# Statistics in focus

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## Contents



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# Community Innovation Statistics

## Fourth Community Innovation Survey (CIS 4) and European Innovation Scoreboard (EIS) 2006

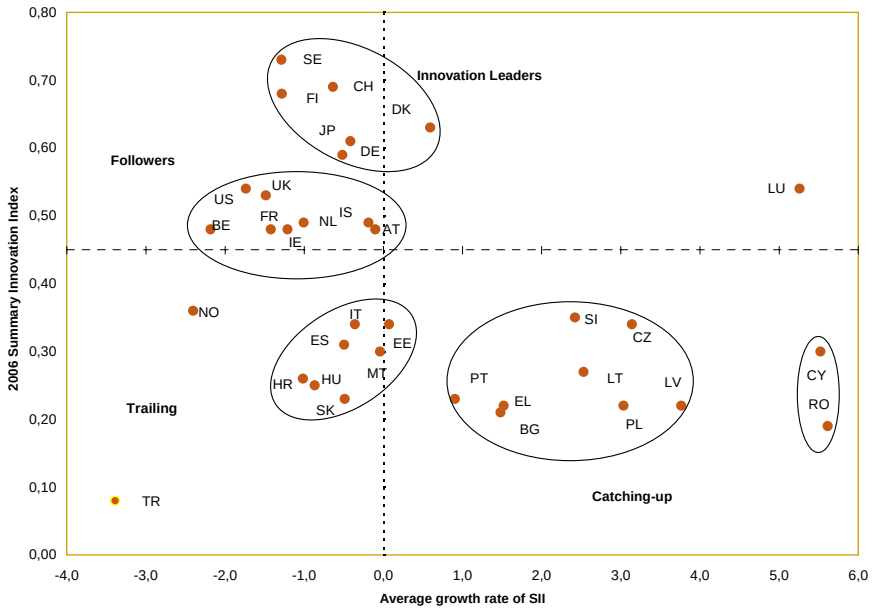
*The European Innovation Scoreboard (EIS) is a statistical instrument developed by the European Commission to evaluate the innovation efforts undertaken by the EU Member States and to make them comparable.*

*Most of the indicators included in the EIS are based on raw data from Eurostat. Seven of the 25 indicators analysed in the EIS 2006 are based on data from the Community Innovation Survey (CIS).*

*This publication first outlines the overall results of the EIS 2006, and then takes a closer look at each of the seven indicators. The last part discusses additional indicators that could be calculated for future editions of the EIS, based on the current CIS questionnaire.*

## Overview of the results of the EIS 2006

**Figure 1: Summary innovation index (SII) and trends, by country, EU-27 and selected countries**




*Dotted lines show EU25 mean performance.*

Source: European Innovation Scoreboard 2006

The core of the EIS 2006, which covers 32 European countries plus the United States and Japan, is an analysis of the Summary Innovation Index (SII). This index is based mainly on Eurostat data. To calculate the index, 25 indicators covering different aspects of innovation are used.

Fifteen of them are innovation input indicators (subgroups: innovation drivers, knowledge creation, innovation and entrepreneurship); the other ten are based on innovation outputs (subgroups: applications and intellectual property). The SII tries to reflect the complexity of innovation and to measure it in a realistic way.

The SII 2006, combined with the average growth rate of the SII over five years, allows both current innovation performance and trends to be evaluated for each country (see Figure 1, page 1). Most of the countries fall into four main groups with similar characteristics vis-à-vis their actual and estimated innovation capacity.

These groups are as follows.

- *Innovation leaders* are Sweden, Switzerland, Finland, Denmark, Japan and Germany. These countries display the highest results in the SII 2006; however, only Denmark recorded a positive average growth rate in the SII.
- The group of *innovation followers* is made up by the Unites States, the United Kingdom, Iceland, France, the Netherlands, Belgium, Austria and Ireland. These countries are also more innovation-efficient than the EU-25 average but the trend is declining.
- Slovenia, the Czech Republic, Lithuania, Portugal, Poland, Latvia, Greece and Bulgaria are called the *catching-up countries*. On the one hand, these countries show SII results below the EU-25 average; on the other hand, they record positive average SII growth rates.
- The SII results for the *trailing countries* Estonia, Spain, Italy, Malta, Hungary, Croatia and Slovakia are below the EU-25 average for the SII and their growth rates are negative, with the exception of Estonia.

