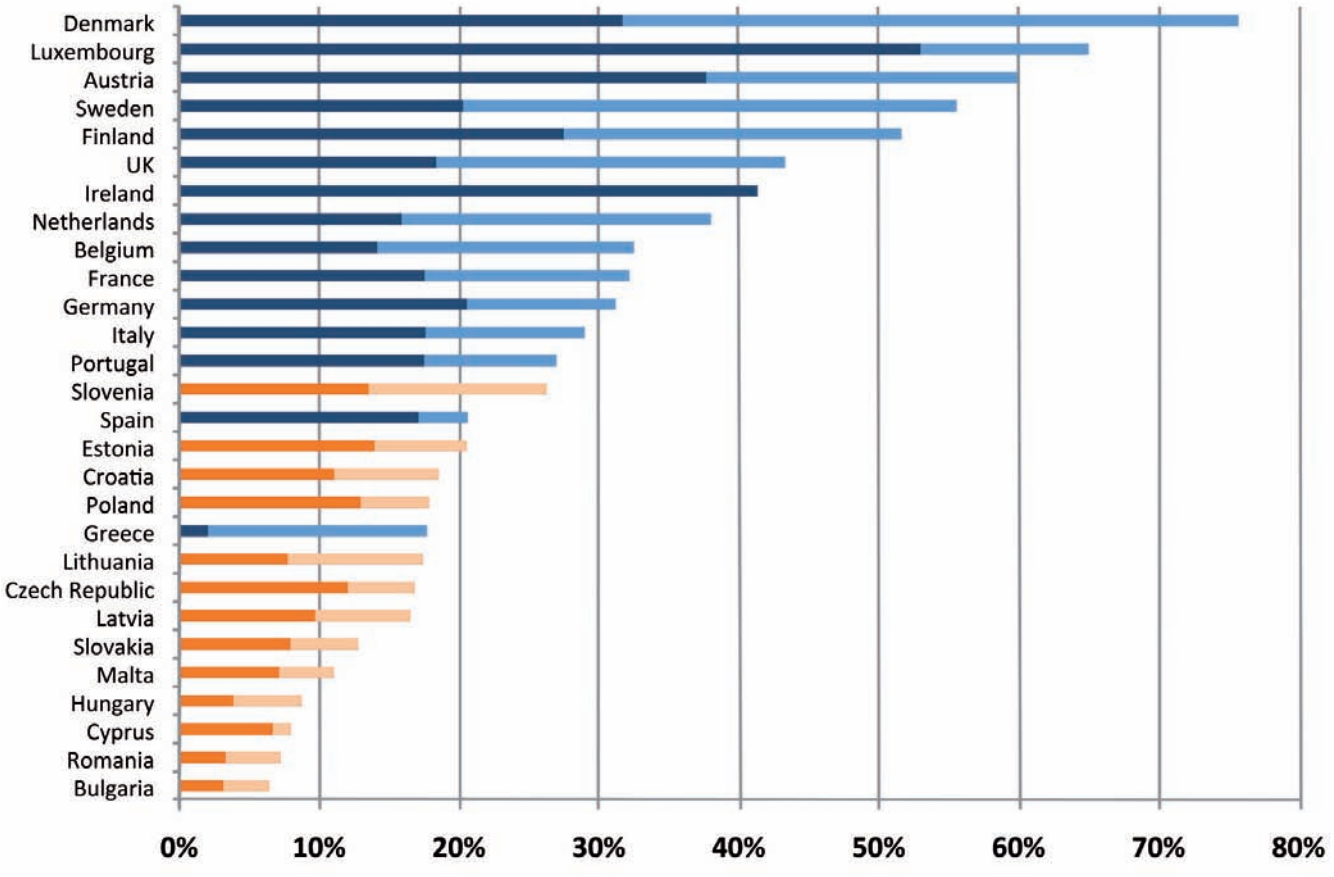
[18] *The OPs are prepared by the EU Member States and negotiated with and ultimately validated by the European Commission. The implementation of OPs is done by the Management Authorities of each Member State and their respective regions. The Commission is involved in the monitoring and quality control of funds management, alongside the country concerned.*

[19] *In cases where there are particular pockets of less developed regions encompassed within more advanced NUTS 1 regions, several countries have opted for tailored OPs to address specific challenges of such Cohesion regions. For instance, Germany has established a separate OP for the NUTS 2 region Lüneburg (DE93) focusing on improvement of infrastructure. Similar rationales have been applied to the Belgian region Hainaut (BE32) and two UK regions – Cornwall and the Isles of Scilly (UKK3) and Lowlands and Uplands of Scotland (UKM6).*

[20] *OPs of Greece do not follow a strict territorial logic. There are five OPs for these combinations of regions: 1) Attiki (EL3); 2) E Kriti, Nisia Aigaio (EL4); 3) Anatoliki Makedonia, Thraki (EL11); 4) Thessalia, Sterea Ellada, Ipeiros (EL14+EL24+EL21); 5) Western Greece, Peloponnese, Ionian Islands (EL23+EL25+EL22)*

To provide an indication on countries' prioritisation of spending for RTDI priorities in their OPs, Figure 5 presents a comparison of the shares of the EU SFs that have been initially earmarked for supporting RTDI. In the period 2007-2013. EU15 countries have allocated significantly larger shares of SFs to research and innovation. On average the share for EU15 countries is around 27%, while for EU12 countries it is approximately 15%. Both EU15 and EU12 countries have put policy importance on stimulating research and technological activities allocating respectively around 16% and 10% of the total SF budget. EU15 countries have earmarked on average 11% of SFs for services for business innovation and commercialisation, however EU12 countries allocated only some 5% of the available funding to this policy priority.

Figure 5: Share of Structural Funds initially allocated under RTDI priorities, 2007-2013



- *Blue: EU15 countries (dark: research and technological activities; light: services for business innovation and commercialisation)*
- *Orange: EU12 countries (dark: research and technological activities; light: services for business innovation and commercialisation)*

Source: Technopolis Group based on the DG REGIO Data Warehouse

4.2.2 Framework Programme for Research and Technological Development

The Framework Programme for Research and Technological Development (FP) is another EU intervention that provides significant funding for research and innovation, but differs in its nature. If SFs favour the emergence of the knowledge economy and aim to foster socio-economic cohesion, the FP is based on organisations bidding for competitive funding based on criteria of excellence. For this reason it is usually the case that innovation leaders are also the best performers in attracting FP funds.

Since the individual regions' participation in the Framework Programme is conditioned by the location of research infrastructures within their boundaries, the data analysis of FP funds attracted by the regions needs to be considered with care. Centralised research systems with wide networks of national research institutes, for example, the French National Centre for Scientific Research (CNRS) or the Spanish National Research Council (CSIC), will attribute the FP participation results to the region where the legal residence of the public research institute network in seated. This creates the so-called "headquarters effect", significantly boosting the FP performance of large capital regions. It must be taken into account that FP participation is also very much determined by temporal path dependence. For example, it is known that FP6 projects have led to increased co-publication activity between project partners[21]. This implies that strong visibility in FP6 could have led to more solid integration of participants in excellent European research networks ultimately improving also their results in FP7 competitive bids.

4.3 Indicators and data availability

4.3.1 Data availability and data sources

There are two main data sources used in this analysis:

1) Structural Funds data was obtained from the data warehouse of the Directorate General for Regional Policy of the European Commission. Different from the data used in the RIS 2012, in this edition the SF data was organised per Operational Programme. Another difference is that the data used concerns committed funding, namely funds earmarked for selected projects that are not yet backed-up with invoices, but will most likely become actual expenditures once the programming period is closed.
2) Framework Programme data was obtained from the External Common Research Data Warehouse E-CORDA of the Directorate General Research and Innovation of the European Commission. The database cut-off date is June 2013.

Based on the data availability only at Operational Programme level, the database for the analysis was constructed of the OPs with data at NUTS 1 and 2 levels, and does not include information on regions in countries where the OPs are managed at national level only. In total the analysis comprises 164 regions[22]. There are 58 regions under Convergence objective and 104 RCE objective regions that represent respectively 35% and 63% of all regions analysed. The structure of Greek Operational Programmes does not follow a strict territorial rationale. Therefore, Greek regions are grouped into NUTS 1 regions, one separate NUTS 2 region and a mix of NUTS 2 regions[23].

To link the expenditure of EU funding in regions with regional innovation performance, the analysis makes use of the results of the assessment of regional innovation performance presented in Section 3 of this report.

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[21] *AVEDAS AG, NetPact (2009), Structuring Effects of Community Research – The Impact of the Framework Programme on RTD on Network Formation*

[22] *Due to the recent administratively territorial reform carried out in Finland in 2013, the results do not disaggregate the region Helsinki-Uusimaa (FI1B) that has been detached from the former region Etelä-Suomi (FI18). In this analysis the results of Helsinki-Uusimaa (FI1B) are displayed within the new administrative region Etelä-Suomi (FI1C).*

[23] *Cf. footnote 21*

4.3.2 Indicators

As in the RIS 2012, the analysis is based on a composite thematic categorisation of the fields of SF intervention for the period 2007-2013. The figures under the specific expenditure categories reflect funding committed to selected projects. The amounts registered for each field of investment are self-reported by the regions, which might create some unobserved bias and thus diminish the validity of the data analysis. In order to compare the use of SF under RTDI priorities across regions in the EU, the values of the funds are reported at a per capita level for each region and annualised.

The relevant thematic categories of investment priorities established by DG REGIO for the Structural Funds were summed into two main indicators that reflect the amount of regional support in two core areas:

1) **Research and technological activities:** portrays the use of funds in support of improving the infrastructure, technological basis and RTDI capacity of the regional players which have an impact on both the public and private sectors' performance;
2) **Support services for business innovation and commercialisation:** concerns the fields of investments that are directly targeting the enhancement of innovation outputs in enterprises (mainly advisory services, technology transfer and training measures aimed at enterprises). This indicator includes also the field of assistance to SMEs for the promotion of environmentally friendly products and production processes.

The Framework Programme funds were analysed based on quantifying four major indicators for the participation of the regions in competitive research and technology development. The indicators were chosen to highlight in particular the strength of the private sector's participation in the programme by considering the following dimensions:

1) **The total amount of subsidies received** by the regional actors per year (per capita) indicates the absorptive capacity of the region in attracting FP funds;
2) **The leverage** (per capita), or the difference between the total cost of the projects and the total subsidies received in the region for the FP projects undertaken, which shows the power of the regional research actors to raise additional funds from further public or private sources to support competitive research;
3) **The number of participations from the private sector** (per thousand inhabitants) is linked to the amount of private enterprises engaged in FP projects in the region. It shows the strength of the business sector as a research actor;
4) **Percentage of SME participation in private sector** shows the share of SMEs in the total number of FP participations from the private sector. This indicator gives a hint about the vibrancy of the business innovation environment in the region.

Table 12 shows the categories of SF expenditures that are included in each indicator, based on the definitions of DG REGIO and the selected FP indicators.

Table 12: Categories of EU funds expenditure under RTDI priorities in the period 2007-2013

INDICATOR	STRUCTURAL FUNDS 2007-2013
Research and technological activities	01: R&TD activities in research centres
	02: R&TD infrastructure and centres of competence in a specific technology
	04: Assistance to R&TD, particularly in SMEs (including access to R&TD services in research centres)
	07: Investment in firms directly linked to research and innovation
Services for business innovation and commercialisation	03: Technology transfer and improvement of cooperation networks
	09: Other measures to stimulate research and innovation and entrepreneurship in SMEs
	05: Advanced support services for firms and groups of firms
	06: Assistance to SMEs for the promotion of environmentally-friendly products and production processes
	14: Services and applications for SMEs (e-commerce, education and training, networking, etc.)
FP7 indicators	Total amount of subsidies received (per capita)
	Leverage (per capita)
	Number of participations from the private sector (per thousand inhabitants)
	Percentage of SME participation in private sector

Source: Technopolis Group

4.3.3 Methodology

This year's methodology differs from that used in the RIS 2012. Given that the current programming period of SFs is still running, it was not possible to provide an analysis based on expenditures and instead data on committed funds to projects have been used. Because the current most updated data on SFs is structurally different to data on expenditures for the programming period 2000-2006, it is not possible to provide a cross-time comparison between both programming periods.[24]

A factor analysis was first performed on all variables in order to find factors among observed variables and group variables with similar characteristics together. The factor analysis revealed that SFs data variables and FP data variables are structurally different.

A cluster analysis was then performed to group information on the use of EU funds in regions based on their similarity on the different sub-indicators presented in section 4.3.2.[25] Hierarchical clustering was chosen as the method to cluster SFs data[26] and based on the characterisations of the different clusters a total of 4 clusters for grouping SFs data was obtained.

A similar clustering method was tested for obtaining typologies related to the use and leverage of FP funding in regions. However, the results were not satisfactory as a consequence, we have applied a similar methodology of that used in chapter 3, identifying FP leading absorbers as those regions that perform at least 120% of the sample average.

4.4 Regional absorption and leverage of EU funding

4.4.1 Regional absorption rate of SF funding for RTDI

For the purpose of this chapter, we define the absorption rate as the share of committed Structural Funds that are allocated to specific projects under RTDI priorities.

The absorption rate has been linked to the capacity to use funds in support of RTDI, which is considered crucial for ensuring that the EU funding is making the greatest effect on economic and social cohesion. It has been recognised as an important concern in relation to the implementation of cohesion policy. Many Member States have experienced difficulties in the absorption of SFs in the initial years after the accession to the EU. The causes of these difficulties in taking up EU funding include shortage of resources to co-finance projects, lack of long-term strategic vision from the policy-makers, low administrative capacity to manage funds in terms of insufficient human resources and skills, weak inter-institutional cooperation and underdeveloped public-private partnerships[27]. While there are many interrelated factors that account for regions' ability to absorb EU funding, a major part of them relates back to the quality of governance.

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[24] *However, the RIS 2012 presents good evidence of the characteristics and funding performance of EU regions in the programming period 2000-2006.*

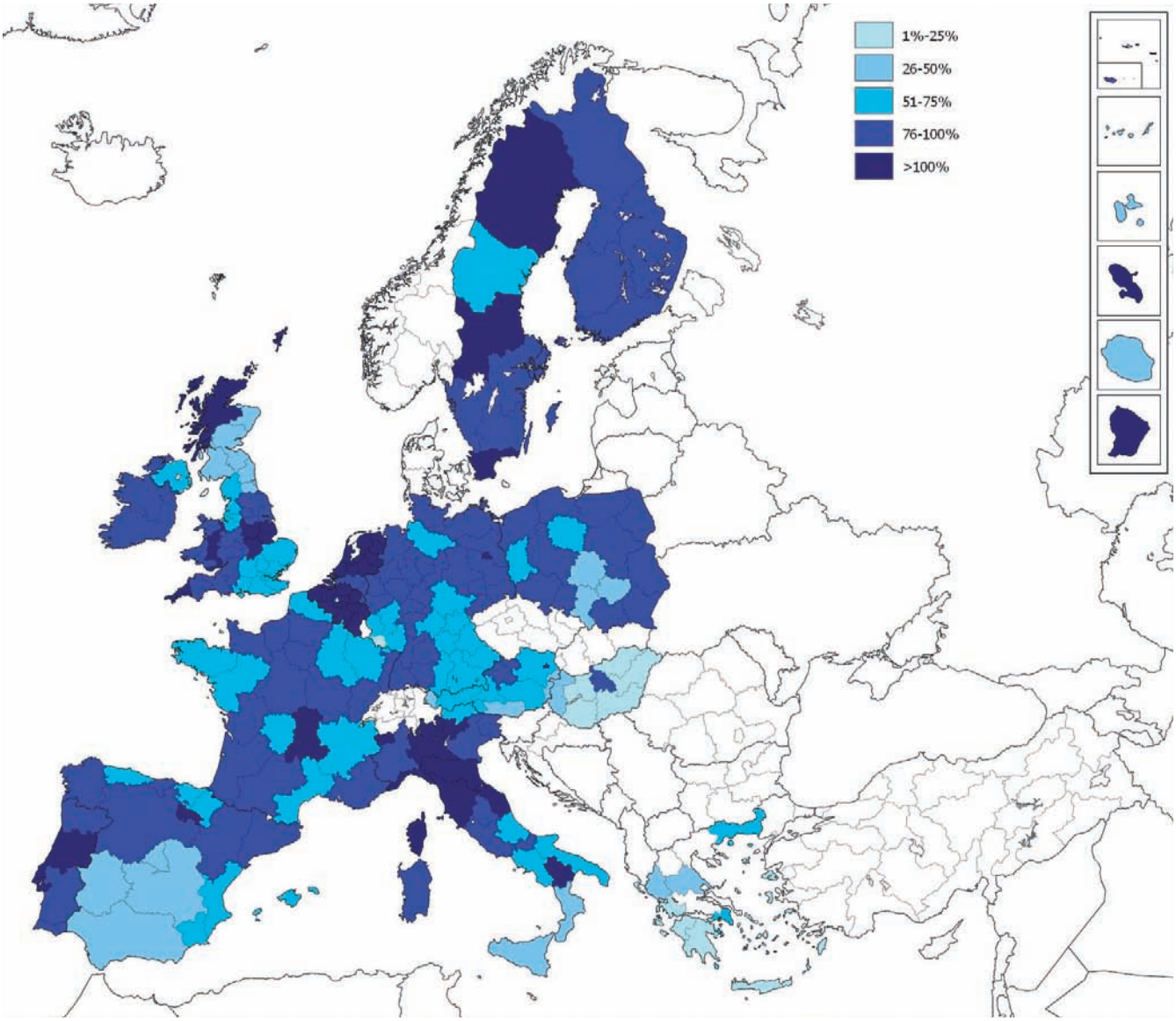
[25] *In order to perform the analysis and to avoid results being influenced by scores of regions over-performing, the dataset has been normalised for outlier's scores with the next best values.*

[26] *The chosen cluster method was between-group linkage. The interval measures are computed using Squared Euclidean distance.*

[27] *E.g. Zaman, G. and Georgescu, G. (2009) Structural Fund Absorption: A New Challenge For Romania?. Journal for Economic Forecasting, Institute for Economic Forecasting, 6(1), 136-154*

Figure 6 provides an overview of SF funding under RTDI priorities that regions have committed to projects, illustrated as a share of the initially allocated funds under RTDI priorities. While the committed funds are not yet backed up by invoices and actually spent, this data serves as a close proxy of funding absorption capacity by regions for research and innovation.

Figure 6: The absorption of the allocated SF funding (under RTDI priorities) by regions, 2007-2013



Map created with Region Map Generator

It is interesting to note that in the period 2007-2013 regions in Northern Italy show a very high absorption rate of SF funding. Good absorption rates are also found for a range of regions in Belgium, Sweden and the Netherlands. The lowest SF absorption rates are for almost all regions of Hungary, where the committed funding under RTDI priorities is very marginal. The overall absorption of available funds seems to be weak also in a number of Greek, Spanish, Italian and Polish regions.

