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PRO INNO EUROPE®

European **Innovation** Scoreboard **(EIS)** 2009

European Commission
Enterprise and Industry

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The innovation policy initiative PRO INNO Europe® combines **analysis and benchmarking** of national and regional innovation policy performance with support for **cooperation of national and regional innovation programmes** and incentives for innovation agencies and other innovation stakeholders to implement joint actions. The initiative aspires to become the main European reference for innovation policy analysis and development throughout Europe. Additional information on PRO INNO Europe® is available at *www.proinno-europe.eu.*

The EIS report and its Annexes, accompanying thematic papers and the indicators database are available at http://www.proinno-europe.eu/metrics

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Comparative analysis of innovation performance

Contents

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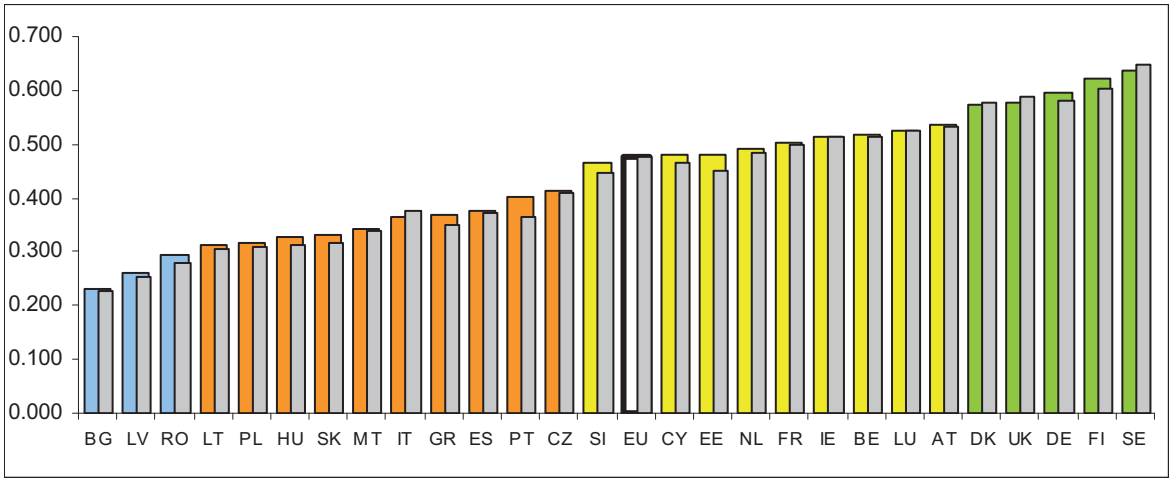
1. Executive summary

This is the ninth edition of the European Innovation Scoreboard (EIS), which provides a comparative assessment of the innovation performance of EU27 Member States, under the EU Lisbon Strategy. The methodology for the 2009 EIS is identical to that of the 2008 EIS.

The EIS 2009 includes innovation indicators and trend analyses for the EU27 Member States as well as for Croatia, Serbia, Turkey, Iceland, Norway and Switzerland. Based on their innovation performance across 29 indicators, EU27 Member States fall into the following four country groups[1]:

- Denmark, Finland, Germany, Sweden and the UK are the **Innovation leaders,** with innovation performance well above that the EU27 average and all other countries. Of these countries, Germany and Finland are improving their performance fastest while Denmark and the UK are stagnating.
- Austria, Belgium, Cyprus, Estonia, France, Ireland, Luxembourg, the Netherlands and Slovenia are the **Innovation followers,** with innovation performance below those of the Innovation leaders but close to or above that of the EU27 average. Cyprus, Estonia and Slovenia have shown a strong improvement compared to 2008, providing an explanation why these countries have moved from the Moderate innovators in the EIS 2008 to the Innovation followers,
- Czech Republic, Greece, Hungary, Italy, Lithuania, Malta, Poland, Portugal, Slovakia and Spain are the **Moderate innovators,** with innovation performance below the EU27 average. The EIS 2009 Moderate innovators are a mix of 5 Member States which were Moderate innovators in the EIS 2008 and 5 Member States which were Catching-up countries in the EIS 2008.

SUMMARY INNOVATION PERFORMANCE EU27 MEMBER STATES (2009 SII)



Note: The Summary Innovation Index (SII) is a composite of 29 indicators going from a lowest possible performance of 0 to a maximum possible performance of 1. The 2009 SII reflects performance in 2007/2008 due to a lag in data availability.

The grey coloured columns show 2008 performance as calculated backward from 2009 using the next-to-last data for each of the indicators. This 2008 performance is not identical to that shown in the EIS 2008 as not for all indicators data could be updated with one year. The difference between the columns for 2008 and 2009 show the most recent changes in innovation performance.

- Bulgaria, Latvia and Romania are the Catching-up countries with innovation performance well below the EU27 average. All three countries are rapidly closing their gap to the average performance level of the EU27, and Bulgaria and Romania have been improving their performance the fastest of all Member States.

This year's assessment shows that there continues to be convergence amongst the groups, with Moderate innovators and the Catching-up countries growing at a faster rate than the Innovation leaders and Innovation followers.

[1] *The country groups have been identified using the average results of hierarchical clustering using 7 different clustering methods: Ward's method, between-groups linkage, within-groups linkage, nearest neighbour, furthest neighbour, centroid clustering and median clustering.*

Germany, Cyprus, Malta and Romania are the EU27 countries displaying the largest improvement within their peer groups (more detail in Section 3.2)

Within each of the country groups there is variation in growth performance, with Finland and Germany showing the best growth performance of the Innovation leaders. Cyprus, Estonia and also Slovenia are the fastest growing Innovation followers. Czech Republic, Greece, Malta and Portugal are the fast growing Moderate innovators and Bulgaria and Romania are not only the fastest growers among the Catching-up countries but also overall.

An impressive average annual growth rate over the last five years has led Estonia and Cyprus to catch up with the EU27 average innovation performance in 2009 (Section 3.1)

Both Cyprus and Estonia have improved their performance from below the EU27 average in the EIS 2008 to an above average performance in the EIS 2009. For Cyprus strong growth in Finance and support, Linkages & entrepreneurship and Throughputs have been the main drivers of its improvement in innovation performance. For Estonia strong growth in Firm investments and Throughputs have been the main drivers of its improvement in innovation performance.

Although the EU27 has been, overall, improving its innovation performance, the economic crisis may threaten this good progress, particularly in moderate innovators and catching-up countries (sections 3.4 and 4)

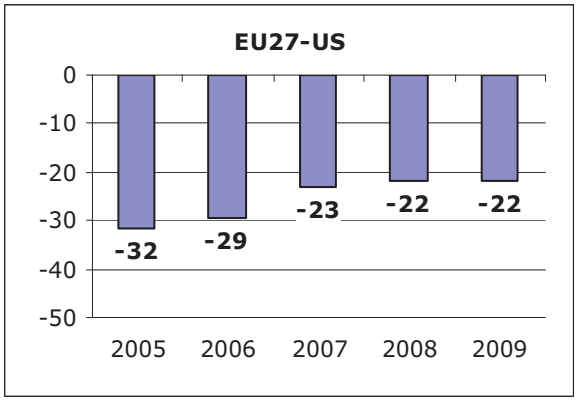
The EU27 is making overall progress, with particularly strong increases in the numbers of graduates in science, engineering, social sciences and humanities, venture capital, private credit, broadband access, community trademarks, community designs, technology balance of payments flows and sales of new-to-market products. The strong increases in venture capital and private credit most likely do not yet capture the impact of the economic downturn in 2008.

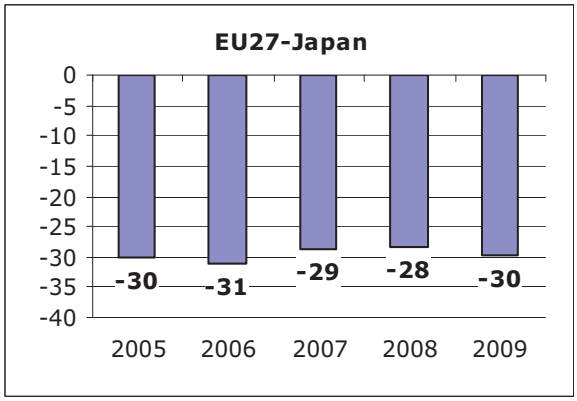
However, the economic crisis may lead to a reversal of the convergence between EU27 countries in innovation performance. The 2008 European Innovation Scoreboard showed a clear process of convergence between EU27 Member States. The 2009 Scoreboard does not capture any possible impacts of the crisis, as most data come from 2007 and 2008. However, data from the 2009 Innobarometer survey suggests that the rapid advances in innovation performance made in many lower performing countries may not be maintained, at least in the short term, due to the severity of the economic crisis.

The catching up in the innovation gap with the US and Japan has ceased or even reversed (Section 5.1)

The 2009 EIS includes a separate analysis of the EU27 performance compared with the United States and Japan based on a set of comparable indicators. This shows that there has been a continued improvement in the EU27's performance relative to the US and a stable performance gap relative to Japan. Nevertheless, there remains a significant gap between the EU27 and these two other countries and catching up with the US seems to have flattened out.

EU27 INNOVATION GAP TOWARDS US AND JAPAN



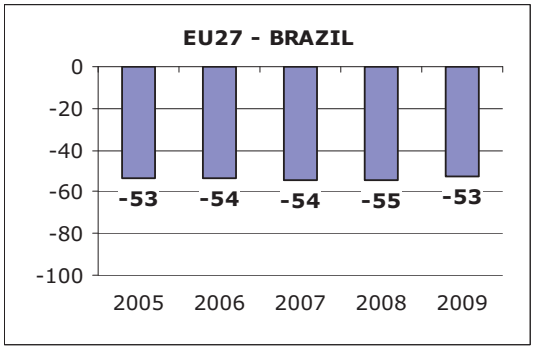


Performance for each reference year is measured using, on average, data with a two-year lag (e.g. performance for 2009 is measured using data for 2007).

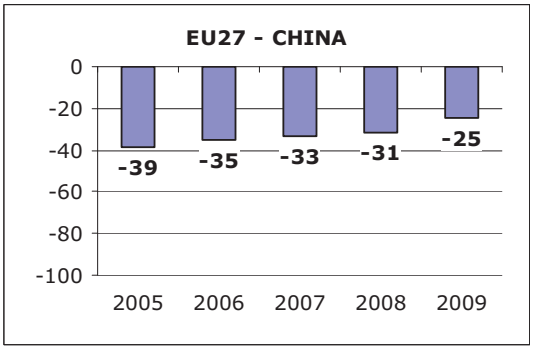
This remaining gap is explained primarily in four areas: international patenting (as measured under the patent cooperation treaty), public private linkages and numbers of researchers (despite the improvements in both these areas), and business R&D expenditures (where both EU27 and US values have stagnated, while Japan's have increased).

EU27 INNOVATION LEAD TOWARDS THE BRIC COUNTRIES

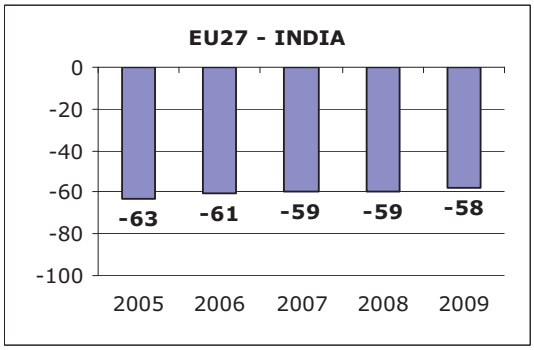
Strong and stable lead to Brazil



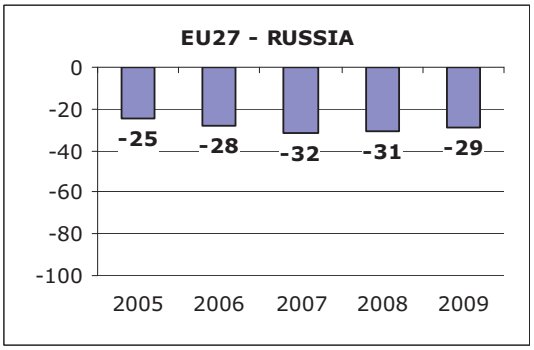
Declining lead to China



Strong but slowly declining lead to India



Stable lead to Russia



Performance for each reference year is measured using, on average, data with a two-year lag (e.g. performance for 2009 is measured using data for 2007).

From within the BRIC countries, China displays the strongest performance (Section 5.2). The EU27 must continue to find ways to turn this performance into growth opportunities

That the EU27 has a strong lead compared to each of the BRIC countries, in particular towards Brazil and India. The performance lead towards Brazil has remained stable and that towards Russia has slightly improved. China and India are both catching-up towards the EU27. The rate of relative improvement for India is more modest than that for China, but China is showing a rapid rate of relative improvement and its performance gap has decreased strongly. Simply extrapolating China's speed of catching-up over the last 5 years could indicate a closure of the performance gap with the EU27 in the (very) near future.

This year's thematic reports have dwelled on the subjects of: long term patterns of innovative performance, user innovation, internationalisation and innovation and regional innovation performance[2] (section 6). The following highlights emerge from these thematic reports:

[2] *These thematic reports use a number of other sources than those used to populate the 29 indicators included in the Summary Innovation Index.*

There are only small differences in innovation between manufacturing and services (Section 6.1)

A sectoral analysis for 8 major European countries shows that there are only limited differences between manufacturing and services sectors. Whereas for services sectors innovative sales are supported by growing demand and technology adoption, for manufacturing sectors it is firm size which drives innovative sales.

More than half of innovating firms involve users in innovation activities (Section 6.2)

While a substantial minority of innovative firms in the EU27 are involved in product and process modification (about 30%), more than half of these firms involve users in support of their innovative activities. User innovation is more or less evenly spread across industrial sectors and across countries. Innovators engaged in user innovation can be classed as "super-innovators". Compared to other innovation firms involving users are more likely to introduce new products, processes or services and to perform R&D and apply for patents.

Internationalization and innovation performance closely linked (Section 6.3)

Research suggests that there seems to be a causal relationship between internationalization and innovation leading to a cumulative process where innovation and internationalization may affect each other in either a virtuous or vicious circle. This calls for more alignment between policies aimed at supporting innovation and those aimed at supporting firms' international activities.

Strong diversity in regional innovation performance across Europe (Section 6.4)

The 2009 Regional Innovation Scoreboard (2009 RIS) adopts the European Innovation Scoreboard approach at regional level and provides a richer analysis compared to previous reports due to the availability of more comprehensive regional Community Innovation Survey data. The analysis shows that all major EU27 countries have diverse levels of performance and relative strengths within their regions, and that Spain, Italy and the Czech Republic are the most heterogeneous. The 2009 RIS marks a significant step forward in measuring regional innovation performance although it also shows that more progress is needed on the availability and quality of innovation data at regional level.

2. Introduction

The European Innovation Scoreboard (EIS) has been published annually since 2001 to track and benchmark the relative innovation performance of EU27 Member States. From the EIS 2008 onwards the methodology has been revised and the number of dimensions increased to 7 and grouped into 3 main blocks covering enablers, firm activities and outputs (Figure 1). These dimensions bring together a set of related indicators to give a balanced assessment of the innovation performance in that dimension. The blocks and dimensions have been designed to accommodate the diversity of different innovation processes and models that occur in different national contexts.

FIGURE 1: DIMENSIONS OF INNOVATION PERFORMANCE CAPTURED IN THE EIS

ENABLERS captures the main drivers of innovation that are external to the firm as:

- Human resources – measures the availability of high-skilled and educated people.
- Finance and support – measures the availability of finance for innovation projects and the support of governments for innovation activities.

FIRM ACTIVITIES captures innovation efforts that firms undertake recognising the fundamental importance of firms' activities in the innovation process:

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

OUTPUTS captures the outputs of firm activities as:

- Innovators – measures the number of firms that have introduced innovations onto the market or within their organisations, covering techn logical and nontechnological innovations.
- Economic effects – captures the economic success of innovation in employment, exports and sales due to innovation activities.

The above described dimensions form the core of national innovation performance. In addition, there are wider socio-economic factors that influence innovation, such as the role of governments, markets, social factors and the demand and acceptance of innovation. These factors and their relationship with innovation performance have been explored in various EIS thematic papers. The indicators which are included in each of the dimensions are listed in Table 1 and full definitions are available in Annex C[3].

The EIS uses the most recent statistics from Eurostat and other internationally recognised sources as available at the time of analysis. International sources have been used wherever possible in order to improve comparability between countries. It is important, as indicated in Table 1[4], to note that the data relates to actual performance in 2006, 2007 and 2008. As a consequence the 2009 EIS does not capture the most recent changes in innovation performance, or the impact of policies introduced in recent years which may take some time to impact on innovation performance. Nor does it capture the impact of the financial crisis on innovation performance.

TABLE 1: INDICATORS FOR THE EIS 2008-2010

EIS dimension / indicator		Data source (reference year)[5]
ENABLERS		
	Human resources	
1.1.1	S&E and SSH graduates per 1000 population aged 20-29 (first stage of tertiary education)	Eurostat (2007)
1.1.2	S&E and SSH doctorate graduates per 1000 population aged 25-34 (second stage of tertiary education)	Eurostat (2007)
1.1.3	Population with tertiary education per 100 population aged 25-64	Eurostat (2008)
1.1.4	Participation in life-long learning per 100 population aged 25-64	Eurostat (2008)
1.1.5	Youth education attainment level	Eurostat (2008)

[3] *The rationale for including these dimensions and indicators is discussed in the 2008 Methodology Report.*
[4] *Of the 29 indicators, 12 indicators capture in performance in 2008, 6 indicators capture performance in 2007, 10 indicators capture performance in 2006 and 1 indicator captures performance in 2005.*
[5] *Exceptions to the reference years are shown in Annex C. For some indicators weighted averages have been used, more details are available in Annex C.*

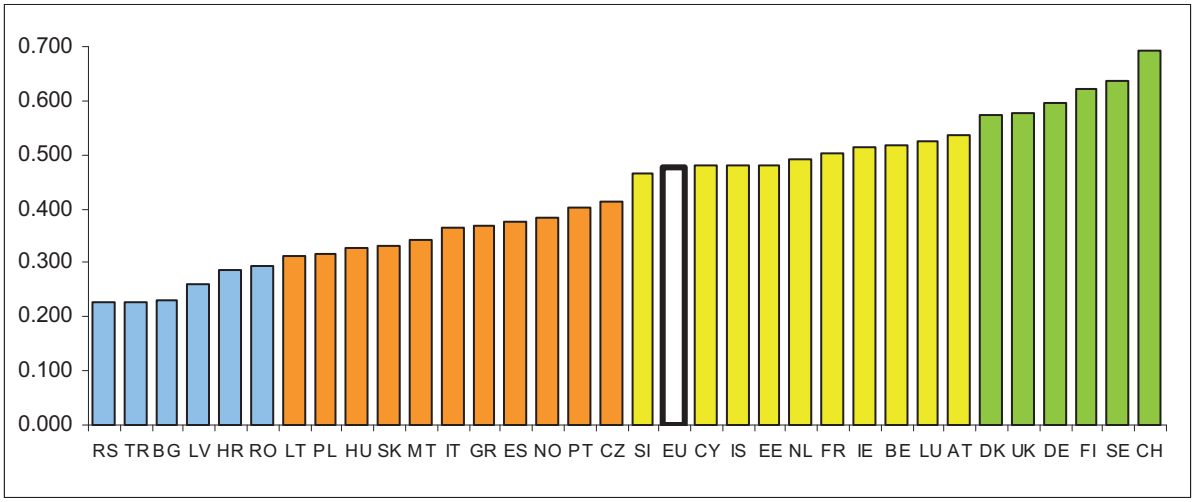
	Finance and support	
1.2.1	Public R&D expenditures (% of GDP)	Eurostat (2008)
1.2.2	Venture capital (% of GDP)	EVCA / Eurostat (2008)
1.2.3	Private credit (relative to GDP)	IMF (2008)
1.2.4	Broadband access by firms (% of firms)	Eurostat (2008)
FIRM ACTIVITIES		
	Firm investments	
2.1.1	Business R&D expenditures (% of GDP)	Eurostat (2008)
2.1.2	IT expenditures (% of GDP)	EITO / Eurostat (2006)
2.1.3	Non-R&D innovation expenditures (% of turnover)	Eurostat (2006)
	Linkages & entrepreneurship	
2.2.1	SMEs innovating in-house (% of SMEs)	Eurostat (2006)
2.2.2	Innovative SMEs collaborating with others (% of SMEs)	Eurostat (2006)
2.2.3	Firm renewal (SME entries plus exits) (% of SMEs)	Eurostat (2005)
2.2.4	Public-private co-publications per million population	Thomson Reuters / CWTS (2007)
	Throughputs	
2.3.1	EPO patents per million population	Eurostat (2006)
2.3.2	Community trademarks per million population	OHIM / Eurostat (2008)
2.3.3	Community designs per million population	OHIM / Eurostat (2008)
2.3.4	Technology Balance of Payments flows (% of GDP)	World Bank (2008)
OUTPUTS		
	Innovators	
3.1.1	SMEs introducing product or process innovations (% of SMEs)	Eurostat (2006)
3.1.2	SMEs introducing marketing or organisational innovations (% of SMEs)	Eurostat (2006)
3.1.3	Resource efficiency innovators, calculated as the average of:	
	Share of innovators where innovation has significantly reduced labour costs (% of firms)	Eurostat (2006)
	Share of innovators where innovation has significantly reduced the use of materials and energy (% of firms)	Eurostat (2006)
	Economic effects	
3.2.1	Employment in medium-high & high-tech manufacturing (% of workforce)	Eurostat (2008)
3.2.2	Employment in knowledge-intensive services (% of workforce)	Eurostat (2008)
3.2.3	Medium and high-tech manufacturing exports (% of total exports)	UN (2008)
3.2.4	Knowledge-intensive services exports (% of total services exports)	UN / Eurostat (2007)
3.2.5	New-to-market sales (% of turnover)	Eurostat (2006)
3.2.6	New-to-firm sales (% of turnover)	Eurostat (2006)

3. European Innovation Scoreboard: 2009 Findings

3.1 Innovation performance

The Summary Innovation Index (SII) gives an "at a glance" overview of aggregate national innovation performance and is calculated as a composite of the 29 EIS indicators (see Section 8.1 for the methodology for calculating composite indicators[6]). Figure 2 shows the results for the 2009 SII for 33 European countries[7]. Compared to the EIS 2007, non-European countries are no longer directly included in the EIS[8].

FIGURE 2: INNOVATION PERFORMANCE (2009 SUMMARY INNOVATION INDEX)



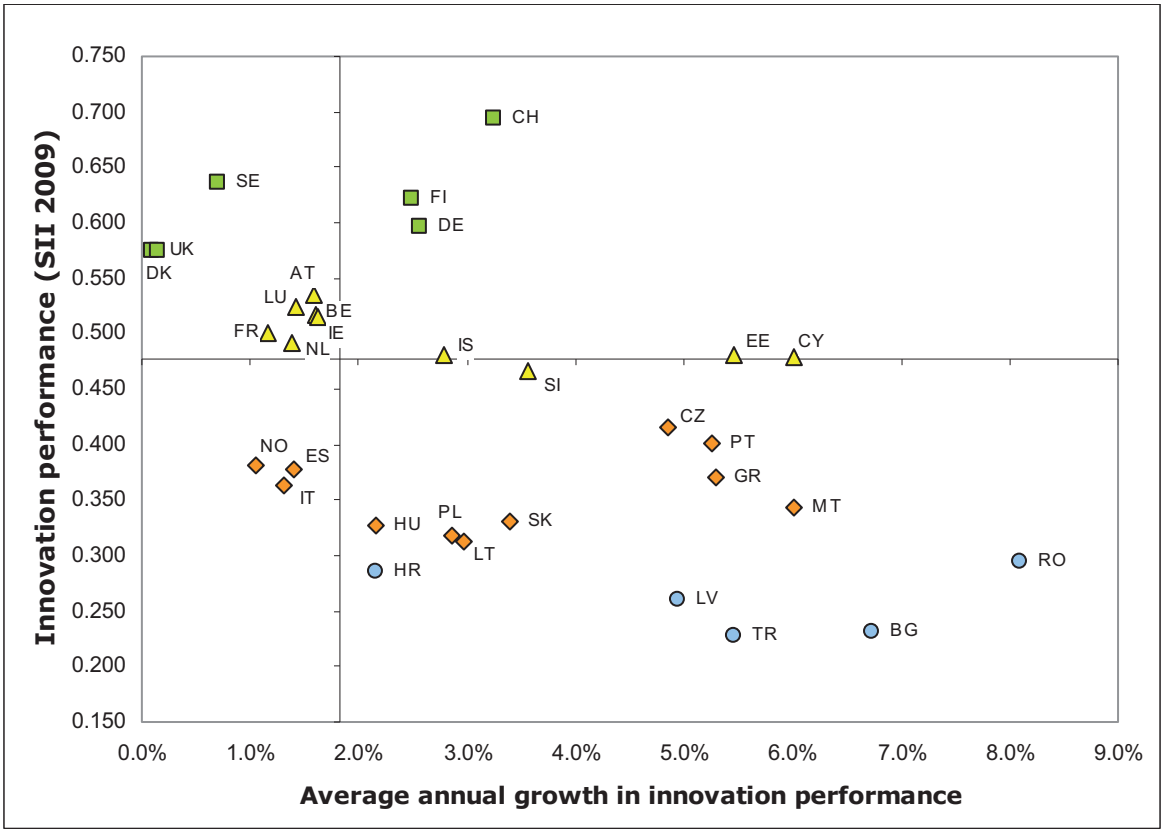
Data for the underlying indicators are for 2005 (3.4%), 2006 (34.5%), 2007 (13.8%) and 2008 (48.3%).

Based on a statistical cluster analysis[9] of the SII scores over a five-year period, the countries can be divided into the following groups[10]:

- Denmark, Finland, Germany, Sweden, Switzerland and the UK are the **Innovation leaders**, with innovation performance well above that of the EU27 and all other countries.
- Austria, Belgium, Cyprus, Estonia, France, Iceland, Ireland, Luxembourg, the Netherlands and Slovenia are the **Innovation followers**, with innovation performance below those of the innovation leaders but close to or above that of the EU27.
- Czech Republic, Greece, Hungary, Italy, Lithuania, Malta, Norway, Poland, Portugal, Slovakia and Spain are the **Moderate innovators** with innovation performance below the EU27.
- Bulgaria, Croatia, Latvia, Romania, Serbia and Turkey are the **Catching-up countries.** Although their innovation performance is well below the EU27 average, this performance is increasing towards the EU27 average over time (Figure 3).

[6] The SII has also been calculated retrospectively using the EIS 2008 methodology for the last five years to enable comparability of results; the SII time series is provided in Annex D.
[7] All of the European countries shown have good data availability, i.e. for at least 70% of the indicators (i.e. for 22 of the 29 indicators).
[8] Non-European countries in the EIS 2007 included Australia, Canada, Israel, Japan and the United States.
[9] The country groups have been identified using the average results of hierarchical clustering using 7 different clustering methods: Ward's method, between groups linkage, within-groups linkage, nearest neighbour, furthest neighbour, centroid clustering and median clustering.
[10] The names of the country groups are identical to those used in the EIS 2008 report.

FIGURE 3: CONVERGENCE IN INNOVATION PERFORMANCE



Colour coding matches the groups of countries identified in Section 3.1: green are the Innovation leaders, yellow are the Innovation followers, orange are the Moderate innovators, blue are the Catching-up countries. Average annual growth rates as calculated over a five-year period. The dotted lines show EU27 performance and growth.

3.2 Growth performance

The growth in innovation performance has been calculated for each country and for the EU27 as a block using data over a five-year period[11]. This calculation is based on absolute changes in the indicators. All countries show an absolute improvement in the innovation performance over the period. Romania has experienced the fastest growth in performance.

Within the four identified country groups growth performance is very different and Table 2 identifies the growth leaders within each group. Within the Innovation leaders, Switzerland is the growth leader but also Finland and Germany show a growth performance clearly above that of the EU27. Cyprus and Estonia are the growth leaders of the Innovation followers, followed by Iceland and Slovenia. Of the Moderate innovators eight countries have grown faster than the EU27, but three countries have shown a slower progress: Italy, Norway and Spain. The growth leaders here are Czech Republic, Greece, Malta and Portugal. All Catching-up countries have grown at a faster pace than the EU27. Bulgaria and Romania are the growth leaders also showing the overall fastest rate of improvement in innovation performance.