Cyprus and Romania have relative low SII results but they seem to be catching up rapidly.

The innovation performance and trends observed for Luxembourg, Norway and Turkey are very different, so they do not belong to any of these groups.

Taking into account current innovation performance and the trends for all European countries, there seems to be a process of convergence. Many countries with SII results higher than the EU-25 average have negative SII average growth rates, whereas more than half of the countries with an SII below the EU-25 average have positive SII average growth rates.

The EIS 2006 also shows that the EU-25 innovation gap with the United States is continuing to decrease, narrowing from 0.14 index points in 2002 to 0.08 index points in 2006.

The EU-25 innovation gap with Japan is larger and tending to decline less. In 2006 it was about 0.16 index points, not much less than the 0.17 index points of 2002.

The EU-25 has made a lot of progress on some indicators such as broadband penetration rate, new patent applications to the European patent office, and new Community trademarks and designs.

At the same time, other indicators have not improved at all – for example, venture capital investments, exports of high-tech products and the population with tertiary education.

**Global Innovation Scoreboard (GIS)**

The analysis of innovation performance at international level can be taken further by comparing the EU-25 Member States with 16 other major R&D spenders and emerging economies. As fewer data are available for these countries, the composite index is based on a reduced set of 12 indicators. In the GIS 2006, the best-performing group (the so-called global innovation leaders) is made up of Finland, Sweden, Switzerland, Japan, the United States, Singapore and Israel.

**Regional Innovation Scoreboard (RIS)**

At regional level, innovation performance has also been analysed for 208 European regions using a composite index based on a small set of indicators. Due to very limited data availability at the time of compilation, the set was made up of only seven indicators.

The top 10 regions were Stockholm (SE), Vätsverige (SE), Oberbayern (DE), Etelä-Suomi (FI), Karlsruhe (DE), Stuttgart, (DE), Braunschweig (DE), Sydsverige (SE), Ile de France (FR) and Östra Mellansverige (SE).

## Link between CIS 4 and the EIS 2006

This section examines in more detail each of the seven indicators based on CIS data that are used in the EIS 2006. The data shown are not completely comparable with the EIS 2006 results (see Figure 1) because in the meantime more CIS 4 data have become available and some data have been updated (see Figures 2 to 8, p. 3 to 7). Due to data availability constraints, the EIS 2006 uses CIS 3 data for some countries and/or indicators. In this publication, only CIS 4 data are shown. Countries for which data are unavailable or confidential are not included.

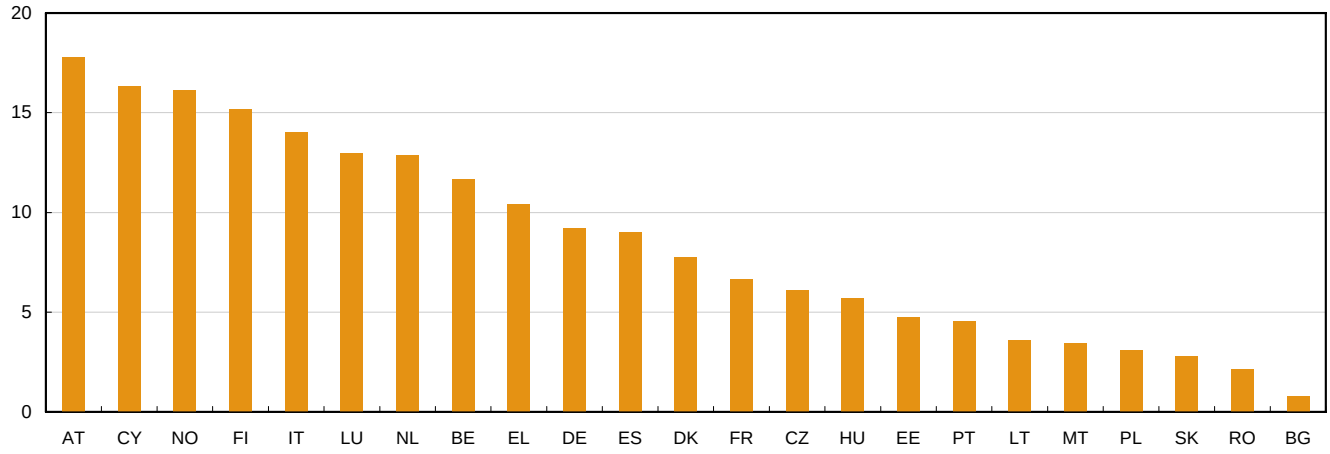
For each indicator, a brief definition is given. As the results are always shown in descending order, figuring out the leading countries is straightforward.

