



Innovation **Union** Scoreboard 2015

*Internal Market
Industry,
Entrepreneurship
and SMEs*

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The Innovation Union Scoreboard report and annexes and the indicators' database are available at:
http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards/index_en.htm

More information on the European Union is available on (<http://europa.eu>)

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Innovation **Union**
Scoreboard 2015



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Executive summary

Innovation Union Scoreboard 2015: for the EU at large innovation performance has been stalling in the last year.

The impact of the economic crisis has become visible for several Member States which showed a decreasing innovation performance compared to last year.

Last year's edition showed that there were positive signs as the innovation performance improved and the catching up process of less innovative countries resumed after it had reversed two years ago. This year's edition shows a mixed picture, with 13 Member States presenting a declining innovation performance and 15 Member States improving their performance compared to last year. However, differences are becoming smaller between the different Member States: innovation performance has continued to converge in 2014 following the trend resumed last year.

Eight innovation dimensions and 25 indicators analyse the performance of the EU innovation system...

The measurement framework used in the Innovation Union Scoreboard distinguishes between 3 main types of indicators and 8 innovation dimensions, capturing in total 25 different indicators.

The **Enablers** capture the main drivers of innovation performance external to the firm and cover 3 innovation dimensions: *Human resources, Open, excellent and attractive research systems* as well as *Finance and support*. **Firm activities** capture the innovation efforts at the level of the firm, grouped in 3 innovation dimensions: *Firm investments, Linkages & entrepreneurship* and *Intellectual assets*. **Outputs** cover the effects of firms' innovation activities in 2 innovation dimensions: *Innovators and Economic effects*.

... and the Member States are classified into four performance groups based on their average innovation performance.

Based on the average innovation performance, the Member States fall into four different performance groups:

- Denmark, Finland, Germany and Sweden are "*Innovation leaders*" with innovation performance well above that of the EU average;
- Austria, Belgium, France, Ireland, Luxembourg, Netherlands, Slovenia and the UK are "*Innovation followers*" with innovation performance above or close to that of the EU average;
- The performance of Croatia, Cyprus, Czech Republic, Estonia, Greece, Hungary, Italy, Lithuania, Malta, Poland, Portugal, Slovakia and Spain is below that of the EU average. These countries are "*Moderate innovators*";
- Bulgaria, Latvia and Romania are "*Modest innovators*" with innovation performance well below that of the EU average.

Sweden's innovation system is once more in first position in the EU with the overall ranking remaining relatively stable...

Sweden has once more the best performing innovation system in the EU, followed by Denmark, Finland and Germany. Overall, the performance group memberships have remained relatively stable compared to the previous IUS edition, with Cyprus and Estonia being the only countries that changed group membership, in their case changing from the Innovation followers to the Moderate innovators.

... but with several changes inside the performance groups.

As each year, there are several upward and downward movements inside each of the performance groups. Finland and Germany switched ranks within the Innovation leaders. Within the Innovation followers, the Netherlands replaced Luxembourg as the top performer, UK and Ireland moved ahead of Belgium, and Austria and France switched ranks. Within the Moderate innovators, Estonia is the top performer followed by the Czech Republic that has overtaken Italy and Cyprus. Malta has improved several rank positions and both Greece and Spain have dropped two rank positions whereas Lithuania and Poland have switched ranks. Within the Modest innovators, Latvia replaced Romania as top performer and ranks very close to the upper group.

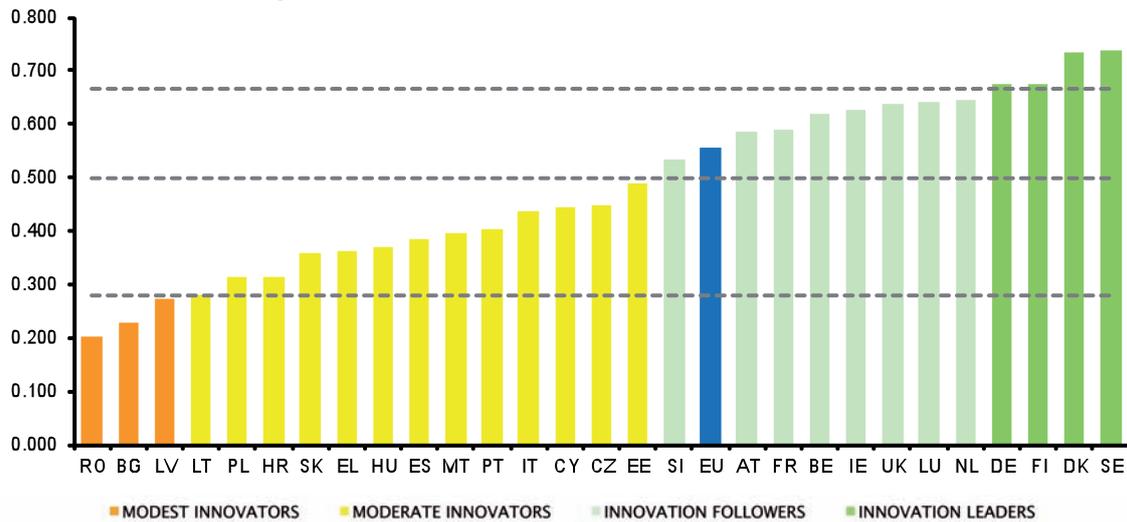
The most innovative countries have balanced innovation systems with strengths in all dimensions...

The most innovative countries perform best on all dimensions: from research and innovation inputs, through business innovation activities up to innovation outputs and economic effects, which reflects a balanced national research and innovation system. The Innovation leaders show the smallest variance in their performance across all eight innovation dimensions: across all dimensions the performance of the Innovation leaders, Sweden, Denmark, Germany and Finland, is thus not too different. The Innovation leaders are also mostly on top and clearly above the EU average. Only in the second dimension *Open, excellent and attractive research system*, Germany scores slightly below the EU average and in the eighth dimension *Economic effects* Finland and Sweden score just below the EU average.

... but some other countries reach top scores in individual dimensions.

However, some other countries reach top scores when looking at individual dimensions. Sweden, Ireland, Finland and United Kingdom score best in *Human resources*; Netherlands, Sweden and Denmark reach top positions in *Open, excellent and attractive research systems*; Estonia, Denmark, Finland and Sweden perform best in *Finance and support*; Germany, Sweden, Estonia and Finland are the best performers in *Firm investments*; Belgium, United Kingdom and Denmark are top performers in *Linkages and entrepreneurship*; Sweden, Denmark, Finland and Germany reach top positions in *Intellectual assets*; Ireland, Luxembourg and Germany are the best performers in the *Innovators* dimension; and Ireland, Denmark and Luxembourg reach the highest results in *Economic effects*.

Figure 1: EU Member States' innovation performance



Over a longer time period of eight years, the EU has been improving its innovation performance, with Latvia, Bulgaria and Malta being the innovation growth leaders...

Overall, the EU average annual growth rate of innovation performance has reached 1.0% over the analysed eight-year period 2007-2014 with most Member States improving their innovation performance. Latvia, Bulgaria and Malta are the innovation growth leaders. For a few Member States innovation performance has not improved. For Luxembourg, Finland and Greece the average annual growth rates are just positive, for Cyprus it is just negative and for Spain and Romania average annual growth rates are negative.

... but innovation growth differences exist also within the groups...

In the group of Innovation leaders, performance over the eight-year period has improved strongest for Denmark, while Finland's performance has been improving at the lowest rate. Slovenia is the fastest growing Innovation follower, while Luxembourg is the slowest. In the group of Moderate innovators, Malta and Czech Republic have improved the most, while performance for Spain and Cyprus has become worse. Among the Modest innovators, the highest innovation progress is recorded in Latvia and Bulgaria whereas a strong performance decline occurred in Romania.

... and the innovation gap between the Member States closes slowly.

Innovation performance among the Member States is converging but, due to a significant increase in performance differences 3 years ago, performance differences between Member States are still at a relatively

high level. This process of convergence is also observed within the groups of the Innovation followers and Moderate innovators, but for the Innovation leaders differences between countries in this group have remained the same and for the Modest innovators differences between countries have increased.

However, compared to last year, innovation has not been improving...

A direct comparison with the results of last year's edition is not possible as there have been some changes in the measurement framework, but a comparison with innovation performance as it would have been last year using the same measurement framework shows that innovation performance has declined for 13 Member States, in particular for Romania, Cyprus, Estonia, Greece and Spain. For the EU at large innovation performance has not changed and for 15 Member States it has improved, most notably for Malta, Latvia and Bulgaria.

... which is mostly due to a decrease in innovation activities as measured by the Community Innovation Survey...

Performance declined in particular for those indicators using the latest 2012 data from the Community Innovation Survey (CIS). For 21 Member States there has been a decline in the share of sales due to new innovative products, for 21 Member States the share of SMEs that introduced a product or process innovation has declined, and for 20 Member States the share of SMEs that introduced a marketing or organisational innovation has declined. Without the use of the latest CIS 2012 data performance would have worsened only for 7 Member States. Also for Public-private co-publications and Venture capital investments performance has decreased for respectively 24 and 16 Member States.

... but might also be the result of a delayed effect of the economic crisis on business activities.

Decreasing shares of enterprises with innovation activities, a reduced activity in public-private interactions as measured by public-private co-publications and declining venture capital investments all signal a possible negative effect of the economic crisis on business activities.

At a wider European level, Switzerland confirms its top position outperforming all EU Member States...

Taking into account European countries outside the EU, also this year Switzerland confirms its position as the overall Innovation leader by continuously outperforming all EU Member States and by being the best performer in as many as six indicators. But Switzerland's innovation performance has improved at a much slower pace than that of the EU. Iceland is an Innovation follower with an above EU-average performance, Norway and Serbia are Moderate innovators and the Former Yugoslav Republic of Macedonia and Turkey are Modest innovators. For both Serbia and Turkey, innovation has improved strongly with average annual growth rates above 6%.

... and internationally South Korea and the US defend their positions as top global innovators.

When looking at performance of innovation systems in a global context, South Korea, the US and Japan all have a performance lead over the EU. South Korea outperforms the EU by 24%, the United States has a lead of 22% and Japan has a lead of 14%. While the gap between the EU and both the US and Japan is decreasing, it widens with South Korea.

The top innovation leaders US, Japan and South Korea are particularly dominating the EU in indicators capturing business activity as measured by R&D expenditures in the business sector, Public-private co-publications and PCT patents but also in educational attainment as measured by the Share of population having completed tertiary education.

As compared with other key international partners, the EU continues to have a performance lead over Australia and Canada that score at 66% and 75% of the EU level, respectively. The performance lead is even larger compared to the BRICS countries (Brazil, Russia, India, China and South Africa). This lead is stable or even increasing for almost all BRICS countries, except for China. Even though its current innovation performance is at 49% of the EU level, China continues to reduce the gap by growing faster than the EU.

1. Introduction

The annual Innovation Union Scoreboard provides a comparative assessment of the research and innovation performance of the EU Member States and the relative strengths and weaknesses of their research and innovation systems. It helps Member States assess areas in which they need to concentrate their efforts in order to boost their innovation performance.

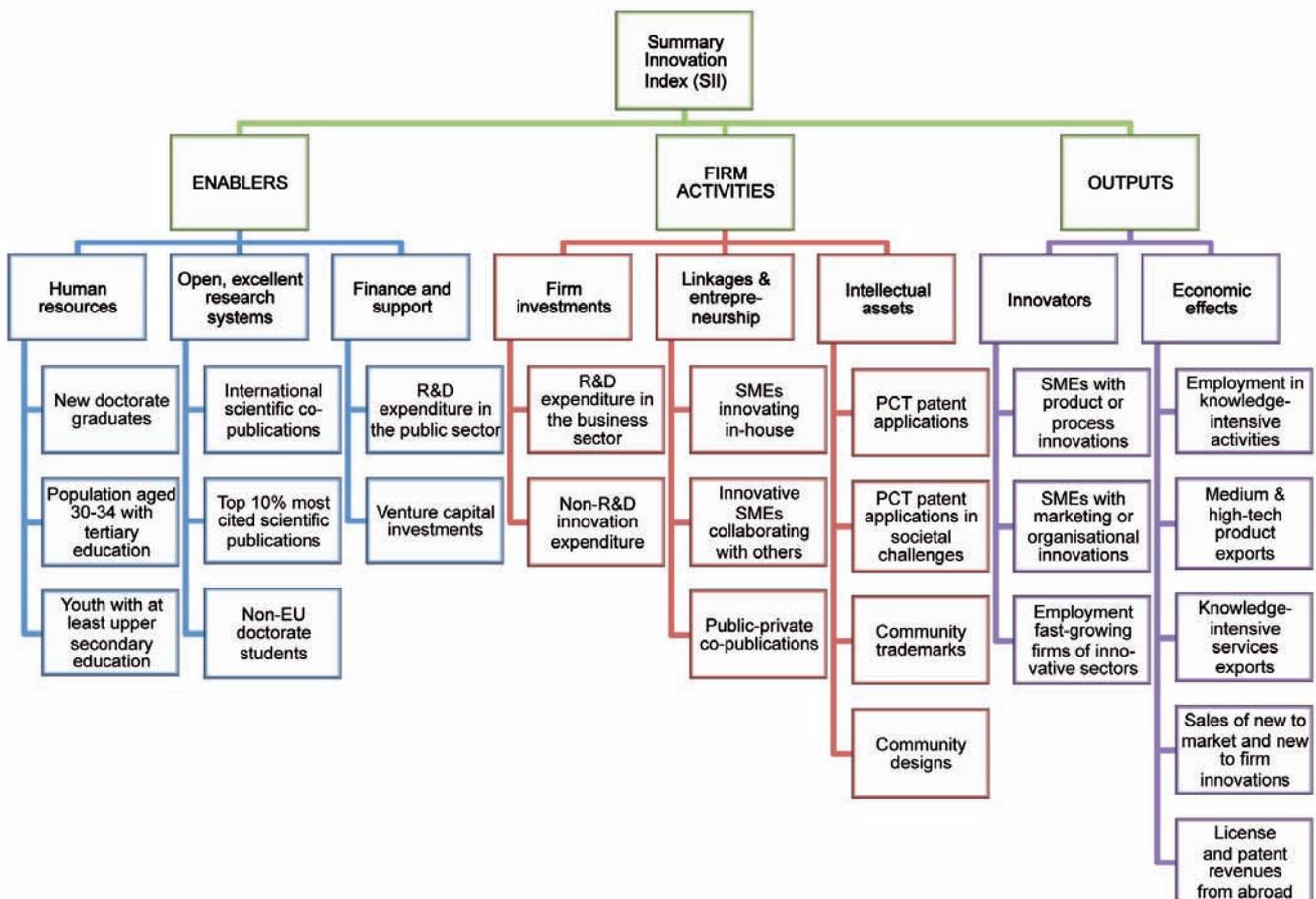
Measurement framework

The Innovation Union Scoreboard 2015, the 14th edition since the introduction of the European Innovation Scoreboard in 2001, follows the methodology of previous editions. Innovation performance is measured using a composite indicator – the Summary Innovation Index – which summarizes the performance of a range of different indicators. The Innovation Union Scoreboard distinguishes between 3 main types of indicators – Enablers, Firm activities and Outputs – and 8 innovation dimensions, capturing in total 25 indicators. The measurement framework is presented in Figure 2 and Table 1.

The **Enablers** capture the main drivers of innovation performance external to the firm and differentiate between 3 innovation dimensions. ‘*Human resources*’ includes 3 indicators and measures the availability of a high-skilled and educated workforce. The indicators capture New doctorate graduates, Population aged 30-34 with completed tertiary education and Population aged 20-24 having completed at least upper secondary education. ‘*Open, excellent and attractive research systems*’ includes 3 indicators and measures the international competitiveness of the science base by focusing on International scientific co-publications, Most cited publications and Non-EU doctorate students. ‘*Finance and support*’ includes 2 indicators and measures the availability of finance for innovation projects by Venture capital investments and the support of governments for research and innovation activities by R&D expenditures by universities and government research organisations.

Firm activities capture the innovation efforts at the level of the firm and differentiate between 3 innovation dimensions. ‘*Firm investments*’ includes 2 indicators of both R&D and Non-R&D investments that firms

Figure 2: Measurement framework of the Innovation Union Scoreboard



make in order to generate innovations. *'Linkages & entrepreneurship'* includes 3 indicators measuring innovation capabilities by looking at SMEs that innovate in-house and Collaboration efforts between innovating firms and Research collaboration between the private and public sector. *'Intellectual assets'* captures different forms of Intellectual Property Rights (IPR) generated as a throughput in the innovation process including PCT patent applications, Community trademarks and Community designs.

Outputs capture the effects of firms' innovation activities and differentiate between 2 innovation dimensions. *'Innovators'* includes 3 indicators measuring the share of firms that have introduced innovations onto the market or within their organisations, covering both technological and non-technological innovations and Employment in fast-growing firms of innovative sectors. *'Economic effects'* includes 5 indicators and captures the economic success of innovation in Employment in knowledge-intensive activities, Exports of medium and high-tech products, Exports of knowledge-intensive services, Sales due to innovation activities and License and patent revenues from selling technologies abroad.

Data sources and data availability

The Innovation Union Scoreboard uses the most recent statistics from Eurostat and other internationally recognised sources such as the OECD and the United Nations as available at the time of analysis with the cut-off day by the end of November 2014¹. International sources have been used wherever possible in order to improve comparability between countries. The data relates to actual performance in 2013 for 10 indicators, 2012 for 12 indicators, 2011 for 2 indicators and 2009 for 1 indicator (these are the most recent years for which data are available as highlighted by the underlined years in the last column in Table 1).

Data availability is good for 19 Member States with data being available for all 25 indicators. For 9 Member States data is missing for only one indicator including Venture capital investment data for 8 Member States and SMEs innovating in-house for the United Kingdom.

Changes to the IUS measurement framework

Although the general methodology of the IUS 2015 remained unchanged there have been four modifications as compared to the IUS 2014.

Firstly, the IUS 2014 indicator measuring the contribution of medium and high-tech product exports to the trade balance has been replaced with the share of medium and high-tech product exports out of total product exports being the same indicator as used up until the IUS 2011. Secondly, the data source for this indicator for the EU Member States has been changed from UN ComTrade to ComExt which is Eurostat's reference database for external trade. Thirdly, the indicator on Employment in fast-growing firms of innovative sectors now also includes the financial sector. And fourthly, the indicator on Non-R&D innovation expenditures has been calculated differently. Total innovation expenditures up until the CIS 2010 included expenditures on 4 innovation activities with the indicator being defined as the sum of expenditures for the acquisition of machinery, equipment and software and expenditures for the acquisition of external knowledge or as the difference between total innovation expenditures and expenditures on both in-house and external R&D. Total innovation expenditures in the CIS 2012 include a fifth innovation activity: expenditures for "other" innovation activities (including design, training, marketing, and other relevant activities). Non-R&D expenditures now also include the expenditures for these "other" innovation activities.

Another change is the impact on 8 IUS indicators using Gross Domestic Product (GDP) data as a result of the revision of GDP data following the adaptation of a revised European System of National and Regional Accounts (ESA 2010)². ESA 2010 provides a revised set of concepts, definitions, classifications and accounting rules that enable the EU Member States to produce consistent, reliable and comparable statistical descriptions of their economies. For most Member States the implementation of the ESA 2010 guidelines has been accompanied by the incorporation of statistical improvements in their data. While these changes give rise to shifts in the GDP levels of most Member States, growth rates have been almost unaffected. The average annual difference between the level of GDP in current prices under ESA 2010 and the previous ESA 95 over the period 1997-2013 amounted to +3.4% in the EU28 but the impact varies significantly across Member States. In 2010, they were largest in Cyprus (+9.5%) and the Netherlands (+7.6%), while relatively small or even negative changes were observed in Luxembourg (+0.2%) and Latvia (-0.1%)³.

The impact of these changes on the innovation index scores is relatively minor as shown in a more detailed discussion provided in Section 7.3.

¹ The data released latest were the 2012 data from the Community Innovation Survey (CIS) by Eurostat 26 November 2014.

² The following indicators use GDP data: R&D expenditure in the public sector as percentage of GDP, Venture capital investment as percentage of GDP, R&D expenditure in the business sector as percentage of GDP, PCT patent applications per billion GDP, PCT patent applications in societal challenges per billion GDP, Community trademarks per billion GDP, Community designs per billion GDP, and License and patent revenues from abroad as percentage of GDP.

³ Eurostat News release 157/2014 provides more details on ESA 2010 and the impact on Member States' GDP data: http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/2-17102014-BP/EN/2-17102014-BP-EN.PDF

Table 1: Innovation Union Scoreboard indicators

Main type / innovation dimension / indicator	Data source: Numerator	Data source: Denominator	Years covered
ENABLERS			
Human resources			
1.1.1 New doctorate graduates (ISCED 6) per 1000 population aged 25-34	Eurostat	Eurostat	2005 – 2012
1.1.2 Percentage population aged 30-34 having completed tertiary education	Eurostat	Eurostat	2006 – 2013
1.1.3 Percentage youth aged 20-24 having attained at least upper secondary level education	Eurostat	Eurostat	2006 – 2013
Open, excellent and attractive research systems			
1.2.1 International scientific co-publications per million population	Science-Metrix using Scopus data	Eurostat	2005 – 2012
1.2.2 Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	Science-Metrix using Scopus data	Science-Metrix using Scopus data	2002 – 2009
1.2.3 Non-EU doctorate students as percentage of all doctorate students ⁴	Eurostat	Eurostat	2005 – 2012
Finance and support			
1.3.1 R&D expenditure in the public sector as percentage of GDP	Eurostat	Eurostat	2006 – 2013
1.3.2 Venture capital investment as percentage of GDP	Eurostat	Eurostat	2008 – 2013
FIRM ACTIVITIES			
Firm investments			
2.1.1 R&D expenditure in the business sector as percentage of GDP	Eurostat	Eurostat	2006 – 2013
2.1.2 Non-R&D innovation expenditures as percentage of turnover ⁵	Eurostat (CIS)	Eurostat (CIS)	2006, 2008, 2010, 2012
Linkages & entrepreneurship			
2.2.1 SMEs innovating in-house as percentage of SMEs	Eurostat	Eurostat (CIS)	2006, 2008, 2010, 2012
2.2.2 Innovative SMEs collaborating with others as percentage of SMEs	Eurostat (CIS)	Eurostat (CIS)	2006, 2008, 2010, 2012
2.2.3 Public-private co-publications per million population	Centre for Science and Technology Studies (CWTS) using Thomson Reuters data	Eurostat	2008 – 2012
Intellectual assets			
2.3.1 PCT patents applications per billion GDP (in Purchasing Power Standard €)	OECD	Eurostat	2004 – 2011
2.3.2 PCT patent applications in societal challenges (environment-related technologies; health) per billion GDP (in Purchasing Power Standard €)	OECD	Eurostat	2004 – 2011
2.3.3 Community trademarks per billion GDP (in Purchasing Power Standard €)	Office for Harmonization in the Internal Market	Eurostat	2006 – 2013
2.3.4 Community designs per billion GDP (in Purchasing Power Standard €)	Office for Harmonization in the Internal Market	Eurostat	2006 – 2013
OUTPUTS			
Innovators			
3.1.1 SMEs introducing product or process innovations as percentage of SMEs	Eurostat (CIS)	Eurostat (CIS)	2006, 2008, 2010, 2012
3.1.2 SMEs introducing marketing or organisational innovations as percentage of SMEs	Eurostat (CIS)	Eurostat (CIS)	2006, 2008, 2010, 2012
3.1.3 Employment in fast-growing firms of innovative sectors	Eurostat	Eurostat	2010 – 2012
Economic effects			
3.2.1 Employment in knowledge-intensive activities (manufacturing and services) as percentage of total employment	Eurostat	Eurostat	2008 – 2013
3.2.2 Medium and high-tech product exports as percentage of total product exports	Eurostat / United Nations	Eurostat / United Nations	2006 – 2013
3.2.3 Knowledge-intensive services exports as percentage of total service exports	Eurostat	Eurostat	2005 – 2012
3.2.4 Sales of new to market and new to firm innovations as percentage of turnover ⁶	Eurostat (CIS)	Eurostat (CIS)	2006, 2008, 2010, 2012
3.2.5 License and patent revenues from abroad as percentage of GDP	Eurostat	Eurostat	2006 – 2013

⁴ For non-EU countries the indicator measures the share of non-domestic doctoral students.

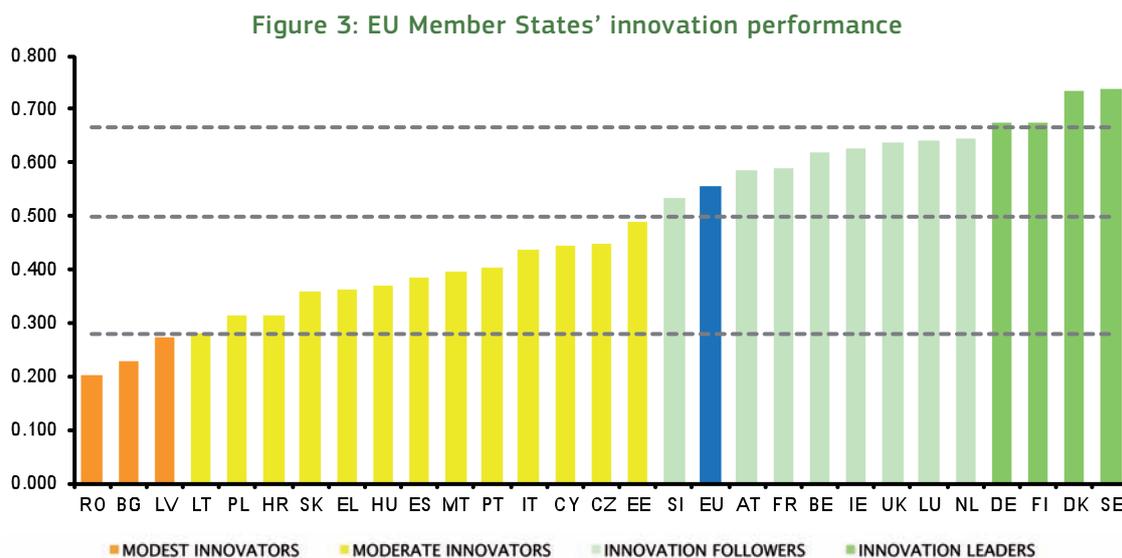
⁵ For France the CIS 2010 value for the indicator on Non-R&D innovation expenditures has been revised by INSEE (French National Institute for Statistics and Economic Research) from 0.25 to 0.37.

⁶ For France the CIS 2010 value for the indicator on Sales of new to market and new to firm innovations has been revised by INSEE from 14.7 to 11.3 as a percentage of total turnover.

2. Innovation performance and trends

2.1 Most recent innovation performance

The performance of EU national innovation systems is measured by the Summary Innovation Index, which is a composite indicator obtained by an appropriate aggregation of the 25 indicators⁷. Figure 3 shows the performance results for all EU Member States.



Note: Average performance is measured using a composite indicator building on data for 25 indicators going from a lowest possible performance of 0 to a maximum possible performance of 1. Average performance reflects performance in 2012 due to a lag in data availability.

As a result, based on this year's Summary Innovation Index, **the Member States fall into the following four performance groups:**

- The first group of **Innovation leaders** includes Member States in which the innovation performance is well above that of the EU, i.e. more than 20% above the EU average. These are Denmark, Finland, Germany and Sweden, which confirms the top position of these countries as compared with last year's edition of the Innovation Union Scoreboard.
- The second group of **Innovation followers** includes Member States with a performance close to that of the EU average i.e. less than 20% above or more than 90% of the EU average. Austria, Belgium, France, Ireland, Luxembourg, Netherlands, Slovenia and the UK are the Innovation followers.
- The third group of **Moderate innovators** includes Member States where the innovation performance is below that of the EU average at relative performance rates between 50% and 90% of the EU average. Croatia, Cyprus, Czech Republic, Estonia, Greece, Hungary, Italy, Lithuania, Malta, Poland, Portugal, Slovakia and Spain belong to the group of Moderate innovators.
- The fourth group of **Modest innovators** includes Member States that show an innovation performance level well below that of the EU average, i.e. less than 50% of the EU average. This group includes Bulgaria, Latvia, and Romania.

Compared to the IUS 2014, Cyprus and Estonia have changed group membership from the Innovation followers to the Moderate innovators⁸.

⁷ Section 7.1 gives a brief explanation of the calculation methodology. The IUS 2010 Methodology report provides a detailed explanation and is available at: http://ec.europa.eu/enterprise/policies/innovation/policy/innovation-scoreboard/index_en.htm

⁸ The IUS performance groups are relative performance groups with countries' group membership depending on their performance relative to that of the EU. With a growing EU innovation performance, the thresholds between these groups will also be increasing over time.

2.2 Performance changes over time

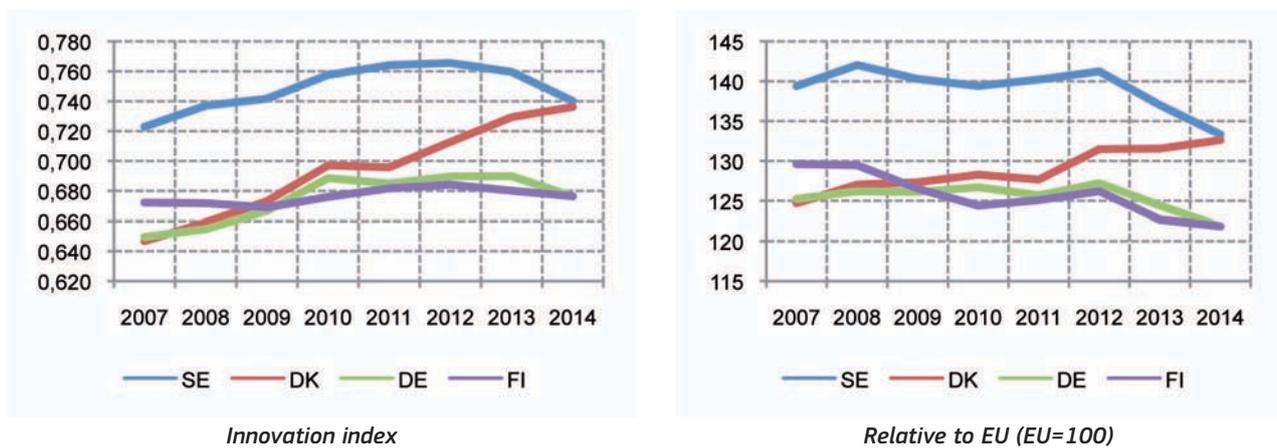
This section will discuss performance changes over time separately for each of the innovation performance groups.

Innovation leaders

Over the analysed period of eight years, innovation performance has been improving for all Innovation leaders up until 2012 (Figure 4, left-hand side). For Sweden and Finland performance started to decline in 2013, for Germany it declined in 2014. Only Denmark has managed to sustain an increasing innovation performance level. Sweden has been the most innovative Member State over the whole 2007-2014 period but Denmark has managed to almost close its performance gap to Sweden.

Performance has improved most for Denmark. The Danish innovation index has grown at an average annual rate of 1.9% (cf. Figure 8 below), followed by Germany (0.6%), Sweden (0.3%) and Finland (0.1%). Denmark's innovation performance has been improving more rapidly than that of the EU and its performance lead has grown from 25% in 2007 to 33% in 2014 (Figure 4, right-hand side). The other Innovation leaders have not been able to match the performance increase of the EU resulting in declining performance leads over the EU average. For example, for Sweden the performance lead over the EU has declined from almost 42% in 2008 to 34% in 2014.

Figure 4: Innovation leaders



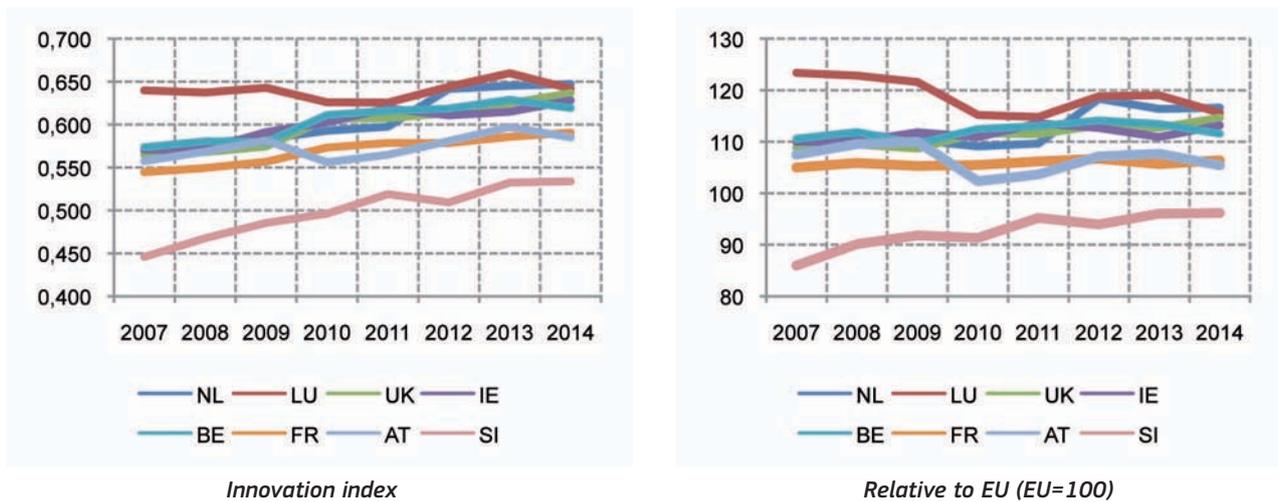
Innovation followers

Within the group of Innovation followers, Luxembourg has been the best performing country until 2013 (Figure 5, left-hand side). The Netherlands replaced Luxembourg as the most innovative Innovation follower in 2014 but performance differences are small. Slovenia has been the weakest performing country in this performance group.

Innovation performance has been improving for most Innovation followers. Performance has improved strongest for Slovenia (2.6%

average annual growth rate, cf. Figure 8 below), the Netherlands (1.8%) and the UK (1.7%). Six Innovation followers have been growing at a higher rate than the EU and for these countries the relative performance to the EU has improved (Figure 5, right-hand side). Growth performance of Austria (0.7%) is below that of the EU and for Luxembourg (0.04%) performance almost remained the same and its relative performance has worsened from 23% above the EU average in 2007 to 16% in 2014 (Figure 5, right-hand side).

Figure 5: Innovation followers



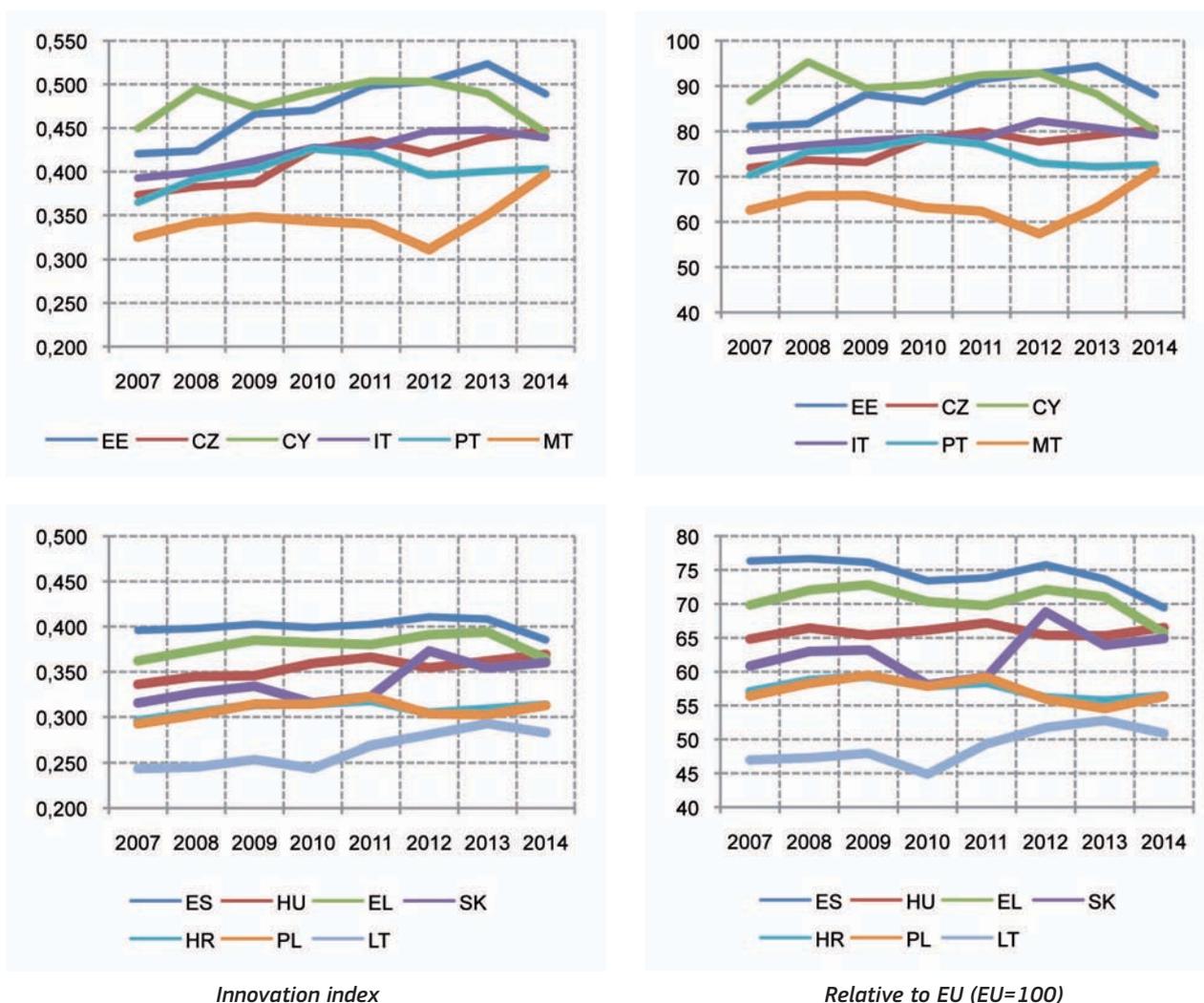
Moderate innovators

Innovation performance has been improving for most Moderate innovators (Figure 6, left-hand side). Cyprus and Estonia are among the best performing countries with both countries having been in the group of Innovation followers in earlier years. Lithuania has been the weakest performing Moderate innovator but the gap to the other countries has decreased significantly as shown by an increase in the performance level relative to that of the EU from 47% in 2007 to 51% in 2014 (Figure 6, right-hand side).

Performance has improved strongest for Malta (2.9% average annual growth rate, cf. Figure 8 below), Czech Republic (2.6%), Estonia

(2.2%) and Lithuania (2.1%). Also Slovakia, Italy, Portugal and Hungary have been growing at a higher rate than the EU and their relative performance to the EU has improved. For Poland innovation performance has improved at almost the same rate as that of the EU. For Croatia and Greece innovation performance has improved but at a rate below that of the EU and for both countries relative performance has decreased. For both Cyprus (-0.1%) and Spain (-0.4%) growth of their innovation index has been negative and Spain has been gradually dropping from third place among the Moderate innovators in 2007 to seventh place in 2014.

Figure 6: Moderate innovators



Innovation index

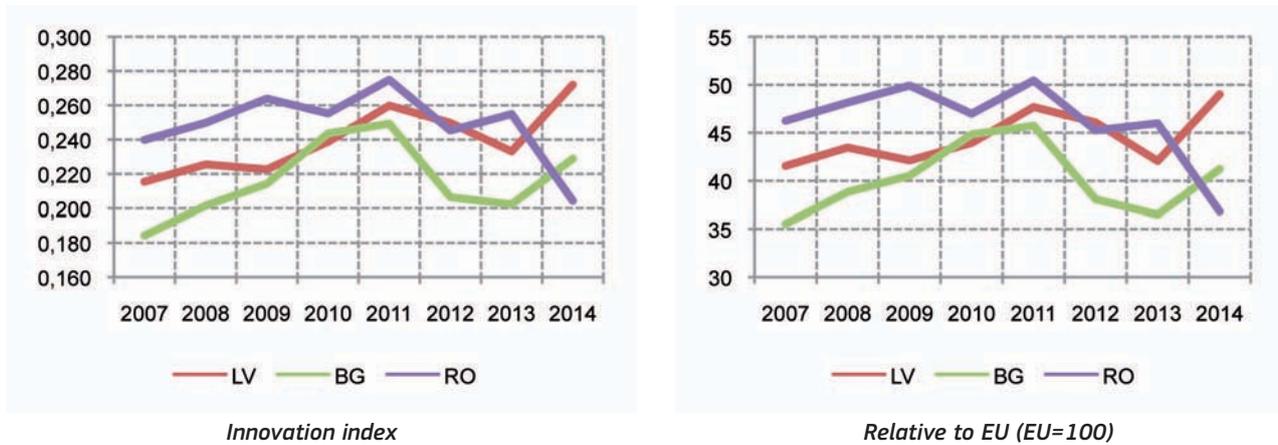
Relative to EU (EU=100)

Modest innovators

Innovation performance has been improving for Bulgaria and Latvia and has worsened for Romania (Figure 7, left-hand side). Bulgaria (3.1% average annual growth rate, cf. Figure 8 below) is among the fastest growing countries, but after a strong increase in its innovation index between 2007 and 2011 it experienced a strong performance decline in 2012 and 2013. The recovery in 2014 has been insufficient to raise the performance level relative to the EU to its 2011 peak level of 46% (Figure 7, right-hand side).

Latvia has been the overall fastest growing country (3.4%) with a very strong performance increase between 2013 and 2014. Latvia's performance level relative to the EU has jumped from 42% in 2013 to 49% in 2014 (in particular due to a very strong increase in Non-R&D innovation expenditures) and the country is close to becoming a Moderate innovator. Romania's performance has declined most of all countries in particular due to a dramatic decrease between 2013 and 2014 (in particular due to a very strong decrease in Sales of new innovative products) with the performance level relative to the EU dropping from 46% to 37%.

Figure 7: Modest innovators



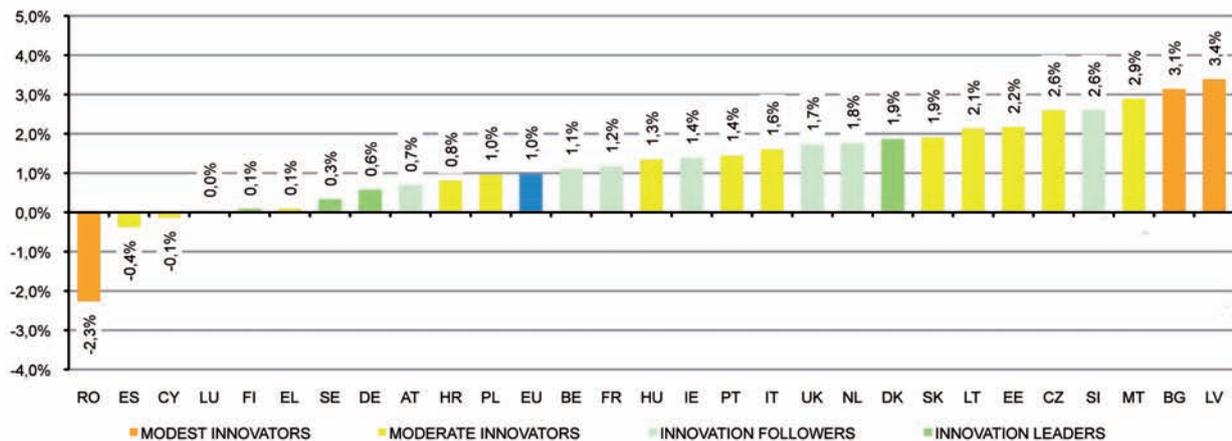
Growth performance and growth leaders

Within the four country groups growth performance is very different. Some countries are growing relatively rapidly and others more slowly (Figure 8). Within the Innovation leaders, Denmark is the growth leader. Slovenia, Netherlands and UK are the growth leaders of the Innovation followers, Malta and Czech Republic are the growth leaders of the Moderate innovators and Latvia and Bulgaria are not only the growth leaders of the Modest innovators but also the overall fastest growing countries.

Innovation performance for the majority of the Innovation followers, Moderate and Modest innovators has been

growing faster than the EU's innovation performance. In addition to this, the slower growth of large Member States such as Germany and Spain and more innovative countries such as Sweden and Finland, countries with an above average contribution to the EU's innovation performance, explains why average EU growth performance is below that of two-thirds of the Member States. Due to the above average growth of the less innovative and below average growth of the more innovative Member States, there has been a gradual process of convergence in innovation performance among the Member States (see section 2.3 for a more detailed discussion).

Figure 8: EU Member States' growth performance

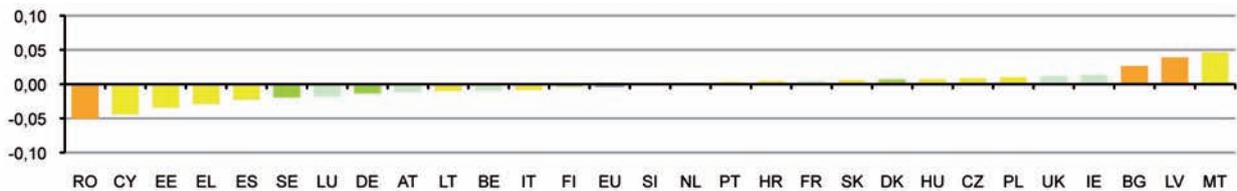


Average annual growth rates of the innovation index have been calculated over an eight-year period (2007-2014).

As there have been several changes in the Measurement framework, as explained in the Introduction, a direct comparison of this year's results with those of the IUS 2014 is not possible, Figure 9 shows the hypothetical change in overall performance levels since last year by using data at least one year less recent for the indicators used in the IUS 2015.

For 13 Member States innovation performance has declined since last year, for 15 Member States it has improved. **For the EU at large innovation performance has not changed.** This contrasts sharply with performance changes observed over the 2007-2014 period when performance only worsened for Romania, Spain and Cyprus.

Figure 9: Increase in performance since last year



Colour coding matches the groups of countries identified in Section 2.1.

Why did innovation performance decrease for so many countries in the last year? On average for each Member State performance increased for more than 12 indicators and decreased for more than 10 indicators. Indicators where performance increased for 20 or more Member States include the Share of population aged 30-34 with completed tertiary education, Share of population aged 20-24 having completed at least upper secondary education, International scientific co-publications, Non-EU doctorate students, Community trademarks and Community designs. But in particular those indicators where performance declined for the majority of Member States and on average for the EU can explain why for several countries overall performance declined. Performance declined in particular for the following indicators: Share of SMEs with product or process innovations (21 Member States), Share of SMEs with marketing or organizational innovations (20 Member States), Sales due to new innovative products (21 Member States), Share of SMEs innovating in-house (17 Member States), Share of innovative SMEs collaborating with others (18 Member States), Venture capital investments (16 Member States) and Public-private co-publications (24 Member States). For 5 of these indicators the underlying data source is the Community Innovation Survey. **For the indicators using CIS data performance is negatively affected by the use of the newest CIS 2012 data⁹.** If the newest CIS 2012 data would not have been used overall performance would have dropped for 7 instead of 13 Member States. The decline in performance compared to last year is also partly explained by worsened performance for the EU average and for 12 or more Member States in PCT

patent applications, PCT patent applications in societal challenges and Exports of medium and high-tech products.

In conclusion, there is a decline in performance for several indicators which explains the decrease in innovation performance compared to last year, in particular for those indicators using CIS data as a result of using the newest CIS 2012 data. This observation is also confirmed by Table 2 which shows per Member State the 3 indicators which changed most positively (highlighted in green) and the 3 indicators which changed most negatively (highlighted in orange).

Table 2 shows clearly which indicators have been the key drivers for the negative change in innovation performance compared to last year (i.e. those indicators with the highest number of cells highlighted in orange): the Share of SMEs innovating in-house, the Share of innovative SMEs collaborating with others, the Share of SMEs with product or process innovations, the Share of SMEs with marketing or organizational innovations, and the Share of sales due to new innovative products.

Indicators which have been driving increases in performance include New doctorate graduates, International scientific co-publications, Non-R&D innovation expenditures (but this is artificial as Non-R&D innovation expenditures includes an additional spending category compared to the previous CIS), Community designs, and Employment in fast-growing firms of innovative sectors.

⁹ For the EU28 at large in 2010-2012 the share of innovative enterprises fell below 50% and compared to 2006-2008 this share has declined by 2.6 percentage points (pp). The largest declines were in Cyprus (-14.0 pp), Germany (-13.0 pp), Romania (-12.6 pp) and Spain (-9.9 pp). (Eurostat News release 15/2015: <http://ec.europa.eu/eurostat/web/products-press-releases/-/9-21012015-BP>).