4.4.2 Findings from the cluster analysis

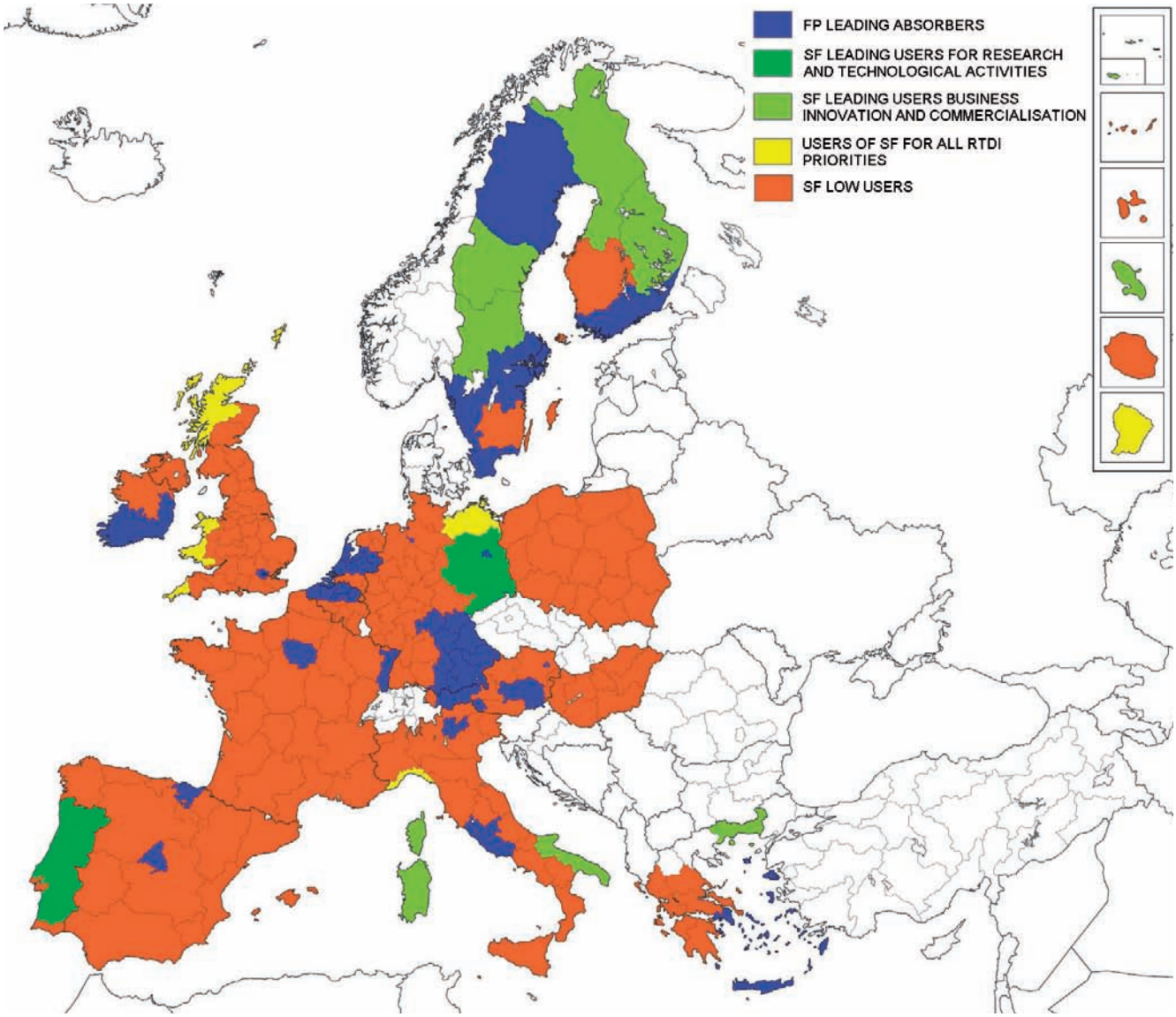
Following the cluster analysis results of SFs funding and the analysis of FP based on relative regional performance to that of the average, there are five main typologies of regions in terms of the use of EU funding for research and innovation in the period 2007-2013.

The five typologies identified are:

1) **FP leading absorbers**, regions with medium-high to very high participation in the FP7 programme (above 120% of the regional average in our sample);
2) **SF leading users** with high use of **SF for research and technological activities**;
3) **SF leading users** with high use of **SF for support services for business innovation and commercialisation**;
4) Users of **SF for all types of RTDI priorities** with medium-to-high use of SF for both research and technological activities and services for business innovation and commercialisation;
5) **SF low users** with low rates of use of SF under research, technological development and innovation priorities.

The detailed cluster membership of each of the 164 regions can be found in Annex 5. The map in Figure 7 below gives an overview of the localisation of the different typologies of regions.

Figure 7: Map of EU funding typology in EU regions



Map created with Region Map Generator

Over the period 2007-2013, the five groups of 164 regions include a majority of low users of Structural Funds (116 regions or 70.7% of total). There were only six regions that were Users of SF for both types of RTDI priorities (3.6% of regions), and 16 leading SF users of both types (i.e. high focus of SFs on research and technological activities and support services for business innovation and commercialisation) (9.7% of total). Over 90% of the 26 regions that are leading FP absorbers are low users of Structural Funds (with an average annual committed expenditure of 3 EUR per capita). Only two of the leading regions in FP participation also show a high use of Structural Funds, in particular targeting services for business innovation and commercialisation (the Greek region of Attiki and the Swedish region Övre Norrland). These two regions were also identified as FP leading absorbers in the RIS 2012.

The SF leading users have the highest shares of these funds directed towards investments to research and business innovation. They can be classified into two sub-categories: those **SF leading users** that invest most in **improving their research and technological activities** (on average 23.9 EUR per capita annually), and those **leading user** regions that prioritise 'softer' measures **targeting support services for business innovation and commercialisation** (on average 24.7 EUR per capita per year) (see Table 13 below). It is interesting to note that the regions with the highest investments in research and technological activities are Convergence regions, 3 of them located in the Eastern part of Germany (Brandenburg, Sachsen, Sachsen-Anhalt) and 3 in Portugal (Norte, Centro and Alentejo). The regions with the highest investments in support services for business innovation and commercialisation are scattered across the Mediterranean part of Europe and the Nordic countries, and split between the Convergence and Competitiveness Objective of the Cohesion Policy: Anatoloki Makedonia, Thraki (EL11) in Greece, Sardegna (ITG2) and Puglia (ITF4) in Italy, Autonomous Region of Açores (PT20) in Portugal, two Outermost regions in France (Martinique and Corse FR83), and the regions of Norra Mellansverige (SE31) and Mellersta Norrland (SE32) in Sweden.

Table 13: Number of regions and average characteristics of EU funds used / leveraged for the five typologies of regions

		FP LEADING ABSORBERS	SF LEADING USERS FOR RESEARCH AND TECHNOL. ACTIVITIES	SF LEADING USERS FOR BUSINESS INNOVATION AND COMMERCIALISATION	SF USERS FOR BOTH RTDI PRIORITIES	SF LOW USERS
Funding programme	No. regions	26	6	10	6	116
SFs PP 2007-2013 (funds committed to projects selected): Euros/annual/per capita (Dec 2012)	Research and technological activities	2.4	23.9	7.1	15.1	2.9
	Support services for business innovation and commercialisation	3.7	4.7	24.7	11.8	2.7
FP7 (June 2013)	Total amount of subsidies received (per capita)	106.9	14.3	8.0	15.2	17.3
	Leverage (per capita)	35.5	5.2	2.9	4.8	6.1
	Number of participations from the private sector (per thousand inhabitants)	0.08	0.02	0.01	0.03	0.02
	Percentage of SME participation in private sector	62%	71%	47%	99%	69%

Source: Technopolis Group

In comparison, Users of SFs for both types of RTDI priorities show medium-high average committed expenditures to R&D and business innovation, with an average annual per capita sum of 15.1 EUR for research and technological activities and 11.8 EUR for support services for business innovation and commercialisation. This category of regions is composed of only six regions, being three Convergence regions in the UK (UKK3 Cornwall and Isles of Scilly, UKL1 West Wales and the Valleys, and UKM6 Highlands and Islands of Scotland), DE8 Mecklengburg-Vorpommern in Germany (another Convergence region), FR93 Guyane (a French Outermost region), and a competitiveness region in Italy (ITC3 Liguria).

As shown in Figure 7, most regions in our sample are low users of SFs, investing low shares of these funds to support R&D and business innovation. Arguably, these regions allocate a greater share of SFs to other priorities that are not RTDI related. They have an annual average amount planned for selected projects of up to 3 EUR per capita, around five to six times less than the other two typologies of SF user regions. The low users of SF have, nevertheless, also received on average annual higher amounts of FP7 funding per capita than the other categories of SF users. At a deeper look, however, the low users of SF that have participated more actively in the FP7 programme have been regions belonging to the Competitiveness Objective of the cohesion policy, mostly located in the old Member States (Austria, France, Germany, Italy, the Netherlands, Spain, United Kingdom). There are 37 Convergence regions that show both low use of SFs and very low participation in FP7, such as the Outermost Regions in France, Greece, the South of Italy, all of the eight Convergence regions in Spain, and all regions in New Member States such as Hungary and Poland.

Table 14 shows the country frequencies of the 5 typologies of regions. The FP leading absorber regions are mainly located in Sweden, Austria and Germany. In the case of the SF leading users, those investing most in research and technological activities are from Germany and Portugal, and those investing mostly in support services for business innovation and commercialisation are equally split between France, Italy, Portugal and Spain. Most regions that are Users of structural funds for both types of RTDI priorities are in the United Kingdom. Low users of SF are mainly French, Polish, Italian and Spanish regions. However, this frequency analysis has to be analysed with care because countries like France, Poland, Spain and Italy have comparatively a larger numbers of regions than the rest of the countries in our sample.

Table 14: Main country memberships of four types of regions using EU funds in 2007-2013

FP LEADING ABSORBERS		SF LEADING USERS FOR RESEARCH AND TECHNOLOGICAL ACTIVITIES		SF LEADING USERS FOR BUSINESS INNOVATION AND COMMERCIALISATION		SF USERS FOR BOTH TYPES OF RTDI PRIORITIES		SF LOW USERS	
Sweden	19%	Germany	50%	France	20%	UK	50%	France	18%
Austria	12%	Portugal	50%	Italy	20%	Germany	16%	Poland	15%
Germany	12%			Portugal	20%	France	16%	Spain	15%
				Sweden	20%	Italy	16%	Italy	14%

Source: Technopolis Group

4.4.3 Matching leverage and absorption capacity to innovation performance

While the landscape of the regional absorption of EU funds for RTDI helps to identify how the regions are making use of EU support, this section aims to understand to what extent the absorption of EU funds is reflected in the regional innovation performance of the regions. We perform a cross analysis between the different categories of regional use of EU funds and the regions' levels of innovation performance as discussed in Chapter 3. We use the same classification of innovation performance as the RIS: leaders, followers, moderate and modest innovators. The cross analysis results show 20 different groups of regions (see Table 15 below and Annex 5 for the detailed overview of the results).

Table 15: Use of EU funding and innovation performance in 20 groups of regions

		RIS INNOVATION PERFORMANCE GROUPS 2014			
		Leader	Follower	Moderate	Modest
Typologies use of EU funding period 2007-2013	FP leading absorber	8	13	5	0
	SF leading user research and technological activities	1	2	3	0
	SF leading user business innovation and commercialisation	0	3	5	1
	SF user for both types of RTDI priorities	0	2	2	0
	SF low user	11	40	45	18

Source: Technopolis Group

Note: the analysis does not contain five regions that were not classified for innovation performance in the RIS: BE32 Hainaut, DE93 Lüneburg, FI1D Pohjois- ja Itä-Suomi, UKK3 Cornwall and the Isles of Scilly and UKM6 Lowlands and Uplands of Scotland.

The regions making high use of SFs for research and technological activities, as well as the Users of SF for both types of RTDI priorities show a comparatively even distribution of their innovation performance between followers and moderate innovators. The only leading region with regards to its use of SF for research and technological activities exhibiting high innovation performance is the German region Saxony (DED). In the case of the leading SF users for services for business innovation and commercialisation, the majority of the regions are moderate innovators, located in the Mediterranean regions, while there are a few follower Swedish regions. A modest innovating region investing high amounts in business innovation is the Portuguese Autonomous Region of Madeira (PT3).

Different than in the RIS 2012, where the FP leading absorbers were rather evenly split between the leader and follower innovator categories, there are discrepancies in the distribution of innovation performance in the groups of FP leading absorber regions. 30.8% of the FP leading absorbers are innovation leaders, whereas 50% of them are followers and 19.2% are moderate innovators.

The low users of SF show an interesting distribution of performance among regions, with 55% of the regions categorised as moderate (40%) or modest (15%) innovators, and around 45% of the low SF user regions falling in the follower (35%) or leading innovator (9%) categories. There is a striking North-South and West-East division in the regions that are low absorbers of SF, signalling the fact that the 55% of low users of SF that show moderate and modest innovation performance are not prioritising measures to boost their innovation performance, but may be focusing their spending on other types of support, risking to continue to lag behind better performing regions:

- 63% of the leading innovators but low SF users are represented by German regions, followed by British, Dutch and Finnish regions. Moreover, follower innovators and low SF absorbers are 30% from France, 22.5% from the UK and 15% from Austria.
- The modest innovators and low SF users are mostly regions in Poland, Hungary and Spain, while the moderate innovators and low SF users are from Italy (28%), Spain (26%), France (17%), Greece (13%), Poland (11%) and Hungary (9%).

4.4.4 Regional research and innovation potential through EU funding: discussion

The analysis of the regions' use of EU funding under RTDI priorities and the relationship with their innovation performance shows striking features of the European regional innovation landscape, confirming the trends identified in the RIS 2012 report.

Most FP leading absorbers show good to very good performance in regional innovation. In these regions, EU funds seem to have a complementary role in the regional innovation system. The use of EU funding is high and medium-to-high in a relatively low number of FP leading absorber regions, which partly also exhibit innovation potential that is higher than average. Nevertheless, a higher share of the regions investing larger amounts in support for business innovation are moderate innovators. This might show a partial disconnection between the regions' innovation support policies and the actual needs of innovators.

Regions absorbing low amounts of SF for business innovation make up the largest share of EU regions (71%). More than half of the low SF users are moderate or modest innovators, located in Mediterranean regions or in the Eastern European countries. This finding points to the fact that the lack of regions' prioritisation of investments in innovation is reflected in their low innovation performance.

Our results confirm that the "regional innovation paradox"[28] is at work in Europe, whereby less innovative regions with greater needs for investments in innovation and in solutions to structural problems have lower absorption capacity than performing regions, and invest lower amounts of resources into supporting RTDI activities. According to recent research in the field[29], these regions risk to remain locked in the "middle-income trap", in case the regions do not implement solutions to restore their competitive advantage and to improve the quality of governance and the structural problems that they are facing.

There are several further trends that need to be highlighted to better understand the context in which the regional innovation paradox takes place in Europe. Beyond the trends of globalisation, and diminishing competitiveness of EU regions, the complexity of the multi-level-governance schemes in place for implementing European policies and particularly the funding programmes of the cohesion policy. While the Framework Programme funds are awarded on a competitive basis to research actors, the process of awarding of Structural Funds is subject to the Member States' varieties of governance arrangements for implementing policies for (regional) development (ranging from decentralised city, county- or regional-level planning to national level steering), which ultimately influences the success of the cohesion policy.

Recent scholar contributions suggest that there is a gap in implementing development policy thinking at national level.[30] The placed-based approach to development has been receiving wide recognition starting with the 2009 World Bank report on the role of economic geography to local development[31] and the 2009 Barca report for the European Commission on reforming the cohesion policy.[32] Both reports emphasise the role of taking the interactions of economic geography and local and regional institutions into account, and of capitalising on the knowledge of local and external actors by engaging them in participatory processes when delivering development policies. It is argued that these approaches have been integrated into the future cohesion policy 2014-2020, but some of the national and regional implementation mechanisms of development and innovation policies have remained unchanged in EU Member States, based on rather spatially-blind and top-down approaches.

In addition, a similar statement can be made regarding the policy thinking in the field of regional innovation systems. The different ways of understanding innovation in the Member States is reflected in the type of governance mechanisms in the field of innovation promotion: while some governments have transferred competencies to regions or local governments to better foster a thriving environment for innovators, others have preferred to maintain the top-down, linear approach to RTDI support.[33] This can be also recognised in the way Operational Programmes have been designed, as discussed in section 4.3. Some Member States have

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[28] *See Oughton, C., Landabaso, M., Morgan, K. (2002): "The Regional Innovation Paradox: Innovation Policy and Industrial Policy" in Journal of Technology Transfer, 27, 97-100 pp.*

[29] *Reid, A., Muscio, A., R ivera-Leon, L. (forthcoming): "An empirical test of the Regional Innovation Paradox: can smart specialisation overcome the paradox in the central and eastern European countries?".*
Eichengreen, B., Park, D., Shin, K. (2013). Growth Slowdowns Redux: New Evidence on the Middle-Income Trap. NBER Working Paper No. 18673.

[30] *See Barca, F., McCann,P, Rodriguez-Pose, A. (2012): "The case for regional development intervention: place-based versus place-neutral approaches", in Journal of Regional Science, vol. 52, no. 1, pp. 134-152.*

[31] *World Bank, (2009): "World Development Report 2009: Reshaping Economic Geography", Washington DC: World Bank.*

[32] *Barca, F. (2009): "An Agenda for a Reformed Cohesion Policy: A Place-Based Approach to Meeting European Union Challenges and Expectations", Independent Report, prepared at the request of the European Commissioner for Regional Policy, European Commission, Brussels.*

[33] *Riche, M. (2010): "Regional Innovation Governance", in Regional Focus, no. 2, 2010 DG Regional Policy, Brussels.*

tailored the OPs based on the territorial boundaries of NUTS 2 or NUTS 1 regions, or also taking into account the socio-economic profile of distinct territories (e.g. the UK has a specific ERDF Operational Programme covering the NUTS 2 Convergence region Cornwall and Isles of Scilly and a different one covering the NUTS 1 region South West England where the NUTS 2 region belongs). On the other hand, many Member States, particularly in Eastern Europe, have left the design of the Operational Programmes for the national level (see Figure 7). While there is no prescribed recipe for managing (regional) innovation systems, the variance in implementing innovation policies and development policies in the EU, coupled with the quality of governance in several Member States can be considered further challenges to exiting the trap of the regional innovation paradox.

4.5 Conclusions

The analysis of the use of EU funding in the programming period 2007-2013 shows that there are 5 typologies of regions: Framework Programme leading absorbers (15.85%); Structural Funds (SFs) leading users targeting research and technological activities (3.66%); Structural Funds leading users prioritising services for business innovation and commercialisation (6.10%); Users of Structural Funds for both types of RTDI priorities, with similar medium-to-high amounts of SF committed to projects targeting both types of priorities (3.66%); and regions with low use of Structural Funds, which make up the majority of regions in our sample (71%).

This chapter also illustrated the low absorption capacity of several European regions by analysing the changes in initial allocations for business innovation support within the SF Operational Programmes and the latest data covering the amounts committed to projects in the field of business innovation. It is striking that in countries such as Greece, Hungary, Italy, Spain and Poland, a large part of the regions resorted to awarding less funding to innovation than initially foreseen, shifting priorities during the course of the economic crisis away from promoting innovation.

The absorption of FP funds shows that it is regions with low use of SFs that are the most prominent participants in the FP programme. This can be considered an evidence of the complementarities of the two programmes in these particular regions. However, there is a relatively low share of regions that are making medium-to-high use of SFs for business innovation. The majority of the regions that made use of low amounts of SFs are generally Convergence regions, located in the New Member States or in the Mediterranean countries most struck by the economic crisis. This shows that, in spite of the structural problems encountered and the diminishing competitiveness of EU regions, they have not been prioritising innovation through EU funds as a means to tackle these issues.

In order to understand to what extent EU funding is reflected in the innovation performance of the recipient regions, a cross-analysis of the region's absorption of EU funding and their regional innovation performance was performed. The analysis shows that, while there are several regions that can be classified as pockets of excellence in terms of participation in the FP programme and in regional innovation, only few of the regions that are using EU funds for business innovation more intensely are follower innovating regions, and only one is a leading innovator. The majority of EU regions in the analysed sample are low absorbers of EU FP funds and SFs and exhibit moderate to modest levels of innovation.

Taking into account their low use of SF in comparison to other leading regions in the EU and the moderate to modest innovation potential, the analysis points to the fact that the regional innovation paradox continues to be a feature of the European regional innovation landscape, which needs to be tackled with more care in the future programming period. The different approaches to development policy thinking in terms of place-based versus spatially-blind policies in the EU Member States, and the varieties of governance arrangements towards fostering (regional or national) innovation systems are further challenges that need to be taken into account as factors influencing the success of European funding and ultimately the innovation performance of regions.

5. RIS methodology

5.1 Missing data: imputations

For 190 regions, 4 years (corresponding to having regional data for 4 waves of the CIS) and 11 indicators, full data availability would require data for 8,360 data cells. But data availability is not very good with 29.2% of data not being available. For several indicators, in particular the indicators using CIS data, regional data is missing for a number of years or even for the entire period considered. Ideally, for calculating composite indicators data should be available for all indicators, although some degree of missing data is acceptable (e.g. in the IUS for several countries data availability is below 100%). To increase data availability, a CIS regionalization technique has been used for the indicators using CIS data followed by a set of imputation techniques for the remaining missing CIS data and the indicators not using CIS data.

5.1.1 CIS regionalization technique

If CIS data are missing for all regions but the aggregate for the country is available, a CIS "regionalization" technique will be used using country and regional level data on employment and number of firms at the 2-digit industry level assuming that industry intensities at the country level also hold at the regional level.

We explain the method for regionalizing the CIS data by using the share of firms with product innovations as an example:

- **Step 1:** Calculate for each country Y the share of firms with product innovations for each industry I using the CIS 2010 country level data: PI_Y_I
- **Step 2a:** Identify the employment share of industry I for region R: EMPL_R_I
- **Step 3a:** Calculate the estimate for the share of firms with product innovations by multiplying EMPL_R_I with PI_Y_I: PI_EMPL_R_I
- **Step 2b**: Identify the share of local units (enterprises) of industry I for region R: ENTR_R_I
- **Step 3b:** Calculate the estimate for the share of firms with product innovations by multiplying ENTR_R_I with PI_Y_I: PI_ENTR_R_I
- **Step 4:** Calculate the average of PI_EMPL_R_I and PI_ENTR_R_I as the estimate for the regional share of product innovators: PI_R_I

The same method can be applied for all indicators using CIS data. The RIS Methodology report includes an example for an unnamed region for the share of product and process innovators using CIS 2010 data.