**The seven EIS 2006 indicators from the CIS 4**

| | |
|---|---|
| Knowledge creation | Share of enterprises receiving public funding for innovation |
| Innovation & entrepre-neurship | Small and medium sized enterprises (SMEs) innovating in-house |
| | Innovative SMEs cooperating with others |
| | Innovation expenditure |
| | SMEs using organisational innovation |
| Application | Sales of new-to-market products |
| | Sales of new-to-firm products |

The indicator shown in Figure 2 gives the percentage of innovative enterprises that received any public financial support for innovation from at least one of three levels of government (local, national and European Union). In general, in a majority of countries, the national government gives the largest part of innovation funding from public sources.
For this indicator, Cyprus, one of the fast-growing catching-up countries, ranks second behind Austria and ahead of Norway.

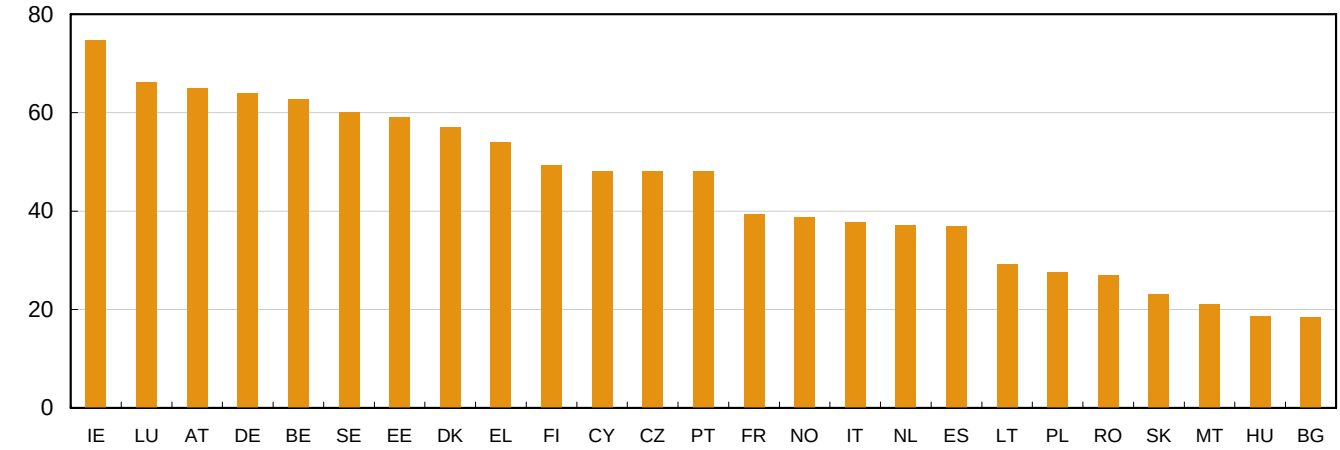
**Figure 2: Share of enterprises receiving public funding for innovation, as a percentage of all enterprises, by country, EU-27 Member States and Norway**




Source: Eurostat – Community Innovation Statistics, 2004; missing/confidential data: IE, LV, SI, SE, UK

The indicator displayed in Figure 3 measures the degree to which SMEs which have introduced new or significantly improved products or production processes during the period 2002-2004 have innovated in-house. In-house (intramural) innovation also includes innovations developed jointly with other enterprises or institutions. The indicator is limited to SMEs for better comparability. Results may be biased by including larger enterprises.

