Regional Innovation Scoreboard 2009

Methodology report

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Regional Innovation Scoreboard (RIS) 2009 report

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1. Introduction

Innovation is a key factor determining productivity growth. Understanding the sources and patterns of innovative activity in the economy is fundamental to develop better policies. The European Innovation Scoreboard (EIS) benchmarks on a yearly basis the innovation performance of Member States, drawing on statistics from a variety of sources, including the Community Innovation Survey. It is increasingly used as a reference point by innovation policy makers across the EU.

The EIS benchmarks performance at the level of Member States, but innovation plays an increasing role in regional development, both in the Lisbon strategy and in Cohesion Policy. Regions are increasingly becoming important engines of economic development. Geographical proximity matters in business performance and in the creation of innovation. Recognising this, innovation policy is increasingly designed and implemented at regional level. However, despite some advances, there is an absence of regional data on innovation indicators which could help regional policy makers design and monitor innovation policies.

The European Regional Innovation Scoreboard (RIS) addresses this gap and provides statistical facts on regions' innovation performance. In 2002 and 2003 under the European Commission's "European Trend Chart on Innovation" two Regional Innovation Scoreboards have been published[3,4]. Both reports focused on the regional innovation performance of the EU15 Member States using a more limited number of indicators as compared to the EIS. In 2006 a Regional Innovation Scoreboard was published providing an update of both earlier reports by using more recent data and also including the regions from the New Member States[5] but with an even more limited set of data as regional CIS data were not available. Annex 1 provides an overview of the previous RIS reports.

Following the revision of the EIS in 2008, the 2009 RIS is using as many of the EIS indicators at the regional level for all EU Member States and Norway including regional data from the Community Innovation Survey (CIS) where available. The 2009 RIS will, following the revised EIS methodology, pay more attention to wider measures of innovation including among others non-R&D and non-technological innovation. However the use of some data at regional level presents certain limitations regarding data availability and data reliability. In particular, for the first time regional CIS data have been collected (directly from most but not all Member States) on a large scale. This methodological report examines the available data and discusses how they can be used to develop a Regional Innovation Scoreboard.

In section 2 we will discuss the availability of regional data, the indicators that are available for the RIS and the regions for which regional CIS data are available. Section 3 sets out the potential limitations of using regional CIS data, analyses the extent of these limitations, and presents methodological proposals to address them. Section 4 will conclude by summarising the indicators and regions which will be included in the 2009 RIS and the foreseen analyses.

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[3] Hollanders, H., "EU Regions", European Trend Chart on Innovation Technical Paper, Brussels: DG Enterprise and Industry, November 2002 (http://www.proinno-europe.eu/admin/uploaded_documents/eis_2002_tp3_EU_Regions.pdf).

[4] Hollanders, H., "Regional innovation performances", European Trend Chart on Innovation Technical Paper, Brussels: DG Enterprise and Industry, November 2003 (http://www.proinno-europe.eu/ScoreBoards/Scoreboard2003/pdf/eis_2003_tp3_regional_innovation.pdf).

[5] Hollanders, H., "European Regional Innovation Scoreboard (2006 RIS)", European Trend Chart on Innovation Technical Paper, Brussels: DG Enterprise and Industry, November 2006 (http://www.proinno-europe.eu/ScoreBoards/Scoreboard2006/pdf/eis_2006_regional_innovation_scoreboard.pdf).

2. RIS: Data, indicators and regions

2.1 Regional innovation indicators

The European Innovation Scoreboard (EIS) uses a wide variety of indicators to measure innovation performance at the country level. The indicators are grouped into dimensions to capture different aspects of innovation performance as summarised in Figure 1. The EIS 2008 Methodology Report explains the rationale for the selection of indicators and for their grouping[6].

FIGURE 1: DIMENSIONS OF INNOVATION PERFORMANCE CAPTURED IN THE EIS

- **ENABLERS** captures the main drivers of innovation that are external to the firm as:
  - **Human resources** – the availability of high-skilled and educated people.
  - **Finance and support** – the availability of finance for innovation projects and the support of governments for innovation activities.

- **FIRM ACTIVITIES** captures innovation efforts that firms undertake recognising the fundamental importance of firms' activities in the innovation process:
  - **Firm investments** – covers a range of different investments firms make in order to generate innovations.
  - **Linkages & entrepreneurship** – captures entrepreneurial efforts and collaboration efforts among innovating firms and also with the public sector.
  - **Throughputs** – captures the Intellectual Property Rights (IPR) generated as a throughput in the innovation process and Technology Balance of Payments flows.

- **OUTPUTS** captures the outputs of firm activities as:
  - **Innovators** – the number of firms that have introduced innovations onto the market or within their organisations, covering technological and non-technological innovations.
  - **Economic effects** – captures the economic success of innovation in employment, exports and sales due to innovation activities.

Table 1 shows the direct data availability at regional level for the indicators used in the EIS and summarizes for which indicators regional data are available. Of the 29 indicators used in the EIS, data at the regional level are only available from public sources for 8 indicators, and a further 8 indicators are potentially available by using regional data collected directly from Member State Community Innovation Surveys (CIS). Therefore, the use of regional CIS data is very important in order to construct a Regional Innovation Scoreboard, and in particular to capture non-technological aspects of innovation.

Annex 2 discusses the availability of regional data for the EIS 2008-2010 indicators in more detail. Regional data availability for the CIS data will be discussed in more detail in the following section.

[6] Hollanders, H. and A. van Cruysen, "Rethinking the European Innovation Scoreboard: A New Methodology for 2008-2010", INNO Metrics Thematic Paper, Brussels: DG Enterprise and Industry, September 2008 (http://www.proinno-europe.eu/extranet/admin/uploaded_documents/EIS_2008_Methodology_Report.pdf).

TABLE 1: INDICATORS FOR THE EIS 2008-2010 AND AVAILABILITY AT REGIONAL LEVEL

	Data source	Regional data (latest available year)
ENABLERS		
• **Human resources**		
1.1.1 S&E and SSH graduates	Eurostat	NO
1.1.2 S&E and SSH doctorate graduates	Eurostat	NO
1.1.3 Tertiary education	Eurostat	**YES (2006)**
1.1.4 Life-long learning	Eurostat	**YES (2006)**
1.1.5 Youth education	Eurostat	NO
• **Finance and support**		
1.2.1 Public R&D expenditures	Eurostat	**YES (2005)**
1.2.2 Venture capital	EVCA/ Eurostat	NO
1.2.3 Private credit	IMF	NO
1.2.4 Broadband access by firms	Eurostat	**Broadband access by households (2006)**
FIRM ACTIVITIES		
• **Firm investments**		
2.1.1 Business R&D expenditures	Eurostat	**YES (2005)**
2.1.2 IT expenditures	EITO/Eurostat	NO
2.1.3 Non-R&D innovation expenditures	Eurostat (CIS)	**YES (2006)**
• **Linkages & entrepreneurship**		
2.2.1 SMEs innovating in-house	Eurostat (CIS)	**POSSIBLE (2006)**
2.2.2 Innovative SMEs collaborating with others	Eurostat (CIS)	**POSSIBLE (2006)**
2.2.3 Firm renewal (SMEs entries + exits)	Eurostat	NO
2.2.4 Public-private co-publications	Thomson/ ISI	NO
• **Throughputs**		
2.3.1 EPO patents	Eurostat	**YES (2003)**
2.3.2 Community trademarks	OHIM	NO
2.3.3 Community designs	OHIM	NO
OUTPUTS		
• **Innovators**		
3.1.1 Product and/or process innovators	Eurostat (CIS)	**POSSIBLE (2006)**
3.1.2 Marketing and/or organisational innovators	Eurostat (CIS)	**POSSIBLE (2006)**
3.1.3 Resource efficiency innovators 3.1.3a Reduced labour costs 3.1.3b Reduced use of materials and energy	Eurostat (CIS)	**POSSIBLE (2006)**
• **Economic effects**		
3.2.1 Employment in medium-high & high-tech manufacturing	Eurostat	**YES (2006)**
3.2.2 Employment in knowledge-intensive services	Eurostat	**YES (2006)**
3.2.3 Medium and high-tech exports	Eurostat/UN	NO
3.2.4 Knowledge-intensive services exports	Eurostat/UN	NO
3.2.5 New-to-market sales	Eurostat (CIS)	**POSSIBLE (2006)**
3.2.6 New-to-firm sales	Eurostat (CIS)	**POSSIBLE (2006)**
3.2.7 Technology Balance of Payments flows	World Bank	NO

2.2 Availability of Community Innovation Survey data at regional level

The EIS relies on data from the Community Innovation Survey (CIS) for 8 of its 29 indicators. Validated national aggregates for most countries are directly available from Eurostat, but regional CIS data are not available. Regional CIS data for the 8 EIS indicators using CIS data have been collected directly from the Member States. Although the data collection was done in collaboration with Eurostat, none of the regional CIS data have been validated by Eurostat.

TABLE 2: REGIONAL COMMUNITY INNOVATION SURVEY (CIS) DATA AVAILABILITY

	Data available at	1. Non-R&D innovation expenditures	2. SMEs innovating in-house	3. Innovative SMEs collaborating with others	4. Product and/or process innovators	5. Marketing and/or organisational innovators	6. Resource efficiency innovators	7. New-to-market sales	8. New-to-firm sales
Austria	NUTS 1	N/A	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	N/A	N/A
Belgium	NUTS 1	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004	2004 & 2006	2004 & 2006
Bulgaria	NUTS 1	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006
Cyprus		No regional data requested as this country is defined at the NUTS 2 level							
Czech Republic	NUTS 2	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006
Denmark		No regional data requested as this country is defined at the NUTS 2 level							
Estonia		No regional data requested as this country is defined at the NUTS 2 level							
Finland	NUTS 2	N/A	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	N/A	N/A
France	NUTS 1	2004	2004	2004	2004	2004	2004	2004	2004
Germany		No regional data available (CIS sample is too small to deliver reliable regional data)							
Greece	NUTS 2	2006	2006	2006	2006	2006	2006	2006	2006
Hungary	NUTS 2	2006	2006	2006	2006	2006	2006	2006	2006
Ireland		No regional data available							
Italy	NUTS 2	N/A	2004	2004	2004	2004	2004	N/A	N/A
Latvia		No regional data requested as this country is defined at the NUTS 2 level							
Lithuania		No regional data requested as this country is defined at the NUTS 2 level							
Luxembourg		No regional data requested as this country is defined at the NUTS 2 level							
Malta		No regional data requested as this country is defined at the NUTS 2 level							
Netherlands		No regional data available							
Norway	NUTS 2	2004	2004 & 2006	2004 & 2006	2004 & 2006	2004	2004	2004 & 2006	2004 & 2006
Poland	NUTS 2	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006
Portugal	NUTS 2	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2006	2004 & 2006	2004 & 2006
Romania	NUTS 2	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006
Slovakia	NUTS 2	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006
Slovenia	NUTS 2	2004 & 2006	2004 & 2006	2004 & 2006	2004	2004	2004	2004 & 2006	2004 & 2006
Spain	NUTS 2	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006
Sweden		No regional data available							
United Kingdom	NUTS 1	N/A	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	2004 & 2006	N/A	N/A

N/A: not available

For the RIS we have chosen to follow the suggestion to focus on SMEs only (see Section 3.1). All of the indicators using CIS data thus only use data for SMEs. For the following countries regional CIS data have been collected from national sources (cf. Table 2):

- NUTS 2 level data are available for
  - Czech Republic (CZ) for all indicators for both 2004 and 2006
  - Spain (ES) for all indicators for both 2004 and 2006
  - Finland (FI) for 5 indicators for both 2004 and 2006
  - Greece (GR) for all indicators for 2006
  - Hungary (HU) for all indicators for 2006
  - Italy (IT) for 5 indicators for 2004
  - Norway (NO) for all indicators for both 2004 and 2006 except three indicators for which only 2004 data are available
  - Poland (PL) for all indicators for both 2004 and 2006
  - Portugal (PT) for all indicators for both 2004 and 2006 except the indicator on Resource-efficiency innovators for which only 2006 data are available
  - Romania (RO) for all indicators for both 2004 and 2006
  - Slovenia (SI) for all indicators for both 2004 and 2006 except three indicators for which only 2004 data are available
  - Slovakia (SK) for all indicators for both 2004 and 2006

- NUTS 1 level data are available for
  - Austria (AT) for 5 indicators for both 2004 and 2006
  - Belgium (BE) for all indicators for both 2004 and 2006 except the indicator on Resource-efficiency innovators for which only 2004 data are available
  - Bulgaria (BG) for all indicators for both 2004 and 2006
  - France (FR) for all indicators for 2004
  - United Kingdom (UK) for 5 indicators for both 2004 and 2006

For Cyprus (CY), Denmark (DK), Estonia (EE), Lithuania (LT), Latvia (LV) and Malta (MT) no NUTS 1 or NUTS 2 regions are defined so these countries are analysed at the national level. No regional CIS data are available for Germany (DE), Ireland (IE), Netherlands (NL) and Sweden (SE).

3. Interpretation and use of regional data for a Regional Innovation Scoreboard

There is limited availability of Community Innovation Survey (CIS) data at regional level and therefore limited experience in the use and interpretation of these data sets. Discussions with statistical offices and experts have identified three key limitations of using CIS data at regional level.

- **Limitation 1: Misreporting of regional activities in the CIS for multi-establishment enterprises**
  For most Member States, the survey sample is drawn at the enterprise level and not at the workplace or establishment level as recommended by Eurostat. For companies with activities in multiple establishments in more than one region it would thus be impossible to know at which workplace/in which region the innovation activities are occurring. A comparison of regional innovation performance could therefore attribute all innovative activities of an enterprise to the region where the enterprise's head-office is located, while a substantial part of these innovative activities may in fact be carried out in other regions. The problem is especially relevant in the case of the EIS indicators Non-R&D innovation expenditures, New-to-market sales and New-to-firm sales, which include large enterprises and are related to expenditure. Since large enterprises are more likely to be active in more than one region and spend high amounts of innovative

turnover and non-R&D innovation expenditure, the aggregation of data at the regional level may be misleading.