5.1.2 General imputation techniques

The following techniques will be applied in the order as shown below.

- **At the country level**, if data for both the previous and following year are available first the average of both years will be used $X_C^T = (X_C^{T-1} + X_C^{T+1})/2$, then that of the previous year $X_C^T = X_C^{T-1}$ and finally that of the following year $X_C^T = X_C^{T+1}$, where C denotes the country, T the current year, T-1 the previous year and T+1 the following year. If data are not available for the previous and following year missing data will not be imputed.

- If regional data are available for the previous year the ratio between the corresponding NUTS level and that at a higher aggregate level (NUTS1 for NUTS2 regions, country level for NUTS1 regions) for the previous year is multiplied with the current value at the higher aggregate level. $X_R^T = (X_R^{T-1} / X_C^{T-1}) * X_C^T$, where R denotes the region, C the country (as the higher aggregate level), T the current year and T-1 the previous year.

- If regional data for the previous year is not available, the same procedure as in step 2 will be used but using the ratio between the corresponding NUTS level and that at a higher aggregate level (NUTS1 for NUTS2 regions, country level for NUTS1 regions) for the following year: $X_R^T = (X_R^{T+1} / X_C^{T+1}) * X_C^T$, where R denotes the region, C the country (as the higher aggregate level), T the current year and T+1 the following year.

- If there are no regional data for both the previous and following year, the higher level aggregate ((NUTS1 for NUTS2 regions, country level for NUTS1 regions)), first that for the current year, and, if not available, that for the previous year otherwise that for the following year: $X_R^T = X_C^T$ or $X_R^T = X_C^{T-1}$ or $X_R^T = X_C^{T+1}$, where R denotes the region, C the country (as the higher aggregate level), t the current year, T-1 the previous year and T+1 the following year.

- If there are no regional and no country level data available for the current, previous and following year, missing data will not be imputed.

The RIS Methodology report provides examples for steps 3 and 4.

5.1.3 Quality assessment of CIS estimates

The quality of regional estimates can be assessed by comparing the regional CIS 2010 estimates with real regional CIS 2010 data for 87 to 127 regions as made available by Member States and Norway. The regional estimates are of relatively good quality for those indicators measured as a share of all SMEs (with correlation coefficients above 90%), in particular innovative SMEs collaborating with others, product and/or process innovators and marketing and/or organizational innovators. The estimates are of lower quality for both indicators measured as a share of turnover (with correlation coefficients below 70%), i.e. non-R&D innovation expenditures and sales due to new-to-market and new-to-firm products.

Table 16: Correlation coefficients between real and estimated regional CIS 2010 data

	CORRELATION COEFFICIENT	NUMBER OF REGIONS
Non-R&D innovation expenditure	0.617*	125
SMEs innovating in-house	0.812*	87
Innovative SMEs collaborating with others	0.919*	126
Product or process innovators	0.915*	127
Marketing or organisational innovators	0.903*	127
Sales of new-to-market and new-to-firm innovations	0.688*	101

** Correlation significant at 1%*

5.1.4 Summary of data imputations per country and indicator

Of the different imputation steps, the one used most frequently at the regional level is step 2 (11.4%), followed by steps 3 (6.6%), 5 (5.1%) and 4 (5.0%). After applying the imputation techniques outlined above data availability has increased from 70.8% to 98.9% reducing the share of missing data to only 1.1% (cf. Annex 4 in the RIS Methodology report for full details on the different imputation techniques used in every region). Annex 4 provides the full database for all regions and indicators after imputation.

Tables 17 and 18 provide details on the relative share of imputations per country and indicator. For most countries data availability after imputation is 100% except for Spain and France (99.0%), Finland (96.4%) and the UK (90.9%). For most indicators data imputations have raised data availability to 99% or more, except for EPO patent applications, Marketing or organisational innovators and Non-R&D innovation expenditure due to a lack of data at the country level.

Table 17: Data availability per country after imputation

COUNTRY/COUNTRIES	DATA AVAILABILITY
Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, Switzerland	100%
Spain	99.0%
France	99.0%
Finland	96.4%
United Kingdom	90.9%

Table 18: Data availability per indicator after imputations

INDICATOR	DATA AVAILABILITY
Population having completed tertiary education	100%
R&D expenditure in the public sector	100%
R&D expenditure in the business sector	100%
SMEs innovating in-house	100%
Innovative SMEs collaborating with others	100%
Product or process innovators	100%
Sales of new-to-market and new-to-firm innovations	100%
Employment in medium-high/high-tech manufacturing and knowledge-intensive services	99.5%
EPO patents	97.9%
Marketing or organisational innovators	96.3%
Non-R&D innovation expenditure	93.7%

5.2 Composite indicators

5.2.1 Normalising data

Ideally for calculating composite indicators the individual indicators should follow a normal distribution. Most of the indicators are fractional indicators with values between 0% and 100% and most of these follow a normal distribution. Some indicators are unbound indicators, where values are not limited to an upper threshold. These indicators can have skewed data distributions (where most regions show low performance levels and a few regions show exceptionally high performance levels).

For all indicators data have been transformed using a square root transformation with power N if the degree of skewness of the raw data exceeds 1 such that the skewness of the transformed data is below 1. This transformation will be applied after the imputation of missing data.

Table 19 summarizes the degree of skewness before and after the transformation and the power N used in the transformation. The data are then normalized using the min-max procedure. The transformed score is first subtracted with the minimum score observed for all regions across all four yearly observations and then divided by the difference between the maximum and minimum scores observed for all regions across all four yearly observations. The maximum normalised score is equal to 1 and the minimum normalised score is equal to 0.

Table 19: Degree of skewness and transformation

	DEGREE OF SKEWNESS BEFORE TRANSFORMATION	POWER USED IN TRANSFORMATION	DEGREE OF SKEWNESS AFTER TRANSFORMATION
Population having completed tertiary education	0.154	1	--
R&D expenditure in the public sector	1.058	0.75	0.563
R&D expenditure in the business sector	1.727	0.5	0.676
Non-R&D innovation expenditure	2.525	0.5	0.610
SMEs innovating in-house	0.130	1	--
Innovative SMEs collaborating with others	0.843	1	--
EPO patents	2.130	0.5	0.759
Product or process innovators	0.360	1	--
Marketing or organisational innovators	0.723	1	--
Employment in medium-high/high-tech manufacturing + knowledge-intensive services	-0.091	1	--
Sales of new-to-market and new-to-firm innovations	1.824	0.5	0.610

5.2.2 Regional Innovation Index

Average innovation performance is measured using composite indicators. The Regional Innovation Index is calculated as the unweighted average of the normalised scores of the 11 indicators.

A comparison of the Regional Innovation Index at the country level with the Summary Innovation Index in the Innovation Union Scoreboard shows that, due to using a more restricted set of indicators in the RIS, countries' relative to the EU performance in the RIS is different than that in the Innovation Union Scoreboard. The following correction is therefore applied to the composite indicator scores:

1) Calculate the ratio of the IUS Summary Innovation Index at country level with that of the EU: IUS_index_CTR / IUS_index_EU
2) Calculate the ratio of the RIS innovation index at country level with that of the EU: RIS_index_CTR / RIS_index_EU
3) Calculate the correction factor by dividing the ratios 1) and 2)

These country correction factors are then multiplied with the Regional Innovation Index for each region in the correspond country.

5.3 Group membership

Where group membership in the RIS 2012 was determined using hierarchical clustering, the RIS 2014 adopts the classification scheme used in the Innovation Union Scoreboard:

- Innovation leaders are those regions with a relative performance of 20% or more above that of the EU27;
- Innovation followers are those regions with a relative performance less than 20% above but more than 10% below that of the EU27;
- Moderate innovators are those regions with a relative performance less than 10% below but more than 50% below that of the EU27;
- Modest innovators are those regions with a relative performance of 50% or less that of the EU27.

This classification scheme is more transparent and identical to that used in the IUS and provides more consistent results over time.

Annex 1: RIS indicators

POPULATION AGED 30-34 HAVING COMPLETED TERTIARY EDUCATION (%)	
Numerator	Number of persons in age class with some form of post-secondary education (ISCED 5 and 6)
Denominator	The reference population is all age classes between 30 and 34 years inclusive
Rationale	This is a general indicator of the supply of advanced skills. It is not limited to science and technical fields because the adoption of innovations in many areas, in particular in the service sectors, depends on a wide range of skills. Furthermore, it includes the entire working age population, because future economic growth could require drawing on the non-active fraction of the population
Included in RIS 2012	Comparable, RIS 2012 refers to age group 25-64
Included in IUS	Yes
Data source	Eurostat, regional statistics
Data availability	NUTS 2, 2006-2012

R&D EXPENDITURES IN THE PUBLIC SECTOR (%)	
Numerator	All R&D expenditures in the government sector (GOVERD) and the higher education sector (HERD)
Denominator	Regional Gross Domestic Product
Rationale	R&D expenditure represents one of the major drivers of economic growth in a knowledge-based economy. As such, trends in the R&D expenditure indicator provide key indications of the future competitiveness and wealth of the EU. Research and development spending is essential for making the transition to a knowledge-based economy as well as for improving production technologies and stimulating growth
Included in RIS 2012	Yes
Included in IUS	Yes
Data source	Eurostat, regional statistics
Data availability	NUTS 2, 2003-2009 (for 2010 data availability is less than 50%)

R&D EXPENDITURES IN THE BUSINESS SECTOR (%)	
Numerator	All R&D expenditures in the business sector (BERD)
Denominator	Regional Gross Domestic Product
Rationale	The indicator captures the formal creation of new knowledge within firms. It is particularly important in the science-based sector (pharmaceuticals, chemicals and some areas of electronics) where most new knowledge is created in or near R&D laboratories
Included in RIS 2012	Yes
Included in IUS	Yes
Data source	Eurostat, regional statistics
Data availability	NUTS 2, 2003-2009 (for 2010 data availability is less than 50%)

NON-R&D INNOVATION EXPENDITURES (%)	
Numerator	Sum of total innovation expenditure for SMEs only, excluding intramural and extramural R&D expenditures
Denominator	Total turnover for SMEs only (both innovators and non-innovators)
Rationale	This indicator measures non-R&D innovation expenditure as percentage of total turnover. Several of the components of innovation expenditure, such as investment in equipment and machinery and the acquisition of patents and licenses, measure the diffusion of new production technology and ideas
Included in RIS 2012	Yes
Included in IUS	Yes
Data source	Community Innovation Survey – Eurostat in collaboration with individual Member States
Data availability	NUTS 1: 2004-2006-2008-2010: BE, BG; 2004-2008-2010: FR; 2008-2010: AT NUTS 2: 2004-2006-2008-2010: CZ, ES, PL, PT, RO, SI, SK; 2004-2008-2010: NO; 2006: GR; 2006-2008-2010: HU; 2008-2010: IT, SE; 2010: HR

SMES INNOVATING IN-HOUSE (%)	
Numerator	Sum of SMEs with in-house innovation activities. Innovative firms with in-house innovation activities have introduced a new product or new process either in-house or in combination with other firms. The indicator does not include new products or processes developed by other firms
Denominator	Total number of SMEs (both innovators and non-innovators).
Rationale	This indicator measures the degree to which SMEs, that have introduced any new or significantly improved products or production processes, have innovated in-house. The indicator is limited to SMEs because almost all large firms innovate
Included in RIS 2012	Yes
Included in IUS	Yes
Data source	Community Innovation Survey – Eurostat in collaboration with individual Member States
Data availability	NUTS 1: 2004-2006-2008-2010: AT, BE, BG; 2004-2006: UK; 2004-2008: FR NUTS 2: 2004-2006-2008-2010: CZ, FI, PL, PT, RO, SI, SK, NO; 2004-2006-2008: ES; 2004-2008-2010: IT; 2006: GR; 2006-2008-2010: HU; 2008-2010: SE; 2010: HR

INNOVATIVE SMES COLLABORATING WITH OTHERS (%)	
Numerator	Sum of SMEs with innovation co-operation activities. Firms with co-operation activities are those that had any co-operation agreements on innovation activities with other enterprises or institutions
Denominator	Total number of SMEs
Rationale	This indicator measures the degree to which SMEs are involved in innovation co-operation. Complex innovations, in particular in ICT, often depend on the ability to draw on diverse sources of information and knowledge, or to collaborate on the development of an innovation. This indicator measures the flow of knowledge between public research institutions and firms and between firms and other firms. The indicator is limited to SMEs because almost all large firms are involved in innovation co-operation
Included in RIS 2012	Yes
Included in IUS	Yes
Data source	Community Innovation Survey – Eurostat in collaboration with individual Member States
Data availability	NUTS 1: 2004-2006-2008-2010: AT, BE, BG, FR; 2004-2006-2010: UK; 2004-2008-210: FR NUTS 2: 2004-2006-2008-2010: CZ, ES, FI, PL, PT, RO, SI, SK, NO; 2004-2008-2010: IT; 2006: GR; 2006-2008-2010: HU; 2008-2010: SE; 2010: HR

Annex 1: RIS indicators

EPO PATENT APPLICATIONS (PER BILLION GDP)	
Numerator	Number of patents applied for at the European Patent Office (EPO), by year of filing. The national distribution of the patent applications is assigned according to the address of the inventor
Denominator	Gross Domestic Product
Rationale	The capacity of firms to develop new products will determine their competitive advantage. One indicator of the rate of new product innovation is the number of patents. This indicator measures the number of patent applications at the European Patent Office
Included in RIS 2012	Yes
Included in IUS	No, IUS uses PCT patent applications
Data source	Eurostat
Data availability	NUTS 2: 2002-2008

PRODUCT OR PROCESS INNOVATORS (%)	
Numerator	The number of SMEs who introduced a new product or a new process to one of their markets
Denominator	Total number of SMEs
Rationale	Technological innovation as measured by the introduction of new products (goods or services) and processes is key to innovation in manufacturing activities. Higher shares of technological innovators should reflect a higher level of innovation activities
Included in RIS 2012	Yes
Included in IUS	Yes
Data source	Community Innovation Survey – Eurostat in collaboration with individual Member States
Data availability	NUTS 1: 2004-2006-2008-2010: AT, BE, BG, FR; 2004-2006: UK; 2004-2006-2008-2010: CZ, ES, FI, PL, PT, RO, SI, SK, NO NUTS 2: 2004-2008-2010: IT; 2006: GR; 2006-2008-2010: HU; 2008-2010: SE; 2010: HR

MARKETING OR ORGANISATIONAL INNOVATORS (%)	
Numerator	The number of SMEs who introduced a new marketing innovation and/or organisational innovation to one of their markets
Denominator	Total number of SMEs
Rationale	Many firms, in particular in the services sectors, innovate through non-technological forms of innovation. Examples of these are organisational innovations. This indicator tries to capture the extent that SMEs innovate through non-technological innovation
Included in RIS 2012	Yes
Included in IUS	Yes
Data source	Community Innovation Survey – Eurostat in collaboration with individual Member States
Data availability	NUTS 1: 2004-2006-2008-2010: AT, BE, BG, FR; 2004-2006: UK NUTS 2: 2004-2006-2008-2010: CZ, ES, FI, PL, PT, RO, SI, SK, NO; 2004-2008-2010: IT; 2006: GR; 2006-2008-2010: HU; 2008-2010: SE; 2010: HR

EMPLOYMENT IN MEDIUM-HIGH/HIGH-TECH MANUFACTURING AND KNOWLEDGE-INTENSIVE SERVICES (%)	
Numerator	Number of employed persons in the medium-high and high-tech manufacturing sectors include chemicals (NACE24), machinery (NACE29), office equipment (NACE30), electrical equipment (NACE31), telecommunications and related equipment (NACE32), precision instruments (NACE33), automobiles (NACE34) and aerospace and other transport (NACE35). Number of employed persons in the knowledge-intensive services sectors include water transport (NACE 61), air transport (NACE 62), post and telecommunications (NACE64), financial intermediation (NACE 65), insurance and pension funding (NACE 66), activities auxiliary to financial intermediation (NACE 67), real estate activities (NACE 70), renting of machinery and equipment (NACE 71), computer and related activities (NACE72), research and development (NACE73) and other business activities (NACE 74)
Denominator	Total workforce including all manufacturing and service sectors
Rationale	The share of employment in high technology manufacturing sectors is an indicator of the manufacturing economy that is based on continual innovation through creative, inventive activity. The use of total employment gives a better indicator than using the share of manufacturing employment alone, since the latter will be affected by the hollowing out of manufacturing in some countries. Knowledge-intensive services provide services directly to consumers, such as telecommunications, and provide inputs to the innovative activities of other firms in all sectors of the economy. The latter can increase productivity throughout the economy and support the diffusion of a range of innovations, in particular those based on ICT
Included in RIS 2012	Yes
Included in IUS	No (IUS uses indicator on employment in knowledge-intensive activities for which regional data are not available)
Data source	Eurostat
Data availability	NUTS 2: 2000-2011, break in time series between 2007 and 2008 due to revision of NACE classification

SALES OF NEW-TO-MARKET AND NEW-TO-FIRM INNOVATIONS (%)	
Numerator	Sum of total turnover of new or significantly improved products for SMEs only
Denominator	Total turnover for SMEs only (both innovators and non-innovators)
Rationale	This indicator measures the turnover of new or significantly improved products to the firm as a percentage of total turnover. These products are not new to the market. Sales of new to the firm but not new to the market products are a proxy of the use or implementation of elsewhere already introduced products (or technologies). This indicator is a proxy for the degree of diffusion of state-of-the-art technologies
Included in RIS 2012	Yes
Included in IUS	No, merged with indicator on sales of new-to-firm products
Data source	Community Innovation Survey – Eurostat in collaboration with individual Member States
Data availability	NUTS 1: 2004-2006-2008-2010: BE, BG; 2004-2008-2010: FR; 2008-2010: AT NUTS 2: 2004-2006-2008-2010: CZ, ES, PL, RO, SI, SK, NO; 2006: GR; 2006-2008-2010: HU, PT; 2008-2010: SE; 2010: HR

Annex 2: Regional innovation performance groups

		2004	2006	2008	2010
BE	Belgium				
BE1	Région de Bruxelles-Capitale / Brussels Hoofdstedelijk Gewest	Follower	Follower	Follower	Follower
BE2	Vlaams Gewest	Leader	Follower	Leader	Follower
BE3	Région Wallonne	Follower	Follower	Follower	Follower
BG	Bulgaria				
BG3	Severna i iztochna Bulgaria	Modest	Modest	Modest	Modest
BG4	Yugozapadna i yuzhna tsentralna Bulgaria	Modest	Modest	Modest	Modest
CZ	Czech Republic				
CZ01	Praha	Follower	Follower	Follower	Moderate
CZ02	Střední Cechy	Moderate	Moderate	Moderate	Moderate
CZ03	Jihozápad	Moderate	Moderate	Moderate	Moderate
CZ04	Severozápad	Moderate	Moderate	Moderate	Moderate
CZ05	Severovýchod	Moderate	Moderate	Moderate	Moderate
CZ06	Jihovýchod	Moderate	Moderate	Moderate	Moderate
CZ07	Střední Morava	Moderate	Moderate	Moderate	Moderate
CZ08	Moravskoslezsko	Moderate	Moderate	Moderate	Moderate
DK	Denmark				
DK01	Hovedstaden	Leader	Leader	Leader	Leader
DK02	Sjælland	Leader	Follower	Follower	Leader
DK03	Syddanmark	Leader	Follower	Follower	Follower
DK04	Midtjylland	Leader	Leader	Leader	Leader
DK05	Nordjylland	Follower	Follower	Follower	Leader
DE	Germany				
DE1	Baden-Württemberg	Leader	Leader	Leader	Leader
DE2	Bayern	Leader	Leader	Leader	Leader
DE3	Berlin	Follower	Leader	Leader	Leader
DE4	Brandenburg	Follower	Follower	Follower	Follower
DE5	Bremen	Follower	Follower	Follower	Follower
DE6	Hamburg	Follower	Follower	Follower	Leader
DE7	Hessen	Leader	Leader	Leader	Leader
DE8	Mecklenburg-Vorpommern	Follower	Follower	Follower	Follower
DE9	Niedersachsen	Leader	Leader	Leader	Leader
DEA	Nordrhein-Westfalen	Leader	Leader	Leader	Leader
DEB	Rheinland-Pfalz	Leader	Leader	Leader	Leader
DEC	Saarland	Follower	Follower	Follower	Follower
DED	Sachsen	Leader	Leader	Leader	Leader
DEE	Sachsen-Anhalt	Follower	Follower	Follower	Follower
DEF	Schleswig-Holstein	Follower	Follower	Follower	Follower
DEG	Thüringen	Leader	Leader	Leader	Leader
IE	Ireland				
IE01	Border, Midland and Western	Follower	Follower	Follower	Follower
IE02	Southern and Eastern	Follower	Follower	Follower	Leader

