European Innovation Scoreboard 2017

Annex B
Performance per indicator

EUROPEAN COMMISSION

Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs

Directorate F – Innovation and Advanced Manufacturing

Unit F1 – Innovation Policy and Investment for Growth

E-mail: GROW-F1@ec.europa.eu

European Commission

B-1049 Brussels

This annex is part of the European Innovation Scoreboard 2017 report prepared by

Hugo Hollanders and Nordine Es-Sadki

Maastricht University
(Maastricht Economic and Social Research Institute on Innovation and Technology – MERIT)

as part of the European Innovation Scoreboards (EIS) project for the European Commission, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs.

Coordinated and guided by

Mark Nicklas, Head of Unit, Daniel Bloemers, Alberto Licciardello, and Marshall Hsia

Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs

Directorate F – Innovation and Advanced Manufacturing

Unit F1 – Innovation Policy and Investment for Growth

in close co-operation with

Román Arjona, Chief Economist, Marnix Surgeon, Deputy Head of Unit, and Richard Deiss

Directorate-General for Research and Innovation

Unit A4 – Analysis and monitoring of national research policies

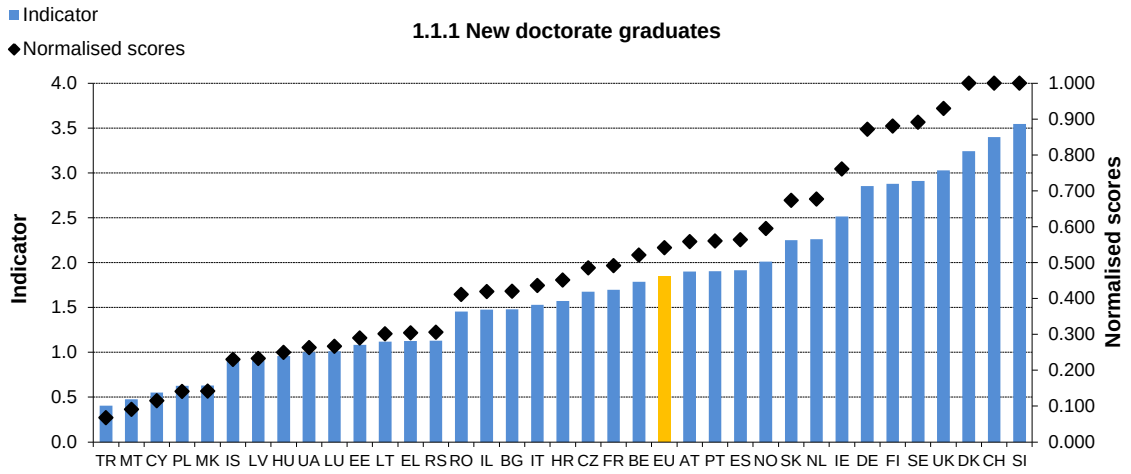
This report is a part of the European Innovation Scoreboards project for the Directorate-General Internal Market, Industry, Entrepreneurship and SMEs, Directorate F – Innovation and Advanced Manufacturing, Unit F1– Innovation Policy and Investment for Growth.

Annex B – Performance per indicator

This annex shows the static (most recent) and dynamic (over time) performance for each of the indicators. In the static graphs, real data and normalised scores are shown. Normalised scores are obtained by transforming real data such that the minimum value across all countries and years equals zero and the maximum value equals one. In the dynamic graphs, both the change between the most recent year and 2010, and between the most recent year and the previous year are shown. Performance changes over time ignore breaks in series as reported by Eurostat; data before a break have been replaced with the data in the year in which the break took place (cf. the section in the EIS 2017 Methodology Report explaining the calculation of the Summary Innovation Index).

1.1.1 New doctorate graduates per 1000 population aged 25-34

The indicator is a measure of the supply of new second-stage tertiary graduates in all fields of training (ISCED 8). For most countries, ISCED 8 captures PhD graduates.

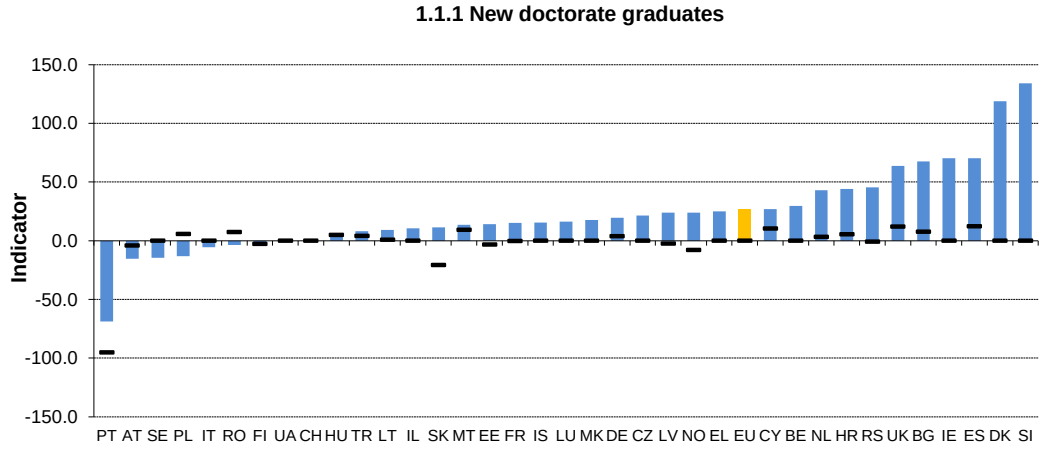


Performance for 2015 or most recent year available. Statistical outliers: Slovenia and Switzerland.

In 2015, on average 1.8 new PhD degrees were awarded in the EU per 1000 population aged 25-34. The highest scores are observed in Slovenia, Switzerland, Denmark, and the United Kingdom, with at least 3 new PhD graduates per 1000 population aged 25-34. In Turkey, Malta, Cyprus, Poland, and the Former Yugoslav Republic of Macedonia, performance is relatively weak with 0.6 or less new PhD graduates per 1000 population aged 25-34.

Performance change

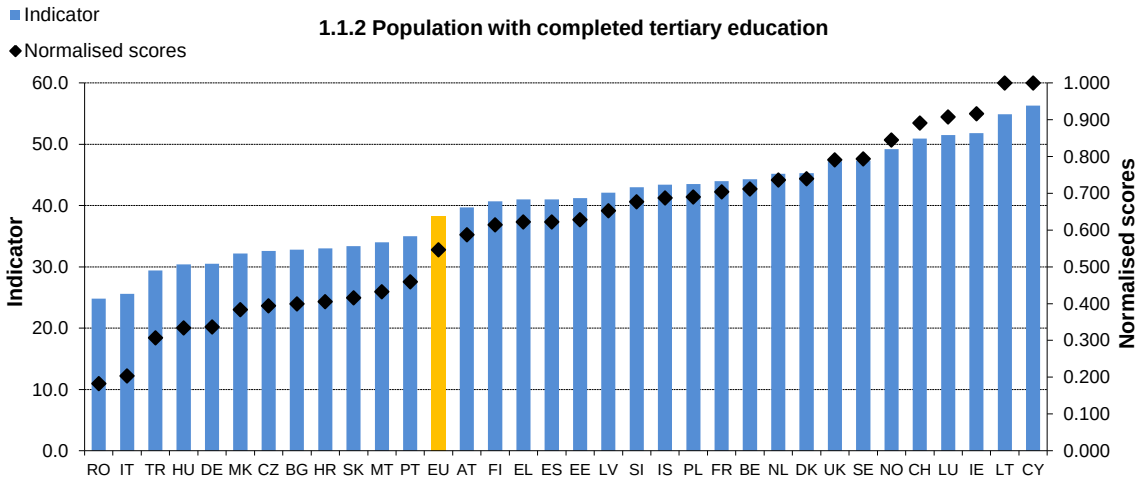
Compared to 2010, performance has increased for 28 countries and decreased for seven countries. Performance has increased most in Slovenia and Denmark, and has decreased most in Portugal. Compared to the previous year, performance has increased for 13 countries and decreased for nine countries, in particular in Portugal.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

1.1.2 Percentage population aged 25-34 having completed tertiary education

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. The indicator focuses on a relatively young age cohort of the population, aged 25 to 34, and will therefore easily and quickly reflect changes in educational policies leading to more or less tertiary graduates.

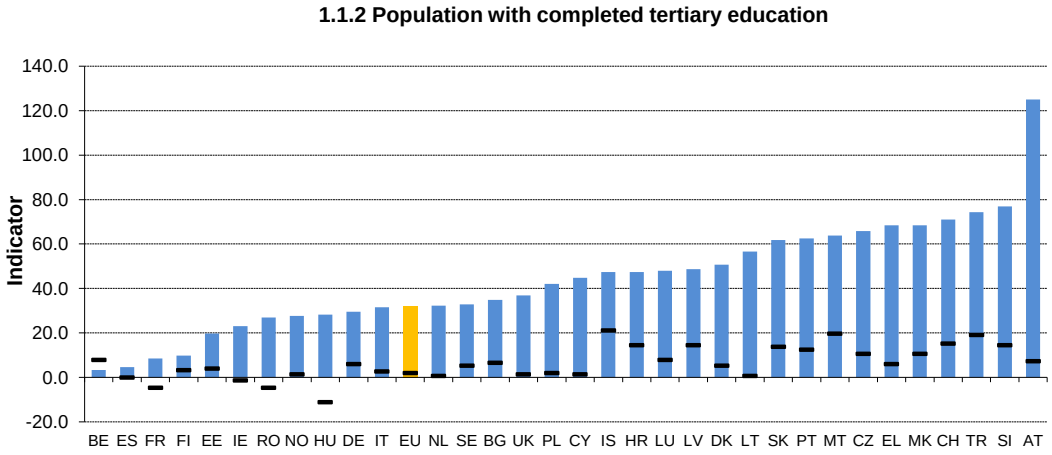


Performance for 2016 or most recent year available. No data for Israel, Serbia, and Ukraine.

On average, 38.2% of the EU population aged 25-34 have completed tertiary education. There are large differences between countries with tertiary attainment rates of 50% or more in Cyprus, Lithuania, Ireland, Luxembourg, and Switzerland, and rates below 30% in Romania, Italy, and Turkey.

Performance change

Compared to 2010, performance has increased for 34 countries, in particular for Austria. Compared to the previous year, performance has increased for 29 countries and decreased for four countries, in particular in Hungary.



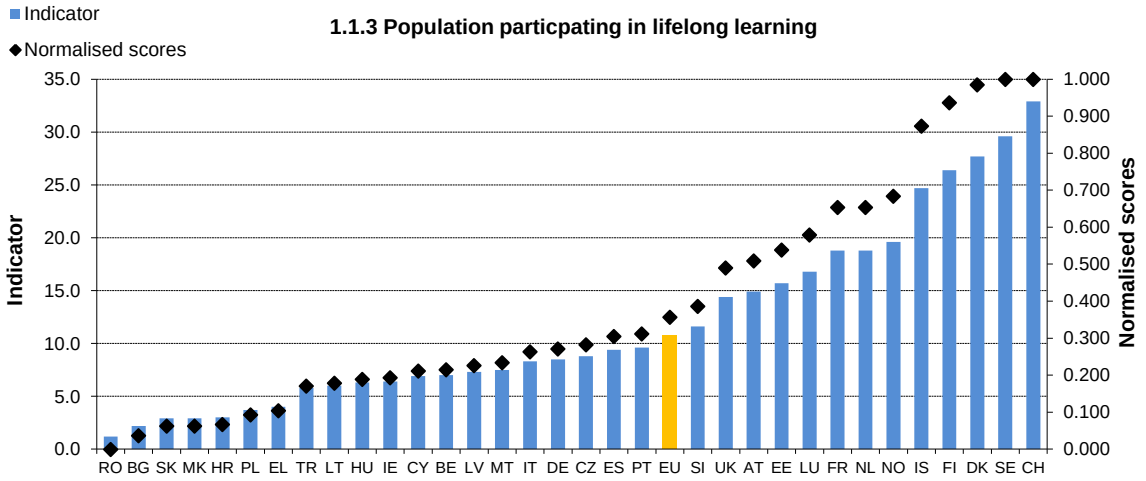
Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

For several countries, in particular Austria, changes over time are overstated, as a break in series in 2014 has not been corrected for in the calculation of the normalised scores for this indicator.

No data for Israel, Serbia, and Ukraine.

1.1.3 Percentage population aged 25-64 participating in lifelong learning

Lifelong learning encompasses all purposeful learning activity, whether formal, non-formal or informal, undertaken on an ongoing basis with the aim of improving knowledge, skills, and competence. The intention or aim to learn is the critical point that distinguishes these activities from non-learning activities, such as cultural or sporting activities.

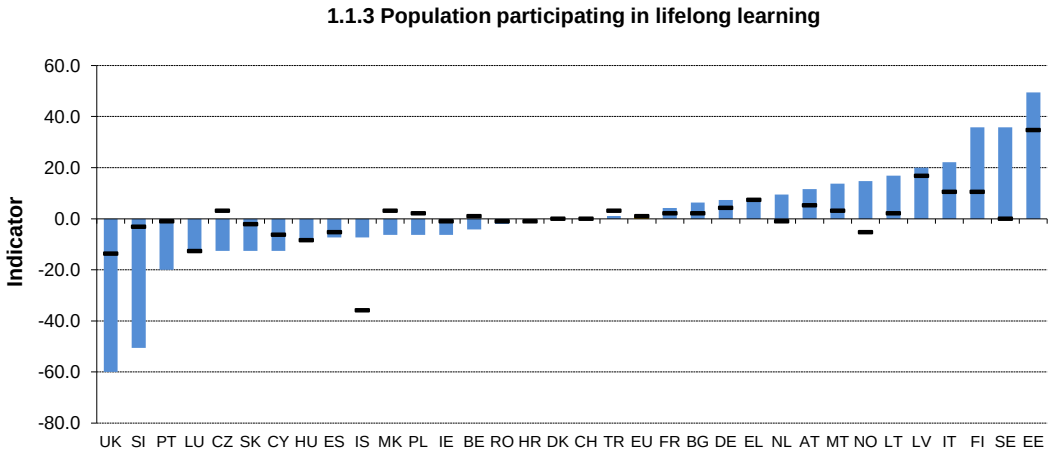


Performance for 2016 or most recent year available. No data for Israel, Serbia, and Ukraine. Statistical outliers: Sweden and Switzerland.