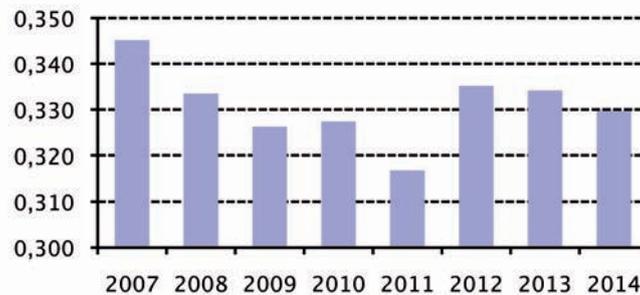
2.3 Convergence in innovation performance

Innovation performance differs between Member States and these differences can become smaller (*convergence*) or larger (*divergence*) over time.¹⁰ Until 2011, differences in innovation performance have become smaller (Figure 10). But in 2012 the process of convergence reversed and differences in countries' innovation performance increased to a level between that observed in 2008. **Innovation performance**

has been converging once more in both 2013 and in particular in 2014.

Differences in innovation performance are becoming smaller between the different Member States. Does convergence also take place within each of the four performance groups?

Figure 10: Convergence in Member States innovation performance



The bars show the degree of sigma-convergence (cf. footnote 10). Lower (higher) degrees of sigma-convergence reveal higher (lower) convergence.

Differences between the four performance groups

Among the Innovation leaders performance has hardly converged over the 2007-2014 period despite the fact that the performance gap between the best and worst performing country has decreased, in particular between 2013 and 2014 (Figure 11).

Among the Innovation followers we see a similar pattern as **observed for all countries**, a process of convergence until 2011 followed by increasing performance differences in 2012 after which performance differences became smaller again in 2013 and 2014 (Figure 12).

Figure 11: Innovation leaders

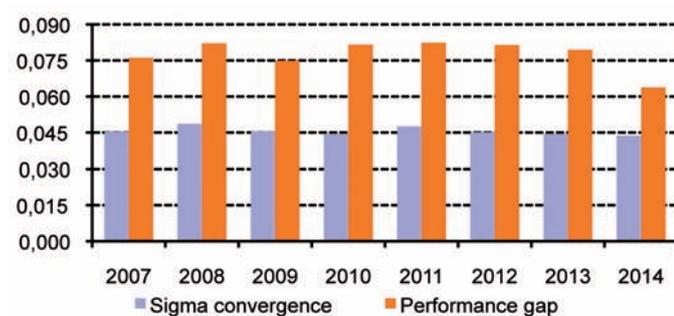
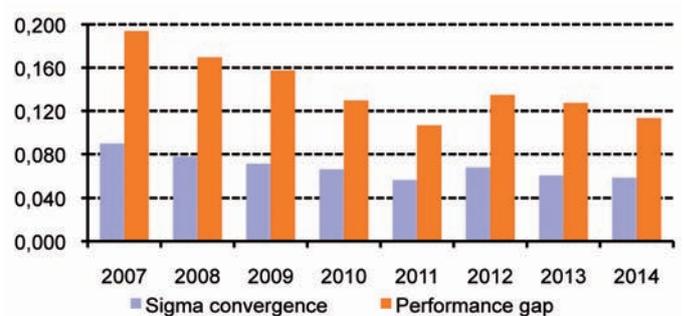


Figure 12: Innovation followers



¹⁰ The change in performance difference over time can be measured by sigma-convergence. Sigma-convergence occurs when the spread in innovation performance across a group of economies falls over time. This spread in convergence is measured by the ratio of the standard deviation and the average performance of all EU Member States. Figures 11 to 14 show an additional indicator for measuring changes in performance differences using the performance gap ratio between the best and worst performing country in each performance group.

Among the Moderate innovators there is some convergence with increases and decreases in performance differences fluctuating from year to year (Figure 13). For the Modest innovators we see a mixed pattern for the years before 2010, 2010 and the years after 2010. Before 2010 there was some convergence and in 2010, due to a strong

performance improvement for Bulgaria, the innovation performance differences within this group strongly declined (Figure 14). **From 2011 onwards there is a strong process of divergence** caused by a significant decline in performance for Romania compared to a strong performance increase for Latvia.

Figure 13: Moderate innovators

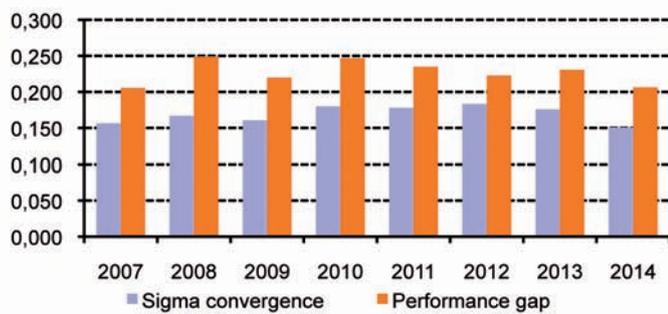
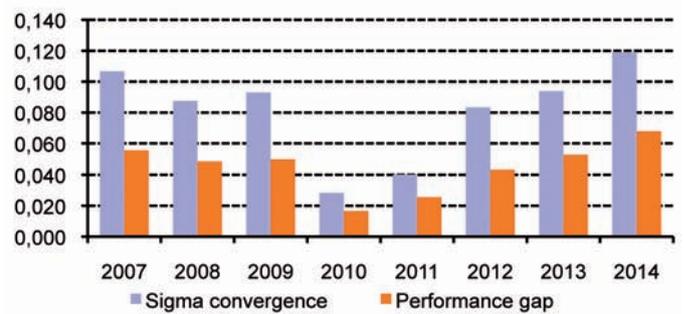


Figure 14: Modest innovators



The results for the different performance groups show that what is observed for all Member States - a process of convergence with decreasing differences in innovation performance – is also observed within the Innovation followers and to a certain extent the Moderate

innovators. However, this is not the case for the Modest innovators where differences between countries have rather increased over time, and the Innovation leaders where differences have remained more or less the same.

3. Innovation dimensions

Where section 2.1 introduced four performance groups based on the average performance of countries for 25 innovation indicators, a different pattern emerges when a comparison in performance is made across the eight innovation dimensions (Figure 15).

The performance order for overall innovation performance is also observed for the individual dimensions. The Innovation leaders perform best on all dimensions, followed by the Innovation followers, the Moderate innovators and the Modest innovators. Only in a few cases performance differences are small: for Human resources, Open, excellent and attractive research systems, Innovators and Economic effects between the Innovation leaders and Innovation followers, for Firm investments between the Innovation followers and Moderate innovators, and for Human resources and Intellectual assets between the Moderate and Modest innovators. These results show that the

Innovation leaders and Innovation followers share similar relative performance patterns as do the Moderate and Modest innovators.

Variance in performance is a measure for the spread in performance across different countries¹¹ and it shows how large differences are between Member States when looking at individual strengths and weaknesses. Performance differences between Member States across the 8 dimensions are smallest within the Innovation leaders (variance of 0.46%) and largest within the Modest innovators (variance of 1.78%) (Table 3), confirming that **to achieve a high level of performance, countries need a balanced innovation system performing well across all dimensions**. Performance differences within the Innovation followers are larger than those within the Moderate innovators. The high variance within the Innovation followers is the result from a relatively weak performance in Firm investments.

Figure 15: Country groups: innovation performance per dimension

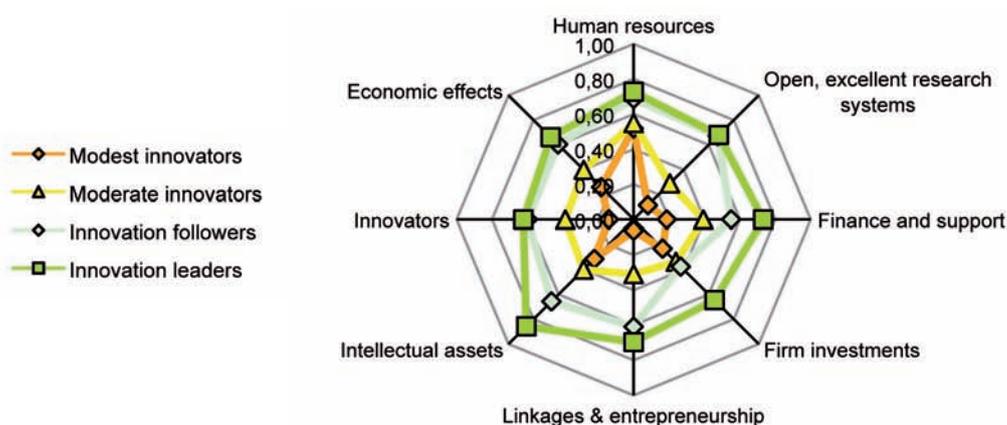


Table 3: Average performance in and variance in performance across the innovation dimensions for four performance groups

	MODEST INNOVATORS	MODERATE INNOVATORS	INNOVATION FOLLOWERS	INNOVATION LEADERS
Average performance				
Human resources	0.518	0.549	0.687	0.727
Open, excellent research systems	0.114	0.290	0.672	0.680
Finance and support	0.187	0.394	0.551	0.732
Firm investments	0.231	0.337	0.376	0.646
Linkages & entrepreneurship	0.063	0.308	0.609	0.710
Intellectual assets	0.315	0.400	0.657	0.858
Innovators	0.142	0.387	0.599	0.624
Economic effects	0.259	0.399	0.608	0.665
Variance across all 8 dimensions	1.78%	0.56%	0.85%	0.46%

¹¹ The variance of a data set is the arithmetic average of the squared differences between the values and the mean or average value and it is a measure of the spread of the distribution about the mean. If all countries would have the same performance level variance would be 0%. Variance would be highest (25%) if half of all countries would share the highest possible normalised score of 1 and the other half would share the lowest possible normalised score of 0. High levels of variance signal large differences in performance across countries, whereas low levels of variance signal small differences in performance across countries. There are no statistical rules for identifying high versus low levels of variance as variance, for example, also depends on the number of countries included in the sample (e.g. a higher spread in performance is more likely for a larger group of countries).

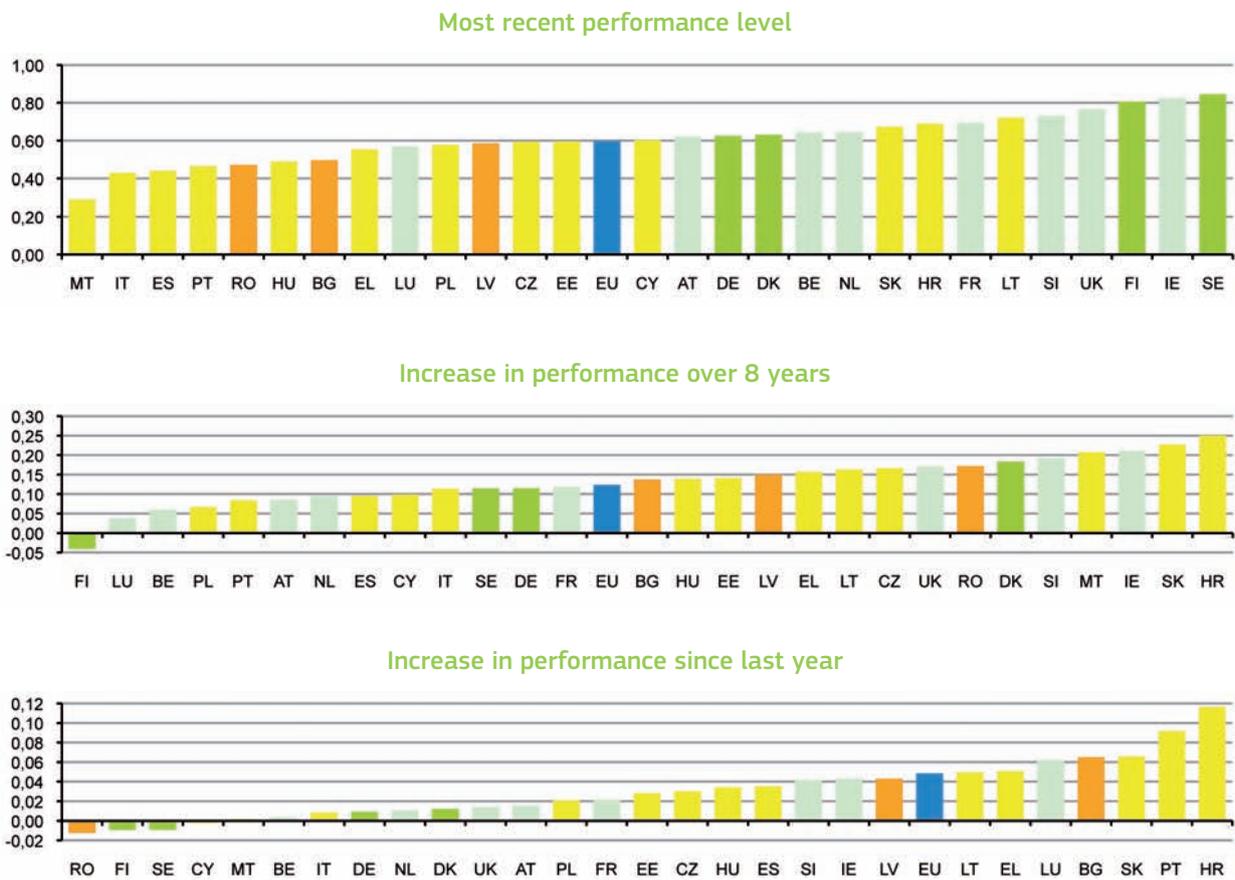
Performance in Human resources

Finland and Sweden, two of the Innovation leaders, are among the top-3 performers in Human resources. Ireland and United Kingdom also perform very well (Figure 16). A high share of the workforce in these countries has the skills needed to participate in and further develop the knowledge-based economy. Most Innovation followers perform above the EU average, except for Luxembourg. Most Moderate innovators perform below the EU average, except Lithuania, Croatia, Slovakia and Cyprus.

All countries except Finland have improved their performance on Human resources over the last 8 years. Average performance has improved more for the less innovative countries than for the more innovative countries. **Performance differences have become smaller over time contributing to the overall process of convergence in innovation performance.**

Compared to last year average performance has significantly improved but not for all countries. Where performance has improved strongly in Croatia and Portugal, performance has worsened for 4 countries: Romania, Finland, Sweden and Cyprus.

Figure 16: Human resources



Colour coding matches the groups of countries identified in Section 2.1.

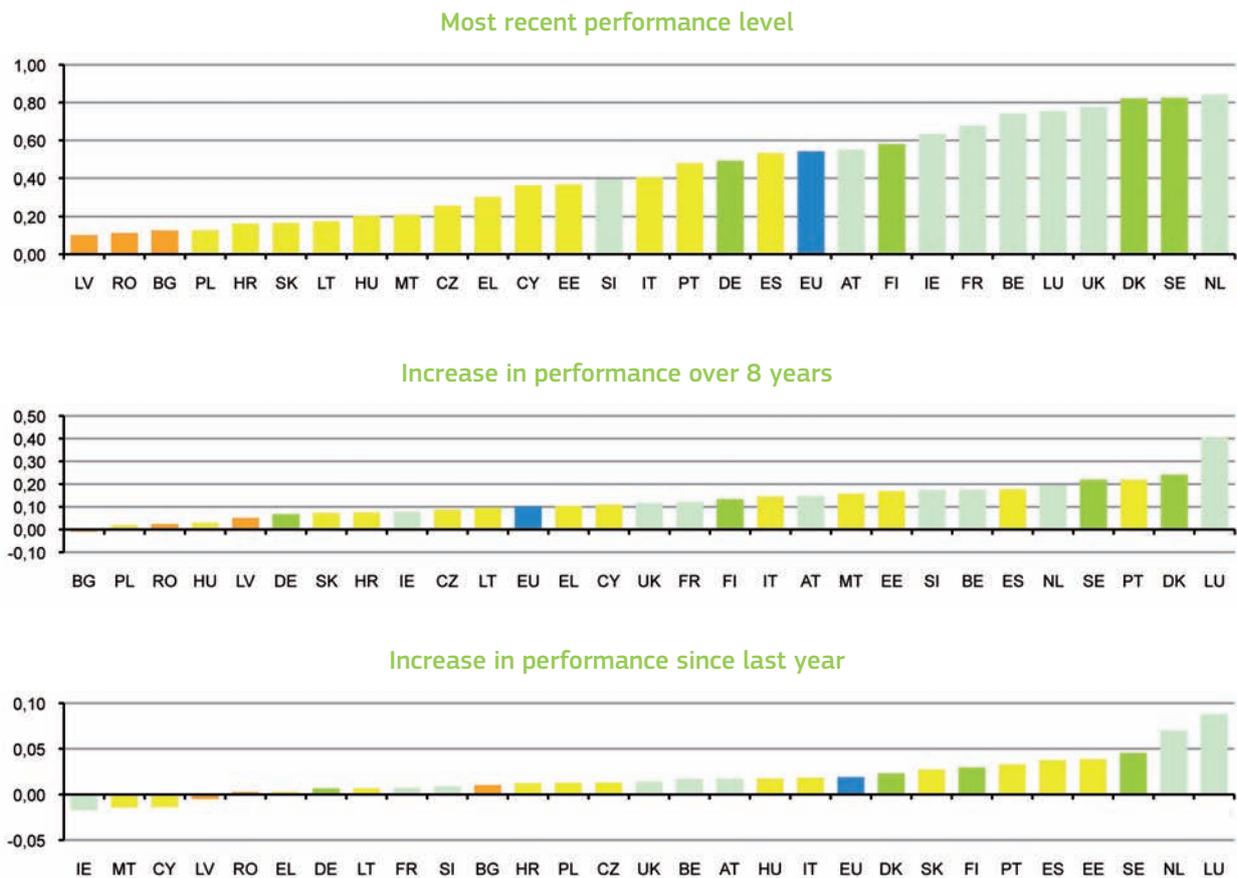
Performance in Open, excellent and attractive research systems

The Innovation leaders and followers are performing the best in this dimension (Figure 17). The Netherlands is the overall leader followed closely by Sweden and Denmark. The innovation systems in these countries are open for cooperation with partners from abroad, researchers are well networked at international level and the quality of research output is very high. Germany, one of the innovation leaders, performs below average performance due to a low share of Non-EU doctorate students at only 44% of the EU average. All the Modest and Moderate innovators perform below the EU average, only Spain and Portugal manage to get relatively close to the EU average.

All countries, except Bulgaria, have improved their performance over time with Luxembourg being the star performer. **Performance of the more innovative countries on average has improved more than that of the less innovative countries** whereas there has been almost no improvement for the Modest innovators. Moderate and Modest innovators will need to intensify their efforts increasing the output of their research systems if they want to close the performance gap with the Innovation leaders and followers.

Compared to last year most countries have improved their performance, in particular Luxembourg and the Netherlands. For 4 countries performance has worsened: Ireland, Malta, Cyprus and Latvia.

Figure 17: Open, excellent and attractive research system



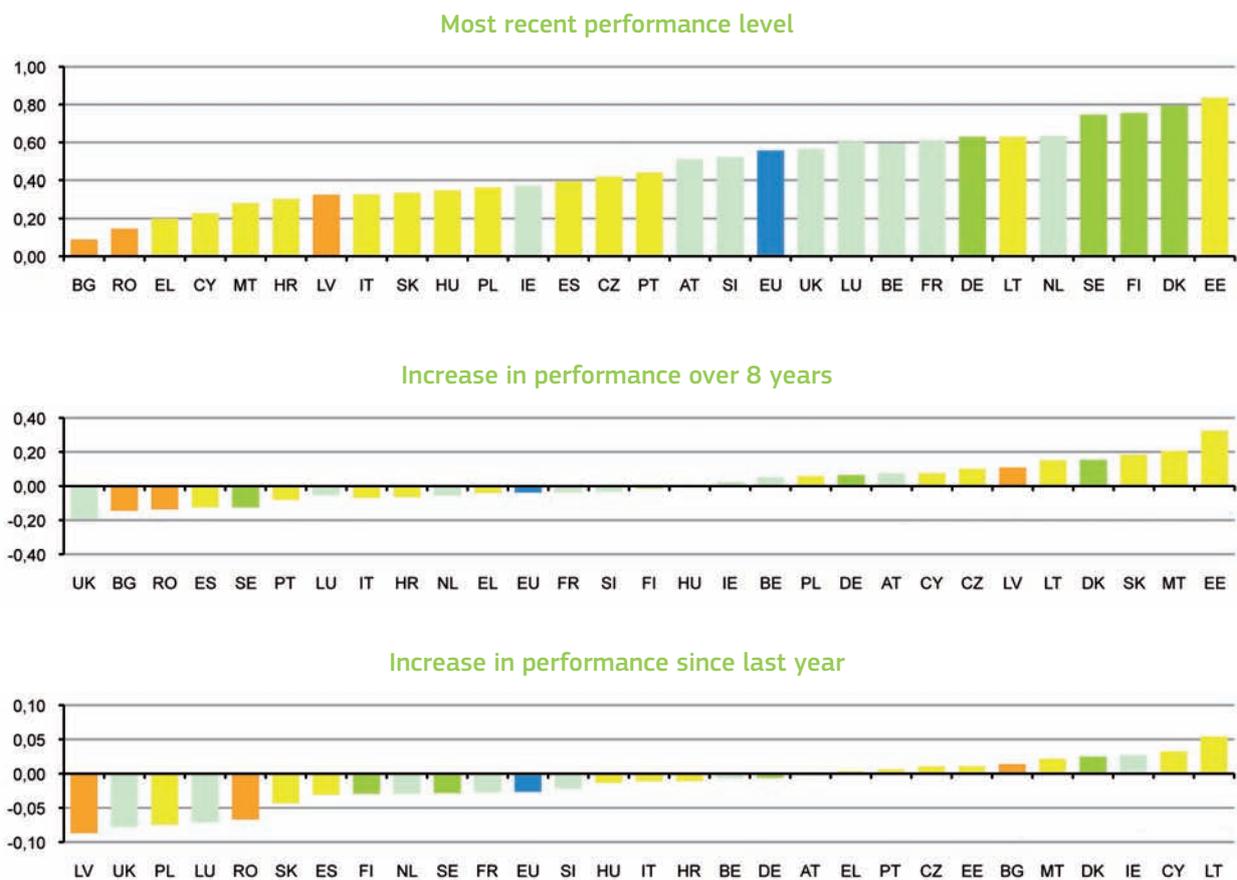
Colour coding matches the groups of countries identified in Section 2.1.

Performance in Finance and support

The Innovation leaders and followers are performing the best in Finance and support (Figure 18). Estonia, a Moderate innovator, is the overall leader in this dimension¹² followed closely by Denmark, Finland and Sweden. These countries are characterised by a public sector which is well endowed to perform R&D activities and by the availability of risk capital for private firms to develop new technologies. Almost all Modest and Moderate innovators perform below the EU average. In addition to Estonia, only Lithuania has managed to significantly improve its performance compared to last year now performing above the EU average.

For half of the Member States as well as for the EU average performance has not improved over time in particular due to declining Venture capital investments. Compared to last year the situation has even become worse with performance having declined in 17 Member States, in particular in Latvia, United Kingdom, Poland, Luxembourg and Romania. Besides increasing R&D spending by universities and public research organizations, venture capital markets need to be supported to increase venture capital investments.

Figure 18: Finance and support



Colour coding matches the groups of countries identified in Section 2.1.

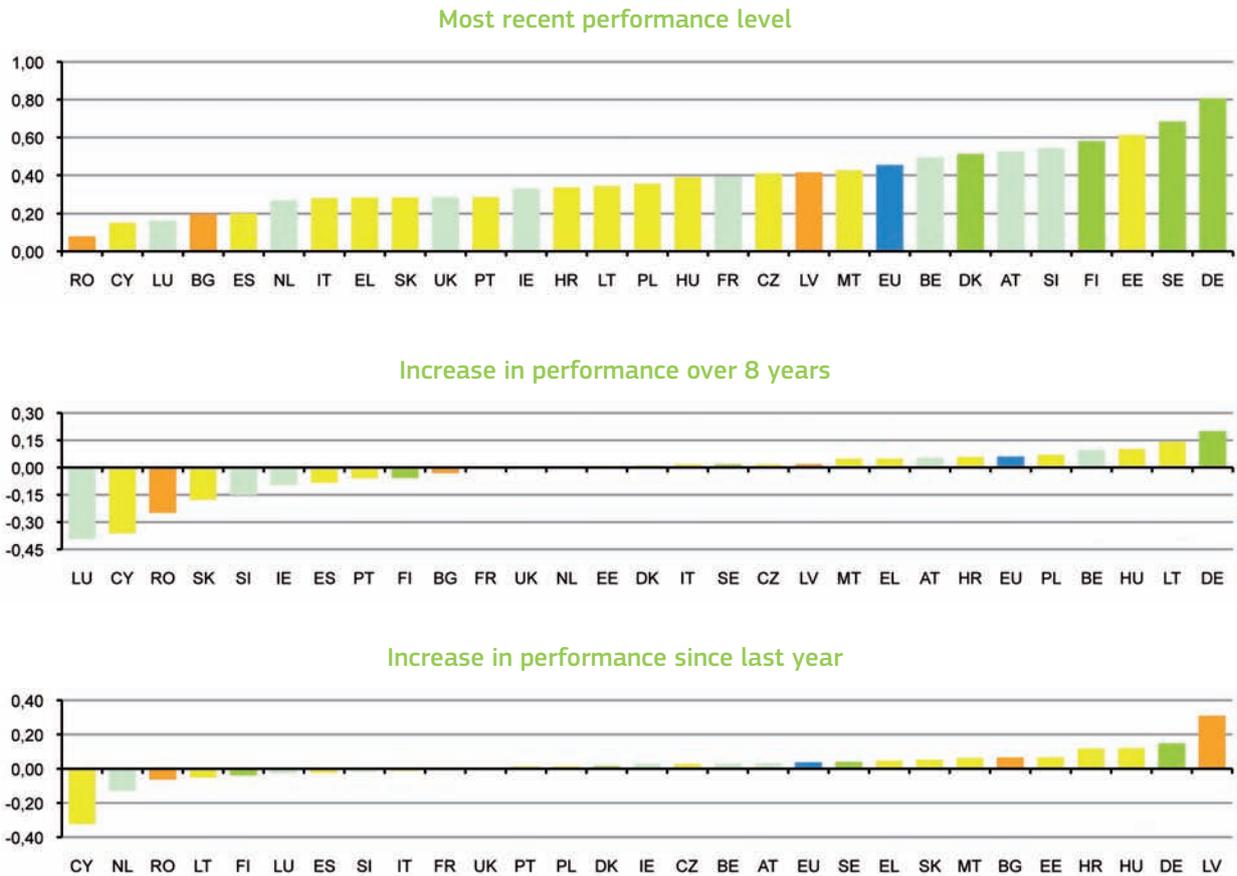
¹² Estonia's strong performance has to be interpreted with care as the score for this dimension is based on one indicator only (R&D expenditures in the public sector) as data on venture capital investments are not available.

Performance in Firm investments

In Firm investments, the Innovation leaders and followers are performing the best (Figure 19). Germany and Sweden are the overall leaders followed closely by Estonia and Finland. In these countries companies invest much more in innovation activities, both for science-based R&D activities and non-R&D innovation activities including investments in advanced equipment and machinery. The performance of Luxembourg, one of the Innovation followers, is relatively weak, in particular due to a low share of Non-R&D innovation expenditures. Except for Estonia, all the Modest and Moderate innovators perform below the EU average, with Romania being at the bottom of the performance scale.

There are huge differences in performance improvements over a longer period of time, with performance having worsened for 10 Member States, in particular for Luxembourg, Cyprus, Romania, Slovakia and Slovenia, and having improved for 18 Member States, most notably for Germany and Lithuania. The performance improvement of the EU is higher than that for 23 Member States which is a direct result of the fact that Germany contributes more than one-third to the EU's overall business R&D expenditures and non-R&D innovation expenditures. Compared to last year performance has improved for 19 countries and worsened for 9 countries, most notably for Cyprus and the Netherlands.

Figure 19: Firm investments



Colour coding matches the groups of countries identified in Section 2.1.

Performance in Linkages & entrepreneurship

In Linkages & entrepreneurship, the Innovation leaders and followers are performing the best. Belgium, United Kingdom, Denmark, Netherlands and Sweden are the overall leaders (Figure 20). SMEs in these countries have more deeply rooted innovation capabilities as they combine in-house innovation activities with joint innovation activities with other companies or public sector organisations. The research systems in these countries are also geared towards meeting the demand from companies, as highlighted by high co-publication activities. All Innovation leaders and Innovation followers perform above the EU average. All Modest and most of the Moderate innovators

perform below the EU average and Poland is performing relatively weak compared to the other Moderate innovators.

For 18 Member States average performance has not improved over time in particular due to declining performance in SMEs innovating in-house and Innovative SMEs collaborating with others. Compared to last year, the situation has even worsened with performance having declined for the EU average and 21 Member States, in particular in Cyprus, Austria and Luxembourg. Significant performance increases were only obtained in Malta, Belgium and Denmark.

Figure 20: Linkages & entrepreneurship



Colour coding matches the groups of countries identified in Section 2.1.

Performance in Intellectual assets

In Intellectual assets, the Innovation leaders are performing best (Figure 21). These countries manage very well protecting their new ideas and innovations, whether by using patents to protect new technologies or by using trademarks or designs which protect new goods and services. Half of the Innovation followers perform below average, as do all the Modest and Moderate innovators. The average EU performance is higher than that of most Member States due to the very good performance of the leading countries.

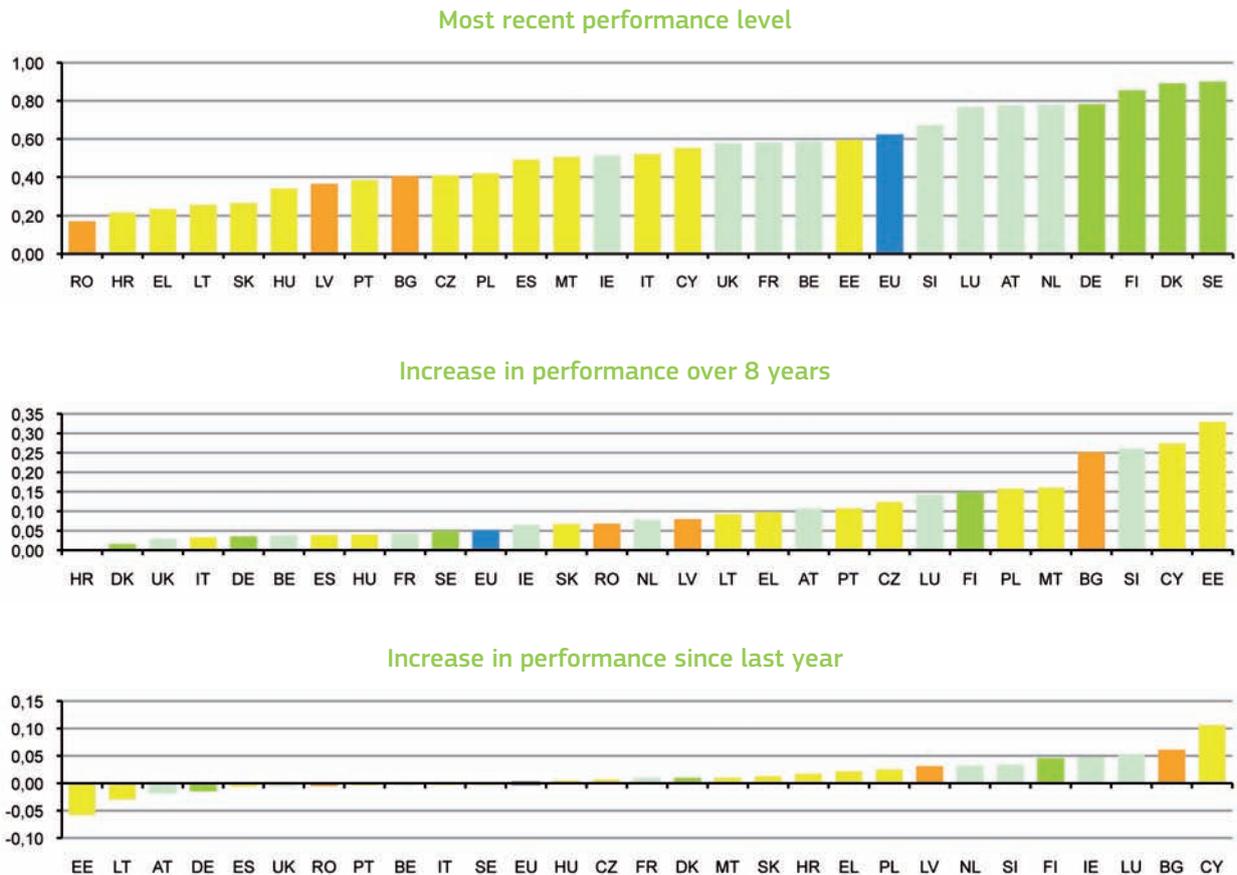
All countries have improved their performance over time, in particular Estonia, Cyprus, Slovenia and Bulgaria. The performance increase for Croatia however has been very modest. This general trend of improved

performance in Intellectual assets has been a strong driver of overall performance increases. In particular performance in Community trademarks and designs has improved strongly.

Worrying, however, is the fact that **compared to last year performance in Intellectual assets has declined for 8 countries**, most notably for Estonia, Lithuania, Austria and Germany **in particular due to a decrease in the number of PCT patent applications**.

Intellectual assets has been a stronghold for the Innovation leaders and followers but the more rapid performance increases for Bulgaria, Slovenia, Cyprus and Estonia show that it is possible for less innovative countries to catch-up to the Innovation leaders and followers.

Figure 21: Intellectual assets



Colour coding matches the groups of countries identified in Section 2.1.

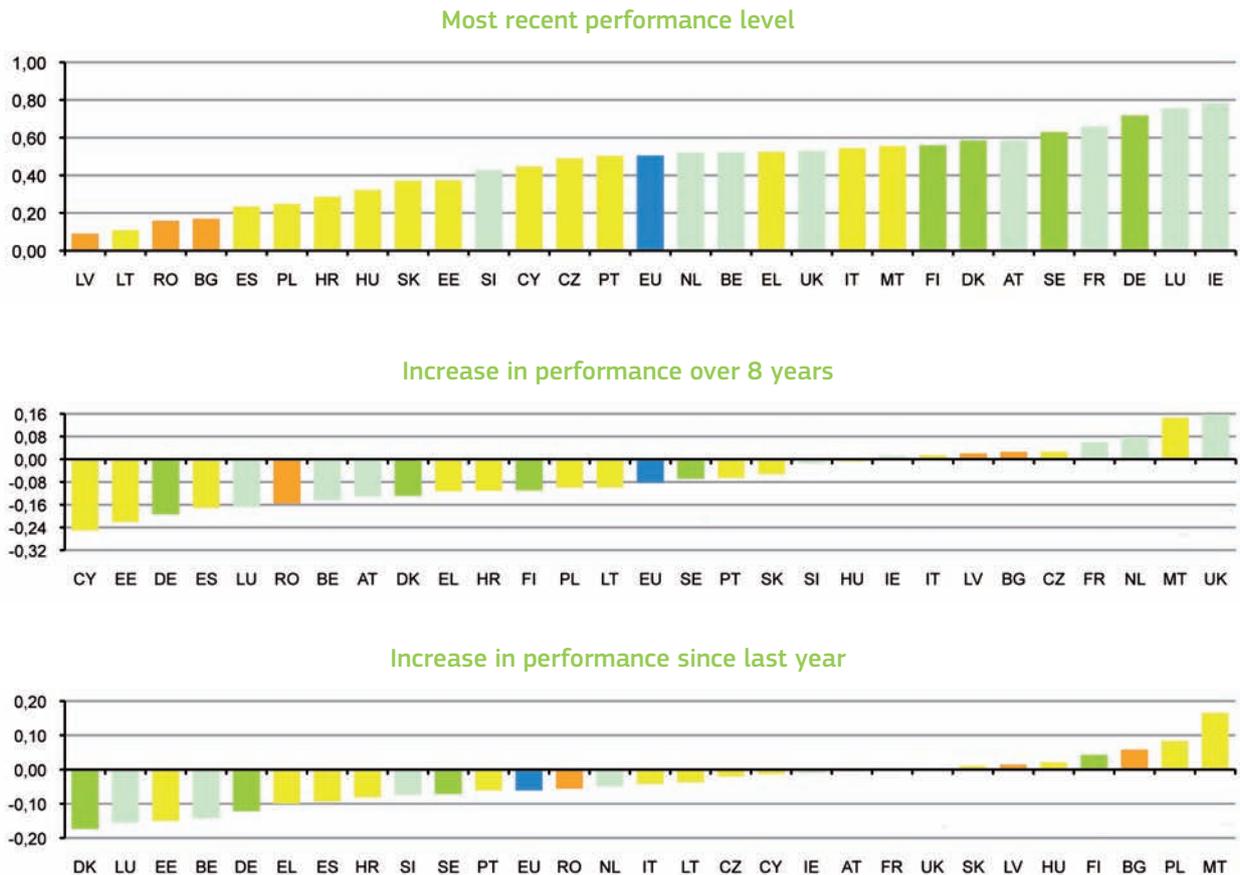
Performance in Innovators

In the Innovators dimension, the Innovation followers and innovation leaders are performing best. Ireland is the overall leader followed by Luxembourg, Germany and France (Figure 22). Innovation systems in these countries are characterised by high rates of firms involved in innovation activities: innovation seems a natural strategy for firms to meet their customers' demands and to face competitive pressures. This also results in faster employment growth linked to innovation activities. Malta, Italy and Greece are the strongest performing Moderate innovators. The performance of the Modest innovators is weak with Latvia showing the overall weakest performance.

Over time performance has worsened for 19 Member States and the EU at large. The UK, Malta, Netherlands and France have been the only

countries where performance has increased significantly over time. Compared to last year the situation has not improved with 19 Member States showing a decrease in their performance. For the share of SMEs introducing product or process innovations performance has decreased for 21 countries and the share of SMEs introducing marketing or organizational innovations has decreased for 20 countries. Remarkable is the strong performance decrease for Luxembourg as the country also has the second highest performance level. For Luxembourg performance has decreased strongly with 17% compared to last year, but as the country was in leading position one year ago with a performance lead of almost 15% over Ireland and 9% over Germany, Luxembourg only dropped to second place.

Figure 22: Innovators



Colour coding matches the groups of countries identified in Section 2.1.

Performance in Economic effects

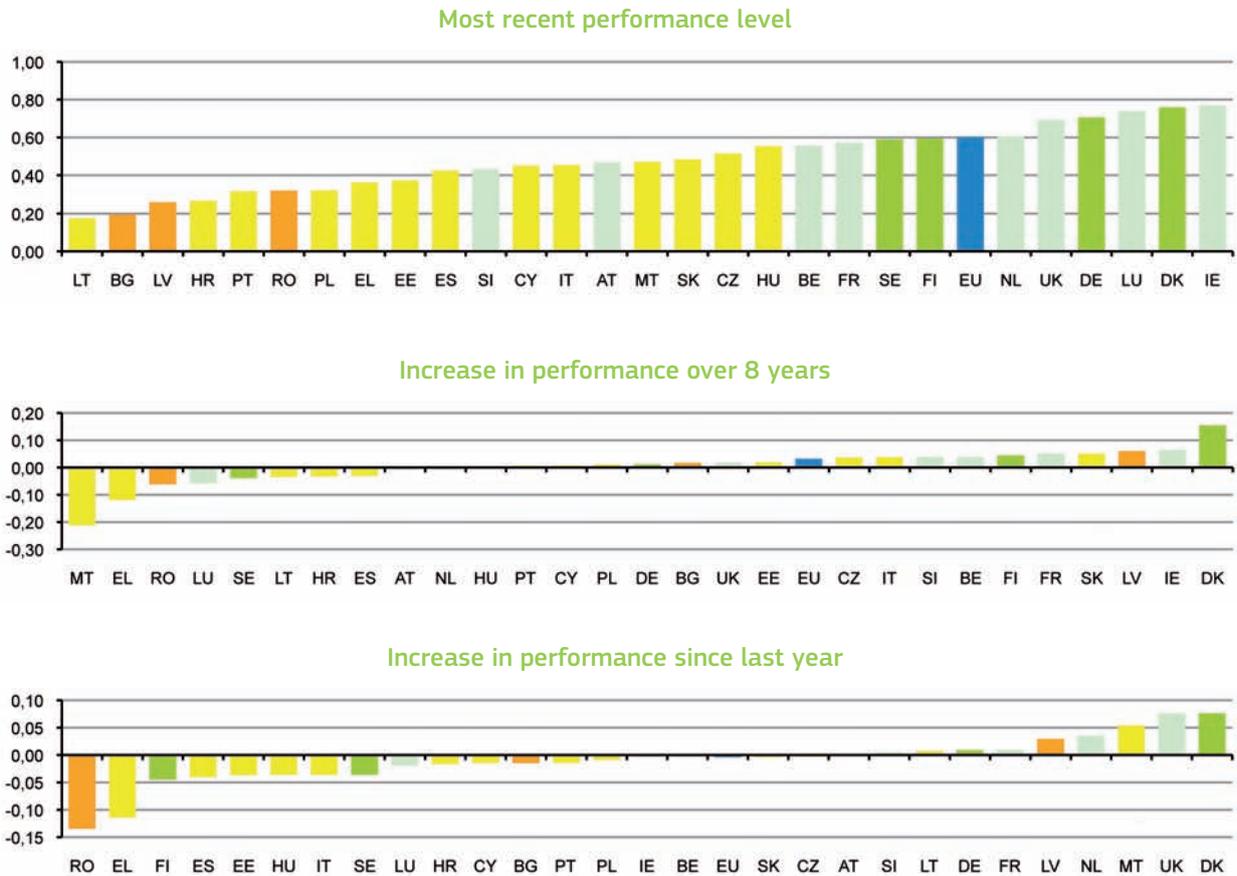
In Economic effects, the Innovation leaders and Innovation followers are performing best (Figure 23). Ireland is the overall leader in this dimension followed by Denmark, Luxembourg, Germany and United Kingdom. All the Modest and Moderate innovators perform below the EU average, with Hungary showing the best performance and Lithuania and Bulgaria the worst performance.

Performance has improved for 19 Member States over time and had decreased for 9 Member States, in particular for Malta and

Greece. Performance of the more innovative countries on average has improved more than that of the less innovative countries where there has been almost no improvement for the Modest innovators.

Compared to last year performance for 17 Member States has worsened with the strongest declines in Romania and Greece. Denmark, United Kingdom, Malta, Netherlands and Latvia are the only countries which managed to significantly improve their performance compared to last year.

Figure 23: Economic effects



Colour coding matches the groups of countries identified in Section 2.1.

4. Innovation performance of the European Union

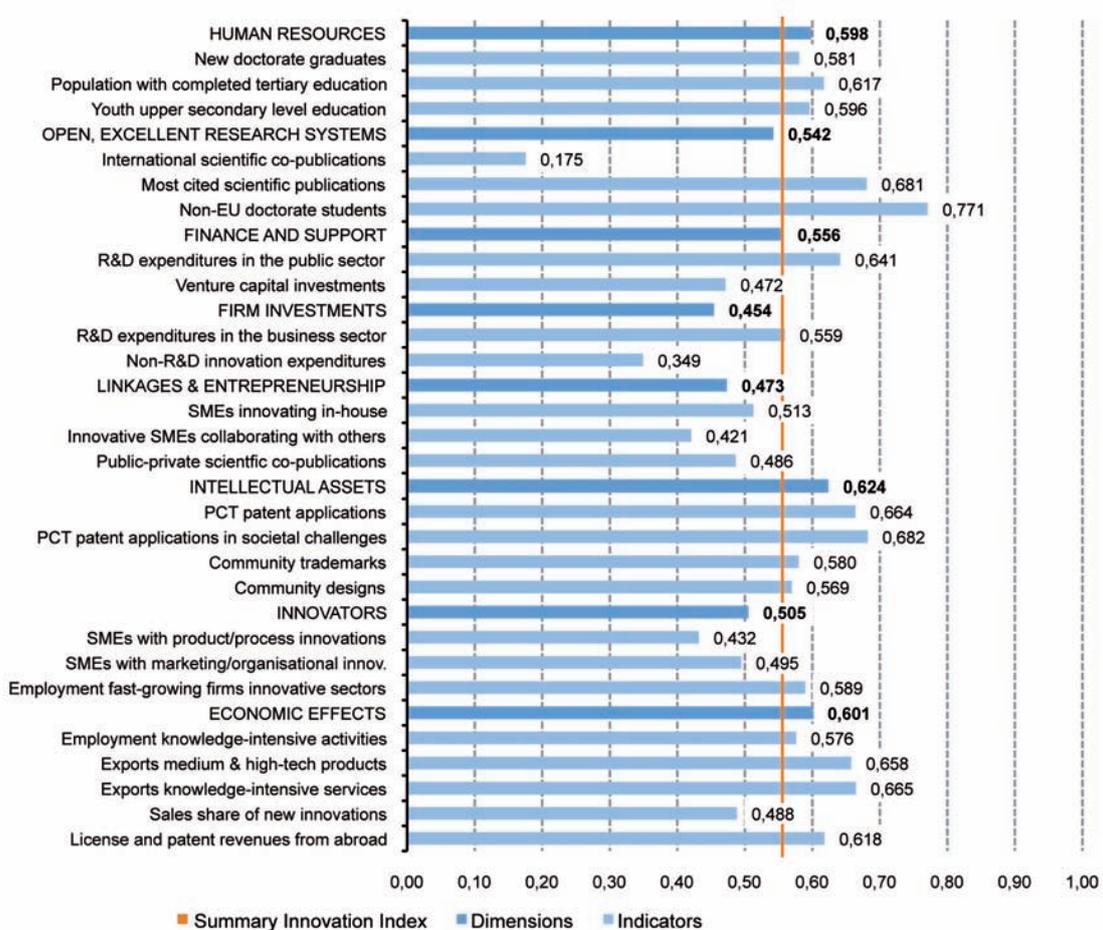
4.1 EU innovation performance

Average innovation performance for the EU depends on the performance of each of the Member States but also on the average performance of the Member States on each of the innovation dimensions and indicators. A comparison of the normalised performance scores by dimension and indicator to the average performance as measured by the Summary Innovation Index reveals relative strengths and weaknesses of the EU as a whole (Figure 24).

For the innovation dimensions relative strengths for the EU, as compared to the average performance measured by the Summary

Innovation Index, are in Intellectual assets (in particular in PCT patent applications), Economic effects (in particular in exports of medium and high-tech products and knowledge-intensive services) and Human resources (in particular in population with completed tertiary education). Relative weaknesses are in Firm investments (in particular due to a weak performance in non-R&D innovation expenditures), Linkages & entrepreneurship (most notably due to a low share of innovative SMEs collaborating with others) and Innovators (due to a low share of SMEs with product or process innovations).

Figure 24: EU innovation performance by dimension



Performance in Open, excellent and attractive research systems is close to average but above average performance in Most-cited scientific publications and Non-EU doctorate students is negatively offset by a below average performance in International scientific co-publications. Performance in International scientific co-publications

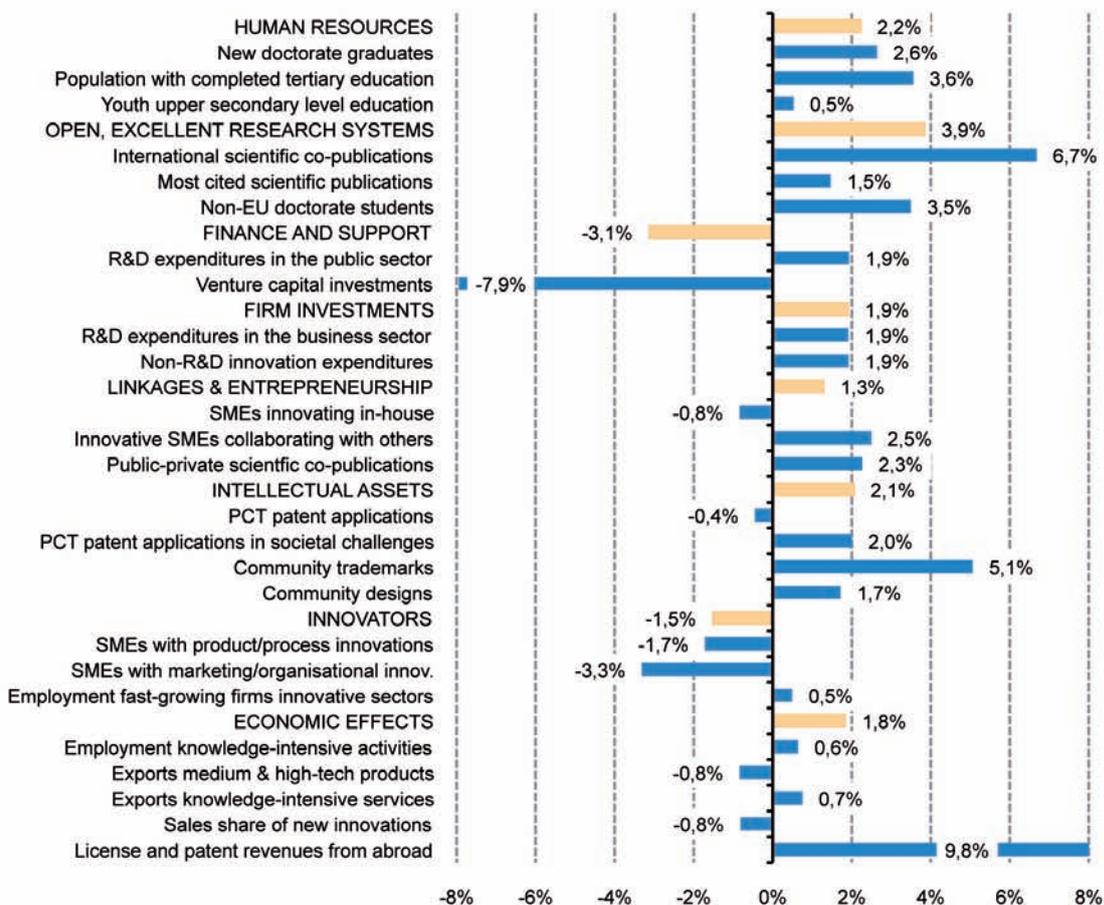
for the EU however is very low and below that of most Member States for a "technical" reason. For the EU co-publications between co-authors in different Member States are excluded from the indicator, whereas these co-publications are included in the indicator scores for the individual Member States.

