



# European Innovation Scoreboard 2022

Annex B Performance per indicator

## European Innovation Scoreboard 2022 - Annex B Performance per indicator

European Commission

Directorate-General for Research and Innovation

Directorate G - Common Policy Centre

Unit G1 - Common R&I Strategy & Foresight Service

Contact Alexandr Hobza, Chief Economist and Head of Unit G1

Athina Karvounaraki, Team Leader, Coordinator of European Innovation Scoreboard 2022, Unit G1

Tiago Pereira, Coordinator of European Innovation Scoreboard 2022, Unit G1

Email [RTD-STATISTICS@ec.europa.eu](mailto:RTD-STATISTICS@ec.europa.eu)

[RTD-PUBLICATIONS@ec.europa.eu](mailto:RTD-PUBLICATIONS@ec.europa.eu)

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

Directorate A - Strategy and Economic Analysis

Unit A1 - Chief Economist

Contact Román Arjona, Chief Economist and Head of Unit A1

Xosé-Luis Varela-Irimia, Coordinator of European Innovation Scoreboard 2022, Unit A1

Email [GROW-A1@ec.europa.eu](mailto:GROW-A1@ec.europa.eu)

European Commission

B-1049 Brussels

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# **European Innovation Scoreboard 2022**

## **Annex B Performance per indicator**

**This report was prepared and coordinated by**

Deloitte Belgium, Maastricht University/UNU-MERIT, Valdani Vicari & Associati (VVA)

**The report was written by**

Hugo Hollanders and Nordine Es-Sadki, Maastricht University (UNU-MERIT)

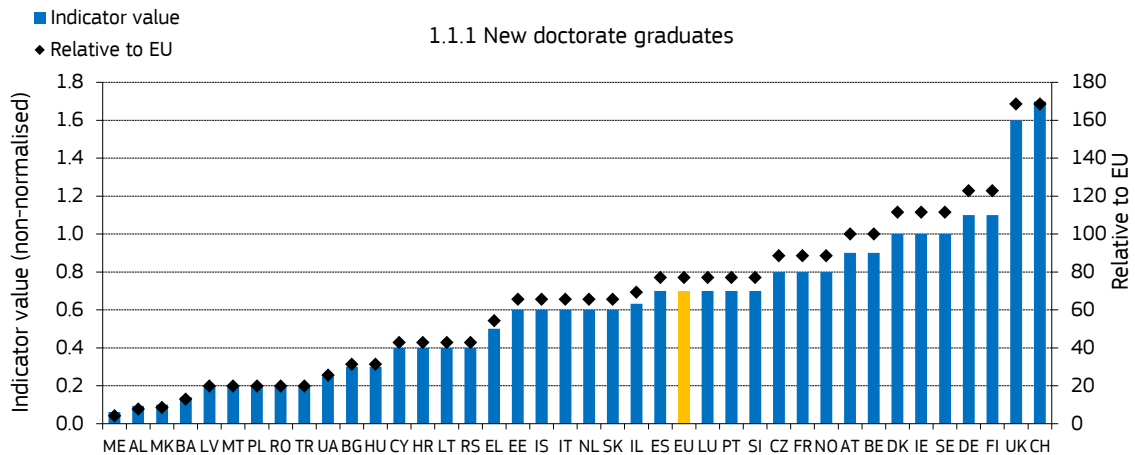
as part of the **Development of the European Innovation Scoreboard** project for the European Commission, Directorate-General for Research and Innovation

## **Annex B – Performance per indicator**

This annex shows the static (most recent) and dynamic (over time) performance for each of the indicators used in the European Innovation Scoreboard 2022. 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 2022, the most recent year, and 2015, and between 2022, the most recent year, and 2021, the previous year, are shown.

### 1.1.1 New doctorate graduates in science, technology, engineering and mathematics (STEM) per 1000 population aged 25-34

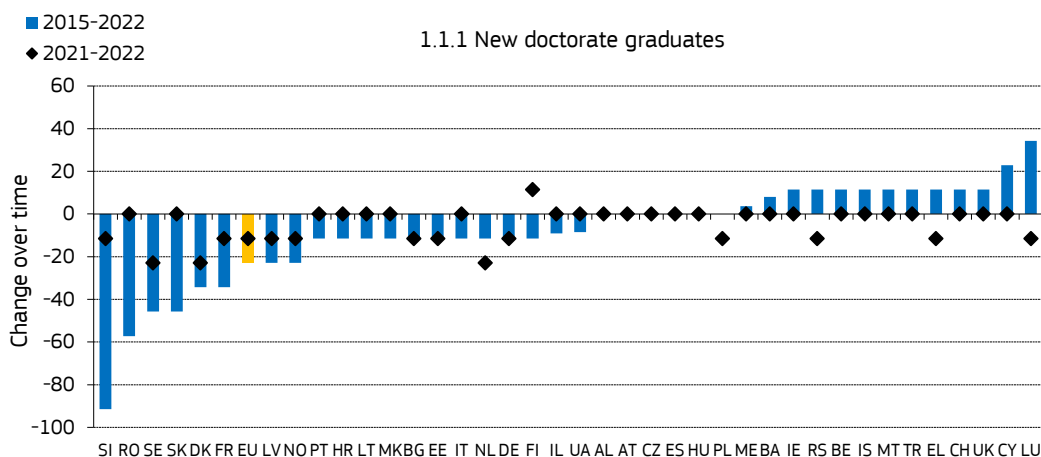
On average, 0.7 new PhD degrees were awarded in the EU per 1000 population aged 25-34. The highest scores are observed in Switzerland and the United Kingdom, with at least 1.6 new PhD graduates per 1,000 population aged 25-34. In Montenegro, Albania, North Macedonia, and Bosnia and Herzegovina, performance is relatively weak with less than 0.15 new PhD graduates per 1,000 population aged 25-34.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right.

### Performance change

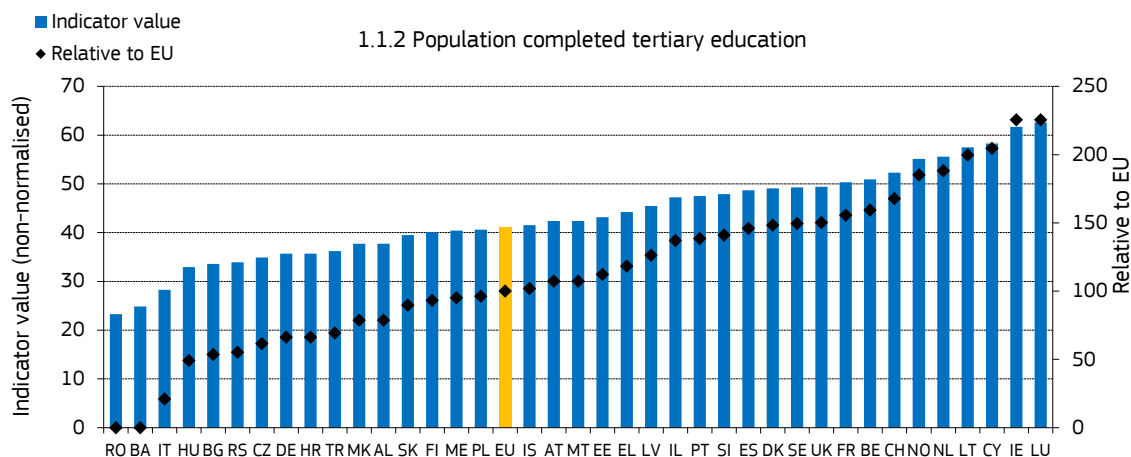
Compared to reference year 2015, performance has increased for 13 countries and decreased for 21 countries and the EU. Performance has increased most in Luxembourg and Cyprus, and performance has decreased most in Slovenia and Romania. Compared to 2021, performance has increased for only one country, remained the same for 24 countries and decreased for 14 countries and the EU.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 1.1.2 Percentage population aged 25-34 having completed tertiary education

On average 41.2 percent of the EU population aged 25-34 have completed tertiary education. The highest scores are observed in Luxembourg, Ireland, Cyprus, Lithuania, the Netherlands, and Norway, where at least 55 percent of the population aged 25-34 completed tertiary education. In Romania, Bosnia and Herzegovina, and Italy, performance is relatively weak with less than 30 percent of the population aged 25-34 having completed tertiary education.



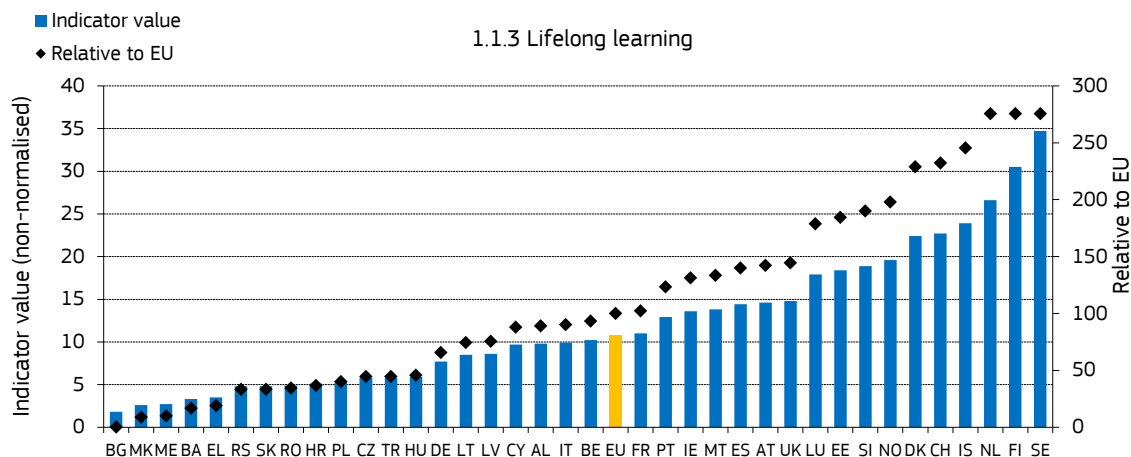
The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Ukraine.

### Performance change

Due to a break in series in 2021, no performance change results are available.

### 1.1.3 Percentage population aged 25-64 participating in lifelong learning

On average, 10.8 percent of the EU population aged 25-64 participated in lifelong learning activities. The highest scores are observed in Sweden, Finland, and the Netherlands, where at least 25 percent of the population aged 25-64 participated in lifelong learning activities. In Bulgaria, North Macedonia, and Montenegro, performance is relatively weak with less than 3 percent of the population aged 25-64 participating in lifelong learning activities.



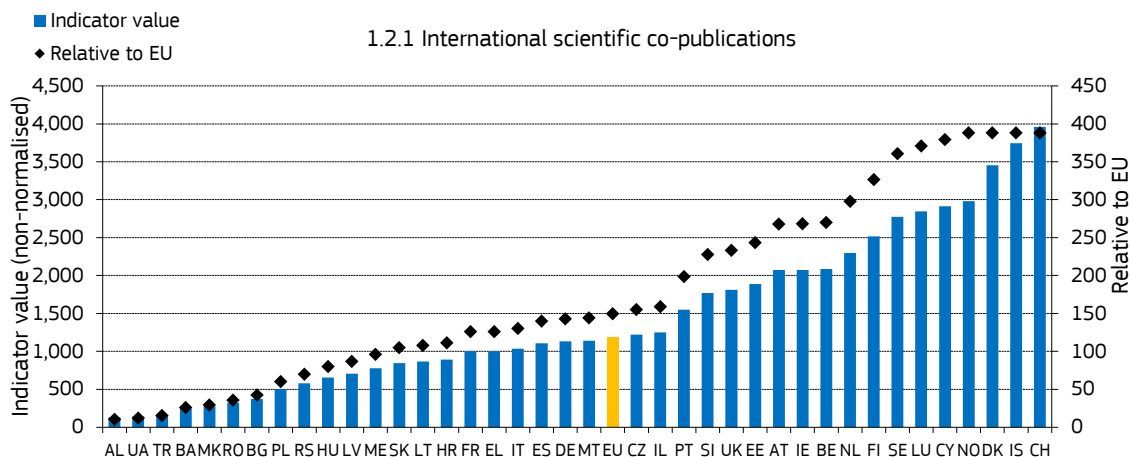
The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Israel and Ukraine.

#### Performance change

Due to a break in series in 2021 for most countries, no performance change results are available. Only for 4 countries trend results are available, showing a small increase between 2015 and 2021 for Turkey and a decrease for the United Kingdom, North Macedonia, and Montenegro.

### 1.2.1 International scientific co-publications per million population

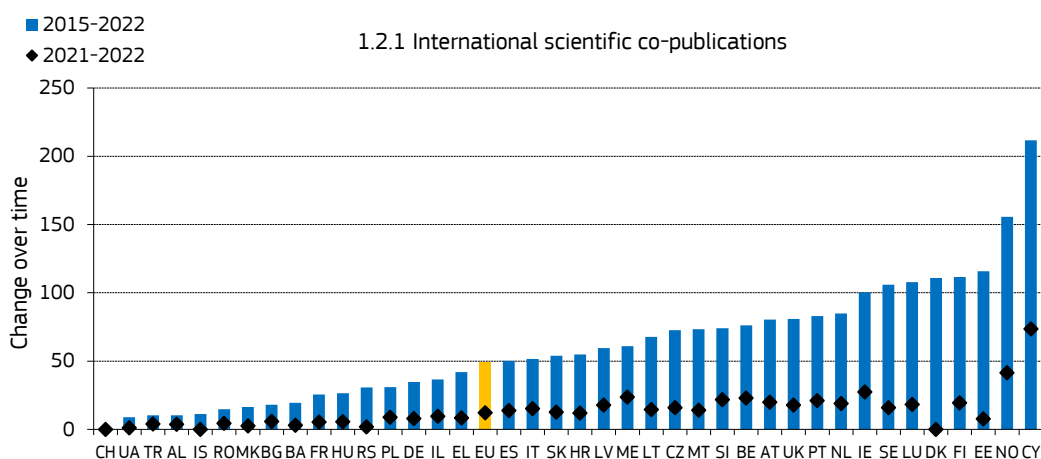
On average, 1,180 international scientific co-publications were published in the EU per million population. The highest scores are observed in Switzerland, Iceland, and Denmark, with more than 3,000 international scientific co-publications per million population. In Albania, Ukraine, Turkey, and Bosnia and Herzegovina, performance is relatively weak with less than 250 international scientific co-publications per million population.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right.

### Performance change

Compared to reference year 2015, performance has increased for 38 countries and the EU, and did not change for one country (Switzerland). Performance has increased most in Cyprus and Norway, and performance has increased least in Ukraine. Compared to 2021, performance has increased for 36 countries and the EU, and did not change for three countries, Denmark, Iceland, and Switzerland, as these countries already have the highest normalised scores due to a correction for statistical outliers.

