



European Innovation Scoreboard 2024

Innovation

European Innovation Scoreboard 2024

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European Innovation Scoreboard 2024

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FOREWORD

Faced with ongoing global challenges including climate change, geopolitical turmoil, energy crises and economic uncertainty, it is crucial to prioritise policy solutions that enhance the EU's competitiveness as we are tackling these major challenges. As a key driver of the EU's long-term competitiveness and prosperity, research and innovation (R&I) policy is a powerful tool to achieve Europe's ambitious digital and green objectives and to enhance its resilience and technological sovereignty.

In this context, the European Innovation Scoreboard (EIS) for 2024 serves as a performance compass for Europe's commitment to fostering innovation. The 10% improvement in the EU's innovation performance between 2017 and 2024 represents substantial progress. This progress is in good part wed to the ongoing implementation of the New European Innovation Agenda, launched in 2022. It is key to accelerate the development of cutting-edge technologies and fostering a dynamic environment for startups and established businesses. The European Innovation Council, part of the European R&I Framework Programme Horizon Europe, is instrumental in supporting breakthrough innovation by helping high-risk innovative companies scale up.

The EIS also shows that Member States are making progress at different rates in their innovation performance, with particular improvements among those countries that already perform bove the EU average in the North of Europe, notably driven by significant progress in research collaborations and the adoption of digital technologies. Nevertheless, as already highlighted in the recently published Science, Research and Innovation Performance of the EU (SRIP) 2024 report, the EU still lags behind the US as regards the adoption of digital technologies.

Furthermore, the EU has seen a decline in intellectual assets over the 2017-2024 period, particularly in the share of international patent and design applications. The EIS also highlights that, compared to its global competitors, the EU needs greater investments in R&I, notably by the private sector. This message is also echoed in the Annual Single Market and Competitiveness Report 2024.

Innovation is essential for long-term competitiveness, through productivity growth and in a context of environmental sustainability, macroeconomic stability and fairness. To enhance the EU's innovation performance, a flexible and future-proof Single Market with a stable regulatory environment, and reduced administrative burden is key.

By offering insights into the state of innovation performance in Europe, the EIS serves as a valuable tool to guide policy actions and to support policymakers in designing and implementing effective, innovation-friendly policies. We count on you – researchers, innovators, investors and policymakers – to help strengthen our innovation capacity and to make the whole of Europe a more competitive and innovation-driven economy, for the benefit of society at large.



Iliana Ivanova
European Commissioner for Innovation, Research, Culture, Education and Youth

A stylized handwritten signature in black ink.

Content

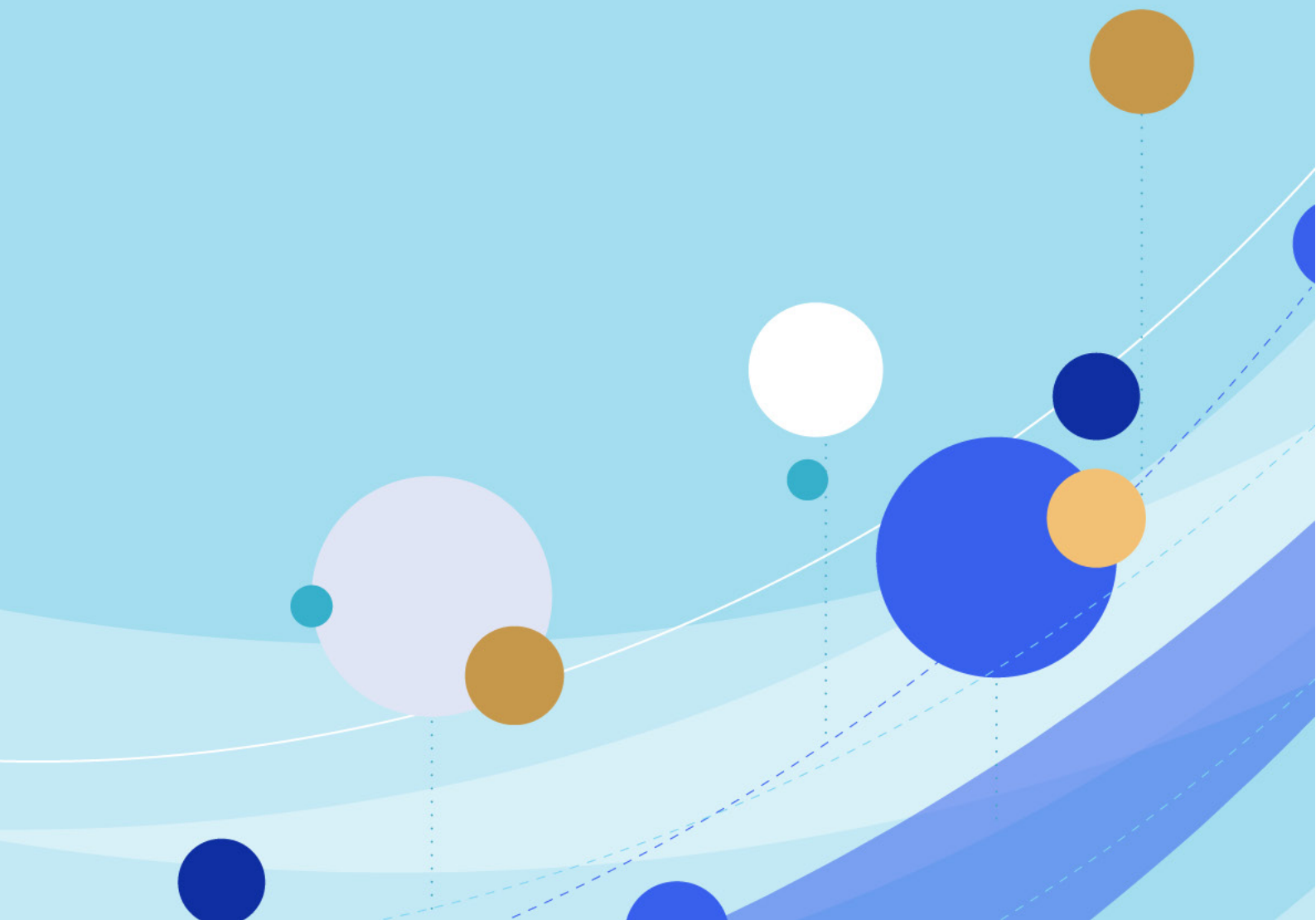
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1. Executive Summary



The European Innovation Scoreboard (EIS), published annually since 2001, provides a comparative assessment of the research and innovation (R&I) performance of EU Member States, neighbouring European countries and selected third countries (global competitors). It helps stakeholders assess areas in which they need to concentrate their efforts to boost innovation performance, considering the national socio-economic context (which is captured by a complementary set of structural indicators to help interpret the results). The EIS results can help reveal which dimensions of national innovation systems are especially weak or strong and thus should be the subject of attention from policymakers.

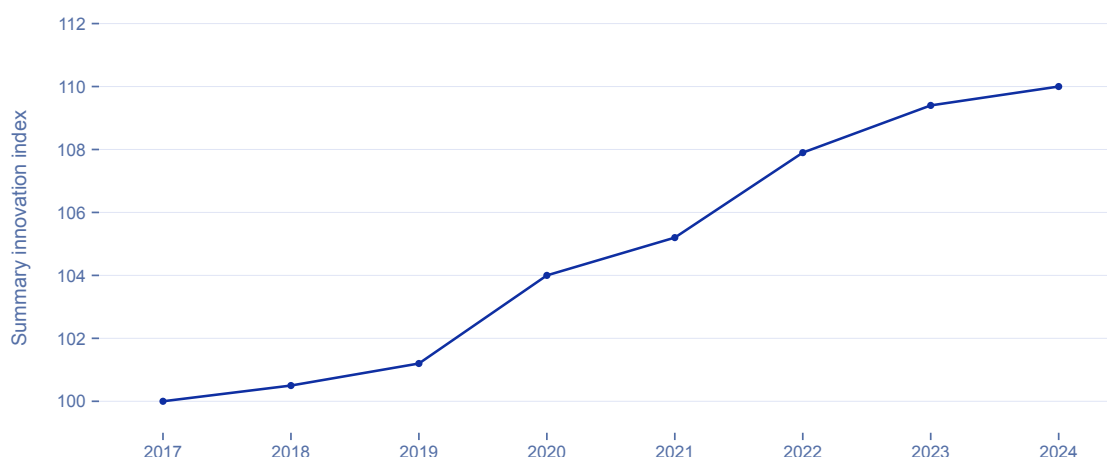
The EIS 2024 is the fourth edition applying the current measurement framework, introduced in 2021, of

32 indicators. The report uses updated data for the period 2017-2024 for all EU Member States and 12 neighbouring European countries, including Moldova for the first time. It also compares the EU's performance, using a smaller set of 19 indicators, with that of 11 global competitors.

Since 2017, the EU's innovation performance has increased by 10%-points

Most EU Member States have increased their innovation performance since 2017. Although all Member States, except Luxembourg, have experienced an increase in their innovation performance since 2017, the extent to which they have improved varies strongly. On the one hand, Romania, France, Ireland, Slovakia, Latvia, Bulgaria, Germany, Portugal, Austria and Slovenia

Figure 1: Improvement in performance of the EU over time



displayed increases of less than 5%-points¹ over the period 2017-2024. On the other hand, 11 Member States experienced faster performance growth than the EU over the same period, with Cyprus and Estonia displaying the most notable improvements (+39%-points and +27%-points respectively).

Compared to 2022-2023, the EU's innovation performance is growing at a similar pace

The EU's annual innovation performance has improved at a rate of 0.6%-points from 2023 to 2024 as was the case from 2022 to 2023. Innovation performance increased in 15 Member States, with Lithuania, Poland and Cyprus recording an increase of more than 3%, and declined in 11 Member States. Croatia remained stable.

The innovation divide persists, despite a slight decrease in the disparities in innovation performance across Europe

