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Innovation Scoreboard 2001

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Contents

Note: This special edition presents the text of the European Commission's working paper '2001 Innovation scoreboard' (SEC(2001) 1414). The full text is available at http://www.cordis.lu/scoreboard

Annex 2 of the working paper, which provides detailed technical explanations and descriptions of each indicator, is not included here. Selected charts from Annex 2 are presented, however.

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An indication of things to come

The innovation scoreboard was requested by the Lisbon European Council of March 2000 as part of its strategy for creating in the European Union "the most competitive and dynamic knowledge-based economy in the world within the next decade". The Council called for the benchmarking of national performance in the fields of employment, innovation, enterprise and research – the regular collection of data on specific indicators, the development of guidelines for national policies, and mutual learning or 'open co-ordination' effected through peer reviews.

The 2001 innovation scoreboard summarises data on 17 indicators of innovation performance in each Member State. These cover:

- the quantity and quality of the **human resources** devoted to innovation
- public and private sector investment in **knowledge creation**, and the resulting output of new patents
- activities other than research leading to **the transmission and application of new knowledge**
- the supply of **innovation finance,** the value of **outputs** associated with innovation, and commercial and domestic investment in information and communication technologies (ICT)

Building on the outline scoreboard published in September 2000, the latest edition for the first time establishes trends for many indicators, by comparing figures for the period 1995-97 with those for 1999-2000.

On most innovation indicators, one EU Member State or another has already moved ahead of both the United States and Japan. The goal now must be to raise EU average scores which currently lag behind these competitors. Effort and investment will come mainly from the Member States, but the Commission will continue to encourage the development of national innovation policies. The scoreboard provides a valuable starting point for debate, and in particular for co-operation and mutual learning between innovation policy-makers and practitioners. And as Erkki Liikanen, European Commissioner for Enterprise points out, it is "a tool which policy-makers and opinion-formers can use to drive home the messages about innovation... and to plan more effectively to create an innovation culture".

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1 Introduction

The Lisbon European Council in March 2000 called for the enhancement of innovation in the Union as a response to globalisation and the challenges of the knowledge-driven economy. At Lisbon the Union set itself the combined goal of strengthening social cohesion *and* becoming the most competitive and dynamic knowledge-based economy in the world within the next decade.

The overall strategy to achieve this was also mapped out at Lisbon. Establishing a European area of research and innovation to better combine the efforts of the Union and the Member States in these two areas was one of the key messages. Building on the economic convergence already achieved, an "open method of co-ordination" was devised in order to help Member States develop more effective policies for creating new skills and capacities. In this context, the European Council explicitly requested the introduction of a European Innovation Scoreboard. At its meeting in Stockholm on 23-24 March 2001 devoted to economic and social questions, the European Council noted the Commission's intention to present the first European Innovation Scoreboard and supported the full integration of candidate countries into the Lisbon process.

The Communication "Innovation in a knowledge-driven economy", adopted in September 2000(1), marked an important step in the Commission's innovation and enterprise policies. The Communication reviewed progress in the Union following the "First Action Plan for Innovation"(2); defined five objectives for the next four years, and set out a plan of concerted action by the Commission and the Member States. The Communication included the first outline of the European Innovation Scoreboard, based on data available at the time.

The 2001 scoreboard in the present Working Paper follows the general scheme of the 2000 outline. It analyses the current data in depth,

(1) COM(2000) 567.

(2) COM(1996) 589.

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Overview of the different scoreboards

The Lisbon Council called for the 'benchmarking' of Member States' performance in four key areas. In each area, quantitative and qualitative indicators have been defined and are monitored and regularly evaluated as a basis for national and EU policy guidelines, and for mutual learning between countries through peer reviews.

1. The Directorate-General for **Employment** has carried out regular benchmarking exercises since 1998. The latest report (ISBN 92-894-1475-8) is available at **http://www.europa.eu.int/comm/employment_social/empl&esf/docs/empleurope2001_en.pdf**

2. The first outline of the **innovation** scoreboard – the forerunner of the present document – was published as part of the Commission Communication *Innovation in a knowledge-driven economy*. The scoreboard forms part of the Trend Chart on Innovation in Europe, and regularly updated information can be found at **http://trendchart.cordis.lu/Scoreboard/scoreboard.htm**

3. The **enterprise** scoreboard overlaps the innovation scoreboard but has a broader focus on entrepreneurship, innovation and market access. The document (SEC(2000) 1841) can be found at **http://www.europa.eu.int/comm/enterprise/enterprise_policy/competitiveness/index.htm**

4. The benchmarking of national **research** policies closely complements the innovation scoreboard, covering human resources in R&D, public and private investment in RTD, scientific and technological productivity, and impact of RTD on economic competitiveness and employment. The first report was published in June 2001 as *Key Figures 2001* (KI-38-01-463-EN-C), available at **http://europa.eu.int/comm/research/area/benchmarking2001_en.html** Minor discrepancies between figures found there and those for equivalent innovation indicators are the result of the different data-collection methodologies employed.

5. Finally, the Commission has defined 27 **'structural indicators'** to ensure the necessary coherence between the specific scoreboards. The Communication (COM(2000) 594) is available at **http://europa.eu.int/comm/economy_finance/document/misc/com_2000_0594_en.pdf**

depicts achievements and trends, highlights strengths and weaknesses in Member State performances, examines the level of European convergence, and leads to proposals for action. The scoreboard shows that the world's leading countries for many innovation policy areas are to be found among EU Member States. This demonstrates the enormous potential for the exchange of good practice and learning within the EU.

The scoreboard is one of the benchmarking exercises of the European Commission launched subsequent to the Lisbon European Council. In its Communication "Realising the potential of the European Union – Consolidating and extending the Lisbon strategy"(3) the Commission provided a series of "structural" or "flagship" indicators, on which the more specialised scoreboards such as the European Innovation Scoreboard, the Enterprise Scoreboard(4), and the ongoing benchmarking of national research policies(5) should draw.

The innovation scoreboard complements the "structural indicators". Some scoreboard indicators are identical to the "structural indicators", while several scoreboard indicators either complement the corresponding "structural indicator" or apply more restricted definitions to fulfil the purpose of the scoreboard to "zoom" into the area of innovation policy. To minimise additional statistical burden, the innovation scoreboard mainly uses official Eurostat data, or private data of sufficient reliability if official data is not available.

(3) COM(2001) 79.

(4) Benchmarking Enterprise Policy. First results from the scoreboard, SEC(2000) 1841.

(5) Progress report on benchmarking national research policies, SEC (2001) 1002

2 The European Innovation Scoreboard

The European Innovation Scoreboard provides an overview of Europe's innovation performance by presenting data on 17 indicators relevant to the innovation process(6). The scoreboard uses 'traditional' indicators based on R&D and patent statistics and indicators derived from recent surveys. Table A in Annex 1 shows the definition, the data source and the most recent year available. Annex 2 provides further background information on each indicator: its advantages and disadvantages, precautions for its interpretation, comparability or complementary with indicators used elsewhere by the Commission, a graph showing Member State performance, and a trend diagram (for those indicators for which time series are available).

As a policy instrument derived from recent statistics, the scoreboard offers new insights. However, there is still a shortage of internationally comparable statistics in several vital areas such as knowledge diffusion, learning and networking. Therefore, the scoreboard is complemented by more qualitative policy benchmarking tools and analysis, such as the comprehensive database of innovation policy measures and the peer reviews under the "European Trend Chart on Innovation" (see section 4.2).

The 2001 innovation scoreboard builds on the outline scoreboard published in 2000. There are several major improvements: updated data, improved definitions of several indicators in order to focus on innovative activities(7), better coverage of the US and Japan (now for 10 indicators), availability of trend data for 10 indicators, integration of a new indicator on life-long learning, improvement of the patent indicator by inclusion of US patent data, a detailed analysis of trends, variations, and correlations, and recommendations on how the scoreboard could be used as one instrument of the "open co-ordination method".

The indicators of the scoreboard are grouped into four categories:

2.1. Human resources

The scale and quality of human resources are major determinants of both the creation of new knowledge and its diffusion throughout the economy. The indicators are divided into two groups: three indicators for education and learning and two indicators for employment. The former include the supply of new scientists and engineers, the skill-level of the working age population, and a measure of life-long learning (one of the five "structural indicators"). For the first two indicators, data from US and Japan are now available, but their comparability with European data may be limited due to differences between their education systems and those of Europe.

(6) The two measures of patenting at the EPO and at the USPTO are counted as a single patent indicator.

(7) The definitions of indicators 1.1, 1.2, 4.1, 4.2, 4.4, and 4.6 in the 2001 innovation scoreboard differ from the definitions in the 2000 outline. These changes produce different results compared to the earlier version. Readers who wish to compare the two scoreboards are advised to carefully check the full definition of each indicator in the Annex.

> **"For many innovation indicators, the EU leaders are also world class leaders, in some cases exhibiting very significant advances over the US and Japan."**

The two employment indicators are the share of the workforce in medium-high and high technology manufacturing and in high technology services. These indicators reflect the structural focus (or pattern of specialisation) of each economy on sectors that are likely to have a high innovation content.

2.2. Creation of new knowledge

The three indicators for the creation of knowledge measure inventive activity: public R&D expenditures, business R&D (equivalent to the comparable structural indicator), and patenting. The latter has two sub-categories: high technology patents at the European Patent Office (EPO) and high technology patents at the US Patent Office (USPTO).

2.3. Transmission and application of new knowledge

This area covers innovation activities outside formal invention, such as the adaptation of new equipment to a firm's production and service systems, adopting innovations developed by other firms or organisations, and adapting new knowledge to the firm's specific needs. Collecting data in this area is relatively new to the national and international statistical systems. The section therefore relies entirely on the second Community Innovation Survey (CIS-2) which is the only source of comparable European data for innovation diffusion[8]. The indicators on in-house innovation and co-operative innovation are limited to small and medium-sized enterprises (SMEs). They provide a better picture of the innovative status of SMEs than business R&D, which is more prevalent among large firms. Separate data for SMEs is worthwhile because they form the majority of firms in most countries and can play a vital role in innovation: as intermediaries between the public research infrastructure and large firms, as developers of new ideas, and as adopters of new technology.

