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ERA Scoreboard 2025

Independent Expert Report

ERA Scoreboard 2025

European Commission
Directorate-General for Research and Innovation
Directorate A - ERA & Innovation
Unit A.2 - ERA, Spreading Excellence and Research Careers
Contact Magda De Carli, Head of Unit A.2
Heiko Prange-Gstöhl
Email RTD-ERA-FORUM@ec.europa.eu
RTD-PUBLICATIONS@ec.europa.eu
European Commission
B-1049 Brussels

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EUROPEAN COMMISSION

ERA Scoreboard 2025

This report was prepared by Chiara Ferrante, Peter Neuhäusler, and Rainer Frietsch (Fraunhofer ISI) as part of the 'Implementation of the ERA Monitoring Mechanism' for the European Commission, Directorate-General for Research and Innovation (RTD/2023/OP/0017)

2026 Directorate-General for Research and Innovation

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Foreword

Based on the COUNCIL RECOMMENDATION of 24 June 2025 on the European Research Area Policy Agenda 2025-2027 (C/2025/3593), the ERA Scoreboard 2025 monitors progress towards the ERA objectives both at EU and national level. Considering this Recommendation, the ERA Forum on 4 June 2025 advised that the previous ERA Scoreboard and ERA Dashboard are merged into one “ERA Scoreboard 2025”.

At its meeting on 10 December 2025, the ERA Forum further advised that the new Scoreboard incorporates elements of both the former ERA Scoreboard and the former ERA Dashboard, including three different graphs for each indicator (see chapter 1) as well as the “traffic light system” based on the ERA Scoreboard indicators already used in 2024.

Executive summary

The European Research Area (ERA) Scoreboard is a component of the ERA Monitoring Mechanism (EMM), which provides a basis for evidence-informed policymaking in the European Research Area. The indicator system includes 60 indicators covering all four ERA priorities and the related 16 priority areas for joint action as defined by the Pact for Research and Innovation in Europe.

For each indicator, three graphs are provided: the first shows the evolution over time for the European Union; the second provides an assessment of the performance and changes in performance of each EU Member State; finally, values for EU Member States and countries associated to Horizon Europe ("Associated Countries") are reported for 2018 and the latest available year. The results of the ERA Scoreboard 2025 should also be read in combination with the ERA Country Snapshots 2025, which provide some additional qualitative assessment.

Key insights for ERA Priority 1 "Deepening a truly functioning internal market for knowledge":

- **Open Science**: At EU level, performance is strong and improving, particularly for open access publishing, which is well consolidated across Member States and Associated Countries. Countries such as the Netherlands, France and Spain perform comparably well, while challenges persist in research data openness and repository availability in several widening countries, including Romania and Bulgaria.

- **Research infrastructures**: EU-level performance remains high but highly concentrated, with participation in European research infrastructures dominated by a small group of countries. Italy, France and Spain lead in terms of participation and financial contributions, while several smaller Member States naturally show lesser engagement due to their limited capacities.

- **Gender equality, equal opportunities for all and inclusiveness**: Progress at EU level is gradual but uneven. Improvements are visible in women's representation in senior academic positions and mixed-gender authorship, with countries such as Latvia, Romania and Lithuania showing positive dynamics on these indicators. However, EU performance remains weaker for women in STEM doctorates and top-cited publications, with comparably lower levels in Malta, Luxembourg and Cyprus.

- **Researchers' careers, mobility, research assessment and reward systems**: EU-level trends show improvements in some mobility indicators but growing imbalances in others. Luxembourg and Malta perform strongly in attracting foreign doctoral candidates, while Italy and several Eastern European countries show weaker internationalisation and less favourable mobility dynamics.

- **Knowledge valorisation**: Public–private co-publications and academic patenting have increased in many countries, notably Austria, Sweden and Germany. At the same time, indicators related to patenting intensity and public-private collaboration show stagnation or decline in countries such as Romania and Croatia, pointing to persistent gaps in valorisation capacities.

- **Scientific leadership**: While ERC grants per researcher have increased in many countries, including Cyprus, Poland and Romania, the share of top-10% most cited publications shows weaker dynamics in several Member States, particularly in Eastern

Europe. Among Associated Countries, the United Kingdom and Israel continue to perform strongly.

- **Global engagement**: At EU level, global engagement remains relatively strong across most of the indicators. France and Germany lead in European and international co-patenting, while Cyprus and Luxembourg perform well in international co-publications and co-inventions.

Key insights for ERA Priority 2 – Taking up together the green transition, digital transformation and other challenges with impact on society, and increasing society's participation in the ERA

- EU performance concerning the **Challenge-based ERA actions** sub-priority remains stable. GBARD slightly increased, while environmental R&D budgets stayed mostly constant. SET Plan investments peaked in 2020, then declined. Hungary, France, and Latvia lead overall R&D; Latvia and Finland in environmental R&D. Germany and France excel in SET investments. Cyprus leads environmental patenting. Amongst the Associated Countries, the UK and South Korea lead GBARD, Serbia and South Korea in environmental R&D.

- **Synergies with education and the European skills agenda**: Performance has been generally positive. Although enterprise acquisition of intellectual property from public research declined between 2018 and 2020, university-industry collaboration and participation in EU Framework Programme projects have steadily increased. Top performers include Poland, Czechia, Italy, Cyprus, Estonia, and Belgium, along with Israel and Switzerland.

- **Synergies with sectoral and industrial policies** show a stable upward trend. Government R&D support relative to GDP has remained steady, while GBARD for industrial production has increased since 2017, peaking in 2023. Leading countries include Portugal, France, Denmark, Sweden, and Finland, as well as South Korea, the United Kingdom, and Iceland.

- The development in the sub-priority **Active citizen and societal engagement in R&I** is positive overall. Trust in science slightly declined after 2021, but social innovation research output increased. Malta, Ireland, and Lithuania lead in trust, while Cyprus and Austria lead in social innovation. Kosovo ranks highest among Associated Countries, followed by Turkey, Iceland, and North Macedonia.

Key insights for ERA Priority 3 – Enhancing access to research and innovation excellence across the Union and enhancing interconnections between innovation ecosystems

- **More investments and reforms in countries and regions with lower R&I performance**: At EU level, convergence between the Member States has slowed in recent years. Widening countries such as Poland, Romania and Slovakia show long-term improvements, but recent declines in R&D intensity can also be found.

- **Synergies between Union, national and regional funding programmes**: EU performance is improving, particularly in multi-level funding uptake. Finland, Cyprus and Belgium perform comparably strong, while Romania and Malta remain at the lower end. Seal of Excellence uptake shows renewed momentum but uneven distribution across the ERA.

- **Increased collaborative links and excellence-based integration**: EU-level trends are mixed and weakening in recent years. Greece and Portugal lead in collaboration networks among widening countries. Patent-based collaboration shows improvements in Hungary and Greece but declines in Cyprus and Malta.

Key insights for ERA Priority 4 – Advancing concerted research and innovation investments and reforms

- **Support to prioritise and secure long-term R&I investments and policy reforms**: At EU level, public–private co-financing of public R&D is largely stable over time. Germany, Belgium and Romania perform well, while Hungary, Cyprus and Slovakia remain at comparably low levels. Among Associated Countries, Israel and Switzerland stand out.

- **Coordination of R&I investments**: EU-level performance shows a recovery after earlier declines. Belgium, Spain, Italy and Sweden allocate high levels of GBARD to transnational and multilateral programmes, while Hungary, Slovakia, Romania and Bulgaria allocate fewer amounts.

1 Content of the report

As part of the ERA Monitoring Mechanism (EMM), the ERA Scoreboard provides a basis for evidence-informed policymaking within the European Research Area. The ERA Scoreboard delivers robust, EU-wide analytical tools to monitor and assess progress towards ERA priorities at European and national levels.

The time series collected for each indicator allows the monitoring of progress over time. In addition to the indicators at the EU-level, results for each EU Member State and country associated to Horizon Europe ("Associated Country") are displayed in a single graph to enable the analysis of the performance of each indicator.[1]

The ERA Scoreboard 2025 comprises 60 indicators. Besides four general R&I indicators, it includes 56 indicators grouped by the four ERA priorities and covering all 16 priority areas for joint action ("ERA sub-priorities"):

- Deepening a truly functioning internal market for knowledge
- Taking up together the green transition and digital transformation and other challenges with an impact on society and increasing society's participation in the ERA
- Enhancing access to research and innovation excellence across the Union and enhancing interconnections between innovation ecosystems across the Union
- Advancing concerted research and innovation investments and reforms

A list of all indicators and the data sources is provided in Annex 1. The data stems predominantly from publicly available sources; the latest available data are included in the Scoreboard. Compared to the ERA Scoreboard 2024, the list of indicators has changed, integrating the previous indicators of the ERA Scoreboard 2024 and the EAR Dashboard 2024. Moreover, the list of indicators has been slightly updated to improve the Scoreboard´s validity. In particular, 11 new indicators were added, 5 indicators were removed for their low coverage, 3 indicators were moved to improve the coherence across the sub-priorities, and finally 10 indicators were slightly changed to improve both the coherence and comparability across all indicators (i.e. harmonising the denominators on researchers, or adding a denominator), and the coverage across countries.[2]

As still not all data points are available for each year, a conservative imputation method has been applied, whereby gaps are filled only with the most recent available data. In most cases, the latest available year is 2023. When this is not available, the most recent year between 2019 and 2022 is used. However, for some indicators, recent data is not available for all the countries. In such cases, where data for any of the years (2019-2023) is not available, no values are

[1] The list of countries covered can be found in Annex 2.

[2] The updated version is the result of a revision process consulting all ERA Forum actors, holding a methodology workshop and pursuing analytical work. The results can be found in a methodology report that provided the basis for updating the indicator list.

reported to avoid misleading cross-country comparisons. A detailed description of the data and the imputation process is provided in the methodology report for the ERA Scoreboard 2025.[3]

In the next sections, the results for each indicator are presented, organised by ERA priorities. For each indicator, the following graphs are provided to describe their performance:

- A bar chart is showing the evolution of the indicator for the EU-27 over time. For this graph, when available, the year 2024 is included.

- A scatter plot illustrates the performance and changes in performance of the Member States. Member States with values above the EU average and showing above EU-average growth are positioned in the upper-right quadrant. Member States with values above the EU average but with below EU-average growth are located in the upper-left quadrant. Those with values below the EU average and below EU-average growth appear in the lower-left quadrant. Finally, Member States with values below the EU average but with above EU-average growth are positioned in the lower-right quadrant. The colour coding aligns with the categories used in the European Innovation Scoreboard (EIS):

    - Dark blue: “Innovative leaders”
    - Light blue: “Strong innovators”
    - Yellow: “Moderate innovators”
    - Brown: “Emerging innovators”

- A second bar chart is showing the latest available data of the indicator for each Member States and Associated Countries, alongside its value in the 2018.

The graphs only show countries for which data are available. Therefore, countries not displayed indicate that data for the corresponding country and year is not available (N.A.).

Finally, as the Scoreboard primary objective is to monitor the progress of the countries towards ERA priorities, the interpretation of the indicators should be approached with caution, as cross-country differences may reflect diverse structural, institutional, and historical contexts, that are not described within the report. However, some of these context conditions have already been addressed in the ERA Country Reports 2023 and 2024[4] as well as in the ERA Dashboards 2023 and 2024.[5]

[3] All reports as well as the data sets can be downloaded on the ERA Policy Platform.

[4] See https://european-research-area.ec.europa.eu/era-country-reports.

[5] https://op.europa.eu/en/publication-detail/-/publication/1d49ca62-ec09-11ee-8e14-01aa75ed71a1/language-en/format-PDF/source-311951441 (2023) and https://op.europa.eu/en/publication-detail/-/publication/b253c5b7-19a8-11f0-b1a3-01aa75ed71a1/language-en (2024).

2 Overview of the performance of the EU-27 in the ERA Scoreboard

To ensure consistency with the 2023 and 2024 ERA Scoreboards, this report monitors the performance of the EU-27 against the ERA priorities using a "traffic light system". The monitoring of the performance is limited to indicators already included in the ERA Scoreboard 2024 (and still present in the current Scoreboard), to maintain consistency across reports and avoid overburdening the reader.

The "traffic light system" combines information on relative performance changes over three timeframes: since 2010, since 2015, and since 2018, to the latest available year. For each period, the compound annual growth rate (CAGR) is calculated. This represents the average annual growth rate of an indicator, providing an annualised measure of growth over a specified time period. The CAGR smooths out fluctuations in periodic values, offering a clearer picture of long-term trends.[6]

If the CAGR is positive for all three periods, i.e. there is growth in all three time periods, the indicator receives the highest score and is marked with two dark green "++" signs in the following table. In case the CAGR is positive for two time periods, the indicator receives a medium-high score, i.e. growth in two out of three time periods, and is marked with a light-green "+" sign in the table. If the CAGR is positive for one period, the indicator receives a medium score and is marked with a yellow "o" sign in the table. In case the CAGR is negative in all three periods, the indicator receives the lowest score, marked by a red "- " sign. It is important to note that an increase in an indicator's value does not necessarily imply an improvement, as this depends on the specific policy objective. In addition, the table does not distinguish between different magnitudes of growth; both large and small changes are simply marked as "+" or "-". For a more detailed view, including the exact values of each indicator and comparisons across Member States and Associated Countries, please refer to the graphs included in this report.

Based on the results shown in Table 1, the ERA sub-priorities where the EU-27 is showing the highest score, i.e. substantial positive change, include:

- R&D investment
- Open Science
- Gender Equality
- Researchers´ career and mobility
- Global engagement
- Synergies with sectorial policies and industrial policies
- Active citizen and societal engagement in R&I

[6] The country developments based on the CAGR are visualised for all indicators on the ERA Policy Platform through "heat maps".

- Synergies between EU, national and regional funding programmes

The ERA sub-priorities where the EU-27 is showing a medium-high score, i.e. slower positive change, are:

- Knowledge valorisation
- More investments and reforms in countries and regions with lower R&I performance

The ERA sub-priorities where the EU-27 is showing a medium score or the lowest score, i.e. a limited positive change or even zero/negative change, include:

- Scientific leadership
- Challenge-based ERA actions
- Synergies with education and the European Skills Agenda
- Increased collaborative links and excellence-based integration in countries and regions with lower R&I performance
- Support to prioritise and secure long-term R&I investments and policy reforms
- Coordination of R&I investments

Table 1 Overview of the EU-27 performance[7]

ID[8]	ERA Scoreboard Indicator	Growth 2010-recent	Growth 2015-recent	Growth 2018-recent	Score
R&D Investment					
1	Gross Domestic Expenditure on R&D (GERD) as a percentage of GDP	+	+	+	++
3	Researchers (in full-time equivalent) per million inhabitants	+	+	+	++
Open Science					
5	Share of publications available in open access (green, gold and diamond)	+	+	+	++

[7] The table shows the results of the "traffic light system", only for those indicators, in each ERA sub-priority, that were featured also in the ERA Scoreboard 2024. As a result, it does not provide the complete list of indicators for each ERA sub-priority. The full list can be found in Annex 1, and each indicator is described in more detail in the subsequent sections.

[8] The numbering of the indicators follows the new list of indicators for the ERA Scoreboard 2025, available in Annex 1.

ID[8]	ERA Scoreboard Indicator	Growth 2010-recent	Growth 2015-recent	Growth 2018-recent	Score
Research Infrastructures					
9	Share of national public R&D expenditure committed to European research infrastructures		n.a.		
Gender equality, equal opportunities for all and inclusiveness					
11	Proportion of women of Grade A among academic staff/researchers	+	+	+	++
Researchers' careers and mobility and research assessment and reward systems					
17	Share of foreign doctorate students as a percentage of all doctorate students	n.a.	+	+	++
Knowledge Valorisation					
26	Share of innovating firms collaborating with HEI/PRO out of all innovative firms	+	+	-	+
Scientific leadership					
29	Percentage of scientific publications among the top-10% most cited publications worldwide	-	-	-	-
Global engagement					
35	International co-publications with non-EU partners per 1,000 researchers in the public sector	+	+	+	++
Challenge-based ERA actions					
38	Environmentally related government R&D budget as percentage of total government R&D	-	-	+	o
Synergies with education and the European Skills Agenda					
41	Enterprises that purchased or licensed-in patents or other IPRs from public research organisations, universities or higher education institutions[9]	n.a.	n.a.	-	-

[9] The current indicator is substituting the previous ERA Scoreboard indicator n.12 (see here) for methodological reasons. The CAGR is calculating the average value of the indicator across widening counties.

ID[8]	ERA Scoreboard Indicator	Growth 2010-recent	Growth 2015-recent	Growth 2018-recent	Score
Synergies with sectorial policies and industrial policy, in order to boost innovation ecosystems					
44	Direct government support and indirect government support through R&D tax incentives as a percentage of GDP	+	+	+	++
Active citizen and societal engagement in R&I					
48	Share of publications on social innovation or social entrepreneurship	+	+	+	++
More investments and reforms in countries and regions with lower R&I performance					
49	Increase in total R&D expenditure, expressed as a percentage of GDP	-	+	+	+
Synergies between Union, national and regional funding programmes					
54	Number of Seal of Excellence projects on the InvestEU Portal per 1,000 FTE R&D personnel	n.a.	n.a.	+	++
Increased collaborative links and excellence-based integration of research-performing organisations from countries/regions with lower R&I performance					
57	Share of patents registered by a widening country together with partners from other EU countries[10]	-	-	-	-
Support to prioritise and secure long-term R&I investments and policy reforms					
59	Share of public R&D expenditures financed by the private sector	+	-	n.a.	o
Coordination of R&I investments					
60	Government budget allocations for R&D (GBARD) allocated to Europe-wide transnational, as well as bilateral or multilateral, public R&D programmes per FTE researcher	+	-	-	o

Note: the current list of IDs refers to the numbering of the actual Scoreboard report 2025, to keep coherence across the report.

[10] As the previous ERA Scoreboard indicator n.17 (see here) had no time series available for the growth calculation, it has been substituted with the current indicator covering the same ERA sub-priority.

3 General indicators

In this section, the results of the general indicators are presented. The general indicators examined are the following:

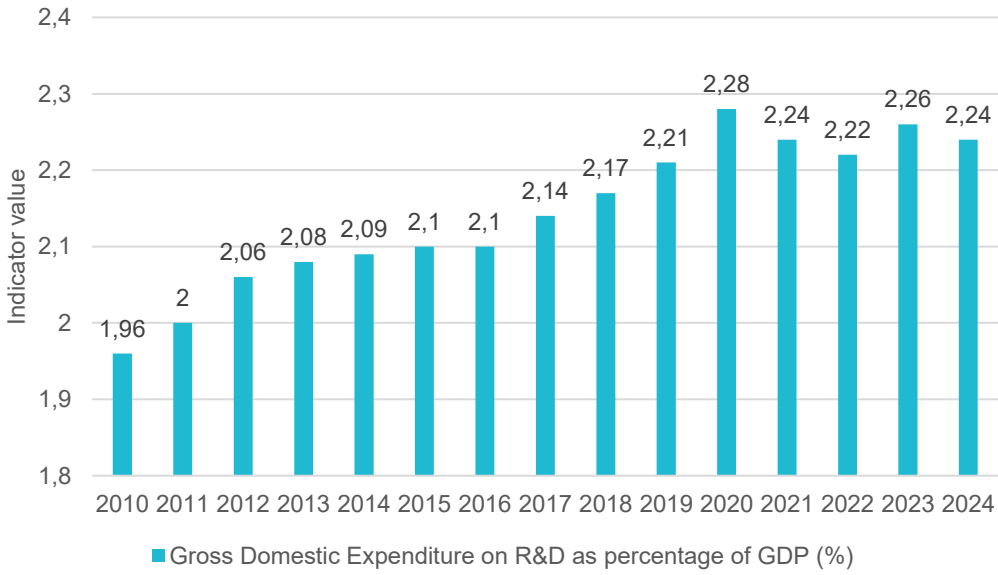
- Gross Domestic Expenditure on R&D (GERD) as a percentage of GDP
- Government Budget Allocations for R&D (GBARD) as a percentage of GDP
- Researchers (in full-time equivalent) per million inhabitants
- Business Enterprise Expenditure on R&D (BERD) as a percentage of GDP

3.1 #1 Gross Domestic Expenditure on R&D (GERD) as a percentage of GDP

This indicator measures the share of total R&D expenditures as a percentage of GDP (Gross Domestic Product). It is a key metric for assessing national investment in innovation and scientific progress relative to the size of the economy.

The trend for this indicator for the EU-27 is depicted over time in Figure 1. There has been a rather continuous increase of the indicator from 1.96% in the year 2010 to its peak of 2.28% in 2020. The strong increase in 2020 compared to 2019 can be explained by a decrease in GDP as a consequence of the Covid-19 pandemic. Since 2020, the indicator shows slight fluctuations, settling at 2.24% in 2024.

Figure 1 Gross Domestic Expenditure on R&D as a percentage of GDP, for the EU-27 over time

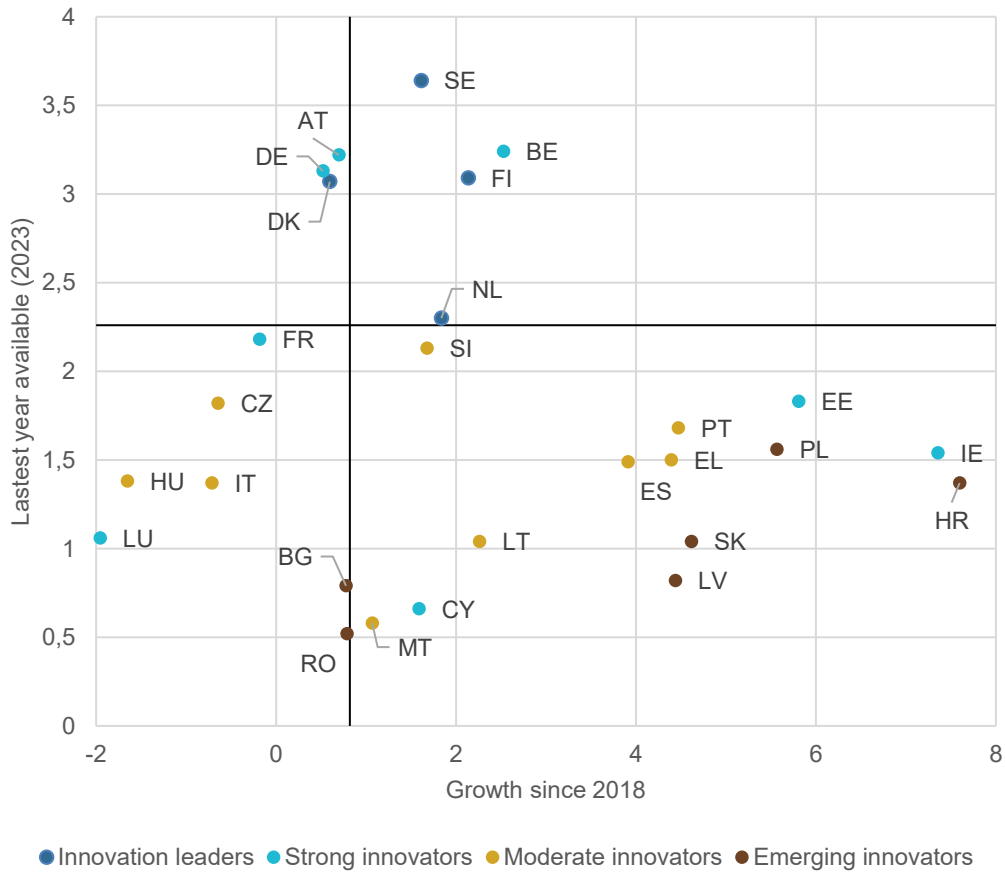


Source: Eurostat, OECD, UNESCO UIS. Calculations by Fraunhofer ISI.

Figure 2 shows the latest available value of GERD as percentage of GDP compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above

the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. This group includes Sweden, Belgium, Finland, and the Netherlands. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Austria, Germany, and Denmark. France, Czechia, Italy, Hungary, Luxembourg, Bulgaria, and Romania are instead depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The rest of the Member States can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 2 Gross Domestic Expenditure on R&D as a percentage of GDP, latest indicator value and change by EU-27 countries



Source: Eurostat, OECD, UNESCO UIS. Calculations by Fraunhofer ISI.

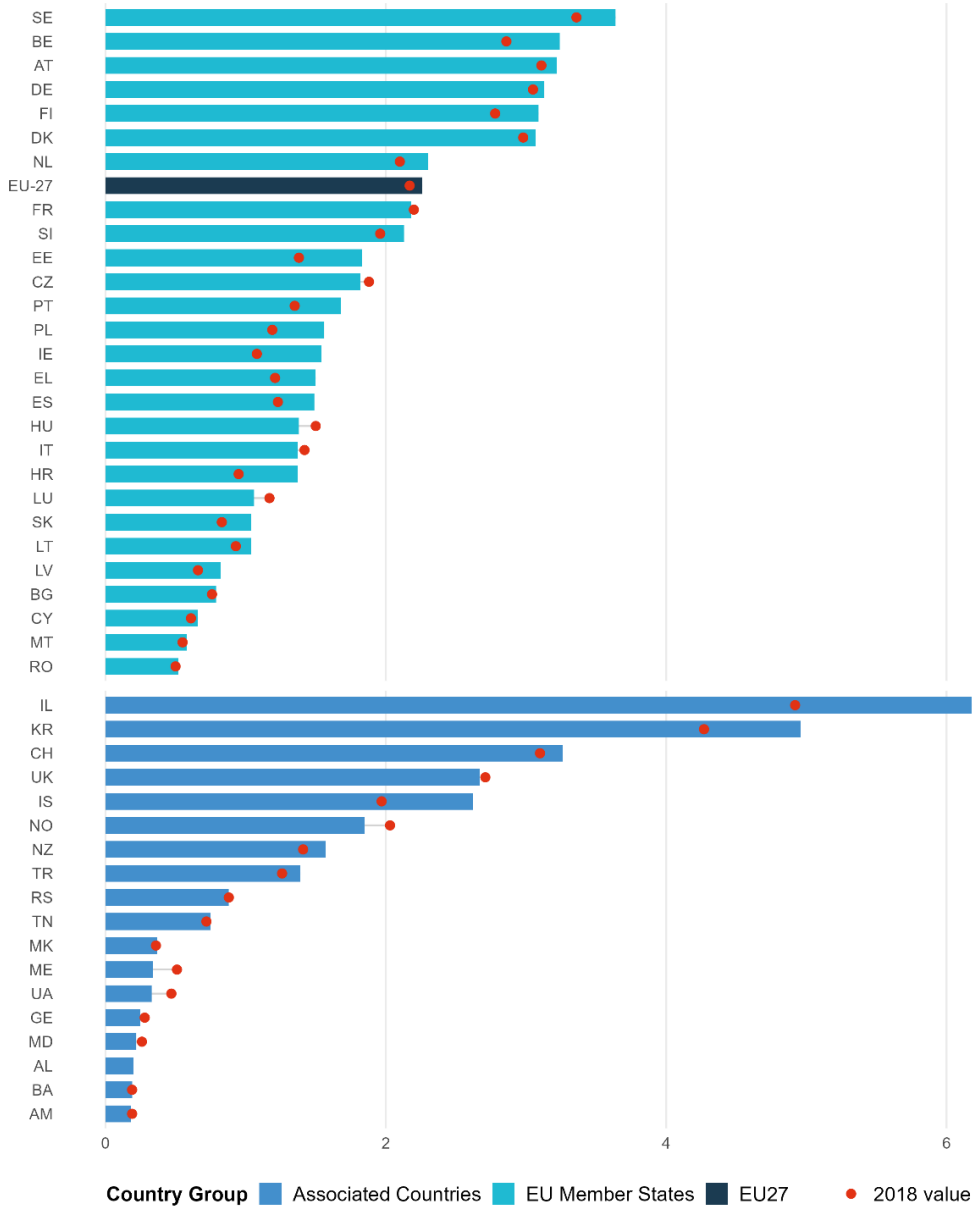
The most recent values for each country are shown in

Figure 3. The highest share of GERD as percentage of GDP within the EU-27 can be found in Sweden, with a value above 3.5%, followed by Belgium, Austria, Germany, Finland, and Denmark, showing indicator values that exceed 3%. However, there are also Member States that registered less than 1% in the last year available, namely Latvia, Bulgaria, Cyprus, Malta, and Romania.

Among the Associated Countries, the highest shares of GERD as percentage of GDP can be observed in Israel, with a value exceeding 6%, followed by South Korea, Switzerland, the United Kingdom, and Iceland.

Compared to the indicator values in 2018, most of the countries in both groups show a higher value in 2023, or no big differences between the two years. Few exceptions are Hungary, Luxembourg, Norway, Montenegro, and Ukraine which show a slightly higher value in 2018.

Figure 3 Gross Domestic Expenditure on R&D as a percentage of GDP, by country for the latest available year and 2018



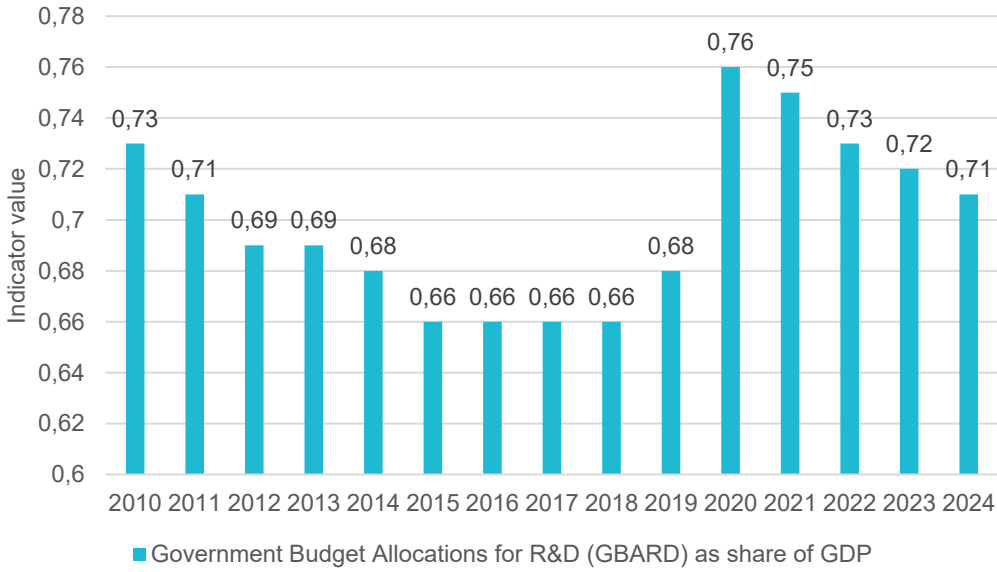
Source: Eurostat, OECD, UNESCO UIS. Calculations by Fraunhofer ISI.

3.2 #2 Government Budget Allocations for R&D (GBARD) as share of GDP

This indicator measures the Government Budget Allocations for R&D (GBARD) as a share of GDP, capturing the extent to which governments prioritise research and innovation through direct public funding. It is a central metric for understanding the public sector's role in supporting innovation development relative to the size of the economy.

The trend for this indicator for the EU-27 is shown in Figure 4. Overall, the evolution between 2010 and 2024 is characterised by moderate fluctuations rather than sustained growth. The indicator starts at 0.73% in 2010 and declines gradually to values around 0.66% between 2015 and 2018, indicating a period of relative stabilisation at a lower level of public R&D spending effort. A first notable increase occurs in 2020, when GBARD rises to 0.76%. This increase could be partly linked to the Covid-19 pandemic, during which governments boosted R&D-related spending in targeted research programmes. Since 2020, the indicator slightly decreases year by year to reach 0.71% in 2024, which corresponds to the level in 2011.

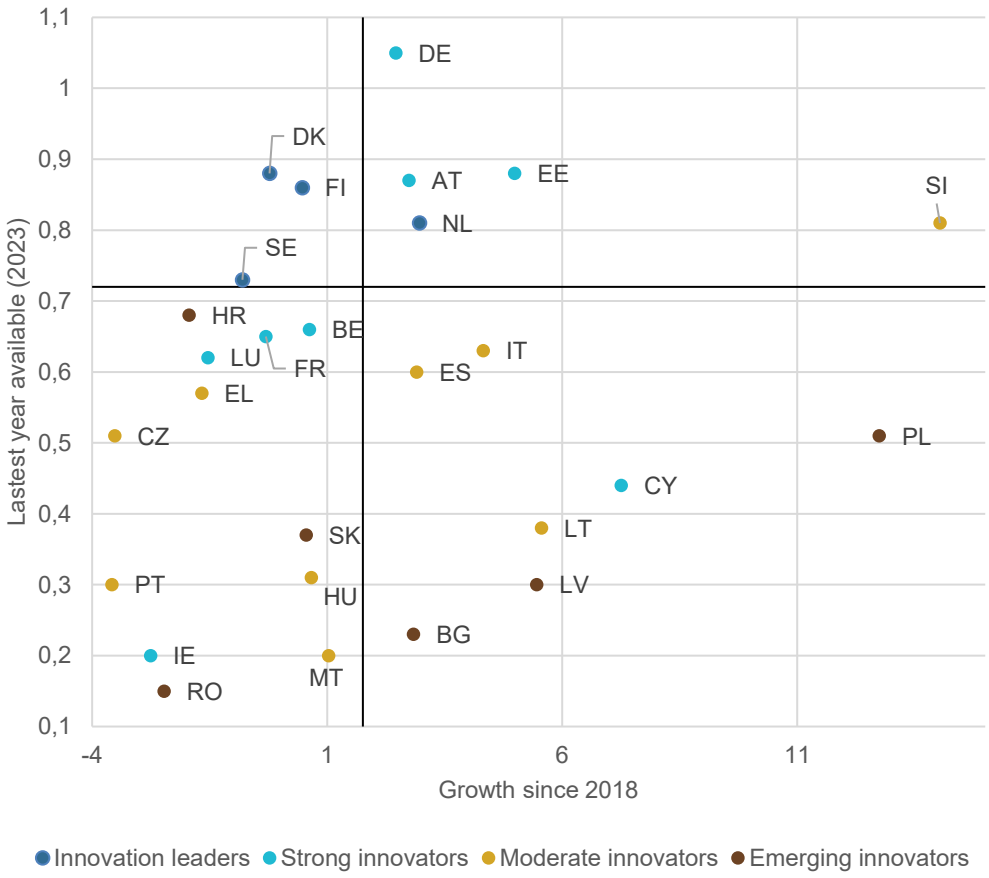
Figure 4 Government Budget Allocations for R&D (GBARD) as share of GDP, for the Eu-27 over time



Source: Eurostat, OECD. Calculation by Fraunhofer ISI.

Figure 5 shows the latest available value of GBARD as share of GDP compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Germany, Austria, Estonia, the Netherlands, and Slovenia. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Denmark, Finland, and Sweden. Croatia, Belgium, France, Luxembourg, among others, are instead depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The rest of the Member States can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 5 Government Budget Allocations for R&D (GBARD) as share of GDP, latest indicator value and change by EU-27 countries



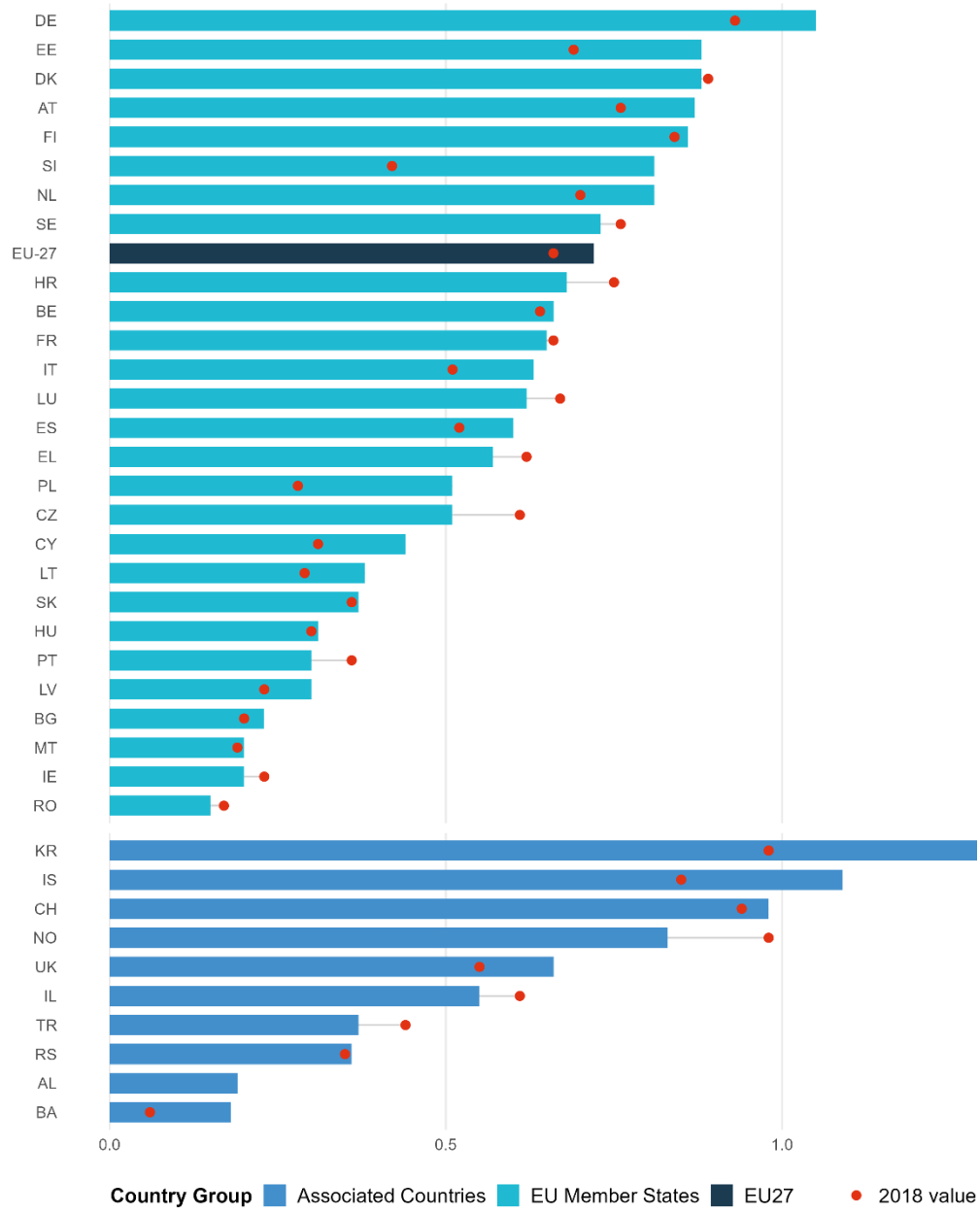
Source: Eurostat, OECD. Calculation by Fraunhofer ISI.

The most recent values for each country are shown in Figure 6. The highest share of GBARD as share of GDP within the EU-27 can be found in Germany with a value above 1%, followed by Estonia, Denmark, Austria, and Finland showing indicator values that exceed 0.85%. However, there are also Member States that registered less than 0.3% in the last year available, namely Bulgaria, Ireland, Malta, and Romania.

Among the Associated Countries, the highest shares of GERD as percentage of GDP can be observed in South Korea, with a value of 1.29%, followed by Iceland, Switzerland, and Norway.

Compared to the indicator values in 2018, while most of the countries in both groups show a higher value in 2023, or no big differences between the two years, still exceptions exist. Indeed, Hungary, Luxembourg, Greece, Czechia, Portugal, Norway, Israel, and Türkiye show a much higher value in 2018.

Figure 6 Government Budget Allocations for R&D (GBARD) as share of GDP, by country for the latest year available and 2018

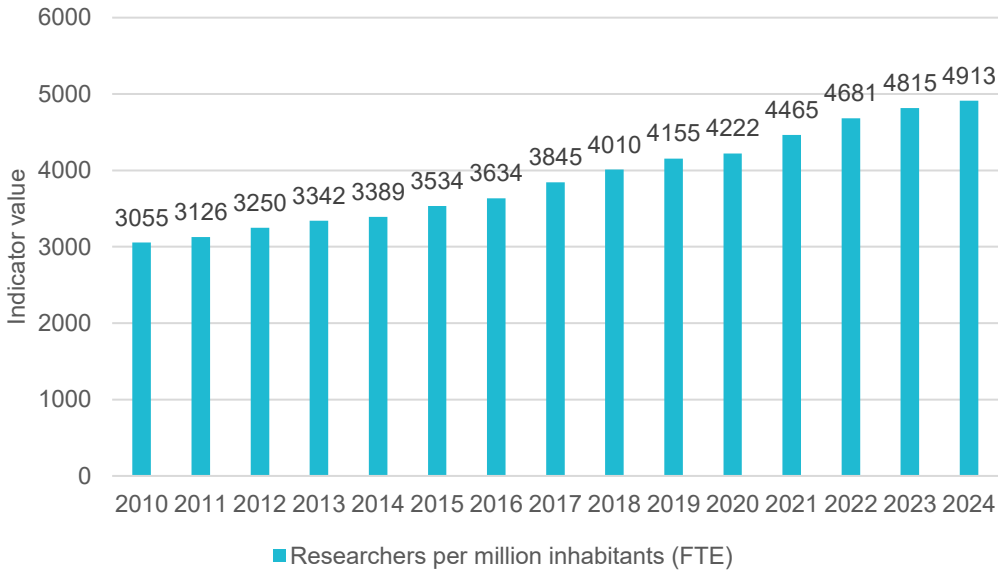


Source: Eurostat, OECD. Calculation by Fraunhofer ISI.

3.3 #3 Researchers per million inhabitants (FTE)

This indicator measures the number of researchers per million inhabitants, expressed in full-time equivalents (FTE). This indicator shows the researcher workforce relative to the country´s population and is a core measure of human resource capacity for science, technology, and innovation. The trend for this indicator for the EU-27 is depicted over time in Figure 7. The number of researchers per million inhabitants has steadily increased over the 2010–2024 period, growing from 3,055 per million inhabitants in 2010 to 4,913 in 2024, the highest level in the series.

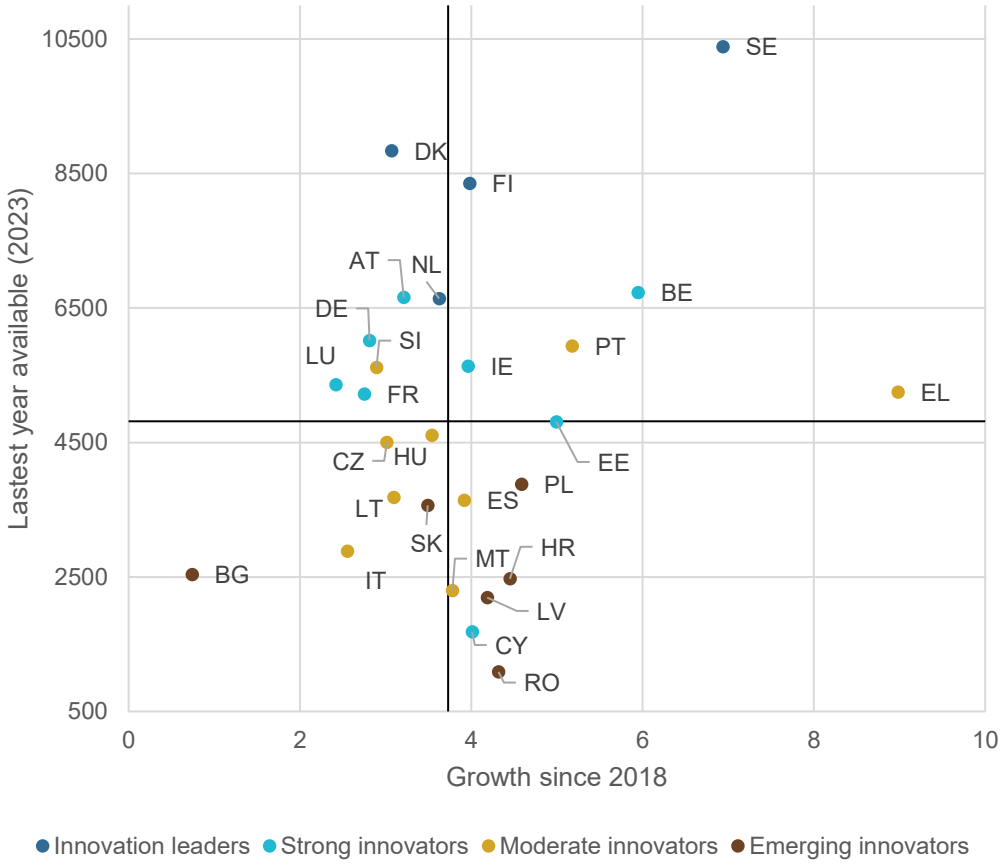
Figure 7 Researchers per million inhabitants (FTE), for the EU-27 over time



Source: Eurostat, UNESCO UIS. Calculations by Fraunhofer ISI.

Figure 8 shows the latest available value of number of researchers per million inhabitants compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Sweden, Finland, Belgium, Portugal, Greece, and Ireland. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Denmark, Austria, the Netherlands, Germany, Slovenia, Luxembourg, and France. Bulgaria, Italy. Lithuania, Slovakia, Hungary, and Czechia, are instead depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The rest of the Member States can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 8 Researchers per million inhabitants (FTE), latest indicator value and change by EU-27 countries



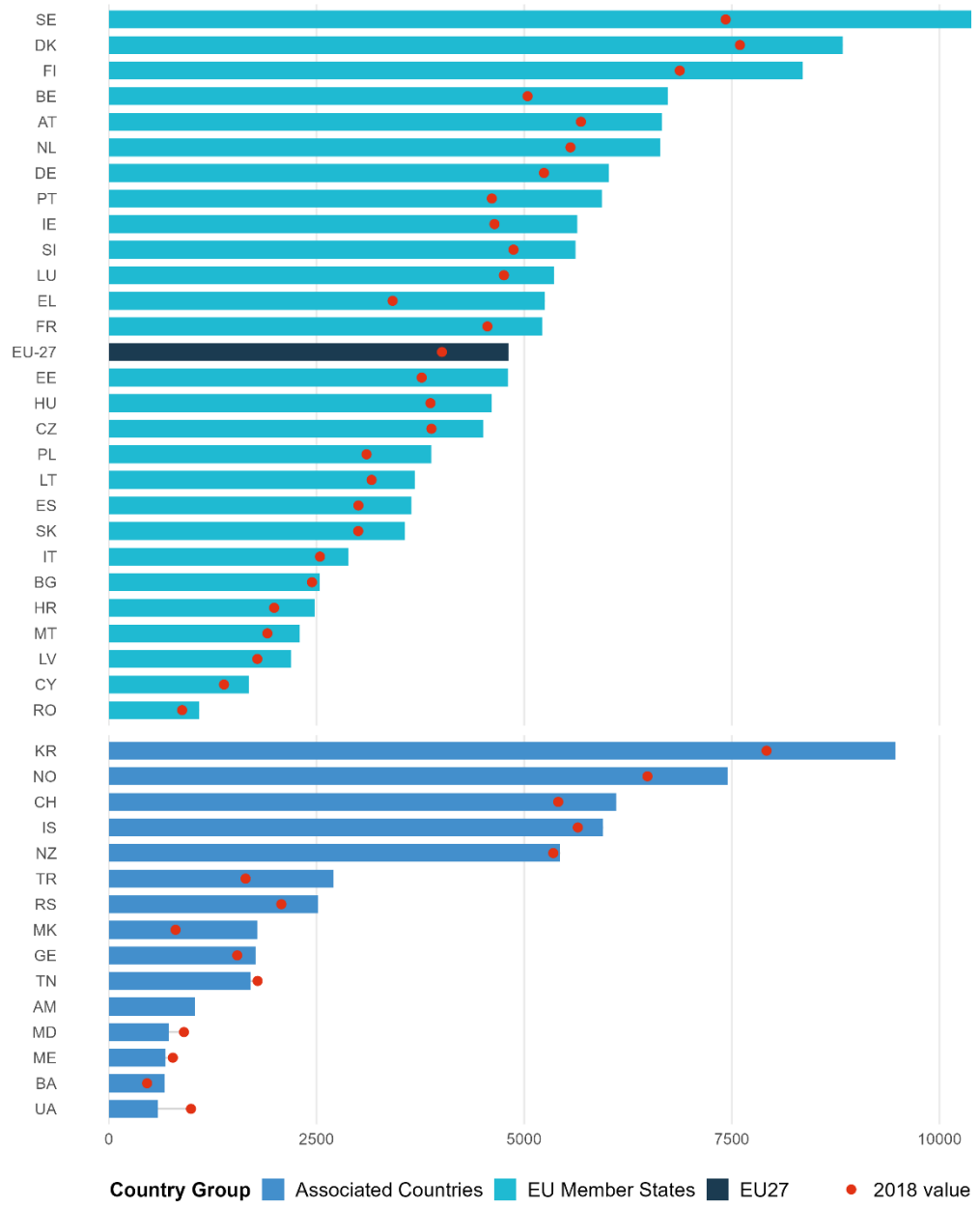
Source: Eurostat, UNESCO UIS. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in Figure 9. The highest number of researchers per million inhabitants (FTE) within the EU-27 can be found in Sweden, with a value above 10,000, followed by Denmark, and Finland, showing indicator values above 8,000. However, there are also Member States that registered values below 2,000 in the last year available, namely Cyprus and Romania.

Among the Associated Countries, the highest number of researchers per million inhabitants (FTE) can be observed in South Korea, with a value exceeding 9,000, followed by Norway, Switzerland, Iceland, and New Zealand.

Compared to the indicator values in 2018, most of the countries in both groups show a higher value in 2023, or no big differences between the two years. The only exceptions are Moldova and Ukraine which show a slightly higher value in 2018.

Figure 9 Researchers per million inhabitants (FTE), by country for the latest available year



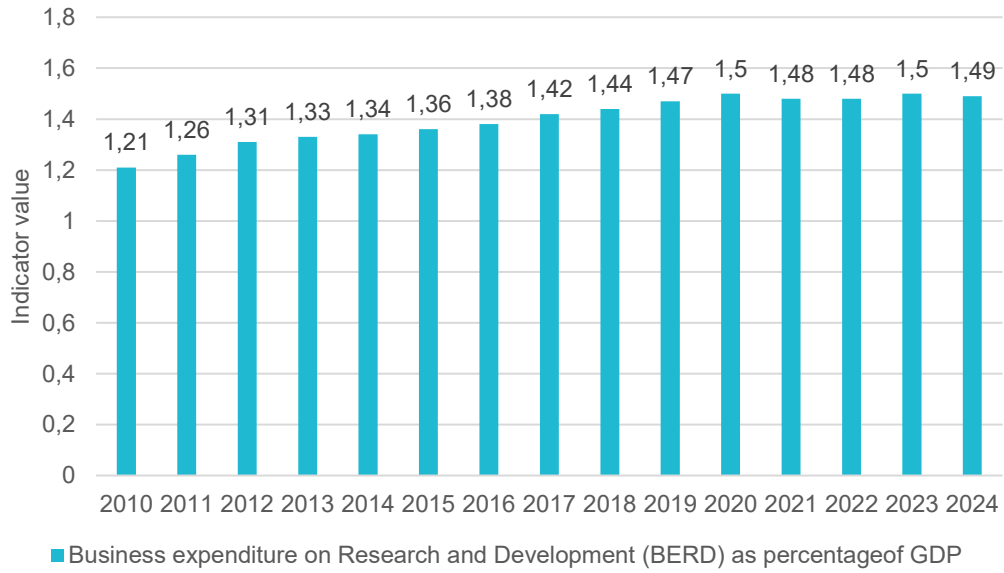
Source: Eurostat, UNESCO UIS. Calculations by Fraunhofer ISI.

3.4 #4 Business Enterprise expenditure on R&D (BERD) as a percentage of GDP

This indicator measures the business enterprise R&D expenditures (BERD) as a percentage of GDP. It captures the scale of R&D expenditure undertaken by the business sector relative to the size of the economy and is a key metric for assessing industry's role in driving innovation and technological development.

The trend for this indicator for the EU-27 is depicted over time in Figure 10. There has been a rather continuous increase of the indicator from 1.21% in 2010 to 1.5% in 2020. After 2020, the indicator slightly decreased in 2021 and 2022, reaching again 1.5% in 2023, and registering 1.49% in 2024.

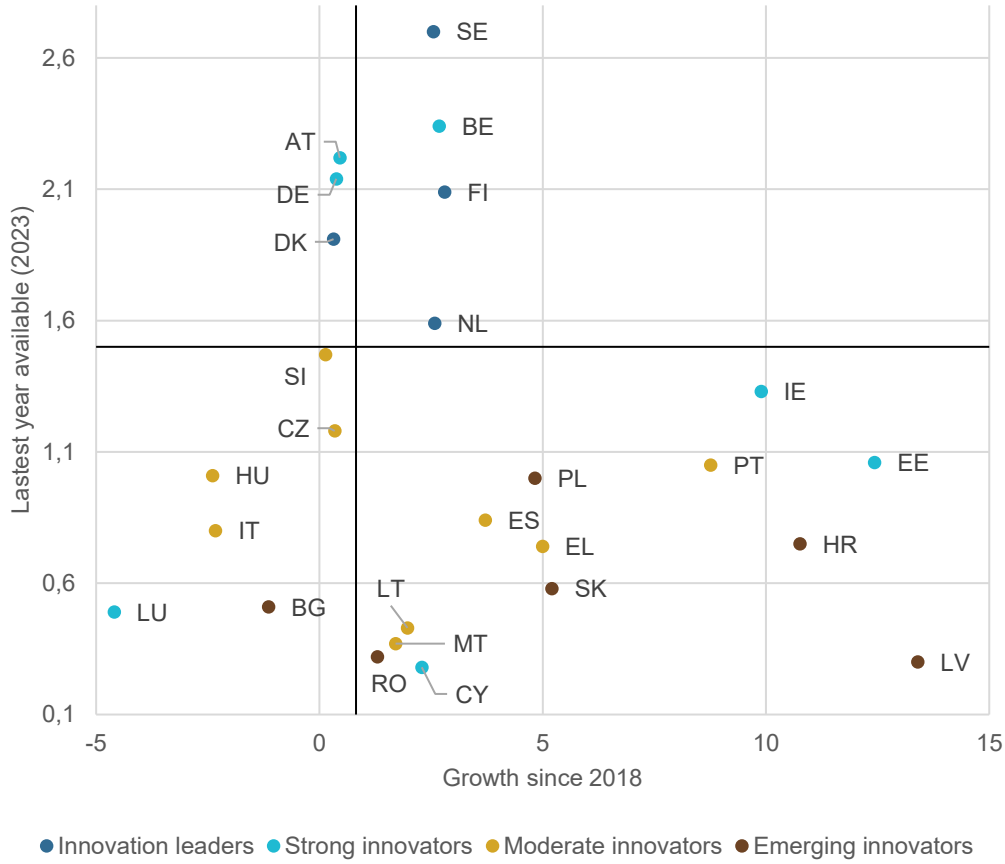
Figure 10 Business Enterprise expenditure on R&D (BERD) as a percentage of GDP, for the EU-27 over time



Source: Eurostat, OECD. Calculations by Fraunhofer ISI.

Figure 11 shows the latest available value of BERD as percentage of GDP compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Sweden, Belgium, Finland, and the Netherlands. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Austria, Germany, and Denmark. Czechia, Italy, Hungary, Luxembourg, Bulgaria, and Slovenia are instead depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The rest of the Member States can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 11 Business Enterprise expenditure on R&D (BERD) as a percentage of GDP, latest indicator value and change by EU-27 countries



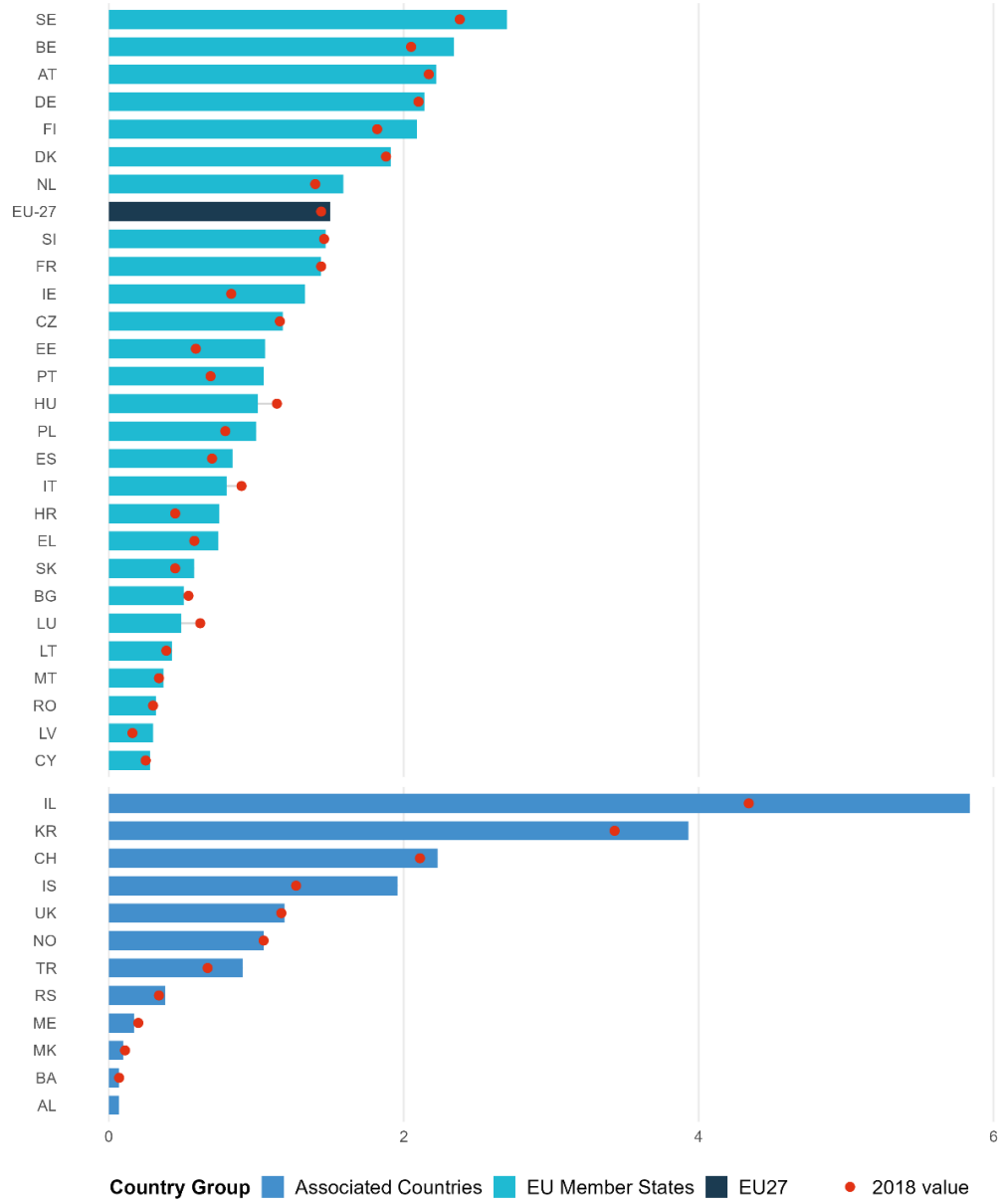
Source: Eurostat, OECD. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in Figure 12. The highest share of BERD as percentage of GDP within the EU-27 can be found in Sweden, with a value of 2.7%, followed by Belgium, Austria, Germany, and Finland, showing indicator values that exceed 2%. However, there are also Member States that registered less than 0.4% in the last year available, namely Malta, Romania, Latvia, and Cyprus.

Among the Associated Countries, the highest shares of BERD as percentage of GDP can be observed in Israel, with a value almost reaching 6%, followed by South Korea and Switzerland.

Although Hungary, Italy, and Luxembourg show slightly higher indicator values in 2018, the rest of the countries in both groups show a higher value in 2023, or no big differences between the two years.

Figure 12 Business Enterprise expenditure on R&D (BERD) as a percentage of GDP, by country for the latest available year and 2018



Source: Eurostat, OECD. Calculations by Fraunhofer ISI.

4 ERA Priority 1: Deepening a truly functioning internal market for knowledge

In this section, the results of ERA Priority 1: Deepening a truly functioning internal market for knowledge are presented. ERA Priority 1 is divided into seven sub-priorities:

- Open Science
- Research infrastructures
- Gender equality, equal opportunities for all and inclusiveness
- Researchers' careers and mobility and research assessment and reward systems
- Knowledge valorisation
- Scientific leadership
- Global engagement

4.1 Sub-priority 1.1: Open Science

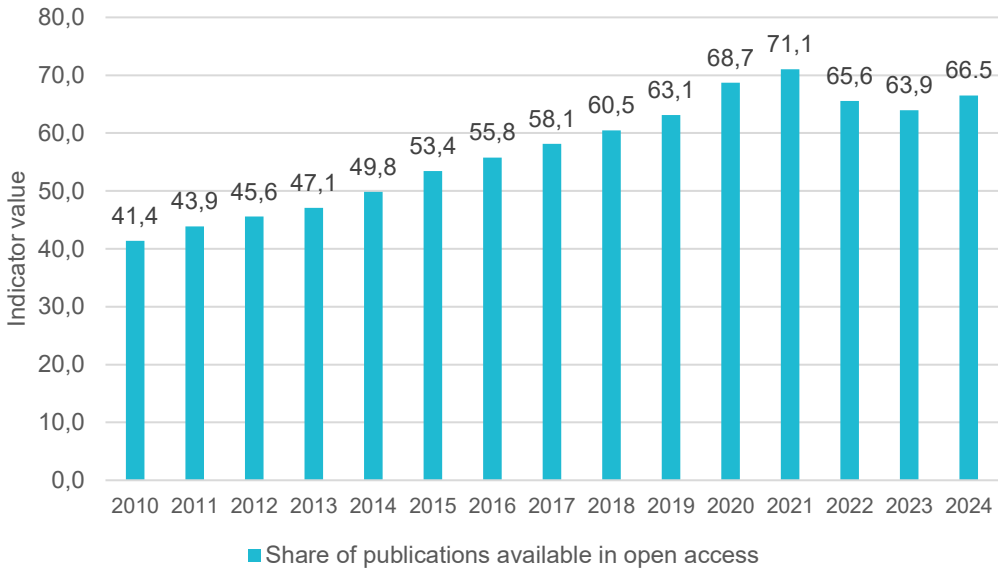
4.1.1 #5 Share of publications available in open access

This indicator measures the share of publications available in open access (OA). The time series for this indicator for the EU-27 is plotted in Figure 13. Between 2010 and 2021, there has been a continuous increase of the indicator from 41.1% to 71.1%. In 2022 and 2023, it decreased to 63.9%. In 2024, the indicator went up again reaching 66.5% of publications in open access in the EU-27.

To have a better understanding of the open access publications, Figure 14 shows the trend of the EU-27 for the shares of gold OA publications, green OA publications, and publications in diamond Journals.[11] Noting that the different categories of OA can overlap, the figure shows a stable increase of all types of OA publications over time, with a stabilisation period for diamond publications and a slight decrease for green and gold publications since 2020. The EU-27 average in 2024 for diamond journal publications is 2.2%, while for gold OA publications is 24.3%, and green publications register 49.3%. These shares, however, do not consider the fact that around 16% of publications in 2024 are both green and gold, and the data collected do not separate those that are either only green or only gold OA publications.

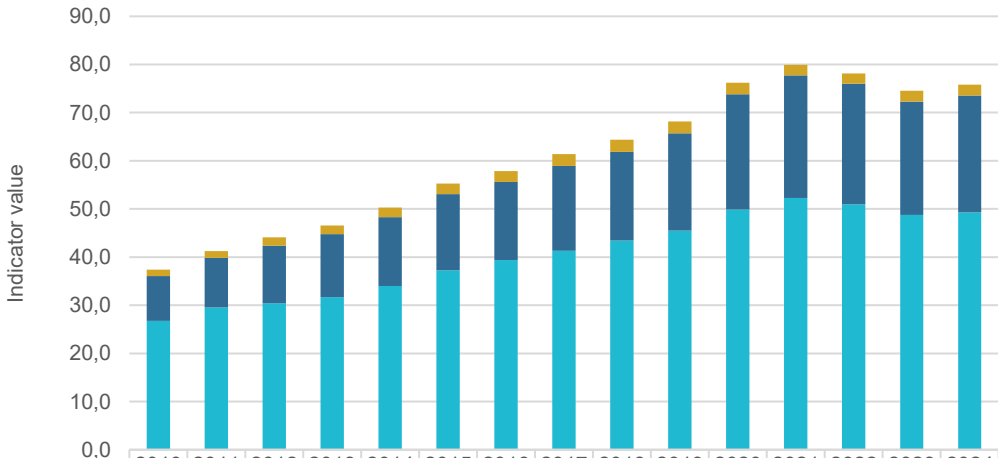
[11] Following the DFG – Deutsche Forschungsgemainschaft definitions: Gold Open Access refers to the first publication of research outputs directly in an open access medium, such as open access journals or publishers. Diamond Open Access is a form of "open-access first" publishing in which neither authors nor readers pay any fees. The publishing infrastructure is funded and provided by academic institutions or scholarly associations, ensuring fully cost-free access and dissemination. Green Open Access refers to the self-archiving or secondary publication of research outputs that have already been published elsewhere. Authors make a version of their work publicly accessible, often on institutional or subject repositories, at no cost, sometimes as preprints or accepted manuscripts that may not have undergone final peer review.

Figure 13 Share of publications available in open access (in % of total), for the EU-27 average over time



Source: OpenAIRE. Calculations by Fraunhofer ISI. Note: In 2025, data from OpenAIRE has been retrieved via the API, while in 2024 it was retrieved via web scraping. Therefore, values between the Scoreboards 2024 and 2025 may not be directly comparable. Nonetheless, the trends of the indicator values are coherent.

Figure 14 Share of publications available in open access (Gold, Green, Diamond), for the EU-27 over time

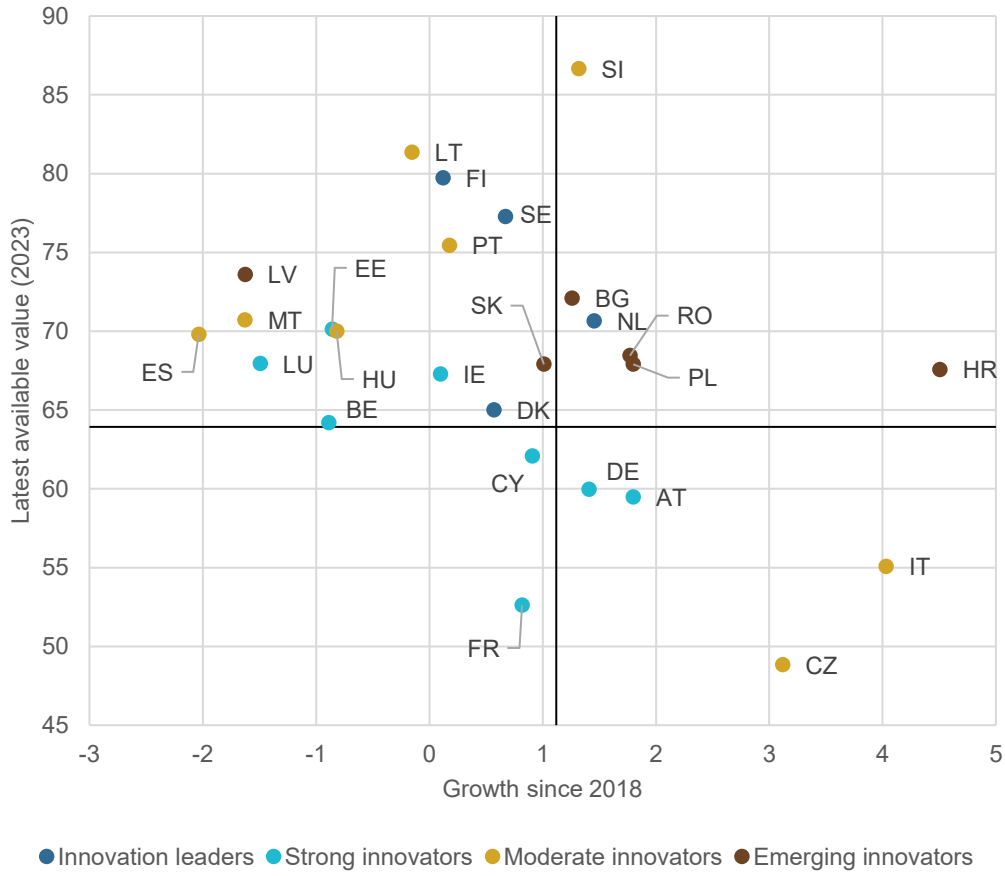


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Diamond	1,3	1,4	1,7	1,8	2,0	2,2	2,3	2,5	2,5	2,5	2,4	2,2	2,2	2,2	2,2
Gold	9,4	10,3	12,0	13,1	14,3	15,8	16,2	17,6	18,4	20,2	23,9	25,5	25,0	23,6	24,3
Green	26,7	29,6	30,4	31,7	34,0	37,3	39,4	41,3	43,4	45,5	49,9	52,3	51,0	48,8	49,3

Source: OpenAIRE. Calculations by Fraunhofer ISI. Note: publications can be classified as multiple types of open access. Thus, these shares do not disentangle only green, only gold OA publications, or only Diamond OA publications.

The latest available values of the share of publications available in open access, plotted against its growth, are shown for all Member States in Figure 15. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Slovenia, Romania, the Netherlands, Poland, Bulgaria, and Croatia. The ones on the upper left quadrant, while still having higher values, they are instead growing below the EU-27. Among these, we find Lithuania, Latvia, Finland, Sweden, Portugal, Slovakia, Denmark, Belgium, Greece, Estonia, Hungary, Ireland, and Luxembourg. Cyprus and France are the only countries in the lower left quadrant of the graph, indicating both below average growth and a lower-than-EU-27 average indicator value in 2023.

Figure 15 Share of publications available in open access (in % of total), latest indicator value and change by EU-27 countries (EU-27 values are plotted as black x- and y- axes)



Source: OpenAIRE. Calculations by Fraunhofer ISI. Note: In 2025, data from OpenAIRE has been retrieved via the API, while in 2024 it was retrieved via web scraping. Therefore, values between the Scoreboards 2024 and 2025 may not be directly comparable. Nonetheless, the trends of the indicator values are coherent.

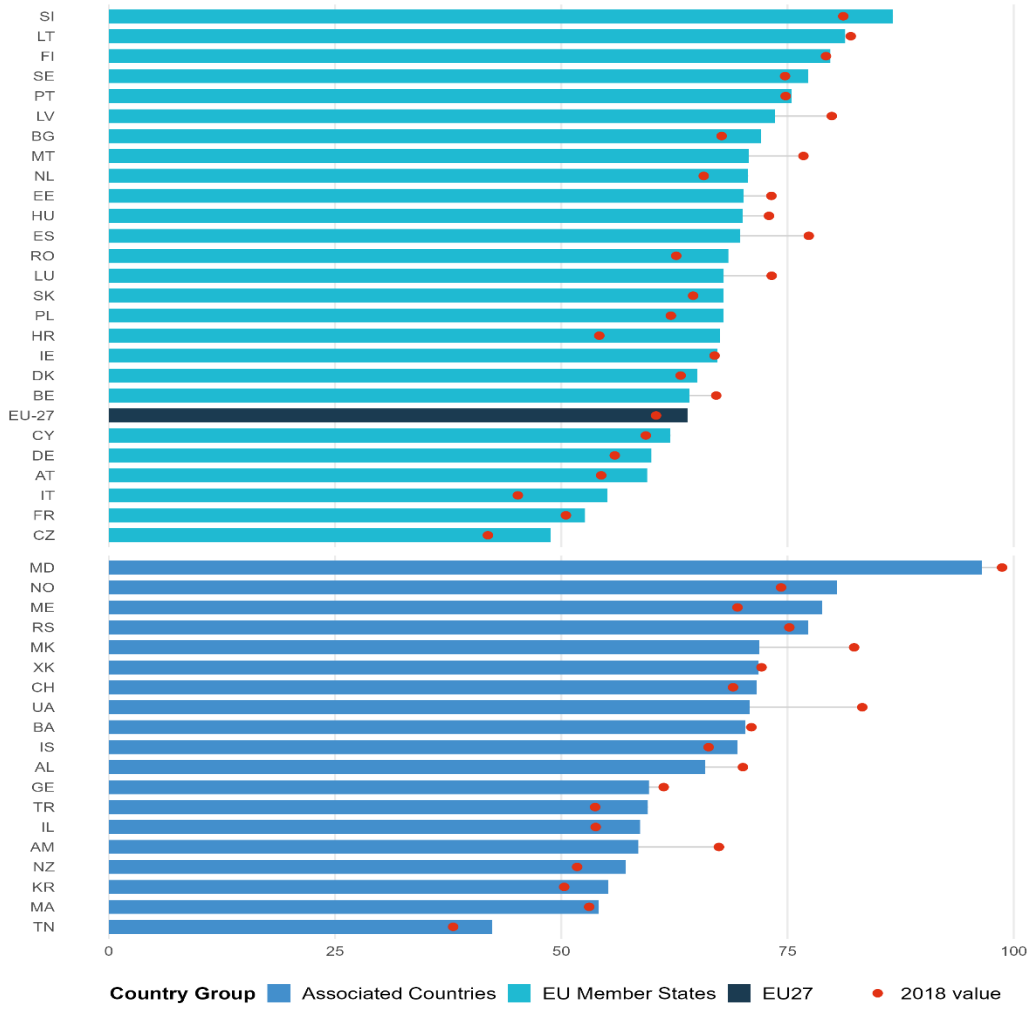
The most recent values for both Member States and Associated Countries are shown in Figure 16. The bars show the most recent value (2023), while the red point shows the indicator value in 2018, allowing a comparison across a 5-year time span. The results among Member States and Associated Countries are quite homogenous, being almost all above 50%. The only exceptions are Czechia among Member States, and Tunisia among Associated Countries, both

being slightly below. The highest shares of open access publications within the EU-27 are observed in Slovenia, followed by Lithuania, Finland, Sweden, and Portugal with indicator values above 75%. Conversely, the lowest values in 2023, falling below the EU-27 average, are recorded in Cyprus, Germany, Austria, Italy, France, and Czechia.

Among the Associated Countries, the highest shares for open access publications are in Moldova, with a value slightly below 100%, followed by Norway, North Macedonia, Montenegro, and Serbia.

Compared to the indicator values in 2018, most of the countries in both groups shows a higher value in 2023. Few exceptions, however, exist. Lower values in 2023 across Member States can be found in Latvia, Malta, Spain, and Luxembourg, while across Associated Countries these can be identified in North Macedonia, Ukraine, and Armenia.