**Figure 3: SMEs innovating in-house, as a percentage of all SMEs, by country, EU-27 Member States and Norway**

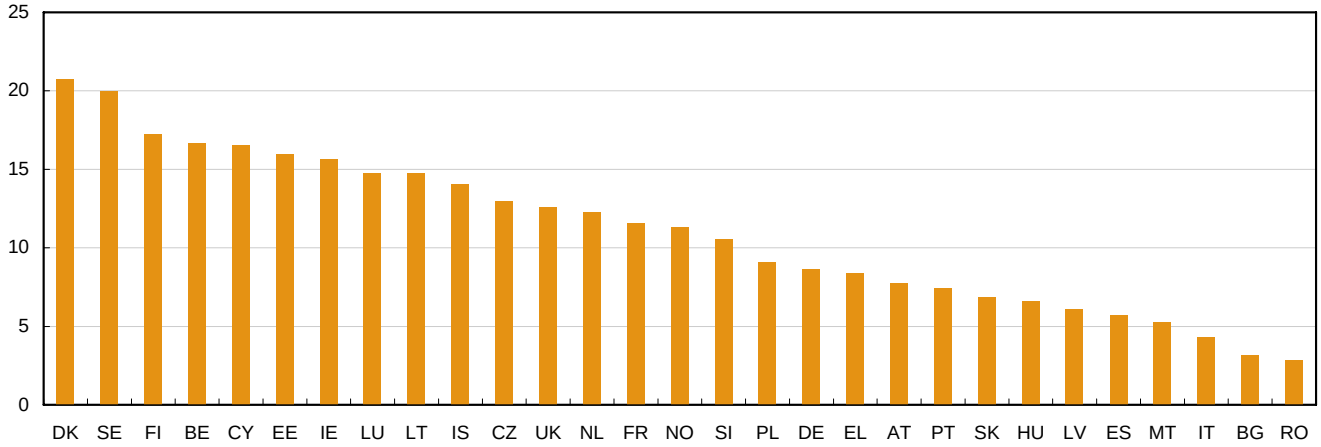



Source: Eurostat – Community Innovation Statistics, 2004; missing/confidential data: LV, SI, UK

Figure 4 shows the degree to which SMEs were involved in innovation cooperation between 2002 and 2004. Complex innovation, for example in ICT (information and communication technologies), often depends on the ability to draw on diverse sources of information and knowledge, or to collaborate on the development of an innovation.

This indicator includes all kinds of cooperation with any kind of entity – public research institutions, other enterprises, etc. The indicator is limited to SMEs to improve cross-country comparability. Cooperation seems to be much more developed in smaller economies, especially in the north of Europe.

**Figure 4: Innovative SMEs co-operating with others, as a percentage of all SMEs, by country, EU-27 Member States and Norway**