2.4. Innovation finance, output and markets

This group includes six indicators that cover a range of issues: the supply of high-tech venture capital, capital raised on stock markets (new markets or newly admitted firms on main markets), sales from innovations, home internet access (structural indicator), ICT investment (structural indicator), and value-added in advanced manufacturing sectors. Three of these indicators are based on private sources, due to a lack of equivalent public data, but they are included because of their high policy interest. The main drawback to using private data is that there is less information available on how the data are obtained. This makes it difficult to assess their reliability. ≡

(8) The CIS is implemented by all Member States and has become the main innovation statistics instrument of the European Union. A number of OECD countries outside the EU have adopted the CIS methodology for their own national innovation surveys. No innovation statistics comparable to the CIS are available from the US and Japan, but the latter seems to be considering the possibility of carrying out a national innovation survey using the CIS approach. The data from the most recent CIS is for 1996, but 1998 data are available for a few countries (e.g. Germany, the Netherlands and Spain). The third CIS has been launched recently. At present, the CIS is carried out every four years. Increasing this frequency is currently under discussion between Eurostat and the national statistical offices. More frequent data gathering is a precondition for keeping the innovation scoreboard up-to-date.

3 Main findings from the 2001 innovation

Table 1: Indicator results based on the most recent data available

No	Indicator	EU mean	EU leaders			US	JP
1.1	S&E graduates / 20 - 29 years	10,4 ‰	17,8 (UK)	15,8 (F)	15,6 (IRL)	8,1	11,2
1.2	Population with tertiary education	21,2 %	32,4 (FIN)	29,7 (S)	28,1 (UK)	34,9	30,4
1.3	Participation in life-long learning	8,4 %	21,6 (S)	21,0 (UK)	20,8 (DK)		
1.4	Employed in med/high-tech manuf.	7,8 %	10,9 (D)	8,3 (S)	7,6 (I/UK)		
1.5	Employed in high-tech services	3,2 %	4,8 (S)	4,5 (DK)	4,3 (FIN)		
2.1	Public R&D / GDP	0,66 %	0,95 (FIN)	0,87 (NL)	0,86 (S)	0,56	0,70
2.2	Business R&D / GDP	1,19 %	2,85 (S)	2,14 (FIN)	1,63 (D)	1,98	2,18
2.3a	High-tech EPO patents / population	17,9	80,4 (FIN)	35,8 (NL)	29,3 (D)	29,5	27,4
2.3b	High-tech USPTO patents / pop.	11,1	35,9 (FIN)	29,5 (S)	19,6 (NL)	84,3	80,2
3.1	SMEs innovating in-house	44,0 %	62,2 (IRL)	59,1 (A)	59,0 (DK)		
3.2	SMEs innovation co-operation	11,2 %	37,4 (DK)	27,5 (S)	23,2 (IRL)		
3.3	Innovation expenditure / total sales	3,7 %	7,0 (S)	4,8 (DK)	4,3 (FIN)		
4.1	High-tech venture capital / GDP	0,11 %	0,26 (UK)	0,20 (S)	0,17 (B)		
4.2	New capital raised / GDP	1,1 %	5,6 (NL)	4,5 (DK)	4,4 (E)	1,9	
4.3	Sales of new-to-market products	6,5 %	13,5 (I)	9,5 (E)	8,4 (IRL)		
4.4	Home internet access	28,0 %	55 (NL)	54 (S)	52 (DK)	47	28
4.5	ICT markets / GDP	6,0 %	7,4 (S)	6,6 (NL)	6,6 (P)	5,9	4,3
4.6	High-tech value added in manuf.	8,2 %	20,5 (IRL)	18,8 (S)	12,5 (FIN)	25,8	13,8

Table 1 presents, for every indicator, the overall EU mean[9], the three leading Member States with the best results for each indicator, and the results for the US and Japan where available. Full details on each indicator for all Member States, the US and Japan are provided in Table B of Annex 1[10].

Looking at the EU average, the EU leads for only three of the 10 indicators for which US data are available (S&E graduates, public R&D expenditure and ICT investment).

The most significant US lead over the EU is in business R&D (74 % higher that the overall EU mean), new capital raised (73 %), home internet access (68 %) and high-tech patenting (659 % for US patents; 64 % for EPO patents). The latter demonstrates the strong high-tech US patenting activity in Europe. Including national patents in addition to EPO patents might slightly improve this picture, but it is clear that the US applies for more high technology patents in Europe than Europe in the US.

The position of the EU compared to Japan also shows a quite unfavourable situation: the EU is leading only in ICT expenditure. In home internet access Japan and the EU are equal, while Japan clearly leads in business

(9) The overall EU mean treats the EU as a single statistical unit and sums the numerator and denominator across all EU countries. In contrast, the trend analyses use a country-level mean that sums the indicator for each country and then divides by the number of countries.

(10) See Table A in Annex 1 and Annex 2 for exact indicator definitions.

scoreboard

R&D (almost double the EU average) and to a lesser extent in S&E graduates, public R&D and the share of the working age population with a tertiary education. EU/Japan high-tech patenting is almost as unbalanced as with the US. Japanese high-tech patenting in the US is almost as strong as domestic US patenting, a situation which is radically different from the EU weakness in this indicator.

Shifting the focus from the EU average to the leading Member States shows a different picture. For many innovation indicators, the EU leaders are also world class leaders, sometimes exhibiting very significant advances over the US and Japan: the UK, Ireland and France for example lead in S&E graduates; Finland, the Netherlands and Sweden in public R&D; Sweden in business R&D; the Netherlands, Sweden and Denmark in home internet access. However, the patenting imbalance compared to the US remains valid even for the EU leaders(11).

Looking closer at these strong disparities in innovation performance in Europe, it is particularly striking that the leading slots are dominated by the smaller European countries: Sweden appears 13 times among the leading three; Finland 8 times; Denmark 7 times; the Netherlands 6 times and Ireland 5 times. In comparison, Germany and the UK appear 3 times each, Italy twice, and France once.

The fact that many of the smaller EU economies do either better or worse than the larger EU economies is partly due to larger EU economies contributing more to the overall EU mean than smaller economies, which means that they are less able to diverge from the mean. A second explanation is due to structural conditions(12). The industrial distribution of small economies is often concentrated in a few sectors, while larger economies are more diverse, spanning all sectors from low to high technology. This can shift the scores towards the mean for many innovation indicators in large economies, while small economies can exhibit either a high or low innovative capacity, depending on the sectors that dominate the economy. This is apparent in the high innovative capacity of the Nordic countries and the relatively low innovation performance of Greece and Portugal. Of course, this shift towards high or low technology sectors is not accidental, but reflects both public and private institutions seeking out areas of comparative advantage and high profitability. This indicates the need for different "paths" of innovation policy in Europe that can build on current strengths and solve country-specific weaknesses.

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> **"The most significant US lead over the EU average is in business R&D, new capital raised, home internet access and high-tech patenting."**

(11) A note of caution is required: this comparison is between the EU leading countries with the entire United States. A comparison of EU Member States with highly innovative American states, such as California or Massachusetts, could be instructive.

(12) There are exceptions to the tendency for large economies to revert to the mean. Germany has the best performance for the share of medium-high and high technology manufacturing, while the UK and France have the first and second highest scores for the share of new Science and Engineering graduates. In the future, it might be possible to compare regions with similar sized economies. This would reduce the "mean-reverting" properties of the overall mean.

3.1. Current trends

Table 2 shows trend data for those indicators with available time series(13). The trends refer to the percentage change in each indicator between the last year for which data are available and the average over the preceding three years, after a one year lag(14). The trend analysis for the entire EU is favourable, showing an improvement in seven indicators, a minimal increase in one, and a decline in three: public R&D, business R&D, and the share of manufacturing value-added from high technology sectors.

Trend data for the US and Japan are only available for five indicators (the two patenting indicators count as one indicator). The US trend results lag the overall EU average for public R&D, USPTO patents, and the share of investment in ICT, but the US is ahead in business R&D and in high technology value added. The lag in ICT investment is probably due to much higher past levels of investment in the US, which means that less is currently required to stay ahead. Japan leads the EU on three of the four trend indicators.

About half (17 out of 33) of the leading slots for the trend results are occupied by countries that are below the EU average for many innovation indicators (see section 3.4 below). Greece and Spain appear four times and Italy three times. Ireland, with a slightly above average innovation index, appears four times. Among the most innovative countries, Finland appears five times and Denmark and the UK three times.

(13) Time series are either unavailable for some indicators (new capital raised and the four CIS-based indicators) or the definition of the indicator was changed in recent years, preventing comparisons over time (S&E graduates and internet use). The time series for tertiary education needs to be interpreted cautiously, due to a change in the definition that increased the number of tertiary graduates. Trend results for specific countries are missing for some indicators, particularly for the smaller EU economies.

(14) For example, when the most recent data are for 2000, the trend is based on the percentage change between 2000 and the average for 1996 to 1998 inclusive. The results for 1999 are excluded in order to provide a one year lag. There are several exceptions to this rule due to a lack of adequate data. Annex 2 provides the specific years used to calculate the trends for each indicator.

Table 2: Trends of innovation performances (% change)

No	Indicator	EU mean	EU leaders			US	JP
1.2	Population with tertiary education	15 %	73 (A)	56 (FIN)	24 (UK)		
1.3	Life-long learning	29 %	134 (B)	81 (UK)	67 (LUX)		
1.4	Employment in medium / high-tech manufacturing	1 %	8 (GR)	4 (IRL)	4 (I)		
1.5	Employment in high-tech services	12 %	70 (IRL)	65 (L)	22 (UK)		
2.1	Public R&D	-6 %	13 (FIN)	12 (GR)	11 (P)	-10	2
2.2	Business R&D	-1 %	48 (FIN)	21 (E)	20 (DK)	11	12
2.3a	High-tech EPO patents	59 %	350 (IRL)	157 (L)	120 (E)	65	23
2.3b	High-tech USPTO patents	76 %	234 (E)	181 (DK)	143 (FIN)	-10	200
4.1	High-tech venture capital	74 %	350 (GR)	230 (DK)	168 (I)		
4.5	ICT markets / GDP	18 %	41 (GR)	36 (E)	33 (I)	-18	-10
4.6	High-tech value added in manufacturing	-12 %	87 (IRL)	73 (FIN)	70 (S)	21	-21

> "Looking at the strong disparities in innovation performance in Europe, it is particularly striking that the leading slots are dominated by the smaller European countries."