[11] *The methodology for calculating growth rates is described in Section 8.2.*

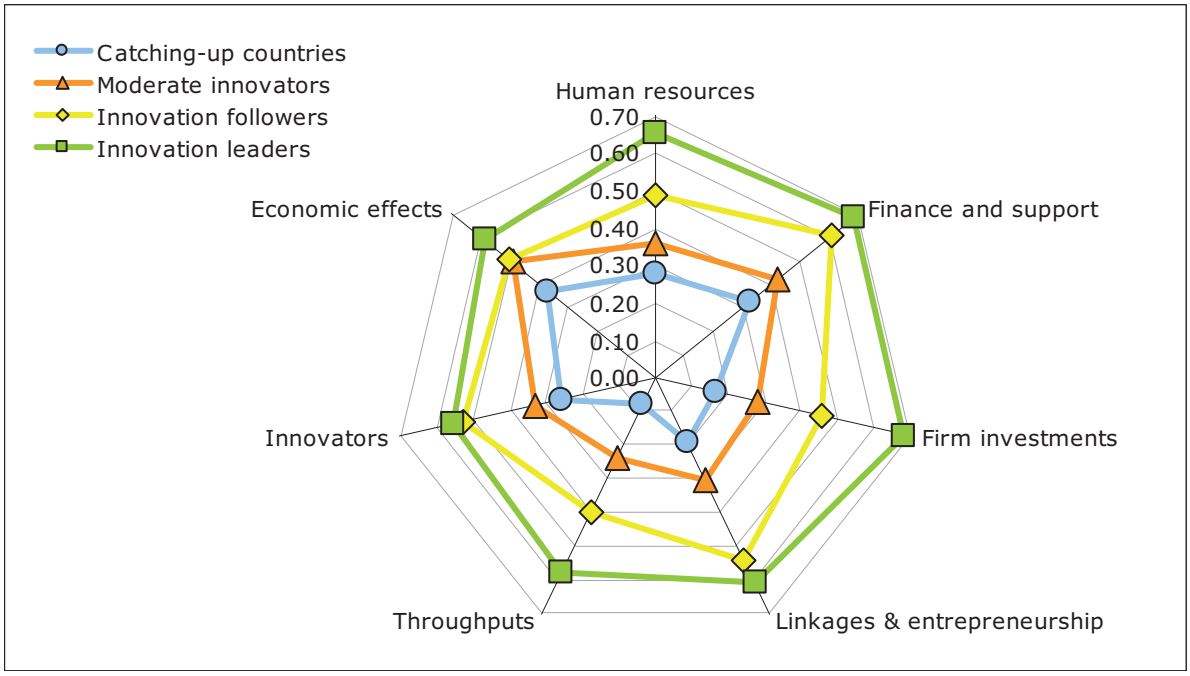
The average growth rates for the four country groups (Table 2) show that there is between group convergence with the Innovation followers growing at a faster rate than the Innovation leaders, the Moderate innovators growing faster than the Innovation followers and the Catching-up countries growing at a faster rate than the Moderate innovators. The overall process of catching up, where countries with below average performance have faster growth rates than those with above average performance, can also be observed at the level of most individual countries.

TABLE 2: INNOVATION GROWTH LEADERS

Group	Growth rate	Growth leaders	Moderate growers	Slow growers
Innovation leaders	1.5%	Switzerland (CH)	Finland (FI), Germany (DE)	Denmark (DK), Sweden (SE), United Kingdom (UK)
Innovation followers	2.7%	Cyprus (CY), Estonia (EE)	Iceland (IS), Slovenia (SI)	Austria (AT), Belgium (BE), France (FR), Ireland (IE), Luxembourg (LU), Netherlands (NL)
Moderate innovators	3.3%	Czech Republic (CZ), Greece (GR), Malta (MT), Portugal (PT)	Hungary (HU), Lithuania (LT), Poland (PL), Slovakia (SK)	Italy (IT), Norway (NO), Spain (ES)
Catching-up countries	5.5%	Bulgaria (BG), Romania (RO)	Latvia (LV), Turkey (TR)	Croatia (HR)

Average annual growth rates as calculated over a five-year period.

FIGURE 4: COUNTRY GROUPS: INNOVATION PERFORMANCE PER DIMENSION



3.3 Innovation dimensions

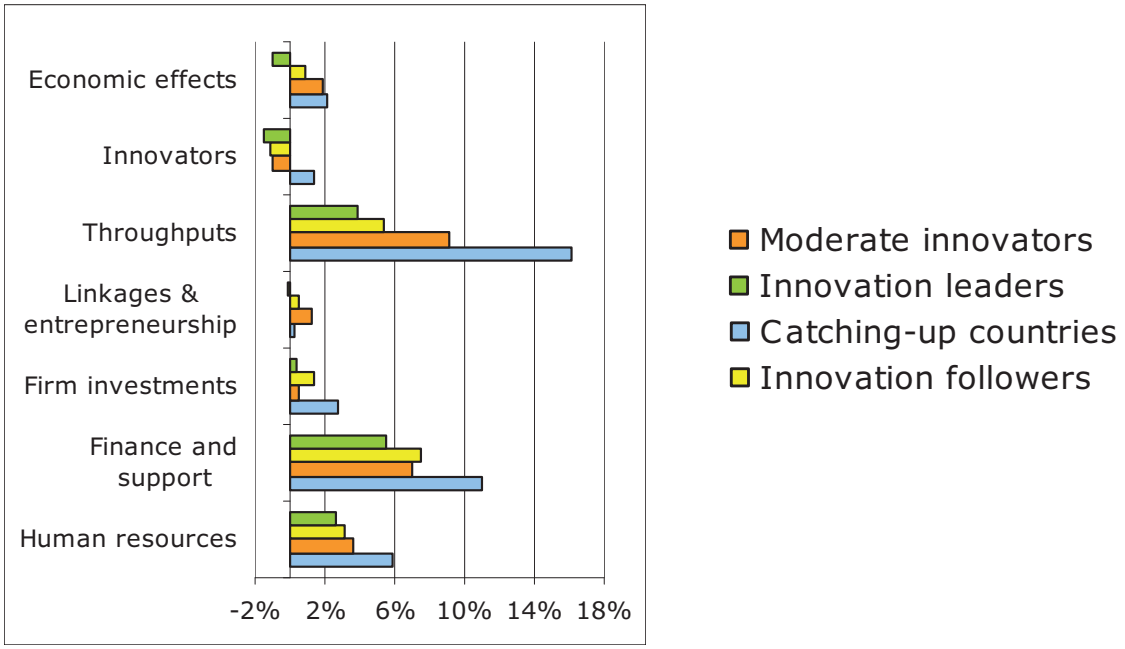
The performance of the four country groups across the different innovation dimensions is shown in Figure 4 (country level profiles are provided in Section 7). The Innovation leaders and the Innovation followers have the smallest variance in their performance across the different dimensions[12]. This suggests that high levels of performance require countries to perform relatively well over all the dimensions of innovation. For the Innovation followers performance in Firm investments is a relative weakness.

For the Moderate innovators and Catching-up countries the pattern of performance is less balanced across the dimensions. Moderate innovators, on average, show a relatively strong performance in Finance and support and a relatively weak performance in Throughputs. The Catching-up countries show a relatively strong performance in Economic effects and a relatively weak performance in Throughputs.

Growth performance of the four country groups shows some similarities as well as differences (Figure 5). In all groups, the strongest drivers of growth are Throughputs, Finance and support and Human resources. The Moderate innovators and Catching-up countries show improvements in Economic effects, Linkages & entrepreneurship and Firm investments, while the Innovation leaders and Innovation followers are on average stagnating or declining across these dimensions except for Firm investments. Three groups show some decline in the Innovators dimension, only the Catchingup countries show some improvement. Figure 5 confirms that the overall convergence process as shown in Figure 3 also generally takes place within each innovation dimension.

Country rankings for each innovation dimension are shown in Figures 6 and 7. Within the different innovation dimensions, the Innovation leaders on average take the leading spots, in particular in the Enablers and Firm activities dimensions, followed by the Innovation followers (Figure 6). Growth performance is dominated by the Moderate innovators and Catching-up countries in all dimensions (Figure 7)[13]. Figures 6 and 7 combined lead to a number of interesting observations which will be discussed next.

FIGURE 5: COUNTRY GROUPS: GROWTH PERFORMANCE PER DIMENSION



Average annual growth rates as calculated over a fiveyear period.

[12] *The variance across all 7 dimensions is 0.22% for the Innovation leaders, 0.37% for the Innovation followers, 0.66% for the Moderate innovators and 0.82% for the Catching-up countries.*

[13] *The average number of top-10 growth performances per Catching-up country is 4.2, per Moderate innovator 2.7, per Innovation follower 1.5 and per Innovation leader 0.7.*

Innovation leaders (Denmark, Finland, Germany, Sweden, Switzerland, United Kingdom)

All Innovation leaders except Germany perform well in Human resources. However, these countries are among the slow to average growers in this dimension. This may be due to their high performance level which means that there is less room for rapid improvements. Within Finance and support Germany is showing the weakest performance and also its growth performance is relatively weak. Switzerland and the UK are the only Innovation leaders showing a strong growth in this dimension, in particular due to very rapid growth in Venture capital for Switzerland and Broadband access by the UK. All Innovation leaders combine a high performance level in Firm investments with either moderate rates of improvement (Finland, Germany, UK) or moderate declines (Denmark, Sweden). In Linkages & entrepreneurship all Innovation leaders show a strong performance, but only Finland, Germany and Switzerland have managed to improve their performance. Switzerland is the best performer in Throughputs and it also has the highest growth rate, closely followed by Finland, Germany and Sweden. Within the Innovators dimension, performance is most unequal, with Germany and Switzerland performing very strongly and Denmark, Finland and Sweden performing moderately. Only Finland has managed to improve its performance in this dimension showing the fastest growth of all countries. Germany is leading in Economic effects and as Finland and Switzerland it managed to improve its performance in this dimension relative to that of the EU27.

Innovation followers (Austria, Belgium, Cyprus, Estonia, France, Iceland, Ireland, Luxembourg, Netherlands, Slovenia)

In Human resources Ireland is notable in combining a high performance level and a strong growth performance. Austria, Belgium, France and Luxembourg are among the slowest growers in Human resources across the EU27 and Estonia and Ireland are among the fastest growers. Iceland and the Netherlands are performing relatively well in Finance and support; Austria, Belgium, Ireland and Slovenia are performing below the EU27 average. Luxembourg is showing the fastest rate of improvement of the Innovation followers whereas Austria and France are showing almost no improvement. Austria and Estonia are performing strongly in Firm investments where both also show a high rate of improvement relative to the other Innovation followers. All Innovators followers, except Luxembourg, show above average performance in Linkages & entrepreneurship. Growth performance of Luxembourg and Ireland is among the worst of all countries but Cyprus is showing the overall highest rate of improvement. Most Innovation followers do relatively well in Throughputs, in particular Luxembourg, which is also showing an above EU27 average growth performance. Also Cyprus, Estonia, Iceland, and Slovenia show a relative improvement in their performance compared with the EU27 average. All Innovation followers perform above the EU27 average in the Innovators dimension except Iceland and the Netherlands, but the Netherlands is the only Innovation follower which has managed to improve its performance. In Economic effects Ireland is showing the strongest performance followed by Austria and France, and Austria, Estonia and in particular Cyprus are showing the highest rates of improvement.

Moderate innovators (Czech Republic, Greece, Hungary, Italy, Lithuania, Malta, Norway, Poland, Portugal, Slovakia, Spain)

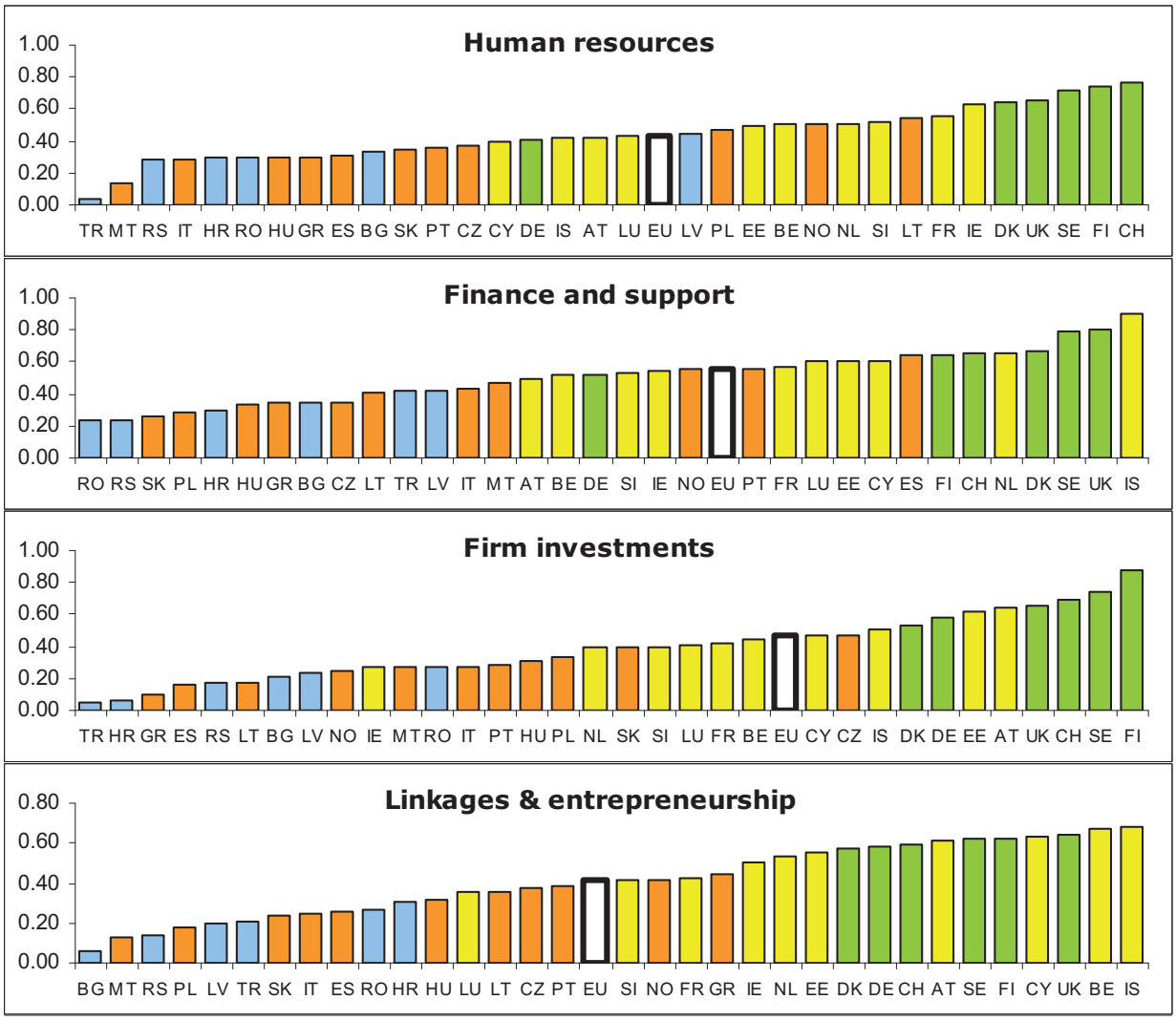
In Human resources Lithuania, Norway and Poland show above EU27 average performance, and, except for Hungary and Spain, all Moderate innovators show an above EU27 rate of improvement with Malta and Portugal showing the overall highest rates of improvement. In Finance and support only Portugal and Spain show above EU27 average performance; Czech Republic and Greece are among the fastest growing countries. In Firm investments Czech Republic performs above the EU27 average and six Moderate innovators have managed to improve their performance relative to that of the EU27, in particular Portugal and Spain. Linkages & entrepreneurship shows two Moderate innovators performing above average. Except for Spain all Moderate innovators show an above EU27 rate of improvement with Greece and Malta being among the fastest growers of all countries. In Throughputs all Moderate innovators perform below average. Nine of these countries have managed to improve their performance faster than the EU27 in this dimension, while the growth performance of Italy and Spain is among the weakest of all countries. In Innovators Czech Republic, Greece and Portugal show above EU27 average performance; only Greece and Slovakia have managed to improve their performance in this dimension. Czech Republic, Malta and Slovakia perform above average in Economic effects while all other Moderate innovators perform below average. Growth performance of Greece and Hungary is among the highest of all countries, and also Czech Republic, Lithuania, Portugal, Slovakia and Spain have grown faster than the EU27.

Catching-up countries (Bulgaria, Croatia, Latvia, Romania, Serbia, Turkey)

The Catching-up countries generally perform below EU27 average on Human resources, with the exception of Latvia. Growth performance is above average, with all countries growing at a rate above average[14]. Performance in Finance and Support is below average for all Catching-up countries, but Bulgaria, Latvia, Turkey and in particular Romania have grown

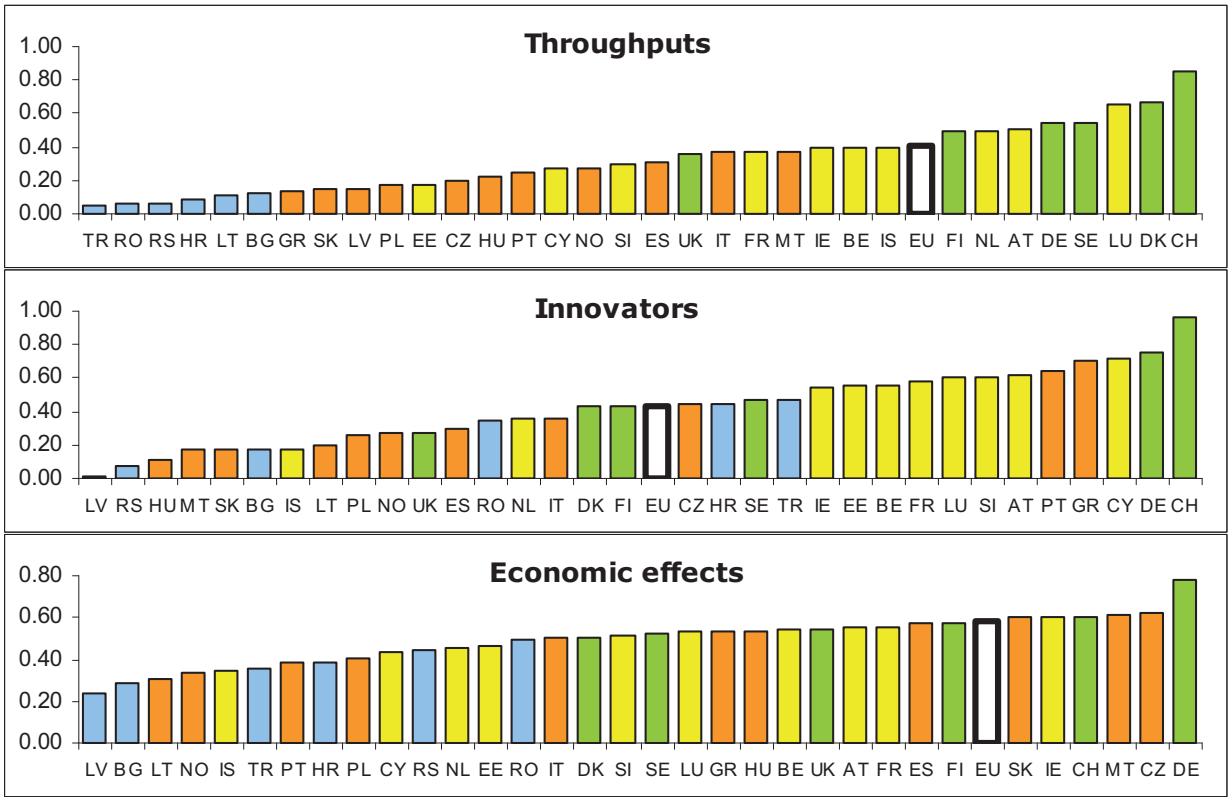
faster than average. Of the Catching-up countries Romania is the best performer in Firm investments, while Bulgaria and Turkey are among the fastest growing countries. In Linkages & entrepreneurship no Catching-up country is performing above the EU27 average but the majority of countries have grown faster than the EU27 average with only Latvia experiencing a strong decline in performance. In Throughputs all Catching-up countries perform below average but are also showing the strongest rates of improvement. Bulgaria and Romania are the fastest growing of all countries in Throughputs and also Latvia and Turkey show high rates of improvement. Performance in Innovators shows that Croatia and Turkey are performing above the EU27 average, but also that three Catching-up countries have the lowest levels of performance. Only two Catching-up countries have managed to improve their performance, in particular Bulgaria, which is having one of the fastest rates of improvement. None of the Catchingup countries is performing above EU27 average in Economic effects. Growth performance is more diverse, with only Bulgaria improving at a slower rate than the EU27 average.

FIGURE 6: INNOVATION PERFORMANCE PER DIMENSION



[14] *In the discussion on Catching-up countries "all countries" excludes Serbia as for this country insufficient time series data are available to calculate improvement over time.*

FIGURE 6: INNOVATION PERFORMANCE PER DIMENSION



Colour coding matches the groups of countries identified in Section 3.1: green are the Innovation leaders, yellow are the Innovation followers, orange are the Moderate innovators, blue are the Catching-up countries.

FIGURE 7: GROWTH PERFORMANCE PER DIMENSION

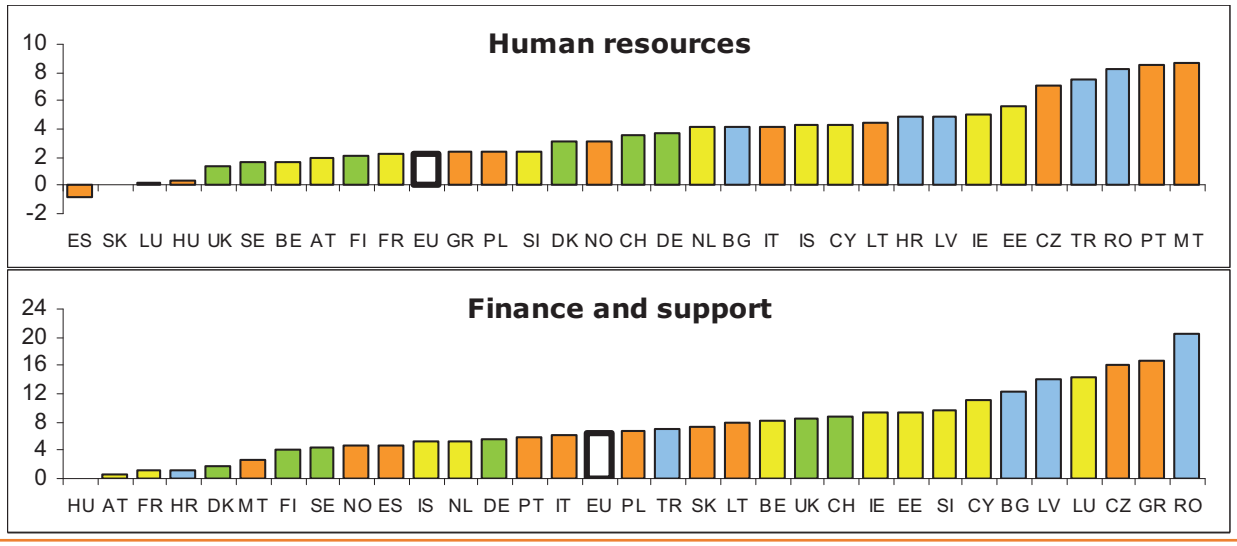
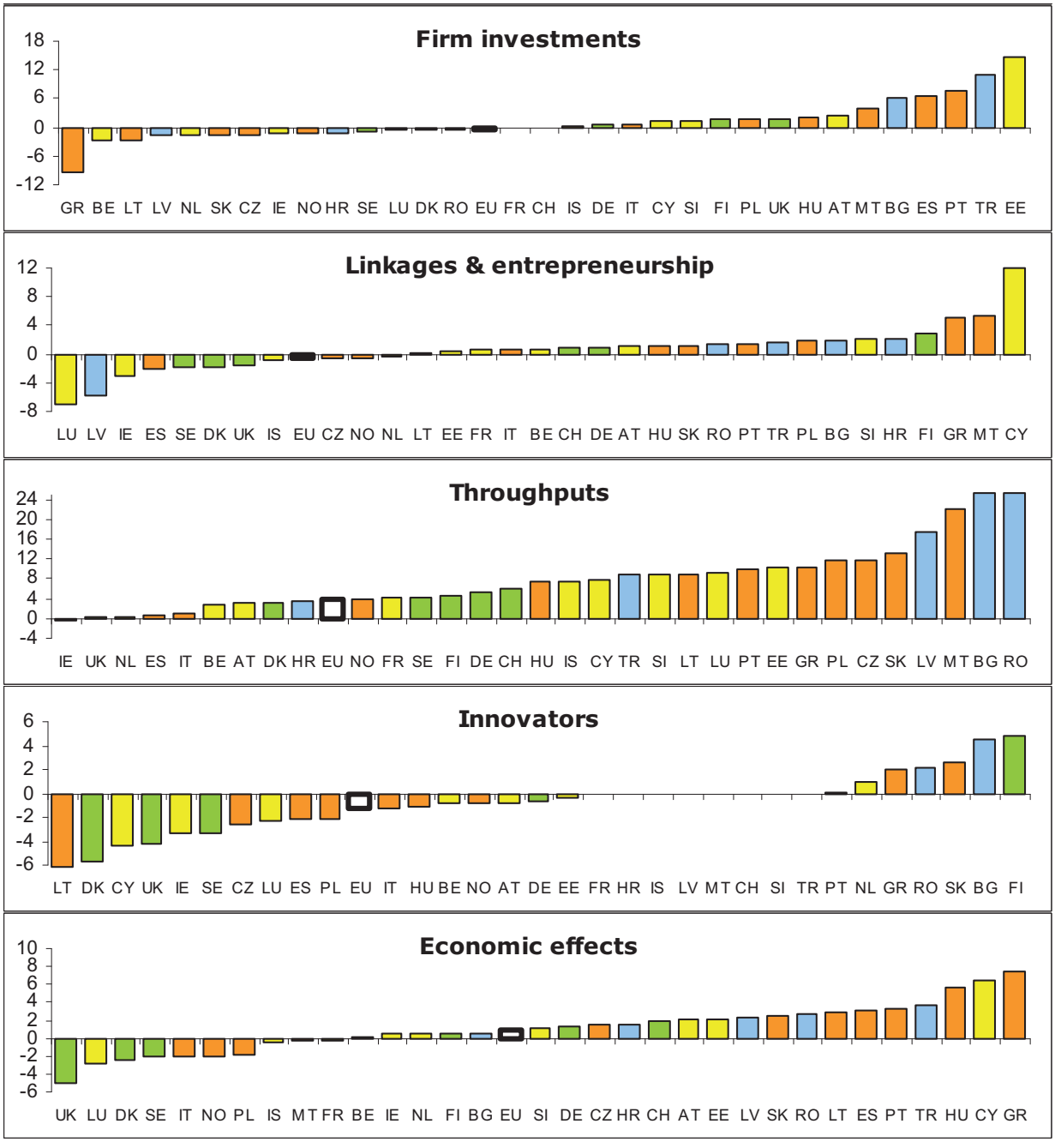


FIGURE 7: GROWTH PERFORMANCE PER DIMENSION



Colour coding matches the groups of countries identified in Section 3.1: green are the Innovation leaders, yellow are the Innovation followers, orange are the Moderate innovators, blue are the Catching-up countries.

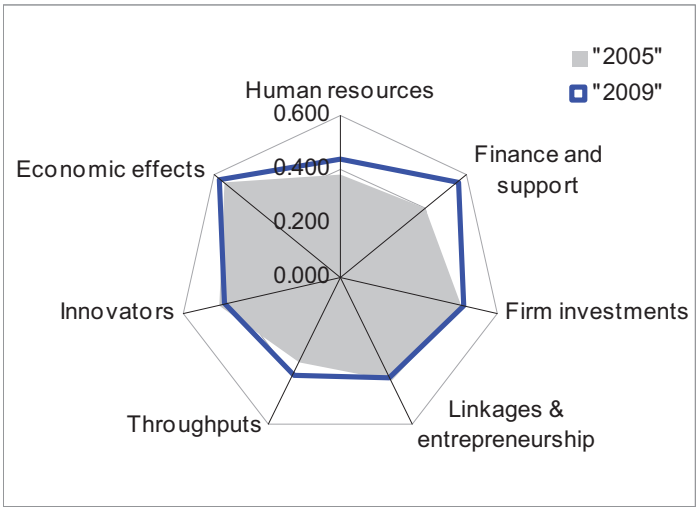
3.4 EU27 performance

The analysis of the EU27 growth rate in innovation performance shows an average annual growth rate of 1.8% over a five year period. This improvement is particularly due to Human resources (2.3%), Finance and support (6.5%) and Throughputs (3.8%) where the EU27 has progressed most compared to 2005 (Figure 8). In Economic effects (0.9%) improvement has been small and in Firm investments (-0.4%), Linkages & entrepreneurship (-0.6%) and Innovators (- 1.3%) improvement has worsened.

Within the individual indicators, the EU27 is showing relative strengths[15] in Youth education, Public R&D expenditures, Broadband access, IT expenditures, Knowledge-intensive services employment, Medium-high and high-tech manufacturing exports, Knowledge-intensive services exports and Sales of new-to-market products (Figure 9). The EU27 is showing relative weaknesses in S&E and SSH doctorate degrees, Life-long learning, Innovative SMEs collaborating with others, Technology Balance of Payments flows and Resource efficiency innovators.

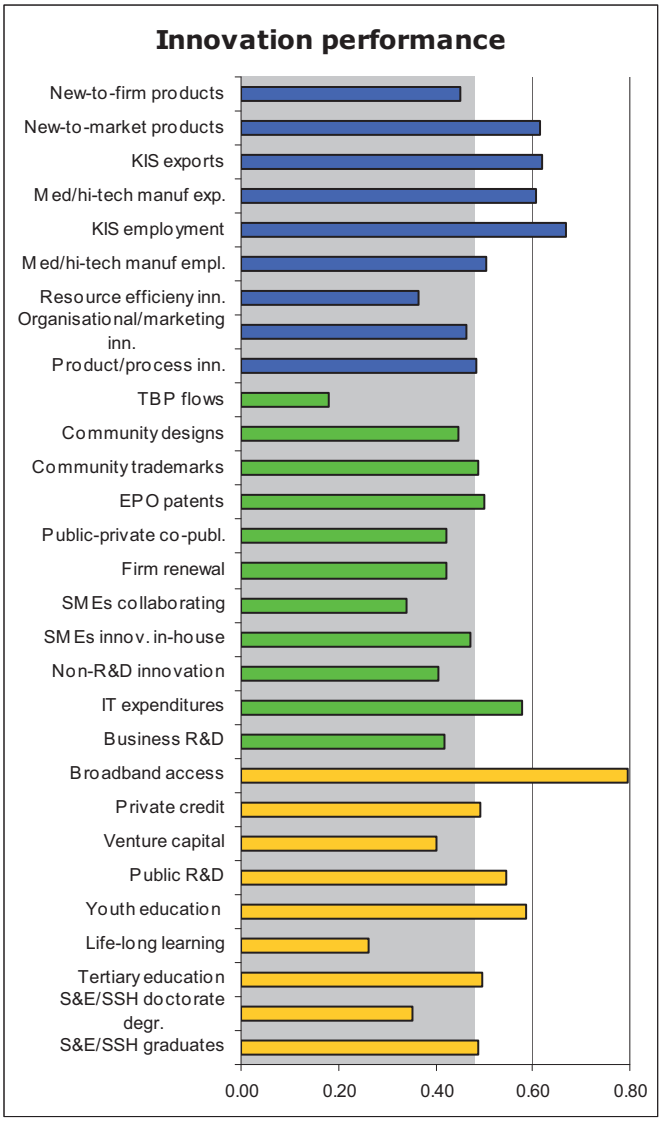
The EU27 is showing a strong growth in the Enablers dimensions, in particular in S&E and SSH graduates, Venture capital, Private credit and Broadband access. Growth in Firm activities is strongest in Throughputs, in particular in Community trademarks, Community designs and Technology Balance of Payment (TBP) flows. Overall growth is weakest in Outputs, both in Innovators and Economic effects. All indicators show a negative growth rate except for New-to-market product sales. Performance is declining for 7 indicators, in particular for Non-R&D innovation expenditures and Firm renewal.