Almost 11% of the EU population aged 25-64 has participated in lifelong learning activities during the reference period. In Switzerland, Sweden, Denmark, Finland, and Iceland, shares are more than twice that of the EU at almost 25% or more. In Romania, Bulgaria, Slovakia, the Former Yugoslav Republic of Macedonia, Croatia, Poland, and Greece, less than 5% of the population aged 25-64 has participated in lifelong learning activities during the reference period.

Performance change

Compared to 2010, performance has increased for 16 countries and decreased for 15 countries. Performance has increased most in Estonia, Sweden, and Finland, and has decreased most in the United Kingdom and Slovenia. Compared to the previous year, performance has increased for 17 countries and decreased for 14 countries, in particular in Iceland.

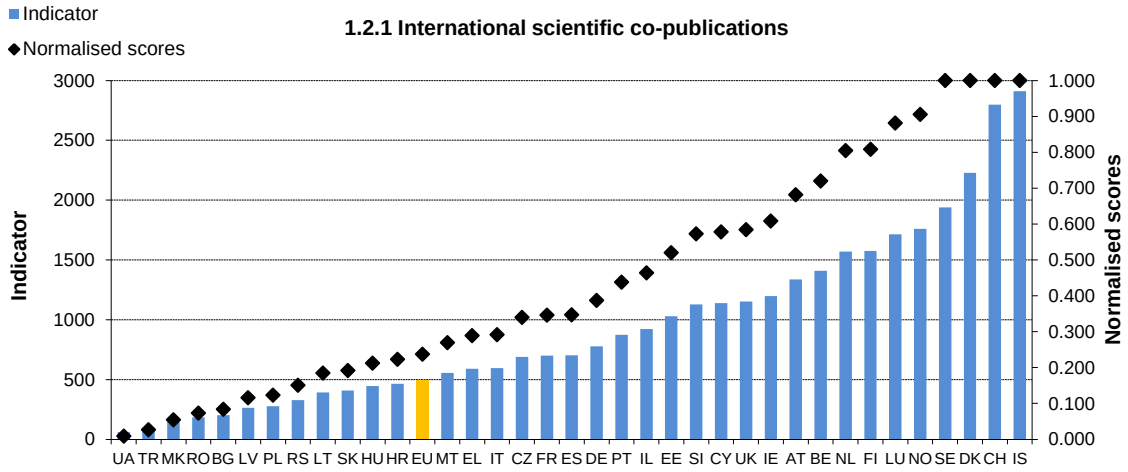


Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

No data for Israel, Serbia, and Ukraine.

1.2.1 International scientific co-publications per million population

International scientific co-publications are a proxy for the quality of scientific research, as collaboration increases scientific productivity.

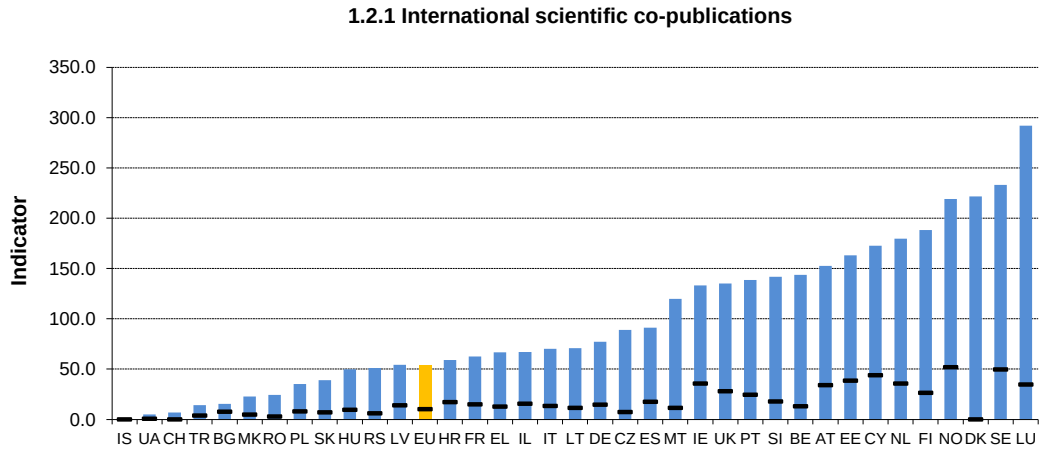


Performance for 2016 or most recent year available. Statistical outliers: Denmark, Iceland, and Switzerland.

There is a high spread in performance, with Switzerland and Iceland having more than 2,500 international scientific co-publications per million population, and five countries having less than 250 international scientific co-publications per million population. The EU average is relatively low, as here only co-publications with non-EU countries are included.

Performance change

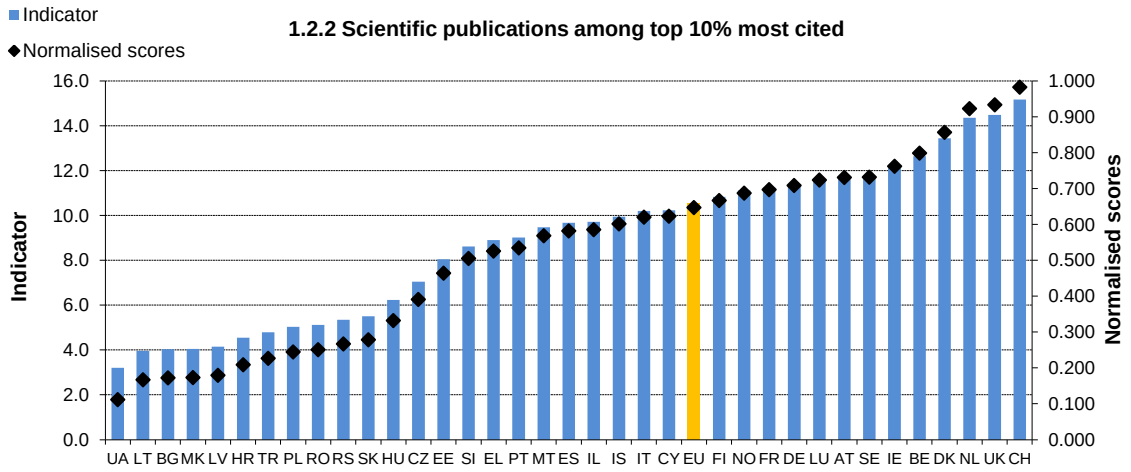
Compared to 2010, performance has increased for all 36 countries, in particular for Luxembourg, Sweden, Denmark and Norway. Compared to the previous year, performance has increased for 34 countries.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

1.2.2 Scientific publications among the top-10% most cited publications worldwide as percentage of total scientific publications of the country

The indicator is a measure 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.

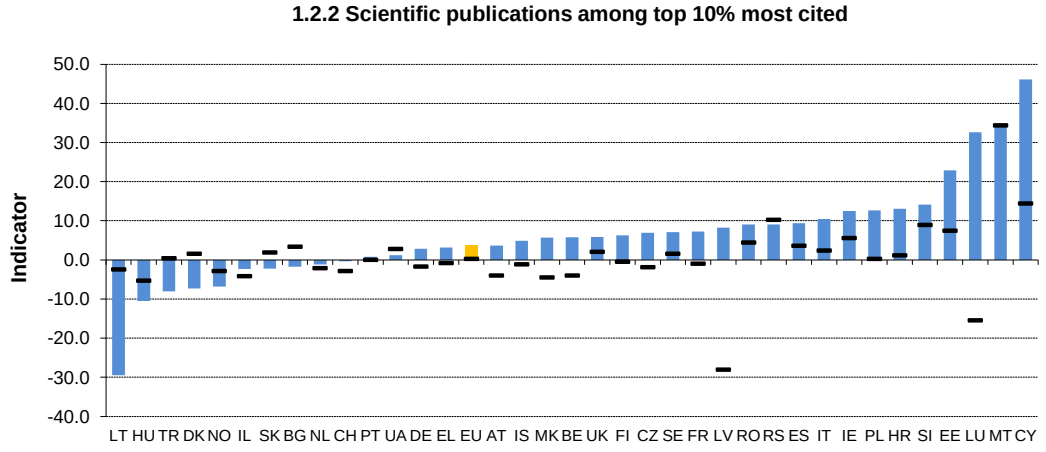


Performance for 2014 or most recent year available.

About 10.6% of the scientific publications in the EU, are among the top-10% most cited publications worldwide. The best performance is observed for Switzerland, the United Kingdom, and the Netherlands, where more than 14% of publications are among the top-10% most cited publications worldwide. Performance in Ukraine, Lithuania, Bulgaria, the Former Yugoslav Republic of Macedonia, and Latvia, is relatively weak with 4.1% or less publications among the top-10% most cited publications worldwide.

Performance change

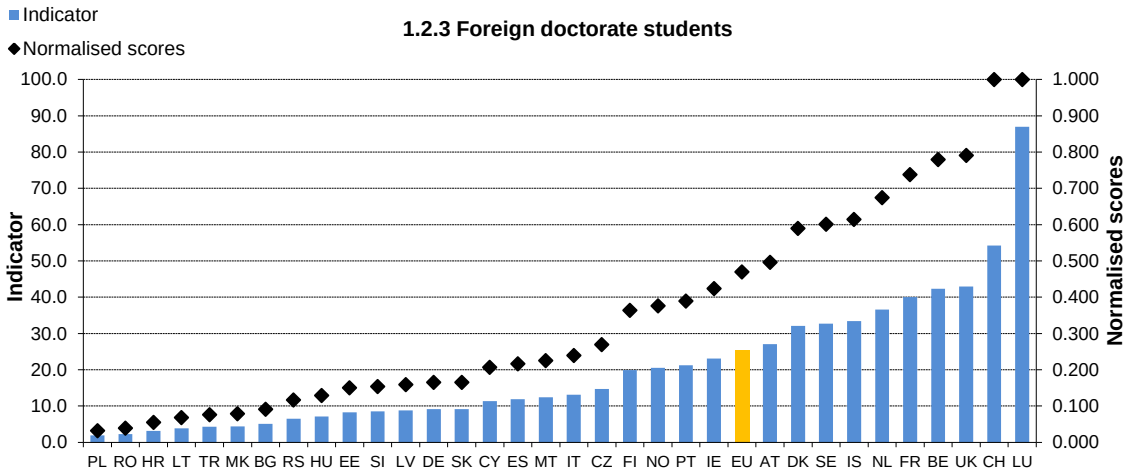
Compared to 2010, performance has increased for 27 countries and decreased for ten countries. Performance has increased most in Cyprus, Malta, Luxembourg, and Estonia. It has decreased most strongly in Lithuania. Compared to the previous year, performance has increased for 19 countries and decreased for 18 countries, in particular in Latvia and Luxembourg.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

1.2.3 Foreign doctorate students as percentage of all doctorate students

The share of foreign doctorate students reflects the mobility of students as an effective way of diffusing knowledge. Attracting high-skilled foreign doctorate students will secure a continuous supply of researchers.

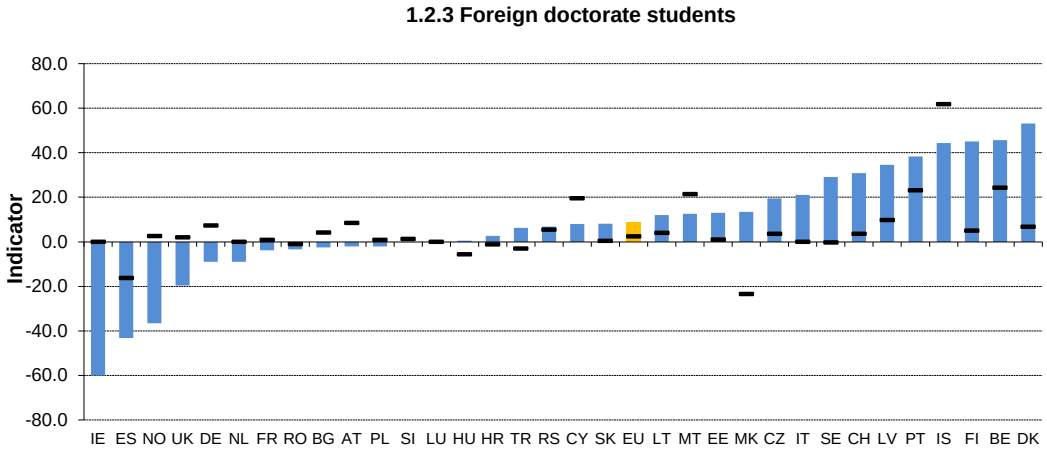


Performance for 2015 or most recent year available. No data for Greece, Israel, and Ukraine. Statistical outlier: Luxembourg.

The average share of foreign doctorate students in the EU is 25.6%. In Luxembourg, this share is close to 90%, and in Switzerland, the United Kingdom, Belgium, and France, this share is more than 40%. In Poland, Romania, Croatia, Lithuania, Turkey, and the Former Yugoslav Republic of Macedonia, the shares of foreign students are very small at rates below 5%.

Performance change

Compared to 2010, performance has increased for 21 countries and decreased for 12 countries. Performance has increased most in Denmark, Belgium, Finland, and Iceland, and has decreased most in Ireland, Spain, and Norway. Compared to the previous year, performance has increased for 23 countries and decreased for seven countries, in particular for the Former Yugoslav Republic of Macedonia and Spain.

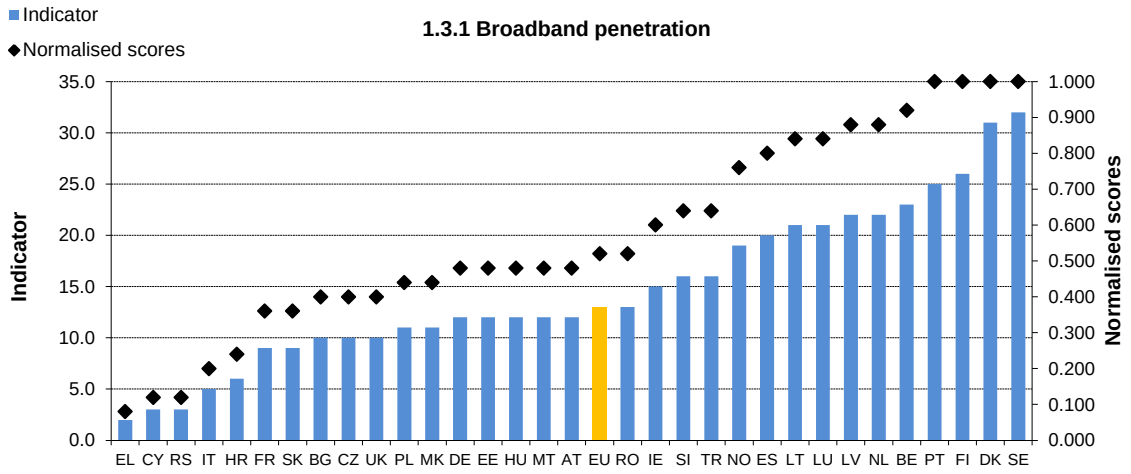


Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

No data for Greece, Israel, and Ukraine.