3.2. Country results

Tables 3 and 4 summarise the results for each EU country. Both tables are based exclusively on the scoreboard findings and therefore miss certain strengths and weaknesses that are not reflected in statistics, due to lags in data availability or to a lack of indicators for some innovative activities.

Table 3 summarises some of the major relative strengths and weaknesses of each EU Member State, as far as the scoreboard provides indicators to measure them. The table reflects the current situation, while Table 4 summarises the major trends per country for individual indicators (limited to large differences from the baseline trends for the EU as a whole). It should be underlined that the scoreboard is an additional input for a more comprehensive benchmarking process involving information on innovation policies gathered under the "European Trend Chart on Innovation" which will gradually produce a more complete picture.

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Table 3: Major relative strengths and weaknesses of Member States

Country	Major relative strengths	Major relative weaknesses
Belgium	Population with tertiary degree; High-tech venture capital	Innovative SMEs; Public R&D expenditure
Denmark	High-tech services; Patenting; Innovative SMEs	S&E graduates supply; New-to-market products;
Germany	Medium-high / high-tech manufacturing; Patenting; Innovative SMEs	Life-long learning; High-tech services
Greece	Innovation finance	Public and business R&D; High-tech patenting; Innovative SMEs; Internet
Spain	Innovation finance; New to market products	Public and business R&D; High-tech patenting; Internet access
France	Supply of S&E graduates; Public R&D; Product innovation	Internet; Innovation finance
Ireland	Supply of S&E graduates; Innovative SMEs; High-tech services	Public R&D; High-tech patenting; Life-long learning
Italy	Product innovation; Innovative SMEs	Public R&D; Education; High-tech patenting; Innovation finance;
Luxembourg	Internet access	High-tech patenting; Innovative SMEs; Life-long learning;
Netherlands	Public R&D; High-tech patenting; Internet; Innovation finance	S&E graduate supply
Austria	Innovative SMEs	S&E graduate supply; High-tech patenting; Innovation finance
Portugal	ICT expenditure; Product innovation	Public and business R&D; Education; Innovative SMEs; High-tech patenting
Finland	Workforce with tertiary degree; R&D; High-tech patenting; Internet	Innovative SMEs
Sweden	R&D; Life-long learning; High-tech services; SMEs; High-tech venture capital; Internet	New capital raised
United Kingdom	Education; High-tech venture capital; Internet	Public R&D

Table 4: Significant Member State trends

Country	Average change(1)	Major trends
Greece	52.9 %	Increasing public R&D and ICT investment; declining business R&D
Spain	46.8 %	Increasing business R&D and USPTO patenting
Luxembourg	45.8 %	Rapid increase of employment in high-tech services
Ireland	41.9 %	Increased high-tech service employment, EPO patenting, high-tech value-added, declining public R&D
Finland	39.2 %	Surging ahead on many indicators: tertiary education share, public and business R&D, USPTO patenting, high-tech value added
Denmark	37.2 %	Increase in USPTO patents; decline of educated workforce
Belgium	32.6 %	Increase in USPTO patents
Sweden	30.5 %	Leading Member State; increased high-tech value added in manufacturing; otherwise no major changes
EU mean(2)	30.5 %	-
Italy	28.0 %	Lowest increase in EPO high-tech patents; increase in ICT investment.
Austria	26.5 %	Catching up on tertiary education share, but few other signs of a major improvement
United Kingdom	24.6 %	Declining public and business R&D
Netherlands	17.5 %	Declining share of high-tech value-added in manufacturing
France	14.0 %	Declining business R&D
Germany	11.5 %	Declining share of high-tech value-added in manufacturing
Portugal	8.6 %	Increase in R&D, limited improvement of trend indicators

(1) Average percentage change in the indicators for which trend data are available.

(2) The EU country-level mean (see footnote 9) is used for all trend analyses.

3.3. A tentative European innovation index

A ranking of countries by their innovation performance is not the primary purpose of the scoreboard. However, to improve the readability of the Trend Chart results and to enable comparisons of the overall innovation performance with other national performance indicators, a tentative summary innovation index (SII) was designed.

The SII is equal to the number of indicators that are more than 20 % above the EU overall mean, minus the number that are more than 20 % below. The SII is adjusted for differences in the number of available indicators for each country. The index can vary between +10 (all indicators are above average) to -10 (all indicators are below average)(15). The two patent variables count as 0.5 each, giving a maximum of 17 possible indicators(16).

Several cautions are necessary in order to interpret the SII. First, the SII is a *relative* rather than an absolute index. An index of zero means that there is no meaningful difference from the EU average. Second, the SII is not fully comparable between countries because of missing indicators for seven countries. The SII is based on only 8 indicators for Japan, 9 for the US and Luxembourg, 14 for Greece, 15 for Portugal, and 16 for Austria and Belgium. Third, minor differences in the SII between countries are unlikely to be meaningful due to limitations with some of the indicators.

Figure 1 summarises conditions in each country by giving the SII and the average percentage change in the indicators for which relevant data are available. For some countries, the latter is based only on a limited number of indicators, depending on the availability of trend data.

Countries above the horizontal axis have an above average SII, while countries to the right of the vertical axis show an overall trend above the EU average. These two axes divide the chart into four quadrants. Countries in quadrant 1 are *"moving ahead"* (both the SII and the trend are above the EU average). Those in quadrant 2 are *"losing momentum"* (SII above the EU average, but with a trend below average). Quadrant 3 countries are *"catching up"* (SII below the EU average, but with an above average trend). Countries in quadrant 4 are *"falling further behind"* (SII

> "The trend analysis for the entire EU is favourable, showing an improvement in seven indicators, a minimal increase in one, and a decline in three – public R&D, business R&D, and the share of manufacturing value-added from high-technology sectors."

and trend below EU average)(17). The picture for countries with innovation performances that are already high is mixed. Denmark and Finland have been rushing further ahead. Sweden is the best performer but with a slightly below average improvement rate. The improvement rate of the Netherlands is below the EU country mean.

For the three largest EU economies, the trend results are below the EU country mean. The best conditions are for the UK, while the trend position for both France and Germany is *well below average*. The strongest overall trends towards improved innovation performances are for three countries with currently low results: Greece, Luxembourg and Spain. Ireland has also improved very quickly. Italy is one of the weak performers on the scoreboard but has been catching up on all trend indicators, except for a relatively poor performance for high technology patenting at the EPO. The very low rate of change for Portugal indicates that its innovation performance has been falling further behind.

Figure 2 shows the SII for all countries providing a "snapshot" of present country performances.

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Fig. 1: Overall country trends by innovation index

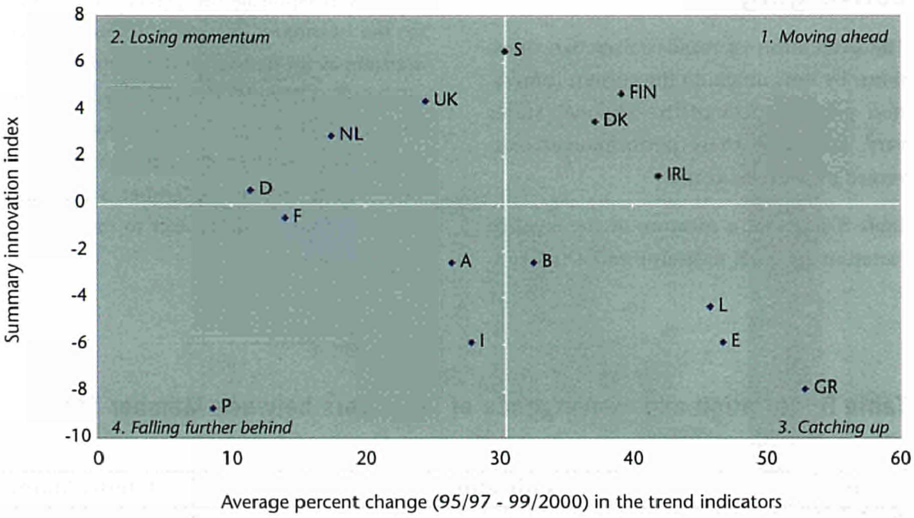
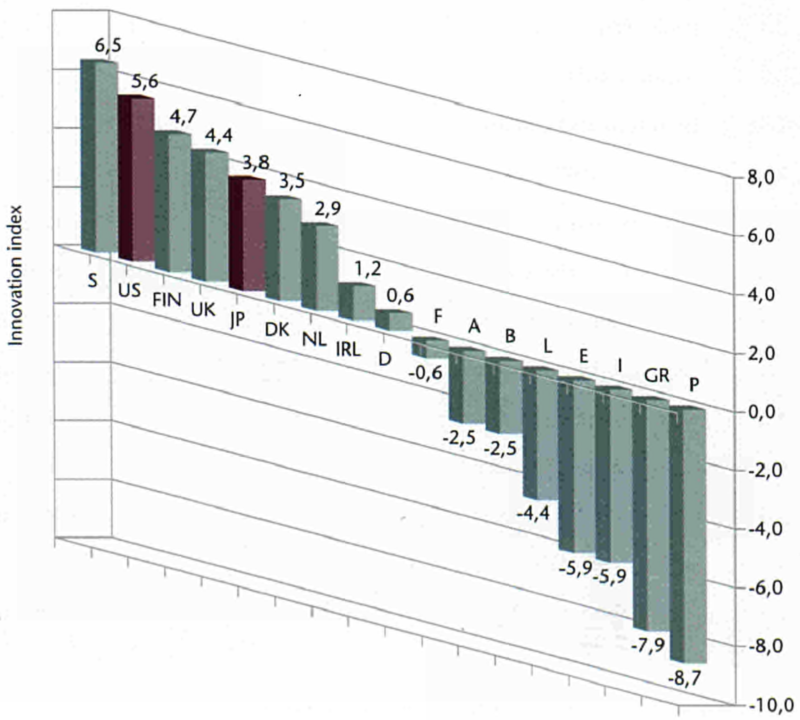


Fig. 2: Tentative Summary Innovation Index 2001



(15) A generally applicable model for how each indicator influences innovation is not available, which is why all indicators are given equal value in calculating the SII Due to sampling, definitional, and other errors for many of the indicators, we assume that indicators within +20 % and -20 % of the overall EU mean do not differ in any meaningful way from the average. The choice of a 20 % boundary is largely arbitrary. Sensitivity analysis found a high correlation (R^2 of .98) between the summary index using a 20 % boundary and those for a 15 % and 25 % boundary. The range in the SII from +10 to -10 is also arbitrary – it could have equally varied from -1 to 1 or -100 to +100.