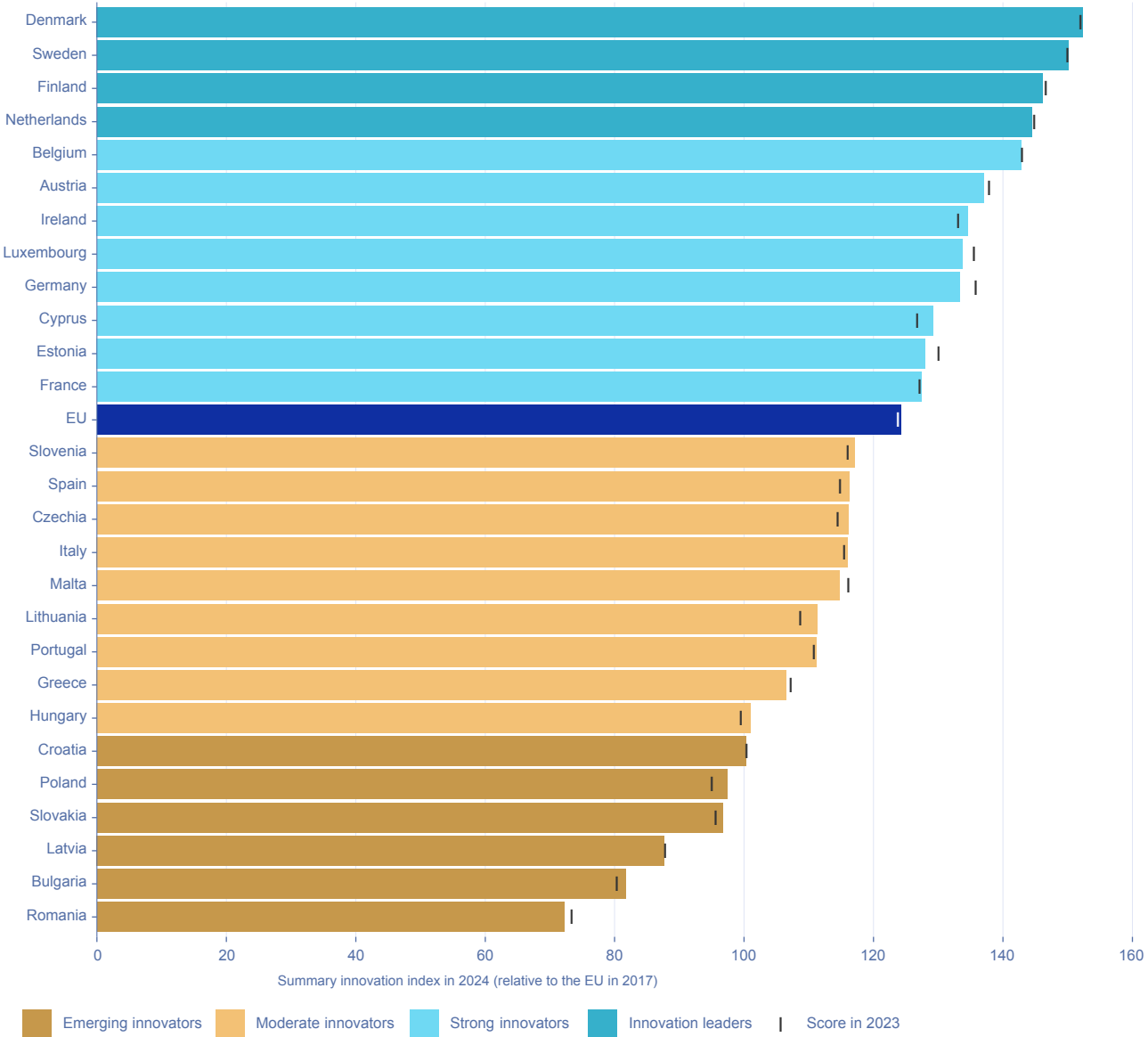
Based on their performance relative to the EU average in 2024, Member States fall into four different performance groups (see Figure 2). In performance order, Denmark, Sweden, Finland and the Netherlands are Innovation Leaders with innovation performance well above the EU average (above 125% of EU average). Belgium, Austria, Ireland, Luxembourg, Germany, Cyprus, Estonia and France are Strong Innovators with performance above the EU average. Slovenia, Spain, Czechia, Italy, Malta, Lithuania, Portugal, Greece and Hungary are Moderate Innovators with performance below the EU average. Croatia, Poland, Slovakia, Latvia, Bulgaria and Romania are Emerging Innovators with performance well below the EU average (below 70% of EU average).

¹ 'Percent' refers to one hundredth of something. 'Percentage point' (%-point) is used when comparing changes between percentages. For example, when inflation drops from 3% to 2%, it decreases by 1%-point. This is a decrease of approximately 33.3% relative to the original inflation rate.

Between 2017 and 2024, the coefficient of variation, which indicates whether lower performing Member States are catching up with other Member States, shows a modest positive convergence trend at the EU level. This suggests that the innovation divide persists and only a slight decrease in the disparities in innovation performance is observed across the EU. A

more detailed analysis is required to confirm this trend. This modest convergence in innovation performance is primarily observed in reduced differences within the groups of Strong Innovators and Moderate Innovators. However, divergence in innovation performance has increased within the Innovation Leaders and the Emerging Innovators between 2017 and 2024.

Figure 2: Innovation performance of the EU Member States, relative to the EU in 2017 and compared to national performance in 2023.



Note: All performance scores are relative to that of the EU in 2017. Coloured bars show countries' performance in 2024, using the most recent data for 32 indicators. The vertical bars show performance in 2023, using the next most recent data.

Denmark retains its position as the top EU innovation performer

Denmark retained first position as the most innovative Member State, ahead of Sweden which was the leading EU Member State from 2017-2022. Two of the top three indicators (driving a 2 to 5%-point increase in Denmark's score in 2024 compared to 2023) are from the Community Innovation Survey (CIS): *Sales of new-to-market and new-to-enterprise innovations*, and *Non-R&D innovation spending*. The third indicator is *Training to develop or upgrade ICT skills of their personnel provided by enterprises*. In contrast, Sweden's innovation performance remained almost unchanged between 2023 and 2024 and improved by slightly less than the EU as a whole (9.3%-points compared to 10%-points) during the period 2017-2024.

Estonia becomes a Strong Innovator following a steady growth pattern since 2017

Estonia has moved up to the Strong Innovators group, with a performance increase of 26.8%-points (compared to the EU27's increase of 10%-points) during the period 2017-2024. The three indicators contributing the most to the Estonian performance (improving by 2 to 5%-points compared to 2023), are *Individuals with above basic overall digital skills*, *Air emissions in Industry* and *Exports of medium and high technology products as a share of total product exports*.

Belgium leads the group of Strong Innovators in 2024

Belgium leads the Strong Innovators in 2024, which is a change in performance group compared to the EIS 2023, when the country was an Innovation Leader. However, Belgium's performance rank (5th in the EU27) remains the same and this change in performance group is explained largely by Belgium's proximity to the cut-off value used for the performance groups. The three indicators that most negatively impact Belgium's score, with a decline of 2 to 5%-points between 2023 and 2024, are *non-R&D innovation expenditures*, a CIS indicator using data from CIS 2020, *Development of environment-related technologies* and *Job-to-job mobility of Human Resources in Science & Technology*.

Switzerland ranks as the most innovative European country

An extended analysis, which includes the EU and 12 other European countries, finds that Switzerland is the most innovative European country due to its high performance on several dimensions including human resources, attractive research systems, firm investments and intellectual assets.

South Korea remains the most innovative global competitor in 2024

South Korea remains the most innovative global competitor in 2024 outperforming the EU by 21.1%-points. Three other competitors, Canada, the United States and Australia lead over the EU, similarly to 2023. China has shown a notable increase in innovation performance: it has increased the most since 2017 (+28.2%-points), it has overtaken Japan, and is catching up with the EU.

Methodological continuity and refinement

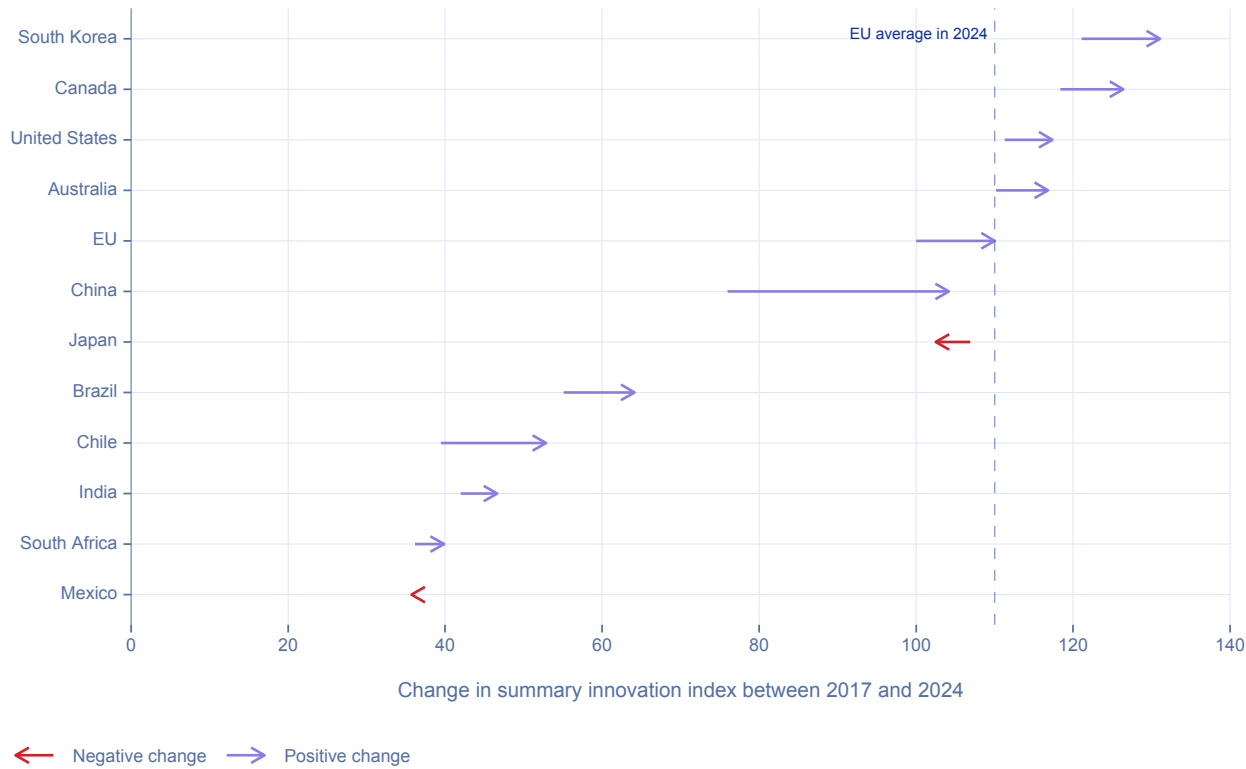
All performance scores described in this report are relative to that of the EU in 2017 to facilitate the tracking of progress and trends that enable policymakers to identify specific areas requiring attention through strategies and programmes at national level. This report applies the same logic and exact methodology as previous EIS editions, advancing by one year compared to the 2023 EIS which included performance scores relative to the EU in 2016.

The data collection and calculation process for the EIS has been automated for the 2024 release. The construction of the Summary Innovation Index (SII) for 2024 has been performed using the COINr package² developed by the European Commission's Competence Centre for Composite Indicators and Scoreboards³. The approach provides a highly replicable and easy to follow data pipeline, which feeds into the COINr package and automatically provides the main outputs of the EIS.

² See: <https://bluefoxr.github.io/COINr/>

³ <https://composite-indicators.jrc.ec.europa.eu/>

Figure 3: Innovation performance change from 2017 to 2024 - EU versus global competitors



Note: Performance change is measured as the difference between 2024 and 2017 scores, relative to that of the EU in 2017. Due to limited data availability for global competitors, scores are calculated using a smaller set of indicators.

2. Introducing the European Innovation Scoreboard



2.1. How can the EIS help users in understanding the nature and impact of innovation?

Innovation is the driving force of progress, materialising in new products, services, or processes that reshape industries and societies. Innovation activities include all developmental, financial, and commercial efforts undertaken by an organisation to improve. Through research and development (R&D) and other types of innovation activity (engineering, design and other creative activities, marketing, intellectual property (IP) management, training, software and development and data, innovation management, etc.), innovation improves living standards, and boosts long term competitiveness and sustainable economic development⁴.

“The term ‘innovation’ can signify both an activity and the outcome of the activity. An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).”

Oslo Manual⁵

While research and innovation (R&I) policy supports all types of innovators, as Metcalfe (2005) famously commented, “the state is not promoting individual innovation events; rather it is setting the framework conditions in which innovation systems can better self-organise”⁶. This is truer than ever as the European Union (EU), its Member States, neighbouring European countries and global competitors grapple with societal challenges, including the climate crisis (e.g. impacting on water and food systems), biodiversity loss, the uneven recovery from the COVID-19 pandemic, the transition to a zero-carbon economy, industrial resilience and access to critical raw materials, and defence and security considerations, exacerbated by Russia’s war of aggression against Ukraine. These challenges are further intensified by rising global competition in artificial intelligence and other emerging technologies, reshaping the landscape for the EU’s performance as a global leader.

In this context, R&I supporting the green and digital transitions is crucial for the EU. The European Green Deal demonstrates the EU’s commitment to combating climate change and achieving carbon neutrality by 2050. The pandemic accelerated the shift towards digital technologies, highlighting the need for the EU to develop its digital infrastructure to remain globally competitive. Investment in digital skills, cybersecurity and innovation is essential for European businesses and citizens to thrive in an increasingly digital society.

In short, the current European and global context is characterised by a complex interplay of crises and challenges that have a significant impact on and generate demand for innovation activities and efforts. In this context, the European Innovation Scoreboard (EIS) provides a comparative assessment of the innovation performance of the EU and its Member States, as well as neighbouring countries and selected global competitors. The EIS helps to assess how favourable the innovation systems of these countries are to innovation, tracks the change and pace of their performance over time, and offers insights into the factors driving or impeding innovation. The EIS is a useful tool for policymakers, but also for scientists, academics, innovators, and the general public.