4.2 EU growth performance

EU innovation performance has been increasing at an average annual rate of 1.0% between 2007 and 2014, but growth has not been equally strong across all dimensions and indicators (Figure 25). In particular, in Open, excellent and attractive research systems growth

has been strong (3.9%). Growth in this dimension has been driven by high growth in International scientific co-publications (6.7%). The EU innovation system is becoming more networked both between the Member States and at the global scale.

Figure 25: EU average annual growth performance over 2007-2014



Also in Human resources (2.2%) and Intellectual assets (2.1%) growth has been relatively strong. In Human resources performance has increased most for New doctorate graduates (2.6%) and Population aged 30-34 with completed tertiary education (3.6%). The EU has been improving its educational knowledge base turning Europe into a more knowledge-based economy. Growth in Intellectual assets is mostly driven by a strong performance increase in Community trademarks (5.1%), while overall patent application activity has been stable.

Growth in Firm investments (1.9%) and Economic effects (1.8%) has also been above average. Relatively strong performance increases are observed for R&D expenditures in the business sector and Non-

R&D innovation expenditures (both at 1.9%) for Firm investments and License and patent revenues from abroad (9.8%) for Economic effects. Growth in Linkages & entrepreneurship has been moderate (1.3%), with improving performance in Innovative SMEs collaborating with others and Public-private co-publications but decreasing performance for SMEs innovating in-house.

Growth in Finance and support has been very negative (-3.1%) due to a strong decline in Venture capital investments (-7.9%). Negative growth is also observed in Innovators (-1.5%) due to declining performance in SMEs that introduced product or process innovations and SMEs that introduced marketing or organisational innovations.

5. Benchmarking innovation performance with non-EU countries

5.1 Benchmarking with other European countries

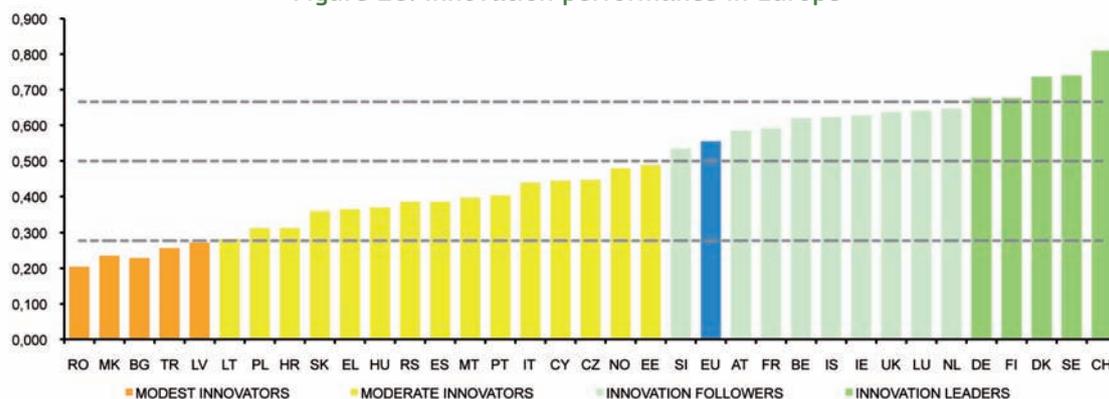
When looking at a wider European comparison, Switzerland is the overall innovation leader in Europe, outperforming all EU Member States (Figure 26). Switzerland's strong performance is linked to being the best performer in 6 indicators, in particular in Open, excellent and attractive research systems where it has the best performance in all three indicators, and Linkages and entrepreneurship where it has best performance in two indicators (SMEs innovating in-house and Public-private co-publications). Switzerland's relative weakness is in having below EU average shares in SMEs collaborating with others (9.4% compared to 10.3% for the EU), Community designs (0.93 compared to 1.13 for the EU) and Exports of knowledge-intensive services (25.0% compared to 49.5% for the EU).

Iceland is an Innovation follower and has the highest performance of all countries in Public R&D expenditures and the Share of SMEs that

introduced product or process innovators, but at the same time the lowest performance in Youth education (together with Turkey) and the Exports of medium and high-tech products.

Norway and Serbia are Moderate innovators with Norway's innovation performance coming close to that of the Innovation followers in particular due to its strong performance in Tertiary education, International scientific co-publications, Non-domestic doctorate students and Public-private scientific co-publications. Norway's growth performance (1.4%) is above that of the EU (1.0%). Serbia performs very well in Youth education, Non-R&D innovation expenditures and Employment in knowledge-intensive activities, and Serbia's innovation performance has been improving rapidly at an average annual growth rate of 6.3%.

Figure 26: Innovation performance in Europe



Non-EU countries include Switzerland (CH), Iceland (IS), Norway (NO), Serbia (RS), Former Yugoslav Republic of Macedonia (MK) and Turkey (TR).

The Former Yugoslav Republic of Macedonia and Turkey are Modest innovators. The Former Yugoslav Republic of Macedonia is performing well above average in Non-R&D innovation expenditures and SMEs with product or process innovations, and its growth performance (3.7%) has

been well above that of the EU. Turkey is performing strongly in Non-R&D innovation expenditures and Sales due to new innovative products. Turkey's growth rate at 7.0% is significantly above that of the EU.

5.2 Benchmarking with global competitors

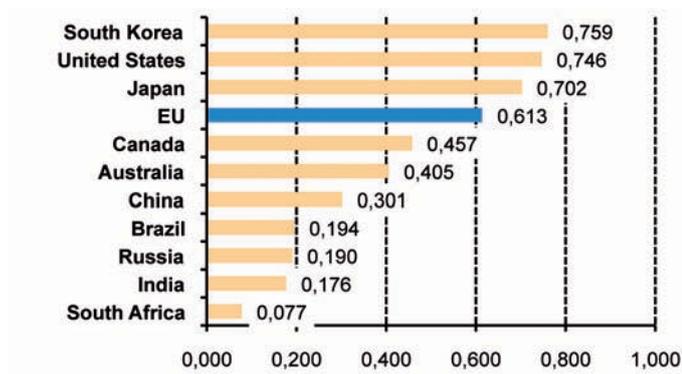
This section provides a comparison of the EU with some of its main global economic competitors including Australia, the BRICS countries (Brazil, China, India, Russia and South Africa), Canada, Japan, South Korea and the United States.

South Korea, the US and Japan have a performance lead over the EU (Figure 27). The performance lead has been increasing for South Korea as its growth rate has been twice that of the EU (Figure 28). **Innovation performance for the EU has been improving at a higher rate than that for the US and Japan.** As a consequence, the EU has been able to close part of its performance gap with the US and Japan. The three global top innovators are particularly dominating

the EU in indicators capturing business activity as measured by R&D expenditures in the business sector, Public-private co-publications and PCT patents, but also in educational attainment as measured by the Share of population having completed tertiary education. Enterprises in these countries invest more in research and innovation, and collaborative knowledge-creation between public and private sectors is better developed. The skilled workforce in these countries is also relatively larger than in the EU.

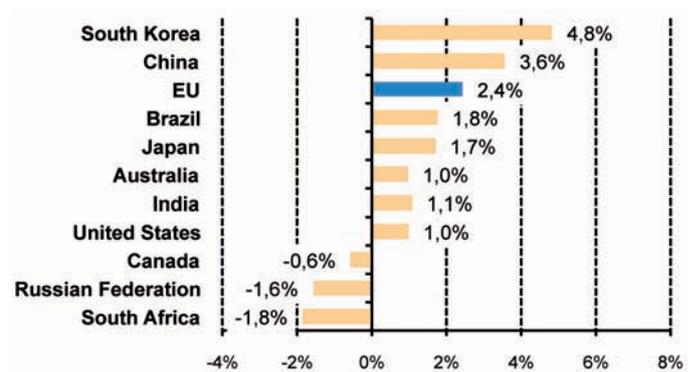
The EU continues to have a performance lead over Australia, Canada and all BRICS countries. Of these countries only China has managed to grow at a higher rate than the EU.

Figure 27: Global innovation performance



Note: Average performance is measured using a composite indicator building on data for 12 indicators ranging from a lowest possible performance of 0 to a maximum possible performance of 1. Average performance reflects that in 2012 due to a lag in data availability.

Figure 28: Global innovation growth rates



Average annual growth rates of the innovation index have been calculated over an eight-year period (2007-2014). Due to a smaller set of indicators the EU28 growth rate shown in this figure is not comparable to the one discussed in previous chapters.

Methodology

For all global competitors data availability is more limited than for the European countries (e.g. comparable innovation survey data are not available for many of these countries). Furthermore, the economic and/or population size of these countries outweighs those of many of the individual Member States and innovation performance is therefore compared with the aggregate of the Member States or the EU.

For the international comparison of the EU with its global competitors a more restricted set of 12 indicators (Table 4) has been used. Most of

the indicators are nearly identical to those used in the measurement framework for the EU Member States (cf. Table 1).¹³ The indicators focus mostly on performance related to R&D activities (R&D expenditures, publications, patents). There are no indicators using innovation survey data as such data are not available for most of the global competitors or are not directly comparable with the European Community Innovation Survey (CIS) data. The indicator measuring the Share of the population aged 30 to 34 having completed tertiary education has been replaced by the same indicator but for a larger age group, namely 25 to 64 as data for the age group 30 to 34 are not available for most countries.

¹³ The methodology for calculating average innovation performance is explained in Section 7.4.

Table 4: Indicators used in the international comparison

Main type / Innovation dimension / Indicator	Data source: Numerator	Data source: Denominator	Most recent year	Date not available for
ENABLERS				
Human resources				
1.1.1 New doctorate graduates (ISCED 6) per 1000 population aged 25-34	OECD	OECD	2012	India
1.1.2 Percentage population aged 25-64 having completed tertiary education	OECD, World Bank, Eurostat	OECD, World Bank, Eurostat	2012	
Open, excellent and attractive research systems				
1.2.1 International scientific co-publications per million population	Science-Metrix (Scopus)	World Bank	2012	Australia, Canada, South Africa
1.2.2 Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	Science-Metrix (Scopus)	Science-Metrix (Scopus)	2009	Australia, Canada, South Africa
Finance and support				
1.3.1 R&D expenditure in the public sector as % of GDP	OECD, UIS	OECD, UIS	2012	
FIRM ACTIVITIES				
Firm investments				
2.1.1 R&D expenditure in the business sector as % of GDP	OECD, UIS	OECD, UIS	2012	
Linkages & entrepreneurship				
2.2.3 Public-private co-publications per million population	CWTS (Thomson Reuters)	World Bank, Eurostat	2008	
Intellectual assets				
2.3.1 PCT patents applications per billion GDP (in PPS€)	OECD	OECD, Eurostat	2011	
2.3.2 PCT patents applications in societal challenges per billion GDP (in PPS€) (environment-related technologies; health)	OECD	OECD, Eurostat	2011	
OUTPUTS				
Economic effects				
3.2.2 Medium and high-tech product exports as a % of total product exports	United Nations	United Nations	2013	
3.2.3 Knowledge-intensive services exports as % total service exports	United Nations	United Nations	2011	South Africa
3.2.5 License and patent revenues from abroad as % of GDP	World Bank	World Bank	2012	

For the EU28 data sources are similar to those in Table 1 except for License and patent revenues from abroad where also for the EU World Bank data have been used.

For some indicators, slightly different definitions have been used for the EU as compared to the previous chapters. For Medium and high-tech product exports and Knowledge-intensive services exports the data for the EU will exclude trade between Member States (so-called intra-EU trade) and will only include exports to non-Member States (so-called extra-EU trade). Indicator values in the international comparison using extra-EU trade only will be higher for the EU compared to those used for the EU in the comparison between Member States. For License and patent revenues from abroad also for the EU data will be used from the World Bank's World Development Indicators. World Bank data are significantly below those obtained from Eurostat (e.g. in 2012 the value was 0.572 using Eurostat data and 0.427 using World Bank data). One explanation

is that the World Bank reports much lower values for the Netherlands and also does not report data for Denmark which, using Eurostat data, is above the EU average. It is considered that due to these significant differences it is more appropriate to use the same data source for both the EU and its international competitors for License and patent revenues from abroad.

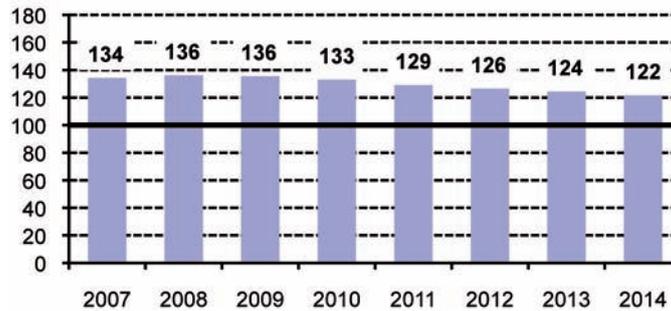
For each of the international competitors the following pages discuss their relative performance to the EU and relative strengths and weaknesses for the different indicators. Indicator values, performance leads and changes in performance leads are shown in Annex G. Data have been extracted from various sources including Eurostat, OECD, UNESCO Institute for Statistics (UIS), United Nations, World Bank and Scopus.

The United States

The United States has been consistently more innovative than the EU but the performance lead is steadily decreasing.

Between 2007 and 2010 the US innovation index was more than 33% higher than that of the EU, but since 2010 the US lead has been steadily declining to 22% in 2014.

Innovation performance: United States

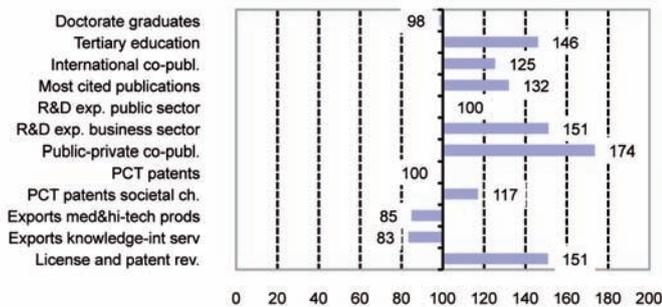


The performance scores are calculated by dividing the US innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

A closer look at the individual indicators reveals that the US is performing better on 7 indicators. A much higher share of the US population has completed tertiary education, 43.1% in the US compared to 29.5% in the EU in absolute terms (cf. Annex G) creating a performance lead of the US over the EU of 46%. The number of International scientific co-publications and the quality of US scientific publications, as measured by most-cited publications, are also much higher and scientific collaboration between the private and public sector is 75% higher than that in the EU. US businesses spend about 51% more on R&D (1.95% of GDP in 2012 compared to 1.29% in the EU). The US is also more successful in commercializing new technologies with 51% more License and patent revenues compared to the EU. The US has relative weaknesses in Exports of medium and high-tech products and Exports of knowledge-intensive services.

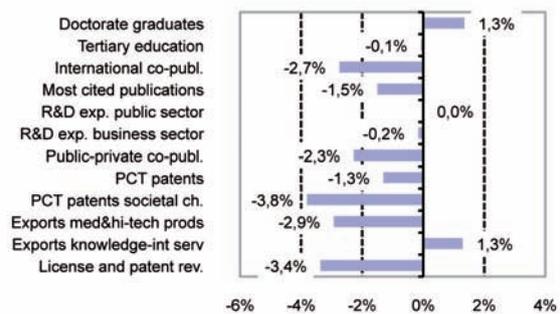
For most indicators however the relative performance of the US has worsened. Only for Doctorate graduates and Exports of knowledge-intensive services the US has managed to improve its performance at a faster rate. For all other indicators either the performance lead has declined or the performance gap to the EU has increased. The strongest relative declines are observed for License and patent revenues from abroad, Patent applications in societal challenges, Exports of medium and high-tech products and International scientific co-publications. In particular for those indicators where the gap is increasing – PCT patent applications and Exports of medium and high-tech products – the US is, compared to the EU, not performing well.

Performance lead: United States



The scores are calculated by dividing the US indicator value by that of the EU and multiplying by 100.

Change in performance lead: United States

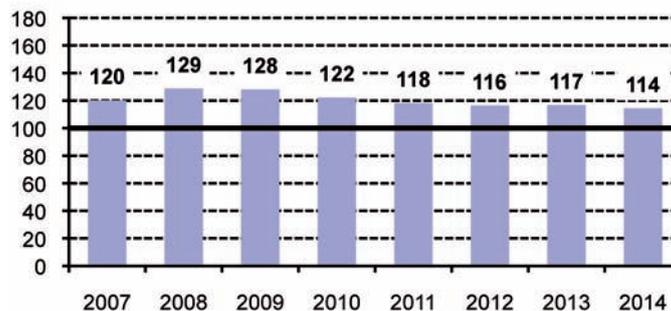


The scores are calculated by subtracting the EU growth rate from that of the US.

Japan

Japan has been consistently more innovative than the EU, but its performance lead decreases. The Japanese innovation index reached a peak in 2008 and 2009 being almost 30% higher than that of the EU. The performance lead started to decline after 2009 and has fallen to 14% in 2014.

Innovation performance: Japan

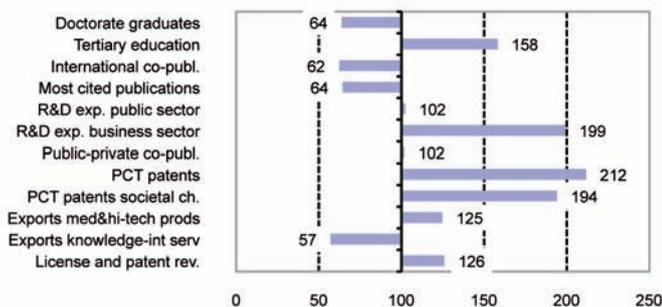


The performance scores are calculated by dividing the Japanese innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

A closer look at the individual indicators reveals that Japan is performing better on 8 indicators. A 58% higher share of population has completed tertiary education (46.6% in Japan compared to 29.5% in the EU). Japanese businesses spend twice as much on R&D and Japan is also much more active in applying for patents. Japan also outperforms the EU on Exports of medium and high-tech products and License and patent revenues from abroad. Japan has relative weaknesses in Doctorate graduates, International scientific co-publications, Most-cited publications and Exports of knowledge-intensive services.

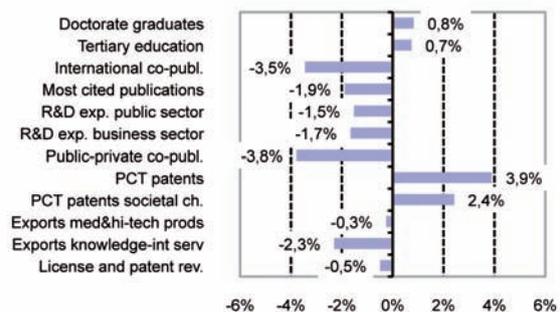
Growth performance of Japan is below that of the EU for 8 indicators and it is above that of the EU for 4 indicators. The Japanese performance lead has been improving in 3 indicators, in both patent indicators and Tertiary education. The gap towards the EU has worsened in 3 indicators, in International scientific co-publications, Most cited publications and Exports of knowledge-intensive services.

Performance lead: Japan



The scores are calculated by dividing the Japanese indicator value by that of the EU and multiplying by 100.

Change in performance lead: Japan

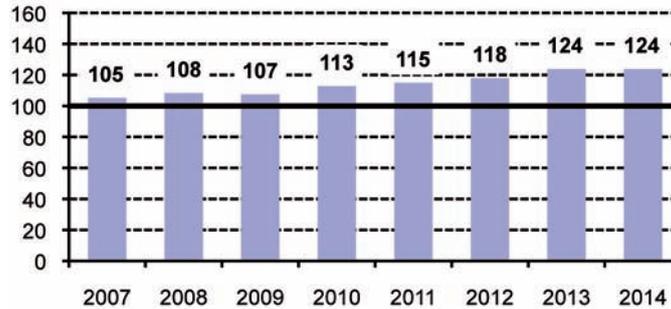


The scores are calculated by subtracting the EU growth rate from that of Japan.

South Korea

South Korea is more innovative than the EU and the innovation lead has been steadily increasing over the last 8 years. In 2007 the lead was relatively small at 5% but in 2014 it has increased to 24%, even higher than the US-EU performance lead.

Innovation performance: South Korea

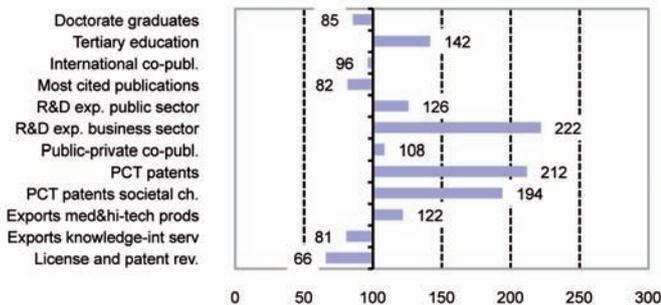


The performance scores are calculated by dividing the South Korean innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

A closer look at the individual indicators reveals that South Korea is performing better on 7 indicators. A 42% higher share of population has completed tertiary education. South Korea is much more successful in applying for patents and in particular the country spends more than twice as much on business R&D (2.86% of its GDP in 2012 as compared to 1.29% in the EU). South Korea has relative weaknesses in Doctorate graduates, License and patent revenues from abroad, Exports of knowledge-intensive services and in its knowledge base with weaker performance compared to the EU in both International scientific co-publications and Most-cited publications.

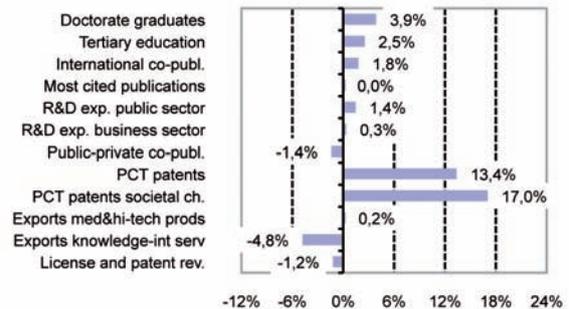
The relative performance of South Korea has improved for 9 indicators. This has led to performance lead increases for 6 indicators, particularly in Patent applications. Furthermore South Korea is decreasing the performance gap with faster growth in Doctorate graduates and International scientific co-publications. South Korea is experiencing a worsening in its performance gap in Exports of knowledge-intensive services and License and patent revenues from abroad.

Performance lead: South Korea



The scores are calculated by dividing the South Korean indicator value by that of the EU and multiplying by 100.

Change in performance lead: South Korea

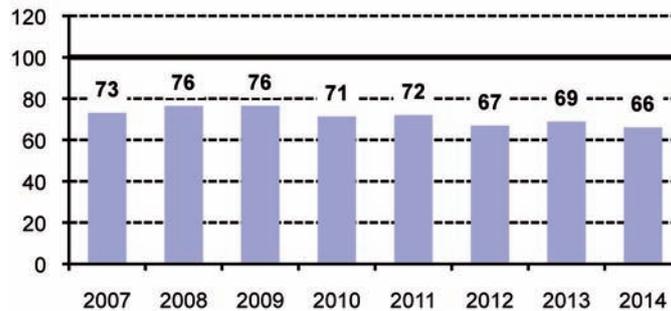


The scores are calculated by subtracting the EU growth rate from that of South Korea.

Australia

Australia's innovation performance is lagging behind that of the EU and the innovation gap slowly widens. The performance gap was at its smallest in 2008 and 2009 when the country's relative performance was 76% of that of the EU and relative performance has since steadily decreased to 66% in 2014.

Innovation performance: Australia

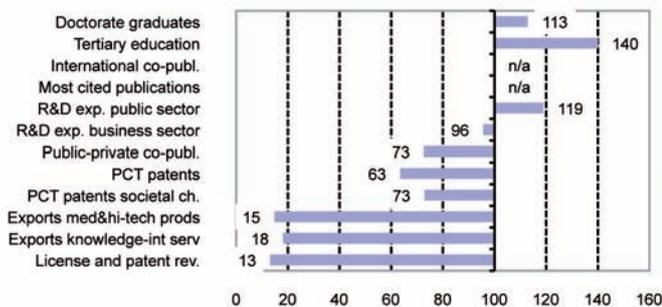


The performance scores are calculated by dividing the Australian innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

Australia is performing worse than the EU in 7 indicators, particularly on License and patent revenues from abroad, Exports of medium and high-tech products, Exports of knowledge-intensive services, Patent applications and Public-private co-publications. Australia is performing better than the EU on 3 indicators related to the public sector: Doctorate graduates, Population having completed tertiary education and R&D expenditures in the public sector.

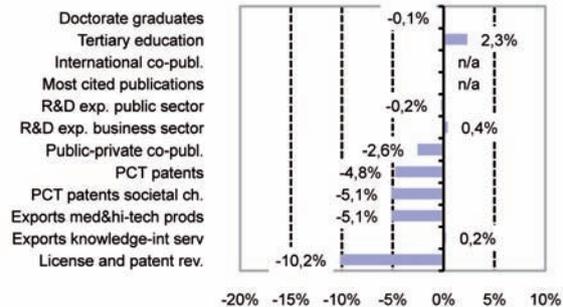
Australia shows a mixed growth performance in its individual indicators with performance in 3 indicators growing slightly faster and in 7 indicators growing slower compared to the EU. Australia has improved its performance lead in Tertiary education. However Australia's performance gap in Public-private co-publications, Patent applications, Exports of medium and high-tech products and License and patent revenues from abroad has worsened. Australia seems to perform much better in its enabling conditions but relatively worse in both firm activities and innovation outputs.

Performance lead: Australia



The scores are calculated by dividing the Australian indicator value by that of the EU and multiplying by 100.

Change in performance lead: Australia



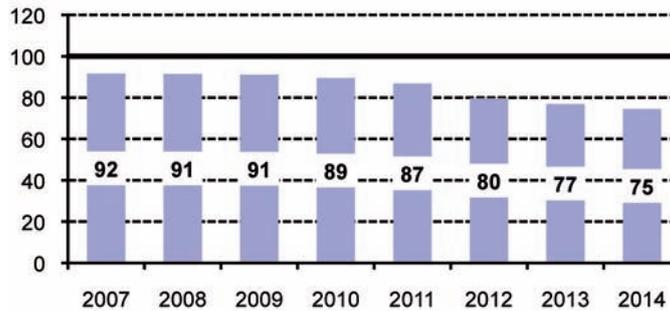
The scores are calculated by subtracting the EU growth rate from that of Australia.

For two indicators International scientific co-publications and Most-cited publications data are not available.

Canada

Canada's innovation performance is lagging behind that of the EU and the innovation gap is further increasing. Relative performance was at its highest in the period 2007 - 2009 at over 90% of that of the EU after which it started to decrease. In 2014 Canada's innovation performance has declined to 75% of that of the EU.

Innovation performance: Canada



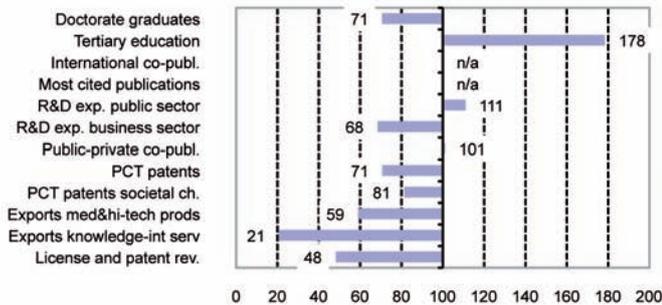
The performance scores are calculated by dividing the Canadian innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

Canada is performing worse than the EU on 7 indicators, in particular on License and patent revenues from abroad and Exports of knowledge-intensive services. Canada is performing better than the EU for 3 indicators: Population with completed tertiary education, where the country is performing almost 80% better than the EU, R&D expenditures in the public sector and Public-private co-publications.

Canada shows a mixed growth performance in its individual indicators with growth performance for 7 indicators below and for 3 indicators

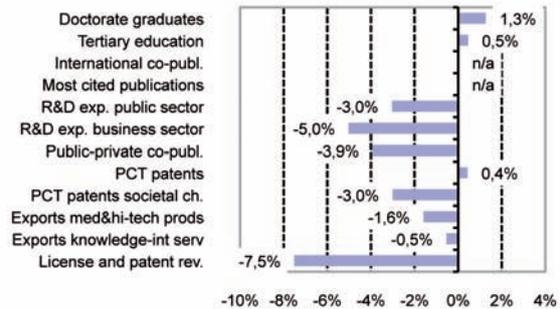
above that of the EU. Canada has only been able to improve its performance lead in Tertiary education. Furthermore it has decreased the performance gap for Doctorate graduates and Patent applications. The performance leads Canada has on R&D expenditures in the public sector and Public-private co-publications are decreasing. In addition the performance gaps in R&D expenditures in the business sector, Patent applications in societal challenges, Exports of medium and high-tech products, Exports of knowledge-intensive services and License and patent revenues from abroad have increased.

Performance lead: Canada



The scores are calculated by dividing the Canadian indicator value by that of the EU and multiplying by 100.

Change in performance lead: Canada



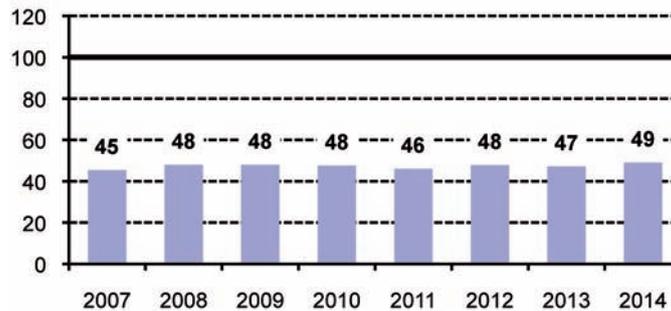
The scores are calculated by subtracting the EU growth rate from that of Canada.

For two indicators International scientific co-publications and Most-cited publications data are not available.

China

China's innovation performance is lagging behind that of the EU but its relative performance has been increasing from 45% in 2007 to 49% in 2014.

Innovation performance: China

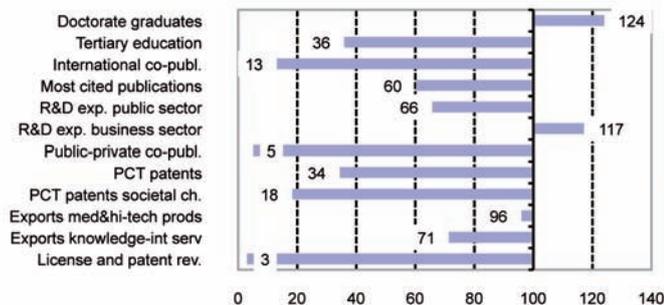


The performance scores are calculated by dividing the Chinese innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

China is performing worse than the EU in 10 out of 12 indicators, in particular in License and patent revenues from abroad, Public-private co-publications, International scientific co-publications, Patent applications and Tertiary education. China is outperforming the EU on two indicators: Doctorate graduates (where the country is performing 24% better as a result of having 2.2 new doctorate graduates per 1,000 population aged 25-34 as compared to 1.8 in the EU) and R&D expenditures in the business sector (1.51% of GDP in China compared to 1.29% in the EU).

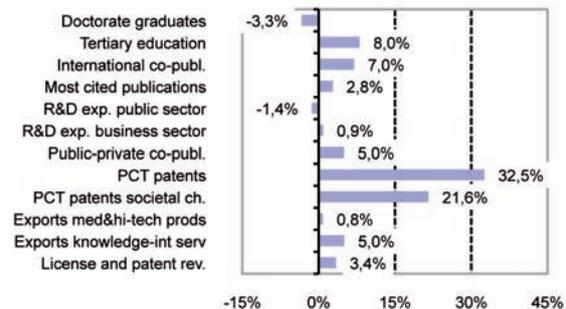
However, China's growth performance has been much stronger than that of the EU with growth rates in 10 indicators being higher, which indicates a continuous catching-up process. Growth was below that of the EU in Doctorate graduates and R&D expenditures in the public sector. China's performance lead in R&D expenditures in the business sector has improved and its performance gap has become smaller in 9 indicators, in particular in Patent applications, Tertiary education and International scientific co-publications. China's performance lead in Doctorate graduates has decreased and its gap in R&D expenditures in the public sector has worsened slightly.

Performance lead: China



The scores are calculated by dividing the Chinese indicator value by that of the EU and multiplying by 100.

Change in performance lead: China

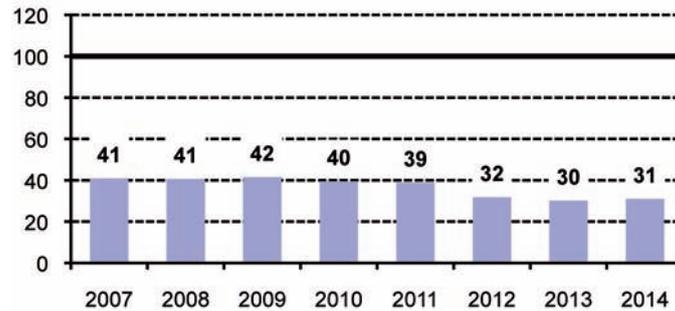


The scores are calculated by subtracting the EU growth rate from that of China.

Russia

Russia's innovation performance is lagging behind that of the EU and the innovation gap continues to widen. Relative innovation performance was above 40% up until 2010 and has decreased to 31% in 2014. The strong decline in 2012 is due to a sharp decline in New doctorate graduates from 1.4 to 0.4 per 1,000 population aged 25-34.

Innovation performance: Russia



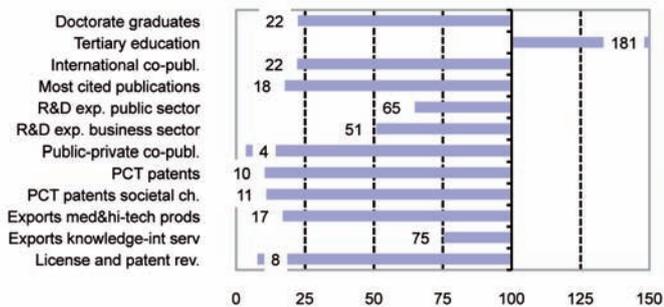
The performance scores are calculated by dividing the Russian innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

A closer look at the individual indicators reveals that Russia is performing worse than the EU on 11 indicators, in particular on Public-private co-publications, License and patent revenues from abroad, Patent applications, Exports of medium and high-tech products and Most-cited publications. An 81% higher share of Russia's population has completed tertiary education.

Russia's growth performance is worse than that of the EU with growth in 10 indicators being below that of the EU, especially for

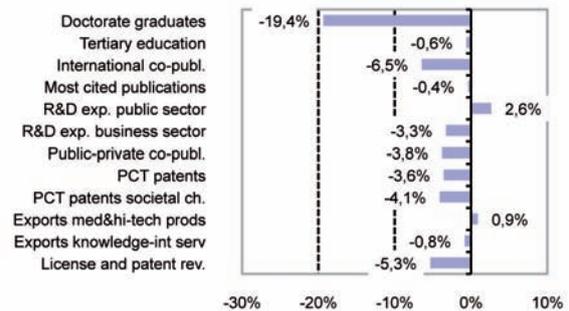
Doctorate graduates, International scientific co-publications and License and patent revenues from abroad. Growth was above that of the EU in R&D expenditures in the public sector and Exports of medium and high-tech products. The performance gap with the EU has worsened for 9 indicators, in particular for Doctorate graduates. The performance gap of Russia with the EU has become smaller for R&D expenditures in the public sector and Exports of medium and high-tech products.

Performance lead: Russia



The scores are calculated by dividing the Russian indicator value by that of the EU and multiplying by 100.

Change in performance lead: Russia

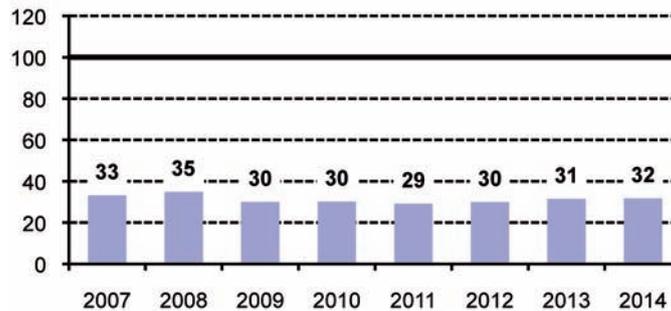


The scores are calculated by subtracting the EU growth rate from that of Russia.

Brazil

Brazil's innovation performance is lagging behind that of the EU and is stagnating. Relative performance was at its highest in 2008 at 35% and declined to 29% in 2011. In 2014 performance has improved to 32%.

Innovation performance: Brazil



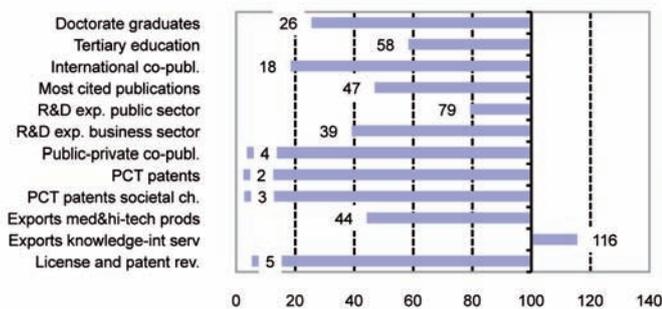
The performance scores are calculated by dividing the Brazilian innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

Taking a closer look at the individual indicators shows that Brazil is performing worse than the EU on 11 indicators, in particular on License and patent revenues from abroad, Patent applications and Public-private co-publications. Brazil is only performing better than the EU on Exports of knowledge-intensive services.

better than that of the EU for 8 indicators, in particular in Tertiary education, Exports of knowledge-intensive services and License and patent revenues from abroad. Brazil has managed to reduce its performance gap in 7 indicators and has improved its performance lead in Exports of knowledge-intensive services. The performance gap in Doctorate graduates, Public-private co-publications, R&D expenditures in the business sector and Exports of medium and high-tech products has worsened.

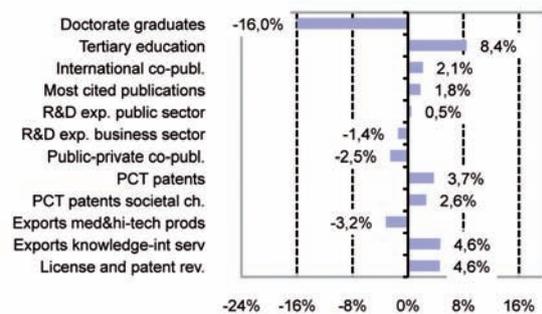
For most indicators however the growth performance of Brazil exceeds the growth performance of the EU. Growth performance is

Performance lead: Brazil



The scores are calculated by dividing the Brazilian indicator value by that of the EU and multiplying by 100.

Change in performance lead: Brazil

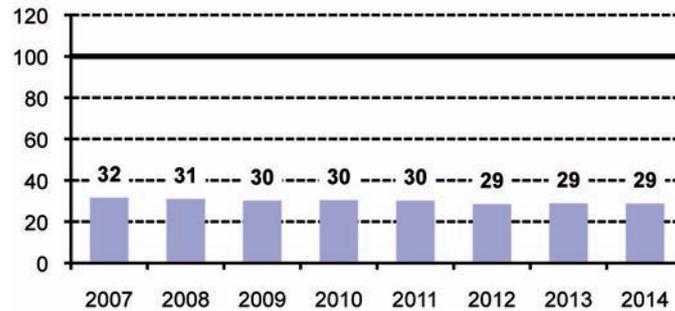


The scores are calculated by subtracting the EU growth rate from that of Brazilian.

India

India's innovation performance is lagging behind that of the EU and has slowly declined over time. Relative performance was at its highest in 2007-2011 and then decreased to 29% from 2012 to 2014.

Innovation performance: India



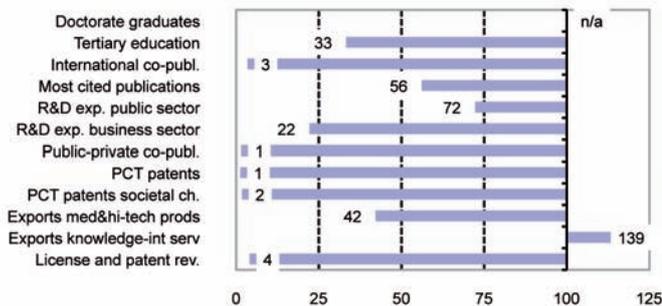
The performance scores are calculated by dividing the Indian innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

Looking at the individual indicators reveals that India is performing worse than the EU on 10 indicators, in particular on License and patent revenues from abroad, International scientific co-publications, Public-private co-publications and Patent applications. India is only performing better than the EU in Exports of knowledge-intensive services where its share of exports is 39% higher than that of the EU.

India's growth performance is mixed with growth in 6 indicators being above the EU, in particular for Most-cited publications, International scientific co-publications and PCT patents. Growth for 5 indicators has

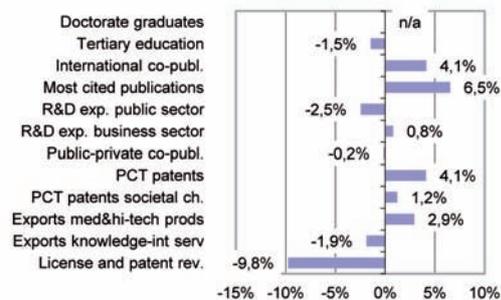
been below that of the EU, with a large growth difference in License and patent revenues from abroad. India has managed to reduce its performance gap in 6 indicators: R&D expenditures in the business sector, PCT patent applications, Exports of medium and high-tech products and 2 of the indicators measuring the performance of its science system: International scientific co-publications and Most-cited publications. The performance gap has worsened for 4 indicators, in particular for License and patent revenues from abroad, R&D expenditures in the public sector and Tertiary education. India's performance lead on Knowledge-intensive service exports has decreased.

Performance lead: India



The scores are calculated by dividing the Indian indicator value by that of the EU and multiplying by 100.

Change in performance lead: India



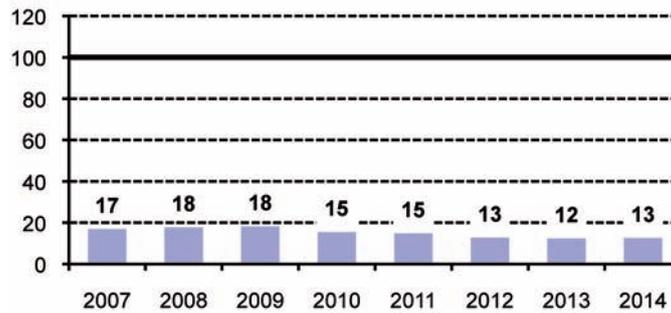
The scores are calculated by subtracting the EU growth rate from that of India.

For the indicator New doctorate graduates data are not available.

South Africa

The innovation performance of South Africa is lagging behind that of the EU and is slowly declining. Relative performance peaked at 18% of the EU level in 2008-2009 and then declined to 13% in 2014.

Innovation performance: South Africa



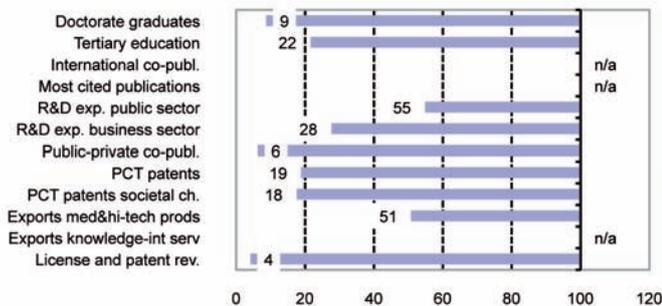
The performance scores are calculated by dividing the South African innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

South Africa is performing worse than the EU for all 9 included indicators, particularly on License and patent revenues from abroad, Doctorate graduates and Public-private co-publications. The gap is smallest in R&D expenditures in the public sector and Exports of medium and high-tech products.

The performance gap has worsened for nearly all indicators especially for License and patent revenues from abroad, R&D expenditures in the business sector and Patent applications.

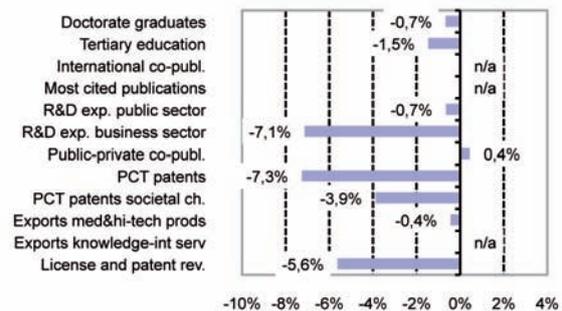
Looking at the relative growth performance reveals that for all indicators, except Public-private co-publications, South Africa's growth performance is below that of the EU explaining the divergence process in innovation performance relative to the EU.

Performance lead: South Africa



The scores are calculated by dividing the South African indicator value by that of the EU and multiplying by 100.

Change in performance lead: South Africa



The scores are calculated by subtracting the EU growth rate from that of South Africa.

For the indicators International scientific co-publications, Most-cited publications and Exports of knowledge-intensive services data are not available.

6. Country profiles

This section provides more detailed individual profiles for all European countries. Each profile includes 3 graphs.

The first graph shows the development of the country's innovation index over time (as shown by the solid line) and its development relative to the EU average (as shown by the dotted line).

The second graph provides a comparison by indicator and dimension with that of the EU highlighting relative strengths and weaknesses. The comparison of the indicators is based on the real indicator values before being corrected for outliers, being possibly transformed and being normalized (cf. Section 7.1 for more details on the methodology used to construct normalized indicator scores). The comparison of the dimensions is based on the composite index values which are the average of the normalized scores of the indicators captured by the respective dimension. The relative performance for a dimension can thus be intuitively different from that of the indicators as some indicators will have been transformed and all indicators will have been normalized. In some cases average performance for a dimension can be above or below that of all the indicators captured by the respective dimension.