(16) A different calculation approach for a summary index was tested based on the average percentage by which each indicator varied from the overall EU average. This indicator is strongly correlated with the retained SII (R^2 of .89). The retained SII is preferred over the percentage index because it ignores minor differences from the EU average which may not be meaningful. It is correlated (R^2 of .64) with the Economic Creativity Index from the "Global Competitiveness Report 2000" of the "World Economic Forum" (WEF).

(17) Annex 2 provides similar diagrams specific to all trend indicators.

> "For seven indicators, the performance of the EU countries has been *diverging*, rather than converging ... Only three indicators show convergence."

3.4. Are national innovation performances in the EU converging?

The evaluation of trends raises two questions: by how much do the current innovation performances of the Member States vary, and have these performances converged over recent years?

Table 5 provides a measure of the level of variation for each indicator and a measure of convergence for ten indicators for which trend data are available. The convergence measure is equal to the percentage change in the standard deviation. Convergence *decreases* as the change in the standard deviation increases, while a decline in the standard deviation shows *increasing* convergence. The table shows which indicators vary widely between Member States and which indicators are subject to only minor differences(18).

The *variation analysis* sorts the 17 indicators (plus the second indicator for patenting) into three groups: high, medium, and low variation. The least variation between EU countries is for ICT investment, followed by public R&D. The indicators with the greatest

*(18) Each indicator is measured using different units, which means that the comparison must be based on a standardised statistic that is unaffected by differences in the unit of measurement. The coefficient of variation (standard deviation/mean*100) is used here and given in Table 5.*

Table 5: Variation and convergence of indicators between Member States

No	Indicator	Member States variation(1)		Convergence(2)	
1.1	S&E graduates	Medium	(48.5)		
1.2	Population with tertiary education	Low	(32.8)	Diverging	(15 %)
1.3	Life-long learning	High	(79.0)	Diverging	(59 %)
1.4	Employment in medium / high-tech manufacturing	Low	(37.5)	Converging	(- 8 %)
1.5	Employment in high-tech services	Low	(33.2)	Diverging	(18 %)
2.1	Public R&D	Low	(32.6)	Converging	(- 6 %)
2.2	Business R&D	High	(65.2)	Diverging	(52 %)
2.3a	High-tech EPO patents	High	(104.1)	Diverging	(53 %)
2.3b	High-tech USPTO patents	High	(92.7)	Diverging	(156 %)
3.1	SMEs innovating in-house	Low	(38.9)	-	
3.2	SMEs innovation co-operation	High	(62.1)	-	
3.3	Innovation expenditure	Medium	(39.4)	-	
4.1	High-tech venture capital	Medium	(56.9)	Diverging	(100 %)
4.2	New capital raised	High	(161.3)	-	
4.3	New-to-market products	Low	(33.7)	-	
4.4	Home internet access	Medium	(42.3)	-	
4.5	ICT markets / GDP	Low	(10.5)	Converging	(- 24 %)
4.6	High-tech manufacturing value added	Medium	(54.5)	-	

(1) Coefficient of variation among the EU Member States is given in parentheses.

(2) The percentage change in the standard deviation across EU countries over the time period (usually 1995 or 1996 compared to 1999 or 2000).

variation among the EU Member States are more directly influenced by private decision making than by policy intervention. They include business R&D, patenting in high technology fields, the percent of SMEs involved in co-operation, and new capital raised. The indicator for life-long learning also varies substantially between countries, and is influenced by both public policies and firms' strategies for retraining. In contrast, there is less variability between countries for most of the indicators that are strongly influenced by public policy, such as education or public R&D investments.

The analyses of *variation over time* determine if there is convergence between EU Member States for the particular indicator. For seven indicators, the performance of the EU countries has been *diverging*, rather than converging. The cause of this divergence is the above average improvement of the indicators in several small countries and the below average improvement of the three largest countries. Only three indicators show convergence: the percentage of employment in medium and high-technology manufacturing, ICT investment as a share of GDP, and the share of GDP for public R&D.

3.5. Understanding the variety of innovation policy "paths" in Europe

In the European Union, the conditions and the need for innovation policy learning are exceptional: some of the world's innovation leaders are Member States, but strong differences in national innovation performances still exist. However, copying policies of the leaders would be a misuse of the scoreboard; there is no "one best way" in innovation policy. A better understanding of the existing "paths", their priorities and internal logic is necessary. To compare innovation performances and, even more, to assess the transferability of "good practices", it is essential to understand the specific environments behind these performances and policy practices.

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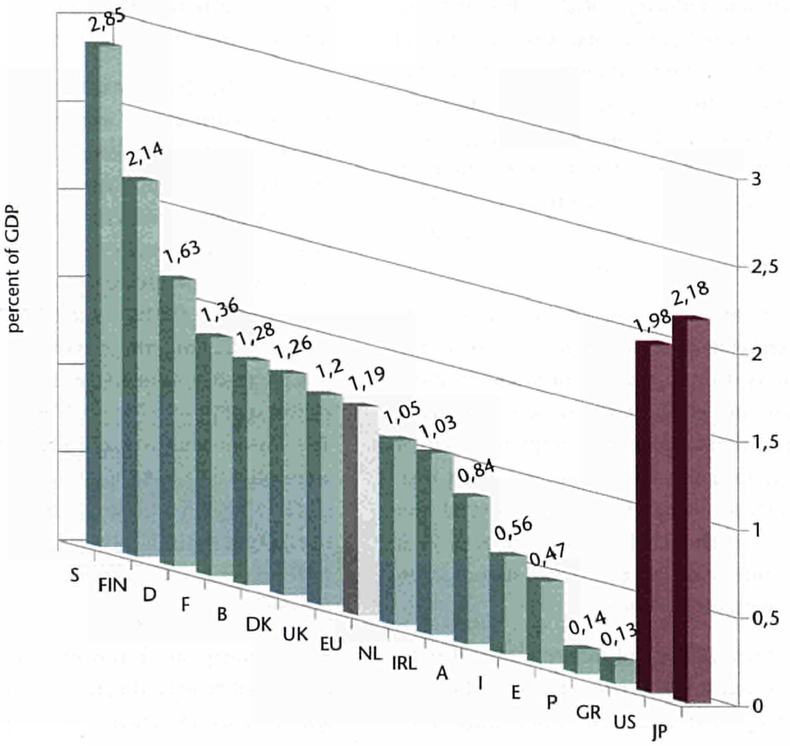
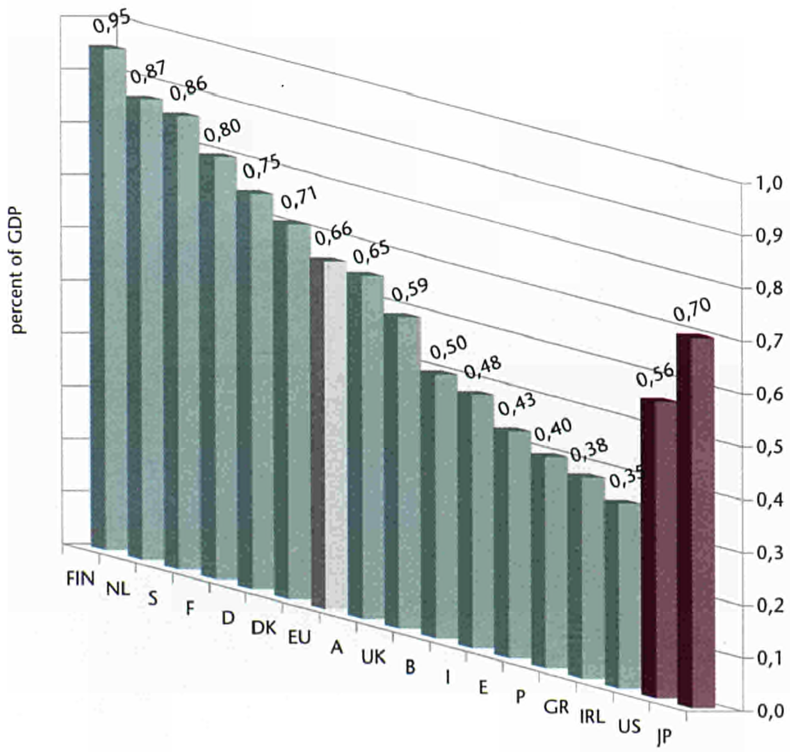
Indicator 2.2: Business R&D expenditure as a percentage of GDP



Indicator 2.1: Government R&D expenditure as a percentage of GDP



All Member States give high priority to innovation but they set different priorities. Each country pursues competitiveness, employment, sustainability, regional balance, and reducing social exclusion by its own original policy mix. A whole range of parameters and techniques could be used to identify different "paths" of innovation policy or clusters of countries applying similar innovation policy strategies. For some available parameters, exploratory correlation analyses with the summary innovation index (SII) were conducted.

A note of caution is needed concerning the interpretation of correlation results. Correlations do not provide information about cause and effect. A statistically significant correlation can only be interpreted as either 1) there might be a cause and effect relationship, although the direction is not known without other information, or 2) at the minimum, the two factors do not interfere with each other(19).

No statistically significant ($p < 0.05$) correlations were found between the SII and several employment and GDP based indicators. One reason for this result is that countries such as Luxembourg, Italy and Belgium have relatively high per capita GDP and a low ranking on the SII. This illustrates how there are different ways for a country to achieve a high living standard.