- **Limitation 2: Lack of regional stratum in the CIS sample design**
  The sample of enterprises at the regional level should represent the size and sector composition of the population of enterprises in that region. Sampling should include a regional stratum, and sample size has to be sufficiently large to keep sampling errors at the regional level at a reasonable magnitude. Not all Member States have considered NUTS 1 or NUTS 2 levels in their national surveys and therefore cannot produce reliable and representative regional data. Within the national surveys some regions will be overrepresented (underrepresented) as a larger (smaller) than average number of firms of that region will be covered.

- **Limitation 3: Too small CIS sample size**
  In some Member States the size of the CIS survey sample is too small to allow for any further reliable breakdown at the regional level. A too small sample size also prevents the inclusion of a regional stratum in the survey (cf. Problem 2).

The proposed Regional Innovation Scoreboard will combine CIS data with other data to analyse regional innovation performance across the European Union and in Norway[7]. This creates two additional limitations relating to regional CIS data.

- **Limitation 4: Overrepresentation of CIS indicators at the regional level**
  At the regional level CIS data account for 50% of the indicators, almost double their number at the national level. This overrepresentation may create a bias in favour of certain regions.

- **Limitation 5: Missing data**
  For many regions data are not available for all indicators. For a representative comparison of performance across regions using composite indicators for all regions we should have 100% data availability whereas average regional data availability for RIS regions is 77%. In particular for the CIS indicators data availability is worse, for the 3 expenditure indicators (Non-R&D innovation expenditures, New-to-market sales and New-to-firm sales) it is about 45%, for the 5 shares indicators (SMEs innovating in-house, Innovative SMEs collaborating with others, Product and/or process innovators, Marketing and/or organisational innovators and Resource efficiency innovators) it is about 58%[8].

In the following sections we will discuss possible solutions to Problems 1, 2, 4 and 5 resulting in recommendations for the RIS report. Problems 3 will not be discussed as increasing the sample size is not feasible within the scope of the RIS.

[7] Norway is included as it has good data availability, including regional CIS data.
[8] For 31% of the regions data availability is between 50% and 60%, for 10% of the regions it is between 60% and 70%, for 10% of the regions it is between 70% and 80%, for 12% of the regions it is between 80% and 90% and for 37% of the regions data availability is at least 90%. If we applied the 70% data availability rule of the EIS, we would need to exclude 41% of the regions from the RIS analyses.

3.1 Misreporting of regional activities in the CIS

Regional CIS data are subject to potential misreporting due to the enterprise/workplace problem (cf. the discussion in section 2.2). This misreporting could limit the usefulness of regional CIS data to properly measure innovation performance at the regional level.

Limiting data to SMEs

As a partial solution to this problem all CIS indicators to be used in the Regional Innovation Scoreboard are for SMEs only. By focusing on SMEs the enterprise/workplace problem is minimized although not completely solved. Box 1 discusses the work done by the Italian Statistical Office trying to regionalize their CIS data.

Box 1 Regionalization of Italian CIS data

The Italian statistical office shares the general concerns about the regionalization of CIS data. The CIS suffers from some critical methodological drawbacks when it is used for measuring innovation at regional level. One of the key questions has to do with the use of the 'enterprise' as statistical unit of observation. The conventional CIS regional attribution of innovation activities might lead to biased results of the actual spatial distribution of innovation and might fail to take into account where innovation activities really take place, if - as it happens in Italy - enterprises (especially the large-sized ones) have several local units located in different regions and some of these play an active role in innovation activities. In such cases, the traditional approach of regionalization of CIS data might lead to an underestimation of the real innovative potential of some regions (those - i.e. in Italy the Southern ones - which host several productive units of enterprises whose headquarters are located elsewhere - i.e. in the Northern ones).

Following the growing and pressing demand for regional statistics on innovation, within the CIS4 framework the Italian statistical office has experienced a new methodological approach for the estimation of innovation at regional level in order to reduce biases in final estimates when capturing the regional dimension of innovation. It relies upon the definition of the Regional Units, obtained by summing up all the establishments of the enterprise located in the same region, so as to provide information on innovation activities performed by Regional Units and, thus, to analyze innovation at RU level.

A small set of new indicators was built at RU level:

- The diffusion of innovation measured by the percentages of innovators – enterprises or Regional Units – in each region;
- Innovation performance measured by the innovation expenditure per employee in each region.

From these new indicators, some comparisons were made with the data provided by the simple regionalization of CIS results (the conventional 'enterprise-based' approach).

Results provide insights into the analysis of the regional dimension of innovation. In particular, in measuring the diffusion of innovation, the comparison of the results seems to give roughly the same snapshot of regional innovativeness: the traditional indicators and the alternative ones, built upon the concept of Regional Units, show quite the same strongly skewed geographical distribution of innovators across Italian regions. But for innovation performance, quite different results emerge in the comparison of the data coming from the two approaches. The alternative indicators show a far more modest concentration of innovative activity than that resulted from the classical ones and, thus, seem to indicate that innovation is much more spread across regions than that resulting from the mere attribution of total innovation expenditure to regions where enterprises' head offices are located and that the innovation activities are sometimes likely to be performed at the location of production, which, especially in the case of larger enterprises, is frequently in different regions from that of enterprises' headquarters.

Sensitivity analysis of regional CIS data compared to national data.

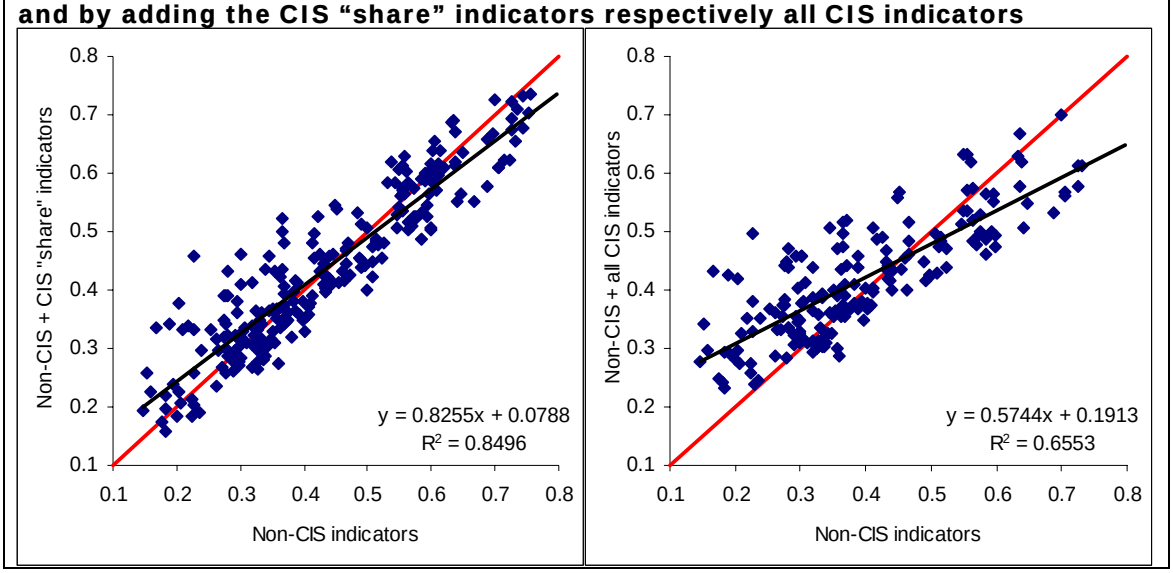
CIS data have been used intensively in all EIS reports since its introduction in 2001. We therefore accept that CIS data are useful and representative for measuring innovation performance at the country level. In this section we will perform a sensitivity analysis

studying the impact on the performance of the regions using regional CIS data in order to provide a recommendation whether or not to use regional CIS data in the RIS. For this we will compare the possible bias created at the regional level by including CIS data with that at the national level using the results from the European Innovation Scoreboard (EIS).

Three different composite indicator scores have been calculated for the following sets of indicators:

- CI-1: using normalized data for the non-CIS indicators only (tertiary education, life-long learning, broadband access, public R&D, business R&D, EPO patents, medium/high-tech manufacturing employment, knowledge-intensive services employment)
- CI-2: using normalized data for the non-CIS indicators plus the CIS "shares" indicators (SMEs innovating in-house, SMEs collaborating with others, product and/or process innovators, marketing and/or organisational innovators, resource efficiency innovators)
- CI-3: using normalized data for the non-CIS indicators plus the CIS shares indicators plus the CIS "expenditure" indicators (non-R&D innovation, new-to-market sales, new-to-firm sales)

Figure 1 Relation between regional performance using non-CIS indicators only and by adding the CIS "share" indicators respectively all CIS indicators

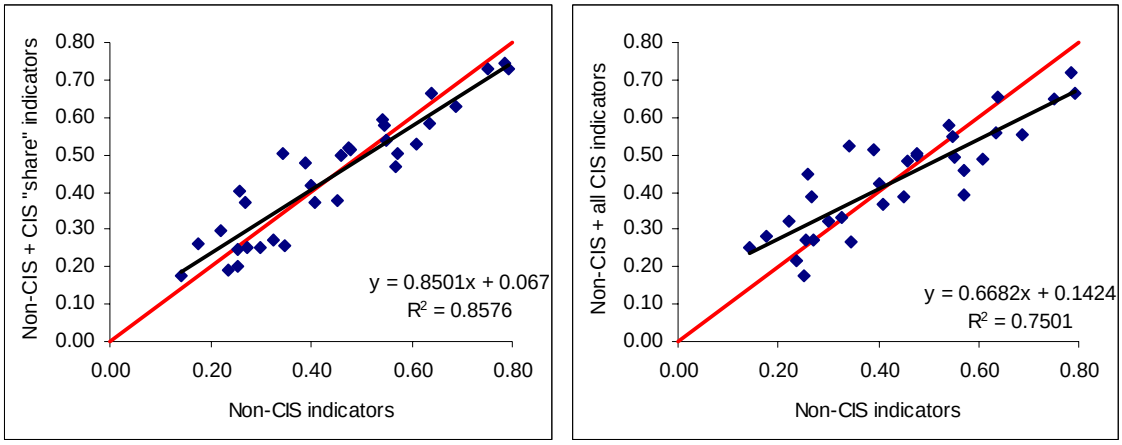


The scatter plots in Figure 1 shows the relation between CI-1 and CI-2 respectively CI-1 and CI-3. The horizontal axes show the average performance in 2004 and 2006 on the non-CIS indicators (CI-1). The vertical axes show the average performance in 2004 and 2006 on the non-CIS plus the CIS share indicators (CI-2) respectively on the non-CIS plus the CIS share and expenditure indicators (CI-3). The plotted red coloured line shows where performance of CI-1 and CI-2 (respectively CI-3) is identical. The scatter plot shows that for regions performing less well on CI-1 (more to the left on the horizontal axis) performance on CI-2 (respectively CI-3) is relatively better (most dots above the red line) and for regions performing better on CI-1 (more to the right on the horizontal axis) performance on CI-2 (respectively CI-3) is relatively worse (most dots below the red line). Regions performing less well using non-CIS indicators only, perform better when adding the CIS indicators, in particular the CIS expenditure data. This is confirmed by the slope of the regression line which is significantly smaller than 1.

One explanation for these observations is that performance based on the non-CIS indicators is biased towards performance on technological or R&D-driven innovation as measured by the indicators on R&D expenditures and patent applications, i.e. CI-1 is better able to capture performance in high-tech regions. By adding the CIS indicators performance in non-technological innovation (e.g. marketing and organisational innovation) is better captured and innovation performance in the non high-tech regions may thus be better captured.

For the comparison with national level data, we use data for 16 indicators from the EIS which are comparable to those proposed for the Regional Innovation Scoreboard of which 8 are non-CIS indicators (Figure 2). We observe a similar pattern as for the data at regional level, the worse performing countries on the non-CIS indicators perform better when adding the CIS indicators. So what we observe at the regional level is not that different from what we observe at the country level once we limit the analysis to the same set of indicators.

Figure 2 Relation between national performance using non-CIS indicators only and by adding the CIS indicators using only those EIS indicators included in the RIS



Conclusion: In order to reduce the effect of misreporting of activities to headquarter regions, the regional data from the CIS has been limited to SMEs. Using this data in an innovation performance summary index (based on the European Innovation Scoreboard methodology) provides different results than if only non-CIS indicators are used. The extent of this difference is very similar to that found in using national CIS data where there should be no misreporting of activities. There is therefore no strong reason to believe that misreporting of SMEs activities is resulting in a misrepresentation of regional innovation performance in the indicators used.

3.2 Sample sizes in regional CIS data

Average population size in the CIS differs significantly between the different countries for which regional CIS data are available (Table 3, cf. Annex 3 for full details). At NUTS 2 level, the average population size in Greece is 900 firms, 1500 in Slovakia, 1600 in Finland and Norway, 1800 in Slovenia and more than 2000 in Czech Republic, Spain, Italy, Hungary, Poland, Portugal and Romania. At NUTS 1 level, the average population size is 3000 or more in all countries for which NUTS 1 regions are defined.