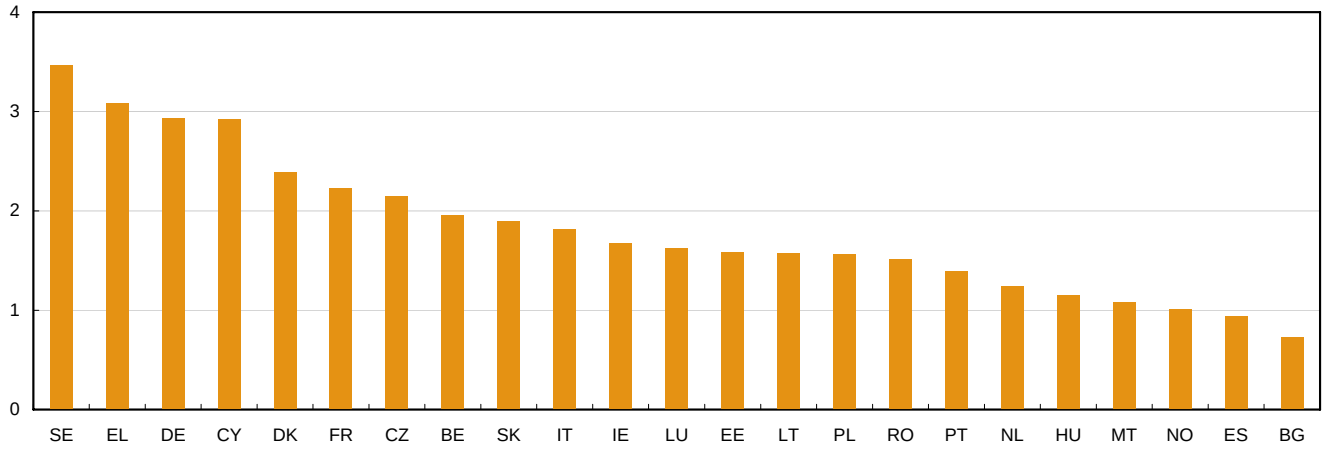



Source: Eurostat – Community Innovation Statistics, 2004

The indicator in Figure 5 relates total innovation expenditure to total turnover. Total innovation expenditure is the sum of expenditure on intra- and extramural R&D, the acquisition of equipment, machinery and software linked to product and/or process innovation and of external knowledge such as patents and licences, industrial design, training and marketing of innovations.
Some of the components of the indicator allow the diffusion of new production technology and ideas to be measured. Taken as a whole, the indicator measures total expenditure on many activities of relevance to innovation.

The top ranking places for each indicator are not always taken by the best performing countries, the so-called innovation leaders. Greece, one of the catching-up countries, ranks second after Sweden and ahead of Germany for this indicator.

**Figure 5: Innovation expenditure, as a percentage of total turnover, by country, EU-27 Member States and Norway**




Source: Eurostat – Community Innovation Statistics, 2004; missing/confidential data: LV, AT, SI, FI, UK

One of the improvements in the current CIS questionnaire is the new question on non-technological changes that seeks to ascertain whether an enterprise uses organisational innovation. Acknowledgment of one of the three items below identifies an enterprise as an organisational innovator.

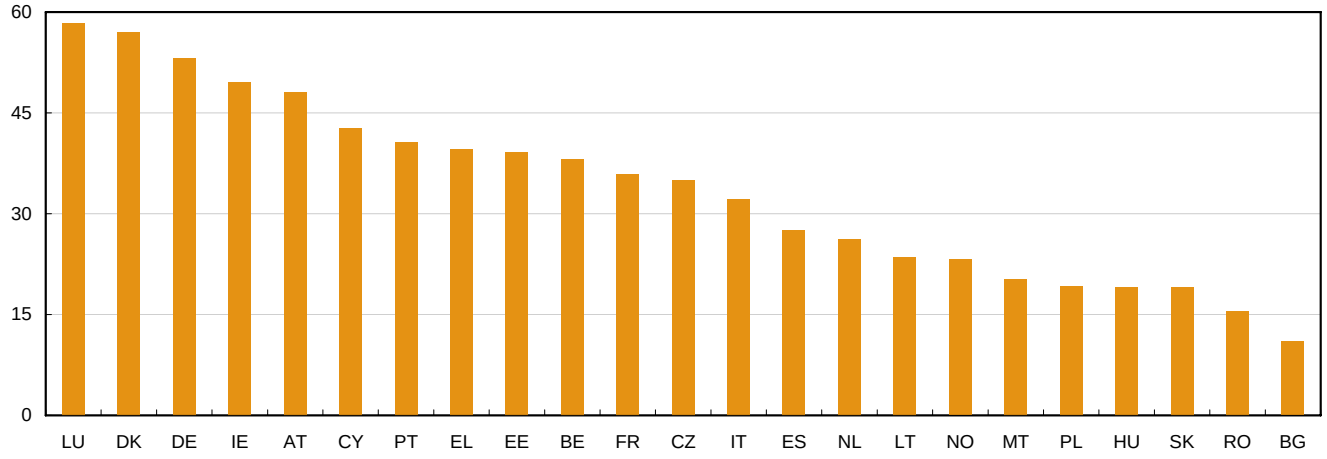
1) New or significantly improved knowledge management systems to better use or exchange information, knowledge and skills within your enterprise.

2) A major change to the organisation of work within the enterprise, such as changes in the management structure or integrating different departments or activities.

3) New or significant changes in relations with other firms or public institutions, such as through alliances, partnerships, outsourcing or sub-contracting.