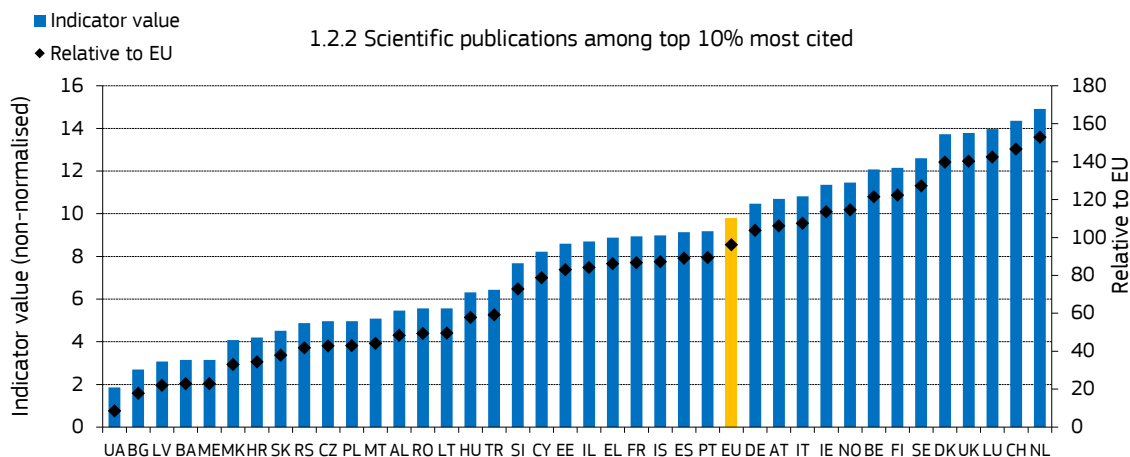


The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.



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

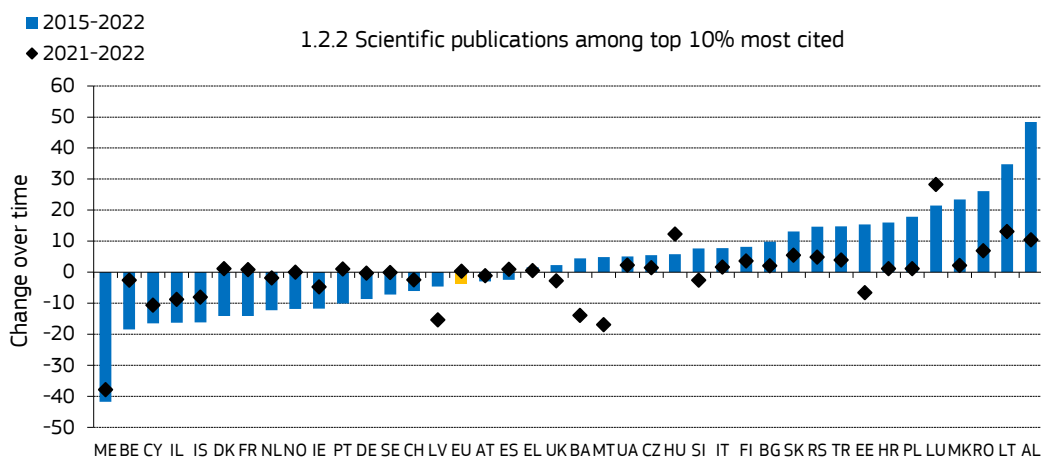
About 9.8% of the scientific publications in the EU are among the top-10% most cited publications worldwide. The highest scores are observed in the Netherlands, Switzerland, United Kingdom, and Denmark, where at least 13% of scientific publications are among the top-10% most cited publications worldwide. In Ukraine, Bulgaria, Latvia, Bosnia and Herzegovina, and Montenegro, performance is relatively weak with less than 3.5% of scientific publications among the top-10% most cited publications worldwide.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right.

### Performance change

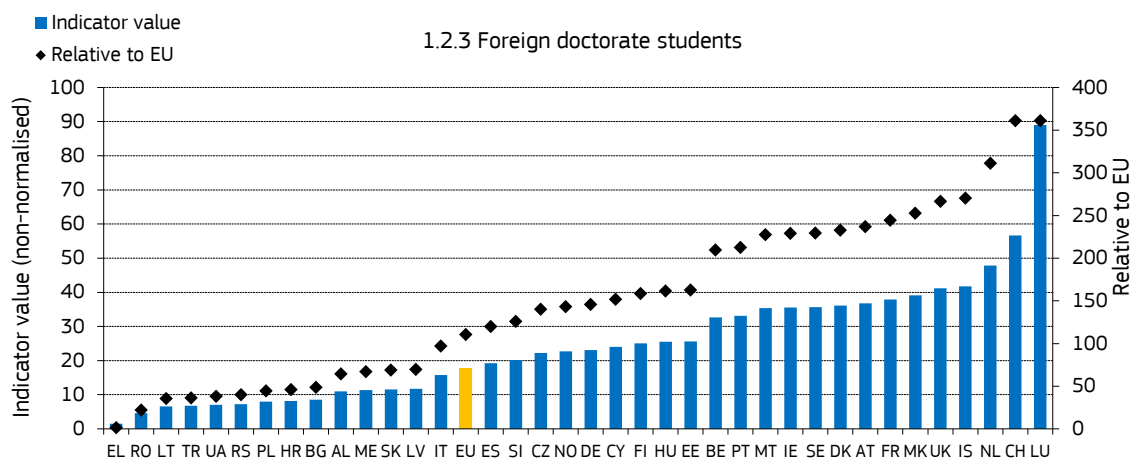
Compared to reference year 2015, performance has increased for 22 countries and decreased for 17 countries and the EU. Performance has increased most in Albania and Lithuania, and performance has decreased most in Montenegro. Compared to 2021, performance has increased for 22 countries and the EU, and decreased for 17 countries.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 1.2.3 Foreign doctorate students as percentage of all doctorate students

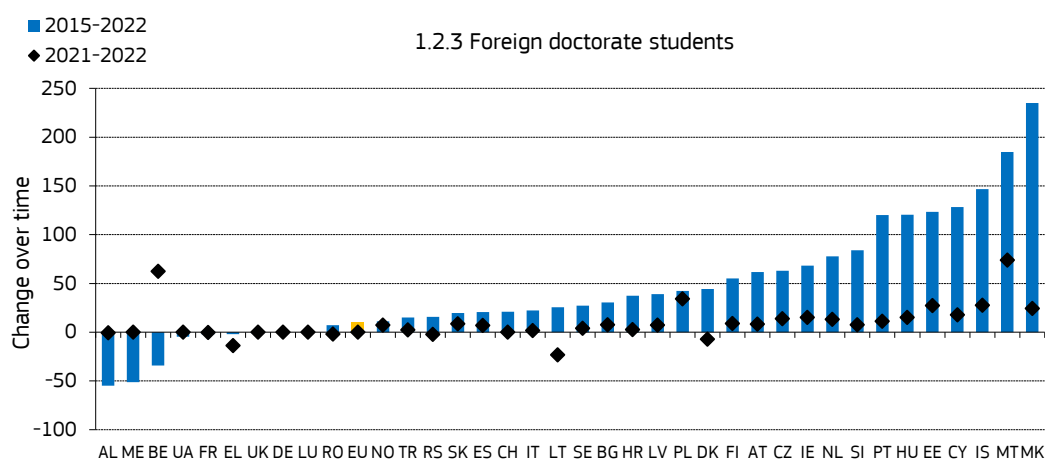
The average share of foreign doctorate students in the EU is 17.8%. The highest scores are observed in Luxembourg, Switzerland, the Netherlands, Belgium, and the United Kingdom, with at least 40% foreign doctorate students. In Greece and Romania, performance is relatively weak with less than 5% foreign doctorate students.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Bosnia and Herzegovina and Israel.

### Performance change

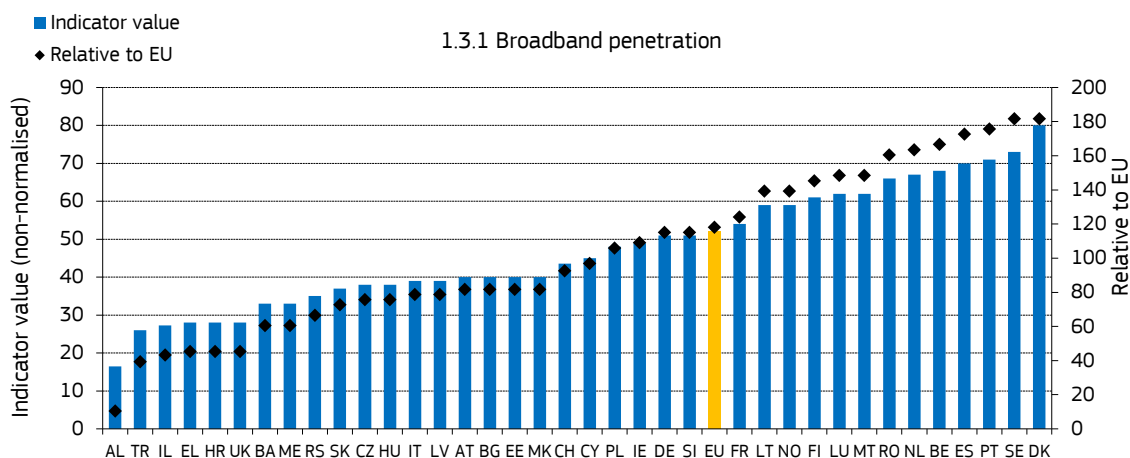
Compared to reference year 2015, performance has increased for 28 countries and the EU, and decreased for 7 countries. Performance has increased most in North Macedonia and Malta, and performance has decreased most in Albania, Montenegro, and Belgium. Compared to 2021, performance has increased for 24 countries, decreased for 7 countries, and did not change for 6 countries and the EU.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 1.3.1 Broadband penetration

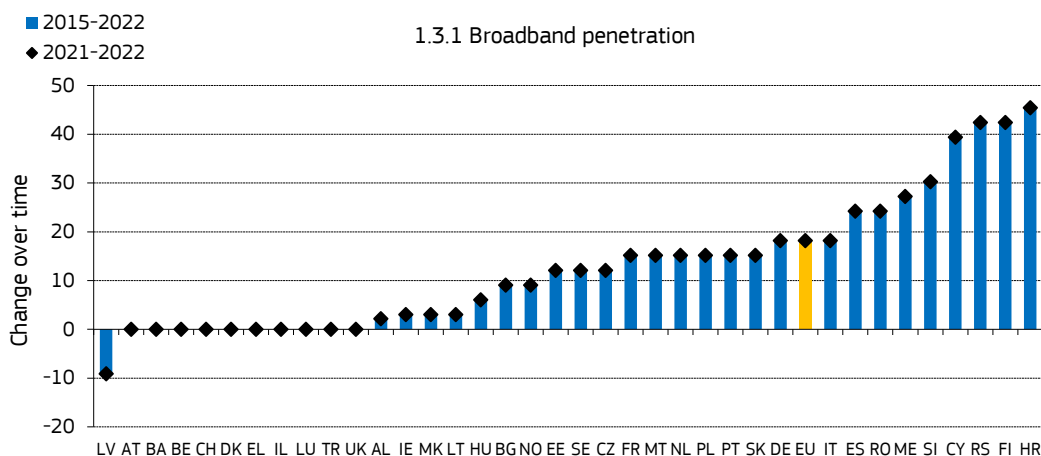
The average share of enterprises with fast broadband access is 52% in the EU. The highest scores are observed in Denmark, Sweden, Portugal, and Spain, with at least 70% of enterprises having fast broadband access. In Albania, Turkey, and Israel, performance is relatively weak with less than 30% of enterprises having fast broadband access.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Iceland and Ukraine.

### Performance change

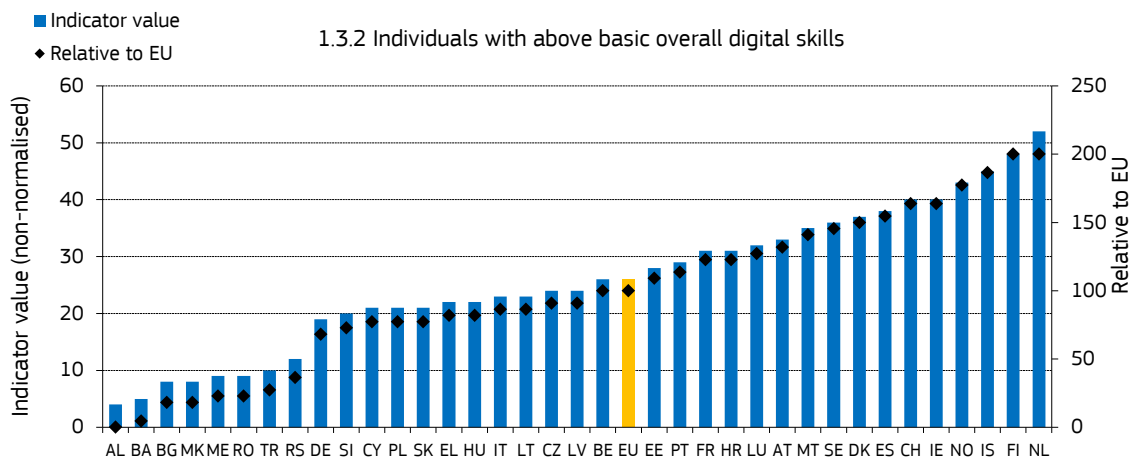
Due to a break in series in 2020, a comparison to reference year 2015 cannot be made. Compared to 2021, performance has increased for 26 countries and the EU, did not change for 10 countries, and decreased for only one country (Latvia).



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 1.3.2 Individuals who have above basic overall digital skills

On average 26% of individuals in the EU have above basic overall digital skills. The highest scores are observed in the Netherlands, Finland, Iceland, and Norway, where more than 40% of individuals have above basic overall digital skills. In Albania, Bosnia and Herzegovina, Bulgaria, North Macedonia, Montenegro, and Romania, performance is relatively weak with less than 10% of individuals having above basic overall digital skills.



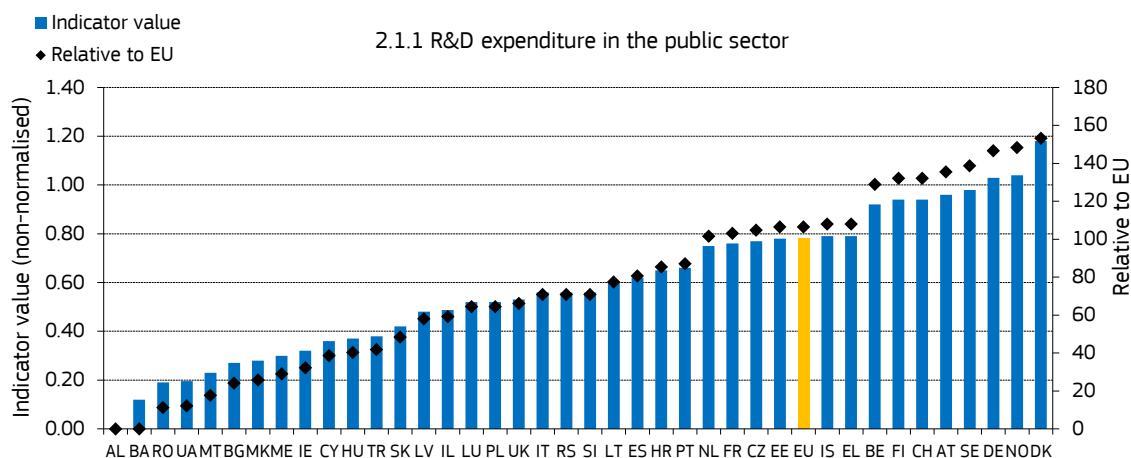
The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Israel, Ukraine, and the United Kingdom.

### Performance change

Due to a break in series in 2021, no performance change results are available.