TABLE 3: AVERAGE SIZE OF REGION

	NUTS 0	NUTS 1		NUTS 2	
	Average Population size	Average Population size	Standard deviation	Average Population size	Standard deviation
BE	--	4674	3493	n/a	n/a
BG	--	6883	880	n/a	n/a
CZ	--	n/a	n/a	2595	788
DK (2006)	10640	--	--	--	--
DE (2006)	98952	--	--	--	--
EE (2006)	3916	--	--	--	--
IE (2006)	7545	--	--	--	--
GR	--	2914	2247	897	1630
ES	--	11397	8139	4432	4632
FR	--	19807	10144	n/a	n/a
IT	--	28632	10793	6297	7403
CY (2006)	1204	--	--	--	--
LV (2006)	5131	--	--	--	--
LT (2006)	6345	--	--	--	--
LU (2006)	1376	--	--	--	--
HU	--	4809	259	2061	1084
MT (2006)	670	--	--	--	--
NL (2006)	28357	--	--	--	--
AT	--	5078	1566	n/a	n/a
PL	--	7318	2378	2744	1878
PT	--	6869	9299	2944	3231
RO	--	6361	1644	3181	1196
SI	--	n/a	n/a	1821	151
SK	--	n/a	n/a	1482	263
FI	--	3894	3818	1558	1540
SE (2006)	15550	--	--	--	--
UK	--	6793	2982	n/a	n/a
NO	--	n/a	n/a	1642	679

Merging of regions based on CIS sample size

Given the fact that the CIS data may be less representative for small than for large regions (cf. the discussion in section 2.2), we merge several NUTS 2 regions with small population sizes. This affects some regions in Greece, Italy and Portugal where the following merging is proposed (cf. Table 4):

- For Greece the following regions have been merged[9]:
  - Anatoliki Makedonia Thraki (GR11), Dytiki Makedonia (GR13) and Thessalia (GR14)

[9] This merging of the Greek regions is in line with the official response from the Greek Statistical Office regarding the availability of regional CIS 4 data stating that the sampling design of the Greek CIS 4 involved the study of the regional aspect at a higher level than that of NUTS2 with Greece being divided in 3 regions: Attiki (GR3), Kentriki Makedonia (GR12) and Rest of Greece. For the CIS 4 this grouping followed from the characteristics of the Greek business demographics with a very large proportion of the CIS population (more than 75%) being allocated in Attiki (GR3) and Kentriki Makedonia (GR12).

- GR21 to GR25 (Ipeiros, Ionia Nisia, Dytiki Ellada, Sterea Ellada and Peloponnissos) into NUTS 1 Kentriki Ellada (GR2)
- GR41 to GR43 (Voreio Aigaio, Notio Aigaio and Kriti) into NUTS 1 Nisia Aigaiou, Kriti (GR4)
- Kentriki Makedonia (GR12) has been kept as a separate region due to its large size (2536 firms)

- For Italy the following regions have been merged[10]:
  - Valle d'Aosta (ITC2) has been added to Piemonte (ITC1)
  - Molise (ITF2) has been added to Abruzzo (ITF1)

- For Portugal the following regions have been merged:
  - Região Autónoma dos Açores (PT2) and Região Autónoma da Madeira (PT3)

The following region will not be included as its size is too small and no appropriate merging is possible:

- Åland (FI2)

Annex 4 shows the list of regions for which regional CIS data are available in the analysis (merged regions are highlighted in bold).

TABLE 4: PROPOSED MERGING OF REGIONS

		Popu-lation				Popu-lation				Population	
		2006				2004				2004	2006
GREECE	**GR**	**11657**		**ITALY**	**IT**	**119247**		**PORTUGAL**	**PT**	**20452**	**20762**
Anatoliki Makedonia, Thraki	GR11	458		Piemonte	ITC1	10046		Norte	PT11	9435	9523
Kentriki Makedonia	GR12	2536		Valle d'Aosta/Vallée d'Aoste	ITC2	149		Algarve	PT15	389	439
Dytiki Makedonia	GR13	353		Liguria	ITC3	2257		Centro	PT16	4675	4662
Thessalia	GR14	562		Lombardia	ITC4	30575		Lisboa	PT17	4541	4616
Ipeiros	GR21	203		Abruzzo	ITF1	2286		Alentejo	PT18	854	906
Ionia Nisia	GR22	36		Molise	ITF2	327		Região Autóno-ma dos Açores	PT2	258	278
Dytiki Ellada	GR23	284		Campania	ITF3	6168		Região Autóno-ma da Madeira	PT3	301	338
Sterea Ellada	GR24	323		Puglia	ITF4	4552					
Peloponnisos	GR25	167		Basilicata	ITF5	539					
Attiki	GR3	6122		Calabria	ITF6	1178					
Voreio Aigaio	GR41	121									
Notio Aigaio	GR42	113									
Kriti	GR43	378									

[10] The merging of Molise and Abruzzo is in line with the fact that both regions formed one region "Abruzzi e Molise" up until 1963 when this larger region was split in two.

3.3 Overrepresentation of CIS indicators in the RIS

This section discusses the possible bias created by the larger number of CIS data in the regional benchmarking as compared to the national benchmarking in the EIS. The EIS uses 29 indicators of which 8 use CIS data (i.e., 28% of the indicators). The RIS uses 16 indicators of which 8 use CIS data (i.e., 50% of the indicators). The selection of indicators for the EIS was guided by the need to have a balance between different types of indicators which measure different aspects of innovation.

To have a similar balance of different aspects of innovation in the Regional Innovation Scoreboard would therefore require adjusting the weights of the CIS indicators as follows:

CI "weighted" = 21/29*average normalized transformed[11] scores non-CIS indicators
+ 8/29* average normalized transformed scores CIS indicators

Conclusion: For the purposes of assessing overall innovation performance it is recommended to adjust the weight of the CIS indicators in the regional benchmarking in accordance with the weights of the CIS indicators in the EIS.

Following the build-up of the EIS composite innovation index, the regional innovation index will be calculated as a weighted average of the average performance for Enablers, Firm activities and Outputs:

- CI Enablers =

  Average of normalized transformed scores for the indicators Tertiary education, Life-long learning, Public R&D expenditures and Broadband access

- CI Firm activities =

  8/11 * average of normalized transformed scores for the indicators Business R&D expenditures EPO patents

  +

  3/11 * average of normalized transformed scores for the indicators Non-R&D innovation expenditures, SMEs innovating in-house and Innovative SMEs collaborating with others

  Where the weights of 8/11 and 3/11 represent the share of non-CIS and CIS indicators in the EIS.

- CI Outputs =

  4/9 * average of normalized transformed scores for the indicators Employment in medium-high & high-tech manufacturing and Employment in knowledge-intensive services

  +

[11] Section 3.5 discusses the transformation of the indicators.

5/9 * average of normalized transformed scores for the indicators Product and/or process innovators, Marketing and/or organisational innovators, Resource efficiency innovators, New-to-market sales and New-to-firm sales

Where the weights of 4/9 and 5/9 represent the share of non-CIS and CIS indicators in the EIS.

- CI RIS =
  9/29 * CI Enablers + 11/29 * CI Firm activities + 9/29 * CI Outputs

Where the weights represent the share of the indicators captures in Enablers, Firm activities and Outputs in the total number of 29 indicators used in the EIS.

This leads to the following percentage share of each of the indicators in the RIS composite index:

Table 5: Percentage share of indicators in the RIS Summary Innovation Index

ENABLERS	
1.1.3 Tertiary education	7.8%
1.1.4 Life-long learning	7.8%
1.2.1 Public R&D expenditures	7.8%
1.2.4 Broadband access by firms	7.8%
FIRM ACTIVITIES	
2.1.1 Business R&D expenditures	13.8%
2.1.3 Non-R&D innovation expenditures	3.4%
2.2.1 SMEs innovating in-house	3.4%
2.2.2 Innovative SMEs collaborating with others	3.4%
2.3.1 EPO patents	13.8%
OUTPUTS	
3.1.1 Product and/or process innovators	3.4%
3.1.2 Marketing and/or organisational innovators	3.4%
3.1.3 Resource efficiency innovators	3.4%
3.2.1 Employment in medium-high & high-tech manufacturing	6.9%
3.2.2 Employment in knowledge-intensive services	6.9%
3.2.5 New-to-market sales	3.4%
3.2.6 New-to-firm sales	3.4%

3.4 Missing data: data imputation

For the selection of regions and indicators a significant amount of data is missing, in particular for the regions of Germany, Ireland, Netherlands and Sweden for which no regional CIS data are available. For the analysis in the RIS report two options are available:

1. Exclude all regions for which too many data are missing (among others all regions from Germany, Ireland, Netherlands and Sweden)

2. Impute the missing data by statistically estimating these missing values using the data which are available

Choosing the first option would significantly reduce the value of the RIS as not all European regions would be covered, including regions in 4 of the more innovative countries. We therefore explore the second option in this section.

3.4.1 Methodology for imputation of missing data

Before the imputation there are 1377 out of a total of 6032 values missing, meaning that 28.8% of the cells are empty. The imputation procedure is implemented entirely in Excel using linear regression and another hierarchical procedure (both explained below).

Not only regional values are missing but also values at national level, whilst all values for the EU27 aggregate are available.

The imputation is based on the following procedure:

Consider a missing value for indicator Y in region R for a given year, e.g. Y-2004.

IF a value is available for Y-2006 in region R, THEN
apply linear regression between Y-2004 and Y-2006 ELSE
{
find the indicator Z with the highest correlation with Y (Z can span both years).
IF correlation between Y and Z is > 0.6 AND a value is available for Z in R THEN
apply linear regression between Y and Z.
}

After regression, only 13% of the missing values could be imputed. Regression was not successful[12] as many regions have missing values for the pairs of indicators that are employed in the regression.

The remaining values are imputed using a hierarchical procedure, which first imputes missing values at national level using values at EU27 level and, in a second phase, imputes missing values at regional level using values at national level. The procedure is illustrated hereafter.

The procedure calculates for each indicator Y, where possible, the ratios between the values of Y for country C and for EU27. Then, the median[13] ratio $\rho_{C,EU}$ across the indicators is calculated. The missing value for indicator Z in country C is imputed by assuming that for Z the median ratio $\rho_{C,EU}$ just computed applies between C and EU27. Given that all values for EU27 are available, all missing values at national level can be imputed.

The procedure calculates for each indicator Y, where possible, the ratios between the values of Y for region R and for country C. Then, the median ratio $\rho_{R,C}$ across the indicators is calculated. The missing value for indicator Z in country R is imputed by assuming that for Z the median ratio $\rho_{R,C}$ just computed applies between R and C. Given that all national values all available, all missing values at regional level can be imputed.

For Germany, Ireland, Netherlands and Sweden data are imputed at the NUTS 2 level. For all other countries imputation is done at the regional level as shown in Annex 4.

Detailed description of the regression:

Linear regression is used to impute missing values between two highly correlated variables (indicators): the dependent variable Y that contains the missing value at row R,

[12] The linear regression produced inconsistently large scores for EPO patents in Romanian regions in both years compared to the available national values, which are much smaller. We decided not to impute such values with regression but via median ratios.
[13] It was decided to consider the median values instead of the mean value, as the distribution of the ratios contained, in some instances, some outliers.

and the independent variable X that possesses a value at row R. The vectors X and Y include all regions, countries and EU27 aggregate for which pairs of values are available. The regression procedure is carried out as follows:

The equation for a straight line that best fits the data X and Y is:

$$Y = m X + b$$

Where m and b are parameters to be estimated. The method of least squares is used for determining the best fit for the data and provides the following formulas for m and b:

$$m = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

$$b = \bar{y} - m\bar{x}$$

Where $\bar{x}$ and $\bar{y}$ are the sample means of X and Y.

Before using regression, the procedure checks that for the cell to be imputed (region R, indicator Y), the indicator X has a value in cell R. This check is carried out via an Excel macro. This macro only needs to be executed if there is a change in the underlying raw data.

3.4.2 Uncertainty analysis

The imputed values obtained via the above described procedure are estimates and, as such, are affected by uncertainty. However, very often this uncertainty is not acknowledged and single ranks for the regions are provided. Here, we analyse the uncertainties associated to the imputed values and check what effect they have on the resulting ranks for the regional innovation index. For each region, uncertainty analysis yields intervals of ranks instead of single ranks.

We restrict the uncertainty analysis to the imputations made by the hierarchical procedure based on median ratios explained in the previous section, as the greatest portion of missing values (i.e. 83%) come from there. The uncertainty of a given imputed value is modelled by removing the assumption, made in the imputation procedure, that regions possess the corresponding nation's median ratio across indicators. In other words, in the uncertainty analysis, all ratios calculated for the available indicators are identically plausible for the imputation. In the uncertainty analysis such plausible ratios are sampled randomly between their ranges of uncertainty and used for the calculation of the RII for all regions, resulting in intervals of ranks instead of single ranks.

Since the aggregation process to build the RII is linear, it is convenient to calculate the extreme RII ranks (best and worst) for each region considering the minimum and maximum values of the previously established ratios. An overview of the uncertainty analysis results is given in Figures 3 to 8. The graphs show the variability of the ranks for all regions when applying minimum and maximum ratios between regions and nations instead of the median ratio. The variability in ranks is shown by the vertical lines. The graphs are provided for the three domains, i.e. Enablers, Firm activities and Output, as well as for the RII.

The upper graph in Figure 3 shows that, for *Enablers 2006*, the ranks of regions are quite robust to the uncertainties of the imputations due to the low number of missing values in this domain. Indeed, only 5% of all regions show a change in ranking of more than one position. The bottom graph in Figure 3 shows the scores of regions against their ranks for

Enablers. Orange and green dots represent the scores obtained for each region using minimum and maximum ratios, respectively. For only 4 regions the min and max scores deviate from the average score confirming the robustness of the analysis for Enablers.