Many enterprises, particularly in the services sector, innovate through non-technical forms of innovation. Luxembourg is the leading country for this indicator in Figure 6, which may be due to its relatively well developed service sector.

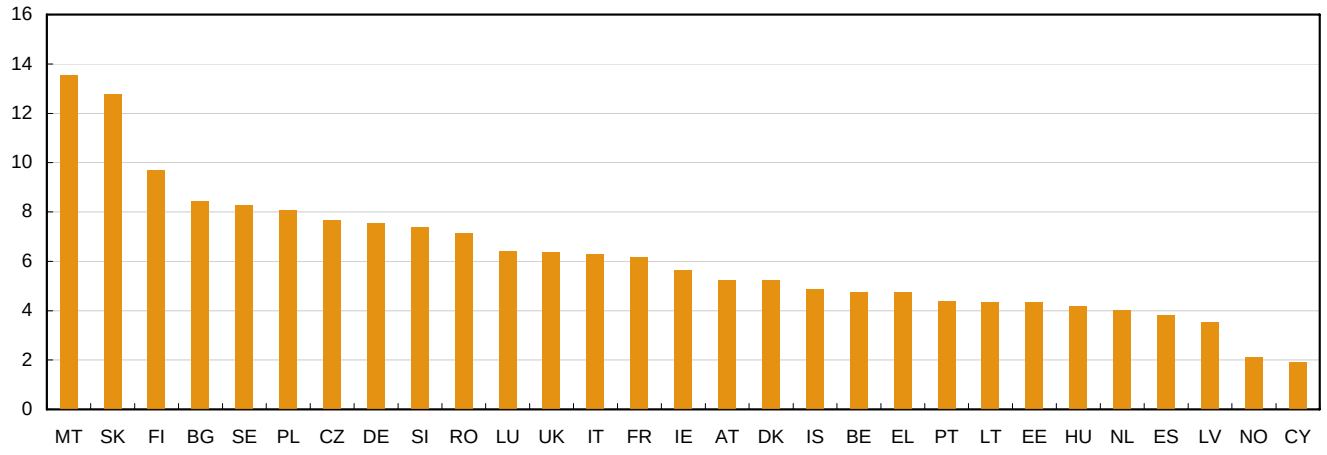
**Figure 6: SMEs using organisational innovation, as a percentage of all SMEs, by country, EU-27 Member States and Norway**




Source: Eurostat – Community Innovation Statistics, 2004; missing/confidential data: LV, SI, FI, SE, UK

Figure 7 shows the turnover from new or significantly improved products which are new to the market, as a percentage of total turnover. This means that the products must also be new to the firm's market, and may also include innovations that are world firsts. A disadvantage of this indicator is that enterprises may not know if their innovative products are really new to the national or global market or only new to the enterprise's market. The term "market" can be defined differently and in a very strict or in a more relaxed fashion.

**Figure 7: Sales of new-to-market products, as a percentage of total turnover, by country, EU-27 Member States and Norway**




Source: Eurostat – Community Innovation Statistics, 2004; unreliable/uncertain data: FR