		2004	2006	2008	2010
EL	Greece				
EL1	Voreia Ellada	Moderate	Moderate	Moderate	Moderate
EL2	Kentriki Ellada	Moderate	Moderate	Moderate	Moderate
EL3	Attiki	Moderate	Moderate	Moderate	Moderate
EL4	Nisia Aigaiou, Kriti	Moderate	Moderate	Moderate	Moderate
ES	Spain				
ES11	Galicia	Moderate	Moderate	Moderate	Moderate
ES12	Principado de Asturias	Moderate	Moderate	Moderate	Moderate
ES13	Cantabria	Moderate	Moderate	Moderate	Moderate
ES21	País Vasco	Follower	Follower	Follower	Follower
ES22	Comunidad Foral de Navarra	Follower	Follower	Follower	Follower
ES23	La Rioja	Moderate	Moderate	Moderate	Moderate
ES24	Aragón	Moderate	Moderate	Moderate	Moderate
ES3	Comunidad de Madrid	Moderate	Moderate	Moderate	Moderate
ES41	Castilla y León	Moderate	Moderate	Moderate	Moderate
ES42	Castilla-la Mancha	Moderate	Moderate	Moderate	Moderate
ES43	Extremadura	Moderate	Modest	Moderate	Moderate
ES51	Cataluña	Moderate	Moderate	Moderate	Moderate
ES52	Comunidad Valenciana	Moderate	Moderate	Moderate	Moderate
ES53	Illes Balears	Modest	Moderate	Modest	Modest
ES61	Andalucía	Moderate	Moderate	Moderate	Moderate
ES62	Región de Murcia	Moderate	Moderate	Moderate	Moderate
ES63	Ciudad Autónoma de Ceuta	Moderate	Moderate	Modest	Modest
ES64	Ciudad Autónoma de Melilla	Moderate	Moderate	Modest	Modest
ES7	Canarias	Modest	Moderate	Modest	Modest
FR	France				
FR1	Île de France	Leader	Leader	Leader	Leader
FR2	Bassin Parisien	Moderate	Moderate	Follower	Moderate
FR3	Nord - Pas-de-Calais	Moderate	Moderate	Moderate	Follower
FR4	Est	Follower	Follower	Follower	Follower
FR5	Ouest	Follower	Follower	Follower	Follower
FR6	Sud-Ouest	Follower	Follower	Follower	Follower
FR7	Centre-Est	Follower	Follower	Follower	Follower
FR8	Méditerranée	Follower	Follower	Follower	Follower
FR9	Départements d'outre-mer	Moderate	Moderate	Moderate	Moderate

Annex 2: Regional innovation performance groups

		2004	2006	2008	2010
IT	Italy				
ITC1	Piemonte	Follower	Follower	Follower	Follower
ITC2	Valle d'Aosta/Vallée d'Aoste	Moderate	Moderate	Moderate	Moderate
ITC3	Liguria	Moderate	Moderate	Moderate	Moderate
ITC4	Lombardia	Moderate	Moderate	Moderate	Moderate
ITH1	Provincia Autonoma Bolzano/Bozen	Moderate	Moderate	Moderate	Moderate
ITH2	Provincia Autonoma Trento	Moderate	Moderate	Moderate	Moderate
ITH3	Veneto	Moderate	Moderate	Moderate	Moderate
ITH4	Friuli-Venezia Giulia	Moderate	Moderate	Moderate	Follower
ITH5	Emilia-Romagna	Moderate	Moderate	Moderate	Follower
ITI1	Toscana	Moderate	Moderate	Moderate	Moderate
ITI2	Umbria	Moderate	Moderate	Moderate	Moderate
ITI3	Marche	Moderate	Moderate	Moderate	Moderate
ITI4	Lazio	Moderate	Moderate	Moderate	Moderate
ITF1	Abruzzo	Moderate	Moderate	Moderate	Moderate
ITF2	Molise	Modest	Modest	Moderate	Moderate
ITF3	Campania	Moderate	Moderate	Moderate	Moderate
ITF4	Puglia	Moderate	Moderate	Moderate	Moderate
ITF5	Basilicata	Moderate	Moderate	Moderate	Moderate
ITF6	Calabria	Modest	Modest	Moderate	Moderate
ITG1	Sicilia	Moderate	Moderate	Moderate	Moderate
ITG2	Sardegna	Moderate	Moderate	Moderate	Moderate
HU	Hungary				
HU1	Közép-Magyarország	Moderate	Moderate	Moderate	Moderate
HU21	Közép-Dunántúl	Moderate	Moderate	Moderate	Moderate
HU22	Nyugat-Dunántúl	Moderate	Moderate	Moderate	Moderate
HU23	Dél-Dunántúl	Modest	Modest	Moderate	Modest
HU31	Észak-Magyarország	Modest	Modest	Moderate	Modest
HU32	Észak-Alföld	Modest	Modest	Modest	Modest
HU33	Dél-Alföld	Modest	Moderate	Modest	Moderate
NL	Netherlands				
NL11	Groningen	Follower	Follower	Follower	Follower
NL12	Friesland	Moderate	Follower	Moderate	Follower
NL13	Drenthe	Follower	Follower	Moderate	Follower
NL21	Overijssel	Follower	Follower	Follower	Follower
NL22	Gelderland	Follower	Follower	Follower	Follower
NL23	Flevoland	Follower	Follower	Follower	Follower
NL31	Utrecht	Leader	Leader	Follower	Leader
NL32	Noord-Holland	Follower	Follower	Follower	Follower
NL33	Zuid-Holland	Follower	Follower	Follower	Follower
NL34	Zeeland	Moderate	Follower	Follower	Follower
NL41	Noord-Brabant	Leader	Leader	Leader	Leader
NL42	Limburg	Follower	Follower	Follower	Follower

		2004	2006	2008	2010
AT	Austria				
AT1	Ostösterreich	Follower	Follower	Follower	Follower
AT2	Südösterreich	Follower	Leader	Follower	Follower
AT3	Westösterreich	Follower	Follower	Follower	Follower
PL	Poland				
PL11	Lódzkie	Moderate	Modest	Modest	Modest
PL12	Mazowieckie	Moderate	Moderate	Moderate	Moderate
PL21	Malopolskie	Moderate	Moderate	Moderate	Moderate
PL22	Slaskie	Moderate	Moderate	Modest	Moderate
PL31	Lubelskie	Moderate	Modest	Modest	Modest
PL32	Podkarpackie	Modest	Moderate	Modest	Moderate
PL33	Swietokrzyskie	Modest	Modest	Modest	Modest
PL34	Podlaskie	Moderate	Modest	Modest	Modest
PL41	Wielkopolskie	Modest	Modest	Modest	Modest
PL42	Zachodniopomorskie	Modest	Modest	Modest	Modest
PL43	Lubuskie	Modest	Modest	Modest	Modest
PL51	Dolnoslaskie	Moderate	Moderate	Moderate	Moderate
PL52	Opolskie	Moderate	Modest	Modest	Modest
PL61	Kujawsko-Pomorskie	Moderate	Modest	Modest	Modest
PL62	Warminsko-Mazurskie	Modest	Modest	Modest	Modest
PL63	Pomorskie	Moderate	Moderate	Moderate	Modest
PT	Portugal				
PT11	Norte	Moderate	Moderate	Moderate	Moderate
PT15	Algarve	Modest	Moderate	Moderate	Moderate
PT16	Centro	Moderate	Moderate	Moderate	Moderate
PT17	Lisboa	Moderate	Moderate	Follower	Follower
PT18	Alentejo	Moderate	Moderate	Moderate	Moderate
PT2	Região Autónoma dos Açores	Moderate	Moderate	Moderate	Moderate
PT3	Região Autónoma da Madeira	Moderate	Modest	Moderate	Modest
RO	Romania				
RO11	Nord-Vest	Modest	Modest	Modest	Modest
RO12	Centru	Modest	Modest	Modest	Modest
RO21	Nord-Est	Modest	Modest	Modest	Modest
RO22	Sud-Est	Modest	Moderate	Moderate	Modest
RO31	Sud - Muntenia	Modest	Modest	Modest	Modest
RO32	Bucuresti - Ilfov	Moderate	Moderate	Moderate	Moderate
RO41	Sud-Vest Oltenia	Modest	Modest	Modest	Modest
RO42	Vest	Modest	Modest	Modest	Modest
SI	Slovenia				
SI01	Vzhodna Slovenija	Moderate	Moderate	Moderate	Moderate
SI02	Zahodna Slovenija	Follower	Follower	Follower	Follower

Annex 2: Regional innovation performance groups

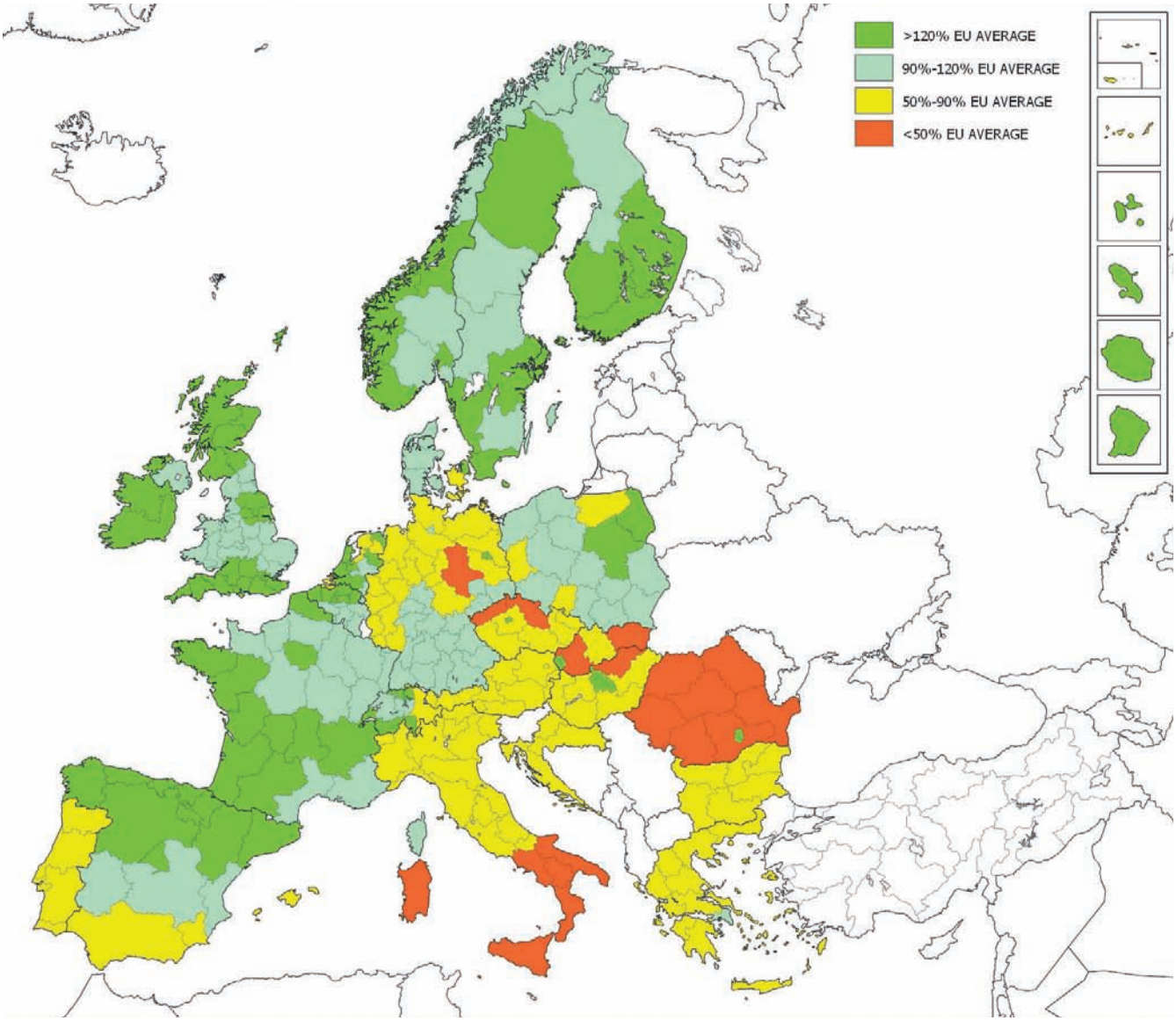
		2004	2006	2008	2010
SK	Slovakia				
SK01	Bratislavský kraj	Moderate	Moderate	Moderate	Follower
SK02	Západné Slovensko	Moderate	Modest	Moderate	Moderate
SK03	Stredné Slovensko	Moderate	Moderate	Moderate	Moderate
SK04	Východné Slovensko	Modest	Moderate	Modest	Modest
FI	Finland				
FI13	Itä-Suomi	Follower	Follower	Follower	Follower
FI18	Etelä-Suomi	Leader	Leader	Leader	Leader
FI19	Länsi-Suomi	Leader	Leader	Leader	Leader
FI1A	Pohjois-Suomi	Follower	Leader	Leader	Leader
FI2	Åland	Follower	Moderate	Follower	Follower
SE	Sweden				
SE11	Stockholm	Leader	Leader	Leader	Leader
SE12	Östra Mellansverige	Leader	Leader	Leader	Leader
SE21	Småland med öarna	Follower	Follower	Follower	Follower
SE22	Sydsverige	Leader	Leader	Leader	Leader
SE23	Västsverige	Leader	Leader	Leader	Leader
SE31	Norra Mellansverige	Follower	Follower	Follower	Follower
SE32	Mellersta Norrland	Follower	Follower	Follower	Follower
SE33	Övre Norrland	Leader	Leader	Leader	Follower
UK	United Kingdom				
UKC	North East	Follower	Follower	Follower	Follower
UKD	North West	Follower	Follower	Follower	Follower
UKE	Yorkshire and The Humber	Follower	Follower	Follower	Follower
UKF	East Midlands	Follower	Follower	Follower	Follower
UKG	West Midlands	Follower	Follower	Follower	Follower
UKH	East of England	Leader	Leader	Leader	Leader
UKI	London	Leader	Follower	Follower	Follower
UKJ	South East	Leader	Leader	Leader	Leader
UKK	South West	Leader	Leader	Follower	Follower
UKL	Wales	Follower	Follower	Follower	Follower
UKM	Scotland	Follower	Follower	Follower	Follower
UKN	Northern Ireland	Follower	Moderate	Follower	Follower
CH	Switzerland				
CH01	Région lémanique	Leader	Leader	Leader	Leader
CH02	Espace Mittelland	Leader	Leader	Leader	Leader
CH03	Nordwestschweiz	Leader	Leader	Leader	Leader
CH04	Zürich	Leader	Leader	Leader	Leader
CH05	Ostschweiz	Leader	Leader	Leader	Leader
CH06	Zentralschweiz	Leader	Leader	Leader	Leader
CH07	Ticino	Leader	Leader	Leader	Leader

		2004	2006	2008	2010
NO	Norway				
NO01	Oslo og Akershus	Follower	Follower	Follower	Follower
NO02	Hedmark og Oppland	Moderate	Moderate	Moderate	Moderate
NO03	Sør-Østlandet	Moderate	Moderate	Moderate	Moderate
NO04	Agder og Rogaland	Moderate	Moderate	Moderate	Moderate
NO05	Vestlandet	Moderate	Moderate	Moderate	Follower
NO06	Trøndelag	Follower	Follower	Follower	Follower
NO07	Nord-Norge	Moderate	Moderate	Moderate	Moderate
HR	Croatia				
HR01	Sjeverozapadna Hrvatska	Moderate	Moderate	Moderate	Moderate
HR02	Sredisnja i Istocna (Panonska) Hrvatska	Modest	Modest	Moderate	Modest
HR03	Jadranska Hrvatska	Modest	Modest	Modest	Modest

Annex 3: Performance maps per indicator

For each of the indicators used in the RIS 2014 regional performance differences are shown in geographical maps showing the performance relative to that of the EU average in 3 performance groups using the same thresholds used for identifying the regional performance groups in Section 3 of this report.

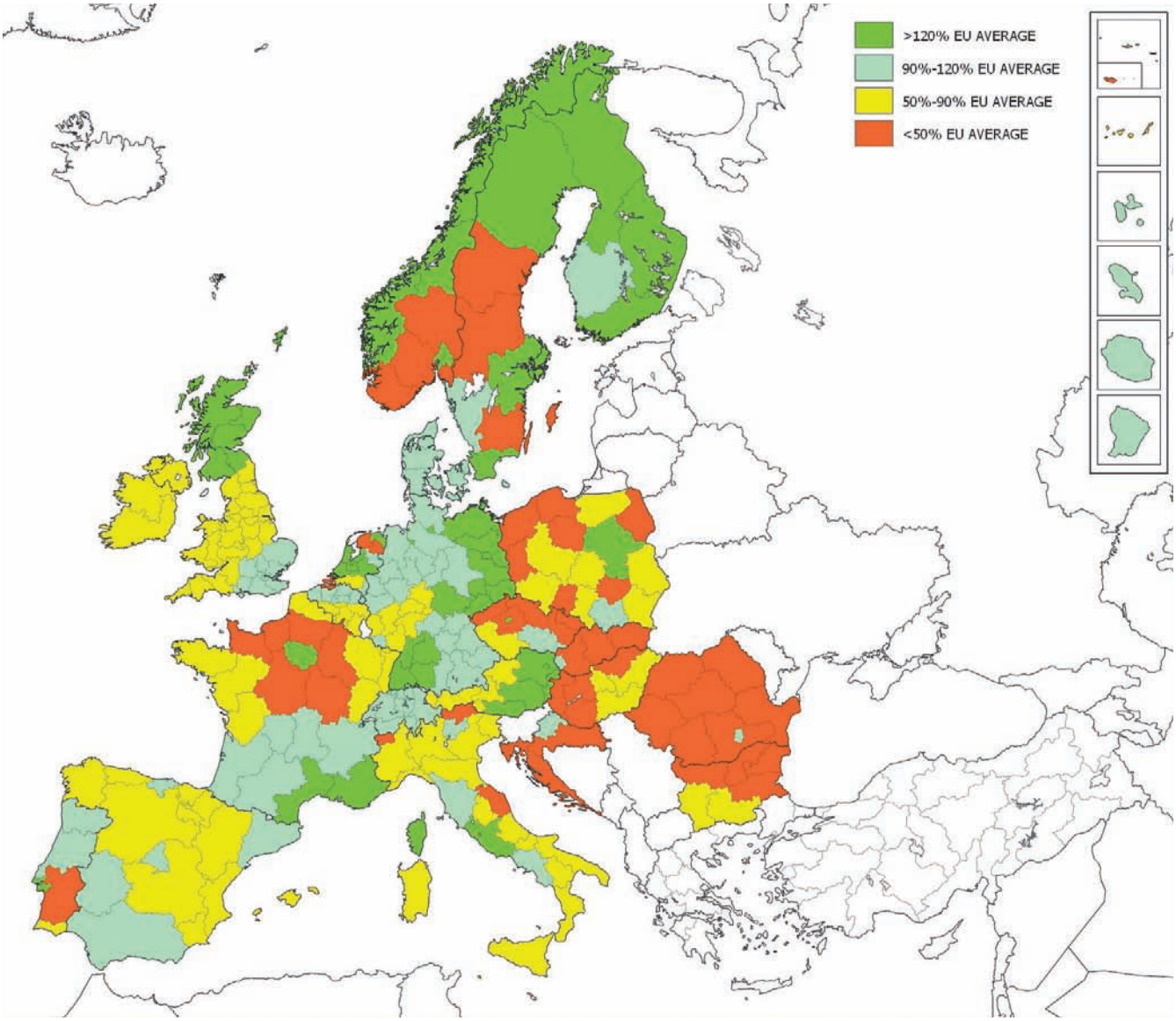
Percentage population aged 25-64 having completed tertiary education



Map created with Region Map Generator

Best performance is observed in parts of Belgium, Finland, France, Ireland, Netherlands, Norway, Poland, Spain, Sweden, Switzerland and the UK. Worst performance is observed in parts of Czech Republic, Eastern Germany, Southern Italy, Romania and Slovakia.