Figure 16 Share of publications available in open access (in % of total), by country for the latest available year and 2018

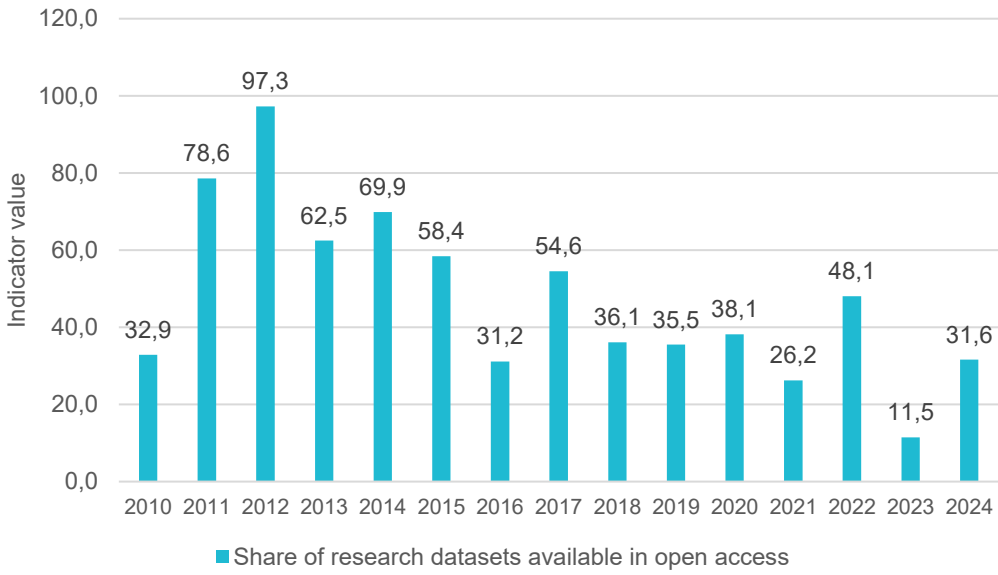


Source: OpenAIRE. Calculations by Fraunhofer ISI. Note: In 2025, data from OpenAIRE has been retrieved via the API, while in 2024 it was retrieved via web scraping. Therefore, values between the Scoreboards 2024 and 2025 may not be directly comparable.

4.1.2 #6 Share of open-access research datasets

This indicator measures the share of open-access research datasets (in % of all data sets) by country. Figure 17 shows the trend over time for the EU-27 average values. The indicator shows many fluctuations over time, which causes peaks in some countries.[12] From 2010 to 2012, the share of open access research datasets increased substantially, from 32.9% to 97.3%, due to a substantial increase of the German open access research datasets. After 2012, fluctuations continued, with a substantial decrease in 2016 that reached 31.2%. After moderate fluctuations, in 2023, the indicator dropped to an average value of 11.5%. In 2024, the indicator value got back to 31.6%.

Figure 17 Share of open-access research datasets, for the EU-27 over time

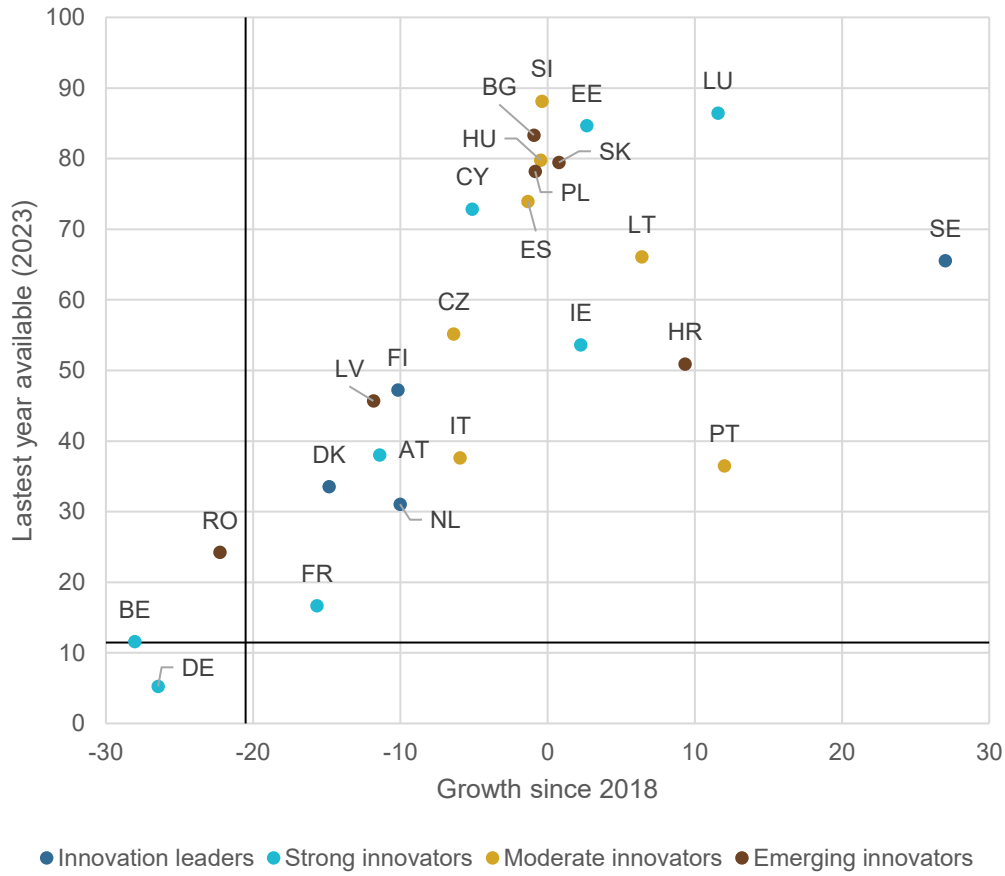


Source: OpenAIRE. Calculations by Fraunhofer ISI. Note: In 2025, data from OpenAIRE has been retrieved via the API, while in 2024 it was retrieved via web scraping. Therefore, values between the Scoreboards 2024 and 2025 may not be directly comparable.

Figure 18 shows the latest available value of the share of open-access research datasets compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include most of the Member States. Malta is also in this quadrant but is not displayed as it showed a growth rate of over 192%, due to a change from a value of 0.38% in 2018 to a value of 80.7% in 2023. The ones on the upper left quadrant, while still having higher values than EU-27 average, they are instead growing below it. Among these, we find Romania, and Belgium. Germany is instead depicted in the lower left quadrant of the graph, indicating both below average growth and a lower-than-EU-27 average indicator value.

[12] The indicator shows peaks in many countries, with major ones in Germany and Cyprus. These peaks find correspondence in the OpenAire platform.

Figure 18 Share of open-access research datasets, latest indicator value and change by EU-27 countries



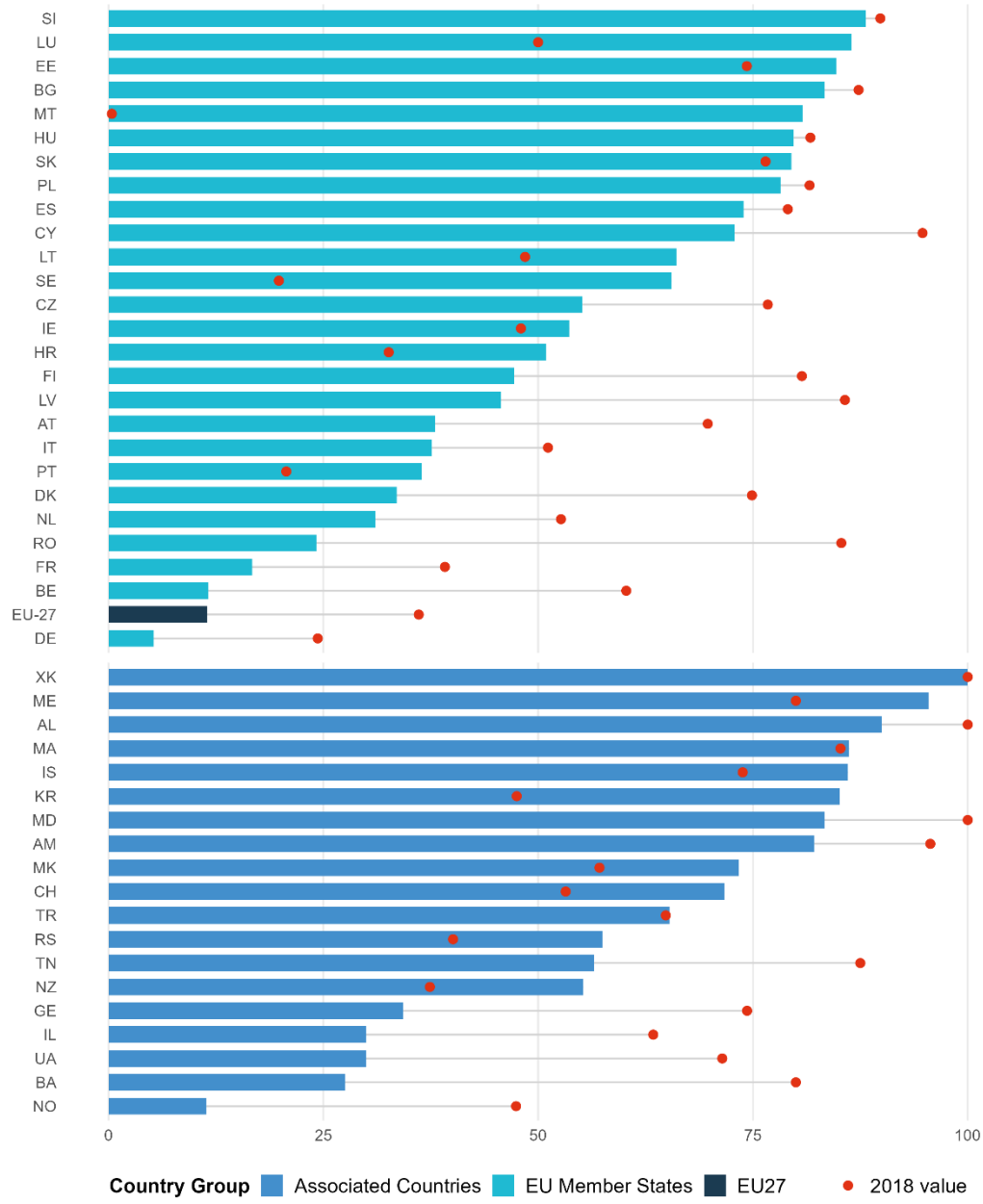
Source: OpenAIRE. Calculations by Fraunhofer ISI. Note: In 2025, data from OpenAIRE has been retrieved via the API, while in 2024 it was retrieved via web scraping. Therefore, values between the Scoreboards 2024 and 2025 may not be directly comparable.

The most recent values for each country are shown in the graph below. The highest share within the EU-27 can be found in Slovenia, followed by Luxembourg, Estonia, Bulgaria, and Malta, showing indicator values above 80%. However, there are also Member States with less than 20% of open-access research datasets, namely France, Belgium, and Germany. The EU-27 average remains low, largely because Germany – despite having the highest total number of research datasets (over 17,000) – has a low proportion of open-access data and therefore has a strong influence on the average. By comparison, Malta has the smallest absolute number of datasets, with just 21 recorded.

Among the Associated Countries, the highest share of open-access research datasets can be observed in Kosovo, with a value of 100%, although in absolute terms the number corresponds to 2. Other countries registering values above 85% are Montenegro, Albania, Morocco, Iceland, and South Korea. The lowest shares can be observed in Norway, with a share of 11.4%.

Compared to the indicator values in 2018, most of the countries among Member States and Associated Countries exhibit a lower value in 2023, with some of them showing big differences, such as Finland, Latvia, Romania, Belgium, Georgia, Bosnia and Herzegovina, and Norway.

Figure 19 Share of open-access research datasets, by country for the latest available year and 2018

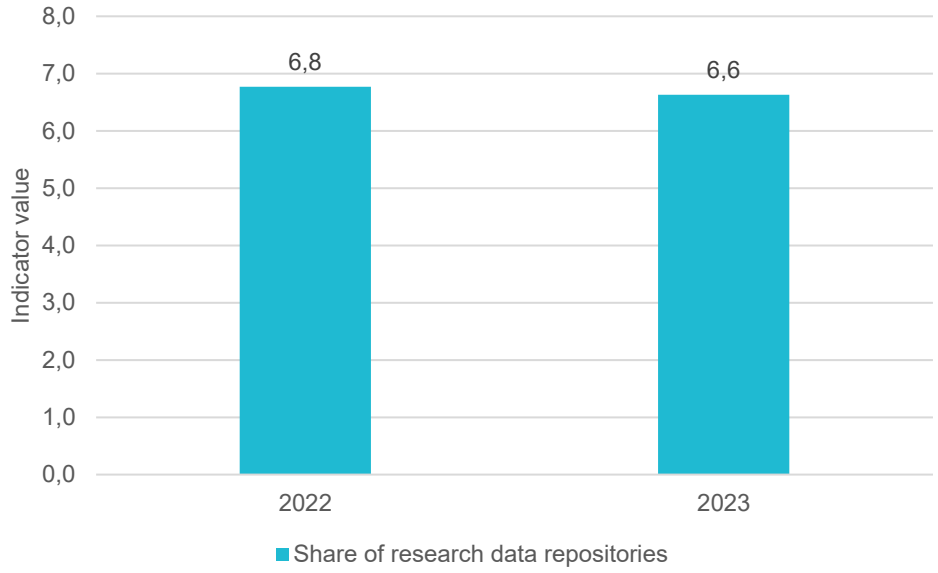


Source: OpenAIRE. Calculations by Fraunhofer ISI. Note: In 2025, data from OpenAIRE has been retrieved via the API, while in 2024 it was retrieved via web scraping. Therefore, values between the Scoreboards 2024 and 2025 may not be directly comparable.

4.1.3 #7 Share of research data repositories

This indicator measures the share of research data repositories.[13] The most recent years for the EU-27 value are shown in Figure 20. In the two available years, 2022 and 2023, the indicator value has remained quite constant, with only a slight decrease from 6.8% in 2022 to 6.6% in 2023. Values for EU-27 refer to those projects where a European Union institution participated, and not to the average value of the Member States.

Figure 20 Share of research data repositories, for the EU-27 over time

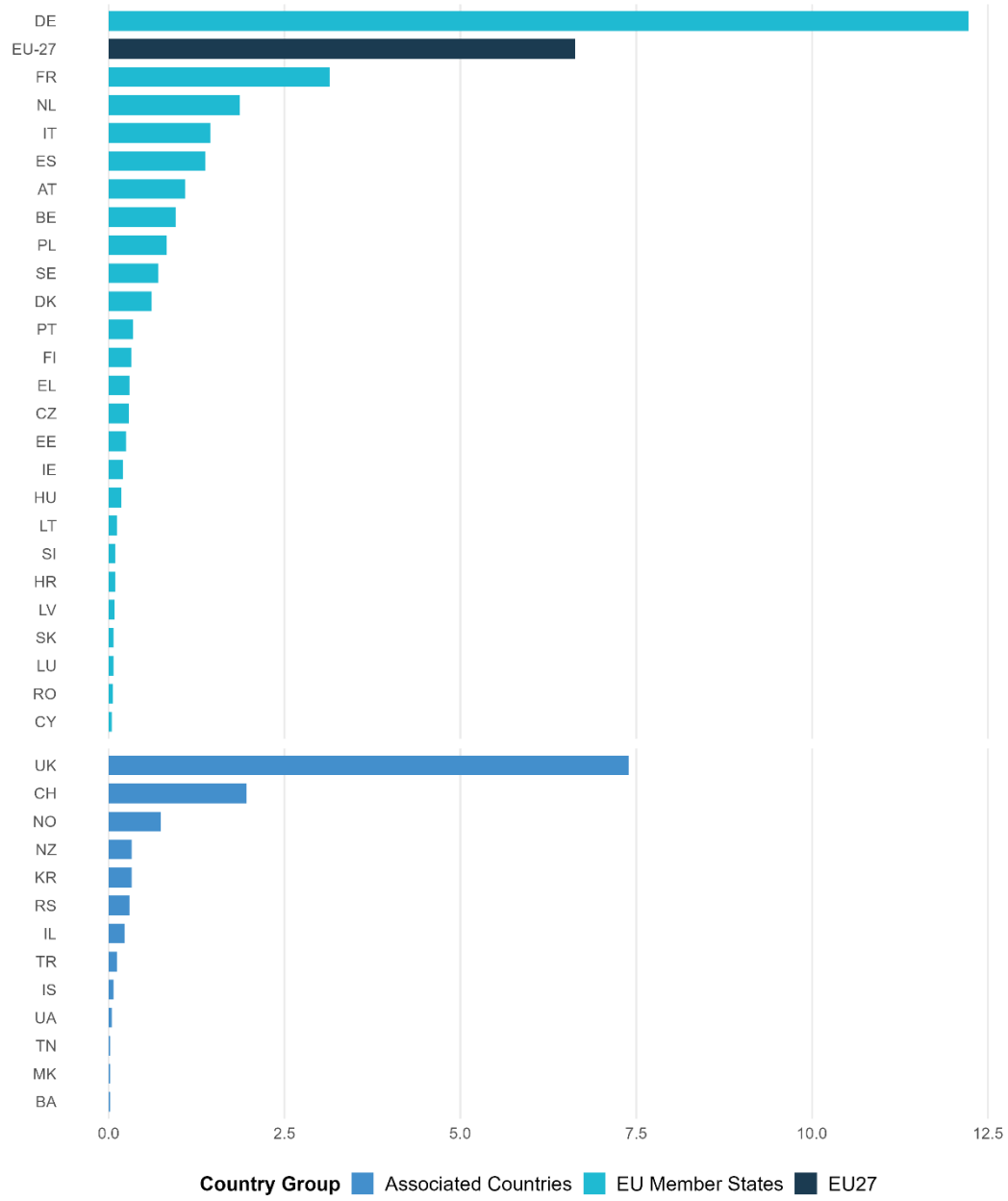


Source: re3data.org. Note: this indicator has been revised. It was previously presented as the absolute number of repositories but is now calculated as each country's share of the total number of research data repositories. In this figure, the EU-27 share refers to the number of research data repositories registered by a European Union institution, over the total number of research data repositories.

The most recent values for each country are shown in Figure 21. The highest number of repositories within the EU-27 can be found in Germany, showing an indicator value that exceeds 11%. However, Germany is the only country with a share of research data repositories above the EU-27. Lowest values can be found in Cyprus, Romania, Luxembourg, Slovakia, and Latvia, with values below 1%. Among the Associated Countries, the highest share of research data repositories can be observed in the UK, with a value close to 7.5%, followed by Switzerland and Norway, although with values below 2.5%.

[13] A research data repository is a subtype of a sustainable information infrastructure which provides long-term storage and access to research data that is the basis for a scholarly publication.

Figure 21 Share of research data repositories, by country for the latest available year



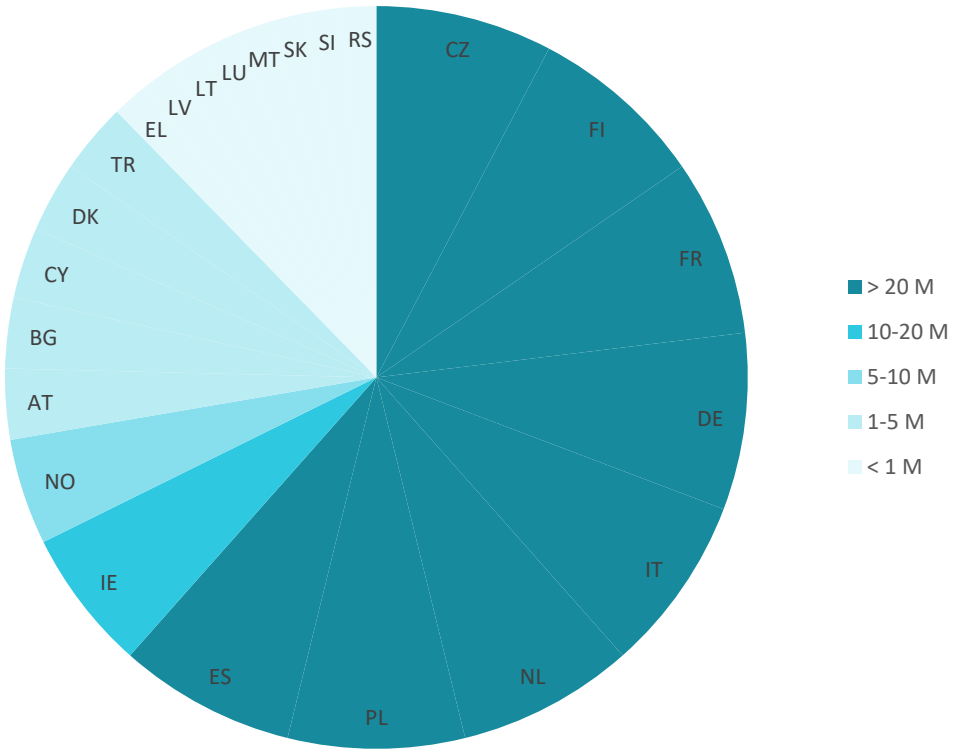
Source: re3data.org. Note: this indicator has been revised. It was previously presented as the absolute number of repositories but is now calculated as each country's share of the total number of research data repositories.

4.1.4 #8 Country investments in EOSC and Open Science (in ranges of investment)

This indicator measures the range of investment in European Open Science Cloud (EOSC) and open science by country, collected by the EOSC Observatory. The EOSC Observatory is a policy intelligence tool to monitor and support the implementation and policymaking of the EOSC. The most recent values for each country are shown in Figure 22. The highest range of investment within the EU-27 can be found in Czechia, Finland, France, Germany, Italy, the Netherlands, Poland, and Spain, showing an investment range above 20 million Euros. Poland significantly increased its investment compared to the previous year, when the investment was between 1 and 5 million Euro. However, several Member States allocated less than 1 million Euro in 2023, namely Greece, Latvia, Lithuania, Luxembourg, Malta, Slovakia, and Slovenia. With respect to the previous year, Cyprus has increased its investment from being below 1 million to a range between 1 and 5 million Euros.

Among the Associated Countries, the highest range of investment can be observed in Norway, with an investment range between 5 and 10 million Euros. Türkiye registers an investment between 1 and 5 million Euro, showing an increase from the previous year when it was still below 1 million. Serbia has the lowest investment range, below 1 million Euro.

Figure 22 Country investments in EOSC and Open Science (in ranges of investment) by country for the latest available year (2023, in EUR)



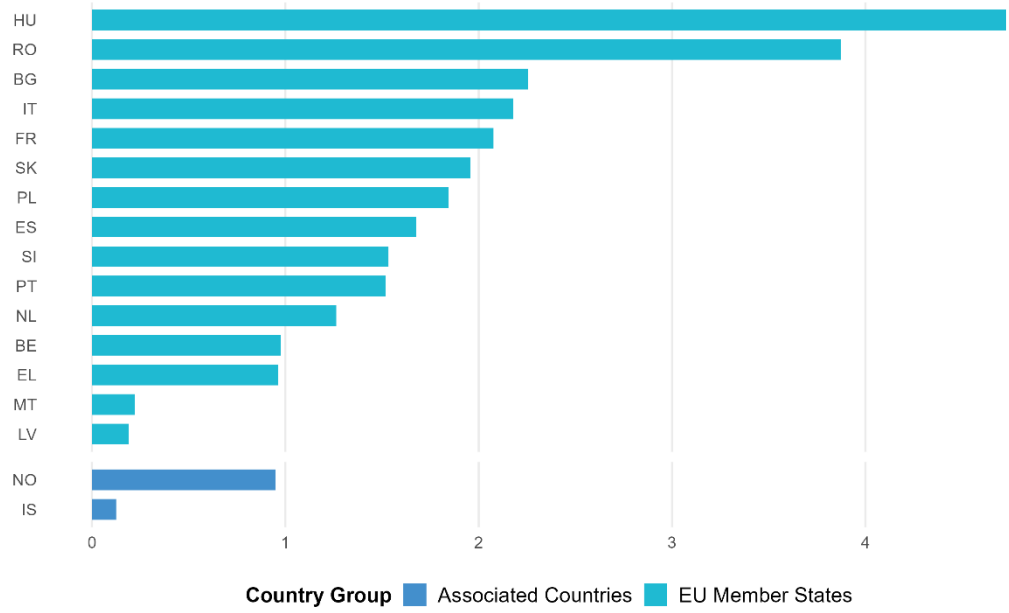
Source: EOSC observatory. Note: 2023 is the reference year of the survey. The data refers to the previous year but for coherence we keep the survey year as main reference year.

4.2 Sub-priority 1.2: Research infrastructures

4.2.1 #9 Share of national public R&D expenditure committed to European research infrastructures

This indicator measures the share of national public R&D expenditure committed to European research infrastructures (RI), based on the data collected by the ESFRI, the European Strategy Forum on Research Infrastructures. The data does not represent the complete expenditure on European RIs by Member States and Associated Countries. It is limited to participation fees and host contributions.[14] The most recent values are from 2022, although a significant number of countries did not report data. The highest R&D shares committed to European RIs within the EU-27 are reported by Hungary, showing an indicator value which exceeds 4.5%, followed by Romania with a value of 3.5%. While Bulgaria, Italy, and France show values slightly above 2%, the remaining Member States allocated less than 2% to European RIs in 2022, with Belgium, Greece, Malta, and Latvia, showing the lowest values, below 1%.

Figure 23 Share of national public R&D expenditure committed to European research infrastructures, by country for the latest available year (2022)



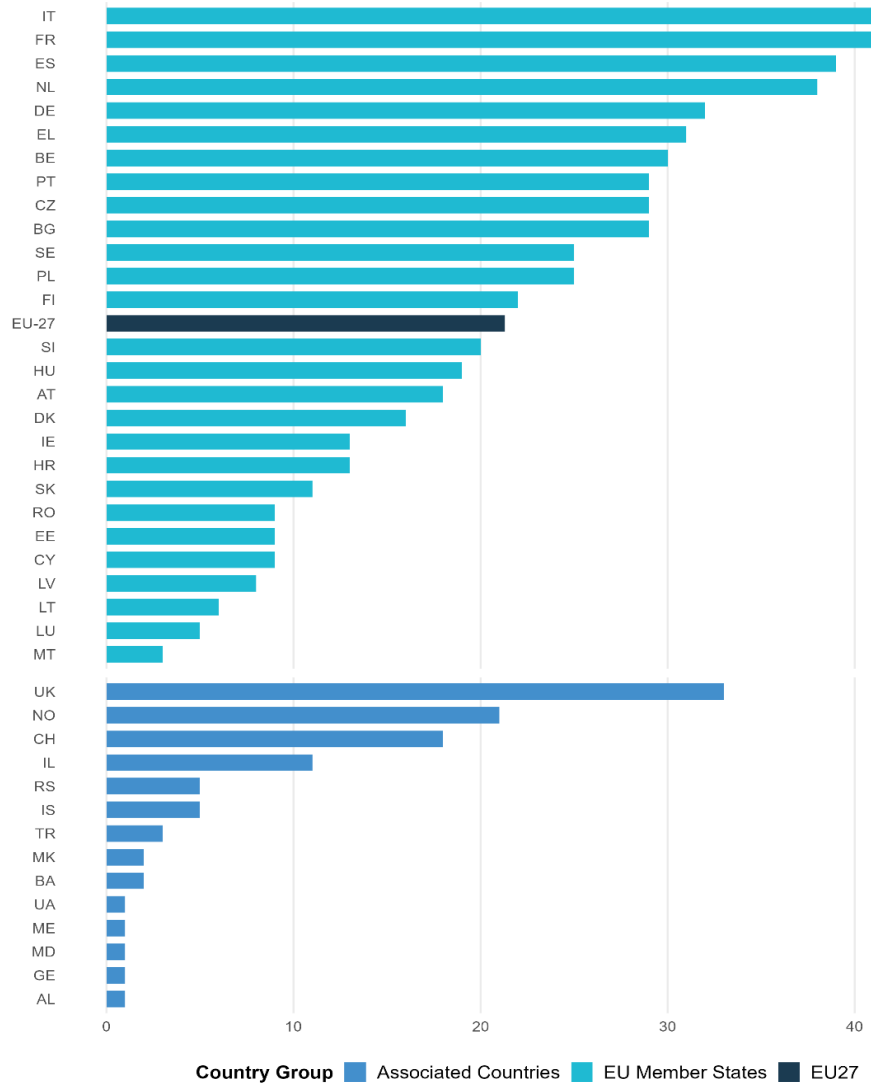
Source: ESFRI, the European Strategy Forum on Research Infrastructures. Note: updates of the data are not available at the time of publication.

[14] To ensure a better coverage for this indicator in future data collections, reflections are ongoing about a data collection mechanism that is better adapted to the diverse national funding landscapes.

4.2.2 #10 Number of European research infrastructures in which a Member State or an Associated Country participates (financially contributes to operations)

This indicator measures the number of European research infrastructures (RI) in which a country participates. To identify the countries that financially contribute to the operations, the following status of the country in the projects has been considered: Leader, Member, Prospective Member, whereas the status of Observer has been excluded.

Figure 24 Number of European research infrastructures in which a Member State or an Associated Country participates, by country for the latest available year



Source: ESFRI, the European Strategy Forum on Research Infrastructures. Note: updates of the data are not available at the time of publication.

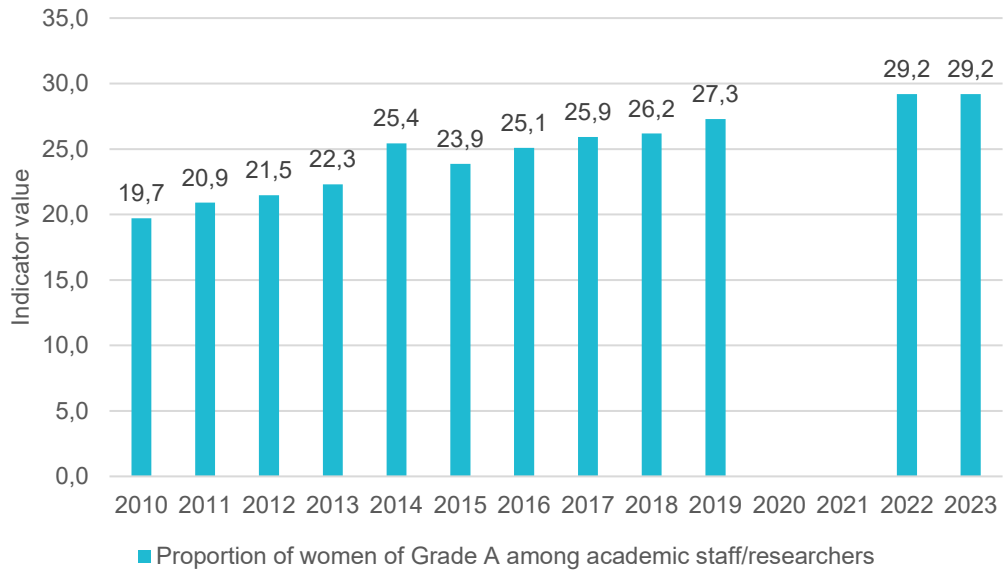
The most recent values for each country, dating from 2024, are shown in the graph below. The highest number of participations in RIs within the EU-27 can be found in Italy and France, showing indicator values that exceed 40, followed by Spain and the Netherlands. Smaller Member States typically participated in less than 5 RIs, for example Luxembourg and Malta. Since the indicator shows absolute values, they could be related to the size of the countries. Countries with a higher population size (e.g. more than 40 million inhabitants) typically have higher values. Among the Associated Countries, the highest number of participations in RIs can be observed in the UK, with a value exceeding 30, followed by Norway, Switzerland, and Israel.

4.3 Sub-priority 1.3: Gender equality, equal opportunities for all and inclusiveness

4.3.1 #11 Proportion of women of Grade A among academic staff/researchers

This indicator measures the proportion of women in Grade A positions among academic staff/researchers, reflecting progress in achieving gender equality in the highest levels of academia. The evolution of this indicator for the EU-27, shown in the first graph, is available up to 2022 (and imputed for 2023), with a gap between 2019 and 2022. Between 2010 and 2014, the proportion of women in Grade A positions increased from 19.7% to 24.9%. After a drop in 2015, an upward trend can be observed between 2016 and 2019, reaching 27.3% in 2019. A further increase is realised in 2022, reaching a value of 29.2%. The increase in women's representation is the result of ongoing efforts to promote gender equality in academia, including initiatives to support women's career advancement and mentorship programmes.

Figure 25 Proportion of women of Grade A among academic staff/researchers, for the EU-27 over time

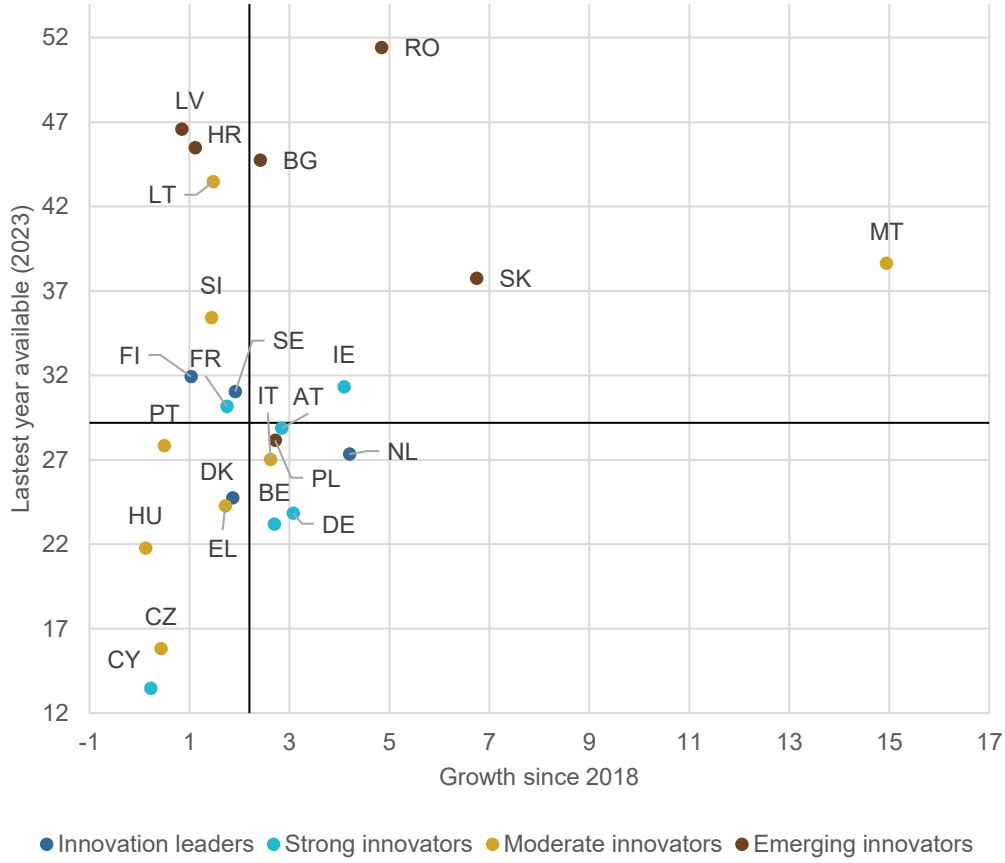


Source: Women in Science database, DG Research and Innovation – She Figures reports. Calculations by Fraunhofer ISI

Figure 26 shows the latest available value of the proportion of women in Grade A positions among academic staff/researchers compared to the growth of the indicator value since 2018,

for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Romania, Slovakia, Malta, and Bulgaria. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Lithuania, Latvia, Croatia, Slovenia, Finland, Sweden, and France. Cyprus, Czechia, Hungary, Greece, Portugal, and Denmark, are instead depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The rest of the Member States can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 26 Proportion of women of Grade A among academic staff/researchers, latest indicator value and change by EU-27 countries



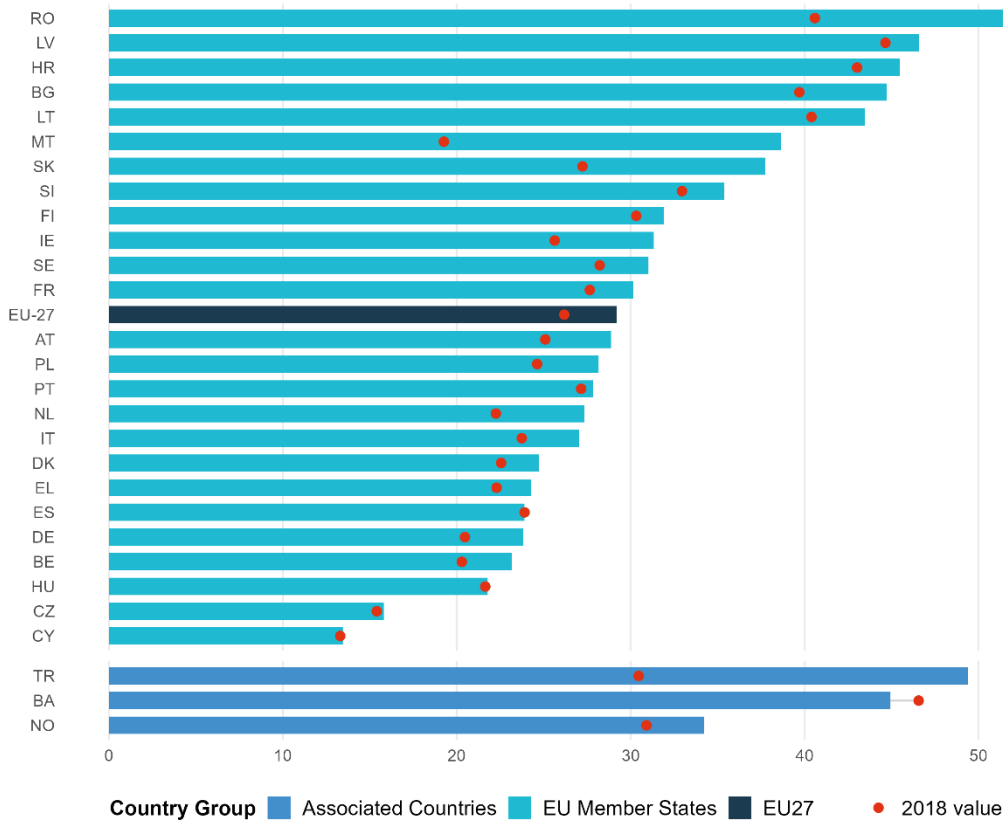
Source: Women in Science database, DG Research and Innovation – She Figures reports. Calculations by Fraunhofer ISI

The most recent values for each country are shown in Figure 27. The highest proportion of women in academic staff/researchers in Grade A position within the EU-27 can be found in Romania with a value above 50%, followed by Latvia, Croatia, Bulgaria, and Lithuania, showing indicator values that exceed 40%. However, there are also Member States that registered less than 20% in the last year available, namely Cyprus and Czechia.

Among the Associated Countries, the highest shares of women in academic staff/researchers in Grade A position can be observed in Türkiye, with a value close to 50%, followed by Bosnia and Herzegovina and Norway.

Compared to the indicator values in 2018, all the countries in both groups show a higher value in 2023, or no big differences between the two years. The only exception is Bosnia and Herzegovina, which shows a slightly higher value in 2018.

Figure 27 Proportion of women of Grade A among academic staff/researchers, by country for the latest available year and 2018

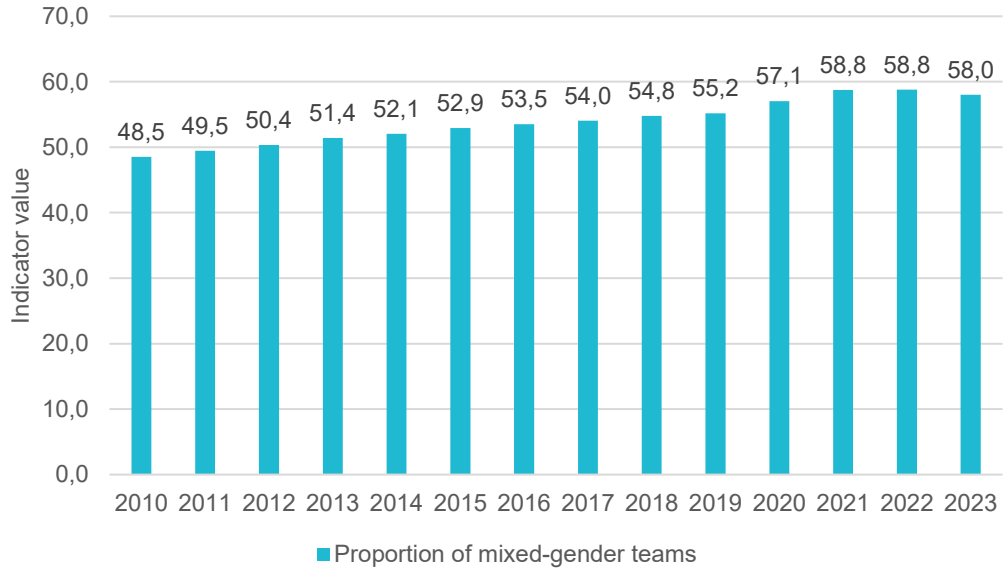


Source: Women in Science database, DG Research and Innovation – She Figures reports. Calculations by Fraunhofer ISI

4.3.2 #12 Proportion of mixed-gender authorship

This indicator measures the proportion of publications with mixed-gender authorship. The evolution of this indicator for the EU-27 is shown in Figure 28. The indicator shows a constant increase over time, registering a value of 48.5% in 2010 to 58% in 2023. However, the highest indicator value is depicted in 2021 and 2022, with 58.8%, therefore indicating a slight decrease in 2023.

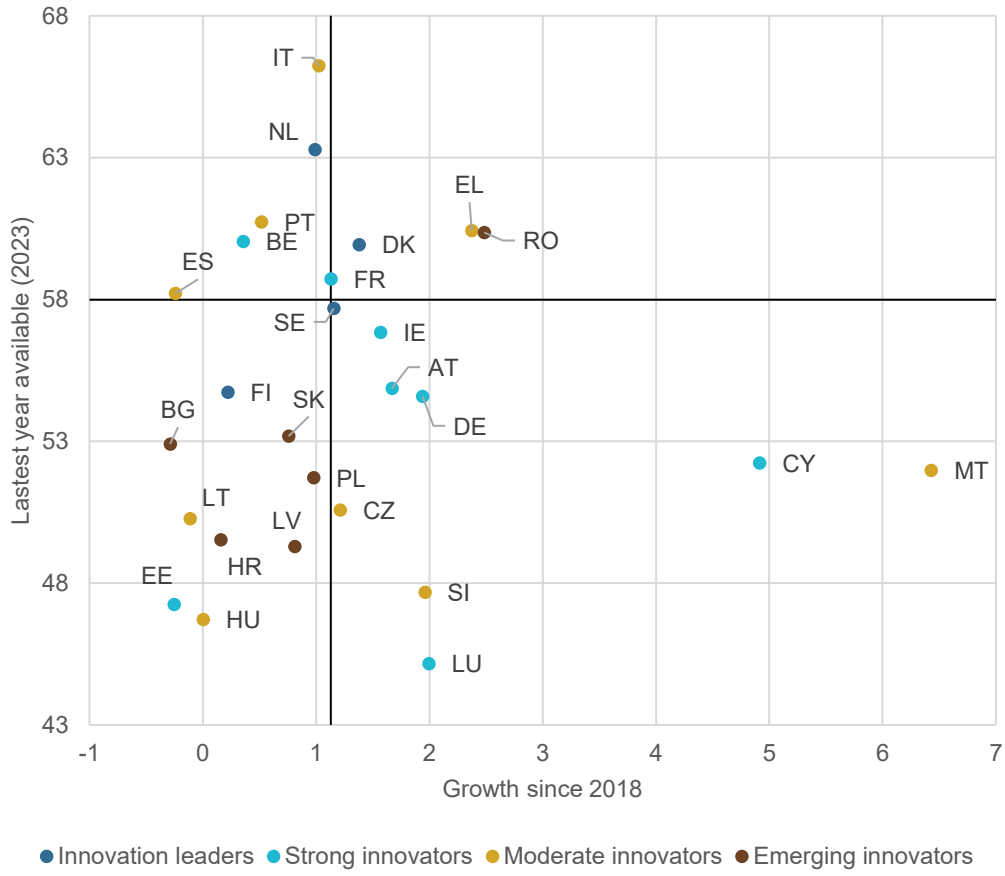
Figure 28 Proportion of mixed-gender teams, for the EU-27 over time



Source: DG Research and Innovation, Common R&I Strategy and Foresight Service Unit, based on Science-Metrix using data from Scopus (Elsevier). Note: this year version of the indicator is not "corrected" (meaning by total number of publications for which the gender of the author could be identified). Therefore, values from previous ERA reports might slightly differ.

Figure 29 shows the latest available value of the proportion of mixed-gender authorship compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Romania, Greece, France, and Denmark. The ones on the upper left quadrant, while still having higher values than EU-27 average, have a growth rate below the EU average. Among these are Italy, the Netherlands, Portugal, Belgium, and Spain. Bulgaria, Finland, Slovakia, Lithuania, Latvia, Croatia, Hungary, Poland, and Estonia are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The rest of the Member States can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 29 Proportion of mixed-gender teams, latest indicator value and change by EU-27 countries



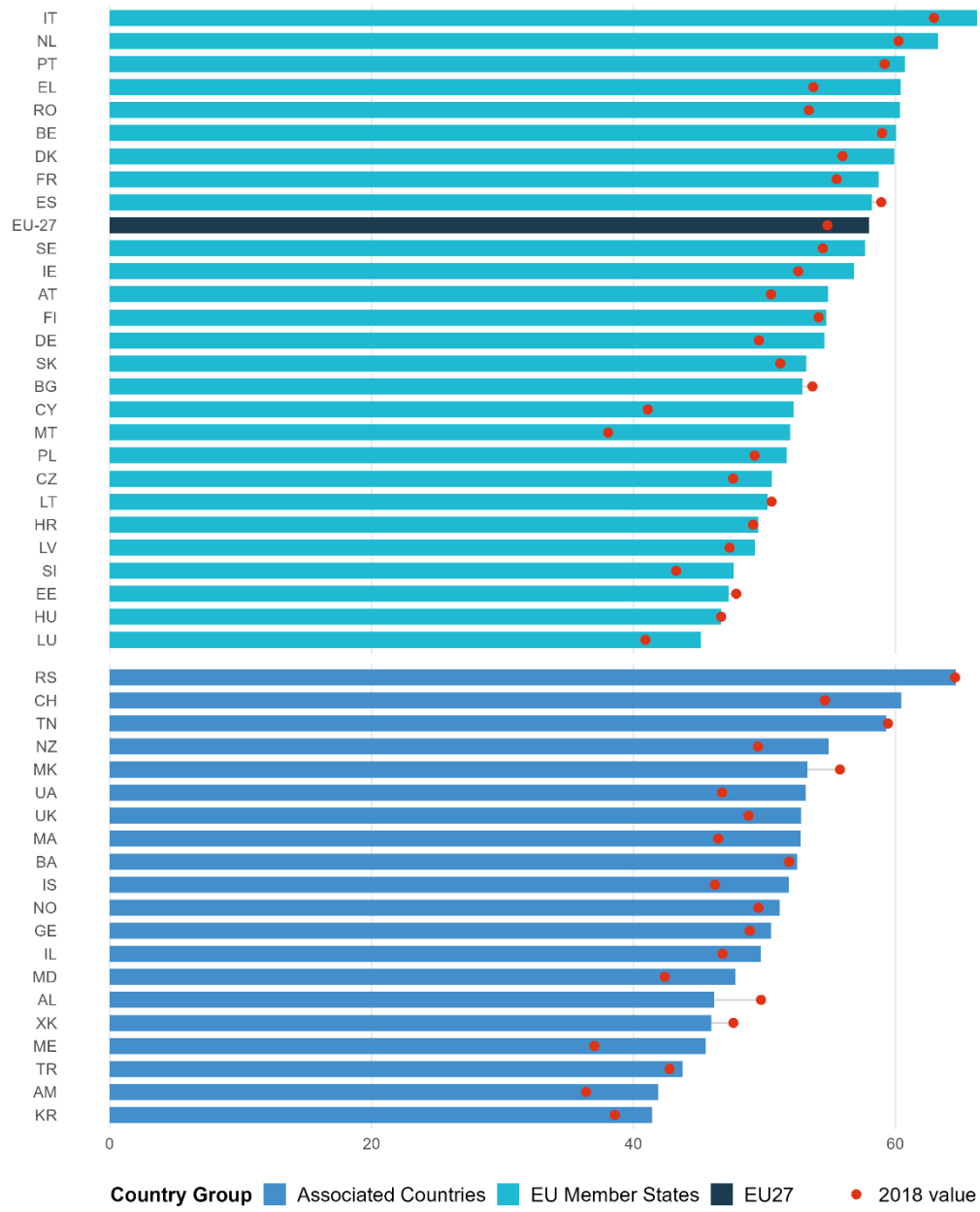
Source: DG Research and Innovation, Common R&I Strategy and Foresight Service Unit, based on Science-Metrix using data from Scopus (Elsevier). Note: this year version of the indicator is not "corrected" (meaning by total number of publications for which the gender of the author could be identified). Therefore, values from previous ERA reports might slightly differ.

The most recent values for each country are shown in the graph below. The highest shares among Member States can be found in Italy, the Netherlands, Portugal, Greece, Romania, and Belgium, showing indicator values that exceed 60%, followed by Denmark, France, and Spain. The Member States that registered the lowest values, slightly above 40%, are Hungary and Luxembourg.

Among the Associated Countries, the highest proportion of publications with mixed-gender authorship can be observed in Serbia, and Switzerland, with values exceeding 60%, followed by Tunisia, New Zealand, and Morocco.

Compared to the indicator values in 2018, all the countries in both groups show a higher value in 2023, or no big differences between the two years. Few exceptions among Associated Countries are New Zealand, Albania, and Kosovo, which show a slightly higher value in 2018.

Figure 30 Proportion of mixed-gender teams, by country for the latest available year and 2018

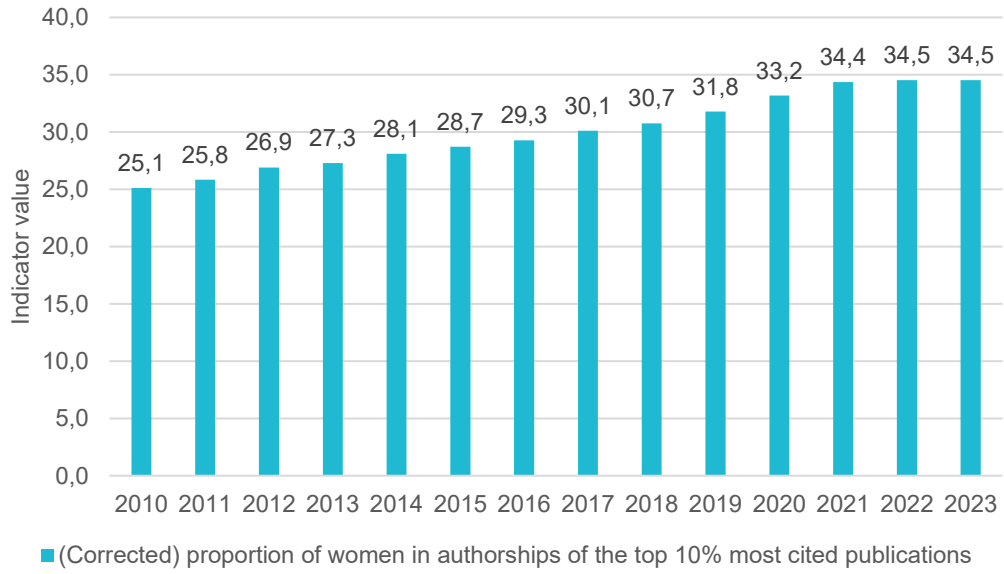


Source: DG Research and Innovation, Common R&I Strategy and Foresight Service Unit, based on Science-Metrix using data from Scopus (Elsevier). Note: this year version of the indicator is not "corrected" (meaning by total number of publications for which the gender of the author could be identified). Therefore, values from previous ERA reports might slightly differ.

4.3.3 #13 Proportion of women in authorships of the top 10% most cited publications

This indicator measures the proportion of women in authorship of the top 10% most cited publications. The evolution of this indicator for the EU-27 is shown in Figure 31. The indicator shows a constant increase over time, from a value of 25.1% in 2010 to 34.5% in 2023.

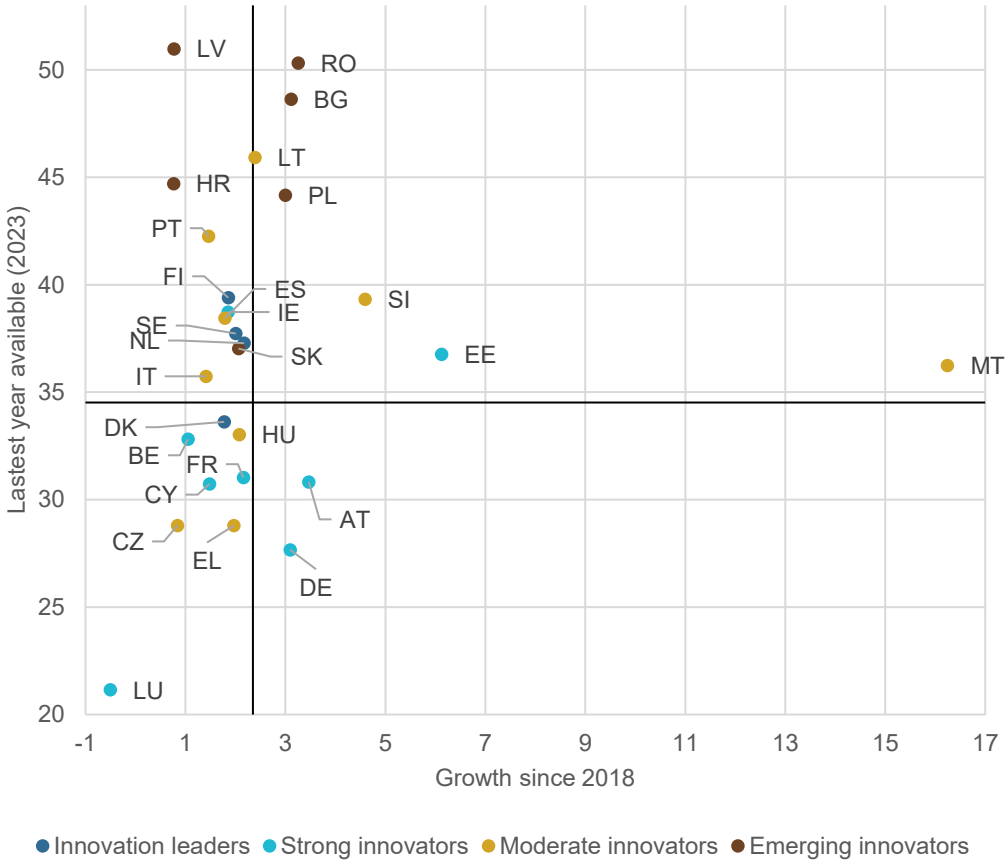
Figure 31 Proportion of women in authorships of the top 10% most cited publications, for the EU-27 over time



Source: DG Research and Innovation, Common R&I Strategy and Foresight Service Unit, based on Science-Metrix using data from Scopus (Elsevier).

Figure 32 shows the latest available value of the proportion of women in authorships of the top 10% most cited publications compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Romania, Bulgaria, Lithuania, Poland, Slovenia, Estonia, and Malta. Malta shows indeed a high growth rate, of 16.2%, with respect to 2018. The ones on the upper left quadrant, while still having higher values than EU-27 average, they are instead growing below it. Among these are Latvia, Croatia, Portugal, Finland, Spain, Ireland, Sweden, Italy, the Netherlands, and Slovakia. Denmark, Hungary, Belgium, France, Cyprus, Czechia, Greece, and Luxembourg are instead depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. Finally, Austria and Germany, can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 32 Proportion of women in authorships of the top 10% most cited publications, latest indicator value and change by EU-27 countries



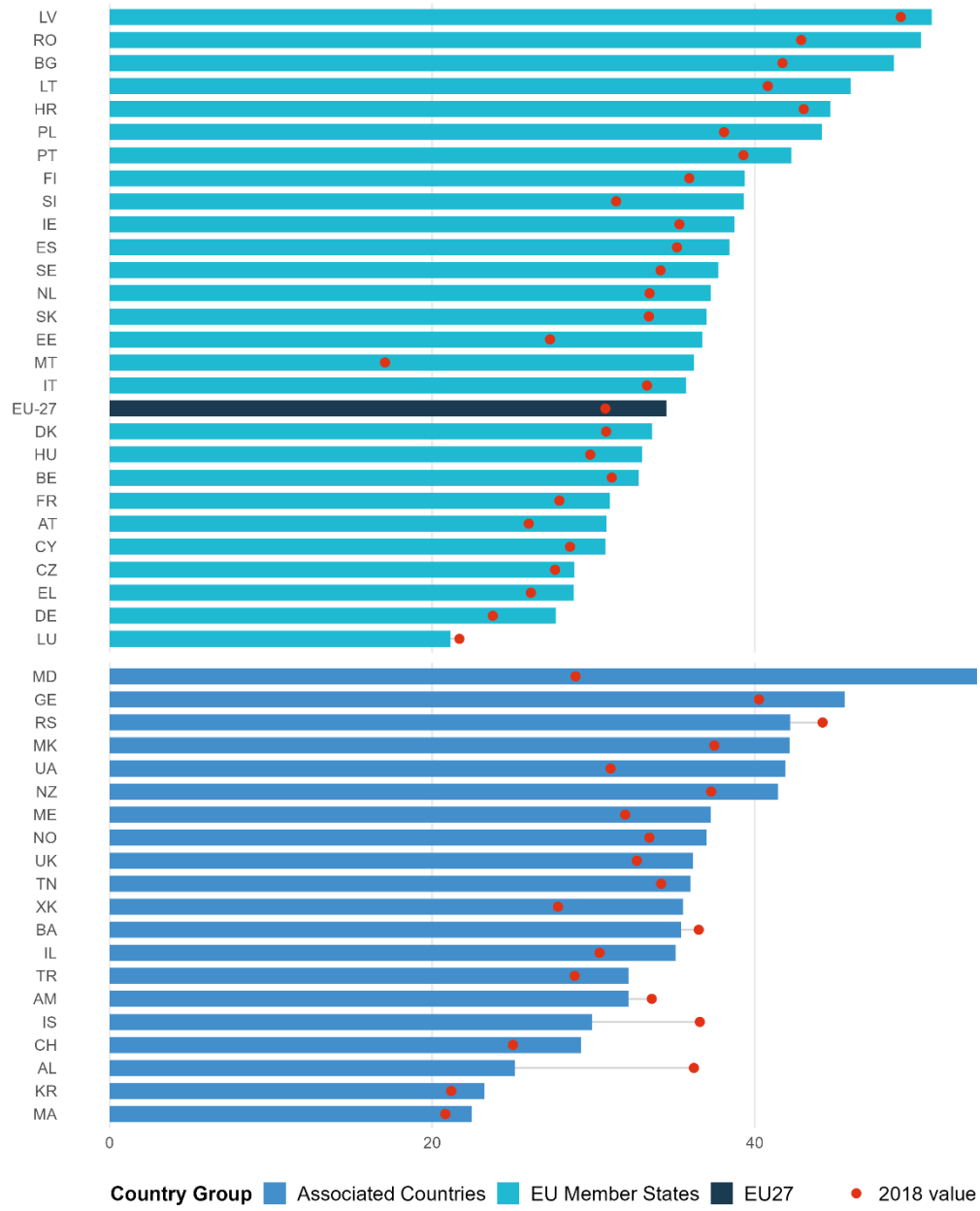
Source: DG Research and Innovation, Common R&I Strategy and Foresight Service Unit, based on Science-Metrix using data from Scopus (Elsevier).

The most recent values for each country are shown in the graph below. The highest shares across the Member States can be found in Latvia, and Romania, showing indicator values of 50%, followed by Bulgaria, and Lithuania. Czechia, Greece, Germany and Luxembourg registered instead less than 30% in 2023.

Among the Associated Countries, the highest shares of women in authorship in the top 10% most cited publications can be observed in Moldova, with a value over 50%, followed by Georgia, Serbia, Ukraine, and New Zealand, with values exceeding 40%.

Compared to the indicator values in 2018, most of the countries in both groups exhibit a higher value in 2023. A few exceptions among Associated Countries are Serbia, Bosnia and Herzegovina, Armenia, Switzerland, and Albania, which show a slightly higher value in 2018. Among Member States, only Luxembourg shows a slightly higher value in 2018.

Figure 33 Proportion of women in authorships of the top 10% most cited publications, by country for the latest available year and 2018

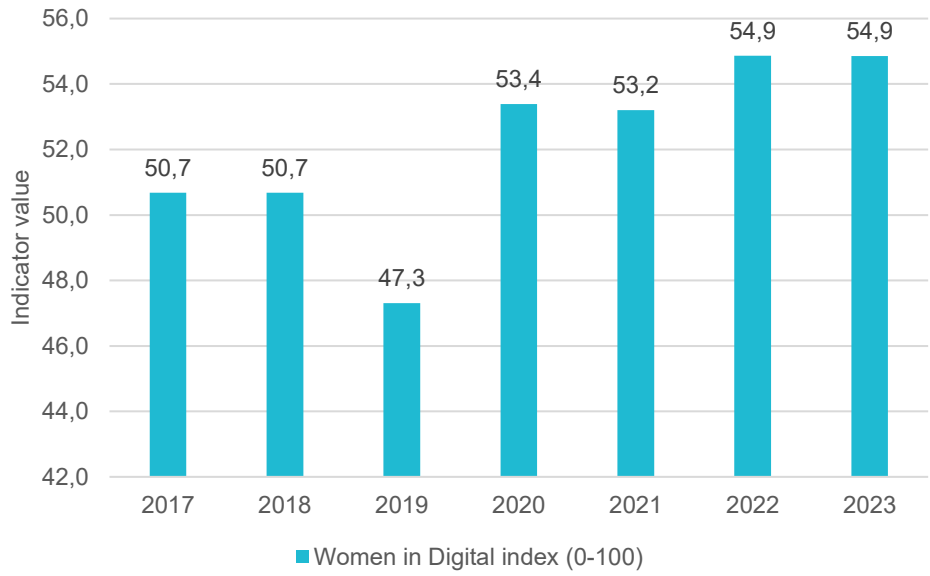


Source: DG Research and Innovation, Common R&I Strategy and Foresight Service Unit, based on Science-Metrix using data from Scopus (Elsevier).

4.3.4 #14 Women in Digital Index

This indicator measures the Women in Digital (WiD) Index, with scores between 0 and 100. The WiD is part of the EU 'Women in Digital Scoreboard', previously included in the Digital Economy and Society Index (DESI)[15], and it evaluates the inclusion of women in digital jobs, careers, and entrepreneurship, across three dimensions: use of internet, internet user skills, and specialist skills and employment. The evolution of this indicator for the EU-27 is shown in Figure 34. Generally, the indicator shows an increases over time. While it registers a value of 50.7% in 2017, the value drops in 2019 to 47.7%, to then increase again and reach 54.9% in 2023.

Figure 34 Women in Digital Index, for the EU-27 over time

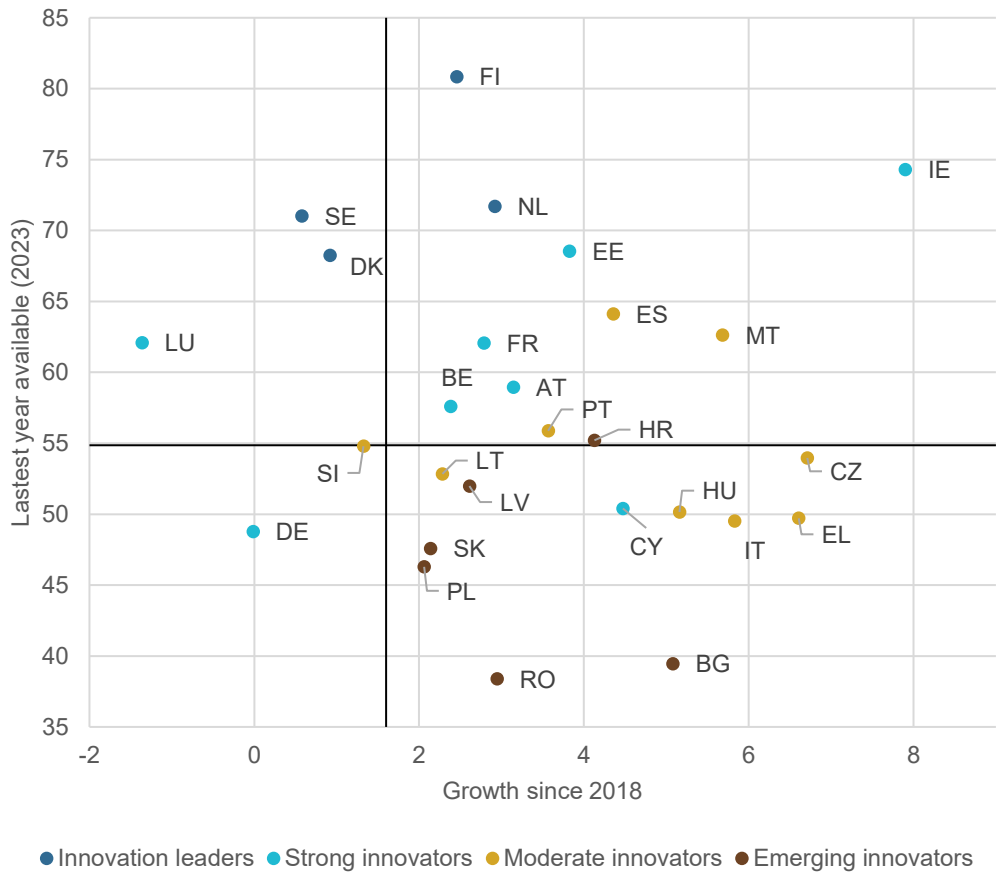


Source: European Commission – Women in Digital Scoreboard.

Figure 35 shows the latest available value of the Women in Digital Index compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Finland, the Netherlands, Ireland, Estonia, Spain, Malta, Belgium, France, Austria, Portugal, and Croatia. The ones on the upper left quadrant, while still having higher values than EU-27 average, they are instead growing below it. Among these are Sweden, Denmark, and Luxembourg. Germany and Slovenia are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The rest of the Member States can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

[15] The Digital Economy and Society Index (DESI) summarises indicators on Europe's digital performance and tracks the progress of EU countries. https://digital-strategy.ec.europa.eu/en/policies/desi

Figure 35 Women in Digital Index, latest indicator value and change by EU-27 countries



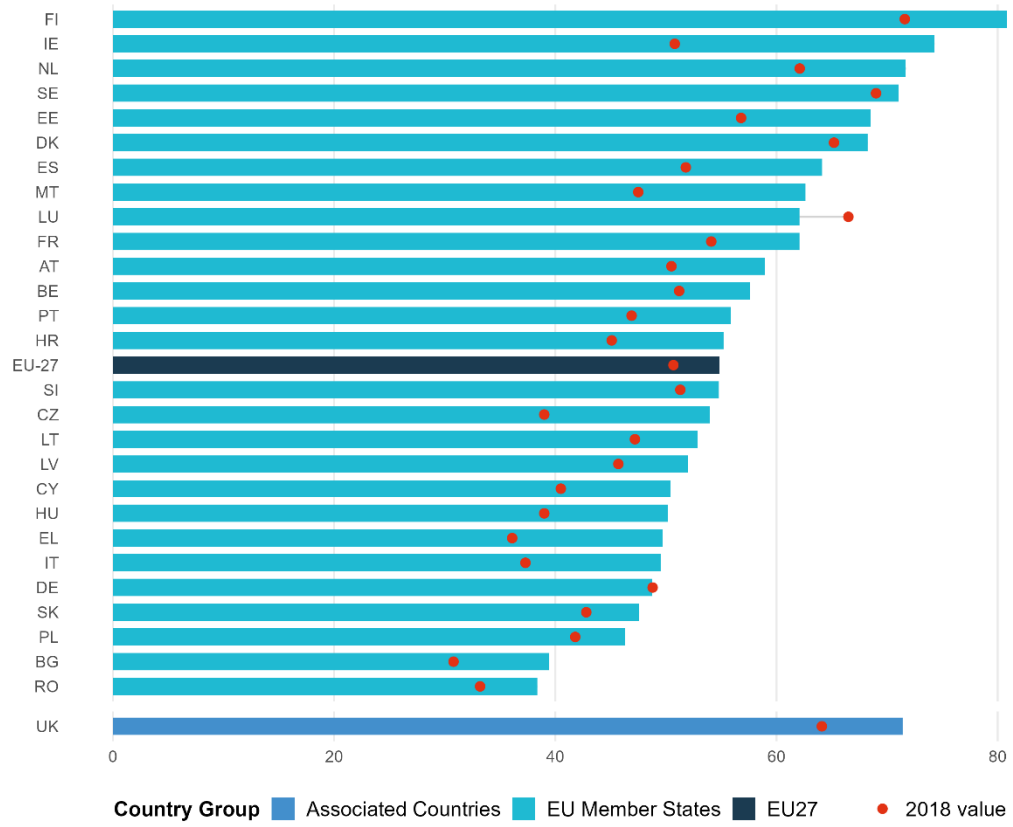
Source: European Commission – Women in Digital Scoreboard.

The most recent values for each country are shown in the graph below. The highest score index within the EU-27 can be found in Finland, showing an indicator value that exceeds 80, followed by Ireland, the Netherlands, and Sweden. However, there are also Member States that registered an index below 40 in 2023, namely Bulgaria and Romania.

Among the Associated Countries, the Women in Digital index is only available for the UK, with a value exceeding 70.

Compared to the indicator values in 2018, most of the countries in both groups exhibit a higher value in 2023. The only exception is Luxembourg showing a slightly higher value in 2018.

Figure 36 Women in Digital Index, by country for the latest available year and 2018

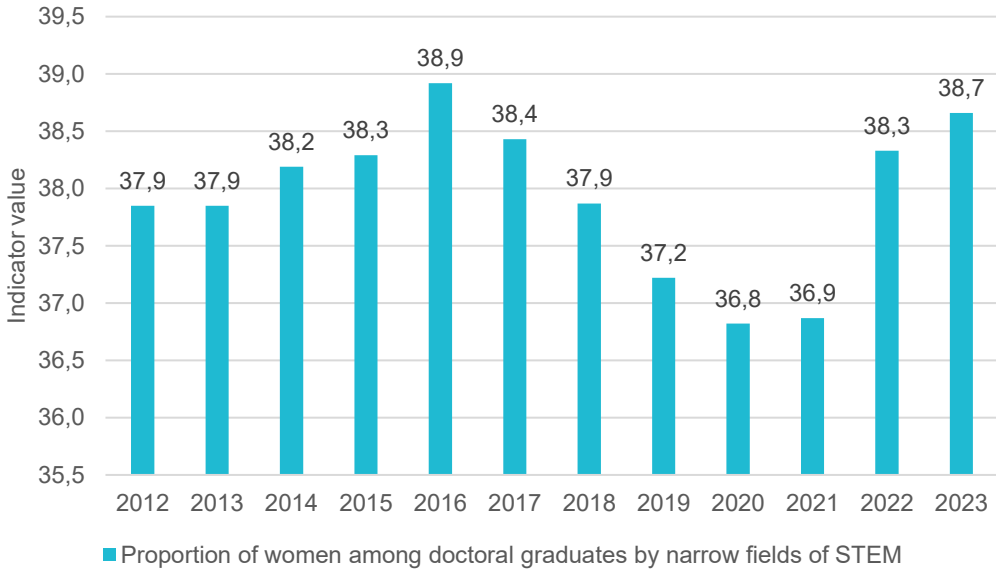


Source: European Commission – Women in Digital Scoreboard.

4.3.5 #15 Proportion (%) of women among doctoral graduates by narrow fields of Science, Technology, Engineering and Mathematics (STEM)

This indicator measures the proportion of women among doctoral graduates in the fields of Science, Technology, Engineering and Mathematics (STEM). Figure 37 shows the trend over time. From 2012 to 2016, the proportion of women among STEM doctoral graduates increased moderately, from 37.9% to 38.9%. However, from 2017 to 2021, the indicator value exhibits a decrease, reaching 36.9%. In 2022, and lastly in 2023, the indicator value increases again, to 38.7%.

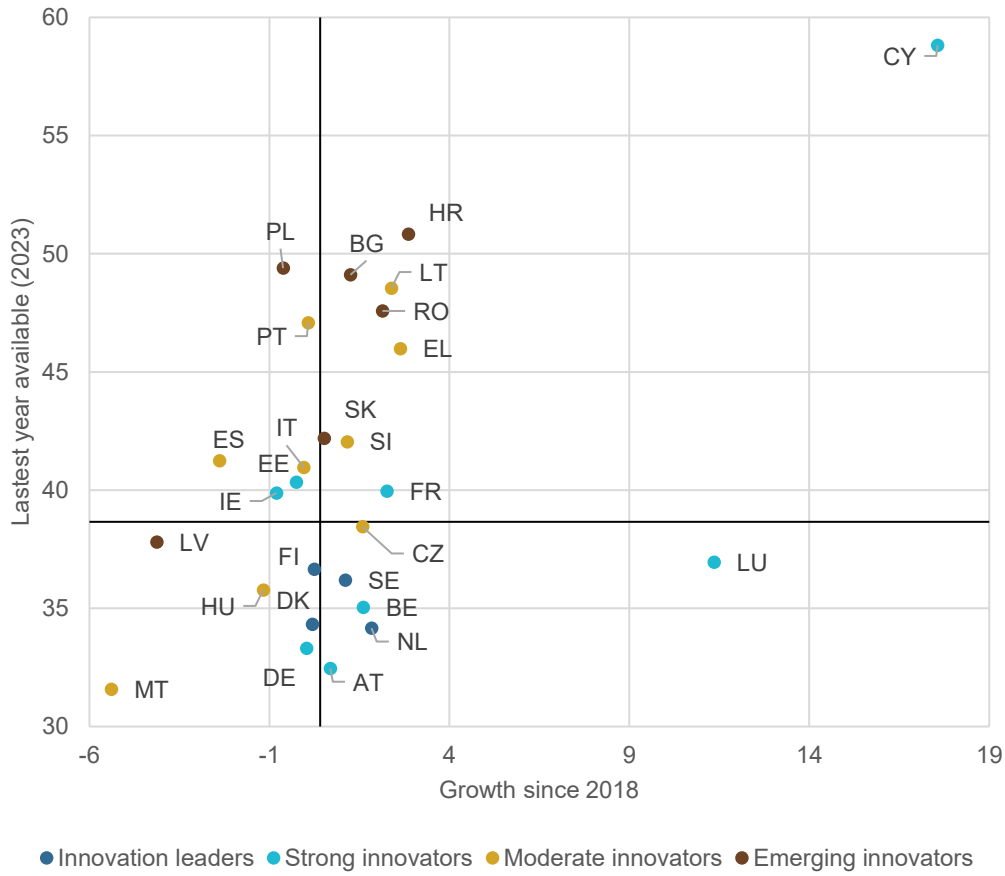
Figure 37 Proportion (%) of women among doctoral graduates by narrow fields of STEM, for the EU-27 over time



Source: Eurostat. Calculations by Fraunhofer ISI.