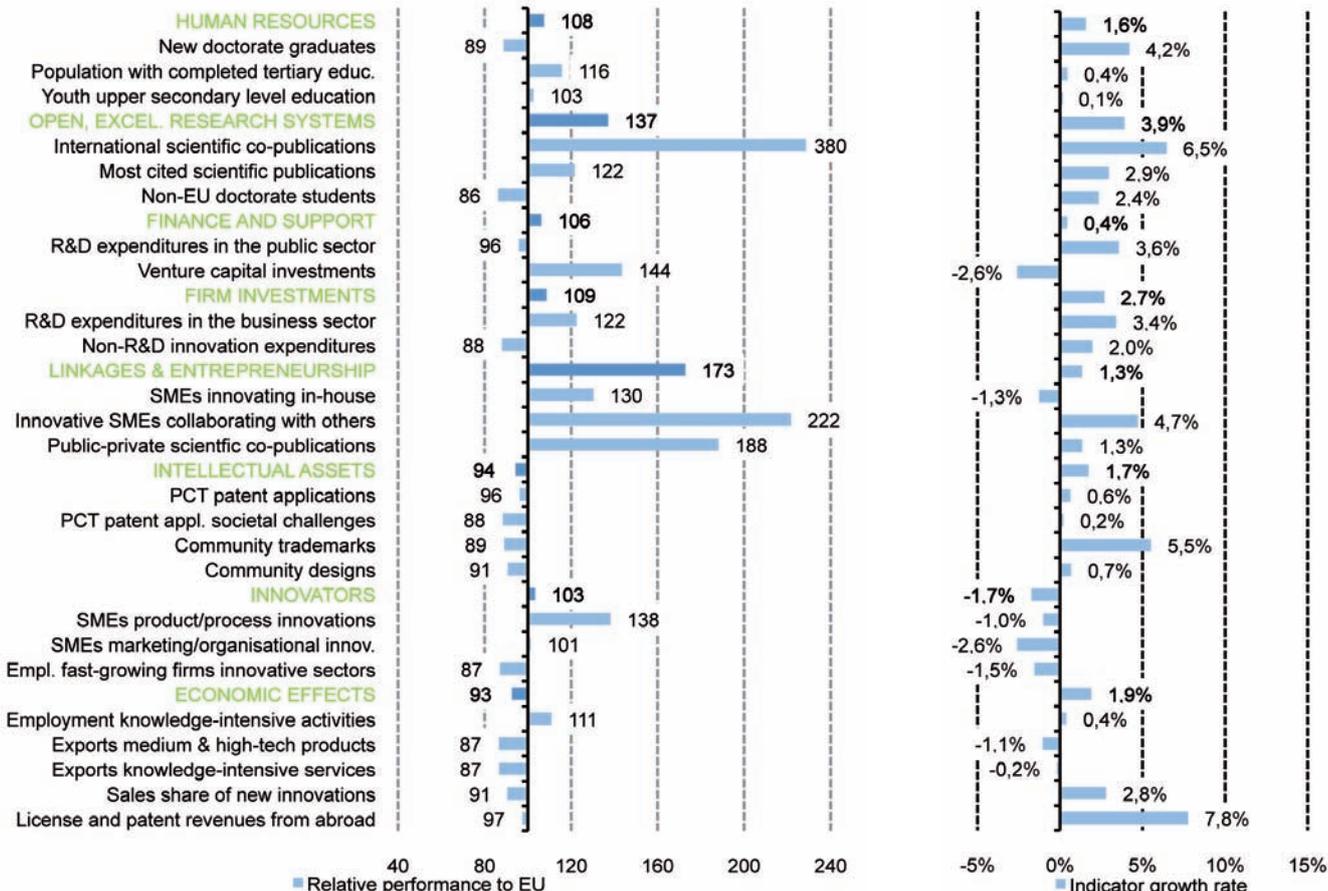
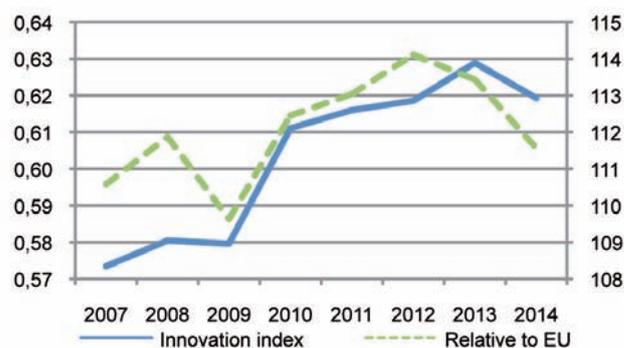
The third graph shows the growth performance by indicator and dimension highlighting which indicators and dimensions have been driving a country's change in innovation performance over time.

Belgium

Belgium is an **Innovation follower**. Innovation performance has been steadily increasing over time until 2013 after which it declined in 2014. The increase in performance has been above that of the EU, with relative performance increasing from almost 10% above average in 2009 to 14% in 2012. For 2014, relative performance is almost 12% above the EU average.

In Linkages and entrepreneurship the country is performing well above the EU average. Also Belgium's research system is performing well in particular due to a high number of International scientific co-publications. Relative weaknesses are in Intellectual assets where performance is somewhat below the EU average for all four indicators and in Economic effects where only Employment in knowledge-intensive activities is above the EU average.

Performance has improved most strongly in Open, excellent and attractive research systems (3.9%). For seven indicators performance has declined, in particular in Venture capital investments (-2.6%) and SMEs with marketing or organizational innovations (-2.6%).



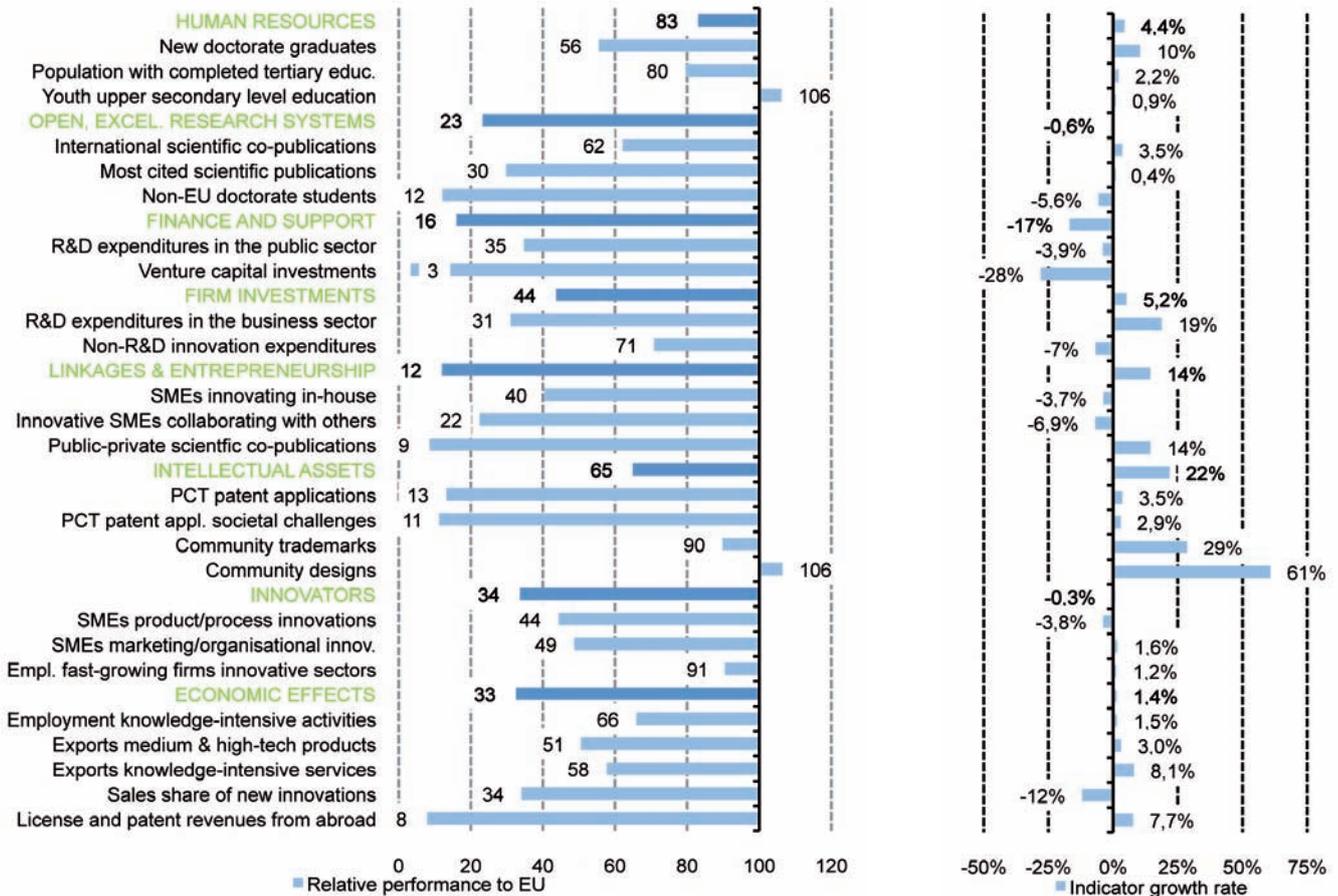
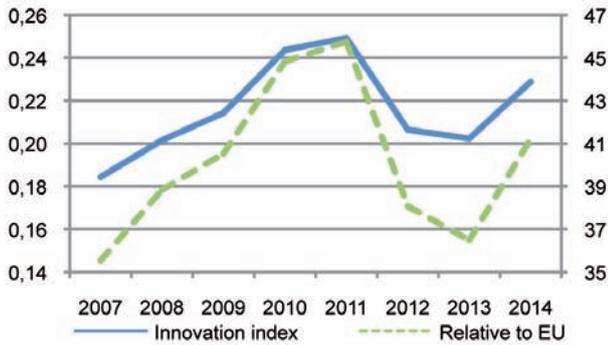
Note: Performance relative to the EU where the EU = 100.

Bulgaria

Bulgaria is a **Modest innovator**. Innovation performance has been steadily increasing over time until 2011, after which it strongly declined in 2012 and 2013, to increase again in 2014. Performance relative to the EU declined from 46% in 2011 to 37% in 2013, and is at 41% for 2014.

Bulgaria's relative strengths are in Human resources and Intellectual assets. The country has high shares of highly educated people and performs well in applying for Community trademarks and designs. Linkages and entrepreneurship and Finance and support are the main weaknesses, in particular due to very low Venture capital investments. For all indicators, except for Youth with upper secondary level education and Community designs Bulgaria is performing below the average of the EU.

For 17 indicators growth has been positive, most notably for Community designs with a growth rate of 61%. But growth has also been high in Community trademarks (29%), R&D expenditures in the business sector (19%), Public-private co-publications (14%) and New doctorate graduates (10%). Strong declines in performance are observed in Venture capital investment (-28%) and Sales share of new innovations (-12%).



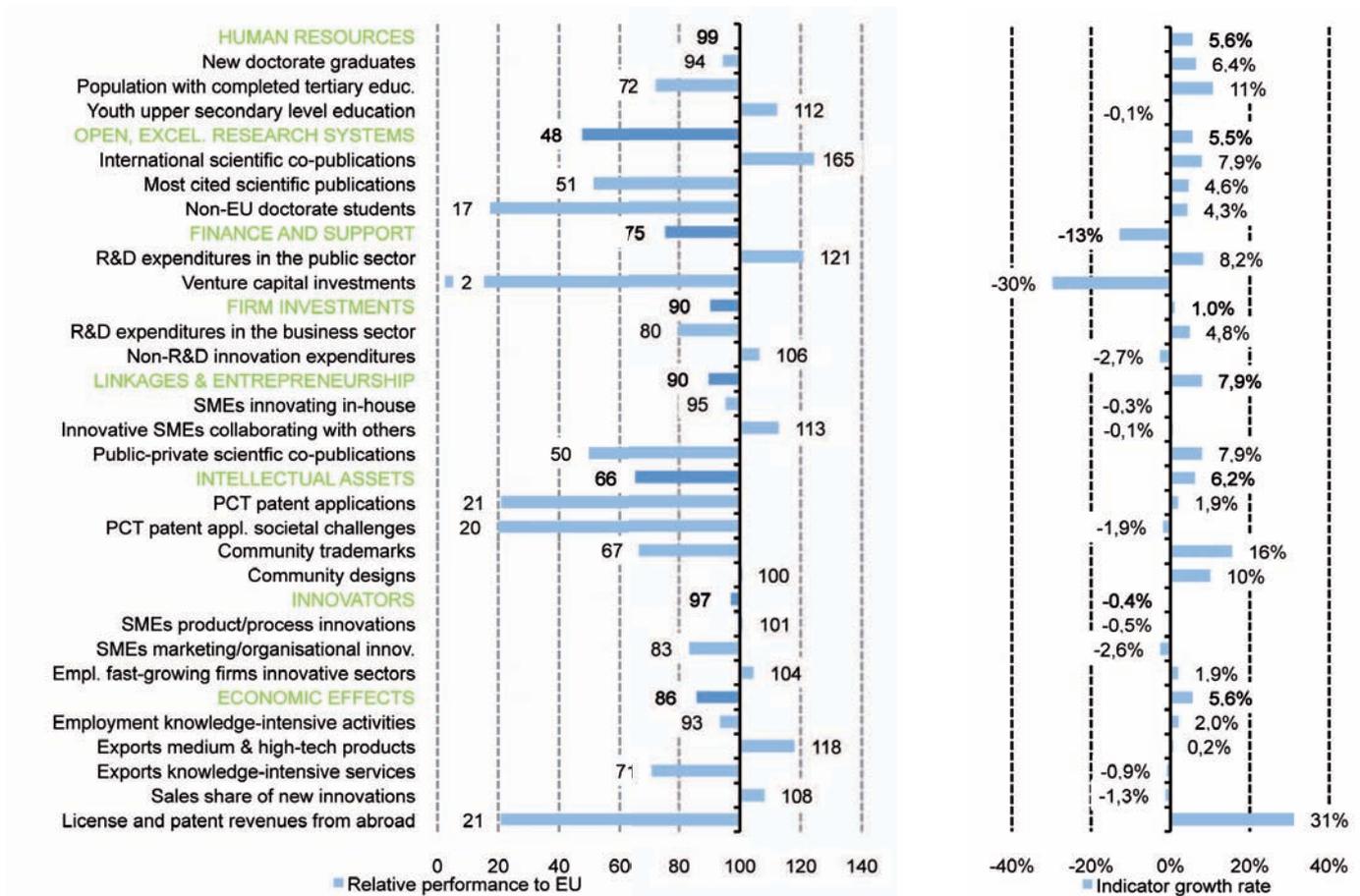
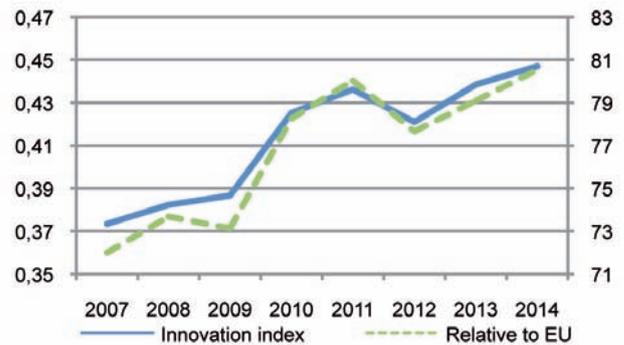
Note: Performance relative to the EU where the EU = 100.

Czech Republic

The Czech Republic is a **Moderate innovator**. Innovation performance has been increasing over most of the period with a decline only in 2012. The performance relative to that of the EU has been increasing between 2007 and 2011 to 80% and, after a decline in 2012, to almost 81% in 2014.

Relative strengths compared to the EU average are in Human resources, Innovators and Linkages and entrepreneurship. Relative weaknesses are in Open, excellent and attractive research systems and Intellectual assets. In the first, there is a quite diverse pattern with below average performance for Most cited scientific publications and Non-EU doctorate students and above average performance for International scientific co-publications.

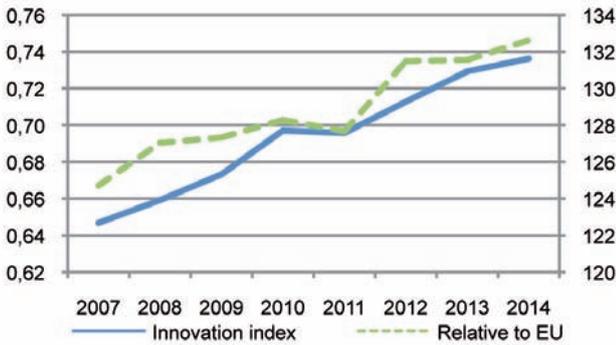
Performance has improved most in Linkages and entrepreneurship (7.9%) and Intellectual assets (6.2%). The fast growing indicators are License and patent revenues from abroad, Community trademarks and Population with completed tertiary education. A strong decline is observed in Venture capital investments (-30%).



Note: Performance relative to the EU where the EU = 100.

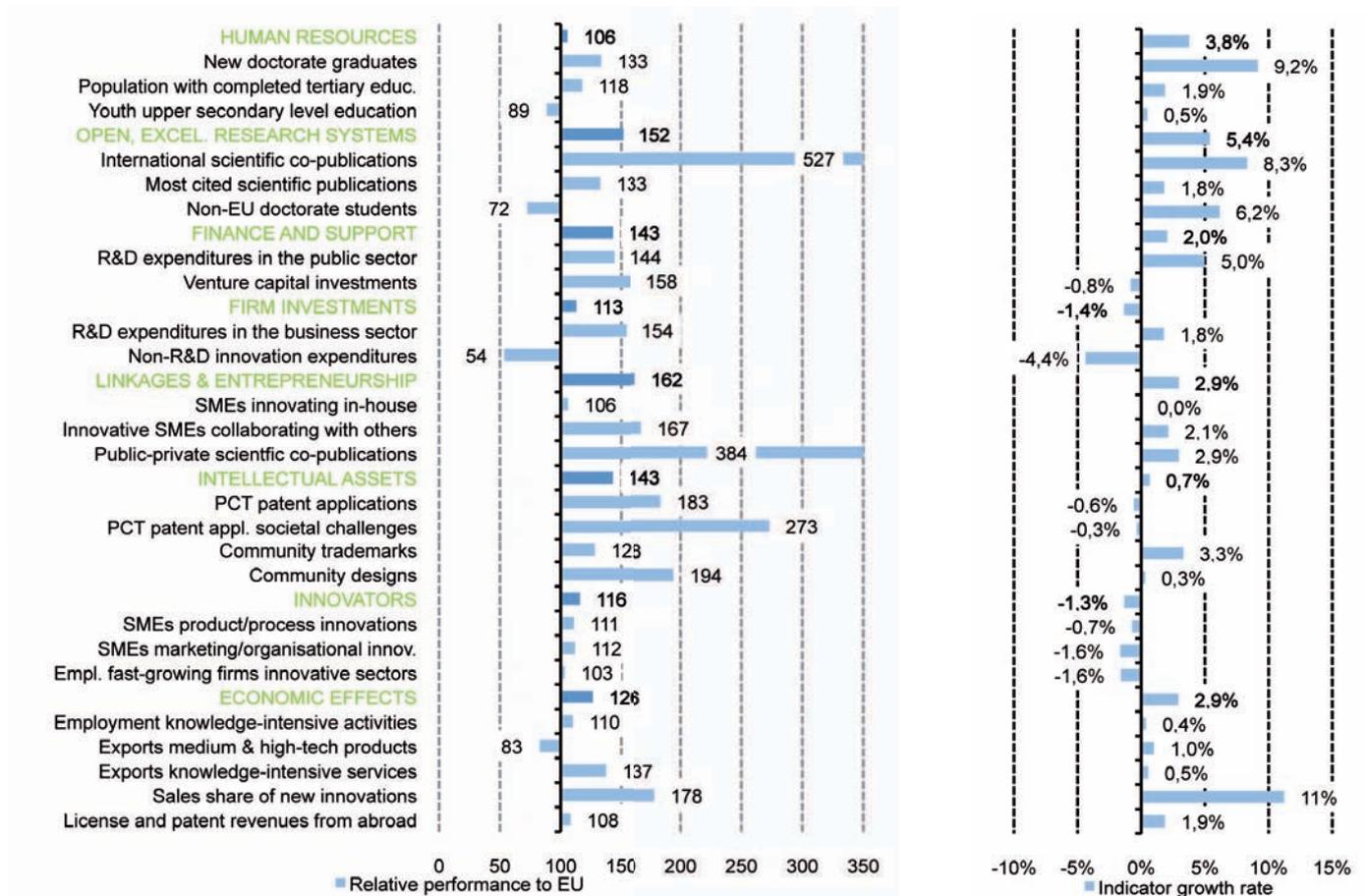
Denmark

Denmark is an **Innovation leader**. Innovation performance has been steadily increasing up until 2014. Performance relative to the EU has increased from 25% in 2007 to 33% above the EU average in 2014.



In all dimensions Denmark is performing above the EU average, but most notably in Linkages and entrepreneurship, Open, excellent and attractive research systems, Finance and support and Intellectual assets. In particular in International scientific co-publications, Public-private co-publications and PCT patent applications in societal challenges the country is performing well above the EU average. Below average performance is observed in Non-R&D innovation expenditures, Non-EU doctorate students, Exports of medium and high-tech products and Youth with upper secondary education.

Performance has improved for 17 indicators and on average most strongly in the dimensions of Open, excellent and attractive research systems (5.4%) and Human resources (3.8%). Performance has declined in Firm investments (-1.4%), due to a relatively sharp decline in Non-R&D innovation expenditures, and in Innovators (-1.3%).



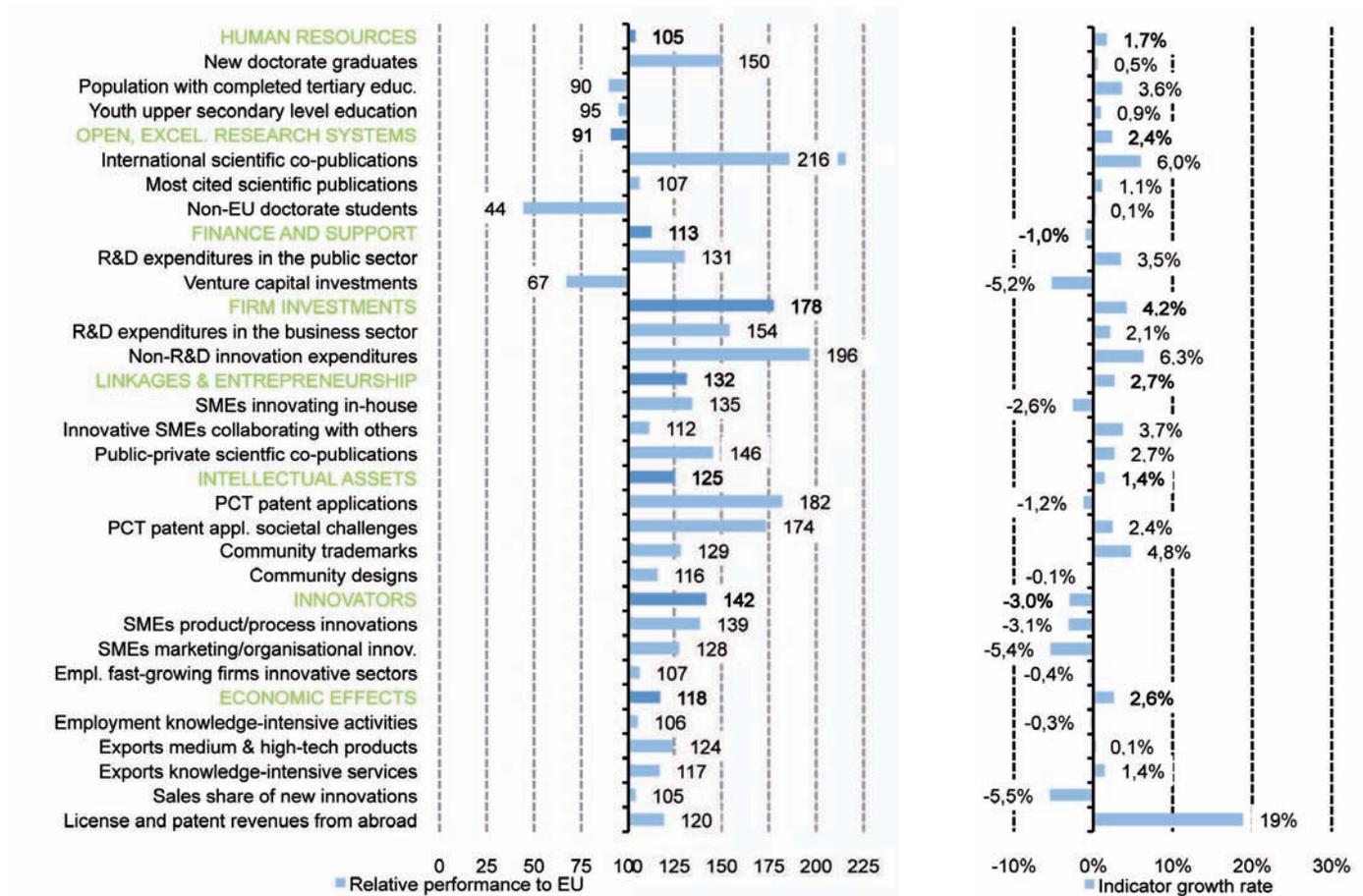
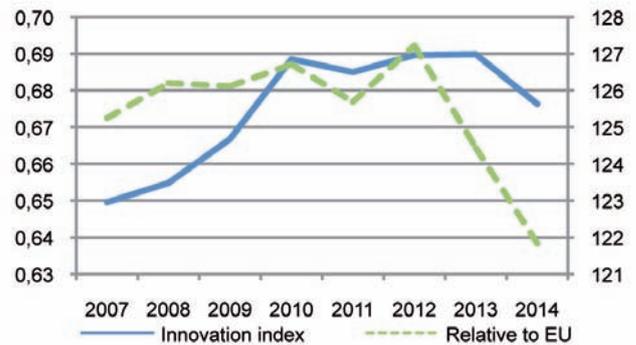
Note: Performance relative to the EU where the EU = 100.

Germany

Germany is an **Innovation leader**. Innovation performance has been increasing up until 2010 after which it remained fairly stable until 2013 and declined in 2014. Relative to EU, performance was the highest at 27% above the average in 2012, but has dropped to 22% above the EU in 2014.

Germany's strongest dimensions are Firm investments and Linkages and entrepreneurship. In all other dimensions except Open, excellent and attractive research systems the country is also performing above the EU average. Below average performance is observed for Non-EU doctorate students, Venture capital investments, Population with completed tertiary education and Youth with upper secondary level education.

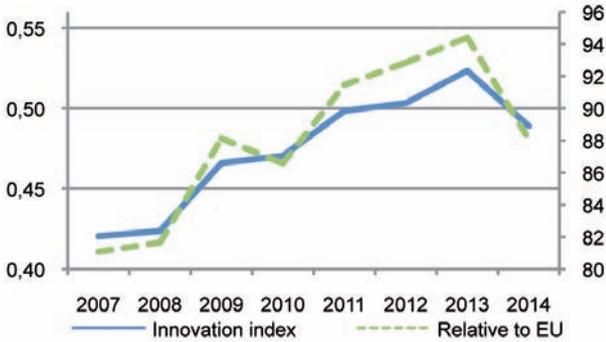
Performance has improved most strongly in License and patent revenues from abroad (19%), Non-R&D innovation expenditures (6.3%) and International scientific co-publications (6.0%). Strong performance declines are observed for Sales share of new innovations (-5.5%), SMEs with marketing or organizational innovations (-5.4%) and Venture capital investments (-5.2%).



Note: Performance relative to the EU where the EU = 100.

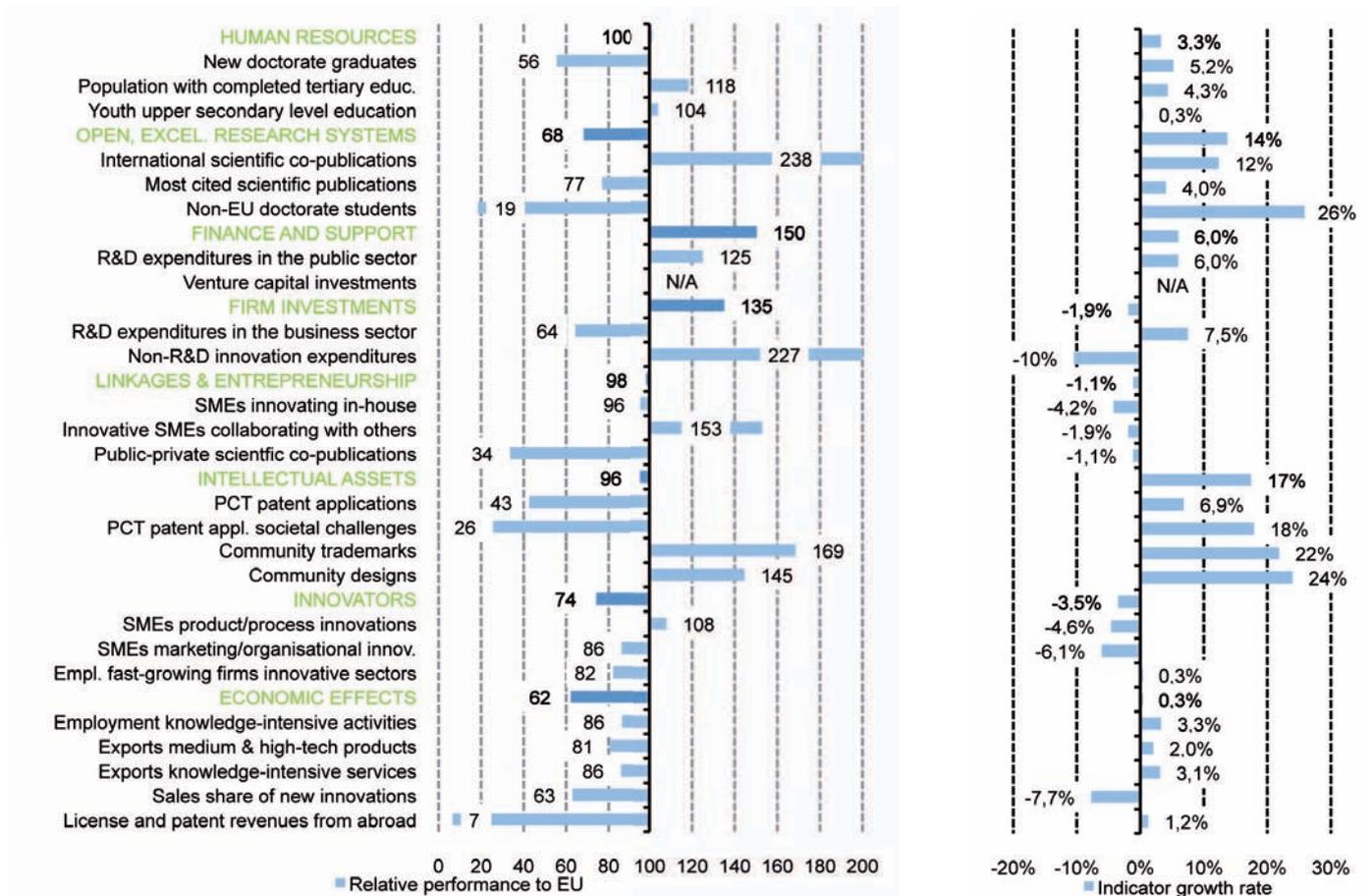
Estonia

Estonia is a **Moderate innovator**. Innovation performance has been increasing at a steady rate until 2013, but declined in 2014. Estonia's performance relative to that of the EU has also been improving from 81% in 2007 to 94% in 2013 but strongly declined to 88% in 2014.



Estonia's relative strengths in dimensions are Finance and support (based on one indicator only) and Firm investments. Estonia performs well above average on International scientific co-publications, Non-R&D innovation expenditures and Community trademarks. Performance is well below the EU average for License and patent revenues from abroad and Non-EU doctorate students.

Performance has improved most strongly in the dimensions of Open, excellent and attractive research systems (14%) and Intellectual assets (17%), in particular due to a strong performance increase in Non-EU doctorate students (26%) and Community designs (24%). Growth has been negative in three dimensions: Innovators (-3.5%), Firm investments (-1.9%) and Linkages and entrepreneurship (-1.1%).



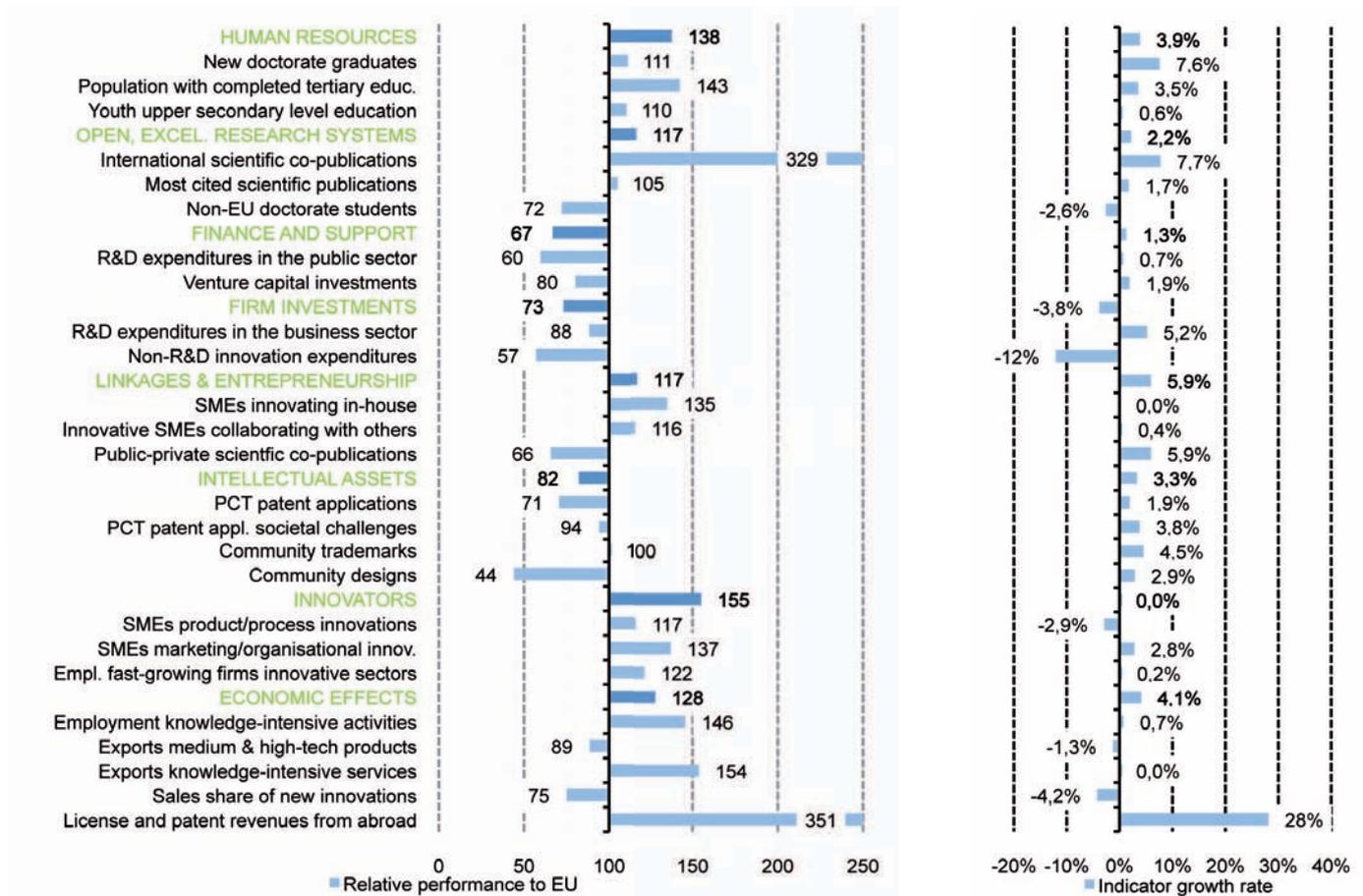
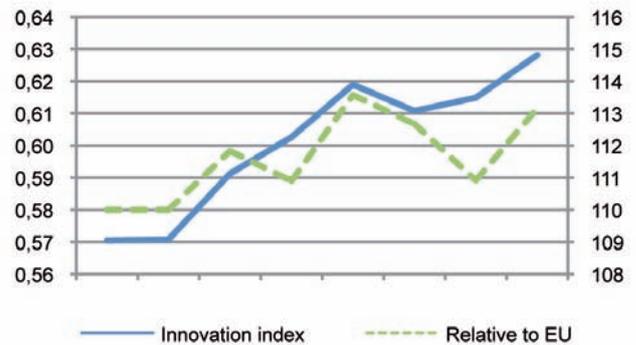
Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.

Ireland

Ireland is an **Innovation follower**. Irish innovation performance has been increasing until 2011 and after a temporary decline in 2012 reached its highest level in 2014. Performance relative to the EU has improved from 10% in 2007 to 13% above the EU average in 2014.

Ireland's relative strengths are especially in Innovators and Human resources. Ireland performs well above the EU average on License and patent revenues from abroad and International scientific co-publications. Other strong performing indicators are Exports in knowledge-intensive services, SMEs innovating in-house, Employment in knowledge-intensive services and Population with tertiary education. Relative weaknesses are in Community designs, Non-R&D innovation expenditures and R&D expenditures in the public sector.

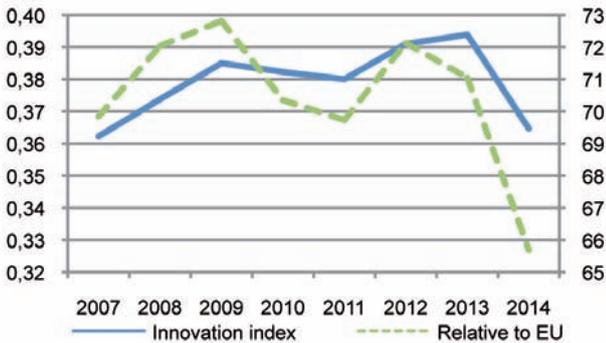
Performance has increased considerably in License and patent revenues from abroad (28%), International scientific co-publications (7.7%) and New doctorate graduates (7.6%). Performance has declined most in Non-R&D innovation expenditures (-12%).



Note: Performance relative to the EU where the EU = 100.

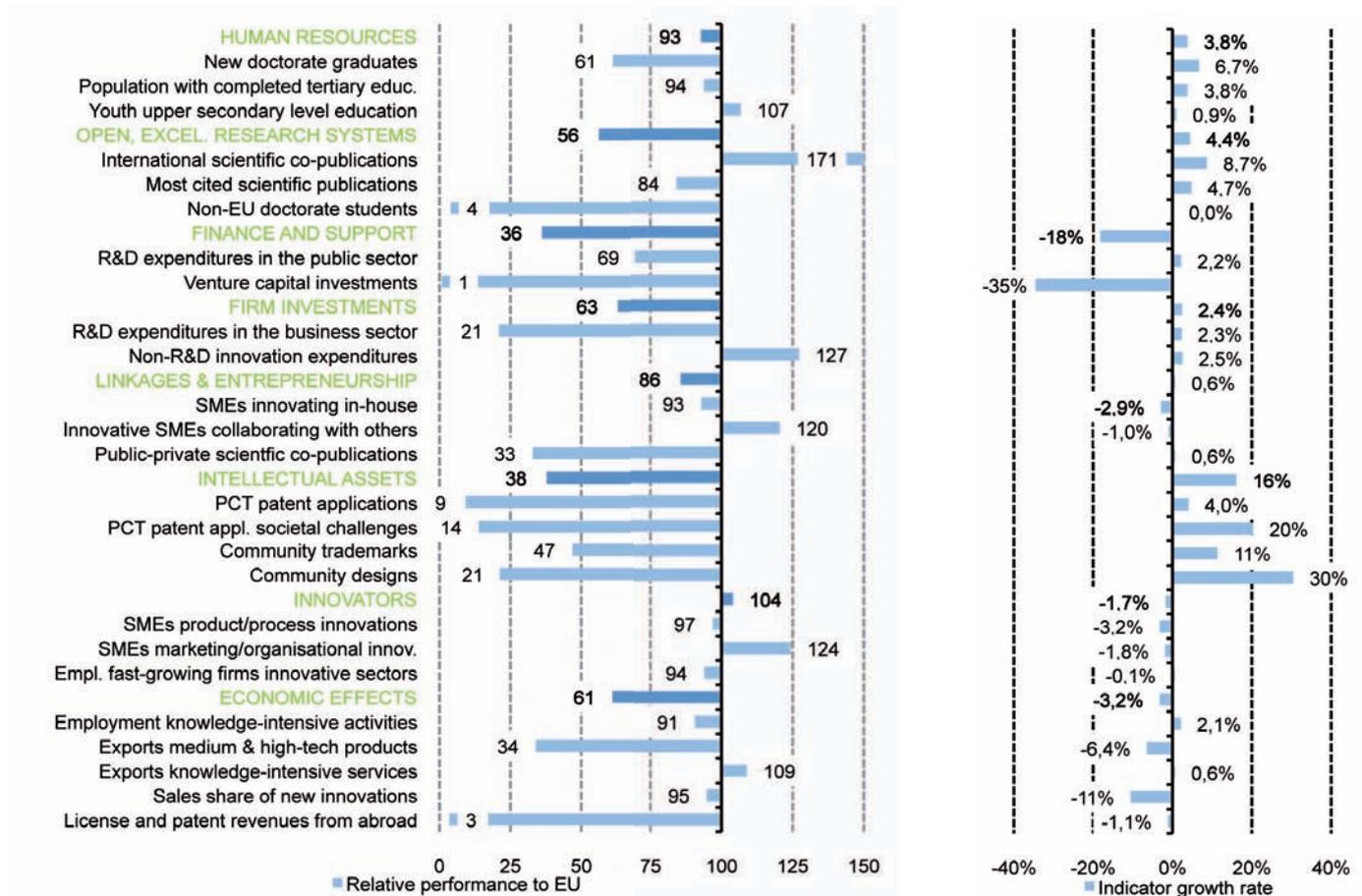
Greece

Greece is a **Moderate innovator**. Over time its innovation performance has been improving. The country did experience a small slowdown in 2010-2011, after which innovation performance increased again from 2012. However, in 2014 the innovation index declined strongly. Relative performance to the EU reached a peak of 73% in 2009, but has been declining after that, apart from an increase in 2012 and was at 66% in 2014.



For all dimensions, except Innovators, Greece performs below the EU average, especially in Finance and support and Intellectual assets. Particularly low performing indicators include Non-EU doctorate students, Venture capital investments and License and patent revenues from abroad. Greece performs above the EU average on International scientific co-publications, Non-R&D innovation expenditures and SMEs with marketing and/or organisational innovations.

Although performance in Intellectual assets is well below the EU average, this dimension has experienced strong growth (16%). Performance has been improving for most indicators. Highest growth is observed for Community designs (30%), Community trademarks (11%) and PCT patent applications in societal challenges (20%). Performance has declined strongly in Venture capital investments (-35%).



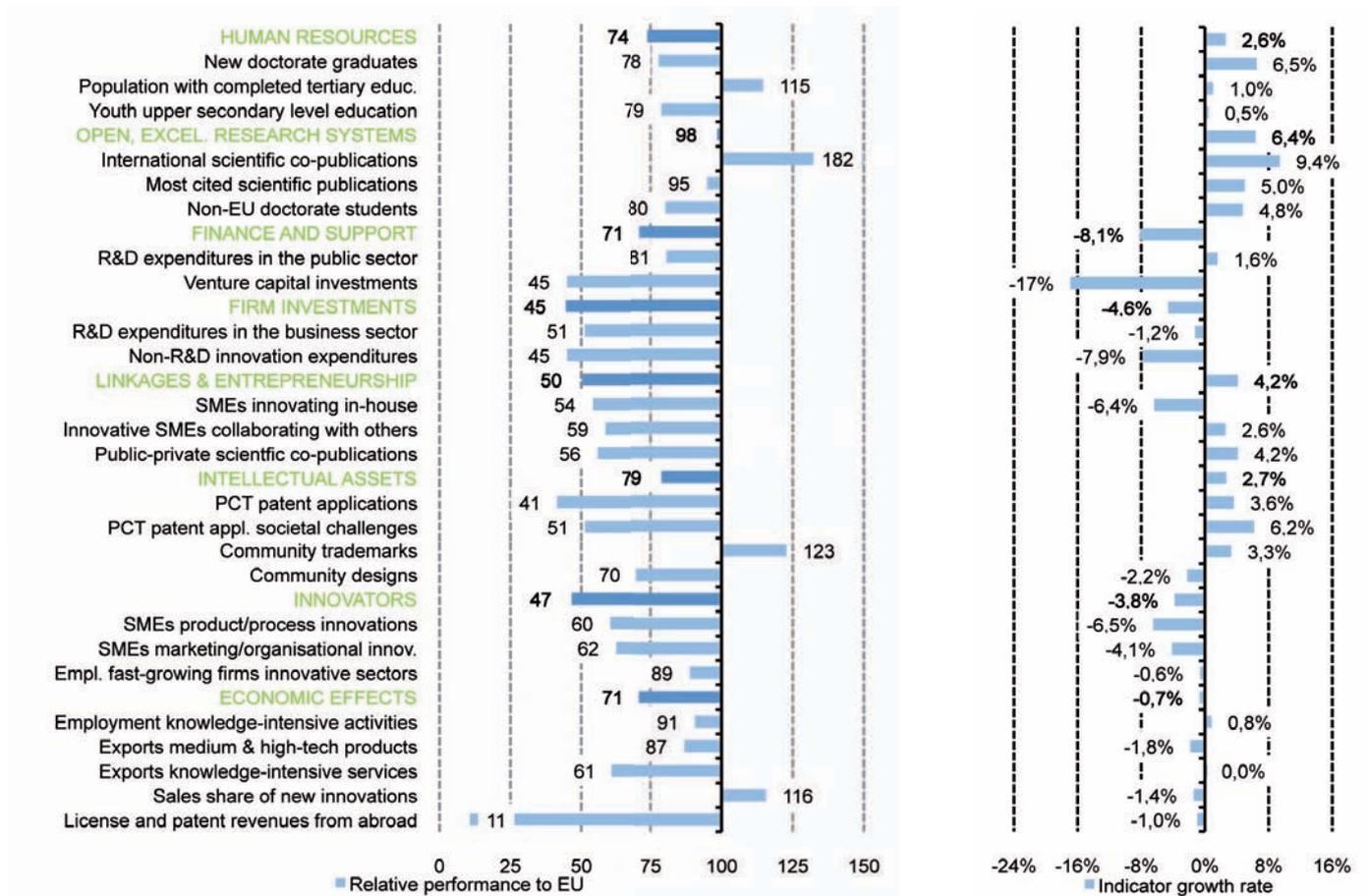
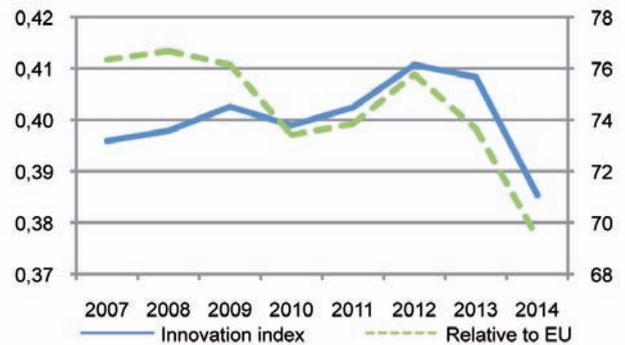
Note: Performance relative to the EU where the EU = 100.

Spain

Spain is a **Moderate innovator**. Innovation performance was improving steadily up until 2012, after which the innovation index has been in decline. For 2014 performance is at a significantly lower level than in 2007. Together with Romania, Spain is the only country with such a decline in performance. The country's gap to the EU has increased over time. In 2008, the relative performance level was at its highest at 77% whereas in 2014 it has decreased to 69%.

For most indicators, Spain is performing below the EU average. In relative terms, the weakest indicator is License and patent revenues from abroad. Performance in Open, excellent and attractive research systems comes close to the average performance of the EU, mainly because of strong relative performance in International scientific co-publications.

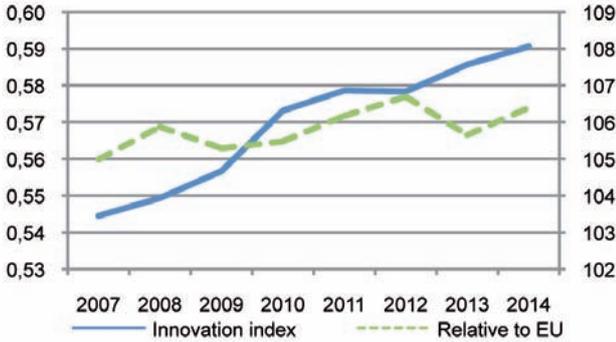
Performance has improved most in the dimension of Open, excellent and attractive research systems (6.4%) and has decreased most in Finance and support and Firm investments. The single indicator that has improved most is International scientific co-publications (9.4%) and Venture capital investments (-1.7%) has declined most.



Note: Performance relative to the EU where the EU = 100.