Policymakers and public authorities at the EU, national, or regional levels can use the EIS to address various questions, such as: What drives innovation? What factors hinder it? Where is action needed to boost performance? What recommendations can be derived for future research and innovation policies? While the EIS does not directly explain the reasons behind the trends, it helps policymakers identify strengths and weaknesses, guiding strategic interventions and policy formulation. Overall, the EIS serves as an evidence base for making informed decisions.

Researchers, think tanks, and the media can also benefit from consulting the EIS to enhance their understanding of innovation trends and their socio-economic impact. The EIS data can be used and built upon to help address relevant policy questions, such as: What is the impact of innovation on an industry, market, or economy? How is innovation performance related to employment rates, productivity gains, or well-being?

4 European Commission, Directorate-General for Research and Innovation, Steeman, J., Di Girolamo, V., Mitra, A. et al., Why investing in research and innovation matters for a competitive, green, and fair Europe – A rationale for public and private action, Publications Office of the European Union, 2024, <https://data.europa.eu/doi/10.2777/01237>.

5 OECD/Eurostat (2018), Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, <https://doi.org/10.1787/9789264304604-en>.

6 Metcalfe, J.S. (2005). Systems Failure and the Case for Innovation Policy. In: Llerena, P., Matt, M. (eds) Innovation Policy in a Knowledge-Based Economy. Springer, Berlin, Heidelberg. https://doi.org/10.1007/3-540-26452-3_3

Well-designed R&I policies play a crucial role in ensuring that the benefits of innovation are distributed fairly throughout society. Yet, achieving this requires a comprehensive understanding of the innovation landscape in Europe, its Member States, and its regions⁷. The 2024 EIS report first assesses the performance of EU Member States (Section 3), then evaluates the performance of the EU as a whole and compares it to its global competitors and neighbours (Section 4), and finally discusses how the EIS can help interpret the past, current and future innovation landscape in the EU and beyond (Section 5).

2.2. How does the EIS measure innovation?

Measuring innovation is a complex process, as it goes far beyond counting the number of new products or business processes that have been introduced on the market or brought into use in society. The EIS considers a wide range of factors that affect innovation. In line with previous editions, the methodological framework of the scoreboard is based on a total of 32 indicators, divided into four main categories and 12 dimensions, to assess the innovation performance of the EU, its Member States and selected third countries (Figure 4).

Framework conditions: Innovation stems from knowledge-based activities, where information and expertise come together to drive progress. A solid scientific foundation is therefore essential for developing innovative solutions to address pressing challenges. Consequently, the EIS assesses the prevalence of tertiary education and science, technology, engineering and maths (STEM) doctorates, the trend towards international collaboration and dissemination of research results, and the extent of digitalisation, recognising that advanced digital skills are instrumental in accessing information and nurturing innovation.

Investments: Financial resources play a vital role in developing new solutions and facilitating their adoption by the market or firms. The EIS therefore evaluates the investments directed towards R&D and innovation coming from diverse sources such as the public sector, venture capitalists and businesses. In addition, the EIS assesses the proficiency of employees in information and communication technologies (ICT), acknowledging the expanding digital landscape in Europe and globally.

Innovation activities: To evaluate a country's innovation activities, the EIS places an emphasis on small and medium enterprises (SMEs), measuring their introduction of novel products or business processes and the degree to which they collaborate or co-publish across different sectors. As highlighted before, an invention must be successfully commercialised or exploited to be considered an innovation. Therefore, the EIS examines how often companies translate inventions into marketed products or related assets. To gauge the intellectual wealth of a country, the EIS also quantifies the number of patents, trademarks, or designs that the country owns.

Impacts: Lastly, the EIS evaluates the impact of innovation activities on employment, sales, exports, and environmental sustainability. The EIS analyses the value and volume of exports of medium and high-tech products, alongside knowledge-intensive services, and assesses the success of new product innovations in generating sales revenue. In addition, the EIS goes beyond economic metrics and also evaluates environmental impacts, underlining the intricate relationship between innovation, economic development, and environmental sustainability.

The EIS draws on extensive data taken from European (Eurostat, etc.) and international statistical services. For certain countries, (notably those in the Western Balkans) that do not transmit data to Eurostat, national statistical offices provide data. While data is often collected at the firm level, the aggregated results offer insights at national and international levels. To calculate an overall score reflecting the innovation performance of each country, the 32 indicators are averaged to produce a summary innovation index (SII). The SII allows countries to be compared to each other and with the EU at a given point in time. When calculating the SII, each of the four main groups of dimensions has an equal weight. Additionally, within each dimension, every individual indicator is equally weighted. This ensures that all groups, and all dimensions within each group, contribute equally to the overall index. Finally, SII scores are normalised to the EU average in the past; with 2017 as the reference year unless otherwise stated. This means that all SII scores represent a percentage relative to the EU average in 2017 (e.g. a score of 110.0 in 2024 indicates that the country is performing 10% above the EU average of 2017).

⁷ European Commission, Directorate-General for Research and Innovation, Regional Innovation Scoreboard 2023, Publications Office of the European Union, 2023, <https://data.europa.eu/doi/10.2777/70412>

Individual countries differ, for instance in size (population, territory), economic structure, sociocultural and governance systems. The EIS uses a set of structural indicators⁸ – including GDP per capita, GDP growth and population size – to help explain the observed innovation trends and to provide a more robust basis for the comparison of innovation performances of the EU Member States and third countries. These structural indicators provide a context that helps readers to understand the innovation capacity, potential and performance trends of a specific country.

2.3. How to interpret the EIS results?

The charts show countries' performance in 2024 using the most recent data for 32 indicators. The bars show performance in 2023, using the next most recent data (which is also indexed to the EU in 2017). Arrows indicate changes in countries' performance between 2017 and 2024 as well as between 2023 and 2024, highlighting both long-term and short-term changes.

The one-page country profiles in this report show the performance scores relative to the EU in 2024 allowing for a complementary assessment of each country's performance. These brief profiles are supplemented by extended country profiles, available on the EIS website and the online interactive tool, which include all EIS indicators and structural indicators.

A revision of the EIS indicators and methodology will start in Autumn 2024 and changes agreed with the Member States will be applied for the EIS 2025.

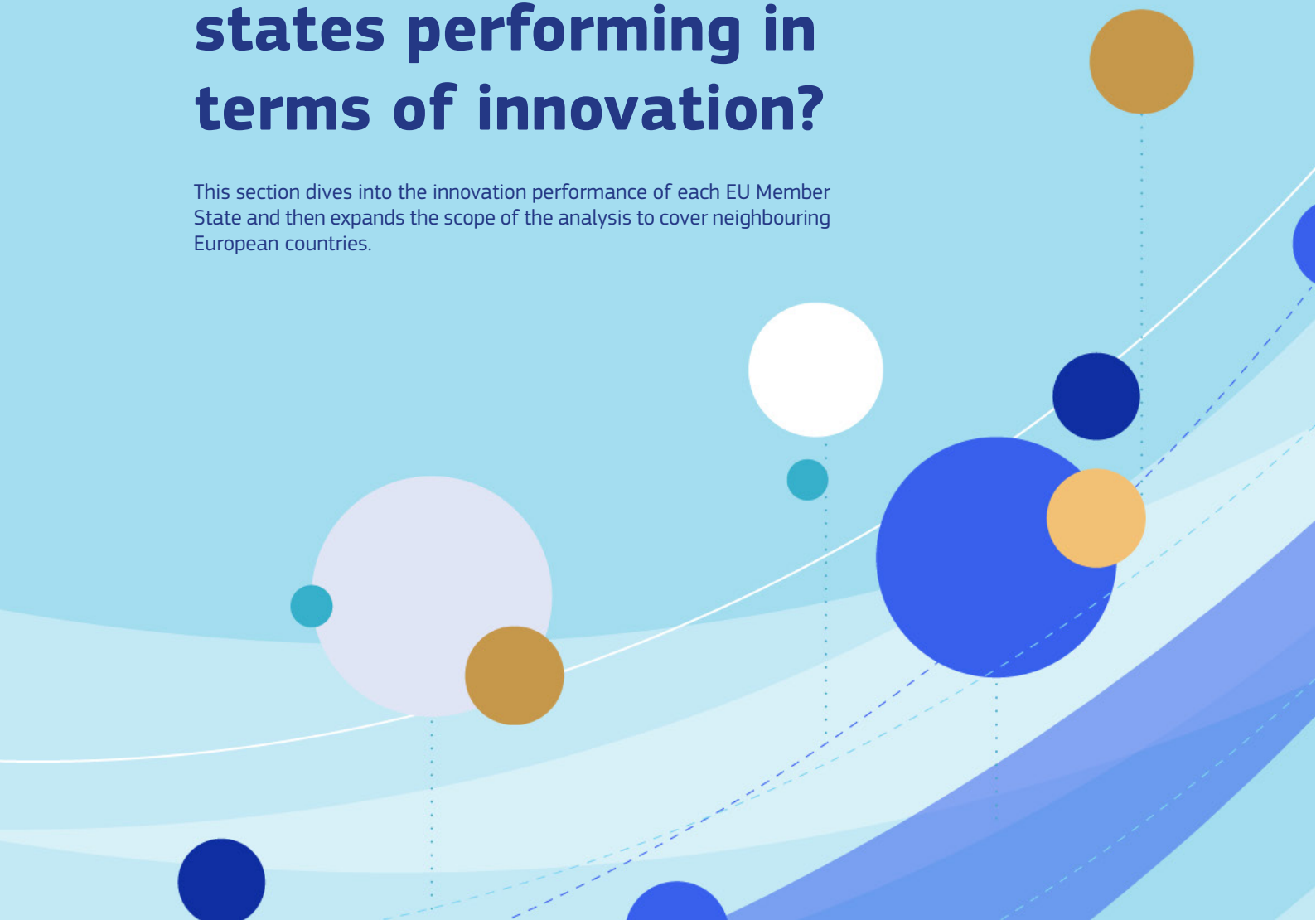
⁸ See the EIS Exploratory report Supplementary analyses and contextualisation of innovation performance data (2018), Cvijanović, V, Elci S., Reid, A. and Hollanders H. Available at <https://ec.europa.eu/docsroom/documents/29306>

Figure 4: Measurement framework and indicator descriptions



3. How are EU member states performing in terms of innovation?

This section dives into the innovation performance of each EU Member State and then expands the scope of the analysis to cover neighbouring European countries.