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

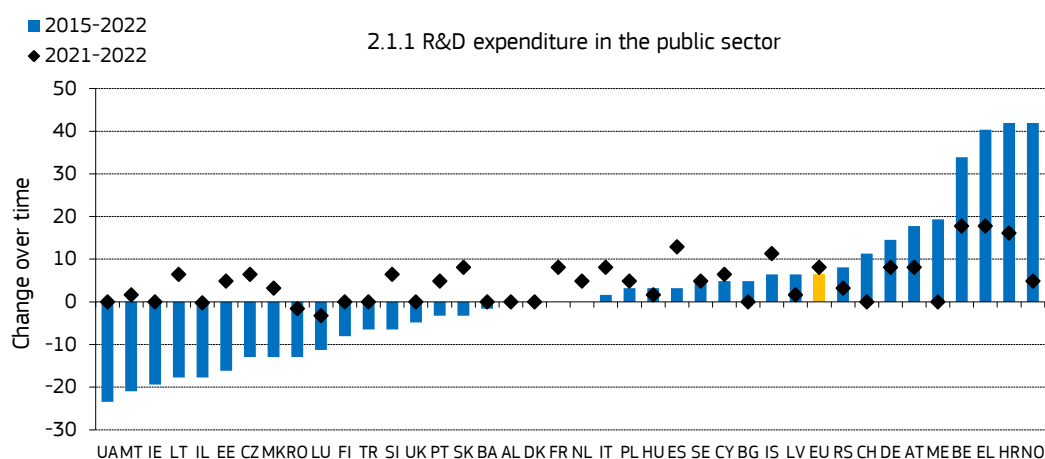
The average R&D intensity in the public sector is 0.78% for the EU. The highest scores are observed in Denmark, Norway, and Germany, where the R&D intensity in the public sector is above 1.00%. In Bosnia and Herzegovina, Romania, and Ukraine, performance is relatively weak with the R&D intensity in the public sector below 0.20%.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. For Albania data are not available but it has been assumed that the normalised score is the same as that of the country with lowest R&D expenditures.

### Performance change

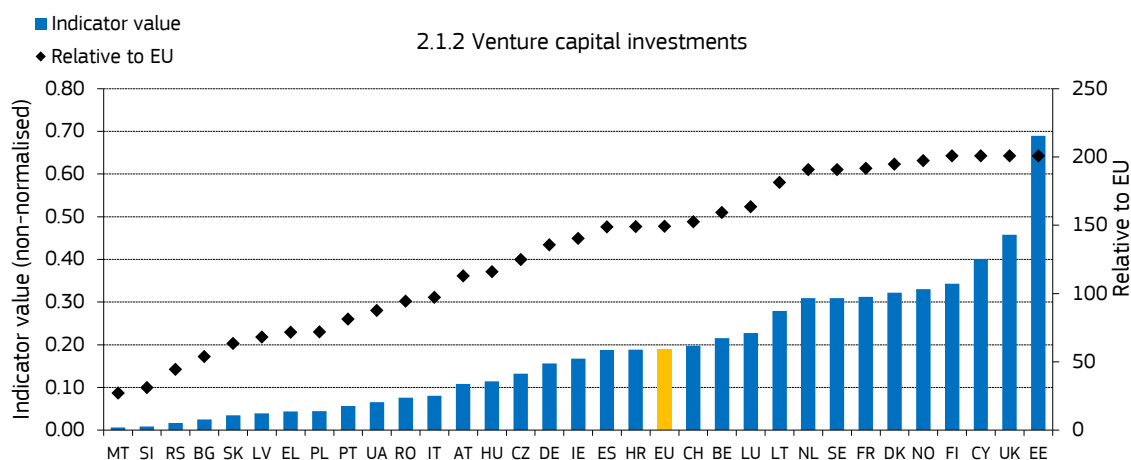
Compared to reference year 2015, performance has increased for 18 countries and the EU, and decreased for 17 countries. Performance has increased most in Norway, Croatia, and Greece, and performance has decreased most in Ukraine, Malta, and Ireland. Compared to 2021, performance has increased for 25 countries and the EU, and decreased for 3 countries (Israel, Luxembourg, and Romania).



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

## 2.1.2 Venture capital expenditures as percentage of GDP

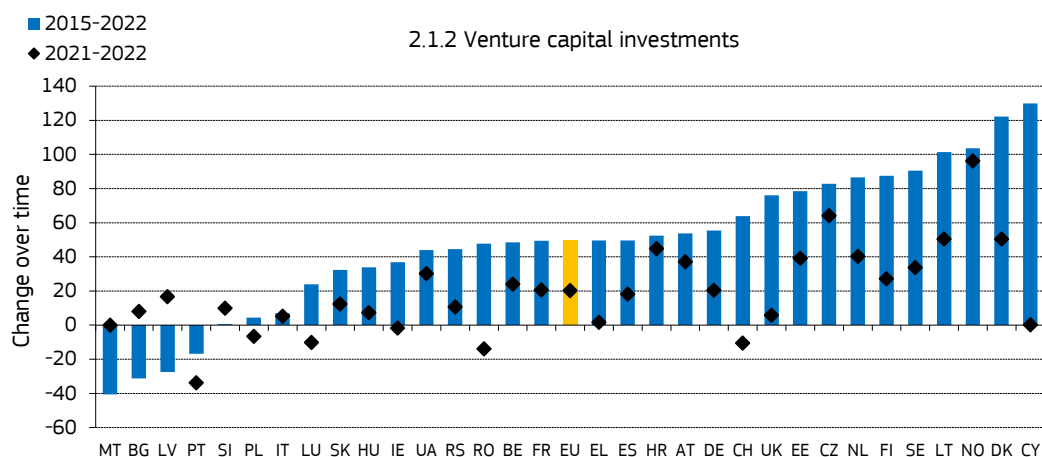
Average venture capital expenditures in the EU are 0.19% of GDP. The highest scores are observed in Estonia, the United Kingdom, and Cyprus, with venture capital expenditures at least 0.40% of GDP. In Malta, Slovenia, Serbia, and Bulgaria, performance is relatively weak with venture capital expenditures below 0.03% of GDP.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Albania, Bosnia and Herzegovina, Iceland, Israel, Montenegro, North Macedonia, and Turkey.

### Performance change

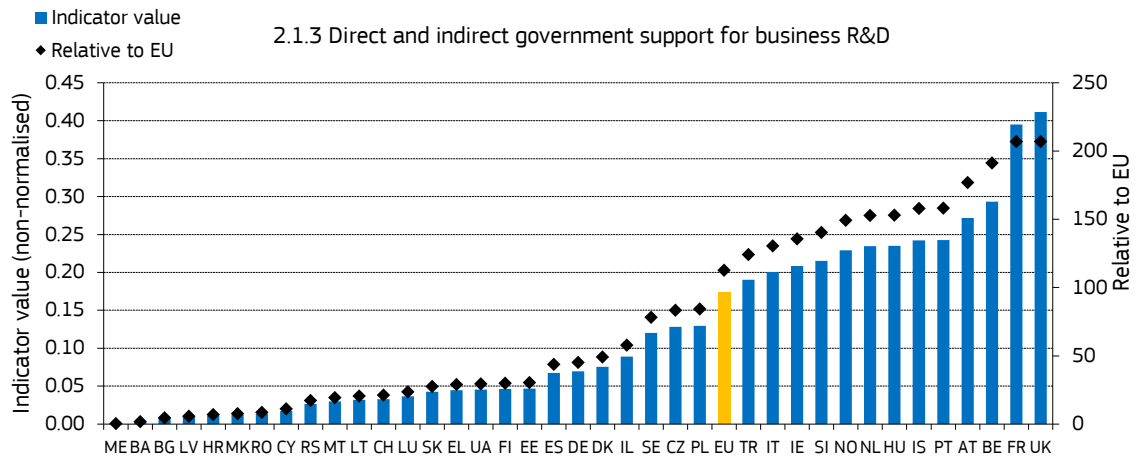
Compared to reference year 2015, performance has increased for 28 countries and the EU, and decreased for 4 countries. Performance has increased most in Cyprus, and Denmark, and performance has decreased most in Malta, Bulgaria, and Latvia. Compared to 2021, performance has increased for 24 countries and the EU, and decreased for 7 countries.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 2.1.3 Direct government funding and government tax support for business R&D as percentage of GDP

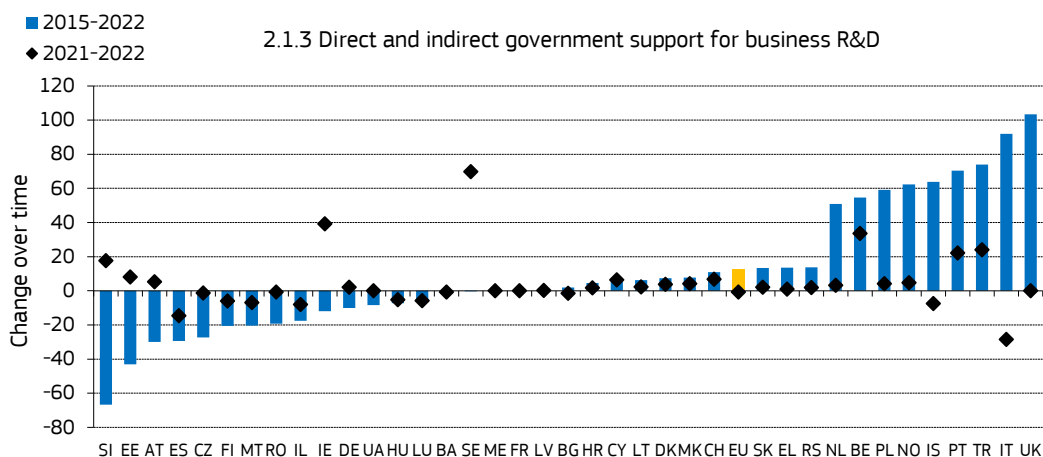
Average direct government funding and government tax support for business R&D in the EU is 0.173% of GDP. The highest scores are observed in the United Kingdom and France, with direct government funding and government tax support for business R&D close to or above 0.40% of GDP. In Montenegro and Bosnia and Herzegovina, performance is relatively weak with direct government funding and government tax support for business R&D being below 0.005% of GDP.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Albania.

### Performance change

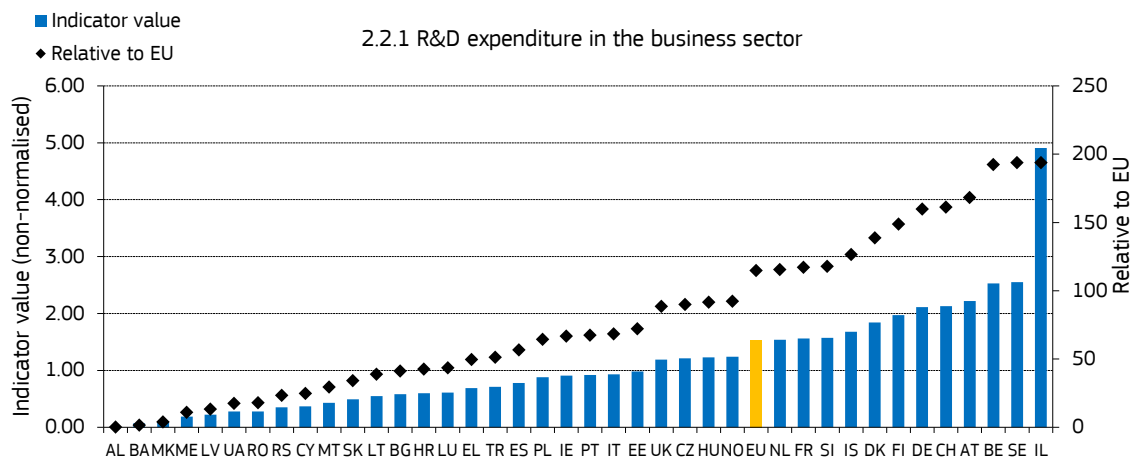
Compared to reference year 2015, performance has increased for 20 countries and the EU, and decreased for 17 countries. Performance has increased most in the United Kingdom and Italy and performance has decreased most in Slovenia and Estonia. Compared to 2021, performance has increased for 22 and decreased for 12 countries and the EU.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

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

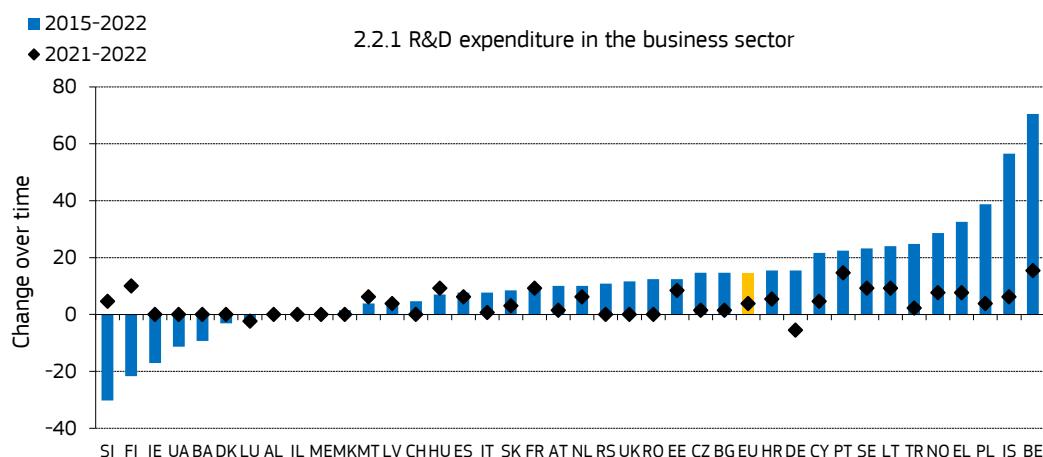
The average R&D intensity in the business sector for the EU is 1.53%. The highest scores are observed in Israel, Sweden, Belgium, Austria, Switzerland, and Germany, where the R&D intensity in the business sector is at least 2.00%. In Israel the R&D intensity is even close to 5%. In Bosnia and Herzegovina, North Macedonia, and Montenegro, performance is relatively weak with the R&D intensity in the business sector being below 0.20% of GDP.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. For Albania data are not available but it has been assumed that the normalised score is the same as that of the country with lowest R&D expenditures.

### Performance change

Compared to reference year 2015, performance has increased for 30 countries and the EU, and decreased for 7 countries. Performance has increased most in Belgium and Iceland, and performance has decreased most in Slovenia, Finland, and Ireland. Compared to 2021, performance has increased for 25 countries and the EU, and decreased for 2 countries (Germany and Luxembourg).