FIGURE 8: EU27 DRIVERS OF GROWTH

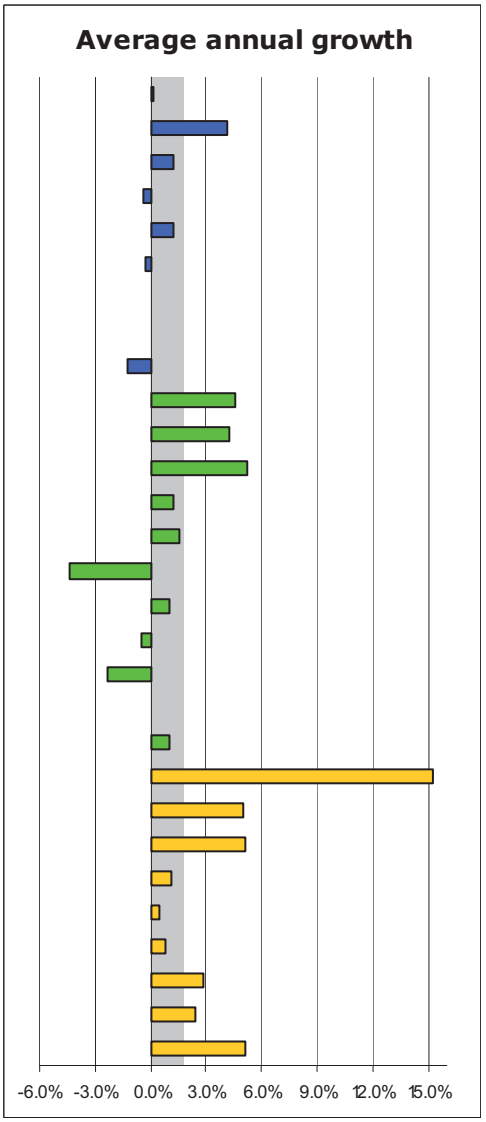


[15] *A relative strength means that the performance of the EU27 on that indicator is above the average performance of the EU27 on all indicators.*

FIGURE 9: EU27 INNOVATION PERFORMANCE AND GROWTH PER INDICATOR



The shaded area gives the average performance for all indicators.



The shaded area gives the average growth rate for all indicators. Average annual growth rates are calculated over a five-year period.

The indicators reflecting Enablers are highlighted in yellow, those reflecting Firm activities in green and those reflecting Outputs in blue.

4. Impact of the financial crisis

The financial crisis which started in 2007 has triggered a global economic downturn. This has resulted in at first falling economic growth rates followed by a real economic decline in many countries. Indicators of innovation performance, including those used in EIS, have a time lag of one or more years and therefore do not yet reveal the full impact of the crisis that reached its height in the second half of 2008.

A thematic paper has been produced[16] based on an analysis of the Innobarometer 2009 survey (EC, 2009b) of innovating firms in the EU27 which was conducted in April 2009. The survey data indicates that 23% of innovative firms had decreased their innovation expenditures as a direct result of the economic downturn, and that 29% of firms expected their 2009 innovation expenditures to be lower than in 2008. This showed a marked transition from the period 2006-08 where only 9% of firms had decreased innovation expenditures. The analysis in this paper uses micro-data from the survey to analyse which factors appear to have influenced firms' decisions to reduce innovation expenditure and to consider what the longer term impacts of this could be. The main findings are as follows.

Firms that are more innovative are less likely to cut back on innovation expenditures.

This finding goes against the initial hypothesis that firms with higher levels of innovation expenditure would be more likely to cut back. It is a positive finding and suggests that the EU27's most innovative firms may be relatively less affected by the economic crisis. Moreover, the analysis shows:

- Firms where innovative products and services account for a larger share of sales are less likely to reduce innovation expenditures.
- Firms that perform R&D as part of their innovation activities are less likely to reduce overall innovation expenditures.
- At the firm level, there is no significant difference between those with high overall innovation expenditures and others in the likelihood to have reduced innovative expenditures. However, at the sectoral level, firms in the medium to high innovation intensive sectors are more likely to expect to cut their innovation expenditures.
- Firms that view cost cutting as the main source of future competitive advantage are more likely to reduce innovation expenditures.

Firms pursuing broader innovation strategies are in some cases less likely to have reduced their innovation expenditure.

This finding tends to support the hypothesis that broader strategies (i.e. that include user innovation, open innovation etc.) make firms more resilient to economic downturns. This is consistent with the EIS thematic paper on user innovation, which shows that "user innovator" firms tend to be more successful innovators. However the findings are inconclusive in that:

- Firms with innovation strategies that involve users and those that use knowledge management systems, are less likely to expect to reduce their innovation expenditures.
- However firms with strategies to integrate different activities in support of innovation (such as staff rotations, but also knowledge management systems) are more likely to have reduced their innovation expenditures in the recent past.

The economic crisis may lead to a reversal of the convergence between EU27 countries in innovation performance.

The 2008 European Innovation Scoreboard showed a clear process of convergence between EU27 Member States. In the 2009 Scoreboard, this process is less clear but this still does not capture the full impacts of the crisis as most data come from 2007 and 2008. The findings in this report suggest that the rapid advances in innovation performance made in many lower performing countries may not be maintained, at least in the short term, due to the severity of the economic crisis. More specifically, the analysis shows that:

- Firms in countries which have been experiencing the fastest rates of improvement in their innovation performance have been affected most by the economic crisis.
- Firms in countries with the largest economic downturns are more likely to reduce their innovation expenditures.

Firm size does not appear to be a relevant factor.

The analysis, somewhat surprisingly, finds no difference between small and large firms in their likelihood to have reduced innovation expenditures, although medium-sized firms (50-249 employees) appear less likely to further reduce their innovation expenditures.

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[16] *Kanerva, M. and H. Hollanders, "The Impact of the Economic Crisis on Innovation - Analysis based on the Innobarometer 2009 survey". Available at http://www.proinno-europe.eu/metrics*

5. Comparison of EU27 innovation gap with main competitors

5.1 US and Japan

The US and Japan are not included in the main EIS analysis as for both countries data are missing for too many indicators. For the innovation gap comparison, we use a different set of 19 indicators of which 14 indicators are identical to those of the EIS (Table 3). The EIS indicators on S&E and SSH graduates have been replaced with the EIS 2007 indicator on S&E graduates. Broadband access by firms is replaced by the share of broadband subscribers and the share of researchers[17] has been added as an additional indicator for Enablers. For Firm activities, an additional indicator is PCT patents[18] (to compensate for a possible home advantage in only using European Patent Office registrations) and trademarks is a weighted average of the EIS indicator on Community trademarks and an indicator from the World Development Indicators measuring national trademark applications by residents (also to compensate for a possible home advantage). For Japan, data for venture capital are not available and data for the employment shares in medium-high and high-tech manufacturing and knowledge-intensive services are for 2003.

TABLE 3: EU27-US-JAPAN INDICATORS

	Data source	Reference year
ENABLERS		
* S&E graduates per 1000 population aged 20-29	Eurostat	2007
Population with tertiary education per 100 population aged 25-64	Eurostat	2007
* Researchers per 1000 population	OECD (MSTI database) / Eurostat	2007 (2006 for US)
Public R&D expenditures (% of GDP)	Eurostat	2007
Venture capital (% of GDP)	EVCA / Eurostat	2008 (no data for JP)
Private credit (relative to GDP)	IMF	2008
* Broadband subscribers per 1000 population	World Bank (World Development Indicators)	2006
FIRM ACTIVITIES		
Business R&D expenditures (% of GDP)	Eurostat	2007
IT expenditures (% of GDP)	EITO / Eurostat	2006
Public-private co-publications per million population	Thomson Reuters / CWTS	2007
EPO patents per million population	Eurostat	2005
* PCT patents per million population	OECD	2005
* Trademarks per million population, average of: • Community trademarks per million population • Trademark applications (residents) per million population	 OHIM / Eurostat World Bank (World Development Indicators)	 2007 2007
Technology Balance of Payments flows (% of GDP)	World Bank (World Development Indicators)	2007
OUTPUTS		
Employment in medium-high & high-tech manufacturing (% of workforce)	Eurostat / OECD	2006 (2003 for JP)
Employment in knowledge-intensive services (% of workforce)	Eurostat / OECD	2006 (2003 for JP)
Medium and high-tech manufacturing exports (% of total exports)	Eurostat	2007
Knowledge-intensive services exports (% of total services exports)	Eurostat	2007

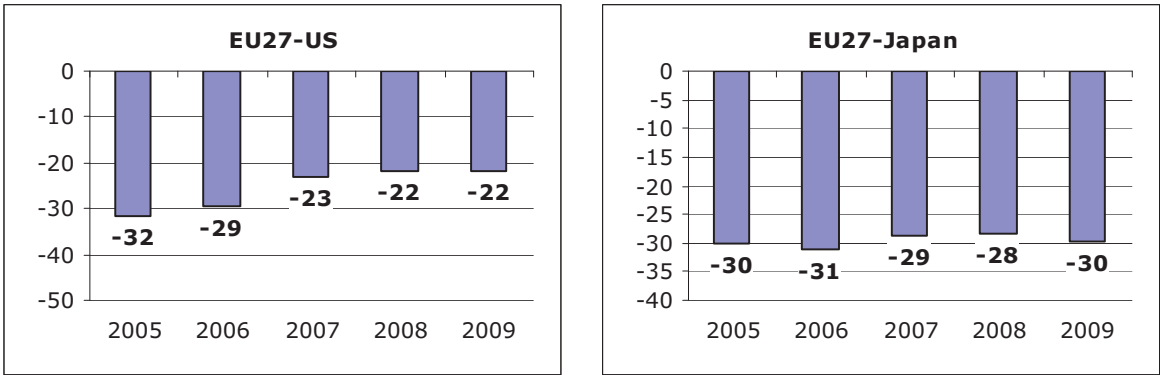
The indicators highlighted with an * are not identical to but proxies for the EIS indicators.

Figure 10 shows that the innovation performance of the US and Japan is well above that of the EU27. The EU27-US gap has dropped significantly[19] up until 2007, but in the last 3 years the relative progress of the EU27 has slowed down. The EU27-Japan gap has remained stable between 2005 and 2009 although the gap has decreased up until 2008 but has increased again in 2009.

[17] *"Researchers are viewed as the central element of the research and development system. They are defined as professionals engaged in the conception and creation of new knowledge, products, processes, methods and systems and are directly involved in the management of projects" (OECD Science, Technology and Industry Scoreboard 2007).*

[18] *The Patent Cooperation Treaty (PCT) is an international treaty, administered by the World Intellectual Property Organization (WIPO), between more than 125 countries. The PCT makes it possible to seek patent protection for an invention simultaneously in each of a large number of countries by filing a single "international" patent application instead of filing several separate national or regional patent applications although the granting of patents remains under the control of the national or regional patent offices.*

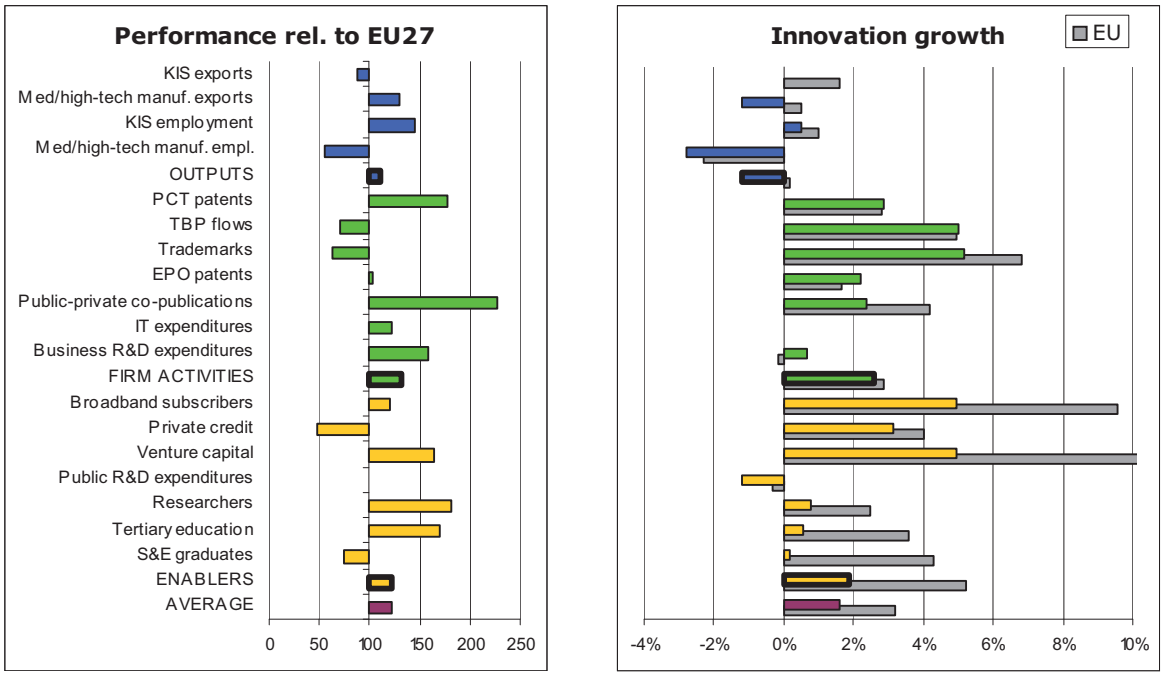
FIGURE 10: EU27 INNOVATION GAP TOWARDS US AND JAPAN



Performance for each reference year is measured using, on average, data with a two-year lag (e.g. performance for 2009 is measured using data for 2007).

The US is performing better than the EU27 in 11 indicators, only in S&E graduates, Private credit, Trademarks, Technology Balance of Payments flows, Medium-high and high-tech manufacturing employment and Knowledge-intensive services is the EU27 performing better (Figure 11). Overall there is a clear performance gap in favour of the US, with the US showing a better performance in Enablers, Firm activities and Outputs. But the US innovation lead is declining, as its innovation performance has grown at an annual rate of 1.63% while the EU27 is growing at an annual rate of 3.17%[20]. It is striking that the EU27 outperforms the US in growth performance in all of the indicators except Business R&D expenditures, EPO patents, TBP flows and PCT patents. The EU27 is closing the performance gap with the US in Tertiary education, Researchers, Public R&D expenditures, Venture capital, Broadband subscribers, Business R&D expenditures, Public-private co-publications, Knowledge-intensive services employment and Mediumhigh and high-tech manufacturing exports. The EU27 is increasing its lead in S&E graduates, Private credit, Trademarks, Medium-high and high-tech manufacturing employment and Knowledge-intensive services exports. The US is slightly improving its lead in EPO patents and PCT patents.

FIGURE 11: EU27-US COMPARISON



Average annual growth rates are calculated over a five-year period.

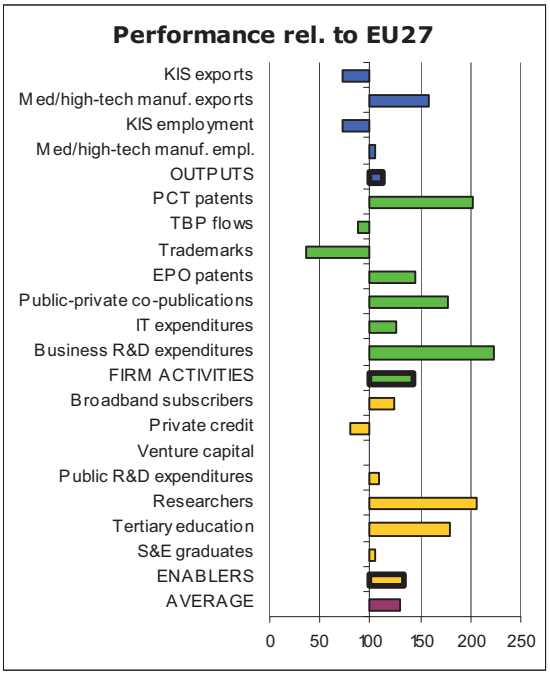
The indicators reflecting Enablers are highlighted in yellow, those reflecting Firm activities in green and those reflecting Outputs in blue.

[19] *Due to the inclusion of the Private credit indicator the results reported here are not directly comparable to those reported in the EIS 2008 report.*

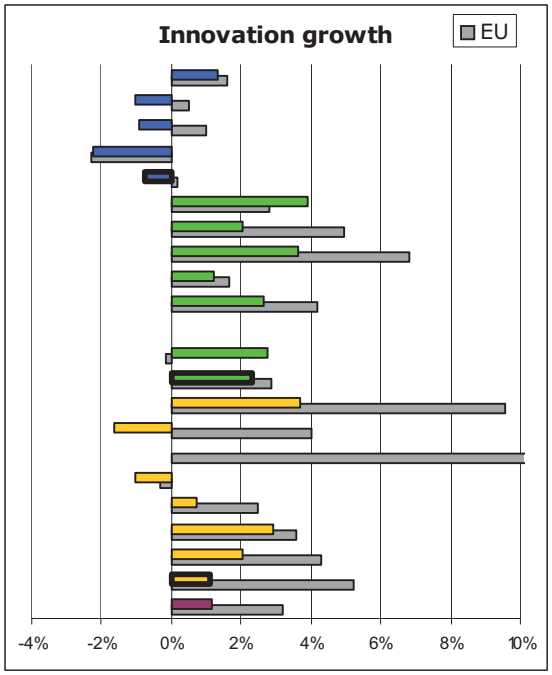
[20] *The growth rate for the EU27 is different from that reported in Section 3 as the set of indicators used for the EU-US and EU-Japan comparison is different from that used in the EIS.*

Japan is performing better than the EU27 in 12 indicators, only in Private credit, Trademarks, Technology Balance of Payments flows, Knowledge-intensive services employment and Knowledge-intensive services exports is the EU27 performing better (Figure 12). Overall there is a clear performance gap in favour of Japan, with Japan showing a better performance in Enablers, Firm activities and Outputs. The Japanese innovation lead is however decreasing, as its innovation performance has grown at 1.16% while the EU27 is growing at an annual rate of 3.17%. It is striking that the EU27 outperforms Japan in growth performance in all of the indicators except Business R&D expenditures and PCT patents. The EU27 is closing the performance gap with Japan in S&E graduates, Tertiary education, Researchers, Public R&D expenditures, Broadband subscribers, Public-private co-publications, EPO patents and Medium-high and high-tech manufacturing exports. The EU27 is increasing its lead in Private credit, Trademarks, TBP flows, Knowledge-intensive services employment and Knowledge-intensive services exports. Japan is improving its lead in Business R&D expenditures and PCT patents.

FIGURE 12: EU27-JAPAN COMPARISON



Data for Venture capital are not available for Japan.



Average annual growth rates are calculated over a five-year period.

The indicators reflecting Enablers are highlighted in yellow, those reflecting Firm activities in green and those reflecting Outputs in blue.

5.2 BRIC countries

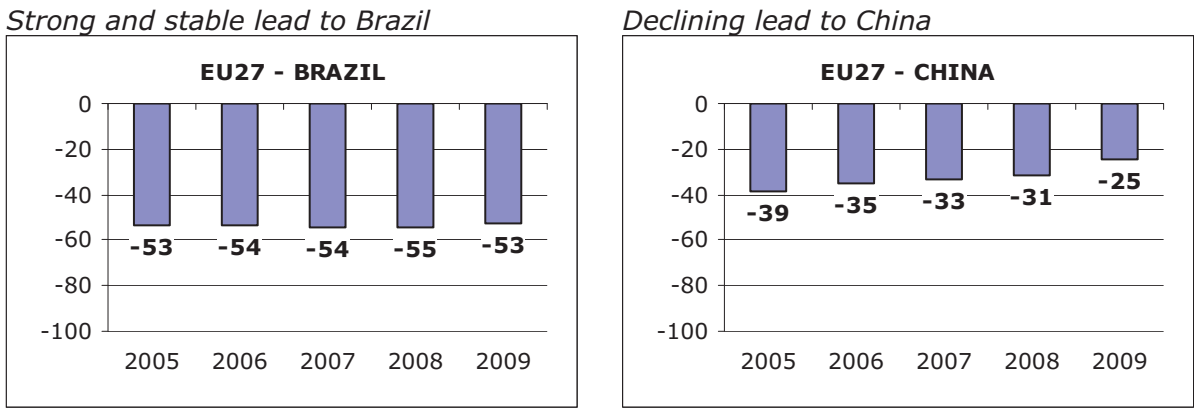
Based on the results from the Global Innovation Scoreboard 2008 (GIS 2008), the 2008 EIS report concluded that the EU27 had a higher overall performance level than each of the four BRIC countries – Brazil, Russia, India and China – and that between 1995 and 2005 Brazil, India and in particular China had improved their relative position to that of the EU27. The GIS 2008 results were based on an analysis for 30 European and 17 non- European countries using 1995 and 2005 data for 9 innovation indicators.

For the EIS 2009 this section shows the results of a more focused analysis between the EU27 as a block and each of the BRIC countries using more recent data for 12 innovation indicators. The indicators are shown in Table 4. For Enablers 5 indicators are included of which most are proxies for the indicators used in the EIS. For Firm activities the available indicators are biased towards measuring performance in the Throughputs dimension. Data availability is more limited as for several of the BRIC countries no comparable innovation survey data exist. As a direct result data availability for Outputs is most limited, as the EIS uses innovation survey for 5 of the 9 indicators capturing performance in Outputs. For the comparison with the BRIC countries output performance had to be limited to measuring performance in exports.

TABLE 4: EU27-BRIC INDICATORS		
	Data source	Reference year
ENABLERS		
Share of labour force with tertiary education	World Bank (World Development Indicators - WDI)	2007
Researchers per million 1000 population	World Bank (WDI)	2006
R&D expenditures (% of GDP)	World Bank (WDI)	2006
Private credit (relative to GDP)	IMF	2007
Fixed broadband subscribers per 100 population	World Bank (WDI)	2008
FIRM ACTIVITIES		
ICT expenditures (% of GDP)	World Bank (WDI)	2007
Public-private co-publications per million population	Thomson Reuters / CWTS	2007
Patent applications by residents per million population	World Bank (WDI)	2007
Trademark applications by residents per million population	World Bank (WDI)	2006
Technology Balance of Payments flows (% of GDP)	World Bank (WDI)	2008
OUTPUTS		
High-tech manufacturing exports (% of total exports)	World Bank (WDI)	2007
Knowledge-intensive services exports (% of total services exports)	United Nations Service Trade Statistics Database	2007

The results in Figure 13 show that the EU27 has a strong lead compared to each of the BRIC countries, in particular towards Brazil and India. The performance lead towards Brazil has remained stable over the last 5 years and that towards Russia has slightly improved albeit during the two most recent years this lead has slightly decreased. China and India are both catching-up towards the EU27. The rate of relative improvement for India is more modest than that for China and given the current performance lead for the EU27, it is not be expected that India will close its gap within the foreseeable future. China however is showing a rapid rate of relative improvement and its performance gap has decreased with almost 14%-points. Simply extrapolating China's speed of catchingup over the last 5 years could indicate a closure of the performance gap with the EU27 in the near future[21].

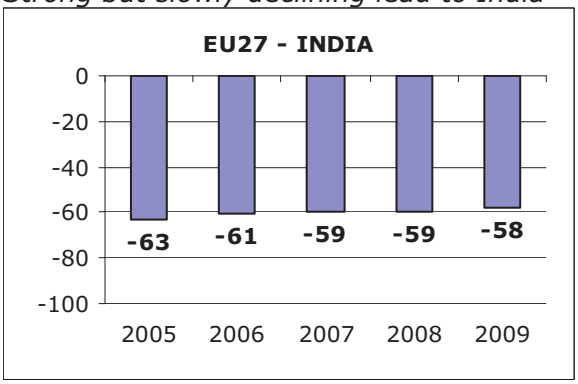
FIGURE 13 EU27 INNOVATION LEAD TOWARDS THE BRIC COUNTRIES



[21] *This simple extrapolation indicates that the gap would be closed in 10 years time, but due to its simplicity this result should not be interpreted as a statistical fact. It only serves to indicate that China is catching-up rapidly.*

FIGURE 13 EU27 INNOVATION LEAD TOWARDS THE BRIC COUNTRIES

Strong but slowly declining lead to India



Stable lead to Russia

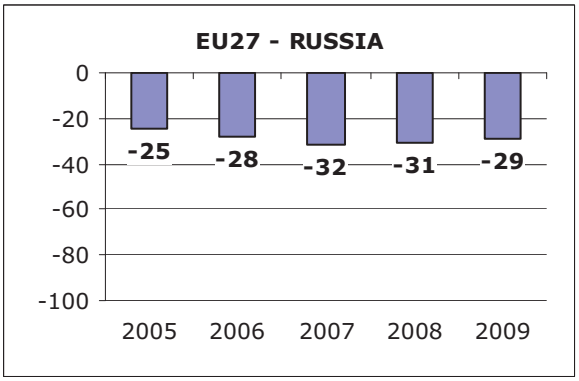
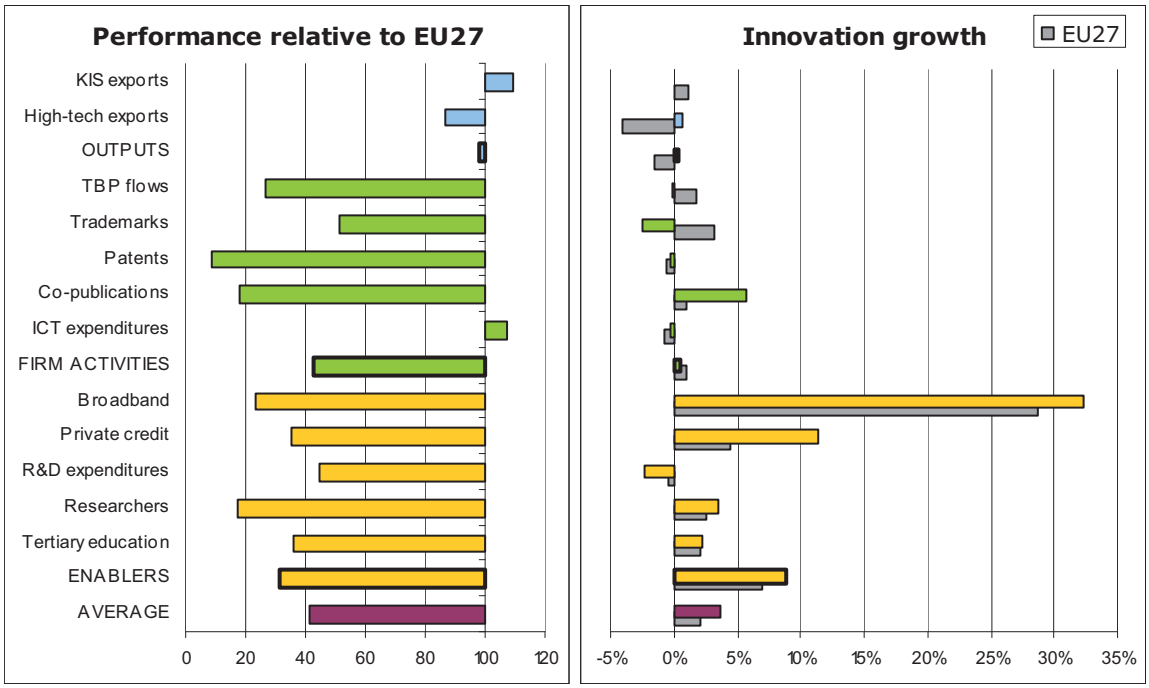
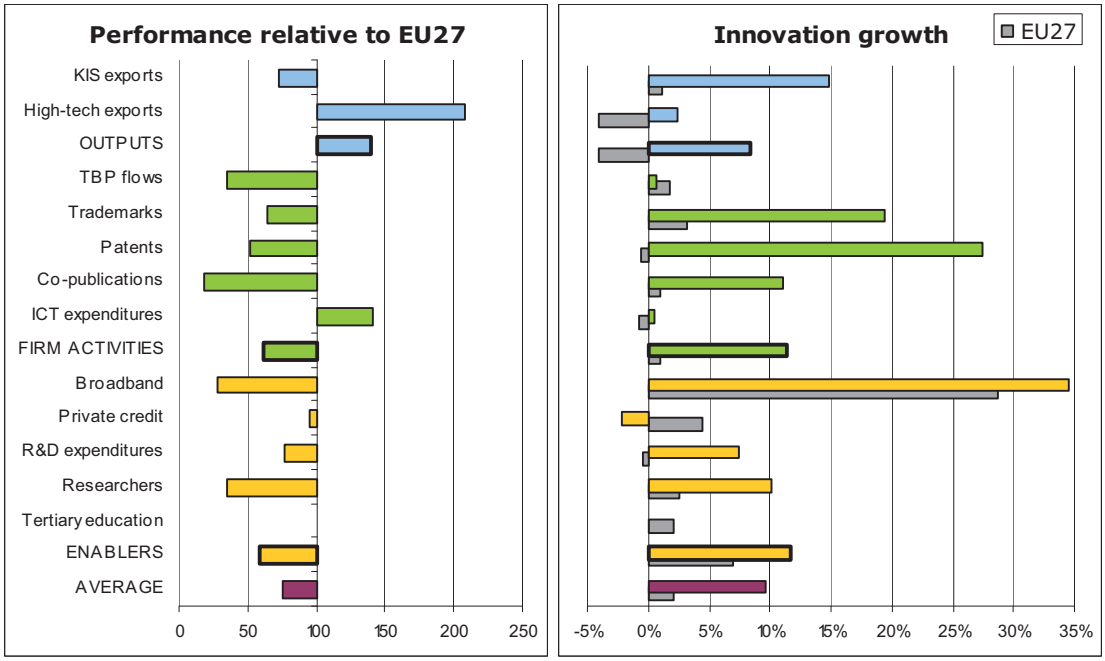


FIGURE 14: EU27 - BRAZIL COMPARISON



The indicators reflecting Enablers are highlighted in yellow, those reflecting Firm activities in green and those reflecting Outputs in blue.