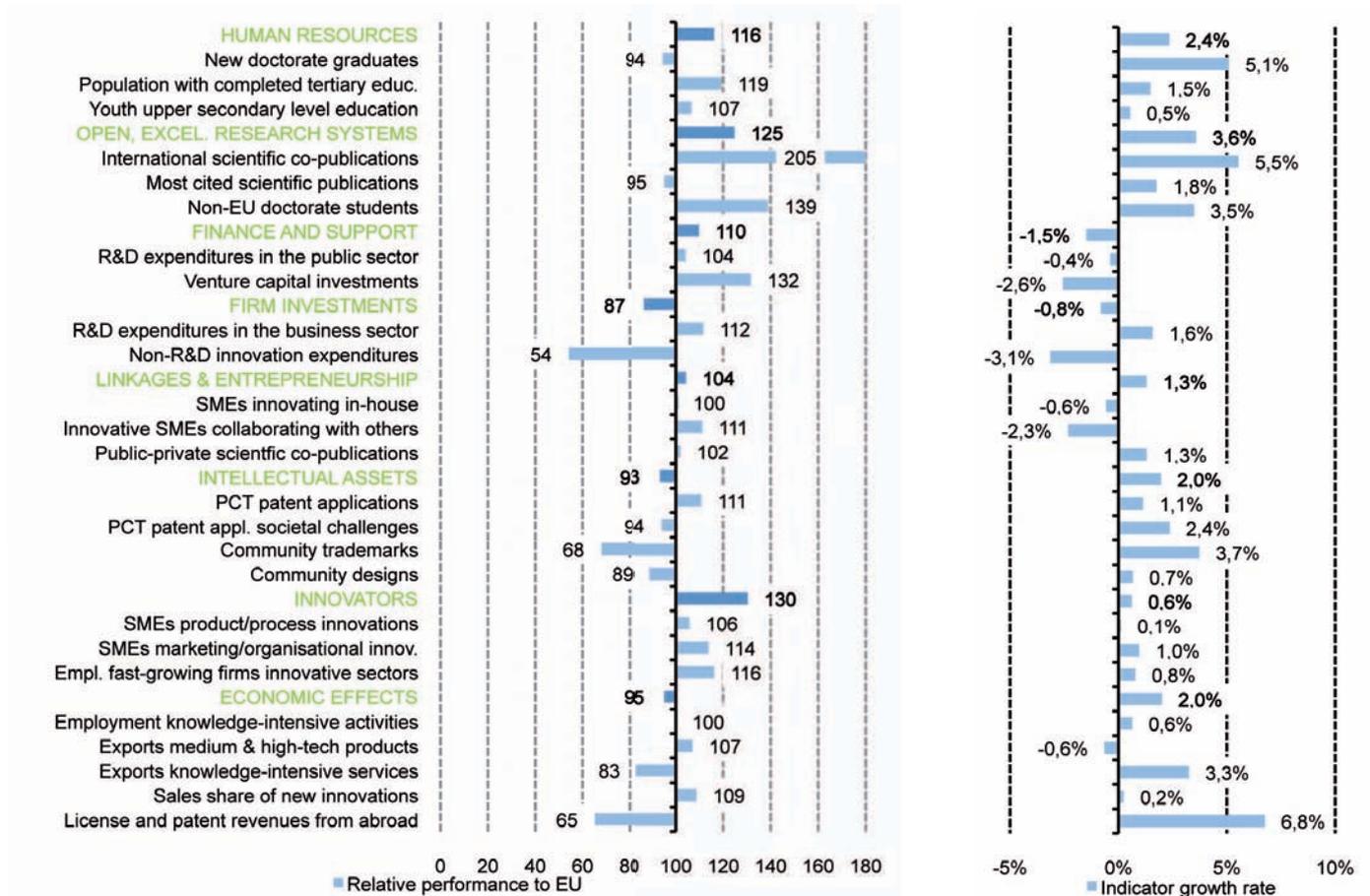
France

France is an **Innovation follower**. Innovation performance has been increasing between 2007 and 2014. The performance level relative to the EU reached a peak of 8% above the average in 2012, and is at 6% above the EU average in 2014.



France's relative strengths in terms of dimensions are in Innovators, Open, excellent and attractive research systems and Human resources. The best performing single indicator is International scientific co-publications. France is experiencing relative weaknesses in Firm investments, Intellectual assets and Economic effects, although for the last two dimensions, the performance is near the EU average. Performance is particularly weak in Non-R&D innovation expenditures.

France has experienced positive growth for most indicators, particularly in License and patent revenues from abroad (6.8%), International scientific co-publications (5.5%) and New doctorate graduates (5.1%). The sharpest performance decline is observed for Non-R&D innovation expenditures (-3.1%), followed by Venture capital investments (-2.6%) and Innovative SMEs collaborating with others (-2.3%).



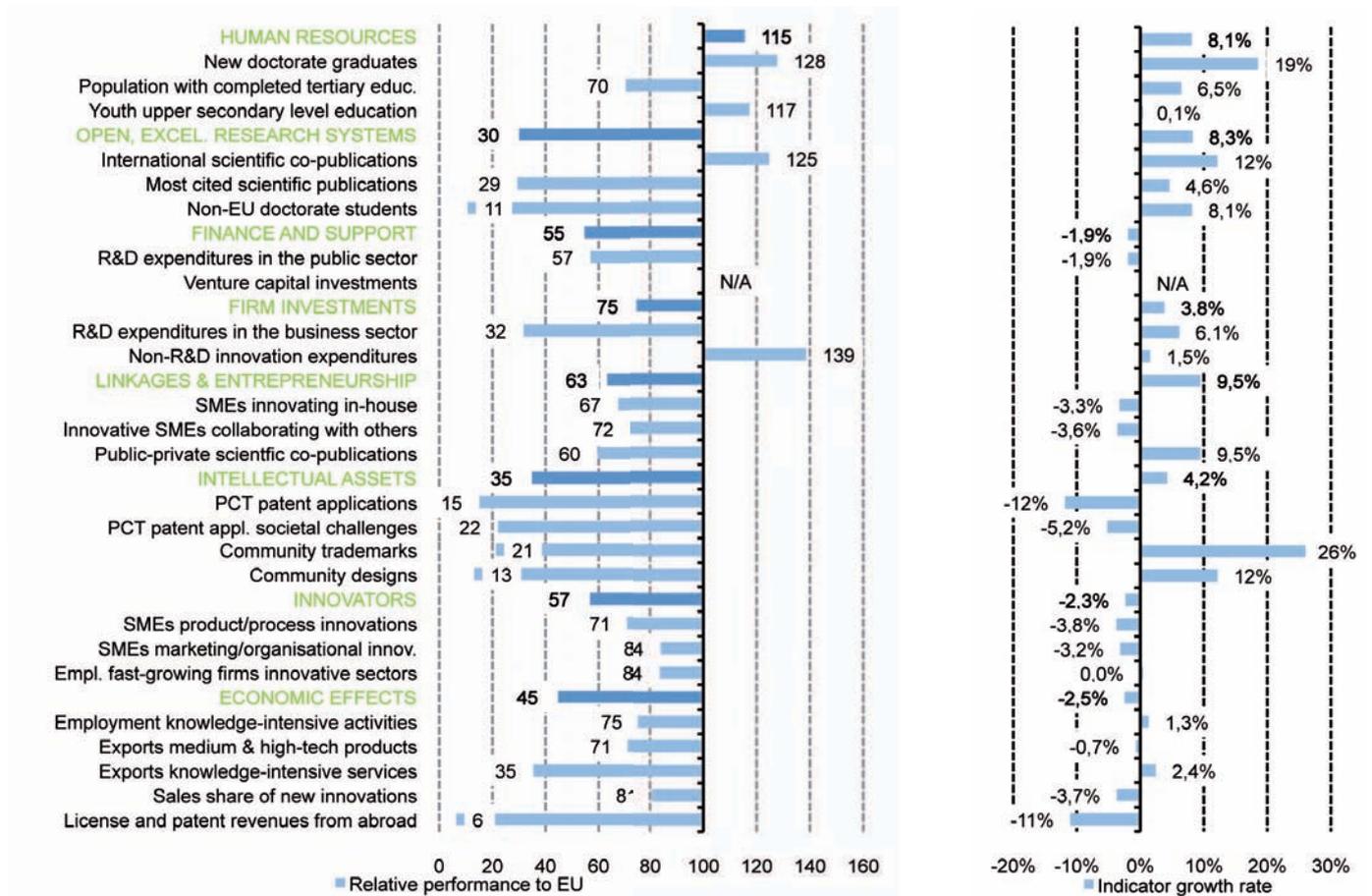
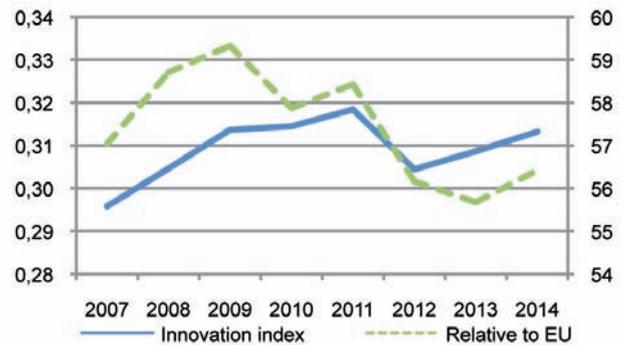
Note: Performance relative to the EU where the EU = 100.

Croatia

Croatia is a **Moderate innovator**. Innovation performance improved until 2011 and then declined, followed by a recovery in 2013. Performance relative to the EU reached a peak of 59% in 2009 and dropped to less than 56% in 2013, after which it partially recovered in 2014.

Croatia is performing below the EU average in most dimensions but above the EU average in Human resources, due to above average performance in New doctorate graduates and Youth with upper secondary level education. The weakest performing dimensions are Open, excellent and attractive research systems and Intellectual assets. For four indicators performance is above the EU average, with Non-R&D innovation expenditures being the strongest of these.

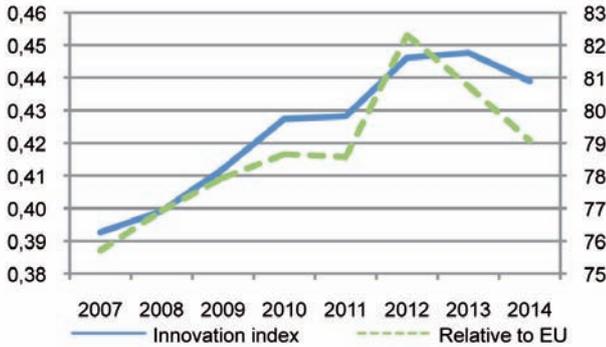
Significant performance increases in dimensions are observed in Linkages and entrepreneurship (9.5%), Open, excellent and attractive research systems (8.3%) and Human resources (8.1%), with the largest improvement for Community trademarks (26%) at the indicator level. Performance has worsened slightly in Economic effects, Innovators and Finance and support, with the indicators declining most being PCT patent applications and License and patent revenue from abroad.



Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.

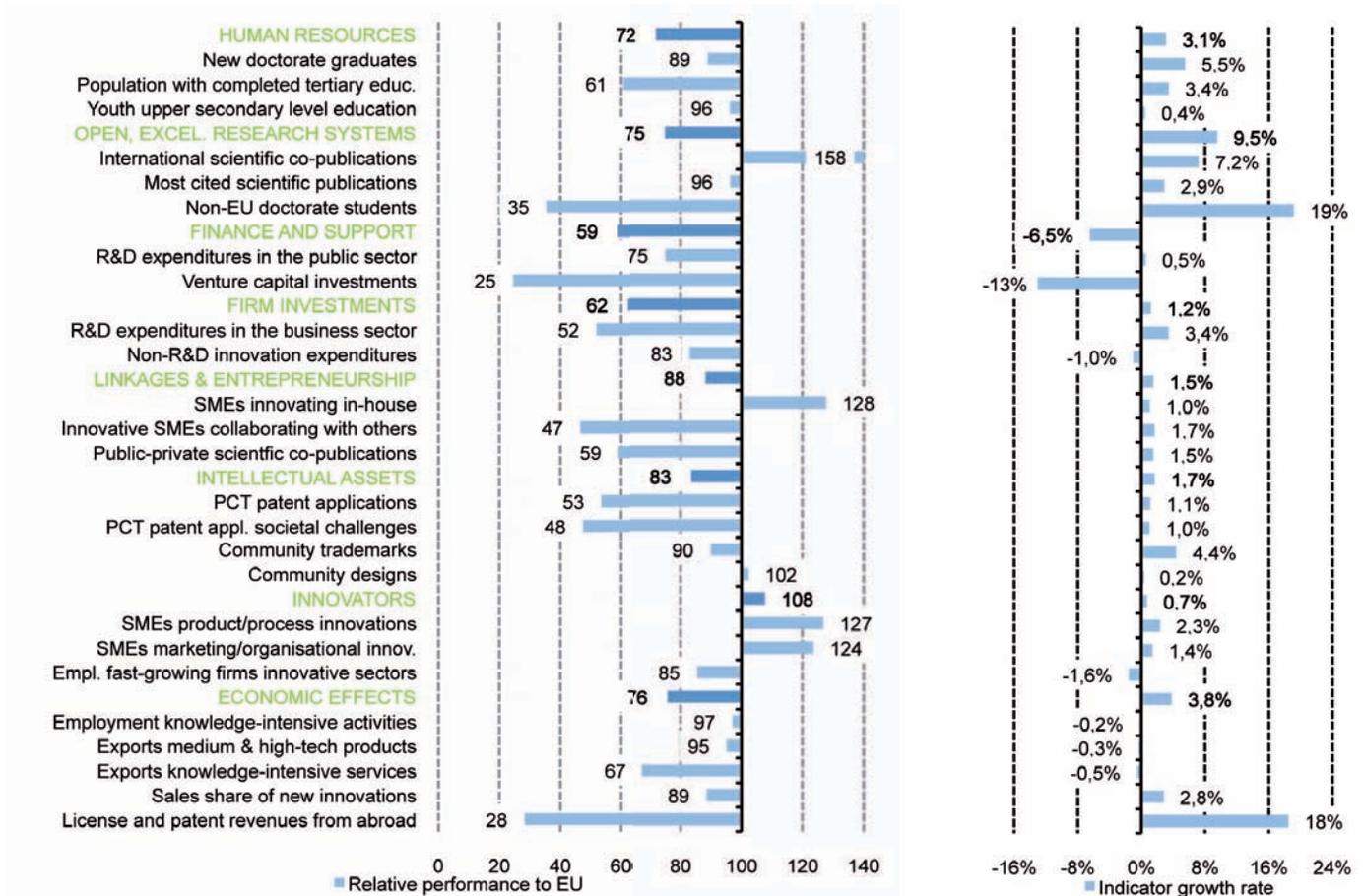
Italy

Italy is a **Moderate innovator**. Its innovation performance has been increasing steadily until 2013, but experienced a small decline in 2014. Italy has been increasing its innovation performance relative to the EU up until 2012 with a peak of 82%, after which it declined to 79% in 2014.



Italy performs below the EU average in most dimensions, in particular in Finance and support and in Firm investments, with the worst relative performance being in Venture capital investments and License and patent revenues from abroad. In the Innovators dimension, Italy performs better than average. The relatively best performing indicators are International scientific co-publications, SMEs innovating in-house, SMEs with product or process innovations and SMEs with marketing or organizational innovations.

Italy has experienced performance increases for most indicators. Growth has been strong in the dimension of Open, excellent and attractive research systems (9.5%), due to performance improvements in Non-EU doctorate students (19%) and International scientific co-publications (7.2%). Performance has also increased strongly in License and patent revenues from abroad (18%). A strong performance decline is observed in Venture capital investments (-13%).



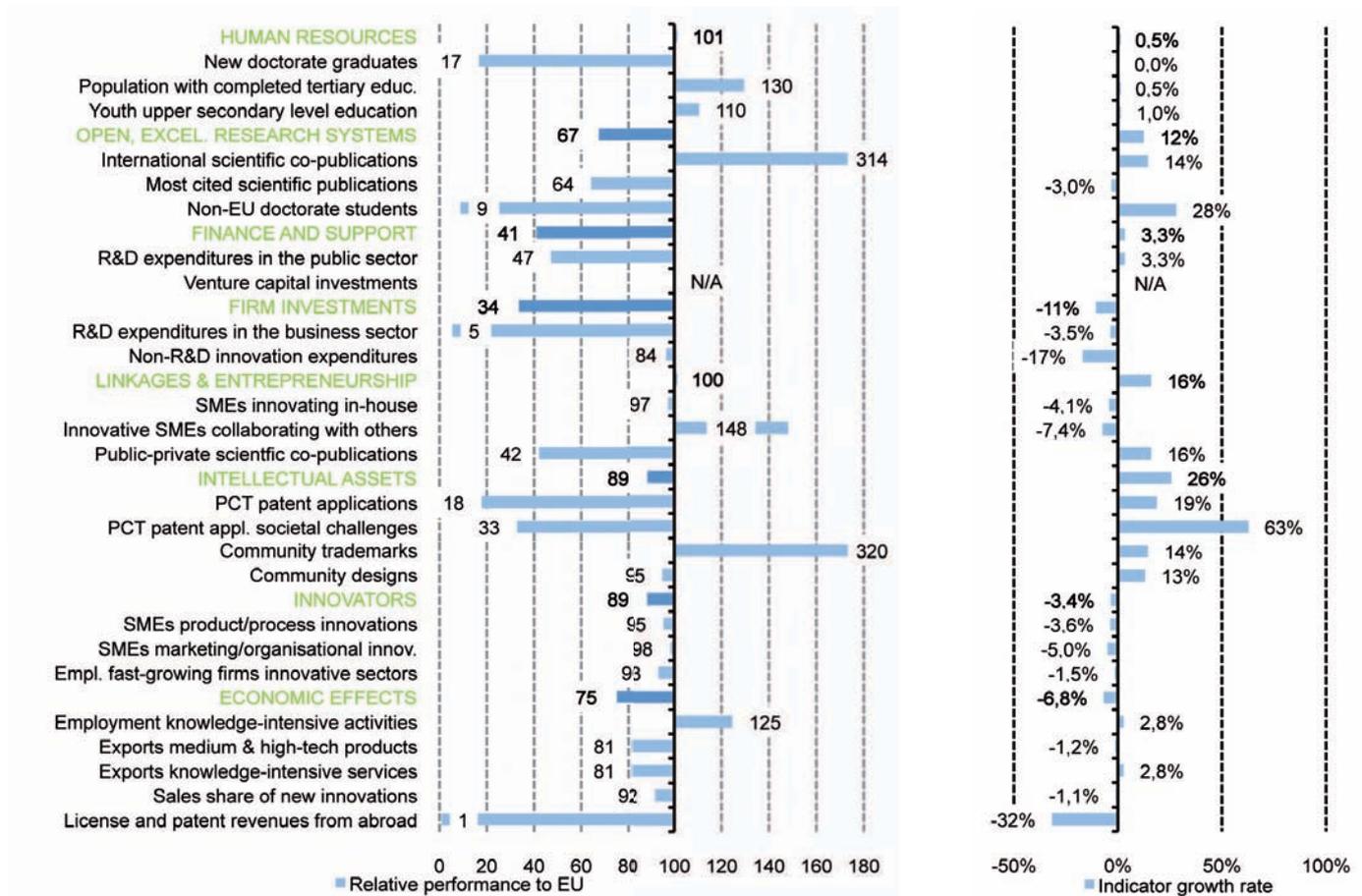
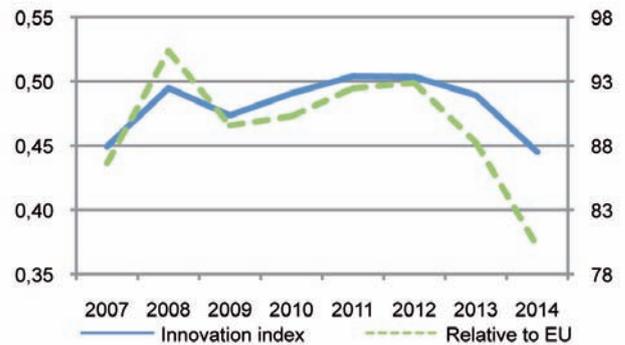
Note: Performance relative to the EU where the EU = 100.

Cyprus

Cyprus is a **Moderate innovator**. Innovation performance increased from 2009, but started to decline from 2012 onwards. For 2014 the innovation index is just below that in 2007. The performance relative to the EU peaked in 2008 (95%), but has been in decline as well from 2012. In 2014, relative performance dropped to 80%.

Cyprus performs below the EU average for most dimensions. At the indicator level, performance is well below average in License and patent revenues from abroad, R&D expenditures in the business sector, Non-EU doctorate students, New doctorate graduates and PCT patent applications. Relative strong performance is observed for Community trademarks, International scientific co-publications and Innovative SMEs collaborating with others.

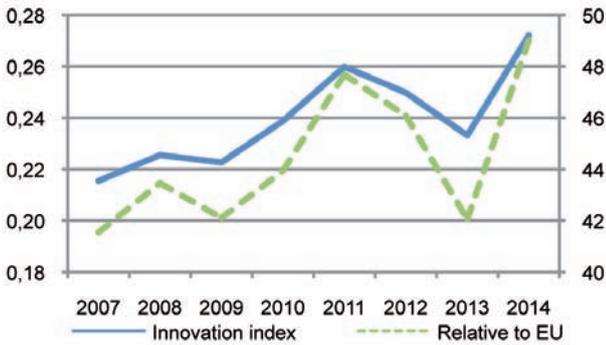
Performance has improved in five dimensions, in particular in Intellectual assets (26%) and Linkages and entrepreneurship (16%). The indicator with overwhelmingly strongest growth is PCT patent applications in societal challenges (63%). Performance has worsened in Firm investments, Economic effects and Innovators, in particular due to strong performance declines in License and patent revenues from abroad (-32%) and Non-R&D innovation expenditures (-17%).



Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.

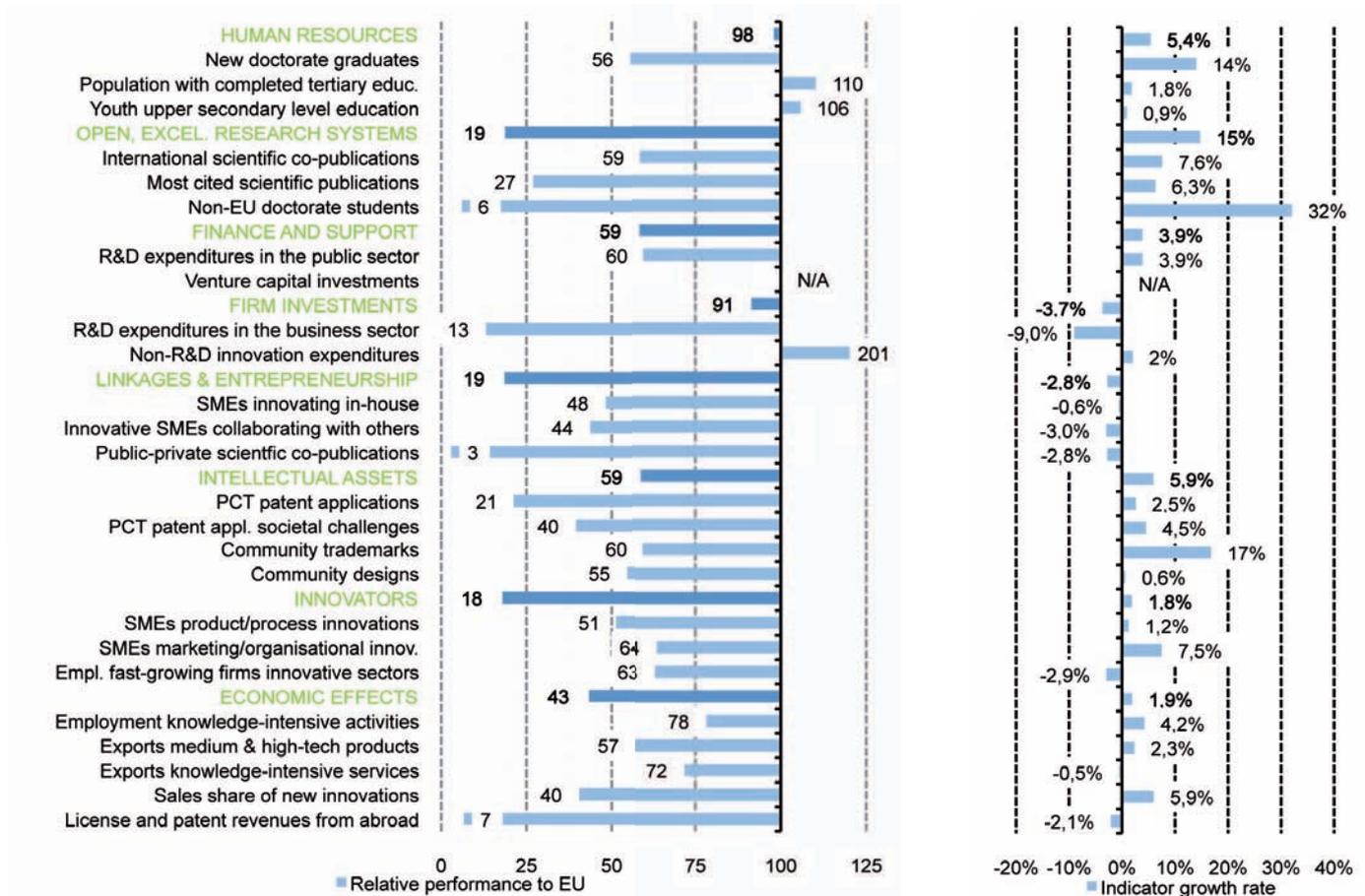
Latvia

Latvia is a **Modest innovator**. Innovation performance has been increasing until 2011 but dropped in 2012-2013. In 2014, the innovation index rose sharply. Over time, Latvia has been improving its relative performance to the EU from 42% in 2007 to 49% in 2014, although there was a significant dip in 2012-2013.



Latvia performs well below the EU average for most dimensions, particularly for Open, excellent and attractive research systems, Linkages and entrepreneurship and Innovators. The relatively worst performing indicators are Public-private co-publications, Non-EU doctorate students and License and patent revenues from abroad. Relative strengths for Latvia are in Non-R&D innovation expenditures, Population with completed tertiary education and Youth with upper secondary level education.

Despite the fact that Latvia performs below the average of the EU for almost all indicators, performance is increasing for about two-thirds of the indicators. High growth is observed for Non-EU doctorate students (32%), Community trademarks (17%) and New doctorate graduates (14%). A large decline in performance is observed for R&D expenditures in the business sector (-9.0%).



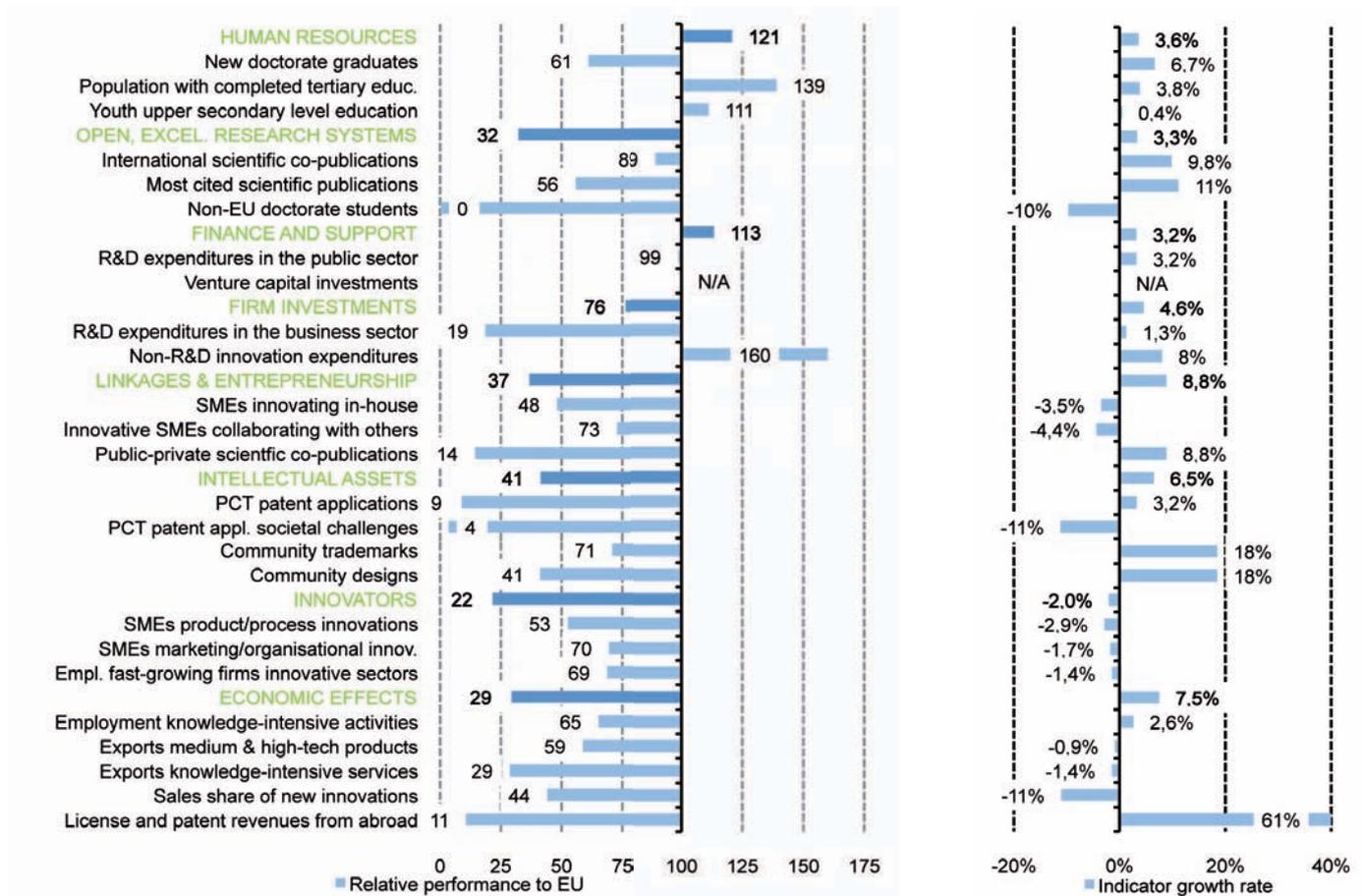
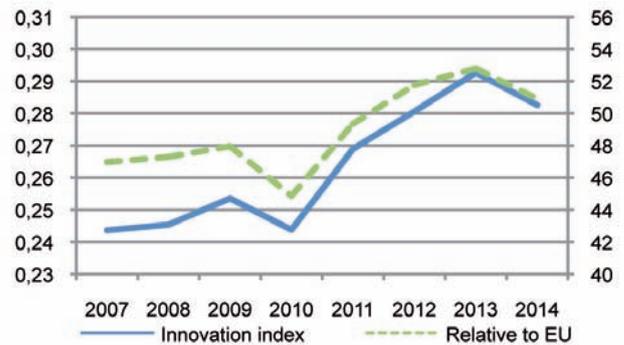
Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.

Lithuania

Lithuania is a **Moderate innovator**. Despite some fluctuations the overall innovation performance has been improving since 2007. The performance relative to the EU has also been improving in the last few years, and although there has been a slight decline in 2014, the performance is above the 50% threshold value between being a Modest or Moderate innovator.

Lithuania performs below the average of the EU for most dimensions, except for Human resources and Finance and support. Relatively worst performing indicators are Non-EU doctorate students, PCT patent applications in societal challenges, License and patent revenues from abroad and PCT patent applications. Performance above average is observed for Non-R&D innovation expenditures, Population with completed tertiary education and Youth with upper secondary level education.

Particularly high growth is observed for License and patent revenues from abroad (61%), but also Community trademarks (18%) and Community designs (18%) show high growth. The largest performance declines are for PCT patent applications in societal challenges, Sales share of new innovations and Non-EU doctorate students.



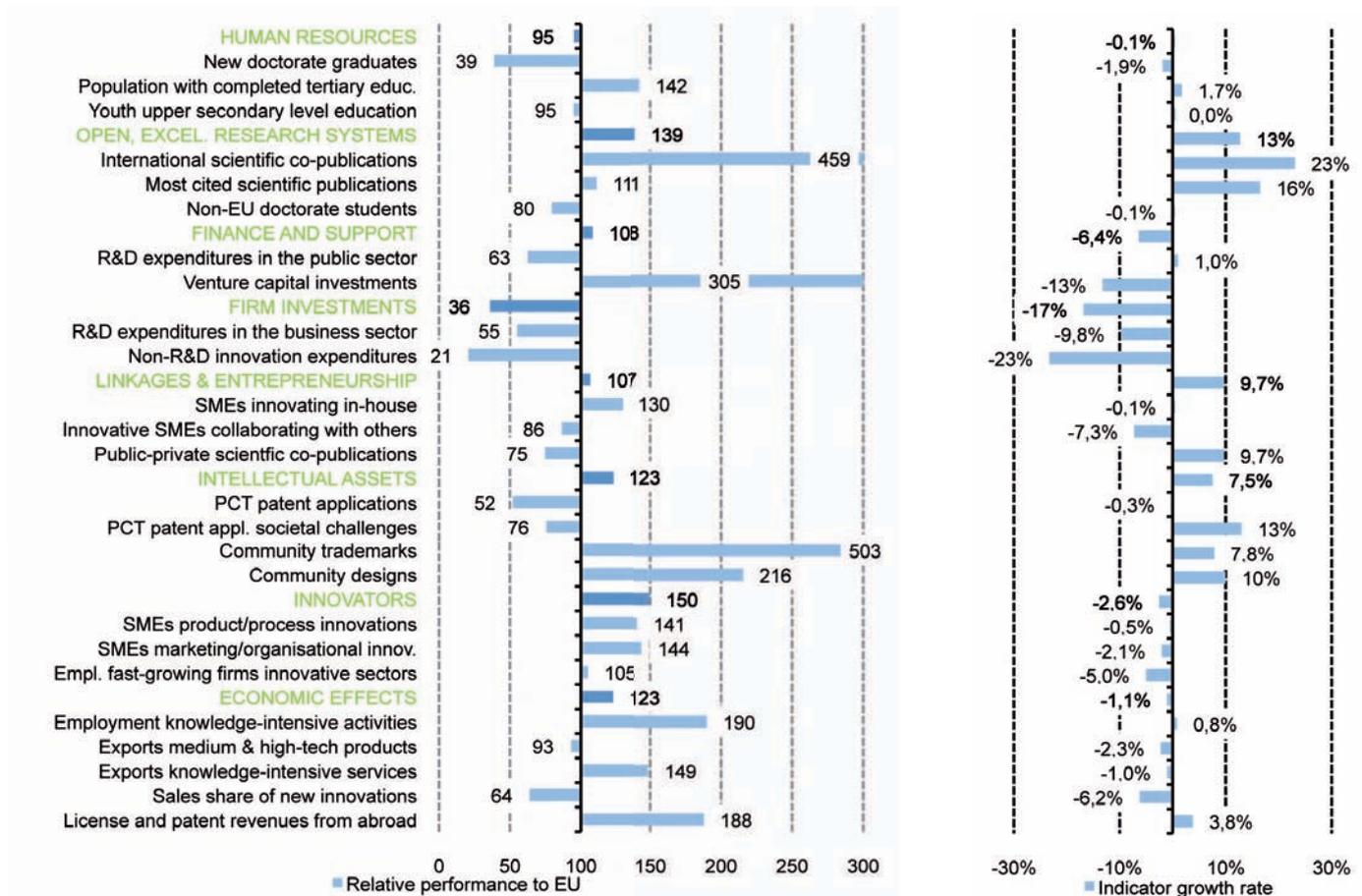
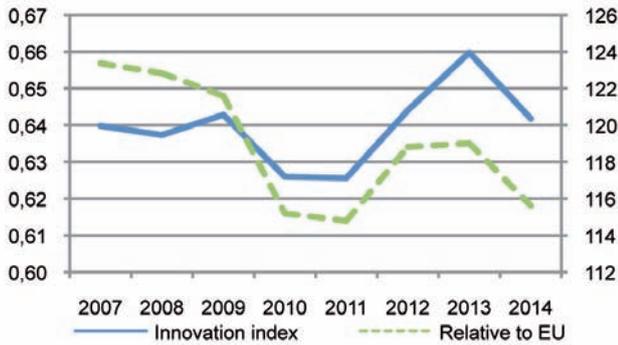
Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.

Luxembourg

Luxembourg is an **Innovation follower**. Performance declined in 2010 and 2011 (due to a much worse performance in Non-R&D innovation expenditures) but more than fully recovered in 2012 and 2013. However, in 2014 there is again a significant decline and the innovation index is nearly at the same level in 2014 as it was in 2007. The performance relative to the EU has declined over time from 23% in 2007 to 16% above the EU average in 2014.

For most dimensions Luxembourg performs close to or above the EU average, with the only exception being Firm investments where performance is significantly worse. Relative strengths for Luxembourg at the indicator level are in Venture capital investments, Community trademarks and International scientific co-publications. Luxembourg performs well below the average for Non-R&D innovation expenditures and New doctorate graduates.

Performance in Luxembourg's research system has been growing strongly (13%), mainly because of high growth in International scientific co-publications (23%) and Most cited publications (16%). Growth is observed for close to half of the innovation indicators. Strong declines are observed in Non-R&D innovation expenditures, Venture capital investments and R&D expenditures in the business sector.



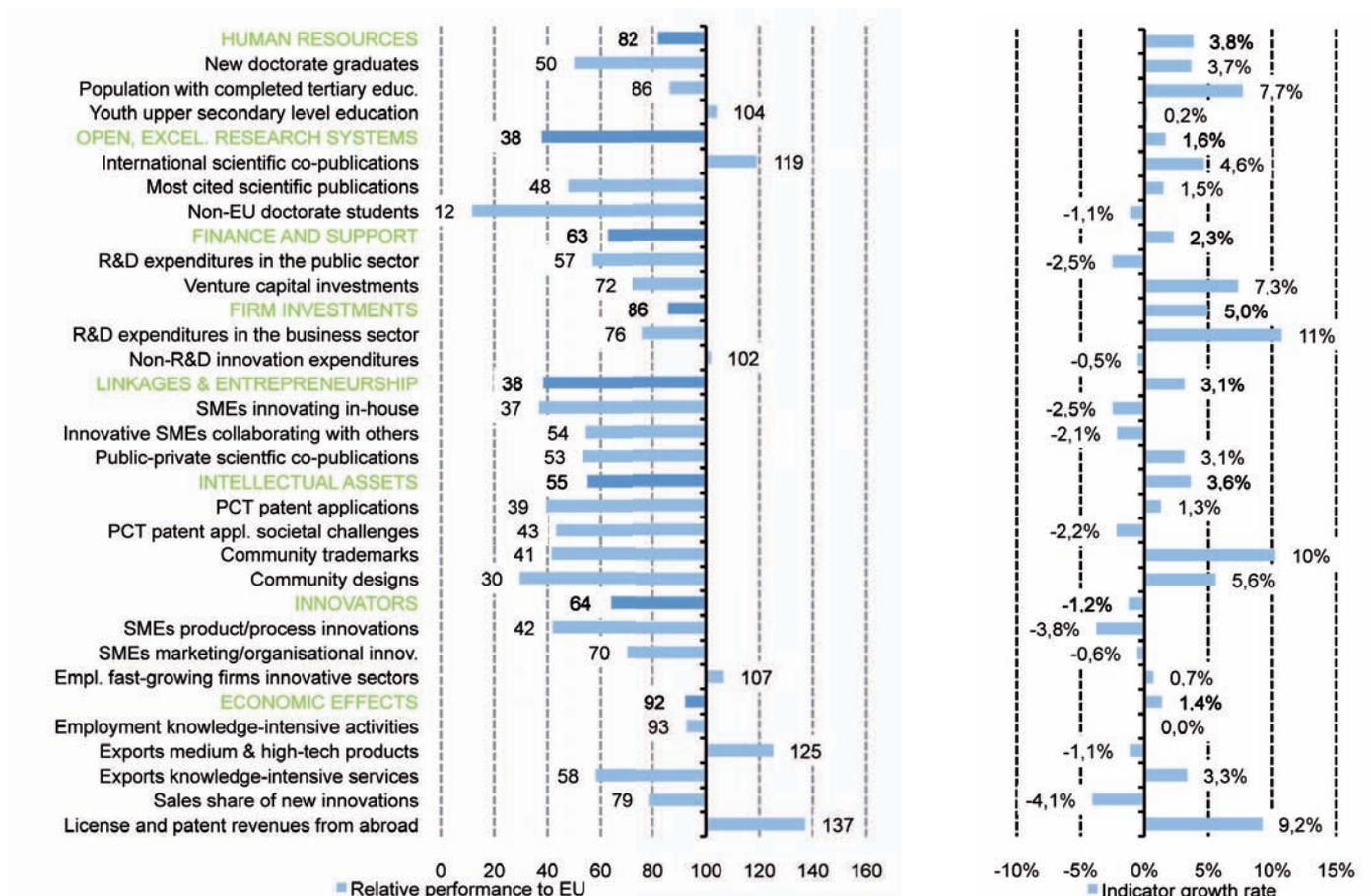
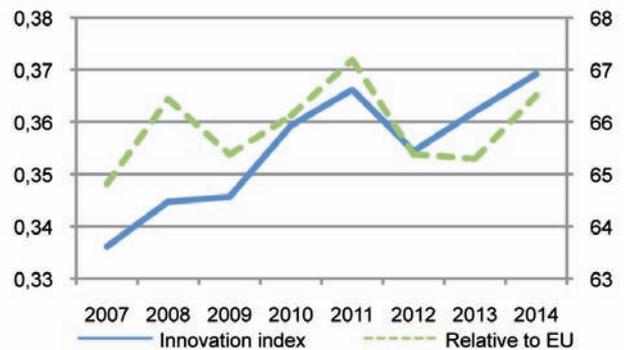
Note: Performance relative to the EU where the EU = 100.

Hungary

Hungary is a **Moderate innovator**. The country's innovation performance, despite some fluctuations, improved between 2007 and 2014. The performance relative to the EU has had more fluctuations, but over time it has increased to 67% in 2014 from around 65% in 2007.

Hungary performs below the EU average for all dimensions, and nearly all indicators, especially for Non-EU doctorate students and Community designs. Relative strengths in terms of indicators are observed in License and patent revenues from abroad, Exports in medium and high-tech products and International scientific co-publications.

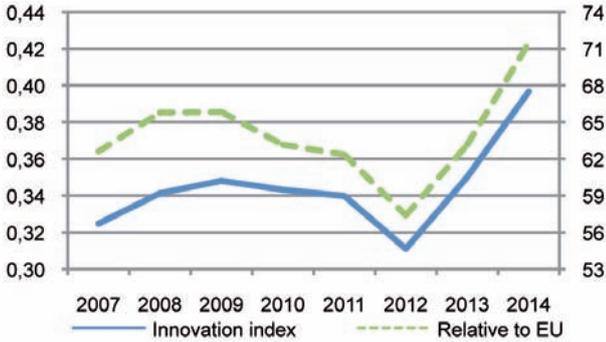
For more than half of the innovation indicators performance has improved. High growth is observed for R&D expenditures in the business sector (11%), Community trademarks (10%) and License and patent revenue from abroad (9.2%). Notable declines in performance are observed in Sales share of new innovations (-4.1%) and SMEs with product or process innovations (-3.8%).



Note: Performance relative to the EU where the EU = 100.

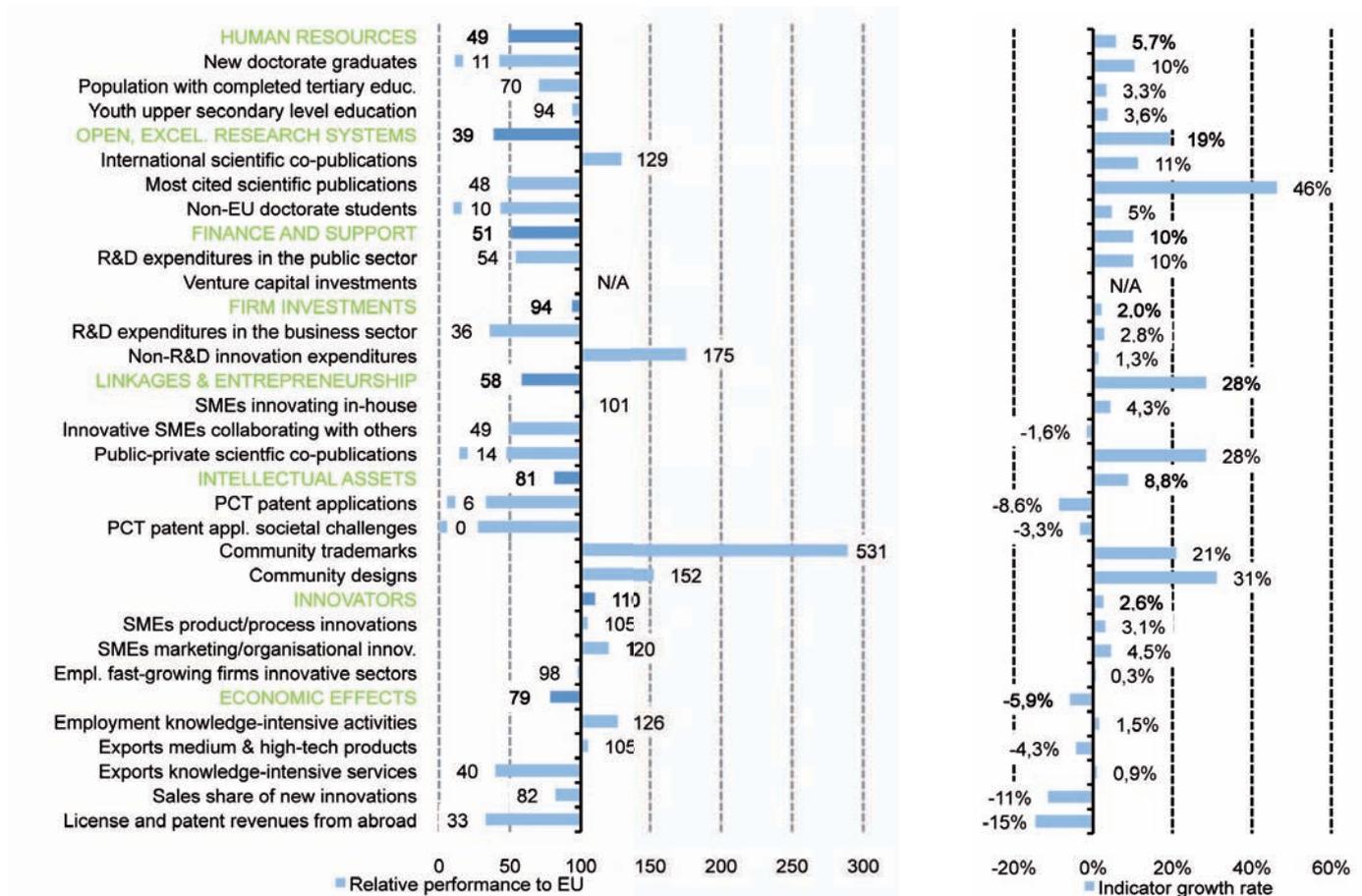
Malta

Malta is a **Moderate innovator**. Innovation performance was fairly stable until 2011 after which it declined followed by a strong recovery in 2013 and 2014. The performance relative to the EU reached 66% in 2009, 57% in 2012 and strongly improved to 71% in 2014.



Malta is performing below the average of the EU for most dimensions and indicators. The strongest relative weaknesses are in PCT patent applications in societal challenges and PCT patent applications. Relative strengths are in particular in Community trademarks, but also in Non-R&D innovation expenditures and Community designs, among others.

Two strongly growing innovation dimensions are Linkages and entrepreneurship (28%) and Open, excellent and attractive research systems (19%), the first because of strong growth in Public-private co-publications (28%), and the latter mainly because of exceptional growth in Most cited publications (46%). Performance for most innovation indicators has improved, with large increases also observed for Community designs (31%) and Community trademarks (21%). Declining performance is observed in particular for License and patent revenues from abroad (-15%), Sales share of new innovations (-11%) and PCT patent applications (-8.6%).