On the other hand, statistically significant negative correlations were found between the SII and two indicators of social exclusion: the percentage of the population living below the poverty line for three consecutive years ($R^2 = 0.52$ with $p = 0.013$) and the skewness of the income distribution ($R^2 = 0.43$ with $p = 0.014$). A third indicator of social exclusion, the poverty rate before social transfers, is negative and close to statistical significance ($R^2 = 0.27$ with $p = 0.07$). The Nordic countries and the Netherlands score high on the SII and low on the three social exclusion indicators – in other words: the European innovation leaders manage to increase innovation performance and reduce poverty.

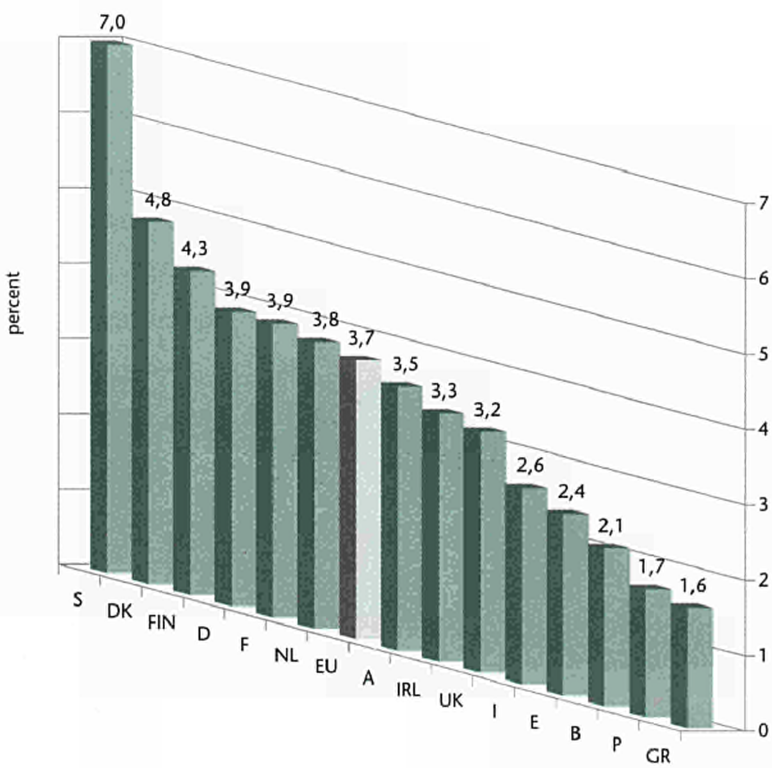
Both poverty and innovation are actively influenced by government policies. The negative correlation between them supports the hypothesis of a policy pattern that encourages innovation *and* reduces poverty. This is the policy pattern put forward at Lisbon as a European model. Although we do not know if the two results are causally related, they suggest that the outstanding innovation performances of the small welfare economies in Europe could partly be due to giving their citizens more economic security. A more conservative interpretation would be that policies preventing social exclusion need not interfere with innovation.

A similar, but less significant pattern could be assumed on the basis of a statistically significant ($p = 0.007$) positive correlation between the SII and an index for environmental sustainability(20): highly innovative countries tend to give high priority to sustainability.

Another obvious clustering criteria could be country size, since small economies face different problems than large economies. For instance, large economies can maintain a full range of publicly funded research, but small economies tend to specialise and devote most of their resources to a narrow range of public research. Smaller economies could benefit from sharing their experiences on this and related issues.

As an example, cohesion countries, such as Portugal, and Greece to a lesser extent, have made progress on introducing structural reforms and show the highest rates of structural change in Europe(21). The problem for cohesion countries is how to establish policies and framework conditions that will permit them to rapidly improve their innovation performance, an objective which ranks among the top priorities for regional programmes under the Structural Funds. Strengthening the critical mass of existing high-tech regions and developing the innovation performances of the other regions have to go hand in hand. In this respect,

Indicator 3.3: All innovation expenditures as a percentage of total sales, manufacturing



(19) For example, a strong correlation between innovation performance and GDP per person employed (a measure of productivity) would not indicate that a high innovative capability increases productivity. Such an interpretation can not be drawn as long as the data cover the same period. For instance, a strong positive correlation between the SII and a productivity measure would suggest, at best, that there might be a relationship or, alternatively, that the factors increasing SII do not interfere with improved productivity.

(20) The "sustainability indicator" from the "World Economic Forum" (WEF) was used for this analysis. The R^2 for the correlation is 0.47. The results of the WEF survey presented in the Global Competitiveness Report 2000 equally indicate a positive correlation between performances in innovation and sustainability (the 'double dividend' hypothesis).

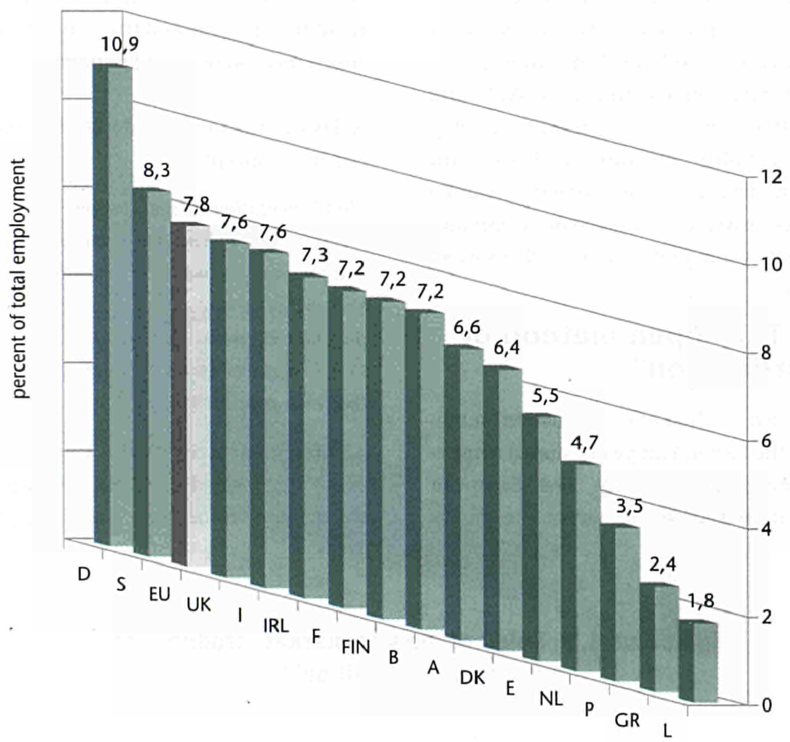
cohesion countries probably have more to learn from Ireland, which has improved rapidly from a low level, than they could learn from the Nordic countries, which are the current innovation leaders.

The level of decentralisation could be another relevant factor. Countries like Belgium, Spain, and to some extent Germany, give more decision making power over innovation policies to regions or provinces than other countries. The regional dimension will be further developed in future versions of the innovation scoreboard(22).

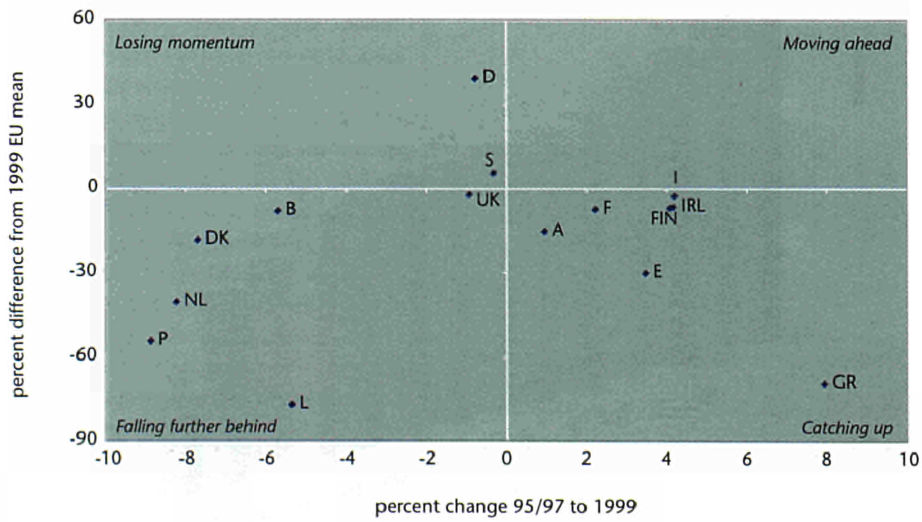
To conclude, the scoreboard results suggest that it is possible to distinguish broadly defined clusters of countries, such as the leading "small modernised welfare economies" (Nordic countries and the Netherlands). However, the assumed underlying similarities do not allow "country classes", "best of class" countries and other quantitative "benchmarking" methods to be applied, and even less the "top-down" definition of individual national "targets". The scoreboard results should be used as a starting point to develop a deeper understanding of the different national policy environments and strategies in Europe. Enhancing innovation policy learning in Europe will be a major part of the common European effort for more innovation. ≡

"The outstanding innovation performances of the small welfare economies in Europe could partly be due to giving their citizens more economic security."

Indicator 1.4: Employment in medium-high and high-tech manufacturing



Indicator 1.4: Employment in medium-high and high-tech manufacturing (trend)



(21) *European competitiveness report – 2000; p 48.*

(22) *This development work will build upon the "Regional Innovation Observatory" (RINNO; www.rinno.com) and the "Network of innovating regions in Europe" (www.innovating-regions.org) supported by the European Commission.*

4 Benchmarking innovation policy

Benchmarking innovation policy requires an original approach. The methods are bound to be different from policies, which use binding quantitative targets and strict co-ordination methods. Innovation policy concentrates on creating new skills and capacities. It involves the need to develop original policy measures and to learn quickly. Here, European "diversity" can be an asset provided Member States communicate closely and build on each other's experiences.