FIGURE 15: EU27 - CHINA COMPARISON



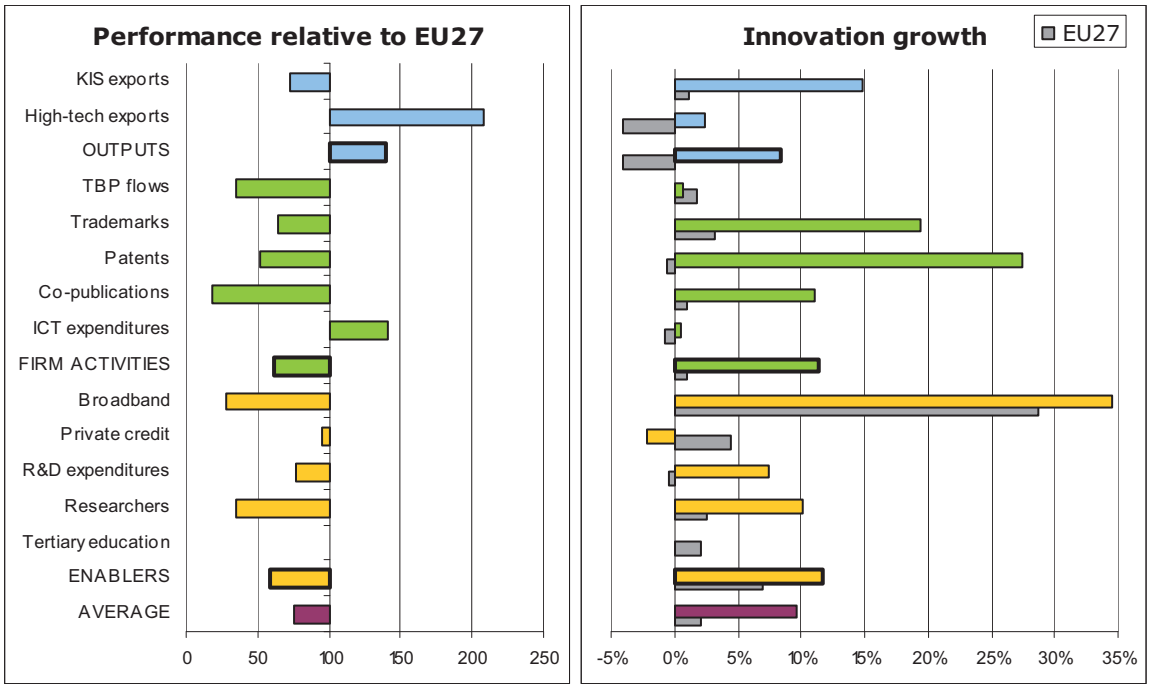
No data on tertiary education.

The indicators reflecting Enablers are highlighted in yellow, those reflecting Firm activities in green and those reflecting Outputs in blue.

Figures 14 to 17 show current and trend performance of the EU27 with each of the BRIC countries. Brazil is outperforming the EU27 in ICT expenditures and Knowledge-intensive services exports (Figure 14). For all other indicators captured in Enablers and Firm activities Brazil is facing a large gap towards the EU27. Growth performance is almost double that of the EU27 and growth is driven in particular by improvements in performance in Broadband, Private credit and Public-private co-publications.

China is outperforming the EU27 ICT expenditures and High-tech exports (Figure 15). The gap towards the EU27 is small for Private credit but relatively large for Researchers, Broadband, Public-private co-publications and Technology Balance of Payments flows. Growth performance is almost 5 times as high as that of the EU27 and growth is driven in particular by improvements in performance in Broadband, Patents, Trademarks and Knowledge-intensive services exports.

FIGURE 16: EU27 – INDIA COMPARISON



No data on researchers and tertiary education.

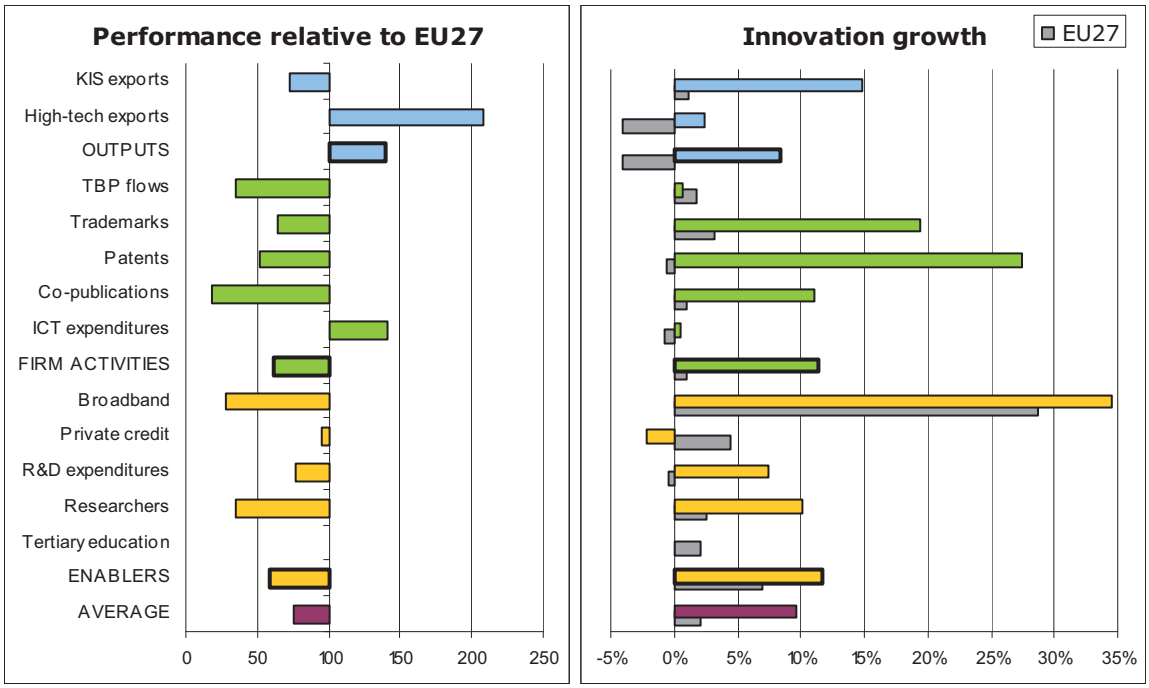
The indicators reflecting Enablers are highlighted in yellow, those reflecting Firm activities in green and those reflecting Outputs in blue.

India is outperforming the EU27 in ICT expenditures and Knowledge-intensive services exports (Figure 16). For all other indicators India is facing a large gap towards the EU27. Growth performance is more than 5 times as high as that of the EU27 and growth is driven in particular by improvements in performance in Broadband.

Russia is outperforming the EU27 in Tertiary education and Researchers (Figure 17). In all other indicators the EU27 is performing better, in particular in Broadband, Publicprivate co-publications, Trademarks, Technology Balance of Payments flows and Hightech exports. Russia is the only BRIC country which shows a worse growth performance than the EU27, in particular due to a sharp decline in High-tech exports. Russian performance in Private credit and Broadband has improved significantly and much faster than that of the EU27.

The comparison between the EU27 and the BRIC countries shows that although the lead of the EU27 towards each of the BRIC countries is still significant, there are signs that India and in particular China are closing their gap towards the EU27. The EU27 must continue exploring ways to turn the strong growth performance of these BRIC countries into growth opportunities for its Member States.

FIGURE 17: EU27 – RUSSIA COMPARISON



The indicators reflecting Enablers are highlighted in yellow, those reflecting Firm activities in green and those reflecting Outputs in blue.

6. Thematic reports

6.1 Sectoral innovation performance

In the thematic paper "**Innovation performances in Europe: a long term perspective**"[22] the long term mechanisms that are at the root of innovative activities and link innovation to economic performances are investigated in detail based on three waves of the European Community Innovation Surveys. The patterns of innovative activities, outcomes and performances are examined at the sectoral level, allowing testing the cumulative nature of technological change and the possible presence of lockin effects in the trajectories of technological development of major EU27 countries. The long term patterns of innovative performances are examined with reference to both industries and countries.

The database used is the Sectoral Innovation Database developed at the University of Urbino with data from national sources of the 2nd, 3rd and 4th Community Innovation Surveys. Data are available at the two-digit NACE classification for 21 manufacturing and 17 service industries. Countries' coverage includes 7 major European Union countries Germany, France, Italy, the Netherlands, Portugal, Spain, and the United Kingdom, and Norway. A statistical analysis of the stability of the distributions of a large number of CIS variables reveals that CIS variables are appropriate for investigating the dynamics of innovation over time, as well as across industries and countries.

Two innovation strategies have been studied distinguishing between either searching for technological competitiveness, through knowledge generation, product innovation and expansion to new markets, or for cost competitiveness, through labour saving investment, flexibility and restructuring. While such strategies may coexist in firms and industries, either one is likely to be dominant in the innovative efforts of each sector.

A three-equation model addresses the complexity of the relationships underlying the long term process of technological change and its economic impact. The equations explain the relevance of R&D efforts, the innovative outcomes (innovative turnover) and economic performances (profit growth). R&D per employee is explained by the cumulative nature of R&D, by the lagged growth of profits (providing the resources for funding R&D), by the distance from the technological frontier in the industry (measured by the gap in labour productivity), by the average firm size and by the relevance of market-oriented innovation (measured by the share of firms aiming to open up new markets). The share of innovation-related turnover is explained by efforts for improving technological competitiveness and for improving cost competitiveness through technology adoption, and by the growth of demand. The growth of profits (operating surplus, in real terms) is explained by the relevance of lagged innovative sales (a measure of Schumpeterian profits), and by the growth of demand (a measure of market expansion). In addition, there is a significant influence of lagged profits on R&D efforts, of the cumulative effects of past R&D on current one, and of lagged innovative turnover on profits. A three to four year lag is the most relevant one.

Growth of industries' profits is jointly driven by the "pull" effect of expanding demand and by the "push" effect of the success of lagged innovative sales. They are supported by the parallel efforts searching for technological competitiveness – through R&D, and for cost competitiveness - through the adoption of new technologies. R&D activities are cumulative, supported by lagged profits, and more important the closer industries are to the technological frontier.

A separate test for manufacturing industries alone shows that limited differences exist between manufacturing and service sectors; in manufacturing innovative sales are supported neither by growing demand, nor by technology adoption, while R&D efforts remain related to firm size. In consequence, this suggests that demand and technology adoption are more important for innovation in service sectors, while firm size is not relevant.

This view on the innovation-performance link may contribute to redefine innovation policies at the EU27 and country level, considering three main implications from the findings: a) demand side factors have a significant influence on innovative and economic performances; b) R&D activities, efforts to enter new markets, decisions to adopt new technologies affect innovative and economic performances in different ways; c) the lags that we have identified mean that we cannot expect policies supporting R&D and innovation to have a visible economic impact for some years.

6.2 User innovation

There is a long history of studying the role of users, both as individuals and as firms, in the innovation process. Much of the conventional literature on user innovation is based on detailed case studies of individual firms, sectors or specific products. This has changed recently with systematic surveys undertaken in the Netherlands and Canada. The thematic report "**Prevalence of**

[22] *Bogliacino, F. and M. Pianta, "Innovation performance in Europe: a long term perspective?". Available at http://www.proinno-europe.eu/metrics*

User Innovation in the EU"[23] is the first to explore user innovation amongst a large cross section of EU27 firms. Further in contrast to many of the previous studies, which focus mainly on process innovation, this thematic report analyses different forms of user innovation, distinguishing between: User Process Innovation, User Product Innovation, and User Involvers.

The findings, based on an analysis of the Innobarometer surveys of 2007 and 2009, show that while a substantial minority of innovative firms in the EU27 are involved in process and product modification (around 30%), more than half such firms involve users in support of their innovative activities. User innovation is also more or less evenly spread across industrial sectors and across EU27 countries categorized according to their innovative capabilities. Large firms are more likely to be involved in all forms of user innovation than small firms. For example 39% of all innovative firms with more than 500 employees are User Process Innovators, and in the case of User Involvers this rises to 61%.

A clear message from the analysis is that firms engaged in user innovation can be classed as "super-innovators". Compared to other innovative firms, they are more likely to introduce new products, processes or services. They are also more likely to initiate new organizational methods. Moreover a higher proportion of user innovators carries out both intra and extra mural R&D and applies for patents. The main internal sources of ideas for user innovators are management and production engineers and technicians. Externally the most important source of information, advice or support to help customize or modify comes from the original developer or supplier of these products.

These findings raise a series of issues for the future measurement of this form of innovative activity and the policies that may be developed to support it. A number of promising new directions for future research also emerge from the findings.

Innovation by modification has been a significant activity for both process and product innovators, but the report leaves a number of questions unanswered. For example in the case of product modification, it is unclear from the IB survey responses the form that such modifications take. This could involve firms that engage in complex systems integration, repurposing products in ways their suppliers had not anticipated, or simply re-working partly finished products as part of more conventional manufacturing process. Being able to distinguish between these very different forms of behaviour would enable a more complete picture of User Product Innovation to emerge.

Similarly, User Process Innovation only focuses on one aspect – modification – while the broader conventional definition of user innovation also includes the creation of new process technologies from scratch. Being able to distinguish between the conditions under which each form of innovative activity takes place and the precise role of external actors, e.g. suppliers, would be a valuable addition to our understanding. For example, it would enable innovations to begin to be tracked within value chains and enable spillovers between user firms and their suppliers to be identified and monitored. It would also enable a more detailed picture of the parameters within which activities such as process modification and creation take place, and give us a better understanding of the various measures used by firms to safeguard their intellectual property.

Future studies of user innovation at firm level could explore in more detail the expenditures associated with this activity, both in terms of direct costs and staff time. Collecting more detailed data on the sources of funding for this form of innovation and how that is related to more traditional forms of R&D would further illuminate the importance of the phenomenon.

Our understanding of User Involvement remains at an early stage of development. Although it is clear that users are being involved it is unclear at what stage, and by what mechanisms, their contributions are become relevant to firm innovation processes. It could be that users are involved passively, simply providing suggestions or they may be more actively engaged in design, testing or idea generation. Similarly, it is unclear whether we are looking at business to business relationships (in which the user is another firm) or business to consumer relationships (in which the user is an individual or a community of individuals). At the same time we know little about the role played by internet communities in firm innovation processes. The Innobarometer survey presents a firm-based account of innovation and overlooks the role of individual consumers and communities of individual consumers in innovation. Early research in this area suggests that consumers are active user innovators albeit at a low level, with significant positive spillover effects. Extending the survey to incorporate this aspect would provide a more complete account of innovation within the EU27.

Modification in both products and processes makes relatively little use of the skills and expertise within an R&D department and relies more on production engineers and managers. This suggests that subsidies for R&D will have little direct effect on this form of innovation and policy to support such

[23] *Flowers, S., T. Sinozic and P. Patel, "Prevalence of User Innovation in the EU: Analysis based on the Innobarometer Surveys of 2007 and 2009". Available at http://www.proinno-europe.eu/metrics*

innovative activities need to rely on alternative mechanisms, possibly focusing on capability development. The part played by modification within firm innovation processes also raises issues for policy on intellectual property. Innovation is clearly a dynamic process and little is known about what happens to intellectual property when firms engage in product and process modification. Similarly, if firms are seeking to draw their users into their innovation processes, what is the status of the intellectual property that is created in this process?

The understanding of user innovation and the implications for policy remains incomplete. Further research, based on surveys or qualitative case studies, needs to focus on the possible role of policy, for example in relation to the barriers faced by firms in undertaking user innovation. In the case financial barriers, this would require policy instruments designed to provide direct support, and incentives to optimise the economic benefits of user innovation. Further research should be aimed at providing the evidence base for devising policies that are sensitive to the contexts in which user innovation arises and the mechanisms by which it flourishes.

6.3 Internationalization

The extent to which a country's businesses, institutions and industries are linked with resources and capabilities located outside the country is likely to positively impact on the innovation performance of that country. Conversely, innovation-intensive firms and countries are more likely to be able to compete successfully in international locations. These propositions are rooted in theoretical analysis and are supported by empirical evidence for various countries. The thematic report "**Is the innovation performance of countries related to their internationalization?**"[24] looks at the association between innovation and internationalization.

The research identifies three possible levels of internationalization relevant for innovation: the full aggregate level (A) in which internationalization variables are considered for the whole country and all industries; the level of technology-intensive industries (B) where internationalization of countries is considered with respect to these industries; and level (C) reported activities of firms in each country on the basis of data derived from two surveys – the Innobarometer survey and the Community Innovation Survey (CIS). Level A includes inward and outward FDI, imports and exports, mobility of employees and of students. Level B includes inward and outward FDI for technologyintensive manufacturing sectors and for knowledge-intensive services, imports and exports of technology-intensive products, balance of payments debits and credits for knowledge-intensive services, and mobility of research students. Level C includes variables from the Innobarometer (proportions of companies that operated in international markets, outsourced activities to companies located abroad, invested into companies located abroad, cooperated with partners which were located abroad, recruited employees from other countries, carried out market-testing in foreign countries, considered international markets to be the lead markets) and from the CIS (proportions of enterprises that operated in international markets, foreign-owned enterprises, enterprises reporting cooperation with partners abroad).

For each variable normalised indicators of countries' scores are calculated applying a methodology similar to the one used in the EIS. Summary Globalization Indices (SGI) are then calculated for each of the three levels. The association between innovation and internationalization is tested by calculating correlation coefficients between the Summary Innovation Index (SII) and various SGIs. The results show a clear association between internationalization and innovation at all levels of analysis. The internationalization variables that show association throughout the four levels are those related to outward foreign direct investment, foreign students and foreign employees. The latter show the relevance of cross-border movements of skilled human resources for a positive, virtuous relationship between innovation and internationalization.

The study was exploratory and time series or causality analyses were beyond the scope of research. Nonetheless the results are robust enough to (a) warrant further deepening research; and (b) support the following conclusion. From the analysis of all the results together and from the underlying theoretical background it follows that there is causal interaction between internationalization and innovation and that this leads to a cumulative process in which the innovation and internationalization elements affect each other in a virtuous or vicious circle.

In policy terms, the relationship between innovation and internationalization points to the relevance of both for the performance of countries. The interrelationship between the two suggests that public authorities should consider links between their innovation support to enterprises and support to internationalisation. The strong relationship between innovation performance and the cross-border movement of skilled people, suggests that innovation policy could usefully consider policies that support international mobility, training and secondments.

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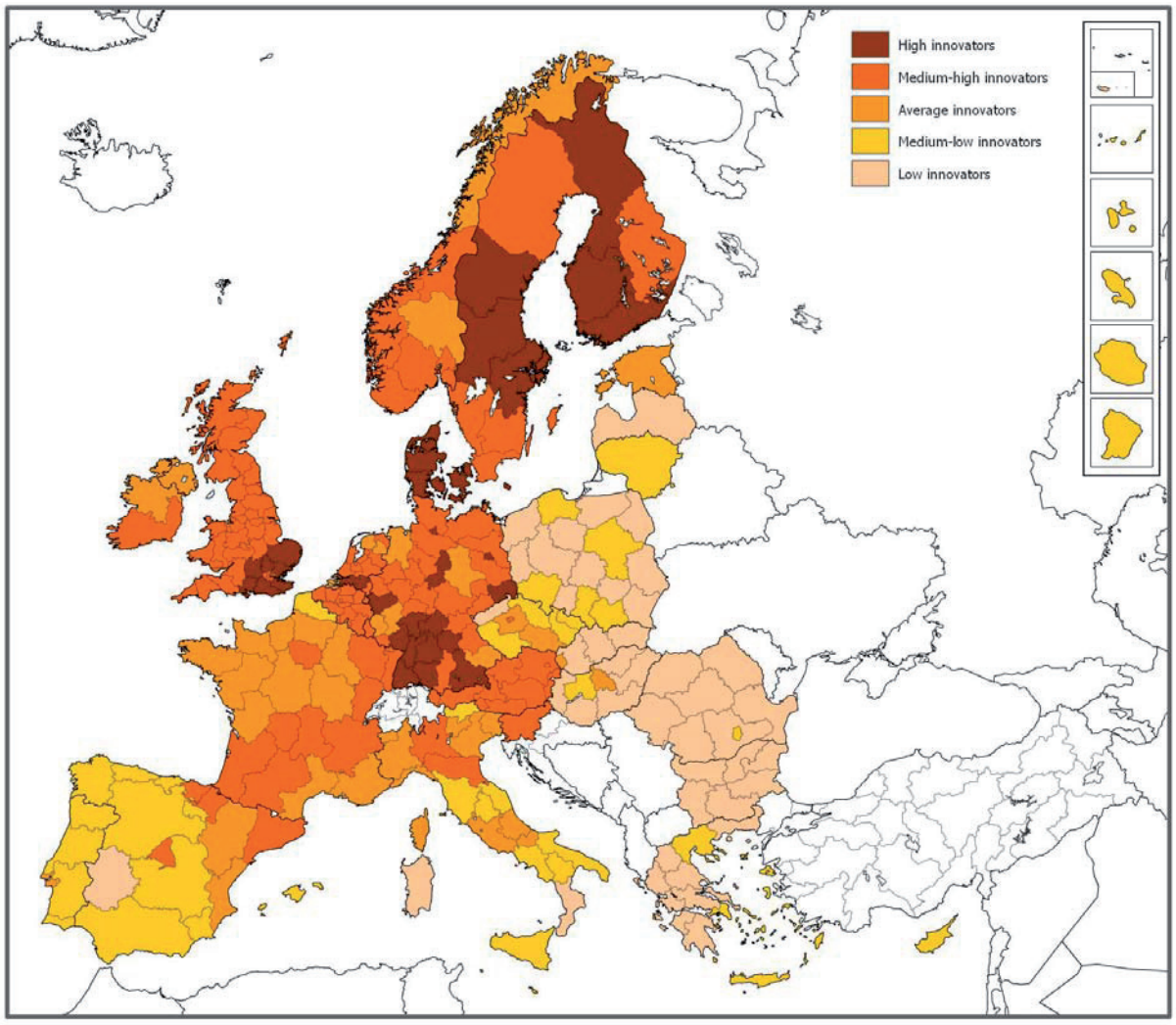
[24] *Filippetti, A., M. Frenz and G. Ietto-Gillies, "Is the innovation performance of countries related to their internationalization?". Available at http://www.proinno-europe.eu/metrics*

FIGURE 18: EUROPEAN REGIONAL INNOVATION PERFORMANCE GROUPS



6.4 Regional innovation performance

The 2009 edition of the "**European Regional Innovation Scoreboard (RIS)**"[25] provides a comparative assessment of innovation performance across the NUTS 2 regions of the European Union and Norway. As the regional level is important for economic development and for the design and implementation of innovation policies, it is important to have indicators to compare and benchmark innovation performance at regional level. Such evidence is vital to inform policy priorities and to monitor trends.

With respect to the previous report published in 2006, which used a very limited set of regional indicators, this report offers richer information to regional innovation policymakers, mainly thanks to the availability for the first time, of more comprehensive and detailed, regional Community Innovation Survey (CIS) indicators. As a result, the 2009 RIS is able to replicate the methodology used at national level in the European Innovation Scoreboard (EIS), using 16 of the 29 indicators used in the EIS for 201 Regions across the EU27 and Norway. Changes over time are considered using principally data from 2004 and from 2006.

[25] *Hollanders, H., S. Tarantola and A. Loschky, "Regional Innovation Scoreboard (RIS) 2009" and Hollanders, H., S. Tarantola and A. Loschky, "Regional Innovation Scoreboard - Methodology report". Both reports are available at http://www.proinno-europe.eu/metrics*

Despite this progress, the data available at regional level remains considerably less than at national level, and in particular four Member States - Germany, Sweden, Ireland and the Netherlands – were not able to provide regional CIS data. Due to these limitations, the 2009 RIS does not provide an absolute ranking of individual regions, but ranks groups of regions at broadly similar levels of performance. The main results of the grouping analysis are summarised in the map shown in Figure 18, which shows five performance groups, ranging from the highest to the lowest overall performers for 2006.

The main findings of the 2009 Regional Innovation Scoreboard are:

- **There is considerable diversity in regional innovation performances.** The results show that all countries have regions at different levels of performance. This emphasizes the need for policies to reflect regional contexts and for better data to assess regional innovation performances. The most heterogeneous countries are Spain, Italy and Czech Republic where innovation performance varies from low to medium-high.

- **The most innovative regions are typically in the most innovative countries.** Nearly all the "high innovators" regions are in the group of "Innovation leaders" identified in the European Innovation Scoreboard (EIS). Similarly all of the "low innovators" regions are located in countries that have below average performance in the EIS. However, the results also show regions that outperform their country level:

  - Noord-Brabant in the Netherlands is a high innovating region located in an Innovation follower country.

  - Praha in the Czech Republic, Pais Vasco, Comunidad Foral de Navarra, Comunidad de Madrid and Cataluña in Spain, Lombardia and Emilia-Romagna in Italy, Oslo og Akershus, Sør-Østlandet, Agder og Rogaland, Vestlandet and Trøndelag in Norway are all medium-high innovating regions from Moderate innovators.

  - The capital region in Romania, Bucuresti – Ilfov, is a medium-low innovating region in a Catching-up country.

- **Regions have different strengths and weaknesses.** A more detailed analysis was conducted for those regions with good data availability. This shows that regions are performing at different levels across three dimensions of innovation performance included in the EIS: Innovation enablers, Firm activities and Innovation outputs. Although there are no straight forward relationships between level of performance and relative strengths, it can be noted that many of the "low innovators" have relative weaknesses in the dimension of Innovation enablers which includes Human resources.

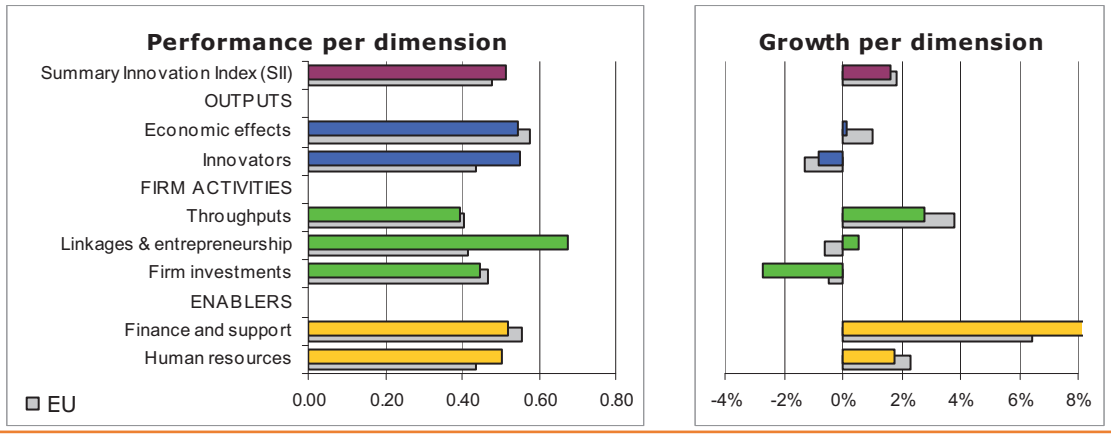
- **Regional performance appears relatively stable since 2004.** The pattern of innovation is quite stable between year 2004 and 2006, with only a few changes in group membership. More specifically, most of the changes are positive and relate to Cataluña, Comunidad Valenciana, Illes Balears and Ceuta (Spain), Bassin Parisien, Est and Sud-Ouest (France), Unterfranken (Germany), Közép- Dunántúl (Hungary), Algarve (Portugal) and Hedmark og Oppland (Norway). Longer time series data would be needed to analyse the dynamics of regional innovation performance and how this might relate to other factors such as changes in GDP, industrial structure and public policies.

The additional maps that are presented in the RIS 2009 report highlight regional innovation performance in the three constituent domains of innovation: Enablers, Firm Activities and Outputs.

7. Country profiles

In this section for each country a more detailed country profile is shown highlighting for each country is relative strengths and weaknesses in innovation performance and its main drivers of innovation growth. For each country detailed data tables are available from the INNO Metrics website (http://www.proinno-europe.eu/metrics) and detailed information on policy measures and governance is available at the INNO-Policy TrendChart website (http://www.proinno-europe.eu/trendchart).