1.3.1 Broadband penetration

Realising Europe's full e-potential depends on creating the conditions for electronic commerce and the Internet to flourish. This indicator captures the relative use of this e-potential by the share of enterprises that have access to fast broadband.

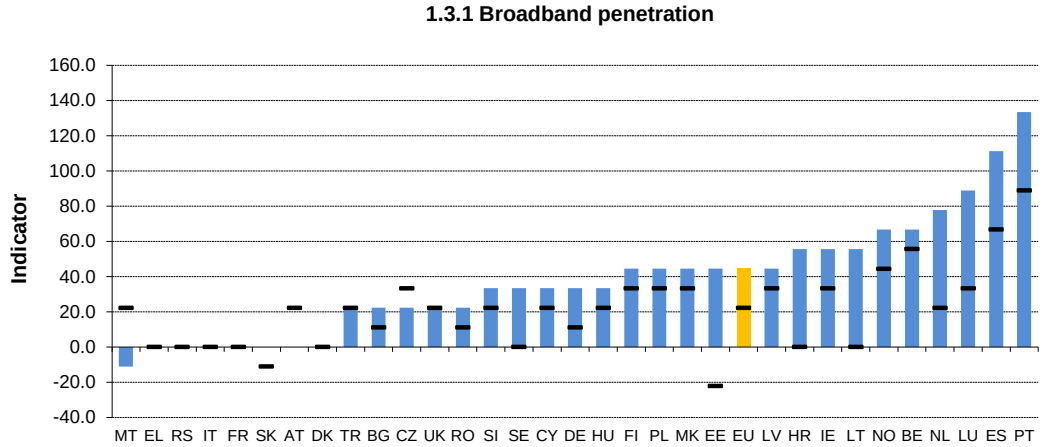


Performance for 2016 or most recent year available. No data for Iceland, Israel, Switzerland, and Ukraine. Statistical outliers: Denmark, Finland, and Sweden.

The average share of enterprises with fast broadband access is 13% in the EU. In Sweden, Denmark, Finland, and Portugal, these shares are 25% or more. Broadband penetration is less well developed in Greece, Cyprus, Serbia, Italy, and Croatia, with penetration rates between 2% and 6%.

Performance change

Compared to 2010, performance has increased for 25 countries and decreased for only one country (Malta). Performance has increased most in Portugal, Spain, and Luxembourg. Compared to the previous year, performance has increased for 23 countries and decreased for two countries (Estonia and Slovakia).

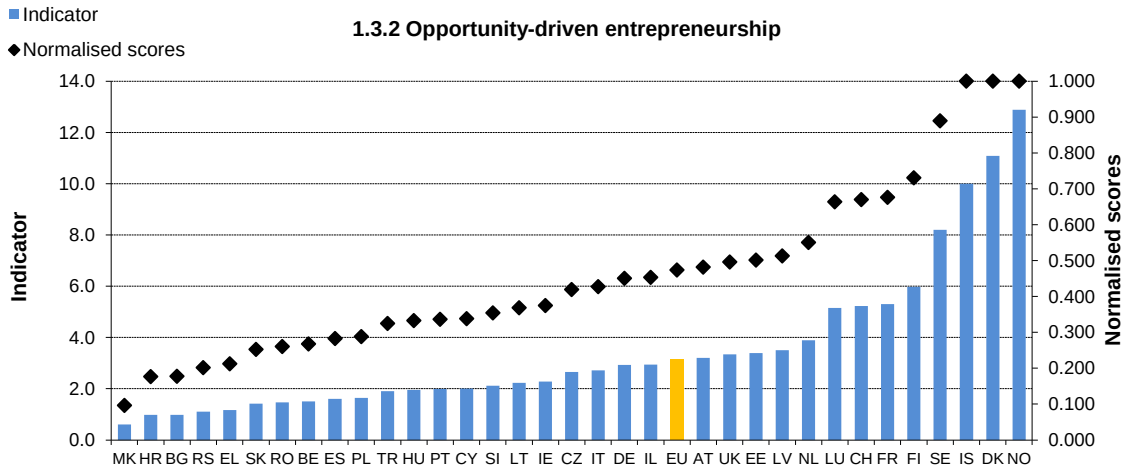


Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

No data for Iceland, Israel, Switzerland, and Ukraine.

1.3.2 Opportunity-driven entrepreneurship (Motivational index)

The Motivational index measures the relative degree of opportunity- or improvement-driven entrepreneurship using data from the Global Entrepreneurship Monitor. Improvement-driven entrepreneurship includes persons involved in entrepreneurial activities who claim to be driven by opportunity as opposed to finding no other option for work, and who indicate the main driver for being involved in this opportunity is being independent or increasing their income, rather than just maintaining their income.

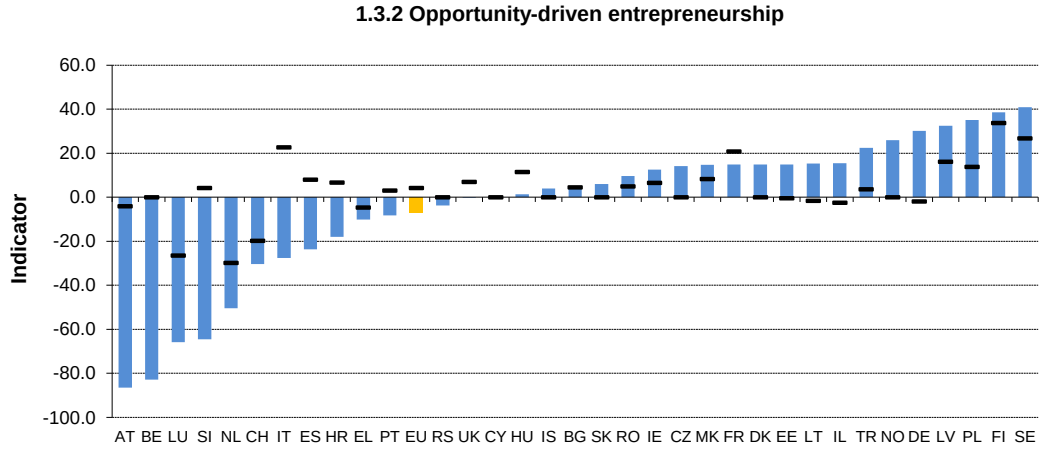


Performance for 2016 or most recent year available, using three-year averages, calculated as the average of the reference year itself and the two years before. No data for Malta and Ukraine. Statistical outliers: Denmark and Norway.

Opportunity-driven entrepreneurship is high in Norway, Denmark, Iceland, and Sweden, and low in the Former Yugoslav Republic of Macedonia, Croatia, Bulgaria, Serbia, and Greece.

Performance change

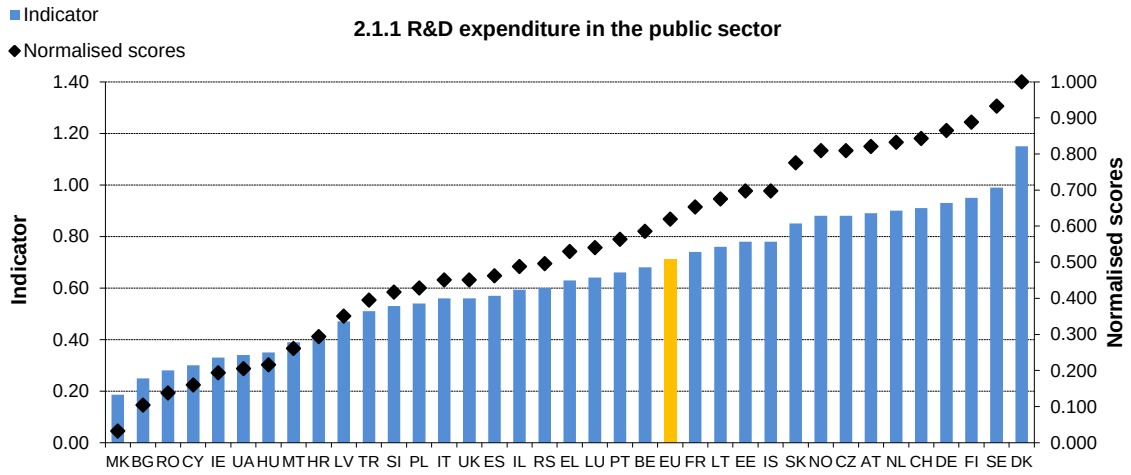
Compared to 2010, performance has increased for 20 countries and decreased for 14 countries. Performance has increased most in Sweden, Finland, and Poland, and decreased most in Austria, Belgium, Luxembourg, Slovenia, and the Netherlands. Compared to the previous year, performance has increased for 18 countries and decreased for nine countries, in particular in the Netherlands, Luxembourg, and Switzerland.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015. No data for Malta and Ukraine.

2.1.1 R&D expenditure in the public sector as percentage of GDP

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.

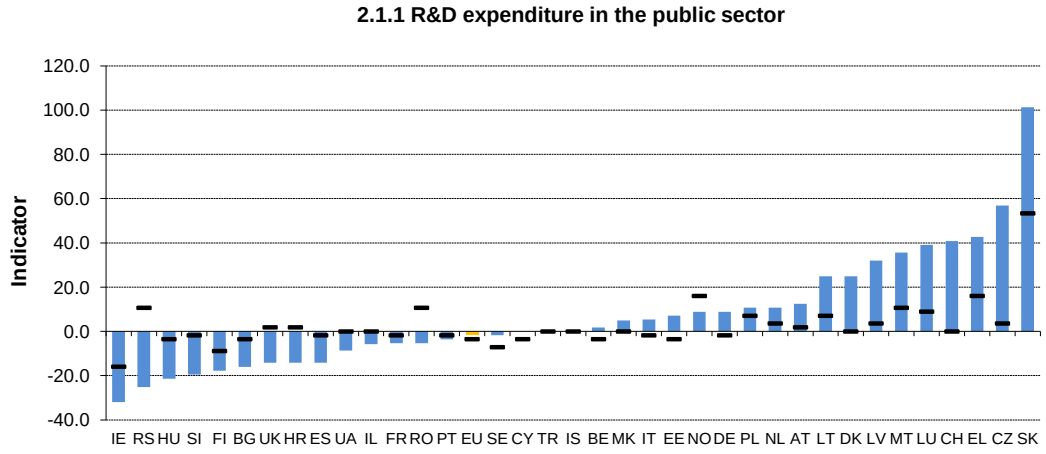


Performance for 2015 or most recent year available. Statistical outliers: Denmark.

The average R&D intensity in the public sector is 0.71% for the EU. R&D expenditure in the public sector is close to or above 1% of GDP in Denmark, Sweden, and Finland. In the Former Yugoslav Republic of Macedonia, Bulgaria, and Romania, R&D intensities in the public sector are below 0.30% of GDP.

Performance change

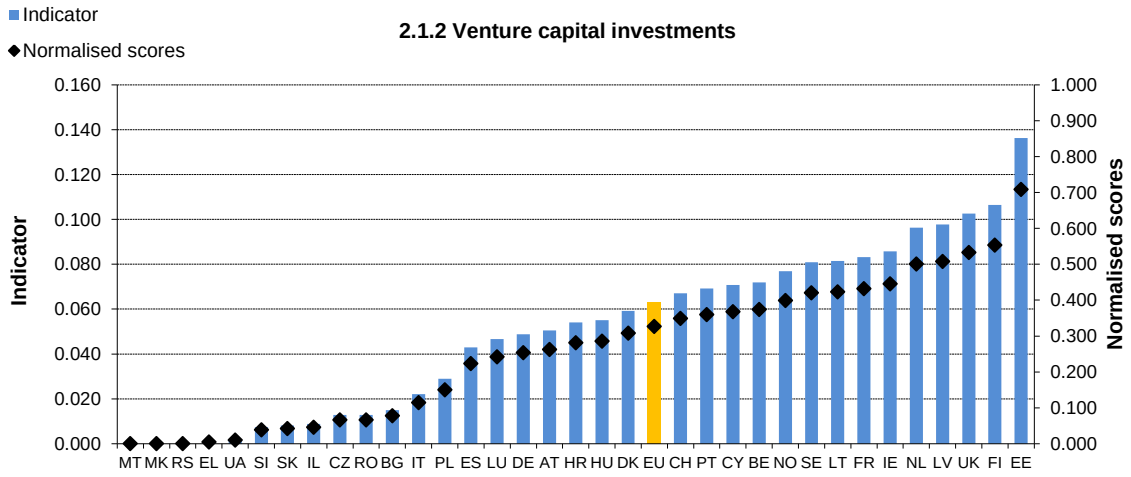
Compared to 2010, performance has increased for 18 countries and decreased for 16 countries. Performance has increased most in Slovakia and the Czech Republic, and decreased most in Ireland, Serbia, and Hungary. Compared to the previous year, performance has increased for 15 countries and decreased for 15 countries. Compared to the previous year, performance has increased most in Slovakia and decreased most in Ireland.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

2.1.2 Venture capital investment as percentage of GDP

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.