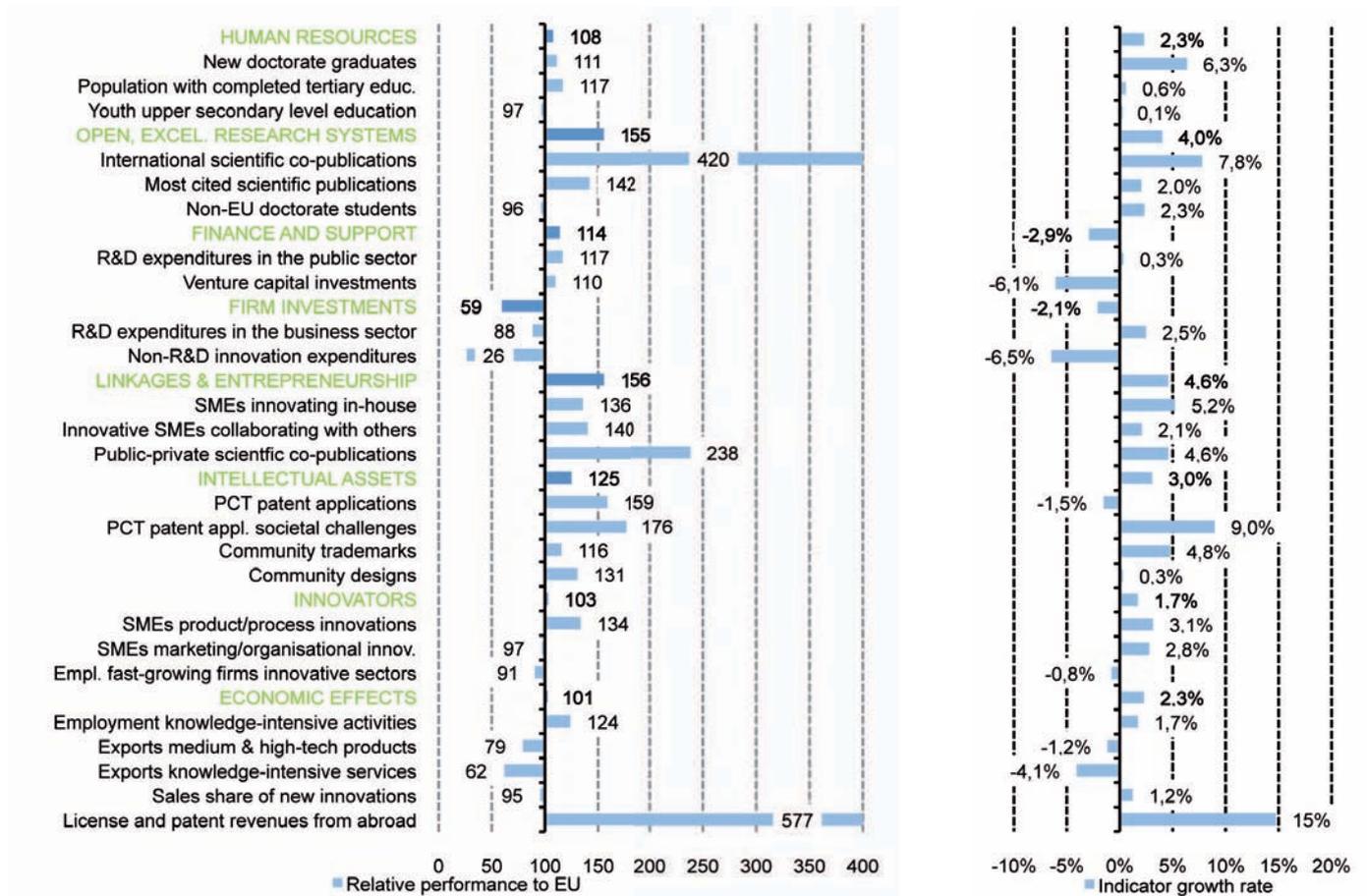
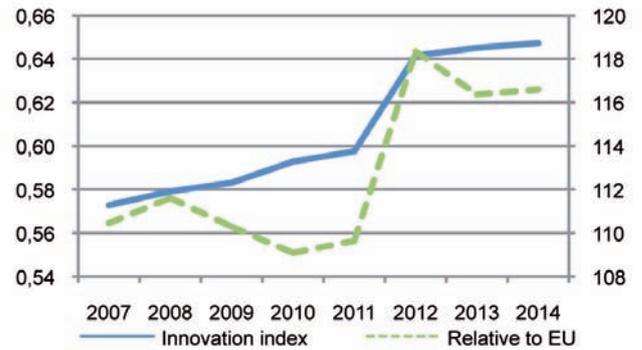
Note: Performance relative to the EU where the EU = 100. No data for Venture capital investments.

Netherlands

The Netherlands is an **Innovation follower**. Performance has been improving steadily up until 2011 then increased strongly in 2012 (among others due to an increase in the share of product or process innovators), after which it has continued to increase at a modest pace. The performance relative to the EU reached a peak of 18% above the average in 2012. In 2014, it is at 17% above the EU average.

The Netherlands is performing at or above the EU average for most dimensions, the only exception being Firm investments, because of poor relative performance in Non-R&D innovation expenditures. Excellent relative performance is observed in International scientific co-publications, License and patent revenues from abroad and Public-private co-publications. Relative weaknesses are in Non-R&D innovation expenditures and Exports in knowledge-intensive services.

Performance has improved for most dimensions and indicators. High growth is observed, in particular, for License and patent revenues from abroad (15%), PCT patent applications in societal challenges (9.0%) and International scientific co-publications (7.8%). Significant declines in performance are observed for Venture capital investments, Non-R&D innovation expenditures and Exports in knowledge-intensive services.



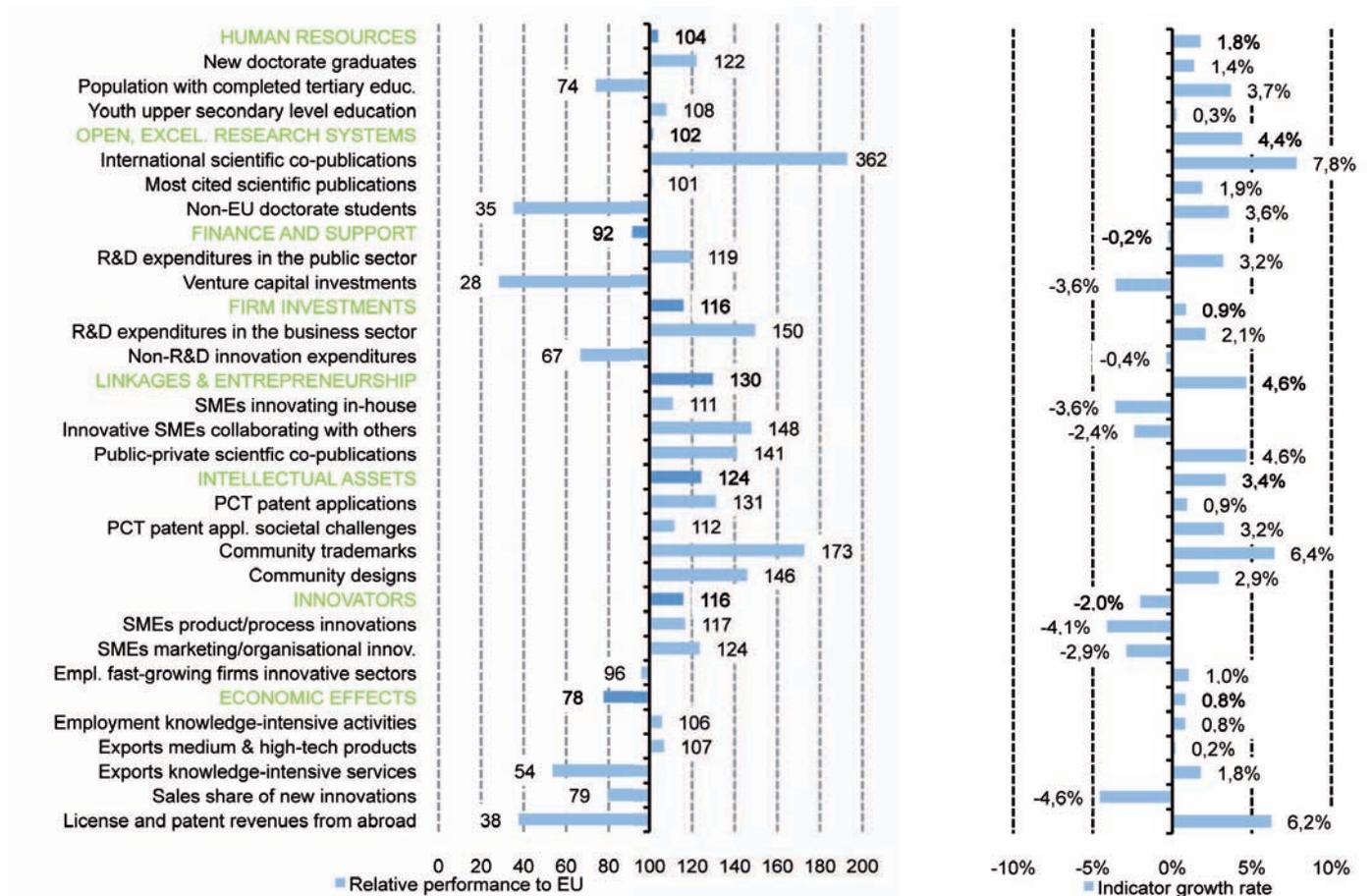
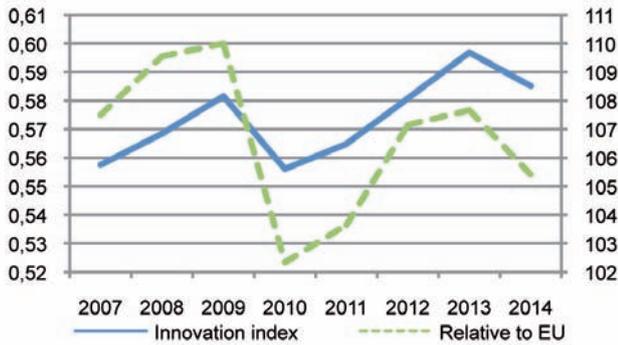
Note: Performance relative to the EU where the EU = 100.

Austria

Austria is an **Innovation follower**. Innovation performance was increasing until 2009, but declined in 2010. The innovation performance more than fully recovered since but there has been another decline in performance in 2014. The performance relative to the EU peaked at 10% above the average in 2009 and is at 5% in 2014.

Austria performs better than the EU average for most dimensions, except Economic effects and Finance and support, the latter because of poor relative performance in Venture capital investments. In terms of indicators, relative strengths for Austria are particularly International scientific co-publications and Community trademarks. Relative weaknesses are in Venture capital investments, Non-EU doctorate students and License and patent revenues from abroad.

Most dimensions and indicators show positive growth. The strongest increases in performance are observed for International scientific co-publications (7.8%), Community trademarks (6.4%) and License and patent revenues from abroad (6.2%). Significant declines in performance are observed in Sales share of new innovations (-4.6%) and SMEs with product or process innovations (-4.1%).



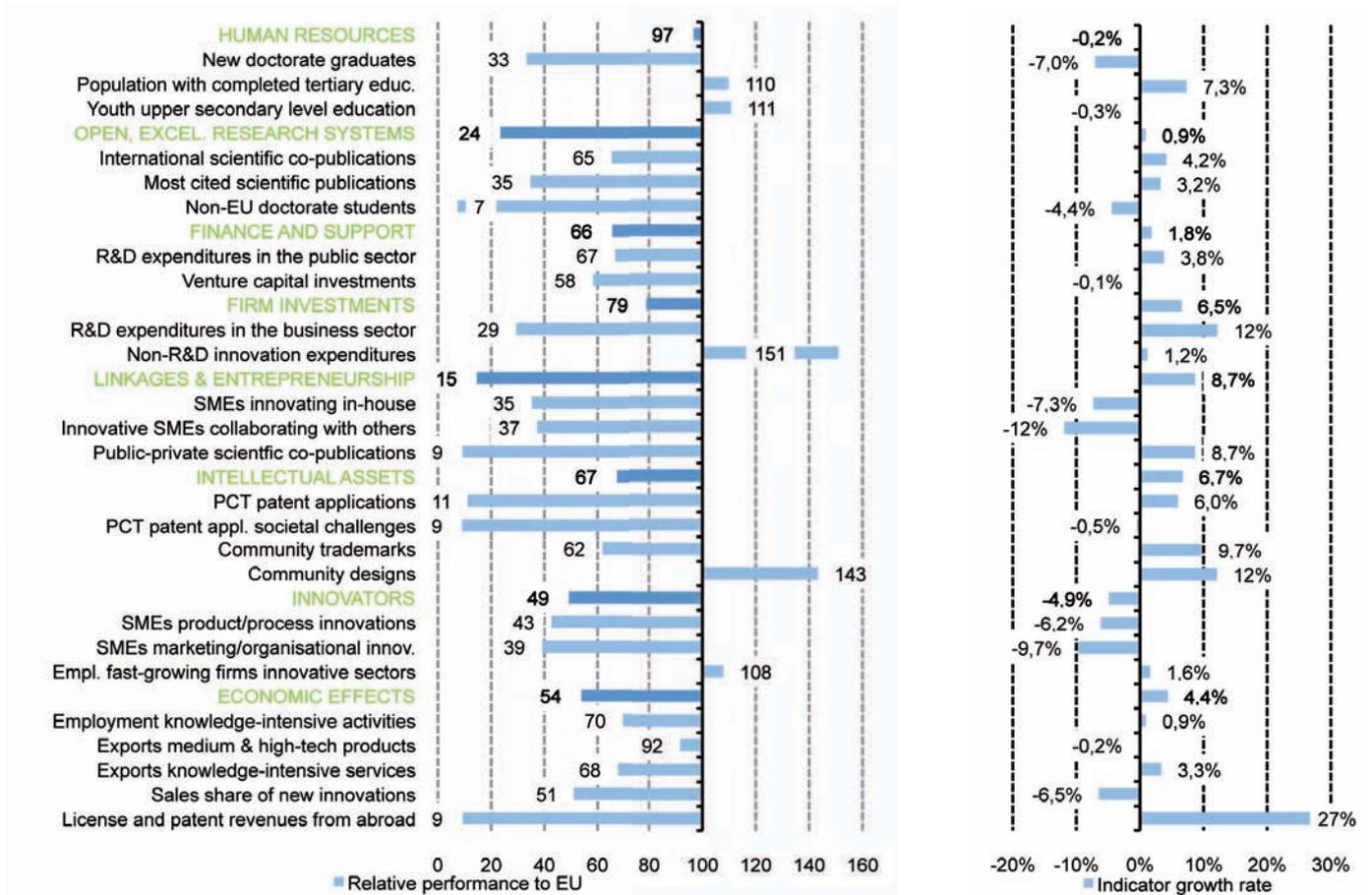
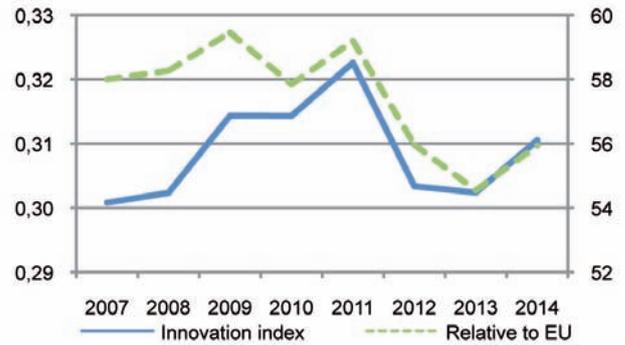
Note: Performance relative to the EU where the EU = 100.

Poland

Poland is a **Moderate innovator**. Innovation performance has been somewhat volatile within a relatively narrow range: it improved between 2007 and 2011, but then fell for 2012 and 2013, and increased again for 2014. Poland's relative performance has declined from 58% in 2007 to 56% in 2014.

Poland is performing below the EU average for all dimensions, particularly for Open, excellent and attractive research systems and Linkages and entrepreneurship. For most indicators performance is also performing below the EU average, with largest relative weaknesses in Non-EU doctorate students, PCT patent applications in societal challenges, Public-private co-publications, License and patent revenues from abroad and PCT patent applications. Relative strengths for Poland are in Non-R&D innovation expenditures and Community designs.

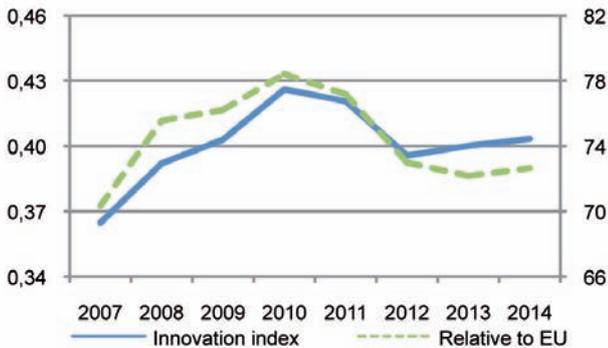
Performance has increased for about half of the dimensions and indicators. High growth is observed for License and patent revenues from abroad (27%), and more moderate growth for Community designs (12%) and R&D expenditures in the business sector (12%). Fairly strong declines in performance are observed in Innovative SMEs collaborating with others and SMEs with marketing or organisational innovations.



Note: Performance relative to the EU where the EU = 100.

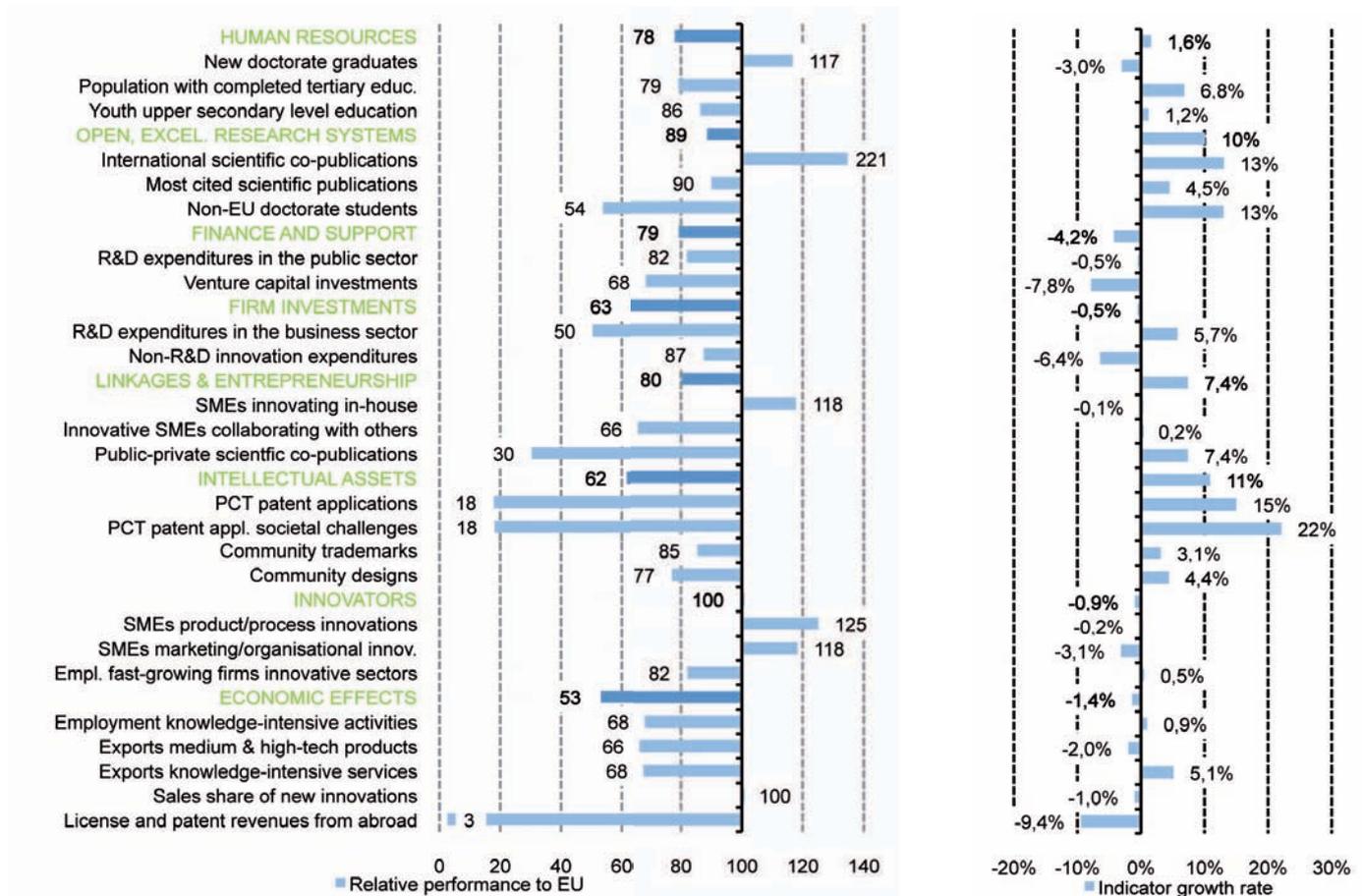
Portugal

Portugal is a **Moderate innovator**. Innovation performance was increasing until 2010 after which it declined. Portugal managed to improve its performance relative to the EU from 70% in 2007 to 78% in 2010 but performance declined to less than 73% of that of the EU in 2014.



Portugal performs below the EU average for all dimensions, except Innovators which is exactly at the average level. Performance for most indicators is also below the average, in particular for License and patent revenues from abroad, PCT patent applications and PCT patent applications in societal challenges. Relative strengths for Portugal are in International scientific co-publications, SMEs innovating in-house and SMEs with product or process innovations.

Performance in half of the innovation dimensions is growing, especially in Intellectual assets (11%) and Open, excellent and attractive research systems (10%). Performance in most indicators has improved, in particular in PCT patent applications in societal challenges (22%), PCT patent applications (15%), International scientific co-publications (13%) and Non-EU doctorate students (13%). Fairly large declines in performance are observed in License and patent revenues from abroad, Venture capital investments and Non-R&D innovation expenditures.



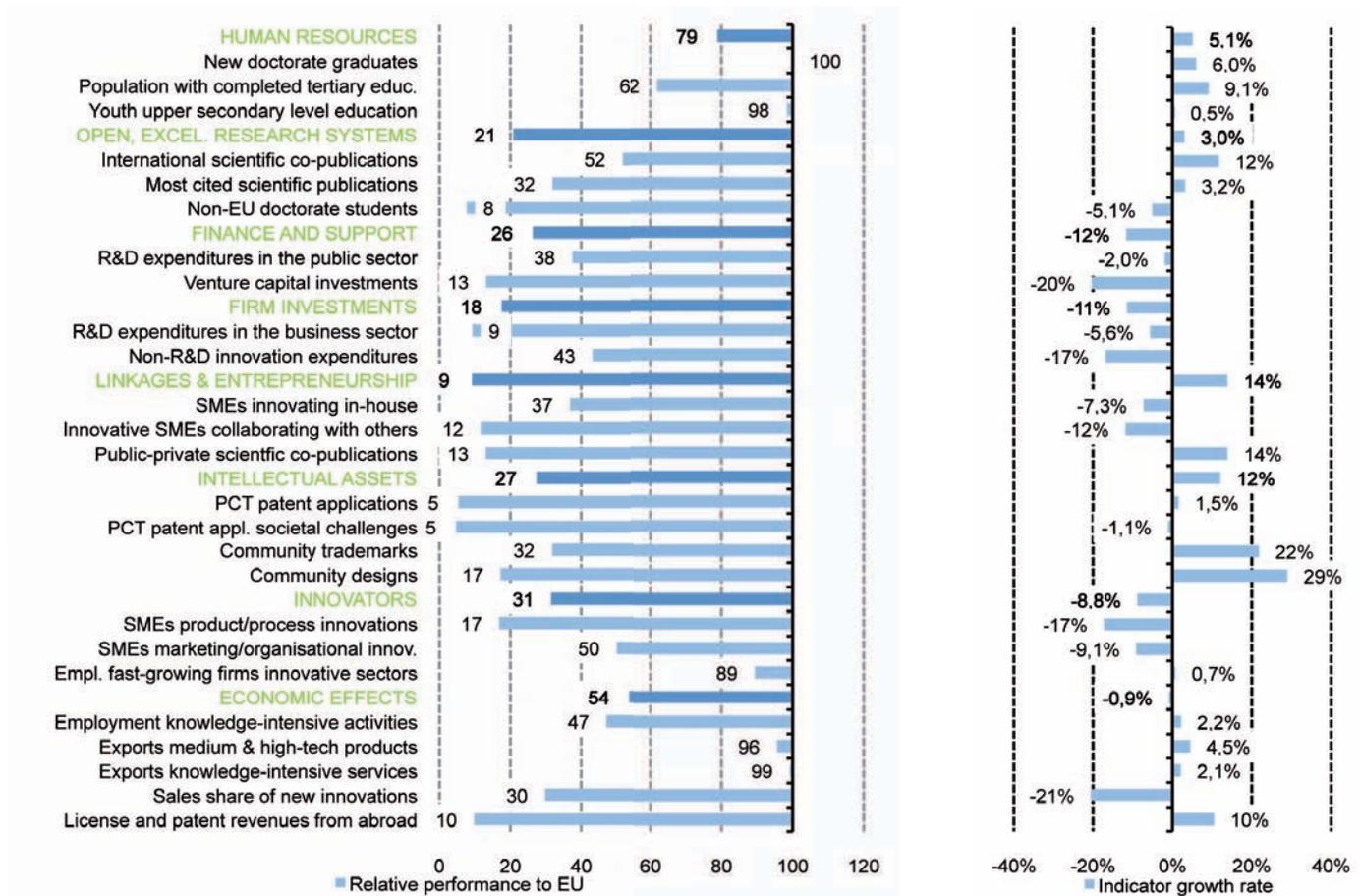
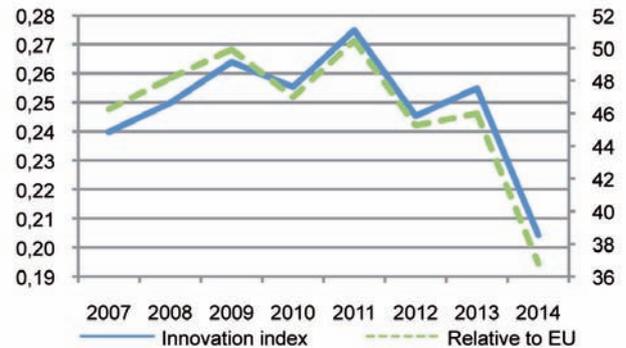
Note: Performance relative to the EU where the EU = 100.

Romania

Romania is a **Modest innovator**. Innovation performance mostly increased until 2011 after which it has been declining. Innovation performance in 2014 is at a significantly lower level than in 2007. The development of Romania's relative performance to the EU has closely followed the development of the innovation index. Over time, the relative performance has worsened from 46% in 2007 to 37% in 2014.

Romania is performing well below the average of the EU for all dimensions and almost all indicators. The weakest relative performance in terms of dimensions is Linkages and entrepreneurship while in terms of indicators the worst relative performance is observed for PCT patent applications and PCT patent applications in societal challenges. Romania performs similar to the EU average for a number of indicators, in particular New doctorate graduates, Exports in knowledge-intensive services and Youth with upper secondary level education.

Performance has increased for most innovation dimensions, especially Linkages and entrepreneurship and Intellectual assets, and for about half of the indicators. High growth is observed for Community designs (29%) and Community trademarks (22%). The strongest declines in performance are observed in Sales share of new innovations (-21%) and Venture capital investments (-20%).



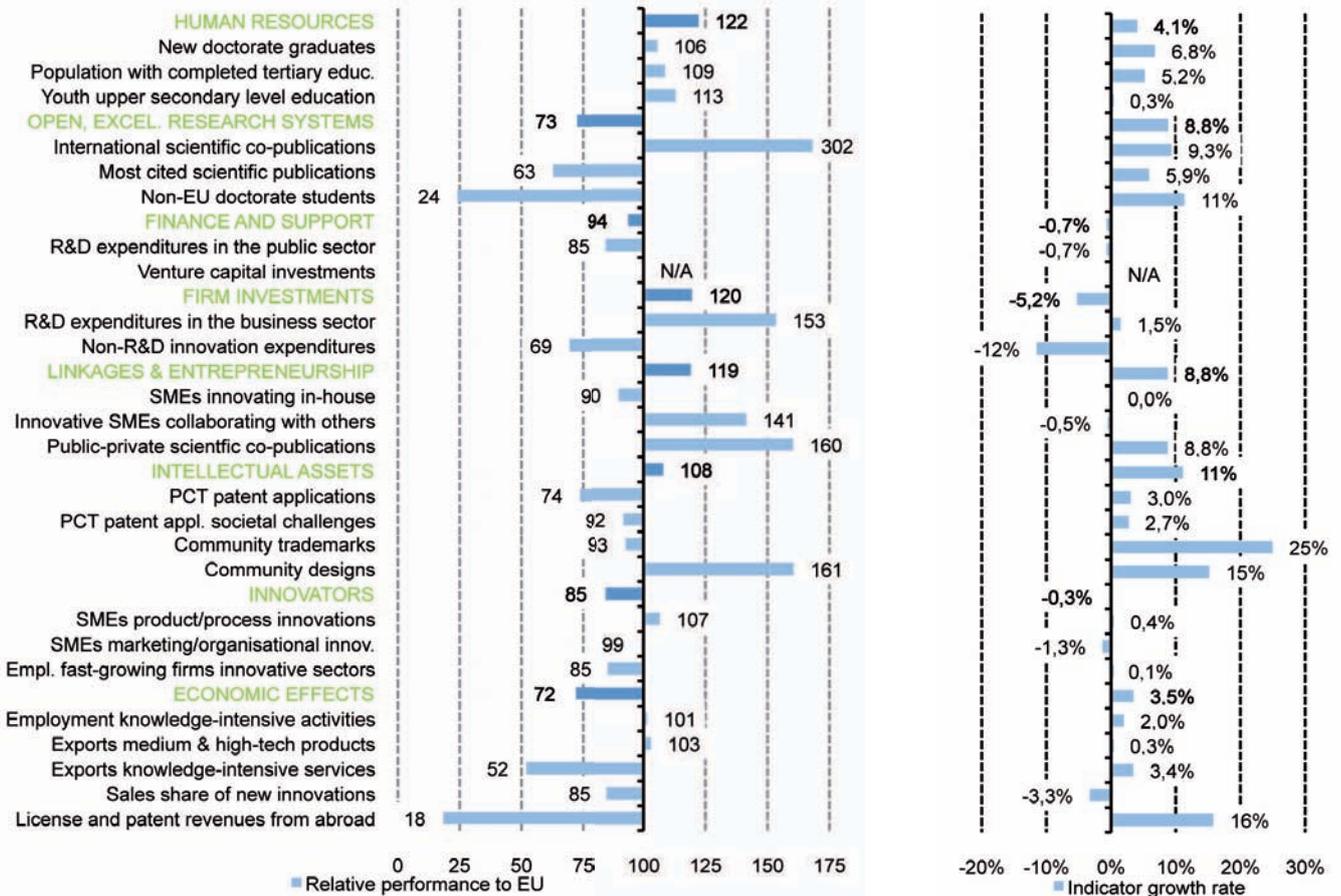
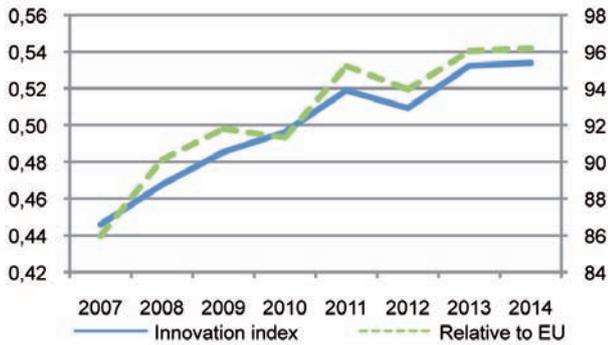
Note: Performance relative to the EU where the EU = 100.

Slovenia

Slovenia is an **Innovation follower**. Innovation performance has been steadily increasing with a minor downfall in 2012. Slovenia's relative performance to the EU has improved from 86% in 2007 to 96% in 2014. The increase in relative performance has moved the country from the Moderate innovators into the Innovation followers from 2008 onwards.

Slovenia performs close to the EU average with performance for 4 dimensions being above and for 4 dimensions being below the average. Particular relative strengths are in International scientific co-publications, Public-private co-publications, Community designs and R&D expenditures in the business sector. Strong relative weaknesses are observed for License and patent revenues from abroad and Non-EU doctorate students.

Performance in most dimensions and indicators has improved. The fastest growing dimension is Intellectual assets (11%), and for indicators, the highest growth is observed for Community trademarks (25%), License and patent revenues from abroad (16%), Community designs (15%) and Non-EU doctorate students (11%). A strong decline in performance is observed only in Non-R&D innovation expenditures (-12%).



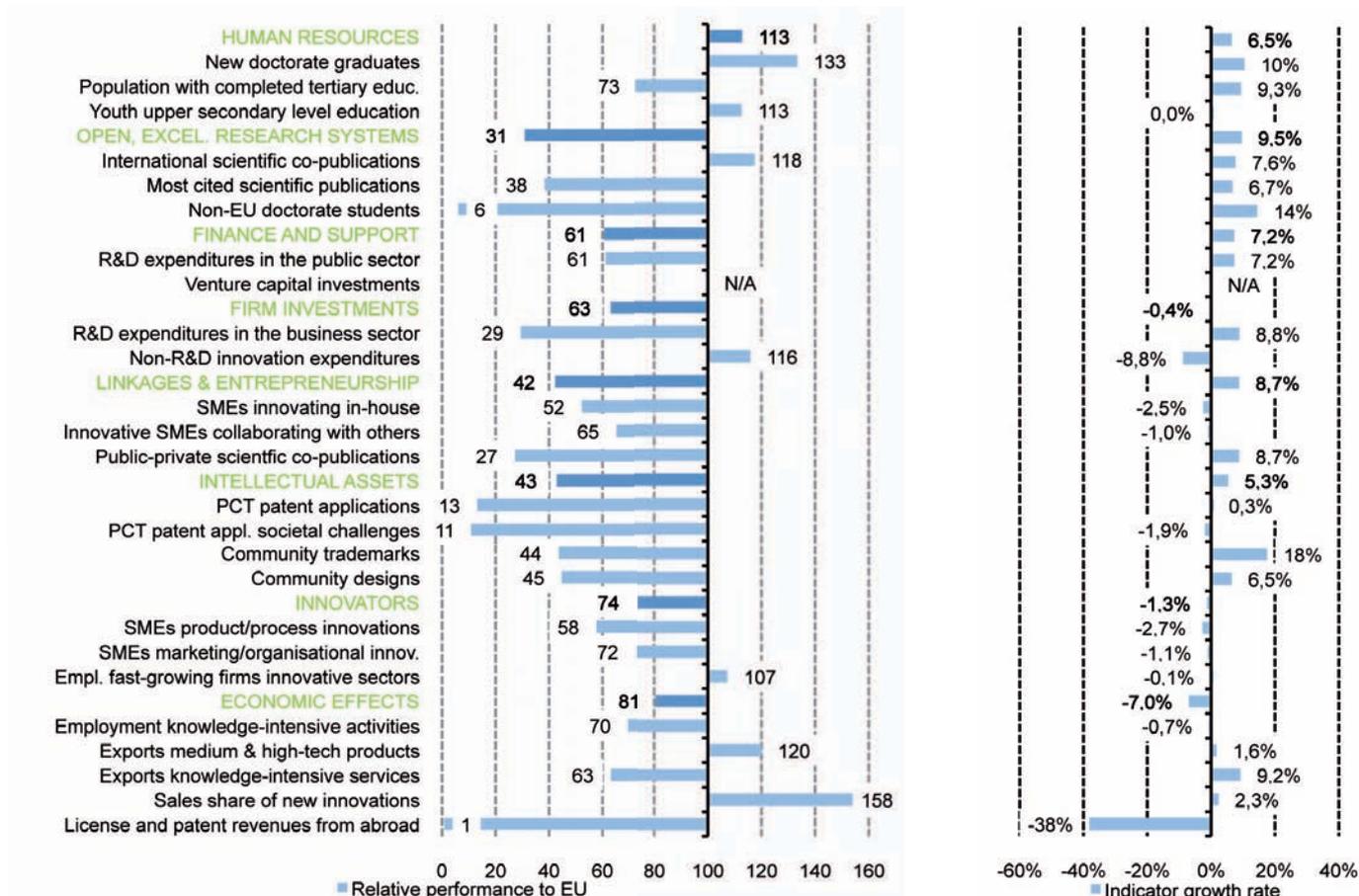
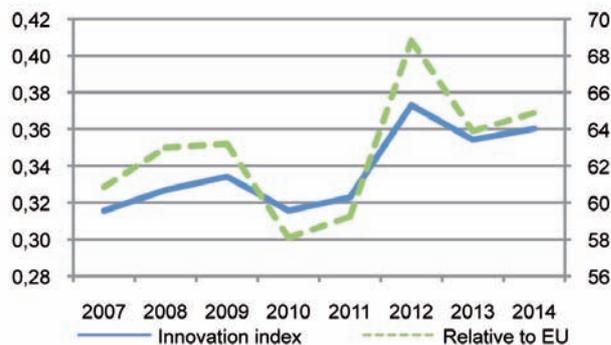
Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.

Slovakia

Slovakia is a **Moderate innovator**. Innovation performance has increased between 2007 and 2014, but declined in 2010 and in 2013. The performance relative to the EU has had more fluctuations but over time has increased significantly. Performance relative to the EU reached a peak in 2012 at 69% of the EU average, but fell to 64% in 2014.

Slovakia performs below the EU average for all dimensions, except Human resources, and also for most indicators. Large relative strengths in terms of indicators are in Sales share of new innovations and New doctorate graduates. Large relative weaknesses are in License and patent revenues from abroad, Non-EU doctorate students, PCT patent applications in societal challenges and PCT patent applications.

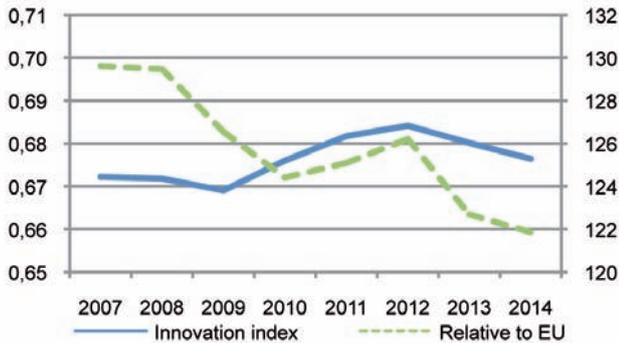
Performance in most dimensions and most indicators has improved. The highest growth in terms of indicators is observed for Community trademarks (18%) and Non-EU doctorate students (14%). A very strong decline in performance can be observed in License and patent revenues from abroad (-38%), and a more modest decline for Non-R&D innovation expenditures (-8.8%).



Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.

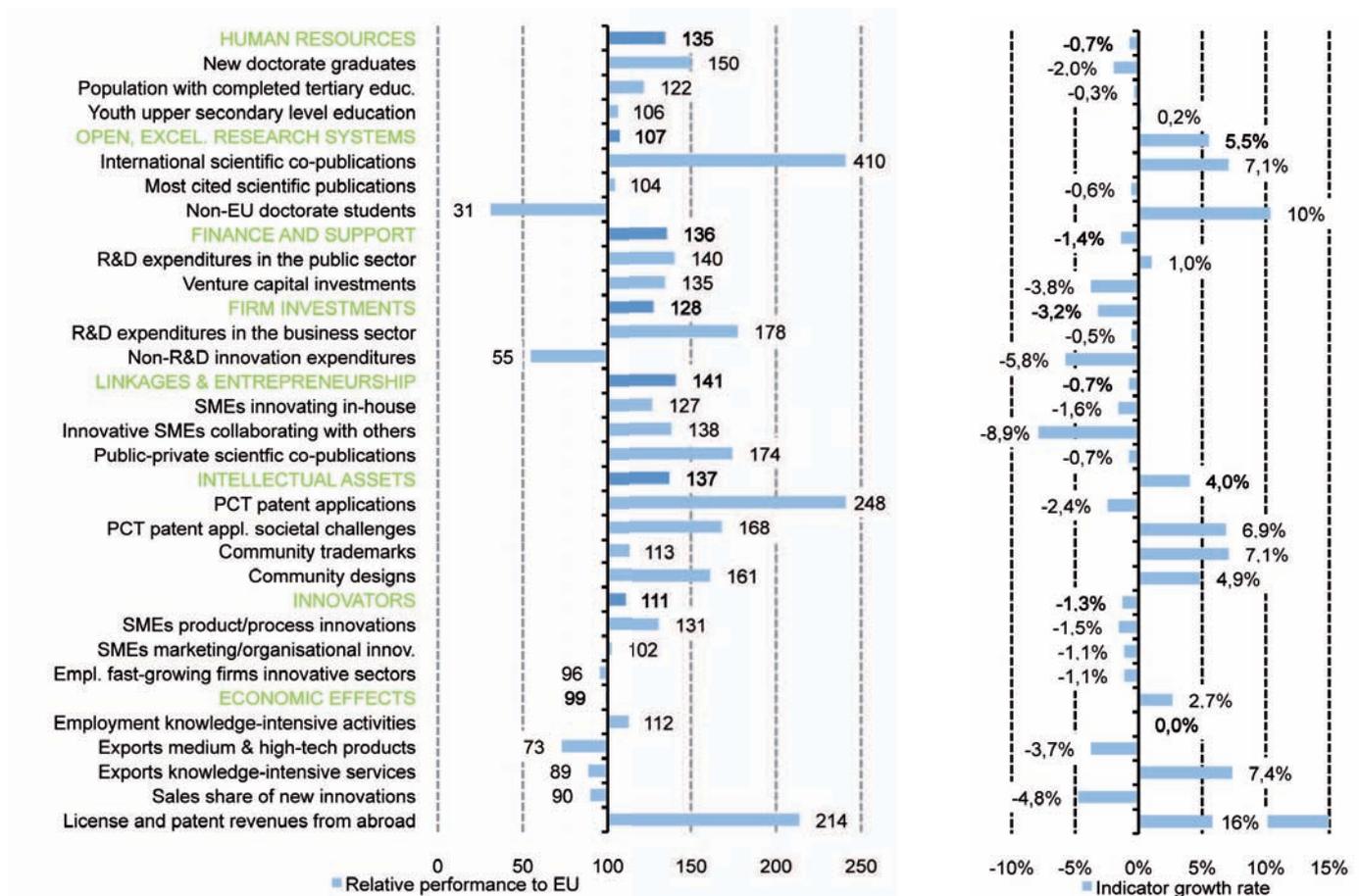
Finland

Finland is an **Innovation leader**, and its innovation performance has been steadily increasing until 2012, after which it has slightly declined. Finland's performance relative to the EU has been declining from its peak of 30% above the EU average in 2007 to 22% in 2014.



Finland is performing above the average of the EU for most dimensions and most indicators. The strongest relative strengths are in PCT patent applications, International scientific co-publications and License and patent revenues from abroad. Relative weaknesses are in Non-EU doctorate students, Non-R&D innovation expenditures and Exports in knowledge-intensive services.

Performance in only two innovation dimensions has improved, in Open, excellent and attractive research systems and Intellectual assets. Performance in less than half of the indicators has improved. Particularly high growth is observed for License and patent revenues from abroad (16%) and Non-EU doctorate students (10%). Notable declines in performance are observed for Non-R&D innovation expenditures (-5.8%) and Innovative SMEs collaborating with others (-8.9%).



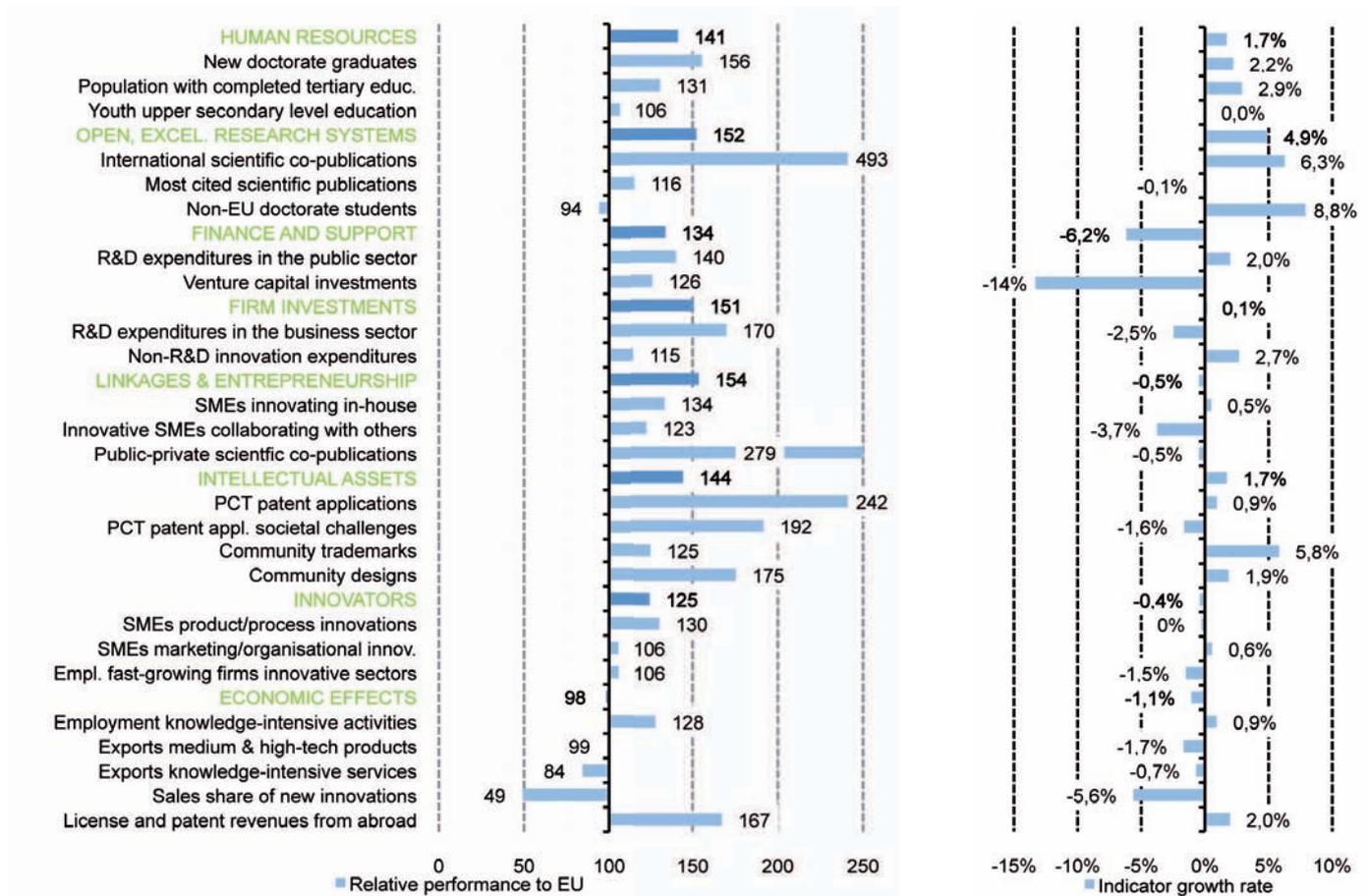
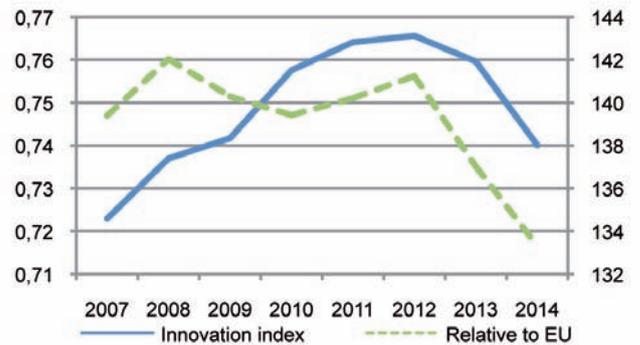
Note: Performance relative to the EU where the EU = 100.

Sweden

Sweden is an **Innovation leader**. Its innovation performance increased until 2012, but has been declining since, with the decline being rather sharp in 2014. The performance relative to the EU has been declining more or less over the whole period from its peak of 42% above the average in 2008 to 33% in 2014.

Sweden is performing above the average of the EU for all dimensions, except Economic effects which is just below the EU average. Performance in nearly all of the indicators is also above the EU average, especially in Public-private co-publications, International scientific co-publications, PCT patent applications and PCT patent applications in societal challenges. Relative weaknesses can be observed for Sales share of new innovations and Exports in knowledge-intensive services.

Performance has improved strongly in Open, excellent and attractive research systems (4.9%) but declined strongly in Finance and support (-6.2%). Performance for about half of the indicators has improved with significant positive growth being observed for Non-EU doctorate students (8.8%), International scientific co-publications (6.3%) and Community trademarks (5.8%). A strong decline in performance can be observed for Venture capital investments (-14%) while more modest declines are registered for Sales share of new innovations and Innovative SMEs collaborating with others.