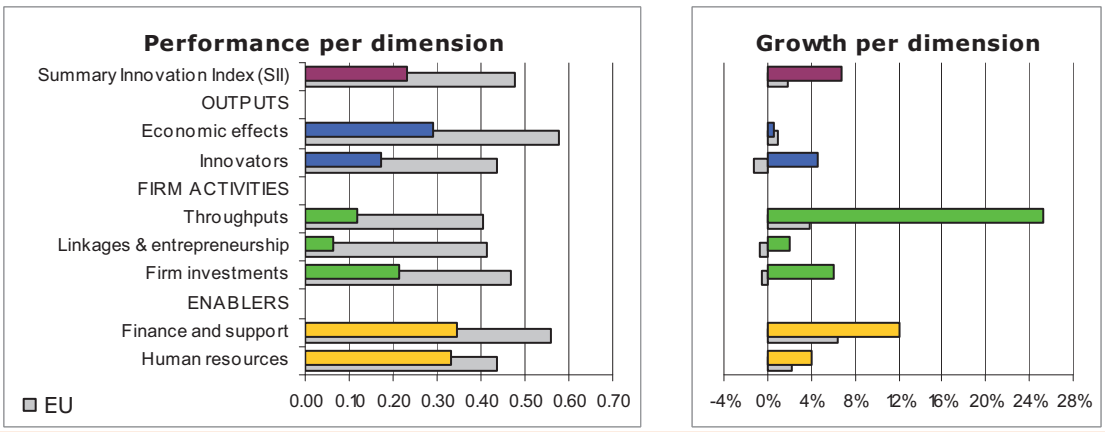
BELGIUM



For Belgium, one of the Innovation followers, innovation performance is above the EU27 average but the rate of improvement is below that of the EU27. Relative strengths, compared to the country's average performance, are in Linkages & entrepreneurship, Innovators and Economic effects and relative weaknesses are in Firm investments and Throughputs.

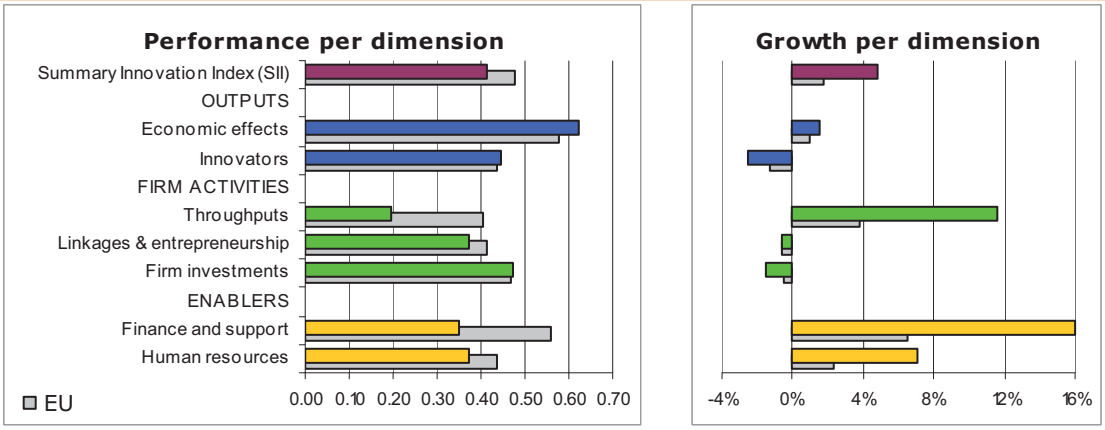
Over the past 5 years, Finance and support and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Venture capital (17.8%). Performance in Firm investments and Innovators has worsened, in particular due to a decrease in Non-R&D innovation expenditures (-8.5%).

BULGARIA



Bulgaria is one of the Catching-up countries with an innovation performance well below the EU27 average but the rate of improvement is one of the highest of all countries and it is a growth leader within the Catching-up countries. Relative strengths, compared to the country's average performance, are in Human resources, Finance and support and Economic effects and relative weaknesses are in Linkages & entrepreneurship and Throughputs Over the past 5 years, Throughputs and Finance and support have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Private credit (19.8%), Broadband access by firms (22.0%), Community trademarks (69.6%) and Community designs (24.1%). Performance in Economic effects has hardly grown, in particular due to a decrease in New-to-market sales (-5.7%) and New-to-firm sales (-3.1%)..

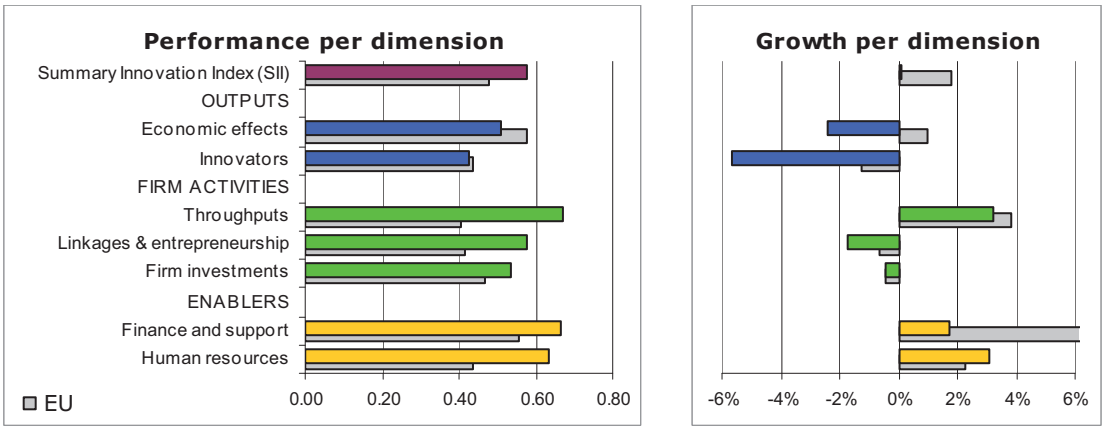
CZECH REPUBLIC



The Czech Republic is among the group of Moderate innovators with innovation performance below the EU27 average but the rate of improvement is above that of the EU27. Relative strengths, compared to the country's average performance, are in Firm investments, Innovators and Economic effects and a relative weakness is in Throughputs.

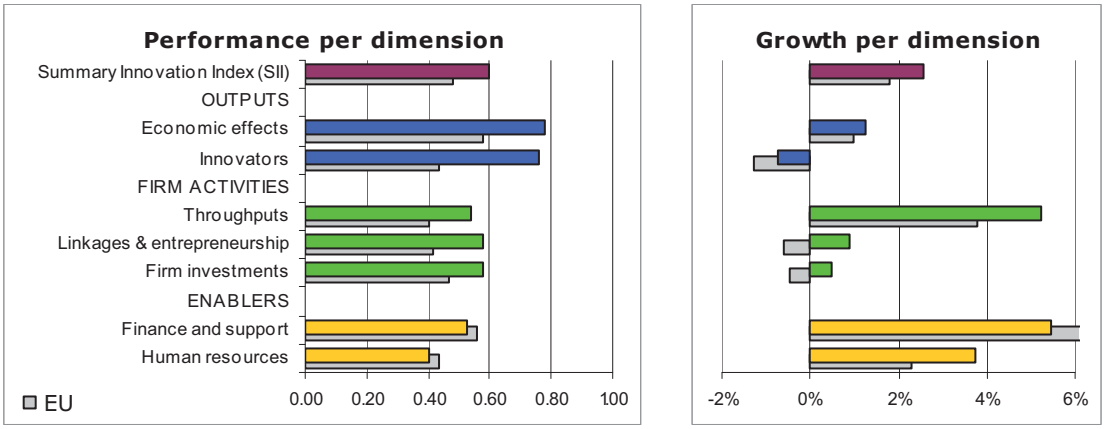
Over the past 5 years, Throughputs, Human resources and Finance and support have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in S&E and SSH graduates (18.1%), Venture capital (26.6%), Private credit (13.6%), Broadband access by firms (20.1%), Community designs (24.5%) and Technology Balance of Payments flows (14.5%). Performance in Innovators has worsened, due to a decrease in SMEs introducing product or process innovations (- 2.6%).

DENMARK



For Denmark, one of the Innovation leaders, innovation performance is well above the EU27 average but the rate of improvement is not only below that of the EU27 but virtually zero. Relative strengths, compared to the country's average performance, are in Human resources, Finance and support and Throughputs and relative weaknesses are in Firm investments, Innovators and Economic effects. Over the past 5 years, Human resources, Finance and support and Throughputs have been the main drivers of a stagnating innovation performance, in particular resulting from strong growth in S&E and SSH graduates (8.1%), Private credit (8.4%) and Community trademarks (4.9%). Performance in Firm investments, Linkages & entrepreneurship, Innovators and Economic effects has worsened, in particular due to decreases in Innovative SMEs collaborating with others (-8.0%), SMEs introducing product or process innovations (-5.7%), New-to-market sales (-7.7%) and New-to-firm sales (-8.5%).

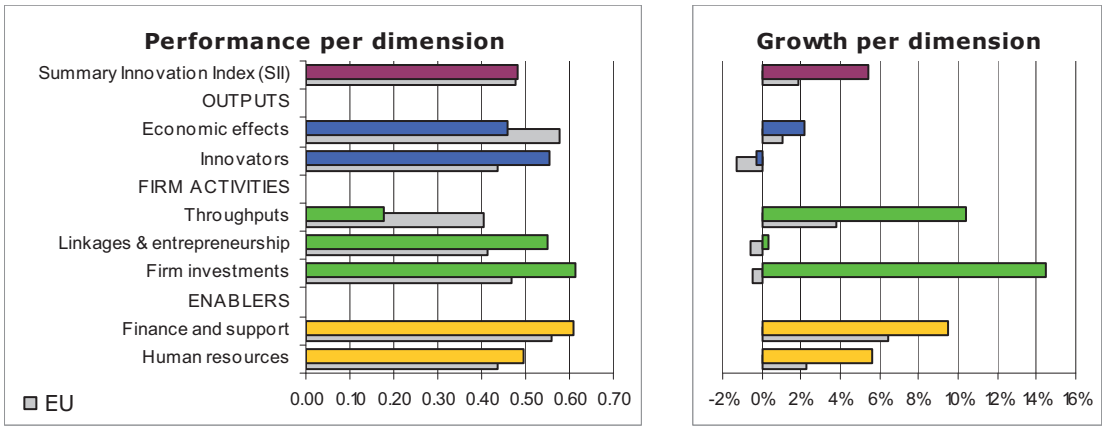
GERMANY



Germany is one of the Innovation leaders with innovation performance considerably above the EU27 average and the rate of improvement is also above that of the EU27. Relative strengths, compared to the country's average performance, are in Innovators and Economic effects and relative weaknesses are in Human resources, Finance and support and Throughputs.

Over the past 5 years, Human resources, Finance and support and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in S&E and SSH graduates (12.2%), Venture capital (10.4%), Broadband access (11.7%) and Technology Balance of Payments flows (8.2%). Performance in Innovators has slightly worsened, due to a decrease in SMEs introducing product or process innovations (-0.7%).

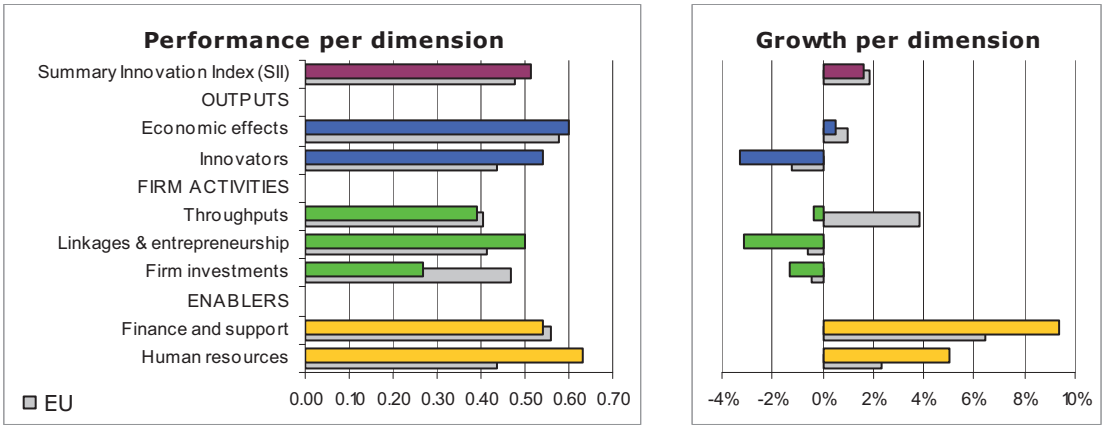
ESTONIA



For Estonia, one of the Innovation followers, innovation performance is just below the EU27 average but the rate of improvement is above that of the EU27. Relative strengths, compared to the country's average performance, are in Finance and support, Firm investments, Linkages & entrepreneurship and Innovators and relative weaknesses are in Throughputs.

Over the past 5 years, Firm investments and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Business R&D expenditures (20.0%), Non-R&D innovation expenditures (29.3%), Community trademarks (14.5%) and Technology Balance of Payments flows (16.9%). Performance in Innovators has remained stable.

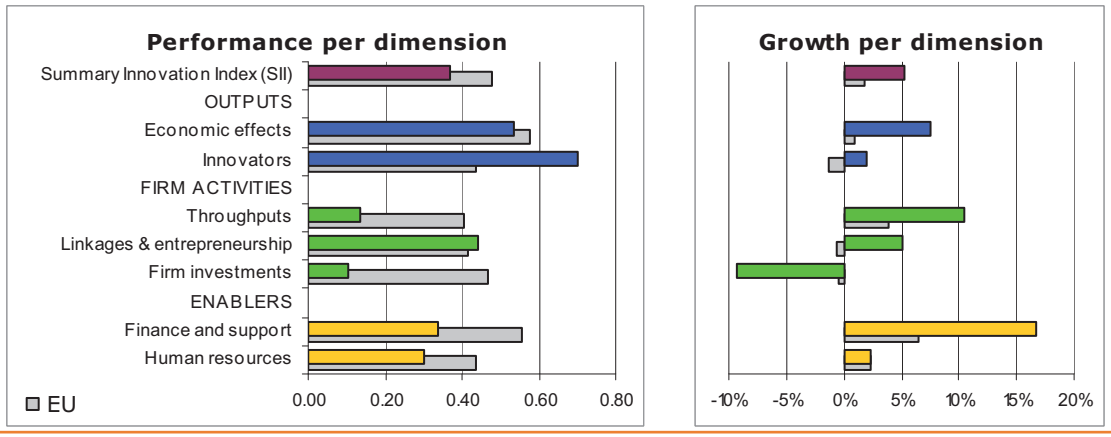
IRELAND



Ireland is in the group of Innovation followers, with an innovation performance above the EU27 average. It's rate of improvement just below that of the EU27. Relative strengths, compared to the country's average performance, are in Human resources and Economic effects and relative weaknesses are in Firm investments and Throughputs.

Over the past 5 years, Human resources and Finance and support have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Lifelong learning (13.7%), Private credit (12.7%) and Broadband access by firms (26.9%). Performance in Firm investments, Linkages & entrepreneurship, Throughputs and Innovators has worsened, in particular due to a decrease in Non-R&D innovation expenditures (-5.7%), Innovative SMEs collaborating with others (-7.0%), Community designs (-7.2%) and SMEs introducing product or process innovations (-3.3%).

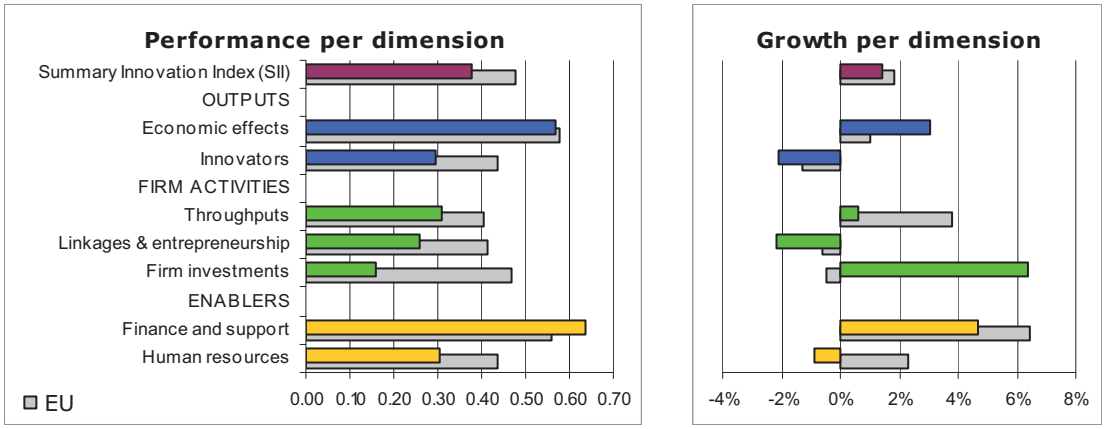
GREECE



For Greece, one of the Moderate innovators, innovation performance is below the EU27 average and the rate of improvement is above that of the EU27. Relative strengths, compared to the country's average performance, are in Linkages & entrepreneurship, Innovators and Economic effects and relative weaknesses are in Firm investments and Throughputs.

Over the past 5 years, Finance and support, Throughputs and Economic effects have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Venture capital (24.1%), Broadband access by firms (35.4%), Community designs (34.2%) and New–to-market sales (32.8%). Performance in Firm investments has worsened, due to a decrease in Business R&D expenditures (- 4.5%) and Non-R&D innovation expenditures (-22.7%).

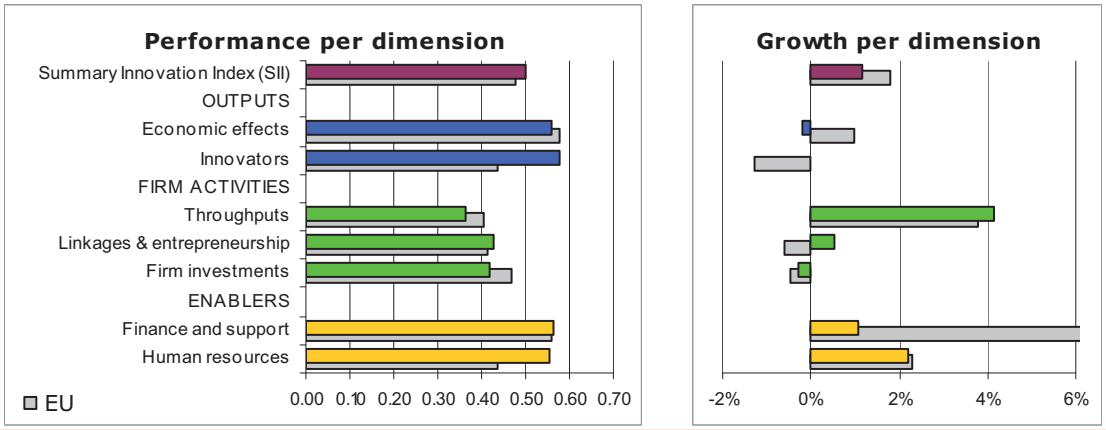
SPAIN



For Spain, one of the Moderate innovators, innovation performance is below the EU27 average and the rate of improvement is also below that of the EU27. Relative strengths, compared to the country's average performance, are in Finance and support and Economic effects and relative weaknesses are in Firm investments and Linkages & entrepreneurship.

Over the past 5 years, Finance and support and Firm investments have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Private credit (12.2%) and Non-R&D innovation expenditures (13.4%). Performance in Human resources, Linkages & entrepreneurship and Innovators has worsened, in particular due to a decrease in S&E and SSH doctorate graduates (-3.2%) and the Firm renewal rate (-5.9%).

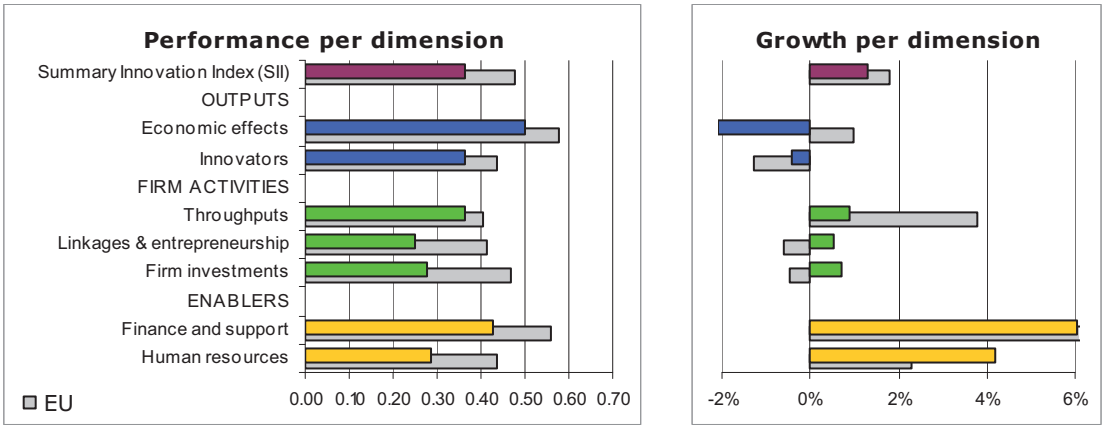
FRANCE



France is in the Innovation followers group of countries with an innovation performance above the EU27 average but the rate of improvement is below that of the EU27. Relative strengths, compared to the country's average performance, are in the Enablers (Human resources, Finance and support), and Outputs (Innovators and Economic effects) and relative weaknesses are in Firm activities (Firm investments, Linkages & entrepreneurship and Throughputs).

Over the past 5 years, Human resources, Finance and support and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from growth in S&E and SSH doctorate graduates (7.3%), Private credit (4.5%) and Technology Balance of Payments flows (7.1%). Performance in Economic effects has decreased, in particular due to a decrease in Employment in medium-high & high-tech manufacturing (-1.2%) and Medium-high & high-tech manufacturing exports (-1.2%).

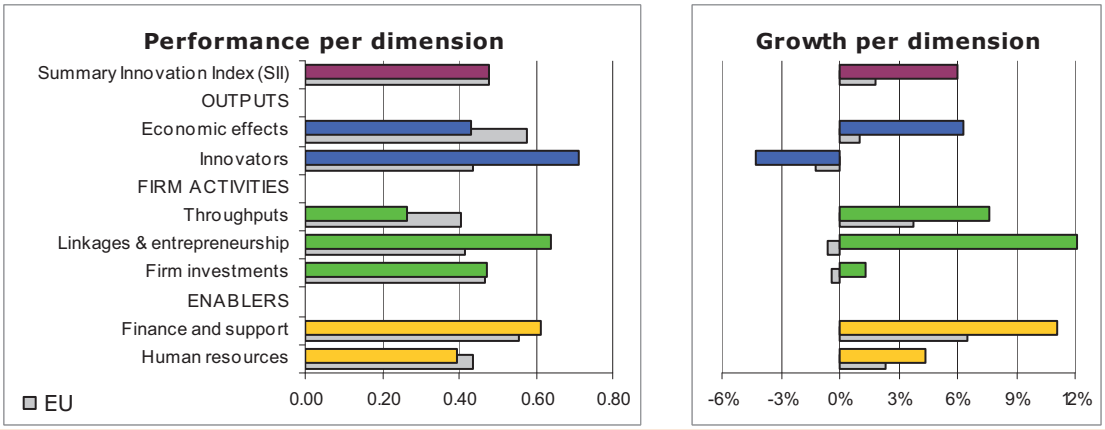
ITALY



For Italy, one of the Moderate innovators, innovation performance is below the EU27 average and the rate of improvement is also below that of the EU27. Relative strengths, compared to the country's average performance, are in Finance and support and Economic effects and relative weaknesses are in Human resources, Firm investments and Linkages & entrepreneurship.

Over the past 5 years, strong growth has come from Human resources and Finance and support which have been the drivers of the improvement in innovation performance, in particular as a result from strong growth in S&E and SSH doctorate graduates (12.8%) and Broadband access by firms (29.8%). Performance in Firm investments has not improved and performance in Innovators and Economic effects has worsened, in particular due to a decrease in New-to-market sales (-7.8%) and New-to-firm sales (- 5.3%).

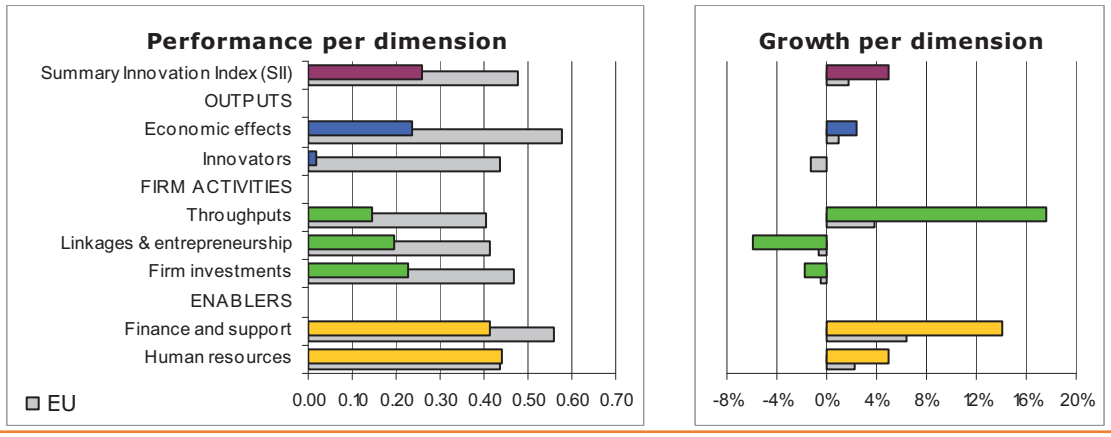
CYPRUS



Cyprus is a growth leader among the group of Innovation followers, with an innovation performance just above the EU27 average and a rapid rate of improvement. Relative strengths, compared to the country's average performance, are in Finance and support, Linkages & entrepreneurship and Innovators and relative weaknesses are in Human resources and Throughputs.

Over the past 5 years there has been strong growth in Finance and support, Linkages & entrepreneurship and Throughputs which have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in S&E and SSH doctorate graduates Broadband access by firms (22.6%), Innovative SMEs collaborating with others (12.3%), Public-private co-publications (22.1%), EPO patents (13.1%) and Community designs (15.3%). Performance in Innovators has worsened (- 4.3%).

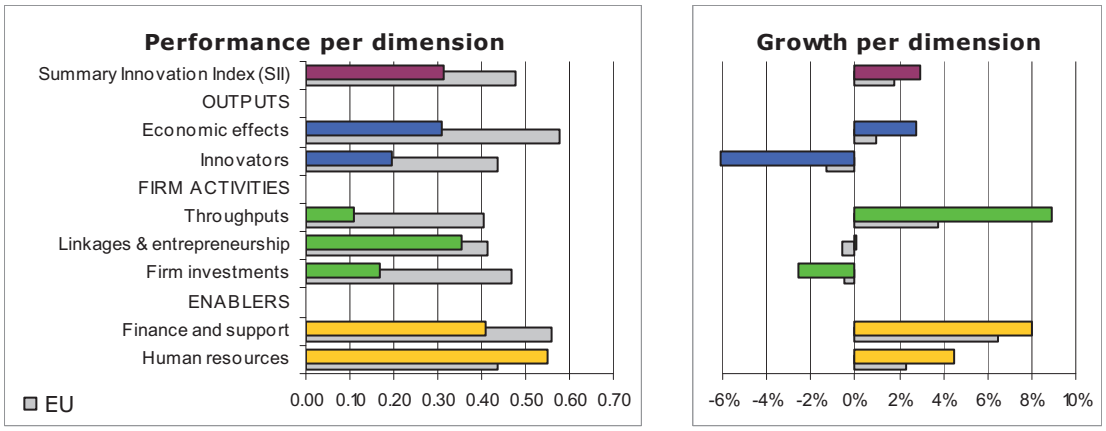
LATVIA



For Latvia, one of the Catching-up countries, innovation performance is well below the EU27 average but the rate of improvement is above that of the EU27. Relative strengths, compared to the country's average performance, are in Human resources and Finance and support and relative weaknesses are in Linkages & entrepreneurship, Throughputs and Innovators.

Over the past 5 years, Finance and support and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Public R&D expenditures (12.5%), Private credit (15.4%), EPO patents (17.8%), Community trademarks (35.9%) and Community designs (21.0%). Performance in Linkages & entrepreneurship has worsened, in particular due to a decrease in the Firm renewal rate (-17.2%).

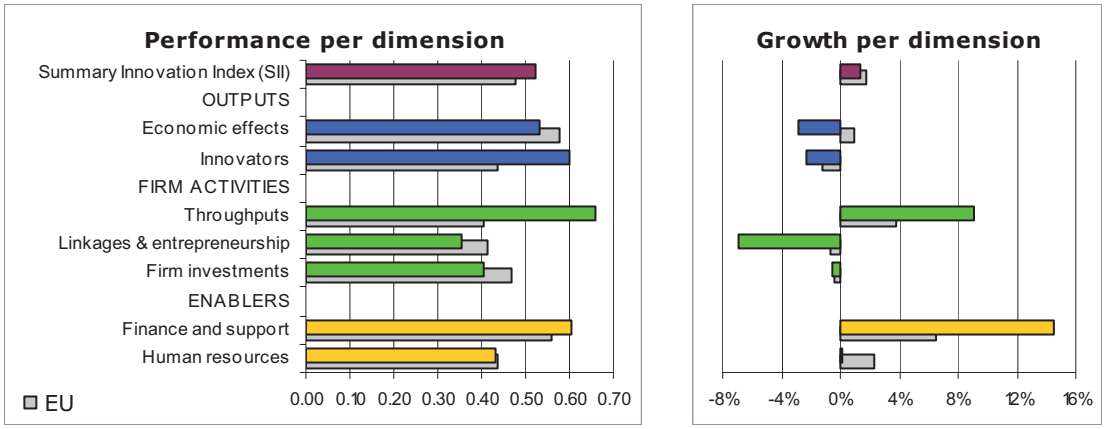
LITHUANIA



Lithuania is among the group of Moderate innovators, with an innovation performance well below the EU27 average and a rate of improvement above that of the EU27. Relative strengths, compared to the country's average performance, are in Human resources, Finance and support and Linkages & entrepreneurship and relative weaknesses are in Firm investments, Throughputs and Innovators.