Figure 3: Ranks of regions and uncertainty intervals for Enablers in 2006

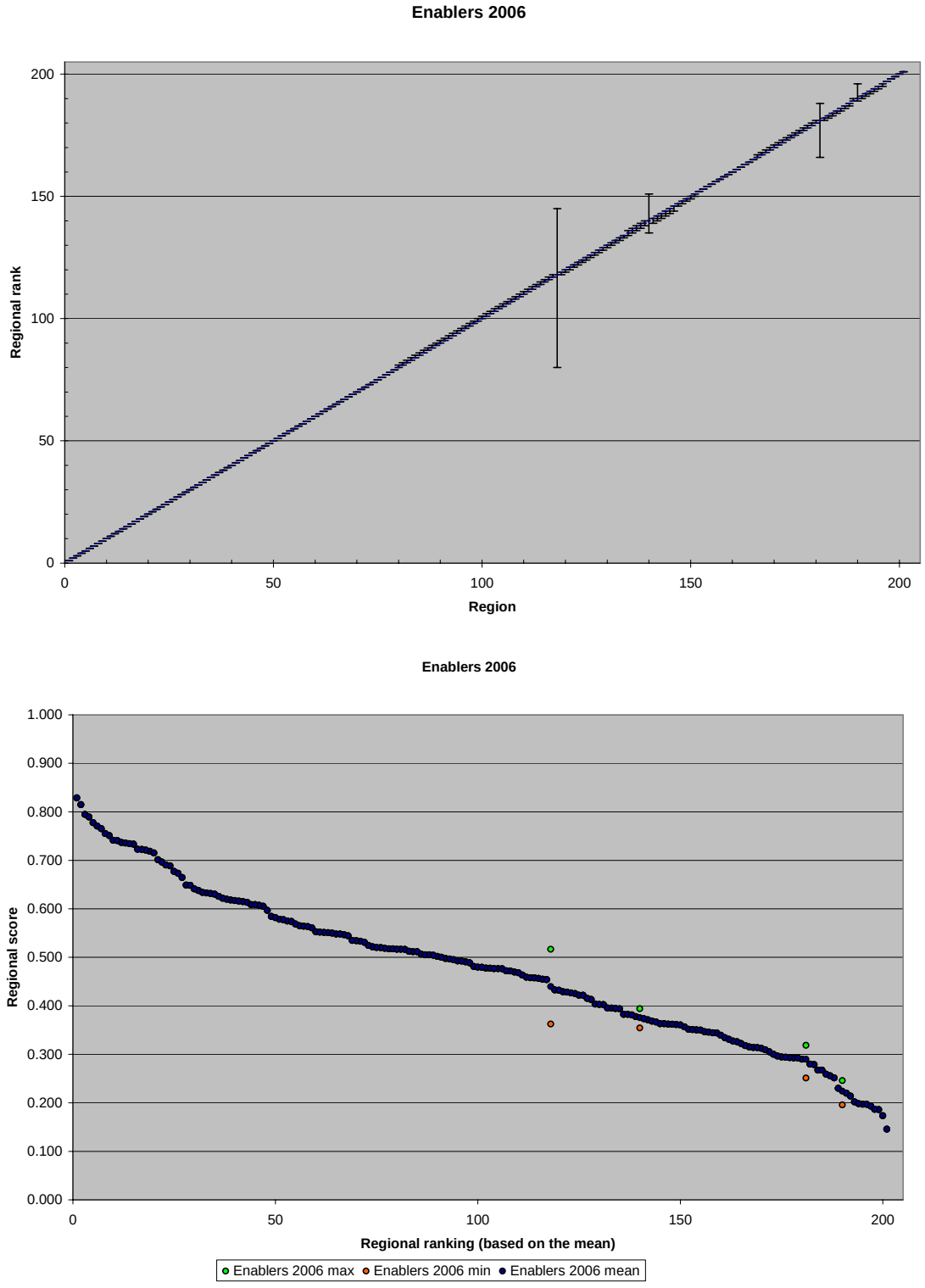
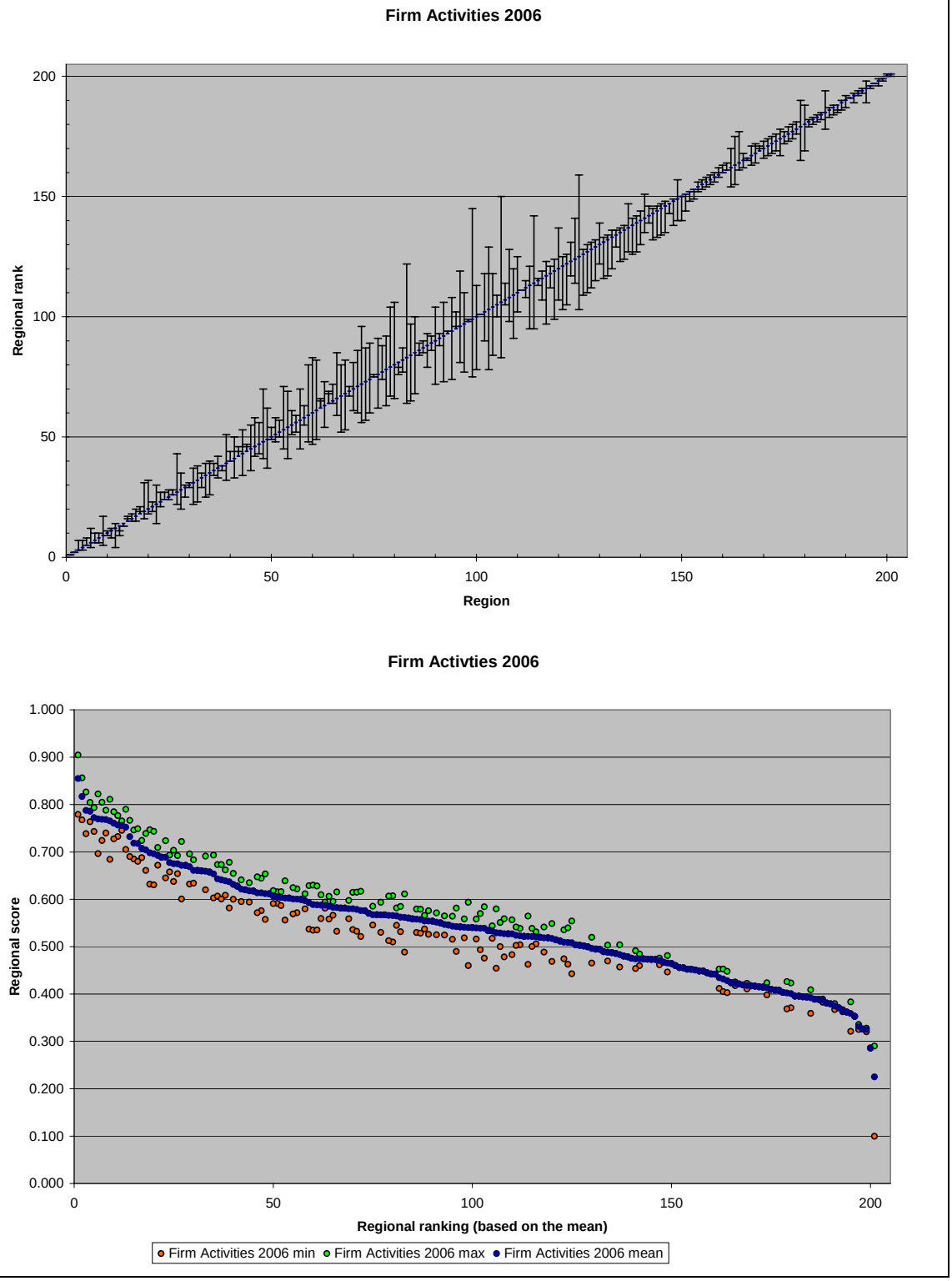


Figure 4: Ranks of regions and uncertainty intervals for Firm Activities in 2006



In the domain *Firm Activities 2006* the average uncertainty interval of ranks is 14 positions. Almost 13% of all regions show an uncertainty interval of ranks of more than 10 positions. Note how the top and bottom performing regions have smaller uncertainties in their ranks (upper graph in Figure 4). The bottom graph in Figure 4 shows that for

most regions the difference between Firm Activities scores for the minimum (orange dots) and the maximum (green dots) ratios is relatively small.

Figure 5: Ranks of regions and uncertainty intervals for Output in 2006

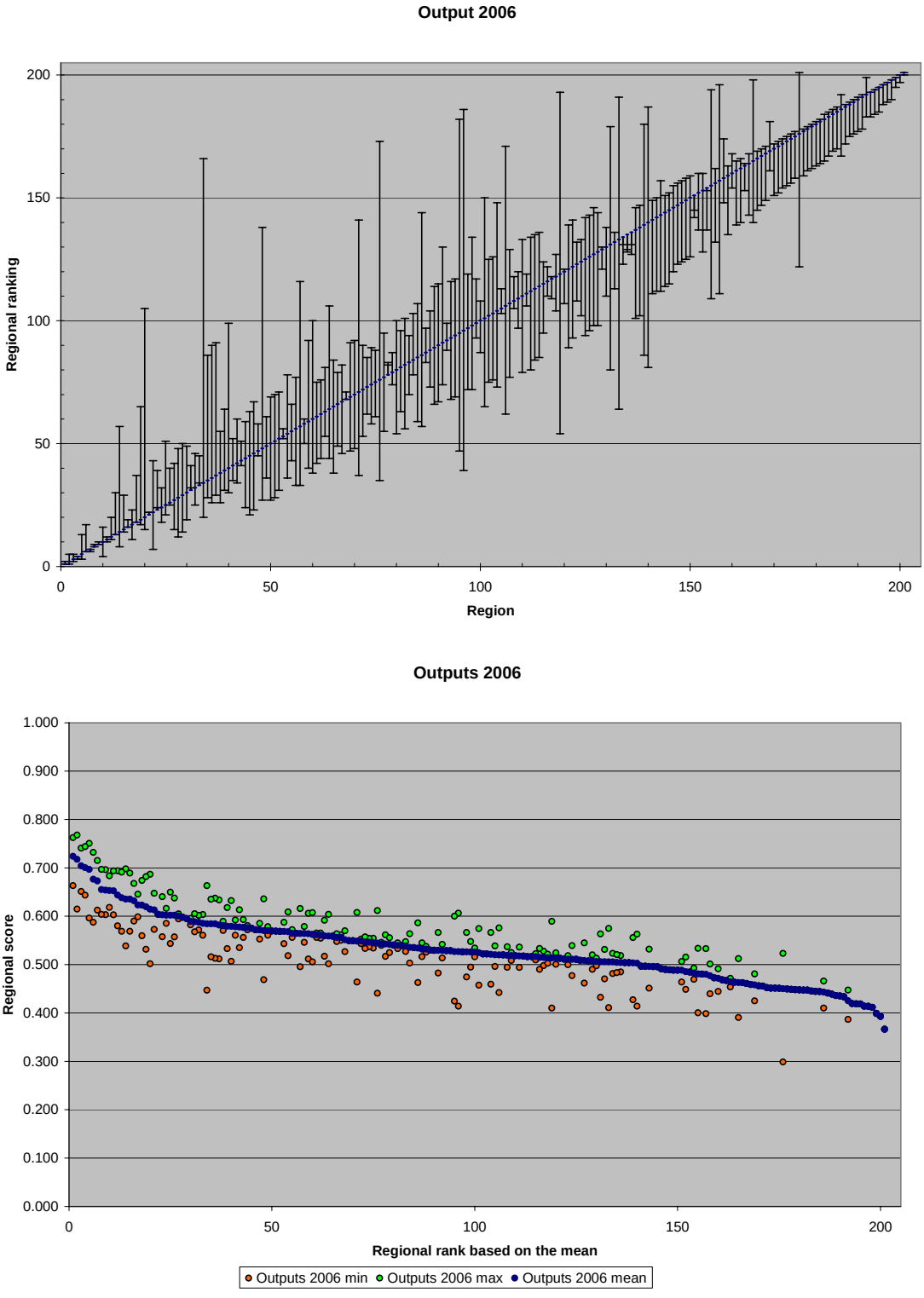
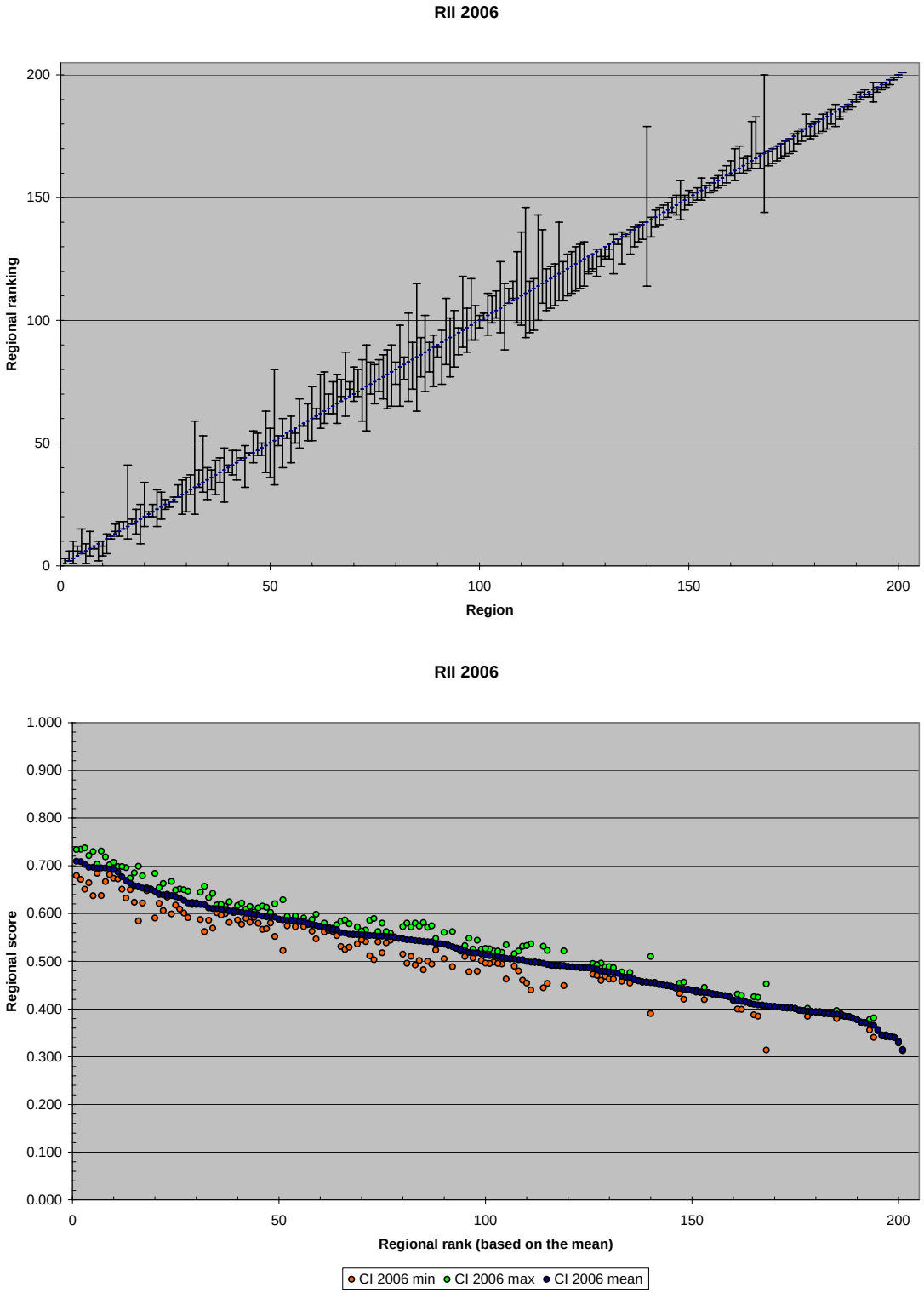


Figure 6: Ranks of regions and uncertainty intervals for the Regional Innovation Index in 2006



The *Outputs 2006* domain contains a considerable number of imputed values, resulting in very pronounced uncertainties for the ranks of regions. Here the average uncertainty interval of ranks is 25 positions, which is considerably higher than for the other domains

(upper graph in Figure 5). In extreme cases the range of ranks can reach more than 150 positions (the total number of regions analysed is 201) and 11% of all regions show ranges of more than 50 positions. The bottom graph in Figure 5 shows the large difference in *Outputs 2006* scores for the minimum (orange dots) and maximum (green dots) ratios. For some regions it is impossible to draw useful information on their performance within this domain.