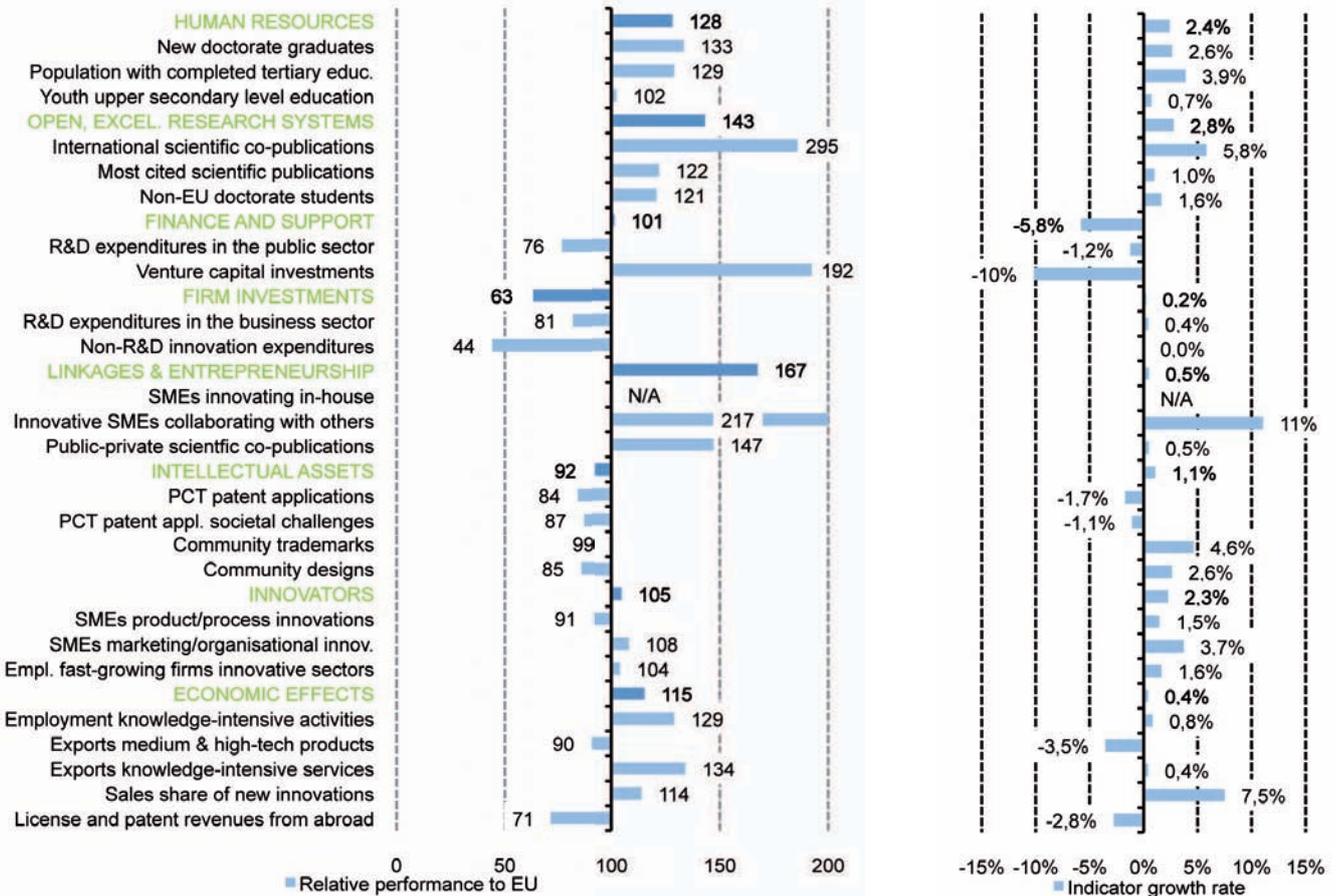
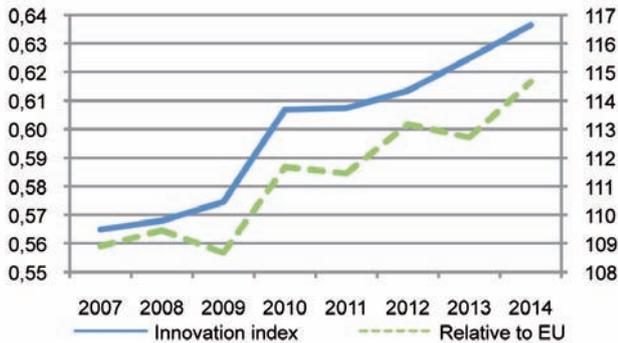
Note: Performance relative to the EU where the EU = 100.

United Kingdom

The United Kingdom is an **Innovation follower**. Its innovation performance has been improving at a steady rate between 2007 and 2014. The performance relative to the EU has also been on the rise for most of the same time period. The performance was at 9% above the EU average in 2007, and is at 15% above the average for 2014.

The UK performs better than the EU average for most dimensions and slightly more than half of the indicators. The best performing dimension is Linkages and entrepreneurship. Relative best performance is in Innovative SMEs collaborating with others, Venture capital investments and International scientific co-publications. A relative weakness is the dimension of Firm investments, especially due to bad relative performance in Non-R&D innovation expenditures.

Performance in most dimensions and indicators has improved, although in most cases growth is modest. Performance has improved most clearly for Innovative SMEs collaborating with others (11%) and Sales share of new innovations (7.5%). A strong decline in performance is observed in Finance and support (-5.8%), mainly due to a significant decline in Venture capital investments (-10%).



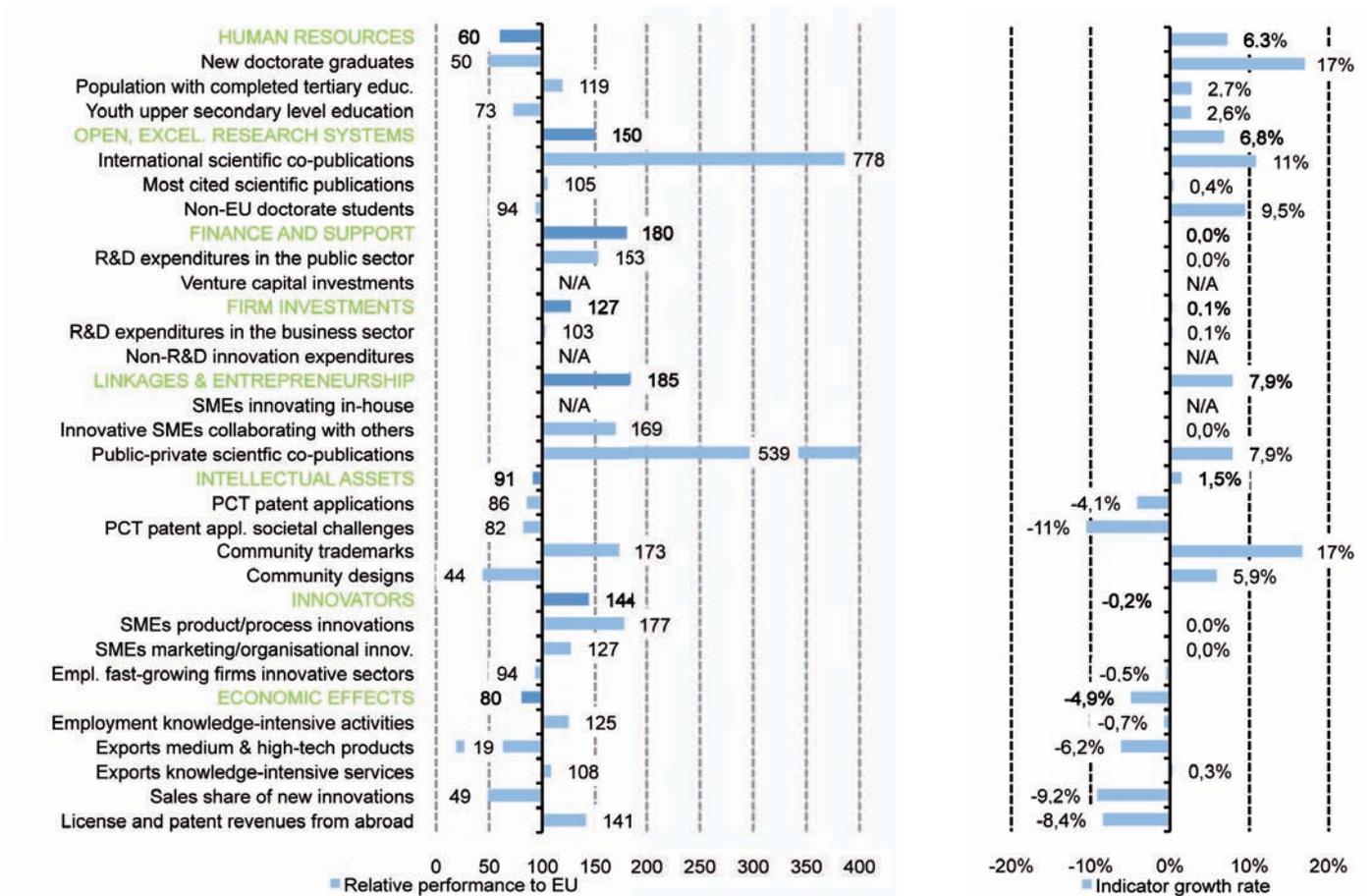
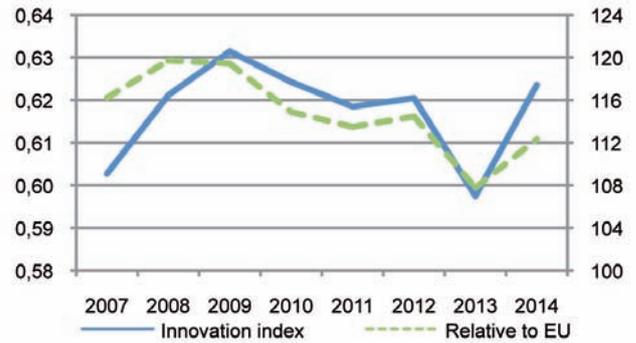
Notes: Performance relative to the EU where the EU = 100. No data for SMEs innovating in-house.

Iceland

Iceland is an **Innovation follower**. Performance improved strongly until 2009 after which it declined, mainly due to declining performance in Patent applications and Community trade-marks. In 2013 innovation performance was below its level in 2007, but it recovered strongly in 2014. The performance relative to the EU has declined from being 20% above the EU average in 2008-2009 to 12% above average in 2014.

Iceland performs better than the EU average in most innovation dimensions. The overwhelmingly strongest relative strengths for Iceland in terms of indicators are Public-private co-publications and International scientific co-publications. Relative weaknesses are in Exports in medium and high-tech products, Community designs, Sales share of new innovations and New doctorate graduates.

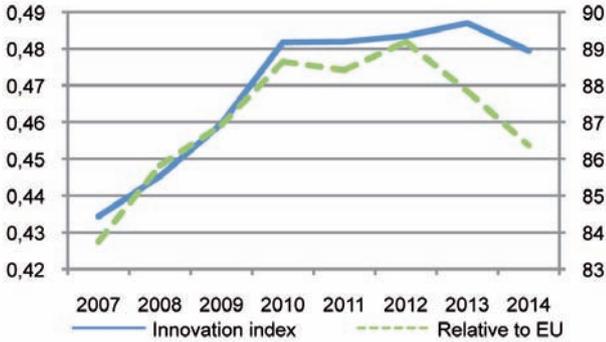
For half of the dimensions and most indicators performance has improved. The highest growth is observed in New doctorate graduates (17%) and Community trademarks (17%). Fairly significant declines in performance are observed in PCT patent applications in societal challenges (-11%), Sales share of new innovations (-9.2%) and License and patent revenues from abroad (-8.4%).



Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments, Non-R&D innovation expenditures and SMEs innovating in-house.

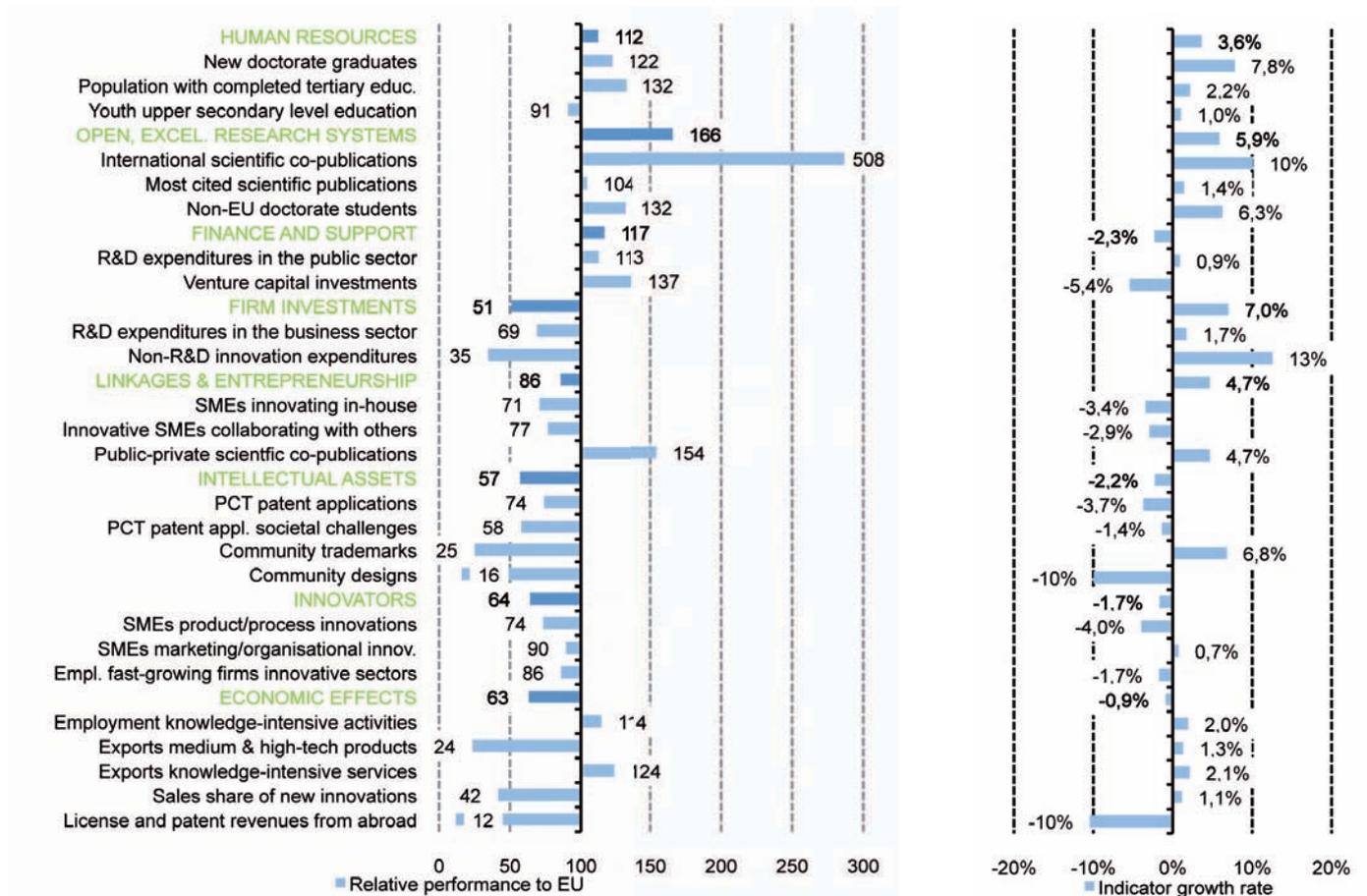
Norway

Norway is a **Moderate innovator**. Norwegian innovation performance has been increasing since 2007, with a small decline in 2014. Norway's performance, as compared to the EU, increased until 2012, peaking at 89%, but relative performance has since then been in decline and is at 86% of the EU average for 2014.



Norway is performing below the EU average for most dimensions and most indicators, particularly for License and patent revenues from abroad, Community designs and Exports in medium and high-tech products. A strong innovation dimension for Norway is Open, excellent and attractive research systems, due to exceptional relative performance in International scientific co-publications. Good relative performance is also observed for Public-private co-publications and Venture capital investments.

Performance in most innovation dimensions and most innovation indicators has increased. The highest growth at the indicator level is observed for Non-R&D innovation expenditures (13%) and International scientific co-publications (10%). Large performance declines are observed in License and patent revenues from abroad (-10%) and Community designs (-10%).



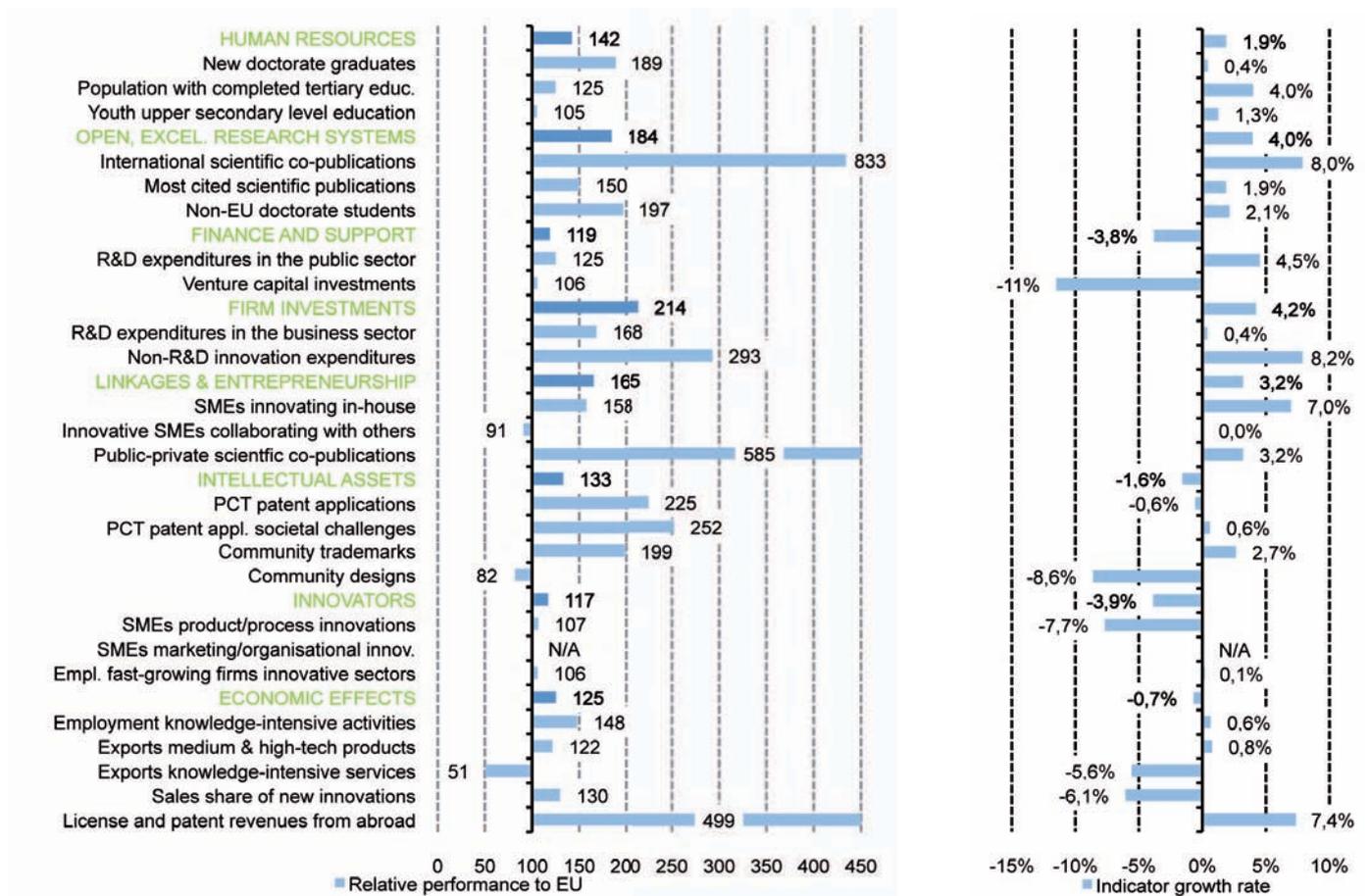
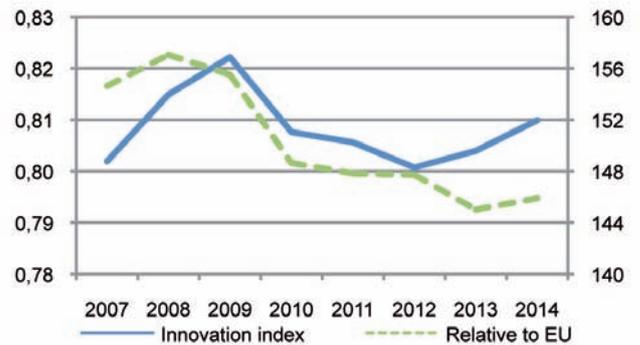
Note: Performance relative to the EU where the EU = 100.

Switzerland

Switzerland is an **Innovation leader** and the most innovative country in Europe. Its performance increased until 2009, then declined until 2012 and has started climbing again since then. The lead over the EU has been declining since 2009 but is still 46% above the EU average.

Switzerland is performing well above the EU average for all dimensions and for most indicators, in particular in 3 indicators: International scientific co-publications, Public-private co-publications and License and patent revenues from abroad. Relative weaknesses are in Exports in knowledge-intensive services, Community designs and Innovative SMEs collaborating with others.

For half of the innovation dimensions and more than half of the indicators performance has increased. Performance has improved most for Non-R&D innovation expenditures (8.2%), International scientific co-publications (8.0%), License and patent revenues from abroad (7.4%) and SMEs innovating in-house (7.0%). The strongest declines in performance are observed in Venture capital investments and Community designs.



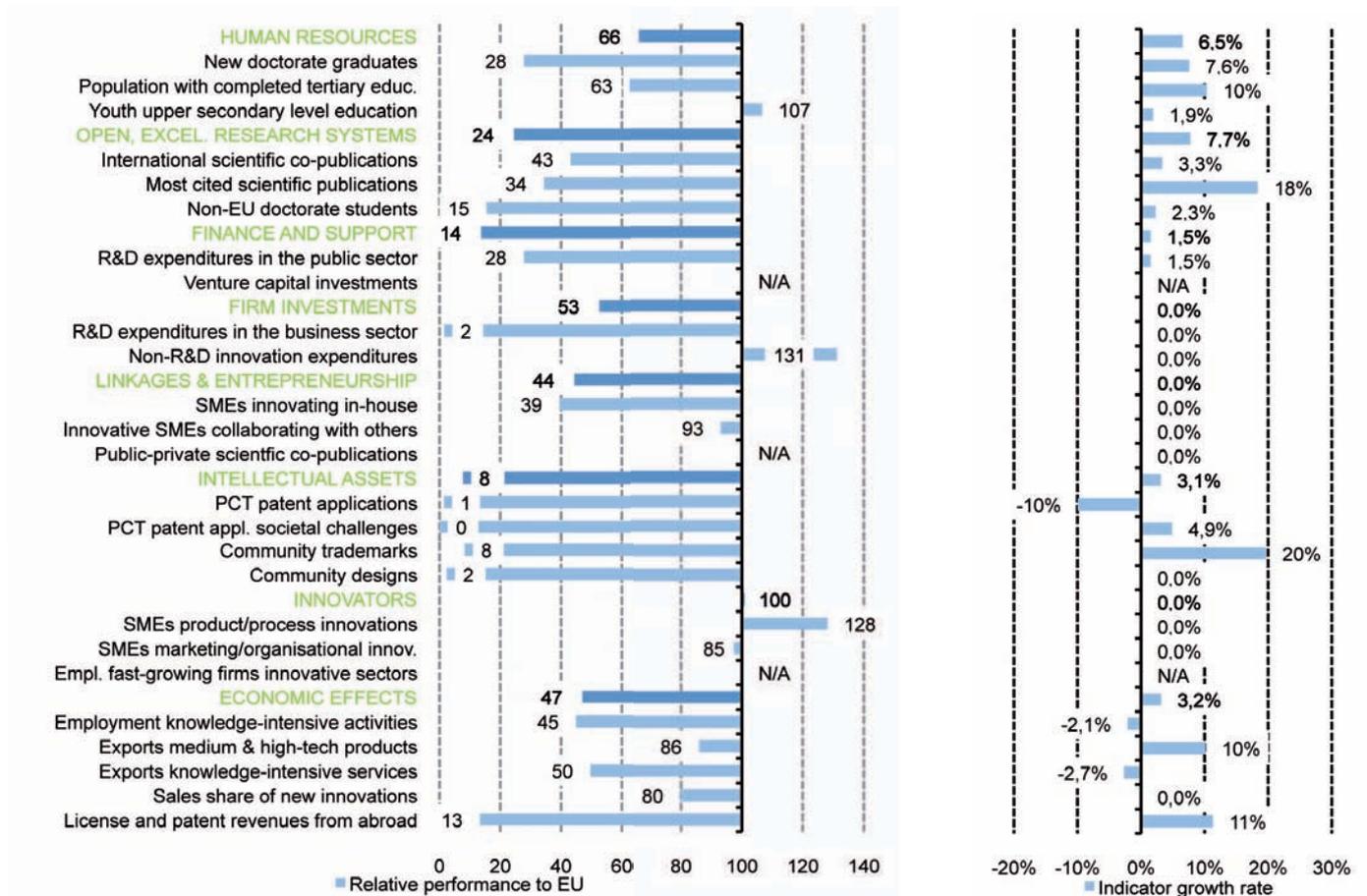
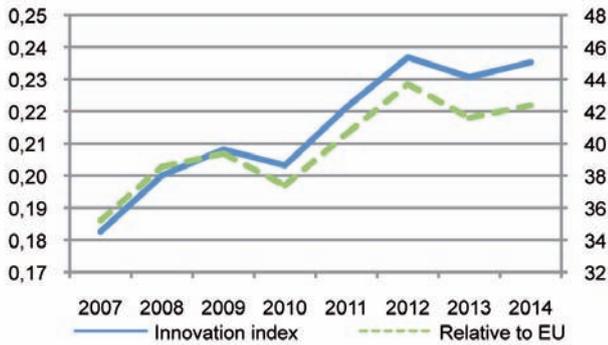
Notes: Performance relative to the EU where the EU = 100. No data for SMEs with marketing or organisational innovations.

Former Yugoslav Republic of Macedonia

The Former Yugoslav Republic of Macedonia is a **Modest innovator**. Innovation performance was increasing between 2007 and 2012, but has declined slightly since then. The country has been catching up to the performance level of the EU: its relative performance improved from 35% in 2007 to 42% in 2014.

The Former Yugoslav Republic of Macedonia is performing well below the EU average for nearly all dimensions and indicators. In relative terms the worst performing dimension is Intellectual assets. Relative performance is also weak in all the indicators that belong to this dimension. Relative strengths can be found in Non-R&D innovation expenditures and SMEs with product or process innovations.

For many indicators performance has not changed over time as, due to a lack of data, data is available for one year only. Performance has increased most significantly for the dimensions of Open, excellent and attractive research systems (7.7%) and Human resources (6.5%). At the indicator level, the highest growth can be observed for Community trademarks (20%) and Most cited publications (18%). The only strong decline in performance can be observed for PCT patent applications (-10%).



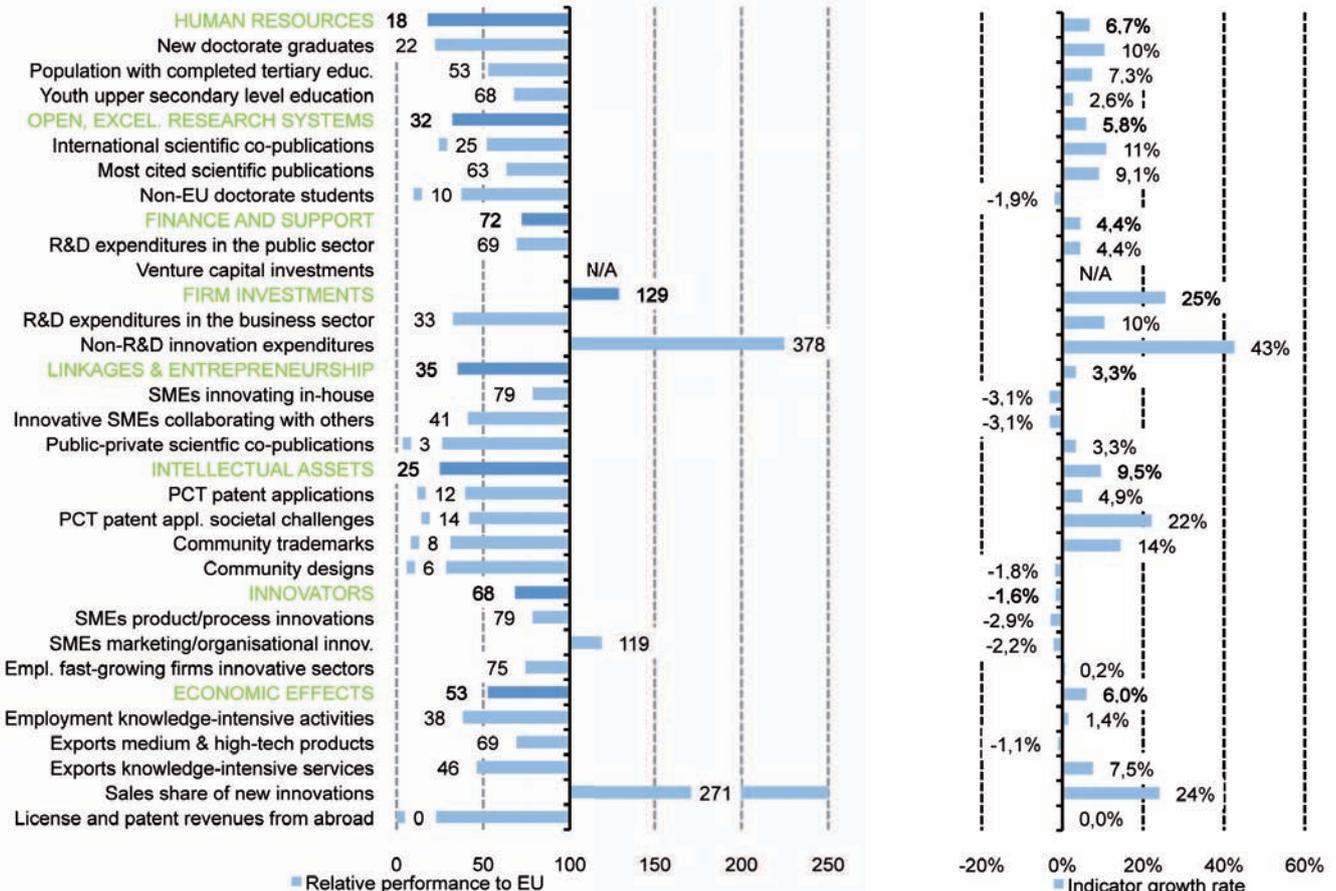
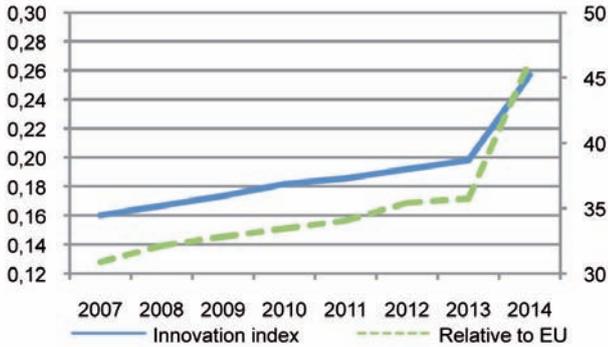
Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments, Public-private scientific co-publications and Employment in fast-growing firms of innovative sectors.

Turkey

Turkey is a **Modest innovator**. Innovation performance has been improving at a steady rate between 2007 and 2013, and for 2014 a sharp increase can be observed. Turkey is catching up to the EU; its relative performance has improved from 31% in 2007 to 36% in 2013 and then jumped to 46% in 2014.

Turkey is performing well below the average of the EU for all dimensions except Firms investments - due to high relative performance in Non-R&D innovation expenditures - and in almost all indicators. Another strong relative performance is observed for Sales share of new innovations. The most significant relative weaknesses are in License and patent revenues from abroad, Public-private scientific co-publications, Community designs and Community trademarks.

In nearly all dimensions - especially Firm investments - and most indicators performance has improved. Particularly high growth is observed for Non-R&D innovation expenditures (43%), Sales share of new innovations (24%), PCT patent applications in societal challenges (22%) and Community trademarks (14%). The few declines in performance are minor, with the largest one in SMEs innovating in-house (-3.1%) and Innovative SMEs collaborating with others (-3.1%).



Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.

7. Innovation Union Scoreboard methodology

7.1 How to calculate composite indicators

The overall innovation performance of each country has been summarized in a composite indicator (the Summary Innovation Index). The methodology used for calculating this composite innovation indicator will be explained in detail.

Step 1: Identifying and replacing outliers

Positive outliers are identified as those country scores which are higher than the mean across all countries plus 2 times the standard deviation. Negative outliers are identified as those country scores which are smaller than the mean across all countries minus 2 times the standard deviation. These outliers are replaced by the respective maximum and minimum values observed over all the years and all countries.

Step 2: Setting reference years

For each indicator a reference year is identified based on data availability for all 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 IUS refers. Thus for the IUS 2015 the reference year will be 2012 or 2013 for most indicators (cf. Table 1).

Step 3: Imputing for missing values

Reference year data are then used for "2014", etc. If data for a year-in-between is not available we substitute with the value for the previous year. If data are not available at the beginning of the time series, we replace missing values with the next available year. The following examples clarify this step and show how 'missing' data are imputed. If data are missing for all years, no data will be imputed (the indicator will not contribute to the Summary Innovation Index).

LATEST YEAR MISSING	"2014"	"2013"	"2012"	"2011"	"2010"
Available data	N/A	45	40	35	30
Use most recent year	45	45	40	35	30
YEAR-IN-BETWEEN MISSING	"2014"	"2013"	"2012"	"2011"	"2010"
Available data	50	N/A	40	35	30
Substitute with previous year	50	40	40	35	30
BEGINNING-OF-PERIOD MISSING	"2014"	"2013"	"2012"	"2011"	"2010"
Available data	50	45	40	35	N/A
Substitute with next available year	50	45	40	35	35

Step 4: Determining Maximum and Minimum scores

The Maximum score is the highest score found for the whole time period within all countries excluding positive outliers. Similarly, the Minimum score is the lowest score found for the whole time period within all countries excluding negative outliers.

Step 5: Transforming data if data are highly skewed

Most of the indicators are fractional indicators with values between 0% and 100%. Some indicators are unbound indicators, where values are not limited to an upper threshold. These indicators can be highly volatile and can have skewed data distributions (where most countries show low performance levels and a few countries show exceptionally high performance levels). For the following indicators data have been transformed using a square root transformation: Venture capital investments, Public-private co-publications, PCT patent applications, PCT patent applications in societal challenges, Community trademarks and License and patent revenues from abroad. A square root

transformation means using the square root of the indicator value instead of the original value.

Step 6: Calculating re-scaled scores

Re-scaled scores of the country scores (after correcting for outliers and a possible transformation of the data) 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 the re-scaled score is equal to 1 or 0, respectively.

Step 7: Calculating composite innovation indexes

For each year a composite Summary Innovation Index is calculated as the unweighted average of the re-scaled scores for all indicators where all indicators receive the same weight (1/25 if data are available for all 25 indicators).

7.2 How to calculate growth rates

Average annual growth rates of the Summary Innovation Index, the innovation dimensions and the individual indicators as calculated using

the following formula where the number of years equals 7 (i.e. the number of yearly changes between 2007 and 2014):

$$\text{AAGR} = \left(\frac{\text{Value end of period}}{\text{Value beginning of period}} \right)^{\left(\frac{1}{\text{number of years}} \right)} - 1$$

7.3 Impact of changes in the methodology on innovation index

Compared to last year countries' performance levels have changed. A direct comparison between the innovation index scores in this year's report and the IUS 2014 is however not possible for several reasons.

First, the IUS 2014 indicator measuring the contribution of medium and high-tech product exports to the trade balance has been replaced with the share of medium and high-tech product exports out of total product exports. The impact on the innovation index varies from a positive impact for 15 and a negative impact for 17 countries (Table 5, column 5). In particular Luxembourg, Malta, Czech Republic, Denmark, Hungary and Slovakia benefit from revising the indicator whereas for Cyprus, Former Yugoslav Republic of Macedonia and Greece the innovation index declines most. The impact on countries' rank performance is more moderate with a positive impact for 4 and a negative impact for 5 countries (Table 5, column 6).

Second, the data source for medium and high-tech product exports for the EU Member States has been changed from UN ComTrade to ComExt, Eurostat's reference database for external trade. The impact on the innovation index varies from a positive impact for 12 and a negative impact for 20 countries (Table 5, column 9). But changes are more minor with Malta, Luxembourg and Denmark benefiting most whereas for the Former Yugoslav Republic of Macedonia the innovation index declines most. The impact on countries' rank performance is moderate with a positive impact for 2 and a negative impact for 2 countries (Table 5, column 10).

Thirdly, including the financial sector in the indicator on employment in fast-growing firms of innovative sectors has a positive impact on the

innovation index of 16 countries and a negative impact on the index of 15 countries (Table 5, column 13). The highest positive impact on the innovation index is for Belgium, Denmark, Finland and Sweden, the highest negative impact is for Poland, Ireland, Bulgaria and Czech Republic. The impact on countries' rank performance is more moderate with a positive impact for 6 and a negative impact for 6 countries (Table 5, column 14).

A fourth change in the methodology is the inclusion of "Other" innovation expenditures in Non-R&D innovation expenditures. As this component was not included before, adding this component will increase the value for the indicator and there is no negative impact on innovation index scores (Table 5, column 17). There is a very small impact on countries' rank performance with a positive impact for 1 (Spain) and a negative impact for 1 country (Serbia) (Table 5, column 18).

Another change (although not a change in the methodology) is the impact of the revised GDP data on 8 indicators using revised GDP data following the adaptation of a revised European System of National and Regional Accounts (ESA 2010). Performance for 28 countries has improved in particular for Estonia, Luxembourg and Switzerland (Table 5, column 21). Performance for 6 countries has worsened with the highest negative impact for the Netherlands, Ireland and Cyprus. There is only a moderate impact on countries' rank performance with a positive impact for 2 and a negative impact for 2 countries (Table 5, column 22).

The results for the different changes in the table cannot be added to arrive at the overall impact of the above-mentioned changes.

7.4 International benchmarking

The methodology for calculating average innovation performance for the EU and its major global competitors is similar to that used for calculating average innovation performance for the EU Member States:

1. Calculate normalised scores for all indicators as follows:

$$Y_i = ((X_i - \text{smallest } X \text{ for all countries}) / (\text{largest } X \text{ for all countries} - \text{smallest } X \text{ for all countries})) \text{ such that all normalised scores are between 0 and 1}$$

2. Calculate the arithmetic average over these index scores (C_{li})

3. Calculate performance relative to that of the EU: C_{li}* = 100*C_{li}/C_{IEU}

Note that the results for country i depend on the data from the other countries as the smallest and largest scores used in the normalisation procedure are calculated over all countries.

Table 5: Impact of changes in methodology on countries' innovation index scores and ranks

	IUS 2015			CONTRIBUTION MED & HI-TECH PRODUCT EXPORTS TO TRADE BALANCE (INSTEAD OF EXPORT SHARE MEDIUM & HI-TECH PRODUCTS)			USE COMTRADE AS SOURCE INSTEAD OF COMEXT FOR MED & HI-TECH PRODUCT EXPORTS			EMPLOYMENT FAST GROWING FIRMS INNOVATIVE SECTORS - EXCLUDE FINANCIAL SECTOR			NON-R&D INNOVATION EXPENDITURES - EXCLUDE OTHER EXPENDITURES			GDP DATA NOT REVISED						
	SII	rank	change SII	SII	rank	rank change	SII	rank	rank change	SII	rank	rank change	SII	rank	rank change	SII	rank	rank change				
	(1)	(2)	(5)	(3)	(4)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
EU28	0,555		0,005	0,559		-0,004	0,559		-0,004	0,558		0,558		-0,003	0,550		0,005	0,552		0,552		0,003
BE	0,619	11	-0,001	0,620	11	0,000	0,620	11	0,000	0	0,604	11	0,016	0	0,618	11	0,002	0	0,617	11	0,003	0
BG	0,229	33	-0,002	0,229	33	0,000	0,229	33	0,000	0	0,241	32	-0,012	-1	0,228	33	0,000	0	0,228	33	0,001	0
CZ	0,447	17	0,007	0,448	17	-0,001	0,448	17	-0,001	0	0,458	17	-0,011	0	0,445	17	0,002	0	0,447	17	0,000	0
DK	0,736	3	0,007	0,733	3	0,004	0,733	3	0,004	0	0,722	3	0,014	0	0,732	3	0,004	0	0,732	3	0,004	0
DE	0,676	5	-0,001	0,676	5	0,001	0,676	5	0,001	0	0,673	4	0,003	-1	0,664	5	0,012	0	0,672	5	0,004	0
EE	0,489	15	0,005	0,487	15	0,002	0,487	15	0,002	0	0,488	15	0,001	0	0,487	15	0,002	0	0,484	15	0,005	0
IE	0,628	9	0,000	0,629	9	-0,001	0,629	9	-0,001	0	0,646	6	-0,018	-3	0,627	9	0,001	0	0,630	9	-0,002	0
EL	0,365	25	-0,008	0,372	24	-0,004	0,365	25	-0,001	0	0,370	25	-0,006	0	0,363	25	0,001	0	0,363	25	0,002	0
ES	0,385	22	-0,004	0,389	21	-0,004	0,386	21	-0,001	-1	0,385	23	0,001	1	0,384	23	0,002	1	0,383	23	0,002	1
FR	0,591	12	0,000	0,592	12	-0,001	0,592	12	-0,001	0	0,593	12	-0,002	0	0,589	12	0,001	0	0,587	12	0,003	0
HR	0,313	27	-0,005	0,314	27	-0,001	0,314	27	-0,001	0	0,312	28	0,001	1	0,311	27	0,002	0	0,312	27	0,002	0
IT	0,439	19	-0,006	0,440	19	-0,001	0,440	19	-0,001	0	0,440	19	-0,001	0	0,435	19	0,003	0	0,438	19	0,001	0
CY	0,445	18	-0,012	0,446	18	-0,001	0,446	18	-0,001	0	0,455	18	-0,010	0	0,443	18	0,002	0	0,447	18	-0,002	0
LV	0,272	30	-0,001	0,273	30	-0,001	0,271	30	0,001	0	0,267	30	0,005	0	0,272	30	0,000	0	0,269	30	0,003	0
LT	0,283	29	-0,004	0,287	29	-0,004	0,283	29	0,000	0	0,283	29	0,000	0	0,280	29	0,002	0	0,280	29	0,002	0
LU	0,642	7	0,013	0,630	8	0,011	0,630	8	0,011	1	0,640	8	0,001	1	0,641	7	0,000	0	0,636	8	0,005	1
HU	0,369	24	0,007	0,369	24	0,000	0,369	24	0,000	0	0,379	24	-0,010	0	0,367	24	0,002	0	0,366	24	0,003	0
MT	0,397	21	0,008	0,384	22	0,012	0,384	22	0,012	1	0,404	21	-0,008	0	0,395	21	0,002	0	0,395	21	0,002	0
NL	0,647	6	-0,002	0,647	6	0,000	0,647	6	0,000	0	0,639	9	0,008	3	0,647	6	0,001	0	0,651	6	-0,003	0
AT	0,585	13	0,003	0,584	13	0,001	0,584	13	0,001	0	0,580	13	0,005	0	0,584	13	0,001	0	0,582	13	0,003	0
PL	0,313	28	0,004	0,313	28	-0,001	0,313	28	-0,001	0	0,337	27	-0,024	-1	0,310	28	0,002	0	0,310	28	0,003	0
PT	0,403	20	-0,004	0,404	20	-0,001	0,404	20	-0,001	0	0,405	20	-0,002	0	0,401	20	0,002	0	0,402	20	0,001	0
RO	0,204	34	0,006	0,204	34	0,000	0,204	34	0,000	0	0,210	34	-0,005	0	0,204	34	0,001	0	0,203	34	0,001	0
SI	0,534	14	-0,002	0,535	14	-0,001	0,535	14	-0,001	0	0,537	14	-0,003	0	0,531	14	0,003	0	0,530	14	0,003	0
SK	0,360	26	0,007	0,361	26	-0,001	0,361	26	-0,001	0	0,368	26	-0,007	0	0,360	26	0,000	0	0,359	26	0,001	0
FI	0,676	4	-0,005	0,678	4	-0,002	0,678	4	-0,002	0	0,665	5	0,012	1	0,675	4	0,001	0	0,674	4	0,003	0
SE	0,740	2	0,003	0,739	2	0,001	0,739	2	0,001	0	0,728	2	0,012	0	0,738	2	0,002	0	0,737	2	0,003	0
UK	0,636	8	0,004	0,634	7	0,003	0,634	7	0,003	-1	0,642	7	-0,006	-1	0,634	8	0,002	0	0,637	7	-0,001	-1
TR	0,257	31	0,001	0,257	31	-0,001	0,257	31	-0,001	0	0,253	31	0,004	0	0,257	31	0,000	0	0,255	31	0,002	0
IS	0,624	10	0,000	0,624	10	0,000	0,624	10	0,000	0	0,620	10	0,004	0	0,624	10	0,000	0	0,622	10	0,001	0
NO	0,479	16	0,000	0,479	16	0,000	0,479	16	0,000	0	0,477	16	0,002	0	0,477	16	0,002	0	0,475	16	0,004	0
CH	0,810	1	-0,001	0,810	1	0,000	0,810	1	0,000	0	0,806	1	0,004	0	0,810	1	0,000	0	0,804	1	0,006	0
MK	0,235	32	-0,012	0,247	32	-0,012	0,247	32	-0,012	0	0,235	33	0,000	1	0,235	32	0,000	0	0,235	32	0,000	0
RS	0,385	23	0,002	0,383	23	0,002	0,383	23	0,002	0	0,385	22	0,000	-1	0,385	22	0,000	-1	0,387	22	-0,001	-1

■ positive impact ■ negative impact of the respective change in the methodology to calculate the Summary Innovation Index on respectively each country's index score and its rank.