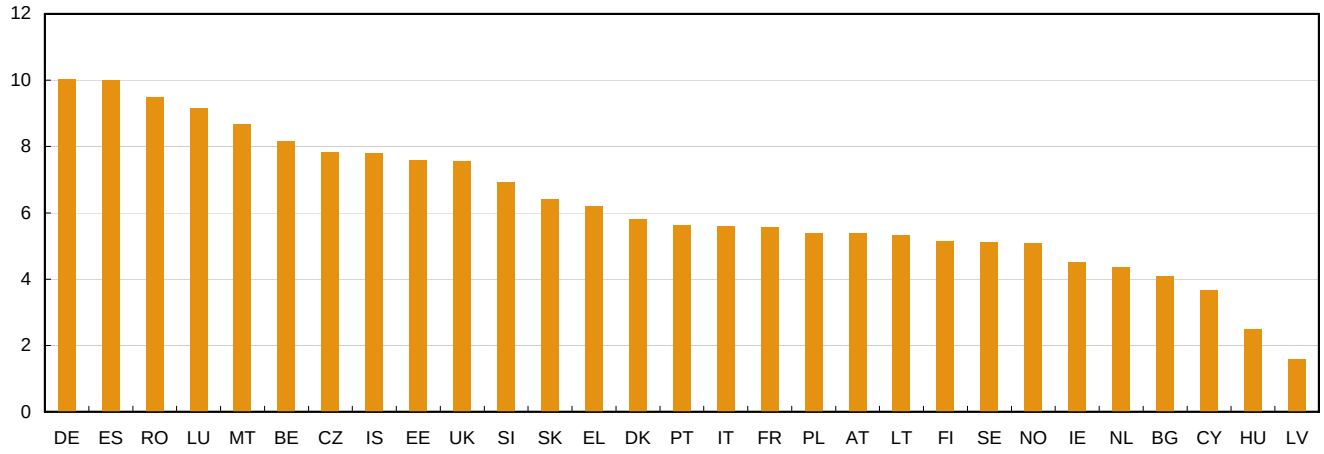
The turnover from products new to the firm or significantly improved, as a percentage of total turnover, is shown in Figure 8. As these products are not new to the market, the sales of these products can be used as a proxy for the use or implementation of products (or technologies) already introduced elsewhere. This indicator measures the degree of diffusion of technologies.

As both indicators have the same denominator they can easily be compared. In sales of products which are new to the market, as a percentage of total turnover, Malta leads with 14%, followed by Slovakia (13%) and Finland (10%).

The top three countries for sales of products which are new to the firm are Germany, Spain and Romania with around 10% each for all three countries.

The top countries in these rankings are not all innovation leaders. New products can play a significant role in the turnover of an enterprise even if the country as a whole is considered to be one of the trailing countries, as in the cases of Malta and Slovakia. Romania, too, shows low results for the 2006 SII, but ranks highly for sales of new-to-firm products.

**Figure 8: Sales of new-to-firm products, as a percentage of total turnover, by country, EU-27 Member States and Norway**




Source: Eurostat – Community Innovation Statistics, 2004; unreliable/uncertain data: FR

## The CIS–EIS link may be strengthened by more CIS-based indicators

Innovation is not a straightforward, linear process but a very complex one with multiple facets. The CIS questionnaire produces a wide range of raw data which are partly used for the European Innovation Scoreboard. In turn, the CIS questionnaire itself is continuously improved, as researchers try to find more and better indicators to measure innovation.

There are three possible approaches.

The first approach is to look at the current CIS questionnaire and see which new indicators can be calculated using the CIS data (see Table 9).

The second is to change the existing CIS questionnaire in order to obtain additional or new data for the construction of new indicators. The scope for adding new questions is very restricted, because the length of the questionnaire is a constraint. Making changes to existing questions would mean losing other data and consequently cause a break in continuity.

The third way of approaching the problem is to investigate the possibility that there are other data worth collecting to construct new innovation indicators. In this case, the data would be collected as part of another survey.

Only the first approach is presented here because the second and third go beyond the scope of this publication.

The indicators listed in Table 9 are discussed as potential new indicators in the 2006 EIS. They need access to the CIS micro data because they require the CIS data to be analysed in new ways.

**Table 9: New indicators that can be constructed from the CIS data**

| |
|---|
| Knowledge diffusion |
| Technology diffusion |
| Effective technology diffusion |
| Fast growing gazelles |
| Organisational innovation |
| Innovation demand |
| Technology demand |

Source: based on “2006 Trend Chart Methodology Report”, A. Arundel, H. Hollanders, MERIT, July 2006

The current EIS indicators look closely at the input and output of innovation, but other aspects could be included, such as the successful use of new technologies. This would be the concern of the first three indicators in Table 9.

The purpose of the fourth indicator is to identify innovative, fast-growing enterprises.

The different aspects of organisational innovation should be better explored, as it is thought to play an increasingly crucial role especially in the service sector.

Most of the existing innovation indicators consider only the supply side of innovation. The last two indicators might remedy this lack by measuring the demand side.

## ➢ ESSENTIAL INFORMATION – METHODOLOGICAL NOTES

### Community Innovation Survey

The Community Innovation Survey (CIS) is a survey of innovation activity in enterprises covering EU Member States, candidate countries, Iceland and Norway.