4.1. The "open method of co-ordination"

The "open method of co-ordination" adopted by the Lisbon European Council emphasises European diversity. The European Innovation Scoreboard serves the implementation of this method in the area of innovation policy. To better define the practical use of the scoreboard, it is useful to recall the rationale and the principles of the "open method of co-ordination":

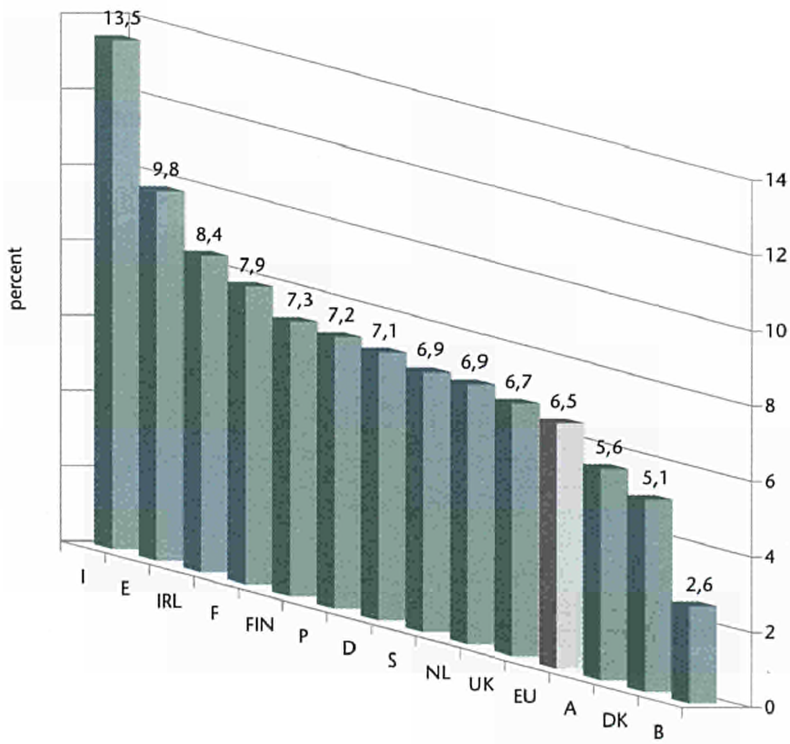
At Lisbon, the Council adopted this method as a new concept:

"Implementation of the strategic goal will be facilitated by applying a new open method of co-ordination as the means of spreading best practices and achieving greater convergence towards the main EU goals. This method … is designed to help Member States to progressively develop their own policies."(23)

A subsequent note of the Council presidency emphasised that it is the purpose of the method "to organise a learning process at the European level in order to stimulate exchange and the emulation of best practices and in order to help Member States improve their own national policies."(24) Best practices should be assessed and adapted in their national context and a clear distinction should be made between reference indicators to be used at the European level and concrete targets to be set by each Member State for each indicator. The process should involve not only public administrations, but also the stakeholders of innovation.

The European Commission plays a crucial role as a catalyst in the different stages of the open method of co-ordination by presenting proposals on European guidelines, organising the exchange of best practices, presenting proposals on indicators, and supporting monitoring and peer review.

Indicator 4.3: Sales of 'new to market' products as a percentage of all sales



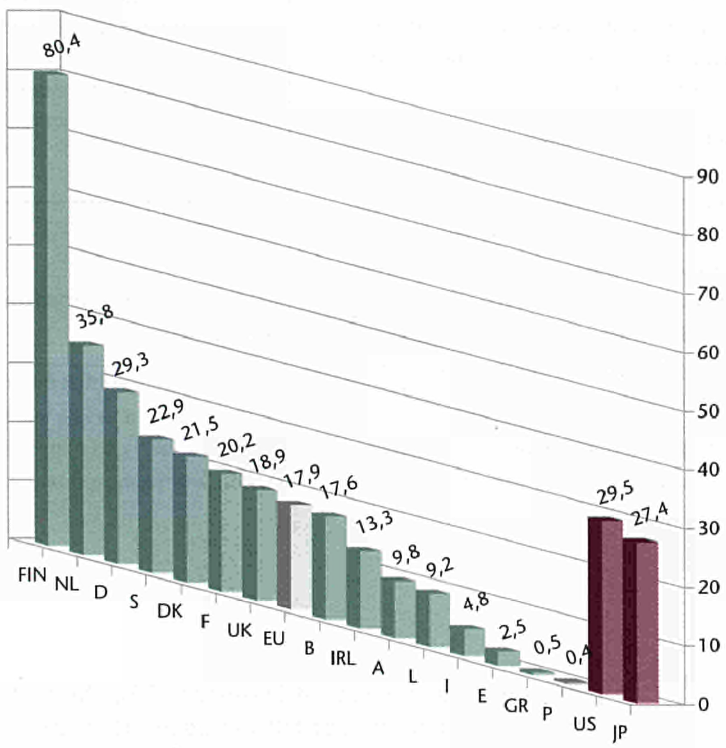
4.2. A common reference framework for innovation policy

In the area of innovation policy, the so-called "European Trend Chart on Innovation" is one of the pillars of the open co-ordination method and provides the framework for analysis and co-ordination. The project is run under the Fifth Framework Programme for Community R&D and relies on a network of national correspondents in all Member and Candidate States. In addition to developing and updating the innovation scoreboard it offers the following services:

- A database with more than 400 innovation policy schemes and a "who's who" of agencies and government departments involved in such schemes
- Six-monthly "country reports" and "trend reports";
- Annual synthesis reports: "Innovation policy in Europe"(25);
- Peer reviews by policy makers to identify "good practices" and assess the efficiencies of approaches and tools(26).

> "The indicators with the greatest variation among the EU Member States ... include business R&D, patenting in high-technology fields, the percent of SMEs involved in co-operation, and new capital raised."

Indicator 2.3a: Number of European (EPO) high-tech patent applications per million population



These products are available via CORDIS(27). A Group of Senior Officials (GSO) from the Member States advises the Commission on the "Trend Chart". Its role in the co-operation and exchange of views on innovation policy will be strengthened.

4.3. Practical application of the 2001 innovation scoreboard

The scoreboard results provide further support for the objectives of the Communication "Innovation in a knowledge-driven economy"(28) and evidence for 'fine tuning' of the actions proposed in this Working Paper. The scoreboard will be used to further develop innovation policy benchmarking in different ways.

4.3.1. Exchange of good practices and monitoring progress

By means of its 17 indicators, the 2001 innovation scoreboard brings to light differences in the innovation *performance* of Member States. The scoreboard provides many examples where countries have made substantial and rapid progress in specific areas, but it also reveals cases of underperformance. Most importantly, the scoreboard shows that the leading countries in innovation performance can be found among EU Member States. This demonstrates the high potential for the exchange of good practice and learning in Europe.

The analysis of strong and weak innovation *performances* derived from the scoreboard complements the qualitative analysis of policy *schemes and measures* already carried out under the "European Trend Chart on Innovation". This is an important step towards closing the "causality gap" between measuring aggregate performances and designing adequate policies. The scoreboard identifies strengths and weaknesses in many policy areas and offers new entry points for policy makers in the Member States to find other Member States for "learning partnerships".

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Action foreseen

The Commission invites the Member States to analyse the scoreboard results; to make comments; and to define, where appropriate, national targets. Member States should evaluate their innovation policies systematically and, wherever practical, evaluate similar national policies jointly. The Commission services support this mutual learning process under the "European Trend Chart on Innovation" (database of national policies, country reports, trend reports, peer reviews). The annual reports "Innovation policy in Europe" will include input from the scoreboard and provide a synthesis view of the results from benchmarking innovation policy in Europe. These actions will gradually involve the candidate states.

(23) Council document SN 100/00.

(24) Presidency note from the Council 9088/00.

(25) "Innovation policy in Europe 2000" was published in September 2000.

(26) Workshops on "innovation policy co-ordination mechanisms", "Learning networks", and IPR policies" have already taken place.

(27) www.cordis.lu/trendchart

(28) COM(2000) 567.

4.3.2. Stimulating the innovation policy debate

Benchmarking informs policy but it cannot substitute the democratic process of decision making. The challenge for Member States is not to copy the best performers, but to define their own original innovation policy, taking into account specific strengths, weaknesses, priorities and cultural and institutional traditions. This supposes a broad political debate among stakeholders (business, professional associations, unions, academia) to explore the acceptability of the policy options available.

Launching these debates is primarily the responsibility of the Member States, but it also includes an important European dimension: similarly to policy makers, stakeholders need to be informed about policies in other countries, how these perform and what a successful transfer might require. The Commission will support Member States in providing such a European outlook.

Collecting "informed opinions" from stakeholders is another reason why this debate is important. The Commission will investigate whether systematic Europe-wide hearings and polls among stakeholders are an appropriate means to produce representative and comparable data complementary to statistics.

Action foreseen

The Commission offers Member States its support to introduce a European dimension into the national stakeholder debates on innovation policy. It will launch a Europe-wide pilot survey to collect "informed opinions" on innovation policy issues from stakeholders across Member and Candidate States.

4.3.3. Tackling common EU weaknesses

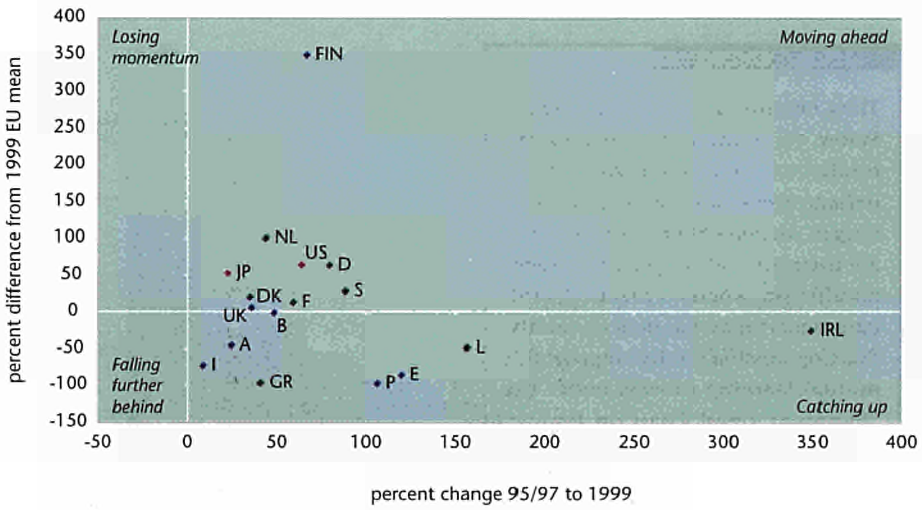
The scoreboard identifies two key areas where the European Union as a whole does poorly: business R&D(29) and high-tech patenting in the US. Both seem to reveal structural weaknesses of the European innovation system and justify action at European level. Both themes are included in the Commission's proposals for the Sixth Framework Programme and for the European Research Area.