3.1. What is the composition and characteristics of innovation groups?

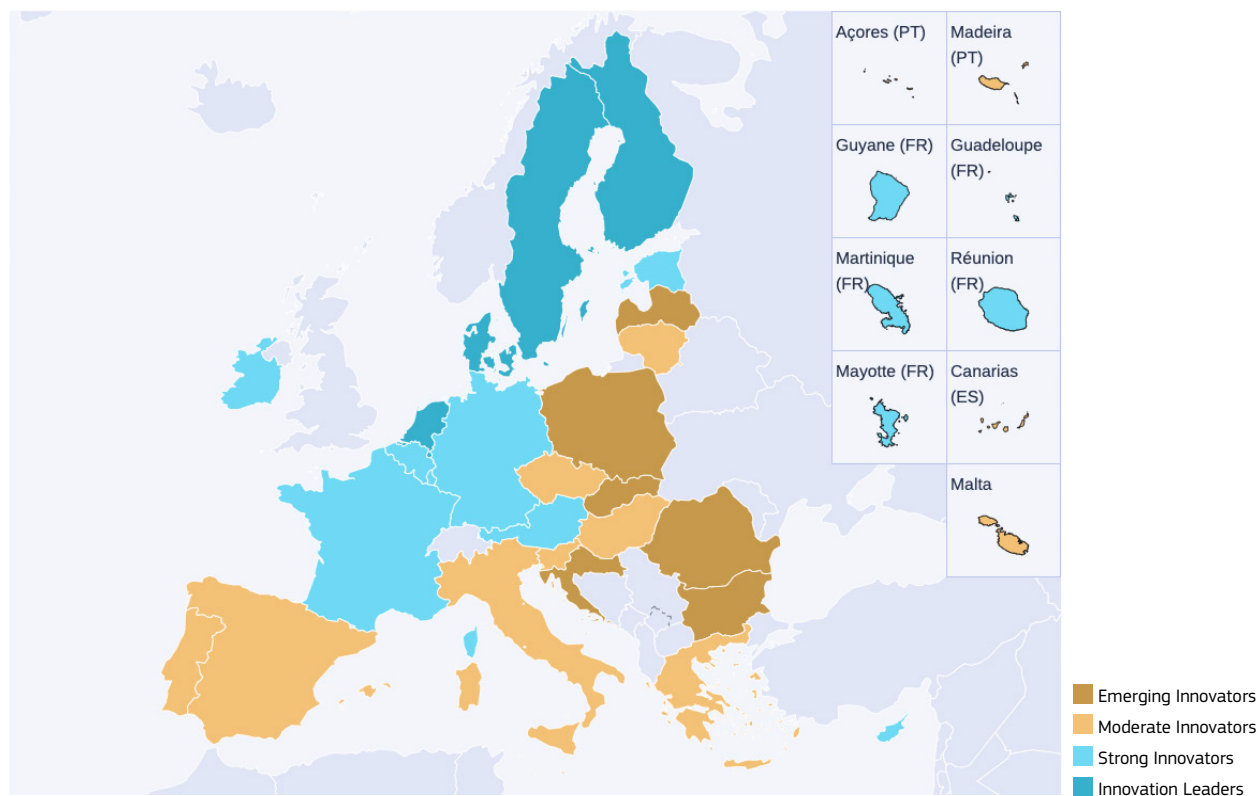
Innovation performance of each country is measured by the summary innovation index (SII). The SII is a composite indicator obtained by taking an unweighted, normalised average of the 32 indicators that compose it (see Annex E). Based on their SII in 2024, Member States are categorised into four different groups, namely Innovation Leaders, Strong Innovators, Moderate Innovators, and Emerging Innovators. More specifically:

- **Innovation Leaders** include four Member States where performance is above 125% of the EU average in 2024 (equal to 110.0). This group includes (by order of performance) Denmark, Sweden, Finland, and the Netherlands.
- **Strong Innovators** include eight Member States with a performance between 100% and 125% of the EU average in 2024 (equal to 110.0). This group includes (by order of performance) Belgium, Austria, Ireland, Luxembourg, Germany, Cyprus, Estonia, and France.
- **Moderate Innovators** include nine Member States where performance is between 70% and 100% of the EU average in 2024 (equal to 110.0). This group includes (by order of performance) Slovenia, Spain, Czechia, Italy, Malta, Lithuania, Portugal, Greece and Hungary.
- **Emerging Innovators** include six Member States that show a performance level below 70% of the EU average in 2024 (equal to 110.0). This group includes (by order of performance) Croatia, Poland, Slovakia, Latvia, Bulgaria and Romania.

Compared to the EIS 2023 edition⁹, two Member States have moved from one performance group to another. First, **Estonia moved up from Moderate Innovator to Strong Innovator**. The change in performance group is a direct result of the steady improvement of Estonia's innovation performance over the last eight years, with a 3.3% average annual growth since 2017. Between 2023 and 2024, Estonia has particularly improved in the dimensions *Human Resources*, *Attractive research systems*, *Digitalisation*, and *Use of information technologies*.

Secondly, **Belgium, previously categorised as an Innovation Leader, is among the Strong Innovators in 2024**. This change is not due to a significant decrease in Belgium's performance but due to the proximity between Belgium's SII score and the 125% threshold. In 2023 Belgium's SII was just above the threshold and in 2024 it is just below. Similarly, Croatia's SII is very close to the threshold between Emerging Innovators and Moderate Innovators and is likely to join the Moderate Innovators group if it keeps improving at a pace faster than the EU.

Figure 5: Innovation performance of the EU Member States



Note: Administrative boundaries: © EuroGeographics © UN-FAO © Turkstat. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the European Union.

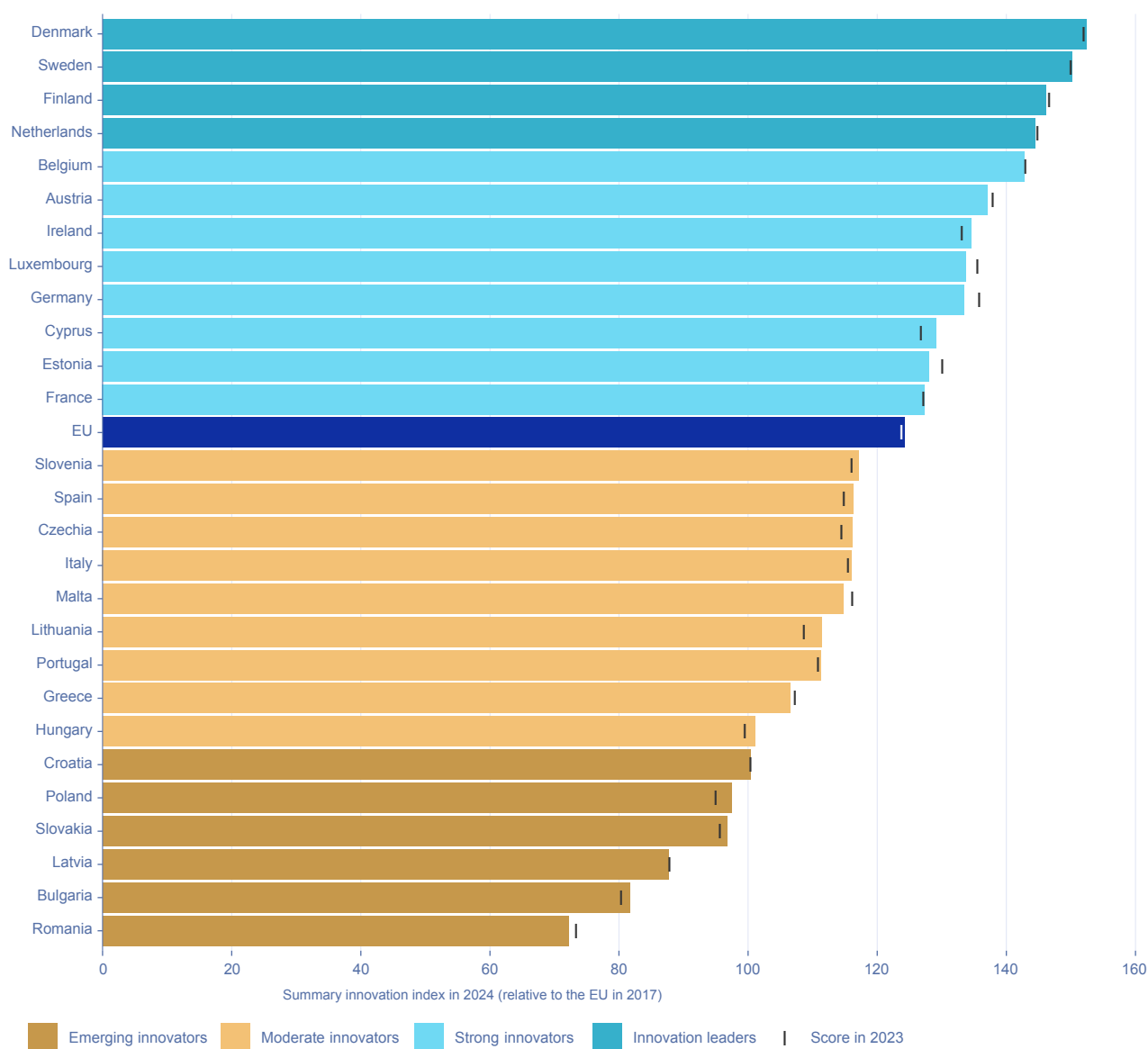
⁹ The EIS 2023 edition was completed in June 2023, based on the data available at that time. Data updates were performed in the EIS 2024 edition based on new available data, including for previous years.

3.2. How do EU Member States compare to each other?

Figure 6 shows the scores for the SII for all EU Member States in 2024 (the baseline being the EIS SII score for 2017), compared to their SII score in 2023: 12 Member States rank above the EU average and 15 below. The ranking compared to 2023, calculated using the latest available data in 2024, remains unchanged for 11 Member States while 15 Member States have shifted one or two positions upwards or downwards. Malta shifted downwards by four positions between 2023 and 2024.

Although the performance of national innovation systems has improved over the years, **the progress observed between 2023 and 2024 is limited**. In practice, year-on-year changes in indicator performance are rare, except for a few more volatile indicators such as venture capital or in the case of shocks created by specific 'black swan' events (pandemic, conflicts, etc.) which may impact investments. While Ireland, Cyprus, Slovenia, Spain, Czechia, Lithuania, Hungary, Poland, Slovakia, Bulgaria increased their innovation performance since 2023 (compared to the EU average of 2017), the score of most Member States decreased or remained stable. The most significant changes are observed in Lithuania (4%-points) and Germany (-3%-points). As a result, the performance of the EU has stabilised, with a score of 110.0 (compared to 109.4 in 2023).

Figure 6: Innovation performance of the EU Member States, compared to 2023



Note: All performance scores are relative to that of the EU in 2017. Horizontal coloured bars show countries' performance in 2024, using the most recent data for 32 indicators. The vertical bars show performance in 2023, using the next most recent data.

Compared to their performance in 2017, **all EU Member States improved their innovation performance, except for Luxembourg** whose performance dropped by -6%-points.

Drivers of change – the case of Luxembourg: Luxembourg's performance has decreased by -6%-points between 2017 and 2024. A declining trend is observed in 18 out of the 32 indicators. The most significant change is seen in design applications which have dropped by 96%-points since 2017. Additionally, the CIS-based indicator on employment in innovative enterprises referring to the period of the pandemic (2018-2020) shows a decline of 61%-points compared to 2017. Among the top three indicators driving this negative change, the environmental technologies indicator also declined significantly by 48%-points. These trends can be examined alongside the low performance (compared to the EU average) and declining trend over the period 2017-2024 in business expenditures on R&D, public government funding and government tax support for business R&D. The low R&D expenditure is further explained by the country's specialisation in services (employment share in services), considering the lower research intensity in services compared to manufacturing.

Estonia and Cyprus have achieved the strongest performance increase, with SII increasing by 27 and 39%-points, respectively. As a result, the two countries jumped, respectively, from ranks 19 and 23 in 2017, to ranks 14 and 13 in 2024. Greece, Czechia and Lithuania have also significantly improved their performance since 2017, gaining ca. 16%-points. Similar performance progress is visible in Belgium and Italy (15%-points), Croatia (14%-points), and Poland (13%-points).