The data are collected on a two-yearly basis (from 2004 onwards). The latest survey (CIS 4) was carried out in 25 Member States, candidate countries, Iceland and Norway in 2005 based on the reference year 2004.

In order to ensure comparability across countries, Eurostat, in close cooperation with the EU Member States and other countries, developed standard core questionnaires for CIS 4, with an accompanying set of definitions and methodological recommendations.

CIS 4 is based on the *Oslo Manual* (2nd edition, 1997), which gives methodological guidelines and defines the concept of innovation, and on Commission Regulation No 1450/2004.

This Statistics in Focus compares data compiled on the basis of the CIS 4 survey.

#### STATISTICAL UNITS

The main statistical unit for CIS 4 was the enterprise, as defined in Council Regulation No 696/1993 on statistical units or as defined in the national statistical business register. EU Regulation No 2186/1993 requires Member States to set up and maintain a register of enterprises, as well as associated legal units and local units.

#### TARGET POPULATION

The population of CIS 4 is determined by the size of the enterprise and its principal activity. At least all enterprises with 10 or more employees in any of the specified sectors were included in the statistical population.

The target population of CIS 4 was the total population of enterprises with mostly the following market activities: mining and quarrying (NACE 10-14), manufacturing (NACE 15-37), electricity, gas and water supply (NACE 40-41), wholesale trade (NACE 51), transport, storage and communication (NACE 60-64), financial intermediation (NACE 65-67), computer and related activities (NACE 72), architectural and engineering activities (NACE 74.2) and technical testing and analysis (NACE 74.3)

#### TYPE OF SURVEY

Most Member States and other countries carried out CIS 4 by means of a stratified sample survey, while a number of countries used a census or a combination of both.

The CIS 4 data are organised in the Eurostat reference database following broadly the same structure as the harmonised survey questionnaire.

The enterprise size classes referred to in this publication are:

- *small:* 10-49 employees;
- *medium-sized:* 50-249 employees;
- l*arge:* 250+ employees.

#### REFERENCE PERIOD

For CIS 4 the observation period covered was 2002-2004 inclusive, i.e. the three-year period from the beginning of 2002 to the end of 2004. The reference period for CIS 4 was the year 2004.

All countries covered collected data for this observation period; only the Czech Republic took 2003-2005 as the observation period.

#### DEFINITIONS (Oslo Manual, 1997)

*Innovation:* a new or significantly improved product (good or service) introduced to the market or a new or significantly improved process introduced within an enterprise. Innovations are based on the results of new technological developments, new combinations of existing technology or the utilisation of other knowledge acquired by the enterprise.

*Enterprises engaged in innovation activity (propensity to innovate)*: enterprises that introduce new or significantly improved products (goods or services) to the market or enterprises that implement new or significantly improved processes. Innovations are based on the results of new technological developments, new combinations of existing technology or the utilisation of other knowledge acquired by the enterprise. The term covers all types of innovator, i.e. product innovators, process innovators and enterprises with only ongoing and/or abandoned innovation activities.

An *organisational innovation* is the implementation of new or significant changes in firm structure or management methods that are intended to improve the firm's use of knowledge, the quality of its goods and services, or the efficiency of work flows.

### European Innovation Scoreboard

The 2006 version is the sixth edition of the *European Innovation Scoreboard* (EIS). The EIS is the instrument developed by the European Commission, under the Lisbon Strategy, to evaluate and compare the innovation performance of the EU Member States.

The EIS 2006 includes innovation indicators and trend analyses for the EU-25 Member States, plus the two new Member States: Bulgaria and Romania, as well as for Croatia, Turkey, Iceland, Norway, Switzerland, the US and Japan.

The Annex includes tables with definitions as well as comprehensive data sheets for every country. The EIS report and its annexes, accompanying thematic papers and the indicators' database are available on this website.

http://www.proinno-europe.eu/

Data presented in this publication reflect the data available in Eurostat's reference database on 16 July 2007.

# *Further information:*

**Data:** **EUROSTAT Website/Home page/Science and technology/Data**

**Science and technology**
**Community innovation survey**
**Results of the fourth community innovation survey (CIS4)**

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