Figure 6 shows the ranks of regions and their uncertainty intervals for the RII in 2006. In spite of the volatility of ranks for the *Output 2006* domain, the RII is relatively stable. Here the average uncertainty interval of ranks is 8 positions and the highest change of rank for a region is 47 positions. In a large majority of cases (87% of all regions) the range is less than 15 positions.

In the graphs in Annex 5 the RII is represented against the domains *Enablers*, *Firm Activities* and *Outputs* with the uncertainty intervals for the ranks. Each region is identified with a point and two uncertainty intervals: one, horizontal, for the domain and one, vertical, for the RII. A region placed at large distance from the diagonal indicates that its performance in a domain does not reflect its overall performance. This is especially true for the domain *Output* with respect to the RII. This is a result of the high amount of missing data and the resulting high uncertainty in the domain *Output* after imputation.

Figure 7 visualizes the stability of the ranks over 2004 and 2006. Note that, in spite of the uncertainties, the ranks in 2004 correspond relatively well to those in 2006. Further, the regions with intervals of ranks placed at the right of the diagonal, improved their rank from 2004 to 2006.

Figure 7: Ranks of regions and uncertainty intervals for the Regional innovation index in 2004 and 2006

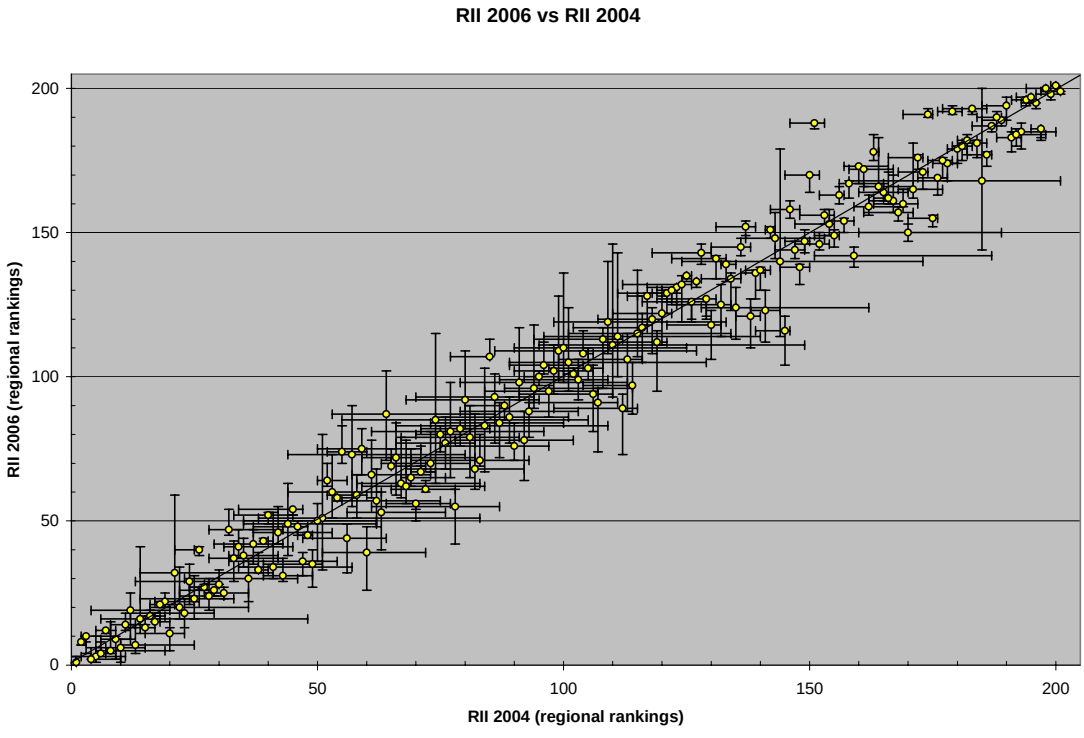
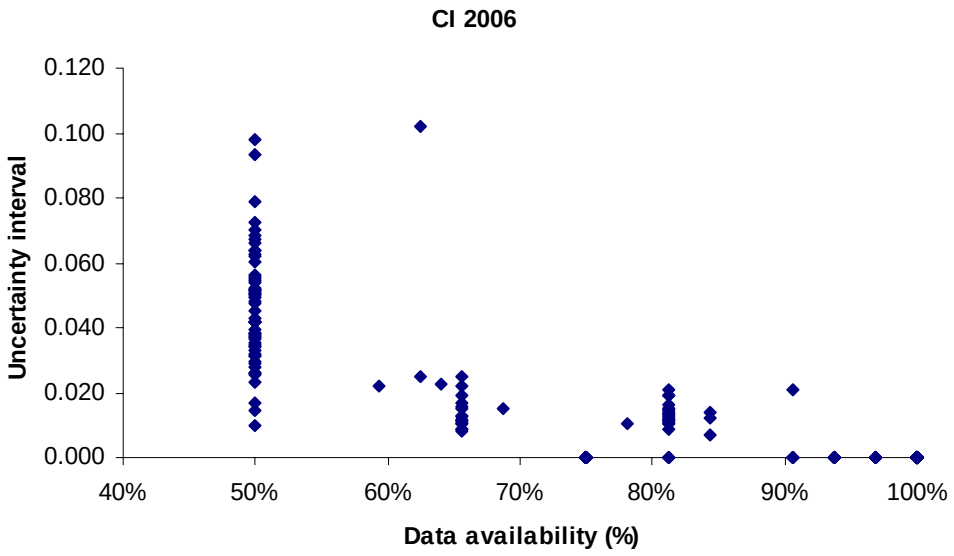


Figure 8 shows how data imputation leads to increased uncertainty in RII regional rankings; in other words, regions with good data availability have smaller uncertainty in their ranks. The figure clearly shows that, even for regions where 50% of the data have been imputed, the uncertainty interval is small.

Figure 8: Data availability and uncertainty interval of regional rankings



Conclusion: Although some regions undoubtedly outperform others, it is not possible to attribute ranks to individual regions due to consistent overlaps between their uncertainty intervals. The uncertainty levels for those countries where no CIS data is available are higher than for other countries which would limit possibilities for more detailed analysis of regional performance in these countries.

3.5 Normalisation of the indicators

Most of the indicators are fractional indicators with values between 0% and 100%. 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 will be transformed using a square root transformation with power *N* if the degree of skewness of the raw data exceeds 0.5 such that the skewness of the transformed data is below 0.5 (none of the imputed data are included in this process):

$$\tilde{X}_r = \sqrt[N]{X_r}$$

Table 6 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 where the transformed score is first subtracted with the minimum score over all regions in both 2004 and 2006 and

then divided by the difference between the maximum and minimum scores over all regions in both 2004 and 2006:

$$\hat{X}_r = \frac{\tilde{X}_r - MIN(\forall_r \tilde{X}_r)}{MAX(\forall_r \tilde{X}_r) - MIN(\forall_r \tilde{X}_r)}$$

The maximum normalised score is thus equal to 1 and the minimum normalised score is equal to 0. These normalised scores are then used to calculate the composite indicators as discussed in Section 3.3.

Table 6: Degree of skewness and transformation for each of the RIS indicators

	Degree of skewness before transformation	Power used in transformation	Degree of skewness after transformation
ENABLERS			
1.1.3 Tertiary education	0.152	1	0.152
1.1.4 Life-long learning	1.449	1/3	0.402
1.2.1 Public R&D expenditures	1.166	1/2	0.150
1.2.4 Broadband access by firms	0.619	3/4	0.329
FIRM ACTIVITIES			
2.1.1 Business R&D expenditures	2.019	1/3	0.434
2.1.3 Non-R&D innovation expenditures	2.441	1/5	0.434
2.2.1 SMEs innovating in-house	0.193	1	0.193
2.2.2 Innovative SMEs collaborating with others	1.231	1/2	0.300
2.3.1 EPO patents	2.115	1/3	0.270
OUTPUTS			
3.1.1 Product and/or process innovators	0.196	1	0.196
3.1.2 Marketing and/or organisational innovators	0.641	3/4	0.465
3.1.3 Resource efficiency innovators			
• Labour	1.107	2/3	0.412
• Energy	2.407	1/2	0.294
3.2.1 Employment in medium-high & high-tech manufacturing	1.089	1/2	0.320
3.2.2 Employment in knowledge-intensive services	0.685	3/4	0.388
3.2.5 New-to-market sales	3.969	1/3	0.275
3.2.6 New-to-firm sales	1.544	1/3	0.407

4. RIS report: conclusions and foreseen analysis

The analysis in this report shows that the use of regional Community Innovation Survey (CIS) data does complement other regional innovation indicators to provide a broader picture of innovation performance. In general it shows that regions with lower performance on non-CIS indicators (largely technology based indicators such as R&D, patenting) tend to perform better when CIS based indicators are included, suggesting that performance on non-technological innovation is more widely distributed across Europe. This is potentially important information to take into account in the policy debate on regional innovation.

However, this report also highlights some limitations of regional CIS data which, together with the non-availability of other data at regional level, means that greater caution is needed in a Regional Innovation Scoreboard than is the case with the European Innovation Scoreboard.

4.1 Conclusions on geographical coverage in the 2009 RIS

Based on real data availability and data imputations it is proposed that the 2009 RIS report covers 201 regions (cf. Figure 9) for all EU Member States and Norway at different NUTS levels as follows:

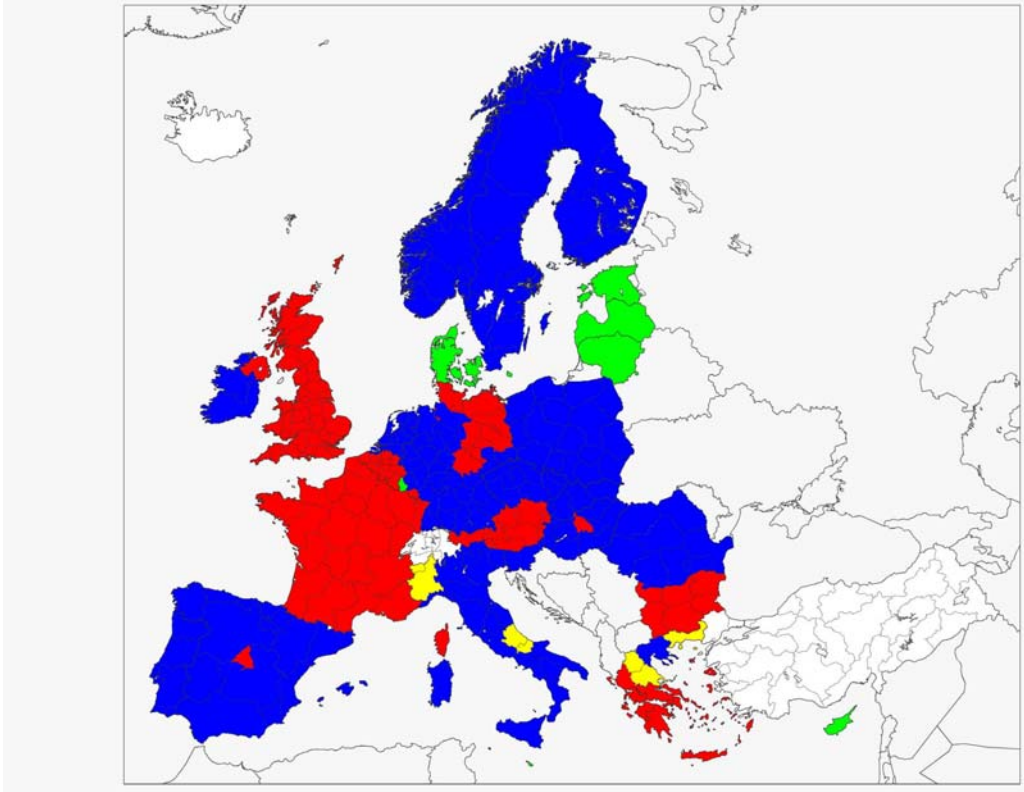
- NUTS 1: 3 regions from Austria, 3 regions from Belgium, 2 regions from Bulgaria, 9 regions from France, 9 regions from Germany, 3 regions from Greece, 1 region from Hungary, 2 regions from Spain, 12 regions from UK.

- NUTS 2: 8 regions from Czech Republic, 29 regions from Germany, 1 region from Greece, 6 regions from Hungary, 2 regions from Ireland, 17 regions from Italy, 12 regions from the Netherlands, 7 regions from Norway, 16 regions from Poland, 5 regions from Portugal, 8 regions from Romania, 2 regions from Slovenia, 4 regions from Slovakia, 16 regions from Spain, 4 regions from Finland, 8 regions from Sweden.

- 1 merged region for Greece, 2 merged regions for Italy, 1 merged regions for Portugal.