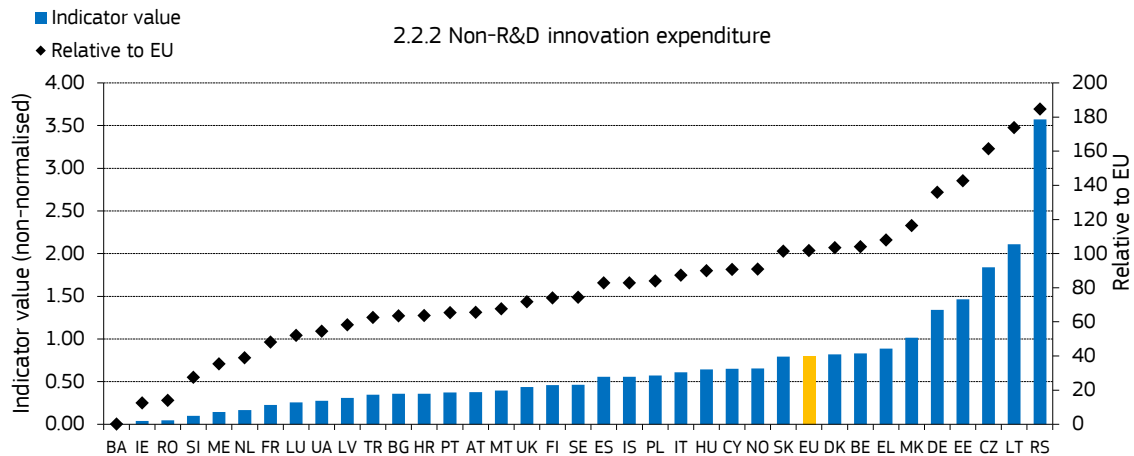


The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.



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

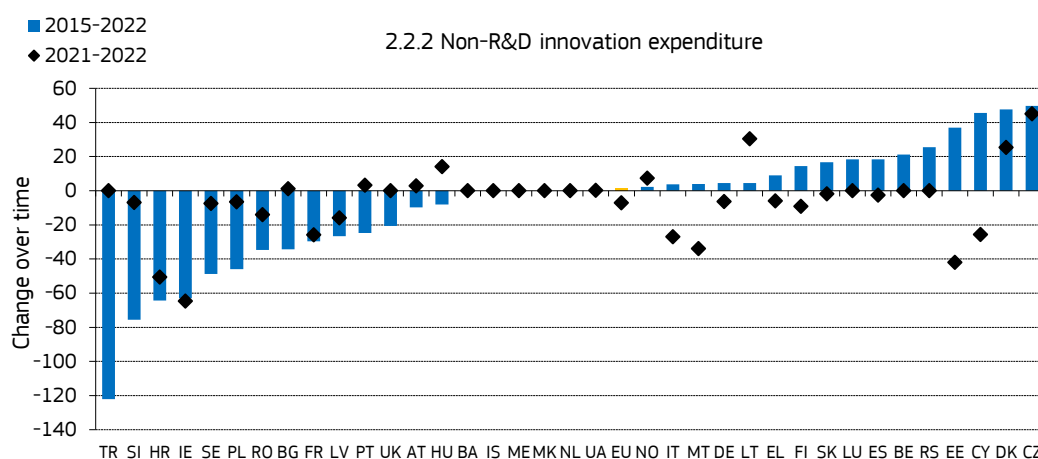
On average, 0.80% of enterprises' total turnover is spent on non-R&D innovation activities in the EU. The highest scores are observed in Serbia and Lithuania with more than 2% of total turnover spent on non-R&D innovation activities. In Bosnia and Herzegovina, Ireland, Romania, Slovenia, and Montenegro, performance is relatively weak with less than 0.15% of total turnover spent on non-R&D innovation activities.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Albania, Israel and Switzerland.

### Performance change

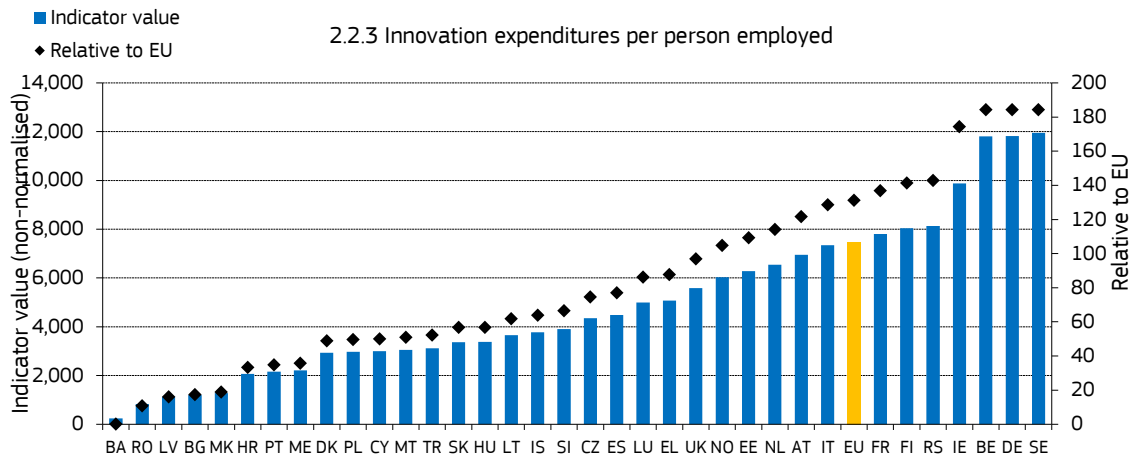
Compared to reference year 2015, performance has increased for 17 countries and the EU, and decreased for 14 countries. Performance has increased most in Czechia, Denmark, and Cyprus, and performance has decreased most in Turkey and Slovenia. Compared to 2021, performance has increased for 9 countries and decreased for 17 countries and the EU.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 2.2.3 Innovation expenditures per person employed

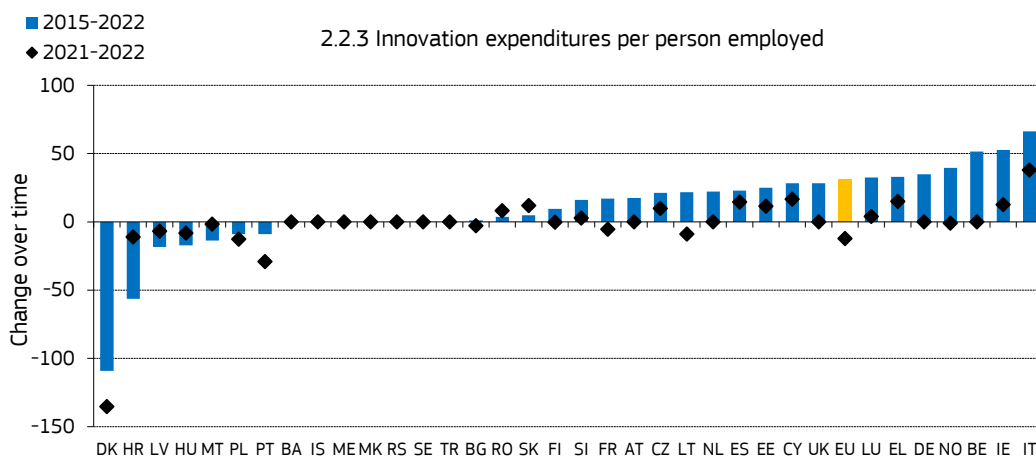
Average innovation expenditures per person employed in the EU are almost 7,500 Euros (PPS). The highest scores are observed in Sweden, Germany, and Belgium, where innovation expenditures per person employed are above 11,000 Euros (PPS). In Bosnia and Herzegovina and Romania, performance is relatively weak with innovation expenditures per person employed below 1,000 Euros (PPS).



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Albania, Israel, Switzerland, and Ukraine.

### Performance change

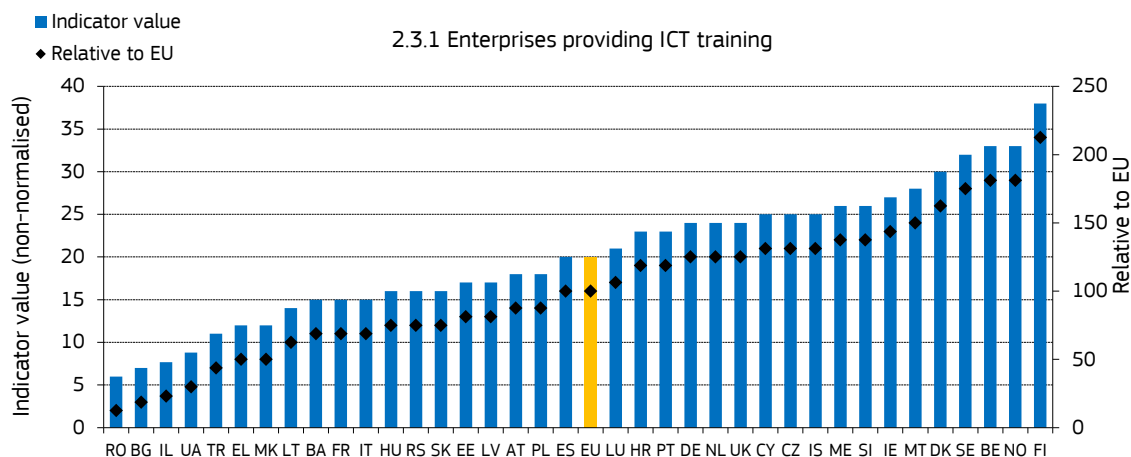
Compared to reference year 2015, performance has increased for 21 countries and the EU, and decreased for 7 countries. Performance has increased most in Italy, Ireland, and Belgium, and performance has decreased most in Denmark and Croatia. Compared to 2021, performance has increased for 11 countries and decreased for 13 countries and the EU.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

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

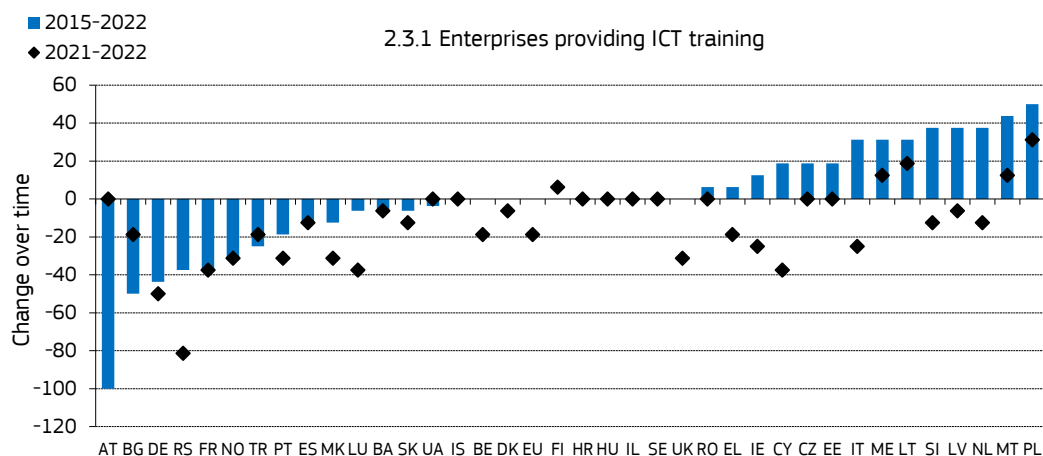
On average, 20% of enterprises in the EU provide ICT training to their personnel. The highest scores are observed in Finland, Norway, Belgium, Sweden, and Denmark, where at least 30% of enterprises provide ICT training to their personnel. In Romania, Bulgaria, Israel, and Ukraine, performance is relatively weak with less than 10% of enterprises providing ICT training to their personnel.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Albania and Switzerland.

### Performance change

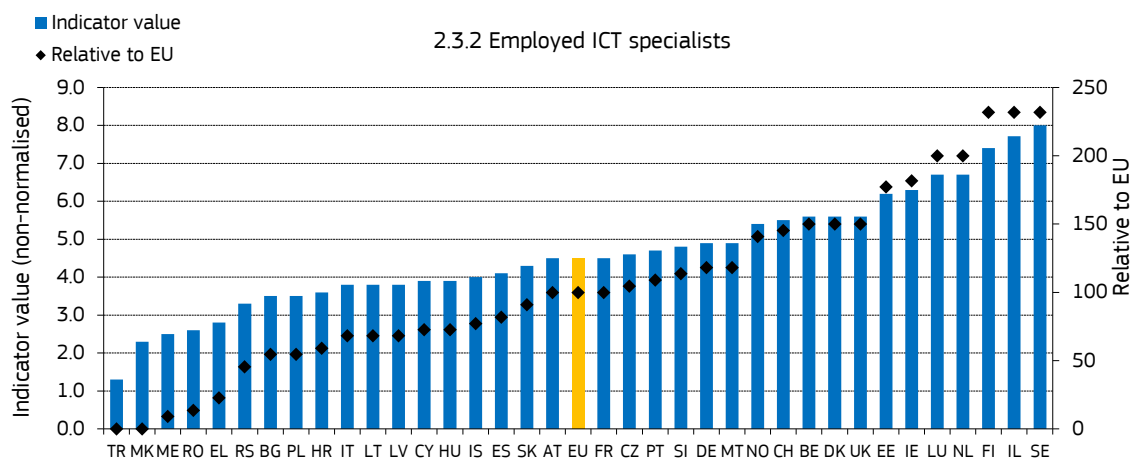
Compared to reference year 2015, performance has increased for 14 countries, did not change for 9 countries and the EU, and decreased for 14 countries. Performance has increased most in Poland and Malta, and performance has decreased most in Austria, Bulgaria, and Germany. Compared to 2021, performance has increased for only 5 countries, did not change for 10 countries, and decreased for 22 countries and the EU.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 2.3.2 Employed ICT specialists as a percentage of total employment

On average, in the EU 4.5% of total employment are ICT specialists. The highest scores are observed in Sweden, Israel, and Finland, where at least 7% of total employment are ICT specialists. In Turkey, North Macedonia, and Montenegro, performance is relatively weak where at most 2.5% of total employment are ICT specialists.



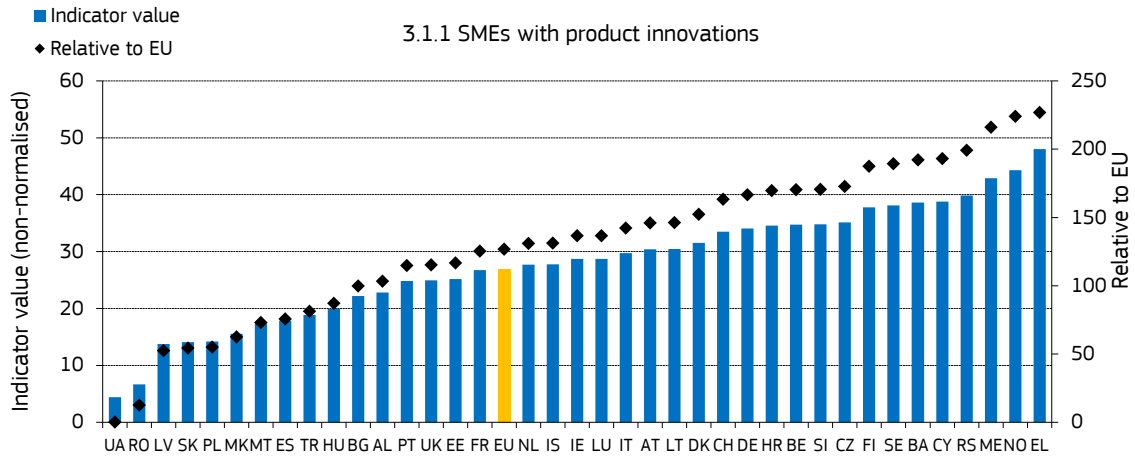
The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Albania, Bosnia and Herzegovina, and Ukraine.

#### Performance change

Due to a break in series in 2021 for almost all countries, no performance change results are available. Only for Israel trend results are available, showing a strong increase between 2015 and 2021.