Over the past 5 years, Human resources, Finance and support and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in S&E and SSH doctorate graduates (14.8%), Private credit (21.5%), EPO patents (15.5) and Community trademarks (26.8%). Performance in Innovators has worsened, in particular due to a decrease in SMEs introducing product or process innovations (-6.1%).

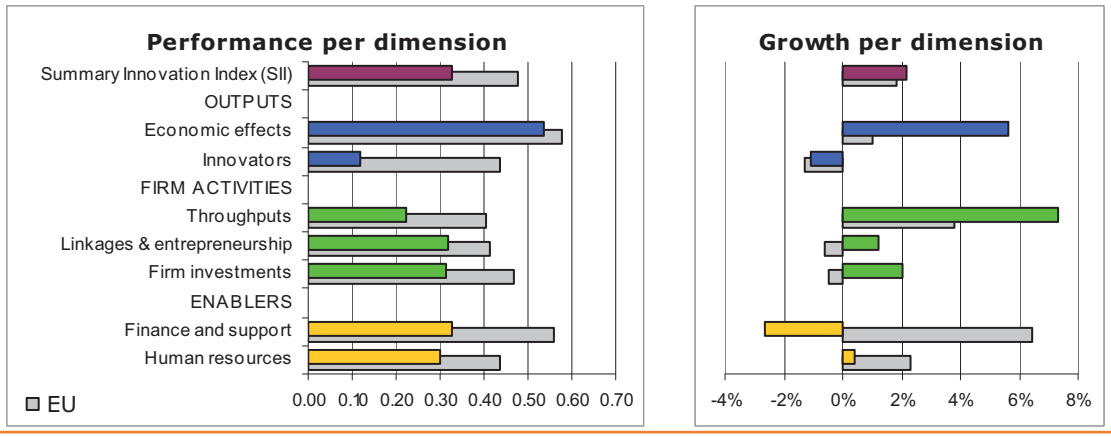
LUXEMBOURG



For Luxembourg, one of the Innovation followers, innovation performance is above the EU27 average but the rate of improvement is slightly below that of the EU27. Relative strengths, compared to the country's average performance, are in Finance and support, Throughputs and Innovators and relative weaknesses are in Human resources, Firm investments and Linkages & entrepreneurship.

Over the past 5 years, Finance and support and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Private credit (16.8%), Broadband access by firms (16.0%) and Community trademarks (10.3%). Performance in Linkages & entrepreneurship, Innovators and Economic effects has worsened, in particular due to a decrease in the Firm renewal rate (-10.7%), Public-private co-publications (-10.1%), Employment in medium-high & hightech manufacturing (-6.9%) and New-to-firm sales (-8.0%).

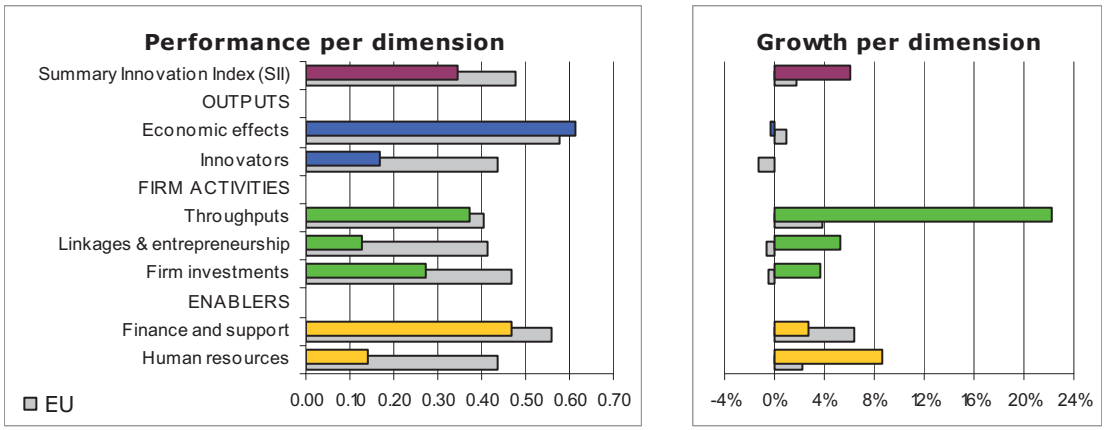
HUNGARY



Hungary is in the group of Moderate innovators with an innovation performance well below the EU27 average but a rate of improvement above that of the EU27. Relative strengths, compared to the country's average performance, are in Economic effects and relative weaknesses are in Throughputs and Innovators.

Over the past 5 years, Throughputs and Economic effects have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Community trademarks (11.7%), Community designs (9.7%), Knowledge-intensive services exports (12.1%) and New-to-market sales (17.0%). Performance in Finance and support and Innovators has worsened, in particular due to a decrease in Venture capital (-26.1%).

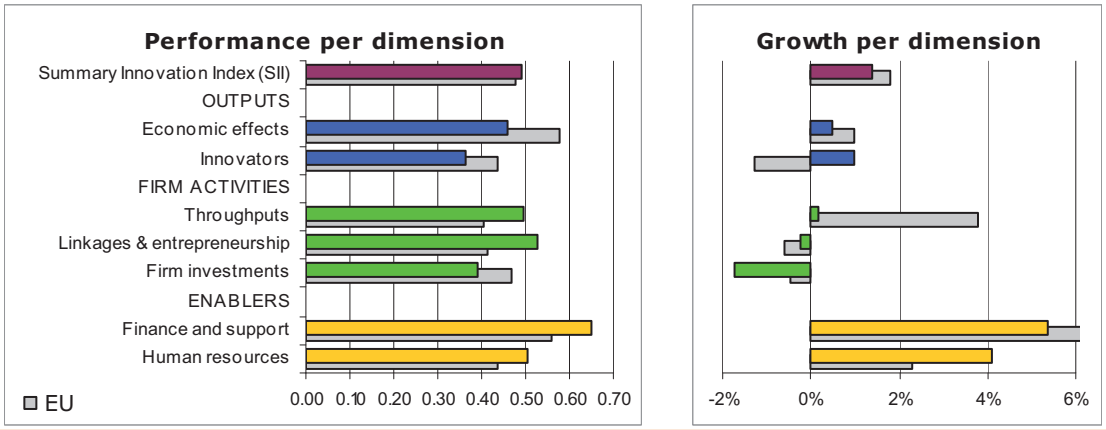
MALTA



For Malta, one of the Moderate innovators, innovation performance is below the EU27 average but the rate of improvement is above that of the EU27. Relative strengths, compared to the country's average performance, are in Finance and support and Economic effects and relative weaknesses are in Human resources, Linkages & entrepreneurship and Innovators.

Over the past 5 years, Throughputs has been the main driver of the improvement in innovation performance, in particular as a result from strong growth in EPO patents (16.2%), Community trademarks (16.5%), Community designs (23.5%) and Technology Balance of Payments flows (33.6%). Performance in Economic effects has hardly grown, in particular due to a stronger decrease in New-to-firm sales (-18.4%) than the increase in New-to-market sales (16.3%)[26].

NETHERLANDS

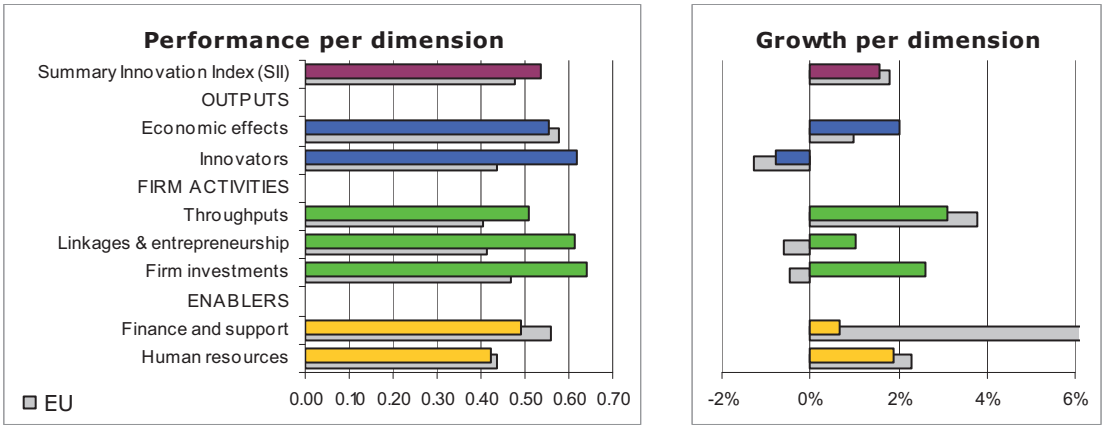


The Netherlands is one of the Innovation followers. Its innovation performance is just above the EU27 average but the rate of improvement is below that of the EU27. Relative strengths, compared to the country's average performance, are in Finance and support and Linkages & entrepreneurship while relative weaknesses are in Firm investments and Innovators.

Over the past 5 years, Human resources and Finance and support have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in S&E and SSH graduates (10.4%) and Broadband access by firms (12.3%). Performance in Firm investments and Linkages & entrepreneurship has worsened, in particular due to a decrease in Non-R&D innovation expenditures (-1.5%) and the Firm renewal rate (-4.4%).

[26] *The drop in sales new-to-firm products between the results for 2004 from CIS-4 and CIS-2006 is due to a change in the Maltese questionnaire such that the simple resale of new goods purchased from other enterprises is no longer considered as a product innovation.*

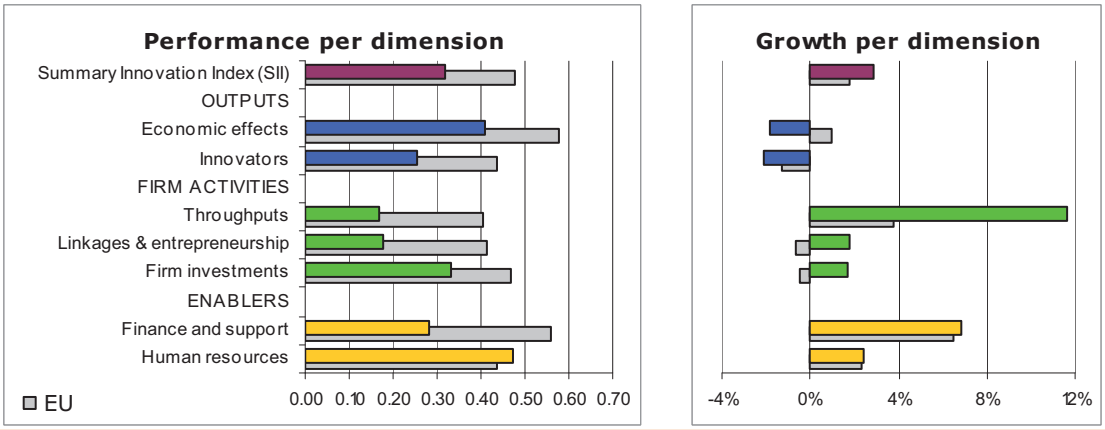
AUSTRIA



For Austria, among the group of Innovation followers, innovation performance is above the EU27 average and the rate of improvement close to that of the EU27. Relative strengths, compared to the country's average performance, are in Firm investments, Linkages & entrepreneurship and Innovators and relative weaknesses are in Human resources and Finance and support.

Over the past 5 years, Throughputs and Economic effects have been the main drivers of the improvement in innovation performance, in particular as a result from growth in Community trademarks (5.4%), New-to-market sales (5.8%) and New-to-firm sales (7.1%). But also Human resources, Finance and support, Firm investments and Linkages & entrepreneurship have shown a steady and substantial improvement. Performance in Innovators however has slightly worsened.

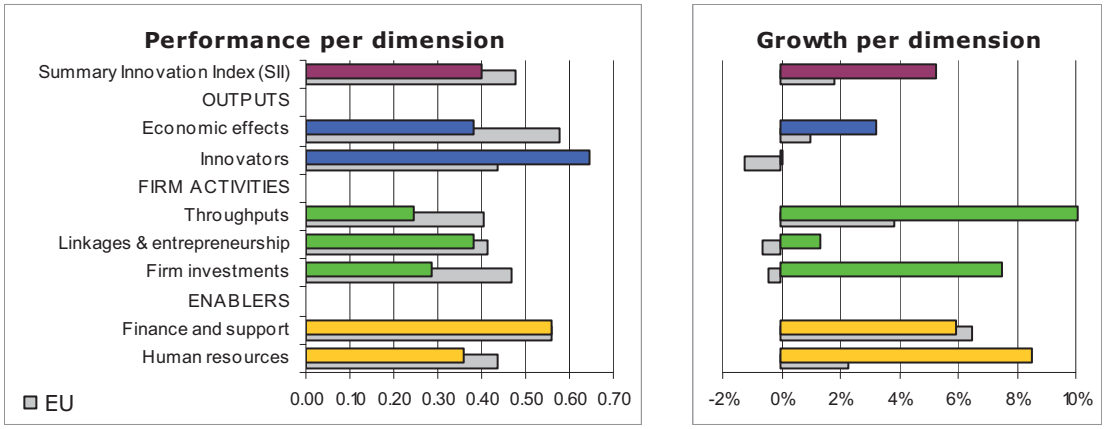
POLAND



Poland is among the group of Moderate innovators, with an innovation performance considerably below the EU27 average but an above average rate of improvement. Relative strengths, compared to the country's average performance, are in Human resources, Firm investments and Economic effects and relative weaknesses are in Linkages & entrepreneurship, Throughputs and Innovators.

Over the past 5 years, Finance and support and Throughputs have been a strong driver of improved performance, in particular as a result from strong growth in Private credit (15.4%), Broadband access by firms (20.5%), Community trademarks (14.4%) and Community designs (28.7%). Performance in Innovators and Economic effects has worsened, in particular due to a decrease in New-to-market sales (-13.4%).

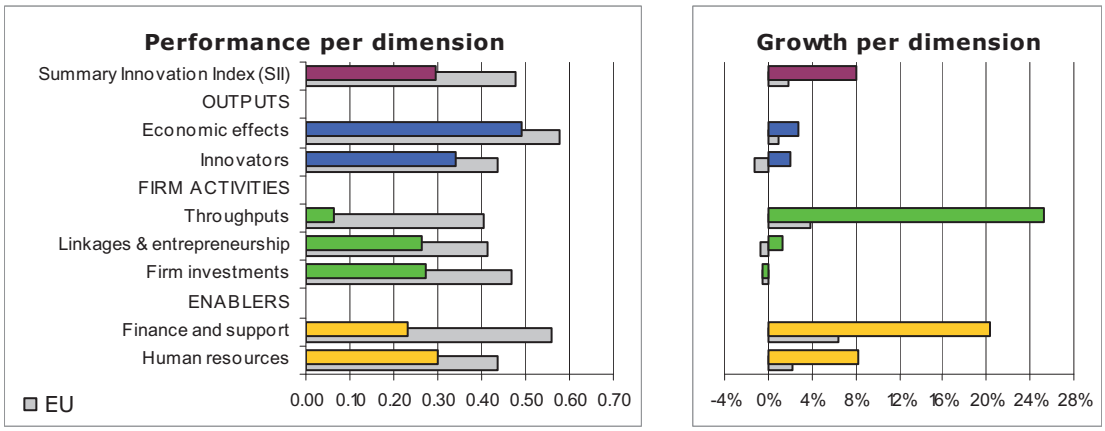
PORTUGAL



For Portugal, one of the Moderate innovators, innovation performance is below the EU27 average but the rate of improvement is three times that of the EU27 making it a growth leader within the group of Moderate innovators. Relative strengths, compared to the country's average performance, are in Finance and support and Innovators while relative weaknesses are in Firm investments and Throughputs.

Over the past 5 years, Human resources, Firm investments and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in S&E and SSH graduates (15.8%), S&E and SSH doctorate graduates (16.9%), Business R&D expenditures (26.3%) and EPO patents (16.4%). Performance in the other dimensions has increased at a slower pace, except in Innovators where there has been almost no improvement.

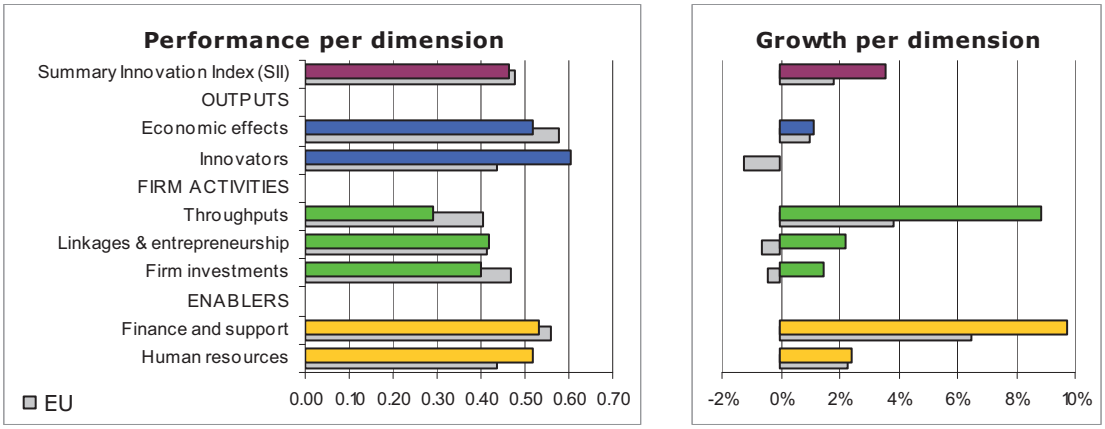
ROMANIA



Romania is one of the growth leaders among the Catching-up countries, with an innovation performance well below the EU27 average but a rate of improvement that is one of the highest of all countries. Relative strengths, compared to the country's average performance, are in Innovators and Economic effects and relative weaknesses are in Finance and support and Throughputs.

Over the past 5 years, Finance and support and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Public R&D expenditures (18.0%), Private credit (25.8%), Broadband access by firms (46.7%), Community trademarks (34.5%) and Community designs (37.3%). Performance in Firm investments, Linkages & entrepreneurship, Innovators and Economic effects has increased at a slower pace.

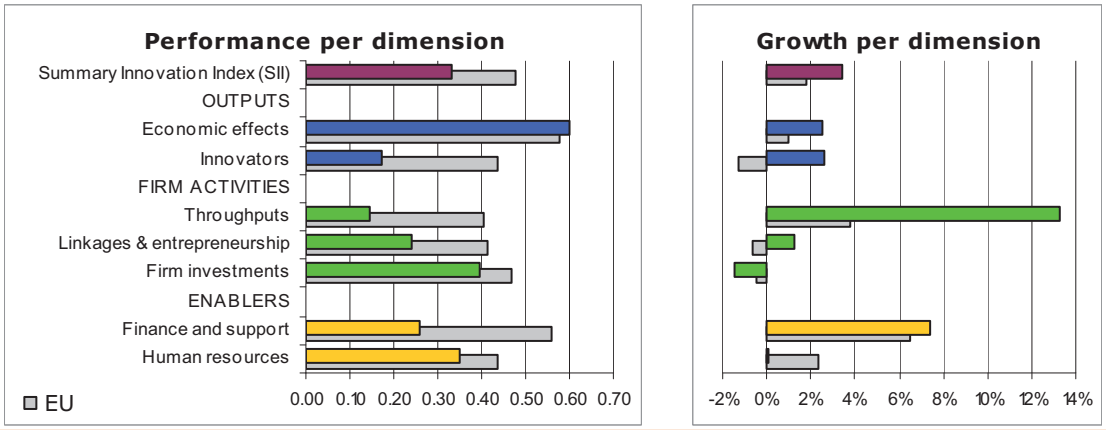
SLOVENIA



For Slovenia, one of the Innovation followers, innovation performance is just below the EU27 average but the rate of improvement is above that of the EU27. Relative strengths, compared to the country's average performance, are in Human resources, Finance and support, Innovators and Economic effects and relative weaknesses are in Firm investments and Throughputs.

Over the past 5 years, Finance and support and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Private credit (15.5%) and Community trademarks (13.1%). Performance in Human resources, Firm investments, Linkages & entrepreneurship and Economic effects has increased at a slower pace.

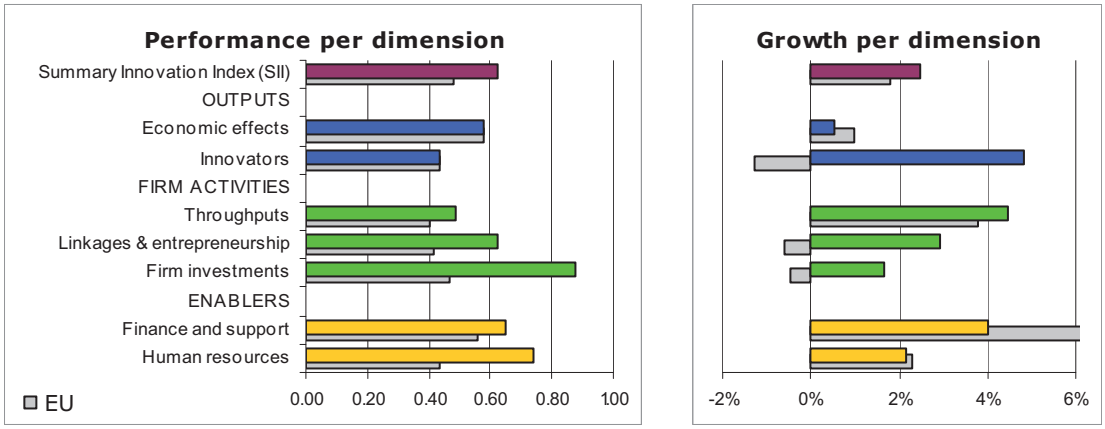
SLOVAKIA



For Slovakia, one of the Catching-up countries, innovation performance is well below the EU27 average but the rate of improvement is above that of the EU27. Relative strengths, compared to the country's average performance, are in Firm investments and Economic effects and relative weaknesses are in Finance and support, Linkages & entrepreneurship, Throughputs and Innovators.

Over the past 5 years, Finance and support and notably Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Broadband access by firms (33.3%), Community trademarks (34.1%) and Community designs (19.1%). Performance in Human resources has hardly improved and that in Firm investments has worsened, in particular due to a decreases in S&E and SSH doctorate graduates (-5.9%), Life-long learning (-6.4%) and Business R&D expenditures (-13.4%).

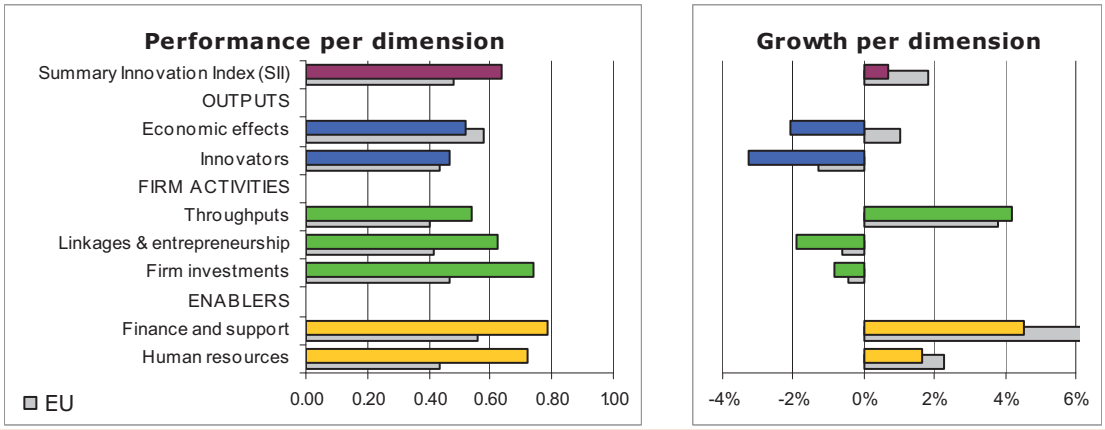
FINLAND



For Finland, one of the Innovation leaders, innovation performance is well above the EU27 average and the rate of improvement is also above that of the EU27. Relative strengths, compared to the country's average performance, are in Human resources and Firm investments and relative weaknesses are in Throughputs and Innovators.

Over the past 5 years, Finance and support, Throughputs and Innovators have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Innovative SMEs collaborating with others (12.4%) and Community trademarks (7.0%). Performance in both Firm investments and Economic effects has increased at a slower pace.

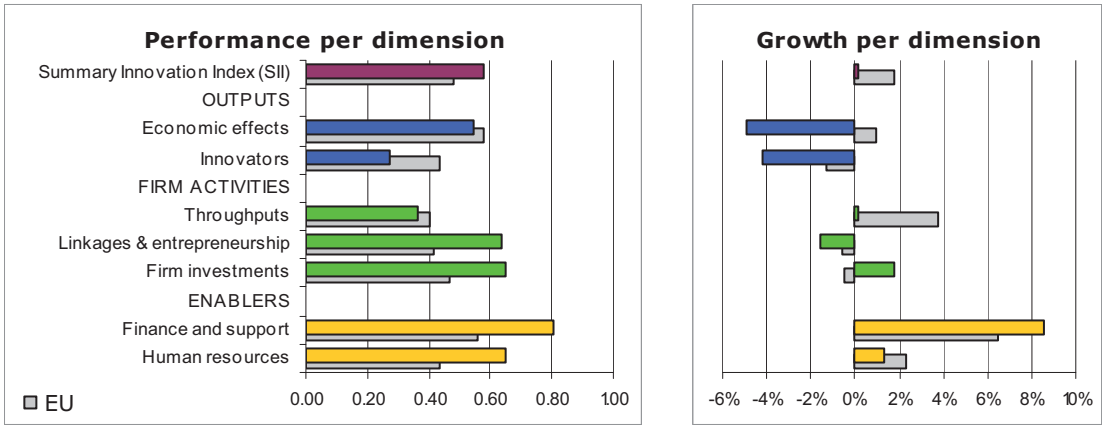
SWEDEN



Sweden is one of the Innovation leaders and the best performing EU Member State, although its rate of improvement is below that of the EU27. Relative strengths, compared to the country's average performance, are in Human resources, Finance and support and Firm investments and relative weaknesses are in Throughputs and Innovators.

Over the past 5 years, Finance and support and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from relatively ,strong growth in Venture capital (10.6%) and Community designs (7.3%). Performance in Firm investments, Linkages & entrepreneurship, Innovators and Economic effects has worsened, in particular due to a decrease in Innovative SMEs collaborating with others (- 4.5%), the Firm renewal rate (-4.2%) and Knowledge-intensive services exports (- 5.0%).

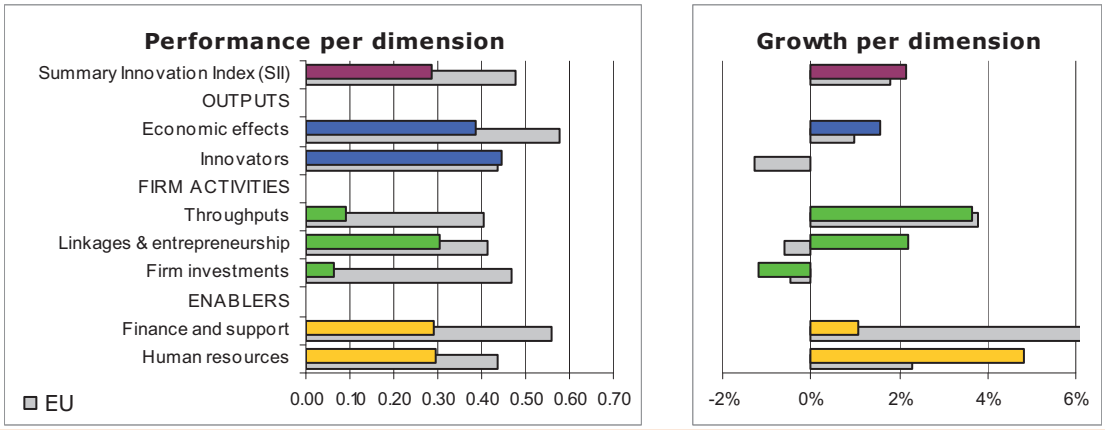
UNITED KINGDOM



For the UK, one of the Innovation leaders, innovation performance is above the EU27 average but the rate of improvement is negative and below that of the EU27. Relative strengths, compared to the country's average performance, are in Human resources, Finance and support, Firm investments and Linkages & entrepreneurship and relative weaknesses are in Throughputs, Innovators and Economic effects.

Over the past 5 years, Finance and support has been the main driver of the improvement in innovation performance, in particular as a result from strong growth in Broadband access by firms (14.9%). Performance in Linkages & entrepreneurship, Innovators and Economic effects has worsened, in particular due to a decrease in Newto- market sales (-12.7%) and New-to-firm sales (-10.7%). Performance in Firm investments and Throughputs has hardly improved.

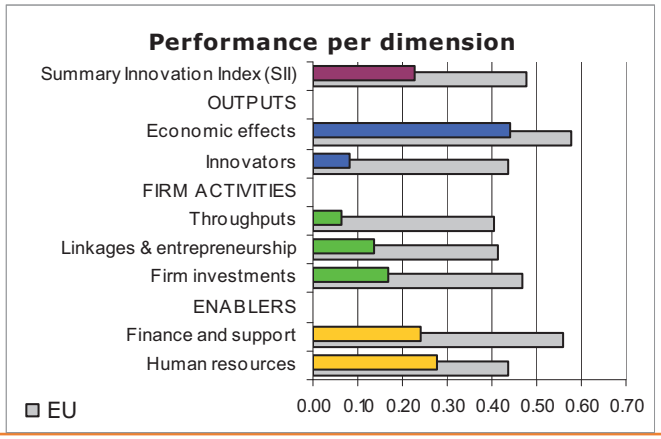
CROATIA



For Croatia, one of the Catching-up countries, innovation performance is well below the EU27 average and its rate of improvement is above that of the EU27. Relative strengths, compared to the country's average performance, are in Innovators and Economic effects and relative weaknesses are in Firm investments and Throughputs.