Figure 38 shows the latest available value of the proportion of women among STEM doctoral graduates compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Cyprus, Croatia, Bulgaria, Lithuania, Romania, Greece, Slovakia, Slovenia, and France. Cyprus shows a very high growth rate since 2018 at 17.5%, - together with Luxemburg that exhibits a growth rate of around 11% - being an outlier among Member States. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Poland, Portugal, Italy, Estonia, Spain, and Ireland. Germany, Finland, Hungary, Denmark, Latvia, and Malta are instead depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The rest of the Member States can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 38 Proportion (%) of women among doctoral graduates by narrow fields of STEM, latest indicator value and change by EU-27 countries



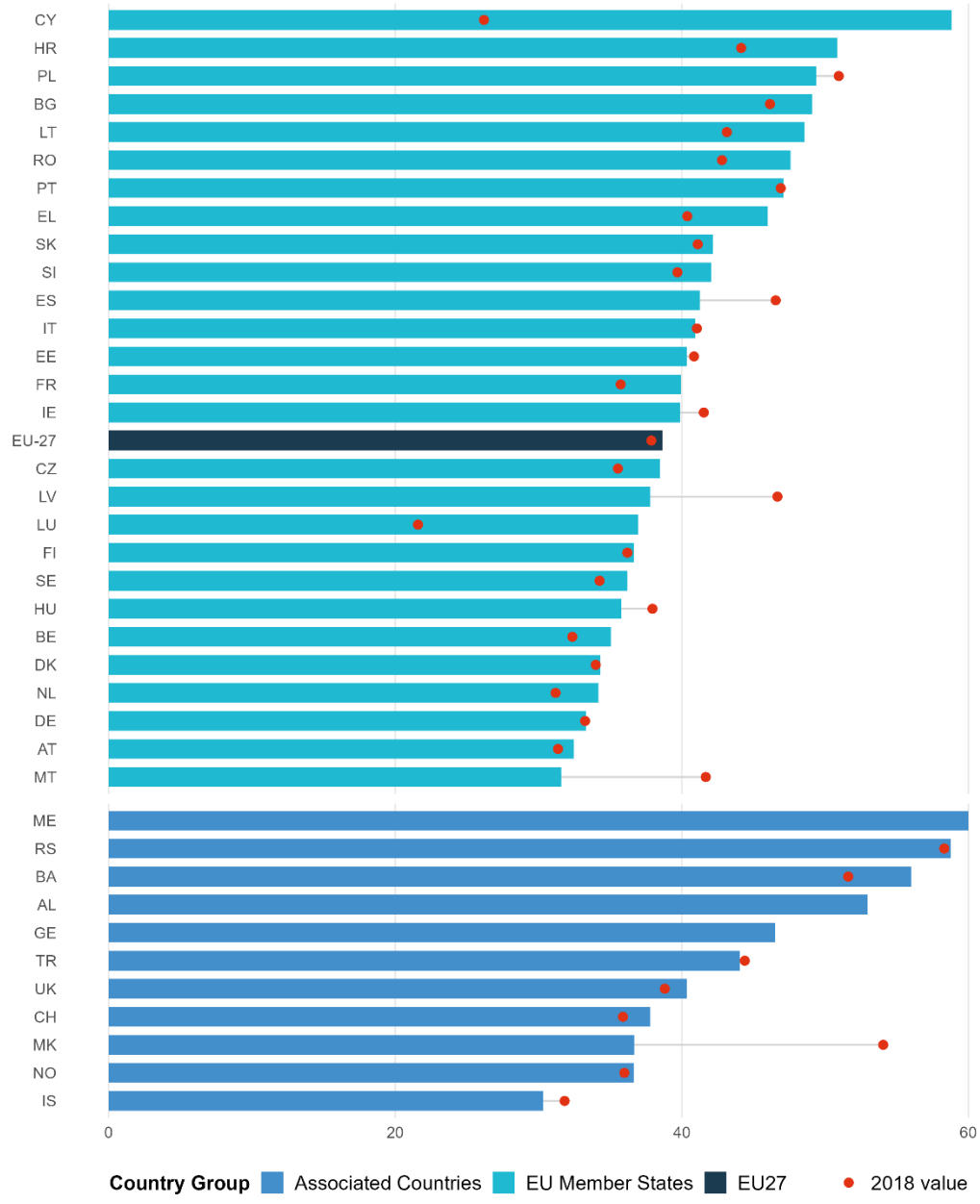
Source: Eurostat. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest value among Member States is registered by Cyprus, registering 58.8%, followed by Croatia with 50.8%. The values across Member States are overall quite homogenous, with all values between 30% and 50%. Member States that registered less than 35% in the proportion of women among doctoral graduates in STEM in 2023 are Denmark, the Netherlands, Germany, Austria, and Malta.

Among the Associated Countries, the highest indicator values can be observed in Montenegro, Serbia, and Bosnia and Herzegovina, with values above 55%. The lowest value is registered by Iceland, with 30% women among doctoral graduates in STEM.

Compared to the indicator values in 2018, most of the countries in both groups exhibit either a higher value in 2023, or their values remain quite similar. Worth noting are the differences between 2018 and 2023 indicator values in Cyprus and Luxembourg, showing significantly higher values in 2023. However, some countries in both groups also display higher indicator values in 2018 than in 2023, such as Poland, Spain Latvia, Hungary, and Malta among Member States, and North Macedonia, among Associated Countries.

Figure 39 Proportion (%) of women among doctoral graduates by narrow fields of STEM, by country for the latest available year and 2018



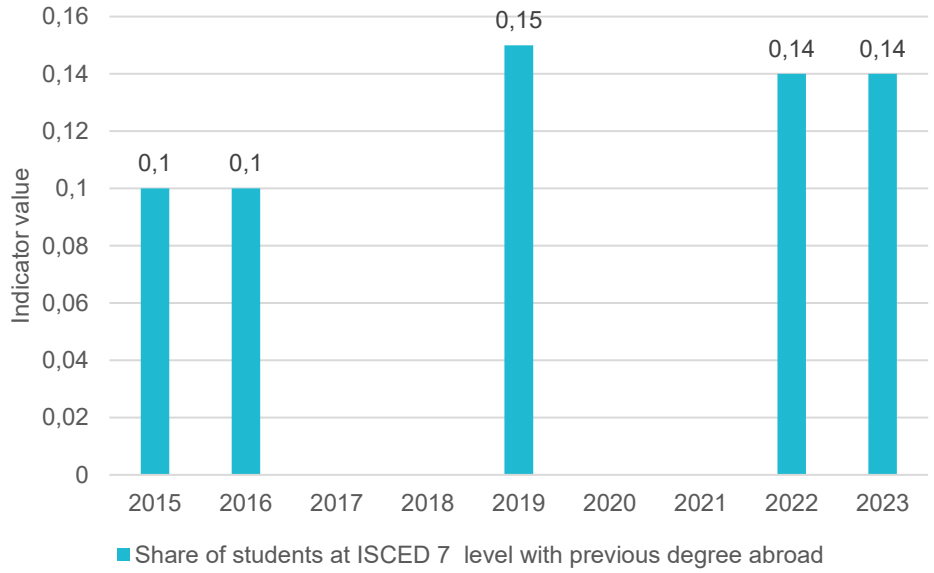
Source: Eurostat. Calculations by Fraunhofer ISI.

4.4 Sub-priority 1.4: Researchers' careers and mobility and research assessment and reward systems

4.4.1 #16 Share of students at ISCED 7 level with previous degree abroad

This indicator measures the share of students at ISCED-7 level with previous degree abroad, reflecting progress in the international mobility of master students, and the attractiveness of the country's higher education system. The evolution of this indicator for the EU average, shown in the graph below, is available for 2016 (2015 imputed), 2019, and 2022 (and 2023 imputed). The indicator value remains quite stable across the available years, with a higher value of 0.15% in 2019, and 0.14% in 2022

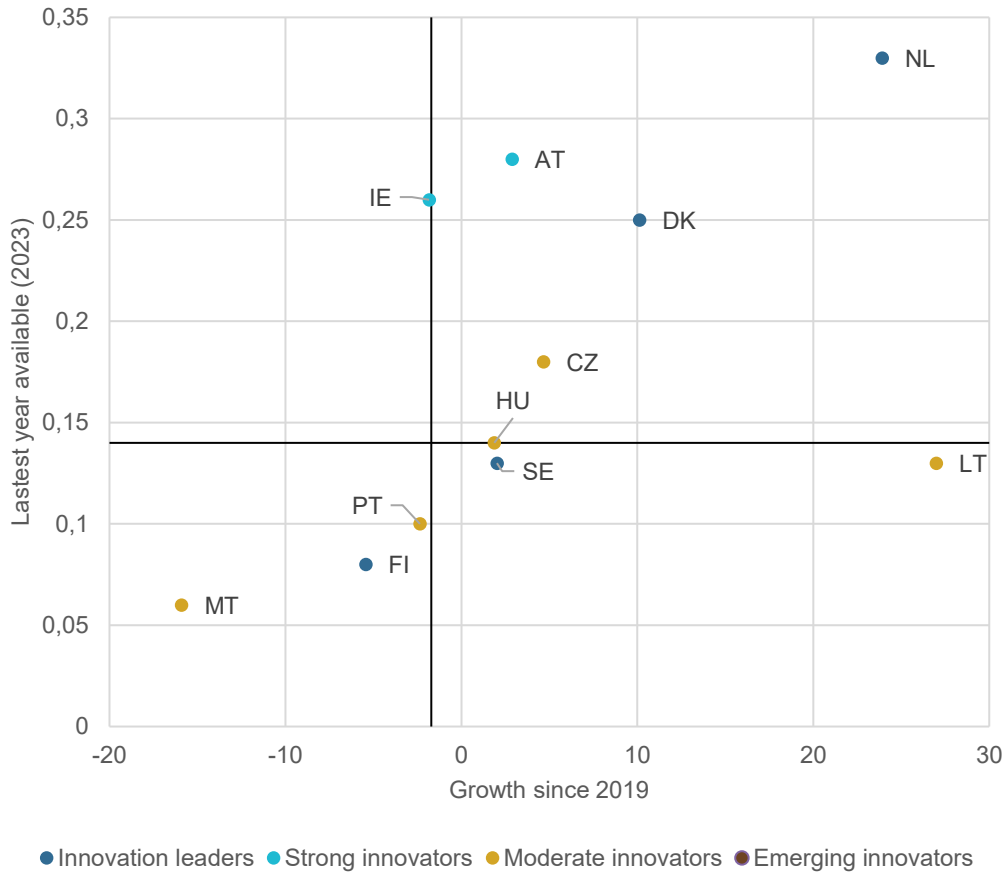
Figure 40 Share of students at ISCED-7 level with previous degree abroad, for the EU average over time



Source: European Higher Education Sector Scoreboard. Calculations by Fraunhofer ISI. Note: values are not available for all Member States, therefore the EU-27 average value is the result of the manual calculation based on the data for the available Member States.

Figure 41 shows the latest available value of the share of students at ISCED-7 level with previous degree abroad compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include the Netherlands, Austria, Denmark, Czechia, and Hungary. Ireland in the upper left quadrant maintains above-average values but records below-average growth. Malta, Portugal, and Finland are placed in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. Sweden and Lithuania can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 41 Share of students at ISCED 7 level with previous degree abroad, latest indicator value and change by EU-27 countries



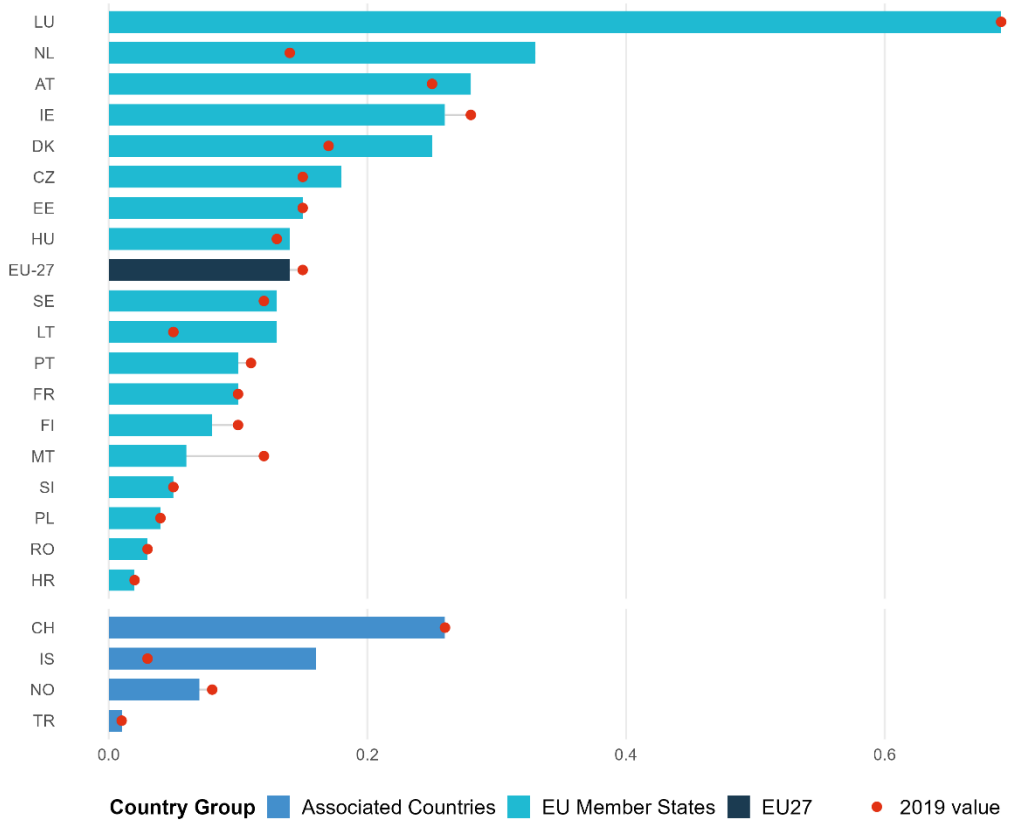
Source: European Higher Education Sector Scoreboard. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in Figure 42. The highest share of students at ISCED-7 level with previous degree abroad within the EU-27 can be found in Luxembourg with a value above 0.6%, followed by the Netherlands, Austria, Ireland, and Denmark, showing indicator values that exceed 0.2%. However, there are also Member States that registered less than 0.05% in the last year available, namely Poland, Romania, and Croatia.

Among the Associated Countries, the highest share of students at ISCED-7 level with previous degree abroad can be observed in Switzerland, with a value above 0.2%, followed by Iceland, Norway, and Türkiye.

Compared to indicator values in 2019, all the countries in both groups show either a higher value in 2023, or no big differences between the two years. Only few exceptions like Ireland, Finland, and Malta which show slightly higher values in 2019.

Figure 42 Share of students at ISCED-7 level with previous degree abroad, by country for the latest available year and 2019

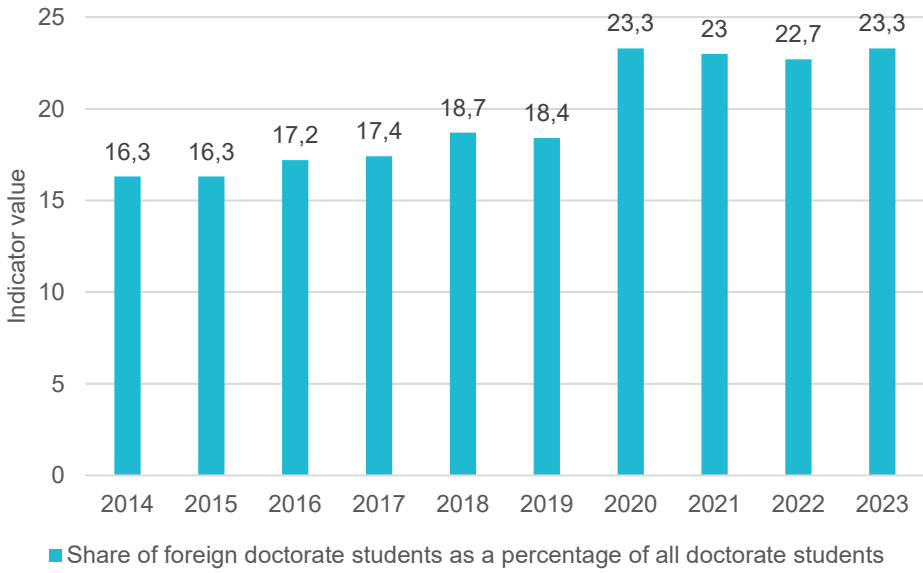


Source: European Higher Education Sector Scoreboard. Calculations by Fraunhofer ISI.

4.4.2 #17 Share of foreign doctorate students as a percentage of all doctorate students

This indicator measures the share of foreign doctorate students among all doctorate students in a country, providing insight into the international mobility of PhD students. It refers to the share of mobile doctorate students, coming from abroad (from any country in the world). The indicator is available for the EU-27 since 2014. The graph below shows the trend over time. From 2014 to 2019, the share of foreign doctorate students in the EU-27 increased moderately from 16.3% to 18.4%. In 2020, a notable increase in the indicator value was observed. Following the peak, the indicator value slightly declined, but reaching again 23.3% in 2023. This trend reflects an overall increase in the international mobility of PhD students over the years.

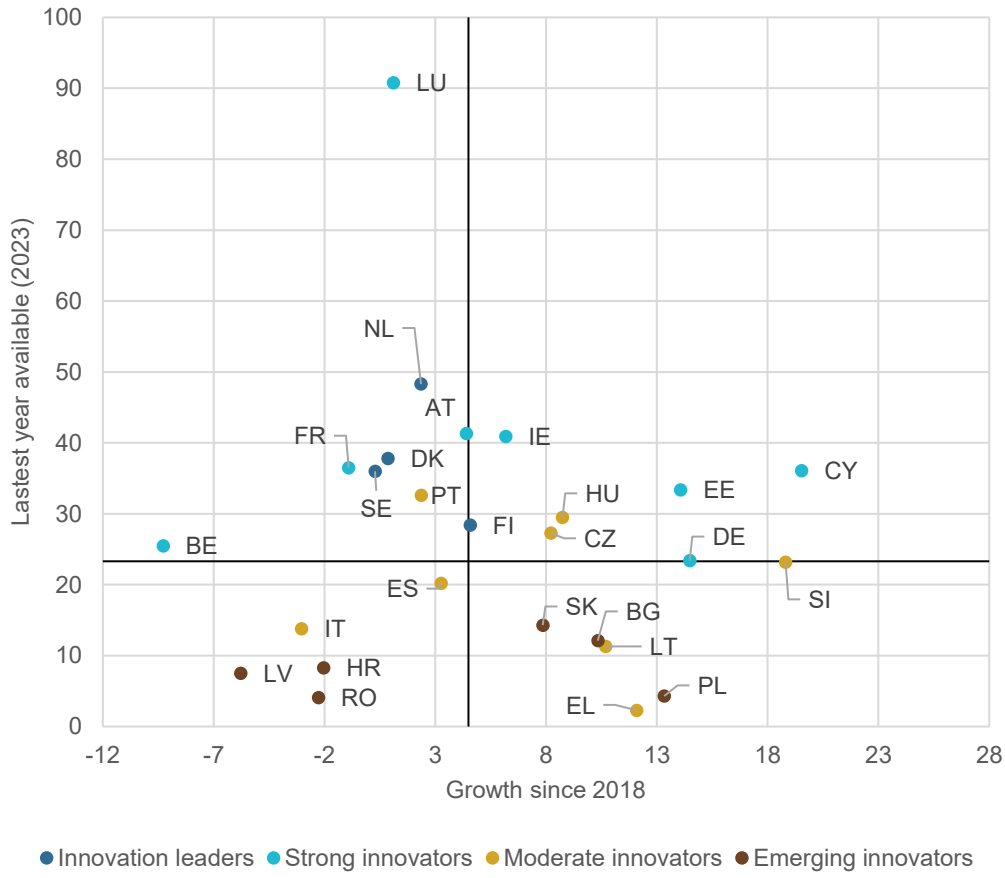
Figure 43 Share of foreign doctorate students as a percentage of all doctorate students, for the EU-27 over time



Source: Eurostat. Calculations by Fraunhofer ISI.

The graph below shows the latest available value of the share of foreign doctorate students among all doctorate students, along with the growth of the indicator value for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Ireland, Cyprus, Finland, Czechia, Estonia, and Germany. Malta is also in this quadrant but is not displayed as it showed a growth rate of over 64%, due to a change from a value of 6.4% in 2018 to a value of 76.5% in 2023. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Luxembourg, the Netherlands, Austria, Denmark, Fance, Belgium, Portugal, and Sweden. Spain, Italy, Latvia, Romania, and Croatia are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The rest of moderate and emerging innovators can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 44 Share of foreign doctorate students as a percentage of all doctorate students, latest indicator value and change by EU-27 countries



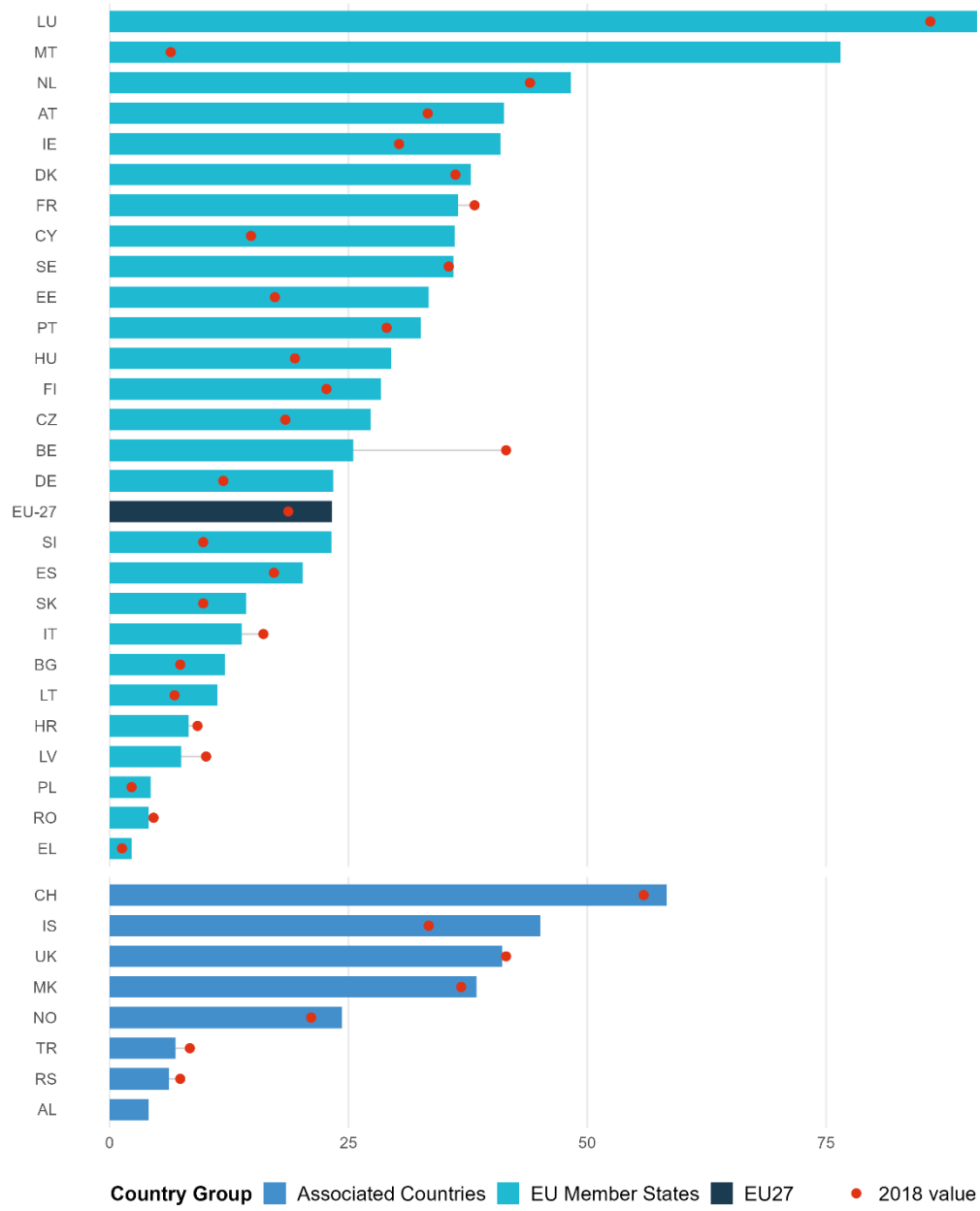
Source: Eurostat. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in Figure 45. The highest share of foreign doctorate students within the EU-27 can be found in Luxembourg and Malta with a value above 75 %, followed by the Netherlands, Austria, and Ireland. However, there are also Member States that registered less than 5% in the last year available, namely Poland, Romania, and Greece.

Among the Associated Countries, the highest share of foreign doctorate students can be observed in Switzerland, with a value above 50%, followed by Iceland, the United Kingdom, and North Macedonia.

Compared to the indicator values in 2018, all the countries in both groups show either a higher value in 2023, or no big differences between the two years. The only exception is Belgium, which shows a much higher value in 2018.

Figure 45 Share of foreign doctorate students as a percentage of all doctorate students, by country for the latest available year and 2018



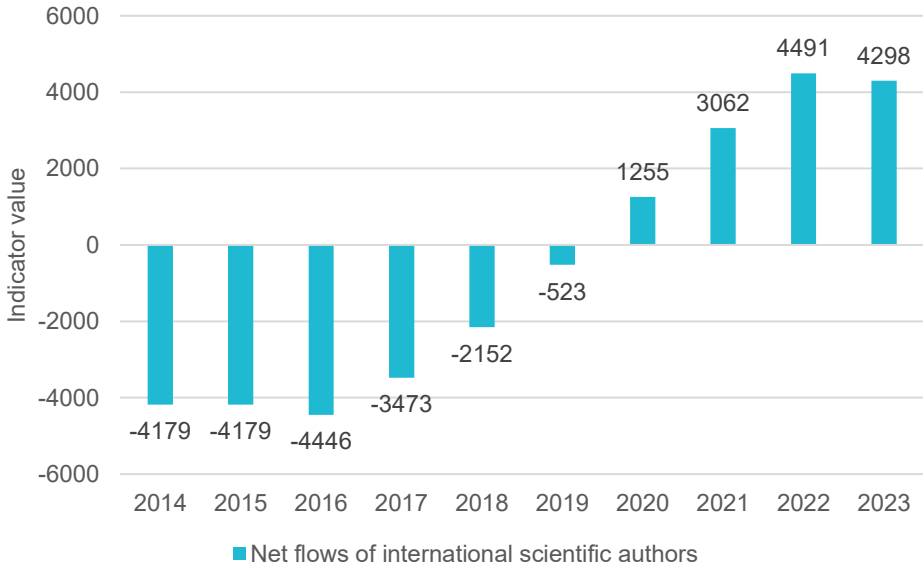
Source: Eurostat. Calculations by Fraunhofer ISI.

4.4.3 #18 Net flows of international scientific authors

This indicator measures the net flows of international scientific authors, which shows the balance between incoming and outgoing researchers based on changes in authors' main institutional affiliations across publications. It captures whether, in a given year, more scientific authors enter the EU-27 research system (inflows and returnees) or leave it (outflows), considering only authors with at least two Scopus-indexed publications. A mobility episode is identified when an author's affiliation in a given year differs from their affiliation in the closest earlier publication. The net flow represents the difference between the number of authors arriving and those leaving. Importantly, the EU indicator considers only mobility between the EU and non-EU countries, therefore moves within EU Member States are not included. As a result, this measure captures the EU's capacity to attract international scientific talent, but it is not directly comparable to national-level indicators.[16]

Figure 46 shows the evolution of the indicator. The figure shows a persistent but gradually improving negative net flow from 2014, with a value of -4,179, to 2019, with a value -523, indicating that the outflows of scientific authors exceed the inflows. The indicator becomes positive in 2020, with a value of 1,255. This positive trend continues until 2023, with a peak in 2022 of 4,491, and stabilises at 4,298 in 2023.

Figure 46 Net flows of international scientific authors, for the EU-27 over time

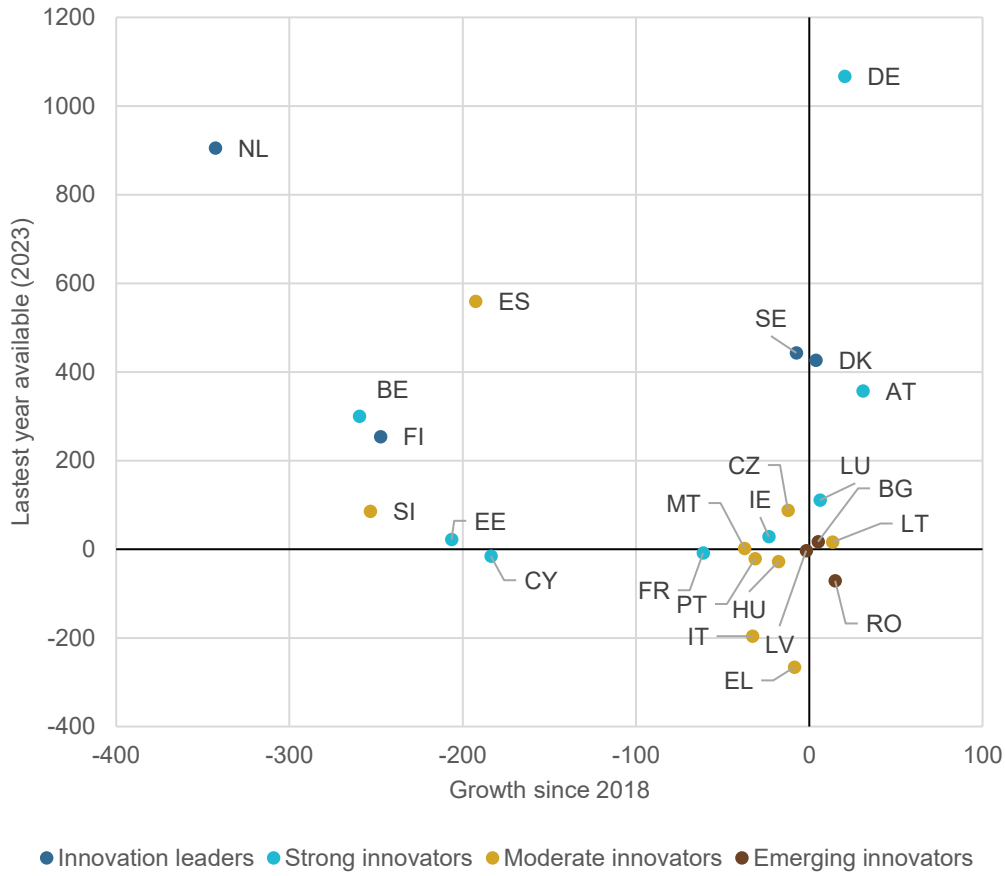


Source: Reico Observatory (OECD)

Figure 47 shows the latest available value of the net flows of international scientific authors compared to the growth of the indicator value since 2018, for all EU-27 Member States. In this case, we do not plot the EU-27 average, as the value for the EU-27 considers only mobility between the EU and non-EU countries, and therefore it is not directly comparable to the national values. Countries showing both growth of net flows with respect to 2018 and positive net flows in 2023 are Germany, Denmark, Austria, Luxembourg, Bulgaria, and Lithuania. Those that show negative growth since 2018, and negative net flows in 2023 are Cyprus, France, Portugal, Italy, Hungary, and Greece.

[16] The change in the author´s affiliation may not correspond to permanent migration.

Figure 47 Net flows of international scientific authors, latest indicator value and change by EU-27 countries



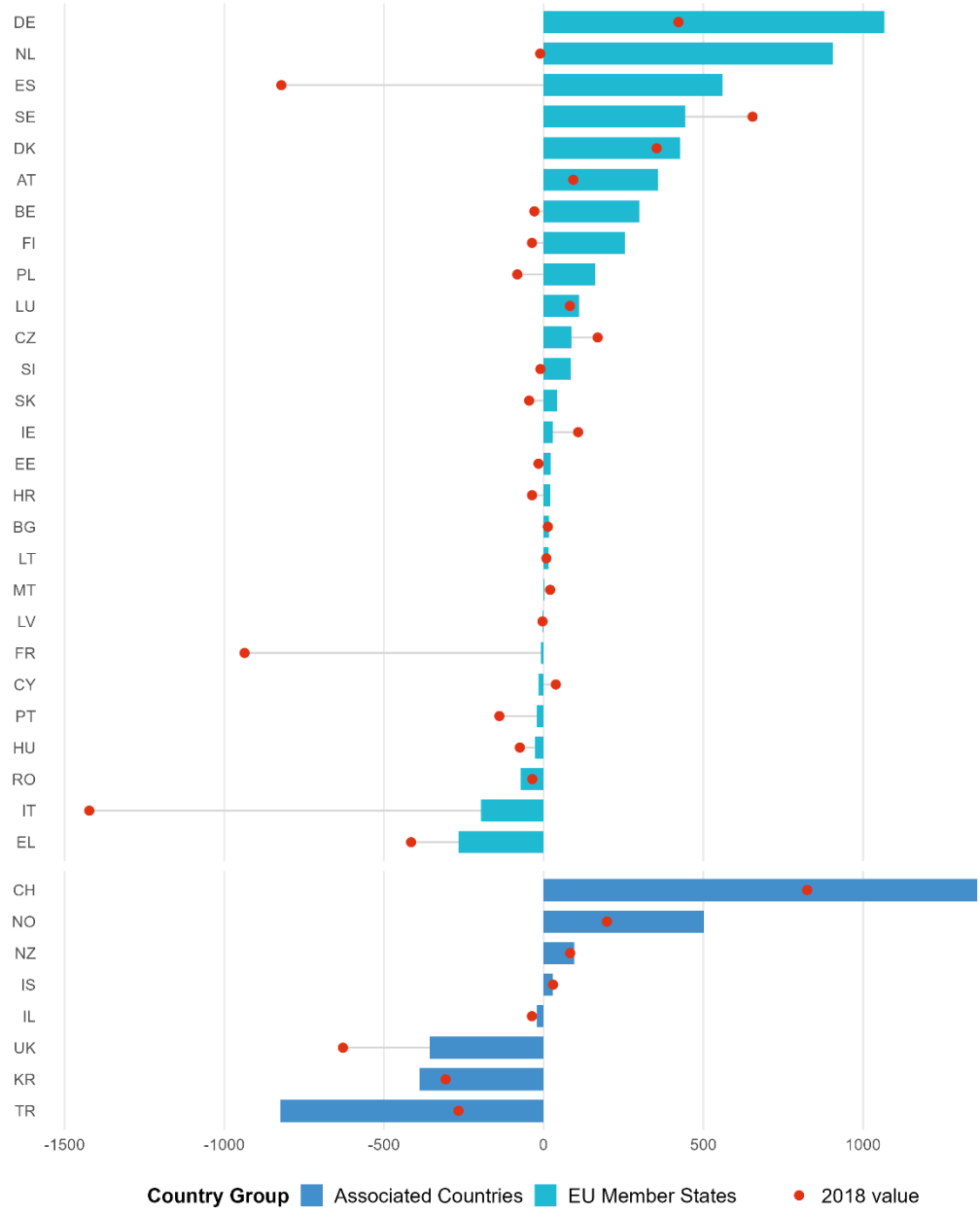
Source: Reico Observatory (OECD). Note: The bold axes represent a zero-centred reference line used to emphasize the direction of net flows (inflows vs. outflows), or a positive or negative growth. They do not correspond to EU-average values.

The most recent values for each country are shown in Figure 48. The highest positive net flows of international scientific authors within the EU-27 can be found in Germany, with a value above 1000, followed by the Netherlands, Spain, Sweden, and Denmark. However, there are also Member States that registered negative net flows in 2023, such Romania, Italy, and Greece.

Among the Associated Countries, the highest positive net flows of international scientific authors can be observed in Switzerland, with a value above 1300, followed Norway, and New Zealand. Major negative outflows occur in the United Kingdom, South Korea, and Türkiye.

Compared to the indicator values in 2018, most of the countries in both groups don't report big differences. However, significant differences between 2018 and 2023 exist in Spain, France, Italy, Belgium, Finland, and Poland, showing negative values in 2018 and positive values in 2023. Lower indicator values in 2023 can be found instead in Sweden and Türkiye.

Figure 48 Net flows of international scientific authors, by country for the latest available year and 2018

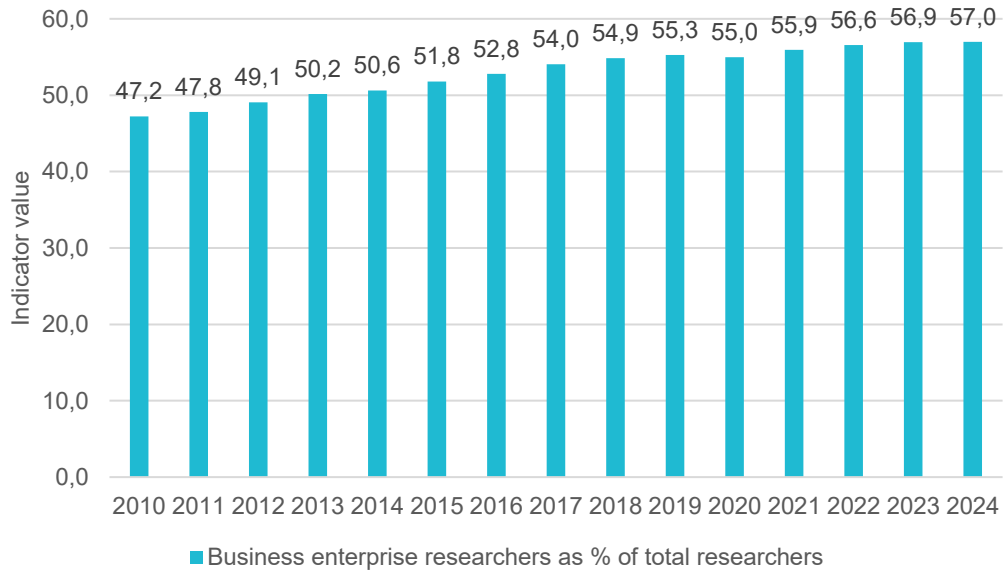


Source: Reico Observatory (OECD).

4.4.4 #19 Business enterprise researchers as a percentage of total researchers

This indicator measures the share of researchers in the business enterprise sector as percentage of total researchers. It shows how much the private sector contributes to the country´s innovation capacity, via the employment of research workforce. The trend of this indicator is shown in Figure 49. The EU-27 shows a moderate increase over time, starting from 47.2% in 2010, and reaching 57% in 2024. This result shows that the business sector researchers represent the largest share of total researchers.

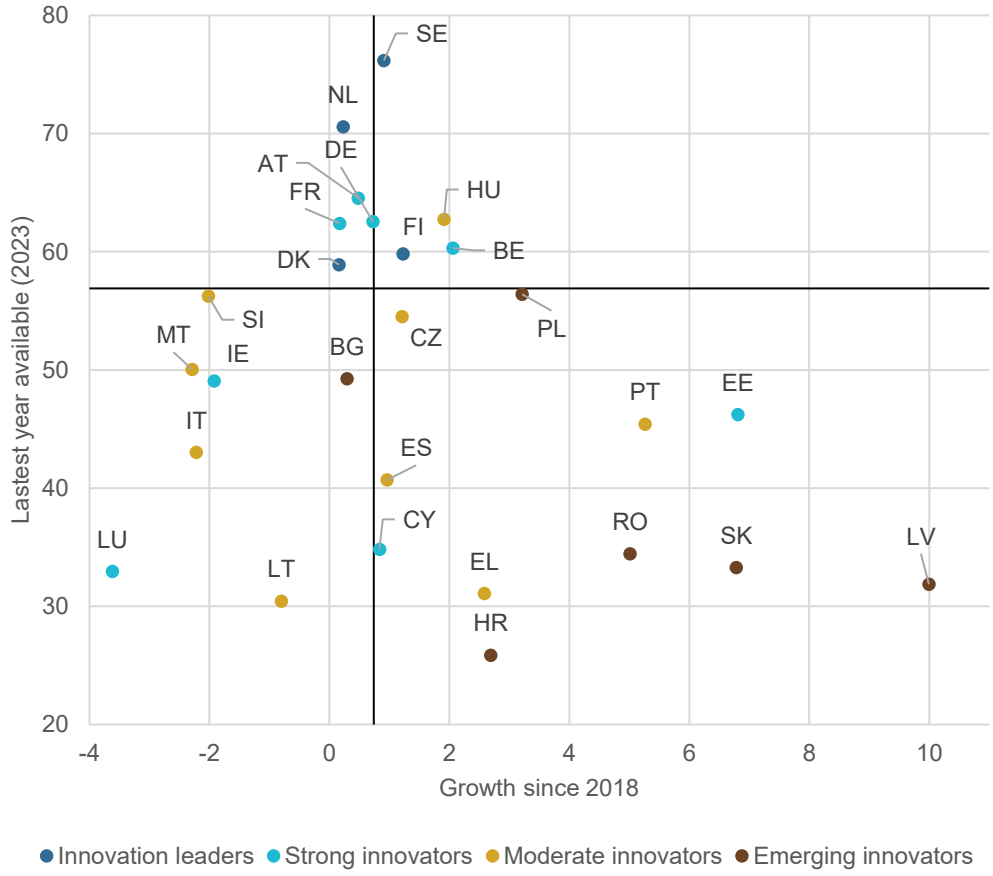
Figure 49 Business enterprise researchers as a percentage of total researchers, for the EU-27 over time



Source: Eurostat and OECD. Calculations by Fraunhofer ISI.

Figure 50 shows the latest available value of the share of researchers in the business enterprise sector as percentage of total researchers compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Hungary, Sweden, Belgium, and Finland. Countries in the upper left quadrant maintain above-average values but record below-average growth which are Germany, the Netherlands, Austria, France, and Denmark. Slovenia, Ireland, Bulgaria, Italy, Luxembourg, and Lithuania are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The rest of the Member States can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 50 Business enterprise researchers as a percentage of total researchers, latest indicator value and change by EU-27 countries



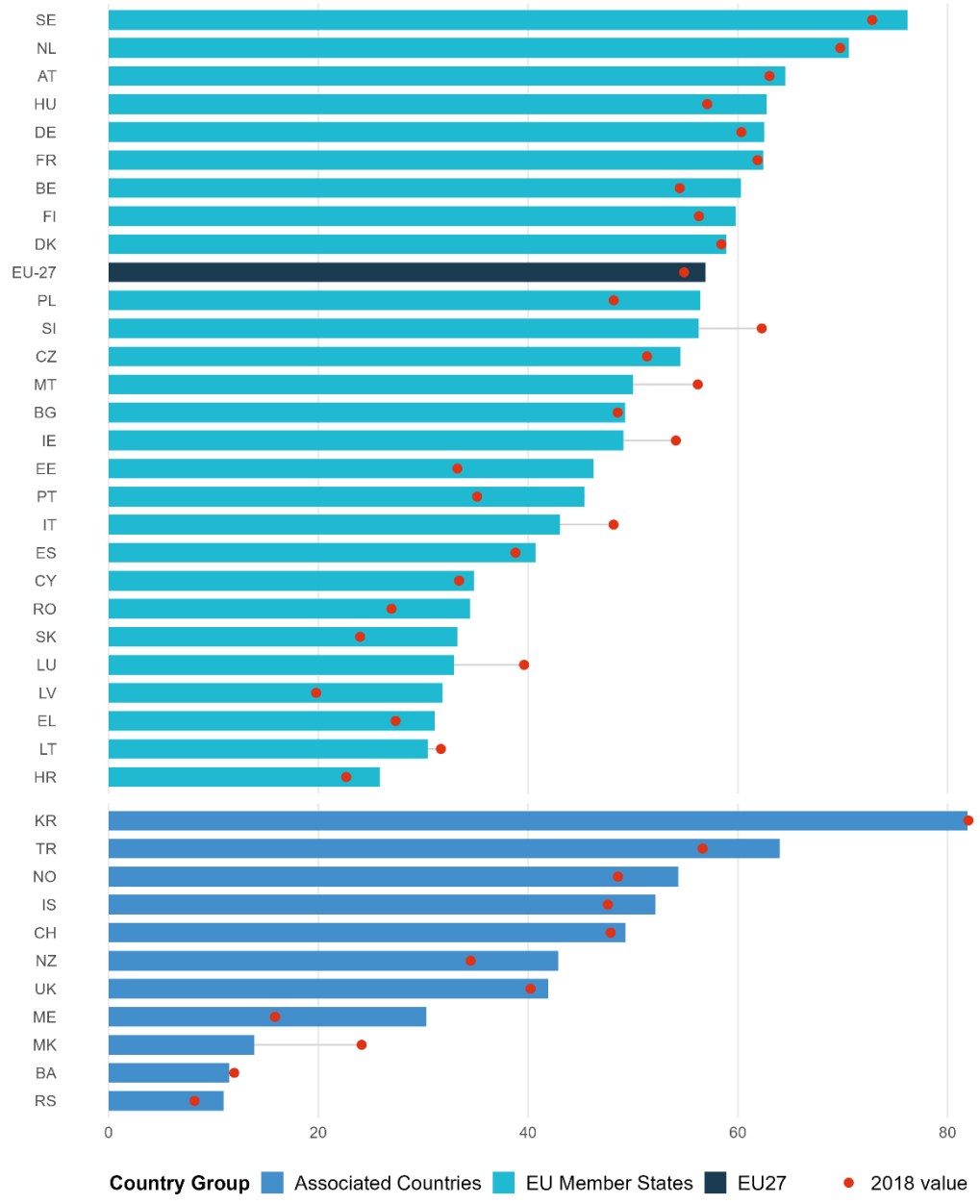
Source: Eurostat and OECD. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest shares within the EU-27 can be found in Sweden and the Netherlands, showing indicator values that exceed 70%, followed by the Netherlands, Austria, Hungary, Germany, and France. Lithuania and Croatia registered instead values below 35% in 2023.

Among the Associated Countries, the highest shares of researchers in the business enterprise sector can be observed in South Korea, with a value exceeding 80%, followed by Türkiye, with a value above 60%.

Compared to the indicator values in 2018, most of the countries in both groups show a higher value in 2023, or no big differences between the two years. Only few exceptions like Slovenia, Malta, Ireland, Italy, Luxembourg, and Lithuania show higher values in 2018.

Figure 51 Business enterprise researchers as a percentage of total researchers, by country for the latest available year and 2018

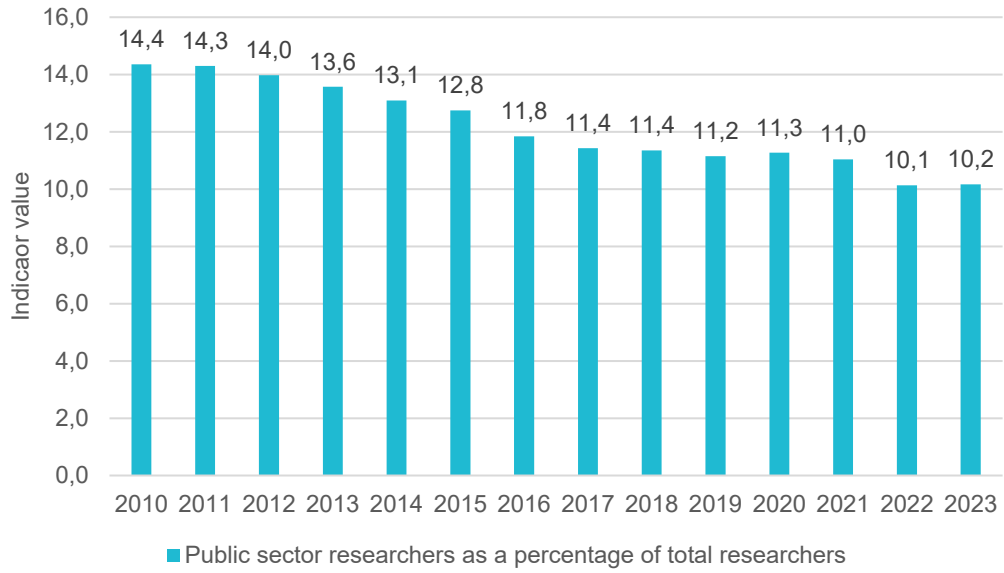


Source: Eurostat and OECD. Calculations by Fraunhofer ISI.

4.4.5 #20 Public sector researchers as a percentage of total researchers

This indicator measures the share of researchers in the public sector as percentage of total researchers.[17] It shows how much the public sector contributes to the country´s innovation capacity, via the employment of research workforce. The trend of this indicator is shown in Figure 52. The EU-27 shows a steady decrease over time, starting from 14.4% in 2010, and reaching 10.2% in 2023. This result shows that the public sector researchers represent only a small part of the share of total researchers.

Figure 52 Public sector researchers as a percentage of total researchers, for the EU-27 over time

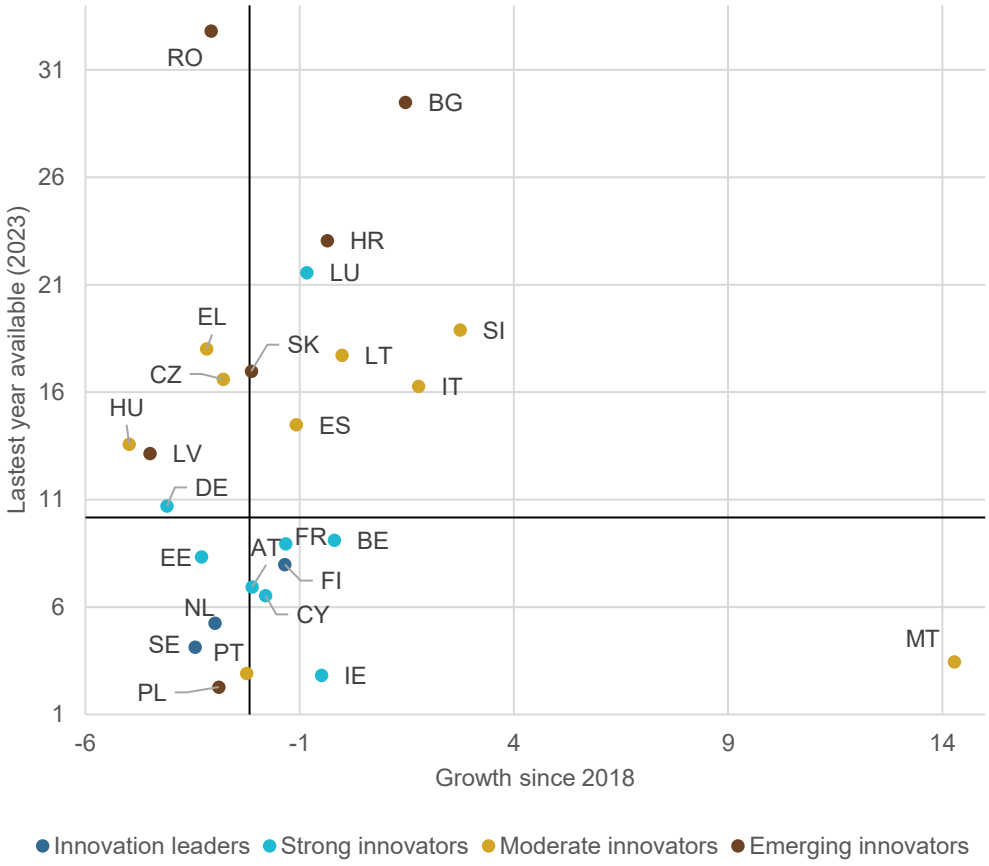


Source: Eurostat. Calculations by Fraunhofer ISI:

Figure 53 shows the latest available value of the share of researchers in the public sector as percentage of total researchers compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Bulgaria, Croatia, Luxembourg, Slovenia, Italy, Lithuania, Spain, and Slovakia. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Romania, Greece, Hungary, Latvia, Czechia, and Germany. Estonia, the Netherlands, Sweden, Poland, and Portugal are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The rest of the Member States can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

[17] The indicator refers to researchers in the Government sector only.

Figure 53 Public sector researchers as a percentage of total researchers, latest indicator value and change by EU-27 countries



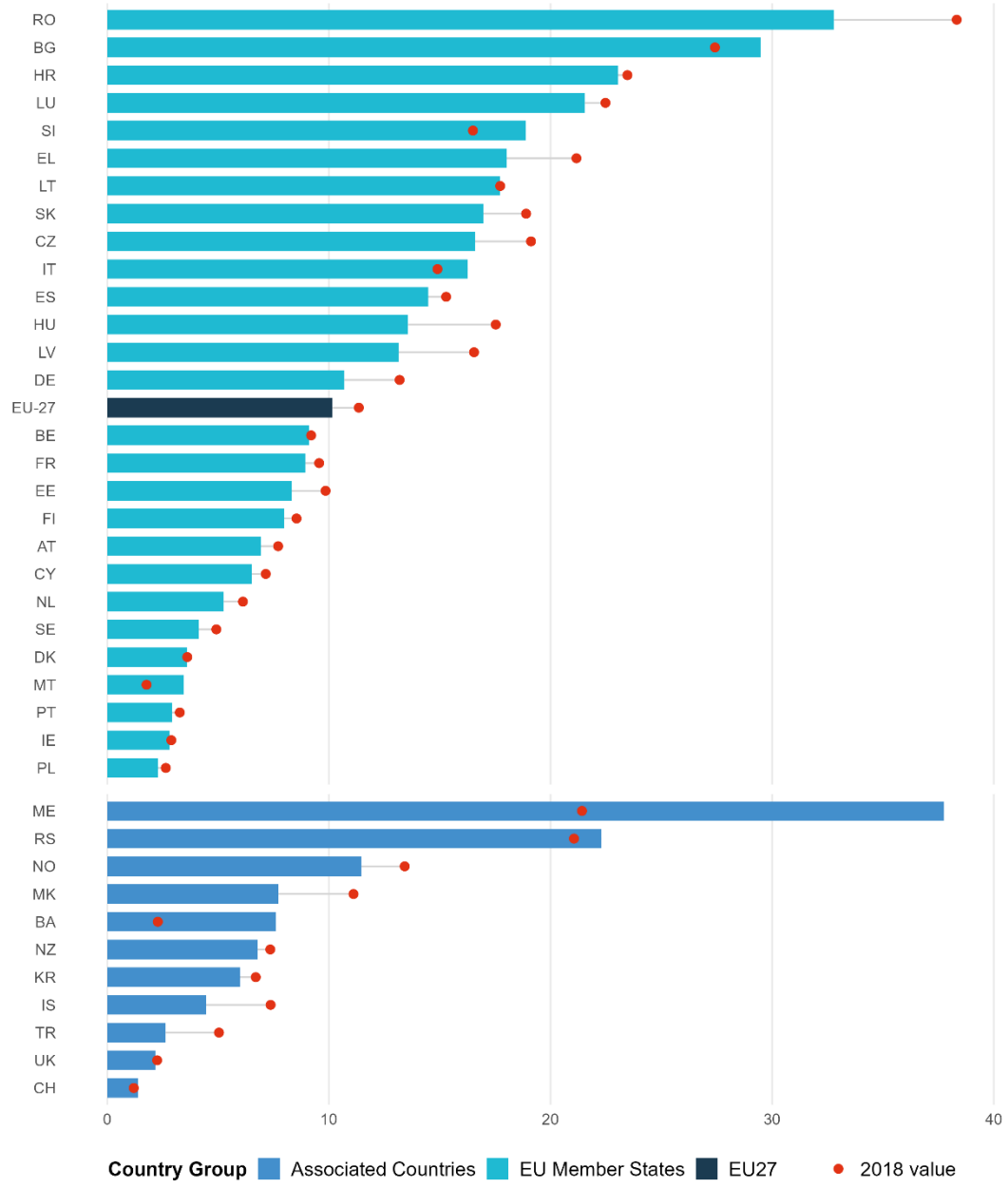
Source: Eurostat. Calculations by Fraunhofer ISI:

The most recent values for each country are shown in the graph below. The highest shares within the EU-27 can be found in Romania, showing an indicator value that exceed 30%, followed by Bulgaria, Croatia, and Luxembourg. Portugal, Ireland, and Poland registered instead values below 3% in 2023.

Among the Associated Countries, the highest shares of researchers in the public sector can be observed in Montenegro, with a value exceeding 35%, followed by Serbia, with a value above 20%.

Compared to the indicator values in 2018, most of the countries in both groups show a lower value in 2023. Only few exceptions like Bulgaria, Slovenia, Malta, Montenegro, Serbia, and Bosnia and Herzegovina show lower values in 2018.

Figure 54 Public sector researchers as a percentage of total researchers, by country for the latest available year and 2018



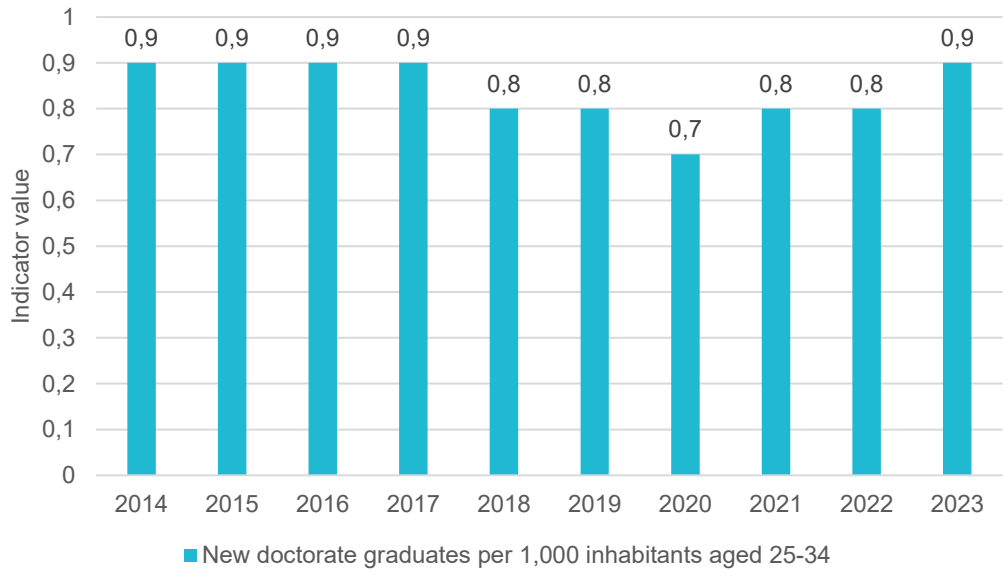
Source: Eurostat. Calculations by Fraunhofer ISI:

4.4.6 #21 Doctoral graduates per 1,000 inhabitants aged 25-34

This indicator measures the number of graduates at doctoral level per 1,000 inhabitants aged between 25 and 34.[18] The trend of the indicator in the EU-27 is shown in Figure 55.

The indicator shows a stable trend over the years between 2014 and 2023. A slight decrease in the indicator value can be observed between 2018 and 2022, to then go back to 0.9 in 2023.

Figure 55 Doctoral graduates per 1,000 inhabitants aged 25-34 (in %), for the EU-27 over time

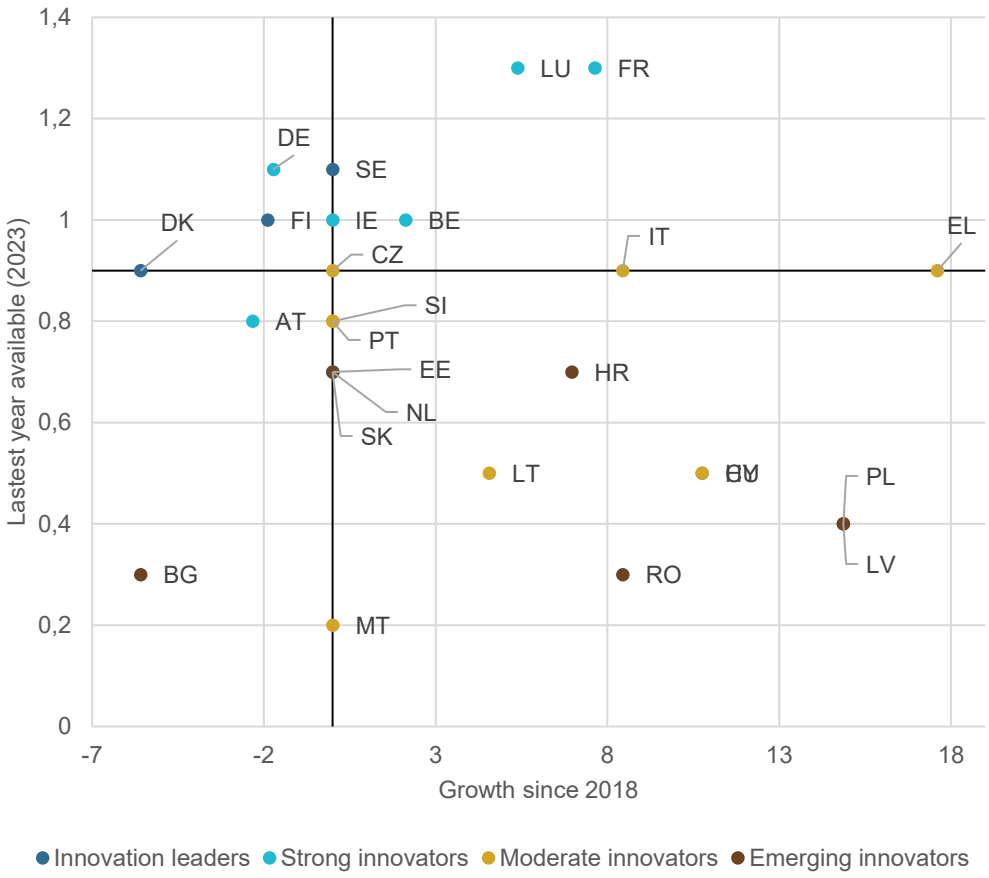


Source: Eurostat. Calculations by Fraunhofer ISI.

Figure 56 shows the latest available value of the number of new graduates at doctoral level per 1,000 inhabitants aged between 25 and 34 compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Belgium, Luxembourg, France, Italy, and Greece. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Germany, Finland, and Denmark. Austria and Bulgaria are instead depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. Croatia, Lithuania, Hungary, Cyprus, Poland, Latvia, and Romania can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

[18] The indicator and the related figures refer to the graduates at doctoral level, in science, math., computing, engineering, manufacturing, construction, per 1000 of population aged 25-34.

Figure 56 New doctorate graduates per 1,000 inhabitants aged 25-34, latest indicator value and change by EU-27 countries



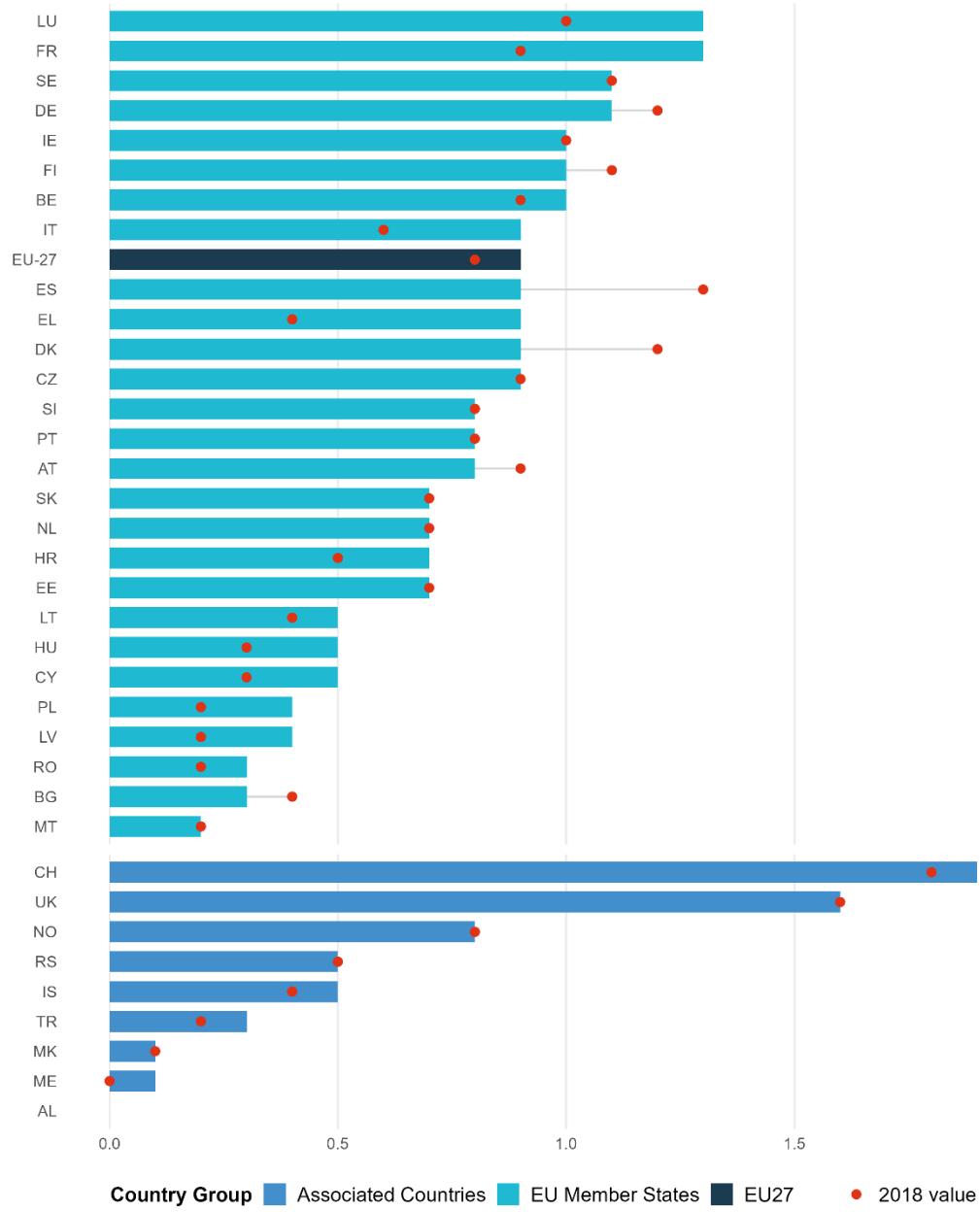
Source: Eurostat. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The number of new doctoral graduates within the EU-27 can be found in Luxembourg and France, showing indicator values at 1.3, followed by Sweden, and Germany. Member States with the least new doctorate graduates per 1,000 inhabitants aged 25-34 in 2023 are Romania, Bulgaria, and Malta, with values below 0.4.

Among the Associated Countries, the highest number of new doctoral graduates can be observed in Switzerland, with a value of 1.9, followed by the UK, with a value of 1.6.

Compared to the indicator values in 2018, while most of the countries in both groups show a higher value in 2023, or no big differences between the two years, still some exceptions exist. Indeed, Germany, Finland, Spain, Denmark, Austria, and Bulgaria show higher values in 2018.

Figure 57 New doctorate graduates per 1,000 inhabitants aged 25-34, by country for the latest available year and 2018

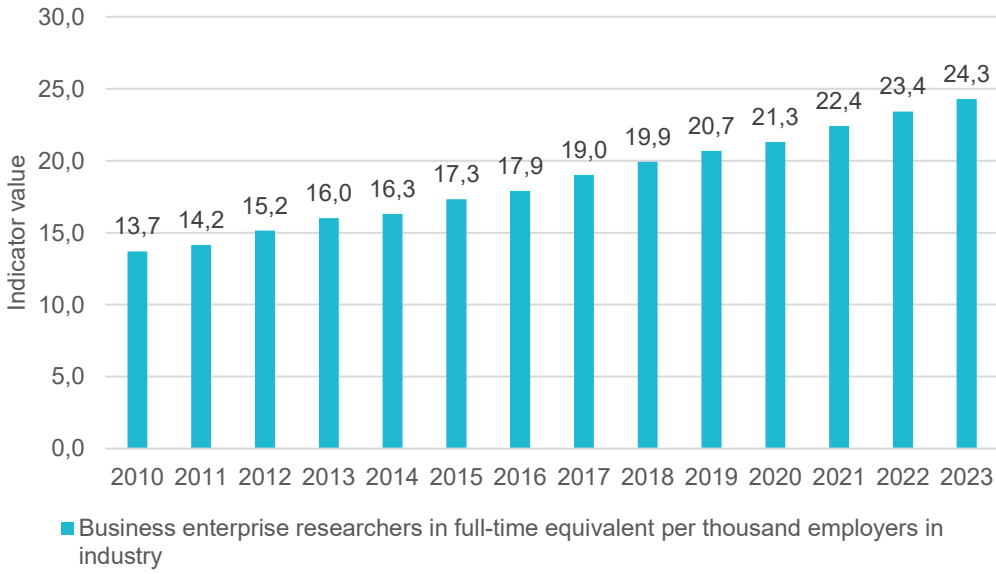


Source: Eurostat. Calculations by Fraunhofer ISI.

4.4.7 #22 Business enterprise researchers in full-time equivalent per thousand employers in industry

This indicator measures the number of business enterprise researchers in full-time equivalent (FTE) per 1,000 employed persons in industry. It captures the number of researchers in the business sector relative to the size of the industrial workforce, allowing comparisons of research capacity in industry across countries or over time. Figure 58 shows the trend of the indicator. A steady increase over time can be observed, going from a value of 13.7 in 2010 to a value of 24.3 in 2023, being the highest value over the years.

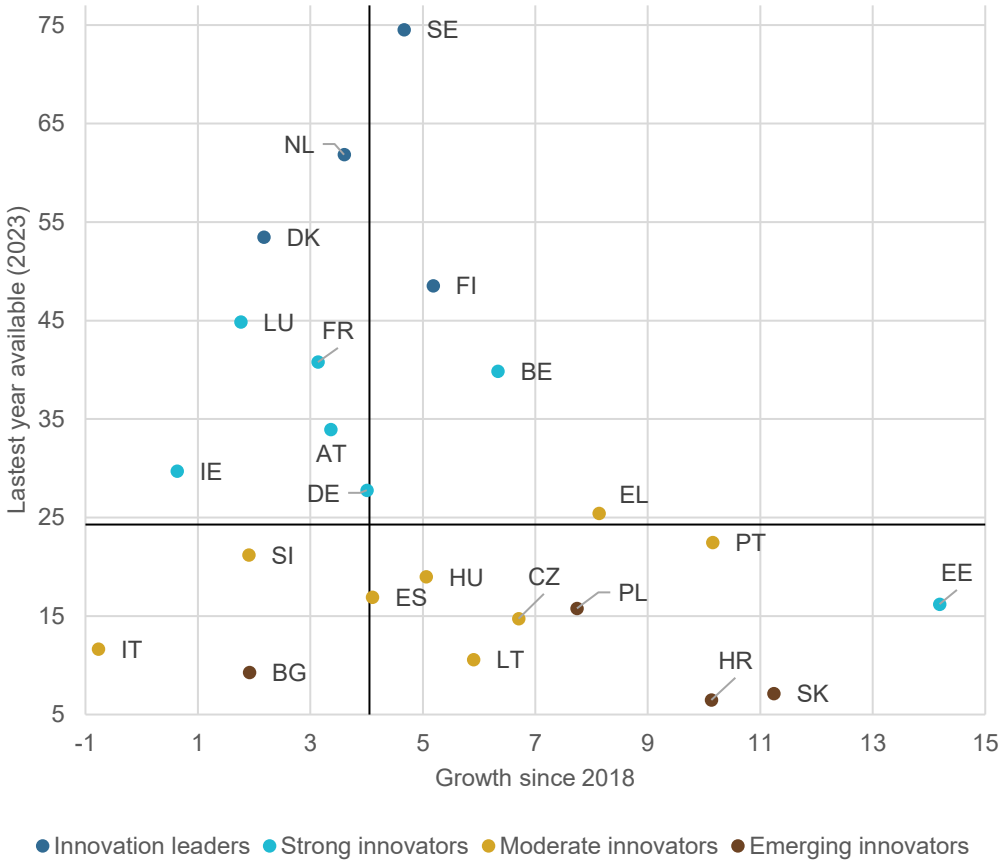
Figure 58 Business enterprise researchers in full-time equivalent per thousand employers in industry, for the EU-27 over time



Source: OECD. Calculations by Fraunhofer ISI.

Figure 59 shows the latest available value of the number of FTE business enterprise researchers per 1,000 employed persons in industry compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Sweden, Finland, Belgium, and Greece. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Germany, Austria, Ireland, France, Luxembourg, Denmark, and the Netherlands. Slovenia, Italy, and Bulgaria are to be found in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The rest of Member States is situated in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 59 Business enterprise researchers in full-time equivalent per thousand employers in industry, latest indicator value and change by EU-27 countries



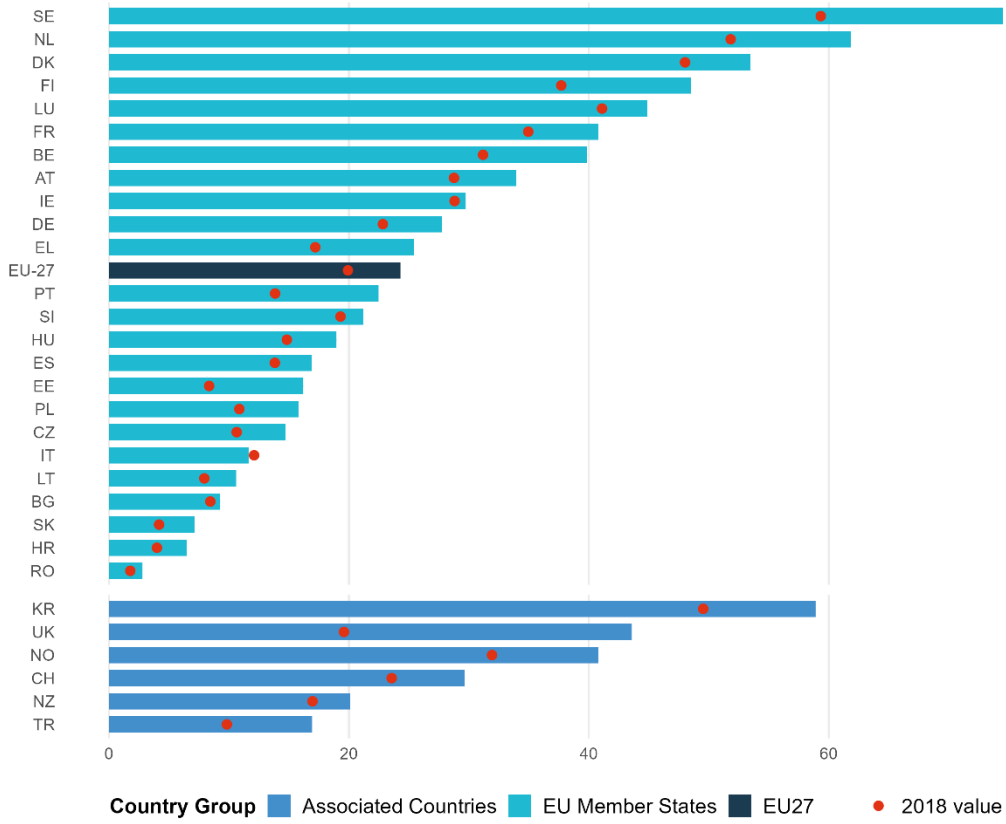
Source: OECD. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest number within the EU-27 can be found in Sweden, showing indicator values exceeding 70, followed by the Netherlands, and Denmark, with values above 50. However, there are also Member States that registered less than 10 in 2023, namely Bulgaria, Slovakia, Croatia, and Romania.

Among the Associated Countries, the highest indicator values can be observed in South Korea, with a value exceeding 55, followed by the United Kingdom, and Norway, with values above 40.

Compared to the indicator values in 2018, all the countries in both groups show a higher value in 2023, or no big differences between the two years.