### 3.1.1 SMEs introducing product innovations as percentage of SMEs

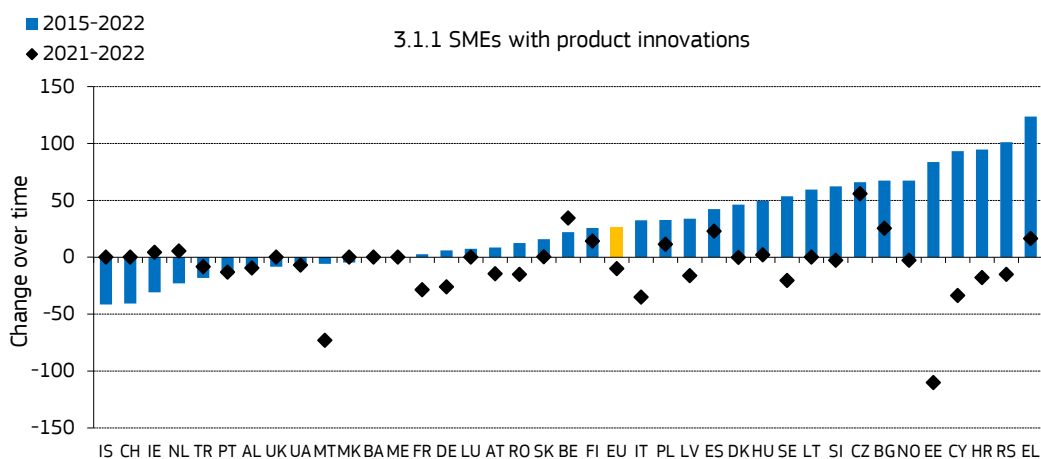
Almost 27% of EU SMEs have innovated by introducing at least one new or improved product. The highest scores are observed in Greece, Norway, and Montenegro, where more than 40% of SMEs have introduced at least one new or improved product. In Ukraine, Romania, Latvia, Slovakia, and Poland, performance is relatively weak with less than 15% of SMEs having introduced at least one new or improved product.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Israel.

### Performance change

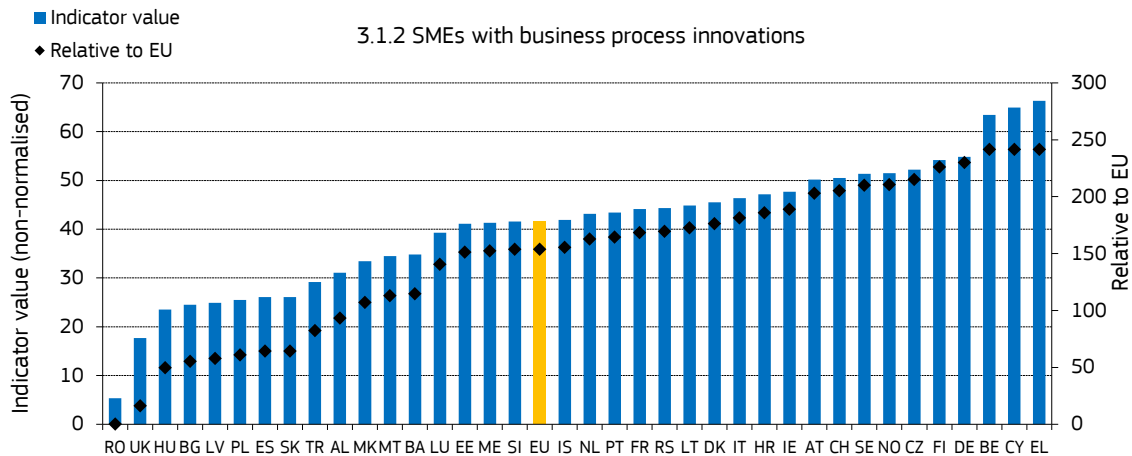
Compared to reference year 2015, performance has increased for 25 countries and the EU, and decreased for 11 countries. Performance has increased most in Greece and Serbia, and performance has decreased most in Iceland and Switzerland. Compared to 2021, performance has increased for 12 countries and decreased for 19 countries and the EU. Performance decreased very strongly between 2021 and 2022 for Estonia and Malta.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 3.1.2 SMEs introducing business process innovations as percentage of SMEs

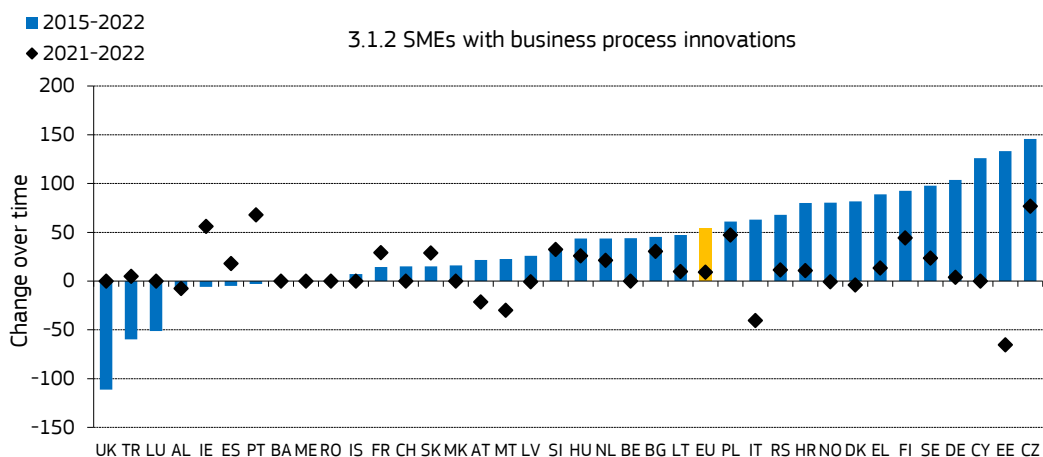
On average, 41.6% of EU SMEs have innovated by introducing at least one new or improved business process. The highest scores are observed in Greece, Cyprus and Belgium, where more than 60% of SMEs have introduced at least one new or improved business process. In Romania and the United Kingdom, performance is relatively weak with less than 20% of SMEs having introduced at least one new or improved business process.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Israel and Ukraine.

### Performance change

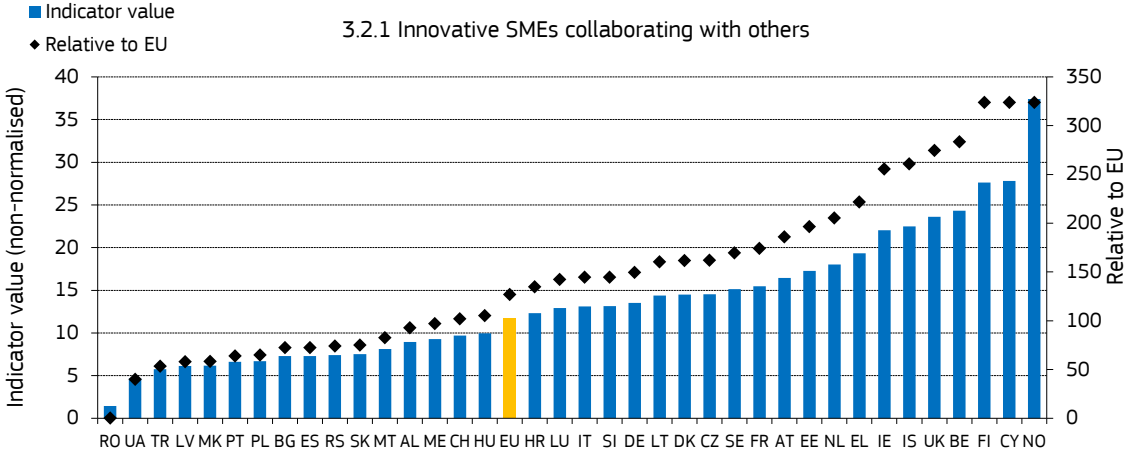
Compared to reference year 2015, performance has increased for 27 countries and the EU, and decreased for 7 countries. Performance has increased most in Czechia, Estonia, and Cyprus, and performance has decreased most in the United Kingdom, Turkey, and Luxembourg. Compared to 2021, performance has increased for 19 countries and the EU, and decreased for 8 countries.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 3.2.1 Innovative SMEs co-operating with others as percentage of all SMEs

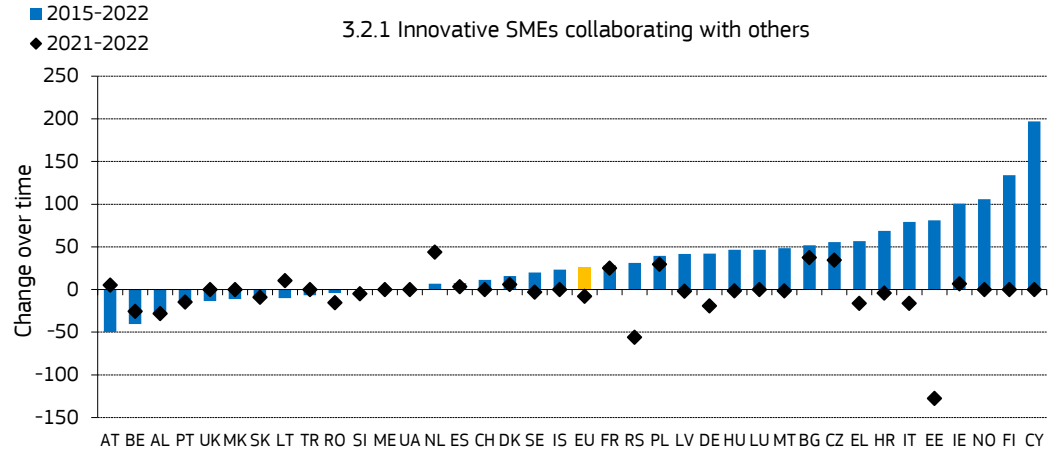
On average, 11.7% of EU SMEs collaborate with others in their innovation activities, including domestic and foreign organisations in both the private and public sector. The highest scores are observed in Norway, Cyprus, and Finland, where at least 25% of innovative SMEs collaborated with others. In Romania, Ukraine, and Turkey, performance is relatively weak with less than 6% of innovative SMEs collaborating with others.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Bosnia and Herzegovina and Israel.

### Performance change

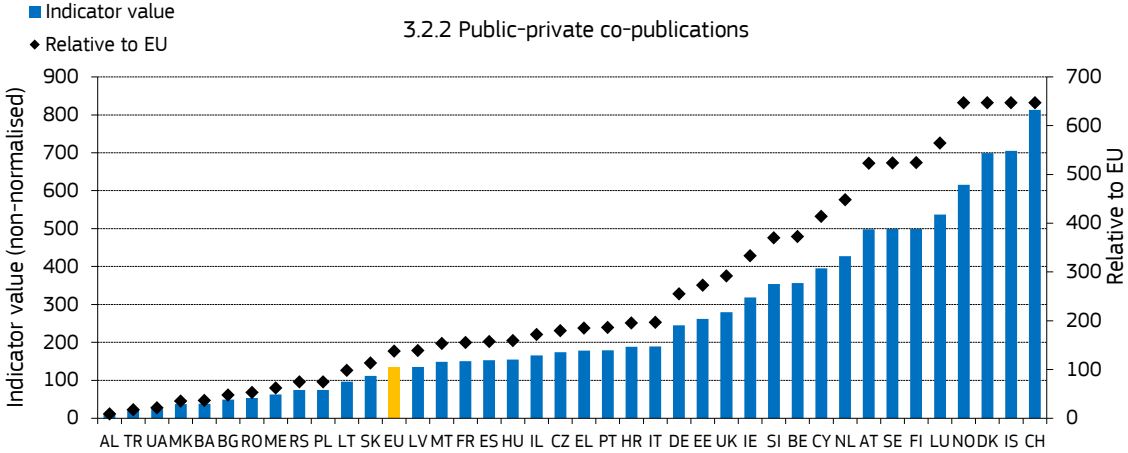
Compared to reference year 2015, performance has increased for 24 countries and the EU, and decreased for 11 countries. Performance has increased most in Cyprus, Finland, Norway, and Ireland, and performance has decreased most in Austria and Belgium. Compared to 2021, performance has increased for 10 countries, did not change for 11 countries, and decreased for 16 countries and the EU. Performance decreased very strongly between 2021 and 2022 for Estonia and Serbia.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 3.2.2 Public-private scientific co-publications per million population

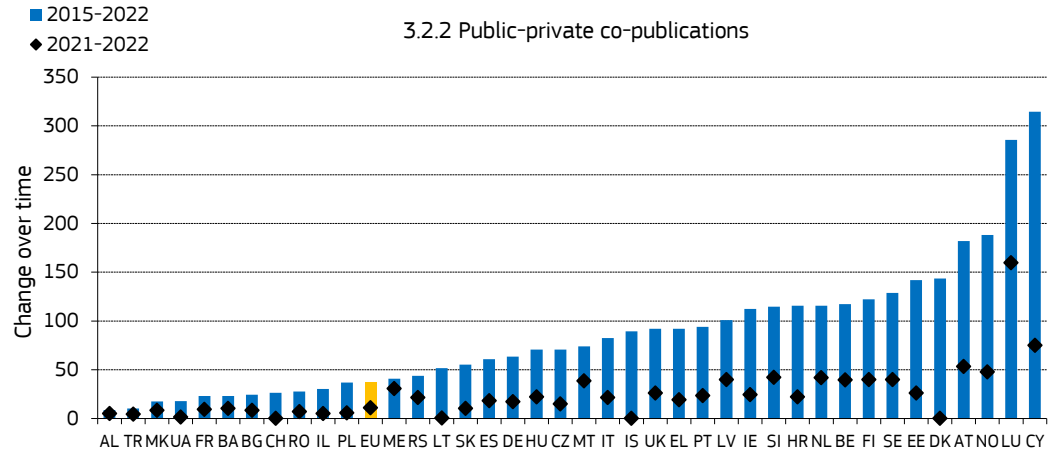
On average, there are about 134 public-private scientific co-publications per million population in the EU. The highest scores are observed in Switzerland, Iceland, and Denmark, with more than or close to 700 public-private scientific co-publications per million population. In Albania, Turkey, Ukraine, and North Macedonia, performance is relatively weak with less than 40 public-private scientific co-publications per million population.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right.

### Performance change

Compared to reference year 2015, performance has increased for all countries and the EU. Performance has increased most in Cyprus and Luxembourg, and performance has increased least in Albania and Turkey. Compared to 2021, performance has increased for 36 countries and the EU, and did not change for 3 countries.

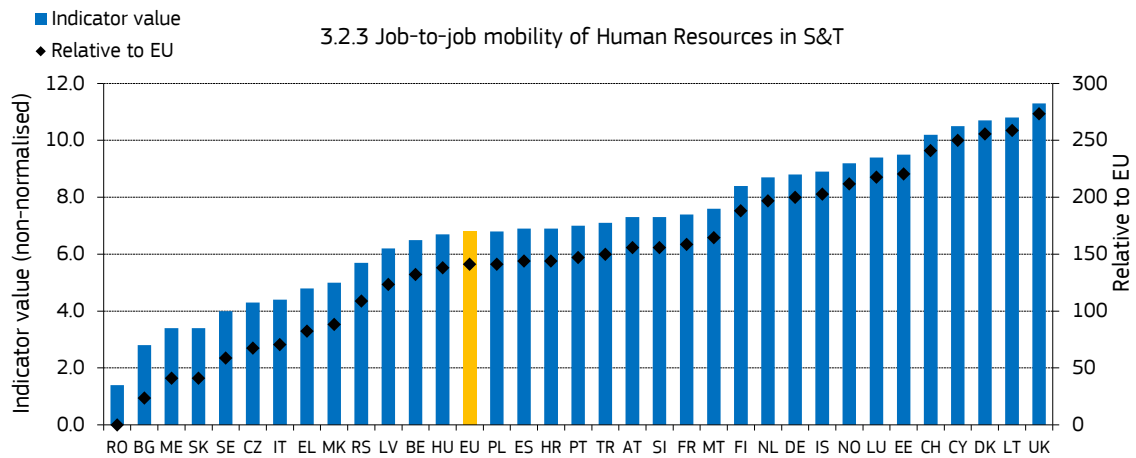


The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.