Over the past 5 years, Human resources and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from S&E and SSH doctorate graduates (10.7%) and Community designs (11.8%). Performance in Firm investments has worsened, in particular due to a decrease in Business R&D expenditures (-3.5%).

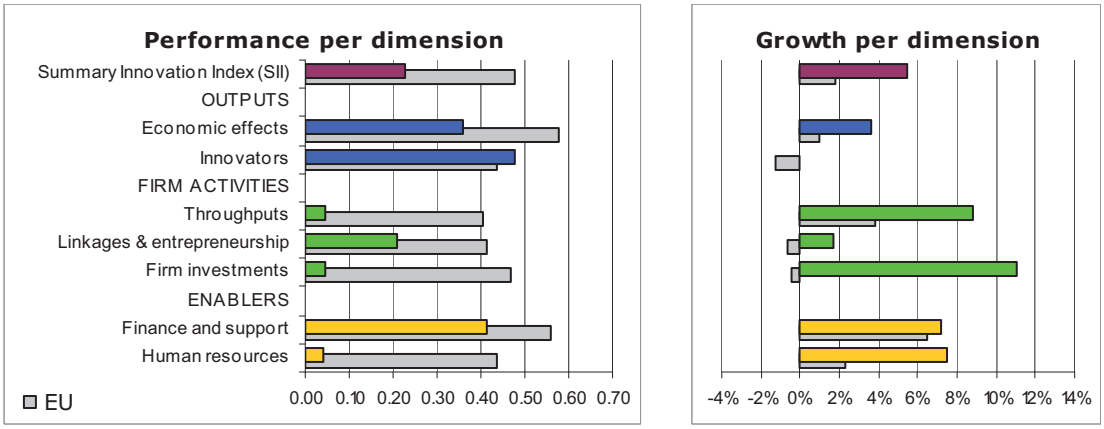
SERBIA



For Serbia, one of the Catching-up countries, innovation performance is well below the EU27 average. Relative strengths, compared to the country's average performance, are in Economic effects and relative weaknesses are in Linkages& entrepreneurship, Throughputs and Innovators.

Available time series data is too limited to analyse the change in Serbia's innovation performance over time.

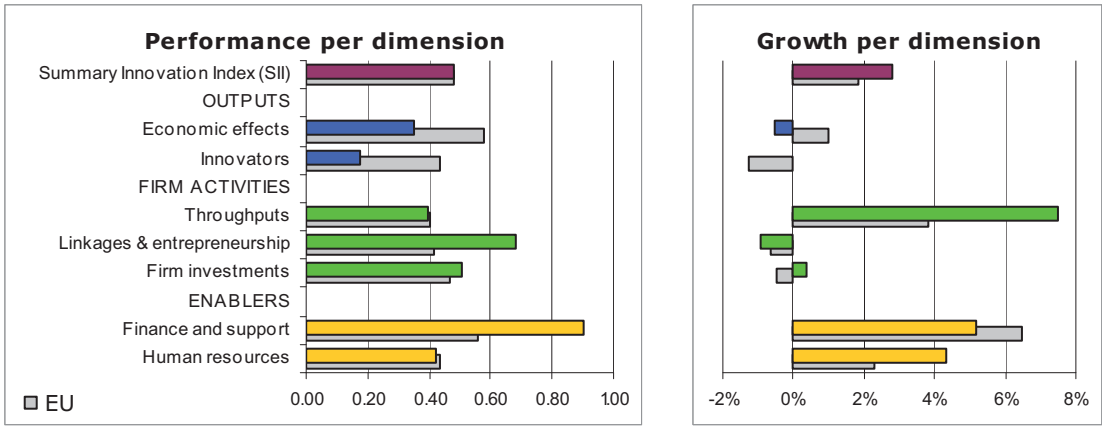
TURKEY



For Turkey, one of the Catching-up countries, innovation performance is well below the EU27 average and the rate of improvement is more than three times that of the EU27. Relative strengths, compared to the country's average performance, are in Finance and support, Innovators and Economic effects and relative weaknesses are in Human resources, Firm investments and Throughputs.

Over the past 5 years, Human resources, Finance and support, Firm investments and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in S&E and SSH graduates (17.2%), Lifelong learning (13.1%), Private credit (17.3%), Business R&D expenditures (28.5%) and EPO patents (15.0%). Performance in the other dimensions has increased at a lower pace.

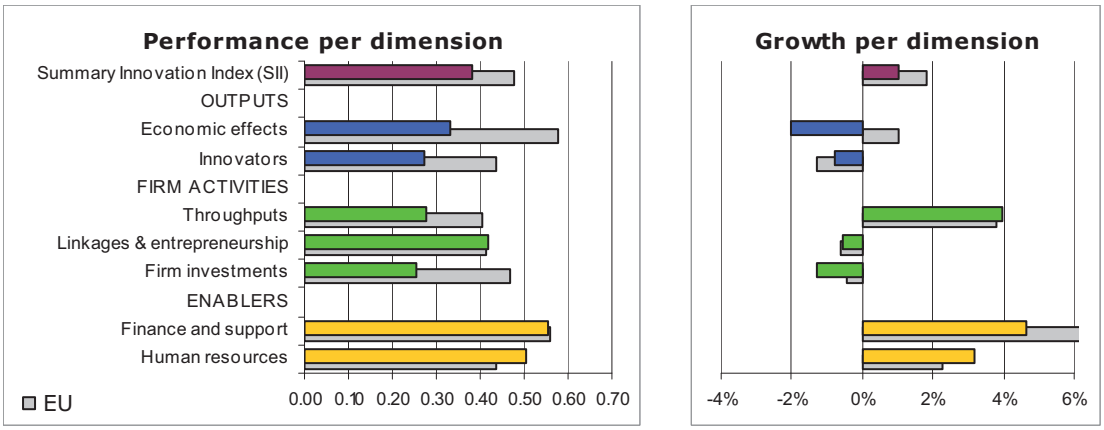
ICELAND



Iceland is among the Innovation followers, with an innovation performance just below the EU27 average but the rate of improvement is above that of the EU27. Relative strengths, compared to the country's average performance, are in Finance and support and Linkages & entrepreneurship and relative weaknesses are in Human resources, Throughputs, Innovators and Economic effects.

Over the past 5 years, Human resources, Finance and support and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from growth in S&E and SSH doctorate graduates (10.2%), Private credit (18.0%), Community trademarks (21.1%) and Community designs (14.4%). Performance in Linkages & entrepreneurship and Economic effects has worsened, in particular due to a decrease in Employment in medium-high & high-tech manufacturing (-5.0%) and Knowledge-intensive services exports (-5.4%).

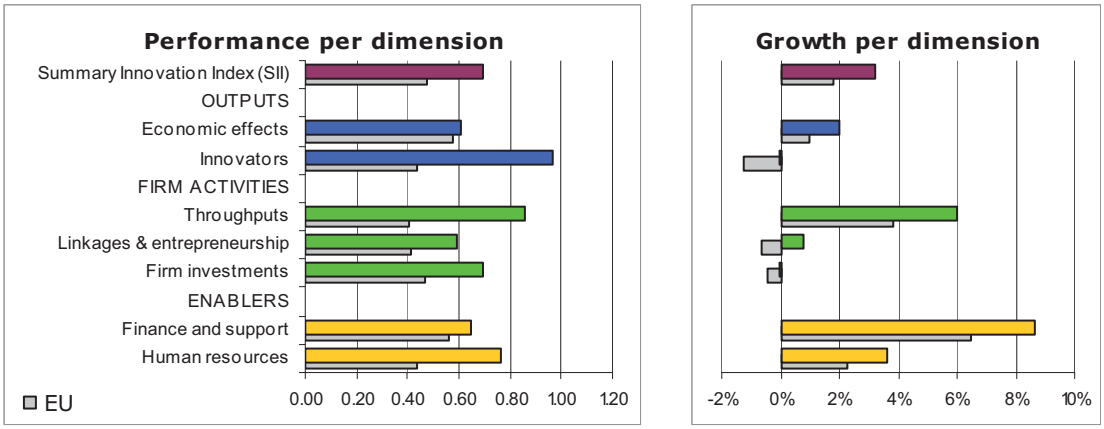
NORWAY



For Norway, one of the Moderate innovators, innovation performance is below the EU27 average and the rate of improvement is also below that of the EU27. Relative strengths, compared to the country's average performance, are in Human resources and Finance and support and relative weaknesses are in Firm investments, Throughputs and Innovators.

Over the past 5 years, Human resources, Finance and support and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Broadband access by firms (9.4%) and Community trademarks (12.1%). Performance in Firm investments, Linkages & entrepreneurship, Innovators and Economic effects has worsened, in particular due to a decrease in IT expenditures (-3.8%), New-to-market sales (-6.5%) and New-to-firm sales (-11.0%).

SWITZERLAND



Switzerland has the highest overall level of innovation performance and its rate of improvement is also above that of the EU27. Relative strengths, compared to the country's average performance, are in Throughputs and Innovators and relative weaknesses are in Linkages & entrepreneurship and Economic effects.

Over the past 5 years, Finance and support and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Venture capital (37.8%) and Community trademarks (9.4%). Performance in Firm investments and Innovators has not improved.

8. Technical annex

8.1 Calculating composite indexes

For each of the 7 innovation dimensions average performance will be summarized by calculating a composite innovation index. For each of the 3 blocks of dimensions average performance will be summarized by calculating a weighted composite index using the composite innovation indexes for those dimensions belonging to a specific block. Overall innovation performance will be summarized in the Summary Innovation Index. The methodology used for calculating these composite innovation indexes will now be explained in detail. The explanation refers to the EIS 2008 as this was the first year in which this methodology has been implemented.

Step 1: Transforming data

Most of the EIS indicators are fractional indicators with values between 0% and 100%. Some EIS indicators are unbound indicators, where values are not limited to an upper threshold. These indicators can be highly volatile and have skewed data distributions (where most countries show low performance levels and a few countries show exceptionally high performance levels). For these indicators – Public-private co-publications, EPO patents, Community trademarks and Community designs, all measured per million population – data will be transformed using a square root transformation.

Step 2: Identifying outliers

Positive outliers are identified as those relative scores which are higher than the EU27 mean plus 3 times the standard deviation[27]. Negative outliers are identified as those relative scores which are smaller than the EU27 mean minus 3 times the standard deviation. These outliers are not included in determining the Maximum and Minimum scores in the normalisation process (cf. Step 5).

Step 3: Setting reference years

For each indicator a reference year is identified based on data availability for all core EIS countries, i.e. those countries for which data availability is at least 75%. For most indicators this reference year will be lagging 1 or 2 years behind the year to which the EIS refers. Thus for the EIS 2008 the reference year will be 2006 or 2007 for most indicators (cf. Table 1).

Step 4: Sorting data over time

Reference year data are then used for "2008", etc. If data for a year-in-between is not available we substitute with the value for the previous year (except for indicators using CIS data where we use the average of 2004 and 2006 to impute for 2005). If data are not available at the beginning of the time series, we replace missing values with the latest available year. The following examples clarify this step and show how 'missing' data are imputed:

Example 1 (latest year missing)	"2008"	"2007"	"2006"	"2005"	"2004"
Available relative to EU27 score	Missing	150	120	110	105
Use most recent year	150	150	120	110	105
Example 2 (year-in-between missing)	**"2008"**	**"2007"**	**"2006"**	**"2005"**	**"2004"**
Available relative to EU27 score	150	Missing	120	110	105
Substitute with previous year	150	120	120	110	105
Example 3 (beginning-of-period missing)	**"2008"**	**"2007"**	**"2006"**	**"2005"**	**"2004"**
Available relative to EU27 score	150	130	120	Missing	Missing
Substitute with latest available year	150	130	120	120	120

If real data become available for the EIS 2009 or EIS 2010 for any of these 'missing' data, then the 'imputed' values will be replaced by the real data. This might cause some marginal deviations between the composite index scores between the EIS 2008, 2009 and 2010 reports.

Step 5: Extrapolating data

For all indicators and countries we extrapolate data for 2009 and 2010 by assuming the same percentage increase between "2008" and "2007", where for all fractional indicators extrapolated data can never be above 100. The rationale for this extrapolation is to take account of further increases in indicator values beyond the maximum or below the minimum values found within the observed 5 year time period. This way we can fix the Maximum and Minimum scores (cf. Step 6) for the EIS 2009 and EIS 2010 to ensure full comparability of SII scores between the EIS 2008 report and future EIS reports.

Step 6: Determining Maximum and Minimum scores

The Maximum score is the highest relative score found for the

[27] *This approach follows the well-adopted Chauvenet's Criterion in statistical theory, but we use a range of 3 standard deviations around the mean instead of the usual range of 2 standard deviations.*

whole time period (including the two extrapolated years) within the group of core EIS countries (i.e. those countries for which data availability is at least 75%) excluding positive outliers and 'small' countries with populations of 1 million or less (i.e. Cyprus, Iceland, Luxembourg and Malta) as these small countries are 1) responsible for some of the observed outliers (cf. Step 2) and 2) due to their small size cannot be taken as representative for most of the other (larger) countries. Similarly, the Minimum score is the lowest relative score found for the whole time period within the group of core EIS countries excluding negative outliers and 'small' countries.

Step 7: Calculating re-scaled scores

Re-scaled scores of the relative scores for all years are calculated by first subtracting the Minimum score and then dividing by the difference between the Maximum and Minimum score. The maximum re-scaled score is thus equal to 1 and the minimum re-scaled score is equal to 0. For positive and negative outliers and small countries where the value of the relative score is above the Maximum score or below the Minimum score, the re-scaled score is thus set equal to 1 respectively 0.

Step 8: Calculating composite innovation indexes

For each year and for each innovation dimension (Human resources, Finance and support, Firm investments, Linkages & entrepreneurship, Throughputs, Innovators, Economic effects) a dimension composite innovation index (DCII) is calculated as the unweighted average of the re-scaled scores for all indicators within the respective dimension. For each year and for each block of dimensions (Enablers, Firm activities, Outputs) a block composite innovation index (BCII) is calculated as the unweighted average of the re-scaled scores for all indicators within the respective block. For each year the Summary Innovation Index (SII) is calculated as the unweighted average of the re-scaled scores for all indicators. The SII will only be calculated if data are available for at least 70% of the indicators.

8.2 Calculating growth rates

As an input to the EIS workshop in June 2008, the Joint Research Centre prepared a report presenting possible alternatives to calculating growth rates[28]. For the calculation of the average annual growth rate in innovation performance we have adopted a generalized approach:

Step 1:

We first define growth for each country c per indicator i as $y_{ic}^{t} / y_{ic}^{t-1}$, i.e. as the ratio between the non-normalised values for year t and year t-1. In order to minimize the effect of growth outliers on the overall growth rate, these ratios are restricted to a maximum of 2 (such that growth in an individual indicator is restricted to 100%) and 0.5 (such that a decrease in an individual indicator is limited to -50%).

Step 2:

We aggregate these indicator growth rates between year t and year t-1 using a geometric average[29] to calculate the average yearly growth rate τ_c^t :

$$1 + \tau_c^t = \prod_{i \in I} \left(\frac{y_{ic}^t}{y_{ic}^{t-1}} \right)^{w_i}$$

where I is the set of EIS innovation indicators used for calculating growth rates and where all indicators receive the same weight wi (i.e. 1/27 if data for all 27 indicators are available)[30].

The average yearly growth rate τ_c^t is invariant to any ratio-scale transformation and indicates how much the overall set of indicators has progressed with respect to the reference year t-1.

Step 3:

We then calculate for each country c the average annual growth rate in innovation performance as the geometric average of all yearly growth rates:

$$1 + InnovationGrowthRate_c = \prod_t \left(1 + \tau_c^t\right)^{w_t}$$

where $t \in [2004,2008]$ and each average yearly growth rate receives the same weight w_t.

The average annual growth rate in innovation performance is different from that used in the EIS 2007 report as it does not measure the change in the SII but the average change in the 29 innovation indicators.

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[28] *Tarantola, S., (2008), "European Innovation Scoreboard: strategies to measure country progress over time", Joint Research Centre, mimeo.*

[29] *A geometric mean is an average of a set of data that is different from the arithmetic average. The geometric mean is of two data points X and Y is the square root of (X*Y), the geometric mean of X, Y and Z is the cube root of (X*Y*Z), and so forth.*

[30] *It should be noted that the following two indicators are not included in the calculation of growth rates as data are missing for too many countries: Share of SMEs introducing marketing or organisational innovations and Resource efficiency innovators.*

9. Annexes

Annex A: European Innovation Scoreboard 2009 – Current performance

	EU27	BE	BG	CZ	DK	DE	EE	IE	GR	ES	FR	IT	CY	LV	LT	LU	HU
ENABLERS																	
Human resources																	
1.1.1 S&E and SSH graduates	40.5	45.2	34.5	30.3	52.2	27.8	41.2	59.5	24.9	26.1	59.0	28.6	22.7	56.1	59.8	- -	29.4
1.1.2 S&E and SSH doctorate graduates	1.03	0.93	0.40	0.92	0.91	1.55	0.62	1.13	0.50	0.65	1.24	0.95	0.09	0.32	0.68	- -	0.46
1.1.3 Tertiary education	24.3	32.3	22.8	14.5	34.5	25.4	34.3	33.9	22.6	29.2	27.3	14.4	34.5	25.2	30.4	27.7	19.2
1.1.4 Life-long learning	9.6	6.8	1.4	7.8	30.2	7.9	9.8	10.2	2.9	10.4	7.2	6.3	8.5	6.8	4.9	8.5	3.1
1.1.5 Youth education	78.5	82.2	83.7	91.6	71.0	74.1	82.2	87.4	82.1	60.0	83.7	76.5	85.1	80.0	89.1	72.8	83.6
Finance and support																	
1.2.1 Public R&D expenditures	0.67	0.58	0.33	0.56	0.81	0.79	0.71	0.47	0.41	0.61	0.72	0.55	0.32	0.46	0.62	0.30	0.45
1.2.2 Venture capital	0.118	0.119	- -	0.014	0.091	0.061	- -	0.044	0.010	0.112	0.107	0.034	- -	- -	- -	- -	0.022
1.2.3 Private credit	1.27	0.95	0.74	0.52	2.19	1.08	0.99	2.17	0.93	1.98	1.08	1.05	2.17	0.90	0.63	1.97	0.70
1.2.4 Broadband access by firms	81.0	91.0	62.0	79.0	80.0	84.0	88.0	83.0	74.0	92.0	92.0	81.0	79.0	62.0	56.0	87.0	72.0
FIRM ACTIVITIES																	
Firm investments																	
2.1.1 Business R&D expenditures	1.21	1.32	0.15	0.91	1.91	1.84	0.56	0.93	0.16	0.74	1.27	0.60	0.11	0.15	0.19	1.32	0.53
2.1.2 IT expenditures	2.7	2.8	2.0	3.2	3.2	2.9	2.9	1.5	1.2	1.4	3.1	1.7	- -	2.3	1.8	- -	2.5
2.1.3 Non-R&D innovation expenditures	1.03	0.73	0.79	0.88	0.51	1.07	3.36	0.96	0.74	0.49	0.33	1.10	2.12	- -	0.64	0.90	0.72
Linkages & entrepreneurship																	
2.2.1 SMEs innovating in-ho use	30.0	40.8	15.1	28.0	40.8	46.3	37.1	38.8	32.7	24.6	28.3	28.1	37.5	- -	17.7	- -	13.2
2.2.2 Innovative SMEs collaborating with others	9.5	16.7	3.8	11.7	14.9	9.0	18.1	11.7	13.3	5.0	11.5	4.3	26.2	5.6	10.3	15.1	6.5
2.2.3 Firm renewal (SMEs entries +exits)	4.9	- -	- -	3.9	1.9	- -	5.2	- -		4.1	- -	2.6	- -	4.3	9.0	2.8	8.4
2.2.4 Public-private co-publications	36.1	59.3	1.3	17.9	127.2	49.2	17.5	22.0	11.9	13.5	35.2	20.8	10.3	1.1	1.0	9.5	19.2
Throughputs																	
2.3.1 EPO patents	114.9	137.9	3.5	10.8	207.8	290.9	7.1	65.3	10.9	33.4	134.7	85.2	25.0	9.8	3.2	231.8	13.7
2.3.2 Community trademarks	122.4	127.7	36.2	43.5	205.1	188.8	65.6	171.7	36.6	151.7	94.2	120.6	223.2	35.3	33.1	1225.8	27.6
2.3.3 Community designs	120.3	102.9	12.5	61.6	278.1	244.5	26.1	42.0	11.4	95.3	101.9	174.4	11.3	23.8	12.8	738.8	19.5
2.3.4 Technology Balance of Payments flows	1.00	0.67	0.21	0.36	- -	0.57	0.34	10.86	0.21	0.25	0.52	0.12	0.36	0.15	0.06	1.49	1.99
OUTPUTS																	
Innovators																	
3.1.1 SMEs intro ducing product or process innovations	33.7	45.4	17.8	32.0	35.7	52.8	45.8	43.8	37.3	29.5	29.9	33.0	37.9	14.4	19.7	44.7	16.8

	EU27	BE	BG	CZ	DK	DE	EE	IE	GR	ES	FR	IT	CY	LV	LT	LU	HU
OUTPUTS																	
Innovators																	
3.1.2 SMEs introducing marketing or organisational innovations	40.0	45.3	15.7	36.2	45.4	68.1	48.4	40.9	51.3	29.5	41.3	37.5	50.9	- -	28.5	60.2	26.4
3.1.3 Resource efficiency innovators	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
3.1.3a Reduced labour costs	18.0	16.6	15.9	18.2	11.5	15.1	14.3	19.3	26.2	12.9	34.9	18.1	29.2	6.2	10.7	12.9	6.2
3.1.3b Reduced use of materials and energy	9.6	8.8	13.2	14.2	7.3	9.5	7.8	10.2	20.7	8.5	15.9	4.4	19.9	5.4	8.5	6.8	7.2
Economic effects																	
3.2.1 Employment in medium-high & high-tech manufacturing	6.59	6.25	5.13	11.64	5.83	10.89	5.03	5.24	2.05	4.78	6.07	7.27	0.87	2.40	3.02	0.91	9.26
3.2.2 Employment in knowledge-intensive services	14.92	15.62	8.35	11.48	15.74	15.87	11.69	16.35	11.87	14.99	16.13	15.78	16.16	11.22	9.28	25.17	12.17
3.2.3 Medium-tech and high-tech manufacturing exports	47,4	48.1	24.2	61.5	41.6	62.9	35.4	50.9	31.2	51.8	57.2	51.3	37.4	28.7	34.4	29.9	66.4
3.2.4 Knowledge-intensive services exports	48.8	39.2	19.1	33.0	67.3	55.9	43.5	69.1	52.0	- -	- -	36.1	41.2	37.8	12.8	82.4	28.3
3.2.5 New-to-market sales	8.60	6.16	6.70	9.93	3.79	9.12	4.43	7.19	16.60	7.37	6.16	4.53	5.29	2.10	6.04	5.91	7.82
3.2.6 New-to-firm sales	6.28	7.39	3.59	4.72	4.05	10.11	9.27	5.43	9.04	8.48	5.56	4.52	7.04	1.25	6.39	6.54	2.70

	EU27	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK	HR	RS	TR	IS	NO	CH
ENABLERS																		
Human resources																		
1.1.1 S&E and SSH graduates	40.5	35.7	37.2	22.8	56.5	40.1	47.9	41.5	28.1	41.1	28.0	52.0	23.0	34.5	22.1	46.6	30.7	51.3
1.1.2 S&E and SSH docto rate graduates	1.03	0.12	0.92	1.64	0.70	3.12	0.53	1.10	1.03	2.30	2.25	1.73	0.52	0.32	0.14	0.11	1.11	2.38
1.1.3 Tertiary education	24.3	13.1	32.2	18.1	19.6	14.3	12.8	22.6	14.8	36.6	32.0	32.0	16.6	16.5	10.4	31.3	35.5	33.7
1.1.4 Life-long learning	9.6	6.2	17.0	13.2	4.7	5.3	1.5	13.9	3.3	23.1	32.4	19.9	2.2	1.3	1.8	25.1	19.3	26.8
1.1.5 Youth education	78.5	54.2	76.2	84.5	91.3	54.3	78.3	90.2	92.3	86.2	87.9	78.2	95.4	- -	47.8	53.6	70.0	81.2
Finance and support																		
1.2.1 Public R&D expenditures	0.67	0.18	0.73	0.78	0.41	0.63	0.41	0.58	0.26	0.94	0.97	0.63	0.50	0.35	0.43	1.14	0.75	0.68
1.2.2 Venture capital	0.118	- -	0.118	0.033	0.045	0.071	0.051	- -	0.007	0.168	0.288	0.342	- -	- -	- -	- -	0.136	0.170
1.2.3 Private credit	1.27	1.28	1.93	1.18	0.50	1.80	0.39	0.86	0.45	0.86	1.30	2.10	0.65	0.24	0.33	3.20	0.87	1.68
1.2.4 Broadband access by firms	81.0	89.0	86.0	76.0	59.0	81.0	44.0	84.0	79.0	92.0	89.0	87.0	- -	69.4	88.0	99.0	86.0	85.0
FIRM ACTIVITIES																		
Firm investments																		
2.1.1 Business R&D expenditures	1.21	0.35	0.89	1.88	0.19	0.76	0.18	1.07	0.20	2.76	2.78	1.21	0.40	0.15	0.30	1.45	0.87	2.14
2.1.2 IT expenditures	2.7	- -	3.3	2.8	2.6	1.8	2.1	2.2	2.5	3.2	3.8	3.5	- -	- -	- -	- -	2.4	3.7
2.1.3 Non-R&D innovation expenditures	1.03	1.10	0.29	- -	1.03	0.95	1.08	1.12	1.51	- -	0.66	- -	0.12	0.80	0.16	- -	0.17	0.92
Linkages & entrepreneurship																		
2.2.1 SMEs innovating in-house	30.0	- -	27.3	41.1	17.2	34.1	17.9	- -	17.9	40.9	41.8	- -	24.4	27.8	28.2	- -	25.9	34.4
2.2.2 Inno vative SMEs co llaborating with others	9.5	5.7	12.5	18.0	9.3	6.7	2.9	15.1	7.2	27.5	16.6	10.7	9.6	3.5	5.3	14.0	9.8	12.1
2.2.3 Firm renewal (SMEs entries + exits)	4.9	- -	6.3	3.9	- -	5.9	8.3	2.3	4.8	0.7	2.5	10.2	- -	0.1	- -	- -	- -	3.8
2.2.4 Public-private co -publications	36.1	2.5	88.5	65.7	1.6	9.3	4.1	42.6	7.0	105.3	128.0	60.9	13.3	2.0	1.2	126.7	110.1	198.5
Throughputs																		
2.3.1 EPO patents	114.9	33.8	205.8	185.7	3.4	13.2	1.6	57.6	6.1	247.3	269.6	85.9	7.1	4.0	2.7	93.3	111.4	430.7
2.3.2 Community trademarks	122,4	228.2	196.8	241.1	41.9	108.1	12.4	103.4	31.1	141.7	175.3	139.0	5.6	3.3	2.1	403.3	59.1	366.1
2.3.3 Community designs	120,3	26.7	159.4	221.2	49.8	75.3	2.0	54.4	24.8	145.1	176.0	71.1	8.8	0.0	5.4	50.4	34.6	301.4
2.3.4 Technology Balance o f Payments flows	1.00	2.74	0.96	0.58	0.35	0.24	0.28	0.53	0.36	1.09	1.45	0.91	0.43	0.81	0.09	0.03	0.31	- -
OUTPUTS																		
Innovators																		
3.1.1 SMEs introducing productor process innovations	33.7	14.4	32.9	47.8	20.4	38.7	19.4	31.7	21.4	44.7	40.7	25.1	28.3	18.3	29.5	- -	29.8	52.9
3.1.2 SMEs introducing marketing or organisa-tional innovations	40.0	31.8	29.0	54.9	29.1	53.4	35.4	- -	21.5	- -	- -	30.3	38.1	18.1	50.3	- -	34.7	- -

	EU27	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK	HR	RS	TR	IS	NO	CH
OUTPUTS																		
Innovators																		
3.1.3 Resource efficiency innovators	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
3.1.3a Reduced labour costs	18.0	11.8	16.6	11.9	13.8	22.4	18.3	28.4	8.0	10.7	17.0	- -	19.9	7.5	18.0	13.8	10.0	- -
3.1.3b Reduced use of materials and energy	9.6	7.7	10.5	9.7	11.6	15.0	14.8	17.2	10.8	5.2	7.1	- -	15.1	6.7	10.2	5.7	4.3	- -
Economic effects																		
3.2.1 Employment in medium-high & high-tech manufacturing	6.59	5.51	3.36	5.78	5.50	3.30	5.60	9.09	10.33	6.95	6.20	4.87	4.62	3.87	3.86	2.01	4.28	7.11
3.2.2 Employment in knowledge-intensive services	14.92	14.71	18.29	14.90	10.33	9.94	5.66	10.89	10.48	16.87	18.45	18.46	9.74	33.81	5.93	17.54	15.69	19.87
3.2.3 Medium-tech and high-tech manufacturing exports	47.4	71.9	39.5	52.9	51.1	37.6	44.1	56.5	61.5	53.6	51.9	50.3	45.0	28.0	39.1	16.7	13.4	63.6
3.2.4 Knowledge-intensive services exports	48.8	33.7	37.3	- -	27.2	30.6	51.8	21.2	23.0	25.8	42.5	64.4	17.0	38.3	16.7	19.5	55.0	39.8
3.2.5 New-to -market sales	8.60	24.79	6.02	6.56	4.56	7.17	4.85	5.83	7.79	10.84	8.29	3.70	4.58	3.02	4.65	4.88	1.61	4.90
3.2.6 New-to -firm sales	6.28	3.85	4.87	7.08	5.55	6.12	13.69	7.50	8.95	4.83	5.10	4.81	8.45	6.99	11.17	7.81	3.17	5.80