Figure 60 Business enterprise researchers in full-time equivalent per thousand employers in industry, by country for the latest available year and 2018



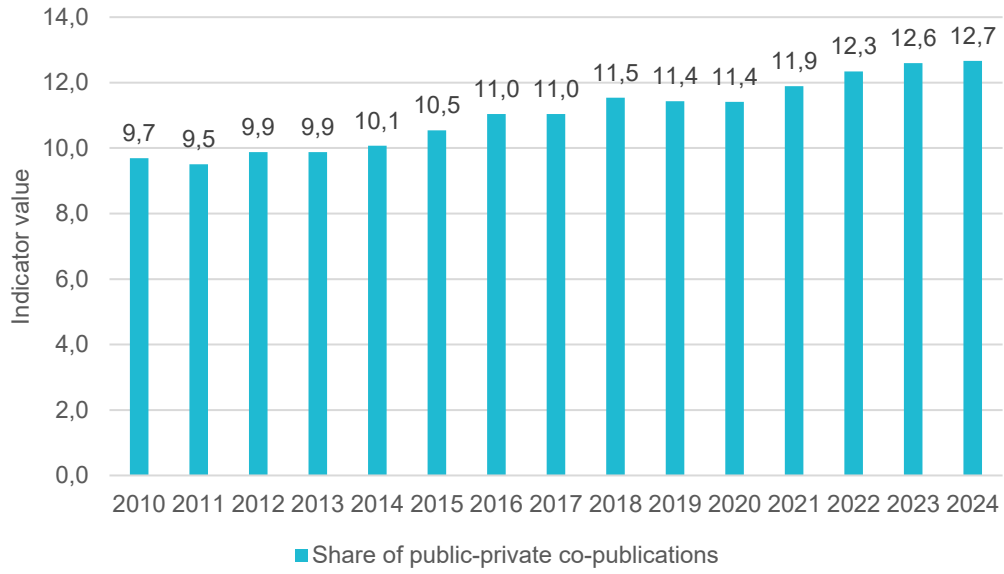
Source: OECD. Calculations by Fraunhofer ISI.

4.5 Sub-priority 1.5: Knowledge valorisation

4.5.1 #23 Share of public-private co-publications

This indicator measures the share of public-private co-publications, involving both a public and a private entity over total scientific publications. Figure 61 shows the trend of the indicator in the EU-27 over time. The indicator follows a quite constant increasing trend between 2010, with a value of 9.7%, to 2024, with a value of 12.7%. A negligible decrease can be observed in 2019 and 2020, but the value increased again in 2021.

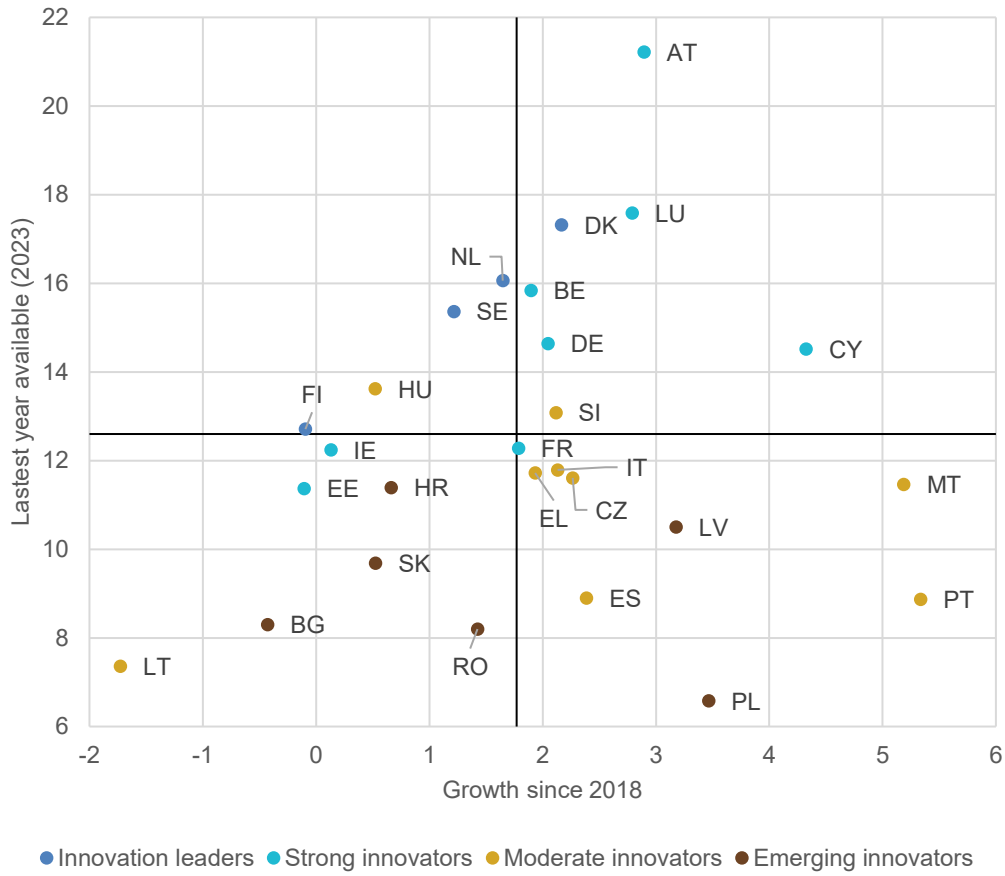
Figure 61 Share of public-private co-publications, for the EU-27 over time



Source: DG Research and Innovation, Common R&I Strategy and Foresight Service Unit, based on Science-Metrix using data from Scopus (Elsevier).

Figure 62 shows the latest available value of the share of public-private co-publications compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Austria, Denmark, Luxembourg, Belgium, Germany, Cyprus, and Slovenia. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find the Netherlands, Sweden, Hungary, and Finland. Ireland, Estonia, Croatia, Slovakia, Bulgaria, Romania, and Lithuania are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. France and the remaining emerging and moderate innovators can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 62 Share of public-private co-publications, latest indicator value and change by EU-27 countries



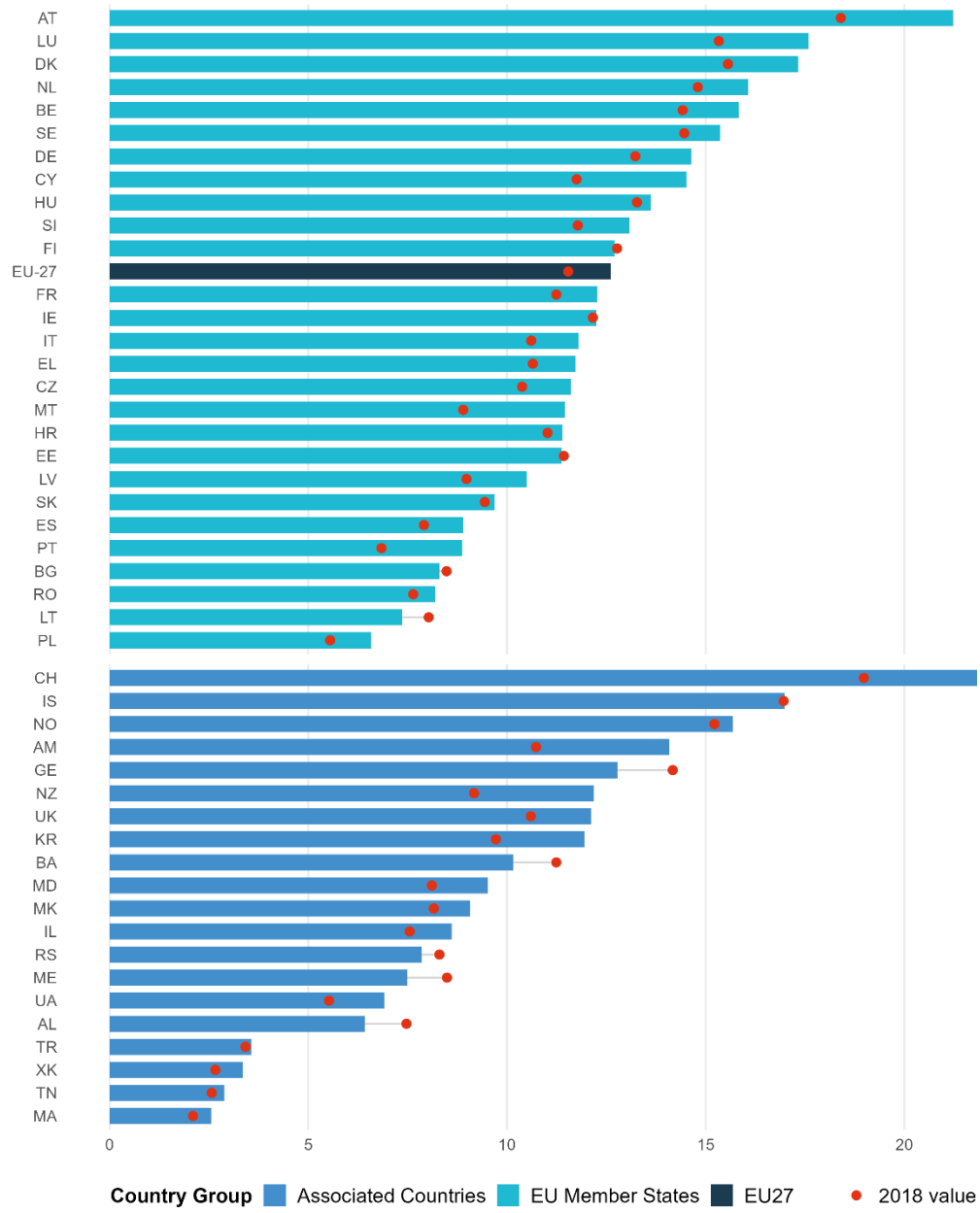
Source: DG Research and Innovation, Common R&I Strategy and Foresight Service Unit, based on Science-Metrix using data from Scopus (Elsevier).

The most recent values for each country are shown in the graph below. The highest public-private co-publication shares within the EU-27 can be found in Austria, with a value above 20%, followed by Luxembourg, Denmark, the Netherlands, Belgium, and Sweden, showing indicator values still above 15%. However, there are also Member States that registered less than 7% in 2023, namely Lithuania and Poland.

Among the Associated Countries, the highest shares of public-private co-publications can be observed in Switzerland, with a value exceeding 20%, followed by Iceland, Norway, Armenia, and Georgia.

Compared to the indicator values in 2018, most of the countries in both groups show a higher value in 2023, or no big differences between the two years, indicating an overall improvement over time. Few exceptions, showing slightly higher values in 2018 are Lithuania, Georgia, Bosnia and Herzegovina, Serbia, Montenegro, and Albania.

Figure 63 Share of public-private co-publications, by country for the latest available year and 2018



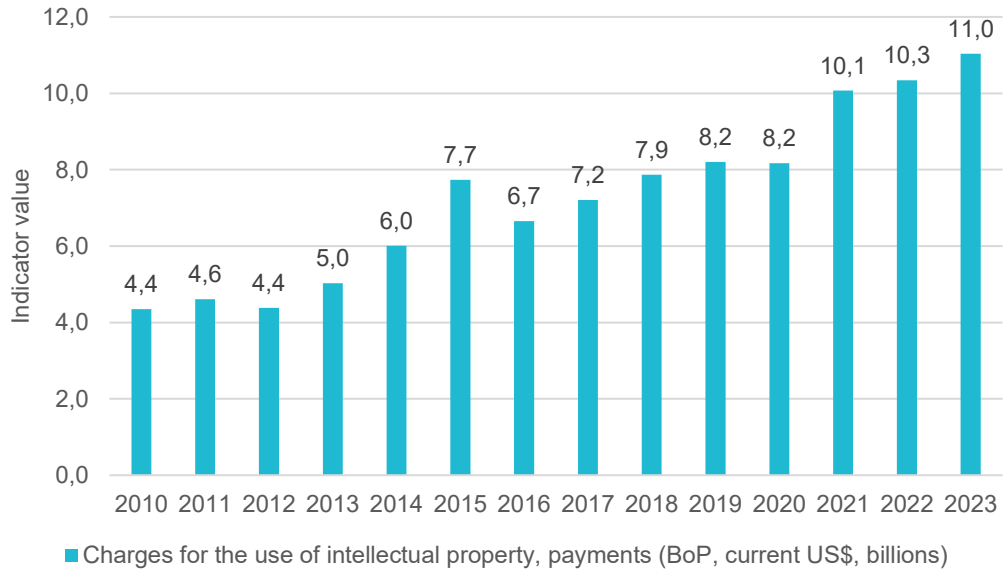
Source: DG Research and Innovation, Common R&I Strategy and Foresight Service Unit, based on Science-Metrix using data from Scopus (Elsevier).

4.5.2 #24 Charges for the use of intellectual property, payments (BoP, current US$, in billions)

This indicator measures payments of the charges for the use of intellectual property, expressed in current US dollars (billions). It captures the revenues coming from the charges for the right to use intellectual property assets such as patents, trademarks, industrial designs, copyrights, and licensing agreements. It assesses the capacity of a country to generate economic returns from intellectual property through royalties and licence fees, reflecting the commercialisation and international competitiveness of its knowledge assets.[19]

Figure 64 shows the evolution of this indicator for the EU average over time. Although the indicator is expressed in current prices and the interpretation of the trend must be cautious, the graph shows a general upward trajectory from 2010, with a value of $4.4 bn, to 2023, with a value of $11 bn. A peak is registered in 2015, with a value of $7.7 bn, after which the indicator slightly declines in 2016 and 2017, to then continue increasing over the following years.

Figure 64 Charges for the use of intellectual property, for the EU average over time



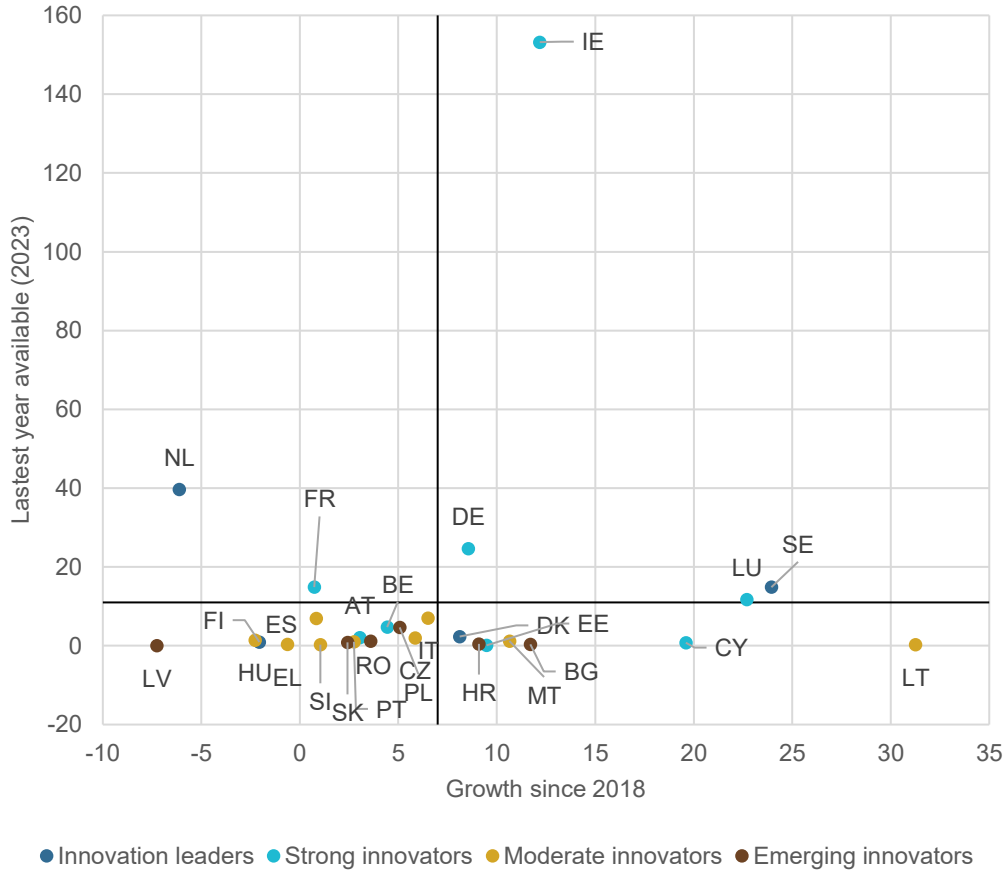
Source: World Bank.

Figure 65 shows the latest available value of the charges for the use of intellectual property, expressed in current US dollars (billions), compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Ireland, Sweden, Luxembourg, and Germany. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find the Netherlands and.

[19] Based on the Study on Metrics and Indicators for Knowledge Valorisation, Study for the European Commission, DG Research and Innovation, Unit E.2 'Knowledge Valorisation and Technology Infrastructures'.

France. Most of the Member States, however, are depicted in the lower left quadrant of the graph, indicating both below average growth and a lower-than-EU-27 average indicator value, and in the lower right quadrant, showing below-average values but above-average growth since 2018. Among those in the lower-left quadrant, we find Latvia, Finland, Spain, Austria, and Belgium. Among those in the lower right quadrant, we can find Cyprus, Lithuania, Estonia, and Bulgaria.

Figure 65 Charges for the use of intellectual property, latest indicator value and change by EU-27 countries



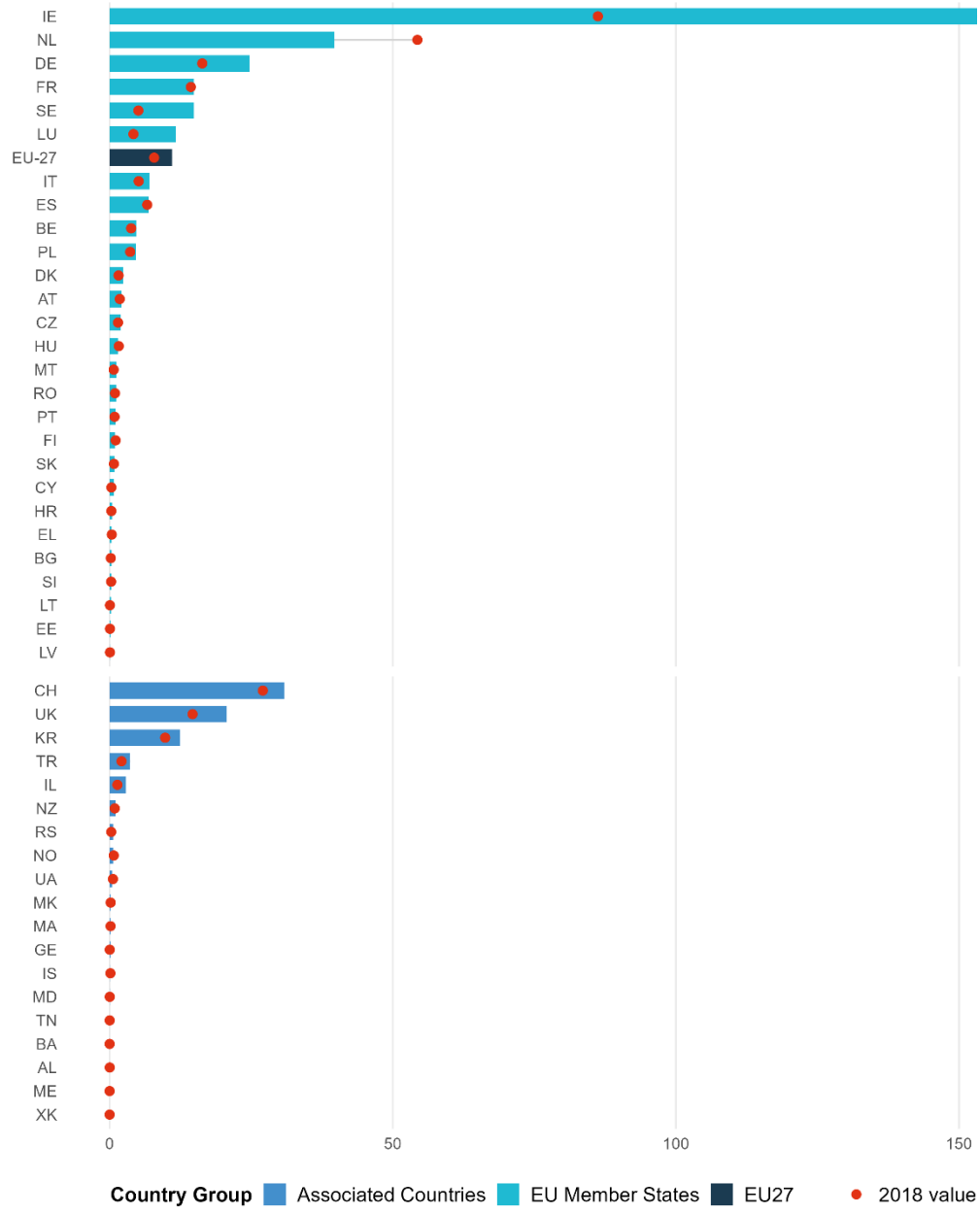
Source: World Bank.

The most recent values for each country are shown in the graph below. The highest value for the charges for the use of intellectual property, expressed in current US dollars (billions) within the EU-27 can be found in Ireland, with a value above $150 bn, followed by the Netherlands and Germany, showing indicator values still above $20bn. However, there are also Member States registering lower values, such as Estonia and Latvia, registering below $0.2 bn. The very high values shown by Ireland could be partly explained by the presence of a large number of multinational enterprises, especially in the ICT, pharmaceutical, and digital sectors.

Among the Associated Countries, the highest value for the charges for the use of intellectual property can be observed in Switzerland, with a value exceeding $20bn, followed by the United Kingdom and South Korea.

Compared to the indicator values in 2018, most of the countries in both groups show no big differences between the two years. Higher values in 2018 can be found in the Netherlands, and much higher values in 2023 can be found in Ireland.

Figure 66 Charges for the use of intellectual property, by country for the latest available year and 2018

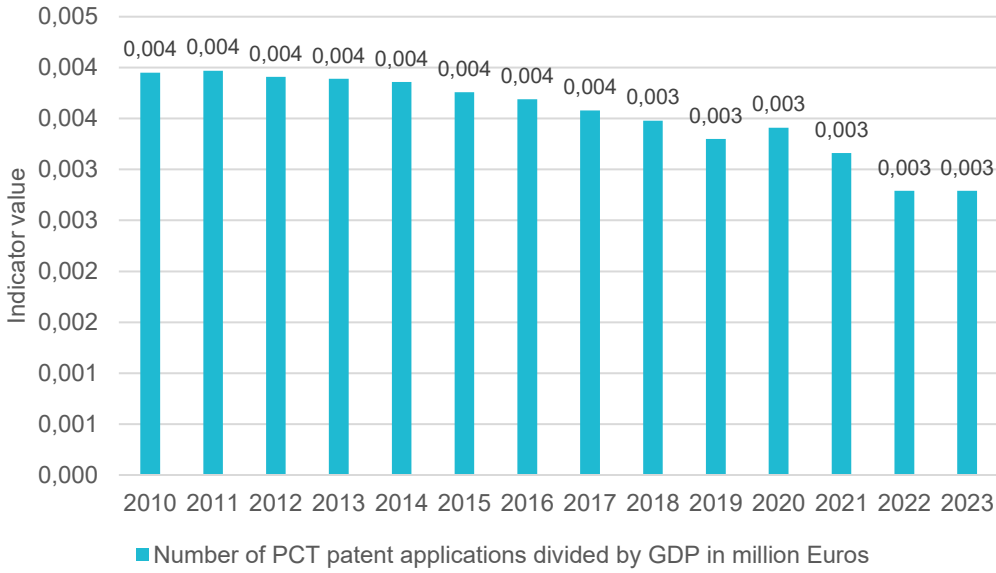


Source: World Bank.

4.5.3 #25 Number of PCT patent applications divided by GDP in million Euros

This indicator measures the number of PCT patent applications divided by GDP in million Euros. It provides an assessment of the intensity of the patenting activity relative to the size of the economy. Figure 67 shows the evolution of the indicator for the EU-27 over time. The indicator follows a stable and slightly decreasing trend, with a value of 0.004 in 2010 and a value of 0.003 in 2023.

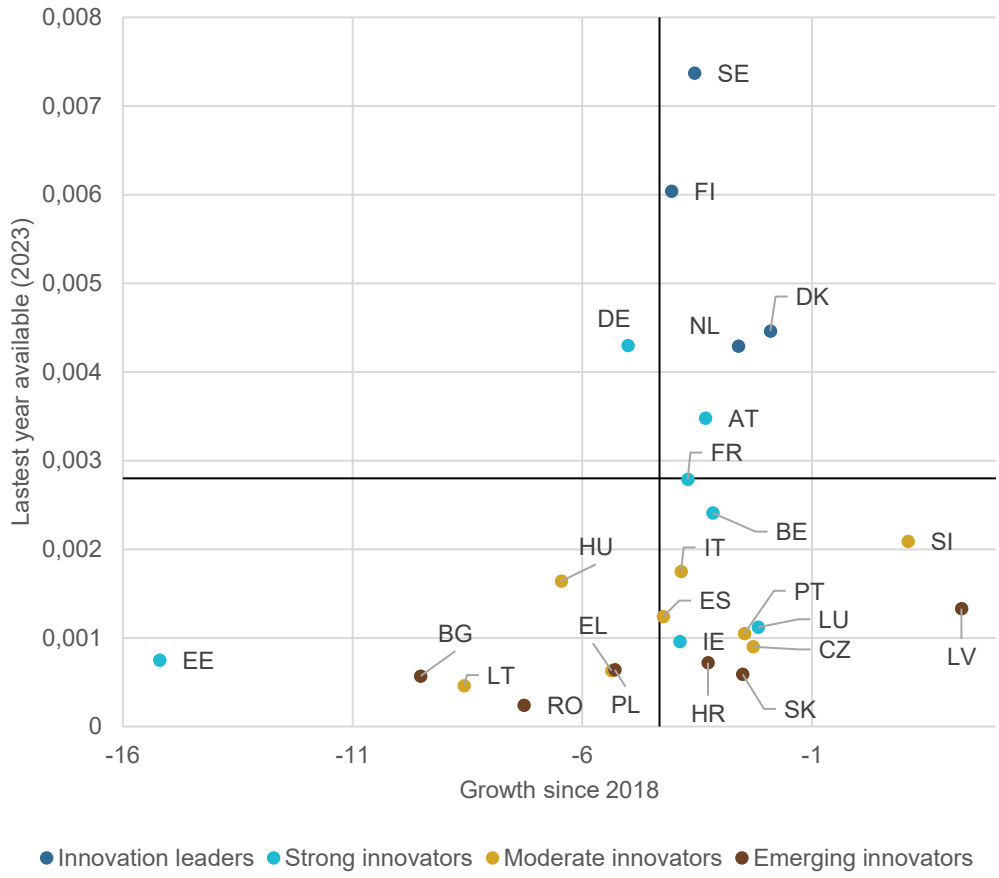
Figure 67 Number of PCT patent applications divided by GDP in million Euros, for the EU-27 over time



Source: OECD, Eurostat. Calculations by Fraunhofer ISI.

Figure 68 shows the latest available value of the number of PCT patent applications divided by GDP in million Euro compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Sweden, Finland, Denmark, the Netherlands, Austria, and France. Countries in the upper left quadrant maintain above-average values but record below-average growth. Here, we find only Germany. Among others, Estonia, Hungary, Bulgaria, and Greece, are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The rest of Member States, such as Belgium, Slovenia, Latvia, Italy, and Spain, can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 68 Number of PCT patent applications divided by GDP in million Euros, latest indicator value and change by EU-27 countries



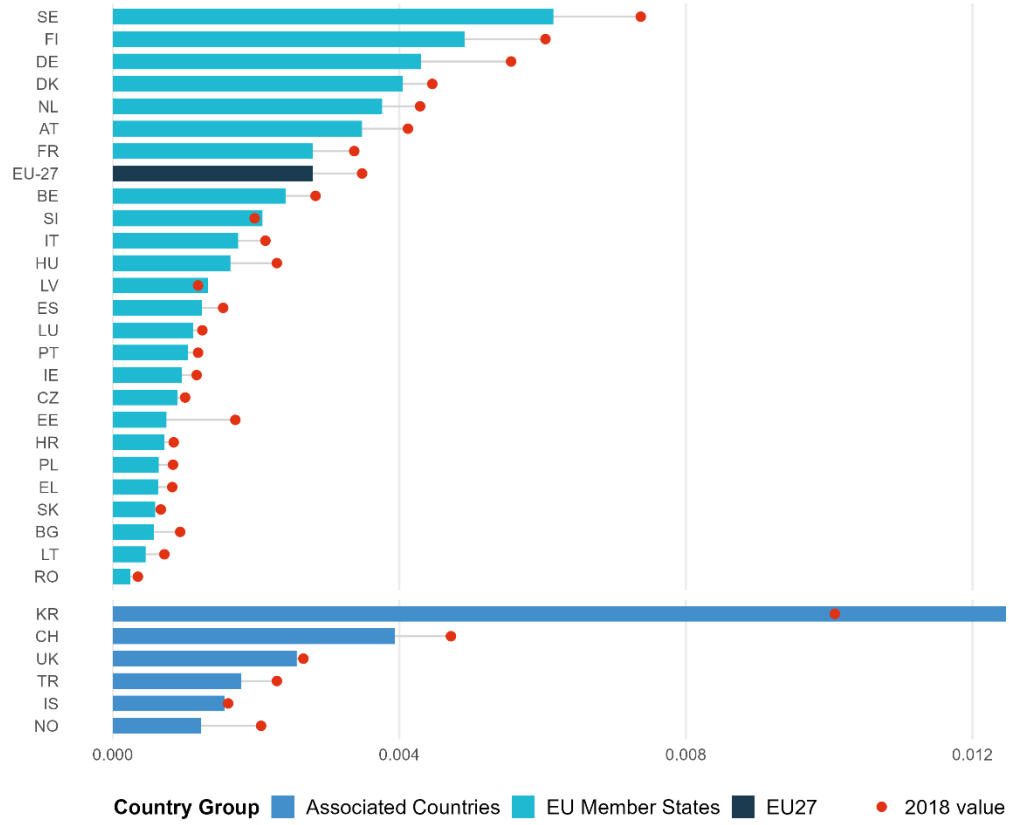
Source: OECD, Eurostat. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. It can be observed that highest values within the EU-27 can be found in Sweden, Finland, Germany, and Denmark, showing indicator values that exceed 0.004. However, there are also Member States that registered less than 0.001 in 2023, such as Lithuania, and Romania.

Among the few Associated Countries for which data is available, the by far highest number of PCT patent applications divided by GDP can be observed in South Korea, with a value exceeding 0.012.

Compared to the indicator values in 2018, all the countries in both groups, with the exception of South Korea, show a lower value in 2023.

Figure 69 Number of PCT patent applications divided by GDP in million Euro, by country for the latest available year and 2018

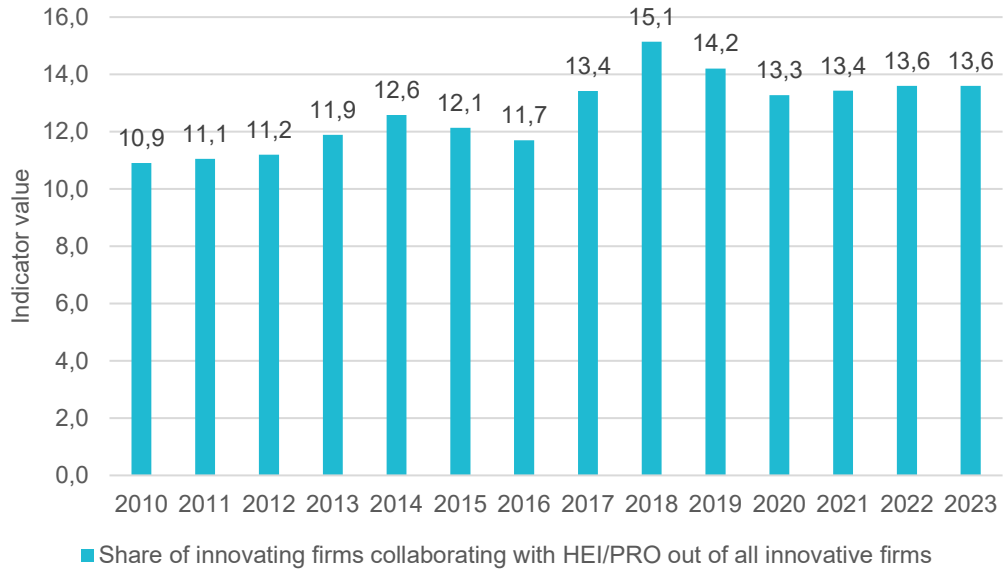


Source: OECD, Eurostat. Calculations by Fraunhofer ISI.

4.5.4 #26 Share of innovating firms collaborating with HEI/PRO out of all innovative firms

This indicator measures the share of innovating firms collaborating with Higher Education Institutions (HEI) or Public Research Organisations (PRO) out of all innovative firms. It indicates the level of knowledge exchange between the business and public sectors. The evolution of this indicator for the EU over time is shown in Figure 70, as an average of the values for the available Member States. Between 2010 and 2014, the indicator value experienced a slight increase, followed by a decline in 2015 and 2016. In 2017 and 2018, the indicator rebounded, reaching a peak value of 15.1%. Following this peak, the value began to decline and eventually stabilised at 13.6% in 2022 and 2023.

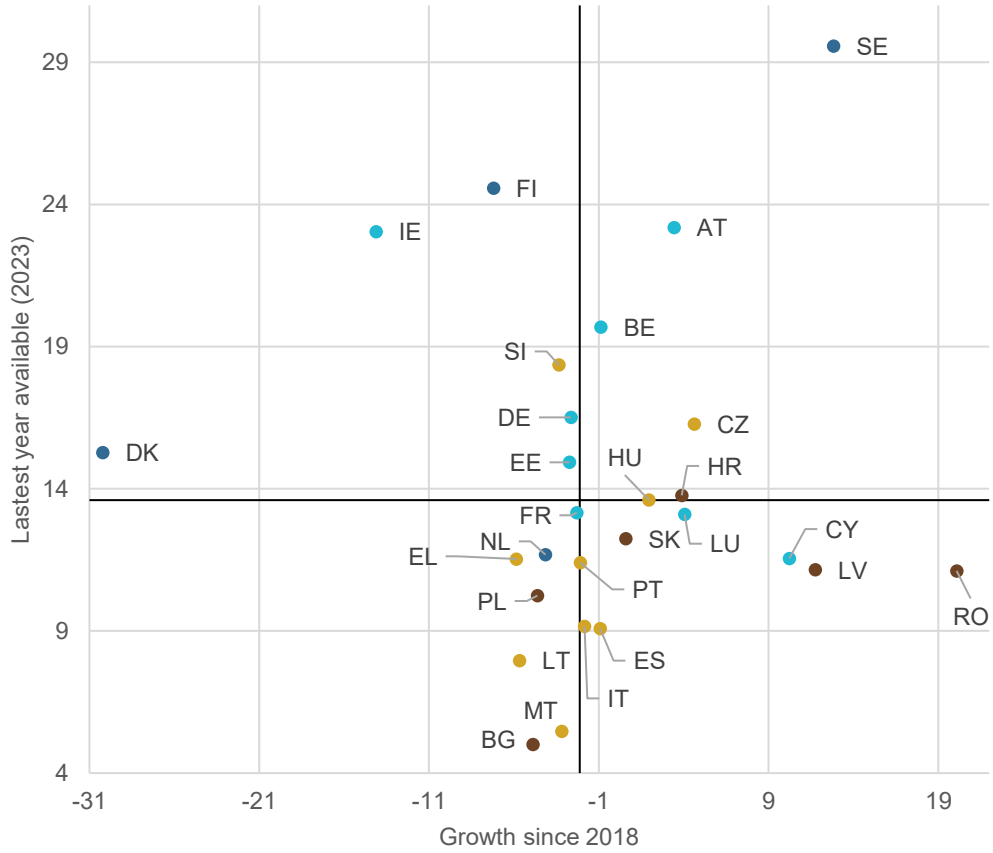
Figure 70 Share of innovating firms collaborating with HEI/PRO out of all innovative firms, for the EU average over time



Source: Eurostat: Community Innovation Survey. Calculations by Fraunhofer ISI.

Figure 71 shows the latest available value of the share of innovating firms collaborating with HEI/PRO compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Sweden, Austria, Belgium, Czechia, Hungary, and Croatia. Countries in the upper left quadrant maintain above-average values but record below-average growth. Here, we find Finland, Ireland, Slovenia, Germany, Estonia, and Denmark. Among others, France, the Netherlands, Greece, and Poland, are instead depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The rest of Member States, such as Italy, Spain, Slovakia, Luxembourg, and Portugal, can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 71 Share of innovating firms collaborating with HEI/PRO out of all innovative firms, latest indicator value and change by EU-available countries



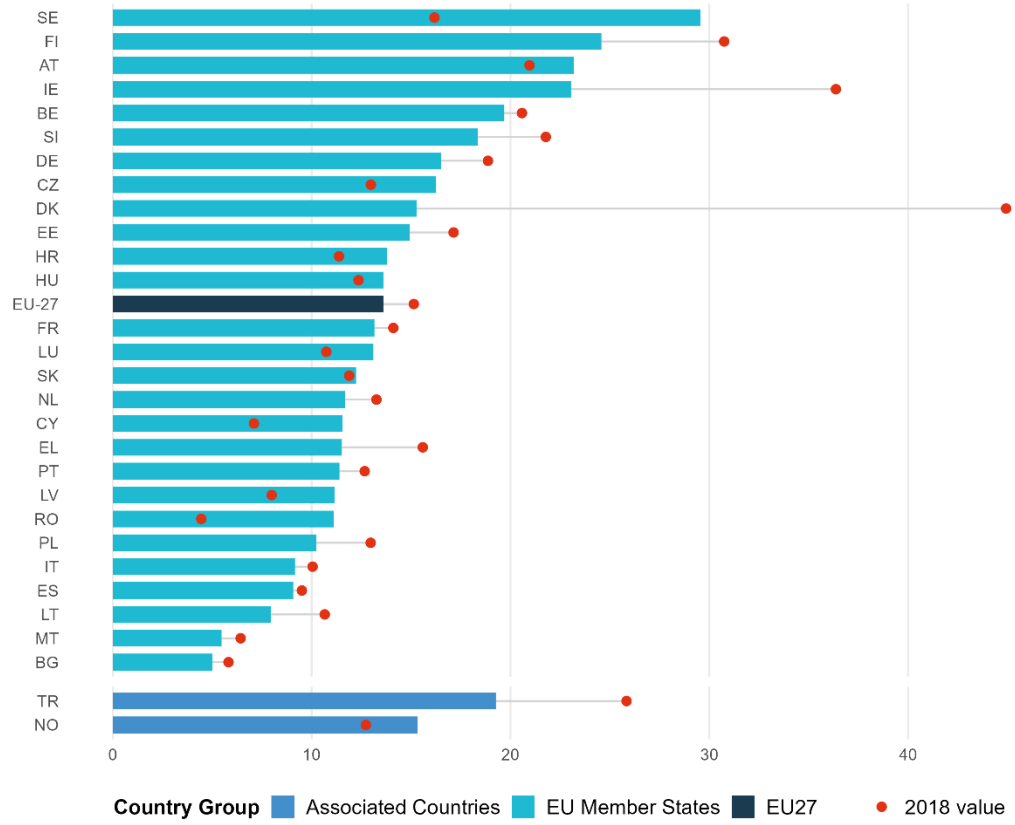
Source: Eurostat: Community Innovation Survey. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest shares within the EU can be found in Sweden, Finland, Austria, and Ireland, showing indicator values that exceed 20%. However, there are also Member States with values lower than 6% in 2021, namely Malta and Bulgaria.

For Associated Countries, data for the year 2023 are only available for Türkiye and Norway, with values between 15% and 19%.

Compared to the indicator values in 2018, most of the countries show a lower value in 2023, especially Ireland and Denmark, depicting a much higher value in 2018. Some of the exceptions, showing lower values in 2018, are Sweden, Austria, Romania, Czechia, and Cyprus.

Figure 72 Share of innovating firms collaborating with HEI/PRO out of all innovative firms, by country for the latest available year and 2018

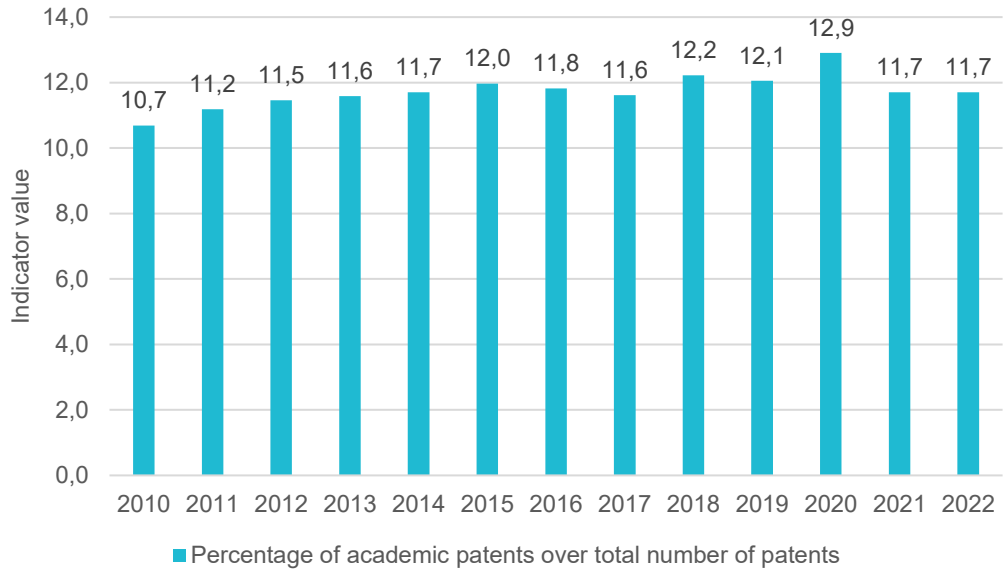


Source: Eurostat: Community Innovation Survey. Calculations by Fraunhofer ISI.

4.5.5 #27 Percentage of academic patents over total number of patents

This indicator measures the percentage of academic patents over the total number of patents. Academic patents are defined as those whose inventors work or study as researchers in universities, PROs or research hospitals, including patents directly filed by these institutions, but also the ones filed by other entities, such as companies, where there are university-affiliated researchers among the inventors listed. Figure 73 shows the evolution of the indicator for the EU-27 average over time. The indicator follows a moderate growth from 2010 to 2015, reaching 12%. In 2016 and 2017, it slightly decreased, to then increase again until 2020, reaching 12.9%. In 2021 and 2022, the indicator slightly decreased and stabilised at 11.7%.

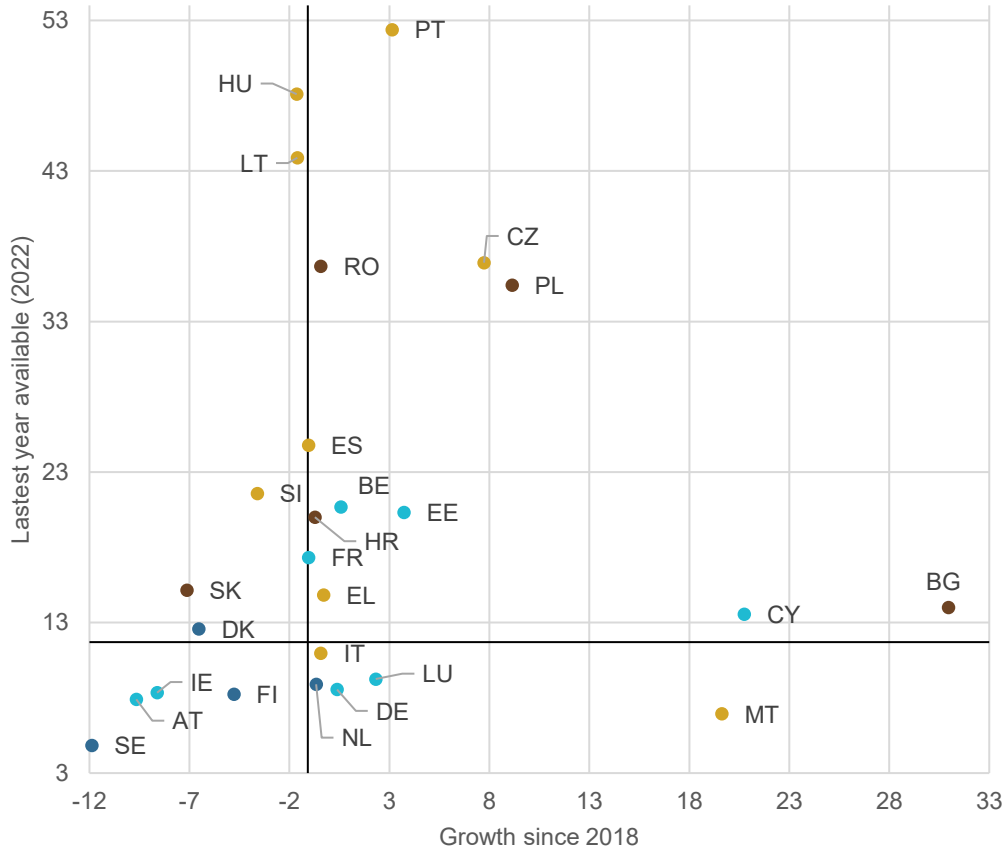
Figure 73 Percentage of academic patents over total number of patents, for the EU-27 average over time



Source: European Patent Office (EPO) PATSTAT. Calculations by Fraunhofer ISI.

Figure 74 shows the latest available value of the percentage of academic patents over the total number of patents compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include, among others, Portugal, Czechia, Poland, Romania, Spain, and Croatia. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these are Hungary, Lithuania, Slovenia, Slovakia, and Denmark. Ireland, Finland, Austria, and Sweden are placed in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. Italy, Luxembourg, Malta, Germany, and the Netherlands can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 74 Percentage of academic patents over total number of patents, latest indicator value and change by EU-27 countries



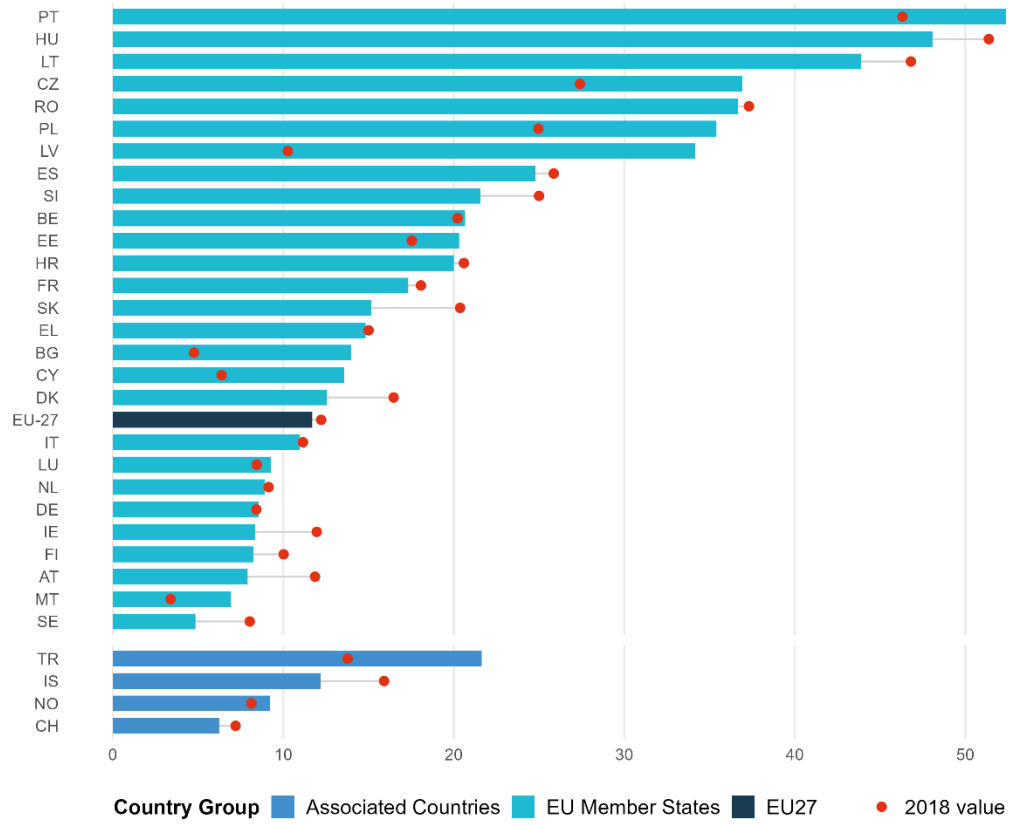
Source: European Patent Office (EPO) PATSTAT. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest percentage of academic patents over the total number of patents within the EU-27 can be found in Portugal, with a value above 50%, followed by Hungary, and Lithuania, showing indicator values still above 40%. However, there are also Member States that registered less than 8% in 2022, namely Austria, Malta, and Sweden.

For Associated Countries data availability is very limited. The highest percentage of academic patents can be observed in Türkiye, with a value exceeding 20%, followed by Iceland, Norway, and Switzerland.

Compared to the indicator values in 2018, the graph shows in both groups either higher or lower values in 2022. Czechia, Latvia, Bulgaria, Cyprus, Malta, and Türkiye are among the countries showing the higher values in 2023 compared to 2018. Much higher values in 2018 can instead be observed in Slovenia, Hungary, Denmark, Ireland, Austria, Sweden, and Iceland.

Figure 75 Percentage of academic patents over total number of patents, by country for the latest available year and 2018



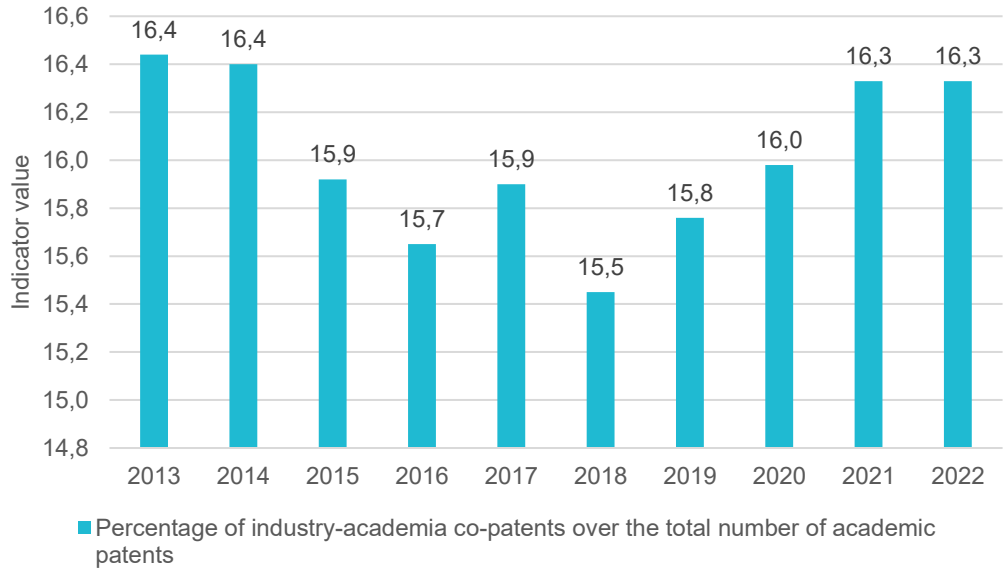
Source: European Patent Office (EPO) PATSTAT. Calculations by Fraunhofer ISI.

4.5.6 #28 Percentage of industry-academia co-patents over the total number of academic patents

This indicator measures the percentage of industry-academia co-patents over the total number of academic patents. This indicator assesses the level of knowledge transfer and practical application of academic research into innovative products or technologies. Higher share of co-patents indicates a stronger collaboration between academia and industry, reflecting the integration of academic research into real-world solutions and commercialisation efforts.

Figure 76Figure 73 shows the evolution of the indicator for the EU-27 average over time. The indicator registers in 2013 16.4% of industry-academia co-patents over the total number of academic patents. Since 2015, the indicator value slightly decreases and oscillates between 15% and 16%, reaching a value of 16.3% in 2022.

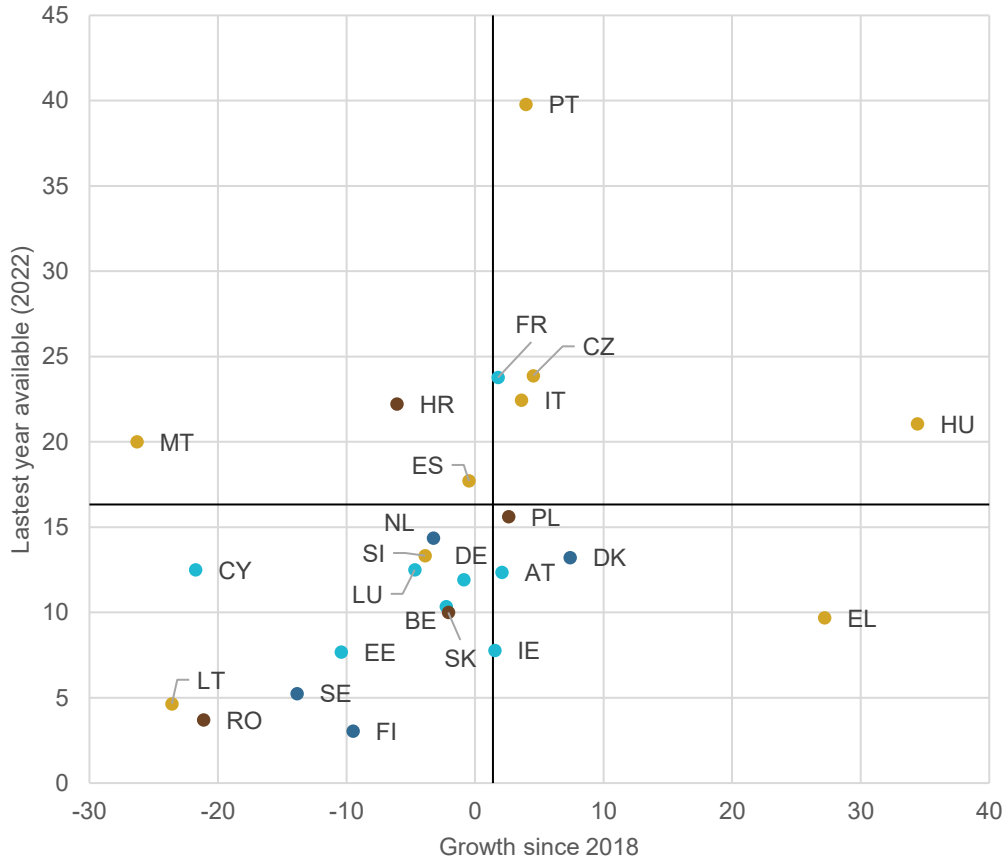
Figure 76 Percentage of industry-academia co-patents over the total number of academic patents, for the EU-27 average over time



Source: European Patent Office (EPO) PATSTAT. Calculations by Fraunhofer ISI.

Figure 77 shows the latest available value of the percentage of industry-academia co-patents over the total number of academic patents compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Portugal, Czechia, France, Italy, and Hungary. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Spain, Croatia, and Malta. Most of the Member States, such as the Netherlands, Germany, Cyprus, Slovenia, and Belgium are instead depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. Poland, Denmark, Austria, Ireland, and Greece can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 77 Percentage of industry-academia co-patents over the total number of academic patents, latest indicator value and change by EU-27 countries



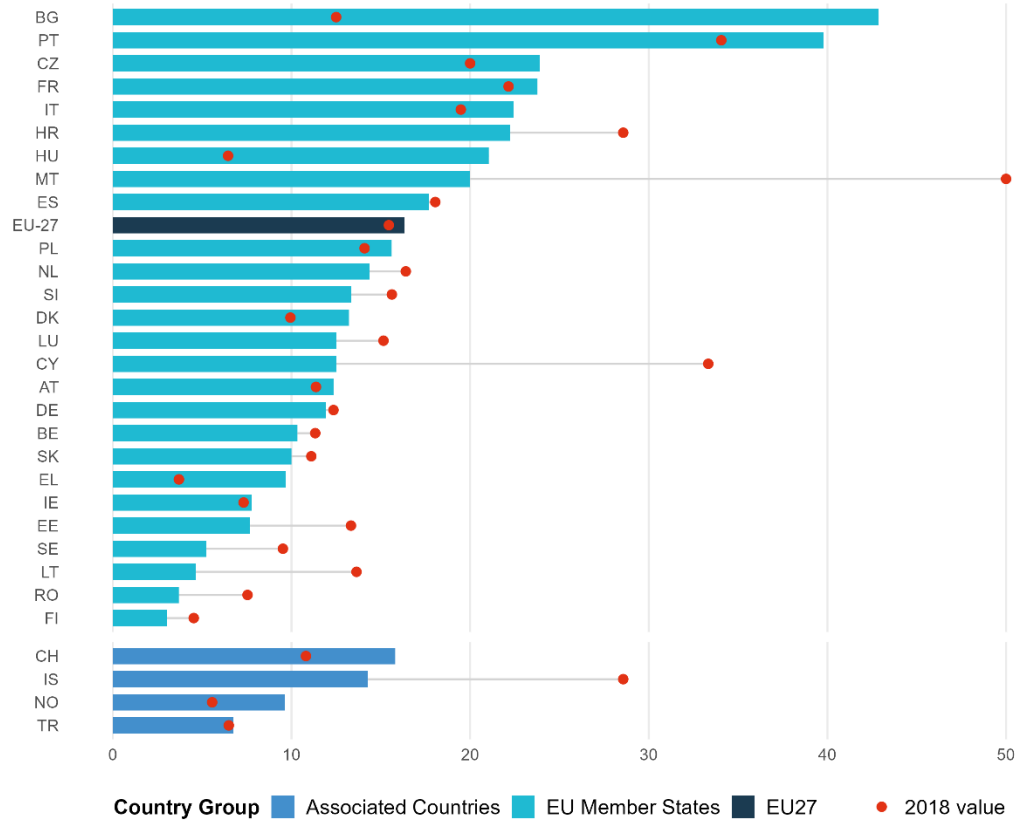
Source: European Patent Office (EPO) PATSTAT. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest percentage of industry-academia co-patents over the total number of academic patents within the EU-27 can be found in Bulgaria and Portugal, with respectively a value above or very close to 40%, followed by Czechia, France, Italy, Croatia, and Hungary, showing indicator values still above 20%. However, there are also Member States that registered less than 5% in 2022, namely Lithuania, Romania, and Finland.

For Associated Countries data is hardly available. The highest percentage of industry-academia co-patents can be observed in Switzerland and Iceland, with values exceeding 14%, followed by Norway, and Türkiye.

Compared to the indicator values in 2018, the graph shows in both groups either higher or lower values in 2022. Bulgaria, Hungary, and Greece are among the countries showing the higher increased values in 2023 compared to 2018. Much higher values in 2018 can instead be observed in Malta, Cyprus, and Iceland.

Figure 78 Percentage of industry-academia co-patents over the total number of academic patents, by country for the latest available year and 2018



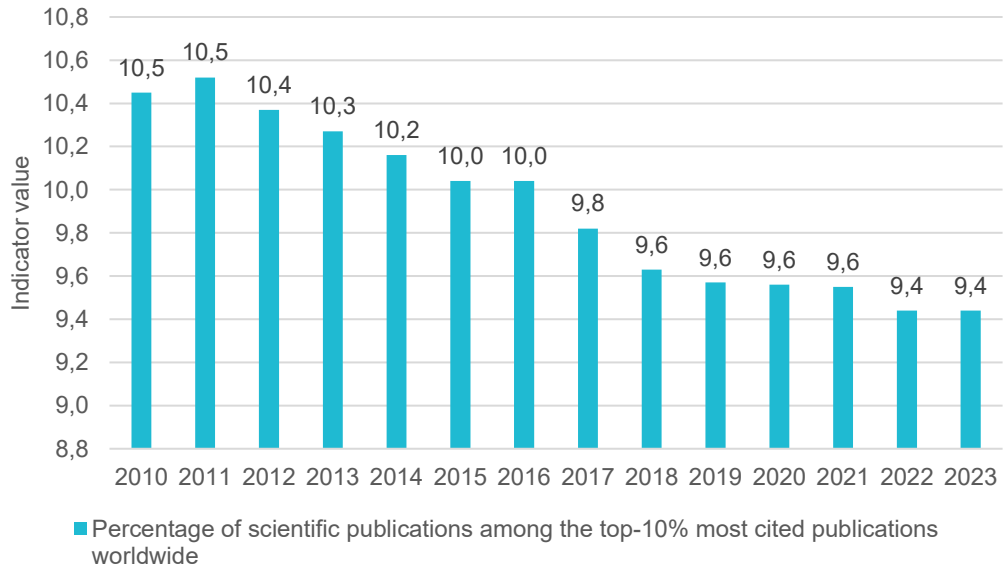
Source: European Patent Office (EPO) PATSTAT. Calculations by Fraunhofer ISI.

4.6 Sub-priority 1.6: Scientific leadership

4.6.1 #29 Percentage of scientific publications among the top-10% most cited publications worldwide

This indicator measures the percentage of scientific publications among the top-10% most cited publications worldwide. It is a measure of the impact and level of dissemination of scientific outputs. The graph for the evolution of the indicator over time for the EU-27 shows a continuous decline of the indicator value from 10.5% in 2010 to 9.8% in 2017, which can at least partly be explained by the increase of the Chinese publications in the top-10% most cited publications. China produces more publications that enter the highly cited category, which affects the relative share of EU publications in the top-10% most cited publications worldwide. The indicator value stabilises at 9.6% between 2018 and 2021 and declines to 9.4% in 2022 (and 2023).

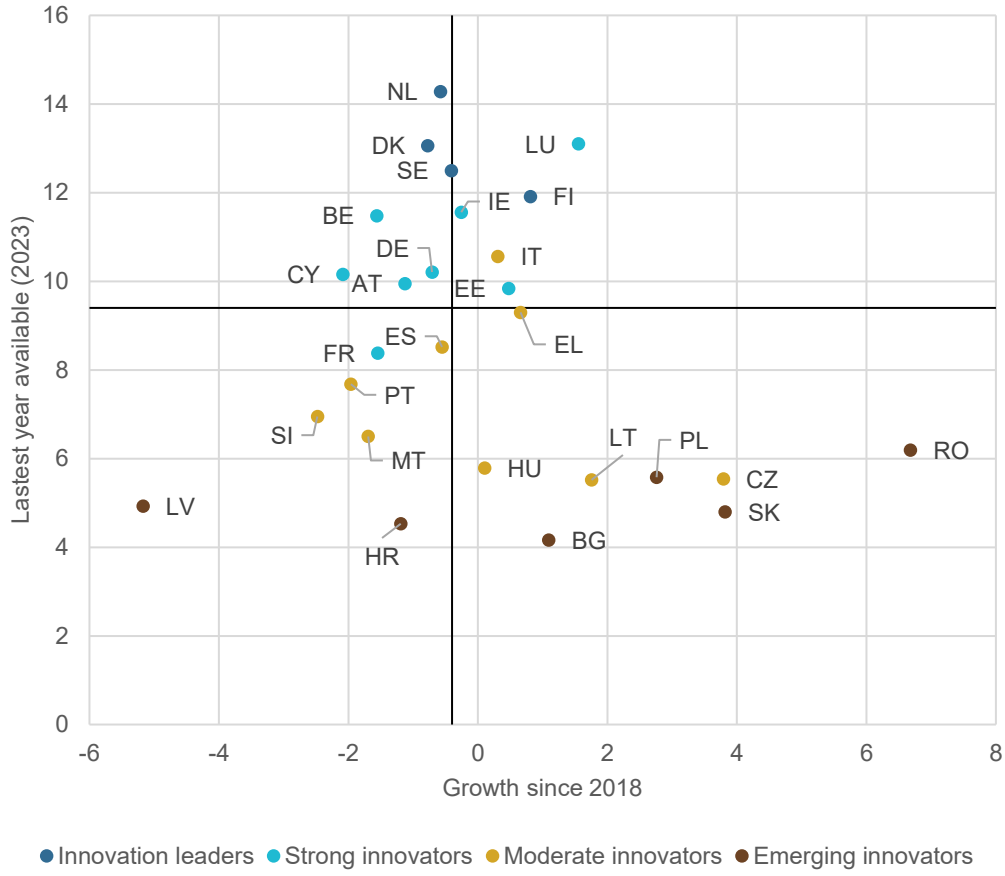
Figure 79 Percentage of scientific publications among the top-10% most cited publications worldwide, for the EU-27 over time



Source: DG Research and Innovation, Common R&I Strategy and Foresight Service Unit, based on Science-Metrix using data from Scopus (Elsevier).

Figure 80 shows the latest available value of the percentage of scientific publications among the top-10% most cited publications worldwide compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Luxembourg, Finland, Ireland, Italy, and Estonia. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find the Netherlands, Sweden, Denmark, Belgium, Cyprus, Germany, and Austria. Spain, France, Portugal, Malta, Slovenia, Croatia, and Latvia are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The remaining emerging and moderate innovators can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 80 Percentage of scientific publications among the top-10% most cited publications worldwide, latest indicator value and change by EU-27 countries



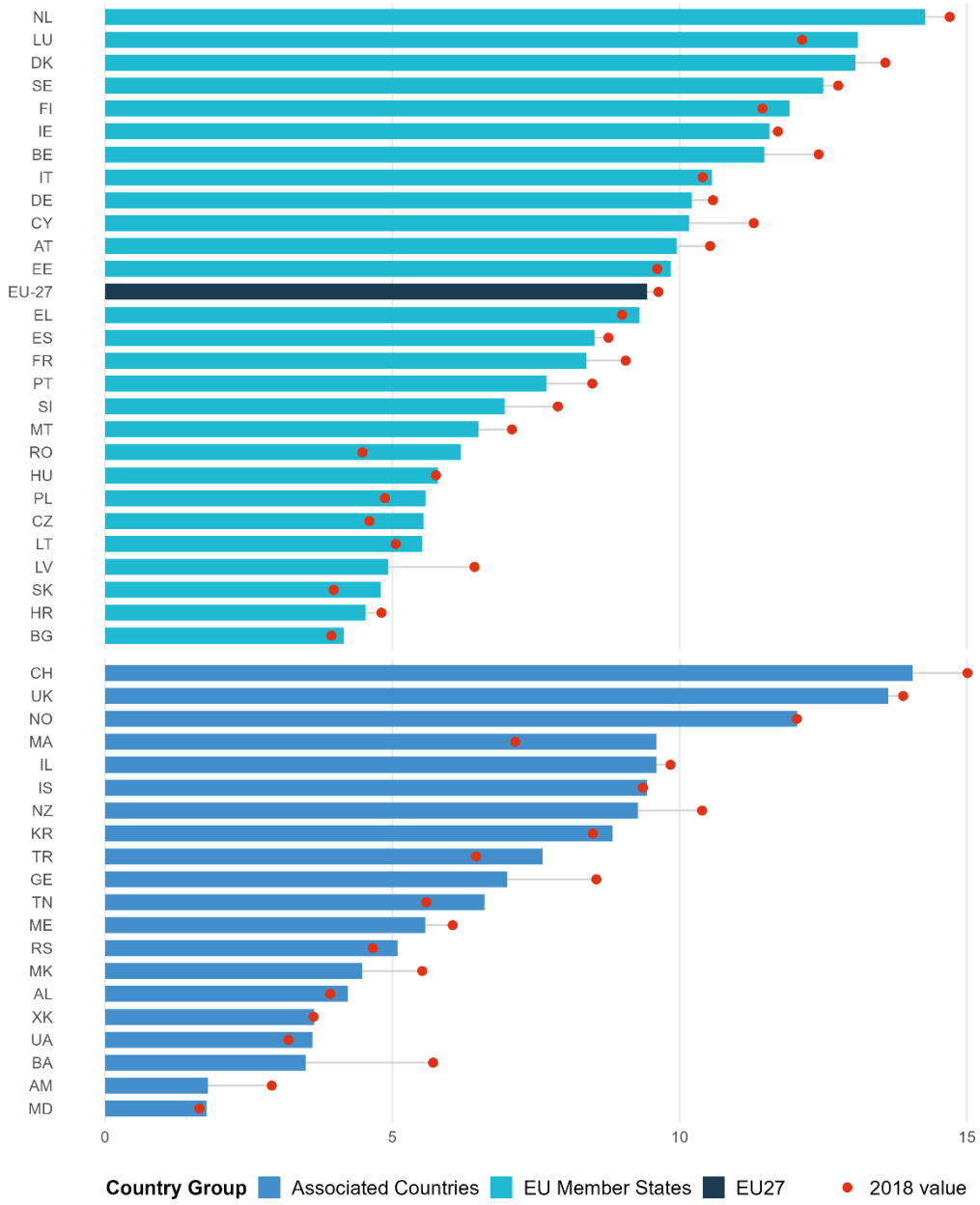
Source: DG Research and Innovation, Common R&I Strategy and Foresight Service Unit, based on Science-Metrix using data from Scopus (Elsevier).

The most recent values for each country are shown in the graph below. The highest values within the EU-27 can be found in the Netherlands, showing indicator values that exceed 14%, followed by Luxembourg, Denmark, and Sweden. With values lower than 5% in 2023, Latvia, Slovakia, Croatia, and Bulgaria are instead depicted at the end of the list of Member States.

Among the Associated Countries, the highest values can be observed in Switzerland, with a value of 14%, followed by the United Kingdom, Norway, with values still above 12%.

Compared to the indicator values in 2018, most of the countries in both groups show either a lower value in 2023, or no big differences between the two years. Few exceptions, showing lower values in 2018, are Luxembourg, Romania, Poland, Czechia, Lithuania, Slovakia, Morocco, Türkiye, and Tunisia.

Figure 81 Percentage of scientific publications among the top-10% most cited publications worldwide, by country for the latest available year and 2018

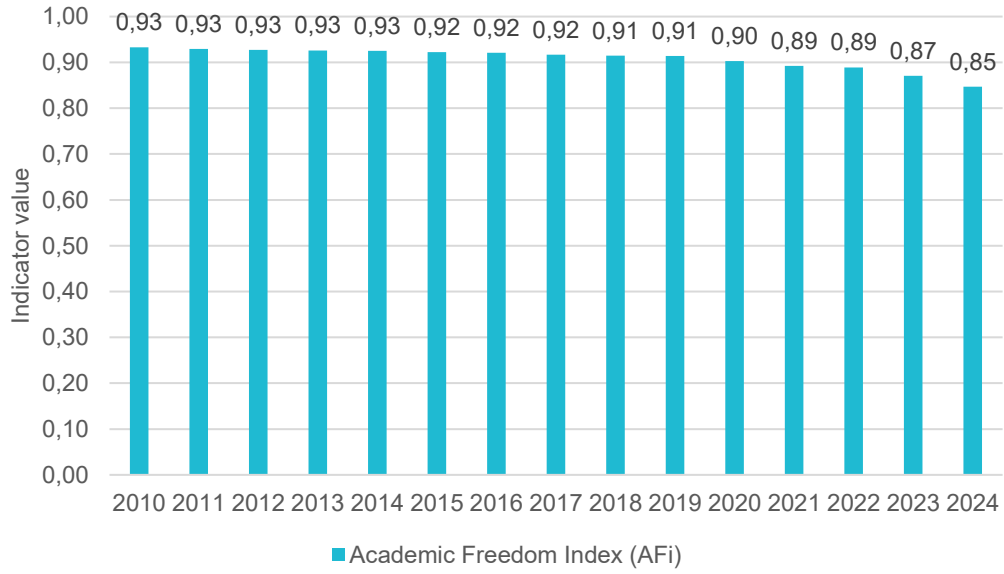


Source: DG Research and Innovation, Common R&I Strategy and Foresight Service Unit, based on Science-Metrix using data from Scopus (Elsevier).

4.6.2 #30 Academic Freedom Index

The Academic Freedom Index provides scores between 0 (lowest) and 1 (highest) for the academic freedom in a country, reflecting the level of protection in the country of the ability of scholars to research, teach, exchange ideas, and participate in public debate without interference. Figure 82 shows the trend of the indicator for the EU-27 over time, as average of all the MS indices. The academic freedom index, while still high, decreases over time, starting from a stable 0.93 between 2010 and 2014, reaching 0.89 in 201 and 2022, to arrive at the lowest level of 0.85 in 2024.

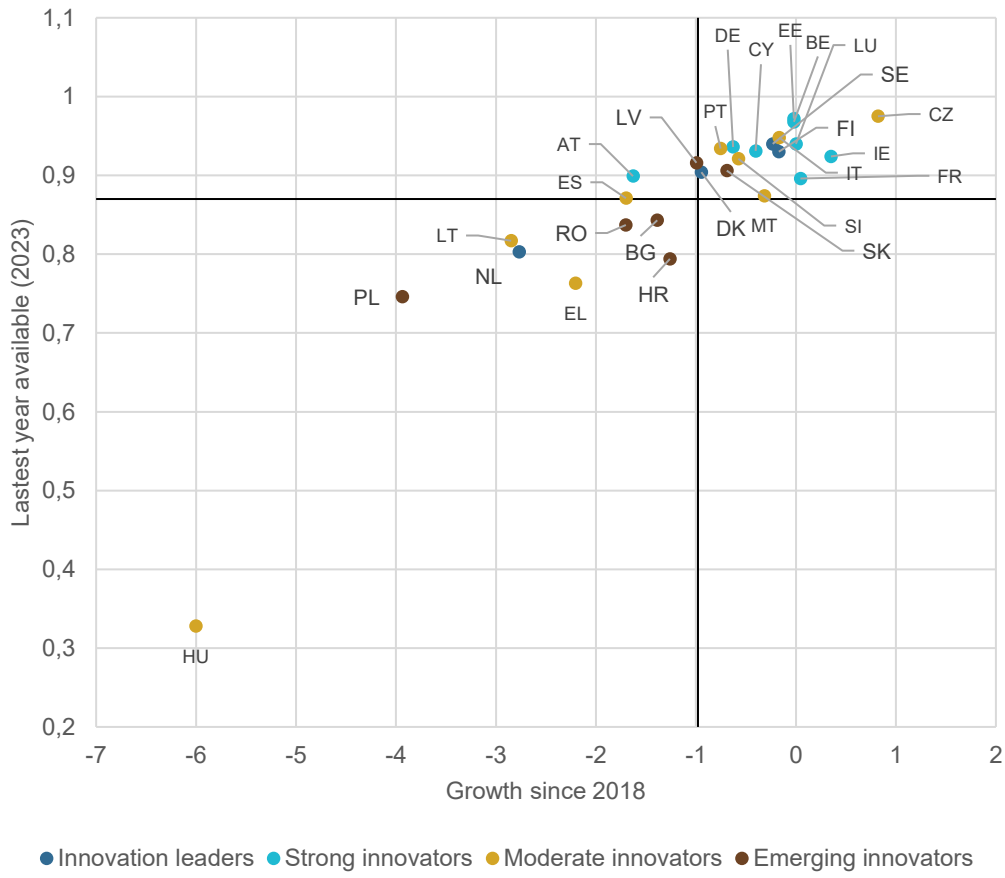
Figure 82 Academic Freedom Index, for the EU-27 average over time



Source: V-DEM Dataset, Varieties of Democracies. Calculations by Fraunhofer ISI.