### 3.2.3 Job-to-job mobility of Human Resources in Science and Technology (HRST)

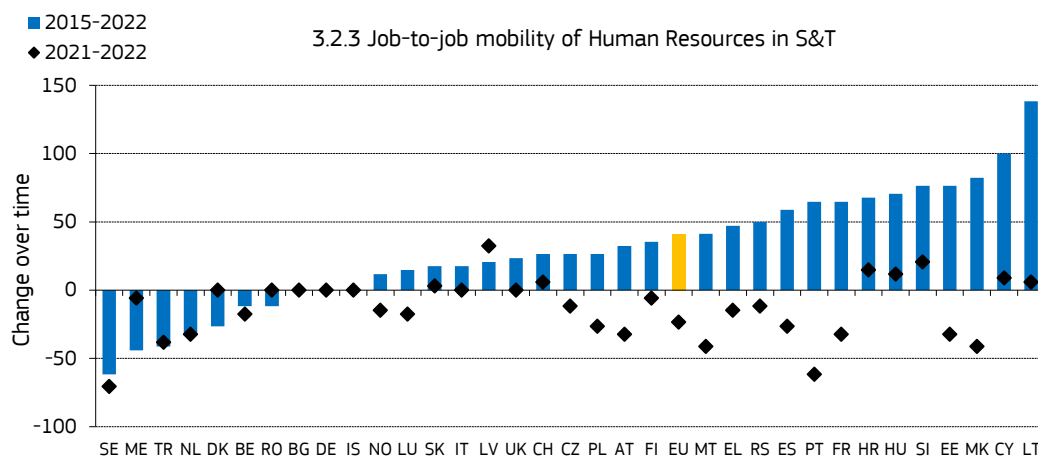
On average, the share of HRST that changed jobs is 6.8% in the EU. The highest scores are observed in the United Kingdom, Lithuania, Denmark, Cyprus, and Switzerland, where the share of HRST that changed jobs is at least 10%. In Romania, Bulgaria, Montenegro, and Slovakia, performance is relatively weak with less than 4% of HRST having changed jobs.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Albania, Bosnia and Herzegovina, Ireland, Israel, and Ukraine.

### Performance change

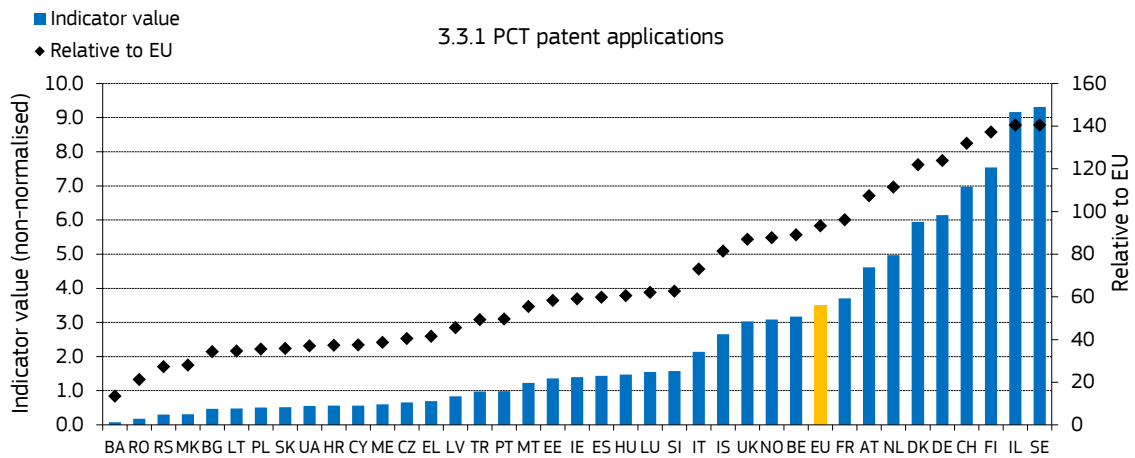
Compared to reference year 2015, performance has increased for 24 countries and the EU, and decreased for 7 countries. Performance has increased most in Lithuania and Cyprus, and performance has decreased most in Sweden, Montenegro, and Turkey. Compared to 2021 performance has increased for 8 countries, did not change for 7 countries, and decreased for 19 countries and the EU.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 3.3.1 PCT patent applications per billion GDP in PPS

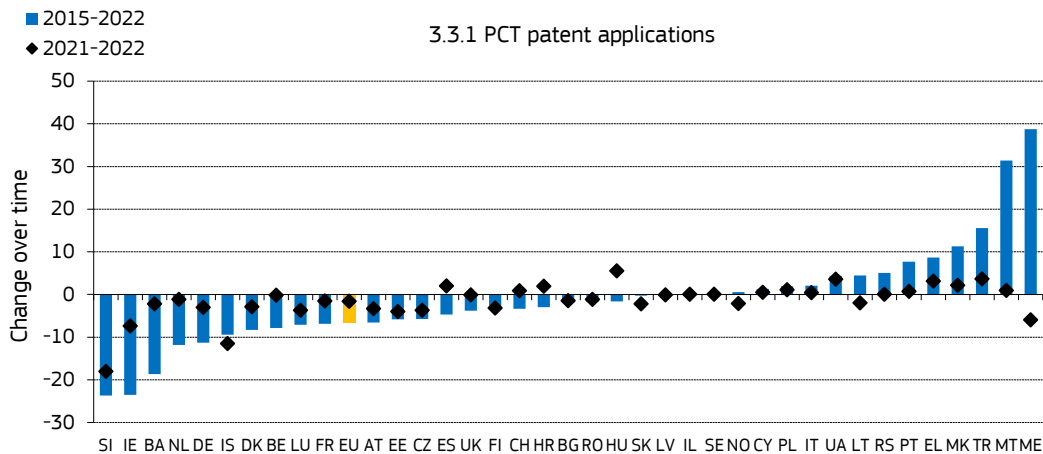
For the EU, on average almost 3.5 patents per billion GDP have been applied for. The highest scores are observed in Sweden and Israel, with patent applications per billion GDP being at least 9. In Bosnia and Herzegovina, Romania, Serbia, and North Macedonia, performance is relatively weak with close to or less than 0.3 patent applications per billion GDP.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Albania.

### Performance change

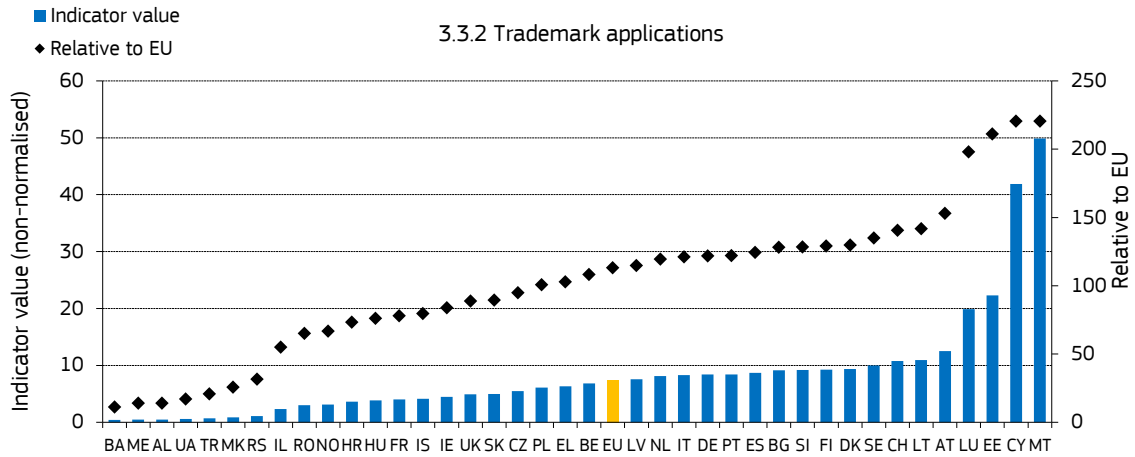
Compared to reference year 2015, performance has increased for 13 countries and decreased for 23 countries and the EU. Performance has increased most in Montenegro and Malta, and performance has decreased most in Slovenia, Ireland, and Bosnia and Herzegovina. Compared to 2021, performance has increased for 13 countries and decreased for 22 countries and the EU.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 3.3.2 Trademark applications per billion GDP in PPS

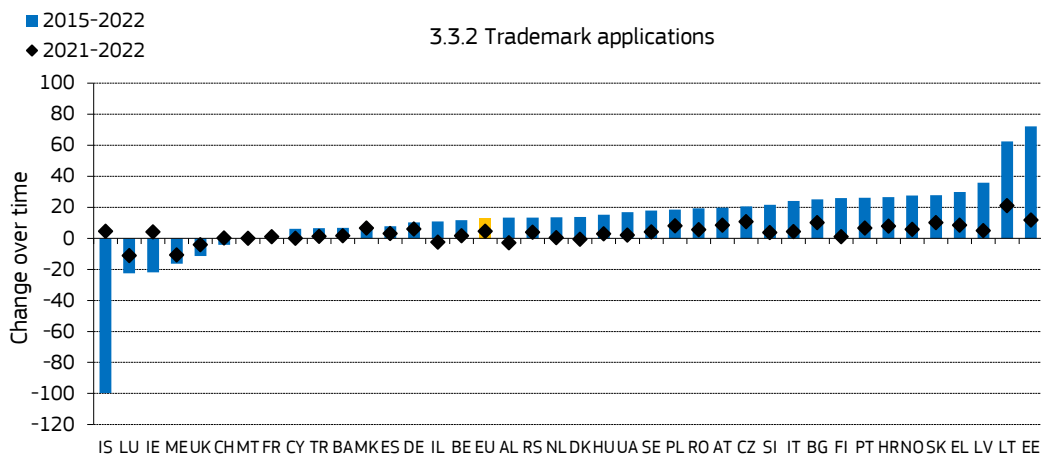
For the EU, on average almost 7.4 trademarks per billion GDP have been applied for. The highest scores are observed in Malta and Cyprus, with trademark applications per billion GDP being at least 40. In Bosnia and Herzegovina, Montenegro, Albania, Ukraine, Turkey, and North Macedonia, performance is relatively weak with less than one trademark application per billion GDP.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right.

### Performance change

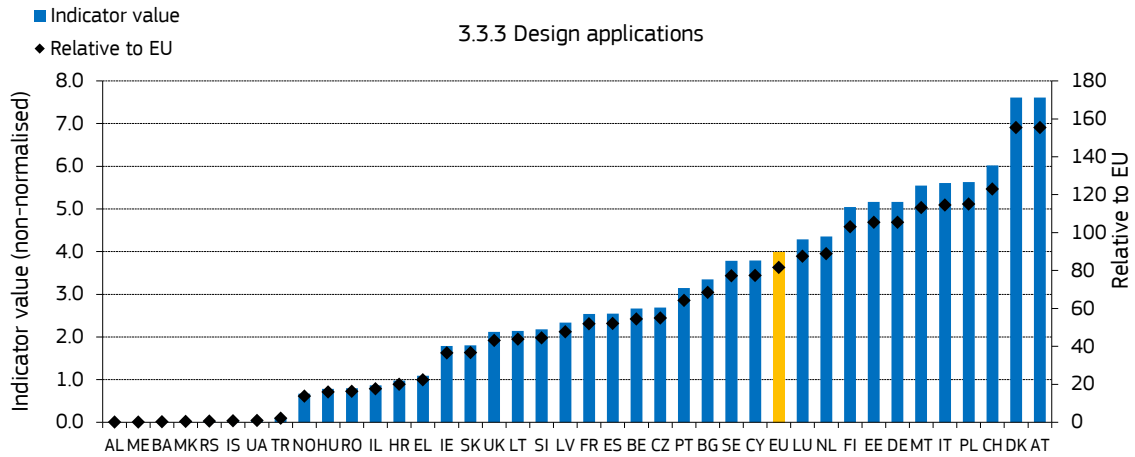
Compared to reference year 2015, performance has increased for 32 countries and the EU, and decreased for 6 countries. Performance has increased most in Estonia and Lithuania, and performance has decreased most in Iceland. Compared to 2021, performance has increased for 31 countries and the EU, and decreased for 6 countries.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 3.3.3 Design applications per billion GDP in PPS

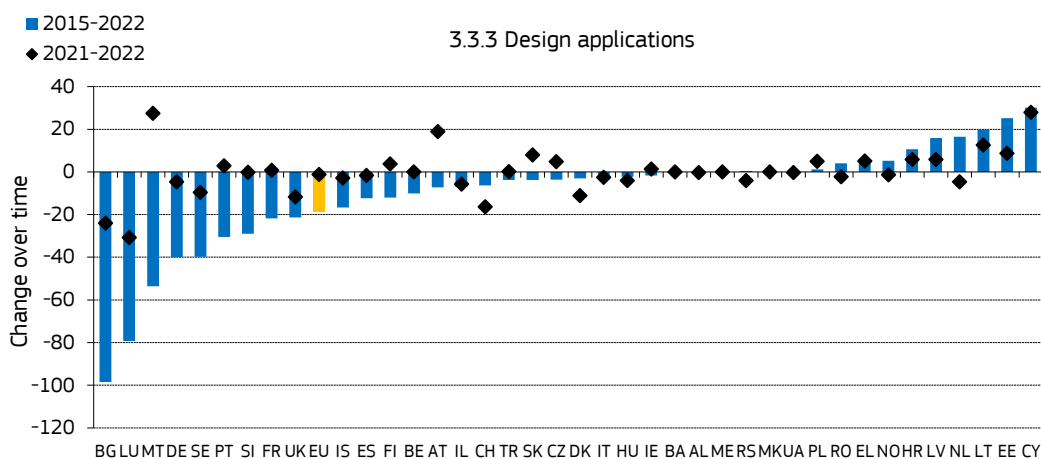
For the EU, on average almost 4 designs per billion GDP have been applied for. The highest scores are observed in Austria, Denmark, and Switzerland, with design applications per billion GDP being at least 6. In Albania, Montenegro, Bosnia and Herzegovina, North Macedonia, Serbia, Iceland, Ukraine, and Turkey, performance is relatively weak with at most 0.1 design applications per billion GDP.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right.