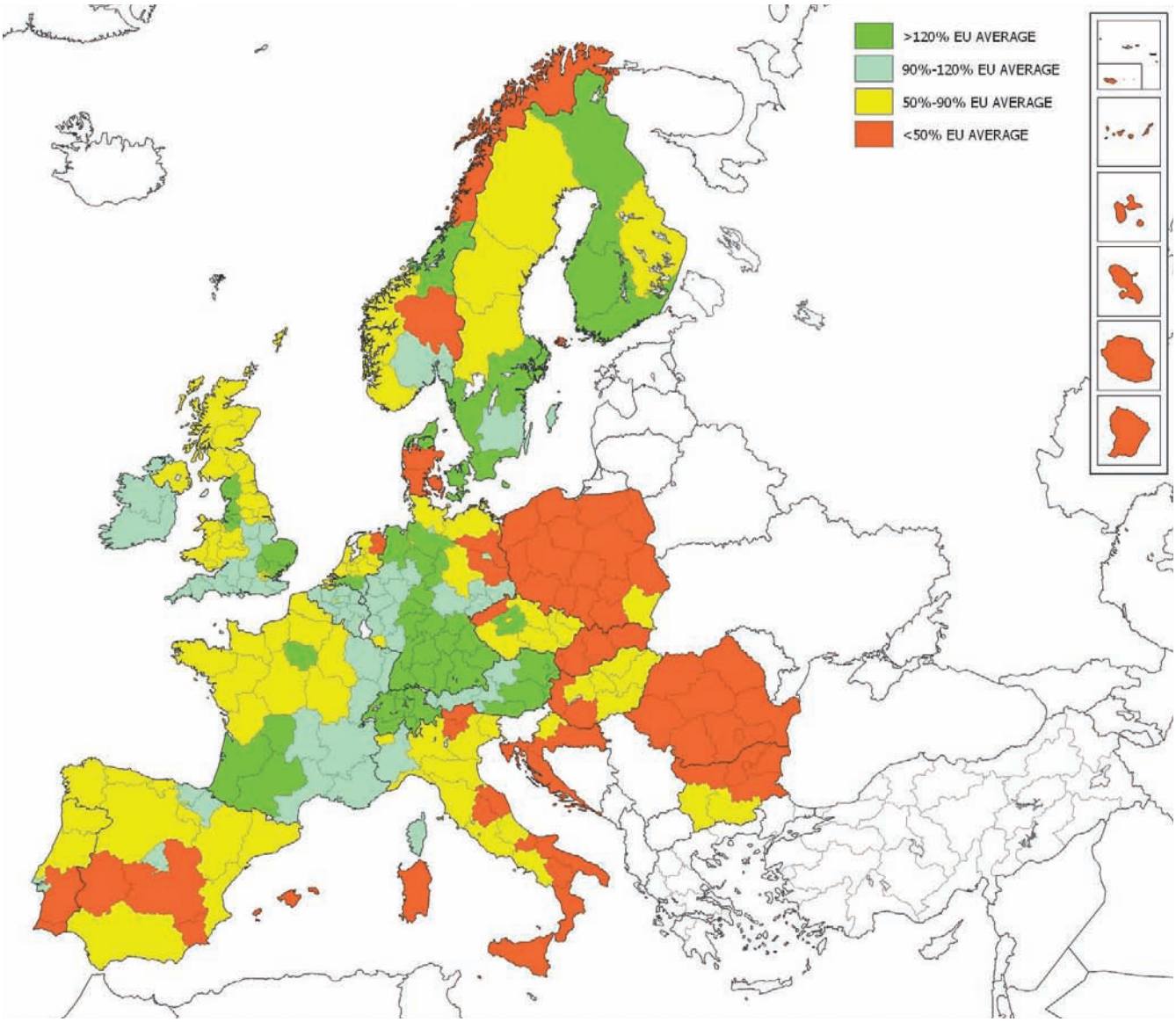
R&D expenditure in the public sector as % of GDP



Map created with Region Map Generator

Best performance is observed in parts of Austria, Finland, France, Germany, Netherlands, Norway, Poland, Sweden and the UK. Worst performance is observed in parts of France, Norway, Portugal, Sweden and Eastern Europe.

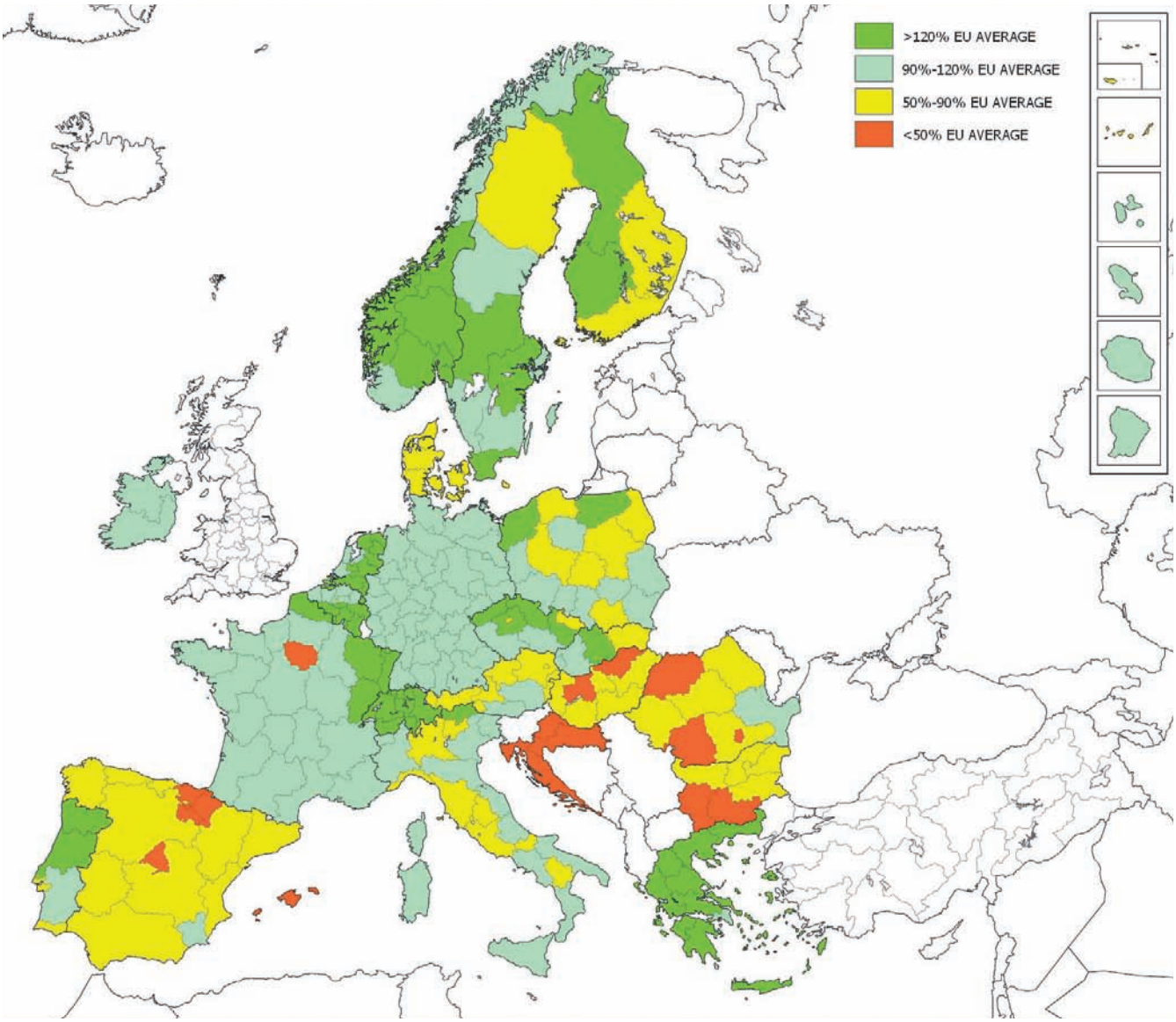
R&D expenditure in the business sector as % of GDP



Map created with Region Map Generator

Best performance is observed in parts of Austria, Finland, France, Germany, Netherlands, Sweden Switzerland and the UK. Worst performance is observed Regions in parts of Denmark, Eastern Germany, Eastern and Southern Europe.

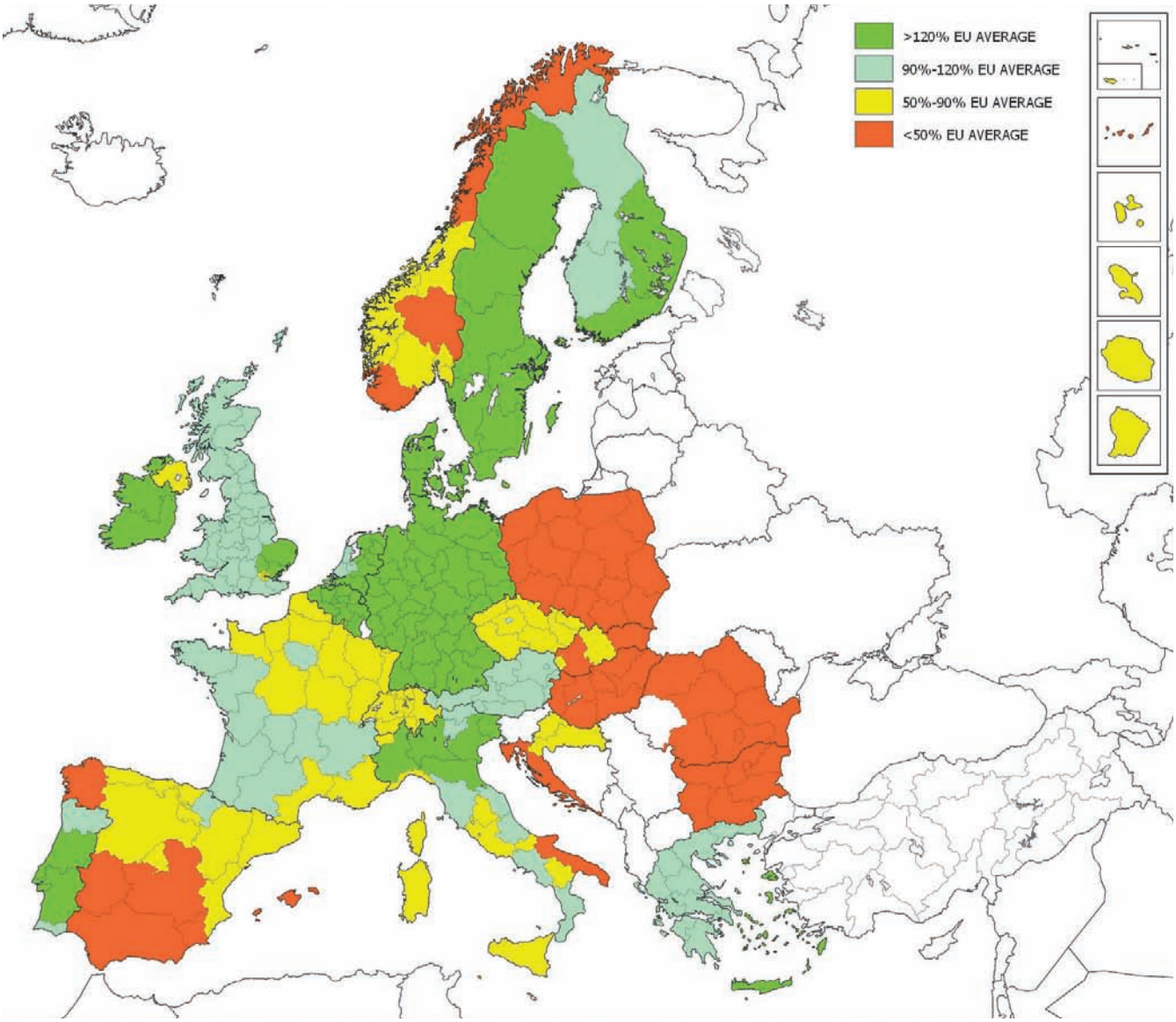
Non-R&D innovation expenditures as % of turnover



Map created with Region Map Generator

Best performance is observed in parts of Belgium, Czech Republic, Finland, France, Greece, Netherlands, Norway, Poland, Sweden and Switzerland. Worst performance is observed in parts of Bulgaria, Croatia, Hungary and Romania. For the UK data are not available.

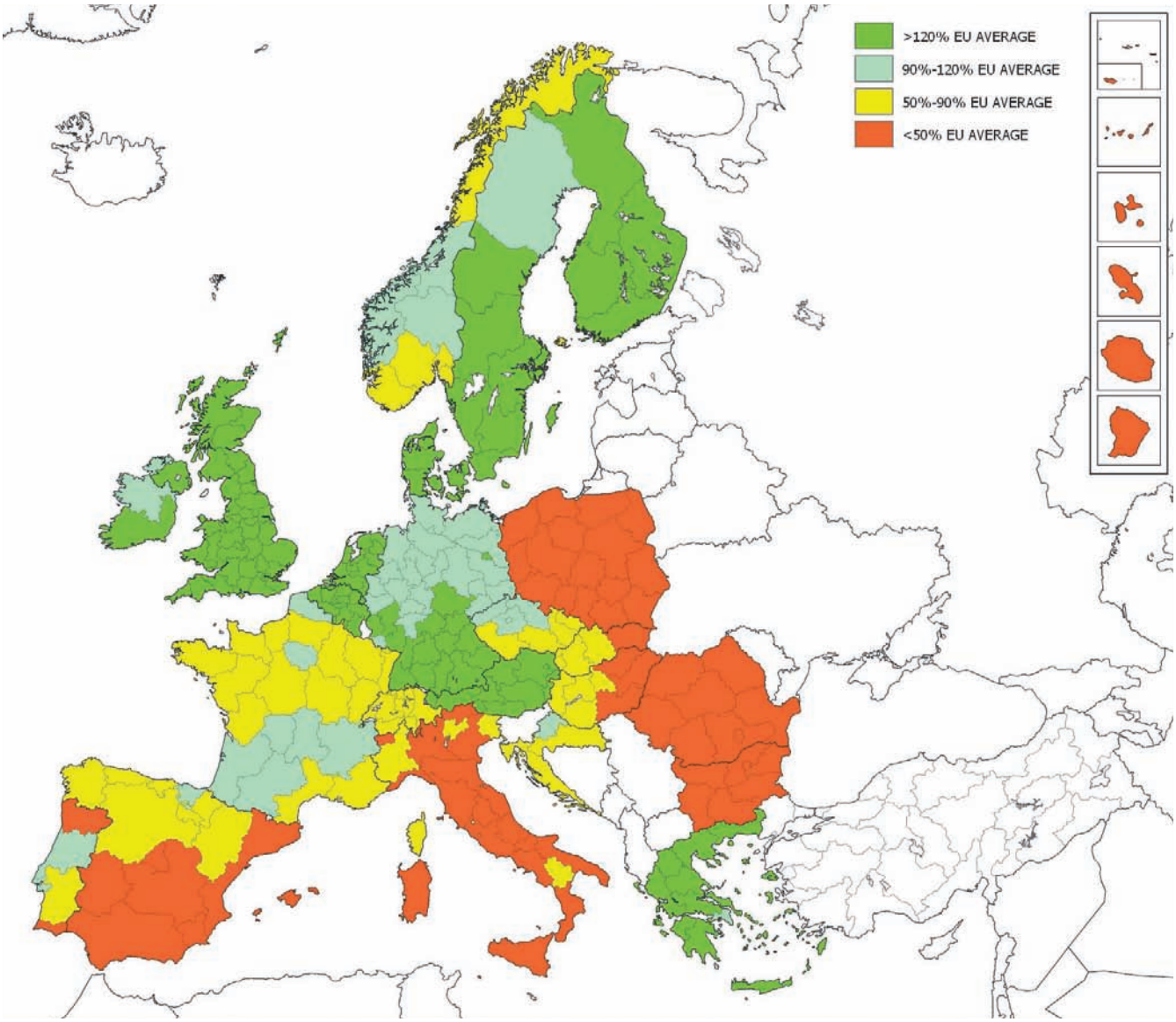
SMEs innovating in-house as % of SMEs



Map created with Region Map Generator

Best performance is observed in Belgium, Ireland, Netherlands and Sweden and partly in Finland, Italy, Portugal and the UK. Worst performance is observed in Bulgaria, Poland, Romania and Slovakia and partly in Norway and Spain.

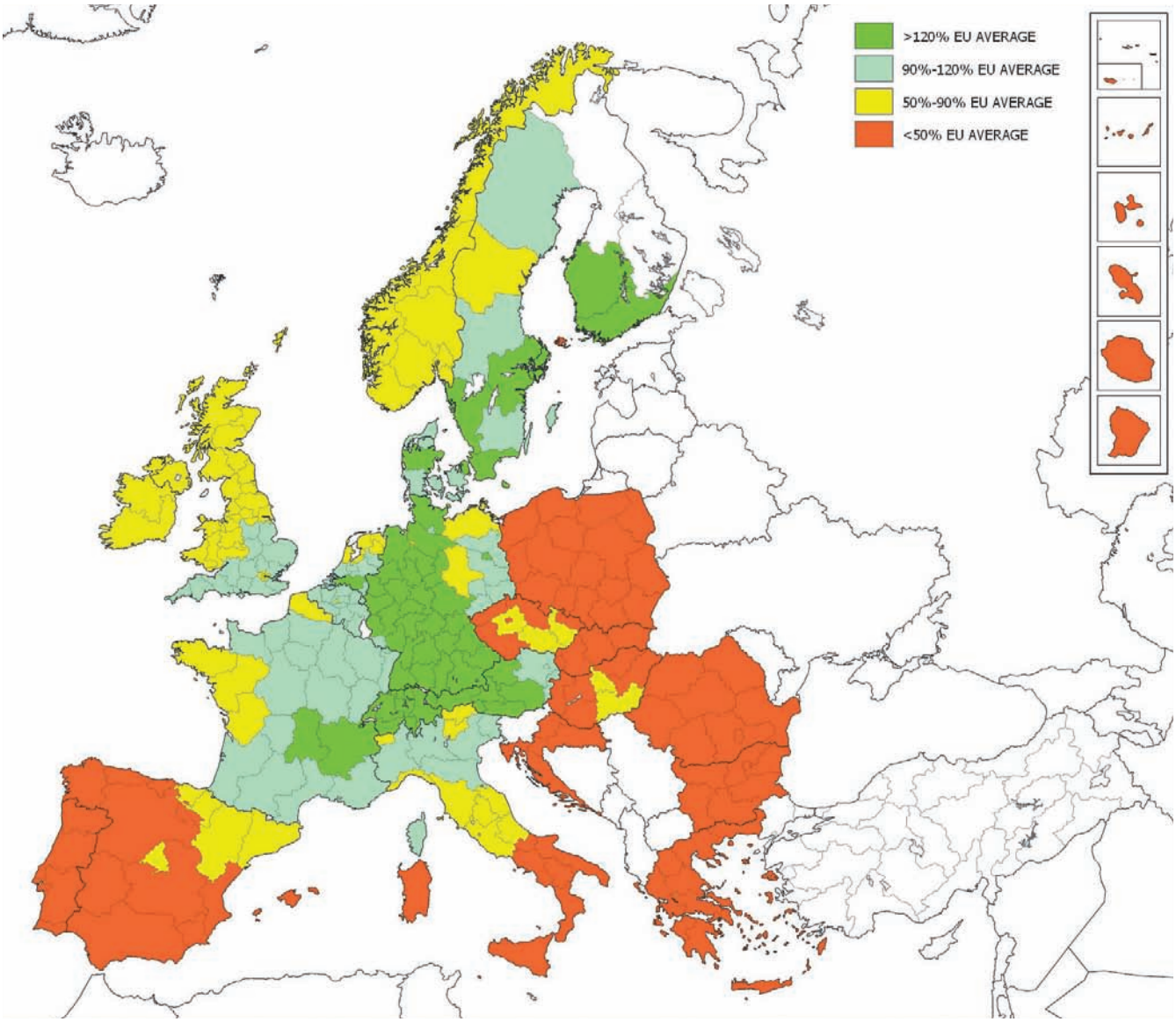
Innovative SMEs collaborating with others as % of SMEs



Map created with Region Map Generator

Best performance is observed in Austria, Belgium, Denmark, Finland, Greece, Netherland and the UK and partly in Finland and Germany. Worst performance is observed in Bulgaria, Poland and Romania and partly in Hungary, Italy and Spain.