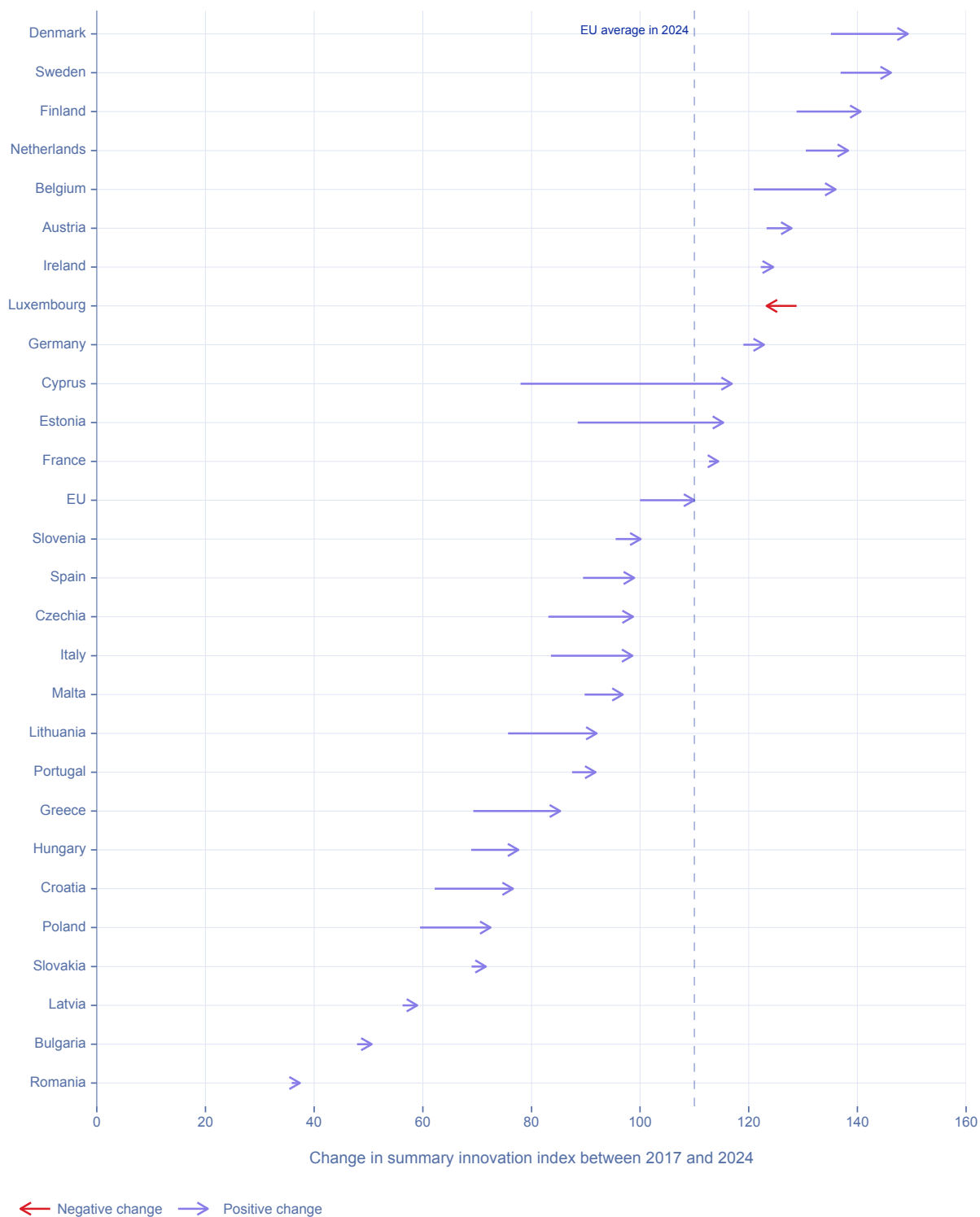
Drivers of change – the case of Cyprus: Cyprus' performance has increased by 39%-points between 2017 and 2024. 28 out of 32 indicators contribute to the growth. In particular indicators experiencing an impressive growth of above 200%-points compared to the EU average in 2017 include scientific outputs and more specifically public-private co-publications and International scientific co-publications. These are followed by innovation outputs namely the CIS-based indicator of Innovative SMEs collaborating with others. It should however be noted that the CIS data for Cyprus refer to CIS 2020 results measured during the pandemic period. The Cypriot research landscape has grown from an embryonic ecosystem into a rather dense research ecosystem (given the size of the country) of public and private universities and research centres reflected by bibliometric time-series data. More recently, the ecosystem has also integrated centres of excellence co-funded by the EU's Widening Initiative. Key research actors in Cyprus are the three public research universities which are growing organically and are systematically building up their research capabilities. While Cyprus is significantly behind the EU average in public and private sector R&D expenditure, venture capital, and government support for business R&D, gross expenditure on R&D has significantly increased over the last decade, jumping from €83 million in 2009 to more than €212 million in 2022, and the share of GDP allocated to R&D almost doubled (0.44% to 0.77%) according to Eurostat data.

Among the Innovation Leaders, the ranking has remained similar between 2017 and 2024, except for Denmark which has overtaken Sweden to take the lead. All the top performers had strong performance improvements between 2017 and 2024 (at least 7%-points). At the bottom of the EIS ranking Latvia, Bulgaria and Romania consistently closing the ranking, despite an improvement in their innovation performance of 1.5 to 3 %-points.

Drivers of change – the case of Estonia: Estonia's performance has increased by 27%-points between 2017 and 2024. In 26 out of 32 indicators recorded an improvement. Indicators experiencing an impressive growth of above 100%-points compared to the EU average in 2017 include foreign doctorate students as a percentage of all doctorate students and employment in innovative enterprises. Concerning doctoral studies the government has taken several measures including a reform of funding in 2022 and a mobility programme for doctoral students working in a company. The number of foreign doctorate students has increased significantly since 2017, also partly driven by policy interventions. Estonia's innovative activity (as measured by the CIS) shows a positive trend since 2017 except for innovative SMEs collaborating with others. Estonia has been successful in developing a dynamic tech-based start-up ecosystem with a range of support measures for innovative businesses¹⁰. To further support upgrading of existing firms, the Government launched a new research and technology organisation to support applied research in 2023. Such measures can be expected to contribute further to Estonia's performance in the innovation dimension and employment impacts.

10 European Commission (2024) Commission Staff Working Document Brussels - 2024 Country Report – Estonia Accompanying the document Recommendation for a COUNCIL RECOMMENDATION on the economic, social, employment, structural and budgetary policies of Estonia (COM(2024) 606 final) - (SWD(2024) 600 final)

Figure 7: Innovation performance change for the EU Member States (2024 vs 2017)



Note: Performance change is measured as the difference between 2024 and 2017 scores, relative to that of the EU in 2017.

3.3. How do EU Member States differ in innovation dimensions?

Human Resources

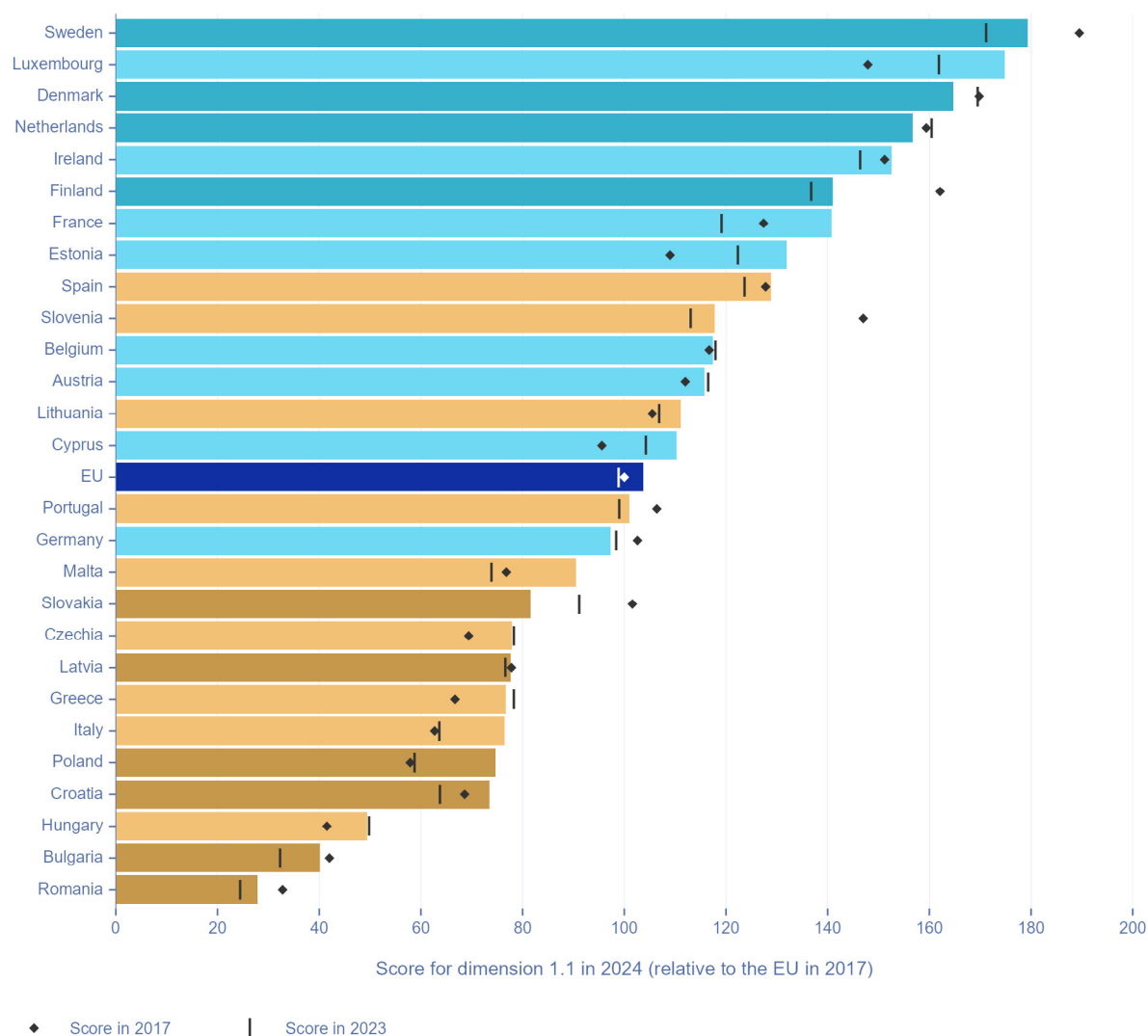
The Human Resources dimension measures the availability of a high-skilled and educated workforce and includes three indicators: New doctorate graduates in STEM, Population aged 25-34 with completed tertiary education, and Population aged 25-64 involved in lifelong learning activities.

For this dimension, the best-performing Member States are three Innovation Leaders—Sweden, Denmark, and the Netherlands—and two Strong Innovators, Luxembourg and Ireland. Sweden holds the top position. While Ireland enters the top five in 2024, Finland exits it. The bottom five in the Human Resources dimension consist of one Moderate Innovator and four Emerging Innovators. Romania, Bulgaria, and Hungary have the lowest performance, with scores below 50, which is half the EU average in 2017. While Hungary's score has remained stable between 2023 and 2024, Bulgaria and Romania have slightly increased their performance.

All Innovation Leaders and Strong Innovators, except for Germany, exceed the EU average in 2024 on the Human Resources dimension. Among the Moderate Innovators, five perform below the EU average, while three (Lithuania, Slovenia, and Spain) perform above it. All Emerging Innovators fall below the EU average. Overall, the EU average stands approximately in the middle of the distribution, with **14 Member States scoring higher and 13 scoring lower than the EU average**.

Compared to 2023, the EU average for the Human Resources dimension improved by 5%-points, driven by increased performance in 18 Member States. France (22%-points) has experienced the strongest improvement, followed by Malta (16%-points) and Poland (16%-points). Performance decreased for nine Member States, with the strongest declines in Slovakia (-10%-points), Denmark (-5%-points), and the Netherlands (-4%-points). Nevertheless, the latter two remain in the top five for this dimension.

Figure 8: Innovation performance of the EU Member States in the Human Resources dimension



Note: All performance scores are relative to that of the EU in 2017 for each dimension. Horizontal coloured bars represent countries' performance in 2024, while diamonds and vertical bars indicate their performance in 2017 and 2023, respectively. The colours denote each country's overall performance group based on the 2024 SII.

Between 2017 and 2024, the EU average for this dimension increased by 4%-points, driven by performance improvements in 16 Member States, with Luxembourg (27%-points) and Estonia (23%-points) showing the largest increases. However, performance decreased for 11 Member States, with the strongest declines in Slovenia (-29%-points), Finland (-21%-points), and Slovakia (-20%-points).