### Performance change

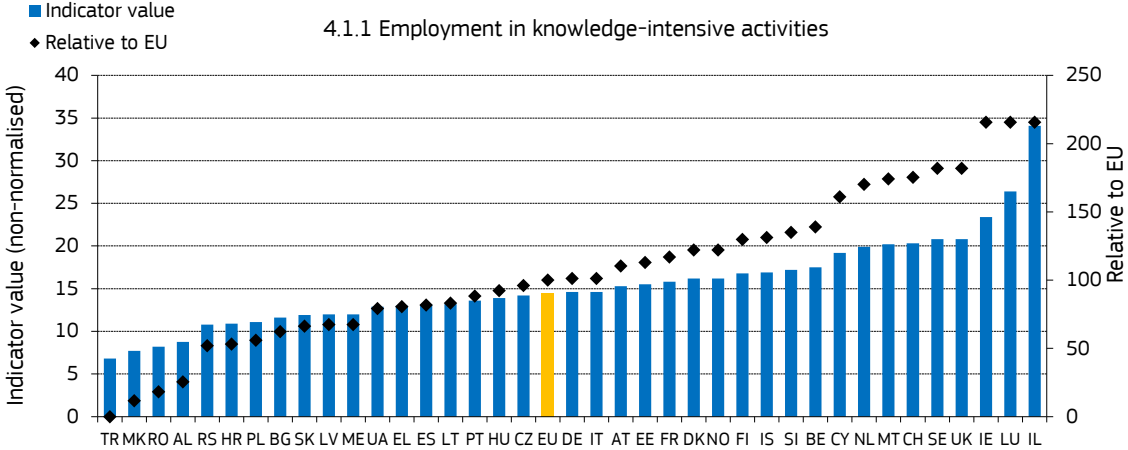
Compared to reference year 2015, performance has increased for 13 countries and decreased for 24 countries and the EU. Performance has increased most in Cyprus and Estonia, and performance has decreased most in Bulgaria, Luxembourg, and Malta. Compared to 2021, performance has increased for 17 countries and decreased for 19 countries and the EU.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 4.1.1 Employment in knowledge-intensive activities as percentage of total employment

The average value for the EU for the share of employment in knowledge-intensive activities is 14.5%. The highest scores are observed in Israel and Luxembourg, where more than 25% of employment is in knowledge-intensive activities. In Turkey, North Macedonia, Romania, and Albania, performance is relatively weak with less than 10% of employment in knowledge-intensive activities.



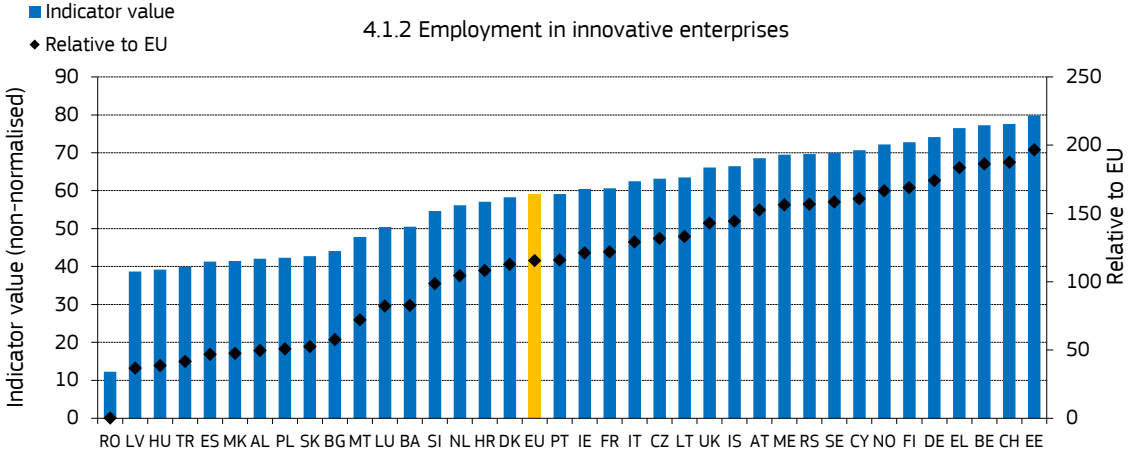
The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Bosnia and Herzegovina.

### Performance change

Due to a break in series in 2021, no performance change results are available.

**4.1.2 Employment in innovative enterprises as percentage of total employment for enterprises with 10 or more employees**

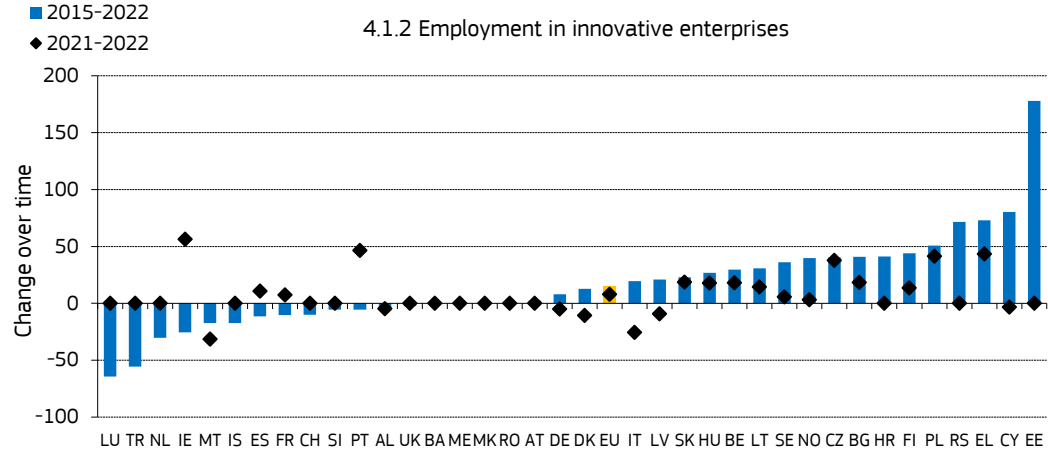
The average employment share in innovative enterprises in the EU is 59%. The highest scores are observed in Estonia, Switzerland, Belgium, and Greece, with at least 75% of employment in innovative enterprises. In Romania, Latvia, Hungary, and Turkey, performance is relatively weak with less than 40% of employment in innovative enterprises.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Israel and Ukraine.

**Performance change**

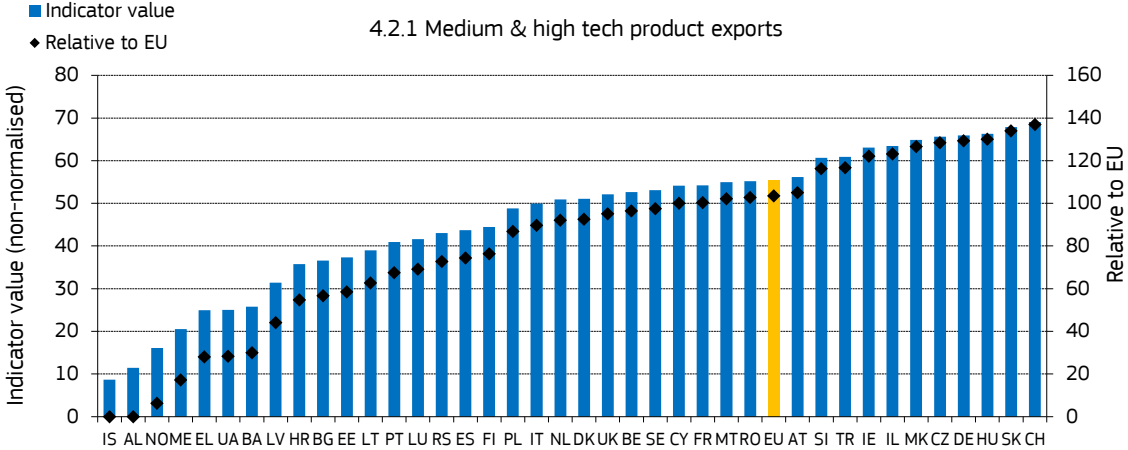
Compared to reference year 2015, performance has increased for 20 countries and the EU, and decreased for 13 countries. Performance has increased most in Estonia, and performance has decreased most in Luxembourg and Turkey. Compared to 2021, performance has increased for 15 countries and the EU, did not change for 15 countries, and decreased for 7 countries.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 4.2.1 Exports of medium and high technology products as a share of total product exports

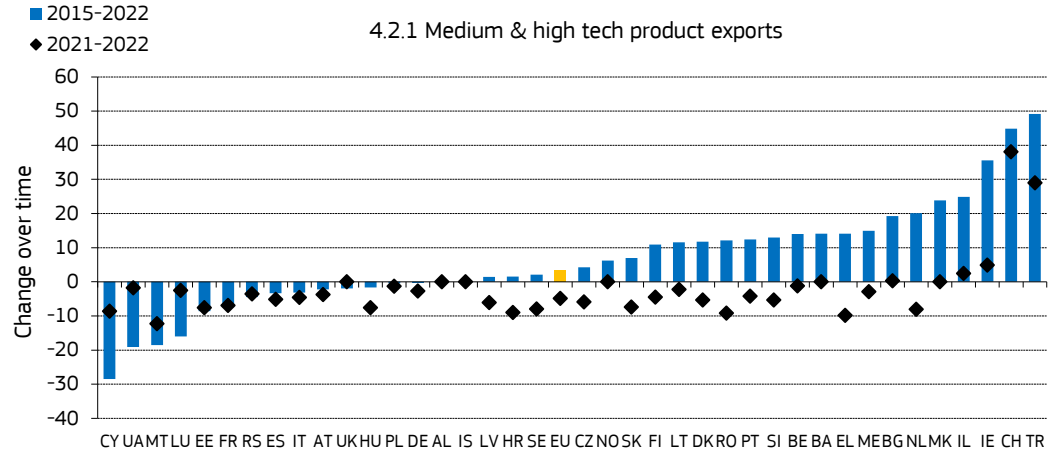
Exports of medium and high-tech products account for 55.5% of total product exports in the EU. The highest scores are observed in Switzerland, Slovakia, Hungary, Germany, and Czechia, where medium and high-tech products account for at least 65% of total product exports. In Iceland, Albania, and Norway, performance is relatively weak with medium and high-tech products accounting for less than 20% of total product exports.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right.

### Performance change

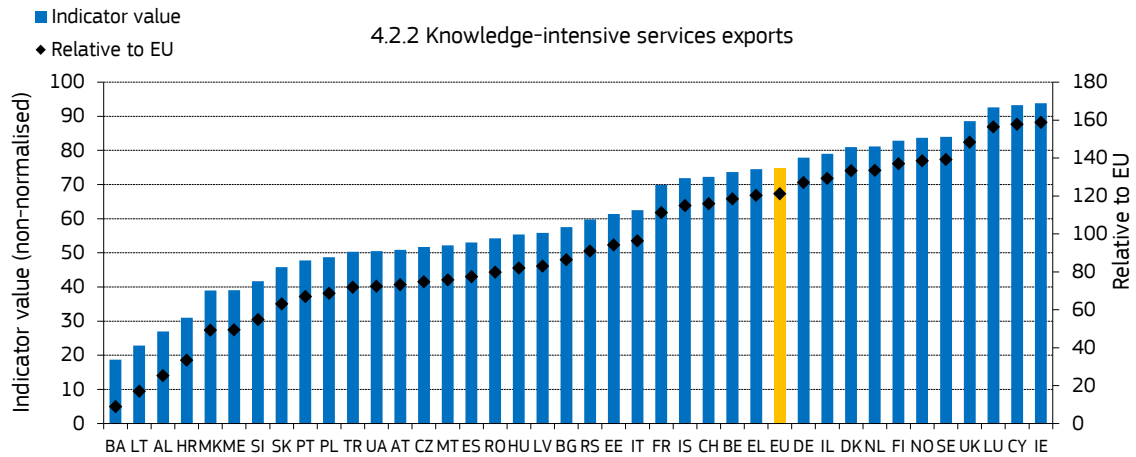
Compared to reference year 2015, performance has increased for 23 countries and the EU, and decreased for 14 countries. Performance has increased most in Turkey and Switzerland, and performance has decreased most in Cyprus, Ukraine, Malta, and Luxembourg. Compared to 2021, performance has increased for 5 countries, did not change for 6 countries, and decreased for 28 countries and the EU.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

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

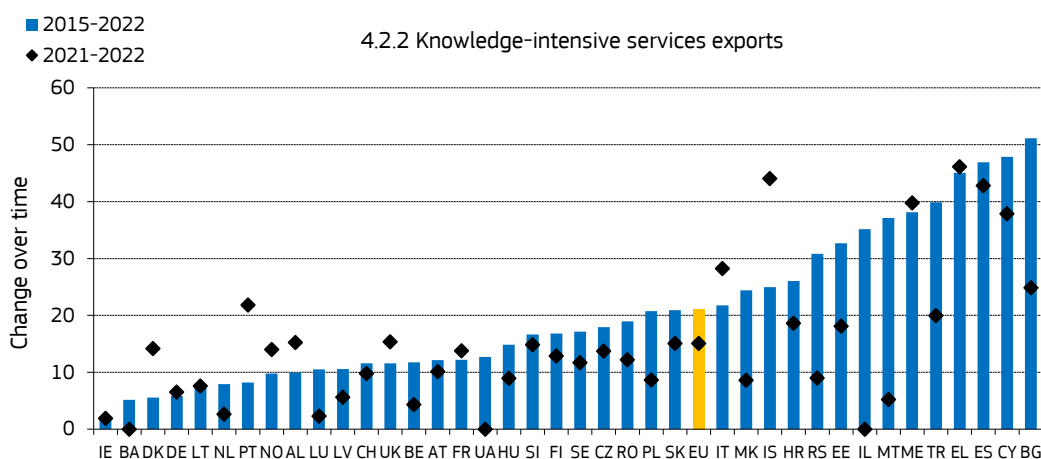
For the EU, 75% of total services exports are knowledge intensive. The highest scores are observed in Ireland, Cyprus, and Luxembourg, with knowledge-intensive services accounting for at least 90% of total services exports. In Bosnia and Herzegovina, Lithuania, and Albania, performance is relatively weak, with knowledge-intensive services accounting for less than 30% of total services exports.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right.

#### Performance change

Compared to reference year 2015, performance has increased for all countries and the EU. Performance has increased most in Bulgaria, Cyprus, Spain, and Greece, and performance has increased least in Ireland, Bosnia and Herzegovina, Denmark, and Germany. Compared to 2021, performance has increased for 36 countries and the EU, and did not change for 3 countries.

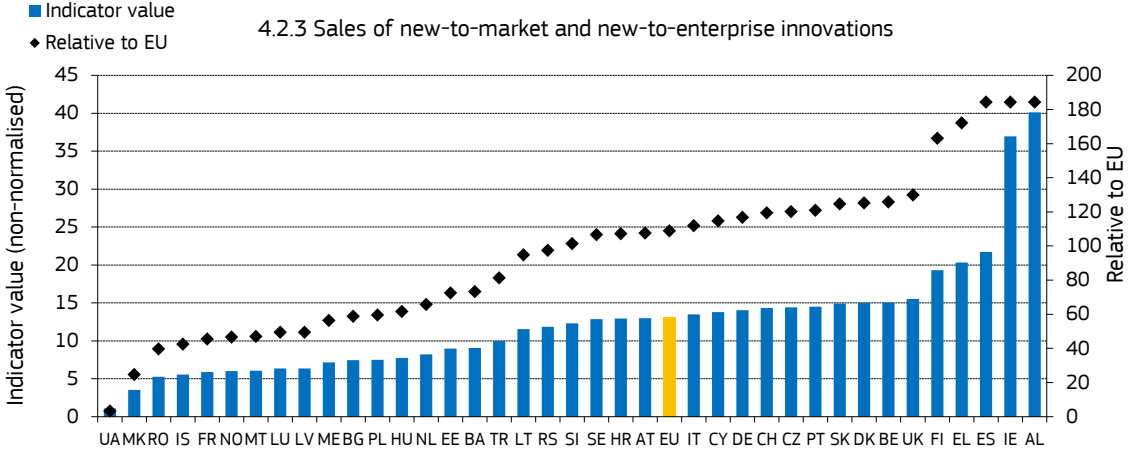


The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.