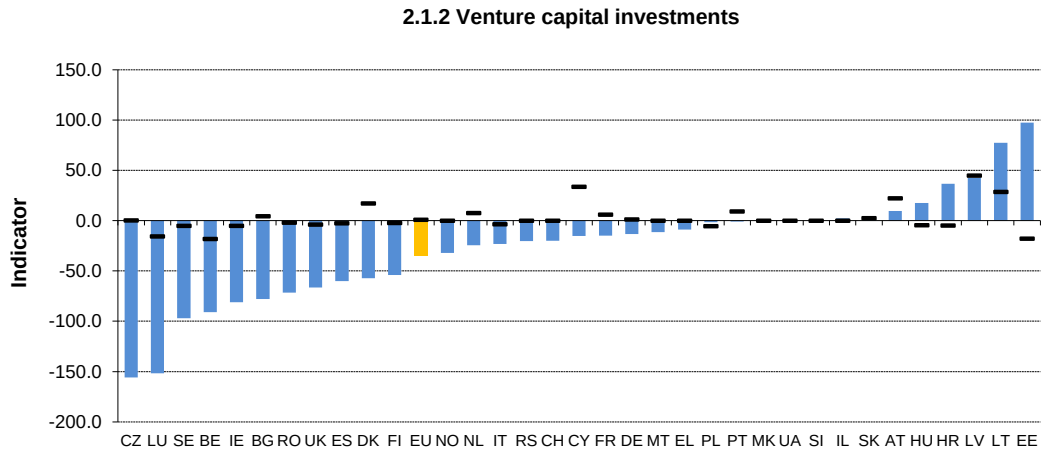


Performance for in 2015 or most recent year available, using three-year averages, calculated as the average of the reference year itself and the two years before. No data for Iceland and Turkey.

Average venture capital investments in the EU are 0.063% of GDP. Venture capital investments are high in Estonia, Finland, the United Kingdom, Latvia, and the Netherlands. Venture capital investments are close to zero in Malta, the Former Yugoslav Republic of Macedonia, Serbia, Greece, and Ukraine.

Performance change

Compared to 2010, performance has increased for nine countries and decreased for 24 countries. Performance has increased most in Estonia, Lithuania, Latvia, and Croatia, and has decreased most in the Czech Republic, Luxembourg, Sweden, and Belgium. Compared to the previous year, performance has increased for 13 countries and decreased for 14 countries.

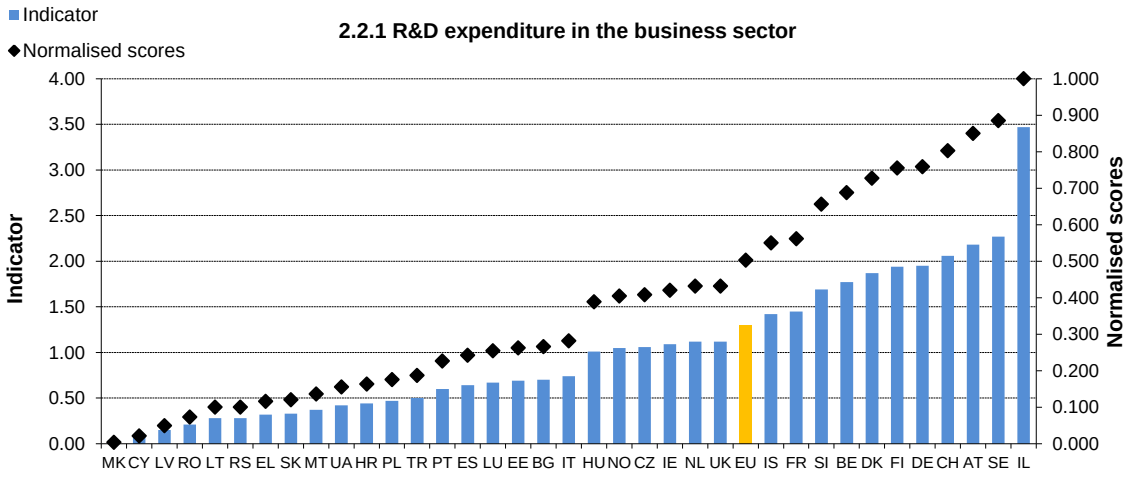


Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

No data for Iceland and Turkey.

2.2.1 R&D expenditure in the business sector as percentage of GDP

The indicator captures the formal creation of new knowledge within firms. It is particularly important in the science-based sectors (pharmaceuticals, chemicals and some areas of electronics), where most new knowledge is created in or near R&D laboratories.

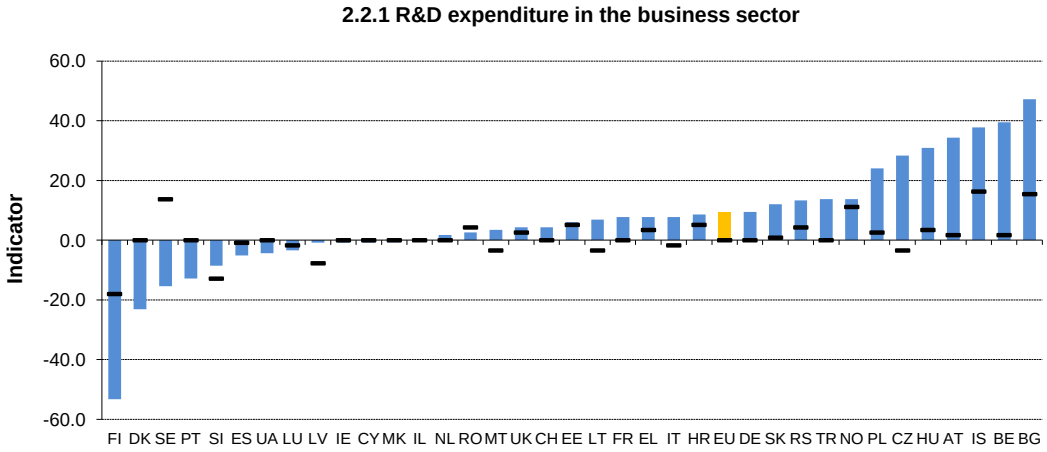


Performance for 2015 or most recent year available.

The R&D intensity in the business sector is above 2.00% of GDP in only four countries: Israel, Sweden, Austria, and Switzerland. The average R&D intensity in the business sector for the EU is 1.30%. For 12 countries, the intensity is below 0.50%, and it is particularly low in the Former Yugoslav Republic of Macedonia, Cyprus, and Latvia.

Performance change

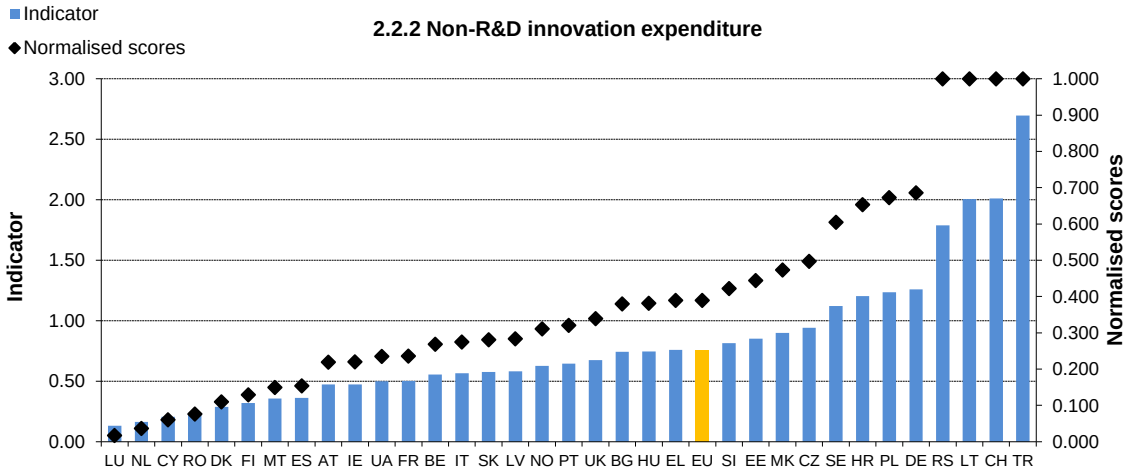
Compared to 2010, performance has increased for 24 countries and decreased for 12 countries. Performance has increased most in Bulgaria, Belgium, and Iceland, and has decreased most in Finland and Denmark. Compared to the previous year, performance has increased for 15 countries and decreased for nine countries.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

2.2.2 Non-R&D innovation expenditure as percentage of total turnover

This indicator measures non-R&D innovation expenditure as a 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.

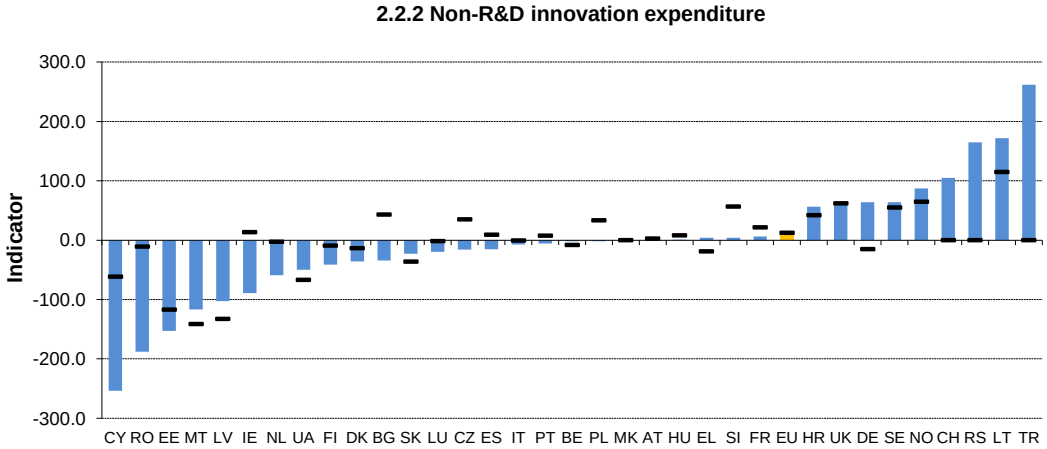


Performance for 2014 or most recent year available. No data for Iceland and Israel. Statistical outliers: Lithuania, Switzerland (2010) and Turkey.

On average, 0.76% of enterprises' total turnover is spent on non-R&D innovation activities in the EU. In Turkey, Switzerland, and Lithuania, this share is at or above 2%. In Luxembourg and the Netherlands, less than 0.2% of enterprises' total turnover is spent on innovation activities not involving R&D.

Performance change

Compared to 2010, performance has increased for 15 countries and decreased for 19 countries. Performance has increased most in Turkey, Lithuania, and Serbia, and has decreased most in Cyprus, Romania, and Estonia. Compared to the previous year, performance has increased for 16 countries and decreased for 15 countries.

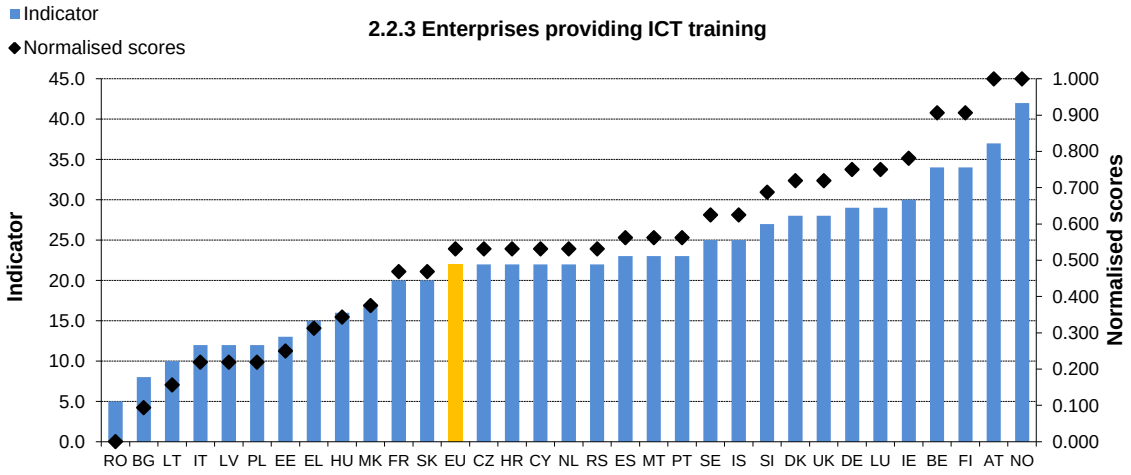


Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

No data for Iceland and Israel.

2.2.3 Enterprises providing training to develop or upgrade ICT skills of their personnel

ICT skills are particularly important for innovation in an increasingly digital economy. The share of enterprises providing training in that respect is a proxy for the overall skills development of employees.

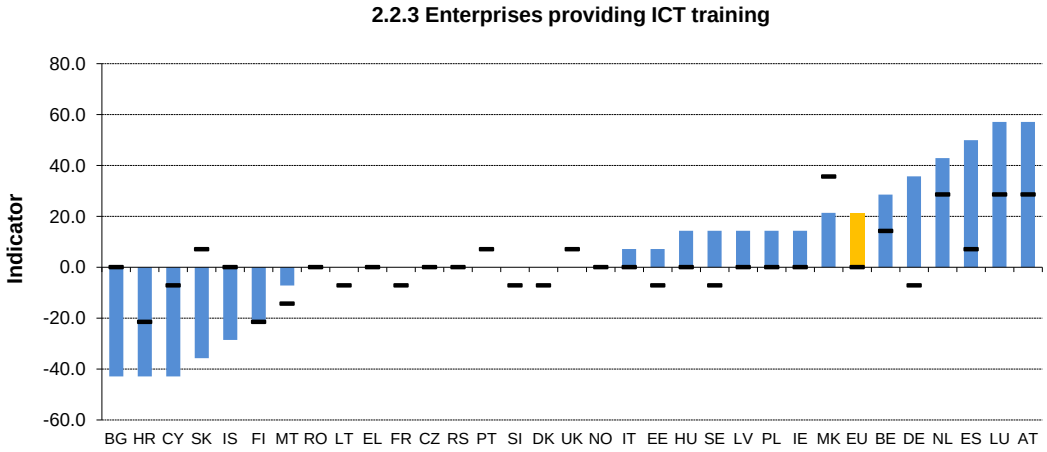


Performance for 2016 or most recent year available. No data for Israel, Switzerland, Turkey and Ukraine. Statistical outlier: Norway.

On average 22% of enterprises in the EU provide ICT training to their personnel. In Norway, Austria, Finland, and Belgium, this share is at least 34%. In Romania, Bulgaria, and Lithuania, this share is relatively low between 5% and 10%.

Performance change

Compared to 2010, performance has increased for 15 countries and decreased for seven countries. Performance has increased most in Austria, Luxembourg, and Spain, and has decreased most in Bulgaria, Croatia, and Cyprus. Compared to the previous year, performance has increased for nine countries and decreased for 11 countries.