Annex B: European Innovation Scoreboard 2009 – Growth performance

	EU27	BE	BG	CZ	DK	DE	EE	IE	GR	ES	FR	IT	CY	LV	LT	LU	HU
Average annual growth rate	1.8	1.6	6.7	4.8	0.1	2.6	5.5	1.6	5.3	1.4	1.2	1.3	6.0	4.9	3.0	1.4	2.2
ENABLERS	4.1	4.6	7.1	11.0	2.5	4.5	7.1	6.9	8.5	1.6	1.7	5.0	6.8	8.3	5.8	7.1	-1.0
Human resources	2.3	1.7	4.1	7.1	3.1	3.7	5.7	5.0	2.3	-0.9	2.2	4.2	4.3	4.9	4.5	0.1	0.4
1.1.1 S&E and SSH graduates	5.1	7.8	2.7	18.1	8.1	12.2	5.5	0.2	4.2	-2.9	-0.2	1.6	5.9	4.8	6.2	- -	2.9
1.1.2 S&E and SSH doctorate graduates	2.4	4.9	12.5	6.0	1.7	3.9	9.2	6.5	-6.4	-3.2	7.3	12.8	0.0	19.6	14.8	- -	1.9
1.1.3 Tertiary education	2.8	2.1	1.5	4.2	1.6	0.5	2.1	4.6	2.4	2.6	3.1	6.0	4.1	6.7	5.8	4.0	3.7
1.1.4 Life-long learning	0.8	-5.7	1.9	7.7	4.2	1.6	11.2	13.7	12.7	-0.2	0.4	0.0	9.6	-5.1	-4.5	-3.5	-6.2
1.1.5 Youth education	0.5	0.1	2.4	0.1	0.1	0.9	0.6	0.6	-0.3	-0.5	0.6	1.0	2.3	0.2	1.2	0.1	0.0
Finance and support	6.5	8.3	12.2	16.1	1.7	5.5	9.5	9.4	16.7	4.7	1.1	6.0	11.1	14.1	8.0	14.5	-2.6
1.2.1 Public R&D expenditures	1.2	1.8	-3.5	5.0	0.9	1.3	9.2	2.9	2.6	6.2	-1.7	1.4	5.3	18.9	0.8	10.7	-1.1
1.2.2 Venture capital	5.1	17.8	-¬	26.6	-2.2	10.4	-¬	-2.7	24.1	-5.3	-0.2	-9.0	- -	- -	- -	- -	-26.1
1.2.3 Private credit	5.0	7.2	19.8	13.6	8.4	-0.9	12.8	12.7	7.6	12.2	4.5	5.5	6.2	15.4	21.5	16.8	11.0
1.2.4 Broadband access by firms	15.2	6.8	22.0	20.1	0.0	11.7	6.7	26.9	35.4	6.3	1.7	29.8	22.6	8.3	2.9	16.0	10.7
FIRM ACTIVITIES	1.0	0.4	12.0	3.4	0.1	2.5	7.7	-1.5	2.6	1.1	1.7	0.7	7.7	4.9	2.4	1.4	3.6
Firm investments	-0.4	-2.7	6.1	-1.5	-0.5	0.5	14.5	-1.3	-9.3	6.4	-0.3	0.7	1.3	-1.8	-2.6	-0.5	2.1
2.1.1 Business R&D expenditures	1.1	0.8	5.7	3.9	3.1	1.4	14.1	3.5	-1.5	6.3	-1.7	3.6	8.3	-5.7	4.4	-2.0	10.2
2.1.2 IT expenditures	0.0	0.0	7.5	3.4	-0.8	0.0	1.8	-1.6	-2.0	0.0	0.8	-1.4	- -	2.3	4.7	- -	1.0
2.1.3 Non-R&D inno vation expenditures	-2.4	-8.5	5.0	-11.0	-3.6	0.0	29.3	-5.7	-22.7	13.4	0.0	0.0	-5.1	- -	-15.4	0.9	-4.5
Linkages & entrepreneurship	-0.6	0.5	2.0	-0.6	-1.7	0.9	0.4	-3.1	5.1	-2.2	0.5	0.5	12.1	-5.9	0.1	-6.9	1.2
2.2.1 SMEs innovating in-ho use	-0.5	-1.2	0.0	-3.1	0.0	0.1	-2.1	-5.1	-0.6	-1.8	0.0	0.0	2.7	- -	-4.2	- -	0.1
2.2.2 Innovative SM Es collaborating with others	1.0	0.1	5.0	-2.5	-8.0	1.0	3.1	-7.0	12.2	-3.0	0.0	-0.3	12.3	-2.2	-8.7	0.6	-0.2
2.2.3 Firm renewal (SMEs entries +exits)	-4.4	- -	- -	-2.9	0.0	- -	-12.2	- -	- -	-5.9	- -	1.2	- -	-17.2	2.8	-10.7	1.8
2.2.4 Public-private co-publications	1.5	2.7	0.9	6.4	1.3	1.7	14.6	3.0	4.0	2.3	1.6	1.2	22.1	3.1	11.5	-10.1	3.3
Throughputs	3.8	2.8	25.2	11.6	3.2	5.2	10.4	-0.4	10.5	0.6	4.2	0.9	7.7	17.5	8.9	9.1	7.3
2.3.1 EPO patents	1.3	1.3	8.2	2.7	2.3	1.4	6.9	1.8	6.2	4.9	1.6	1.9	13.1	17.8	15.5	6.8	1.9
2.3.2 Community trademarks	5.2	5.8	69.6	6.1	4.9	6.2	14.5	3.3	5.0	2.2	3.8	4.8	8.8	35.9	26.8	10.3	11.7
2.3.3 Community designs	4.2	-0.1	24.1	24.5	2.4	5.3	3.8	-7.2	34.2	2.9	4.3	2.6	15.3	21.0	6.0	9.3	9.7
2.3.4 Technology Balance of Payments flows	4.5	4.2	7.8	14.5	- -	8.2	16.9	1.0	-0.5	-7.2	7.1	-5.4	-5.3	-1.4	-9.5	9.9	6.2

	EU27	BE	BG	CZ	DK	DE	EE	IE	GR	ES	FR	IT	CY	LV	LT	LU	HU
OUTPUTS	0.5	0.0	0.9	0.7	-2.3	0.7	1.4	-0.1	5.2	1.6	-0.1	-1.5	3.7	1.8	1.1	-2.1	3.6
Innovators	-1.3	-0.8	4.5	-2.6	-5.7	-0.7	-0.3	-3.3	1.9	-2.1	0.0	-0.4	-4.3	0.0	-6.1	-2.3	-1.1
3.1.1 SMEs introducing product or process innovations	-1.3	-0.8	4.5	-2.6	-5.7	-0.7	-0.3	-3.3	1.9	-2.1	0.0	-1.3	-4.3	0.0	-6.1	-2.3	-1.1
3.1.2 SMEs introducing marketing o r organisa-tional innovations																	
3.1.3 Resource efficiency innovators																	
3.1.3a Reduced labour costs																	
3.1.3b Reduced use o f materials and energy																	
Economic effects	1.0	0.1	0.6	1.5	-2.4	1.2	2.1	0.5	7.5	3.1	-0.2	-2.1	6.4	2.4	2.8	-2.8	5.6
3.2.1 Employment in medium-high & high-tech manufacturing	-0.3	-0.6	2.7	6.6	-0.6	-0.8	-0.4	-5.3	-2.1	-0.4	-1.2	-0.7	-7.3	14.0	1.9	-6.9	2.7
3.2.2 Employment in knowledge-intensive services	1.3	0.2	0.9	3.4	2.3	2.1	3.0	1.6	1.9	4.1	1.5	1.5	4.5	7.0	9.6	2.5	2.7
3.2.3 Medium-tech and high-tech manufacturing exports	-0.4	-0.9	3.3	0.6	-0.2	-0.8	-2.1	-1.9	1.6	-0.7	-1.2	0.1	-8.0	13.1	2.6	-3.3	-1.6
3.2.4 Knowledge-intensive services exports	1.2	-1.7	5.8	4.9	0.7	2.0	7.0	-2.1	4.4	- -	- -	0.0	6.8	0.7	-9.2	1.5	12.1
3.2.5 New-to-market sales	4.1	6.6	-5.7	6.7	-7.7	4.8	0.4	6.3	32.8	17.7	0.0	-7.8	29.1	-12.3	8.4	-2.1	17.0
3.2.6 New-to -firm sales	0.1	-2.5	-3.1	-11.9	-8.5	0.2	5.2	4.8	9.9	-4.0	0.0	-5.3	17.7	-5.6	4.7	-8.0	1.9

For indicators 3.1.2 and 3.1.3 growth rates could not be calculated (cf. Section 8.2).

	EU27	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK	HR	TR	IS	NO	CH
Average annual growth rate	1.8	6.0	1.4	1.6	2.9	5.2	8.1	3.6	3.4	2.5	0.7	0.2	2.2	5.5	2.8	1.0	3.3
ENABLERS	4.1	6.4	4.7	1.3	4.3	7.3	13.5	5.1	3.3	3.0	2.9	4.5	3.7	7.4	4.6	3.8	5.8
Human resources	2.3	8.6	4.1	1.9	2.4	8.5	8.2	2.4	0.1	2.2	1.6	1.3	4.8	7.5	4.3	3.2	3.6
1.1.1 S&E and SSH graduates	5.1	10.4	10.4	8.2	6.4	15.8	31.1	7.1	9.9	3.4	4.0	-0.8	8.9	17.2	6.9	4.4	5.0
1.1.2 S&E and SSH do cto rate graduates	2.4	17.6	6.7	-0.4	0.9	16.9	4.7	4.3	-5.9	4.8	1.5	4.9	10.7	1.1	10.2	5.8	9.6
1.1.3 Tertiary education	2.8	4.7	2.4	-1.0	6.3	3.1	5.3	4.7	3.7	1.9	1.9	2.4	0.7	3.6	2.9	2.7	4.6
1.1.4 Life-long learning	0.8	9.6	0.9	3.3	-1.5	5.4	1.7	-3.8	-6.4	0.3	0.2	-0.1	3.7	13.1	0.9	2.6	-1.6
1.1.5 Youth education	0.5	1.5	0.4	-0.4	0.1	2.3	1.0	-0.1	0.2	0.5	0.5	0.4	0.5	3.3	0.9	0.5	0.8
Finance and support	6.5	2.7	5.4	0.7	6.8	5.9	20.4	9.7	7.4	4.0	4.5	8.5	1.1	7.1	5.2	4.6	8.6
1.2.1 Public R&D expenditures	1.2	0.0	-1.6	2.0	0.6	12.0	24.6	6.0	0.0	-1.8	0.0	1.2	-4.8	2.5	-2.5	1.0	-0.4
1.2.2 Venture capital	5.1	-¬	6.2	-9.5	-7.0	-6.8	3.2	- -	-9.6	5.2	10.6	9.7	- -	- -	- -	5.4	37.8
1.2.3 Private credit	5.0	4.7	5.2	2.7	15.4	6.3	25.8	15.5	10.6	6.1	6.0	8.7	7.4	17.2	18.0	2.9	1.5
1.2.4 Broadband access by firms	15.2	3.4	12.3	8.4	20.5	13.4	29.8	7.9	33.3	6.7	1.8	14.9	- -	2.4	1.0	9.4	0.0
FIRM ACTIVITIES	1.0	13.0	-0.5	2.2	5.6	6.1	8.9	4.6	4.7	3.3	0.6	-0.1	2.1	6.9	4.0	0.9	2.1
Firm investments	-0.4	3.7	-1.7	2.6	1.7	7.5	-0.5	1.5	-1.5	1.7	-0.8	1.8	-1.2	11.0	0.3	-1.3	0.0
2.1.1 Business R&D expenditures	1.1	0.0	-3.6	5.3	4.4	28.4	-3.8	3.3	-5.4	3.3	1.5	3.6	-2.4	23.3	0.3	0.0	0.0
2.1.2 IT expenditures	0.0	- -	0.0	0.0	8.2	0.0	7.0	1.2	4.5	0.0	0.0	0.0	- -	- -	- -	-3.8	0.0
2.1.3 Non-R&D innovatio n expenditures	-2.4	7.6	-1.5	- -	-6.9	-3.2	-4.2	0.0	-3.2	- -	-3.9	- -	0.0	0.0	- -	0.0	0.0
Linkages & entrepreneurship	-0.6	5.3	-0.2	1.0	1.8	1.3	1.3	2.2	1.2	2.9	-1.9	-1.6	2.2	1.7	-0.9	-0.6	0.8
2.2.1 SMEs innovating in-ho use	-0.5	- -	1.0	-0.8	-3.0	0.5	2.6	- -	2.8	4.8	0.0	- -	0.0	0.0	- -	-2.0	0.0
2.2.2 Innovative SMEs collabo rating with others	1.0	1.9	0.5	0.0	0.8	-2.4	0.6	9.5	1.4	12.4	-4.5	-3.9	0.0	0.0	0.0	-3.6	0.0
2.2.3 Firm renewal (SMEs entries +exits)	-4.4	- -	-4.4	0.0	- -	-1.7	-1.2	-6.2	-5.1	-6.7	-4.2	-0.6	- -	- -	- -	0.0	2.0
2.2.4 Public-private co-publications	1.5	8.8	2.1	5.0	7.8	9.2	3.1	3.8	6.2	2.1	1.3	-0.2	6.8	5.3	-1.9	3.5	1.2
Throughputs	3.8	22.3	0.2	3.1	11.6	10.1	25.2	8.8	13.2	4.4	4.2	0.2	3.6	8.8	7.5	4.0	6.0
2.3.1 EPO patents	1.3	16.2	-0.4	2.1	6.1	16.4	14.5	5.3	3.8	0.3	2.3	-0.9	-1.9	15.0	-3.5	3.8	2.2
2.3.2 Community trademarks	5.2	16.5	5.6	5.4	14.4	10.8	34.5	13.1	34.1	7.0	5.9	3.2	6.6	10.1	21.1	12.1	9.4
2.3.3 Community designs	4.2	23.5	2.1	3.8	28.7	11.9	37.3	9.7	19.1	4.6	7.3	-0.1	11.8	10.7	14.4	-3.4	6.5
2.3.4 Technology B alance of P ayments flo ws	4.5	33.6	-6.1	1.1	-0.7	1.7	16.4	7.4	-0.8	5.9	1.5	-1.5	-1.3	0.0	-0.1	3.9	- -
OUTPUTS	0.5	-0.2	0.4	1.1	-1.5	2.2	2.1	0.8	2.0	1.0	-2.0	-4.3	1.0	2.4	-0.5	-1.4	1.7
Innovators	-1.3	0.0	1.0	-0.8	-2.1	0.1	2.1	0.0	2.6	4.8	-3.3	-4.2	0.0	0.0	- -	-0.8	0.0
3.1.1 SM Es intro ducing product or process innovations	-1.3	0.0	1.0	-0.8	-2.1	0.1	2.1	0.0	2.6	4.8	-3.3	-4.2	0.0	0.0	- -	-0.8	0.0

	EU27	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK	HR	TR	IS	NO	CH
OUTPUTS	0.5	-0.2	0.4	1.1	-1.5	2.2	2.1	0.8	2.0	1.0	-2.0	-4.3	1.0	2.4	-0.5	-1.4	1.7
Innovators	-1.3	0.0	1.0	-0.8	-2.1	0.1	2.1	0.0	2.6	4.8	-3.3	-4.2	0.0	0.0	- -	-0.8	0.0
3.1.2 SMEs intro ducing marketing or organisational innovations																	
3.1.3 Resource efficiency innovators 3.1.3a Reduced labour costs																	
3.1.3b Reduced use o f materials and energy																	
Economic effects	1.0	-0.2	0.5	2.0	-1.9	3.2	2.8	1.1	2.5	0.5	-2.1	-5.0	1.6	3.7	-0.6	-2.0	2.0
3.2.1 Employment in medium-high & high-tech manufacturing	-0.3	-7.9	-1.5	-1.9	2.9	-1.9	-0.4	1.9	4.7	0.6	-3.2	-3.8	-0.4	1.5	-5.0	2.5	0.3
3.2.2 Employment in knowledge-intensive services	1.3	5.2	0.3	0.1	2.7	2.3	3.7	2.2	3.3	0.9	- -	0.5	3.7	2.8	1.2	0.8	0.4
3.2.3 Medium-tech and high-tech manufacturing expo rts	-0.4	0.3	-6.1	-0.8	1.9	-2.7	9.1	1.1	3.5	1.5	-2.2	-2.3	1.1	0.4	6.4	1.4	0.3
3.2.4 Knowledge-intensive services exports	1.2	6.9	-2.3	- -	-5.0	7.6	5.0	5.4	8.0	-1.0	-5.0	0.0	5.1	18.4	-5.4	1.7	11.2
3.2.5 New-to -market sales	4.1	16.3	10.6	5.8	-13.4	13.0	-9.2	-5.7	-11.6	2.8	0.0	-12.7	0.0	0.0	0.0	-6.5	0.0
3.2.6 New-to-firm sales	0.1	-18.4	2.9	7.1	0.7	2.1	9.6	2.1	8.7	-1.5	0.0	-10.7	0.0	0.0	0.0	-11.0	0.0

For indicators 3.1.2 and 3.1.3 growth rates could not be calculated (cf. Section 8.2).

Annex C: European Innovation Scoreboard 2009 – Definitions of indicators[31]

	Indicators	Numerator	Denominator	Reference year	Source
1.1.1	S&E and SSH graduates per 1000 population aged 20-29 (first stage of tertiary education)	Number of S&E (science and engineering) and SSH (social sciences and humanities) graduates at first stage of tertiary education (ISCED 5)	Population between 20 and 29 years	2006 (2005 for GR, TR; no data for LU)	Eurostat
1.1.2	S&E and SSH doctorate graduates per 1000 population aged 25-34 (second stage of tertiary education)	Number of S&E (science and engineering) and SSH (social sciences and humanities) graduates at second stage of tertiary education (ISCED 6)	Population between 25 and 34 years	2006 (2005 for GR, IT, IS; no data for LU)	Eurostat
1.1.3	Population with tertiary education per 100 population aged 25-64	Number of persons in age class with some form of postsecondary education (ISCED 5 and 6)	Population between 25 and 64 years	2007 (2006 for IS)	Eurostat
1.1.4	Participation in life-long learning per 100 population aged 25-64	Number of persons involved in life-long learning. Life-long learning is defined as participation in any type of education or training course during the four weeks prior to the survey	Population between 25 and 64 years	2007 (2006 for SE, UK, IS, CH)	Eurostat
1.1.5	Youth education attainment level	level Number of young people aged 20-24 years having attained at least upper secondary education attainment level, i.e. with an education level ISCED 3a, 3b or 3c long minimum	Population between 20 and 24 years	2007 (2006 for IS, NO, CH)	Eurostat
1.2.1	Public R&D expenditures (% of GDP)	All R&D expenditures in the government sector (GOVERD) and the higher education sector (HERD). Both GOVERD and HERD according to the Frascati-manual definitions	Gross Domestic Product	2008 (2007 for GR, TR, RS; 2006 for CH)	Eurostat
1.2.2	Venture capital (% of GDP)	Venture capital investment is defined as private equity being raised for investment in companies. Management buyouts, management buyins, and venture purchase of quoted shares are excluded. VC includes Early stage (seed + start-up) and Expansion and replacement (expansion and replacement capital) capital	Gross Domestic product	2007 (2005 for SK; no data for BG, EE, CY, LV, LT, LU, HU, MT, SI, TR, IS) Two-year averages are used (cf. EIS 2008 Methodology Report)	EVCA / Eurostat
1.2.3	Private credit (relative to GDP)	Claims on the private sector by commercial banks and other financial institutions that accept transferable deposits such as demand deposits (line 22d of IMF International Financial Statistics)	Gross Domestic Product (line 99b of IMF International Financial Statistics)	2007 (2006 for RO, IS)	IMF

[31] *A discussion of the choice of indicators and sources is provided in the 2008 EIS methodology report.*

	Indicators	Numerator	Denominator	Reference year	Source
1.2.4	Broadband access by firms (% of firms)	Number of enterprises (excluding the financial sector) with 10 or more employees with broadband access	Total number of enterprises (excluding the financial sector) with 10 or more employees	2007 (2006 for IS; 2005 for CH)	Eurostat
2.1.1	Business R&D expenditures (% of GDP)	All R&D expenditures in the business sector (BERD), according to the Frascati-manual definitions	Gross Domestic Product	2008 (2007 for GR, TR, RS; 2004 for CH)	Eurostat
2.1.2	IT expenditures (% of GDP)	Total expenditures on IT. IT expenditures capture hardware, software and other services. The data cover the total market, including expenditure of the public and private sector (enterprises, as well as those of individuals and households)	Gross Domestic Product	2006 (no data for CY, LU, MT, TR, IS)	EITO / Eurostat
2.1.3	Non-R&D innovation expenditures (% of turnover)	Sum of total innovation expenditure for enterprises, in national currency and current prices excluding intramural and extramural R&D expenditures	Total turnover for all enterprises	2006 (2005 for CH; 2004 for DE, GR, FR, IT; no data for LV, AT, FI, UK, IS)	Eurostat
2.2.1	SMEs innovating in-house (% of SMEs)	Sum of SMEs with in-house innovation activities. Innovative firms are defined as those firms which have introduced new products or processes either 1) in-house or 2) in combination with other firms	Total number of SMEs	2006 (2005 for CH; 2004 for DK, GR, FR, IT, SE, NO; no data for LV, LU, MT, SI, UK, IS)	Eurostat
2.2.2	Innovative SMEs collaborating with others (% of SMEs)	Sum of SMEs with innovation co-operation activities. Firms with co-operation activities are those that had any cooperation agreements on innovation activities with other enterprises or institutions in the three years of the survey period	Total number of SMEs	2006 (2005 for CH; 2004 for GR, FR, IS, NO)	Eurostat
2.2.3	Firm renewal (SMEs entries + exits) (% of SMEs)	Sum of the number of births and deaths of SMEs. Only SMEs with at least 5 employees and who are active in NACE classes C, D, E, G51, I, J and K are included	Total number of SMEs	2005 (2004 for CZ, IT, LU, HU, NL, PT, SK, FI, CH; 2003 for SI; 2002 for LT; 2001 for NO; no data for BE, BG, DK, DE, IE, GR, FR, CY, MT, AT, PL, TR, IS)	Eurostat
2.2.4	Public-private copublications per million population	Number of public-private co-authored research publications in the Web of Science database. The definition of the "private sector" excludes the private medical and health sector. Publications are assigned to the country/countries in which the business companies or other private sector organisations are located	Total population	2006 Two-year averages are used (cf. EIS 2008 Methodology Report)	Thomson Reuters / CWTS

	Indicators	Numerator	Denominator	Reference year	Source
2.3.1	EPO patents per million population	Number of patents applied for at the European Patent Office (EPO), by year of filing. The national distribution of the patent applications is assigned according to the address of the inventor	Total population	2005	Eurostat
2.3.2	Community trademarks per million population	Number of new community trademarks. A trademark is a distinctive sign, identifying certain goods or services as those produced or provided by a specific person or enterprise	Total population	2007	OHIM / Eurostat
2.3.3	Community designs per million population	Number of new community designs. A registered Community design is an exclusive right for the outward appearance of a product or part of it, resulting from the features of, in particular, the lines, contours, colours, shape, texture and/or materials of the product itself and/or its ornamentation	Total population	2007	OHIM / Eurostat
2.3.4	Technology Balance of Payments flows (% of GDP)	Royalty and license fees, receipts (Balance of Payments, current US$) plus Royalty and license fees, payments (Balance of Payments, current US$)	Gross Domestic Product (current US$)	2006 (2005 for AT; 2004 for TR; 2003 for SK; no data for DK)	World Bank
3.1.1	SMEs introducing product or process innovations (% of SMEs)	Number of SMEs who introduced a new product or a new process to one of their markets	Total number of SMEs	2006 (2005 for CH; 2004 for GR, FR, MT, NO; no data for IS)	Eurostat
3.1.2	SMEs introducing marketing or organisational innovations (% of SMEs)	Number of SMEs who introduced a new marketing innovation and/or organisational innovation to one of their markets	Total number of SMEs	2006 (2004 for BE, GR, ES, FR, IT, SK, NO; no data for LV, SI, FI, SE, IS, CH)	Eurostat
3.1.3	Resource efficiency innovators, unweighted average of the following 2 indicators:				
	• Reduced labour costs (% of firms)	Number of innovating firms who replied that their product or process innovation had a highly important effect on reducing labour costs per unit of output	Total number of innovating firms	2006 (2004 for BE, DE, IE, GR, FR, IT, SI, IS, NO; no data for UK, CH)	Eurostat
	• Reduced use of materials and energy (% of firms)	Number of innovating firms who replied that their product or process innovation had a highly important effect on reducing materials and energy per unit of output	Total number of innovating firms	2006 (2004 for BE, DE, IE, GR, FR, IT, SI, SE, IS, NO; no data for UK, CH)	Eurostat
3.2.1	Employment in mediumhigh & high-tech manufacturing (% of workforce)	Number of employed persons in the medium-high and hightech manufacturing sectors	Total workforce	2007 (2006 for HR, IS)	Eurostat
3.2.2	Employment in knowledgeintensive services (% of workforce)	Number of employed persons in the knowledge-intensive services sectors	Total workforce	2007 (2006 for HR, IS)	Eurostat

	Indicators	Numerator	Denominator	Reference year	Source
3.2.3	Medium and high-tech manufacturing exports (% of total exports)	Value of medium and high-tech exports	Value of total exports	2006 (2005 for TR)	Eurostat
3.2.4	Knowledge-intensive services exports (% of total services exports)	Exports of knowledge-intensive services are measured by the sum of credits in EBOPS (Extended Balance of Payments Services Classification) 207, 208, 211, 212, 218, 228, 229, 245, 253, 254, 260, 263, 272, 274, 278, 279, 280 and 284	Total services exports as measured by credits in EBOPS 200	2006 (2005 for IE, FI; no data for ES, FR, IT)	Eurostat
3.2.5	New-to-market sales (% of turnover)	Sum of total turnover of new or significantly improved products for all enterprises	Total turnover for all enterprises	2006 (2005 for CH; 2004 for GR, FR, SE, IS, NO)	Eurostat
3.2.6	New-to-firm sales (% of turnover)	Sum of total turnover of new or significantly improved products to the firm but not to the market for all enterprises	Total turnover for all enterprises	2006 (2005 for CH; 2004 for GR, FR, SE, IS, NO)	Eurostat

Annex D: European Innovation Scoreboard 2009 – Country abbreviations

AT	Austria	**IS**	Iceland
BE	Belgium	**IT**	Italy
BG	Bulgaria	**JP**	Japan
BR	Brazil	**LT**	Lithuania
CH	Switzerland	**LU**	Luxembourg
CN	China	**LV**	Latvia
CY	Cyprus	**MT**	Malta
CZ	Czech Republic	**NL**	Netherlands
DE	Germany	**NO**	Norway
DK	Denmark	**PL**	Poland
EE	Estonia	**PT**	Portugal
ES	Spain	**RO**	Romania
EU27	EU27	**RS**	Serbia
FI	Finland	**RU**	Russia
FR	France	**SE**	Sweden
GR	Greece	**SI**	Slovenia
HR	Croatia	**SK**	Slovakia
HU	Hungary	**TR**	Turkey
IE	Ireland	**UK**	United Kingdom
IN	India	**US**	United States

Annex E: European Innovation Scoreboard 2009 – SII scores

	2008	2009		2008	2009
EU27	0.476	0.478	**NL**	0.484	0.491
BE	0.513	0.516	**AT**	0.532	0.536
BG	0.227	0.231	**PL**	0.311	0.317
CZ	0.410	0.415	**PT**	0.366	0.401
DK	0.576	0.574	**RO**	0.278	0.294
DE	0.581	0.596	**SI**	0.448	0.466
EE	0.451	0.481	**SK**	0.316	0.331
IE	0.515	0.515	**FI**	0.603	0.622
GR	0.349	0.370	**SE**	0.649	0.636
ES	0.373	0.377	**UK**	0.588	0.575
FR	0.500	0.501	**HR**	0.278	0.286
IT	0.377	0.363	**TR**	0.218	0.227
CY	0.466	0.479	**IS**	0.481	0.481
LV	0.252	0.261	**NO**	0.382	0.382
LT	0.305	0.313	**CH**	0.683	0.694
LU	0.525	0.525	**RS**	--	0.227
HU	0.313	0.328			
MT	0.340	0.343			

The 2008 SII scores have been calculated backward from 2009 using the next-to-last data for each of the indicators. The 2008 scores are not identical to that shown in the EIS 2008 as not for all indicators data could be updated with one year.

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Since 2001 the European Innovation Scoreboard has been providing an annual assessment of innovation performance across the EU. The 2009 report follows the methodology established in 2008, with a revised set of indicators which better recognise the importance of service sectors, non-technological innovation and innovation outputs. Overall innovation performance is calculated on the basis of 29 indicators covering seven dimensions of innovation, which are grouped in three main blocks, covering enablers, firm activities and outputs.

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