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

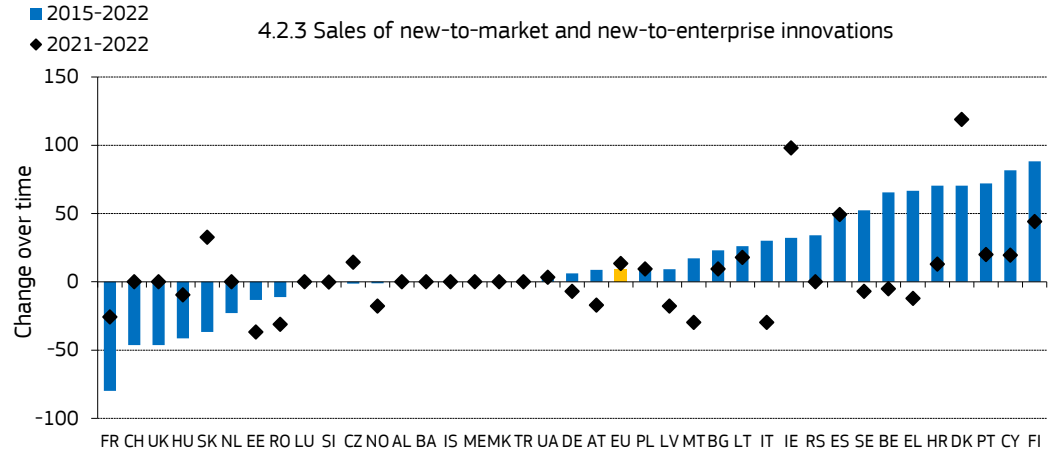
The average sales share of new-to-market and new-to-enterprise innovations for the EU is 13.1%. The highest scores are observed in Albania and Greece, where sales of new-to-market and new-to-enterprise innovations account for at least 35% of turnover. In Ukraine and North Macedonia, performance is relatively weak with sales of new-to-market and new-to-enterprise innovations accounting for less than 5% of turnover.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Israel.

### Performance change

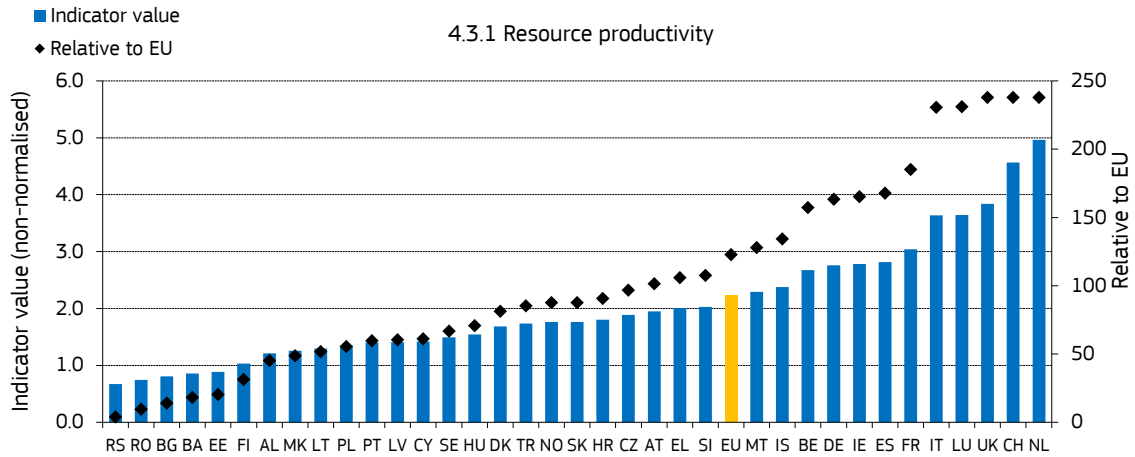
Compared to reference year 2015, performance has increased for 20 countries and the EU, and decreased for 12 countries. Performance has increased most in Finland and Cyprus, and performance has decreased most in Turkey, Switzerland, and the United Kingdom. Compared to 2021, performance has increased for 13 countries and the EU, did not change for 11 countries, and decreased for 14 countries.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 4.3.1 Resource productivity

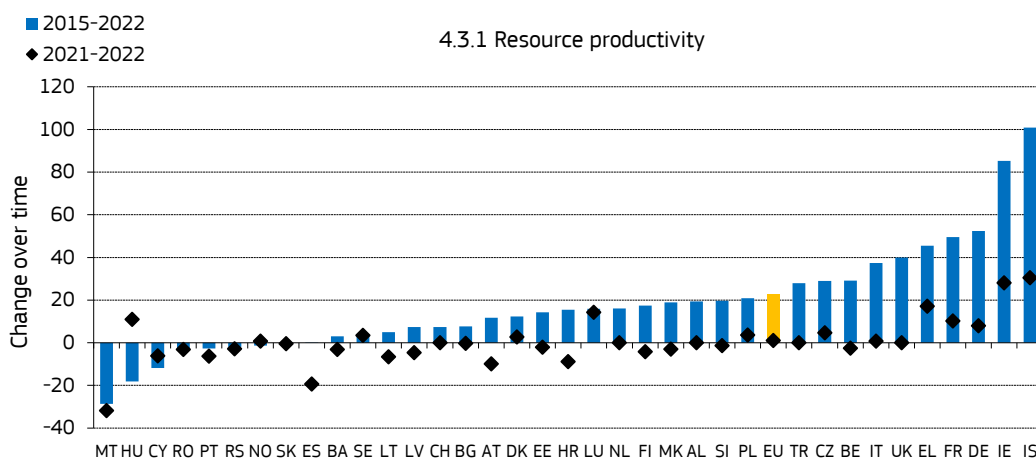
Average resource productivity in the EU equals 2.23 Euros per kilogram. The highest scores are observed in the Netherlands, Switzerland, the United Kingdom, Luxembourg, and Italy, with resource productivity being at least 3.5 Euros per kilogram. In Serbia, Romania, Bulgaria, Bosnia and Herzegovina, and Estonia, performance is relatively weak with resource productivity being less than one Euro per kilogram.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Israel, Montenegro, and Ukraine.

### Performance change

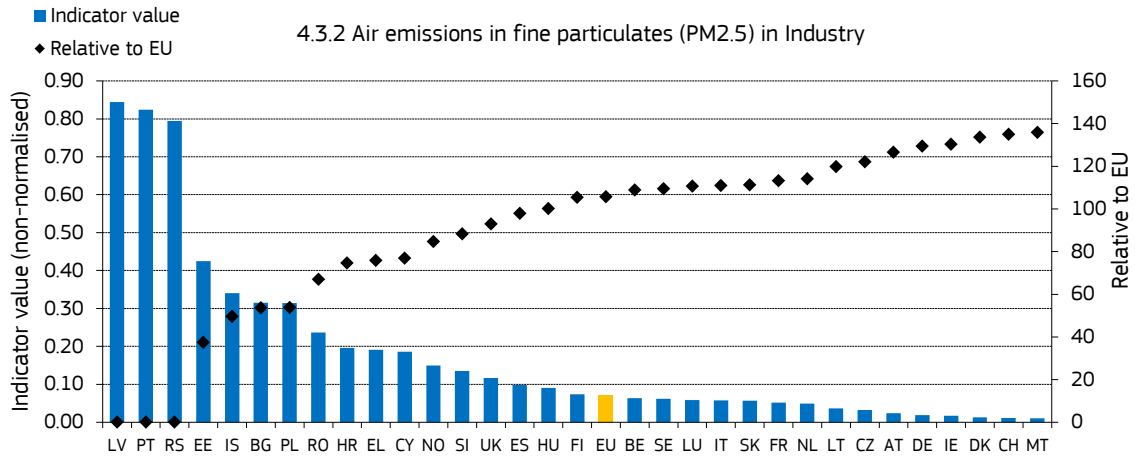
Compared to reference year 2015, performance has increased for 29 countries and the EU, and decreased for 7 countries. Performance has increased most in Iceland and Ireland, and performance has decreased most in Malta and Hungary. Compared to 2021, performance has increased for 13 countries and the EU, did not change for 5 countries, and decreased for 18 countries.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 4.3.2 Air emissions in fine particulates (PM2.5) in industry

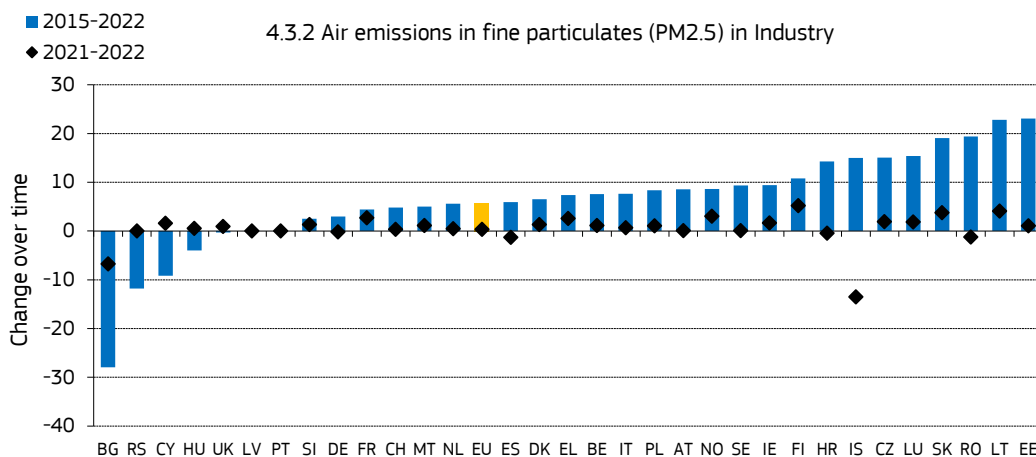
Average air emissions in fine particulates in industry in the EU equal 0.07 tonnes per million Euro. The best scores are observed in Malta, Switzerland, and Denmark, with emissions in fine particulates in industry being less than 0.015 tonnes per million. In Latvia, Portugal and Serbia, performance is relatively weak, with emissions in fine particulates in industry close to or above 0.80 tonnes per million Euro.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right. There are no data for Albania, Bosnia and Herzegovina, Israel, Montenegro, North Macedonia, Turkey, and Ukraine.

### Performance change

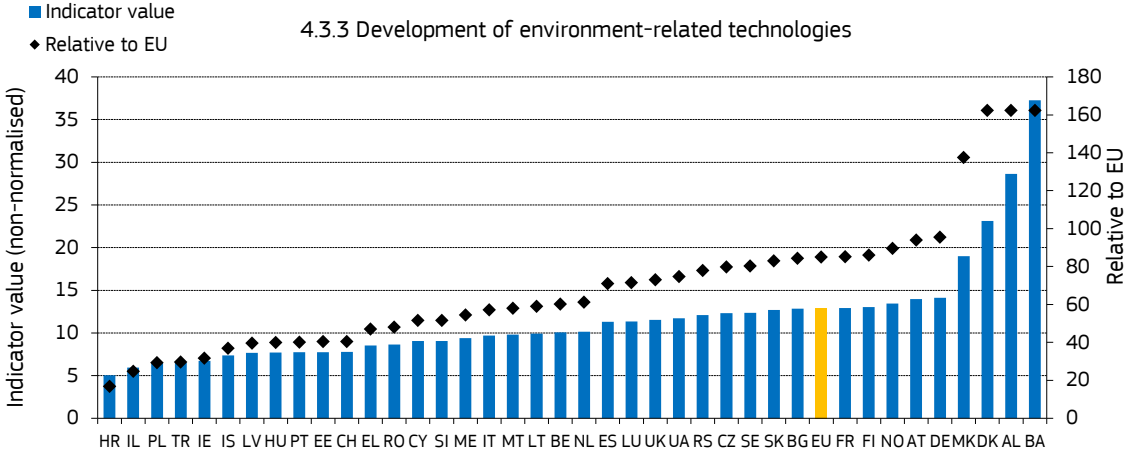
Compared to reference year 2015, performance has increased for 25 countries and the EU, and decreased for 5 countries. Performance has increased most in Estonia and Lithuania, and performance has decreased most in Bulgaria, Serbia and Cyprus. Compared to 2021, performance has increased for 23 countries and the EU, did not change for 3 countries, and decreased for 6 countries.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

### 4.3.3 Development of environment-related technologies as percentage of all technologies

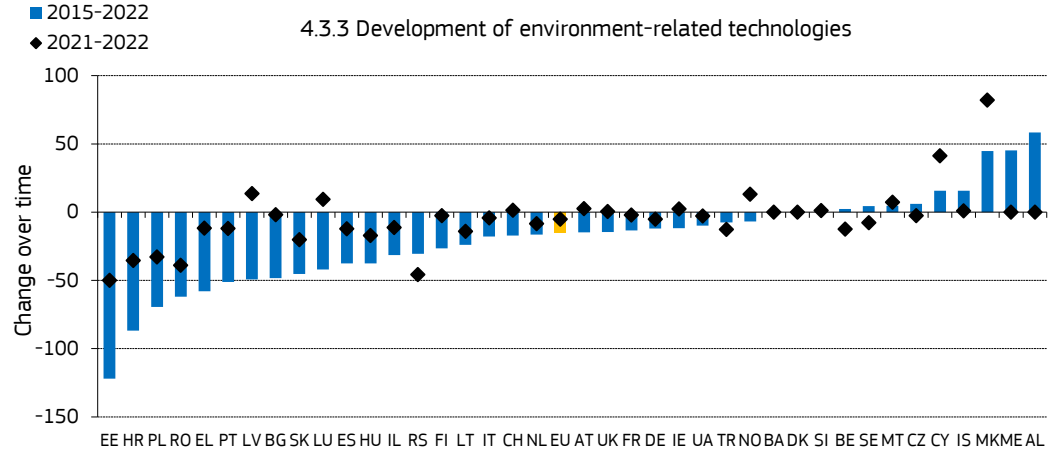
On average, 12.9% of all technologies in the EU are environment related. The highest scores are observed in Bosnia and Herzegovina, Albania, and Denmark, where at least 20% of all technologies are environment related. In Croatia and Israel, performance is relatively weak with less than 6% all technologies being environment related.



The blue columns show the value of the indicator before any possible modifications in the normalisation process (e.g., due to correcting for statistical outliers) on the vertical axis on the left. The rotated squares show the relative to EU scores on the vertical axis on the right.

### Performance change

Compared to reference year 2015, performance has increased for 10 countries and decreased for 27 countries and the EU. Performance has increased most in Albania, Montenegro, and North Macedonia, and performance has decreased most in Estonia and Croatia. Compared to 2021, performance has increased for 12 countries and decreased for 23 countries and the EU.



The blue columns show 'long-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2015. The rotated squares show 'short-run' performance changes, i.e., the performance of the relative to EU scores in 2022 compared to the relative to EU scores in 2021.

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