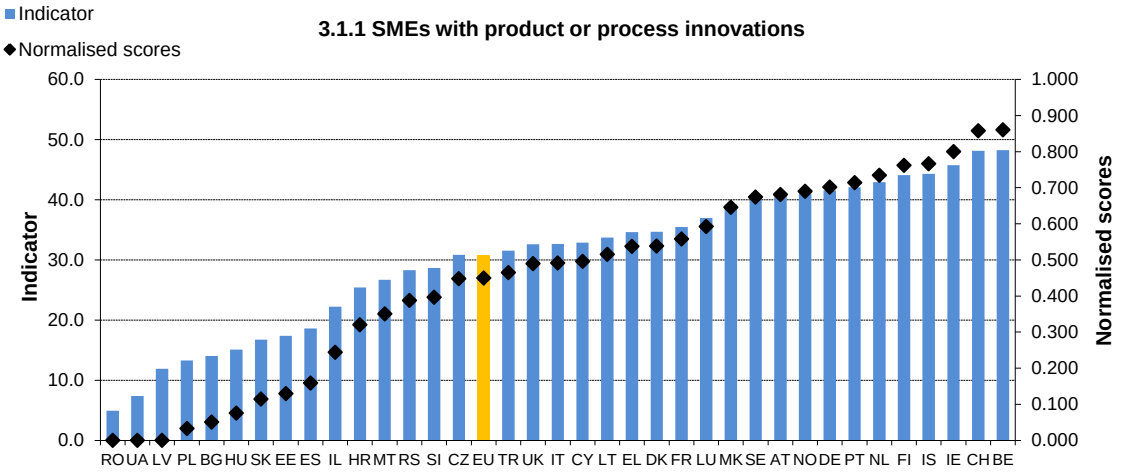


Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

No data for Israel, Switzerland, Turkey, and Ukraine.

3.1.1 SMEs introducing product or process innovations as percentage of SMEs

The introduction of new products (goods or services) and processes is traditionally seen as the most important type of innovation in industry. Higher shares of product and/or process innovators reflect a higher level of innovation activities.

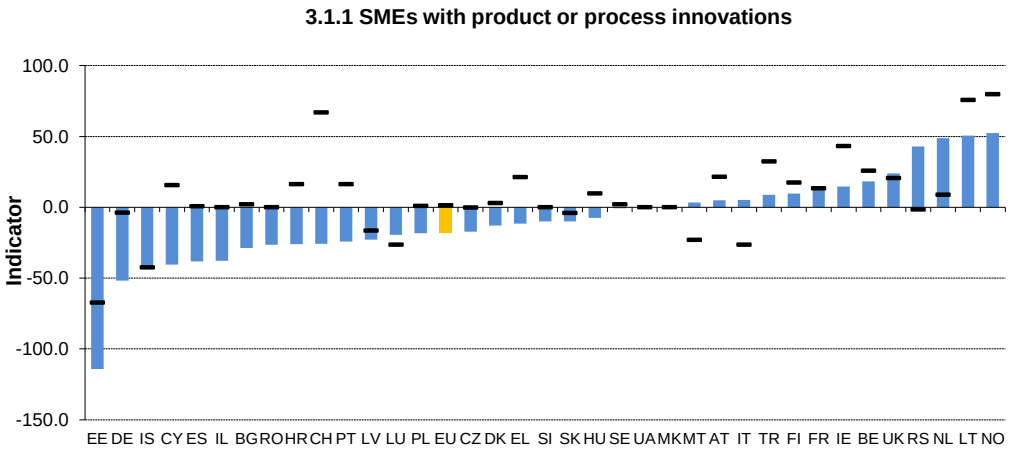


Performance for 2014 or most recent year available. Statistical outlier: Romania.

About 31% of EU SMEs have innovated by introducing at least one new or significantly improved product or process. In Belgium, Switzerland, and Ireland, more than 45% of SMEs have introduced a product or process innovation. In Romania, this share is only 5%, and in Ukraine, Latvia, Poland, and Bulgaria, it is below 15%.

Performance change

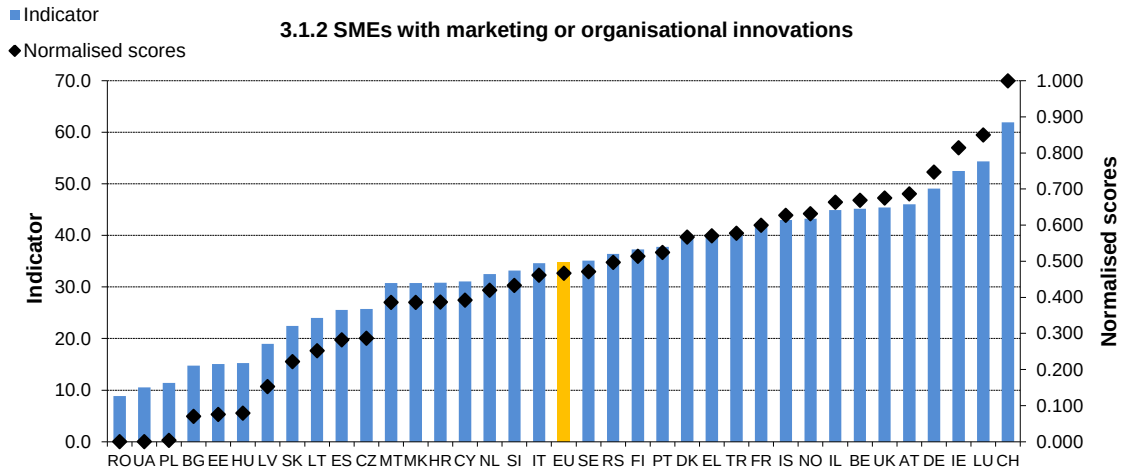
Compared to 2010, performance has increased for 13 countries and decreased for 22 countries. Performance has increased most in Norway, Lithuania, and the Netherlands, and has decreased most in Estonia. Compared to the previous year, performance has increased for 22 countries and decreased for ten countries. Compared to the previous year, performance has increased most in Norway, Lithuania, and Switzerland.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

3.1.2 SMEs introducing marketing or organisational innovations as percentage of SMEs

Many firms, in particular in the services sectors, innovate using marketing and organisational innovations. Marketing innovations involve significant changes in product design or packaging, product placement, product promotion or pricing. Organisational innovations include new organisational method in business practices, workplace organisation or external relations.

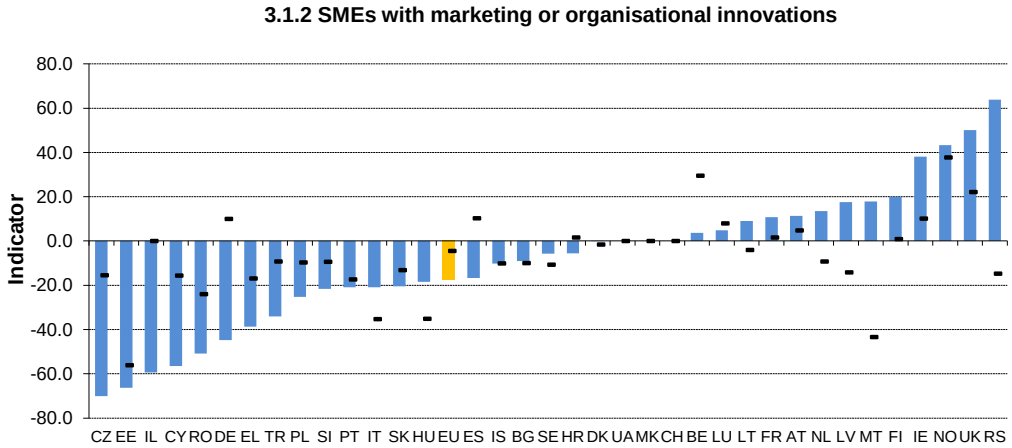


Performance for 2014 or most recent year available. Statistical outlier: Romania.

About 35% of EU SMEs have innovated by introducing a marketing or organisational innovation. In Switzerland, Luxembourg, and Ireland, more than 50% of SMEs have introduced such innovations, whereas in Romania, Ukraine, and Poland, this share is below 12%.

Performance change

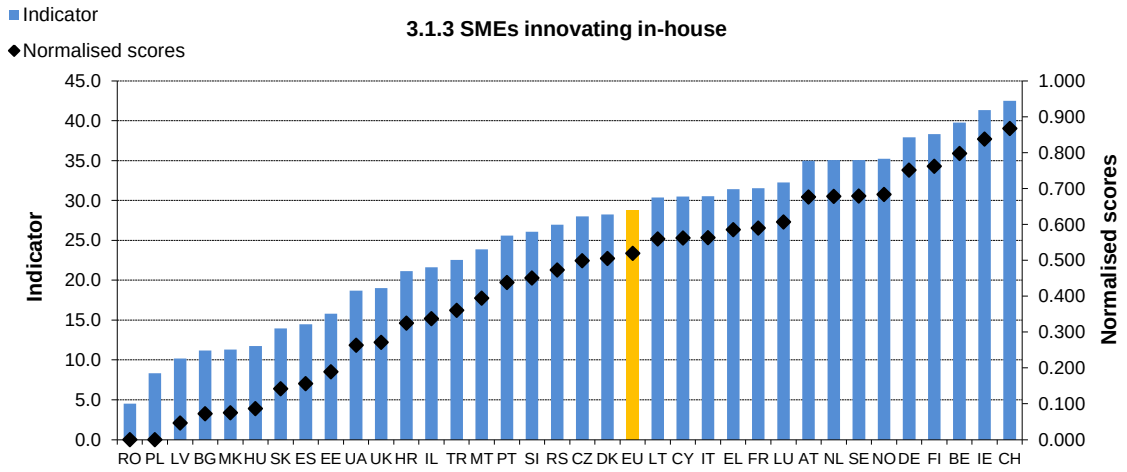
Compared to 2010, performance has increased for 13 countries and decreased for 21 countries. Performance has increased most in Serbia, the United Kingdom, Norway, and Ireland, and has decreased most in the Czech Republic, Estonia, Israel, Cyprus, and Romania. Compared to the previous year, performance has increased for 11 countries and decreased for 22 countries.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

3.1.3 SMEs innovating in-house as percentage of all 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.

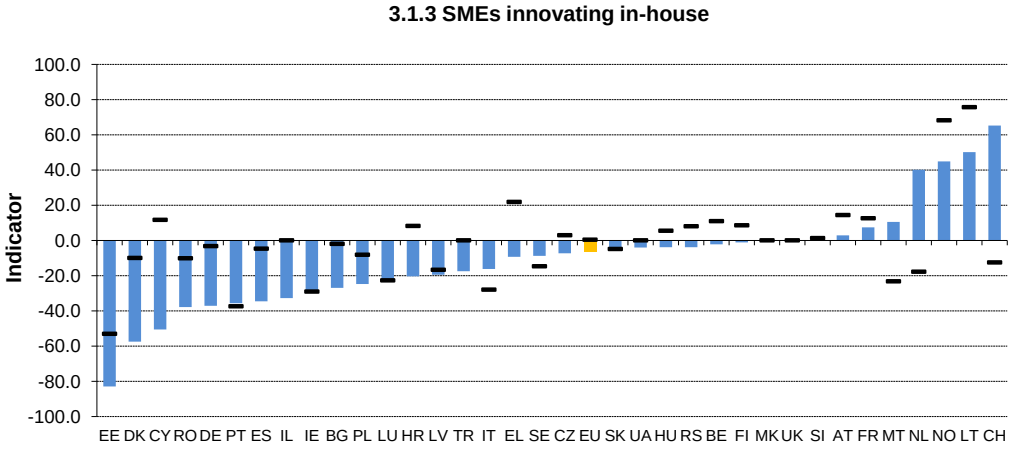


Performance for 2014 or most recent year available. No data for Iceland. Statistical outlier: Romania.

On average 28.8% of SMEs innovate in-house in the EU. Much higher shares are observed in Switzerland and Ireland, where more than 40% of SMEs innovate in-house. In Romania, Poland, Latvia, Bulgaria, the Former Yugoslav Republic of Macedonia, and Hungary, less than 12% of SMEs innovate in-house.

Performance change

Compared to 2010, performance has increased for eight countries and decreased for 26 countries. Performance has increased most in Switzerland, Lithuania, Norway, and the Netherlands, and has decreased most in Estonia, Denmark, and Cyprus. Compared to the previous year, performance has increased for 14 countries and decreased for 17 countries. Compared to the previous year, performance has increased most for Lithuania and Norway.

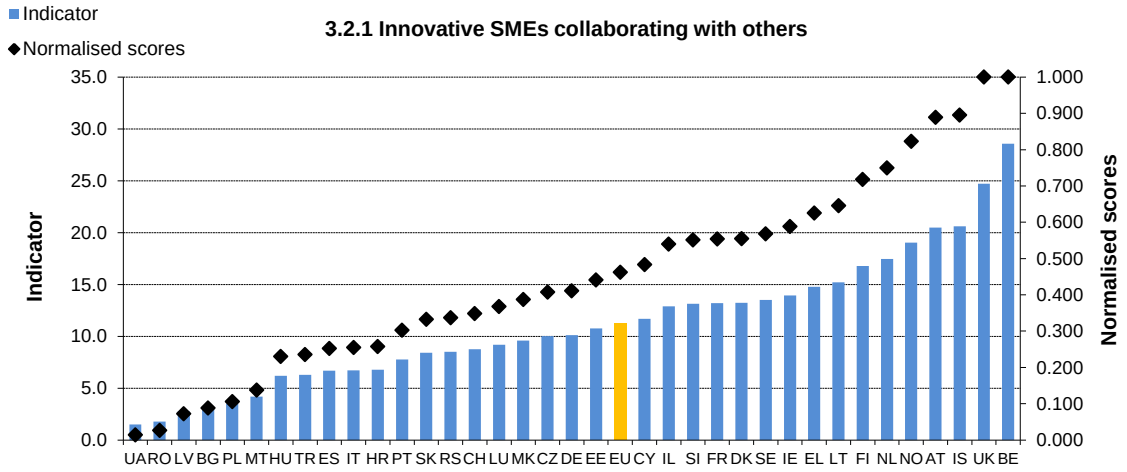


Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

No data for Iceland.

3.2.1 Innovative SMEs co-operating with others (percentage of all 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 private firms, and between firms and other firms. The indicator is limited to SMEs, because almost all large firms are involved in innovation co-operation.