- Denmark, Estonia, Cyprus, Latvia, Lithuania, Luxembourg and Malta will all be covered at the country level.

Figure 9: RIS 2009 Regional coverage



Map generated with *Region Map Generator*.
Regions highlighted in green: countries defined at NUTS1/2 level. Regions highlighted in red: NUTS 1 level.
Regions highlighted in blue: NUTS 2 level. Regions highlighted in yellow: merged regions.
Ciudad Autónoma de Ceuta (ES63), Ciudad Autónoma de Melilla (ES64), French overseas departments (FR9), Região Autónoma dos Açores (PT2) and Região Autónoma da Madeira (PT3) are not shown in this map.

However, given the non-availability of regional CIS data, for the following countries all regional CIS data are imputations: Germany, Netherlands, Ireland and Sweden.

It is hoped that regional CIS data will become available for these countries in future, in which case further editions of the Regional Innovation Scoreboard will provide full analysis of a larger number of countries[14].

4.2 Conclusions for selection of indicators for the 2009 RIS

The RIS will include regional data for 16 of the 29 indicators used in the EIS. For the other EIS indicators regional data are not available. The definition of the indicators will be identical to the EIS for 10 of these indicators, while for 6 indicators there is some difference as shown below. The analysis presented in this report suggests that the redefinition of CIS indicators to include only SMEs helps reduce the problem of misreporting of activities to regions where headquarters are located, although care is needed in the interpretation (see following section).

Table 5: A comparison of the indicators included in the EIS and RIS

	European Innovation Scoreboard (EIS)	Regional Innovation Scoreboard (RIS)
1.1.1	S&E (science and engineering) and SSH (social sciences and humanities) graduates per 1000 population aged 20-29 (first stage of tertiary education – ISCED 5)	Not included: regional data are not available
1.1.2	S&E (science and engineering) and SSH (social sciences and humanities)doctorate graduates per 1000 population aged 25-34 (second stage of tertiary education – ISCED 6)	Not included: regional data are not available
1.1.3	Population with tertiary education (ISCED 5-6) per 100 population aged 25-64	**Included: identical definition**
1.1.4	Participation in life-long learning per 100 population aged 25-64	**Included: identical definition**
1.1.5	Youth education attainment level (share) of young people aged 20-24 years having attained at least upper secondary education attainment level, i.e. with an education level ISCED 3a, 3b or 3c long minimum)	Not included: regional data are not available
1.2.1	Public R&D expenditures (R&D expenditures in the government sector (GOVERD) and the higher education sector (HERD)) as a percentage of GDP)	**Included: identical definition**
1.2.2	Venture capital as a percentage of GDP)	Not included: regional data are not available
1.2.3	Private credit (relative to GDP)	Not included: regional data are not available
1.2.4	Broadband access by firms (% of firms)	**Included: share of households with broadband access**
2.1.1	Business R&D expenditures (BERD) as a percentage of GDP	**Included: identical definition**
2.1.2	IT expenditures (hardware, software) as a percentage of GDP	Not included: regional data are not available
2.1.3	Non-R&D innovation expenditures of all enterprises as a percentage of turnover	**Included: focus on SMEs only**
2.2.1	SMEs innovating in-house as a percentage of all SMEs	**Included: identical definition**
2.2.2	Innovative SMEs collaborating with others as a percentage of all SMEs	**Included: identical definition**
2.2.3	Firm renewal (sum of the number of births and deaths of SMEs with at least 5 employees and who are active in NACE classes C, D, E, G51, I, J and K) as a percentage of all SMEs	Not included: regional data are not available
2.2.4	Public-private co-publications per million population	Not included: regional data are not available
2.3.1	Number of patents applied for at the European Patent Office (EPO) per million population	**Included: identical definition**

[14] For Sweden regional CIS data are expected to become available from the CIS 2008 survey onwards.

	European Innovation Scoreboard (EIS)	Regional Innovation Scoreboard (RIS)
2.3.2	Number of new community trademarks per million population	Not included: regional data are not available
2.3.3	Number of new community designs per million population	Not included: regional data are not available
2.3.4	Technology Balance of Payments flows (receipts plus payments of royalty and license fees) as a percentage of GDP	Not included: regional data are not available
3.1.1	SMEs introducing product or process innovations as a percentage of all SMEs	**Included: identical definition**
3.1.2	SMEs introducing marketing or organisational innovations as a percentage of all SMEs	**Included: identical definition**
3.1.3	Resource efficiency innovators, unweighted average of the following 2 indicators:	
	• Number of all innovating firms who replied that their product or process innovation had a highly important effect on reducing labour costs per unit of output as a percentage of all firms	**Included: focus on SMEs only**
	• Number of all innovating firms who replied that their product or process innovation had a highly important effect on reducing materials and energy per unit of output as a percentage of all firms	**Included: focus on SMEs only**
3.2.1	Employment in medium-high & high-tech manufacturing (% of workforce)	**Included: identical definition**
3.2.2	Employment in knowledge-intensive services (% of workforce)	**Included: identical definition**
3.2.3	Medium and high-tech manufacturing exports (% of total exports)	Not included: regional data are not available
3.2.4	Knowledge-intensive services exports (% of total services exports)	Not included: regional data are not available
3.2.5	New-to-market sales of all enterprises as percentage of turnover	**Included: focus on SMEs only**
3.2.6	New-to-firm sales of all enterprises as a percentage of turnover	**Included: focus on SMEs only**

4.3 Conclusions for analysis of innovation performance in the 2009 RIS

In the RIS report, and given the limitations of the data, we will **not construct a ranking of regions** as is done in the European Innovation Scoreboard for countries. Such a ranking could be considered in future based on further availability and quality of regional data. Instead, we foresee two types of analyses.

Groupings of regions based on their overall level of innovation performance

In the first, all regions will be classified into groups of comparable regions using the Regional Innovation Index scores. This will use the same methodology as the EIS to calculate a composite indicator, but reweighting the indicators to provide a similar balance as in the EIS (cf. section 3.3). This analysis will be conducted for all regions based on imputed data for missing values.

As with the EIS, the aim of this grouping will be to identify robust "peer groups" of regions, as a basis for more in-depth comparisons and policy learning.

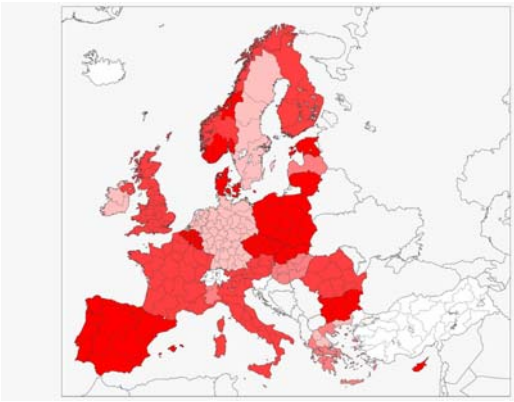
Assessment of relative strengths and weaknesses (profiles) of regions

For those regions for which data availability is sufficient for *Enablers*, *Firm activities* and *Outputs*, we will identify regions with comparable performance patterns within each of the clusters (cf. Figure 11). It is anticipated that this 'profiling' can only be done for those regions for which we have regional CIS data for most of the CIS indicators. In particular for *Outputs*, data availability is insufficient for regions in Germany, Ireland, Netherlands and Sweden and these regions will not be included in the profiling.

The results of the profiling and clustering analysis are presented in maps and graphs. As with the EIS, the purpose of this analysis is to provide regions with additional information about their relative strengths and weaknesses compared to their peer groups, as an input for policy discussions. For each of the indicators, maps are presented showing performance by quintile.

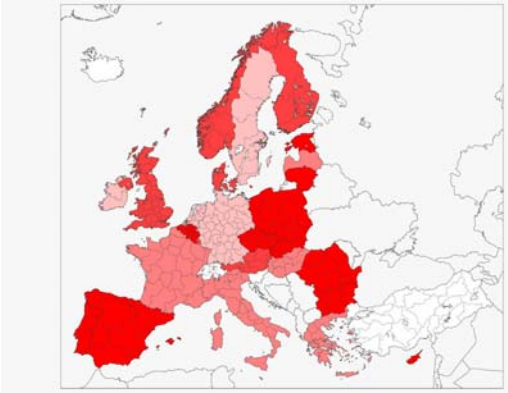
Figure 11: Regional data availability for 2004 and 2006

RIS



Enablers

Firm activities



Outputs

Map generated with *Region Map Generator*.
Darker shades of red show better data availability. Regions highlighted in white do not pass the 70% data availability criterion.
Ciudad Autónoma de Ceuta (ES63), Ciudad Autónoma de Melilla (ES64), French overseas departments (FR9), Região Autónoma dos Açores (PT2) and Região Autónoma da Madeira (PT3) are not shown in these maps.

Annex 1: A comparison of the 2002, 2003, 2006 RIS

	2002 RIS	2003 RIS	2006 RIS	Data source (Eurostat)
Countries	EU15	EU15	EU25	
Number of regions	148	173	208	
Number of indicators	7	13 (incl. indicators using regional CIS-2 data)	7	
Population with tertiary education (% of 25–64 years age class)	Yes: 2001 data or most recent	Yes: 2002 data or most recent	No	Labour Force Survey
Human Resources in Science and Technology – Core (% of population)	No	No	Yes: 2004 data	Labour Force Survey
Participation in life-long learning (% of 25–64 years age class)	Yes: 2001 data or most recent	Yes: 2002 data or most recent	Yes: 2004 data	Labour Force Survey
Employment in medium-high and high-tech manufacturing (% of total workforce)	Yes: 2000 data or most recent	Yes: 2002 data or most recent	Yes: 2004 data	Labour Force Survey
Employment in high-tech services (% of total workforce)	Yes: 2000 data or most recent	Yes: 2002 data or most recent	Yes: 2004 data	Labour Force Survey
Public R&D expenditures (GERD–BERD) (% of GDP)	Yes: 1999 data or most recent	Yes: 2001 data or most recent	Yes: 2002 data or most recent	R&D statistics
Business expenditures on R&D (BERD) (% of GDP)	Yes: 1999 data or most recent	Yes: 2001 data or most recent	Yes: 2002 data or most recent	R&D statistics
EPO high-tech patent applications (per million population)	Yes: 1999 data or most recent	Yes: 2001 data or most recent	No	Patent statistics
EPO patent applications (per million population)	No	Yes: 2001 data or most recent	Yes: 2002 data	Patent statistics
Share of innovative enterprises (% of all manufacturing enterprises)	No	Yes: 1996 data	No	Community Innovation Survey
Share of innovative enterprises (% of all services enterprises)	No	Yes: 1996 data	No	Community Innovation Survey
Innovation expenditures (% of all turnover in manufacturing)	No	Yes: 1996 data	No	Community Innovation Survey
Innovation expenditures (% of all turnover in services)	No	Yes: 1996 data	No	Community Innovation Survey
Sales of 'new to the firm but not new to the market' products (% of all turnover in manufacturing)	No	Yes: 1996 data	No	Community Innovation Survey

Annex 2: RIS 2009 indicators - definitions and data availability

- **1.1.3 Population with tertiary education per 100 population aged 25-64**
  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 25 and 64 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. International comparisons of educational levels however are difficult due to large discrepancies in educational systems, access, and the level of attainment that is required to receive a tertiary degree. Differences among countries should be interpreted with caution.
  Data source: Eurostat – Data Navigation Tree: Database / General and regional statistics / Regional statistics / Regional science and technology statistics (reg_sct) / Human Resources in Science and Technology (HRST) (reg_hrst) / Annual data on HRST and sub-groups (NUTS level 0, 1 and 3) (hrst_st_rcat)
  Data availability: Good: available for most regions for 2004 and 2006.

- **1.1.4 Participation in life-long learning per 100 population aged 25-64**
  Numerator: Number of persons involved in life-long learning. Life-long learning is defined as participation in any type of education or training course during the four weeks prior to the survey. The information collected relates to all education or training whether or not relevant to the respondent's current or possible future job. It includes initial education, further education, continuing or further training, training within the company, apprenticeship, on-the-job training, seminars, distance learning, evening classes, self-learning etc. It includes also courses followed for general interest and may cover all forms of education and training as language, data processing, management, art/culture, and health/medicine courses.
  Denominator: The reference population is all age classes between 25 and 64 years inclusive.
  Rationale: 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.
  Data source: Eurostat – Data Navigation Tree: Database / General and regional statistics / Regional statistics / Regional labour market statistics (reg_lmk) / Regional socio-demographic labour force statistics – LFS series (reg_lfsd) / Life-long learning – participation of adults aged 25-64 in education and training, at NUTS levels 1 and 2 (1000) (ref_lfsd2plll)
  Data availability: Good: Available for most regions for 2004 and 2006.

- **1.2.1 Public R&D expenditures (% of GDP)**
  Numerator: All R&D expenditures in the government sector (GOVERD) and the higher education sector (HERD). Both GOVERD and HERD according to the Frascati-manual definitions, in national currency and current prices.
  Denominator: Gross domestic product as defined in the European System of Accounts (ESA 1995), in national currency and current prices.
  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.

Data source: Eurostat – Data Navigation Tree: Database / General and regional statistics / Regional statistics / Regional science and technology statistics (reg_sct) / R&D expenditure and personnel (reg_rd) / Total intramural R&D expenditure (GERD) by sectors of performance and region (RD_E_gerdreg)
Data availability: Good: available for most regions for 2004 and 2006.

- **1.2.4 Broadband access**
  Numerator: Number of households with broadband access.
  Denominator: Total number of households.
  Rationale: Realising Europe's full e-potential depends on creating the conditions for electronic commerce and the Internet to flourish. This indicator captures the relative use of this e-potential by the number of households that have access to broadband.
  Data source: Eurostat
  Data availability: Good: available for most regions for 2004 and 2006.