Attractive Research Systems

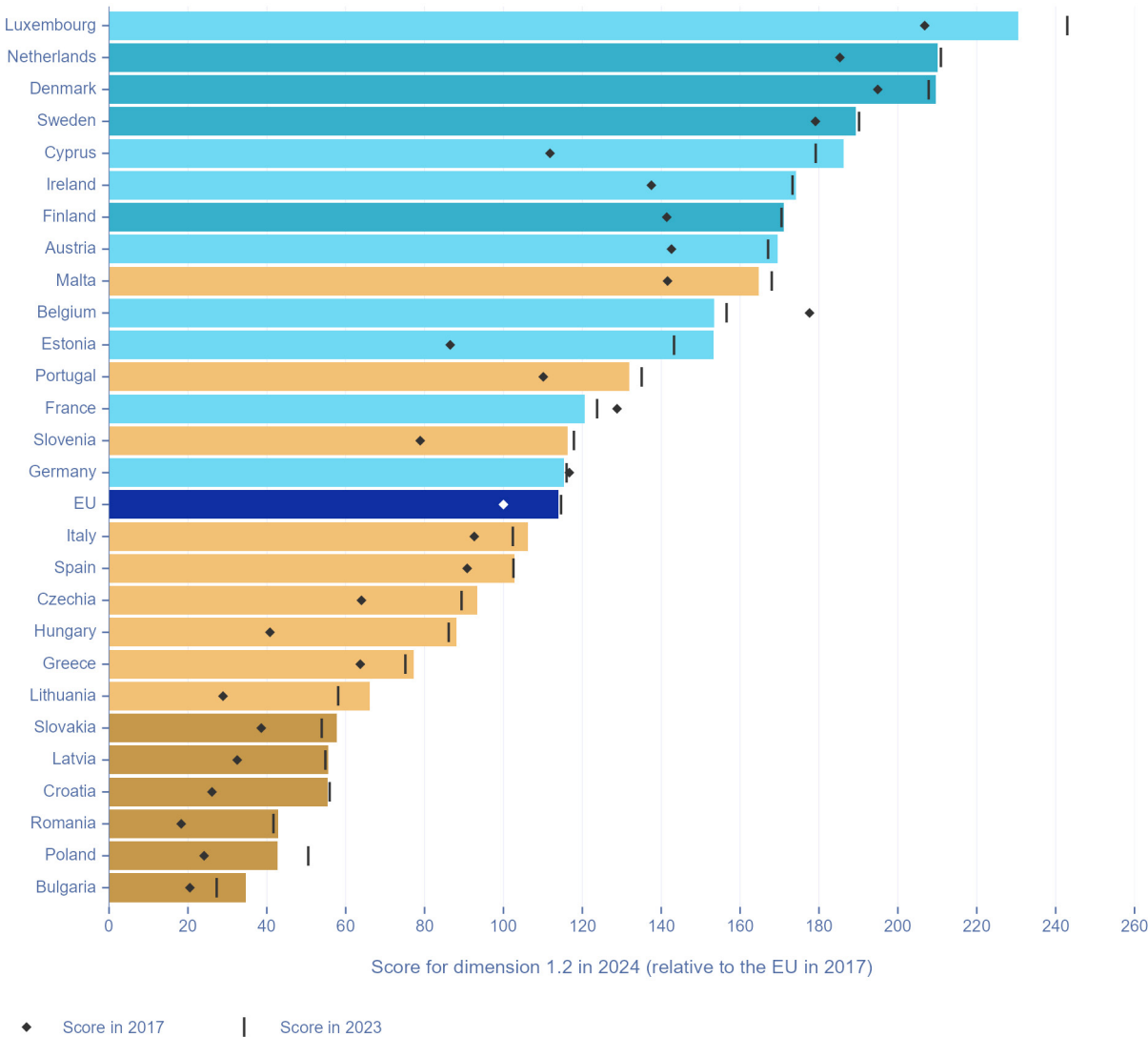
The Attractive Research Systems dimension measures the international competitiveness and attractiveness of the national science base by considering *the number of international scientific co-publications, of most cited publications, and of foreign doctorate students*.

The top-five performers for this dimension are three Innovation Leaders and two Strong Innovators. **The best performing Member State is Luxembourg, followed by the Netherlands and Denmark**, with performances twice higher than the EU average in 2017. In contrast, the six Emerging Innovators are at the bottom of the dimension ranking, with Bulgaria, Poland and Romania recording the lowest performance with scores below 50, despite improvements in recent years.

The outstanding scores of the top-five drive the EU average slightly upwards, and a majority of Member States (15) rank higher than the EU in 2024. While all Innovation Leaders and Strong Innovators perform above the EU average, Moderate Innovators show a wider range of performance, with six Moderate Innovators falling below the EU average, and three performing above (Malta, Portugal and Slovenia).

Between 2023 and 2024, the EU average in the Attractive Research Systems dimension remained relatively stable (-0.7%-points). The performance has increased for 16 Member States, with Estonia (10%-points) experiencing

Figure 9: Innovation performance of the EU Member States in the Attractive Research Systems dimension



Note: All performance scores are relative to that of the EU in 2017 for each dimension. Coloured bars represent countries' performance in 2024, while diamonds and vertical bars indicate their performance in 2017 and 2023, respectively. The colours denote each country's overall performance group based on the 2024 SII.

the strongest improvement, followed by Lithuania (8%-points). Performance has decreased for 11 Member States, with the strongest decline for the top-performer in this dimension, Luxembourg (-12%-points), followed by Poland (-8%-points).

Between 2017 and 2024, the EU average in this dimension improved by 14%-points. This increase was driven by the performance improvement in 24 Member States, with the largest performance increases for Cyprus (74%-points), Estonia (67%-points) and Hungary (47%-points). Performance has decreased for only three Member States, with the strongest decline for Belgium (-24%-points).

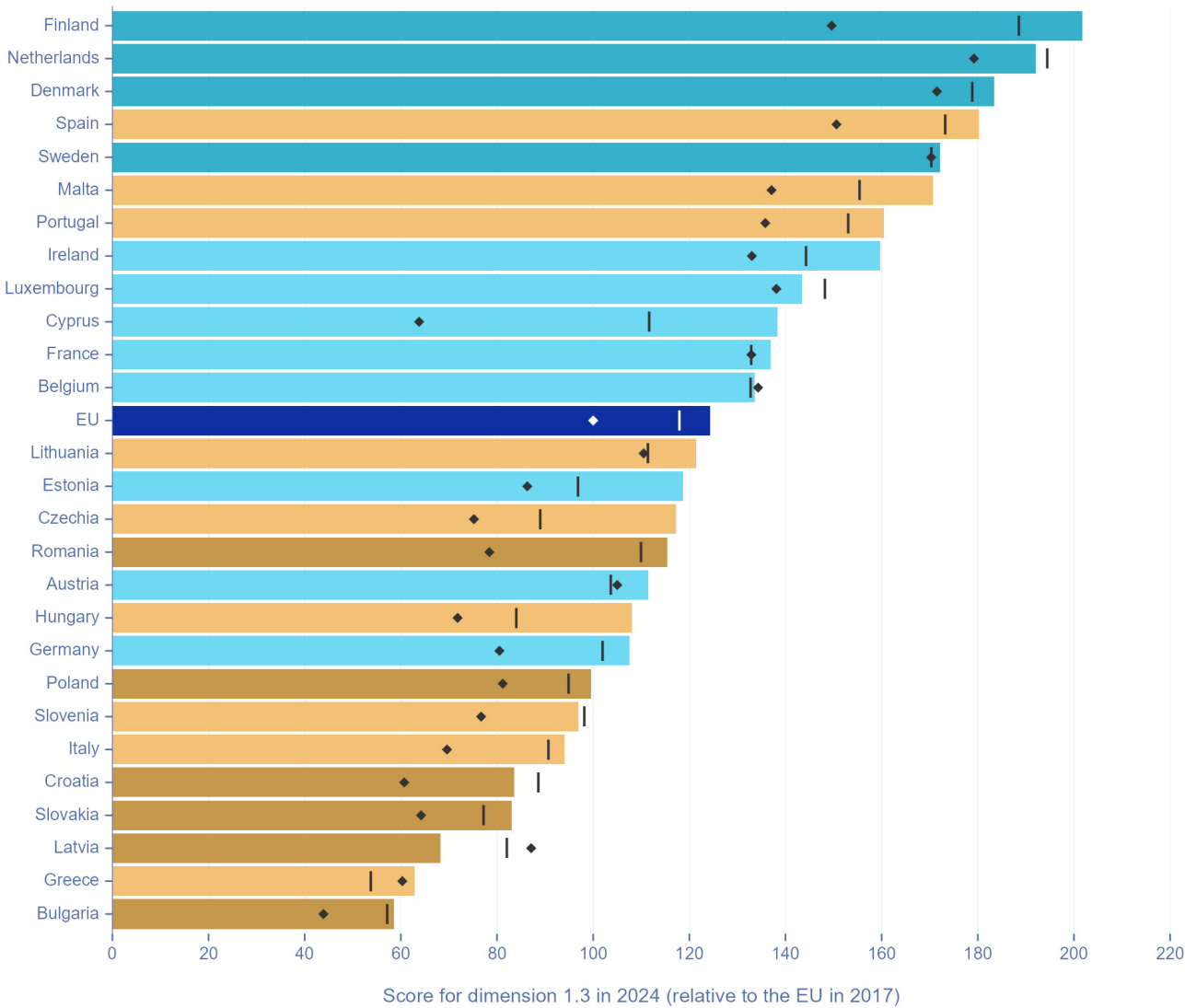
Digitalisation

The Digitalisation dimension measures the penetration of digital technologies and includes two indicators: *Broadband penetration*, as a share of enterprises with a maximum contracted download speed of at least 100 Mb/s for their fastest fixed internet connection, and *Individuals with above basic overall digital skills*.

The **best-performing Member States for this dimension are the four Innovation Leaders, Finland, the Netherlands, Denmark and Sweden, and one Moderate Innovator, Spain**, with scores 70% above the 2017 EU average. Finland holds the top position in 2024, overtaking the Netherlands. At the other end of the scale, one Moderate Innovator, Greece, and two Emerging Innovators, Bulgaria and Latvia, record the lowest performances with scores below 70.

Whereas all Innovation Leaders perform above and all Emerging Innovators perform below the EU average in 2024,

Figure 10: Innovation performance of the EU Member States in the Digitalisation dimension



◆ Score in 2017 | Score in 2023

Note: All performance scores are relative to that of the EU in 2017 for each dimension. Horizontal coloured bars represent countries' performance in 2024, while diamonds and vertical bars indicate their performance in 2017 and 2023, respectively. The colours denote each country's overall performance group based on the 2024 SIL.

Strong and Moderate Innovators show greater heterogeneity. Among Strong Innovators, five exceed the EU average (Ireland, Luxembourg, Cyprus, France, and Belgium), and three perform below it (Estonia, Austria, and Germany). While a majority of Moderate Innovators lag behind the EU average, three (Spain, Malta, and Portugal) stand out for scoring above the EU average and above all Strong Innovators. Overall, a majority of Member States (15) perform below the EU average, revealing a slightly left-skewed distribution for this dimension.