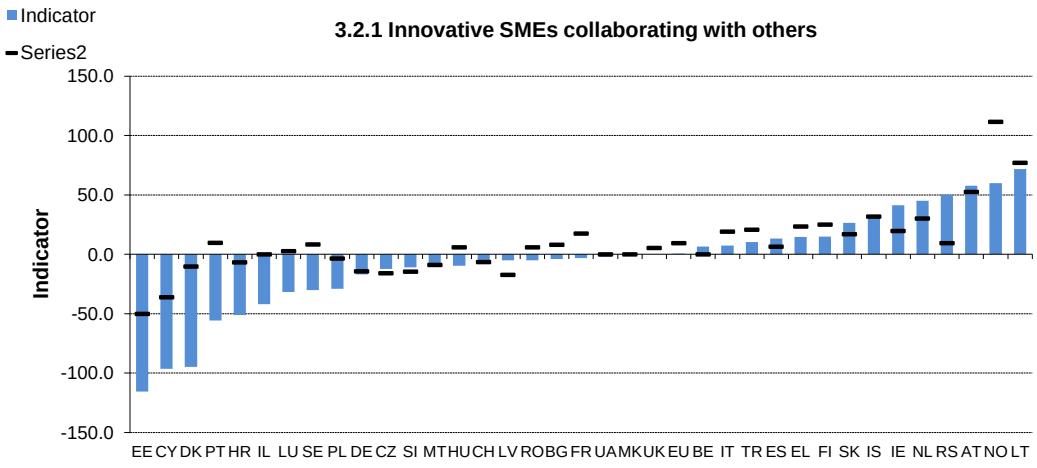


Performance for 2014 or most recent year available. Statistical outliers: Belgium, United Kingdom.

About 11% of EU SMEs collaborate with others in their innovation activities. In Belgium, the United Kingdom, Iceland, and Austria, this share is more than 20%, whilst in Ukraine, Romania, Latvia, Bulgaria, Poland, and Malta, this share is less than 5%.

Performance change

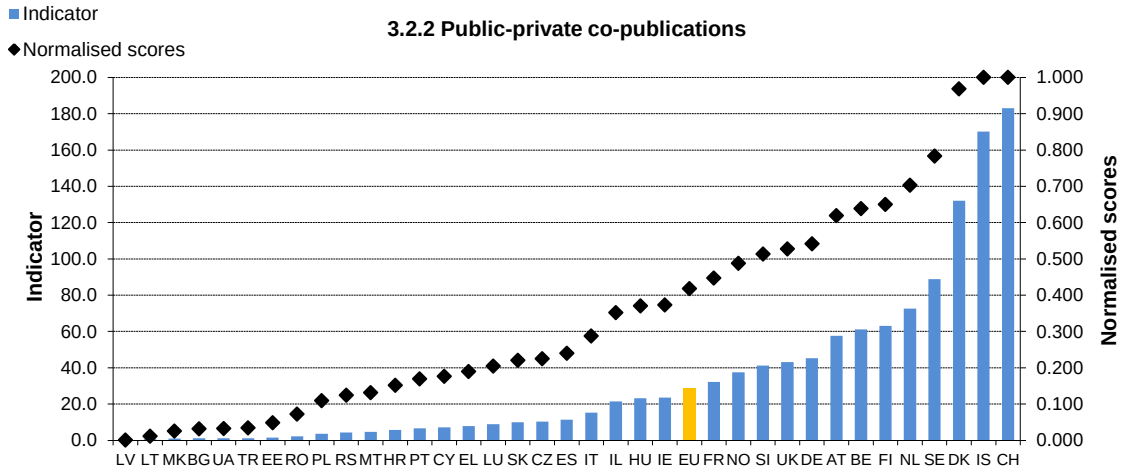
Compared to 2010, performance has increased for 15 countries and decreased for 20 countries. Performance has increased most in Lithuania, Norway, and Austria, and has decreased most in Estonia, Cyprus, and Denmark. Compared to the previous year, performance has increased for 22 countries and decreased for 11 countries. In particular in Norway and Lithuania performance has improved strongly.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

3.2.2 Public-private scientific co-publications per million population

This indicator captures public-private research linkages and active collaboration activities between business sector researchers and public sector researchers resulting in academic publications.

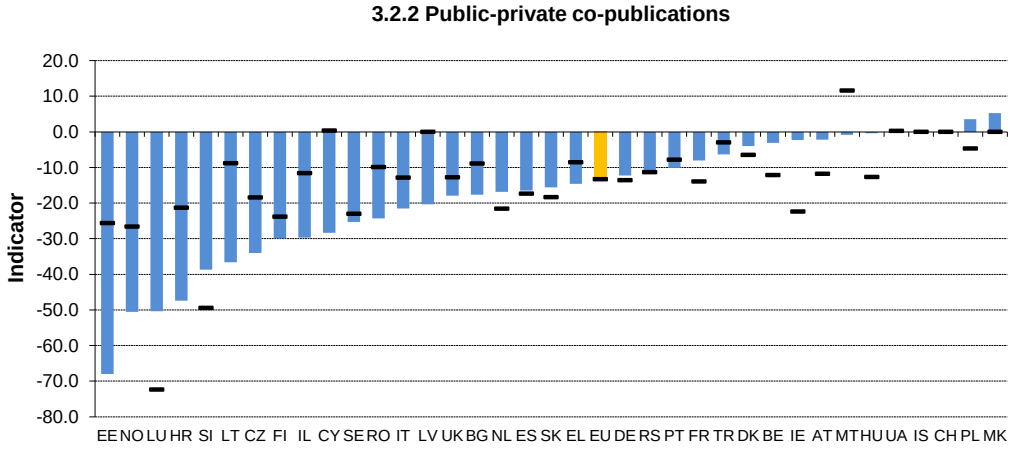


Performance for 2015 or most recent year available. Statistical outliers: Iceland and Switzerland.

On average, there are 28.7 public-private scientific co-publications per million population in the EU. However, there are large differences between countries, with more than 100 co-publications per million population in Switzerland, Iceland, and Denmark, and less than 5 co-publications per million population in 11 countries.

Performance change

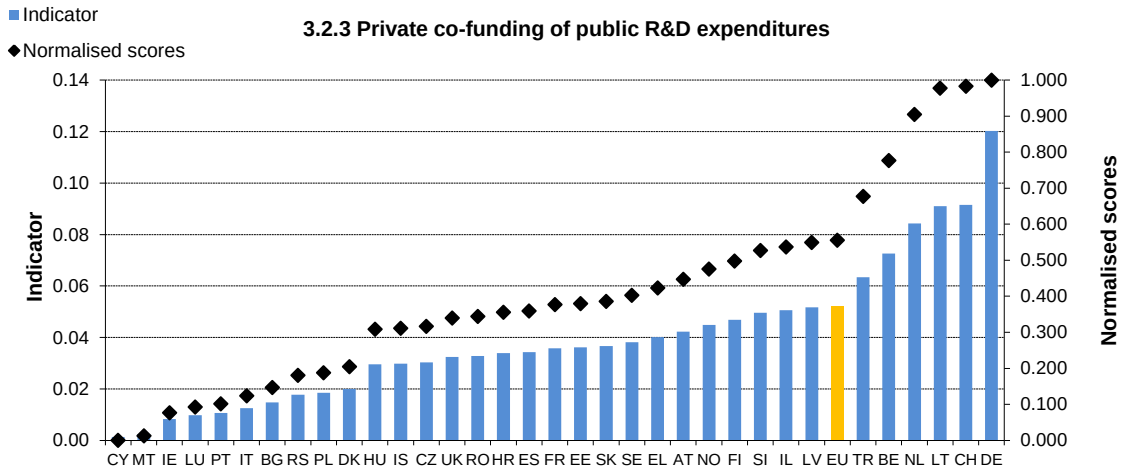
Compared to 2010, performance has increased for two countries and decreased for 33 countries. Compared to the previous year, performance has increased for three countries and decreased for 31. This performance decrease for so many countries might be the result of having used preliminary 2015 data not completely capturing all public-private co-publications in that year.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

3.2.3 Private co-funding of public R&D expenditures (percentage of GDP)

This indicator measures public-private co-operation. University and government R&D financed by the business sector are expected to explicitly serve the shorter-term research needs of the business sector.

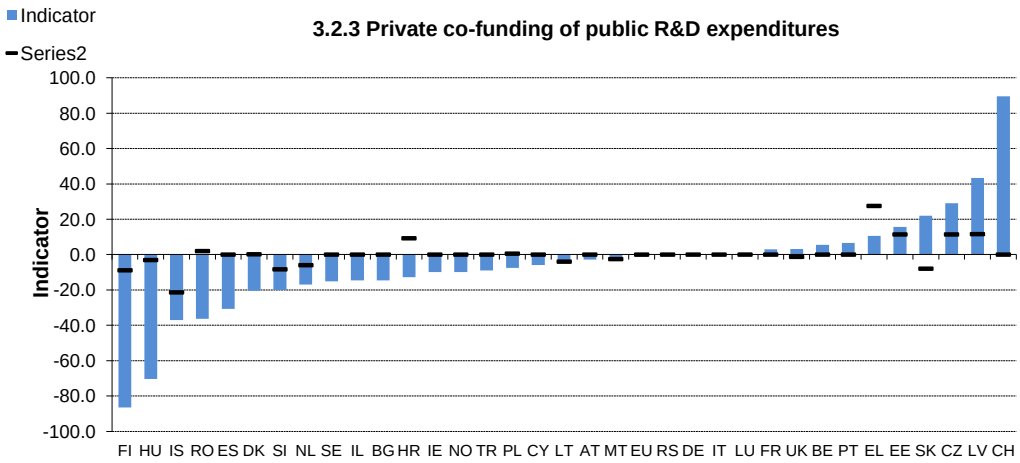


Performance for 2015 or most recent year available. No data for Former Yugoslav Republic of Macedonia and Ukraine.

On average, privately funded public R&D expenditures account for 0.05% of EU GDP. In Germany, this share is very high at 0.12%, and above average shares are also seen in Switzerland, Lithuania, the Netherlands, Belgium, and Turkey. In Cyprus and Malta, this share is close to 0%.

Performance change

Compared to 2010, performance has increased for 12 countries and decreased for 21 countries. Performance has increased most in Switzerland, Latvia, and the Czech Republic, and has decreased most in Finland and Hungary. Compared to the previous year, performance has increased for eight countries and decreased for nine countries. For 17 countries, performance did not change as no new data were available compared to the previous year, and the same data were used for 2015, the most recent year, as for 2014, the previous year.

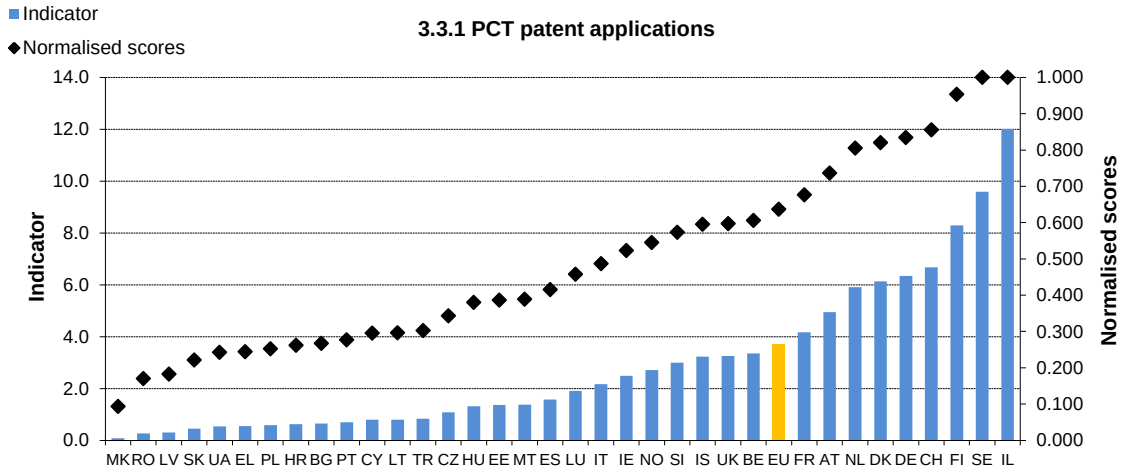


Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

No data for the Former Yugoslav Republic of Macedonia and Ukraine.

3.3.1 PCT patent applications per billion GDP (in PPP€)

The capacity of firms to develop new products strongly influences 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.

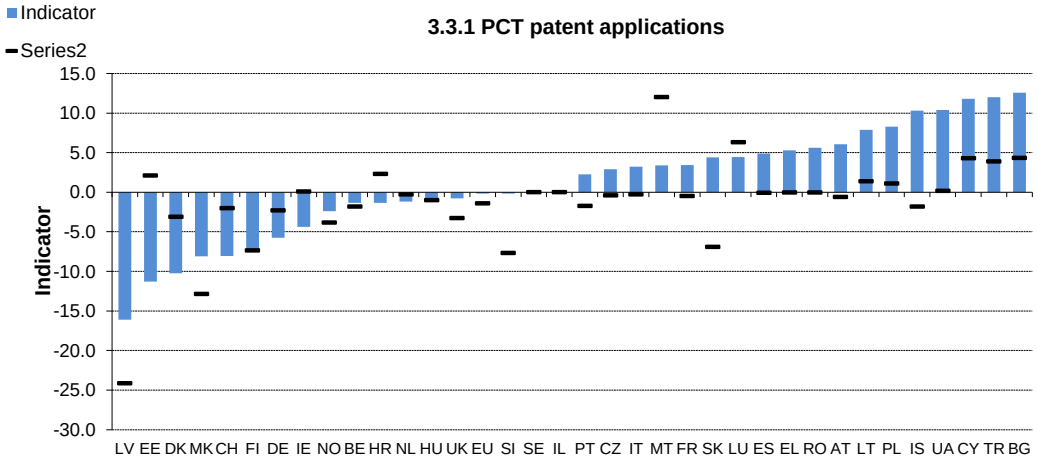


Performance for 2014 or most recent year available. No data for Serbia. Statistical outlier: Israel and Sweden.

There is a high spread in performance in PCT patent applications. For the EU, on average 3.7 PCT patents per billion GDP have been applied for. There are large differences with 8 or more patent applications per billion GDP in Israel, Sweden, and Finland, and less than 1 application per billion GDP in 13 countries.

Performance change

Compared to 2010, performance has increased for 18 countries and decreased for 16 countries. Performance has increased most in Bulgaria, Turkey, and Cyprus, and has decreased most in Latvia, Estonia, and Denmark. Compared to the previous year, performance has increased for 11 countries, in particular for Malta, and decreased for 23 countries, in particular for Latvia.