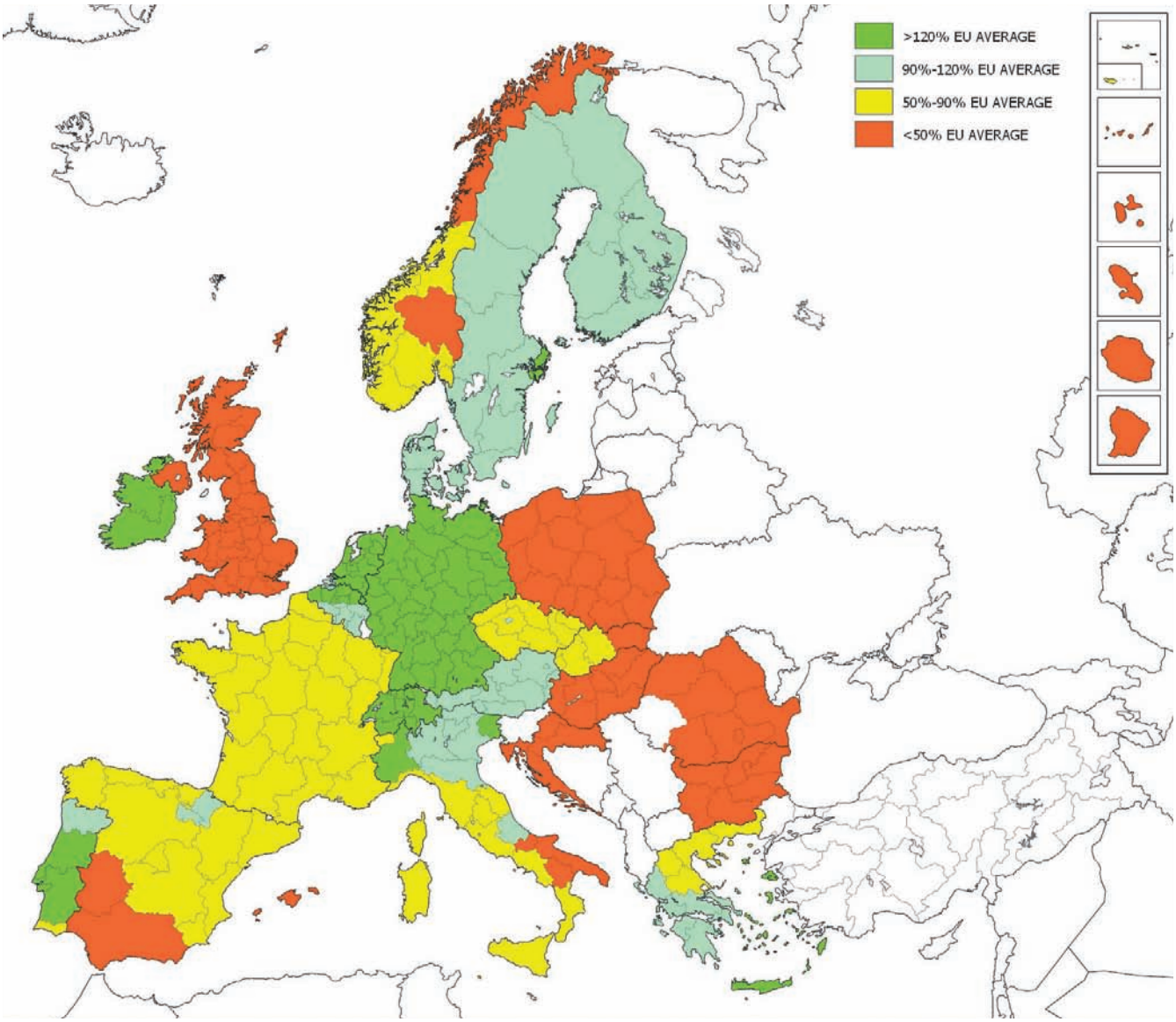
EPO patent applications per billion regional GDP (PPS€)



Map created with Region Map Generator

Best performance is observed in Austria, Germany and Switzerland and partly in Denmark, Finland, France, Netherlands and Sweden. Worst performance is observed in Eastern and Southern Europe.

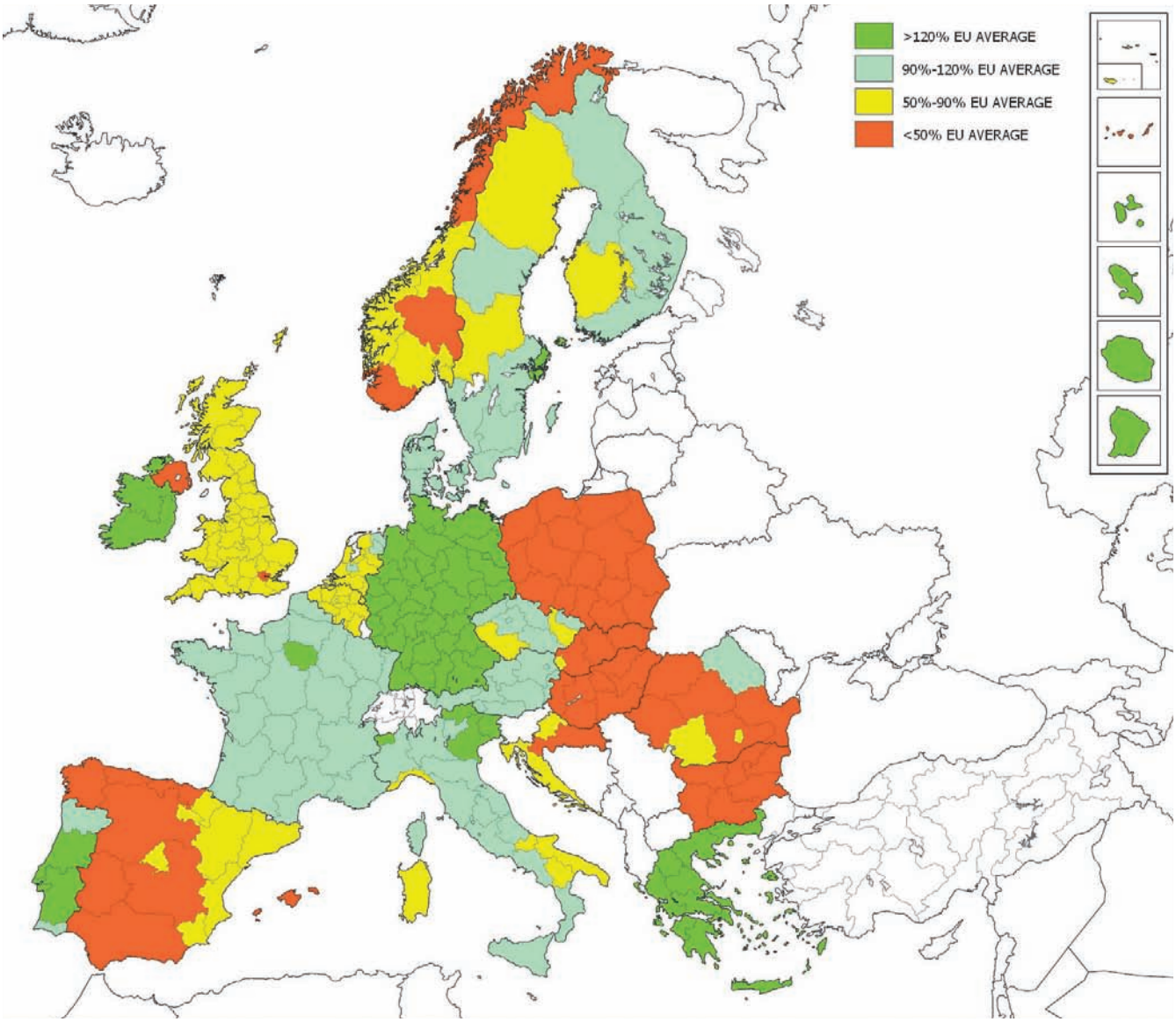
SMEs introducing product or process innovations as % of SMEs



Map created with Region Map Generator

Best performance is observed in Germany, Ireland, Netherland and Switzerland and partly in Belgium and Portugal. Worst performance is observed in Bulgaria, Croatia, Poland, Romania and the UK and partly in Norway and Spain.

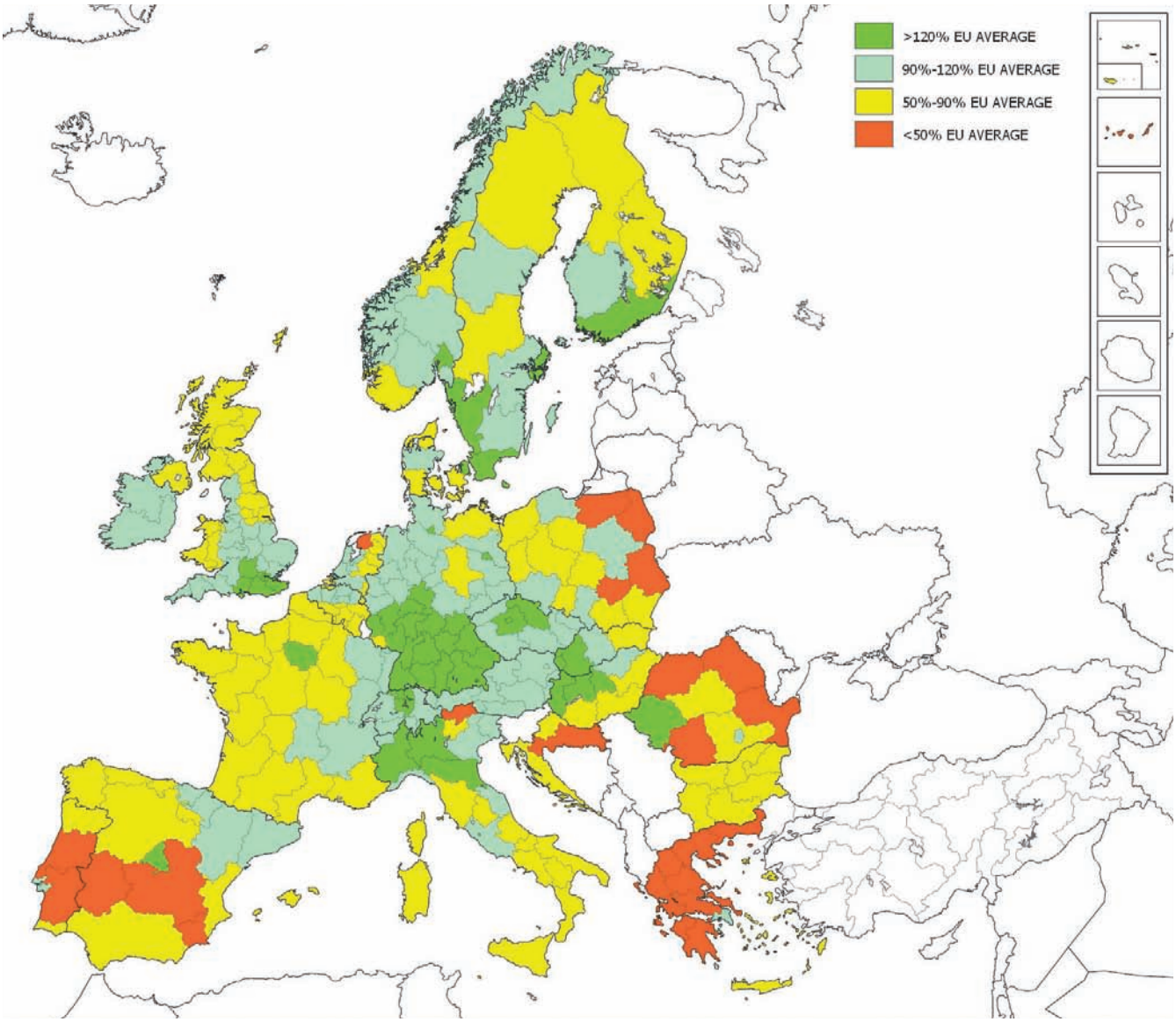
SMEs introducing marketing or organisational innovations as % of SMEs



Map created with Region Map Generator

Best performance is observed in Germany, Greece and Ireland partly in Belgium and Italy and Portugal. Worst performance is observed in Bulgaria, Croatia, Poland and Romania and partly in Norway and Spain.

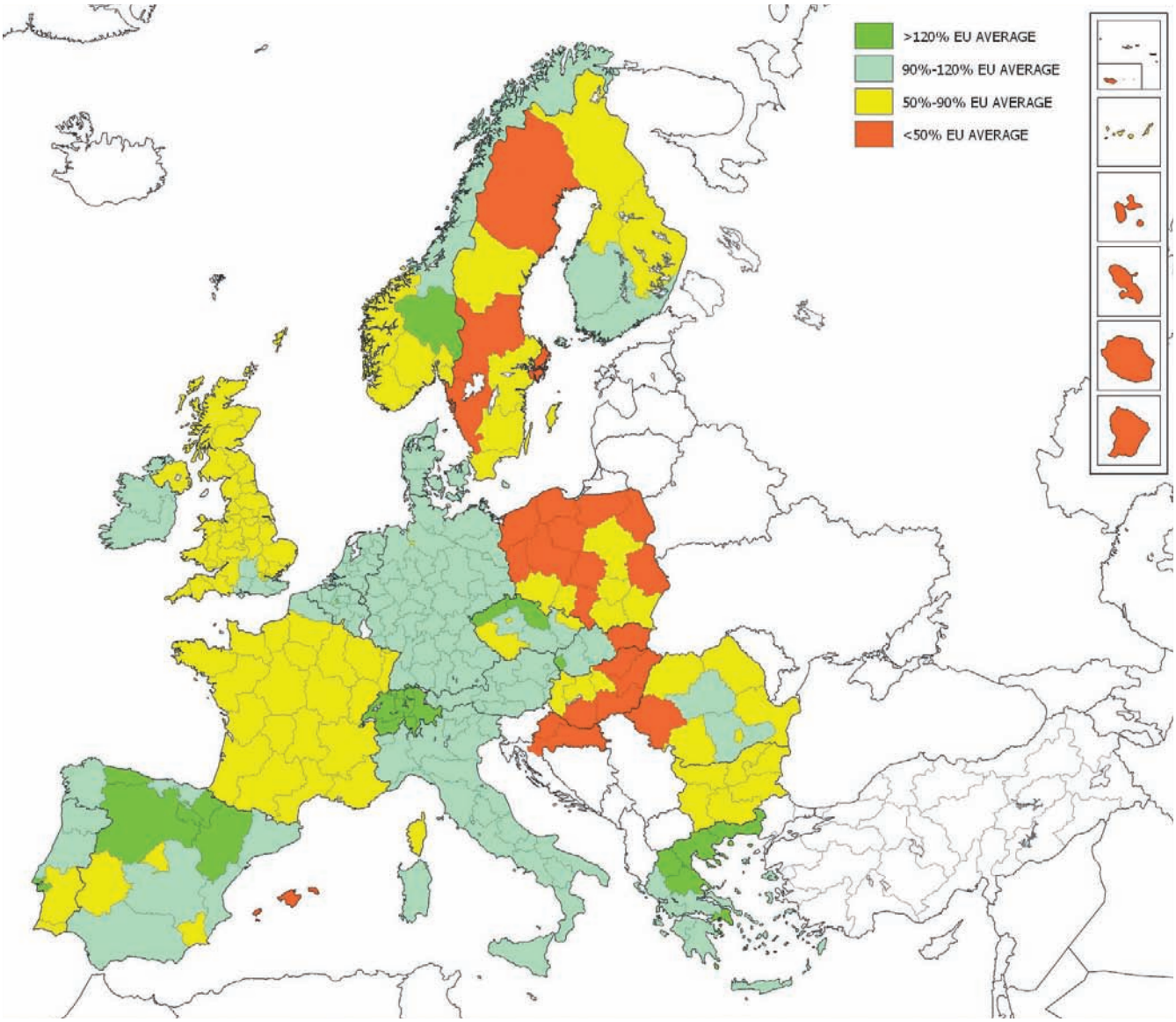
Employment in medium-high/high-tech manufacturing and knowledge-intensive services as % of total workforce



Map created with Region Map Generator

Best performance is observed in parts of Czech Republic, Finland, Germany, Hungary, Italy and the UK. Worst performance is observed in Greece and parts Poland, Portugal and Romania.

Sales of new to market and new to firm innovations as % of turnover



Map created with Region Map Generator

Best performance is observed in Switzerland and parts of Czech Republic, Greece, Norway and Spain. Worst performance is observed in parts of Croatia, Hungary, Poland and Sweden.

Annex 4: RIS normalised database

		POPULATION WITH TERTIARY EDUCATION	R&D EXPENDITURE IN THE PUBLIC SECTOR	R&D EXPENDITURE IN THE BUSINESS SECTOR	NON-R&D INNOVATION EXPENDI-TURES	SMES INNOVATING IN-HOUSE	INNOVATIVE SMES COLLABORAT-ING WITH OTHERS	EPO PATENT APPLICATIONS	SMES INTRODUCING PRODUCT OR PROCESS INNOVATIONS	SMES INTRODUCING MARKETING OR ORGANI-SATIONAL INNOVATIONS	EMPLOYMENT IN KNOWLEDGE-INTENSIVE ACTIVITIES	SALES OF NEW TO MARKET AND NEW TO FIRM INNOVATIONS
BE	Belgium											
BE1	Région de Bruxelles-Capitale / Brussels Hoofd-stedelijk Gewest	0.701	0.416	0.379	0.301	0.589	0.530	0.258	0.663	0.333	0.583	0.704
BE2	Vlaams Gewest	0.681	0.406	0.505	0.337	0.581	0.672	0.404	0.709	0.311	0.562	0.491
BE3	Région Wallonne	0.588	0.322	0.531	0.468	0.587	0.600	0.409	0.599	0.317	0.478	0.496
BG	Bulgaria											
BG3	Severna i iztochna Bulgaria	0.305	0.080	0.090	0.241	0.151	0.082	0.053	0.179	0.055	0.338	0.314
BG4	Yugozapadna i yuzhna tsentralna Bulgaria	0.408	0.268	0.261	0.162	0.088	0.114	0.078	0.122	0.065	0.402	0.272
CZ	Czech Republic											
CZ01	Praha	0.646	0.667	0.370	0.212	0.427	0.371	0.140	0.514	0.489	0.760	0.329
CZ02	Střední Cechy	0.278	0.182	0.717	0.421	0.392	0.352	0.209	0.424	0.435	0.802	0.494
CZ03	Jihozápad	0.310	0.268	0.355	0.318	0.319	0.233	0.182	0.377	0.356	0.638	0.315
CZ04	Severozápad	0.145	0.041	0.165	0.460	0.295	0.362	0.096	0.373	0.474	0.650	0.728
CZ05	Severovýchod	0.250	0.152	0.412	0.662	0.382	0.363	0.174	0.478	0.484	0.781	0.664
CZ06	Jihovýchod	0.377	0.410	0.414	0.342	0.385	0.319	0.194	0.465	0.469	0.650	0.467
CZ07	Střední Morava	0.306	0.176	0.346	0.621	0.374	0.303	0.188	0.431	0.396	0.633	0.617
CZ08	Moravskoslezsko	0.301	0.140	0.324	0.291	0.409	0.310	0.102	0.415	0.500	0.608	0.397
DK	Denmark											
DK01	Hovedstaden	0.863	0.509	0.855	0.227	0.615	0.527	0.556	0.602	0.492	0.768	0.541
DK02	Sjælland	0.389	0.509	0.817	0.243	0.615	0.500	0.433	0.582	0.468	0.440	0.524
DK03	Syddanmark	0.485	0.509	0.175	0.228	0.615	0.476	0.436	0.578	0.463	0.469	0.484
DK04	Midtjylland	0.580	0.509	0.207	0.229	0.615	0.493	0.492	0.595	0.480	0.541	0.512
DK05	Nordjylland	0.562	0.509	0.679	0.234	0.615	0.495	0.353	0.587	0.475	0.482	0.503

Annex 4: RIS normalised database

		POPULATION WITH TERTIARY EDUCATION	R&D EXPENDITURE IN THE PUBLIC SECTOR	R&D EXPENDITURE IN THE BUSINESS SECTOR	NON-R&D INNOVATION EXPENDI-TURES	SMES INNOVATING IN-HOUSE	INNOVATIVE SMES COLLABORAT-ING WITH OTHERS	EPO PATENT APPLICATIONS	SMES INTRODUCING PRODUCT OR PROCESS INNOVATIONS	SMES INTRODUCING MARKETING OR ORGANI-SATIONAL INNOVATIONS	EMPLOYMENT IN KNOWLEDGE-INTENSIVE ACTIVITIES	SALES OF NEW TO MARKET AND NEW TO FIRM INNOVATIONS
DE	Germany											
DE1	Baden-Württemberg	0.529	0.529	0.861	0.338	0.750	0.500	0.717	1.000	0.778	1.000	0.603
DE2	Bayern	0.527	0.410	0.675	0.346	0.734	0.486	0.653	0.988	0.778	0.848	0.587
DE3	Berlin	0.644	0.919	0.507	0.341	0.693	0.458	0.506	0.950	0.775	0.697	0.541
DE4	Brandenburg	0.299	0.562	0.235	0.337	0.635	0.417	0.417	0.904	0.733	0.520	0.515
DE5	Bremen	0.457	0.782	0.414	0.316	0.580	0.339	0.258	0.860	0.726	0.625	0.462
DE6	Hamburg	0.559	0.517	0.467	0.316	0.641	0.401	0.378	0.917	0.768	0.735	0.497
DE7	Hessen	0.503	0.365	0.674	0.333	0.702	0.451	0.501	0.959	0.777	0.760	0.545
DE8	Mecklenburg-Vorpom-mern	0.268	0.629	0.309	0.351	0.593	0.366	0.271	0.865	0.715	0.381	0.482
DE9	Niedersachsen	0.359	0.496	0.575	0.331	0.671	0.428	0.483	0.929	0.749	0.558	0.549
DEA	Nordrhein-Westfalen	0.377	0.441	0.467	0.338	0.679	0.437	0.513	0.943	0.759	0.642	0.530
DEB	Rheinland-Pfalz	0.417	0.332	0.524	0.335	0.696	0.460	0.592	0.955	0.761	0.692	0.536
DEC	Saarland	0.366	0.432	0.291	0.349	0.693	0.447	0.374	0.951	0.745	0.404	0.571
DED	Sachsen	0.483	0.742	0.467	0.342	0.674	0.449	0.389	0.936	0.749	0.646	0.548
DEE	Sachsen-Anhalt	0.242	0.500	0.264	0.338	0.646	0.438	0.243	0.914	0.730	0.397	0.507
DEF	Schleswig-Holstein	0.333	0.405	0.312	0.332	0.655	0.415	0.451	0.930	0.760	0.499	0.511
DEG	Thüringen	0.405	0.586	0.434	0.346	0.693	0.462	0.457	0.955	0.750	0.604	0.565
IE	Ireland											
IE01	Border, Midland and Western	0.685	0.313	0.487	0.331	0.579	0.423	0.331	0.767	0.590	0.507	0.503
IE02	Southern and Eastern	0.814	0.360	0.450	0.335	0.579	0.457	0.229	0.803	0.666	0.646	0.508
EL	Greece											
EL1	Voreia Ellada	0.375	n/a	n/a	0.456	0.459	0.461	0.071	0.459	0.601	0.246	0.926
EL2	Kentriki Ellada	0.301	n/a	n/a	0.472	0.429	0.638	0.055	0.499	0.636	0.212	0.519
EL3	Attiki	0.583	n/a	n/a	0.335	0.477	0.371	0.106	0.548	0.542	0.545	0.766
EL4	Nisia Aigaiou, Kriti	0.326	n/a	n/a	0.814	0.566	0.476	0.112	0.653	0.647	0.351	0.500