- **2.1.1 Business R&D expenditures (% of GDP)**
  Numerator: All R&D expenditures in the business sector (BERD), according to the Frascati-manual definitions, in national currency and current prices.
  Denominator: Gross domestic product as defined in the European System of Accounts (ESA 1995), in national currency and current prices.
  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.
  Data source: Eurostat – Data Navigation Tree: Database / General and regional statistics / Regional statistics / Regional science and technology statistics (reg_sct) / R&D expenditure and personnel (reg_rd) / Total intramural R&D expenditure (GERD) by sectors of performance and region (RD_E_gerdreg)
  Data availability: Good: Available for most regions for 2004 and 2006.

- **2.1.3. Non-R&D innovation expenditures (% of total turnover)**
  Numerator: Sum of total innovation expenditure for SMEs only, in national currency and current prices excluding intramural and extramural R&D expenditures. (Community Innovation Survey: CIS-4 question 5.2, sum of variables RMACX and ROEKX)
  Denominator: Total turnover for SMEs only (both innovators and non-innovators), in national currency and current prices. (Community Innovation Survey: CIS-4 question 11.1, variable TURN04)
  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. Compared to the EIS 2007 the indicator no longer captures intramural and extramural R&D expenditures and thus no longer overlaps with the indicator on business R&D expenditures.
  Data source: Eurostat (Community Innovation Survey)
  Data availability: Poor: data are not available for all countries and for some countries data is not available for both 2004 and 2006.

- **2.2.1 SMEs innovating in-house (% of all SMEs)**
  Numerator: Sum of SMEs with in-house innovation activities. Innovative firms are defined as those firms which have introduced new products or process either 1) in-house or 2) in combination with other firms. This indicator does not include new products or processes developed by other firms.
  Data are taken from CIS4 question 2.2 and 3.2, i.e. whose SMEs which are either:
  - A product innovator who, to the question "Who developed these product innovations", answered Yes to at least one of the following categories of CIS4

question 2.2: "Mainly your enterprise or enterprise group" or "Your enterprise together with other enterprises or institutions".
- A process innovator who, to the question "Who developed these process innovations", answered Yes to at least one of the following categories of CIS4 question 3.2: "Mainly your enterprise or enterprise group" or "Your enterprise together with other enterprises or institutions".

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 during the period 2002-2004, have innovated in-house. The indicator is limited to SMEs because almost all large firms innovate and because countries with an industrial structure weighted to larger firms would tend to do better.
Data source: Eurostat (Community Innovation Survey)
Data availability: Poor: data are not available for all countries and for some countries data is not available for both 2004 and 2006.

- **2.2.2 Innovative SMEs co-operating with others (% of all SMEs)**

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 in the three years of the survey period (i.e. those SMEs who replied Yes to CIS-4 question 6.2).
Denominator: Total number of SMEs (both innovators and non-innovators).
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.
Data source: Eurostat (Community Innovation Survey)
Data availability: Poor: data are not available for all countries and for some countries data is not available for both 2004 and 2006.

- **2.3.1 EPO patents per million population**

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: Total population as defined in the European System of Accounts (ESA 1995).
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.
Data source: Eurostat – Data Navigation Tree: Database / General and regional statistics / Regional statistics / Regional science and technology statistics (reg_sct) / European patent applications to EPO (reg_pat) / Patent applications to the EPO by priority year at the regional level (pat_ep_rtot)
Data availability: Good: available for most regions for 2004 and 2006.

- **3.1.1 Technological (product or process) innovators (% of all SMEs)**

Numerator: The number of SMEs who introduced a new product or a new process to one of their markets.
Data are taken from CIS-4 questions 2.1 and 3.1, i.e. those SMEs which have either introduced:
- A product innovation, i.e. have introduced either "New or significantly improved goods" or "New or significantly improved services".

- A process innovation, i.e. have introduced either "New or significantly improved methods of manufacturing or producing goods or services", "New or significantly improved logistics, delivery or distribution methods for your inputs, goods or services" or "New or significantly improved supporting activities for your processes, such as maintenance systems or operations for purchasing, accounting, or computing".

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.
Data source: Eurostat (Community Innovation Survey)
Data availability: Poor: data are not available for all countries and for some countries data is not available for both 2004 and 2006.

- **3.1.2 Non-technological (marketing or organisational) innovators (% of all SMEs)**

Numerator: The number of SMEs who introduced a new marketing innovation and/or organisational innovation to one of their markets.
Data are taken from CIS-4 question 10.1, i.e. those SMEs which have either introduced:

- A marketing innovation, i.e. have introduced either "'Significant changes to the design or packaging of a good or service" or "New or significantly changed sales or distribution methods, such as internet sales, franchising, direct sales or distribution licenses".
- An organisational innovation, i.e. have introduced either "New or significantly improved knowledge management systems to better use or exchange information, knowledge and skills within your enterprise", "A major change to the organisation of work within your enterprise, such as changes in the management structure or integrating different departments or activities" or "New or significant changes in your relations with other firms or public institutions, such as through alliances, partnerships, outsourcing or sub-contracting.

Denominator: Total number of SMEs.
Rationale: The Community Innovation Survey mainly asks firms about their technical innovation. Many firms, in particular in the services sectors, innovate through other 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.
Data source: Eurostat (Community Innovation Survey)
Data availability: Poor: data are not available for all countries and for some countries data is not available for both 2004 and 2006.

- **3.1.3 Resource efficiency innovators**

This indicator is captured by the following two sub-indicators each contributing for 50% of the overall score for resource efficiency innovators:

- **3.1.3a Reduced labour costs resulting from process innovations (% of SMEs)**

  Numerator: Sum of innovating SMEs who replied that their product or process innovation had a highly important effect on reducing labour costs per unit of output (CIS-4 question 7.1, variable ELBR).
  Denominator: Total number of SMEs.
  Rationale: This indicator captures the cost savings from process innovation.
  Comment: this indicator will be included jointly with indicator 3.1.3b using a relative weight of 50%.
  Data source: Eurostat (Community Innovation Survey)

Data availability: Poor: data are not available for all countries and for some countries data is not available for both 2004 and 2006.

- **3.1.3b Reduced use materials and energy resulting from process innovations (% of SMEs)**
  Numerator: Sum of innovating SMEs who replied that their product or process innovation had a highly important effect on reducing materials and energy per unit of output (CIS-4 question 7.1, variable EMAT.
  Denominator: Total number of SMEs.
  Rationale: This indicator captures the energy savings from process innovation.
  Comment: this indicator will be included jointly with indicator 3.1.3b using a relative weight of 50%.
  Data source: Eurostat (Community Innovation Survey)

  Data availability: Poor: data are not available for all countries and for some countries data is not available for both 2004 and 2006.

- **3.2.1 Employment in knowledge-intensive services (% of total workforce)**
  Numerator: Number of employed persons in the knowledge-intensive services sectors. These 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: The total workforce includes all manufacturing and service sectors.
  Rationale: 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.
  Data source: Eurostat (High-tech industry and knowledge-intensive services: Economic, Science & Technology and Employment statistics)
  Data availability: Good: available for most regions for 2004 and 2006.

- **3.2.2 Employment in medium-high and high-tech manufacturing (% of total workforce)**
  Numerator: Number of employed persons in the medium-high and high-tech manufacturing sectors. These 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).
  Denominator: The total workforce includes 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.
  Data source: Eurostat (High-tech industry and knowledge-intensive services: Economic, Science & Technology and Employment statistics)
  Data availability: Good: available for most regions for 2004 and 2006.

- **3.2.5 Sales of new-to-market products (% of total turnover)**
  Numerator: Sum of total turnover of new or significantly improved products for SMEs only. (Community Innovation Survey, CIS-4 question 2.3, variable TURNMAR)
  Denominator: Total turnover for SMEs only (both innovators and non-innovators), in national currency and current prices. (Community Innovation Survey: CIS-4 question 11.1, variable TURN04)

Rationale: This indicator measures the turnover of new or significantly improved products, which are also new to the market, as a percentage of total turnover. The product must be new to the firm, which in many cases will also include innovations that are world-firsts. The main disadvantage is that there is some ambiguity in what constitutes a 'new to market' innovation. Smaller firms or firms from less developed countries could be more likely to include innovations that have already been introduced onto the market elsewhere.
Data source: Eurostat (Community Innovation Survey)
Data availability: Poor: data are not available for all countries and for some countries data is not available for both 2004 and 2006.

- **3.2.6 Sales of new-to-firm products (% of total turnover)**
  Numerator: Sum of total turnover of new or significantly improved products to the firm but not to the market for SMEs only. (Community Innovation Survey, CIS-4 question 2.3, variable TURNIN)
  Denominator: Total turnover for SMEs only (both innovators and non-innovators), in national currency and current prices. (Community Innovation Survey: CIS-4 question 11.1, variable TURN04)
  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.
  Data source: Eurostat (Community Innovation Survey)
  Data availability: Poor: data are not available for all countries and for some countries data is not available for both 2004 and 2006.

Annex 3: CIS regional sample size

		Population		Innovators	
		2004	**2006**	**2004**	**2006**
BELGIUM	**BE**	**14110**	**13936**	**7060**	**--**
Région de Bruxelles-Capitale / Brussels Hoofdstedelijk Gewest	BE1	1508	1528	543	--
Vlaams Gewest	BE2	9714	9366	5530	--
Région Wallonne	BE3	2888	3042	987	--
BULGARIA	**BG**	**13127**	**14403**	**2015**	**2725**
Severna i iztochna Bulgaria	BG3	5798	6331	715	1074
Yugozapadna i yuzhna centralna Bulgaria	BG4	7329	8072	1300	1651
CZECH REPUBLIC	**CZ**	**19574**	**21945**	**7167**	**7286**
Praha	CZ01	3760	4245	1527	1597
Strední Cechy	CZ02	1921	2165	704	720
Jihozápad	CZ03	2143	2384	726	780
Severozápad	CZ04	1588	1704	483	451
Severovýchod	CZ05	2809	3196	896	978
Jihovýchod	CZ06	3233	3656	1251	1314
Strední Morava	CZ07	2362	2676	942	941
Moravskoslezsko	CZ08	1757	1919	639	506
GREECE	**GR**	**--**	**11657**	**--**	**4667**
Voreia Ellada	GR1	--	3909	--	1439
Anatoliki Makedonia, Thraki	GR11	--	458	--	161
Kentriki Makedonia	GR12	--	2536	--	1011
Dytiki Makedonia	GR13	--	353	--	116
Thessalia	GR14	--	562	--	151
Kentriki Ellada	GR2	--	1014	--	381
Ipeiros	GR21	--	203	--	37
Ionia Nisia	GR22	--	36	--	21
Dytiki Ellada	GR23	--	284	--	108
Sterea Ellada	GR24	--	323	--	181
Peloponnisos	GR25	--	167	--	34
Attiki	GR3	--	6122	--	2570
Nisia Aigaiou, Kriti	GR4	--	612	--	277
Voreio Aigaio	GR41	--	121	--	57
Notio Aigaio	GR42	--	113	--	61
Kriti	GR43	--	378	--	159
SPAIN	**ES**	**73591**	**75865**	**23995**	**22616**
Galicia	ES11	5507	4595	1420	1119
Principado de Asturias	ES12	1261	1410	419	395
Cantabria	ES13	783	866	234	272
Pais Vasco	ES21	5083	5370	1885	1771
Comunidad Foral de Navarra	ES22	1329	1444	397	538
La Rioja	ES23	642	860	169	270
Aragón	ES24	2740	2718	811	856
Comunidad de Madrid	ES3	10808	11279	3784	3157
Castilla y León	ES41	3318	3366	987	921
Castilla-la Mancha	ES42	3060	3226	889	842
Extremadura	ES43	869	1129	208	235
Cataluña	ES51	18303	17174	6415	6039
Comunidad Valenciana	ES52	10680	10824	3274	3267
Illes Balears	ES53	1437	1415	431	283
Andalucia	ES61	9184	9451	2724	2521
Región de Murcia	ES62	1927	2893	771	712
Ciudad Autónoma de Ceuta (ES)	ES63	144	97	43	40
Canarias (ES)	ES7	2023	2343	554	497
FRANCE	**FR**	**178261**	**--**	**42257**	**--**
Île de France	FR1	41113	--	9602	--
Bassin Parisien	FR2	25779	--	4987	--
Nord - Pas-de-Calais	FR3	10215	--	2349	--
Est	FR4	14463	--	3970	--
Ouest	FR5	22579	--	5656	--
Sud-Ouest	FR6	18053	--	5221	--
Centre-Est	FR7	25129	--	5782	--
Méditerranée	FR8	17618	--	3769	--
French overseas departments (FR)	FR9	3312	--	922	--
ITALY	**IT**	**119247**	**--**	**42565**	**--**
Piemonte	ITC1	10046	--	4395	--
Valle d'Aosta/Vallée d'Aoste	ITC2	149	--	50	--
Liguria	ITC3	2257	--	870	--
Lombardia	ITC4	30575	--	11902	--
Provincia Autonoma Bolzano-Bozen	ITD1	1066	--	493	--
Provincia Autonoma Trento	ITD2	960	--	474	--
Veneto	ITD3	16191	--	6391	--
Friuli-Venezia Giulia	ITD4	3115	--	1038	--
Emilia-Romagna	ITD5	12975	--	5385	--
Toscana	ITE1	9571	--	2855	--
Umbria	ITE2	1831	--	650	--
Marche	ITE3	5218	--	1717	--
Lazio	ITE4	5524	--	1637	--
Abruzzo	ITF1	2286	--	642	--
Molise	ITF2	327	--	64	--
Campania	ITF3	6168	--	1480	--
Puglia	ITF4	4552	--	1094	--