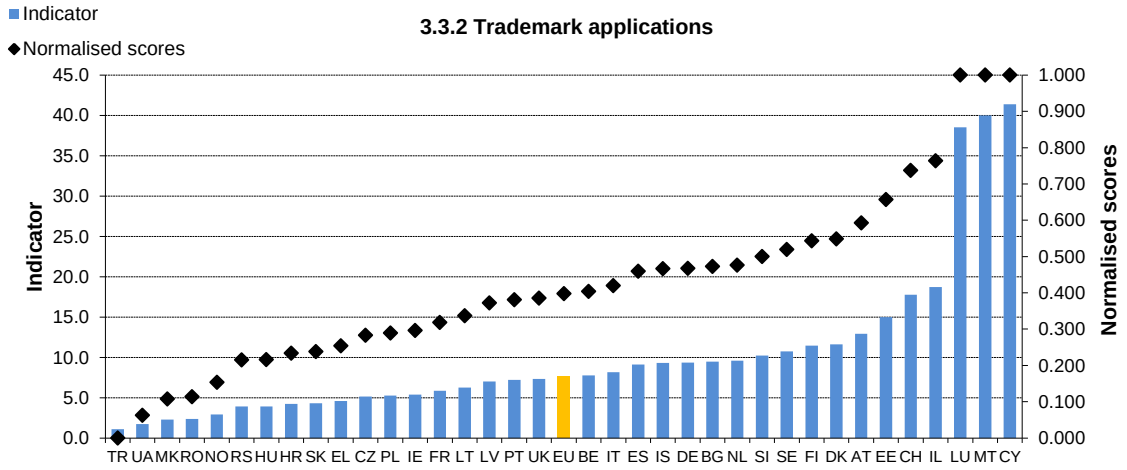


Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

No data for Serbia.

3.3.2 Trademark applications per billion GDP (in PPP€)

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, it guarantees consistent quality through evidence of the company's commitment vis-à-vis the consumer, and it is a form of communication, i.e. a basis for publicity and advertising.

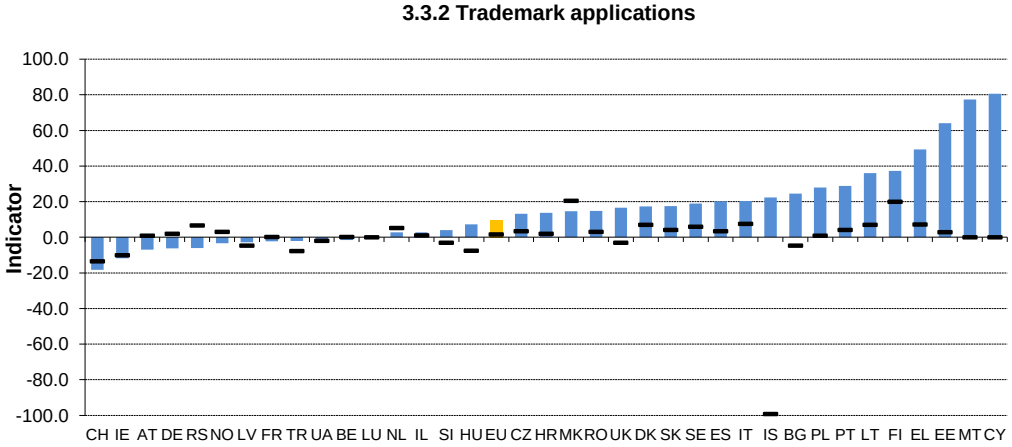


Performance for 2015 or most recent year available, using two-year averages, calculated as the average of the reference year itself and the year before. Statistical outliers: Cyprus, Luxembourg, and Malta.

There is a high spread in performance in trademark applications per billion GDP. High numbers of trademark applications above 35 per billion GDP are observed in Cyprus, Malta, and Luxembourg. Trademark applications per billion GDP are lowest in Turkey, Ukraine, the Former Yugoslav Republic of Macedonia, and Romania, all less than 2.5 per billion GDP.

Performance change

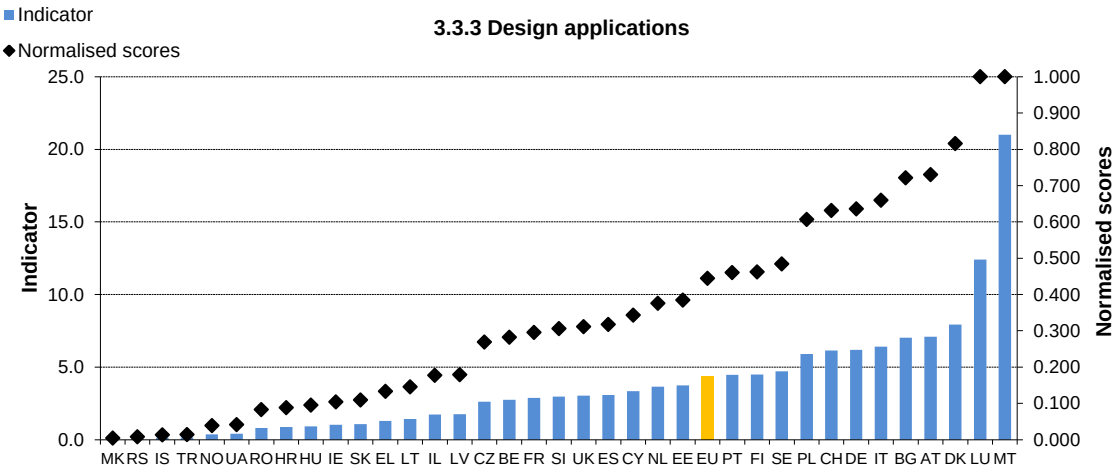
Compared to 2010, performance has increased for 25 countries and decreased for 11 countries. Performance has increased most in Cyprus, Malta, and Estonia. Compared to the previous year, performance has increased for 24 countries and decreased for ten countries, in particular for Iceland.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

3.3.3 Design applications per billion GDP (in PPP€)

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 programmes. It also includes products that are composed of multiple components, which may be disassembled and reassembled.

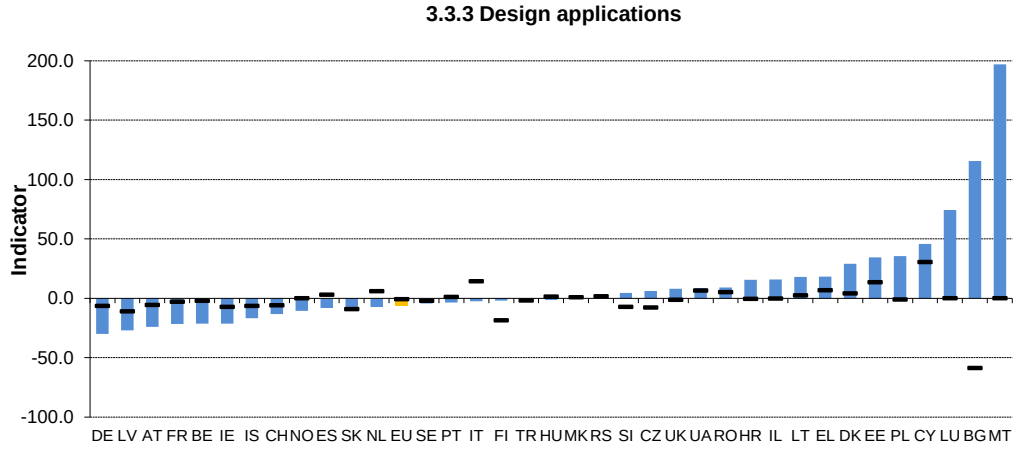


Performance for 2015 or most recent year available, using two-year averages, calculated as the average of the reference year itself and the year before. Statistical outliers: Luxembourg and Malta.

There is a high spread in performance in design applications per billion GDP. The number of design applications is very high in Malta and Luxembourg. The number of design applications is very low in the Former Yugoslav Republic of Macedonia, Serbia, Iceland, and Turkey.

Performance change

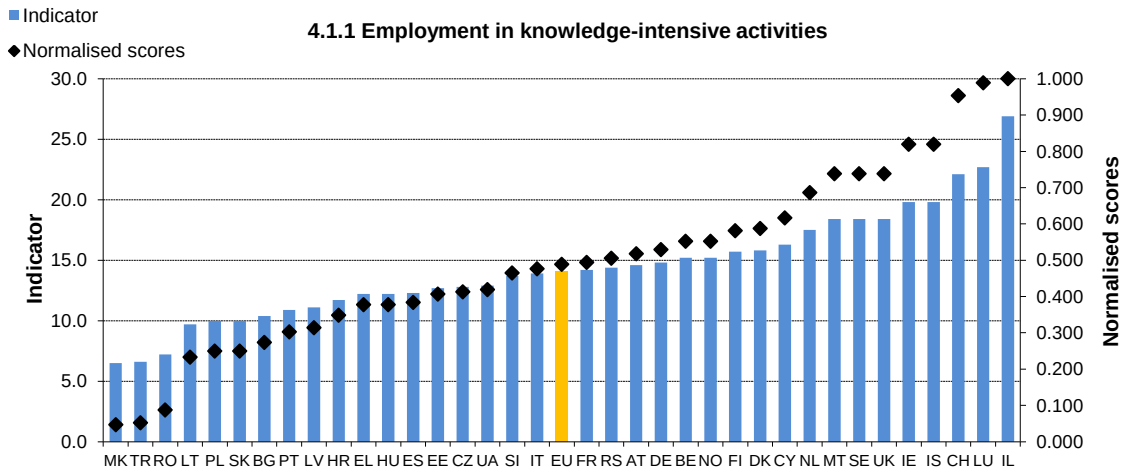
Compared to 2010, performance has increased for 18 countries and decreased for 19 countries. Performance has increased most in Malta, Bulgaria, and Luxembourg, and has decreased most in Germany and Latvia. Compared to the previous year, performance has increased for 15 countries and decreased for 19 countries, in particular in Bulgaria.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

4.1.1 Employment in knowledge-intensive activities as percentage of 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.

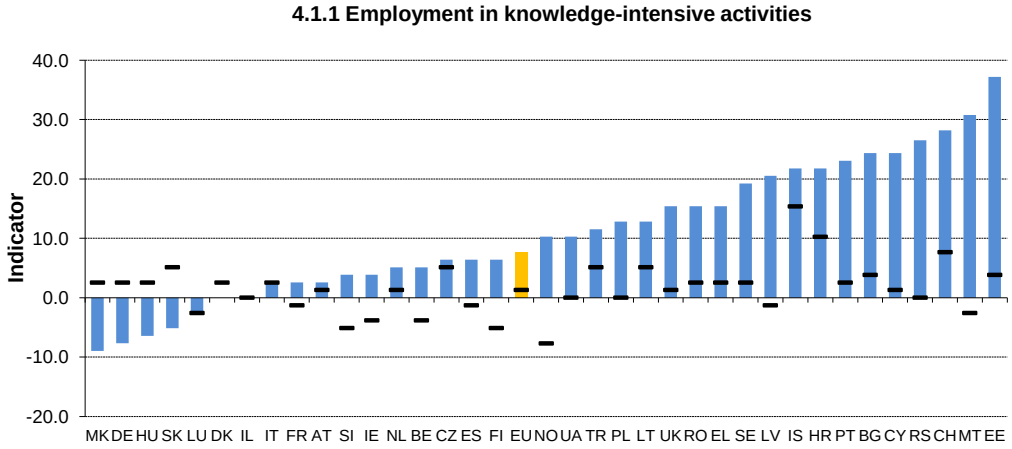


Performance for 2016 or most recent year available.

The average value for the EU for the share of employment in knowledge-intensive activities is 14.1%. Countries with high employment shares in knowledge-intensive activities include Israel, Luxembourg, Switzerland, Iceland, and Ireland. In the Former Yugoslav Republic of Macedonia, Turkey, and Romania, the employment share in knowledge-intensive activities is lowest and half that of the EU average.

Performance change

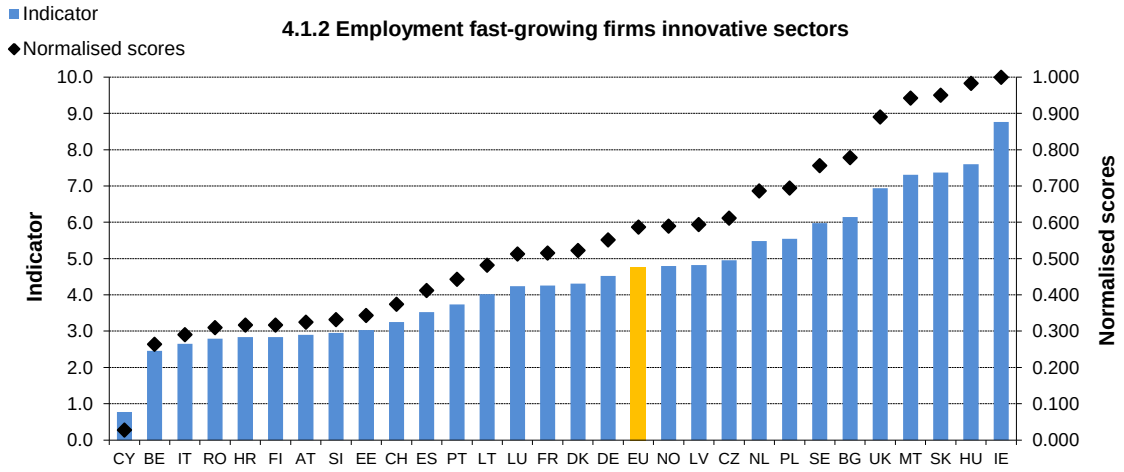
Compared to 2010, performance has increased for 30 countries and decreased for five countries. Performance has increased most in Estonia, Malta, and Switzerland, and has decreased most in the Former Yugoslav Republic of Macedonia, Germany, and Hungary. Compared to the previous year, performance has increased for 23 countries and decreased for ten countries, in particular for Norway.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

4.1.2 Employment in fast-growing enterprises (percentage of 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 rapidly transform its economy to respond to new needs and to take advantage of emerging demand.