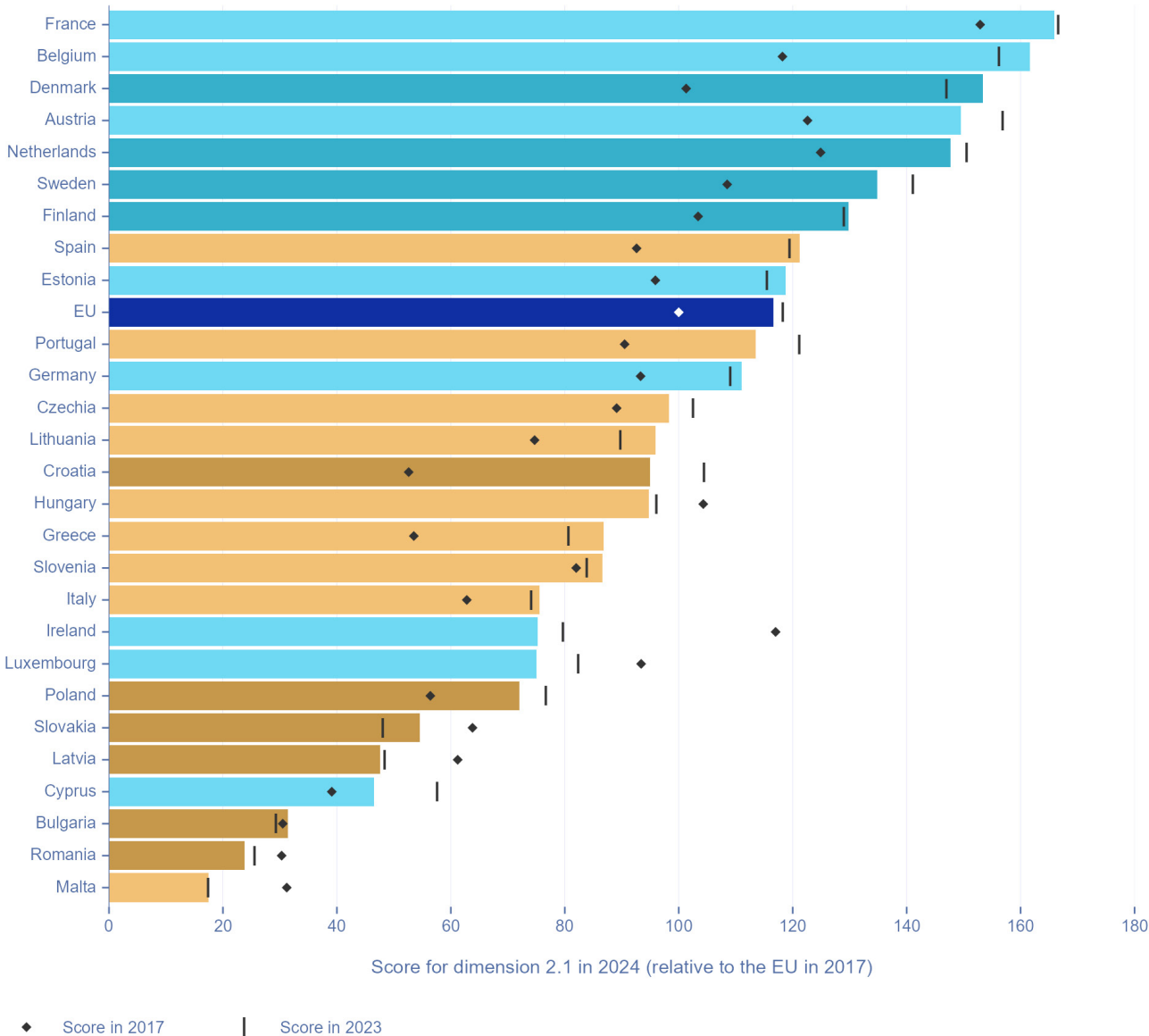
In comparison to 2023, the EU average improved by 6%-points. This increase was driven by an improvement in performance for 22 Member States. Czechia (28%-points), has experienced the strongest increase, followed by Cyprus (27%-points) and Hungary (24%-points). Performance has decreased for 5 Member States, with the strongest decline for Latvia (-14%-points), followed by Croatia (-5%-points) and Luxembourg (-5%-points).

Between 2017 and 2024, the EU average improved by 24%-points, driven by an improved performance in the Digitalisation dimension for 25 Member States, with the largest performance increases for Cyprus (75%-points), Finland (52%-points) and Czechia (42%-points). Performance has decreased for only 2 Member States, Latvia and Belgium, with the strongest decline for Latvia (-19%-points).

Finance and Support

The Finance and Support dimension measures the financing capacity of innovation, and includes three indicators: *Venture capital investments, R&D expenditures in universities and government research organisations, and Direct government funding and tax support for business R&D.*

Figure 11: Innovation performance of the EU Member States in the Finance and support dimension



Note: All performance scores are relative to that of the EU in 2017 for each dimension. Horizontal coloured bars represent countries' performance in 2024, while diamonds and vertical bars indicate their performance in 2017 and 2023, respectively. The colours denote each country's overall performance group based on the 2024 SIL.

The **best-performing Member States in the dimension are two Strong Innovators, France and Belgium, and one Innovation Leader, Denmark**, with performances 50% higher than the 2017 EU average. France remains in the top position, while Denmark has entered the top-3 this year. The bottom-five is composed of one Strong Innovator, Cyprus, one Moderate Innovator, Malta, and three Emerging Innovators, Romania, Bulgaria, and Latvia. These countries record the lowest performances in the Finance and Support Dimension, with scores below 50.

The outstanding scores of top-performing countries raise the EU average, with 18 Member States performing below it on this dimension. While all Innovation Leaders exceed the EU average in 2024, Strong Innovators exhibit varied performances. Apart from France and Belgium, only two other Strong Innovators—Austria and Estonia—score above the EU average. The remaining Strong Innovators perform below it. Among Moderate Innovators, all except Spain fall below the EU average. Lastly, all Emerging Innovators rank in the bottom half on this dimension.

Between 2023 and 2024, the EU average declined by 2%-points. Performance in the Finance and Support dimension increased for 12 Member States, with Slovakia (7%-points) experiencing the strongest improvement, followed by Denmark (6%-points), Greece (6%-points) and Lithuania (6%-points). Performance remained stable for one Member State (Malta) and decreased for 14, with the strongest declines for Cyprus (-11%-points) and Croatia (-9%-points).

Despite this recent decline, **the EU average in the Finance and Support dimension improved by 17%-points between 2017 and 2024.** This increase was driven by the improved performance of 20 Member States, with the largest performance increases for Denmark (52%-points), Belgium (43%-points) and Croatia (43%-points). Performance has decreased for seven Member States, with the sharpest decline in Ireland (-42%-points), followed by Luxembourg (-18%-points).

Firm Investments

The Firm Investments dimension measures the innovation expenditures of the private sector and includes three indicators: *Business R&D expenditures*, *Non-R&D innovation expenditures*, and *Innovation expenditures per person employed*. The latter two indicators are from the CIS 2020 and are therefore not updated with the latest CIS 2022 data which will be included in EIS 2025. Consequently, changes compared to 2023 are driven by R&D expenditure in the business sector.

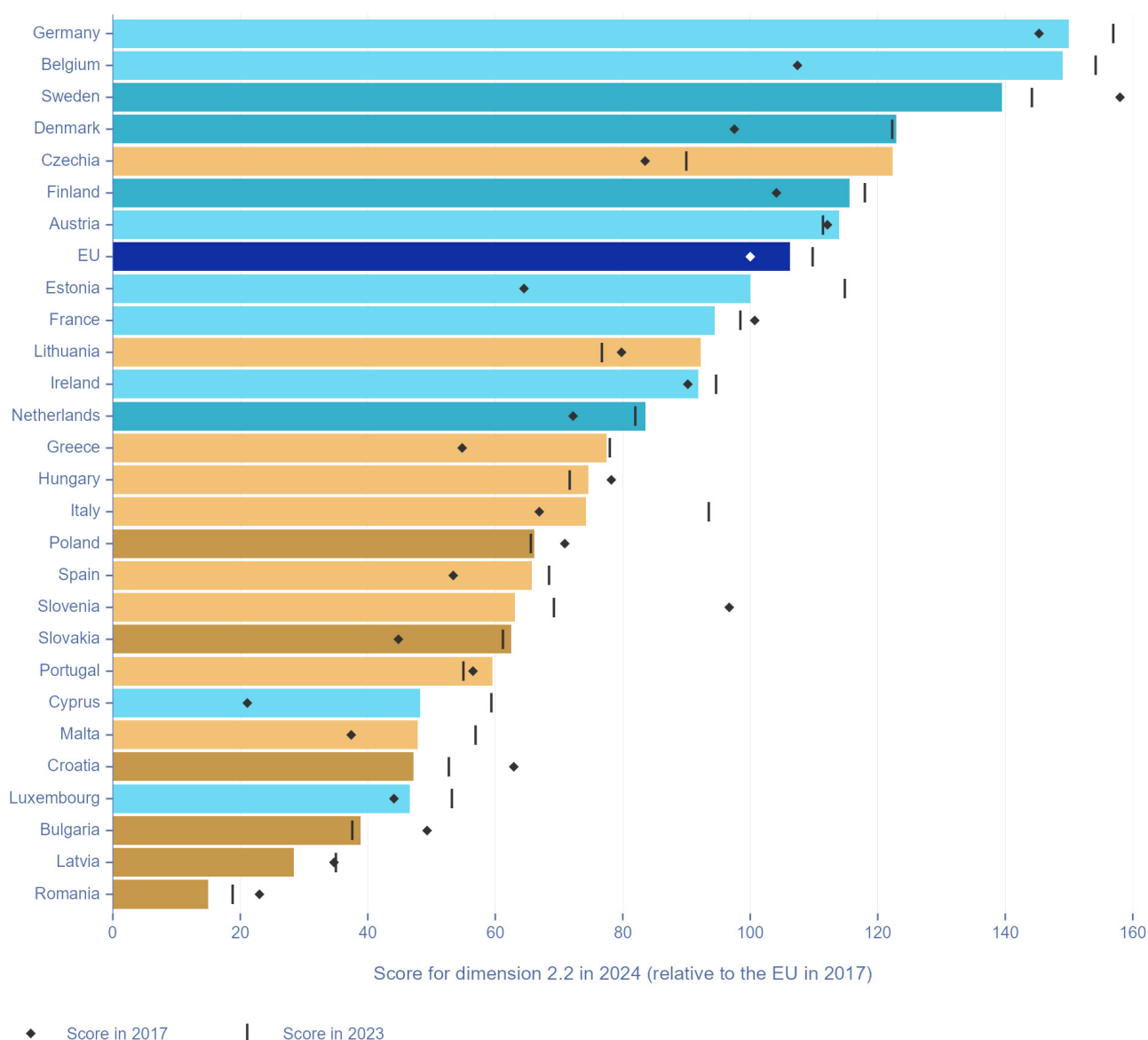
As in 2023, **the best performing Member State in this dimension is Germany, closely followed by Belgium and Sweden**, with scores 30% above the 2017 EU average. Denmark and Czechia complete the top-five, which thus comprises two Innovation Leaders, two Strong Innovators, and one Moderate Innovator. The bottom five is composed of one Strong Innovator, Luxembourg, and four Emerging Innovators, Croatia, Bulgaria, Latvia and Romania. Latvia and Romania remain the countries with the lowest performances on this dimension, with scores below 30.

Overall, **20 out of the 27 Member States perform below the EU average in 2024** on the Firm Investments dimension. Among Innovation Leaders, one country (the Netherlands) scores below the EU average in 2024. Most Strong Innovators perform below the EU average, with only Austria and the top performing countries, Germany and Belgium, exceeding the EU average score. A similar trend was observed among Moderate Innovators, with all except Czechia scoring below the EU average. All Emerging Innovators are in the bottom half of the ranking on this dimension.

In comparison to 2023, the EU average in the Firm Investments dimension declined by 4%-points. This was driven by a fall in performance for 17 Member States, with the strongest decline for Italy (-19%-points), Estonia (-15%-points) and Cyprus (-11%-points). Nevertheless, performance in this dimension has increased for 10 Member States. Czechia (32%-points) has experienced the strongest improvement, followed by Lithuania (16%-points).

Despite this recent decrease, **the EU average improved by 6%-points between 2017 and 2024, driven by increased performance in 18 Member States.** The largest increases were in Belgium (42%-points), Czechia (39%-points) and Estonia (36%-points). Performance has decreased for nine Member States, with the strongest decline for Slovenia (-34%-points), followed by Sweden (-19%-points) and Croatia (16%-points).

Figure 12: Innovation performance of the EU Member States in the Firm investments dimension



Note: All performance scores are relative to that of the EU in 2017 for each dimension. Coloured bars represent countries' performance in 2024, while diamonds and vertical bars indicate their performance in 2017 and 2023, respectively. The colours denote each country's overall performance group based on the 2024 SII.