Figure 83 shows the latest available value of the Academic Freedom Index compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include most of Member States. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Austria, Spain, and Latvia. Romania, Bulgaria, Croatia, Lithuania, the Netherlands, Greece, Poland, and Hungary are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. No countries can be found in the lower right quadrant.

Figure 83 Academic Freedom Index, latest indicator value and change by EU-27 countries



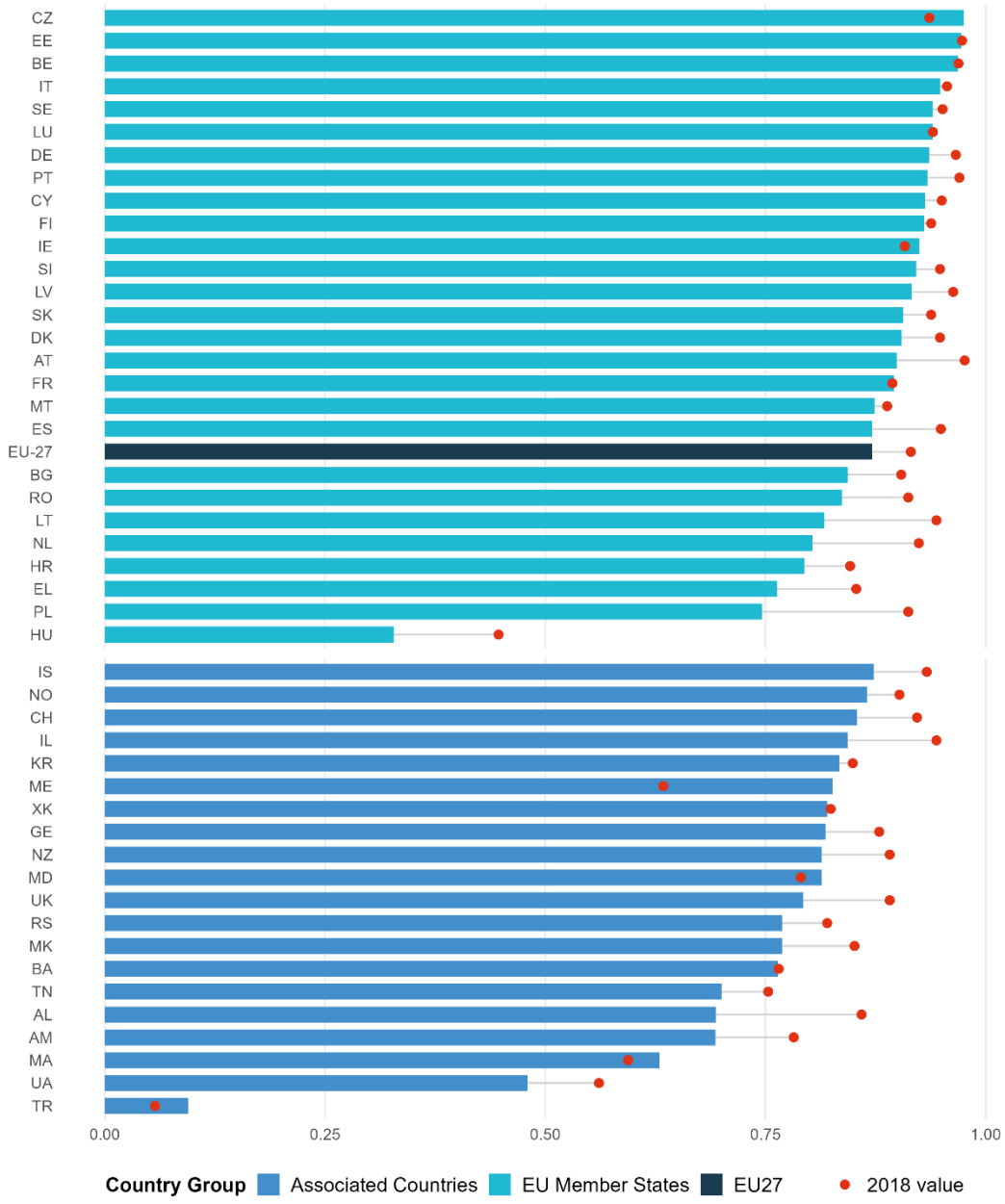
Source: V-DEM Dataset, Varieties of Democracies. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. Most of the Member States of the EU-27 achieve values between 0.8 and 1, with the highest being Czechia, Estonia, Belgium, Italy, Sweden, and Luxembourg. The lowest score among Member States is registered by Hungary, with an index of 0.3. Similarly, most of the Associated Countries register values above 0.75, with the highest values in Iceland, Norway, Switzerland, and Israel. The lowest value is registered in Türkiye, with an index that is below 0.1.

Compared to the indicator values in 2018, however, most of the countries in both groups show a lower value in 2023, or no big differences between the two years. Main differences compared to 2018 concern Hungary, Poland, Albania, Israel, and to a lesser extent Lithuania, the Netherlands, and Greece. A higher value in 2023 compared to 2018 can be observed in Czechia.

Among the Associated Countries, only Montenegro shows a much higher value in 2023.

Figure 84 Academic Freedom Index, by country for the latest available year and 2018

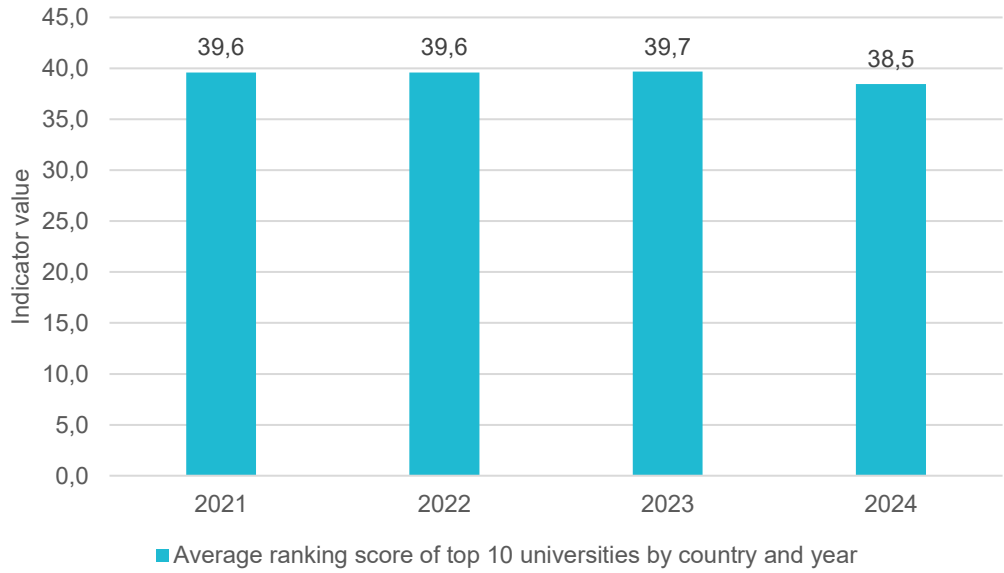


Source: V-DEM Dataset, Varieties of Democracies. Calculations by Fraunhofer ISI.

4.6.3 #31 Average ranking score of top 10 universities

This indicator measures the average ranking score of the top 10 universities of a country. Each university has a score ranging from 0 (lowest) to 100 (highest). For each country. the top 10 universities have been selected and their average score calculated.[20] Figure 85 shows the values of the indicator for the EU average between 2022 (2021 imputed) and 2024, revealing a quite stable, though decreasing trend, going from a value of 39.6 in 2022 to a value of 38.5 in 2024.

Figure 85 Average ranking score of top 10 universities, for the EU average over time



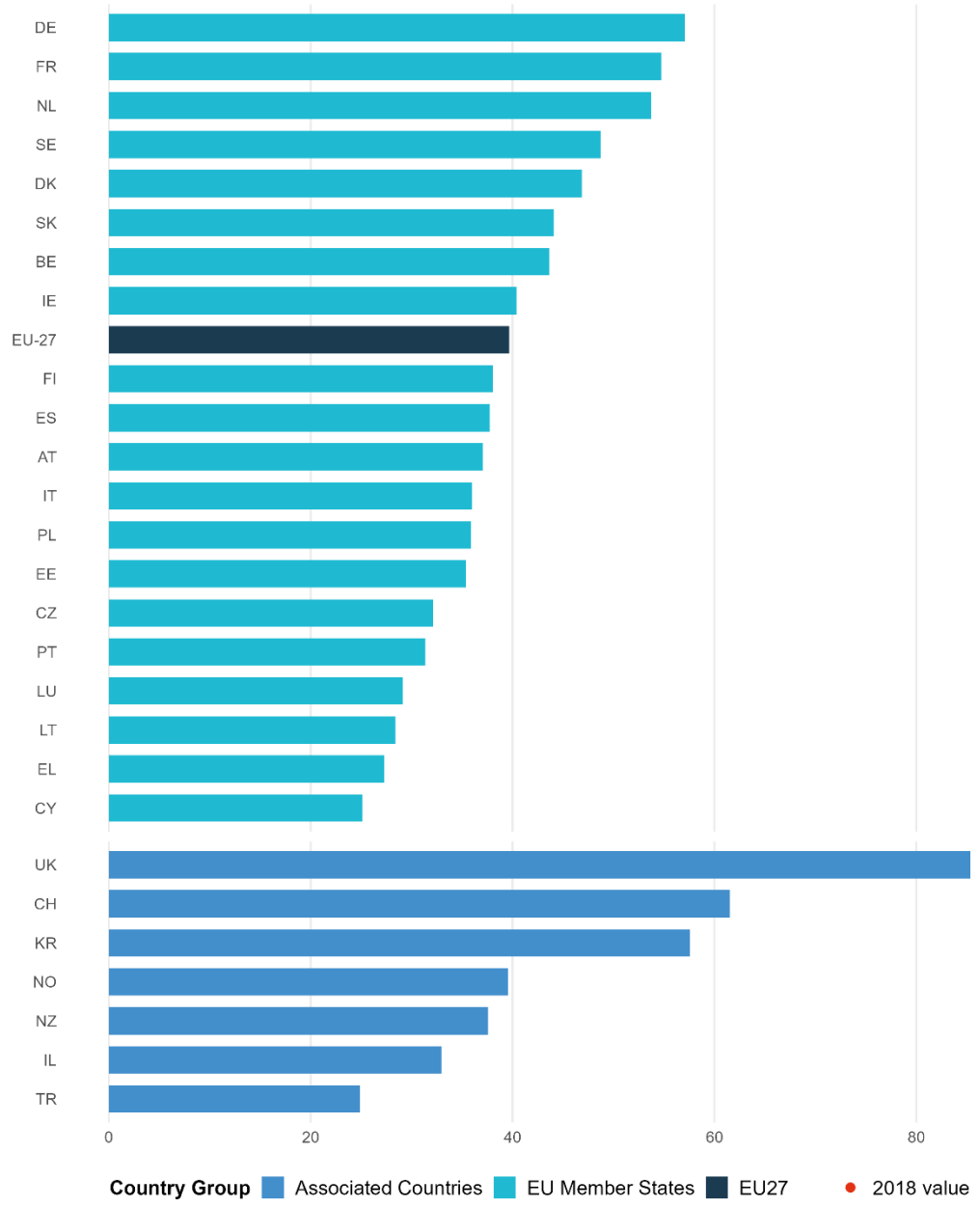
Source: QS World University Rankings (Quacquarelli Symonds Limited). Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest value within the EU-27 can be found in Germany, France, and the Netherlands, showing indicator values that exceed 50. However, there are also Member States that registered less than 30 in 2023, namely Luxembourg, Lithuania, Greece, and Cyprus.

Among the Associated Countries, the highest score can be observed in the UK, with a value exceeding 80, followed by Switzerland which also shows a value above 60. The lowest value can be found in Türkiye, with a score slightly above 20.

[20] Values for Bulgaria, Croatia, Hungary, Latvia, Malta, Romania and Slovenia are missing as the scores for the respective universities are not reported in the QS ranking.

Figure 86 Average ranking score of top 10 universities, by country for the latest available year

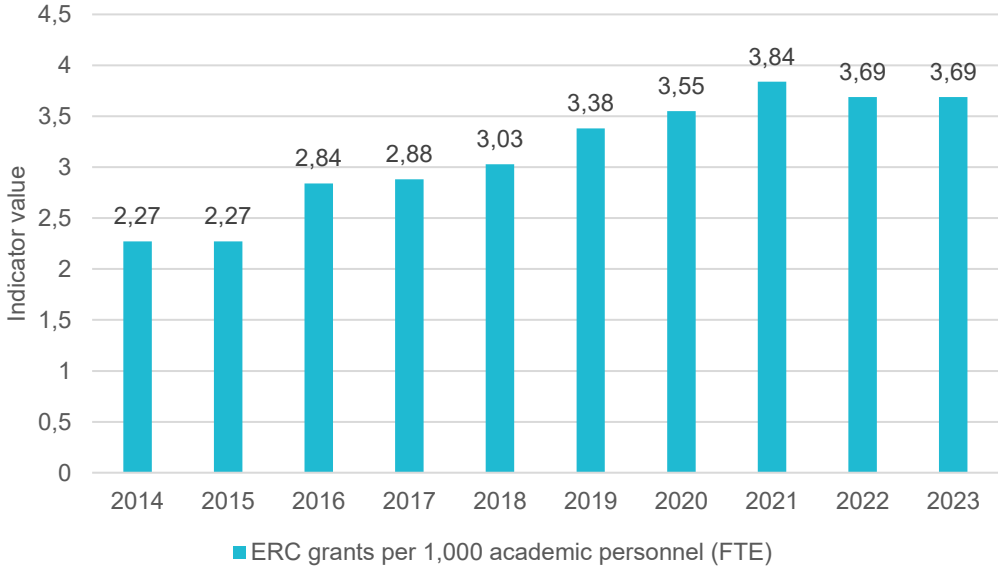


Source: QS World University Rankings (Quacquarelli Symonds Limited). Calculations by Fraunhofer ISI.

4.6.4 #32 ERC grants per 1,000 academic personnel

This indicator measures the number of grants received from the European Research Council (ERC) by the country's higher education institutions, normalised per 1,000 academic personnel (in FTE) in the country. This indicator is a proxy for excellence and competitiveness of the national research workforce. Figure 87 shows the evolution of the average indicator for the EU-27 over time. It depicts a constant increase over the period 2014 to 2021, going from 2.27 to 3.84. In 2022, a slight decrease occurs, registering a value of 3.69 (2023 imputed).

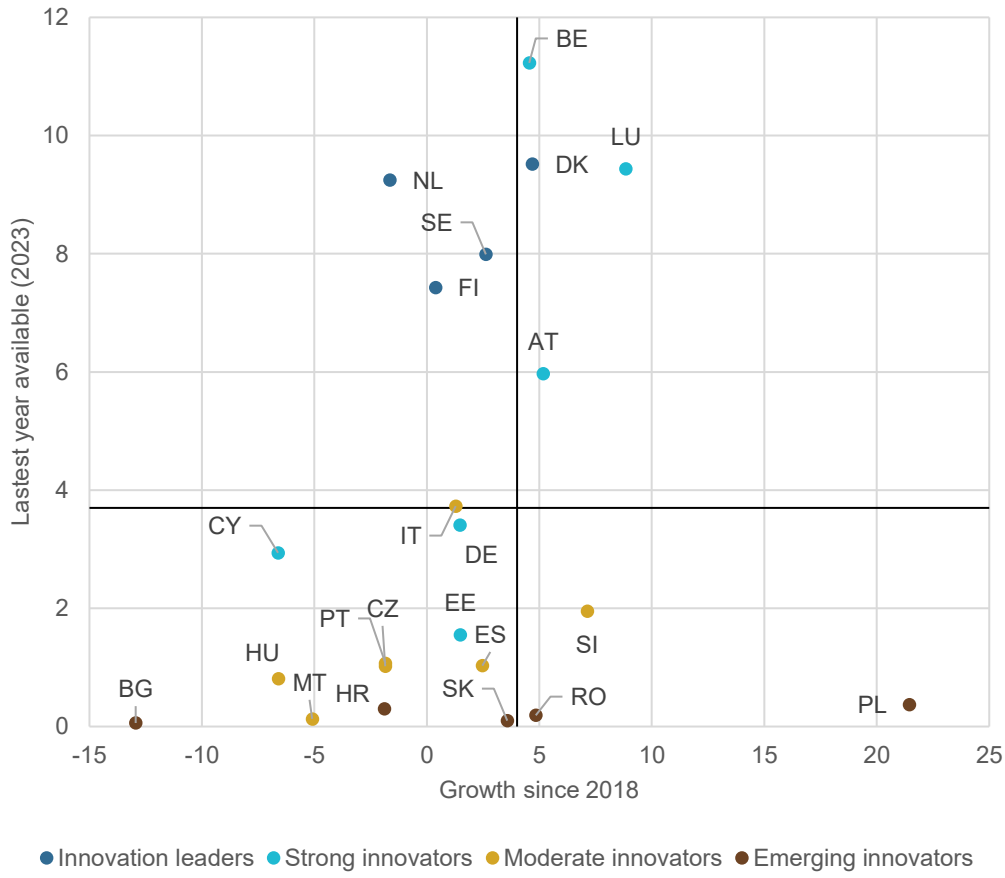
Figure 87 ERC grants per 1,000 academic personnel, for the average of EU-27 over time



Source: European Higher Education Sector Scoreboard (EHESS). Calculations by Fraunhofer ISI.

Figure 88 shows the latest available value of the ERC grants per 1,000 academic personnel compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Belgium, Luxembourg, Denmark, and Austria. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find the Netherlands, Sweden, and Finland. Most of the Member States, however, being mainly moderate and emerging innovators, are depicted in the lower left quadrant of the graph, indicating both below average growth and a lower-than-EU-27 average indicator value. Slovenia, Romania, and Poland can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 88 ERC grants per 1,000 academic personnel, latest indicator value and change by EU-27 countries



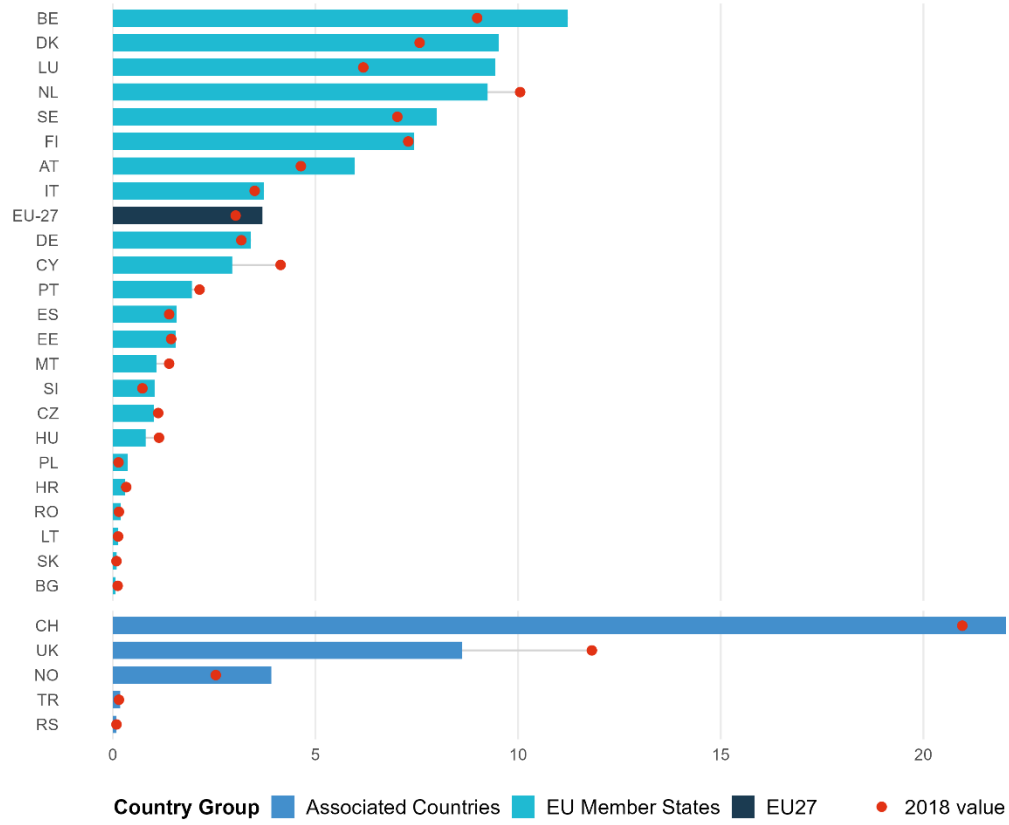
Source: European Higher Education Sector Scoreboard (EHESS). Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest values within the EU-27 can be found in Belgium, showing a value above 11, followed by Denmark, Luxembourg, and the Netherlands. Lowest values, being below 0.2, can be observed in Romania, Lithuania, Slovakia, and Bulgaria.

For the five Associated Countries for which data is available from the European Higher Education Sector Scoreboard, the highest values can be observed in Switzerland, with a value above 20, followed by the United Kingdom and Norway.

Compared to the indicator values in 2018, most of the countries in both groups show a higher value in 2023, or no big differences between the two years. Higher values with respect to 2018 can be observed in Belgium, Denmark, Luxembourg, Austria, and Norway. A lower value in 2023 instead can be observed in the United Kingdom.

Figure 89 ERC grants per 1,000 academic personnel, by country for the latest available year and 2018

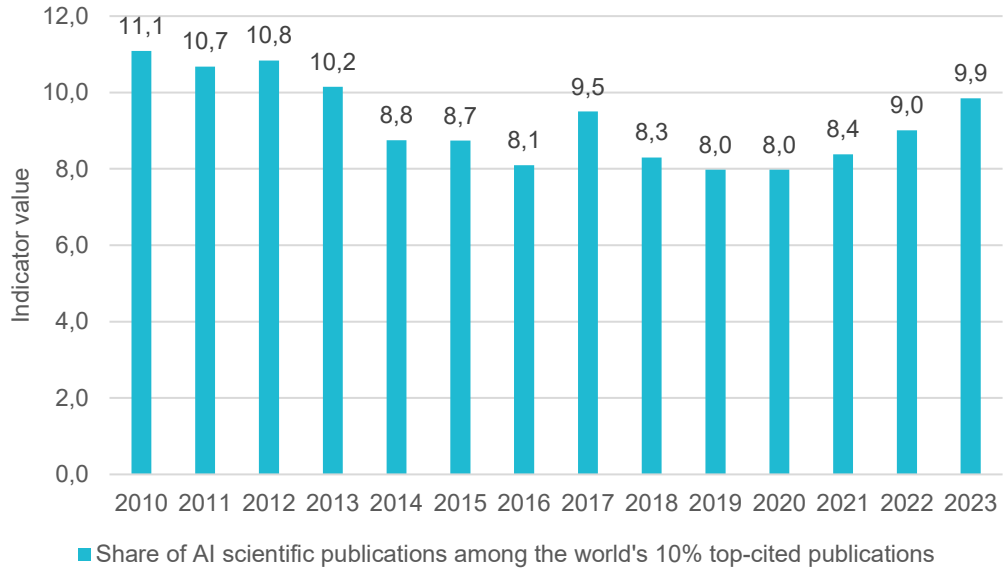


Source: European Higher Education Sector Scoreboard (EHESS). Calculations by Fraunhofer ISI.

4.6.5 #33 Share of AI scientific publications among the world's 10% top-cited publications

This indicator measures the share of AI-related scientific publications from the EU-27 that rank among the world's 10% most-cited AI related publications, capturing the excellence and global impact of European AI-related research. Tracking this share over time provides insight into the EU-27's ability to produce cutting-edge, high-visibility AI research compared with global competitors. Figure 90 shows the evolution of the indicator for the EU-27 over time. The indicator is subject to fluctuations. From 2010 to 2016, the indicator shows a decline from 11.1% to 8.1%. In 2017, it increases to 9.5%, but then it starts declining again until 2022, when it goes back to 9%. In 2023, the indicator registers 9.9%, suggesting a more positive trend.

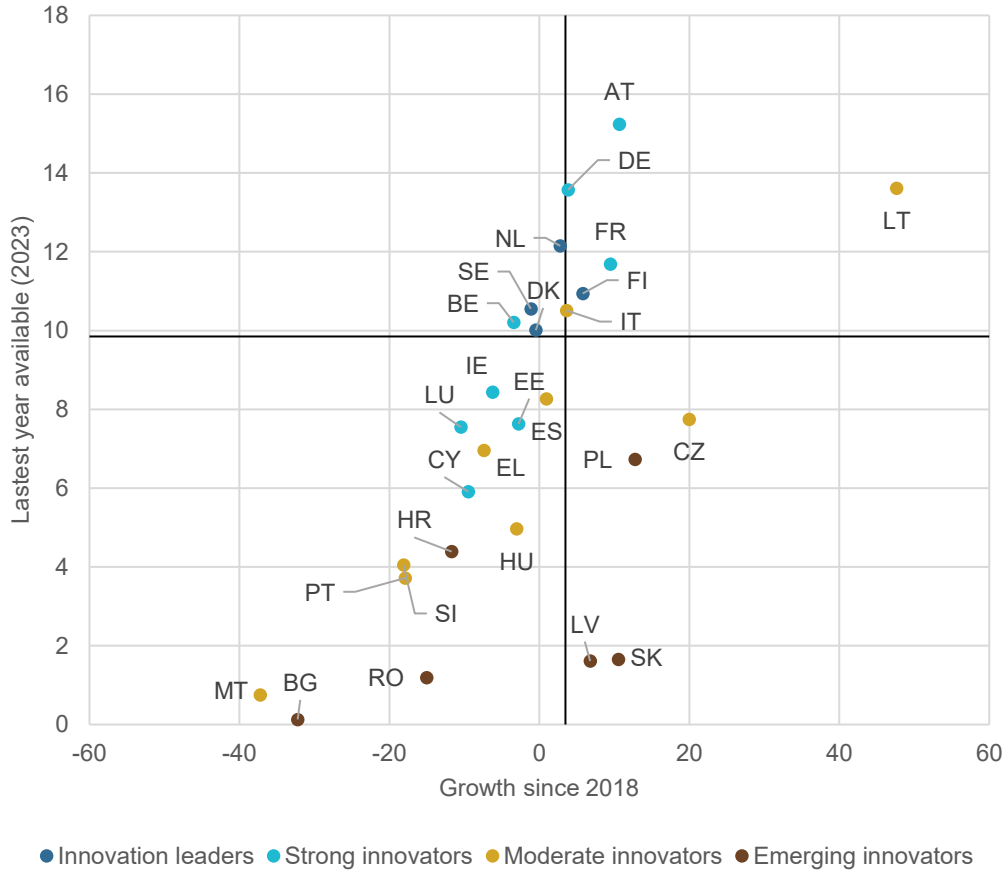
Figure 90 Share of AI scientific publications among the world's 10% top-cited publications, for the EU-27 over time



Source: OECD. Calculations by Fraunhofer ISI.

Figure 91 shows the latest available value of the share of AI scientific publications among the world's 10% top-cited publications compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Austria, Germany, Lithuania, France, and Finland. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find the Netherlands, Sweden, Denmark, Belgium, and Italy. Most of the Member States are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. Czechia, Poland, Latvia, and Slovakia can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 91 Share of AI scientific publications among the world's 10% top-cited publications, latest indicator value and change by EU-27 countries



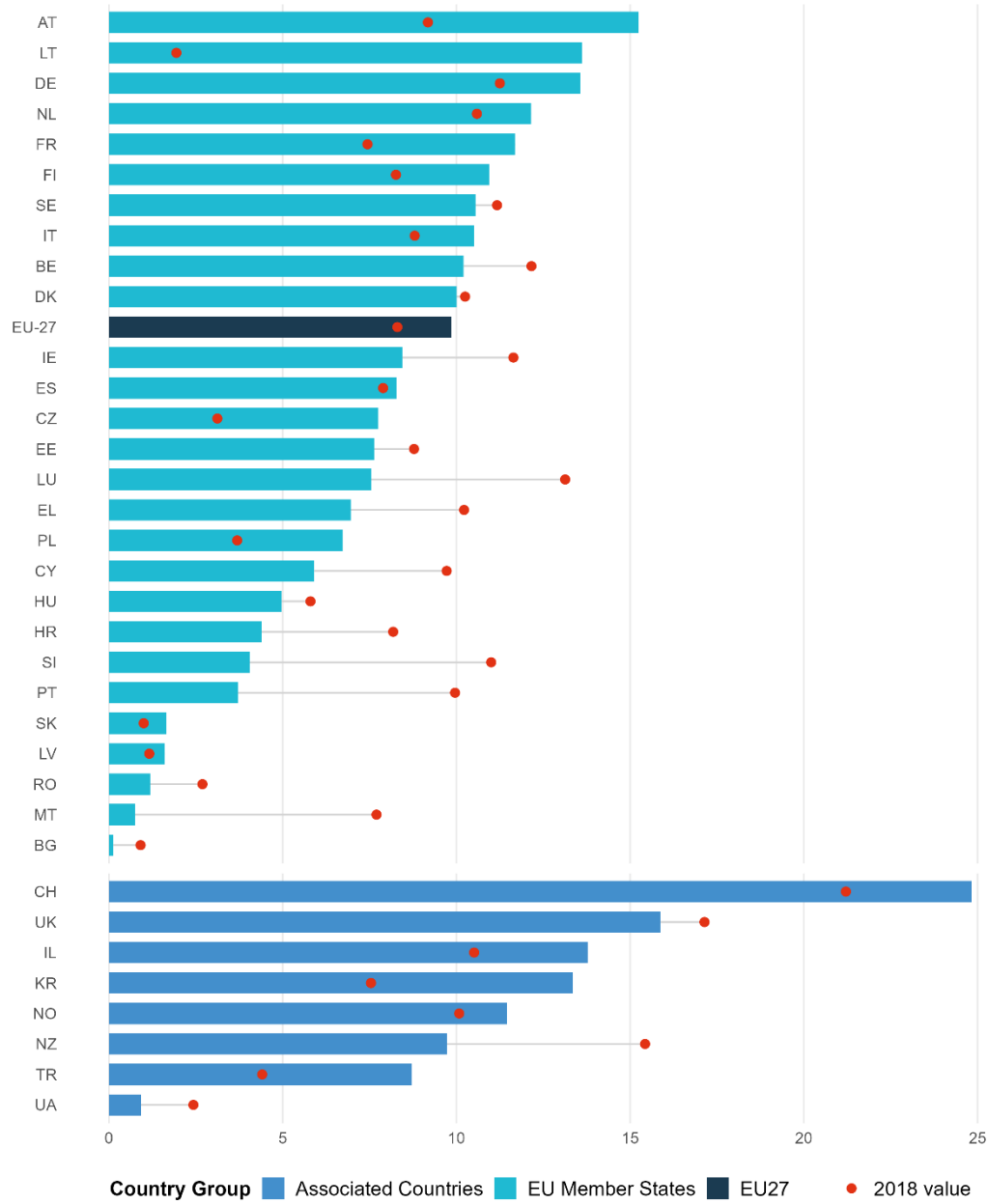
Source: OECD. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest values within the EU-27 can be found in Austria, showing a value above 15%, followed by Lithuania, and Germany. Lowest values, being below 1%, can be observed in Malta and Bulgaria.

Among the Associated Countries, the highest values can be observed in Switzerland, with a value close to 25%, followed by the United Kingdom, Israel, and South Korea.

Compared to the indicator values in 2018, some countries in both groups show a higher value in 2023. Higher values with respect to 2018 can be observed in Austria, Lithuania, France, Czechia, Poland, South Korea, and Türkiye. Other countries show instead much higher value in 2018, such as Luxembourg, Cyprus, Slovenia, Portugal, Malta, and New Zealand.

Figure 92 Share of AI scientific publications among the world's 10% top-cited publications, by country for the latest available year and 2018

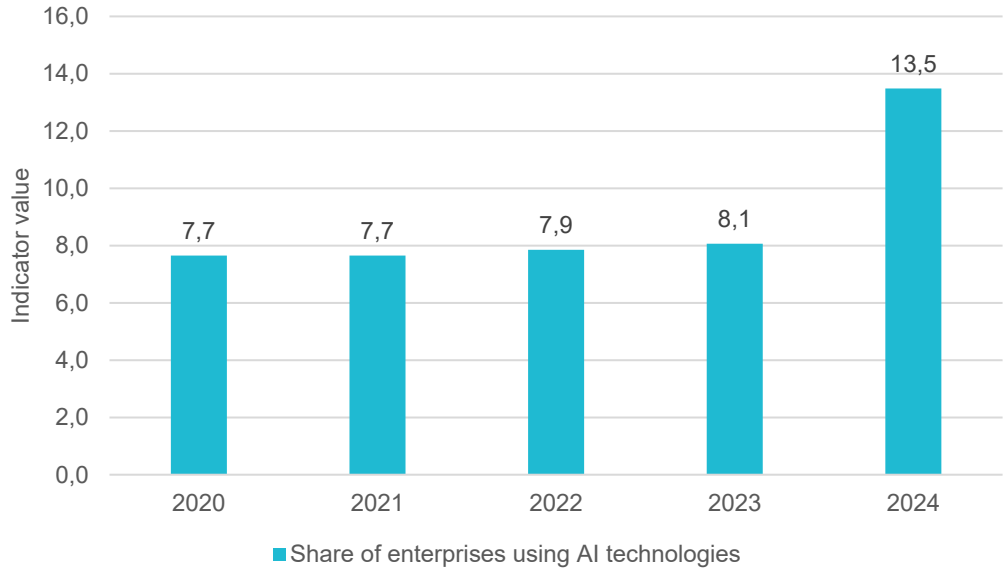


Source: OECD. Calculations by Fraunhofer ISI.

4.6.6 #34 Share of enterprises using AI technologies

This indicator measures the share of enterprises using AI technologies, providing an overview of how widely artificial intelligence is being adopted across the business sector. Figure 93 shows the evolution of the indicator for the EU-27 over time. The indicator is quite stable between 2020 and 2023, with values between 7.7% and 8.1%. In 2024, the indicator value rises to 13.5%, suggesting an increasing trend among enterprises to keep the pace with the digital transformation.

Figure 93 Share of enterprises using AI technologies, for the EU-27 over time

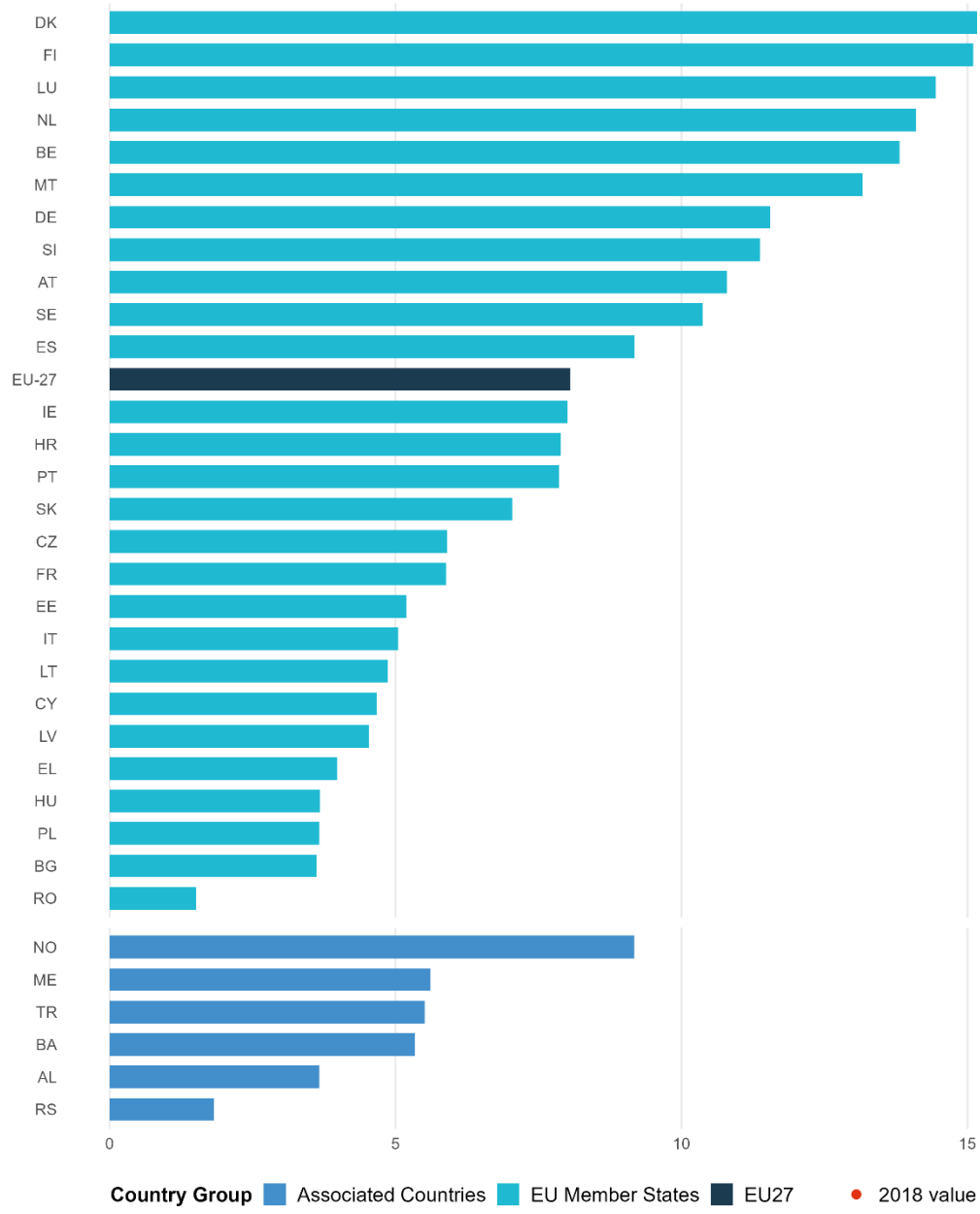


Source: Eurostat. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest values within the EU-27 in 2023 can be found in Denmark and Finland, showing a value above 15%, followed by Luxembourg, the Netherlands, and Belgium. Lowest values, being below 2%, can be observed in Romania.

Among the few Associated Countries for which data is available, the highest values can be observed in Norway, followed by Montenegro, Türkiye, and Bosnia and Herzegovina.

Figure 94 Share of enterprises using AI technologies, by country for the latest available year and 2018



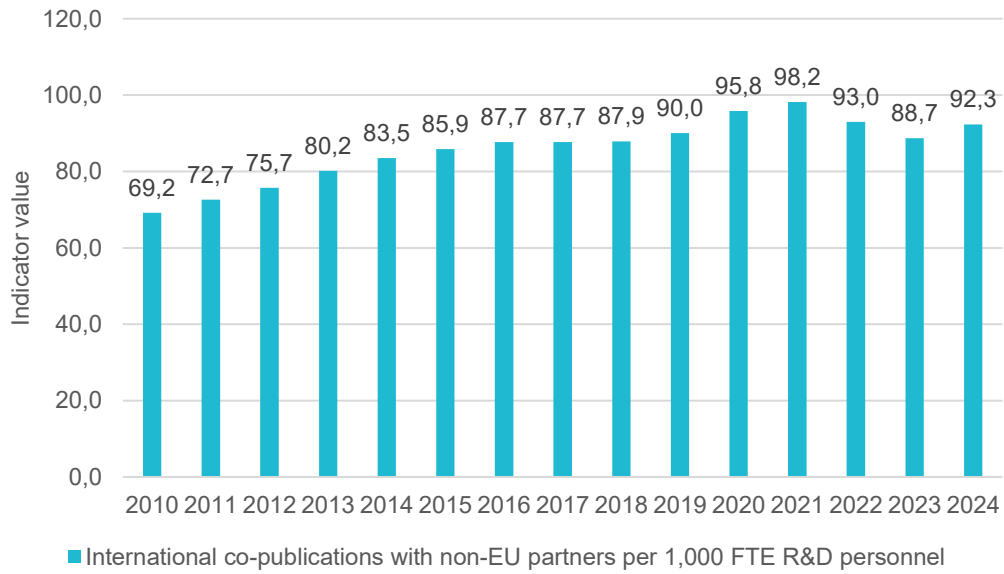
Source: Eurostat. Calculations by Fraunhofer ISI.

4.7 Sub-priority 1.7: Global engagement

4.7.1 #35 International co-publications with non-EU partners per 1,000 FTE R&D personnel

This indicator measures the number of international co-publications[21] with non-EU partners per 1,000 FTE R&D personnel. International scientific co-publications show engagement in international scientific networks and collaborations. As can be seen from the graph below the indicator value constantly increased between 2010 and 2021, from a value of 69.2 to 98.2. In 2022 and 2023, the indicator values decline to 88.7. In 2024, it increases again, reaching a value of 92.3.

Figure 95 International co-publications with non-EU partners per 1,000 FTE R&D personnel, for the EU-27 over time



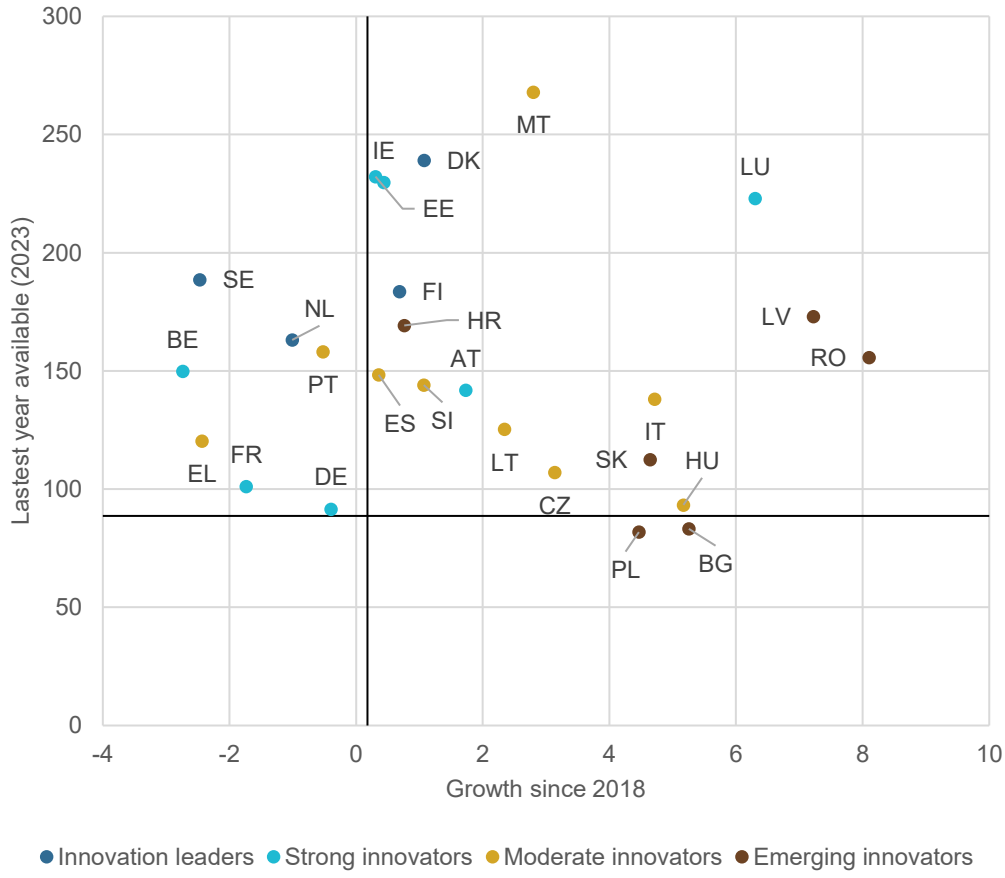
Source: DG Research and Innovation, Common R&I Strategy and Foresight Service Unit, based on Science-Metrix using data from Scopus (Elsevier). Calculations by Fraunhofer ISI.

Figure 96 shows the latest available value of the number of international co-publications with non-EU partners per 1,000 FTE R&D personnel compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include most of the Member States, indicating an overall above-average performance and change in performance of the indicator. Cyprus is also in this quadrant but is not displayed as it shows a

[21] The indicator refers to the total number of co-publications with at least one non-EU27 country (or one other non-EU27 country for non-EU27 countries).

value in 2023 of 788, and a growth rate of 6%, which makes it an outlier.[22] Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find the Netherlands, Sweden, Belgium, Portugal, Greece, France, and Germany. None of the Member States is depicted in the lower left quadrant of the graph, indicating that none of them experience both below average growth and a lower-than-EU-27 average indicator value. Only Poland and Bulgaria can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 96 International co-publications with non-EU partners per 1,000 FTE R&D personnel, latest indicator value and change by EU-27 countries



Source: DG Research and Innovation, Common R&I Strategy and Foresight Service Unit, based on Science-Metrix using data from Scopus (Elsevier). Calculations by Fraunhofer ISI.

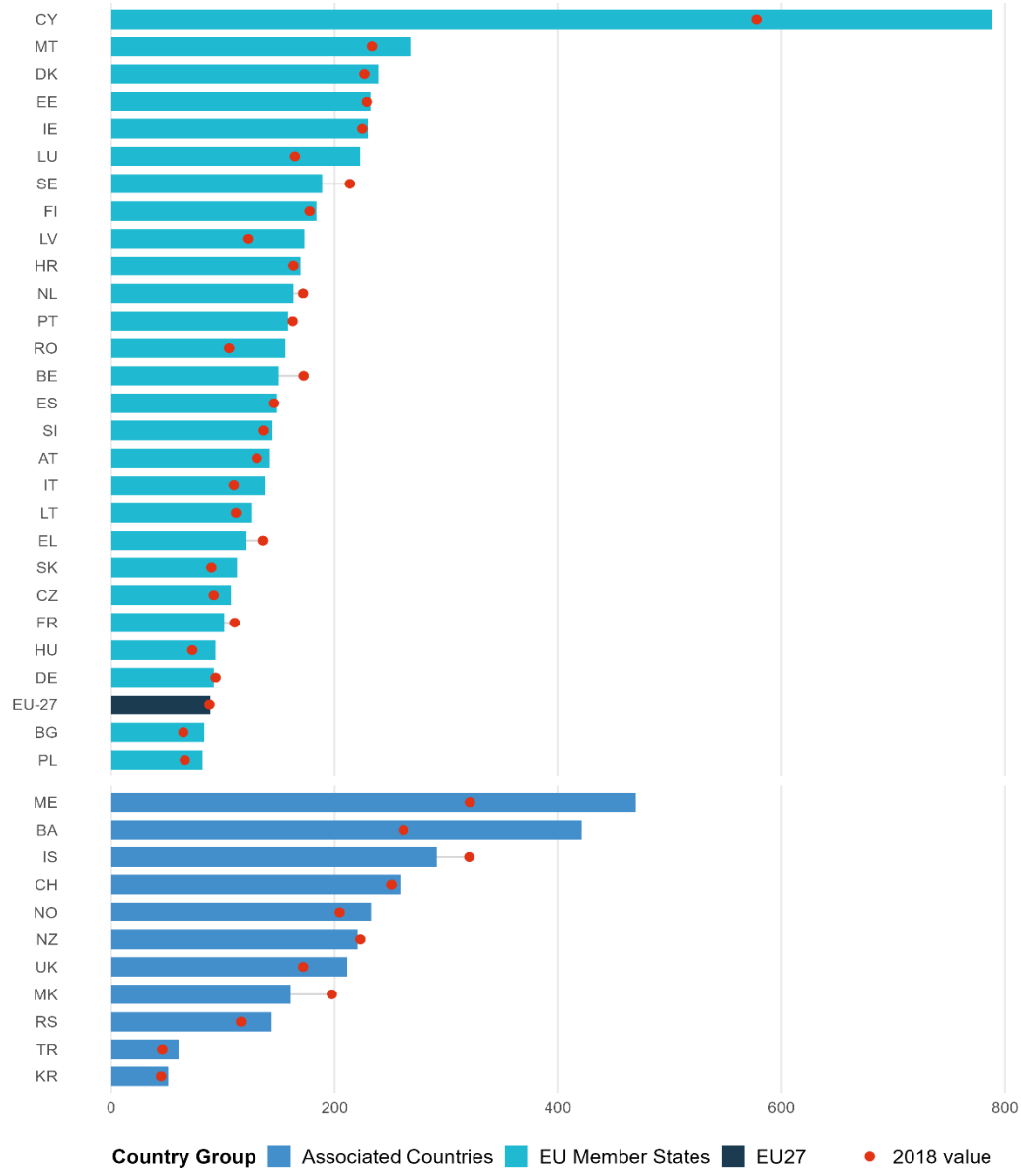
The most recent values for each country are shown in the graph below. The highest values within the EU-27 can be found in Cyprus, showing indicator values that exceed 780, followed by Malta, Estonia, Denmark, Ireland, and Luxembourg. However, there are also Member States that registered less than 100 in 2023, namely Hungary, Germany, Bulgaria, and Poland.

[22] Following the SRIP report in 2024, this might be due to the fact that the number of publications includes those from both the Turkish and non-Turkish sides of the island, while the number of researchers only includes the non-Turkish side.

Among the Associated Countries, the highest values for this indicator can be observed in Montenegro and Bosnia and Herzegovina, with values exceeding 500, followed by Iceland and Switzerland.

Compared to the indicator values in 2018, most of the countries in both groups show a higher value in 2023, or no big differences between the two years. Higher values can be observed in Cyprus, Montenegro, and Bosnia and Herzegovina.

Figure 97 International co-publications with non-EU partners per 1,000 FTE R&D personnel, by country for the latest available year and 2018

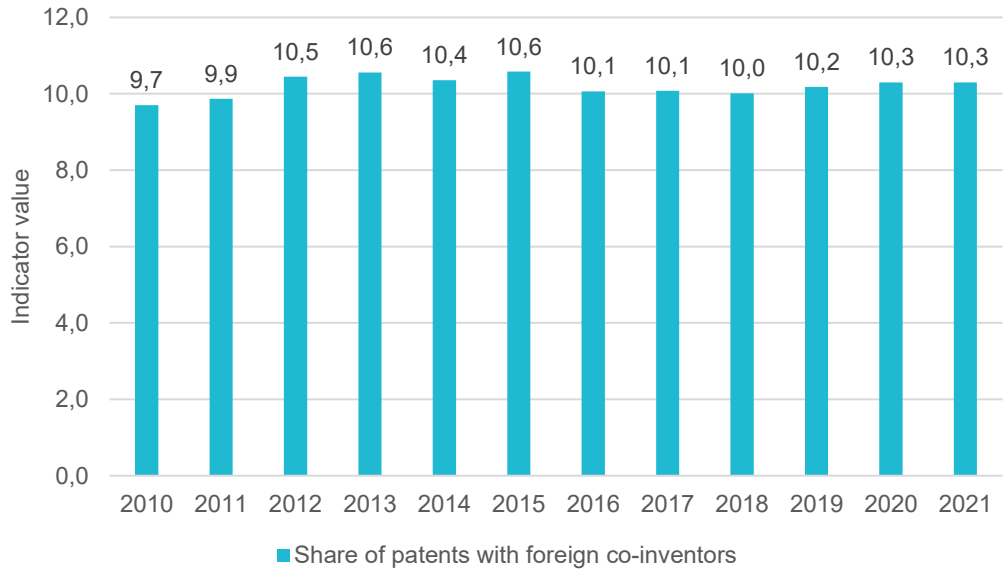


Source: DG Research and Innovation, Common R&I Strategy and Foresight Service Unit, based on Science-Metrix using data from Scopus (Elsevier). Calculations by Fraunhofer ISI.

4.7.2 #36 Share of patents with foreign co-inventors

This indicator measures the share of patents filed with foreign co-inventors. It reflects how strongly a country's innovation system is connected to global research and technology networks. Figure 98 shows the evolution of the indicator for the EU-27 over time. It can be observed that, while small fluctuations exist, the range of the indicator remains quite stable. The lowest value can be observed in 2010 at 9.7%. A peak is reached in 2013 and 2015, reaching 10.6%. In 2021, the latest available year, the value stays at 10.3%.

Figure 98 Share of patents with foreign co-inventors, for the EU-27 over time



Source: OECD. Calculations by Fraunhofer ISI.

Figure 99 shows the latest available value of the share of patents filed with foreign co-inventors compared to the growth of the indicator value since 2018, for all EU-27 Member States. In this case, we do not plot the EU-27 average, as the value for the EU-27 excludes the intra-EU co-operation and therefore it is not directly comparable to the national values. Countries showing both positive growth with respect to 2018 and high levels in 2023 are Hungary, Latvia, Romania, Greece, Czechia, Poland Spain, and Finland, among others. Those that show negative growth are, among others, Cyprus, Lithuania, Malta, and Bulgaria. Luxembourg, Slovenia, Croatia, and Ireland, while having a very high level in 2023, they experience a slight negative growth with respect to 2018.

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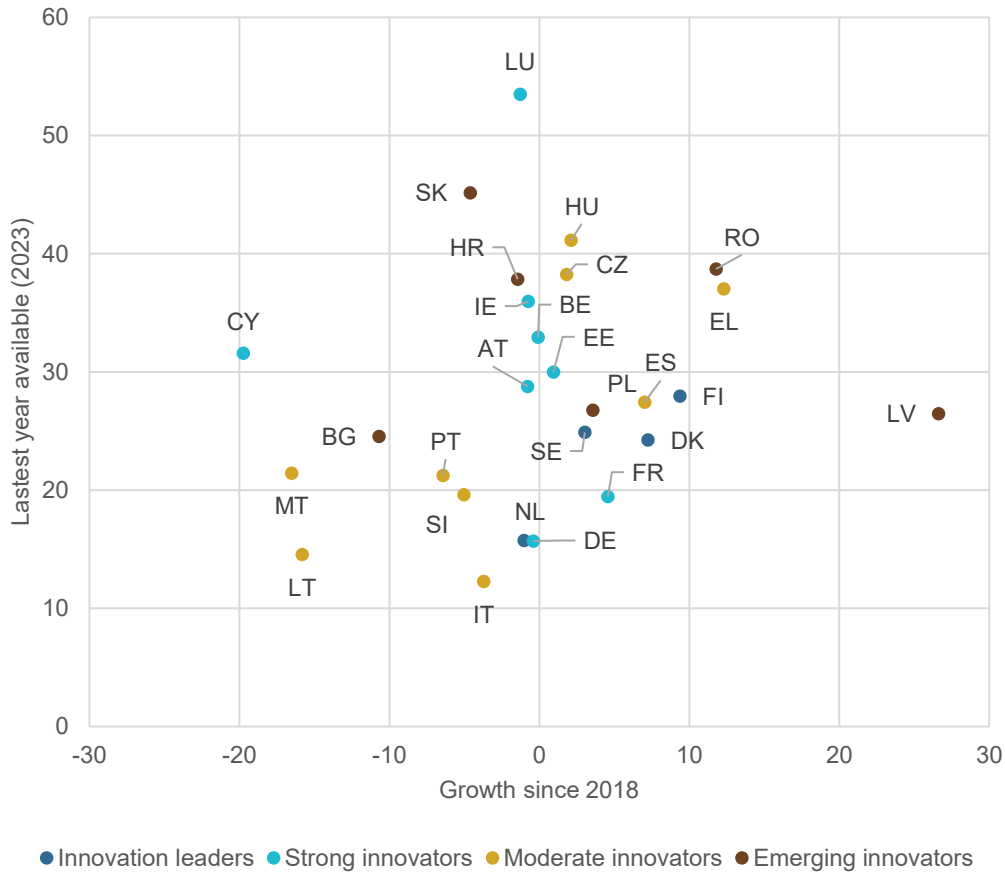
Figure 99 Share of patents with foreign co-inventors, latest indicator value and change by EU-27 countries



Source: OECD. Calculations by Fraunhofer ISI.

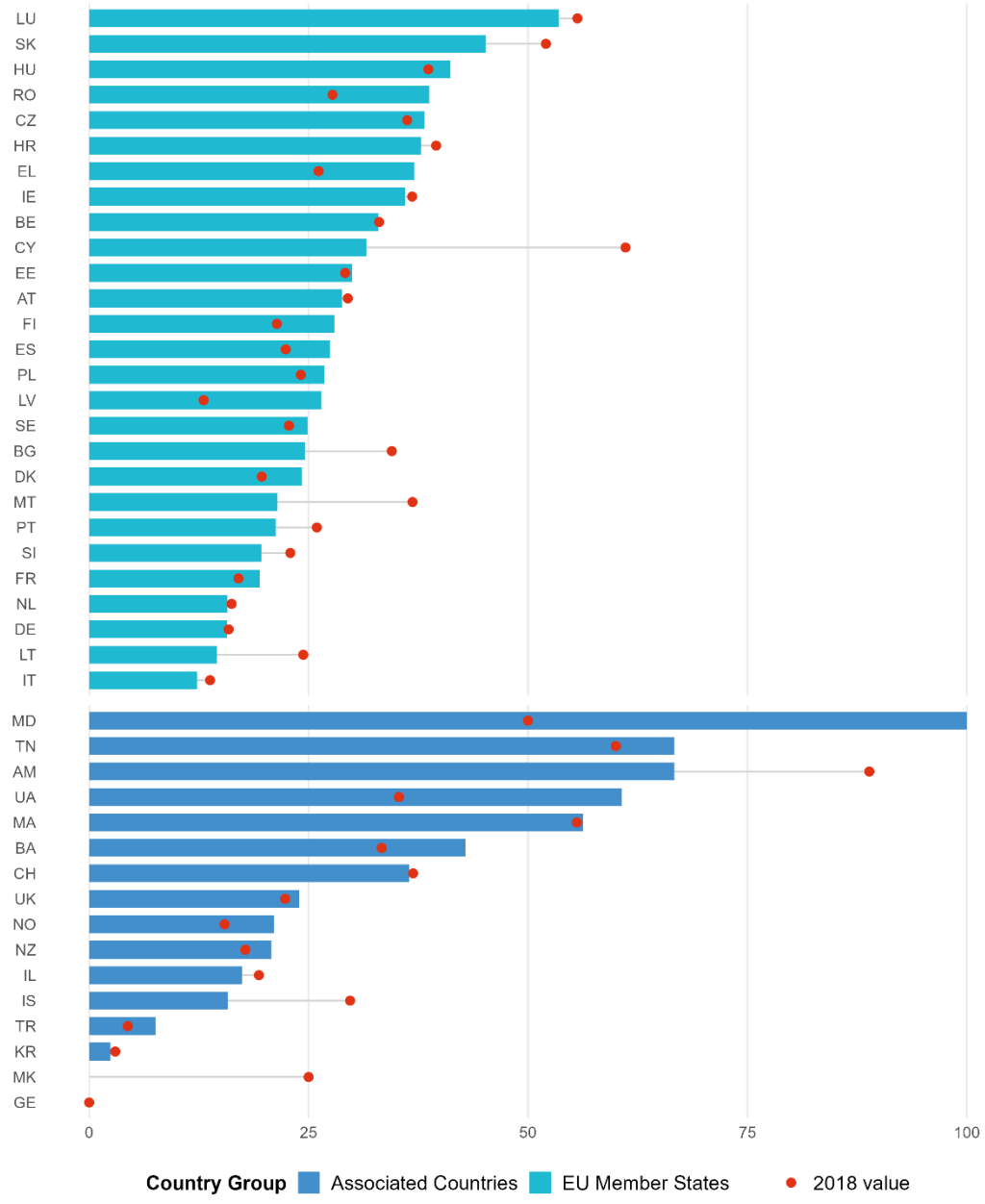
The most recent values for each country are shown in the graph below. The highest shares within the EU-27 can be found in Luxembourg, showing an indicator value that exceed 50%, followed by Slovakia and Hungary. However, there are also Member States that registered less than 15% in 2021, namely Lithuania and Italy.[23]

Among the Associated Countries, the highest shares of patents filed with foreign co-inventors can be observed in Moldova, with a value of 100%, followed by Armenia and Tunisia.

Compared to the indicator values in 2018, most of the countries in both groups show a higher value in 2023, or no big differences between the two years. Higher values can be observed in Romania, Greece, Latvia, Moldova, and Ukraine, while lower values can be observed in Cyprus, Malta, Armenia, and Iceland.

[23] For the EU-27 calculation, the intra-EU co-operation has been excluded.

Figure 100 Share of patents with foreign co-inventors, by country for the latest available year and 2018



Source: OECD. Calculations by Fraunhofer ISI. Note: Values in 2021 for Georgia and North Macedonia are 0, as retrieved by the OECD.

4.8 Key findings on ERA Priority 1

Overall, the EU-27 shows a high and consolidated level of **open science** (#5-#8) adoption, particularly in open access publishing. After a long period of growth, the EU-level share of open access publications experienced a temporary decline after 2021 but recovered in the most recent year. Across the Member States we find a relatively homogeneous performance, with most countries well above half of total publications in open access. Countries such as Slovenia, Lithuania, Finland, Sweden and Portugal are consistently leading, while Cyprus, Czechia, Germany, Austria, Italy and France remain below the EU average. Among Associated Countries, Moldova, Norway, North Macedonia and Montenegro are leading. More uneven patterns persist for open research data and repositories, where EU-level performance remains volatile. A limited number of countries account for a large share of datasets and repositories, creating distortions at EU level. Among both Member States and Associated Countries, very high shares are often linked to small absolute numbers. Investments in EOSC and open science are concentrated in a subset of larger Member States, while several smaller and widening countries continue to allocate limited resources.

The **research infrastructure** (#9-#10) indicators are highly differentiated across the EU-27, but data coverage especially on financial contribution is low and does not allow conclusions to be drawn at EU-27-level. Italy and France lead in the number of participations, while among Associated Countries, engagement overall remains more limited.

Concerning **gender equality, equal opportunities and inclusiveness** (#11-#15), there is continuous progress at EU-27 level, but the level of gender equality achieved remains uneven across indicators. The share of women in Grade A academic positions has steadily increased, indicating structural improvements in career advancement. Several Member States, notably Romania, Latvia, Croatia, Bulgaria and Lithuania, perform particularly well. Similar upward trends can be observed among Associated Countries, with Türkiye, Bosnia and Herzegovina and Norway performing strongly. Mixed-gender authorship and women's participation in highly cited publications continue to improve at the EU level. The Women in Digital Index shows overall progress, led by Finland, Ireland, the Netherlands and Sweden. More persistent weaknesses remain in the share of women among STEM doctoral graduates, where EU-level performance has only recently recovered after a period of decline. Differences across countries are narrower, but Denmark, Germany, Austria, the Netherlands and Malta remain below the EU average. Among the Associated countries, Montenegro, Serbia and Bosnia and Herzegovina show comparably high values.

Recent developments in **researchers' careers, mobility and research assessment** (#16-#22) show a moderate strengthening of international mobility at EU-27 level, particularly for doctoral education. The share of foreign doctorate students has increased over time. Luxembourg and Malta show a high internationalisation, followed by the Netherlands, Austria and Ireland. In contrast, Poland, Romania and Greece show more limited inflows. Among Associated Countries, Switzerland, Iceland, the UK and North Macedonia stand out. Net flows of international scientific authors reveal persistent imbalances across countries. While countries such as Germany, the Netherlands and Spain record strong positive inflows, Romania, Italy and Greece still experience net outflows, despite recent improvements in some cases.

At EU-27 level, **knowledge valorisation** (#23-#28) shows improvements, particularly in public-private collaboration. The share of public-private co-publications has increased over time, with Austria, Luxembourg, Denmark, the Netherlands and Sweden showing the largest values. Patent intensity remains strongest in Sweden, Finland, Germany and Denmark. Similar concentration patterns are observed among Associated Countries, with South Korea, Switzerland and the UK leading. Academic patenting shows high shares in some Member States with smaller patent systems, such as Portugal and Hungary, Similarly, for industry-academia co-patenting countries such as Bulgaria, Portugal and France are performing well.

Scientific leadership (#29-#34) indicators point to stable but slightly declining EU-27 performance. The EU share of top-10% most cited publications has gradually decreased. The Netherlands, Luxembourg, Denmark and Sweden continue to lead among Member States, while Latvia, Slovakia, Croatia and Bulgaria remain below the EU average. Among Associated Countries, Switzerland, the UK and Norway maintain comparably strong positions.

Global engagement (#35-#36) indicators show generally positive developments at EU-27 level. International co-publications and co-inventions have increased for many countries. Cyprus stands out in terms of international publications, while Luxembourg leads in international co-patenting. Conversely, Lithuania, Italy and Slovakia show lower co-patenting shares. Recent developments highlight larger values in Romania, Latvia and Greece for patents with foreign co-inventors, while declines are observed in Cyprus and Malta.

5 ERA Priority 2: Taking up together the green transition and digital transformation and other challenges with impact on society, and increasing society's participation in the ERA

This section presents the results of the indicators of the ERA Priority 2: Taking up together the green transition and digital transformation and other challenges with impact on society and increasing society's participation in the ERA. The ERA Priority 2 is divided into four sub-priorities:

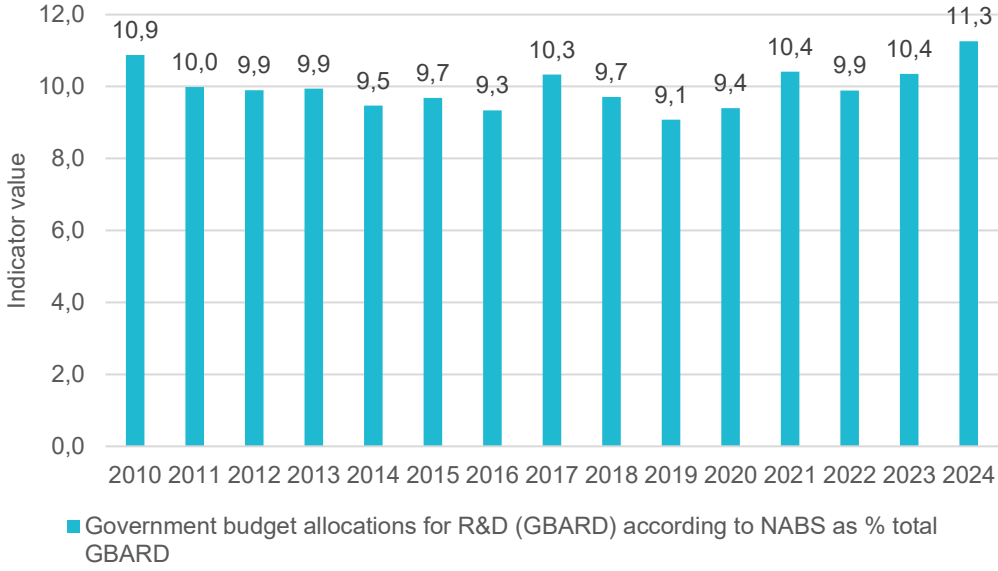
- Challenge-based ERA actions
- Synergies with education and the European Skills Agenda
- Synergies with sectorial policies and industrial policy, in order to boost innovation ecosystems
- An active citizen and societal engagement in R&I in all its dimensions

5.1 Sub-priority 2.1: Challenge-based ERA actions

5.1.1 #37 Government budget allocations for R&D (GBARD) according to NABS as share of total GBARD

This indicator measures the Government budget allocated to R&D (GBARD) according to the nomenclature for the analysis and comparison of scientific programmes and budgets ("NABS 2007"), related to environment, energy and transport, telecommunication and other infrastructures, as a share of the total GBARD. Figure 101 shows the trend of the indicator for the EU-27 over time.

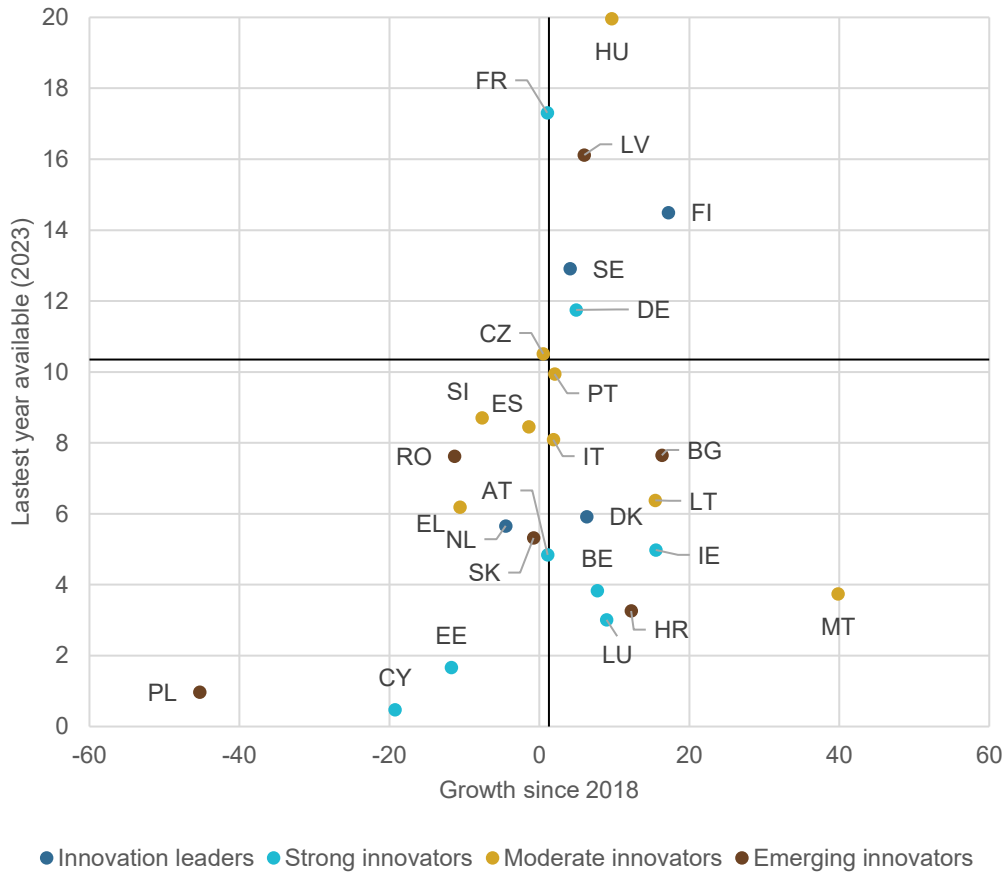
Figure 101 Government budget allocations for R&D (GBARD) according to NABS as share of total GBARD, for the EU-27 over time



Source: Eurostat. Calculations by Fraunhofer ISI.

Figure 102 shows the latest available value of the percentage of GBARD allocated according to "NABS 2007", compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Hungary, Latvia, Finland, Sweden, and Germany. France and Czechia, in the upper left quadrant, maintain above-average values but record below-average growth. Spain, Slovenia, Romania, Austria, Greece, the Netherlands, Slovakia, Estonia, Cyprus, and Poland are situated in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The remaining countries, such as Portugal, Italy, Denmark, and Croatia can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 102 Government budget allocations for R&D (GBARD) according to NABS as share of total GBARD, latest indicator value and change by EU-27 countries



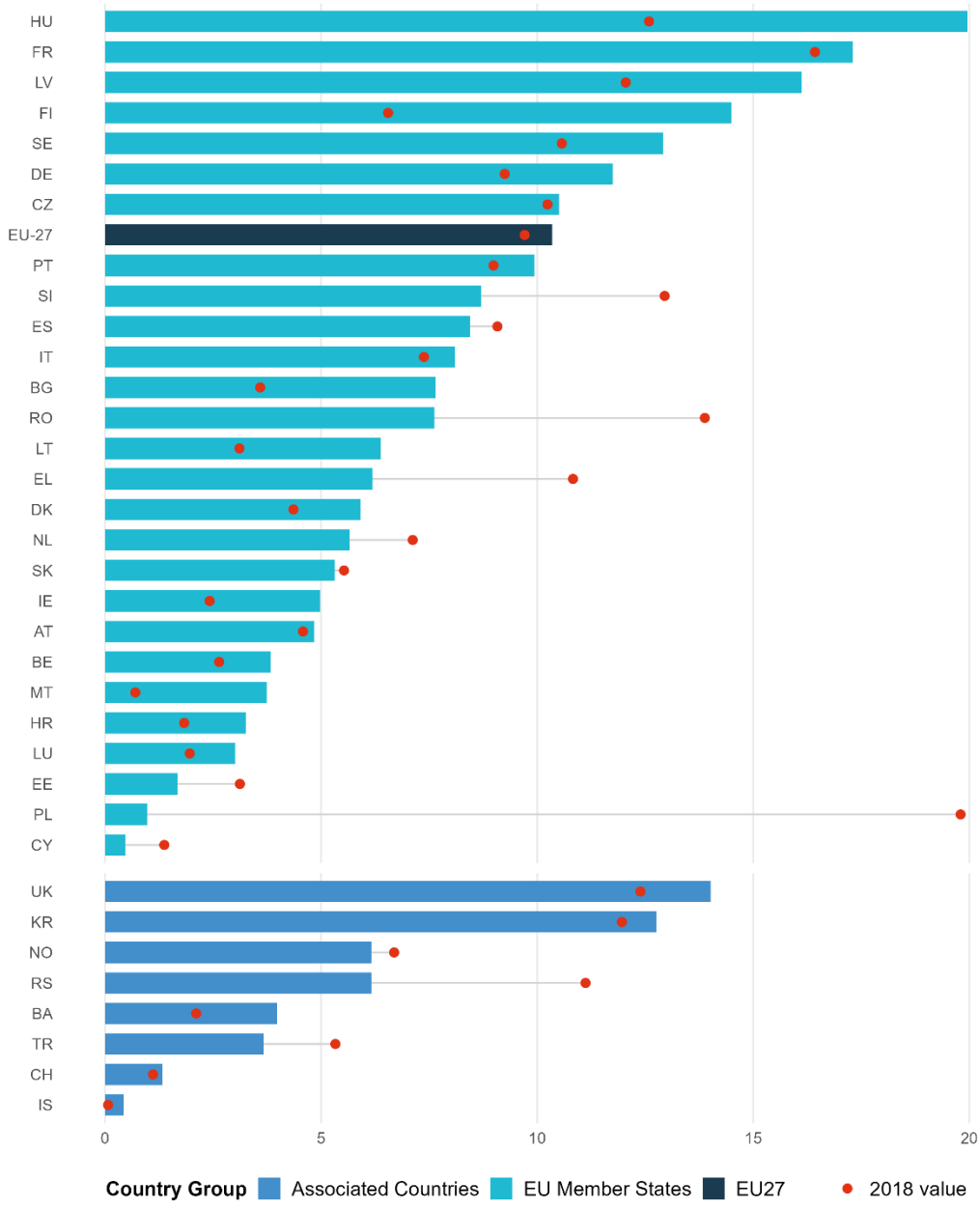
Source: Eurostat. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest GBARD shares according to the above-mentioned “NABS 2007” within the EU-27 can be found in Hungary, showing indicator values very close to 20%, followed by France, and Latvia, with values exceeding 15%. There are also Member States that allocated less than 2% of their GBARD to the mentioned “NABS 2007” in 2023, namely Estonia, Poland, and Cyprus.

Among the Associated Countries, the highest shares can be observed in the United Kingdom and South Koea, with values around 14% and 12% respectively, followed by Norway and Serbia.

Compared to the indicator values in 2018, most of the countries in both groups show a higher value in 2023, or no big differences between the two years. Few exceptions, showing much higher values in 2018, are Slovenia, Romania, Greece, Poland, and Serbia.