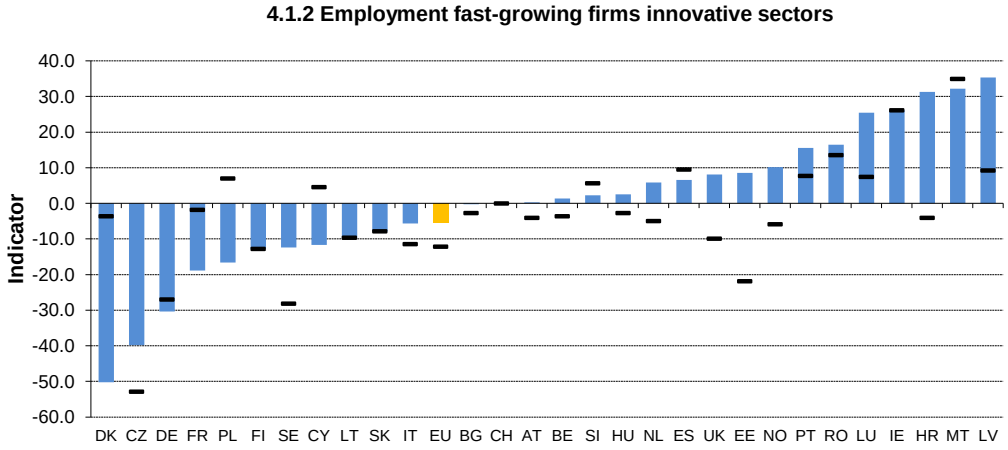


Performance for 2014 or most recent year available. No data for Greece, Iceland, Israel, Former Yugoslav Republic of Macedonia, Serbia, Turkey and Ukraine. Statistical outlier: Ireland.

The average employment share in fast-growing firms of innovative sectors in the EU is 4.8%. Highest employment shares are seen in Ireland, Hungary, Slovakia, Malta, and the United Kingdom, at close to 7% or more. Shares are relatively low in Cyprus.

Performance change

Compared to 2010, performance has increased for 16 countries and decreased for 13 countries. Performance has increased most in Latvia, Malta, and Croatia, and has decreased most in Denmark, the Czech Republic, and Germany. Compared to the previous year, performance has increased for ten countries and decreased for 19 countries, in particular for the Czech Republic.

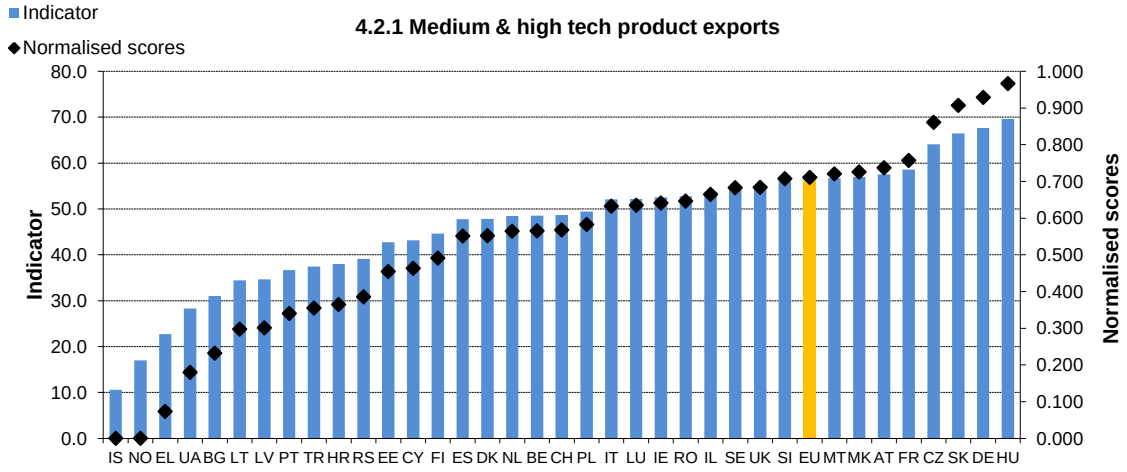


Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

No data for Greece, Iceland, Israel, the Former Yugoslav Republic of Macedonia, Serbia, Turkey, and Ukraine.

4.2.1 Exports of medium and high technology products as a share 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 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.

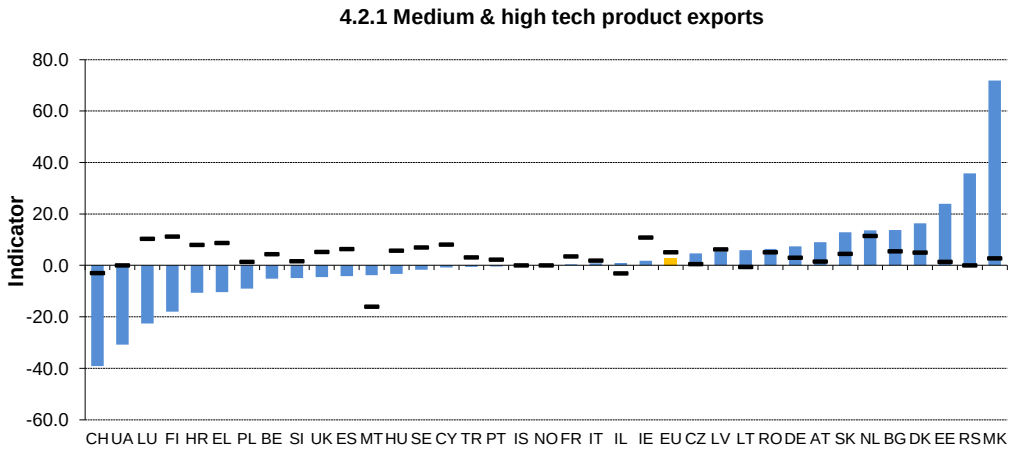


Performance for 2015 or most recent year available.

Exports of medium and high-tech products account for 56% of total product exports in the EU. For Hungary, Germany, Slovakia, and the Czech Republic, shares are above 60%. For Iceland, Norway, and Greece, exports of medium and high-tech products are below 25%.

Performance change

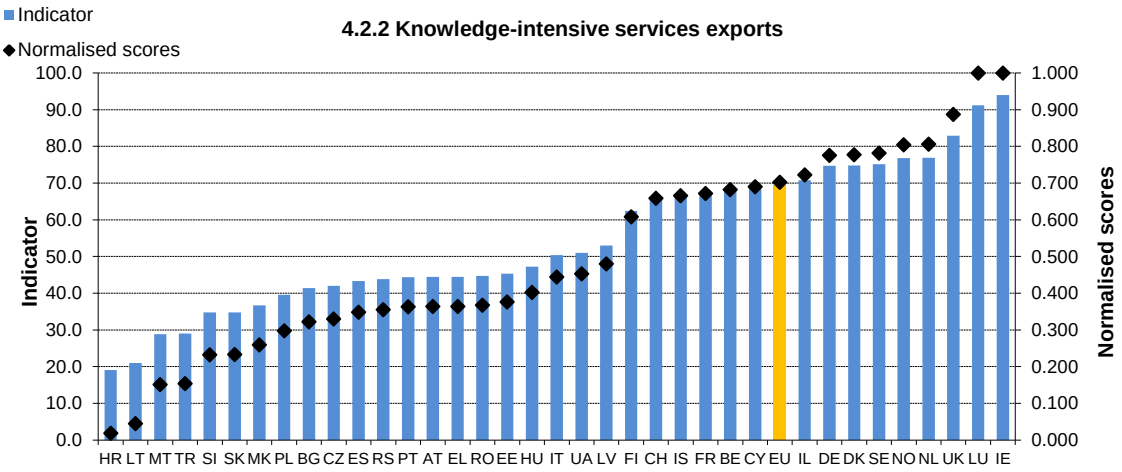
Compared to 2010, performance has increased for 18 countries and decreased for 17 countries. Performance has increased most in the Former Yugoslav Republic of Macedonia, Serbia, and Estonia, and has decreased most for Switzerland, Ukraine, and Luxembourg. Compared to the previous year, performance has increased for 29 countries and decreased for four countries, in particular for Malta.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

4.2.2 Knowledge-intensive services exports as percentage of total services exports

The indicator measures the competitiveness of the knowledge-intensive services sector. Competitiveness-enhancing measures and innovation strategies can be mutually reinforcing for the growth of employment, export shares, and turnover at the firm level. The indicator reflects the ability of an economy, notably resulting from innovation, to export services with high levels of value added, and successfully take part in knowledge-intensive global value chains.

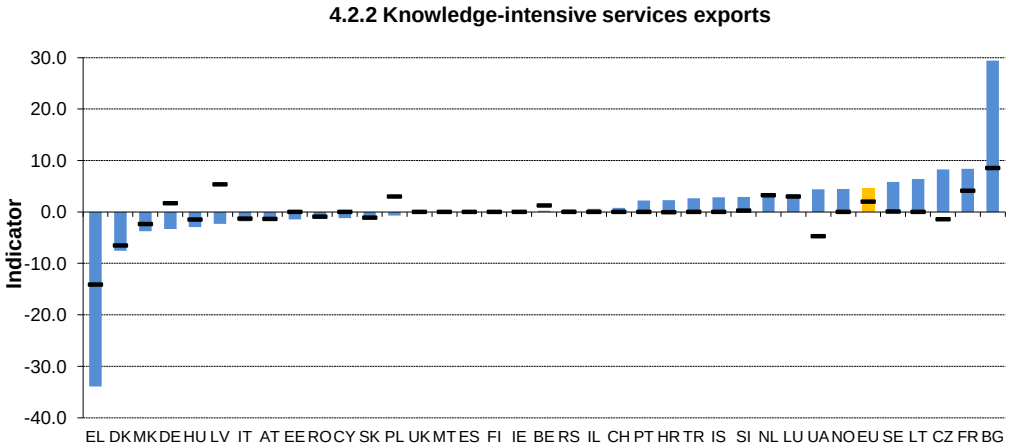


Performance for 2015 or most recent year available. Statistical outlier: Ireland.

At EU level, 69% of total services exports are knowledge-intensive. Export shares are more than 75% in Ireland, Luxembourg, the United Kingdom, the Netherlands, Norway, and Sweden. Export shares of knowledge-intensive services are very low, below 25%, in Croatia and Lithuania.

Performance change

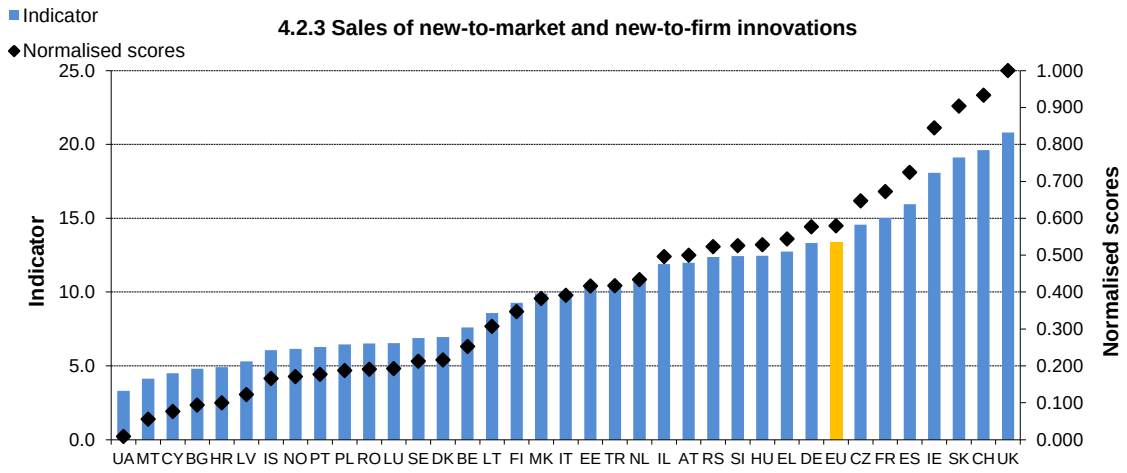
Compared to 2010, performance has increased for 19 countries and decreased for 14 countries. Performance has increased most in Bulgaria, and has decreased most in Greece. Compared to the previous year, performance has increased for 11 countries and decreased for 11 countries. For 14 countries, performance did not change as no new data were available compared to the previous year, and the same data were used for 2015, the most recent year, as for 2014, the previous year.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.

4.2.3 Sales of new-to-market and new-to-firm innovations as percentage of turnover

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).

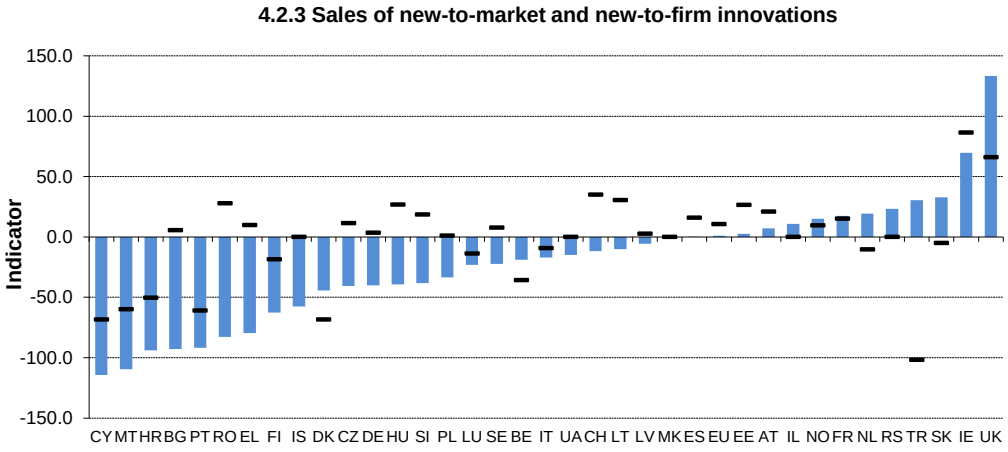


Performance for 2014 or most recent year available.

The average score for the EU is 13.4%. In the United Kingdom, Switzerland, and Slovakia, this share is close to 20%. In Ukraine, Malta, Cyprus, Bulgaria, and Croatia, it is below 5%.

Performance change

Compared to 2010, performance has increased for 13 countries and decreased for 23 countries. Performance has increased most in the United Kingdom and Ireland, and has decreased most in Cyprus and Malta. Compared to the previous year, performance has increased for 20 countries and decreased for 12 countries. Compared to the previous year, performance has increased most in Ireland and the United Kingdom, and has decreased most in Turkey.



Columns show the performance of the normalised indicator scores in the most recent year compared to the situation six years earlier, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2010. The horizontal hyphens show the performance of the normalised indicator scores in the most recent year compared to the previous year, i.e. the normalised score used for calculating the SII in 2016 is compared to the normalised score used for calculating the SII in 2015.