Action foreseen

There is an urgent need for action to strengthen business R&D. Member States are encouraged to initiate or increase incentives in accordance with articles 87 and 88 of the Treaty.

The reasons for the apparent weaknesses of European high-tech patenting in the US need to be better understood. Do European companies apply defensive patenting strategies in the US? Is this part of their overall business strategies or does it reveal weaknesses? Is it a consequence of a different propensity to patent in Europe and the US? A panel of experts in enterprise policy who might also propose appropriate action will further explore these issues. Ongoing Community action to strengthen the patenting and technology transfer capacities of European universities and research institutes will be reinforced with a particular view to extending these capacities to the world-wide level.

Indicator 2.3a: Number of European (EPO) high-tech patent applications per million population (trend)



4.4. Next steps towards improving the innovation scoreboard

In the area of "transmission and application of new knowledge" the Second Community Innovation Survey (CIS) is the only source for comparable data. However, CIS data date back to 1996 (except for countries with more frequent national surveys). New and improved data from the Third Community Innovation Survey are a precondition to update the scoreboard in this area and high priority should be given to the efforts to increase the CIS frequency.

> "Business R&D and high-tech patenting in the US both seem to reveal structural weaknesses of the European innovation system and justify action at European level. Both themes are included in the Commission's proposals for the Sixth Framework Programme and for the European Research Area."

(29) This confirms the analysis drawn from the "structural indicators" in COM(2001) 79. However, innovation policy in this area will be constrained by the distribution of industrial firms in Europe - high business R&D spending and patenting levels is dependent upon a large high technology sector. Neither will increase without an expansion of European high technology sectors, which cannot be expected to happen rapidly.

Europe-wide statistical data is not yet available for important aspects of innovation such as creation of high-tech start-up companies, private public partnerships, knowledge diffusion, the influence of environmental policy and standardisation on innovation, and the quality and intensity of networking. In the short and medium term, the official statistical system will not be able to fill these gaps. To cover these emerging areas adequately, new proxy indicators need to be developed, complementary private data will need to be used, and new types of data collected through surveys.

Innovation has a strong regional dimension and the Commission invites the European regions to participate actively in innovation policy benchmarking. Depending on the contributions from the regions and the availability of data, the regional dimension could be further developed in the next innovation scoreboard.

The following activities are foreseen to update and improve the innovation scoreboard (in close co-operation with Eurostat):

Action foreseen

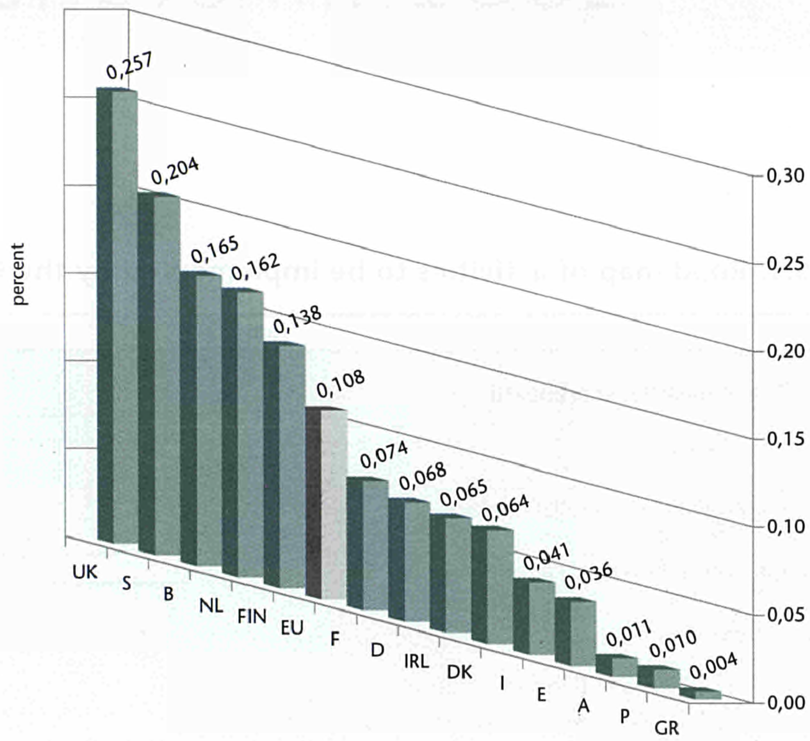
Member States should give high priority to the timely implementation of the Third Community Innovation Survey and to the more frequent production of innovation statistics.

The Commission will develop new innovation indicators and carry out surveys as a complement to official statistics.

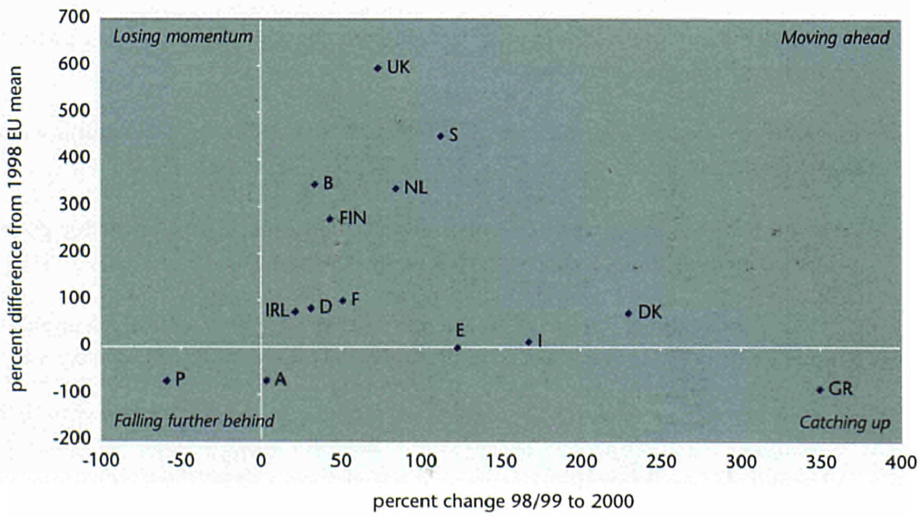
Following the request of the Stockholm Council, the scoreboard will be extended to Candidate States. The aim is to include these countries in the 2002 innovation scoreboard, subject to the availability of statistical data.

A series of regional indicators complementary to the innovation scoreboard will be developed within the limits of the available statistical data.

Indicator 4.1: Venture capital investment in high-technology firms as a percentage of GDP



Indicator 4.1: Venture capital investment in high-technology firms as a percentage of GDP (trend)



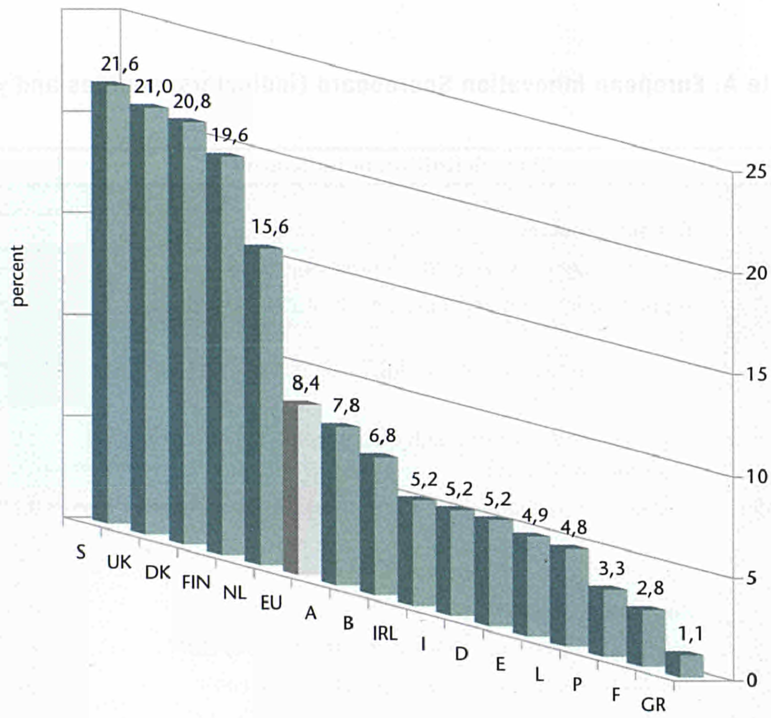
5 Action arising from the 2001 innovation scoreboard

5.1. Road map of activities to be implemented by the Commission

Activity	Date
The innovation scoreboard	
• Annual updates	2002 onwards
• Extension to Candidate Countries	2002
• Including the regional dimension	2002 (draft)
• Improvements:	
- Push forward with CIS 3	2002
- Develop new proxy indicators	2002 (draft)
- Complementary surveys	2003
- More frequent innovation statistics	2004
Common framework of innovation policies	
• Further develop the "European Innovation Trend Chart" (country reports, innovation policy database, peer reviews, annual reports)	Ongoing
• Launch a special activity to better integrate Candidate Countries	2001/2002
• Stimulate the innovation policy debate among the main innovation stakeholders and collect their views through surveys	2002
Further innovation policy actions	
• Investigate the reasons for the weakness of European high-tech patenting in the US and, if relevant, make proposals for Community action	2001/2002
• Strengthen the patenting and technology transfer capacities of European universities and public research institutes	2001/2002
• Under the Next Research Framework Programme: Encourage research on innovation policy "paths" and the relationship of innovation with socio-economic parameters	From 2003
• Under the Next Research Framework Programme: support Member States to open up existing innovation schemes for participants from other countries and to develop adequate methodologies to transfer policy schemes trans-nationally	From 2003

Indicator 1.3: Participation in life-long learning

Percent of population aged 25-64 participating in education and training in previous 4 weeks



5.2. Main recommendations to Member States

The Communication "Innovation in a knowledge-driven economy", adopted in September 2000(30) and the "Broad Economic Policy Guidelines" of April 2001(31) offer recommendations to Member States how to foster innovation in the knowledge based economy. For the specific purpose of using and further improving the innovation scoreboard for policy benchmarking the recommendations below provide further detail:

- Improve national innovation statistics. Implement the ongoing CIS 3 in time and carry out innovation statistics more frequently.
- Promote policy benchmarking and set quantitative "targets" at the national, regional and local levels where appropriate, co-ordinate national and regional policies properly.
- Participate in the co-ordination of innovation policies in Europe and contribute to the diffusion of good practices. Apply a European outlook when fixing priorities and designing innovation policies. Evaluate innovation policies systematically and, wherever practical, evaluate similar national policies jointly.
- Support Commission action addressing the common European weakness of high-tech patenting and business R&D.
- Develop the dialogue on innovation policy options among stakeholders. Address the European dimension in such debates (with Commission support).
- Under the next Framework Programme: Co-operate with the Commission and other Member States to launch common innovation policy initiatives. Open up national and regional innovation support schemes for participants from other countries and develop adequate methodologies to transfer policy schemes trans-nationally. ≡

(30) COM (2000) 567.