Figure 103 Government budget allocations for R&D (GBARD) according to NABS as share of total GBARD, by country for the latest available year and 2018

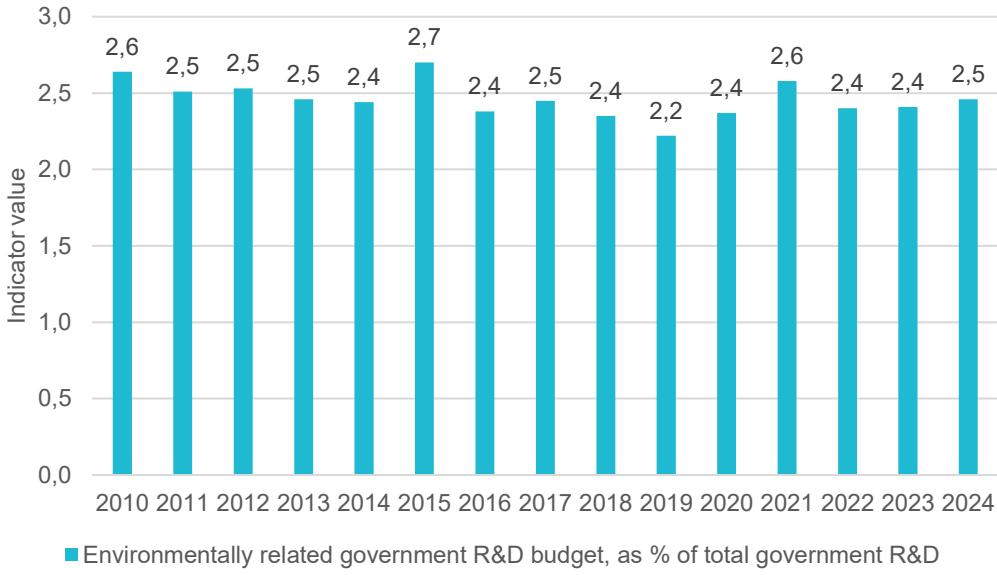


Source: Eurostat. Calculations by Fraunhofer ISI.

5.1.2 #38 Environmentally related government R&D budget, as a percentage of total government R&D

This indicator measures the environmentally related government R&D budget, as a percentage of total government R&D. It indicates progress on research activities supporting the EU's Green Deal. The development of this indicator between the years 2010 and 2024 for the EU-27 is depicted in Figure 104. The indicator has remained at a comparable stable level across the whole period.

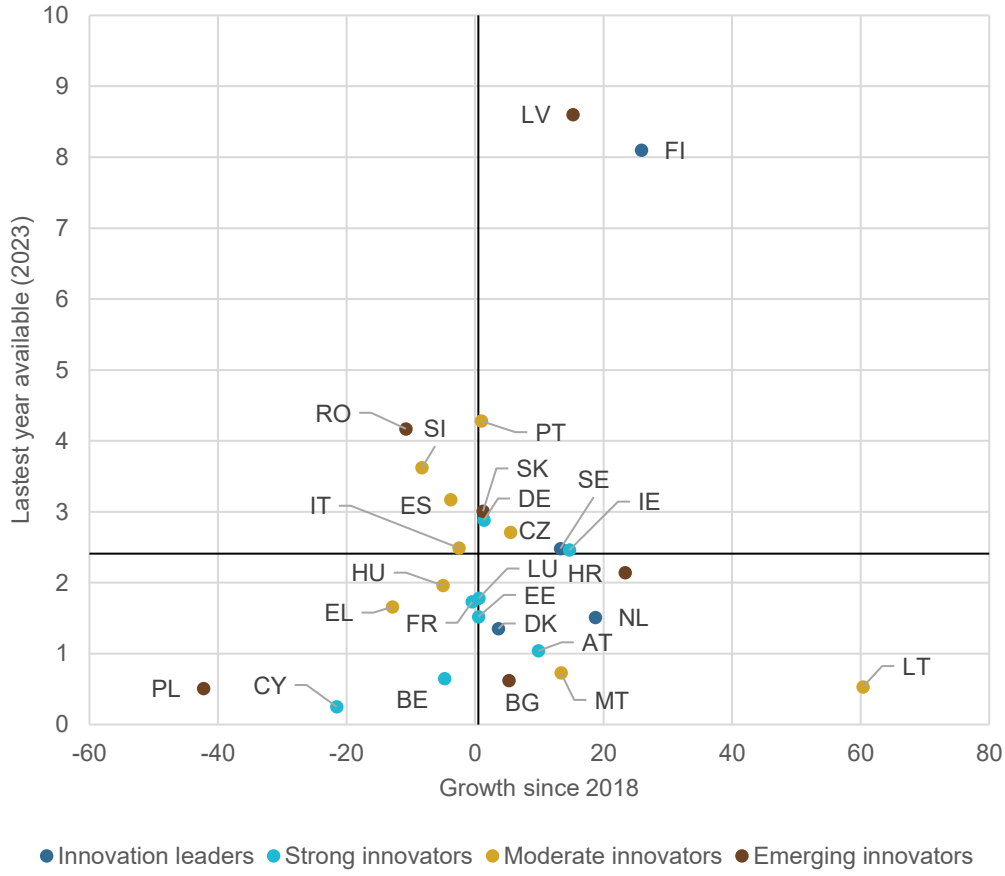
Figure 104 Environmentally related government R&D budget, as a percentage of total government R&D, for the EU-27 over time



Source: Eurostat, OECD. Calculations by Fraunhofer ISI.

Figure 105 shows the latest available value of the percentage of environmentally related government R&D budget, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. Among these, we find Latvia, Finland, Portugal, Slovakia, Germany, and Czechia. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Romania, Slovenia, Spain, and Italy. Hungary, France, Greece, Cyprus, Poland, and Belgium are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The remaining countries, such as Lithuania, Malta, the Netherlands, and Bulgaria can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 105 Environmentally related government R&D budget, as a percentage of total government R&D, latest indicator value and change by EU-27 countries



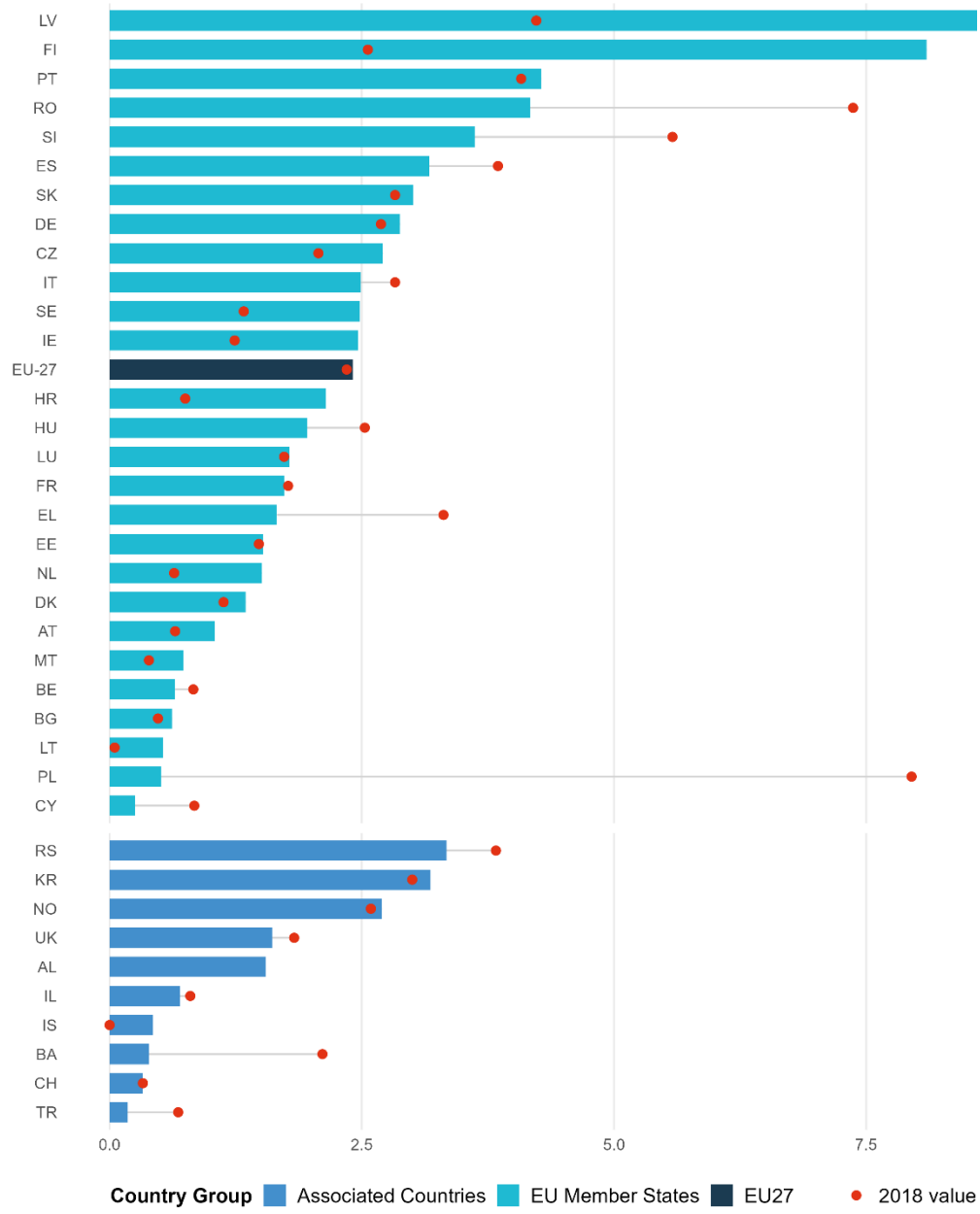
Source: Eurostat, OECD. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest environmentally related government R&D percentage within the EU-27 can be found in Latvia and Finland, showing indicator values that exceed 7.5%, followed by Portugal, Romania, and Slovenia. Member States that allocated less than 1% of their total government R&D to environmentally related R&D in 2023 are Belgium, Bulgaria, Lithuania, Poland, and Cyprus.

Among the Associated Countries, the highest percentage for environmentally related government R&D can be observed in Serbia, South Korea, and Norway, with values exceeding 2.5%, followed by the United Kingdom and Albania.

Compared to the indicator values in 2018, most of the countries in both groups show a higher value in 2023, or no big differences between the two years. Few exceptions, showing much higher values in 2018, are Slovenia, Romania, Greece, Poland, and Bosnia and Herzegovina.

Figure 106 Environmentally related government R&D budget, as a percentage of total government R&D, by country for the latest available year and 2018

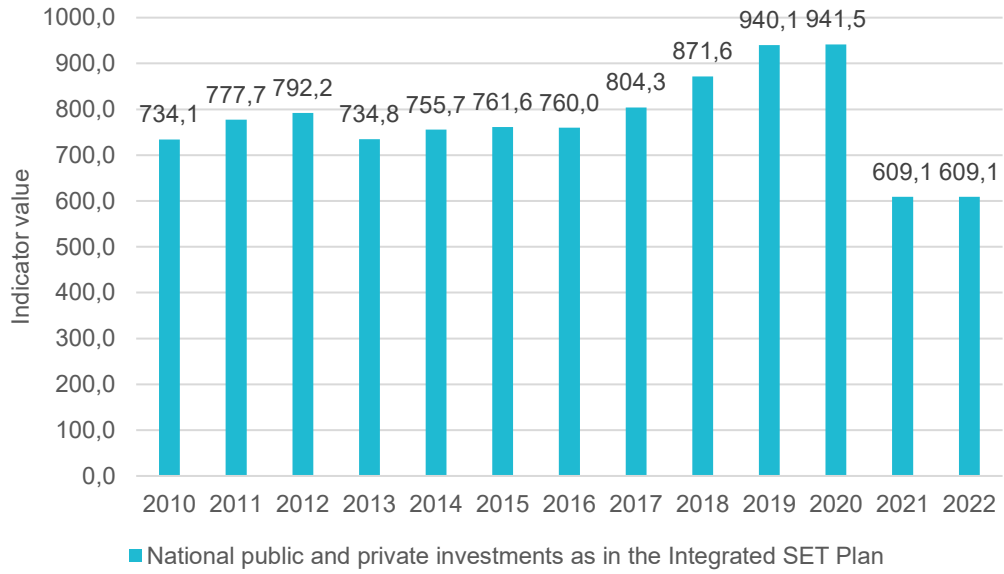


Source: Eurostat, OECD. Calculations by Fraunhofer ISI.

5.1.3 #39 National public and private investments as in the Integrated SET Plan

This indicator measures the national public and private R&I investments (in million Euros) in energy technologies as identified in the Strategic Energy Technology (SET) Plan. The SET Plan, established in 2007, supports the EU's energy and climate goals by advancing low-carbon and energy-efficient technologies, aligning with the Energy Union's research and innovation priorities, and fostering collaboration between National Energy and Climate Plans (NECPs) and SET Plan objectives. Figure 107 shows the evolution of the indicator for the EU average over time. It should be noted that the data reported in 2021 contains only preliminary data, as the data for private investments is still preliminary. Looking at the graph, the indicator shows an increasing trend between 2010 and 2012. While slightly decreasing in 2013, the indicator continues to grow until 2020 reaching 941.5 million Euros. In 2021 (2022 imputed), the value decreases to 609 million Euros, but as mentioned above, this value may change once additional data become available.

Figure 107 National public and private investments as in the Integrated SET Plan, for the EU average over time

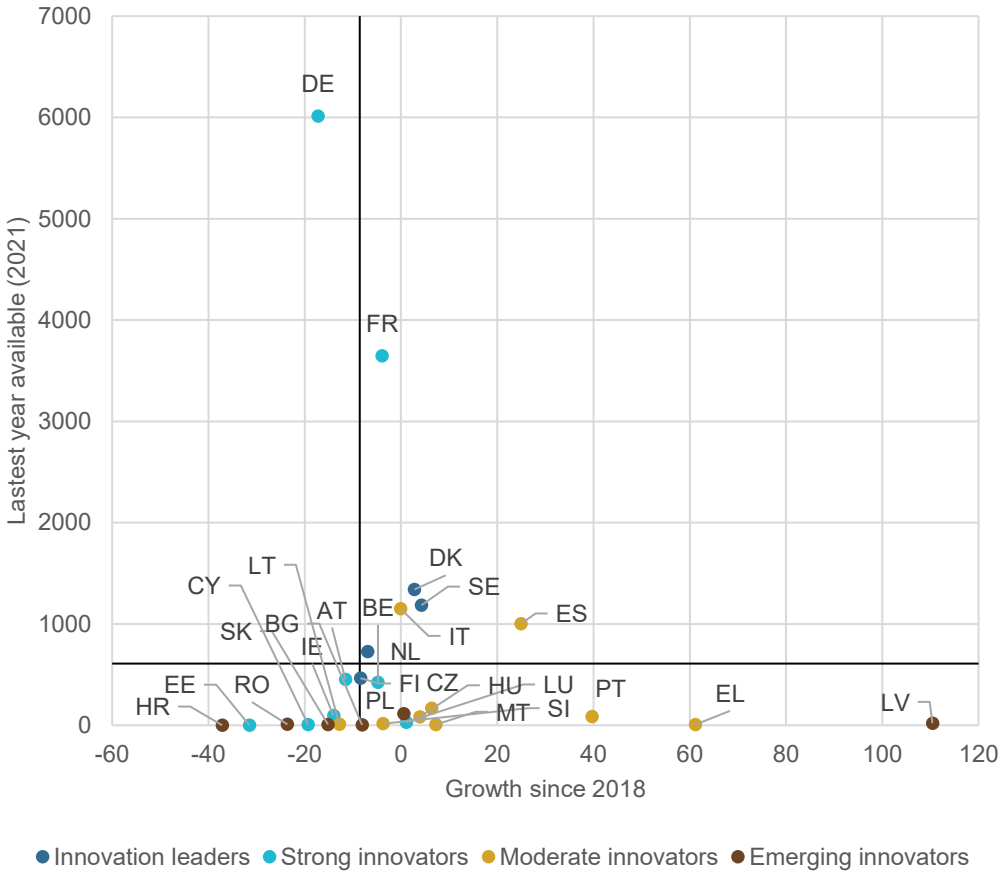


Source: SETIS research and innovation data. Mountraki, A., Georgakaki, A., Ince, E. and Primavera, J. R&I data for SETIS and the State of the Energy Union Report, European Commission 2025, Joint Research Centre (JRC) [Dataset]. http://data.europa.eu/89h/jrc-10115-10001Calculations by Fraunhofer ISI. Note: Data for private investments in 2021 is preliminary, therefore new additional data may become available.

Figure 108 shows the latest available value of the percentage of environmentally related government R&D budget, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. Among these, France, Denmark, Sweden, Spain, Italy, and the Netherlands. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find only Germany. Most of the remaining Member States are however depicted in the lower left quadrant of the graph, indicating both below average growth and below-average indicator value, or in the lower right

quadrant, showing below-average values but above-average growth since 2018. Among the former group, we find Lithuania, Cyprus, Croatia, Austria, among others, while in the latter group we find countries such as Latvia, Portugal, Czechia, and Slovenia.

Figure 108 National public and private investments (in mio Euro) as in the Integrated SET Plan, latest indicator value and change by EU-27 countries

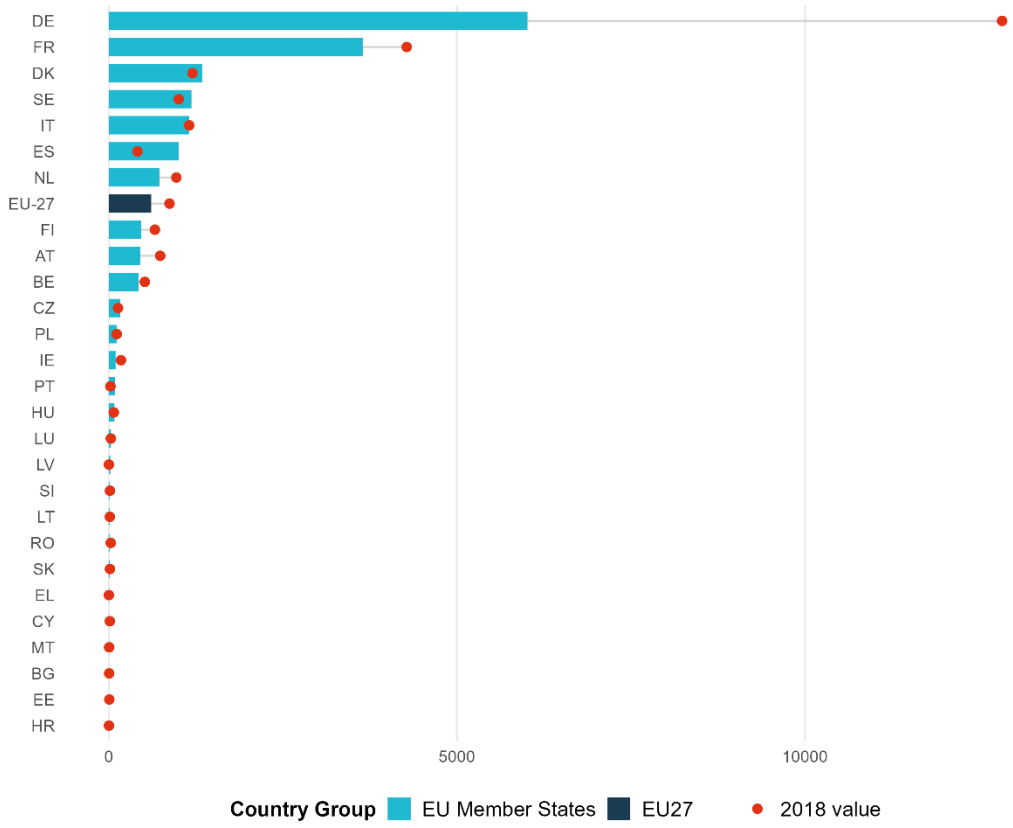


Source: SETIS research and innovation data. Mountraki, A., Georgakaki, A., Ince, E. and Primavera, J. R&I data for SETIS and the State of the Energy Union Report, European Commission 2025, Joint Research Centre (JRC) [Dataset]. http://data.europa.eu/89h/jrc-10115-10001Calculations by Fraunhofer ISI. Note: Data for private investments in 2021 is preliminary, therefore new additional data may become available.

The most recent values for each country are shown in the graph below. The highest values within the EU-27 can be found in Germany, showing indicator values around 6,000 million Euros, followed by France, with a value above 3,000 million Euros. However, there are also Member States that allocated less than 5 million Euro in 2021, namely Bulgaria, Estonia, and Croatia.

Compared to the indicator values in 2018, only Germany shows a much higher value in 2018, while the rest of the countries show no big differences between 2018 and 2021. However, interpretations of these results should be cautious as data reported in 2021 contains only preliminary data for private investments.

Figure 109 National public and private investments as in the Integrated SET Plan, by country for the latest available year and 2018

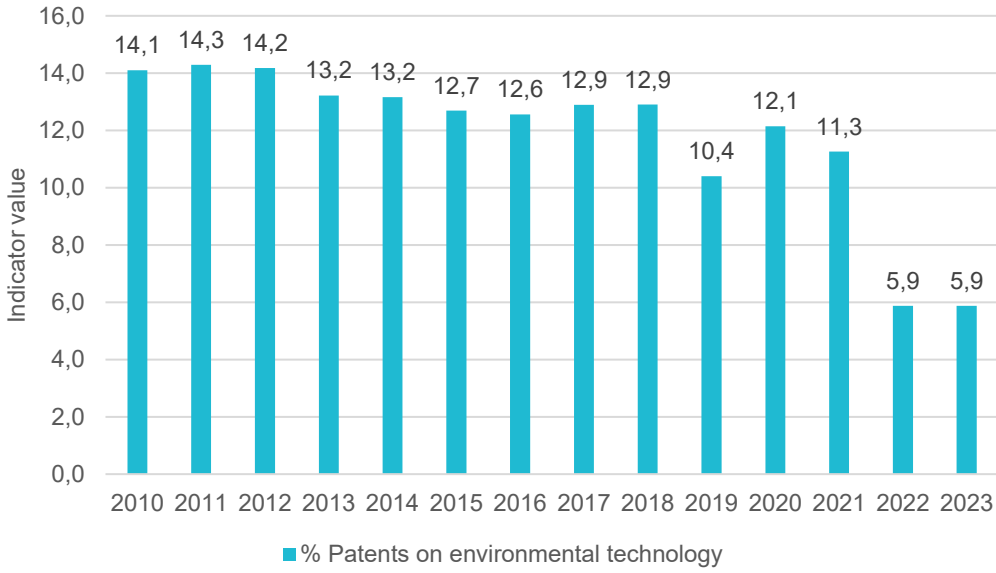


Source: European Commission – SETIS research and innovation data. Calculations by Fraunhofer ISI.

5.1.4 #40 Percentage of patents on environmental technology

This indicator measures the percentage of patents on environmental technology. It reflects the extent to which technologically innovative activities are directed toward solutions that support environmental protection, resource efficiency, and the green transition. Figure 110 shows the trend of the indicator in the EU-27 over time. The indicator is subject to slight fluctuations over time. While remaining around 14% between 2010 and 2012, it lowers around a value of 13% between 2013 to 2014. After slight decreases in 2016 and 2017, the indicator stabilises at 12.9% in 2018. The indicator, however, drops again in 2019 to 10.4%, and goes back to values around 12% and 11% in the following two years. In 2022 (2023 imputed), the indicator shows a big drop to 5.9%.

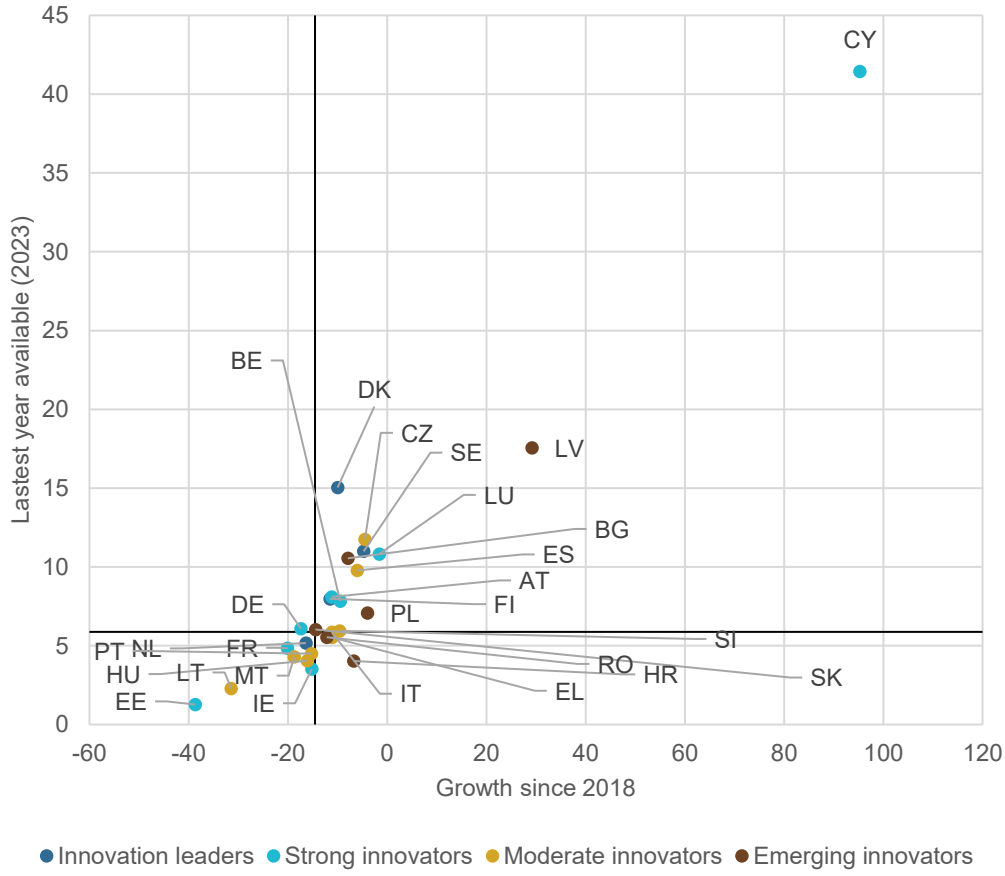
Figure 110 Percentage of patents on environmental technology, for the EU-27 over time



Source: OECD. Calculations by Fraunhofer ISI.

Figure 111 shows the latest available value of the percentage of patents on environmental technology, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. Among these, we find, Cyprus, Latvia, Sweden, Czechia, and Denmark. Germany in the upper left quadrant maintains above-average values but records below-average growth. Most of the Member States, such as Portugal, France, Ireland, and Malta are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The remaining countries, such as Italy, Slovenia, Slovakia, and Croatia can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 111 Percentage of patents on environmental technology, latest indicator value and change by EU-27 countries



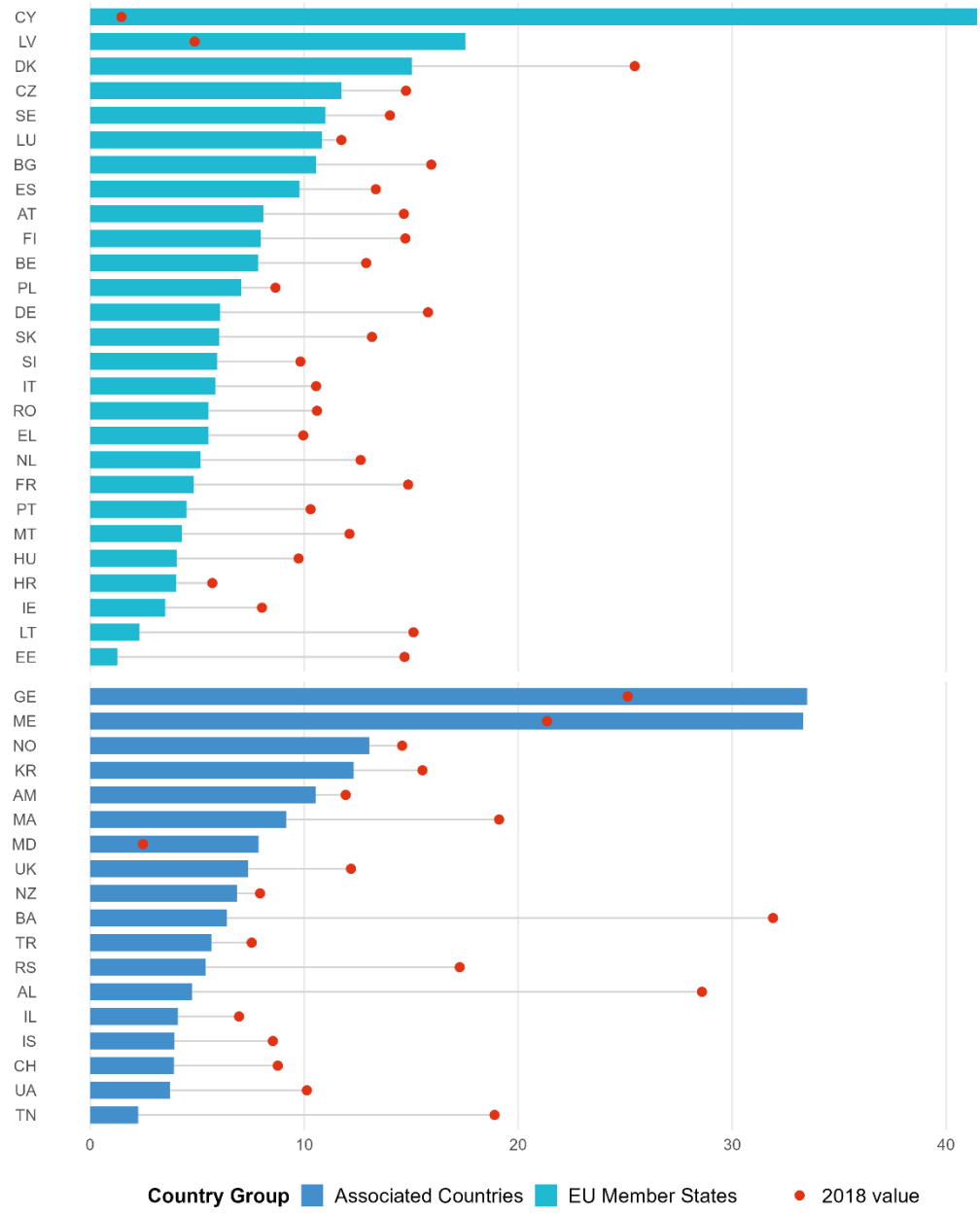
Source: OECD. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest percentage of patents on environmental technology within the EU-27 can be found in Cyprus, showing an indicator value that exceeds 40%, followed by Latvia, Denmark, and Czechia, with values still between 10 and 20%. However, there are also Member States that registered only around 4% of patents on environmental technology in 2023, namely Ireland, Lithuania, and Estonia.

Among the Associated Countries, the highest percentage of patents on environmental technology can be observed in Montenegro and Georgia, with value exceeding 30%, followed by Norway, South Korea, and Armenia.

Compared to the indicator values in 2018, most of the countries in both groups show a lower value in 2023. Few exceptions, showing much lower values in 2018, are Cyprus, Latvia, and Moldova.

Figure 112 Percentage of patents on environmental technology, by country for the latest available year and 2018



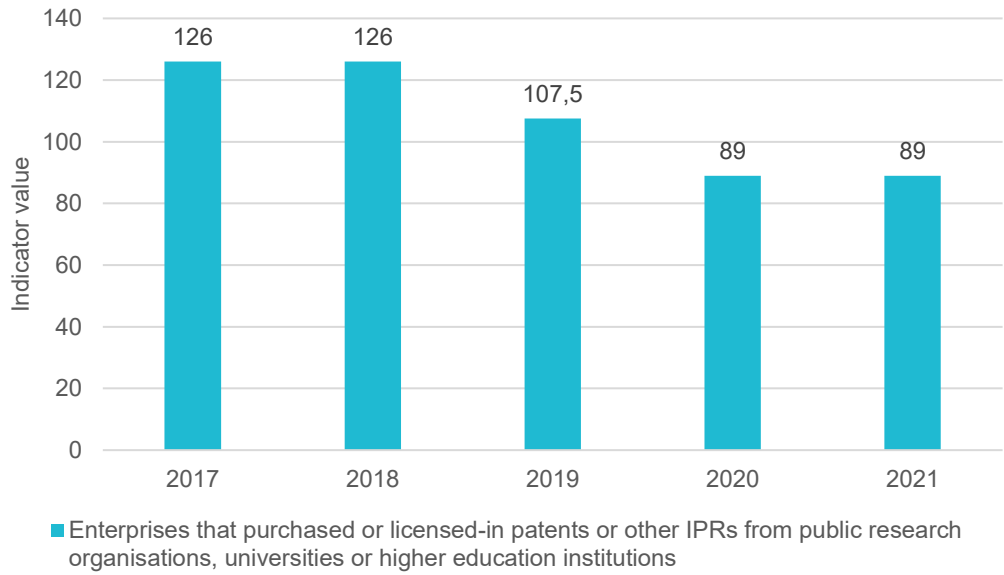
Source: OECD. Calculations by Fraunhofer ISI.

5.2 Sub-priority 2.2: Synergies with education and the European Skills Agenda

5.2.1 #41 Enterprises that purchased or licensed-in patents or other IPRs from public research organisations, universities or higher education institutions

This indicator measures the number of enterprises that purchased or licensed-in patents or other Intellectual Property Rights (IPRs) from PROs, universities or HEIs. Figure 113 shows the evolution of the indicator for the EU average over time. This indicator is only available for 2018 and 2020, and the values for the other years have been imputed. The graph shows a decrease in the number of enterprises that purchased or licensed-in patents or other IPRs from PROs, universities or HEIs, going from 126 in 2018, to 89 in 2020.

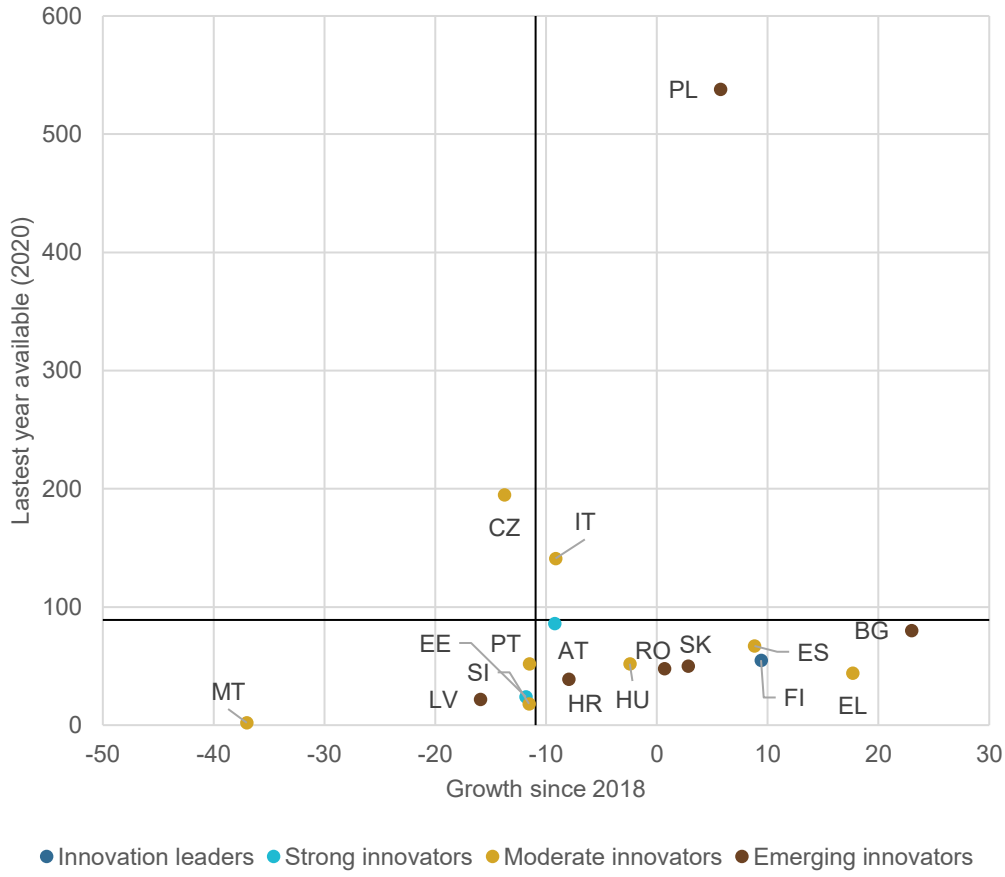
Figure 113 Enterprises that purchased or licensed-in patents or other IPRs from public research organisations, universities or higher education institutions, for the EU average over time



Source: Eurostat: Community Innovation Survey. Calculations by Fraunhofer ISI. Note: the indicator is based on the 2018 and 2020 CIS waves. The latest 2022 CIS does not contain this variable.

Figure 114 shows the latest available value of the number of enterprises that purchased or licensed-in patents or other IPRs from PROs, universities or HEIs, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These are Italy and Poland. Czechia in the upper left quadrant maintains above-average values but records below-average growth. Most of the Member States, such as Malta, Portugal, Slovenia, and Estonia are depicted in the lower left quadrant of the graph, indicating both below average growth and below-average indicator value, or in the lower right quadrant, showing below-average values but above-average growth since 2018, such as Austria, Croatia, Bulgaria, and Finland.

Figure 114 Enterprises that purchased or licensed-in patents or other IPRs from public research organisations, universities or higher education institutions, latest indicator value and change by EU-27 countries

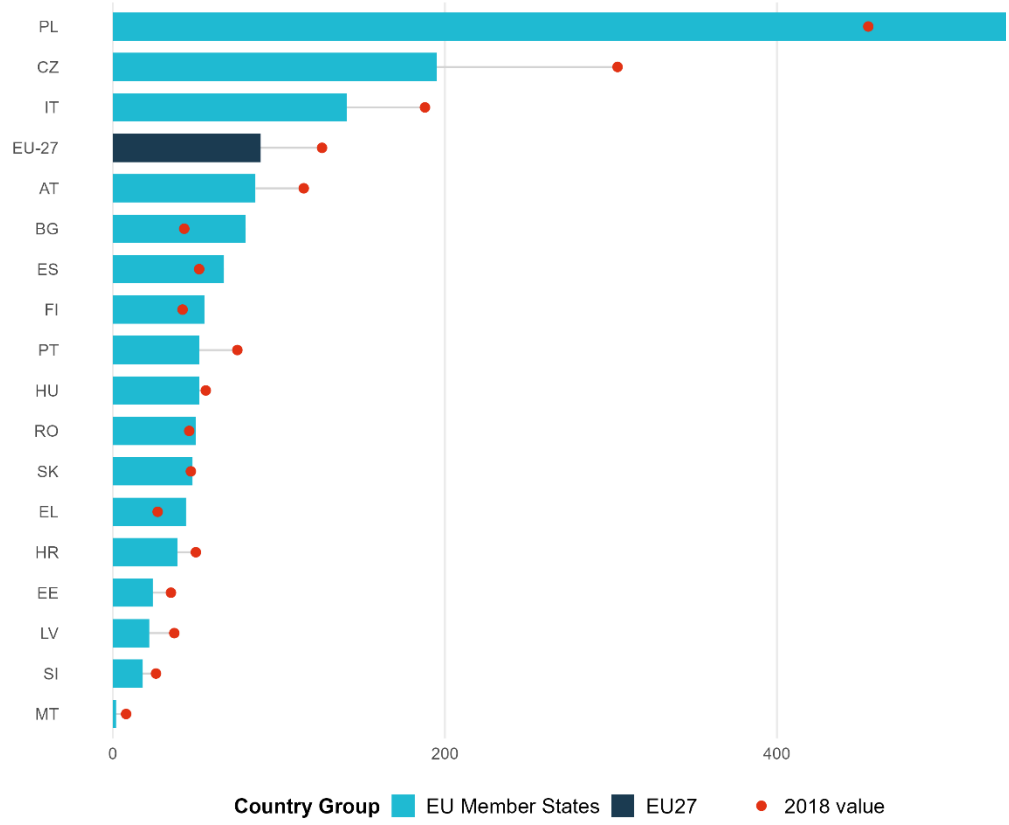


Source: Eurostat: Community Innovation Survey. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest number of enterprises within the EU-27 can be found in Poland, showing indicator values exceeding 450, followed by Czechia and Italy. However, there are also Member States that registered lower values, less than 10 in 2020, namely Malta. Values of the indicator for the Associated Countries are not available.

Compared to the indicator values in 2018, most of the countries show either no big differences or higher values. Few exceptions, showing higher values in 2023, are Poland and Bulgaria.

Figure 115 Enterprises that purchased or licensed-in patents or other IPRs from public research organisations, universities or higher education institutions, by country for the latest available year and 2018

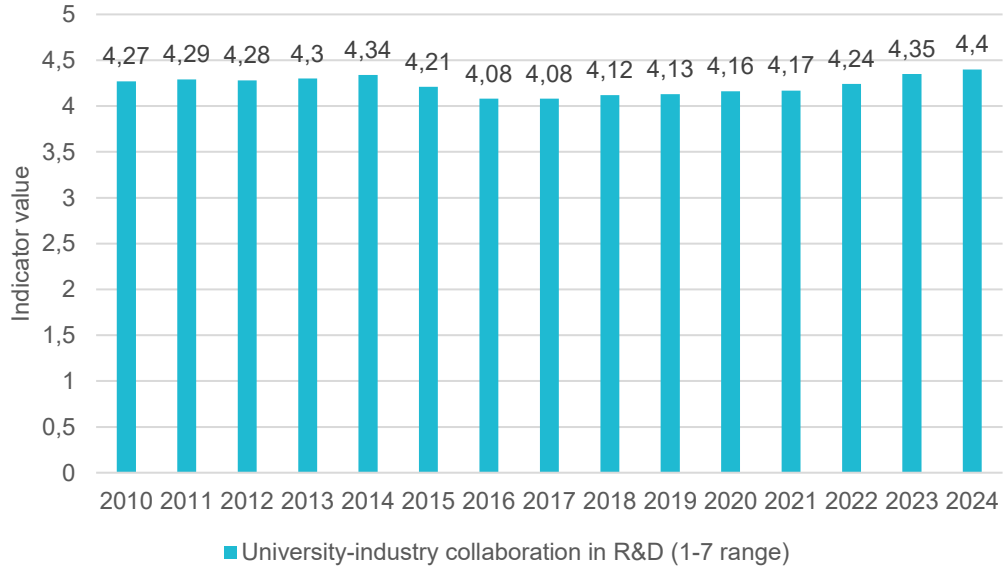


Source: Eurostat: Community Innovation Survey. Calculations by Fraunhofer ISI.

5.2.2 #42 University-industry R&D collaboration

The indicator measures the university-industry collaboration in R&D. The indicator is measured on a scale from 1 to 7, where 1 corresponds to no collaboration in R&D at all, and 7 that the country is collaborating extensively. Figure 116 shows the indicator values for the EU-27 over time. The indicator followed an increasing path between 2010 to 2014, with values around 4.3. Since 2015 until 2017, the values slightly decrease to a value of 4. Since 2018, the indicator started increasing again, reaching 4.4 in 2024.

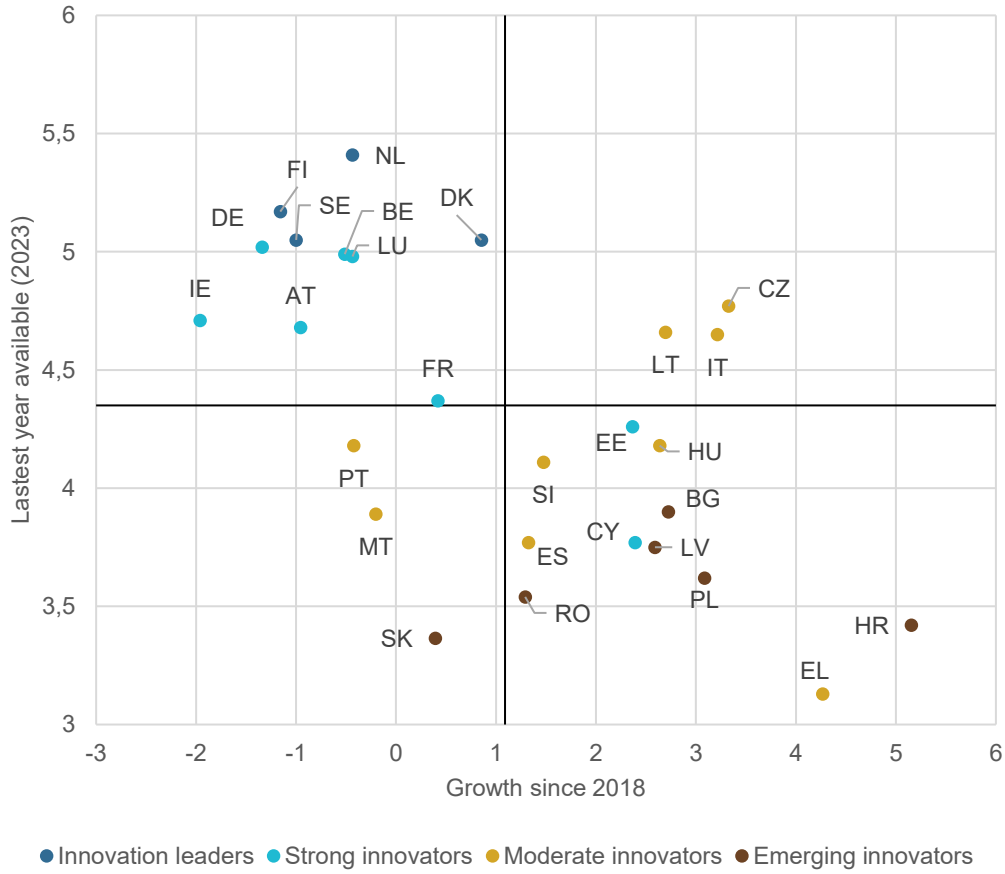
Figure 116 University-industry R&D collaboration, for the EU-27 over time



Source: World Economic Forum, Executive Opinion Survey

Figure 117 shows the latest available value of the university-industry collaboration in R&D, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Czechia, Italy, and Lithuania. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find all innovation leaders, and most of the strong innovators. Poland, Malta, and Slovakia are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The remaining countries, such as Croatia, Estonia, Cyprus, Bulgaria, and Latvia can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 117 University-industry R&D collaboration, latest indicator value and change by EU-27 countries



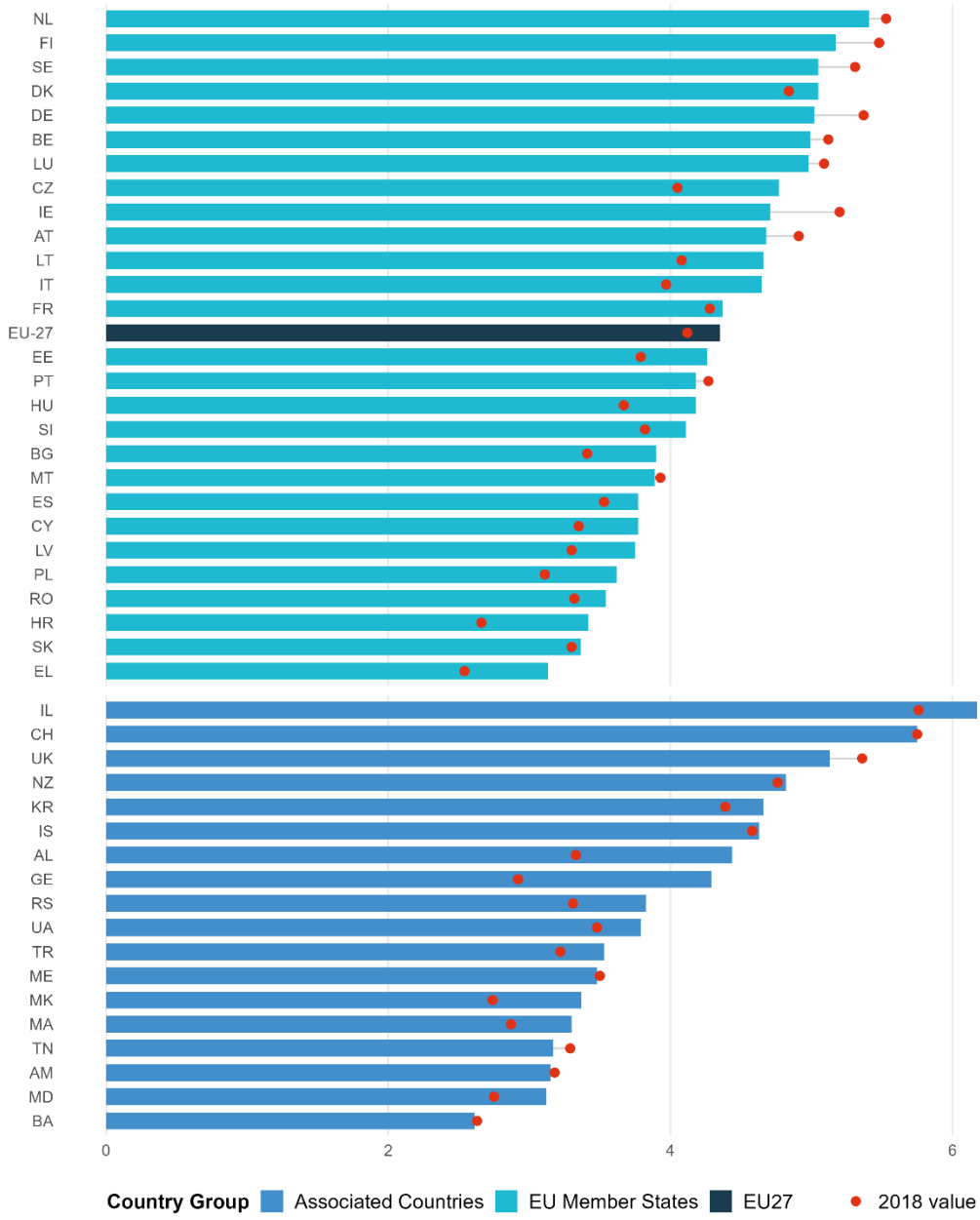
Source: World Economic Forum, Executive Opinion Survey

The most recent values for each country are shown in the graph below. The highest value for university-industry &D collaboration within the EU-27 can be found in the Netherland, Finland, Sweden Denmark, and Germany, all showing an indicator above 5, followed by Belgium and Luxembourg.

Among the Associated Countries, the highest value can be observed in Israel, with a value above 6, followed by Switzerland and the United Kingdom, with values above 5.

Compared to the indicator values in 2018, most of the countries in both groups show either a higher value in 2023, or no big differences between the two years. Few exceptions, showing slightly higher values in 2018, are Germany, Ireland, and Finland.

Figure 118 University-industry R&D collaboration, by country for the latest available year and 2018

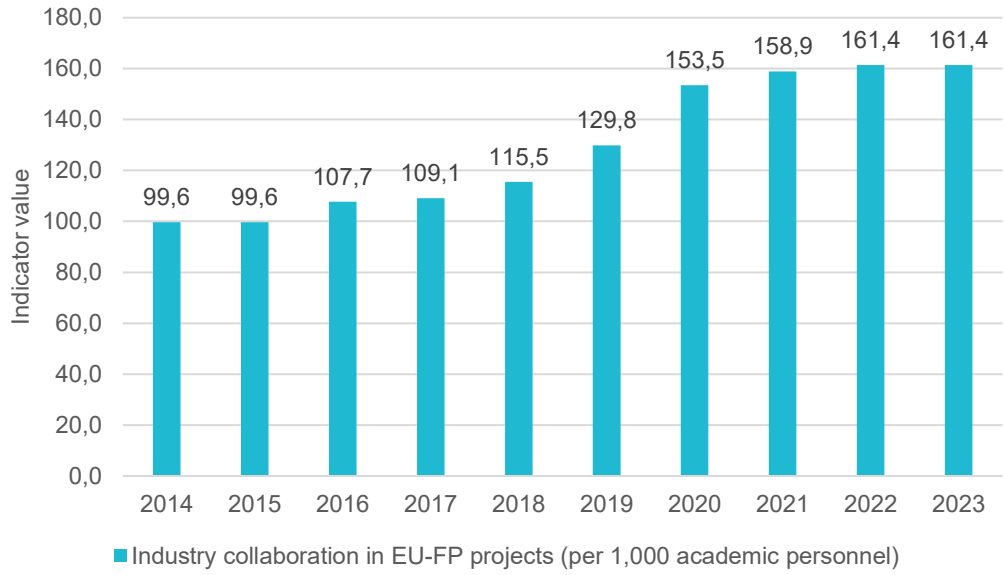


Source: World Economic Forum, Executive Opinion Survey

5.2.3 #43 Industry collaboration in EU-FP projects (per 1,000 academic personnel)

The indicator measures the number of collaborations of higher education institutions with industry partners in projects funded by the EU Framework Programme for Research and Innovation, per 1,000 academic personnel (in headcounts) in the country. Figure 119 shows the indicator values for the EU-27 over time. The indicator followed an increasing path between 2014 and 2023, starting with a value of 99.6, reaching 161.4 in 2023.

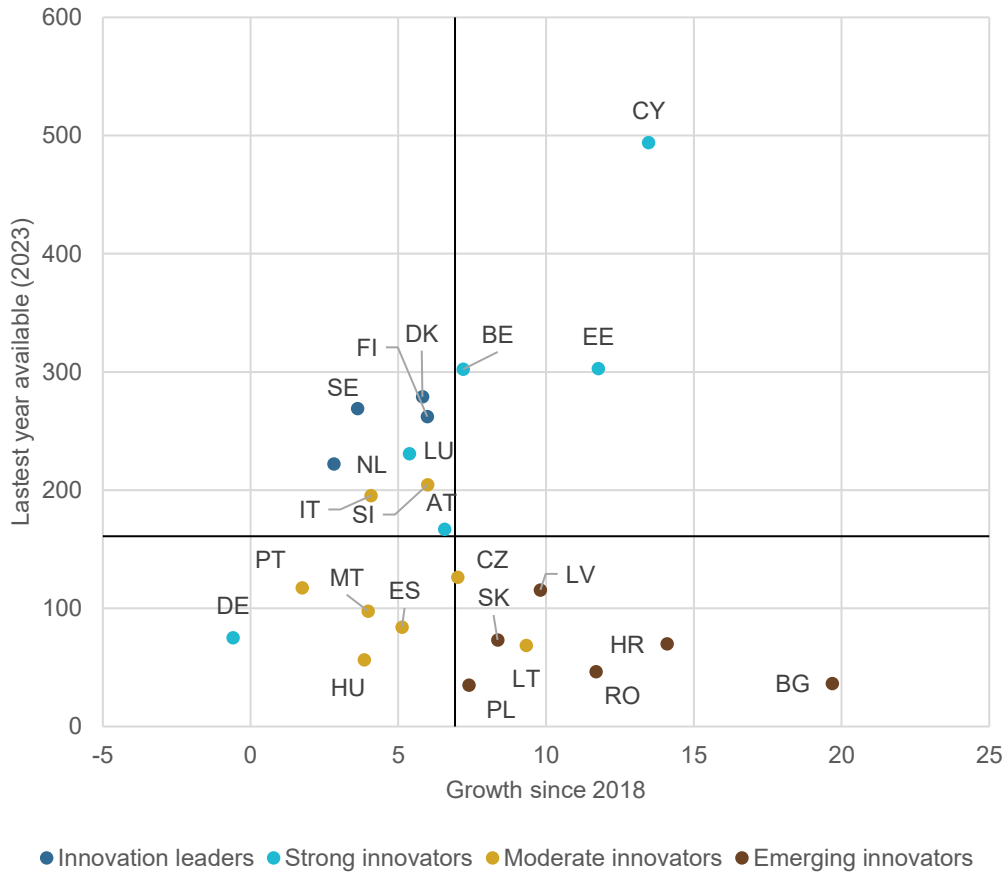
Figure 119 Industry collaboration in EU-FP projects (per 1,000 academic personnel), for the EU-27 over time



Source: European Higher Education Sector Scoreboard (EHESS). Calculations by Fraunhofer ISI.

Figure 120 shows the latest available value of the industry collaboration in EU-FP projects, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Cyprus, Belgium, and Estonia. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find all innovation leaders, Austria, Luxembourg, Italy, and Slovenia. Portugal, Malta, Germany, Spain, and Hungary are listed in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The remaining countries, such as Croatia, Czechia, Bulgaria (outstanding high growth rate), Romania, and Lithuania can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 120 Industry collaboration in EU-FP projects (per 1,000 academic personnel), latest indicator value and change by EU-27 countries



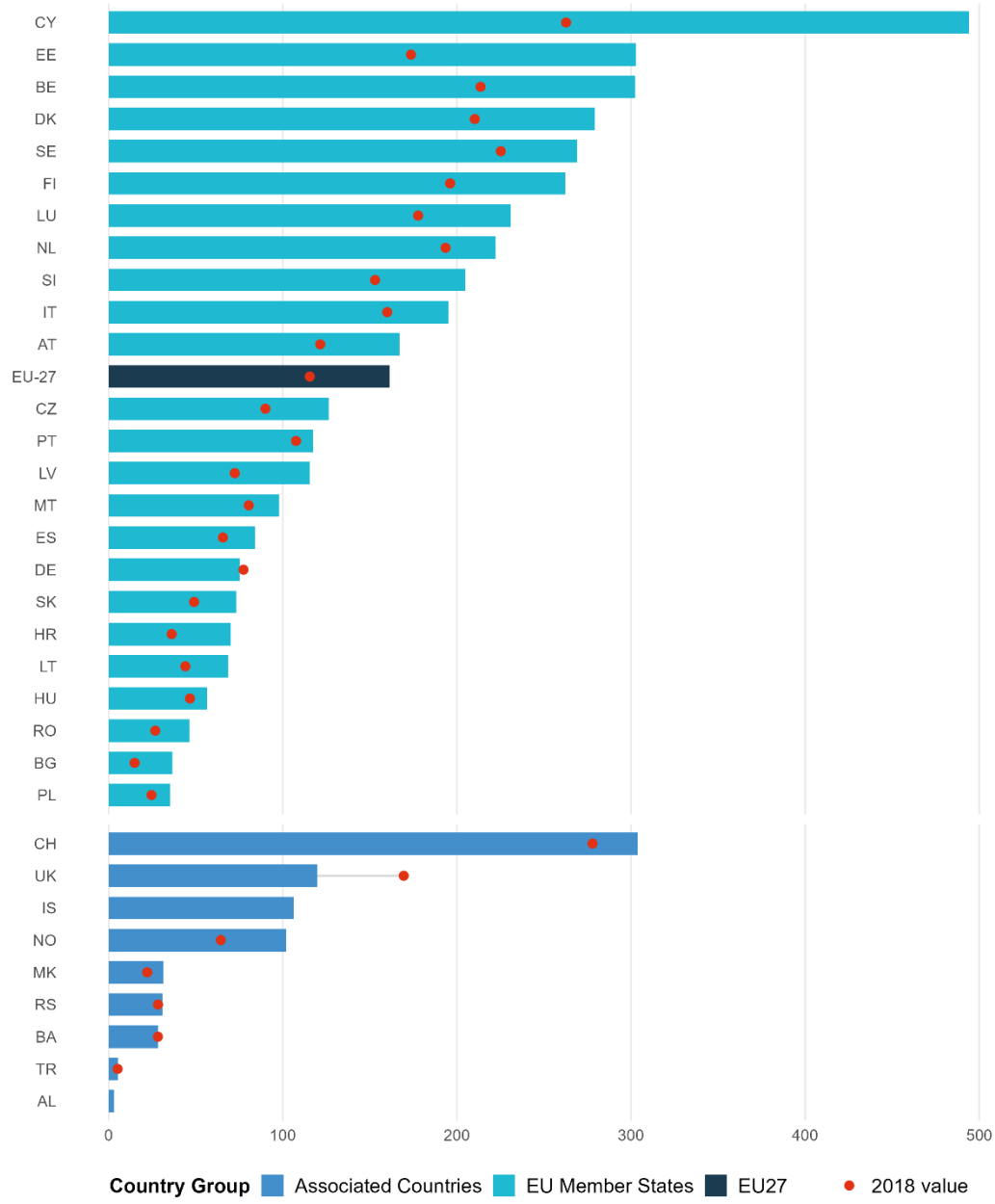
Source: European Higher Education Sector Scoreboard (EHESS). Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest value for industry collaboration in EU-FP projects (per 1,000 academic personnel) within the EU-27 can be found in Cyprus, showing an indicator very close to 500, followed by Estonia, and Belgium, with values slightly above 300. Countries at the lower end (e.g., Poland, Bulgaria, Croatia, Romania) show nevertheless growth rates.

Among the Associated Countries, the highest value can be observed in Switzerland, with a value slightly above 300, followed by the United Kingdom, Iceland, and Norway with values above 100.

Compared to the indicator values in 2018, with the only exception of the UK, all the countries in both groups show either a higher value in 2023, or no big differences between the two years.

Figure 121 Industry collaboration in EU-FP projects (per 1,000 academic personnel), by country for the latest available year and 2018



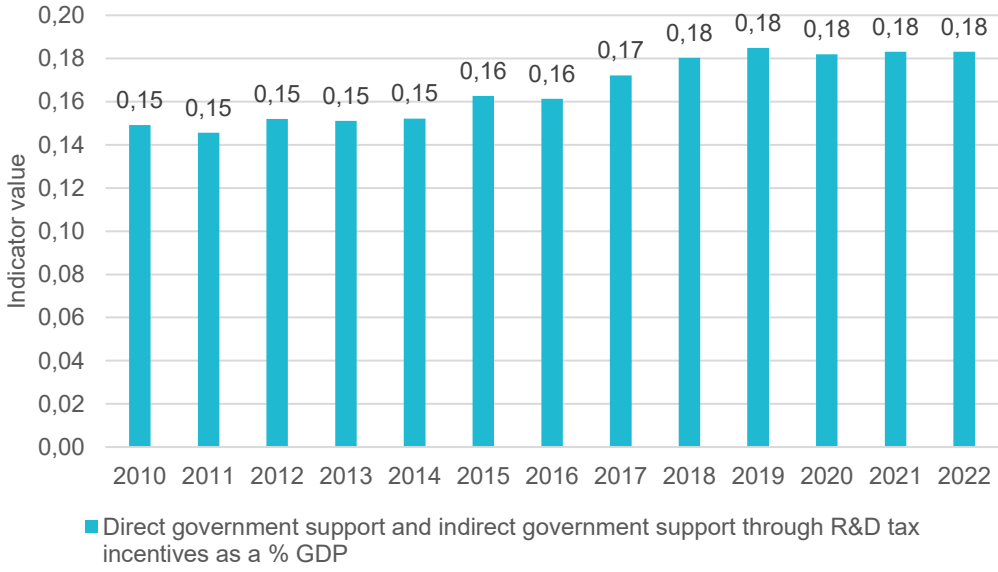
Source: European Higher Education Sector Scoreboard (EHESS). Calculations by Fraunhofer ISI.

5.3 Sub-priority 2.3: Synergies with sectorial policies and industrial policy, in order to boost innovation ecosystems

5.3.1 #44 Direct government support and indirect government support through R&D tax incentives as a percentage of GDP

This indicator measures the level of direct and indirect government support for R&D through tax incentives, expressed as a percentage of GDP. The development of this indicator over time for the EU-27 is presented in Figure 122. Since 2010 the indicator value has slightly increased from 0.15% to 0.18%.

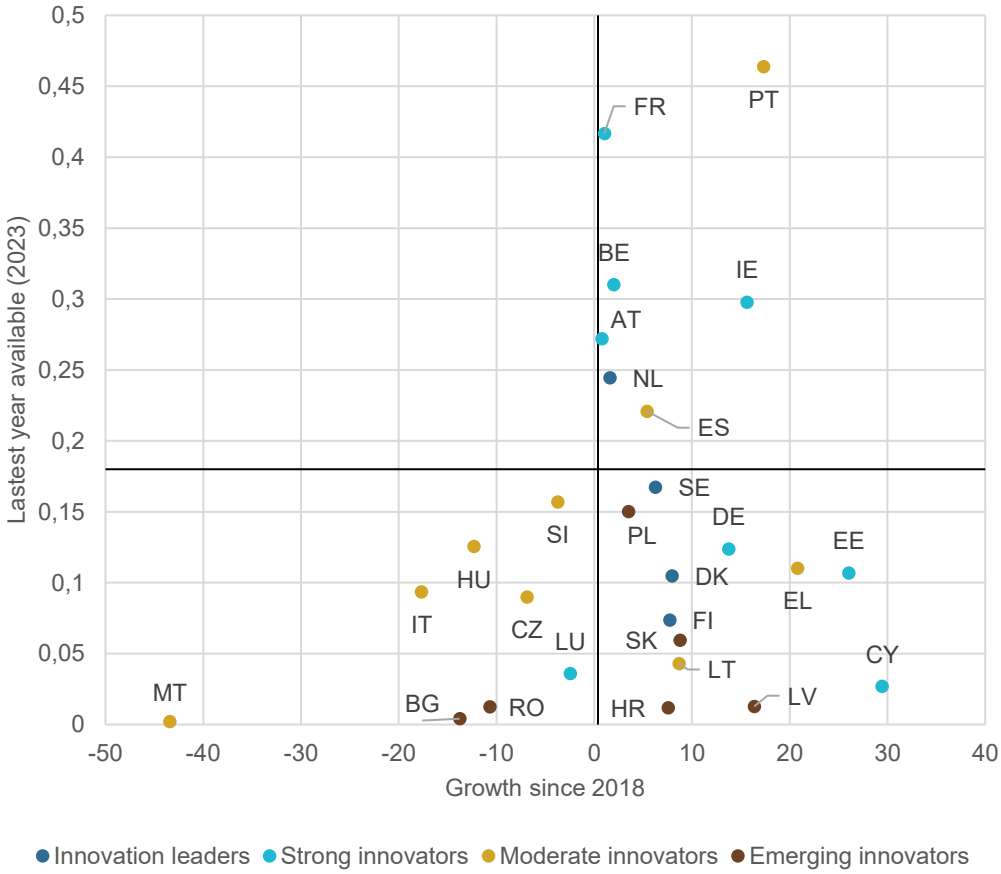
Figure 122 Direct government support and indirect government support through R&D tax incentives as a percentage of GDP, for the EU-27 over time



Source: OECD, Eurostat. Calculations by Fraunhofer ISI.

Figure 123 shows the latest available value of direct and indirect government support for R&D through tax incentives, expressed as a percentage of GDP, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include France, Portugal, Ireland, Austria, Belgium, the Netherlands, and Spain. No countries can be found in the upper left quadrant. Slovenia, Malta, Hungary, Czechia, Italy, Luxembourg, Romania, and Bulgaria are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. 12 Member States can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 123 Direct government support and indirect government support through R&D tax incentives as a percentage of GDP, latest indicator value and change by EU-27 countries



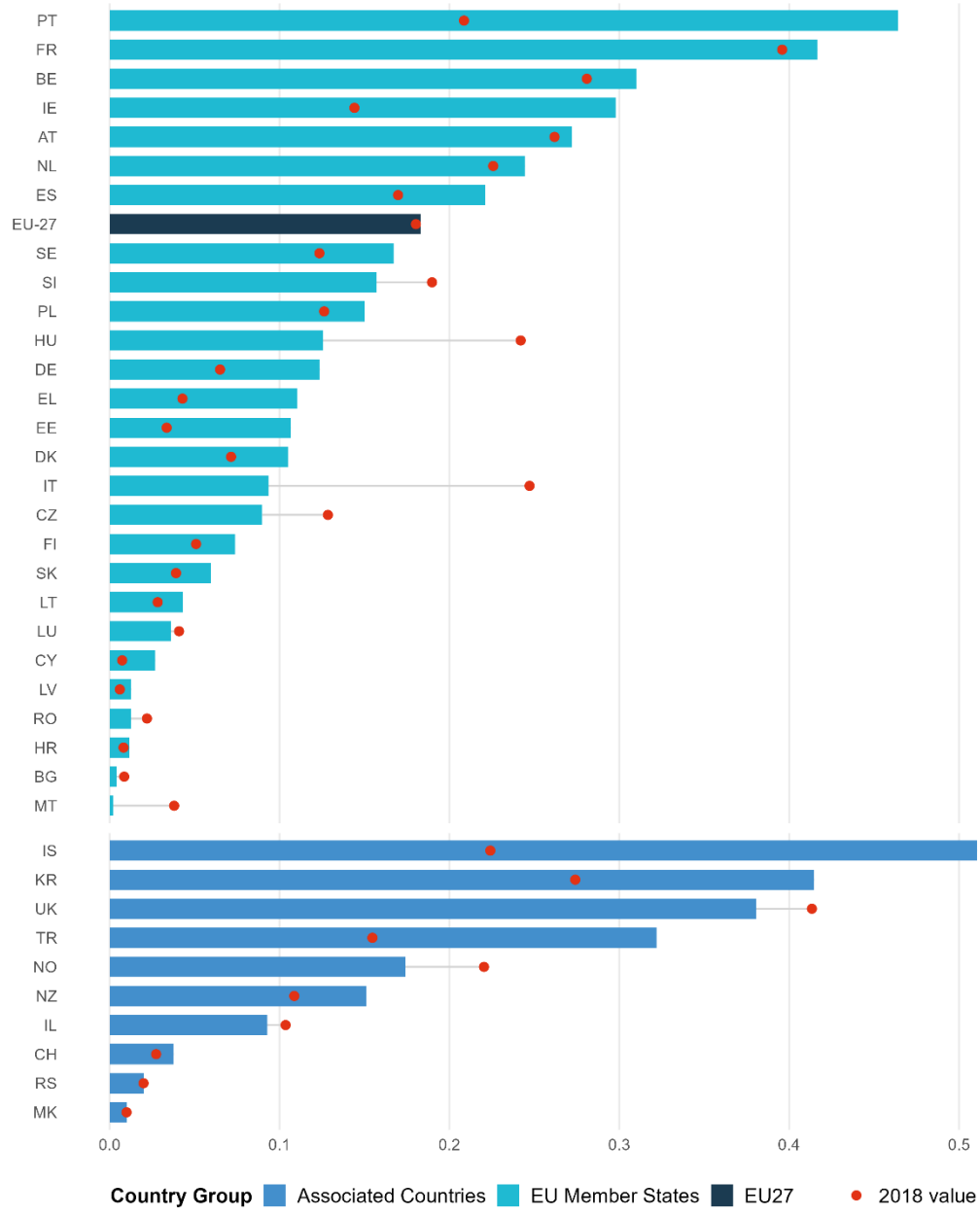
Source: OECD, Eurostat. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest value for direct and indirect government support for R&D through tax incentives, expressed as a percentage of GDP within the EU-27 can be found in Portugal and France, showing indicator values above 0.4%, followed by Belgium and Ireland with values around 0.3%.

Among the Associated Countries, the highest value can be observed in Iceland, with a value slightly above 0.5%, followed by South Korea and the United Kingdom, with values around 0.4%.

Compared to the indicator values in 2018, most of the countries in both groups show a higher value in 2023, or no big differences between the two years. Few countries show much higher values in 2018, such as Hungary, Italy, and Norway.

Figure 124 Direct government support and indirect government support through R&D tax incentives as a percentage of GDP, by country for the latest available year and 2018

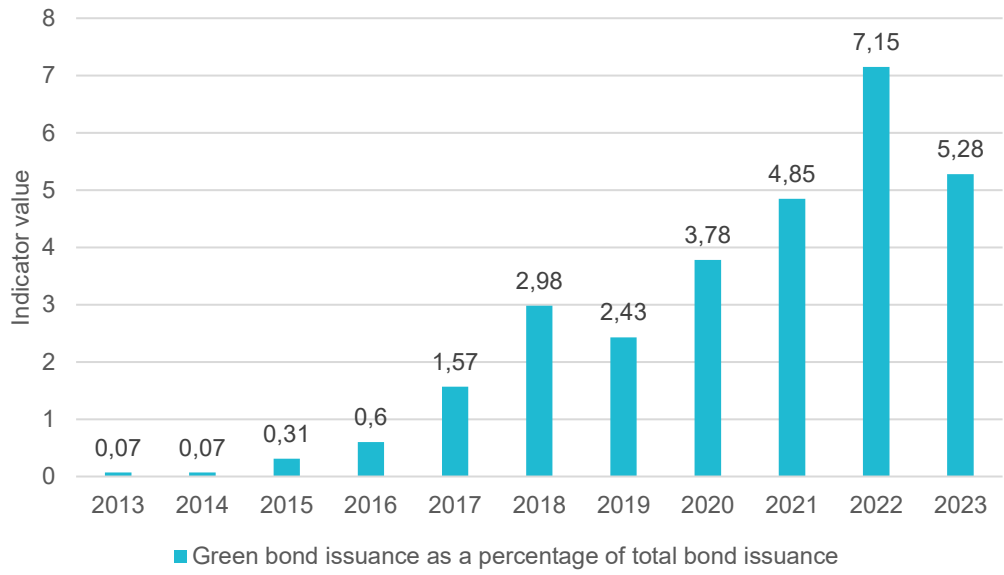


Source: OECD, Eurostat. Calculations by Fraunhofer ISI.

5.3.2 #45 Green bond issuance as a percentage of total bond issuance

This indicator measures the share of green bond issued as a percentage of total bond issuance in a country. It reflects the commitment to sustainable financing and investment in environmentally friendly projects. Figure 125 shows the evolution of the indicator for the EU-27 over time. The graph below shows an increasing path from 2013 to 2022, although with a slight decline in 2018, reaching 7.15% in 2022. In 2023, the indicator shows a significant drop to 5.28%.