		POPULATION WITH TERTIARY EDUCATION	R&D EXPENDITURE IN THE PUBLIC SECTOR	R&D EXPENDITURE IN THE BUSINESS SECTOR	NON-R&D INNOVATION EXPENDI-TURES	SMES INNOVATING IN-HOUSE	INNOVATIVE SMES COLLABORAT-ING WITH OTHERS	EPO PATENT APPLICATIONS	SMES INTRODUCING PRODUCT OR PROCESS INNOVATIONS	SMES INTRODUCING MARKETING OR ORGANI-SATIONAL INNOVATIONS	EMPLOYMENT IN KNOWLEDGE-INTENSIVE ACTIVITIES	SALES OF NEW TO MARKET AND NEW TO FIRM INNOVATIONS
ES	Spain											
ES11	Galicia	0.630	0.317	0.257	0.198	0.227	0.290	0.118	0.328	0.200	0.343	0.503
ES12	Principado de Asturias	0.771	0.365	0.264	0.199	0.253	0.191	0.168	0.303	0.108	0.301	0.743
ES13	Cantabria	0.676	0.462	0.246	0.212	0.258	0.223	0.145	0.402	0.158	0.393	0.486
ES21	País Vasco	0.968	0.313	0.525	0.137	0.404	0.365	0.242	0.422	0.208	0.654	0.615
ES22	Comunidad Foral de Navarra	0.765	0.365	0.507	0.158	0.489	0.316	0.309	0.536	0.295	0.549	0.657
ES23	La Rioja	0.648	0.327	0.294	0.148	0.307	0.305	0.112	0.498	0.238	0.313	0.638
ES24	Aragón	0.697	0.308	0.324	0.220	0.342	0.244	0.217	0.370	0.278	0.604	0.716
ES3	Comunidad de Madrid	0.753	0.500	0.445	0.151	0.278	0.155	0.202	0.287	0.297	0.794	0.437
ES41	Castilla y León	0.655	0.317	0.312	0.267	0.275	0.196	0.119	0.312	0.194	0.381	0.698
ES42	Castilla-la Mancha	0.469	0.221	0.235	0.270	0.214	0.081	0.102	0.291	0.211	0.263	0.605
ES43	Extremadura	0.485	0.405	0.149	0.255	0.168	0.164	0.043	0.239	0.145	0.208	0.358
ES51	Cataluña	0.620	0.410	0.405	0.182	0.349	0.177	0.258	0.371	0.328	0.646	0.480
ES52	Comunidad Valenciana	0.562	0.374	0.261	0.177	0.249	0.185	0.162	0.277	0.240	0.360	0.518
ES53	Illes Balears	0.454	0.242	0.072	0.055	0.153	0.048	0.080	0.197	0.128	0.360	0.090
ES61	Andalucía	0.438	0.436	0.261	0.244	0.213	0.102	0.099	0.229	0.174	0.317	0.558
ES62	Región de Murcia	0.329	0.336	0.235	0.379	0.204	0.091	0.109	0.341	0.232	0.225	0.414
ES63	Ciudad Autónoma de Ceuta (ES)	0.281	0.073	0.028	0.049	0.064	0.231	n/a	0.222	0.057	0.305	0.085
ES64	Ciudad Autónoma de Melilla (ES)	0.250	0.114	0.006	0.049	0.064	0.231	n/a	0.222	0.057	0.305	0.085
ES7	Canarias (ES)	0.457	0.313	0.119	0.271	0.132	0.104	0.079	0.208	0.113	0.204	0.318
FR	France											
FR1	Île de France	0.800	0.541	0.606	0.160	0.463	0.437	0.438	0.456	0.532	0.836	0.463
FR2	Bassin Parisien	0.557	0.146	0.420	0.353	0.395	0.315	0.339	0.354	0.409	0.444	0.341
FR3	Nord - Pas-de-Calais	0.623	0.252	0.259	0.439	0.409	0.341	0.240	0.325	0.450	0.376	0.485
FR4	Est (FR)	0.543	0.379	0.446	0.477	0.371	0.310	0.405	0.379	0.451	0.532	0.411
FR5	Ouest (FR)	0.620	0.294	0.382	0.366	0.426	0.336	0.333	0.437	0.445	0.381	0.401
FR6	Sud-Ouest (FR)	0.709	0.435	0.599	0.378	0.446	0.356	0.346	0.403	0.504	0.469	0.459
FR7	Centre-Est (FR)	0.653	0.462	0.563	0.318	0.465	0.380	0.539	0.448	0.460	0.549	0.411
FR8	Méditerranée	0.555	0.584	0.430	0.334	0.395	0.302	0.341	0.329	0.503	0.414	0.399
FR9	Départements d'outre-mer (FR)	0.651	0.426	0.027	0.373	0.253	0.169	0.058	0.269	0.540	n/a	0.250

Annex 4: RIS normalised database

		POPULATION WITH TERTIARY EDUCATION	R&D EXPENDITURE IN THE PUBLIC SECTOR	R&D EXPENDITURE IN THE BUSINESS SECTOR	NON-R&D INNOVATION EXPENDI-TURES	SMES INNOVATING IN-HOUSE	INNOVATIVE SMES COLLABORAT-ING WITH OTHERS	EPO PATENT APPLICATIONS	SMES INTRODUCING PRODUCT OR PROCESS INNOVATIONS	SMES INTRODUCING MARKETING OR ORGANI-SATIONAL INNOVATIONS	EMPLOYMENT IN KNOWLEDGE-INTENSIVE ACTIVITIES	SALES OF NEW TO MARKET AND NEW TO FIRM INNOVATIONS
IT	Italy											
ITC1	Piemonte	0.277	0.273	0.503	0.387	0.664	0.248	0.381	0.651	0.486	0.768	0.544
ITC2	Valle d'Aosta/Vallée d'Aoste	0.268	0.121	0.261	0.350	0.272	0.100	0.198	0.321	0.572	0.570	0.508
ITC3	Liguria	0.370	0.360	0.385	0.282	0.359	0.133	0.300	0.360	0.345	0.541	0.514
ITC4	Lombardia	0.296	0.268	0.398	0.311	0.565	0.180	0.356	0.588	0.523	0.777	0.543
ITH1	Provincia Autonoma Bolzano/Bozen	0.278	0.148	0.217	0.444	0.505	0.117	0.327	0.551	0.610	0.263	0.501
ITH2	Provincia Autonoma Trento	0.352	0.477	0.189	0.191	0.447	0.208	0.219	0.517	0.489	0.440	0.515
ITH3	Veneto	0.263	0.235	0.237	0.418	0.582	0.095	0.353	0.579	0.531	0.558	0.541
ITH4	Friuli-Venezia Giulia	0.292	0.379	0.342	0.412	0.733	0.292	0.383	0.705	0.644	0.541	0.546
ITH5	Emilia-Romagna	0.389	0.297	0.389	0.355	0.574	0.126	0.399	0.609	0.523	0.663	0.552
ITI1	Toscana	0.291	0.433	0.270	0.311	0.445	0.107	0.296	0.474	0.405	0.469	0.523
ITI2	Umbria	0.335	0.379	0.170	0.284	0.319	0.074	0.236	0.349	0.462	0.465	0.524
ITI3	Marche	0.280	0.184	0.232	0.323	0.412	0.056	0.289	0.412	0.457	0.494	0.506
ITI4	Lazio	0.326	0.668	0.304	0.195	0.353	0.076	0.197	0.359	0.411	0.646	0.506
ITF1	Abruzzo	0.278	0.327	0.243	0.388	0.509	0.127	0.206	0.577	0.419	0.478	0.523
ITF2	Molise	0.306	0.288	0.052	0.198	0.253	0.128	0.042	0.248	0.305	0.393	0.524
ITF3	Campania	0.179	0.428	0.271	0.372	0.416	0.065	0.181	0.449	0.465	0.456	0.506
ITF4	Puglia	0.210	0.346	0.160	0.324	0.214	0.048	0.160	0.254	0.369	0.376	0.506
ITF5	Basilicata	0.257	0.336	0.138	0.232	0.241	0.258	0.144	0.241	0.223	0.410	0.508
ITF6	Calabria	0.212	0.273	0.039	0.413	0.431	0.169	0.081	0.416	0.408	0.288	0.508
ITG1	Sicilia	0.179	0.351	0.180	0.321	0.338	0.107	0.123	0.356	0.463	0.309	0.503
ITG2	Sardegna	0.161	0.369	0.062	0.367	0.302	0.143	0.139	0.312	0.390	0.275	0.498

		POPULATION WITH TERTIARY EDUCATION	R&D EXPENDITURE IN THE PUBLIC SECTOR	R&D EXPENDITURE IN THE BUSINESS SECTOR	NON-R&D INNOVATION EXPENDI-TURES	SMES INNOVATING IN-HOUSE	INNOVATIVE SMES COLLABORAT-ING WITH OTHERS	EPO PATENT APPLICATIONS	SMES INTRODUCING PRODUCT OR PROCESS INNOVATIONS	SMES INTRODUCING MARKETING OR ORGANI-SATIONAL INNOVATIONS	EMPLOYMENT IN KNOWLEDGE-INTENSIVE ACTIVITIES	SALES OF NEW TO MARKET AND NEW TO FIRM INNOVATIONS
HU	Hungary											
HU1	Közép-Magyarország	0.625	0.346	0.414	0.206	0.129	0.263	0.205	0.190	0.213	0.718	0.289
HU21	Közép-Dunántúl	0.270	0.164	0.257	0.174	0.050	0.195	0.115	0.123	0.120	0.789	0.281
HU22	Nyugat-Dunántúl	0.313	0.176	0.227	0.278	0.075	0.194	0.132	0.130	0.148	0.735	0.268
HU23	Dél-Dunántúl	0.312	0.158	0.185	0.238	0.076	0.232	0.126	0.140	0.095	0.431	0.193
HU31	Észak-Magyarország	0.233	0.127	0.254	0.155	0.088	0.172	0.153	0.162	0.157	0.617	0.180
HU32	Észak-Alföld	0.306	0.273	0.333	0.179	0.030	0.152	0.122	0.061	0.126	0.360	0.222
HU33	Dél-Alföld	0.335	0.360	0.261	0.238	0.042	0.185	0.211	0.106	0.139	0.351	0.193
NL	Netherlands											
NL11	Groningen	0.716	0.734	0.207	0.443	0.555	0.503	0.245	0.690	0.398	0.414	0.553
NL12	Friesland (NL)	0.455	0.012	0.357	0.438	0.639	0.485	0.278	0.651	0.358	0.258	0.522
NL13	Drenthe	0.394	0.073	0.219	0.427	0.627	0.518	0.312	0.691	0.399	0.364	0.562
NL21	Overijssel	0.634	0.387	0.385	0.443	0.661	0.489	0.382	0.675	0.380	0.397	0.562
NL22	Gelderland	0.573	0.625	0.375	0.433	0.616	0.473	0.378	0.657	0.373	0.414	0.544
NL23	Flevoland	0.361	0.529	0.318	0.419	0.550	0.466	0.278	0.673	0.396	0.653	0.557
NL31	Utrecht	0.820	0.749	0.254	0.424	0.445	0.488	0.356	0.699	0.415	0.570	0.572
NL32	Noord-Holland	0.739	0.586	0.324	0.417	0.507	0.464	0.300	0.667	0.392	0.583	0.551
NL33	Zuid-Holland	0.629	0.597	0.355	0.416	0.528	0.475	0.374	0.653	0.392	0.524	0.541
NL34	Zeeland	0.263	0.065	0.300	0.449	0.694	0.475	0.351	0.637	0.369	0.402	0.496
NL41	Noord-Brabant	0.639	0.288	0.601	0.437	0.654	0.485	0.779	0.668	0.380	0.511	0.556
NL42	Limburg (NL)	0.489	0.419	0.428	0.450	0.664	0.471	0.435	0.654	0.372	0.461	0.533
AT	Austria											
AT1	Ostösterreich	0.419	0.580	0.577	0.221	0.542	0.707	0.369	0.635	0.521	0.570	0.615
AT2	Südösterreich	0.289	0.550	0.697	0.315	0.458	0.599	0.450	0.516	0.409	0.494	0.537
AT3	Westösterreich	0.296	0.329	0.550	0.301	0.479	0.662	0.502	0.550	0.458	0.494	0.540

Annex 4: RIS normalised database

		POPULATION WITH TERTIARY EDUCATION	R&D EXPENDITURE IN THE PUBLIC SECTOR	R&D EXPENDITURE IN THE BUSINESS SECTOR	NON-R&D INNOVATION EXPENDI-TURES	SMES INNOVATING IN-HOUSE	INNOVATIVE SMES COLLABORAT-ING WITH OTHERS	EPO PATENT APPLICATIONS	SMES INTRODUCING PRODUCT OR PROCESS INNOVATIONS	SMES INTRODUCING MARKETING OR ORGANI-SATIONAL INNOVATIONS	EMPLOYMENT IN KNOWLEDGE-INTENSIVE ACTIVITIES	SALES OF NEW TO MARKET AND NEW TO FIRM INNOVATIONS
PL	Poland											
PL11	Lódzkie	0.571	0.322	0.112	0.265	0.047	0.112	0.139	0.077	0.078	0.385	0.223
PL12	Mazowieckie	0.727	0.533	0.227	0.243	0.088	0.135	0.094	0.128	0.163	0.528	0.300
PL21	Malopolskie	0.587	0.462	0.170	0.255	0.088	0.119	0.147	0.118	0.135	0.381	0.325
PL22	Slaskie	0.601	0.215	0.132	0.410	0.113	0.146	0.088	0.149	0.139	0.520	0.241
PL31	Lubelskie	0.576	0.346	0.098	0.317	0.086	0.134	0.167	0.121	0.095	0.204	0.127
PL32	Podkarpackie	0.518	0.278	0.294	0.349	0.128	0.161	0.095	0.167	0.129	0.343	0.262
PL33	Swietokrzyskie	0.576	0.204	0.149	0.329	0.073	0.087	0.072	0.115	0.082	0.183	0.265
PL34	Podlaskie	0.641	0.182	0.072	0.219	0.047	0.116	0.043	0.088	0.034	0.199	0.071
PL41	Wielkopolskie	0.511	0.293	0.119	0.303	0.081	0.132	0.098	0.118	0.101	0.376	0.241
PL42	Zachodniopomorskie	0.478	0.182	0.072	0.535	0.075	0.102	0.080	0.114	0.117	0.372	0.156
PL43	Lubuskie	0.440	0.065	0.072	0.360	0.065	0.104	0.080	0.101	0.077	0.376	0.191
PL51	Dolnoslaskie	0.524	0.226	0.155	0.358	0.082	0.148	0.095	0.114	0.129	0.604	0.379
PL52	Opolskie	0.440	0.087	0.025	0.357	0.131	0.158	0.113	0.165	0.117	0.343	0.341
PL61	Kujawsko-Pomorskie	0.494	0.176	0.081	0.335	0.086	0.091	0.110	0.109	0.093	0.322	0.149
PL62	Warminsko-Mazurskie	0.396	0.252	0.072	0.421	0.082	0.116	0.047	0.134	0.077	0.204	0.224
PL63	Pomorskie	0.587	0.210	0.211	0.303	0.069	0.114	0.092	0.109	0.124	0.507	0.173
PT	Portugal											
PT11	Norte	0.391	0.449	0.341	0.431	0.468	0.145	0.145	0.554	0.441	0.296	0.487
PT15	Algarve	0.287	0.252	0.072	0.194	0.412	0.156	0.097	0.484	0.492	0.334	0.444
PT16	Centro (PT)	0.287	0.449	0.274	0.503	0.669	0.364	0.123	0.706	0.586	0.216	0.475
PT17	Lisboa	0.448	0.590	0.456	0.244	0.678	0.399	0.111	0.744	0.754	0.532	0.626
PT18	Alentejo	0.271	0.199	0.143	0.387	0.604	0.277	0.073	0.666	0.533	0.202	0.397
PT2	Região Autónoma dos Açores (PT)	0.364	0.226	0.052	0.261	0.607	0.121	0.055	0.687	0.790	0.326	0.161
PT3	Região Autónoma da Madeira (PT)	0.361	0.199	0.039	0.293	0.403	0.126	0.059	0.447	0.327	0.326	0.198

		POPULATION WITH TERTIARY EDUCATION	R&D EXPENDITURE IN THE PUBLIC SECTOR	R&D EXPENDITURE IN THE BUSINESS SECTOR	NON-R&D INNOVATION EXPENDI-TURES	SMES INNOVATING IN-HOUSE	INNOVATIVE SMES COLLABORAT-ING WITH OTHERS	EPO PATENT APPLICATIONS	SMES INTRODUCING PRODUCT OR PROCESS INNOVATIONS	SMES INTRODUCING MARKETING OR ORGANI-SATIONAL INNOVATIONS	EMPLOYMENT IN KNOWLEDGE-INTENSIVE ACTIVITIES	SALES OF NEW TO MARKET AND NEW TO FIRM INNOVATIONS
RO	Romania											
RO11	Nord-Vest	0.231	0.164	0.105	0.173	0.105	0.065	0.041	0.099	0.167	0.225	0.416
RO12	Centru	0.226	0.073	0.105	0.238	0.065	0.055	0.021	0.062	0.111	0.305	0.499
RO21	Nord-Est	0.215	0.152	0.081	0.267	0.133	0.122	0.042	0.125	0.403	0.090	0.389
RO22	Sud-Est	0.186	0.073	0.081	0.380	0.220	0.098	0.009	0.207	0.217	0.221	0.386
RO31	Sud - Muntenia	0.179	0.012	0.227	0.237	0.111	0.064	0.021	0.105	0.199	0.440	0.565
RO32	Bucuresti - Ilfov	0.676	0.414	0.235	0.137	0.069	0.161	0.078	0.065	0.255	0.604	0.300
RO41	Sud-Vest Oltenia	0.208	0.108	0.039	0.099	0.032	0.020	0.025	0.030	0.260	0.221	0.337
RO42	Vest	0.243	0.140	0.039	0.179	0.000	0.013	0.077	0.000	0.044	0.697	0.218
SI	Slovenia											
SI01	Vzhodna Slovenija	0.517	0.127	0.467	0.372	0.375	0.458	0.261	0.443	0.370	0.617	0.472
SI02	Zahodna Slovenija	0.636	0.554	0.537	0.280	0.354	0.497	0.320	0.418	0.423	0.671	0.366
SK	Slovakia											
SK01	Bratislavský kraj	0.716	0.441	0.231	0.327	0.391	0.308	0.133	0.428	0.393	0.869	0.674
SK02	Západné Slovensko	0.210	0.094	0.219	0.355	0.212	0.271	0.053	0.277	0.178	0.705	0.579
SK03	Stredné Slovensko	0.277	0.158	0.138	0.442	0.331	0.297	0.019	0.370	0.217	0.545	0.529
SK04	Východné Slovensko	0.249	0.210	0.155	0.313	0.184	0.159	0.114	0.213	0.156	0.490	0.235
FI	Finland											
FI13	Itä-Suomi	0.636	0.541	0.316	0.278	0.564	0.651	n/a	0.632	0.418	0.381	0.456
FI18	Etelä-Suomi	0.739	0.644	0.696	0.258	0.555	0.526	0.526	0.582	0.454	0.713	0.469
FI19	Länsi-Suomi	0.632	0.500	0.761	0.420	0.522	0.512	0.494	0.570	0.329	0.587	0.517
FI1A	Pohjois-Suomi	0.592	0.649	0.958	0.595	0.498	0.582	n/a	0.530	0.429	0.448	0.449
FI2	Åland	0.690	0.000	0.138	0.188	0.680	0.311	0.119	0.639	0.594	0.612	0.487