		Population		Innovators	
		2004	**2006**	**2004**	**2006**
Basilicata	ITF5	539	--	113	--
Calabria	ITF6	1178	--	276	--
Sicilia	ITG1	3294	--	733	--
Sardegna	ITG2	1425	--	306	--
HUNGARY	**HU**	**--**	**14428**	**--**	**2672**
Közép-Magyarország	HU1	--	4682	--	1068
Közép-Dunántúl	HU21	--	1577	--	323
Nyugat-Dunántúl	HU22	--	1573	--	251
Dél-Dunántúl	HU23	--	1426	--	245
Észak-Magyarország	HU31	--	1433	--	197
Észak-Alföld	HU32	--	1820	--	257
Dél-Alföld	HU33	--	1917	--	331
AUSTRIA	**AT**	**15344**	**15126**	**7572**	**7237**
Ostösterreich	AT1	6068	5796	2926	2786
Südösterreich	AT2	2878	2890	1373	1337
Westösterreich	AT3	6398	6440	3273	3114
POLAND	**PL**	**45529**	**42290**	**10450**	**8831**
Lódzkie	PL11	3444	3436	702	553
Mazowieckie	PL12	8467	6859	1921	1540
Malopolskie	PL21	3428	3277	833	623
Slaskie	PL22	6026	5213	1684	1266
Lubelskie	PL31	1570	1718	389	415
Podkarpackie	PL32	1832	1892	417	467
Swietokrzyskie	PL33	1056	1083	280	233
Podlaskie	PL34	925	944	232	220
Wielkopolskie	PL41	5424	4753	1129	805
Zachodniopomorskie	PL42	1639	1644	283	280
Lubuskie	PL43	1152	1363	161	193
Dolnoslaskie	PL51	3019	2941	692	712
Opolskie	PL52	1003	955	223	219
Kujawsko-Pomorskie	PL61	2228	1917	496	290
Warminsko-Mazurskie	PL62	1535	1490	368	298
Pomorskie	PL63	2781	2805	640	717
PORTUGAL	**PT**	**20452**	**20762**	**8217**	**8387**
Norte	PT11	9435	9523	3456	3380
Algarve	PT15	389	439	123	166
Centro (PT)	PT16	4675	4662	2080	2188
Lisboa	PT17	4541	4616	2014	2093
Alentejo	PT18	854	906	333	344
Região Autónoma dos Açores (PT)	PT2	258	278	117	118
Região Autónoma da Madeira (PT)	PT3	301	338	94	97
ROMANIA	**RO**	**24137**	**26753**	**4307**	**5214**
Nord-Vest	RO11	3681	4090	575	813
Centru	RO12	3379	3788	604	706
Nord-Est	RO21	2807	3044	580	760
Sud-Est	RO22	2504	2867	792	1206
Sud - Muntenia	RO31	2321	2697	364	479
Bucuresti - Ilfov	RO32	5566	5907	936	773
Sud-Vest Oltenia	RO41	1334	1565	161	191
Vest	RO42	2545	2795	295	286
SLOVENIA	**SI**	**3559**	**3723**	**851**	**--**
Vzhodna Slovenija	SI01	1614	1740	374	--
Zahodna Slovenija	SI02	1945	1983	477	--
SLOVAKIA	**SK**	**5822**	**6035**	**1183**	**1367**
Bratislavský kraj	SK01	1627	1163	362	310
Západné Slovensko	SK02	1639	2041	372	431
Stredné Slovensko	SK03	1318	1423	242	340
Východné Slovensko	SK04	1238	1408	207	286
FINLAND	**FI**	**7778**	**7798**	**2878**	**3484**
Itä-Suomi	FI13	669	693	258	279
Etelä-Suomi	FI18	4405	4357	1642	1975
Länsi-Suomi	FI19	1957	1963	766	901
Pohjois-Suomi	FI1A	689	691	195	304
Åland	FI2	58	94	17	25
UNITED KINGDOM	**UK**	**81612**	**81412**	**34400**	**30506**
North East (ENGLAND)	UKC	2572	2457	1031	931
North West (ENGLAND)	UKD	8707	8958	3573	3417
Yorkshire and The Humber	UKE	6987	6962	3066	2418
East Midlands (ENGLAND)	UKF	6751	6871	2824	2710
West Midlands (ENGLAND)	UKG	8480	8537	3292	3331
Eastern	UKH	8267	8060	3537	3394
London	UKI	11363	10486	4768	3242
South East	UKJ	11535	12088	5123	4741
South West (ENGLAND)	UKK	6455	6663	2774	2739
Wales	UKL	2765	2673	1144	1064
Scotland	UKM	5022	5034	2051	1694
Northern Ireland	UKN	2708	2623	1217	826
NORWAY	**NO**	**11239**	**11751**	**2866**	**2867**
Oslo og Akershus	NO01	2973	2708	839	798
Hedmark og Oppland	NO02	849	915	177	202
Sør-Østlandet	NO03	2148	2246	538	599
Agder og Rogaland	NO04	1613	1711	415	374
Vestlandet	NO05	1842	1933	499	453
Trøndelag	NO06	854	1035	212	218
Nord-Norge	NO07	960	1203	186	223

Annex 4: Regions for which regional CIS data are available

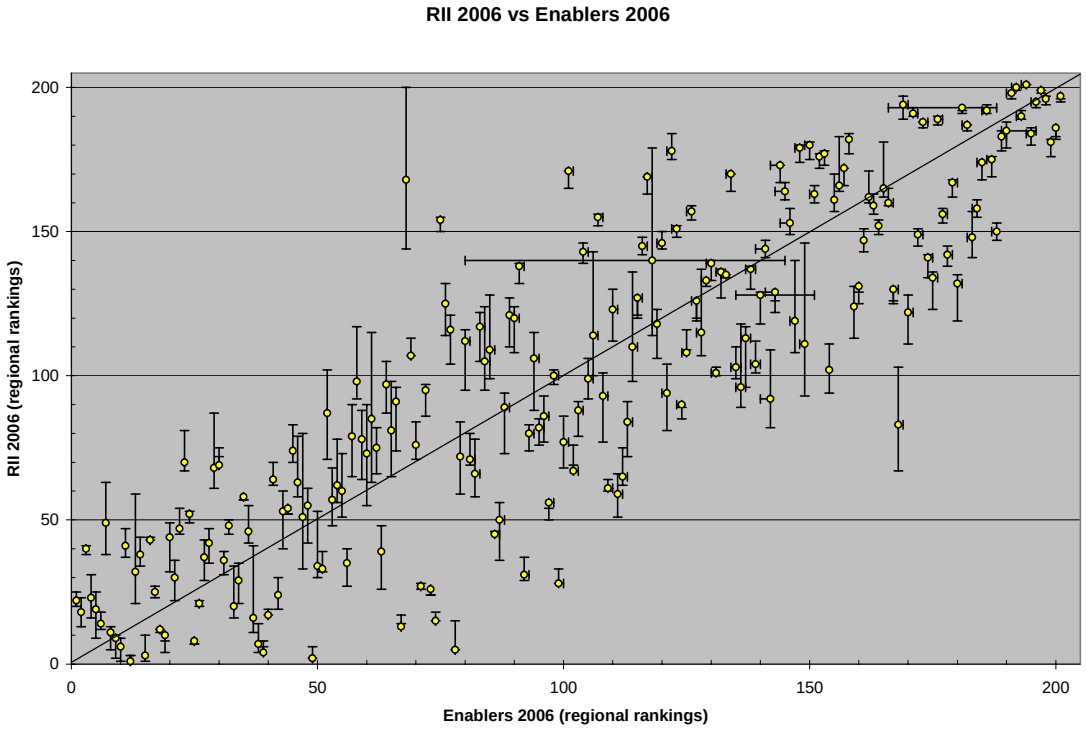
BELGIUM	
Région de Bruxelles-Capitale / Brussels Hoofdstedelijk Gewest	BE1
Vlaams Gewest	BE2
Région Wallonne	BE3
BULGARIA	
Severna i iztochna Bulgaria	BG3
Yugozapadna i yuzhna centralna Bulgaria	BG4
CZECH REPUBLIC	
Praha	CZ01
Strední Cechy	CZ02
Jihozápad	CZ03
Severozápad	CZ04
Severovýchod	CZ05
Jihovýchod	CZ06
Strední Morava	CZ07
Moravskoslezsko	CZ08
GREECE	
Voreia Ellada (excl. Kentriki Makedonia)	**GR11 + GR13 + GR14**
Kentriki Makedonia	GR12
Kentriki Ellada	GR2
Attiki	GR3
Nisia Aigaiou, Kriti	GR4
SPAIN	
Galicia	ES11
Principado de Asturias	ES12
Cantabria	ES13
Pais 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
Andalucia	ES61
Región de Murcia	ES62
Ciudad Autónoma de Ceuta	ES63
Canarias (ES)	ES7
FRANCE	**FR**
Île de France	FR1
Bassin Parisien	FR2
Nord - Pas-de-Calais	FR3
Est	FR4
Ouest	FR5
Sud-Ouest	FR6
Centre-Est	FR7
Méditerranée	FR8
French overseas departments (FR)	FR9

ITALY	
Piemonte + Valle d'Aosta/Vallée d'Aoste	**ITC1 + ITC2**
Liguria	ITC3
Lombardia	ITC4
Provincia Autonoma Bolzano-Bozen	ITD1
Provincia Autonoma Trento	ITD2
Veneto	ITD3
Friuli-Venezia Giulia	ITD4
Emilia-Romagna	ITD5
Toscana	ITE1
Umbria	ITE2
Marche	ITE3
Lazio	ITE4
Abruzzo + Molise	**ITF1 + ITF2**
Campania	ITF3
Puglia	ITF4
Basilicata	ITF5
Calabria	ITF6
Sicilia	ITG1
Sardegna	ITG2
HUNGARY	
Közép-Magyarország	HU1
Közép-Dunántúl	HU21
Nyugat-Dunántúl	HU22
Dél-Dunántúl	HU23
Észak-Magyarország	HU31
Észak-Alföld	HU32
Dél-Alföld	HU33
AUSTRIA	
Ostösterreich	AT1
Südösterreich	AT2
Westösterreich	AT3
POLAND	
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
PORTUGAL	
Norte	PT11
Algarve	PT15
Centro (PT)	PT16

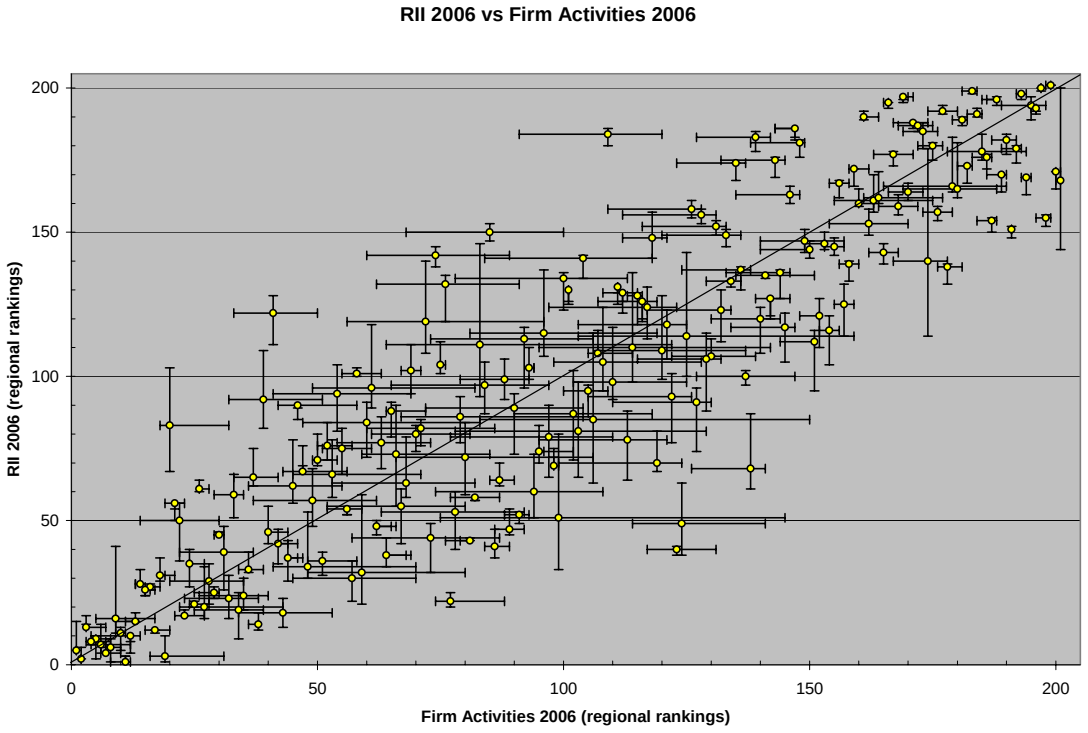
Lisboa	PT17
Alentejo	PT18
Região Autónoma dos Açores (PT) + Região Autónoma da Madeira (PT)	**PT2 + PT3**
ROMANIA	
Nord-Vest	RO11
Centru	RO12
Nord-Est	RO21
Sud-Est	RO22
Sud - Muntenia	RO31
Bucuresti - Ilfov	RO32
Sud-Vest Oltenia	RO41
Vest	RO42
SLOVENIA	
Vzhodna Slovenija	SI01
Zahodna Slovenija	SI02
SLOVAKIA	
Bratislavský kraj	SK01
Západné Slovensko	SK02
Stredné Slovensko	SK03
Východné Slovensko	SK04
FINLAND	
Itä-Suomi	FI13
Etelä-Suomi	FI18
Länsi-Suomi	FI19
Pohjois-Suomi	FI1A
UNITED KINGDOM	
North East (ENGLAND)	UKC
North West (ENGLAND)	UKD
Yorkshire and The Humber	UKE
East Midlands (ENGLAND)	UKF
West Midlands (ENGLAND)	UKG
Eastern	UKH
London	UKI
South East	UKJ
South West (ENGLAND)	UKK
Wales	UKL
Scotland	UKM
Northern Ireland	UKN
NORWAY	
Oslo og Akershus	NO01
Hedmark og Oppland	NO02
Sør-Østlandet	NO03
Agder og Rogaland	NO04
Vestlandet	NO05
Trøndelag	NO06
Nord-Norge	NO07

Annex 5: Ranks of regions and uncertainty intervals: RIS performance versus performance in the individual domains

Ranks of regions and uncertainty intervals for the Regional innovation index against the domain Enablers in 2006



Ranks of regions and uncertainty intervals for the Regional innovation index against the domain Firm Activities in 2006



Ranks of regions and uncertainty intervals for the Regional innovation index against the domain Output in 2006