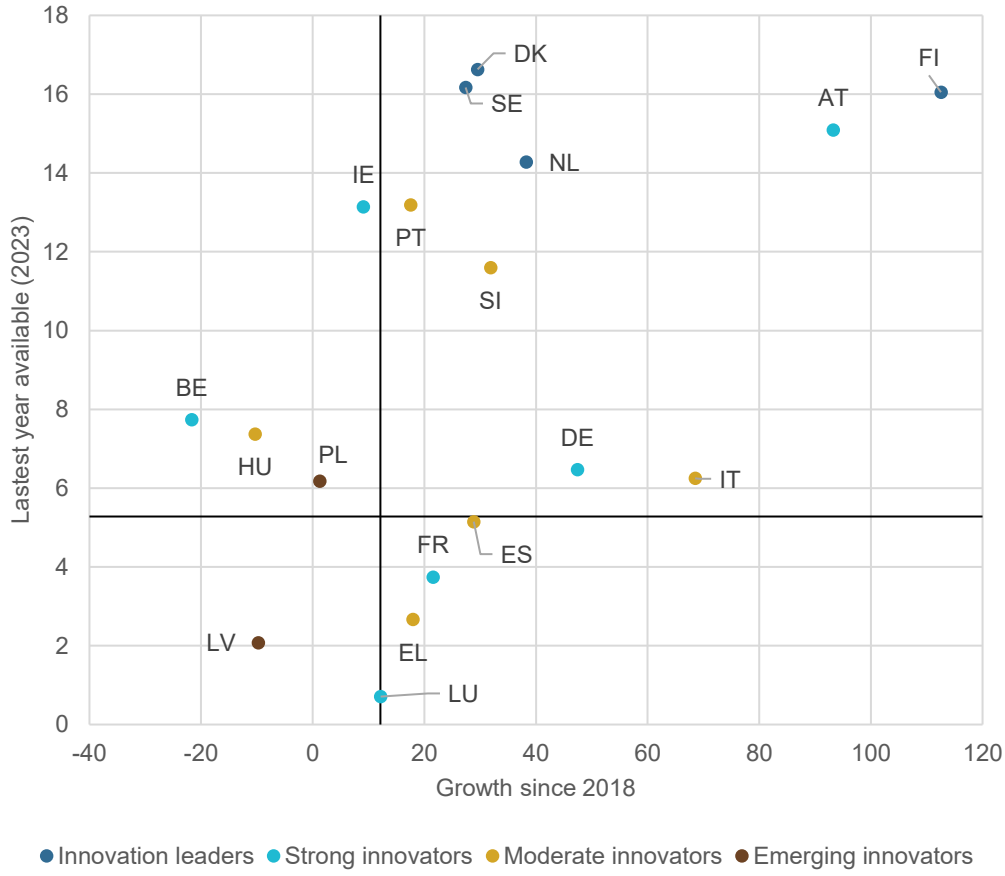
Figure 125 Green bond issuance as a percentage of total bond issuance, for the EU-27 over time



Source: Eurostat. Calculations by Fraunhofer ISI

Figure 126 shows the latest available value of share of green bond issued as a percentage of total bond issuance, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include all innovation leaders, Germany, Italy, Slovenia, among others. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Belgium, Ireland, Poland, and Hungary. Only Latvia is depicted in the lower left quadrant of the graph, indicating both below average growth and a lower-than-EU-27 average indicator value. Spain, France, Greece, and Luxembourg can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 126 Green bond issuance as a percentage of total bond issuance, latest indicator value and change by EU-27 countries

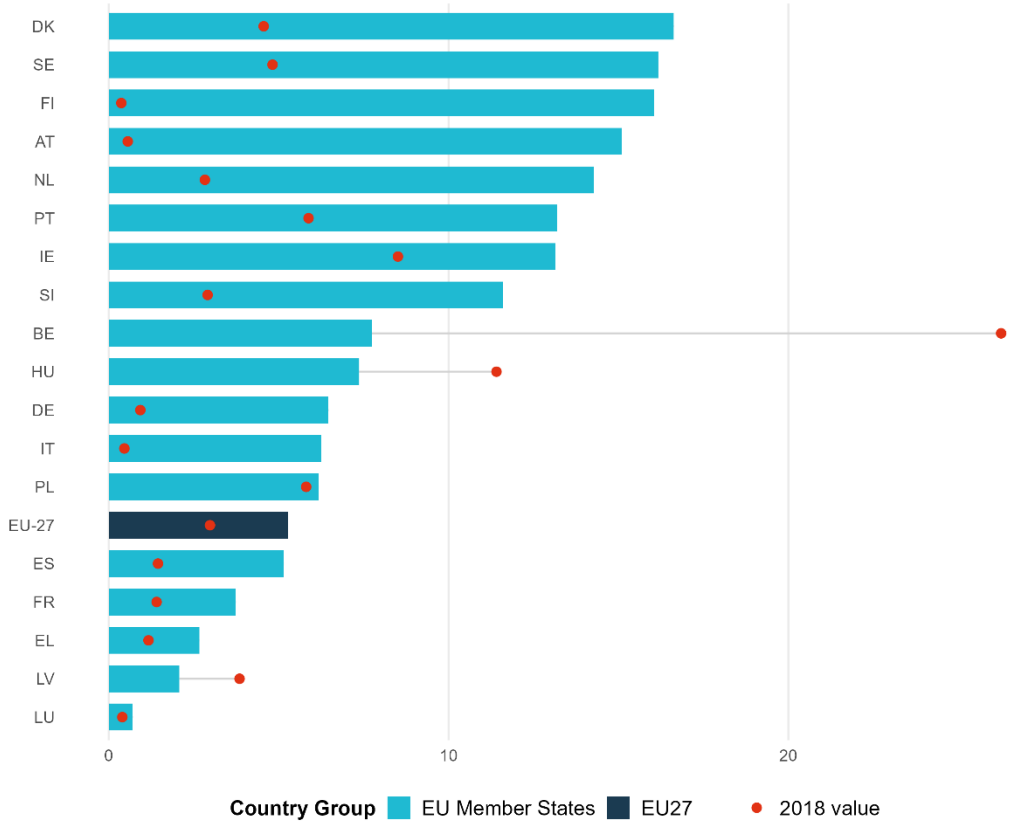


Source: Eurostat. Calculations by Fraunhofer ISI

The most recent values for each country are shown in the graph below. The highest green bond percentage within the EU-27 can be found in Denmark, Sweden, and Finland, showing indicator values that exceed 16%, followed by Austria, the Netherlands, and Portugal. The lowest value below 1% is registered by Luxembourg. Values of the indicator for the Associated Countries are not available.

This indicator is particularly subject to significant fluctuations. Compared to the indicator values in 2018, most of the countries in both groups show a higher value in 2023, or no big differences between the two years. Few countries show much higher values in 2018, such as Belgium and Hungary.

Figure 127 Green bond issuance as a percentage of total bond issuance, by country for the latest available year and 2018

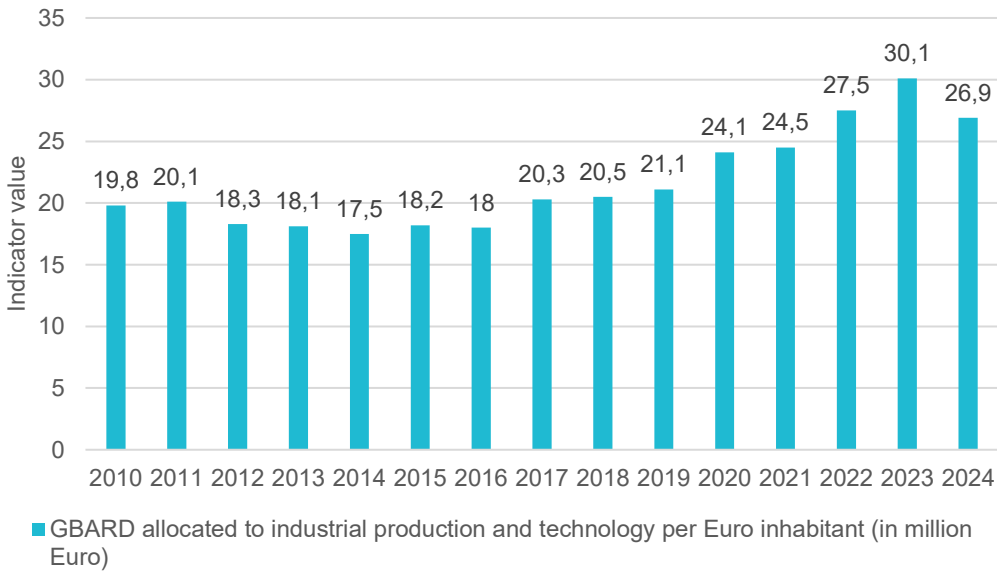


Source: Eurostat. Calculations by Fraunhofer ISI

5.3.3 #46 GBARD allocated to industrial production and technology per inhabitant (in Million Euro)

This indicator measures the Government budget allocated to R&D (GBARD), specific to industrial production and technology, and relative to the size of the population. The values are presented in million Euro per inhabitant. Figure 128 shows the evolution of the indicator for the EU-27 over time. Though from 2010 to 2011 the value increased, a slightly declining trend is observed between 2012 to 2016 with values being around 18 million Euro. Since 2017, the indicator increases year by year, reaching 30.1 million Euro in 2023, while dropping back to 26.9 million Euro in 2024.

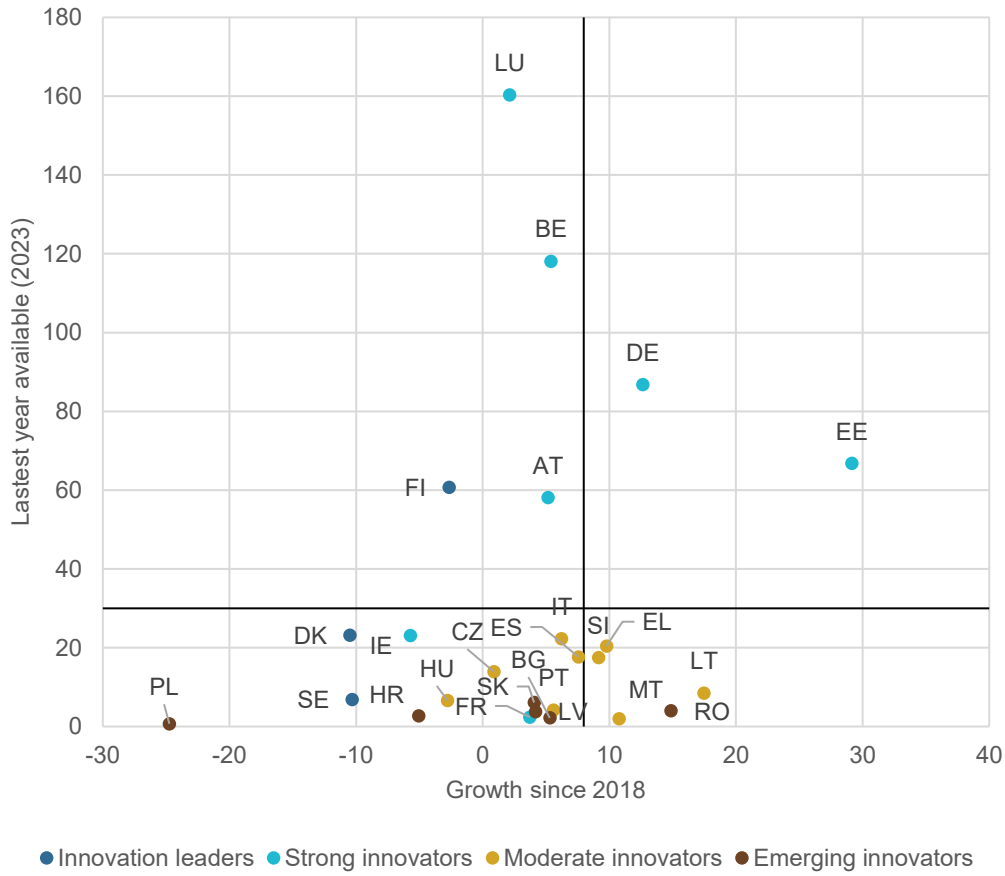
Figure 128 GBARD allocated to industrial production and technology per inhabitant (in million Euro), for the EU-27 over time



Source: Eurostat. Calculations by Fraunhofer ISI

Figure 129 shows the latest available value of the GBARD allocated to industrial production and technology per inhabitant (in Million Euro), compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Germany and Estonia in the upper-right quadrant combine above-average values with above-average growth since 2018. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Belgium, Luxembourg, Austria, and Finland. Most of the Member States are placed in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. Greece, Slovenia, Malta, Lithuania, and Romania can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 129 GBARD allocated to industrial production and technology per Euro inhabitant (in million Euro), latest indicator value and change by EU-27 countries



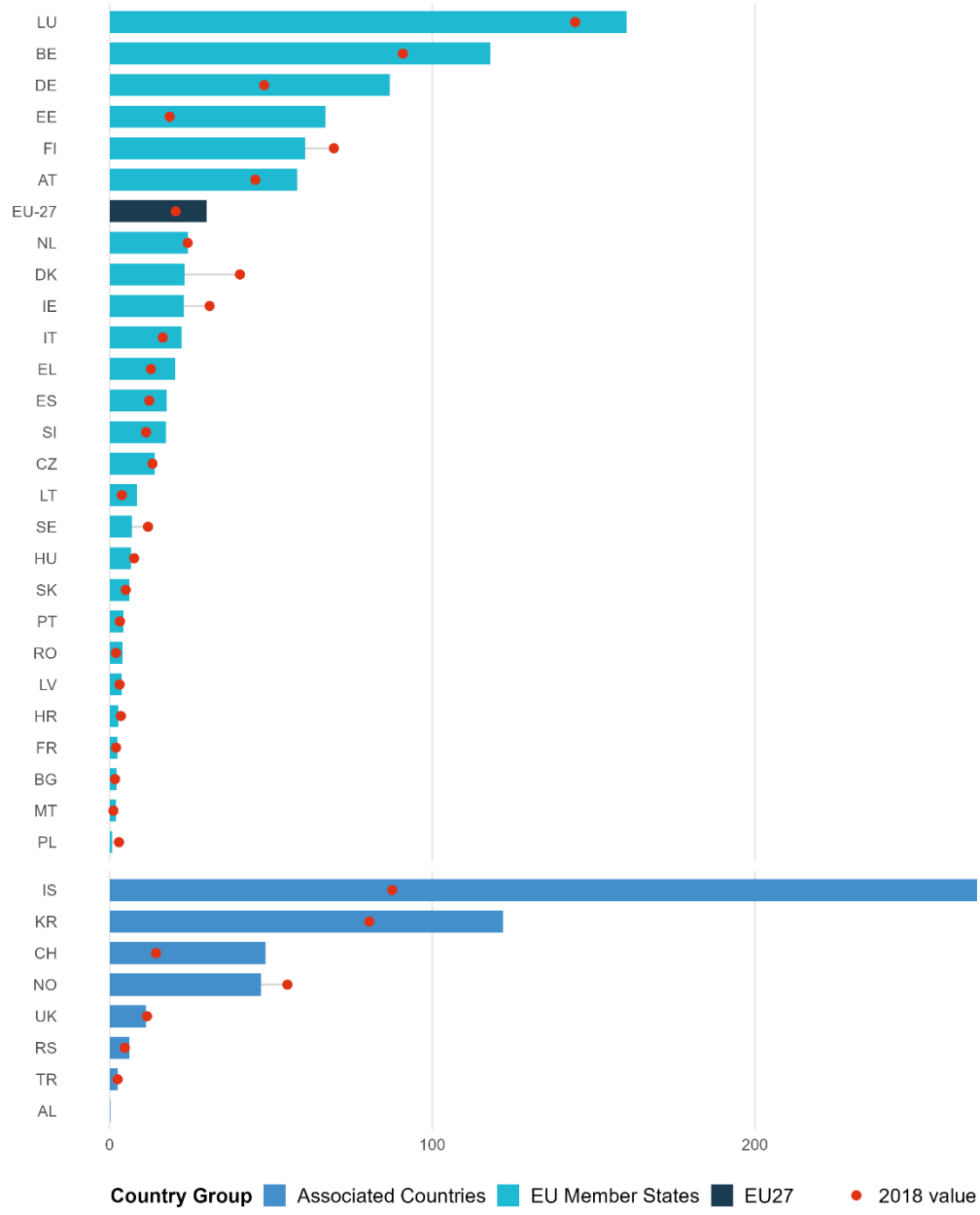
Source: Eurostat. Calculations by Fraunhofer ISI

The most recent values for each country are shown in the graph below. The highest value of GBARD allocated to industrial production and technology per inhabitant (in Million Euro) within the EU-27 can be found in Luxembourg and Belgium, showing indicator values above 100 million Euro per inhabitant, followed by German and Estonia. The lowest values, below 3 million Euro per inhabitant can be observed in Croatia, France, Bulgaria, Malta, and Poland.

Among the few Associated Countries for which data is available, the highest value can be observed in Iceland, with a value slightly above 250 million Euro, followed by South Korea, with a value above 100 million Euro.

Compared to the indicator values in 2018, most of the countries in both groups show either a higher value in 2023, or no big differences between the two years. Higher values can be noted in Germany, Iceland, South Korea, and Switzerland.

Figure 130 GBARD allocated to industrial production and technology per Euro inhabitant (in million Euro), by country for the latest available year and 2018



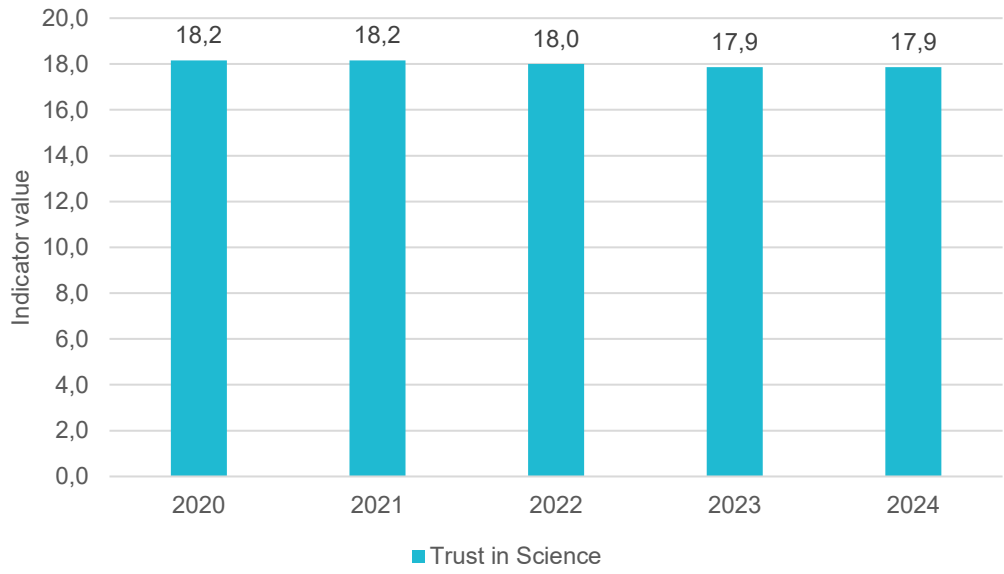
Source: Eurostat. Calculations by Fraunhofer ISI

5.4 Sub-priority 2.4: An active citizen and societal engagement in R&I in all its dimensions

5.4.1 #47 Trust in Science

This indicator measures the share of respondents who expressed trust in science, relative to the total number of respondents.[24] The indicator collects responses from the Eurobarometer 95.2 for the year 2021, while it collects responses from Eurobarometer SP557 (102.1) for the year 2024. The evolution of the responses towards trust in science for the EU-27 average is shown in Figure 131. The share of respondents who expressed trust in science slightly decreased from 18.2% in 2021 to 17.9% in 2024.

Figure 131 Trust in Science, for the EU-27 average over time



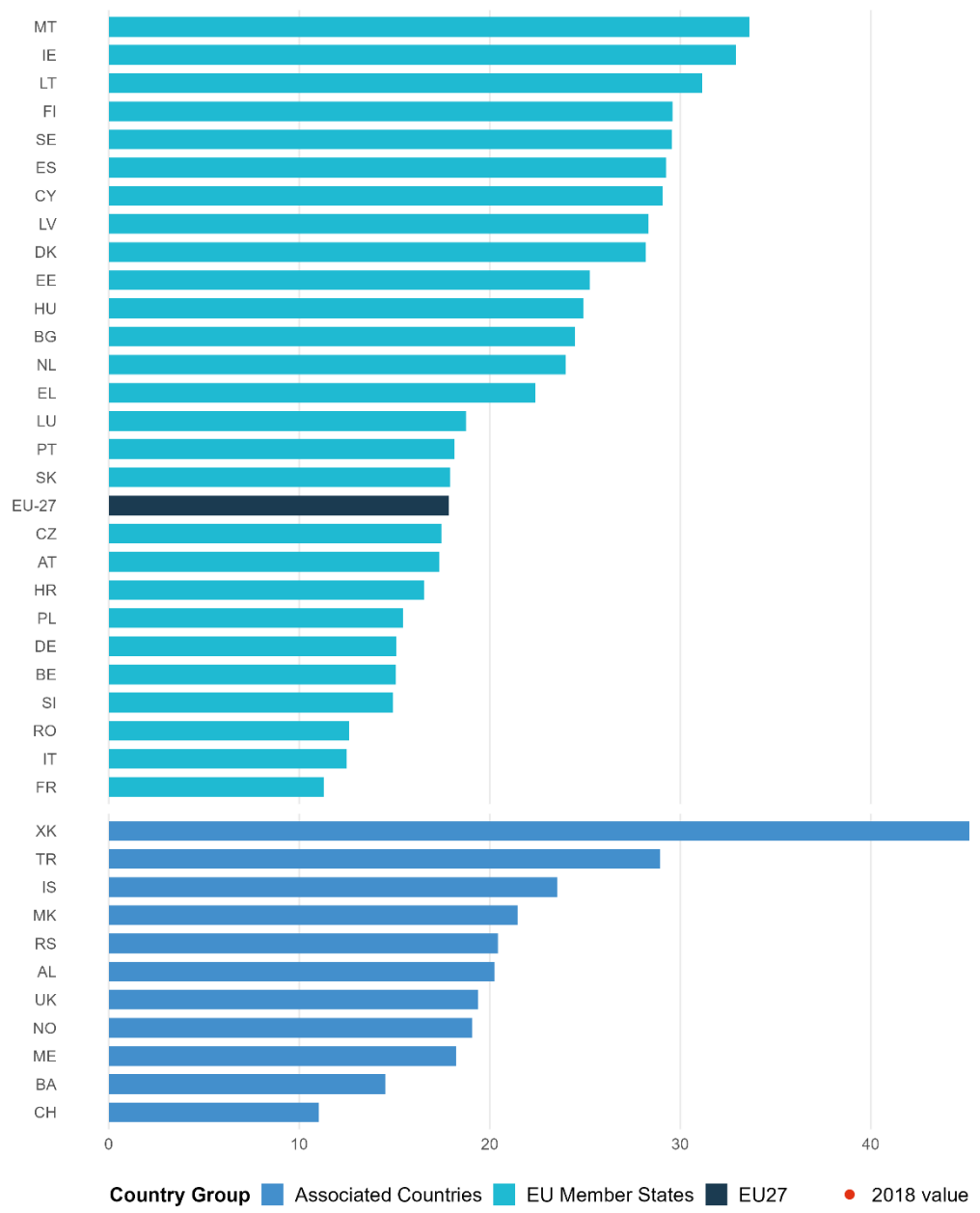
Source: GESIS - Leibniz-Institut für Sozialwissenschaften (Eurobarometer). Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest share of trust in science within the EU-27 can be found in Malta, Ireland, and Lithuania, showing indicator values that exceed 30%, followed by Finland, Sweden, Spain, and Cyprus. While all being above 10%, there are also Member States with lower levels of trust in science, namely Romania, Italy, and France.

Among the Associated Countries, the highest share of trust in science can be observed in Kosovo, with a value exceeding 40%, followed by Türkiye, Iceland, North Macedonia, Serbia, and Albania, with values above 20%.

[24] For the questions that have been asked in these polls and leading to these results, please refer to the ERA Scoreboard 2025, Methodology Report.

Figure 132 Trust in Science, by country for the latest available year and 2018

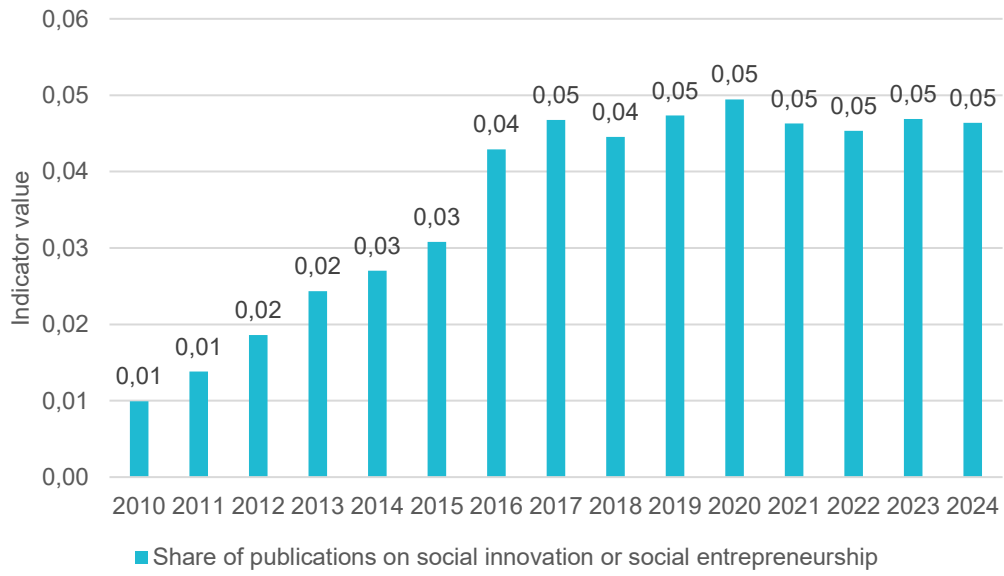


Source: GESIS - Leibniz-Institut für Sozialwissenschaften (Eurobarometer). Calculations by Fraunhofer ISI.

5.4.2 #48 Share of publications on social innovation or social entrepreneurship

This indicator measures the share of publications on 'social innovation' or 'social entrepreneurship'.[25] It thereby captures contributions from public and private sector R&I towards solving societal problems. The share of publications on 'social innovation' or 'social entrepreneurship' has increased over the years. The indicator value for the EU-27 average registers 0.01% in 2010, reaching 0.05% in 2024, with a quite stable increase over time. The indicator values have been quite stable since 2019.

Figure 133 Share of publications on social innovation or social entrepreneurship, for the EU-27 average over time



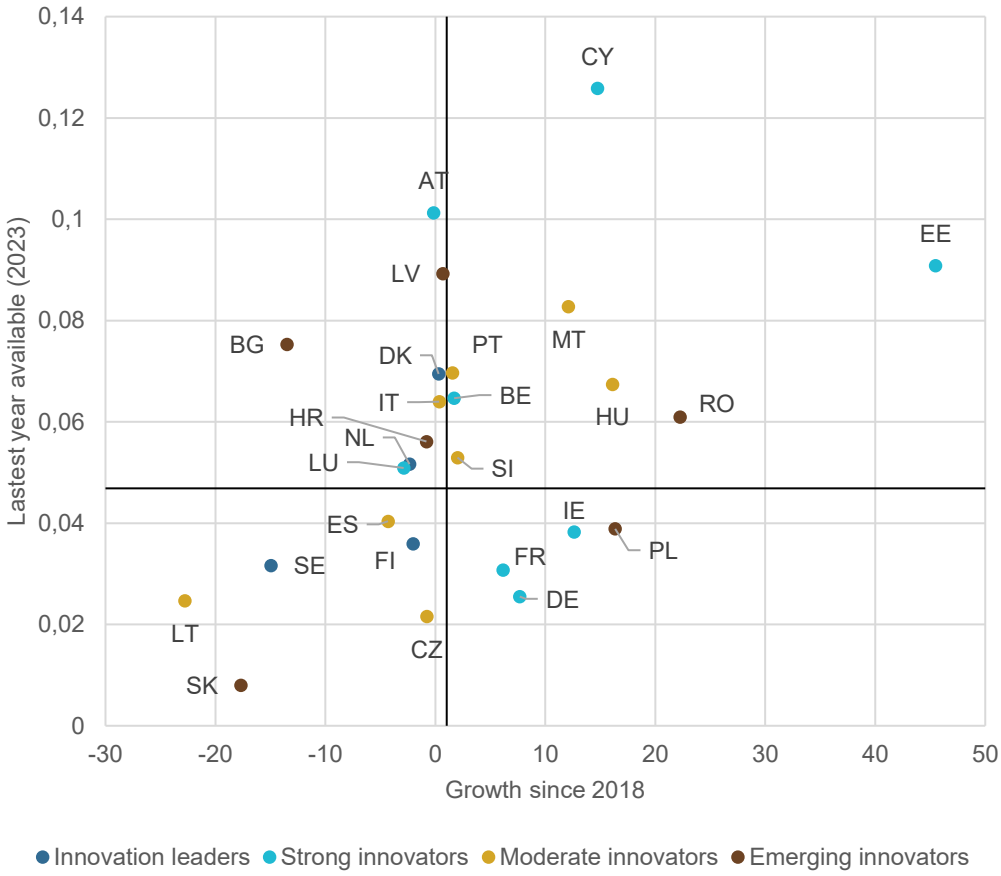
Source: OpenAIRE. Calculations by Fraunhofer ISI. Note: In 2025, data from OpenAIRE has been retrieved via the API, while in 2024 it was retrieved via web scraping. Therefore, values between the Scoreboards 2024 and 2025 may not be directly comparable.

Figure 134 shows the latest available value of the share of publications on social innovation or social entrepreneurship, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Cyprus, Estonia, Malta, Romania, Portugal, Belgium, and Hungary. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Austria, Bulgaria, Denmark, Italy, the Netherlands, Croatia, and Luxembourg. Spain, Finland, Czechia, Sweden, Lithuania, and Slovakia are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. Poland, Ireland, France, and

[25] The indicator captures the publications containing the keywords "social innovation" or "social entrepreneurship".

Germany can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 134 Share of publications on social innovation or social entrepreneurship, latest indicator value and change by EU-27 countries



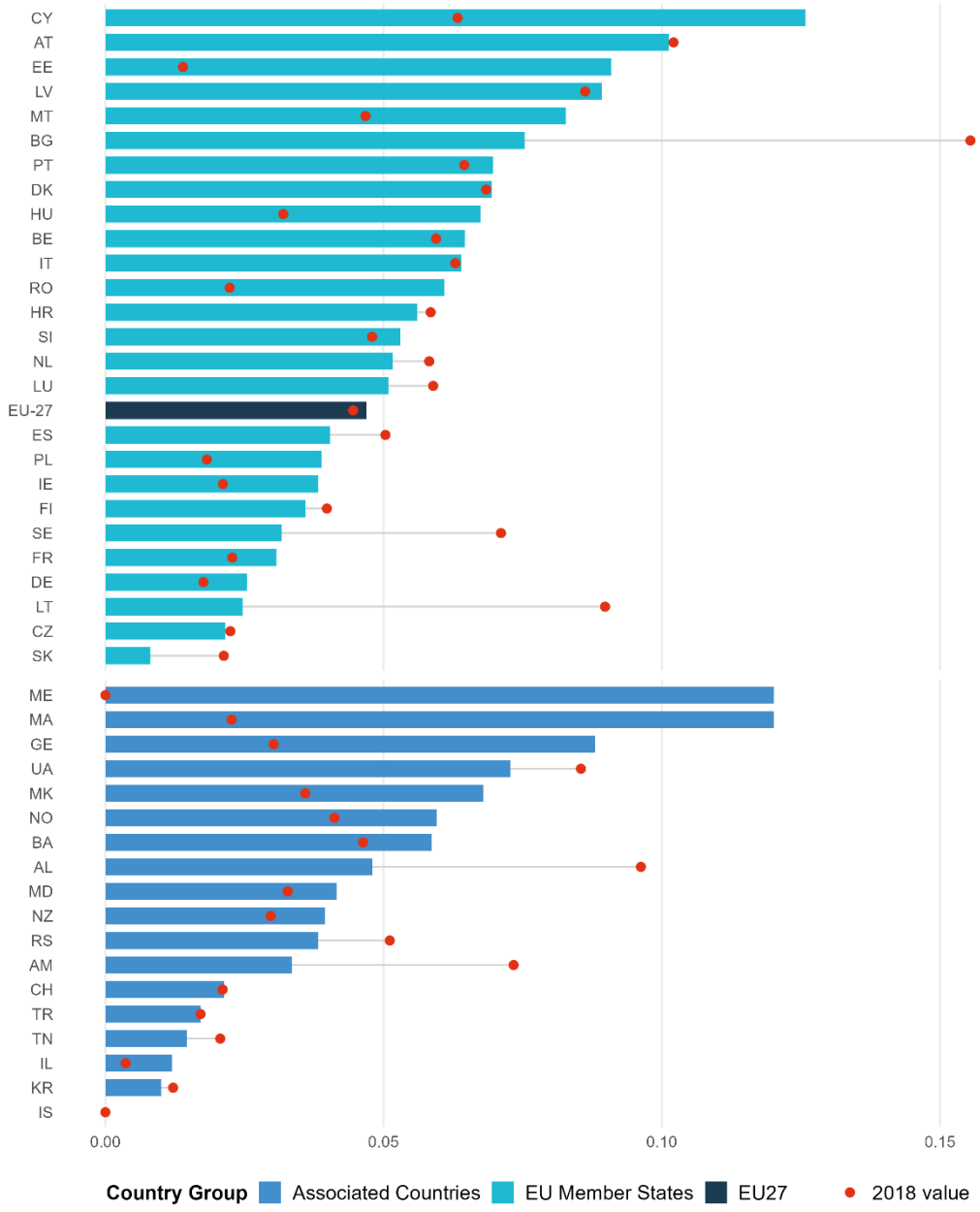
Source: OpenAIRE. Calculations by Fraunhofer ISI. Note: In 2025, data from OpenAIRE has been retrieved via the API, while in 2024 it was retrieved via web scraping. Therefore, values between the Scoreboards 2024 and 2025 may not be directly comparable.

The most recent values for each country are shown in the graph below. The highest share of publications on social innovation or social entrepreneurship within the EU-27 can be found in Cyprus and Austria, showing indicator values above 0.10%, followed by Estonia, Latvia, Malta, and Bulgaria.

Among the Associated Countries, the highest value can be observed in Montenegro and Morocco, with values above 0.10%, followed by Georgia, Ukraine, and North Macedonia.

Compared to the indicator values in 2018, most of the countries in both groups show either a higher value in 2023, or no big differences between the two years. However, some countries also register much higher values in 2018, such as Bulgaria, Sweden, Lithuania, Albania, and Armenia.

Figure 135 Share of publications on social innovation or social entrepreneurship, by country for the latest available year and 2018



Source: OpenAIRE. Calculations by Fraunhofer ISI. Note: İn 2025, data from OpenAIRE has been retrieved via the API, while in 2024 it was retrieved via web scraping. Therefore, values between the Scoreboards 2024 and 2025 may not be directly comparable.

5.5 Key findings on ERA Priority 2

Concerning the **challenge-based ERA actions** (#37-#40), the EU's overall performance in aligning R&D funding and output with major societal and green priorities is rather stable over time across the Scoreboard indicators. Total GBARD allocated to key areas has only slightly increased for the whole EU, and the environmental-related government R&D budget remains relatively stable, showing a slight decrease over the same period. Private and public investments in the Strategic Energy Technology (SET) Plan reached a high point in 2020 before a decrease in 2021 (based on preliminary data). Leading Member States for general R&D allocation (NABS) are Hungary, France, and Latvia. For environmental-related R&D investments, Latvia and Finland lead. In terms of national investments in the SET Plan, Germany and France are the best performers. For environmental patenting, Cyprus shows an exceptionally high percentage, followed by Latvia and Denmark. Leading Associated Countries include the United Kingdom and South Korea for general GBARD, and Serbia and South Korea for environmental- related R&D budgets.

When analysing **synergies with education and the European skills agenda** (#41-#43), the EU's overall performance across is generally positive in the recent years. While the number of enterprises purchasing or licensing IPRs from public research organizations showed a decline between 2018 and 2020, university-industry R&D collaboration and industry collaboration in EU-Framework Programme (EU-FP) projects have consistently increased in the last years. Among the best performers are Poland, Czechia, Italy, Cyprus, Estonia, and Belgium, among the Member States, and Israel and Switzerland for the Associated Countries.

The **synergies with sectorial policies and industrial policy** (#44-#46) show a stable positive trend at the EU level. Government support for R&D through direct funding and tax incentives, expressed as a percentage of GDP, has remained steady through 2022. GBARD allocated specifically to industrial production and technology per inhabitant generally trended upward since 2017, reaching a peak in 2023. Portugal, France, Denmark, Sweden, and Finland perform high among the Member States, South Korea, the United Kingdom and Iceland among the Associated Countries.

The sub-priority focusing on **active citizen and societal engagement in R&I** (#47-#48) also reveals an overall positive picture at the EU level. Trust in science saw a minor decrease between 2021 and 2024, while the share of publications on ‘social innovation’ or ‘social entrepreneurship’ shows a positive trend. Leading countries in trust in science are Malta, Ireland, and Lithuania, while for research output on social innovation, Cyprus and Austria are ahead. Associated Countries are led by Kosovo registering the highest value of trust in science, followed by Turkey, Iceland, and North Macedonia.

6 ERA Priority 3: Enhancing access to research and innovation excellence across the Union and enhancing interconnections between innovation ecosystems across the Union

This section presents the results in performance of the indicators belonging to the ERA Priority 3: Enhancing access to research and innovation excellence across the Union and enhancing interconnections between innovation ecosystems across the Union. The ERA Priority 3 is divided into three sub-priorities:

- More investments and reforms in countries and regions with lower R&I performance
- Synergies between Union, national and regional funding programmes
- Increased collaborative links and the excellence-based integration of research-performing organisations

6.1 Sub-priority 3.1: More investments and reforms in countries and regions with lower R&I performance

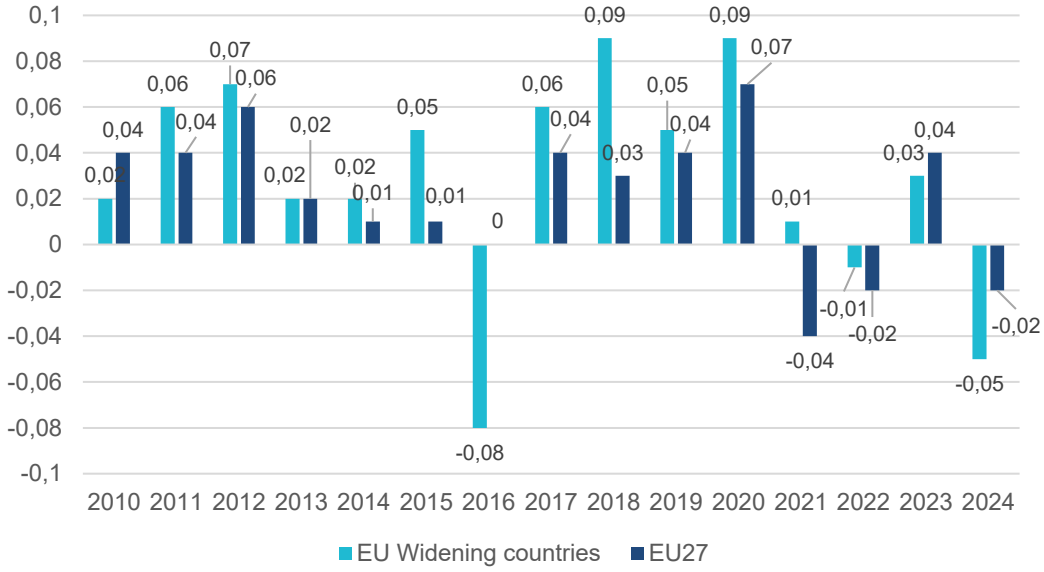
6.1.1 #49 Change in total R&D expenditure in widening countries, expressed as a percentage of GDP

This indicator measures the change in total R&D expenditure in widening countries as a percentage of GDP. It measures the changes in contribution of widening countries in funding research and innovation activities. The group of widening countries includes Bulgaria, Croatia, Cyprus, Czechia, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia and Slovenia. The comparative development of this indicator with the EU-27 is depicted in Figure 136.

Between 2017 and 2020, the increase in total R&D expenditure as a percentage of GDP was larger for the widening countries than for the EU-27. This indicates that widening countries made notable progress in catching up to the EU-27 average in terms of R&D intensity. In the most recent two years, the growth of R&D expenditure as a share of GDP has slowed significantly, both for the EU-27 as a whole and for the widening countries.

This trend reflects a period of strong convergence in R&D investment levels between widening countries and the EU-27, followed by a phase of reduced momentum in recent years. Indeed, in 2024, the latest available year, one can see negative values for both the EU-27 and widening countries only.

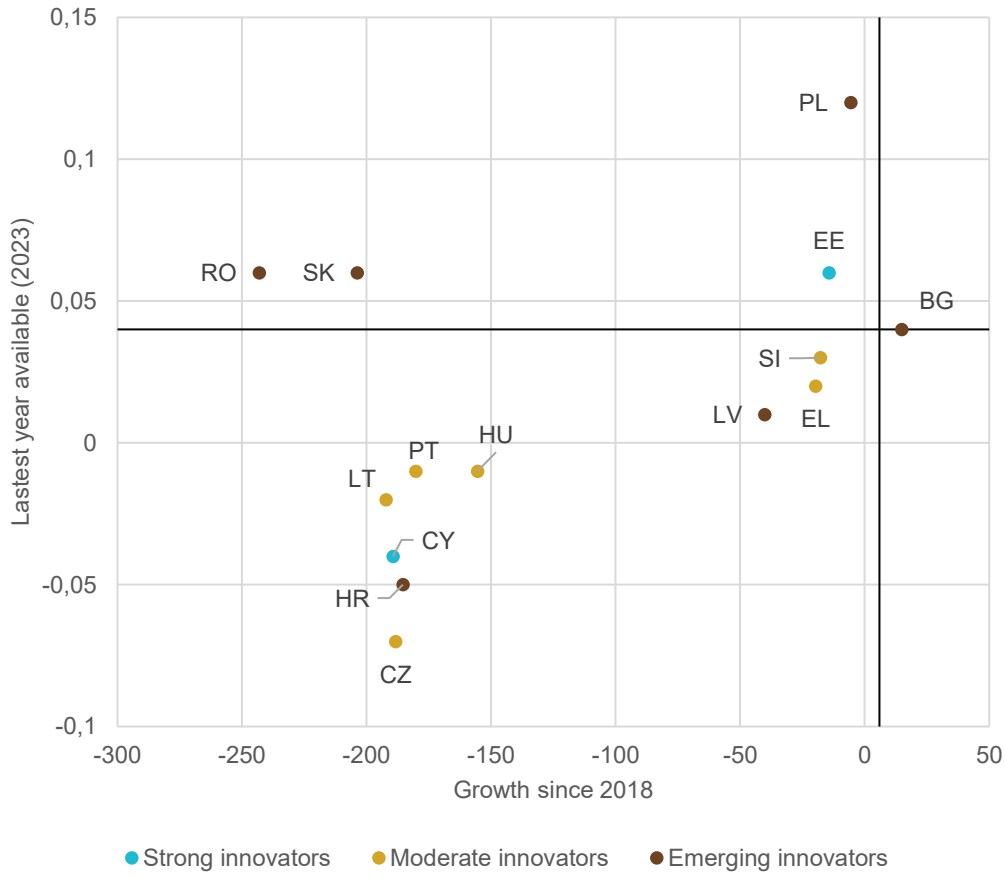
Figure 136 Change in total R&D expenditure as a percentage of GDP in widening countries and EU-27 countries.



Source: Eurostat. Calculations by Fraunhofer ISI

Figure 137 shows the latest available value of the change in total R&D expenditure in widening countries as a percentage of GDP, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Bulgaria in the upper-right quadrant combines above-average values with above-average growth since 2018. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Poland, Estonia, Romania, and Slovakia. The rest of widening countries is depicted in the lower left quadrant of the graph, indicating both below average growth and a lower-than-EU-27 average indicator value.

Figure 137 Change in total R&D expenditure in widening countries, expressed as a percentage of GDP, latest indicator value and change by EU-27 countries

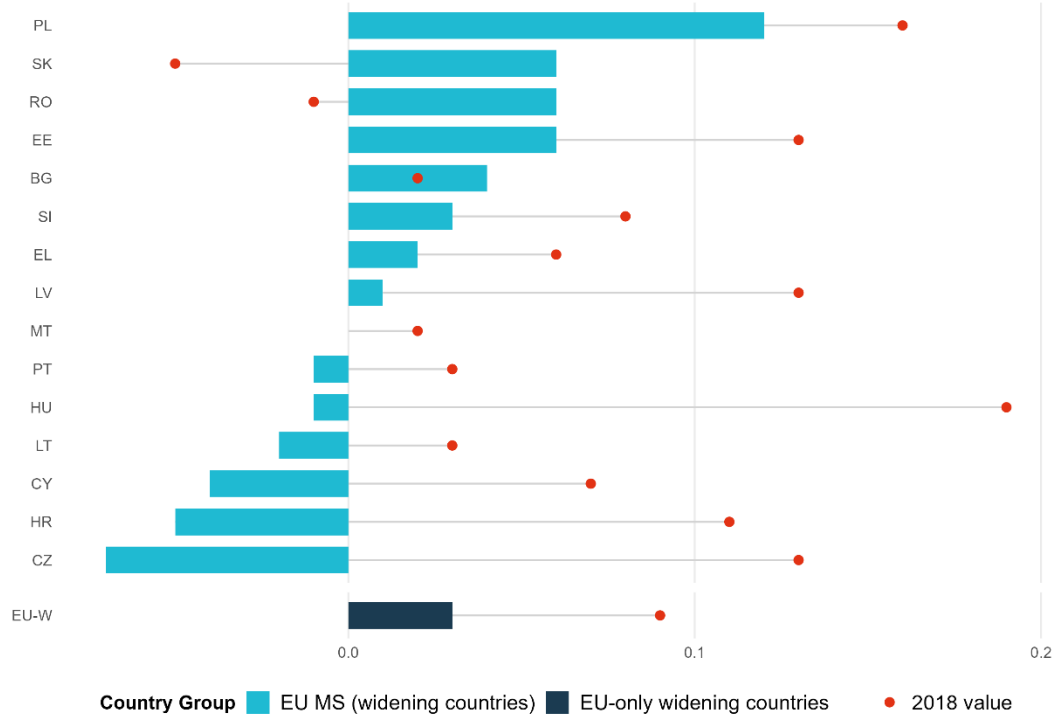


Source: Eurostat. Calculations by Fraunhofer ISI

The most recent values for each country are shown in the graph below. The highest increase in total R&D expenditure in widening countries as a percentage of GDP can be found in Poland, showing an indicator value that exceeds 0.1%, followed by Slovakia, Romania, and Estonia. Among those that experienced a decrease are Czechia, Croatia, and Cyprus.

Compared to the indicator values in 2018, most of the widening countries show a lower value in 2023. Higher values in 2023 can be noted in Slovakia, Romania, and Bulgaria.

Figure 138 Change in total R&D expenditure in widening countries, expressed as a percentage of GDP, by country for the latest available year and 2018

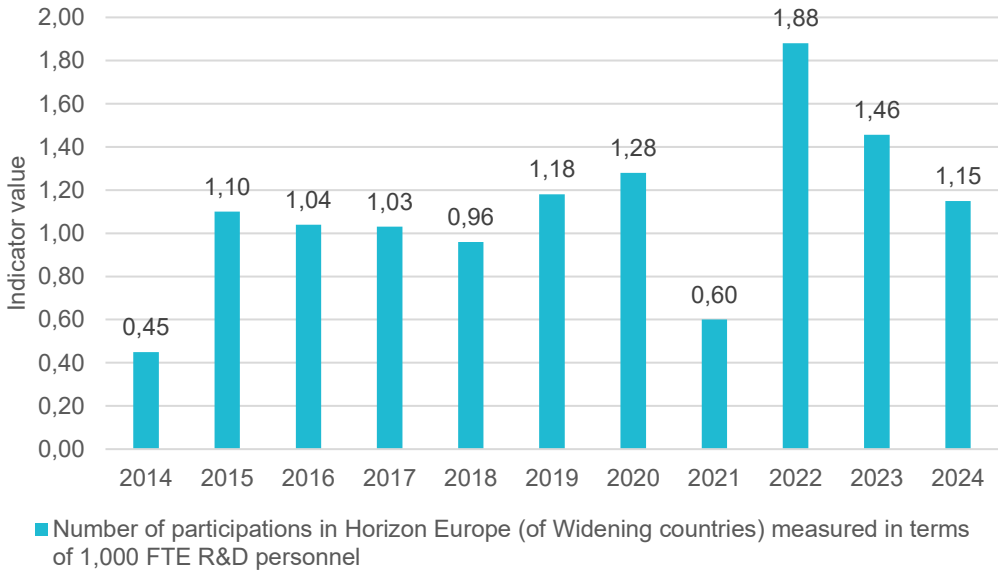


Source: Eurostat. Calculations by Fraunhofer ISI

6.1.2 #50 Number of participations in Horizon Europe (of widening countries) measured in terms of 1,000 FTE R&D personnel

This indicator measures the number of participations of widening countries in the Horizon Europe programme measured in terms of 1,000 FTE R&D personnel. Figure 139 shows the trend of the indicator as average number of participations in Horizon Europe in terms of 1,000 FTE R&D personnel of all widening countries. After a starting value of 0.45 in 2014, the indicator increases sharply to 1.10 in 2015 and remains relatively stable around 1.0 between 2016 and 2018, before rising again to 1.18 in 2019 and 1.28 in 2020. A remarkable drop to 0.60 is observed in 2021, followed by a strong rebound in 2022, reaching a peak of 1.88. The indicator decreases again to 1.15 in 2024, yet remaining well above the initial levels, indicating an overall improvement in Horizon Europe participation among widening countries relative to their R&D workforce.

Figure 139 Number of participations in Horizon Europe (of widening countries) measured in terms of 1,000 FTE R&D personnel, for the EU widening countries over time

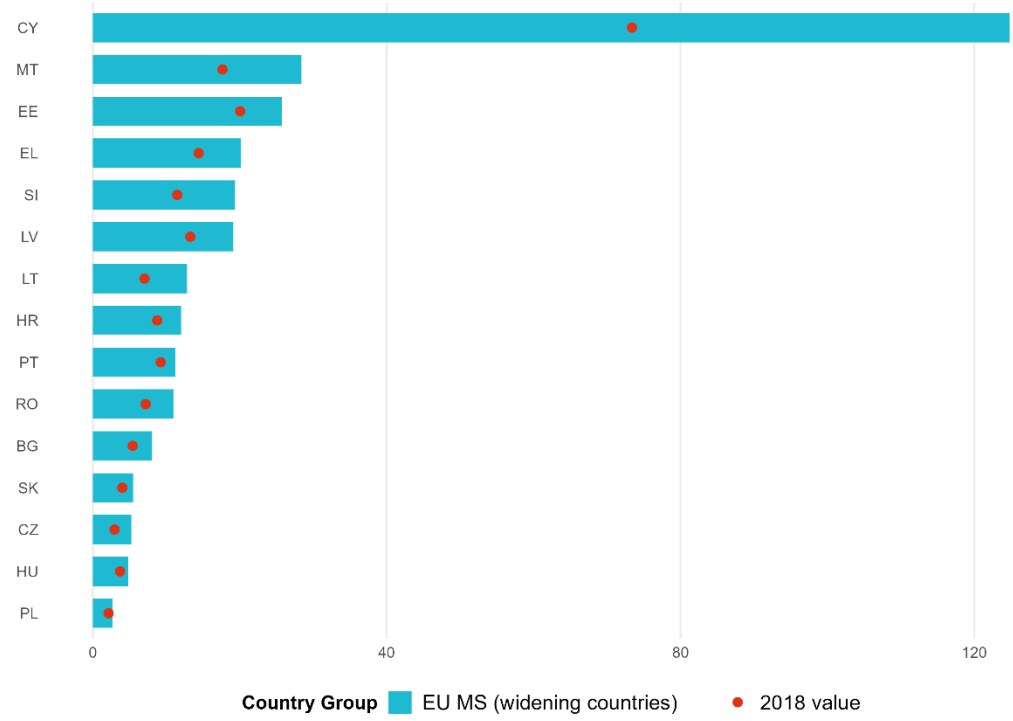


Source: Horizon Dashboard – R&I projects, Eurostat. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest number of participations within the EU-27 can be found in Cyprus, showing indicator values that exceed 120, followed by Malta, and Estonia, with values above 25. The lowest values, below 5, are registered in Hungary and Poland.

Compared to the indicator values in 2018, all widening countries show a higher value in 2023, indicating an overall improvement.

Figure 140 Number of participations in Horizon Europe (of widening countries) measured in terms of 1,000 FTE R&D personnel, by country for the latest available year and 2018

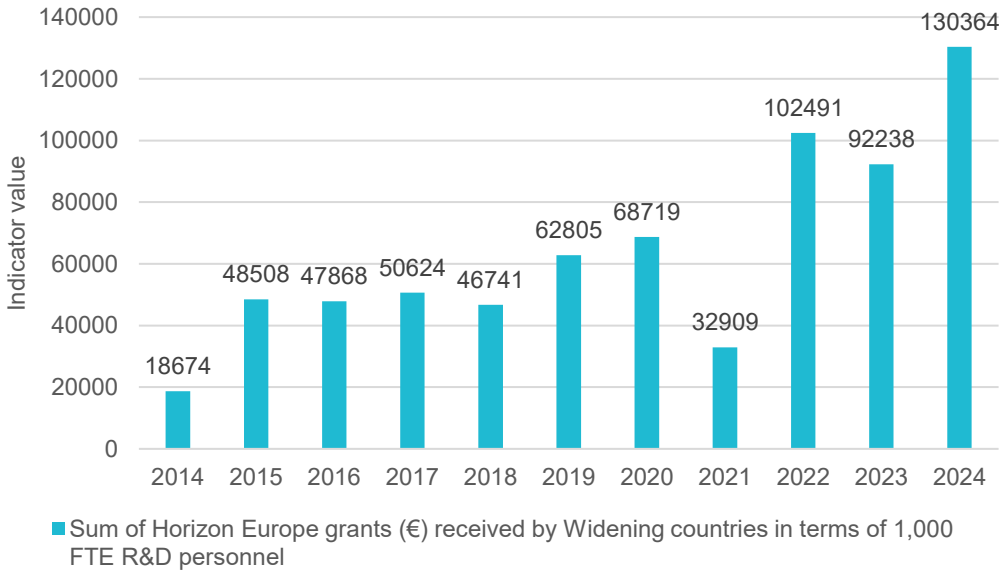


Source: Horizon Dashboard – R&I projects, Eurostat. Calculations by Fraunhofer ISI.

6.1.3 #51 Sum of Horizon Europe grants (€) received by (widening) countries in terms of 1,000 FTE R&D personnel

This indicator measures the sum of Horizon Europe grants (in Euro) received by widening countries measured in terms of 1,000 FTE R&D personnel. Figure 141 shows the trend of the indicator. After a starting value of €18,674 in 2014, grants per 1,000 FTE R&D personnel increase substantially in 2015 (€48,508) and remain broadly stable between 2016 and 2018, fluctuating around €47,000–€51,000. A renewed increase is observed in 2019 (€62,805) and 2020 (€68,719), followed by a decline in 2021 to €32,909. This drop is then succeeded by a pronounced rebound in 2022, when the indicator rises to €102,491, and remains at a high level, with its highest value at €130,364 in 2024.

Figure 141 Sum of Horizon Europe grants (€) received by (widening) countries in terms of 1,000 FTE R&D personnel, for the EU widening countries over time

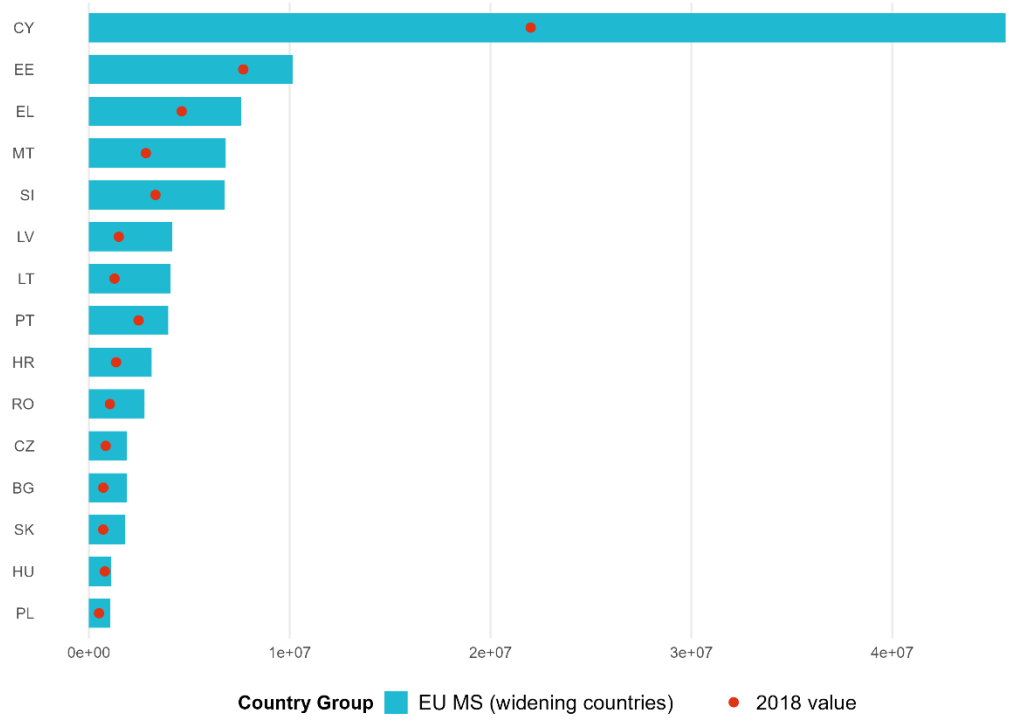


Source: Horizon Dashboard – R&I projects, Eurostat. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest amount of Horizon Europe grants per 1,000 FTE R&D personnel within the EU widening countries can be found in Cyprus, showing indicator values that exceed €45 million, followed by Estonia, Greece, Malta, and Slovenia, all with values above €6 million. The lowest values - below €2 million - are registered in Hungary and Poland.

Compared to the indicator values in 2018, all widening countries show a higher value in 2023, indicating an overall improvement.

Figure 142 Sum of Horizon Europe grants (€) received by (widening) countries in terms of 1,000 FTE R&D personnel, by country for the latest available year and 2018

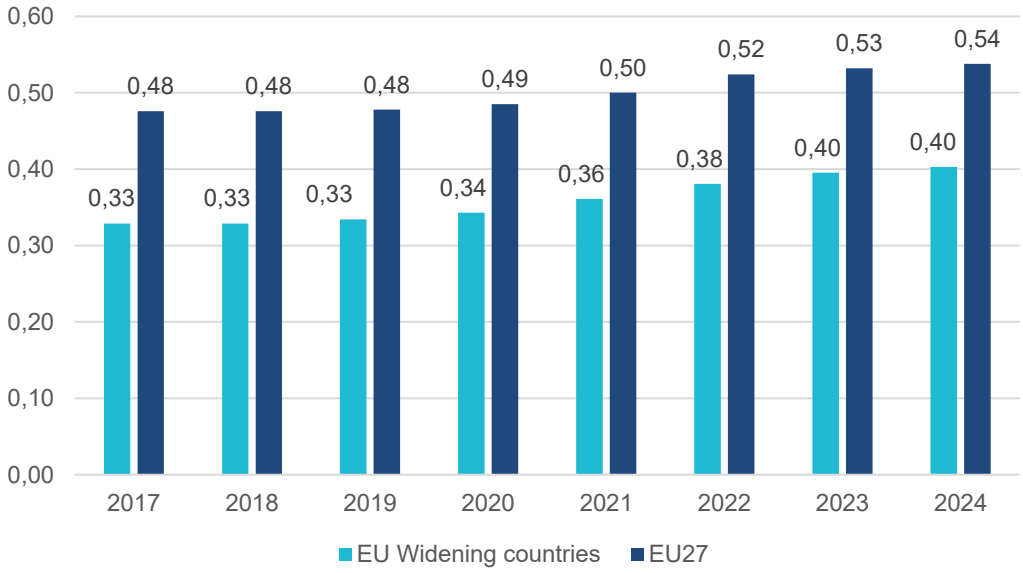


Source: Horizon Dashboard – R&I projects, Eurostat. Calculations by Fraunhofer ISI.

6.1.4 #52 Summary Innovation Index (widening countries)

The Summary Innovation Index (SII) measures a country´s innovation performance, based on the strengths and weaknesses of their national innovation systems. It ranges between 0 and 1 and is based on the European Innovation Scoreboard. Figure 143 shows the results for both the EU-27 and as average index only among EU widening countries. The index shows an upward trend between 2017 and 2024 for both group of countries. Widening countries increased their average value from 0.33 in 2017 to 0.4 in 2024.

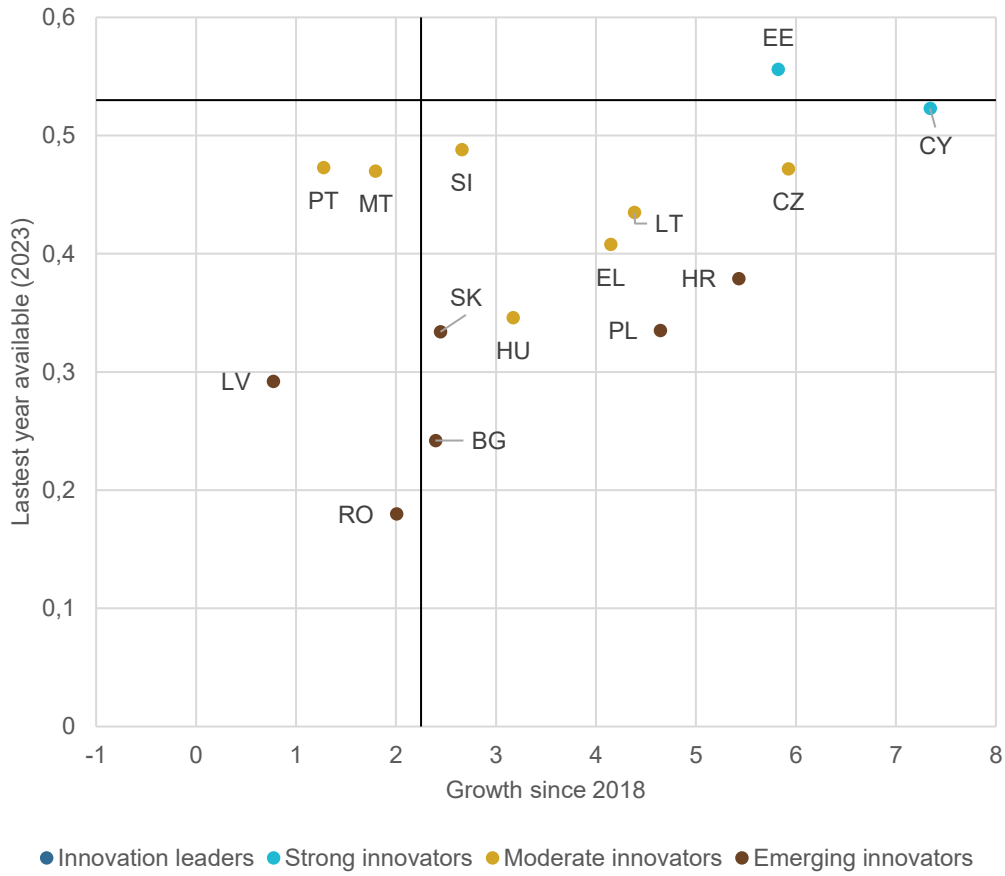
Figure 143 Summary Innovation Index (widening countries), for the EU widening countries over time



Source: European Innovation Scoreboard. Calculations by Fraunhofer ISI.

Figure 144 shows the latest available value of the Summary Innovation Index for all widening countries, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Estonia in the upper-right quadrant combines above-average values with above-average growth since 2018. No countries are in the upper left quadrant. Portugal, Malta, Latvia, and Romania are instead depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The majority of widening countries can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 144 Summary Innovation Index (widening countries), latest indicator value and change by EU-27 countries

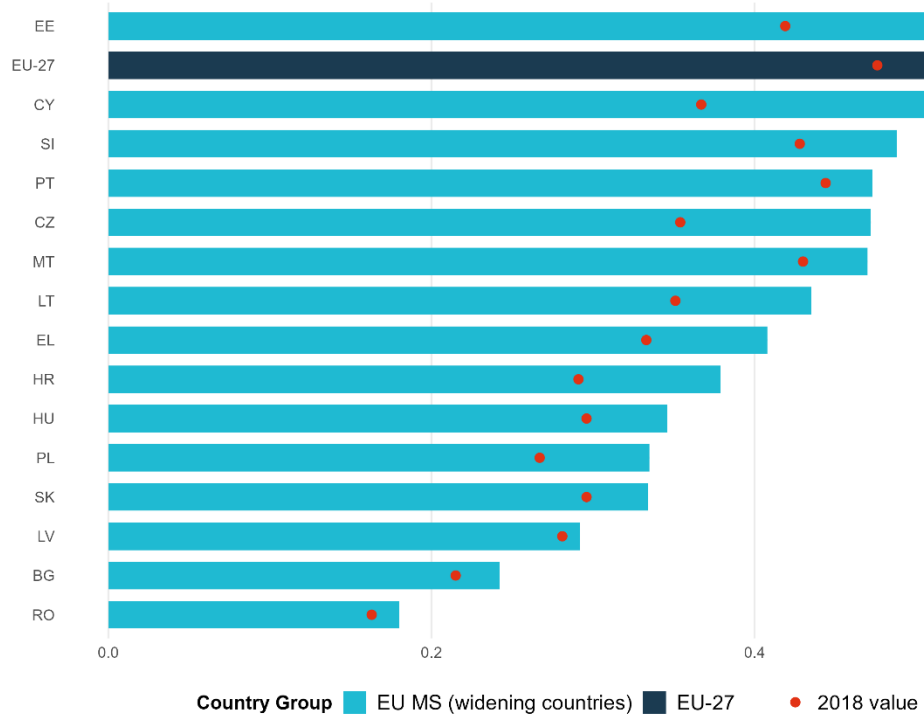


Source: European Innovation Scoreboard. Calculations by Fraunhofer ISI.

The most recent values for each widening country are shown in the graph below. The highest SII within the EU widening countries can be found in Estonia, with a value above the EU-27 average, followed by Cyprus and Slovenia. Most of the widening countries are indeed below the EU-27 average. The widening countries that registered the lowest values, i.e. below 0.3 in 2023, are Latvia, Bulgaria, and Romania.

Compared to the indicator values in 2018, all widening countries show a higher value in 2023, indicating an overall improvement.

Figure 145 Summary Innovation Index (widening countries), by country for the latest available year and 2018



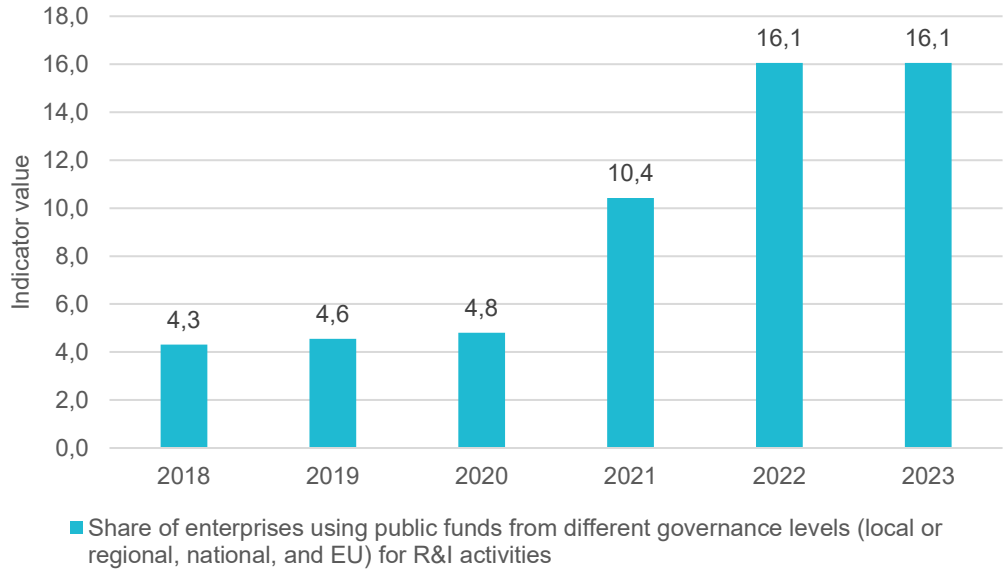
Source: European Innovation Scoreboard. Calculations by Fraunhofer ISI.

6.2 Sub-priority 3.2: Synergies between Union, national and regional funding programmes

6.2.1 #53 Share of enterprises using public funds from different governance levels (local or regional, national, and EU) for R&I activities

This indicator measures the share of enterprises (in %) using public funds from different governance levels (local or regional, national, and EU) for R&I activities. Figure 146 shows the trend of the indicator for the EU Member States. While between 2018 and 2020 the indicator value was stable around 4.6, the indicator increased to 10.4 in 2021 and reached 16.1 in 2022 and 2023 (imputed), reflecting an overall improvement across Member States.

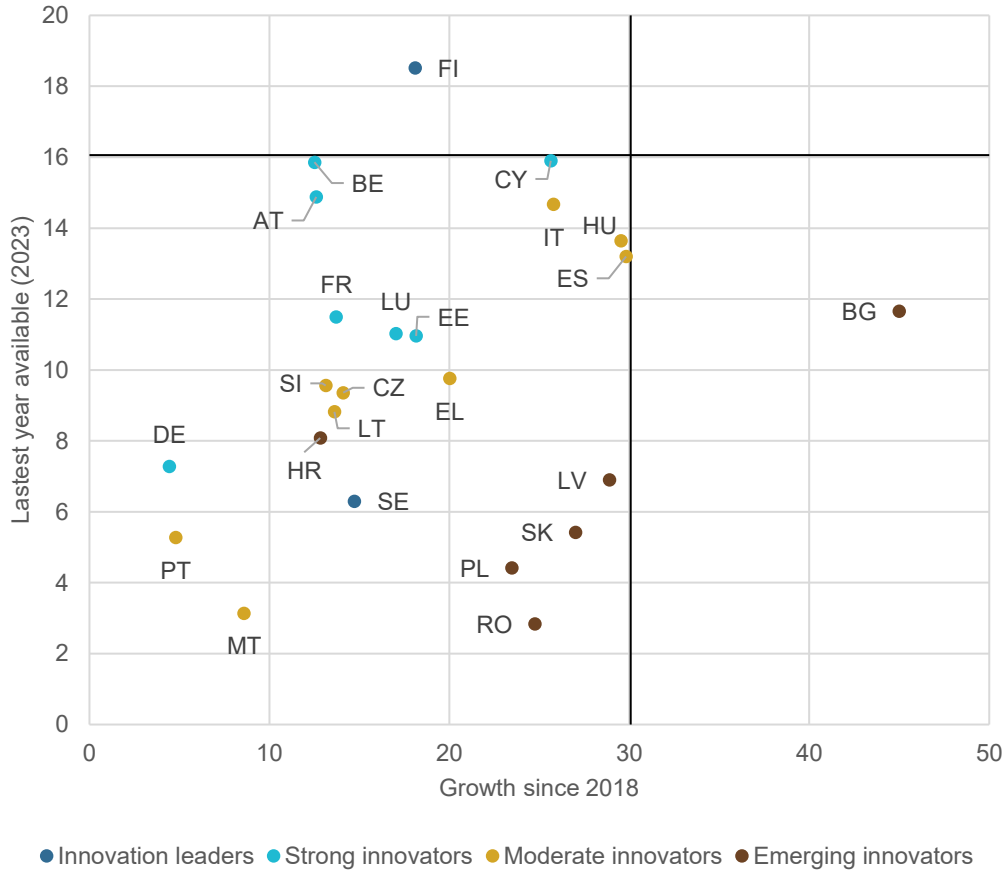
Figure 146 Share of enterprises using public funds from different governance levels (local or regional, national, and EU) for R&I activities, for the EU-27 over time



Source: Eurostat: Community Innovation Survey. Calculations by Fraunhofer ISI.

Figure 147 shows the latest available value of the share of enterprises using public funds from different governance levels for R&I activities, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. There are no countries in the upper-right quadrant with both the indicator value and growth rate above the EU-27 average. Finland in the upper left quadrant maintains above-average values but records below-average growth. Bulgaria can be found in the lower right quadrant, showing below-average values but above-average growth since 2018. All other Member States are situated in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value.

Figure 147 Share of enterprises using public funds from different governance levels (local or regional, national, and EU) for R&I activities, latest indicator value and change by EU-27 countries

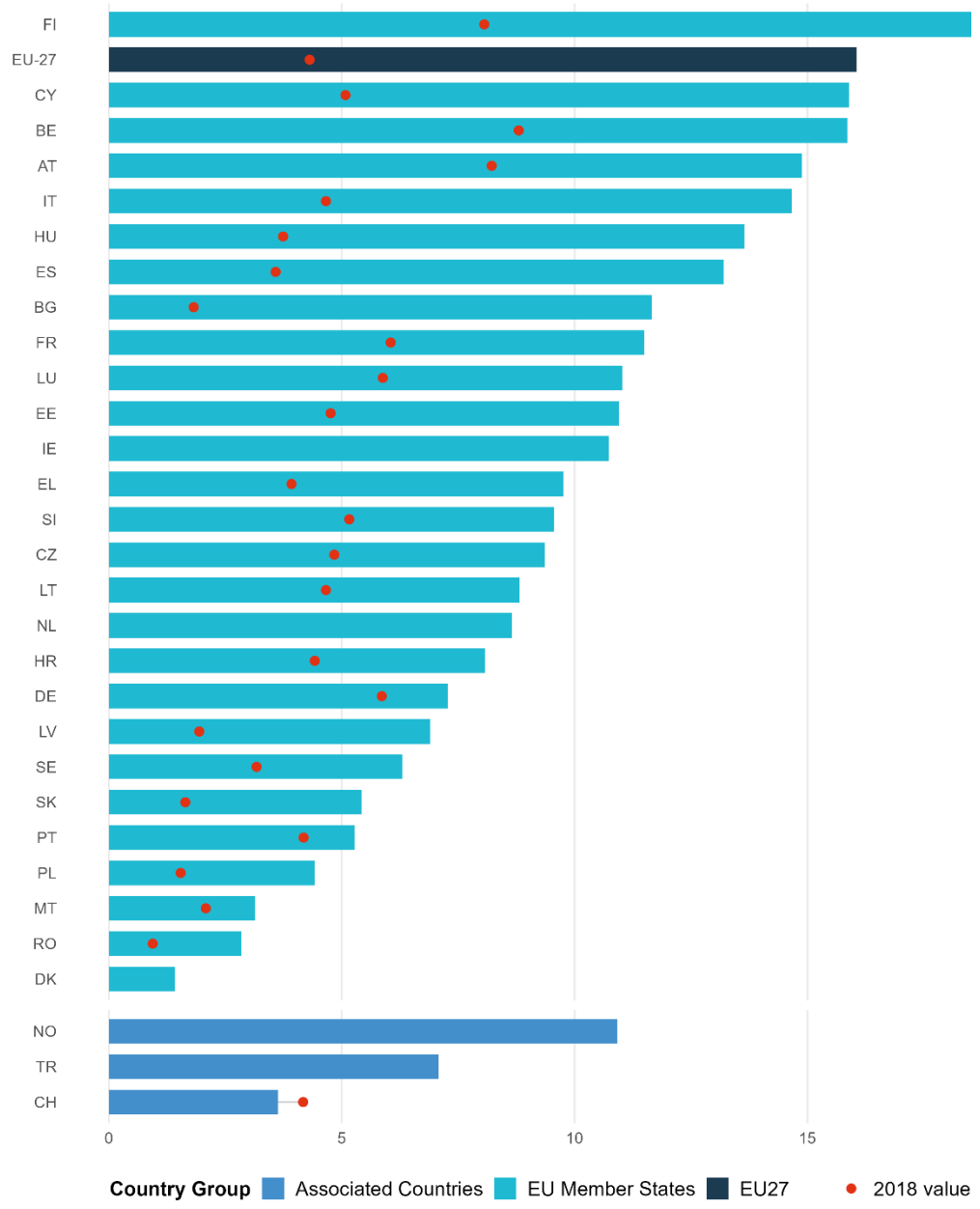


Source: Eurostat: Community Innovation Survey. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the following graph. The highest shares within the EU-27 can be found in Finland, showing indicator values that exceed 18%, and the only value above the EU-27 average value, followed by Cyprus and Belgium, with values above 15%. However, there are also Member States that registered less than 5% in 2023, namely Poland, Malta, Romania, and Denmark.

Compared to the indicator values in 2018, all the countries in both groups, with the only exception of Switzerland, show a much higher value in 2023.