Annex 4: RIS normalised database

		POPULATION WITH TERTIARY EDUCATION	R&D EXPENDITURE IN THE PUBLIC SECTOR	R&D EXPENDITURE IN THE BUSINESS SECTOR	NON-R&D INNOVATION EXPENDI-TURES	SMES INNOVATING IN-HOUSE	INNOVATIVE SMES COLLABORAT-ING WITH OTHERS	EPO PATENT APPLICATIONS	SMES INTRODUCING PRODUCT OR PROCESS INNOVATIONS	SMES INTRODUCING MARKETING OR ORGANI-SATIONAL INNOVATIONS	EMPLOYMENT IN KNOWLEDGE-INTENSIVE ACTIVITIES	SALES OF NEW TO MARKET AND NEW TO FIRM INNOVATIONS
SE	Sweden											
SE11	Stockholm	0.876	0.562	0.732	0.367	0.991	0.568	0.601	0.754	0.579	0.971	0.255
SE12	Östra Mellansverige	0.708	0.807	0.732	0.489	0.825	0.616	0.609	0.611	0.430	0.654	0.375
SE21	Småland med öarna	0.545	0.187	0.434	0.415	0.727	0.593	0.374	0.604	0.492	0.549	0.269
SE22	Sydsverige	0.729	0.613	0.811	0.461	0.792	0.611	0.664	0.630	0.419	0.676	0.323
SE23	Västsverige	0.722	0.504	0.797	0.380	0.749	0.515	0.500	0.568	0.461	0.747	0.254
SE31	Norra Mellansverige	0.555	0.199	0.373	0.435	0.736	0.559	0.364	0.586	0.353	0.435	0.235
SE32	Mellersta Norrland	0.534	0.204	0.312	0.334	0.815	0.711	0.320	0.558	0.465	0.532	0.278
SE33	Övre Norrland	0.643	0.936	0.333	0.275	0.691	0.437	0.369	0.498	0.347	0.473	0.255
UK	United Kingdom											
UKC	North East (UK)	0.564	0.314	0.355	n/a	0.463	0.853	0.312	0.250	0.321	0.448	0.465
UKD	North West (UK)	0.609	0.339	0.569	n/a	0.488	0.820	0.279	0.245	0.257	0.528	0.437
UKE	Yorkshire and The Humber	0.648	0.334	0.266	n/a	0.419	0.807	0.264	0.240	0.263	0.406	0.418
UKF	East Midlands (UK)	0.566	0.309	0.452	n/a	0.527	0.814	0.338	0.243	0.308	0.524	0.423
UKG	West Midlands (UK)	0.515	0.223	0.391	n/a	0.500	0.835	0.270	0.248	0.264	0.562	0.463
UKH	East of England	0.615	0.474	0.812	n/a	0.557	0.851	0.397	0.253	0.347	0.596	0.448
UKI	London	1.000	0.401	0.238	n/a	0.342	0.798	0.189	0.260	0.188	0.823	0.463
UKJ	South East (UK)	0.713	0.447	0.564	n/a	0.481	0.868	0.397	0.269	0.366	0.701	0.471
UKK	South West (UK)	0.704	0.363	0.485	n/a	0.499	0.825	0.340	0.251	0.300	0.549	0.444
UKL	Wales	0.606	0.373	0.283	n/a	0.503	0.810	0.231	0.243	0.293	0.427	0.427
UKM	Scotland	0.814	0.548	0.280	n/a	0.416	0.755	0.277	0.231	0.327	0.444	0.408
UKN	Northern Ireland (UK)	0.560	0.344	0.299	n/a	0.287	0.808	0.211	0.236	0.201	0.368	0.414

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CH	Switzerland											
CH01	Région lémanique	0.722	0.428	0.626	0.493	0.391	0.301	0.587	0.850	n/a	0.532	1.000
CH02	Espace Mittelland	0.602	0.428	0.626	0.493	0.391	0.301	0.587	0.850	n/a	0.650	1.000
CH03	Nordwestschweiz	0.644	0.428	0.626	0.493	0.391	0.301	0.587	0.850	n/a	0.772	1.000
CH04	Zürich	0.802	0.428	0.626	0.493	0.391	0.301	0.587	0.850	n/a	0.768	1.000
CH05	Ostschweiz	0.450	0.428	0.626	0.493	0.391	0.301	0.587	0.850	n/a	0.629	1.000
CH06	Zentralschweiz	0.594	0.428	0.626	0.493	0.391	0.301	0.587	0.850	n/a	0.667	1.000
CH07	Ticino	0.651	0.428	0.626	0.493	0.391	0.301	0.587	0.850	n/a	0.558	1.000
NO	Norway											
NO01	Oslo og Akershus	0.926	0.734	0.525	0.705	0.246	0.274	0.240	0.364	0.293	0.705	0.396
NO02	Hedmark og Oppland	0.490	0.193	0.223	0.522	0.172	0.427	0.240	0.192	0.182	0.537	0.649
NO03	Sør-Østlandet	0.597	0.187	0.439	0.490	0.275	0.271	0.240	0.369	0.242	0.537	0.420
NO04	Agder og Rogaland	0.701	0.193	0.335	0.328	0.196	0.293	0.240	0.275	0.204	0.482	0.301
NO05	Vestlandet	0.692	0.562	0.324	0.429	0.309	0.352	0.240	0.422	0.322	0.629	0.425
NO06	Trøndelag	0.751	1.000	0.695	0.622	0.244	0.371	0.240	0.351	0.326	0.490	0.521
NO07	Nord-Norge	0.466	0.660	0.235	0.369	0.158	0.258	0.240	0.199	0.191	0.629	0.481
HR	Croatia											
HR01	Sjeverozapadna Hrvatska	0.303	0.426	0.323	0.072	0.343	0.355	0.102	0.172	0.383	0.465	0.031
HR02	Sredisnja i Istocna (Pan-onska) Hrvatska	0.303	0.055	0.019	0.107	0.299	0.259	0.102	0.174	0.217	0.199	0.038
HR03	Jadranska Hrvatska	0.312	0.134	0.072	0.069	0.214	0.216	0.102	0.110	0.236	0.478	0.000

Annex 5: Use/absorption of EU funding and regional innovation performance

	REGIONAL INNOVATION LEADERS	REGIONAL INNOVATION FOLLOWERS	REGIONAL MODERATE INNOVATORS	REGIONAL MODEST INNOVATORS
FP leading absorber	DE2 Bayern DE3 Berlin FI1c Etelä-Suomen FR1 Île de France SE11 Stockholm SE12 Östra Mellansverige SE22 Sydsverige SE23 Västsverige	AT13 Wien AT22 Steiermark AT33 Tirol BE1 Région de Bruxelles-Capitale BE2 Vlaanderen DE5 Bremen ES21 País Vasco FR42 Alsace IE02 Southern and Eastern NL2 East Netherlands NL3 West Netherlands SE33 Övre Norrland UKI London	EL3 Attiki EL4 Kriti, Nisia Aigaio ES3 Comunidad de Madrid ITH2 Provincia Autonoma Trento ITI4 Lazio	
SF low user	DE1 Baden-Württemberg DE6 Hamburg DE7 Hessen DE9 Niedersachsen DEA Nordrhein-Westfalen DEB Rheinland-Pfalz DEG Thüringen FI19 Länsi-Suomen NL4 South Netherlands UKH East of England UKJ South East	AT11 Burgenland AT12 Nieder¬österreich AT21 Kärnten AT31 Oberösterreich AT32 Salzburg AT34 Vorarlberg BE3 Wallonie DEC Saarland DEF Schleswig-Holstein ES22 Comunidad Foral de Navarra FI2 Åland FR3 Nord - Pas-de-Calais FR41 Lorraine FR43 Franche-Comté FR51 Pays de la Loire FR52 Bretagne FR53 Poitou-Charentes FR61 Aquitaine FR62 Midi-Pyrénées FR63 Limousin FR71 Rhône-Alpes FR72 Auvergne FR81 Languedoc-Roussillon FR82 Provence-Alpes-Côte d'Azur IE01 Border, Midland and Western ITC1 Piemonte ITH4 Friuli-Venezia Giulia ITH5 Emilia-Romagna NL1 North Netherlands PT17 Lisboa SE21 Småland och Öarna UKC North East UKD North West UKE Yorkshire and Humberside UKF East Midlands UKG West Midlands UKK South West UKL2 East Wales UKM Lowlands and Uplands of Scotland UKN Northern Ireland	EL14 Thessalia EL21 Ipeiros EL22 Ionian Islands EL23 Western Greece EL24 Sterea Ellada EL25 Peloponnese ES11 Galicia ES12 Principado de Asturias ES13 Cantabria ES23 La Rioja ES24 Aragón ES41 Castilla y León ES42 Castilla-La Mancha ES43 Extremadura ES51 Cataluña ES52 Comunidad Valenciana ES61 Andalucía ES62 Región de Murcia FR21 Champagne-Ardenne FR22 Picardie FR23 Haute-Normandie FR24 Centre FR25 Basse-Normandie FR26 Bourgogne FR91 Guadeloupe FR94 Réunion HU1 Közép-Magya¬rország HU21 Közép-Dunántúl HU22 Nyugat-Dunántúl HU33 Dél-Alföld ITC2 Valle d'Aosta/ Vallée d'Aoste ITC4 Lombardia ITF1 Abruzzo ITF2 Molise ITF3 Campania ITF5 Basilicata ITF6 Calabria ITG1 Sicilia ITH1 Provincia Autonoma Bolzano/ Bozen ITH3 Veneto ITI1 Toscana ITI2 Umbria ITI3 Marche PL12 Mazowieckie PL21 Małopolskie PL22 Śląskie PL32 Podkarpackie PL51 Dolnośląskie PT15 Algarve	ES53 Illes Balears ES63 Ciudad Autónoma de Ceuta ES64 Ciudad Autónoma de Melilla ES7 Canarias HU23 Dél-Dunántúl HU31 Észak-Magya¬rország HU32 Észak-Alföld PL11 Łódzkie PL31 Lubelskie PL33 Święto¬krzyskie PL34 Podlaskie PL41 Wielkopolskie PL42 Zachodniopomorskie PL43 Lubuskie PL52 Opolskie PL61 Kujawsko-Pomorskie PL62 Warmińsko-Mazurskie PL63 Pomorskie

	REGIONAL INNOVATION LEADERS	REGIONAL INNOVATION FOLLOWERS	REGIONAL MODERATE INNOVATORS	REGIONAL MODEST INNOVATORS
SF leading user in support to research and technological activities	DED Sachsen	DE4 Brandenburg DEE Sachsen-Anhalt	PT11 Norte PT16 Centro (P) PT18 Alentejo	
SF leading user in support to services for business innovation and commercialisation		FR83 Corse SE31 Norra Mellansverige SE32 Mellersta Norrland	EL11 Anatoliki Makedonia, Thraki FR92 Martinique ITF4 Puglia ITG2 Sardegna PL2 Região Autónoma dos Açores	PT3 Região Autónoma da Madeira
SF user for both types of RTDI priorities		DE8 Mecklenburg-Vorpommern	FR93 Guyane	

Annex 6: Regional Systems of Innovation

The main aim of this Annex is to provide a better understanding of the importance of regions and the related concept of Regional Systems of Innovation (RSI).

Why regions are important

A rich body of literature has been developing over the last 20 years emphasizing the role of Regional Systems of Innovation in augmenting the competitiveness and regional performance. The general consensus in the literature today is that the driving force behind long-term economic growth is science, technology and innovation and long-term differences in growth across countries and regions can be explained by differences in knowledge, productivity and technology (Soete 2011).

Over the last decade it has become increasingly accepted in economic literature and amongst policy makers that **competitiveness and innovation are primarily determined at the regional and local levels** (OECD 2001, 2007, Doloreux and Parto 2004). Political processes of decentralizing the governance of innovation policy and devolution have led to an increase in policy making competences and responsibilities of regions (Magro and Wilson, 2013).

Despite globalization trends and free movement of capital and labor, there is an increased importance of regions as knowledge production, exploitation and the process of accumulation of knowledge remains locally embedded and spatially concentrated. "Differences in knowledge absorption, creation and diffusion capacities across regional innovation systems tend to persist over time, both between and within countries."(OECD 2011). The literature has emphasized three stylized facts: 1) innovative activity is not uniformly or randomly distributed across the geographical landscape, 2) the tendency towards spatial concentration has become more marked over time despite a wide spread of information and communication technologies and increased globalization and 3) even regions with similar innovative capacity tend to have very different growth patterns (Kourtit et al. 2011, Asheim and Gertler 2006).

Regional Systems of Innovation

The Regional System of Innovation (RSI) concept is highly popular mainly due to the emergence of identifiable regional clusters of industrial activity, more policy making competences and responsibilities assigned to regions, policies advanced by the EU for regional development such as the European Cohesion Policy as well as globalization and increased societal challenges that constitute major issues on the political agendas of the regions (McCann and Ortega-Argilés 2013, OECD 2001, 2007).

There is no common standard definition of RSIs. However, there is agreement in the literature that a system of innovation is made of components which are actors (organizations and institutions) and the linkages or relationships between actors (Edquist 2005, Asheim et al. 2013). Braczyk et al. (1998) and Cooke et al. (1992) proposed the RSI concept to examine how governance, institutionalized learning, and culture may impact innovation at the regional level. The system of innovation approach focuses on the fact that firms do not innovate in isolation but rather in collaboration and interdependence with other organizations such as other enterprises, universities and government research institutes (Edquist 2005). The key explanatory factors are "the combinations of institutions involved - and their interactions - , which determine the processes of accumulation of capital and technology" and create growth (Uyarra 2010). There is a clear link between the national system of innovation definitions and the RSI as can be seen from boxes 2.1 and 2.2. Lundvall (1992) argues that "the structure of production" and "the institutional set-up" are the two most important dimensions that "jointly define a system of innovation". Tödtling and Trippl (2005) add a policy dimension to existing sub-systems and show the linkages and flows between sub-systems via knowledge diffusion of innovation.

BOX 2.1 INNOVATION SYSTEMS DEFINITIONS	BOX 2.2 REGIONAL SYSTEM OF INNOVATION DEFINITIONS
" … the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies." (Freeman, 1987)	*" … a collective order based on microconstitutional regulation conditioned by trust, reliability, exchange and cooperative interaction" (Cooke, Gomez Uranga, Etxebarria, 1997)*
" … the elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge … and are either located within or rooted inside the borders of a nation state." *" The structure of production'' and ''the institutional set-up'' are the two most important dimensions that ''jointly define a system of innovation'' (Lundvall 1992)*	*[It contains] "… subsystems of generation and exploitation of knowledge that interact with other regional, national and global systems for the commercialization of new knowledge" (Cooke et al. , 2004)*
" … a set of institutions whose interactions determine the innovative performance … of national firms." (Nelson, 1993)	*" … a set of interacting private and public interests, formal institutions and other organizations that function according to organizational and institutional arrangements and relationships conducive to the generation, use and dissemination of knowledge" (Doloraux, 2004)*
" … the national institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning (or the volume and composition of change generating activities) in a country." (Patel and Pavitt, 1994)	*" … the institutional infrastructure supporting innovation within the production structure of a region" (Asheim and Gertler, 2005)* *"[It compRSIes] two subsystems of actors: …1) the regional production structure or knowledge exploitation subsystem (mainly firms, often displaying clustering tendencies) 2) the regional supportive infrastructure or knowledge generation subsystem. …These two subsystems are systematically engaged in interactive learning in an informal institutional context (i.e. norms, trust and routines).* *This dynamic and complex interaction constitutes what is commonly labeled systems of innovation [where] systems are understood as interaction networks." (Asheim, Coenen, 2006)*
" … that set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts which define new technologies." (Metcalfe, 1995)	
" … all important economic, social political, organizational, institutional and other factors that influence the development, diffusion and use of innovations." (Edquist, 1997, Edquist 2005)	*RSI can be defined as the ".. wider setting of organisations and institutions affecting and supporting learning and innovation in a region" (Asheim, 2009)*

Although a system is normally considered to have a function, this was not addressed in a systematic manner in the early work on systems of innovation and in the theoretical conceptualization (Edquist 2005). Applied research attempted to define either functions or activities of RSIs and to measure and describe RSIs. According to Edquist (2005) a system of innovation has a main function to develop, diffuse and use innovations. Activities in systems of innovations are those factors that influence the development, diffusion and use of innovations or in other words the factors or determinants influencing the function (Edquist 2005). The measurement of RSI can take a linear approach by identifying a structure of the innovation system such as inputs, throughputs and outputs (the approach adopted in the Regional Innovation Scoreboard) or a dynamic approach by focusing on functions of the system such as knowledge creation, absorptive capacity, governance capacity, diffusion capacity, demand, social filters, economies of agglomeration, R&D expenditure and accessibility of regions (Hajek et al. 2013, Navarro et al. 2009, Wintjes and Hollanders 2010). The functional approach has been introduced in order to capture the dynamics of the system of innovation (Hekkert et al. 2007).

The innovation system boundaries may be defined in three ways: spatially/geographically, sectorally and in terms of system activities and functions (Edquist, 2005). Whether the unit of analysis should be national, sectoral or regional depends mainly on the research questions and the source of variation one seeks to explain. RSIs establish relationships with extra-regional actors, networks and institutions and there is a role for geographical proximity in generating spill-overs (Asheim et al. 2013, Tödtling and Trippl 2005). Therefore Tödtling and Trippl (2005) and Asheim and Gertler (2006) emphasized that RSIs are linked with national systems of innovation, supra-national systems of innovation and other RSIs.

However, certain lack of clarity remains in relation to defining the elements and the dynamics of RSIs. This lack of clarity comes from the fact that the concept of RSI is influenced by a number of theories and approaches, and authors aimed to keep the concept open and flexible for interpretation (Uyarra 2010, Edquist 2005). Amongst all the theories and frameworks, the RSI literature is closely linked to the national system of innovation framework and as such it takes stock of both the benefits and the caveats of this approach (Freeman 1987, Edquist 1997, 2005, Lundvall 1992). The RSI framework has been criticized on lack of precision, clarity and rigour, conceptual diffuseness in determining the factors playing a role in the innovation system and the factors to leave out and relative absence of well-established empirical regularities (Edquist 2005, Doloreux and Parto 2004). Another important criticism of RSI is that the literature has been too focused on discussing successful cases of regional performance and that failures and regional decline has not been adequately captured.

Why does location matter? What explains differences in regional performance?

For the first question several explanations are proposed in the literature: regional differences in the availability and the quality of local inputs: for example regions have different knowledge bases (Asheim and Gertler 2006); locations differ with regard to the 'quality' or the 'efficiency' of regional innovation systems (RSI), leading to different levels of innovative output even if the inputs are identical in quantitative as well as in qualitative terms (Fritsch and Slavtchev 2011); tacit knowledge is difficult to exchange over long distances and therefore is context specific and spatially sticky (Asheim and Gertler 2006, Krugman and Venables 1996); agglomeration of firms in close proximity minimizes transaction costs and leads to positive externalities.

For the second research question, several theories have been proposed to explain why some regions achieve significantly higher growth rates than others: theories emphasizing the role of initial conditions, theories emphasizing the potential for innovation and knowledge spillovers and theories focusing on the composition of economic activity (Porter 1990, Glaeser et al. 1992, Barro and Sala-i-Martin 1995, Fujita, Krugman and Venables 1999, Delgado, Porter and Stern 2011). Rees (1979) proposed that technology was the prime driver in regional economic development and follow-up work showed how technology is related to agglomeration economies in regional economic development. Porter (1990)

advanced the thesis that co-location by firms increase efficiency by reducing supply-chain firm costs, more access to talent and more start-up activity, innovation and productivity. More generic conditions for growth such as good infrastructure and education are insufficient for growth (Cooke et al. 2011). Rees (2001) emphasized that technology based theories of regional economic development need to incorporate the role of entrepreneurship and leadership that can lead to the growth of new industrial regions and to the regeneration of older ones. Some theorists argued that it is not only economic factors but also values and cultural factors that have an impact such as social capital and trust in developing collaborative networks among firms, knowledge sharing and in having access to venture capital and creating a powerful R&D and entrepreneurial business climate.

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