Annex A: Current performance

	EU28	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU
ENABLERS																		
Human resources																		
1.1.1 New doctorate graduates	1.8	1.6	1.0	1.7	2.4	2.7	1.0	2.0	1.1	1.4	1.7	2.3	1.6	0.3	1.0	1.1	0.7	0.9
1.1.2 Population completed tertiary education	36.9	42.7	29.4	26.7	43.4	33.1	43.7	52.6	34.6	42.3	44.0	25.9	22.4	47.8	40.7	51.3	52.5	31.9
1.1.3 Youth with upper secondary level education	81.0	83.1	86.0	90.9	71.8	76.8	84.2	89.4	86.5	63.8	86.4	95.0	77.9	89.5	85.7	90.0	76.9	84.3
Open, excellent and attractive research systems																		
1.2.1 International scientific co-publications	363	1380	226	598	1916	784	864	1194	620	660	745	453	574	1142	213	324	1669	432
1.2.2 Scientific publications among top 10% most cited	11.0	13.4	3.3	5.6	14.6	11.7	8.5	11.5	9.2	10.4	10.4	3.2	10.6	7.1	3.0	6.1	12.2	5.3
1.2.3 Non-EU doctorate students	25.5	22.0	3.1	4.4	18.4	11.3	4.7	18.4	1.0	20.4	35.4	2.7	9.0	2.3	1.5	0.1	20.3	3.0
Finance and support																		
1.3.1 R&D expenditure in the public sector	0.72	0.69	0.25	0.87	1.04	0.94	0.90	0.43	0.50	0.58	0.75	0.41	0.54	0.34	0.43	0.71	0.45	0.41
1.3.2 Venture capital investments	0.062	0.089	0.002	0.002	0.097	0.041	n/a	0.049	0.000	0.028	0.081	n/a	0.015	n/a	n/a	n/a	0.188	0.045
FIRM ACTIVITIES																		
Firm investments																		
2.1.1 R&D expenditure in the business sector	1.29	1.58	0.40	1.03	1.99	1.99	0.83	1.14	0.27	0.66	1.44	0.41	0.67	0.07	0.17	0.24	0.71	0.98
2.1.2 Non-R&D innovation expenditure	0.69	0.60	0.49	0.73	0.37	1.35	1.55	0.39	0.87	0.31	0.37	0.95	0.57	0.58	1.38	1.10	0.14	0.70
Linkages & entrepreneurship																		
2.2.1 SMEs innovating in-house	28.7	37.4	11.6	27.3	30.4	38.6	27.4	38.8	26.6	15.5	28.8	19.3	36.6	27.9	13.8	13.8	37.2	10.6
2.2.2 Innovative SMEs collaborating with others	10.3	22.9	2.3	11.6	17.3	11.5	15.8	12.0	12.4	6.0	11.5	7.5	4.8	15.3	4.5	7.5	8.9	5.6
2.2.3 Public-private co-publications	50.3	94.6	4.3	25.1	193.0	73.2	16.9	33.1	16.5	28.1	51.3	30.0	29.7	21.2	1.5	7.2	37.6	26.8
Intellectual Assets																		
2.3.1 PCT patent applications	3.78	3.64	0.50	0.79	6.93	6.89	1.61	2.67	0.35	1.57	4.19	0.57	2.02	0.67	0.80	0.34	1.97	1.49
2.3.2 PCT patent applications in societal challenges	0.98	0.87	0.11	0.20	2.67	1.70	0.25	0.92	0.14	0.50	0.92	0.22	0.47	0.32	0.39	0.03	0.74	0.42
2.3.3 Community trademarks	5.83	5.19	5.24	3.89	7.47	7.49	9.83	5.84	2.73	7.16	3.96	1.24	5.24	18.64	3.47	4.13	29.29	2.42
2.3.4 Community designs	1.13	1.03	1.20	1.14	2.20	1.32	1.64	0.50	0.24	0.79	1.01	0.15	1.16	1.07	0.62	0.46	2.44	0.34
OUTPUTS																		
Innovators																		
3.1.1 SMEs introducing product or process innovations	30.6	42.3	13.6	30.9	33.9	42.4	33.0	35.7	29.6	18.4	32.4	21.6	38.8	29.2	15.7	16.1	43.1	12.8
3.1.2 SMEs introducing marketing/organisational innovations	36.2	36.7	17.6	30.2	40.4	46.2	31.2	49.6	45.0	22.6	41.2	30.4	44.7	35.6	23.1	25.2	52.1	25.3
3.1.3 Employment fast-growing firms innovative sectors	17.9	15.6	16.2	18.7	18.5	19.1	14.7	21.8	16.8	15.9	20.8	15.0	15.3	16.7	11.3	12.3	18.8	19.1
Economic effects																		
3.2.1 Employment in knowledge-intensive activities	13.8	15.3	9.1	12.9	15.2	14.6	11.9	20.1	12.5	12.5	13.8	10.4	13.4	17.2	10.8	9.0	26.2	12.8
3.2.2 Medium & high-tech product exports	53.0	45.9	26.8	62.5	43.9	65.9	42.7	47.0	18.0	46.0	56.7	37.6	50.4	43.0	30.3	31.1	49.3	66.3
3.2.3 Knowledge-intensive services exports	49.5	42.9	28.6	35.2	68.1	58.1	42.5	76.1	53.9	30.0	41.1	17.6	33.3	40.2	35.6	14.2	73.6	28.8
3.2.4 Sales of new to market and new to firm innovations	12.4	11.2	4.2	13.4	22.1	13.0	7.8	9.3	11.8	14.3	13.5	10.0	11.0	11.4	5.0	5.5	7.9	9.7
3.2.5 License and patent revenues from abroad	0.65	0.63	0.05	0.13	0.70	0.78	0.04	2.28	0.02	0.07	0.42	0.04	0.18	0.01	0.04	0.07	1.22	0.89

	EU28	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK	TR	IS	NO	CH	RS	MK
ENABLERS																		
Human resources																		
1.1.1 New doctorate graduates	1.8	0.2	2.0	2.2	0.6	2.1	1.8	1.9	2.4	2.7	2.8	2.4	0.4	0.9	2.2	3.4	0.8	0.5
1.1.2 Population completed tertiary education	36.9	26.0	43.1	27.3	40.5	29.2	22.8	40.1	26.9	45.1	48.3	47.6	19.5	43.9	48.8	46.1	24.7	23.1
1.1.3 Youth with upper secondary level education	81.0	76.1	78.2	87.4	89.7	69.9	79.7	91.5	91.2	85.9	86.2	82.9	55.0	59.1	73.7	85.2	83.4	86.4
Open, excellent and attractive research systems																		
1.2.1 International scientific co-publications	363	467	1525	1314	237	803	188	1096	427	1490	1791	1070	89	2825	1844	3028	326	157
1.2.2 Scientific publications among top 10% most cited	11.0	5.3	15.6	11.1	3.8	9.9	3.5	6.9	4.2	11.5	12.7	13.4	7.0	11.6	11.5	16.5	n/a	3.8
1.2.3 Non-EU doctorate students	25.5	2.6	24.5	9.0	1.9	13.7	2.0	6.1	1.5	7.9	24.0	30.8	2.5	23.9	33.5	50.2	7.1	3.9
Finance and support																		
1.3.1 R&D expenditure in the public sector	0.72	0.39	0.84	0.86	0.48	0.59	0.27	0.61	0.44	1.01	1.01	0.55	0.50	1.10	0.81	0.90	0.68	0.20
1.3.2 Venture capital investments	0.062	n/a	0.068	0.017	0.036	0.042	0.008	n/a	n/a	0.083	0.078	0.119	n/a	n/a	0.084	0.065	n/a	n/a
FIRM ACTIVITIES																		
Firm investments																		
2.1.1 R&D expenditure in the business sector	1.29	0.46	1.14	1.93	0.38	0.65	0.12	1.98	0.38	2.29	2.19	1.05	0.42	1.33	0.89	2.17	0.23	0.02
2.1.2 Non-R&D innovation expenditure	0.69	1.20	0.18	0.46	1.04	0.60	0.30	0.48	0.79	0.37	0.79	0.30	2.59	n/a	0.24	2.01	2.82	0.90
Linkages & entrepreneurship																		
2.2.1 SMEs innovating in-house	28.7	29.0	38.9	31.8	10.1	33.8	10.6	25.8	15.0	36.5	38.3	n/a	22.5	n/a	20.3	45.2	25.2	11.3
2.2.2 Innovative SMEs collaborating with others	10.3	5.1	14.5	15.3	3.9	6.8	1.2	14.6	6.7	14.3	12.7	22.4	4.2	17.5	7.9	9.4	7.6	9.6
2.2.3 Public-private co-publications	50.3	7.2	119.9	71.0	4.7	15.2	6.6	80.6	13.7	87.7	140.3	74.0	1.8	271.2	77.7	294.4	8.4	n/a
Intellectual Assets																		
2.3.1 PCT patent applications	3.78	0.22	6.00	4.96	0.42	0.67	0.20	2.79	0.50	9.37	9.16	3.17	0.46	3.24	2.80	8.51	n/a	0.05
2.3.2 PCT patent applications in societal challenges	0.98	0.00	1.73	1.09	0.09	0.18	0.05	0.90	0.11	1.65	1.88	0.85	0.14	0.81	0.57	2.47	n/a	0.00
2.3.3 Community trademarks	5.83	30.97	6.74	10.07	3.61	4.98	1.85	5.41	2.55	6.57	7.30	5.80	0.48	10.06	1.47	11.62	0.86	0.48
2.3.4 Community designs	1.13	1.72	1.48	1.65	1.62	0.87	0.19	1.82	0.51	1.82	1.99	0.97	0.07	0.50	0.18	0.93	0.01	0.03
OUTPUTS																		
Innovators																		
3.1.1 SMEs introducing product or process innovations	30.6	32.0	40.9	35.7	13.1	38.3	5.2	32.6	17.7	40.1	39.9	27.8	24.0	54.2	22.5	32.6	28.6	39.2
3.1.2 SMEs introducing marketing/organisational innovations	36.2	43.3	35.2	44.7	14.2	42.8	18.1	35.9	26.2	37.0	38.2	39.1	43.2	46.0	32.4	n/a	40.6	30.8
3.1.3 Employment fast-growing firms innovative sectors	17.9	17.5	16.2	17.2	19.3	14.7	16.0	15.3	19.2	17.1	18.9	18.6	13.3	16.7	15.4	19.0	n/a	n/a
Economic effects																		
3.2.1 Employment in knowledge-intensive activities	13.8	17.4	17.1	14.6	9.6	9.4	6.5	14.0	9.6	15.5	17.7	17.8	5.3	17.2	15.8	20.4	14.4	6.2
3.2.2 Medium & high-tech product exports	53.0	55.6	42.1	56.6	48.6	35.2	50.7	54.6	63.6	38.7	52.5	47.8	36.7	10.1	12.5	64.5	41.1	45.6
3.2.3 Knowledge-intensive services exports	49.5	19.6	30.6	26.6	33.6	33.5	49.2	25.7	31.3	43.9	41.8	66.4	22.9	53.6	61.2	25.0	47.7	24.6
3.2.4 Sales of new to market and new to firm innovations	12.4	10.2	11.8	9.8	6.3	12.4	3.7	10.5	19.6	11.1	6.1	14.1	33.6	6.1	5.2	16.1	12.4	9.9
3.2.5 License and patent revenues from abroad	0.65	0.21	3.75	0.24	0.06	0.02	0.06	0.12	0.01	1.39	1.09	0.46	0.00	0.92	0.08	3.24	0.09	0.09

Annex B: Growth performance

	EU28	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU
ENABLERS																		
Human resources																		
1.1.1 New doctorate graduates	2,6%	4,2%	10,4%	6,4%	9,2%	0,5%	5,2%	7,6%	6,7%	6,5%	5,1%	18,5%	5,5%	0,0%	14,0%	6,7%	-1,9%	3,7%
1.1.2 Population completed tertiary education	3,6%	0,4%	2,2%	10,7%	1,9%	3,6%	4,3%	3,5%	3,8%	1,0%	1,5%	6,5%	3,4%	0,5%	1,8%	3,8%	1,7%	7,7%
1.1.3 Youth with upper secondary level education	0,5%	0,1%	0,9%	-0,1%	0,5%	0,9%	0,3%	0,6%	0,9%	0,5%	0,5%	0,1%	0,4%	1,0%	0,9%	0,4%	0,0%	0,2%
Open, excellent and attractive research systems																		
1.2.1 International scientific co-publications	6,7%	6,5%	3,5%	7,9%	8,3%	6,0%	12,3%	7,7%	8,7%	9,4%	5,5%	12,2%	7,2%	14,4%	7,6%	9,8%	23,1%	4,6%
1.2.2 Scientific publications among top 10% most cited	1,5%	2,9%	0,4%	4,6%	1,8%	1,1%	4,0%	1,7%	4,7%	5,0%	1,8%	4,6%	2,9%	-3,0%	6,3%	11,1%	16,5%	1,5%
1.2.3 Non-EU doctorate students	3,5%	2,4%	-5,6%	4,3%	6,2%	0,1%	25,8%	-2,6%	0,0%	4,8%	3,5%	8,1%	19,1%	28,1%	32,0%	-9,7%	-0,1%	-1,1%
Finance and support																		
1.3.1 R&D expenditure in the public sector	1,9%	3,6%	-3,9%	8,2%	5,0%	3,5%	6,0%	0,7%	2,2%	1,6%	-0,4%	-1,9%	0,5%	3,3%	3,9%	3,2%	1,0%	-2,5%
1.3.2 Venture capital investments	-7,9%	-2,6%	-28,0%	-29,7%	-0,8%	-5,2%	n/a	1,9%	-34,5%	-16,9%	-2,6%	n/a	-13,0%	n/a	n/a	n/a	-13,3%	7,3%
FIRM ACTIVITIES																		
Firm investments																		
2.1.1 R&D expenditure in the business sector	1,9%	3,4%	18,8%	4,8%	1,8%	2,1%	7,5%	5,2%	2,3%	-1,2%	1,6%	6,1%	3,4%	-3,5%	-9,0%	1,3%	-9,8%	10,7%
2.1.2 Non-R&D innovation expenditure	1,9%	2,0%	-6,8%	-2,7%	-4,4%	6,3%	-10,4%	-12,1%	2,5%	-7,9%	-3,1%	1,5%	-1,0%	-17,0%	2,0%	8,0%	-23,3%	-0,5%
Linkages & entrepreneurship																		
2.2.1 SMEs innovating in-house	-0,8%	-1,3%	-3,7%	-0,3%	0,0%	-2,6%	-4,2%	0,0%	-2,9%	-6,4%	-0,6%	-3,3%	1,0%	-4,1%	-0,6%	-3,5%	-0,1%	-2,5%
2.2.2 Innovative SMEs collaborating with others	2,5%	4,7%	-6,9%	-0,1%	2,1%	3,7%	-1,9%	0,4%	-1,0%	2,6%	-2,3%	-3,6%	1,7%	-7,4%	-3,0%	-4,4%	-7,3%	-2,1%
2.2.3 Public-private co-publications	2,3%	1,3%	14,4%	7,9%	2,9%	2,7%	-1,1%	5,9%	0,6%	4,2%	1,3%	9,5%	1,5%	15,9%	-2,8%	8,8%	9,7%	3,1%
Intellectual Assets																		
2.3.1 PCT patent applications	-0,4%	0,6%	3,5%	1,9%	-0,6%	-1,2%	6,9%	1,9%	4,0%	3,6%	1,1%	-11,9%	1,1%	18,7%	2,5%	3,2%	-0,3%	1,3%
2.3.2 PCT patent applications in societal challenges	2,0%	0,2%	2,9%	-1,9%	-0,3%	2,4%	17,9%	3,8%	20,3%	6,2%	2,4%	-5,2%	1,0%	62,7%	4,5%	-11,2%	13,0%	-2,2%
2.3.3 Community trademarks	5,1%	5,5%	28,5%	15,5%	3,3%	4,8%	21,9%	4,5%	11,3%	3,3%	3,7%	26,0%	4,4%	14,4%	16,8%	18,4%	7,8%	10,2%
2.3.4 Community designs	1,7%	0,7%	60,8%	10,0%	0,3%	-0,1%	24,0%	2,9%	30,4%	-2,2%	0,7%	12,2%	0,2%	13,0%	0,6%	18,5%	10,0%	5,6%
OUTPUTS																		
Innovators																		
3.1.1 SMEs introducing product or process innovations	-1,7%	-1,0%	-3,8%	-0,5%	-0,7%	-3,1%	-4,6%	-2,9%	-3,2%	-6,5%	0,1%	-3,8%	2,3%	-3,6%	1,2%	-2,9%	-0,5%	-3,8%
3.1.2 SMEs introducing marketing/organisational innovations	-3,3%	-2,6%	1,6%	-2,6%	-1,6%	-5,4%	-6,1%	2,8%	-1,8%	-4,1%	1,0%	-3,2%	1,4%	-5,0%	7,5%	-1,7%	-2,1%	-0,6%
3.1.3 Employment fast-growing firms innovative sectors	0,5%	-1,5%	1,2%	1,9%	-1,6%	-0,4%	0,3%	0,2%	-0,1%	-0,6%	0,8%	0,0%	-1,6%	-1,5%	-2,9%	-1,4%	-5,0%	0,7%
Economic effects																		
3.2.1 Employment in knowledge-intensive activities	0,6%	0,4%	1,5%	2,0%	0,4%	-0,3%	3,3%	0,7%	2,1%	0,8%	0,6%	1,3%	-0,2%	2,8%	4,2%	2,6%	0,8%	0,0%
3.2.2 Medium & high-tech product exports	-0,8%	-1,1%	3,0%	0,2%	1,0%	0,1%	2,0%	-1,3%	-6,4%	-1,8%	-0,6%	-0,7%	-0,3%	-1,2%	2,3%	-0,9%	-2,3%	-1,1%
3.2.3 Knowledge-intensive services exports	0,7%	-0,2%	8,1%	-0,9%	0,5%	1,4%	3,1%	0,0%	0,6%	0,0%	3,3%	2,4%	-0,5%	2,8%	-0,5%	-1,4%	-1,0%	3,3%
3.2.4 Sales of new to market and new to firm innovations	-0,8%	2,8%	-12,0%	-1,3%	11,2%	-5,5%	-7,7%	-4,2%	-10,5%	-1,4%	0,2%	-3,7%	2,8%	-1,1%	5,9%	-11,1%	-6,2%	-4,1%
3.2.5 License and patent revenues from abroad	9,8%	7,8%	7,7%	31,1%	1,9%	18,8%	1,2%	28,2%	-1,1%	-1,0%	6,8%	-11,0%	18,5%	-31,7%	-2,1%	61,1%	3,8%	9,2%

	EU28	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK	TR	IS	NO	CH	RS	MK
ENABLERS																		
Human resources																		
1.1.1 New doctorate graduates	2,6%	10,4%	6,3%	1,4%	-7,0%	-3,0%	6,0%	6,8%	10,4%	-2,0%	2,2%	2,6%	10,4%	17,0%	7,8%	0,4%	7,9%	7,6%
1.1.2 Population completed tertiary education	3,6%	3,3%	0,6%	3,7%	7,3%	6,8%	9,1%	5,2%	9,3%	-0,3%	2,9%	3,9%	7,3%	2,7%	2,2%	4,0%	6,1%	10,3%
1.1.3 Youth with upper secondary level education	0,5%	3,6%	0,1%	0,3%	-0,3%	1,2%	0,5%	0,3%	0,0%	0,2%	0,0%	0,7%	2,6%	2,6%	1,0%	1,3%	0,0%	1,9%
Open, excellent and attractive research systems																		
1.2.1 International scientific co-publications	6,7%	11,3%	7,8%	7,8%	4,2%	13,0%	11,7%	9,3%	7,6%	7,1%	6,3%	5,8%	10,8%	10,8%	10,1%	8,0%	3,5%	3,3%
1.2.2 Scientific publications among top 10% most cited	1,5%	46,3%	2,0%	1,9%	3,2%	4,5%	3,2%	5,9%	6,7%	-0,6%	-0,1%	1,0%	9,1%	0,4%	1,4%	1,9%	n/a	18,3%
1.2.3 Non-EU doctorate students	3,5%	4,7%	2,3%	3,6%	-4,4%	13,0%	-5,1%	11,3%	14,4%	10,4%	8,8%	1,6%	-1,9%	9,5%	6,3%	2,1%	-2,5%	2,3%
Finance and support																		
1.3.1 R&D expenditure in the public sector	1,9%	10,0%	0,3%	3,2%	3,8%	-0,5%	-2,0%	-0,7%	7,2%	1,0%	2,0%	-1,2%	4,4%	0,0%	0,9%	4,5%	-1,2%	1,5%
1.3.2 Venture capital investments	-7,9%	n/a	-6,1%	-3,6%	-0,1%	-7,8%	-20,4%	n/a	n/a	-3,8%	-13,7%	-10,2%	n/a	n/a	-5,4%	-11,5%	n/a	n/a
FIRM ACTIVITIES																		
Firm investments																		
2.1.1 R&D expenditure in the business sector	1,9%	2,8%	2,5%	2,1%	12,2%	5,7%	-5,6%	1,5%	8,8%	-0,5%	-2,5%	0,4%	10,4%	0,1%	1,7%	0,4%	6,3%	0,0%
2.1.2 Non-R&D innovation expenditure	1,9%	1,3%	-6,5%	-0,4%	1,2%	-6,4%	-16,9%	-11,5%	-8,8%	-5,8%	2,7%	0,0%	42,6%	n/a	12,6%	8,2%	19,7%	0,0%
Linkages & entrepreneurship																		
2.2.1 SMEs innovating in-house	-0,8%	4,3%	5,2%	-3,6%	-7,3%	-0,1%	-7,3%	0,0%	-2,5%	-1,6%	0,5%	n/a	-3,1%	n/a	-3,4%	7,0%	-1,4%	0,0%
2.2.2 Innovative SMEs collaborating with others	2,5%	-1,6%	2,1%	-2,4%	-11,9%	0,2%	-11,8%	-0,5%	-1,0%	-8,9%	-3,7%	11,1%	-3,1%	0,0%	-2,9%	0,0%	11,7%	0,0%
2.2.3 Public-private co-publications	2,3%	28,5%	4,6%	4,6%	8,7%	7,4%	13,8%	8,8%	8,7%	-0,7%	-0,5%	0,5%	3,3%	7,9%	4,7%	3,2%	22,0%	n/a
Intellectual Assets																		
2.3.1 PCT patent applications	-0,4%	-8,6%	-1,5%	0,9%	6,0%	15,0%	1,5%	3,0%	0,3%	-2,4%	0,9%	-1,7%	4,9%	-4,1%	-3,7%	-0,6%	n/a	-10,0%
2.3.2 PCT patent applications in societal challenges	2,0%	-3,3%	9,0%	3,2%	-0,5%	22,1%	-1,1%	2,7%	-1,9%	6,9%	-1,6%	-1,1%	22,1%	-10,5%	-1,4%	0,6%	n/a	4,9%
2.3.3 Community trademarks	5,1%	20,9%	4,8%	6,4%	9,7%	3,1%	21,8%	25,0%	17,5%	7,1%	5,8%	4,6%	14,4%	16,7%	6,8%	2,7%	9,5%	19,7%
2.3.4 Community designs	1,7%	31,1%	0,3%	2,9%	12,1%	4,4%	29,0%	15,2%	6,5%	4,9%	1,9%	2,6%	-1,8%	5,9%	-10,0%	-8,6%	-23,3%	0,0%
OUTPUTS																		
Innovators																		
3.1.1 SMEs introducing product or process innovations	-1,7%	3,1%	3,1%	-4,1%	-6,2%	-0,2%	-17,2%	0,4%	-2,7%	-1,5%	-0,3%	1,5%	-2,9%	0,0%	-4,0%	-7,7%	6,6%	0,0%
3.1.2 SMEs introducing marketing/organisational innovations	-3,3%	4,5%	2,8%	-2,9%	-9,7%	-3,1%	-9,1%	-1,3%	-1,1%	-1,1%	0,6%	3,7%	-2,2%	0,0%	0,7%	n/a	12,3%	0,0%
3.1.3 Employment fast-growing firms innovative sectors	0,5%	0,3%	-0,8%	1,0%	1,6%	0,5%	0,7%	0,1%	-0,1%	-1,1%	-1,5%	1,6%	0,2%	-0,5%	-1,7%	0,1%	n/a	n/a
Economic effects																		
3.2.1 Employment in knowledge-intensive activities	0,6%	1,5%	1,7%	0,8%	0,9%	0,9%	2,2%	2,0%	-0,7%	0,0%	0,9%	0,8%	1,4%	-0,7%	2,0%	0,6%	3,2%	-2,1%
3.2.2 Medium & high-tech product exports	-0,8%	-4,3%	-1,2%	0,2%	-0,2%	-2,0%	4,5%	0,3%	1,6%	-3,7%	-1,7%	-3,5%	-1,1%	-6,2%	1,3%	0,8%	9,6%	10,1%
3.2.3 Knowledge-intensive services exports	0,7%	0,9%	-4,1%	1,8%	3,3%	5,1%	2,1%	3,4%	9,2%	7,4%	-0,7%	0,4%	7,5%	0,3%	2,1%	-5,6%	0,3%	-2,7%
3.2.4 Sales of new to market and new to firm innovations	-0,8%	-11,4%	1,2%	-4,5%	-6,5%	-1,0%	-20,6%	-3,3%	2,3%	-4,8%	-5,6%	7,5%	24,0%	-9,2%	1,1%	-6,1%	3,1%	0,0%
3.2.5 License and patent revenues from abroad	9,8%	-14,9%	14,7%	6,2%	27,2%	-9,4%	10,5%	15,8%	-38,2%	16,0%	2,0%	-2,8%	0,0%	-8,4%	-10,5%	7,4%	19,5%	11,3%

Annex C: Definitions of indicators

INDICATOR	DEFINITION NUMERATOR	DEFINITION DENOMINATOR	INTERPRETATION
	Source	Source	
1.1.1 New doctorate graduates (ISCED 6) per 1000 population aged 25-34	Number doctorate graduates (ISCED 6)	Population between 25 and 34 years	The indicator is a measure of the supply of new second-stage tertiary graduates in all fields of training. For most countries ISCED 6 captures PhD graduates only, with the exception of Finland, Portugal and Sweden where also non-PhD degrees leading to an award of an advanced research qualification are included.
	Eurostat	Eurostat	
1.1.2 Percentage population aged 30-34 having completed tertiary education	Number of persons in age class with completed first or second stage of tertiary education (ISCED 5 and 6)	Population between 30 and 34 years	This is a general indicator of the supply of advanced skills. It is not limited to science and technical fields because the adoption of innovations in many areas, in particular in the service sectors, depends on a wide range of skills. International comparisons of educational levels however are difficult due to large discrepancies in educational systems, access, and the level of attainment that is required to receive a tertiary degree. The indicator focuses on a narrow share of the population aged 30 to 34 and will more easily and quickly reflect changes in educational policies leading to more tertiary graduates.
	Eurostat	Eurostat	
1.1.3 Percentage youth aged 20-24 having attained at least upper secondary education	Number of young people aged 20-24 years having 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	The indicator measures the qualification level of the population aged 20-24 years in terms of formal educational degrees. It provides a measure for the "supply" of human capital of that age group and for the output of education systems in terms of graduates. Completed upper secondary education is generally considered to be the minimum level required for successful participation in a knowledge-based society and is positively linked with economic growth.
	Eurostat	Eurostat	
1.2.1 International scientific co-publications per million population	Number of scientific publications with at least one co-author based abroad (where abroad is non-EU for the EU28)	Total population	International scientific co-publications are a proxy for the quality of scientific research as collaboration increases scientific productivity.
	Science-Metrix (Scopus)	Eurostat	
1.2.2 Scientific publications among the top-10% most cited publications worldwide as % of total scientific publications of the country	Number of scientific publications among the top-10% most cited publications worldwide	Total number of scientific publications	The indicator is a proxy for the efficiency of the research system as highly cited publications are assumed to be of higher quality. There could be a bias towards small or English speaking countries given the coverage of Scopus' publication data. Countries like France and Germany, where researchers publish relatively more in their own language, are more likely to underperform on this indicator as compared to their real academic excellence.
	Science-Metrix (Scopus)	Science-Metrix (Scopus)	
1.2.3 Non-EU doctorate students as a % of all doctorate students	For EU Member States: number of doctorate students from non-EU countries (for non-EU countries: number of non-national doctorate students)	Total number of doctorate students	The share of non-EU doctorate students reflects the mobility of students as an effective way of diffusing knowledge. Attracting high-skilled foreign doctorate students will add to creating a net brain gain and will secure a continuous supply of researchers.
	Eurostat	Eurostat	

INDICATOR	DEFINITION NUMERATOR	DEFINITION DENOMINATOR	INTERPRETATION
	Source	Source	
1.3.1 R&D expenditure in the public sector (% of GDP)	All R&D expenditures in the government sector (GOVERD) and the higher education sector (HERD)	Gross Domestic Product	R&D expenditure represents one of the major drivers of economic growth in a knowledge-based economy. As such, trends in the R&D expenditure indicator provide key indications of the future competitiveness and wealth of the EU. Research and development spending is essential for making the transition to a knowledge-based economy as well as for improving production technologies and stimulating growth.
	Eurostat	Eurostat	
1.3.2 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. Venture capital includes early stage (seed + start-up) and expansion and replacement capital	Gross Domestic Product	The amount of venture capital is a proxy for the relative dynamism of new business creation. In particular for enterprises using or developing new (risky) technologies venture capital is often the only available means of financing their (expanding) business.
	Eurostat	Eurostat	Comment: Two-year averages have been used
2.1.1 R&D expenditure in the business sector (% of GDP)	All R&D expenditures in the business sector (BERD)	Gross Domestic Product	The indicator captures the formal creation of new knowledge within firms. It is particularly important in the science-based sector (pharmaceuticals, chemicals and some areas of electronics) where most new knowledge is created in or near R&D laboratories.
	Eurostat	Eurostat	
2.1.2 Non-R&D innovation expenditures (% of turnover)	Sum of total innovation expenditure for enterprises, in thousand Euros and current prices excluding intramural and extramural R&D expenditures	Total turnover for all enterprises	This indicator measures non-R&D innovation expenditure as percentage of total turnover. Several of the components of innovation expenditure, such as investment in equipment and machinery and the acquisition of patents and licenses, measure the diffusion of new production technology and ideas.
	Eurostat (CIS)	Eurostat (CIS)	
2.2.1 SMEs innovating in-house (% of SMEs) ¹⁴	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	This indicator measures the degree to which SMEs, that have introduced any new or significantly improved products or production processes, have innovated in-house. The indicator is limited to SMEs because almost all large firms innovate and because countries with an industrial structure weighted towards larger firms tend to do better.
	Eurostat (CIS)	Eurostat (CIS)	
2.2.2 Innovative SMEs collaborating with others (% of SMEs)	Sum of SMEs with innovation co-operation activities, i.e. those firms that had any co-operation agreements on innovation activities with other enterprises or institutions in the three years of the survey period	Total number of SMEs	This indicator measures the degree to which SMEs are involved in innovation co-operation. Complex innovations, in particular in ICT, often depend on the ability to draw on diverse sources of information and knowledge, or to collaborate on the development of an innovation. This indicator measures the flow of knowledge between public research institutions and firms and between firms and other firms. The indicator is limited to SMEs because almost all large firms are involved in innovation co-operation.
	Eurostat (CIS)	Eurostat (CIS)	

¹⁴ The 2010 Methodology report provides detailed instructions how to calculate this indicator using tabulated CIS data as available from Eurostat's Statistics Database (http://ec.europa.eu/enterprise/policies/innovation/files/ius-methodology-report_en.pdf).

Annex C: Definitions of indicators

INDICATOR	DEFINITION NUMERATOR	DEFINITION DENOMINATOR	INTERPRETATION
	Source	Source	
2.2.3 Public-private co-publications per million population	Number of public-private co-authored research publications. 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	This indicator captures public-private research linkages and active collaboration activities between business sector researchers and public sector researchers resulting in academic publications.
	CWTS (Thomson Reuters)	Eurostat	
2.3.1 PCT patent applications per billion GDP (in PPS€)	Number of patent applications filed under the PCT, at international phase, designating the European Patent Office (EPO). Patent counts are based on the priority date, the inventor's country of residence and fractional counts	Gross Domestic Product in Purchasing Power Standard	The capacity of firms to develop new products will determine their competitive advantage. One indicator of the rate of new product innovation is the number of patents. This indicator measures the number of PCT patent applications.
	OECD	Eurostat	
2.3.2 PCT patent applications in societal challenges per billion GDP (in PPS€)	Number of PCT patent applications in Environment-related technologies and Health. Patents in Environment-related technologies include those in General Environmental Management (air, water, waste), Energy generation from renewable and non-fossil sources, Combustion technologies with mitigation potential (e.g. using fossil fuels, biomass, waste, etc.), Technologies specific to climate change mitigation, Technologies with potential or indirect contribution to emissions mitigation, Emissions abatement and fuel efficiency in transportation and Energy efficiency in buildings and lighting. Patents in health-related technologies include those in Medical technology (IPC codes (8th edition) A61[B, C, D, F, G, H, J, L, M, N], H05G) and Pharmaceuticals (IPC codes A61K excluding A61K8)	Gross Domestic Product in Purchasing Power Standard	This indicator measures PCT applications in health technology and environment-related technologies and is relevant as increased numbers of patent applications in health technology and environment-related technologies will be necessary to meet the societal needs of an ageing European society and sustainable growth.
	OECD	Eurostat	
2.3.3 Community trademarks per billion GDP (in PPS€)	Number of new community trademarks applications	Gross Domestic Product in Purchasing Power Standard	Trademarks are an important innovation indicator, especially for the service sector. The Community trademark gives its proprietor a uniform right applicable in all Member States of the European Union through a single procedure which simplifies trademark policies at European level. It fulfils the three essential functions of a trademark: it identifies the origin of goods and services, guarantees consistent quality through evidence of the company's commitment vis-à-vis the consumer, and is a form of communication, a basis for publicity and advertising.
	Office for Harmonization in the Internal Market	Eurostat	Comment: two-year averages have been used

INDICATOR	DEFINITION NUMERATOR	DEFINITION DENOMINATOR	INTERPRETATION
	Source	Source	
2.3.4 Community designs per billion GDP (in PPSE)	Number of new community designs applications	Gross Domestic Product in Purchasing Power Standard	A design is the outward appearance of a product or part of it resulting from the lines, contours, colours, shape, texture, materials and/or its ornamentation. A product can be any industrial or handicraft item including packaging, graphic symbols and typographic typefaces but excluding computer programs. It also includes products that are composed of multiple components, which may be disassembled and reassembled. Community design protection is directly enforceable in each Member State and it provides both the option of an unregistered and a registered Community design right for one area encompassing all Member States.
	Office for Harmonization in the Internal Market	Eurostat	Comment: two-year averages have been used
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	Technological innovation, as measured by the introduction of new products (goods or services) and processes, is a key ingredient to innovation in manufacturing activities. Higher shares of technological innovators should reflect a higher level of innovation activities.
	Eurostat (CIS)	Eurostat (CIS)	
3.1.2 SMEs introducing marketing or organisational innovations (% of SMEs)	Number of SMEs who introduced a new marketing innovation or organisational innovation to one of their markets	Total number of SMEs	The Community Innovation Survey mainly asks firms about their technological innovation. Many firms, in particular in the services sectors, innovate through other non-technological forms of innovation. Examples of these are marketing and organisational innovations. This indicator captures the extent that SMEs innovate through non-technological innovation.
	Eurostat (CIS)	Eurostat (CIS)	
3.1.3 Employment in fast-growing enterprises in innovative sectors (% of total employment)	Employment in fast-growing enterprises in innovative sectors is calculated through sector-specific innovation coefficients, reflecting the level of innovativeness of each sector, serving as a proxy for distinguishing innovative enterprises. These coefficients are weighted with sectoral shares of employment in fast-growing enterprises, providing an indication of the dynamism of fast-growing firms in innovative sectors. Fast-growing enterprises are defined as firms with average annualised growth in number of employees of more than 10 % a year, over a three-year period, and with 10 or more employees at the beginning of the observation period (period of growth). ¹⁵	Total employment	This indicator provides an indication of the dynamism of fast-growing firms in innovative sectors as compared to all fast-growing business activities. It captures the capacity of a country to transform rapidly its economy to respond to new needs and to take advantage of emerging demand.
	Eurostat	Eurostat	

¹⁵ The economic sectors included are the three-digit NACE business economy sectors as identified by the national statistical office based on national business register data and based on the number of employees in these enterprises. More details are provided in section 3.4 of the Staff Working Document SWD(2013) 325 on "Developing an indicator of innovation output" http://ec.europa.eu/research/press/2013/pdf/staff_working_document_indicator_of_innovation_output.pdf

Annex C: Definitions of indicators

INDICATOR	DEFINITION NUMERATOR	DEFINITION DENOMINATOR	INTERPRETATION
	Source	Source	
3.2.1 Employment in knowledge-intensive activities (% of total employment)	Number of employed persons in knowledge-intensive activities in business industries. Knowledge-intensive activities are defined, based on EU Labour Force Survey data, as all NACE Rev.2 industries at 2-digit level where at least 33% of employment has a higher education degree (ISCED5 or ISCED6)	Total employment	Knowledge-intensive activities provide services directly to consumers, such as telecommunications, and provide inputs to the innovative activities of other firms in all sectors of the economy.
	Eurostat	Eurostat	
3.2.2 Exports of medium and high-technology products as a share of total product exports	Value of medium and high-tech exports, in national currency and current prices. High-tech exports include exports of the following SITC Rev.3 products: 266,267, 512, 513, 525, 533, 54, 553, 554, 562, 57, 58, 591, 593, 597, 598, 629, 653, 671, 672, 679, 71, 72, 731, 733, 737, 74, 751, 752, 759, 76, 77, 78, 79, 812, 87, 88 and 891	Value of total product exports	The indicator measures the technological competitiveness of the EU i.e. the ability to commercialise the results of research and development (R&D) and innovation in the international markets. It also reflects product specialisation by country. Creating, exploiting and commercialising new technologies are vital for the competitiveness of a country in the modern economy. Medium and high-technology products are key drivers for economic growth, productivity and welfare, and are generally a source of high value added and well-paid employment.
	Eurostat (ComExt) for MS, UN ComTrade for non-MS	Eurostat (ComExt) for MS, UN ComTrade for non-MS	
3.2.3 Knowledge-intensive services exports as % 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, 260, 263, 272, 274, 278, 279, 280 and 284	Total services exports as measured by credits in EBOPS 200	The indicator measures the competitiveness of the knowledge-intensive services sector. Knowledge-intensive services are defined as NACE classes 61-62 and 64-72. These can be related to the above-mentioned EBOPS classes using the correspondence table between NACE, ISIC and EBOPS as provided in the UN Manual on Statistics of International Trade in Services (UN, 2002).
	Eurostat	Eurostat	
3.2.4 Sales of new-to-market and new-to-firm innovations as % of turnover	Sum of total turnover of new or significantly improved products, either new to the firm or new to the market, for all enterprises	Total turnover for all enterprises	This indicator measures the turnover of new or significantly improved products and includes both products which are only new to the firm and products which are also new to the market. The indicator thus captures both the creation of state-of-the-art technologies (new to market products) and the diffusion of these technologies (new to firm products).
	Eurostat (CIS)	Eurostat (CIS)	
3.2.5 License and patent revenues from abroad as % of GDP	Export part of the international transactions in royalties and license fees	Gross Domestic Product	Trade in technology comprises four main categories: Transfer of techniques (through patents and licences, disclosure of know-how); Transfer (sale, licensing, franchising) of designs, trademarks and patterns; Services with a technical content, including technical and engineering studies, as well as technical assistance; and Industrial R&D. License and patent revenues capture disembodied technology exports.
	Eurostat	Eurostat	

Annex D: Country abbreviations

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

Annex E: Summary Innovation Index (SII) time series

	2007	2008	2009	2010	2011	2012	2013	2014	GROWTH RATE
EU28	0,519	0,519	0,529	0,543	0,545	0,542	0,554	0,555	0,98%
BE	0,573	0,580	0,580	0,611	0,616	0,619	0,629	0,619	1,10%
BG	0,184	0,201	0,214	0,244	0,249	0,206	0,202	0,229	3,14%
CZ	0,373	0,382	0,387	0,425	0,436	0,421	0,438	0,447	2,61%
DK	0,647	0,659	0,673	0,697	0,696	0,713	0,729	0,736	1,87%
DE	0,650	0,655	0,667	0,689	0,685	0,690	0,690	0,676	0,58%
EE	0,420	0,424	0,466	0,470	0,498	0,503	0,523	0,489	2,18%
IE	0,570	0,571	0,591	0,603	0,619	0,611	0,615	0,628	1,39%
EL	0,362	0,374	0,385	0,382	0,380	0,391	0,394	0,365	0,10%
ES	0,396	0,398	0,403	0,399	0,402	0,411	0,408	0,385	-0,38%
FR	0,544	0,549	0,557	0,573	0,579	0,578	0,586	0,591	1,17%
HR	0,296	0,305	0,314	0,314	0,318	0,304	0,309	0,313	0,82%
IT	0,393	0,399	0,412	0,427	0,428	0,446	0,448	0,439	1,61%
CY	0,449	0,495	0,473	0,491	0,504	0,503	0,489	0,445	-0,14%
LV	0,215	0,225	0,223	0,239	0,260	0,250	0,233	0,272	3,39%
LT	0,244	0,245	0,254	0,244	0,269	0,281	0,293	0,283	2,14%
LU	0,640	0,637	0,643	0,626	0,626	0,644	0,660	0,642	0,04%
HU	0,336	0,345	0,346	0,359	0,366	0,354	0,362	0,369	1,35%
MT	0,325	0,341	0,348	0,343	0,340	0,311	0,350	0,397	2,90%
NL	0,573	0,579	0,583	0,593	0,598	0,642	0,645	0,647	1,76%
AT	0,557	0,568	0,582	0,556	0,565	0,581	0,597	0,585	0,69%
PL	0,292	0,302	0,314	0,314	0,323	0,303	0,302	0,313	0,96%
PT	0,365	0,392	0,403	0,426	0,421	0,396	0,400	0,403	1,44%
RO	0,240	0,250	0,264	0,255	0,275	0,245	0,255	0,204	-2,27%
SI	0,446	0,468	0,485	0,496	0,519	0,509	0,532	0,534	2,61%
SK	0,316	0,327	0,334	0,316	0,323	0,373	0,354	0,360	1,91%
FI	0,672	0,672	0,669	0,676	0,682	0,684	0,680	0,676	0,09%
SE	0,723	0,737	0,742	0,758	0,764	0,766	0,760	0,740	0,34%
UK	0,565	0,568	0,575	0,607	0,607	0,613	0,625	0,636	1,72%
TR	0,160	0,167	0,174	0,182	0,186	0,192	0,198	0,257	6,98%
IS	0,603	0,621	0,631	0,624	0,618	0,620	0,597	0,624	0,49%
NO	0,434	0,445	0,460	0,482	0,482	0,483	0,487	0,479	1,42%
CH	0,802	0,815	0,822	0,808	0,806	0,801	0,804	0,810	0,14%
RS	0,251	0,252	0,259	0,271	0,261	0,334	0,355	0,385	6,31%
MK	0,183	0,200	0,208	0,203	0,221	0,237	0,231	0,235	3,69%

Annex F: Performance scores per dimension

	HUMAN RESOURCES	RESEARCH SYSTEMS	FINANCE AND SUPPORT	FIRM INVESTMENTS	LINKAGES & ENTRE- PRENEURSHIP	INTELLECTUAL ASSETS	INNOVATORS	ECONOMIC EFFECTS
EU28	0,598	0,542	0,556	0,454	0,473	0,624	0,505	0,601
BE	0,643	0,743	0,591	0,494	0,818	0,588	0,522	0,556
BG	0,497	0,126	0,089	0,198	0,057	0,405	0,170	0,195
CZ	0,595	0,258	0,420	0,410	0,425	0,409	0,490	0,515
DK	0,631	0,823	0,797	0,513	0,767	0,892	0,585	0,760
DE	0,625	0,492	0,629	0,807	0,623	0,782	0,718	0,707
EE	0,597	0,370	0,837	0,614	0,465	0,596	0,375	0,374
IE	0,824	0,634	0,372	0,333	0,556	0,513	0,784	0,770
EL	0,554	0,305	0,201	0,286	0,405	0,236	0,525	0,366
ES	0,441	0,534	0,395	0,202	0,238	0,492	0,235	0,426
FR	0,694	0,677	0,611	0,393	0,494	0,582	0,659	0,572
HR	0,690	0,163	0,304	0,340	0,299	0,218	0,287	0,269
IT	0,430	0,406	0,328	0,283	0,417	0,521	0,544	0,455
CY	0,603	0,366	0,228	0,153	0,475	0,553	0,448	0,451
LV	0,586	0,102	0,326	0,415	0,088	0,368	0,091	0,261
LT	0,722	0,175	0,630	0,347	0,174	0,258	0,110	0,177
LU	0,569	0,754	0,603	0,163	0,505	0,768	0,756	0,738
HU	0,491	0,205	0,349	0,390	0,182	0,344	0,323	0,555
MT	0,292	0,209	0,283	0,427	0,276	0,507	0,556	0,472
NL	0,644	0,843	0,634	0,270	0,736	0,779	0,520	0,605
AT	0,622	0,551	0,511	0,527	0,614	0,776	0,585	0,466
PL	0,578	0,128	0,365	0,359	0,069	0,420	0,249	0,324
PT	0,466	0,480	0,441	0,288	0,380	0,384	0,504	0,319
RO	0,471	0,113	0,147	0,080	0,043	0,171	0,159	0,322
SI	0,731	0,393	0,522	0,544	0,564	0,673	0,428	0,433
SK	0,675	0,167	0,337	0,287	0,200	0,268	0,372	0,484
FI	0,806	0,581	0,756	0,581	0,668	0,856	0,560	0,594
SE	0,846	0,826	0,746	0,684	0,727	0,901	0,630	0,590
UK	0,767	0,777	0,564	0,287	0,793	0,577	0,529	0,693
TR	0,107	0,175	0,402	0,588	0,167	0,155	0,345	0,317
IS	0,359	0,813	1,000	0,577	0,875	0,569	0,727	0,483
NO	0,671	0,899	0,649	0,232	0,406	0,356	0,324	0,380
CH	0,851	1,000	0,661	0,974	0,783	0,830	0,591	0,753
RS	0,412	0,185	0,598	0,546	0,285	0,084	0,490	0,482
MK	0,395	0,133	0,076	0,239	0,210	0,048	0,506	0,283

Annex G: International data

	EU28	AU	BR	CA	CN	IN	JP	KR	RU	SA	US
Human resources											
1.1.1 New doctorate graduates	1,8	2,0	0,5	1,3	2,2	n/a	1,1	1,5	0,4	0,2	1,8
1.1.2 Population completed tertiary education	29,5	41,3	17,2	52,6	10,6	9,8	46,6	41,7	53,5	6,4	43,1
Open, excellent and attractive research systems											
1.2.1 International scientific co-publications	363,3	n/a	67,0	n/a	47,6	12,4	226,4	349,3	80,5	n/a	455,2
1.2.2 Scientific publications among top 10% most cited	11,0	n/a	5,2	n/a	6,6	6,2	7,1	9,0	1,9	n/a	14,5
Finance and support											
1.3.1 R&D expenditure in the public sector	0,72	0,86	0,57	0,80	0,47	0,52	0,74	0,91	0,47	0,39	0,72
Firm investments											
2.1.1 R&D expenditure in the business sector	1,29	1,23	0,50	0,88	1,51	0,29	2,57	2,86	0,66	0,36	1,95
Linkages & entrepreneurship											
2.2.3 Public-private co-publications	50,3	36,51	1,83	50,74	2,55	0,75	51,10	54,46	1,76	3,14	87,23
Intellectual assets											
2.3.1 PCT patent applications	3,75	2,38	0,09	2,66	1,29	0,05	7,95	7,95	0,39	0,71	3,74
2.3.2 PCT patent applications in societal challenges	0,93	0,68	0,03	0,75	0,17	0,02	1,80	1,80	0,10	0,16	1,09
Economic effects											
3.2.2 Exports of medium & high-tech products	58,2	8,6	25,8	34,3	55,8	24,6	72,6	70,8	9,8	29,5	49,4
3.2.3 Exports of knowledge-intensive services	56,0	10,13	64,70	11,49	39,93	77,77	31,98	45,11	42,12	n/a	46,68
3.2.5 License and patent revenues from abroad	0,43	0,06	0,02	0,21	0,01	0,02	0,54	0,28	0,03	0,02	0,64
PERFORMANCE LEAD (EU=100)											
Human resources											
1.1.1 New doctorate graduates	112,9	25,5	70,6	124,0	100,0	63,7	85,4	22,4	8,7	98,3	
1.1.2 Population completed tertiary education	140,1	58,4	178,4	35,9	33,2	158,2	141,6	181,5	21,6	146,1	
Open, excellent and attractive research systems											
1.2.1 International scientific co-publications	100,0	18,4	100,0	13,1	3,4	62,3	96,2	22,2	100,0	125,3	
1.2.2 Scientific publications among top 10% most cited	100,0	46,9	100,0	60,2	56,1	64,3	81,6	17,7	100,0	132,0	
Finance and support											
1.3.1 R&D expenditure in the public sector	118,8	79,2	111,0	65,7	72,2	102,3	125,7	64,8	54,8	100,0	
Firm investments											
2.1.1 R&D expenditure in the business sector	95,6	39,1	68,4	117,1	22,2	199,1	221,9	50,9	27,7	151,1	
Linkages & entrepreneurship											
2.2.3 Public-private co-publications	72,7	3,6	101,0	5,1	1,5	101,7	108,4	3,5	6,3	173,6	
Intellectual assets											
2.3.1 PCT patent applications	63,5	2,4	70,7	34,4	1,2	211,8	211,8	10,4	18,8	99,6	
2.3.2 PCT patent applications in societal challenges	72,9	2,7	81,3	18,3	1,7	194,0	194,0	11,0	17,5	117,0	
Economic effects											
3.2.2 Exports of medium & high-tech products	14,8	44,3	59,0	95,9	42,2	124,8	121,6	16,9	50,7	84,8	
3.2.3 Exports of knowledge-intensive services	18,1	115,6	20,5	71,3	139,0	57,1	80,6	75,3	100,0	83,4	
3.2.5 License and patent revenues from abroad	13,2	5,3	48,2	3,0	4,1	125,9	65,9	7,7	4,1	150,9	
CHANGE IN PERFORMANCE LEAD											
Human resources											
1.1.1 New doctorate graduates	-0,1%	-16%	1,3%	-3,3%	n/a	0,8%	3,9%	-19%	-0,7%	1,3%	
1.1.2 Population completed tertiary education	2,3%	8,4%	0,5%	8,0%	-1,5%	0,7%	2,5%	-0,6%	-1,5%	-0,1%	
Open, excellent and attractive research systems											
1.2.1 International scientific co-publications	n/a	2,1%	n/a	7,0%	4,1%	-3,5%	1,8%	-6,5%	n/a	-2,7%	
1.2.2 Scientific publications among top 10% most cited	n/a	1,8%	n/a	2,8%	6,5%	-1,9%	0,0%	-0,4%	n/a	-1,5%	
Finance and support											
1.3.1 R&D expenditure in the public sector	-0,2%	0,5%	-3,0%	-1,4%	-2,5%	-1,5%	1,4%	2,6%	-0,7%	0,0%	
Firm investments											
2.1.1 R&D expenditure in the business sector	0,4%	-1,4%	-5,0%	0,9%	0,8%	-1,7%	0,3%	-3,3%	-7,1%	-0,2%	
Linkages & entrepreneurship											
2.2.3 Public-private co-publications	-2,6%	-2,5%	-3,9%	5,0%	-0,2%	-3,8%	-1,4%	-3,8%	0,4%	-2,3%	
Intellectual assets											
2.3.1 PCT patent applications	-4,8%	3,7%	0,4%	32,5%	4,1%	3,9%	13,4%	-3,6%	-7,3%	-1,3%	
2.3.2 PCT patent applications in societal challenges	-5,1%	2,6%	-3,0%	21,6%	1,2%	2,4%	17,0%	-4,1%	-3,9%	-3,8%	
Economic effects											
3.2.2 Exports of medium & high-tech products	-5,1%	-3,2%	-1,6%	0,8%	2,9%	-0,3%	0,2%	0,9%	-0,4%	-2,9%	
3.2.3 Exports of knowledge-intensive services	0,2%	4,6%	-0,5%	5,0%	-1,9%	-2,3%	-4,8%	-0,8%	n/a	1,3%	
3.2.5 License and patent revenues from abroad	-10%	4,6%	-7,5%	3,4%	-9,8%	-0,5%	-1,2%	-5,3%	-5,6%	-3,4%	

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