Figure 148 Share of enterprises using public funds from different governance levels (local or regional, national, and EU) for R&I activities, by country for the latest available year and 2018

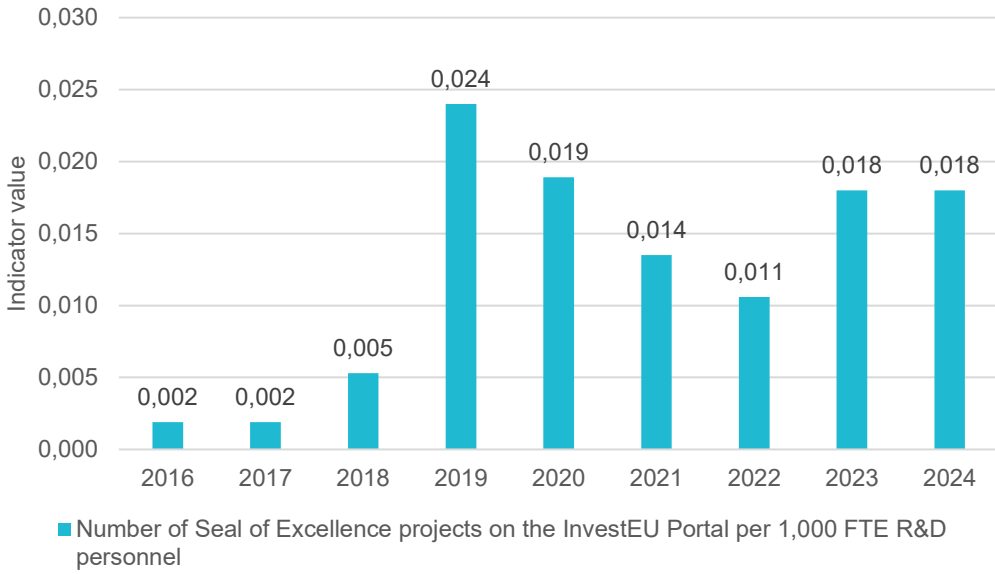


Source: Eurostat: Community Innovation Survey. Calculations by Fraunhofer ISI. Note: the absence of a red dot means that the value for the country in that year was not available.

6.2.2 #54 Number of Seal of Excellence projects on the InvestEU Portal per 1,000 FTE R&D personnel

This indicator measures the number of Seal of Excellence projects on the InvestEU Portal per 1,000 FTE R&D personnel. It counts all projects eligible for funding, independent whether they have already been (fully) funded or have not yet received any funding. The Seal of Excellence is a quality label awarded by the Commission to proposals which have been assessed in a call for proposals under a Union instrument and are deemed to comply with the quality requirements of that instrument but could not be funded. It has become a tool to foster synergies in research and innovation. The evolution of this indicator for the EU-27 is depicted over time in Figure 149. It is available since 2016. In 2016, 2017 and 2018 the number of Seal of Excellence projects per 1,000 FTE R&D personnel was rather low compared to 2019, where a major growth in the indicator value for the EU-average can be observed. After 2020, however, the indicator value started to constantly decrease, reaching 0.011 in 2022. The indicator regained momentum in 2023 raising to 0.018.

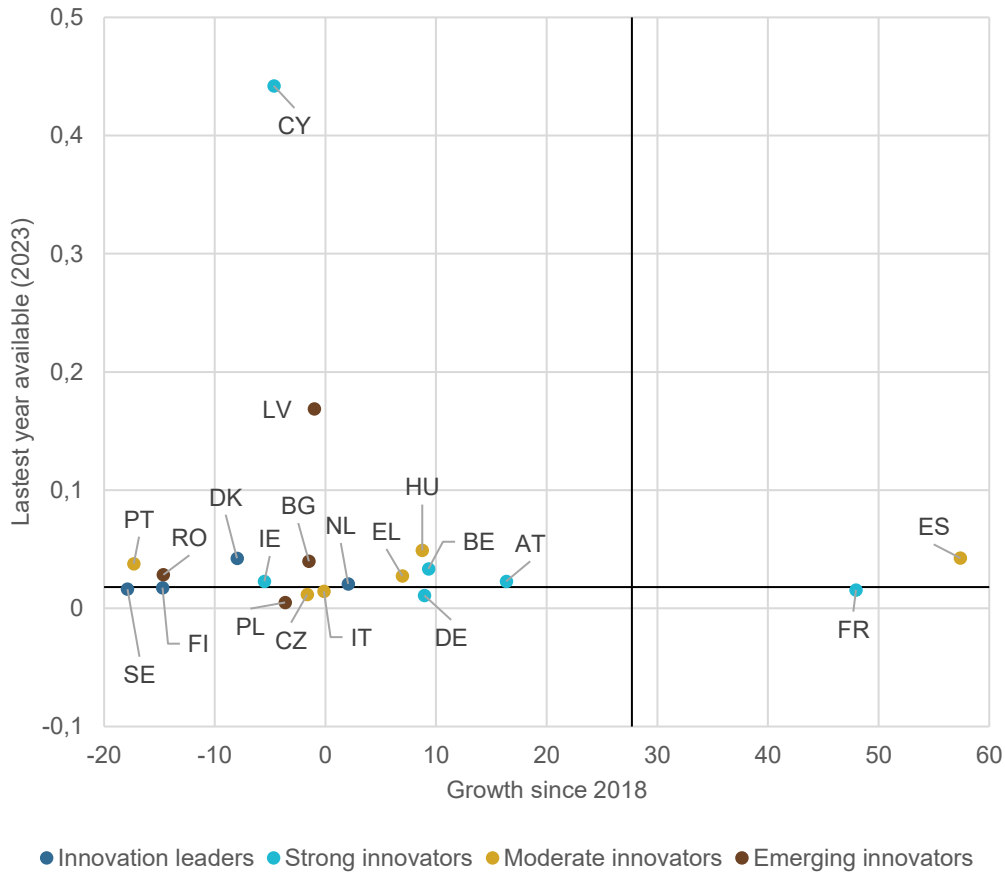
Figure 149 Number of Seal of Excellence projects on the InvestEU Portal per 1,000 FTE R&D personnel, for the EU-average over time



Source : European Commission – Invest EU portal, Eurostat. Calculations by Fraunhofer ISI.

Figure 150 shows the latest available value of the number of Seal of Excellence projects on the InvestEU Portal per 1,000 FTE R&D personnel, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Spain in the upper-right quadrant combines above-average values with above-average growth since 2018. Most of the Member States are in the upper left quadrant, where countries maintain above-average values but record below-average growth. Sweden, Germany Finland, Poland, Czechia, and Italy are depicted in the lower left quadrant of the graph, indicating both below average growth and a lower-than-EU-27 average indicator value. France can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 150 Number of Seal of Excellence projects on the InvestEU Portal per 1,000 FTE R&D personnel, latest indicator value and change by EU-27 countries



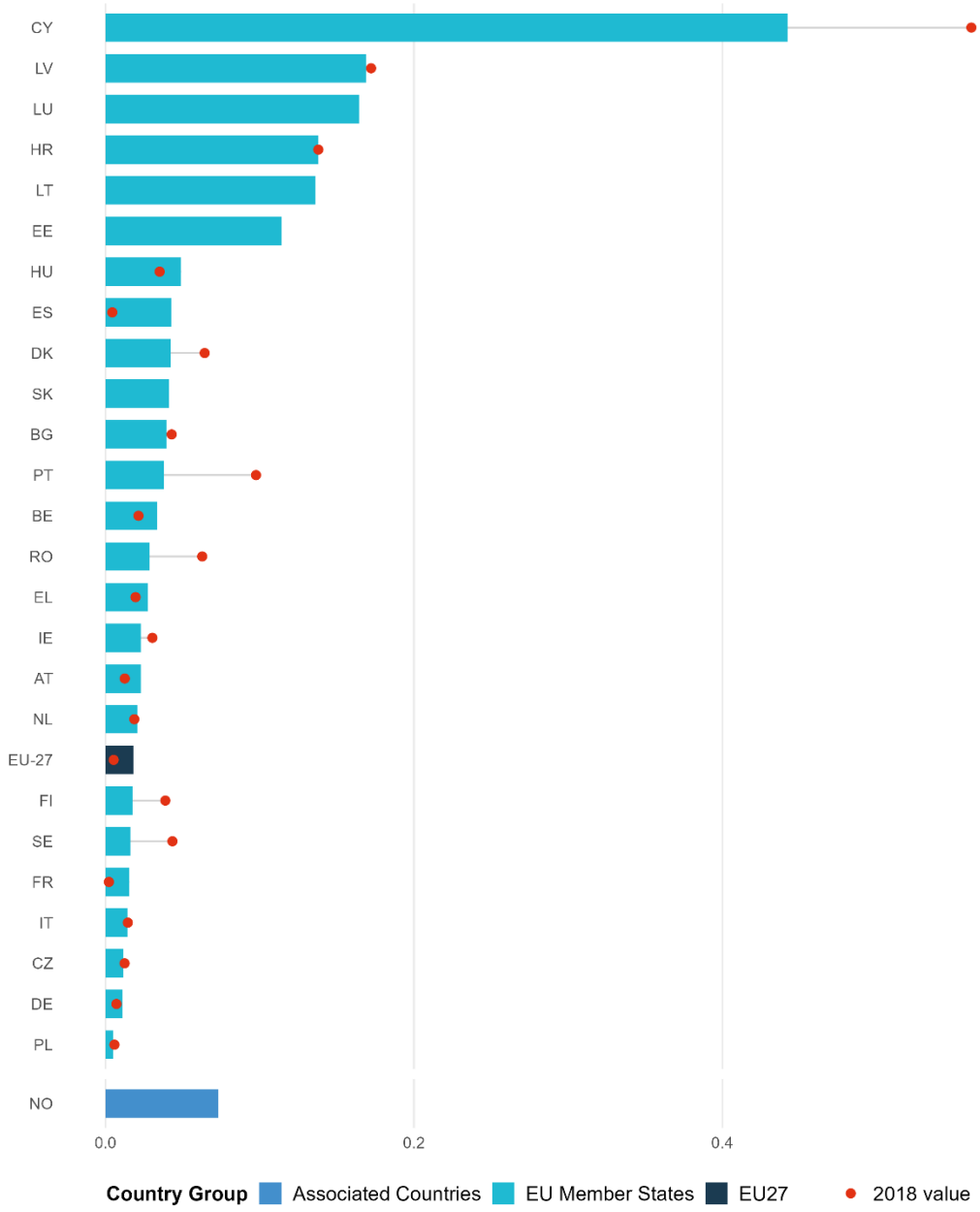
Source: European Commission – Invest EU portal, Eurostat. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest number of Seal of Excellence projects per 1,000 R&D personnel within the EU-27 can be found in Cyprus, showing indicator values that exceed 0.4, followed by Latvia, Luxembourg, Croatia, and Lithuania. However, most of the Member States registered values lower than 0.1 in 2023. Lowest values, below the EU-27 average value, are registered for Germany, Czechia, and Poland.

Among the Associated Countries, only Norway is included, showing an indicator value at 0.07.

Compared to the indicator values in 2018, most of the countries show either no big differences or a lower value. Higher values in 2023 can be observed in Hungary, Spain, Belgium, Greece, Austria, and France.

Figure 151 Number of Seal of Excellence projects on the InvestEU Portal per 1,000 FTE R&D personnel, by country for the latest available year and 2018



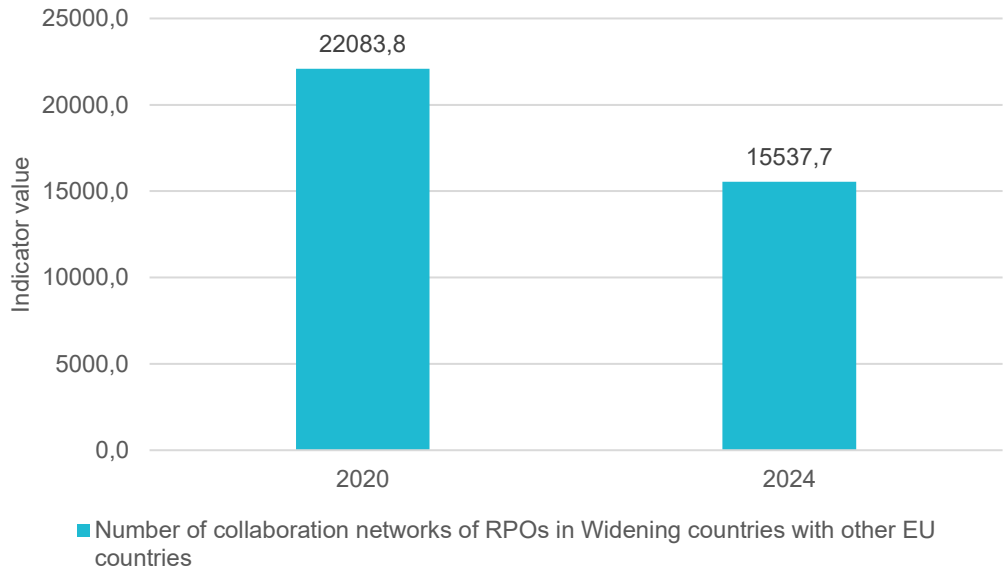
Source: European Commission – Invest EU portal, Eurostat. Calculations by Fraunhofer ISI.

6.3 Sub-priority 3.3: Increased collaborative links and the excellence-based integration of research-performing organisations

6.3.1 #55 Number of collaboration networks of RPOs in widening countries with other EU countries

This indicator measures the number of collaboration links by research performing institutions (RPOs)[26] in widening countries with other EU countries under the Horizon 2020 and Horizon Europe Programmes.[27] By definition, comparison with other MS is not possible, therefore only widening countries are analysed. Figure 152 shows the average value of the number of collaboration links by RPOs among EU widening countries. It can be observed that collaboration links in 2020 were higher than those registered in 2024, switching from 22,083 to 15,537.

Figure 152 Number of collaboration networks of RPOs in widening countries with other EU countries, for the EU widening countries over time



Source: Horizon Dashboard – R&I projects. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest number of collaboration links by widening countries with other EU countries can be found in Greece,

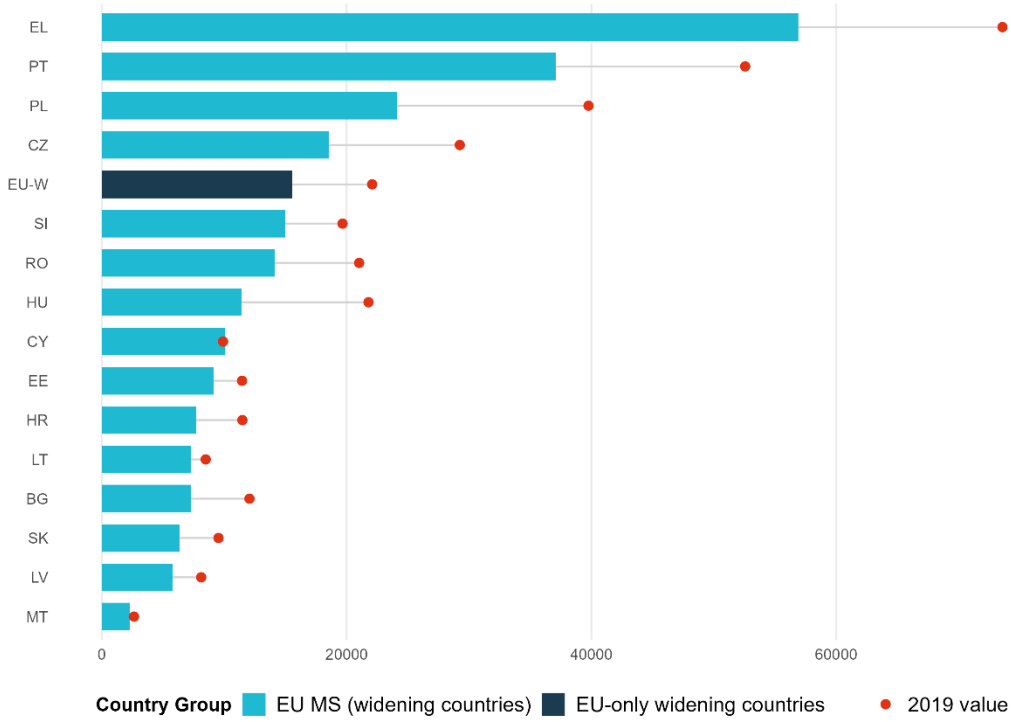
[26] It should be noted that further indicators on RPOs are available (see for example the OECD working paper Galindo-Rueda, F.; van Beuzekom, B. (2023): The contribution of R&D specialist institutions to R&D performance: Findings from the NESTI 2022 pilot data, OECD Science, Technology and Industry Working Papers 2023/04). However, in order ensure consistency with earlier reports and to cover as many countries as possible, the indicator "Number of collaboration networks of RPOs in widening Countries with other EU countries" has been selected for this year's version of the ERA Scoreboard.

[27] Collaboration Links are defined for each widening country that were involved in projects with the other EU countries (non-widening). 2020 covers all years under Horizon 2020 (2014-2020), 2024 covers all years under Horizon Europe (2015-2024).

showing more than 56,000 collaborative links, followed by Portugal, Poland, and Czechia, registering values higher than the widening countries´ average (EU-W in dark blue). Widening countries that registered less than 7,000 collaborative links in 2023 are Slovakia, Latvia, and Malta.

Compared to indicator values in 2019, most of the countries show a lower value in 2024.

Figure 153 Number of collaboration networks of RPOs in widening countries with other EU countries, by country for the latest available year and 2019

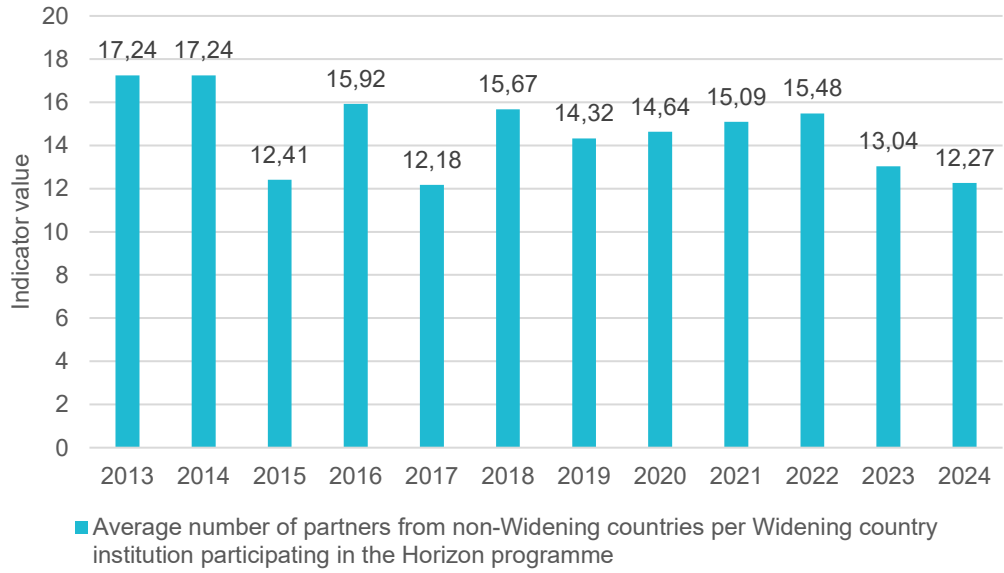


Source: Horizon Dashboard – R&I projects. Calculations by Fraunhofer ISI.

6.3.2 #56 Average number of partners from non-widening countries per widening country institution participating in the Horizon Europe programme

This indicator measures the average number of partners from EU non-widening countries collaborating with institution in widening countries in Horizon programmes. Figure 154 shows the average number of collaborating partners of widening countries from non-widening countries. In 2013 and 2014 (2013 is imputed and 2014 is the starting year of Horizon 2020), the average number of partners register its highest value with 17.24. After fluctuations between 2015 and 2017, where the indicator declines to 12.18, it follows a more stable trend, fluctuating between 14.32 and 15.48 until 2022. In the most recent years, a renewed decline is observed, with the average number of partners decreasing to 13.04 in 2023 and 12.27 in 2024.

Figure 154 Average number of partners from non-widening countries per widening country institution participating in the Horizon programme, for the EU widening countries over time

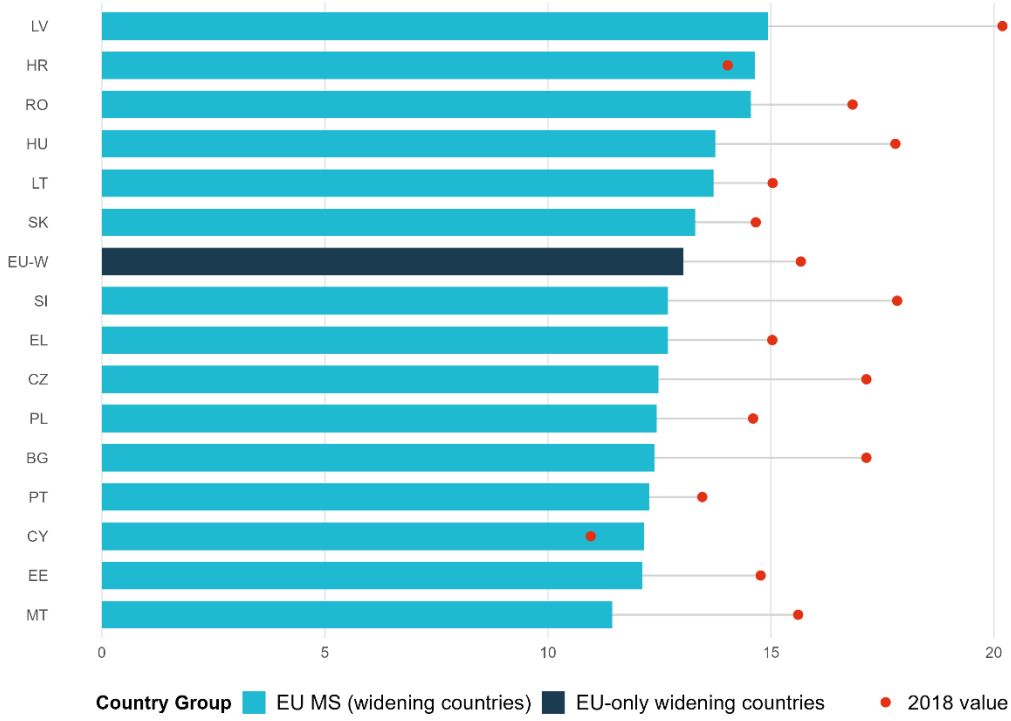


Source: Horizon Dashboard – R&I projects. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest values within the widening countries can be found in Latvia, Croatia, and Romania, showing indicator values between above 14. The rest of the widening countries register values between 11 and 13 in 2023, registering an overall homogenous indicator value.

Compared to the indicator values in 2018, however, all the countries, with the exception of Croatia and Cyprus, show a lower value in 2024.

Figure 155 Average number of partners from non-widening countries per widening country institution participating in the Horizon programme, by country for the latest available year and 2018

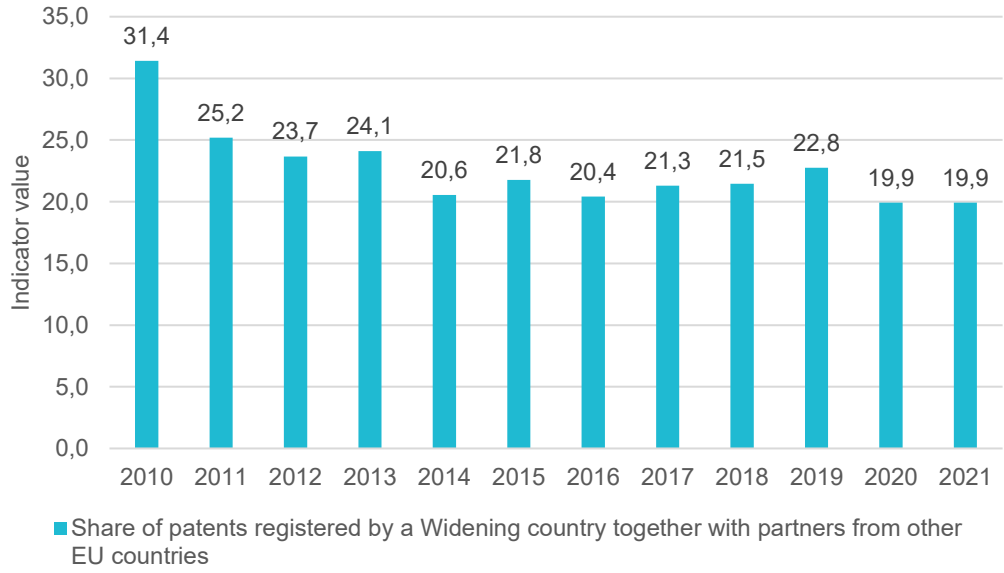


Source: Horizon Dashboard – R&I projects. Calculations by Fraunhofer ISI.

6.3.3 #57 Share of patents registered by a widening country together with partners from other EU countries

This indicator measures the share of patents invented by widening countries together with partners from other non-widening EU countries. Figure 156 shows the average shares. In 2010, the indicator registered its highest value, at 31.4%. It then declined to 25.2% in 2011, and fluctuating around 20% between 2012 and 2019, until reaching the lowest value in 2020 (2021 imputed), registering a value of 19.9%.

Figure 156 Share of patents registered by a widening country together with partners from other EU countries, for the EU widening countries over time

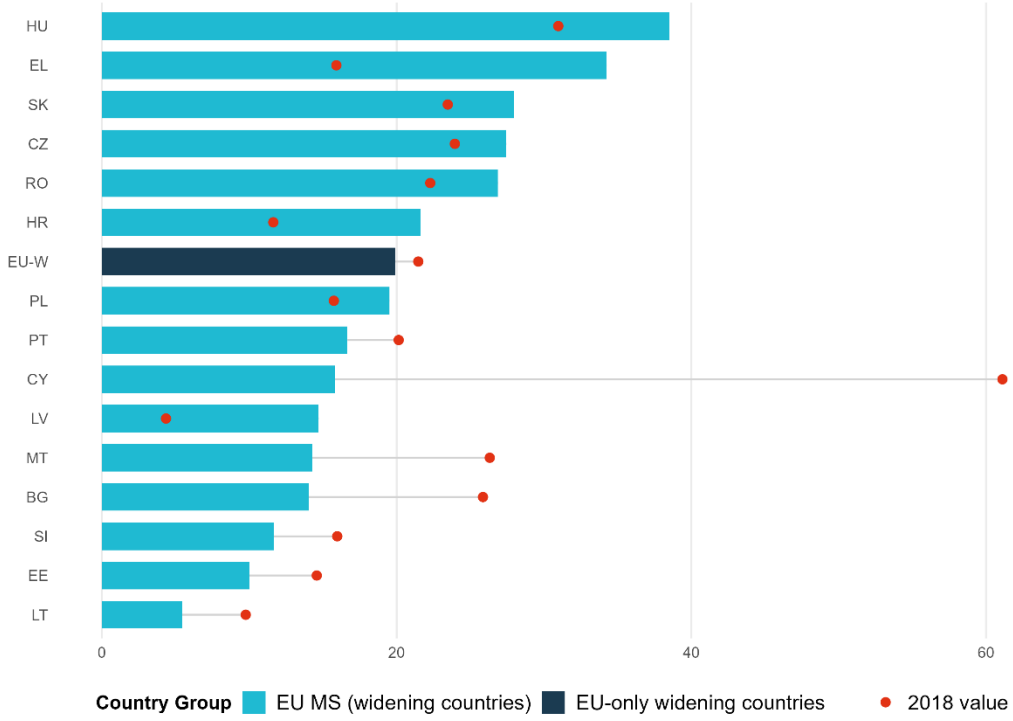


Source: OECD. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest shares of co-invented patents within widening countries can be found in Hungary, showing an indicator value that exceeds 38% in 2021, followed by Greece, Slovakia, Czechia, and Romania. With around 5% the lowest value is registered by Lithuania.

Compared to the indicator values in 2018, countries such as Hungary, Greece, Slovakia, Czechia, Romania, Poland, Croatia, and Latvia, registered a higher value in 2021, indicating an improvement, whereas countries such as Cyprus, Malta, Bulgaria, and Slovenia among others, registered higher values in 2018.

Figure 157 Share of patents registered by a widening country together with partners from other EU countries, by country for the latest available year and 2018

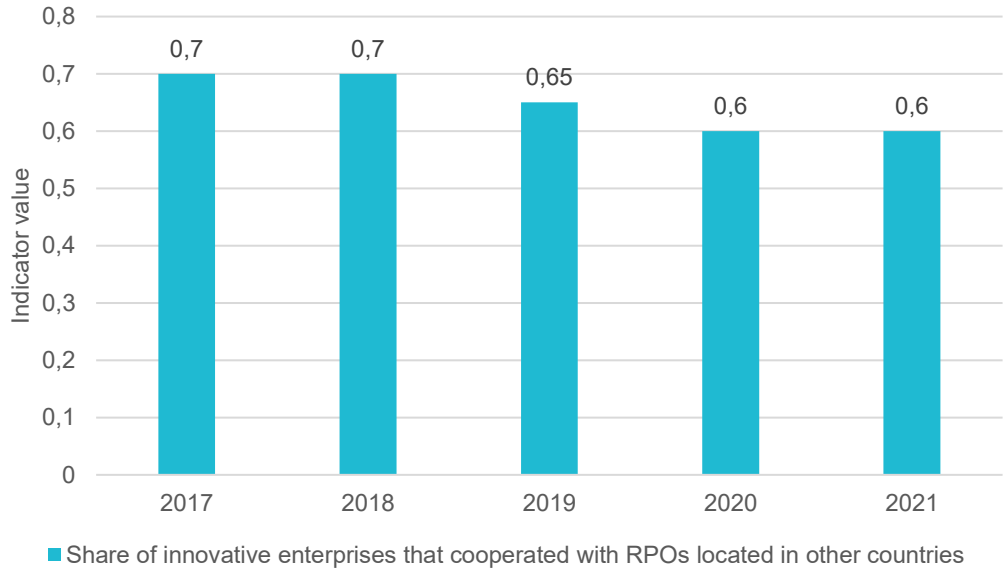


Source: OECD. Calculations by Fraunhofer ISI.

6.3.4 #58 Share of innovative enterprises that cooperated with RPOs located in other countries

This indicator measures the share of innovative enterprises in EU Member States that cooperated with RPOs located in other EU or non-EU countries. Figure 158 shows the trend of the indicator across the 2017-2021 period. The indicator remained quite stable over time, although a slight decline can be observed from 0.7% in 2017 to 0.6% in 2021.

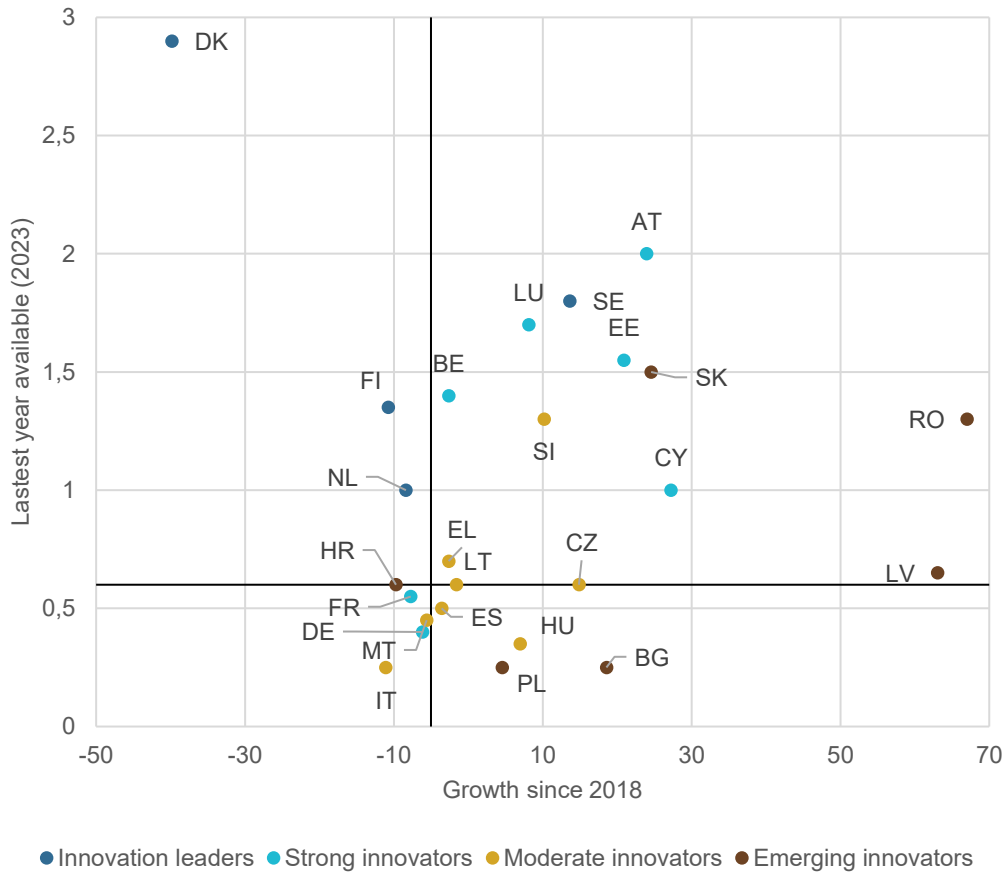
Figure 158 Share of innovative enterprises that cooperated with RPOs located in other countries, for the EU average over time



Source: Eurostat: Community Innovation Survey. Calculations by Fraunhofer ISI.

Figure 159 shows the latest available value of the share of innovative enterprises that cooperated with RPOs located in other countries, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include among others Austria, Belgium, Romania, Latvia, Cyprus, Lithuania, Czechia, and Slovenia. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Denmark, Finland, the Netherlands, and Croatia. France, Germany, Malta, and Italy are instead depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. Spain, Hungary, Bulgaria, and Poland can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 159 Share of innovative enterprises that cooperated with RPOs located in other countries, latest indicator value and change by EU-27 countries



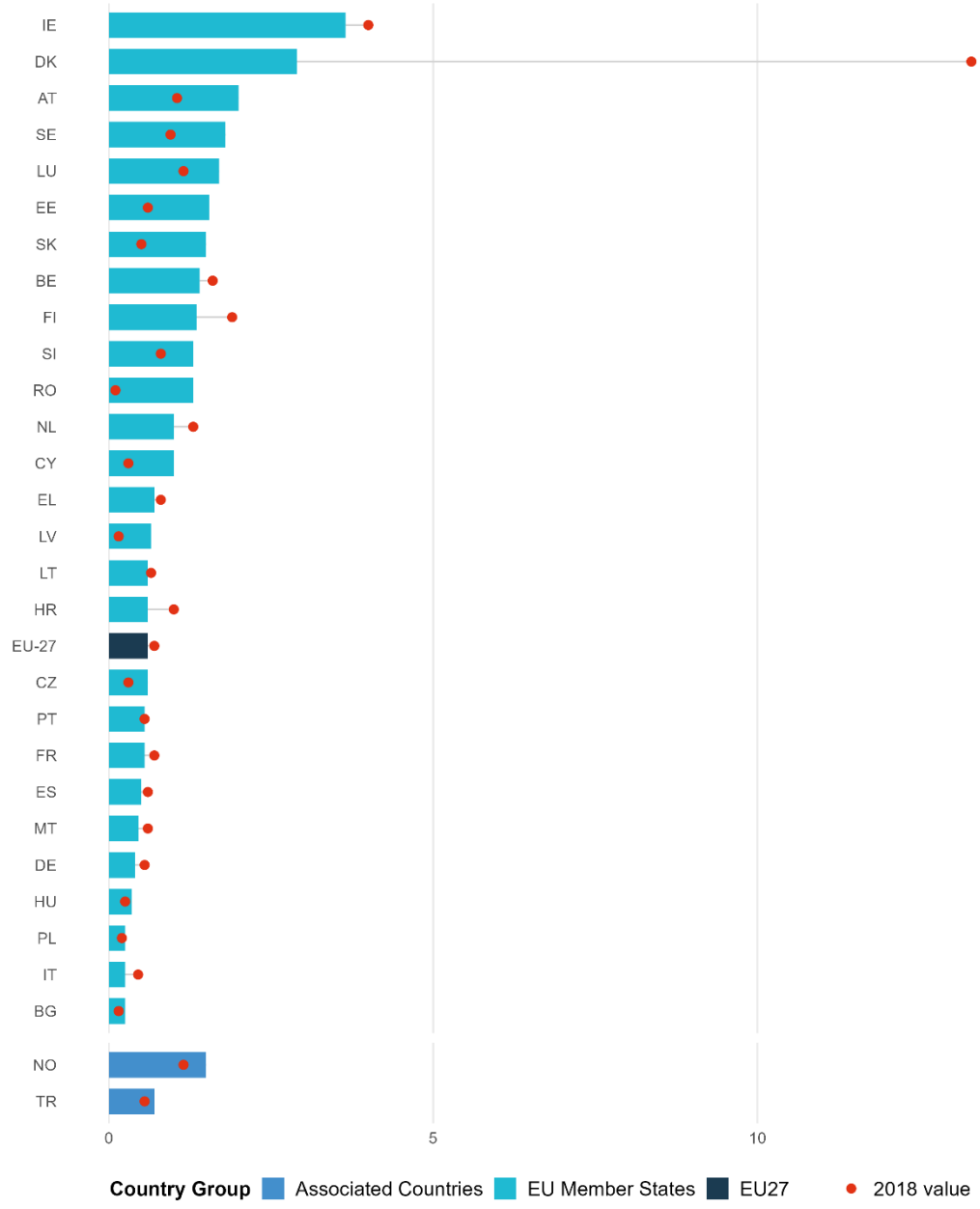
Source: Eurostat: Community Innovation Survey. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest shares of innovative enterprises that cooperated with RPOs located in other countries within the EU-27 can be found in Ireland, showing an indicator value that exceeds 3.6%, followed by Denmark, Austria, and Sweden. However, there are also Member States that registered values lower than 0.5% in 2021, among them being Malta, Germany, Hungary, Italy, Bulgaria, and Poland.

Among the Associated Countries, the indicator is only available for Norway and Türkiye, registering values of 1.5% and 0.7% respectively, both higher than the EU-27 average.

Compared to the indicator values in 2018, most of the countries in both groups show either a higher value in 2023, or no big difference between the two years. However, a much higher value in 2018 is noticeable for Denmark.

Figure 160 Share of innovative enterprises that cooperated with RPOs located in other countries, by country for the latest available year and 2018



Source: Eurostat: Community Innovation Survey. Calculations by Fraunhofer ISI.

6.4 Key findings on ERA Priority 3

The sub-priority **'more investments and reforms in countries and regions with lower R&I performance'** (#49-#52) focuses on so-called widening countries. Overall, they show clear progress over the longer run, although a loss of momentum in the most recent years can be observed. The increase in total R&D expenditure as a share of GDP indicates that widening countries experienced a strong catch-up phase up to 2020, although followed by markedly slower growth afterwards. Within widening countries, Poland, Slovakia, Romania and Estonia show the strongest increases recently, while Czechia, Croatia and Cyprus are among those showing decreases. Participation and funding in Horizon Europe (standardised by 1,000 FTE R&D personnel) show an overall improvement compared to the early period, while still registering fluctuations: after a sharp dip in 2021, both participation and grants rebounded in 2022. In the latest available values, Cyprus is the strongest performer in both participations and grants per R&D workforce, followed by a group of countries including Malta, Estonia, Greece, and Slovenia. Hungary and Poland record the lowest values for both participation and grants per 1,000 FTE R&D personnel. Innovation performance (Summary Innovation Index) shows a steady upward trend for widening countries, indicating gradual strengthening of innovation systems.

Concerning the sub-priority **'synergies between Union, national and regional funding programmes'** (#53-54#), most of the indicators show an overall improvement in the recent years. The EU-27 trend for the share of enterprises using public funds from multiple governance levels for R&I activities shows a relatively stable period up to 2020 and then a sharp rise from 2021 onwards. For Associated Countries (where available), Norway shows the highest level, followed by Türkiye. The number of Seal of Excellence projects (standardised by 1,000 FTE R&D personnel) shows a more cyclical pattern, with a strong rise around 2019, a decline after 2020, and then renewed momentum in the most recent year. In a country comparison, Cyprus stands out with the largest value, followed by Latvia, Luxembourg, Croatia and Lithuania. Germany, Czechia, and Poland show the smallest recent values. Among Associated Countries, only Norway is included, showing a mid-range value.

The indicators under the sub-priority **increased collaborative links and the excellence-based integration of research-performing organisations** (#55-58#) show a more mixed picture, with signs of weakening interconnections in recent years, especially for widening countries' collaborative links. The number of collaboration networks of widening-country RPOs with other EU countries shows a decline since 2020. Greece records the highest number of collaboration links, followed by Portugal, Poland and Czechia, while Slovakia, Latvia, and Malta are among the lowest. Similarly, the average number of partners from non-widening countries collaborating with institutions in widening countries declined in the most recent years. The share of patents co-registered with other EU partners shows a long-term downward trend in the widening countries, reflecting a weakening of cross-border co-invention intensity overall. In the most recent years, Hungary clearly stands out, followed by Greece, Slovakia, Czechia, and Romania, while Lithuania records the lowest share. Finally, cross-border cooperation by innovative enterprises with foreign RPOs is stable at EU-27 level, with only a slight decline over time.

7 ERA Priority 4: Advancing concerted research and innovation investments and reforms

In this section, the results of the ERA Priority 4: Advancing concerted research and innovation investments and reforms are presented. The ERA Priority 4 is divided into two sub-priorities:

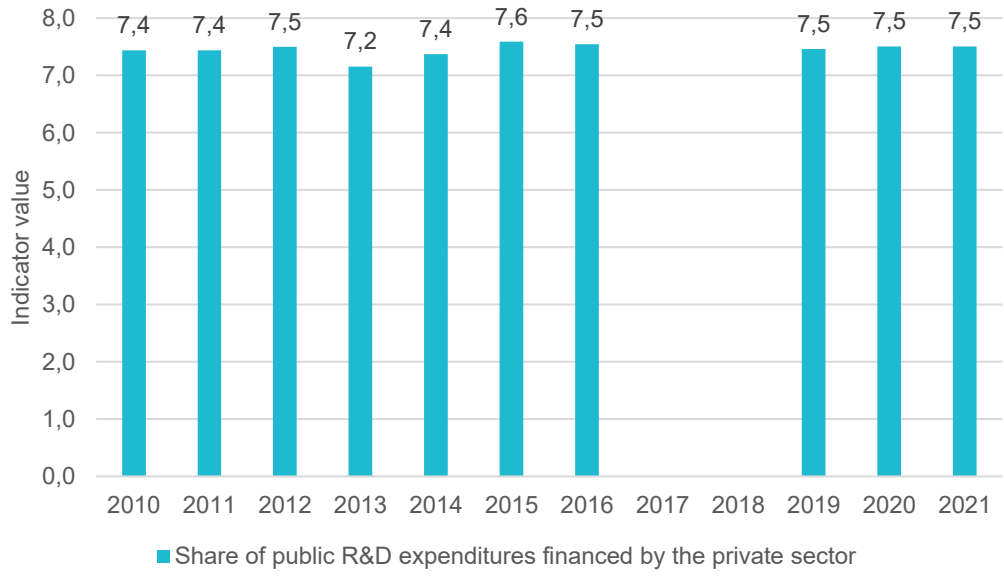
- Support to prioritise and secure long-term R&I investments and policy reforms
- Coordination of R&I investments

7.1 Sub-priority 4.1: Support to prioritise and secure long-term R&I investments and policy reforms

7.1.1 #59 Share of public R&D expenditures financed by the private sector

This indicator measures the share of public R&D expenditures financed by the private sector. It indicates public-private co-operation in research. The willingness of the private sector to co-fund public R&I projects can be seen as a proxy for how closely companies work with universities and public research organisations. For the EU-27, this indicator remains within a rather narrow range of 7.2% to 7.5% over the observation period, although data for 2017 and 2018 is unavailable.

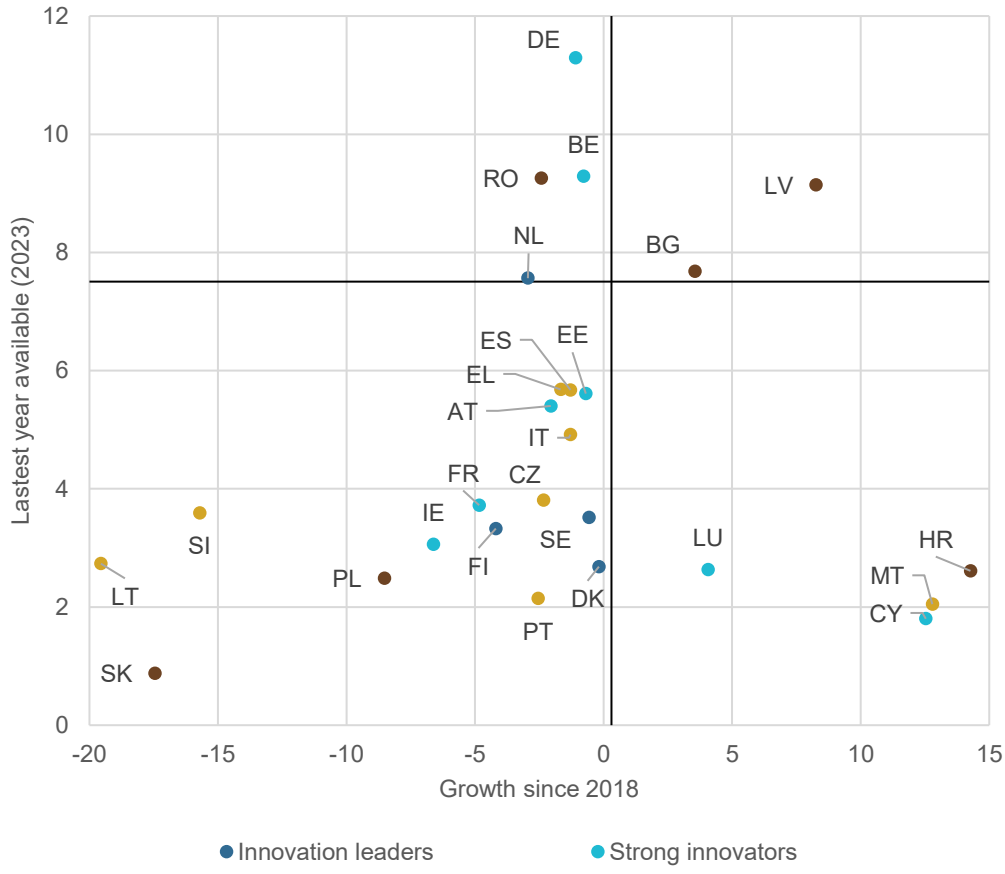
Figure 161 Share of public R&D expenditures financed by the private sector, for the EU-27 over time



Source: Eurostat, OECD. Calculations by Fraunhofer ISI.

Figure 162 shows the latest available value of the share of public R&D expenditures financed by the private sector, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Latvia and Bulgaria. Countries in the upper left quadrant maintain above-average values but record below-average growth. Among these, we find Belgium, Germany, Romania, and the Netherlands. While Luxembourg, Croatia, Malta, and Cyprus can be found in the lower right quadrant, showing below-average values but above-average growth since 2018, the majority of the Member States are depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value.

Figure 162 Share of public R&D expenditures financed by the private sector, latest indicator value and change by EU-27 countries



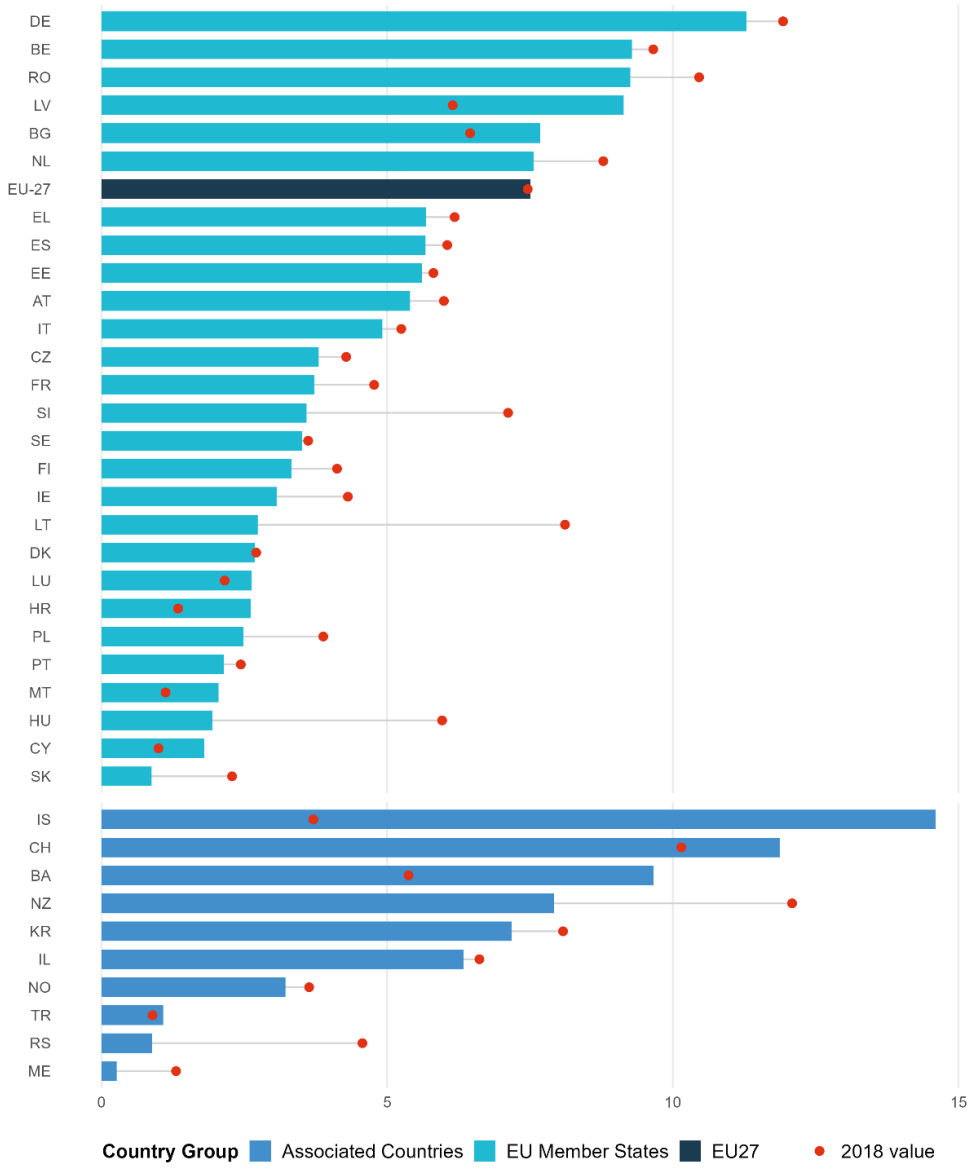
Source: Eurostat, OECD. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest R&D expenditure shares financed by the private sector within the EU-27 can be found in Germany, showing indicator values that exceed 10%, followed by Belgium, Romania, and Latvia. However, there are also Member States that registered less than 2% in 2023, namely Hungary, Cyprus, and Slovakia.

Among the Associated Countries, the highest share of public R&D expenditure financed by the private sector can be observed in Israel, with a value close to 15%, followed by Switzerland, Bosnia and Herzegovina, and New Zealand.

Compared to the indicator values in 2018, most of the countries among Member States show mainly lower values, or no big differences between the two years. Only Latvia, Bulgaria, Croatia, Malta, and Cyprus show higher values in 2023. The latest values for Associate Countries are mostly higher compared to 2018, with the exception of New Zealand and Serbia, which show much higher values in 2018.

Figure 163 Share of public R&D expenditures financed by the private sector, by country for the latest available year and 2018



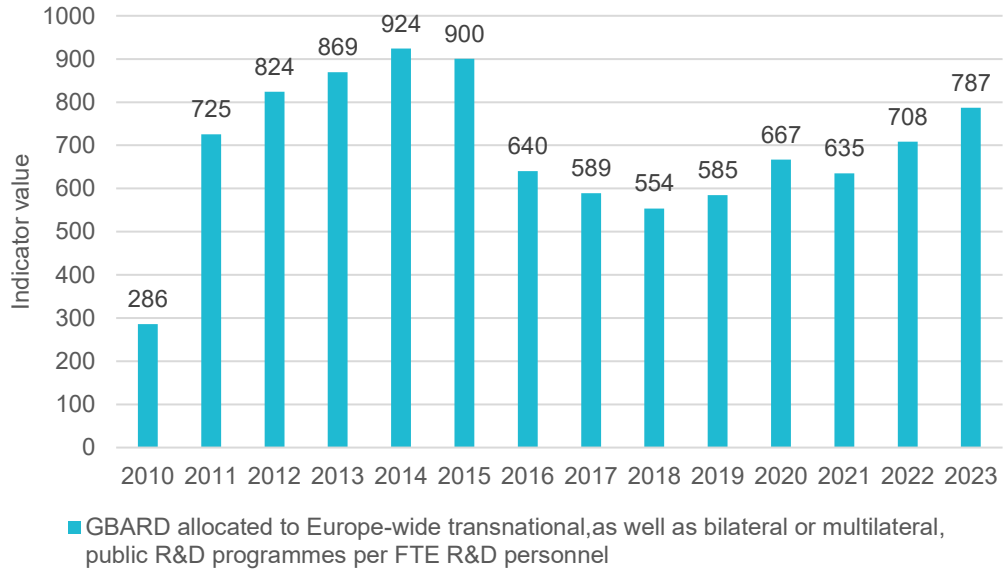
Source: Eurostat, OECD. Calculations by Fraunhofer ISI.

7.2 Sub-priority 4.2: Coordination of R&I investments

7.2.1 #60 GBARD allocated to Europe-wide transnational, as well as bilateral or multilateral, public R&D programmes per FTE R&D personnel

This indicator measures the Government budget allocations for R&D (GBARD[28]) allocated to Europe-wide transnational, as well as bilateral or multilateral, public R&D programmes per FTE R&D personnel. It reflects the emphasis on collaboration and sharing of experiences in R&D across borders, whether national, regional or multilateral. The trend over time of this indicator for the EU average is shown in Figure 164. Since 2010, values are consistently increasing from €286 Million to around €900 Million in 2015. From 2016 onwards, the indicator declines, falling to €640 in 2016 and reaching a low point of €554 Million in 2018. After 2018, the indicator gradually increases again, rising from €585 Million in 2019 to €787 Million in 2023.

Figure 164 GBARD allocated to Europe-wide transnational, as well as bilateral or multilateral, public R&D programmes per FTE R&D personnel, for the EU-average over time



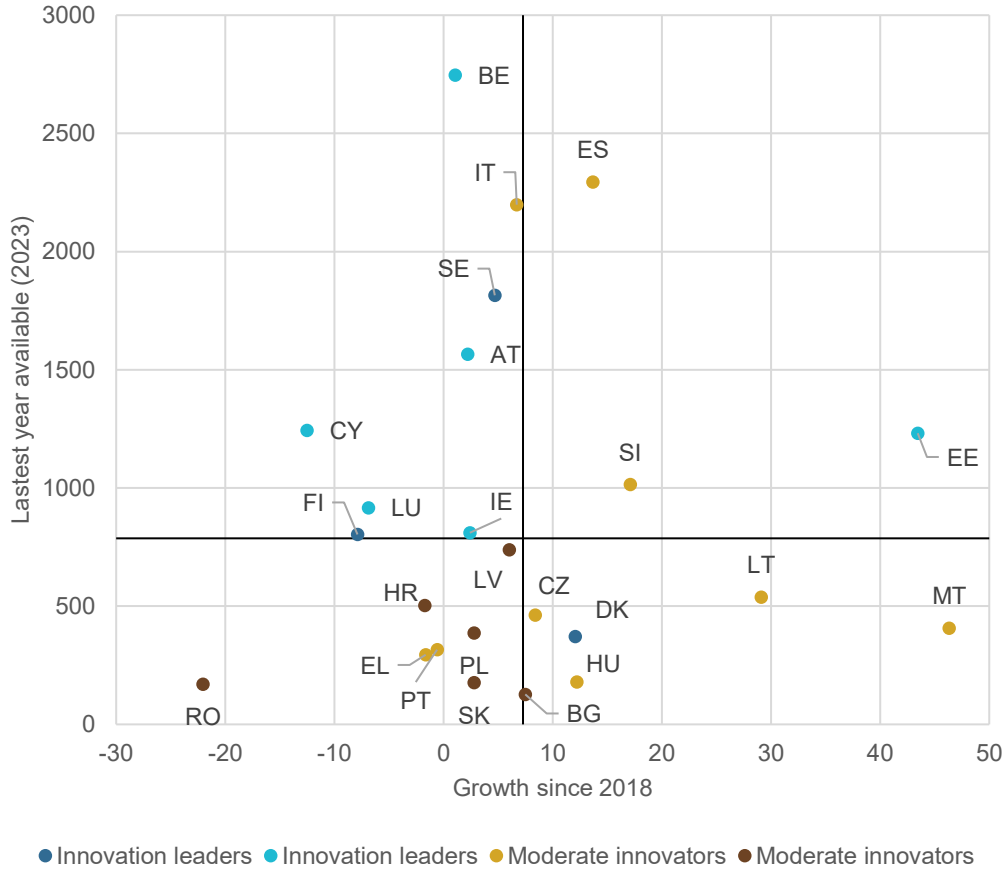
Source: Eurostat. Calculations by Fraunhofer ISI.

Figure 165 shows the latest available value of the GBARD allocated to Europe-wide transnational, bilateral, or multilateral public R&D programmes per FTE R&D personnel, compared to the growth of the indicator value since 2018, for all EU-27 Member States. Countries located above the bold horizontal-axis display indicator values higher than the EU-27 average, while those to the right of the bold vertical axis show growth rates exceeding the EU-27 average. Member States in the upper-right quadrant combine above-average values with above-average growth since 2018. These include Spain, Estonia, and Slovenia. Countries in the upper left quadrant maintain above-average values but record below-average growth. Here,

[28] GBARD refers to government support to research and development (R&D) activities, and thereby provide information about the priority governments give to different public R&D funding activities (https://ec.europa.eu/eurostat/cache/metadata/EN/gba_simsgb_ro.htm).

we find Austria, Belgium, Italy, Sweden, Austria, Cyprus, Luxembourg, Ireland, and Finland. Most emerging innovators, together with Greece and Portugal are instead depicted in the lower left quadrant of the graph, indicating both below-average growth and below-average indicator value. The remaining Member States, such as Czechia, Bulgaria, Hungary, Denmark, Malta, and Lithuania can be found in the lower right quadrant, showing below-average values but above-average growth since 2018.

Figure 165 GBARD allocated to Europe-wide transnational, as well as bilateral or multilateral, public R&D programmes per FTE R&D personnel, latest indicator value and change by EU-27 countries

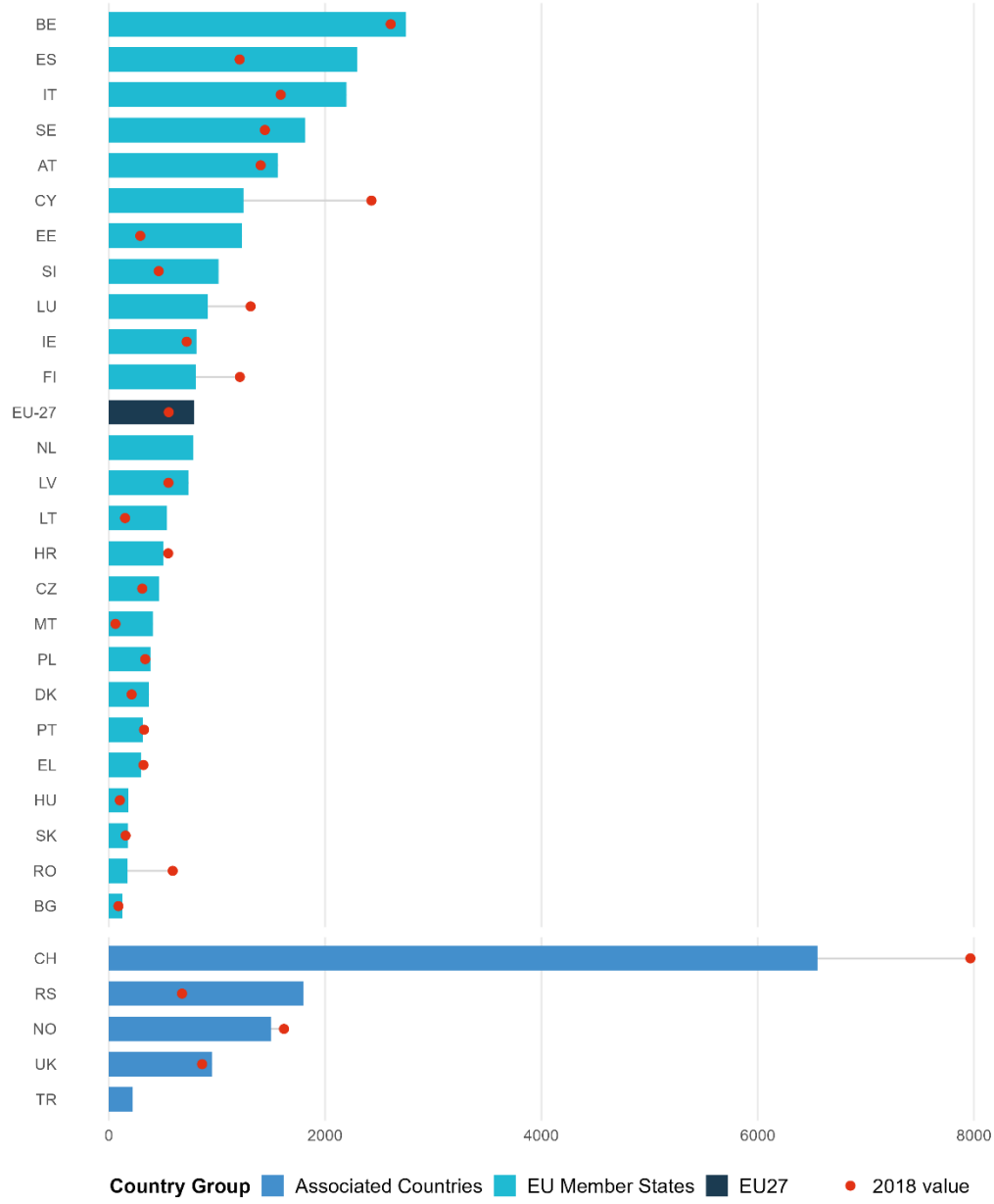


Source: Eurostat. Calculations by Fraunhofer ISI.

The most recent values for each country are shown in the graph below. The highest values within the EU-27 can be found in Belgium, showing an indicator value that exceeds 2,000 million Euros, followed by Spain, Italy, and Sweden. However, there are also Member States that allocated less than 200 million Euro per FTE R&D personnel of their GBARD to Europe-wide transnational, bilateral or multilateral public R&D programmes in 2023, such as Hungary, Slovakia, Romania, and Bulgaria.

Compared to the indicator values in 2018, most of the countries in both groups show higher values or no big differences between the two years. Higher values in 2018 can be noted in Cyprus, Luxembourg, Finland, Romania, and Switzerland.

Figure 166 GBARD allocated to Europe-wide transnational, as well as bilateral or multilateral, public R&D programmes per FTE R&D personnel, by country for the latest available year and 2018



Source: Eurostat. Calculations by Fraunhofer ISI.

7.3 Key findings on ERA Priority 4

Concerning the sub-priority **'support to prioritise and secure long-term R&I investments and policy reforms'**, the share of public R&D expenditure financed by the private sector shows a largely stable pattern over time for the EU-27, with limited change in recent years. Developments since 2018 indicate that improvements are concentrated in a small group of countries, while most Member States show slight declines, pointing to persistent challenges in strengthening public–private co-financing of R&I. Among Member States, Germany records the highest levels of private financing of public R&D, followed by Belgium, Romania and Latvia, while Hungary, Cyprus and Slovakia remain at the lower end. Recent improvements are mainly observed in Latvia, Bulgaria, Croatia, Malta and Cyprus. Among Associated Countries, Israel stands out clearly, followed by Switzerland, Bosnia and Herzegovina and New Zealand, although some Associated Countries show weaker recent dynamics compared to 2018.

Looking at the sub-priority on **coordination of R&I investments**, the indicator on GBARD allocated to transnational and multilateral R&D programmes per FTE R&D personnel shows an upward trend in the recent years. At the country level, Belgium has the highest level of GBARD allocated to transnational and multilateral programmes, followed by Spain, Italy and Sweden, while Hungary, Slovakia, Romania and Bulgaria allocate very low levels to transnational R&D programmes.

8 Conclusions

The 2025 edition of the ERA Scoreboard analyses data for 60 indicators and provides a comprehensive overview of progress made towards achieving the four ERA Priorities, both at the EU-27 level and at the level of single countries. Overall, the **evidence points towards a consolidation of several core strengths of the European Research Area**, alongside some challenges that require further support.

Across Member States and Associated Countries, **substantial progress is observed in open scienc**e, particularly in open access publishing, **as well as in global engagement**, where international co-publications and cross-border research linkages remain relatively strong. **Improvements are also evident in access to and participation in research infrastructures**, supporting the long-term capacity of European research systems. These developments provide a solid foundation for sustaining research excellence and international competitiveness.

At the same time, the **Scoreboard highlights some structural weaknesses** that remain unresolved. Sub-priorities related to **gender equality and inclusiveness** show gradual progress, although some gaps still exist across countries, especially in senior academic positions and in STEM fields. **Research infrastructures** show a similar pattern. Many countries have increased their participation, but commitment levels vary. **Researchers' careers and mobility** continue to display asymmetries, with talent circulation concentrated in a limited number of countries. Similarly, while **knowledge valorisation** indicators show overall stability, collaboration between academia and industry remains uneven across the Member States.

With respect to **societal, green and digital challenges the results show a mixed picture**. Sub-priorities related to the green and digital transitions benefit from stable public investment and policy attention, but recent developments reveal slower dynamics in innovation outputs and uneven uptake across countries. Engagement with societal challenges is broadly maintained, yet indicators linked to participation and mission-oriented outcomes suggest that progress still needs to be supported.

For widening countries, the Scoreboard confirms long-term convergence trends, particularly in R&D investment growth, Horizon programme participation, and innovation performance. However, recent years point to a loss of momentum, and to still existing gaps across countries.

Finally, **indicators related to concerted R&I investments and reforms underline continuing challenges in investment coordination**. Public–private co-financing of public R&D remains broadly stable, with limited recent improvement and country differentiation. Similarly, coordination of R&I investments through transnational and multilateral programmes has recovered after earlier declines but they are more heterogeneously distributed.

9 Annex 1 – List of ERA Scoreboard indicators 2025

Table 2 List of ERA Scoreboard 2025 indicators

ID	Indicator	Source
General indicators		
1	Gross Domestic Expenditure on R&D (GERD) as a percentage of GDP	Eurostat, OECD, UNESCO UIS
2	Government Budget Allocations for R&D (GBARD) as share of GDP	Eurostat, OECD
3	Researchers (in full-time equivalent) per million inhabitants	Eurostat, UNESCO UIS
4	Business Enterprise expenditure on R&D (BERD) as a percentage of GDP	Eurostat, OECD
ERA Priority 1: Deepening a truly functioning internal market for knowledge (a) Open Science		
5	Share of publications available in open access	OpenAIRE
6	Share of research datasets available in open access	OpenAIRE
7	Share of research data repositories	re3data.org
8	Country investments in EOSC and Open Science (in ranges of investment)	EOSC Observatory
(b) Research infrastructures		
9	Share of national public R&D expenditure committed to European research infrastructures	ESFRI
10	Number of European research infrastructures in which a Member State or an Associated Country participates (financially contributes to operations)	ESFRI
(c) Gender equality, equal opportunities for all and inclusiveness		
11	Proportion of women of Grade A among academic staff/researchers	Women in Science database – She Figures reports
12	Proportion of mixed-gender teams in publications	Science-Metrix using the Scopus database (Elsevier) and NamSor
13	Proportion of women in authorships of the top 10% most cited publications	Science-Metrix using the Scopus database (Elsevier) and NamSor
14	Women in Digital Index	Eurostat (Women in Digital Scoreboard)
15	Proportion (%) of women among doctoral graduates by narrow fields of Science, Technology, Engineering and Mathematics (STEM)	Eurostat
(d) Researchers' careers and mobility and research assessment and reward systems		
16	Share of students at ISCED 7 level with previous degree abroad	European Higher Education Sector Scoreboard
17	Share of foreign doctorate students as a percentage of all doctorate students	Eurostat
18	Net flows of international scientific authors	Reico Observatory
19	Business enterprise researchers as a percentage of total researchers	Eurostat, OECD Main STI

ID	Indicator	Source
20	Public sector researchers as a percentage of total researchers	Eurostat
21	New doctorate graduates per 1,000 inhabitants aged 25-34[29]	Eurostat
22	Business enterprise researchers in full-time equivalent per thousand employers in industry	OECD Main STI
(e) Knowledge valorisation		
23	Share of public-private co-publications	EC (Scopus (Elsevier))
24	Charges for the use of intellectual property, payments (BoP, current US$, in billions)	World Bank
25	Number of PCT patent applications divided by GDP in million Euros	OECD, Eurostat
26	Share of innovating firms collaborating with HEI/PRO out of all innovative firms	Eurostat CIS
27	Percentage of academic patents over total number of patents	EPO PATSTAT (Fraunhofer ISI)
28	Percentage of industry-academia co-patents over the total number of academic patents	EPO PATSTAT (Fraunhofer ISI)
(f) Scientific leadership		
29	Percentage of scientific publications among the top-10% most cited publications worldwide	EC (Web of Science / Scopus)
30	Academic Freedom Index (AFi)	V-Dem database
31	Average ranking score of top 10 universities by country and year	QS World University Rankings
32	ERC grants per 1,000 academic personnel	European Higher Education Sector Scoreboard
33	Share of AI scientific publications among the world's 10% top-cited publications	OECD calculations based on Scopus database
34	Share of enterprises using AI technologies	Eurostat (isoc_eb_ai)
(g) Global engagement		
35	International co-publications with non-EU partners per 1,000 FTE R&D personnel	EC (Science-Metrix), Eurostat, OECD
36	Share of patents with foreign co-inventors	OECD
ERA Priority 2: Taking up together the green transition and digital transformation and other challenges with impact on society, and increasing society's participation in the ERA		
(h) Challenge-based ERA actions		
37	Government budget allocations for R&D (GBARD) according to NABS as share of total GBARD	Eurostat
38	Environmentally related government R&D budget, as a percentage of total government R&D	Eurostat, OECD Green Growth Indicators
39	National public and private investments as in the Integrated SET Plan	SETIS research and innovation data
40	Percentage of patents on environmental technology	OECD
(i) Synergies with education and the European Skills Agenda		

[29] The indicator and the related figures refer to the graduates at doctoral level, in science, math., computing, engineering, manufacturing, construction, per 1000 of population aged 25-34.

ID	Indicator	Source
41	Enterprises that purchased or licensed-in patents or other IPRs from public research organisations, universities or higher education institutions	Eurostat CIS
42	University-industry R&D collaboration	WIPO Global Innovation Index (GII)
43	Industry collaboration in EU-FP projects (per 1,000 academic personnel)	European Higher Education Sector Scoreboard using EUPRO data
(j) Synergies with sectorial policies and industrial policy, in order to boost innovation ecosystems		
44	Direct government support and indirect government support through R&D tax incentives as a percentage of GDP	Eurostat for data on direct support. OECD R&D Tax Incentive Database for data on indirect support
45	Green bond issuance as a percentage of total bond issuance	Eurostat - European Environment Agency
46	GBARD allocated to industrial production and technology per inhabitant (in million Euro)	Eurostat
(k) An active citizen and societal engagement in R&I in all its dimensions		
47	Trust in Science	GESIS (Eurobarometer)
48	Share of publications on social innovation or social entrepreneurship	OpenAIRE
ERA Priority 3: Enhancing access to research and innovation excellence across the Union and enhancing interconnections between innovation ecosystems across the Union		
(l) More investments and reforms in countries and regions with lower R&I performance		
49	Change in total R&D expenditure in widening countries, expressed as a percentage of GDP	Eurostat
50	Number of participations in Horizon Europe (of widening countries) measured in terms of 1,000 FTE R&D personnel	Horizon Dashboard, Eurostat
51	Sum of Horizon Europe grants (€) received by (widening) countries in terms of 1,000 FTE R&D personnel	Horizon Dashboard, Eurostat
52	Summary Innovation Index (widening countries)	European Innovation Scoreboard
(m) Synergies between Union, national and regional funding programmes		
53	Share of enterprises using public funds from different governance levels (local or regional, national, and EU) for R&I activities	Eurostat CIS
54	Number of Seal of Excellence projects on the InvestEU Portal per 1,000 FTE R&D personnel	InvestEU Portal, Eurostat
(n) Increased collaborative links and the excellence-based integration of research-performing organisations		
55	Number of collaboration networks of RPOs in widening countries with other EU countries	CORDIS
56	Average number of partners from non-widening countries per Widening country institution participating in the Horizon programme	CORDIS
57	Share of patents registered by a widening country together with partners from other EU countries	OECD
58	Share of innovative enterprises that cooperated with RPOs located in other countries	Eurostat CIS
ERA Priority 4: Advancing concerted research and innovation investments and reforms		
(p) Support to prioritise and secure long-term R&I investments and policy reforms		
59	Share of public R&D expenditures financed by the private sector	Eurostat, OECD
(o) Coordination of R&I investments		

ID	Indicator	Source
60	GBARD allocated to Europe-wide transnational, as well as bilateral or multilateral, public R&D programmes per FTE R&D personnel	Eurostat

10 Annex 2 – Country abbreviations

Table 3 Country abbreviations

EU-27 Member States		Associated Countries	
ISO country code	**Country**	**ISO country code**	**Country**
AT	Austria	AL	Albania
BE	Belgium	AM	Armenia
BG	Bulgaria	BA	Bosnia and Herzegovina
HR	Croatia	GE	Georgia
CY	Cyprus	IS	Iceland
CZ	Czechia	IL	Israel
DK	Denmark	XK	Kosovo
EE	Estonia	MD	Moldova
FI	Finland	ME	Montenegro
FR	France	MA	Morocco
DE	Germany	NZ	New Zealand
EL	Greece	MK	North Macedonia
HU	Hungary	NO	Norway
IE	Ireland	RS	Serbia
IT	Italy	KR	South Korea
LV	Latvia	CH	Switzerland
LT	Lithuania	TN	Tunisia
LU	Luxembourg	TR	Türkiye
MT	Malta	UA	Ukraine
NL	Netherlands	UK	United Kingdom
PL	Poland		
PT	Portugal		
RO	Romania		
SK	Slovakia		
SI	Slovenia		
ES	Spain		
SE	Sweden		

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This report provides the results of the 2025 edition of the European Research Area (ERA) Scoreboard. The ERA Scoreboard is a component of the ERA Monitoring Mechanism, which provides a basis for evidence-informed policymaking in the European Research Area. The indicator system covers 60 indicators that provide a comprehensive overview of the progress made towards achieving the ERA priorities both at the level of the European Union and national levels.

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