(31) COM (2001) 224.

"The challenge for Member States is not to copy the best performers, but to define their own original innovation policies, taking into account specific strengths, weaknesses, priorities and cultural and institutional traditions. This supposes a broad political debate among stakeholders."

6 Annex 1. Overview tables

Table A: European Innovation Scoreboard (indicators, sources and years)

No	Short definition of indicator(1)	Source	Year(2)
1.	**Human resources**		
1.1	New S&E graduates (‰ of 20 - 29 years age class)	EUROSTAT, Education statistics	1999
1.2	Population with tertiary education (% of 25 – 64 years age classes)	EUROSTAT, Labour Force Survey; *OECD Education at a Glance*	2000
1.3	Participation in life-long learning (% of 25 – 64 years age classes)	EUROSTAT, Labour Force Survey (Structural indicator 1.7)	2000
1.4	Employment in medium-high and hi-tech(3) manufacturing (% of total workforce)	EUROSTAT, Labour Force Survey	1999
1.5	Employment in high-tech(4) services (% of total workforce)	EUROSTAT, Labour Force Survey	1999
2.	**Knowledge creation**		
2.1	Public R&D expenditures (GOVERD + HERD) (% of GDP)	EUROSTAT, R&D statistics, OECD	1999
2.2	Business expenditures on R&D (BERD) (% of GDP)	EUROSTAT, R&D statistics (Structural indicator 2.2.1), OECD	1999
2.3a	EPO high-tech patent applications (per million population)	EUROSTAT, EPO	1999
2.3b	USPTO high-tech patent applications (per million population)	EUROSTAT, USPTO	1998
3.	**Transmission and application of knowledge**	EUROSTAT, Community Innovation Survey	1996
3.1	SMEs innovating in-house (% of manufacturing SMEs)	EUROSTAT, Community Innovation Survey	1996
3.2	SMEs involved in innovation co-operation	EUROSTAT, Community Innovation Survey	1996
3.3	Innovation expenditures (% of all turnover in manufacturing)		
4.	**Innovation finance, output and markets**		
4.1	High-technology venture capital investment (% of GDP)	European Technology Investment Report 1999, based on EVCA data	2000
4.2	Capital raised on parallel markets plus by new firms on main markets as a % of GDP	International Federation of Stock Exchanges	1999
4.3	'New to market' products (% of sales by manufacturing firms)	EUROSTAT, Community Innovation Survey	1996
4.4	Home internet access (% of all households)	EUROSTAT, Eurobarometer (Structural indicator 2.4b), US NTIA	2000
4.5	Share of ICT markets as a percent of GDP	EUROSTAT (Structural indicator 2.3), EITO	2000
4.6	Share of manufacturing value-added in high-tech sectors	EUROSTAT	1997

(1) For more information on sources, definitions, interpretations, advantages and disadvantages of the indicators refer to Annex 2.

(2) Most recent year for at least four countries.

(3) Includes chemicals (NACE 24), machinery (29), office equipment (30), electrical equipment (31), telecom equipment (32), precision instruments (33), automobiles (34) and other transport (35). The total workforce includes all manufacturing and service sectors.

(4) Includes communications (NACE 64), software and computer services (72) and R&D services (73).

Table B: Scoreboard 2001

No	Indicator	Yr(1)	So(1)	EU	S	FIN	UK	DK	NL	IRL	D	F	A	B	L	E	I	GR	P	US	JP
1.1	‰ S&E grads/20-29 pop	99	1	10,4	9,7	10,4	17,8	4,7	5,8	15,6	8,6	15,8	7,8	5,1		9,6	4,7		5,5	8,1	11,2
1.2	% pop with 3rd education	00	1,2	21,2	29,7	32,4	28,1	25,8	25,0	22,2	23,8	21,6	14,2	27,1	18,3	21,8	9,6	16,9	9,8	34,9	30,4
1.3	Life-long learning	00	1	8,4	21,6	19,6	21,0	20,8	15,6	5,2	5,2	2,8	7,8	6,8	4,8	4,9	5,2	1,1	3,3		
1.4	% empl. h-tech manuf	99	1	7,8	8,3	7,2	7,6	6,4	4,7	7,3	10,9	7,2	6,6	7,2	1,8	5,5	7,6	2,4	3,6		
1.5	% empl. h-tech services	99	1	3,2	4,8	4,3	4,2	4,5	3,6	4,0	2,8	3,8	2,7	3,2	3,6	2,1	2,7	1,5	1,2		
2.1	Public exp. R&D / GDP	99	1	0,66	0,86	0,95	0,59	0,71	0,87	0,35	0,75	0,80	0,65	0,50		0,43	0,48	0,38	0,40	0,56	0,70
2.2	BERD / GDP	99	1	1,19	2,85	2,14	1,20	1,26	1,05	1,03	1,63	1,36	0,84	1,28		0,47	0,56	0,13	0,14	1,98	2,18
2.3a	EPO h-tech pats / pop	99	1,3	17,9	22,9	80,4	18,9	21,5	35,8	13,3	29,3	20,2	9,8	17,6	9,2	2,5	4,8	0,5	0,4	29,5	27,4
2.3b	USPTO h-tech pats / pop	98	1,4	11,1	29,5	35,9	14,4	17,3	19,6	3,8	14,4	13,3	5,6	12,8	2,3	1,0	4,2	0,5	0,1	84,3	80,2
3.1	% SMEs innov in-house	96	10	44,0	44,8	27,4	35,8	59,0	51,0	62,2	58,7	36,0	59,1	29,4	24,5	21,6	44,4	20,1	21,8		
3.2	% SMEs innov co-op	96	10	11,2	27,5	19,9	15,7	37,4	13,8	23,2	14,7	12,0	12,9	8,9	9,6	7,0	4,7	6,5	4,5		
3.3	% innov exp /total sales	96	10	3,7	7,0	4,3	3,2	4,8	3,8	3,3	3,9	3,9	3,5	2,1		2,4	2,6	1,6	1,7		
4.1	‰ vent capital / GDP	00	1,5	1,08	2,04	1,38	2,56	0,64	1,62	0,65	0,68	0,74	0,11	1,65		0,36	0,41	0,04	0,01		
4.2	% new capital / GDP	99	1,6	1,1	0,5	0,3	0,6	4,5	5,6	0,9	0,6	0,6	0,3	0,9	0,6	4,4	0,1	1,5		1,9	
4.3	% new-to-market products	96	10	6,5	6,9	7,3	6,7	5,1	6,9	8,4	7,1	7,9	5,6	2,6		9,8	13,5		7,2		
4.4	% home internet access	00	7,8	28	54	44	41	52	55	36	27	19	38	29	36	16	24	12	18	47	28
4.5	% ICT markets / GDP	00	9	6,0	7,4	6,0	6,5	6,1	6,6	4,8	5,7	6,1	5,8	5,6		6,3	5,3	6,0	6,6	5,9	4,3
4.6	% h-tech value added	97	1	8,2	18,8	12,5	11,8	7,9	7,5	20,5	5,7	9,7				5,0	5,9			25,8	13,8
	Summary Index				6,5	4,7	4,4	3,5	2,9	1,2	0,6	-0,6	-2,5	-2,5	-4,4	-5,9	-5,9	-7,9	-8,7	5,6	3,8

(1) Most recent data available.

(2) Data sources: 1= Eurostat, 2 = OECD Education at a Glance, 3 = EPO, 4 = USPTO, 5 = EVCA, 6 = FIBV, 7 = Eurobarometer, 8 = US National Telecoms and Information Administration, 9 = EITO, 10 = Community Innovation Survey.

Indicators (except for the summary index) that are more than 20 % above or below the EU average are highlighted in blue or red respectively.

Note

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European Trend Chart on Innovation: Innovation Policy in Europe 2001

The 2001 Trend Chart annual report, which is planned to be published in December, provides an overview of new innovation policy activities, schemes and priorities across all EU Member States, and includes specific articles on:

- science and industry interfaces
- innovation finance and new technology-based firms (NTBFs)
- framework conditions to encourage innovation (IPR and administrative simplification)
- policy options - co-ordination, promotion, regions and clusters
- the Innovation scoreboard's summary innovation index (SII)

The report draws on the reports of national correspondents in each Member State and the Trend Chart's database of innovation policy measures to highlight emerging linkages between innovation inputs (policy and programmes) and innovation outputs (performance statistics).

Contact

The Trend Chart annual report will be downloadable from http://www.cordis.lu/trendchart/
Printed copies will be available on request from innovation@cec.eu.int

Statistics on Innovation in Europe, 2000 edition

KS-32-00-895-EN-C,
ISBN 92-894-0173-7; €35

The Community Innovation Survey (CIS) is a joint exercise of the European Commission, the OECD and EEA Member States, designed to obtain information on technological innovation. Uniquely, it collects comparable firm-level data on inputs to, and outputs from, the innovation process across a wide range of industries and countries. The 2000 edition of Statistics on Innovation in Europe presents an overview of the results of the second CIS (1997-98), by country, sector and firm size:

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