Use of Information Technologies

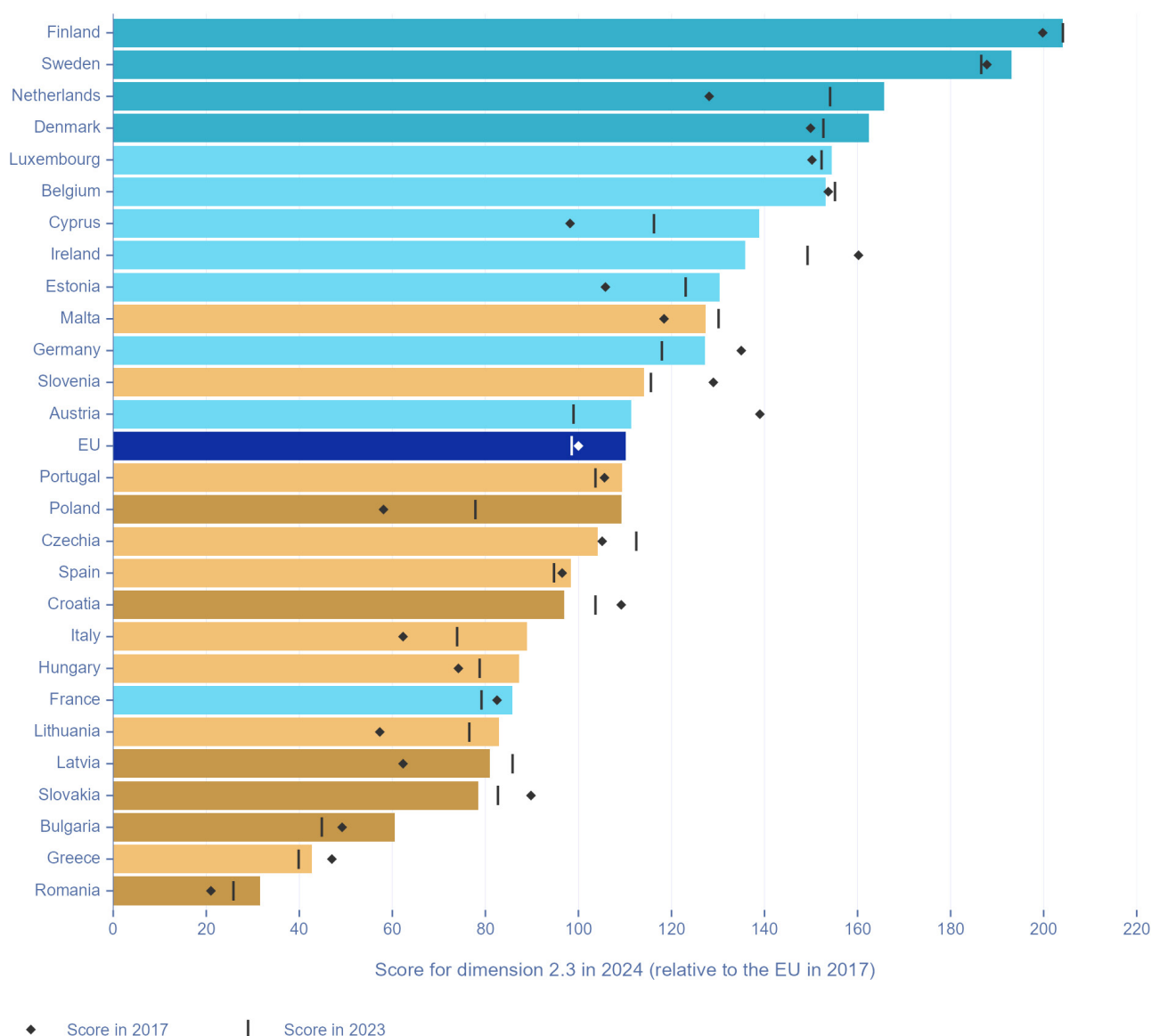
The Use of Information Technologies dimension includes two indicators: *Enterprises actively increasing the ICT skills of their personnel* and *Employed ICT specialists*.

In 2024, most Member States performed above the EU 2017 average for this dimension. **The best performing country is an Innovation Leader, Finland**, with a performance twice higher than the EU average. Finland is followed by the three other Innovation Leaders, Sweden, the Netherlands and Denmark, and by one Strong Innovator, Luxembourg (which replaced Belgium in the top-five). One Moderate Innovator, Greece, and two Emerging Innovators, Romania and Bulgaria, display the lowest performances in the Use of Information Technologies dimension, despite recent improvements.

All Strong Innovators, except France, score above the EU average in 2024. Similarly, all Moderate Innovators, except Malta and Slovenia, perform below the EU average. Lastly, all Emerging Innovators are lagging, with the bottom five on this dimension comprising four Emerging Innovators and one Moderate Innovator. The highest and lowest scores balance each other, resulting in the EU average standing approximately in the middle of the distribution.

In comparison to 2023, the EU average in the Use of Information Technologies dimension improved by 12%-points, driven by an increased performance for 19 Member States. Poland (31%-points) has experienced the strongest improvement, followed by Cyprus (22%-points) and Bulgaria (16%-points). Performance has decreased for eight Member States, with the sharpest declines for Ireland (-14%-points) and Czechia (-8%-points).

Figure 13: Innovation performance of the EU Member States in the Use of information technologies dimension



Note: All performance scores are relative to that of the EU in 2017 for each dimension. Horizontal coloured bars represent countries' performance in 2024, while diamonds and vertical bars indicate their performance in 2017 and 2023, respectively. The colours denote each country's overall performance group based on the 2024 SII.

Between 2017 and 2024, the EU average improved by 10%-points. This was driven by an increase in the performance of 18 Member States, with the largest performance increases for Poland (51%-points), Cyprus (41%-points) and the Netherlands (38%-points). Performance has decreased for nine Member States, with the sharpest decline for Austria (-28%-points), followed by Ireland (-24%-points).

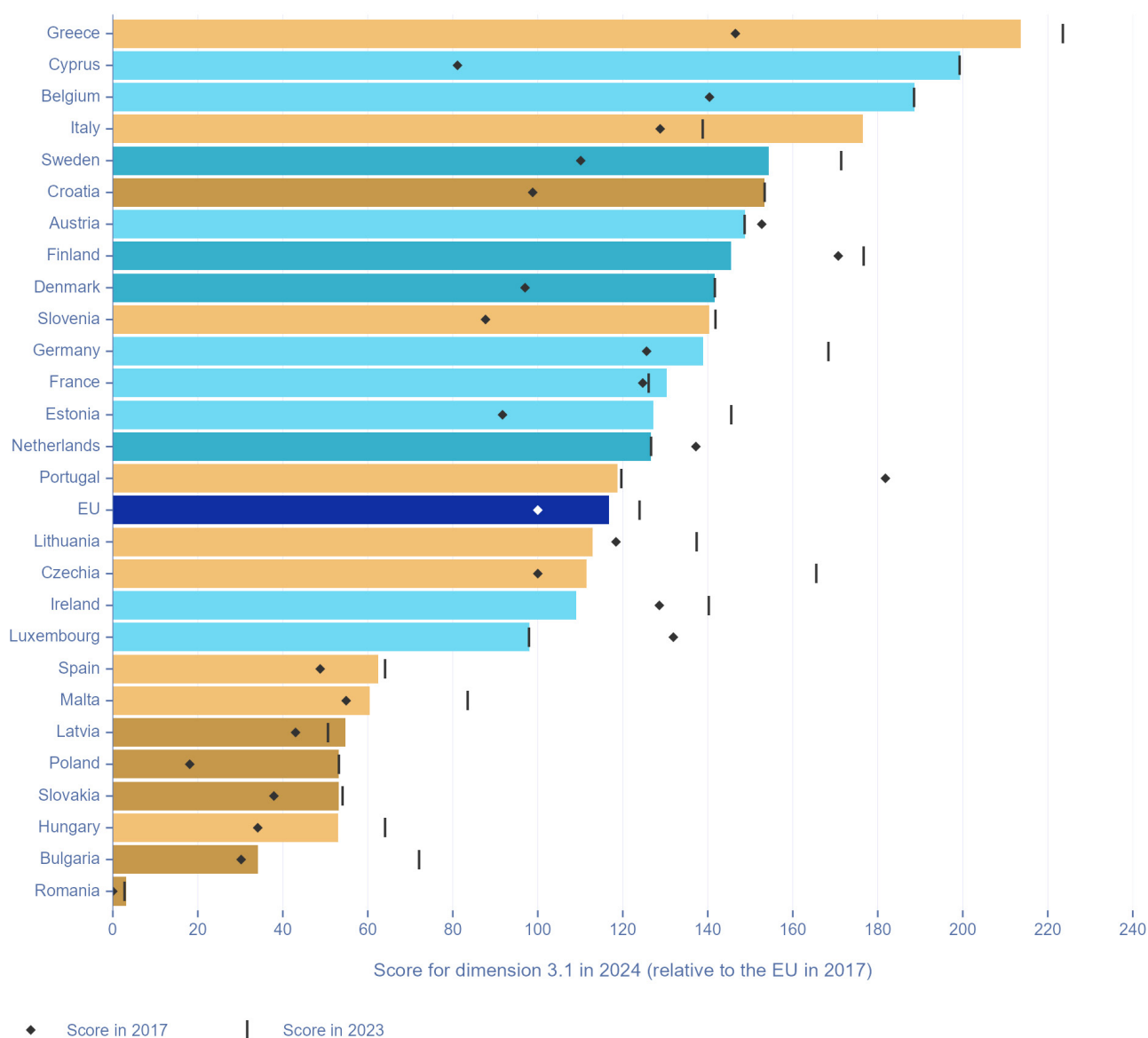
Innovators

The Innovators dimension concerns SMEs that have introduced innovations on the market or within their organisations, by measuring the introduction of both products and businesses process innovations by SMEs. The innovators dimension is entirely based on CIS which has been updated with CIS 2022 data provided as part of the CIS fast-track for 19 Member States¹¹. CIS fast-track is an early data submission process for several indicators collected on a voluntary basis. Please note that fast-track data are considered preliminary.

As in 2023, the best performing Member State for this dimension is Greece, with a score twice higher than the 2017 EU average. The main driver for the Greek performance, identified already in the CIS 2020, has been the impact of the pandemic which forced companies to adapt products and processes. Greece is followed by Cyprus, Belgium, Italy and Sweden. The top-five countries for this dimension therefore consists of one Innovation Leader, two Strong Innovators, and two Moderate Innovators. Despite slight improvements over the years, several Member States perform 30% below

¹¹ EU Member States providing fast track CIS 2022 data include: BG, CZ, DE, EL, ES, FI, HU, IT, LT, MT, PT, RO, SI, SK, EE, FR, IE, LV and SE.

Figure 14: Innovation performance of the EU Member States in the Innovators dimension



Note: All performance scores are relative to that of the EU in 2017 for each dimension. Coloured bars represent countries' performance in 2024, while diamonds and vertical bars indicate their performance in 2017 and 2023, respectively. The colours denote each country's overall performance group based on the 2024 SII.

the 2017 EU average, on the *Innovators* dimension. These include three Moderate Innovators, Hungary, Malta and Spain, and five Emerging Innovators, Romania, Bulgaria, Poland, Slovakia and Latvia.

Except for the Innovation Leaders, which all exceed the EU average in 2024, **performance varies widely within each performance group**. All Strong Innovators perform above the EU average, except for Ireland and Luxembourg, which are surpassed by a majority of Moderate Innovators. Among Moderate Innovators, three Member States perform above the EU average, three perform close to the EU average, and three rank at the bottom. In contrast to other Emerging Innovators, Croatia performs notably above the EU average, ranking 6th. Due to these varying performances, the EU average remains approximately in the middle of the distribution, as the high and low performers balance each other out.

In comparison to 2023, the EU average in the Innovators dimension declined by 7.2%-points. Only four Member States' performance increased between 2023 and 2024, with Italy (38%-points) experiencing the largest improvement. Performance remained stable for eight Member States and has decreased for 16, with the strongest declines witnessed in Czechia (-54%-points), Bulgaria (-38%-points), Ireland (-31%-points), Finland (-31%-points) and Germany (-30%-points).

Over the longer run, **the EU average improved by 17%-points between 2017 and 2024**, because of the improved performance of 20 Member States. Cyprus and Greece experienced the largest increases, by 118%-points and 67%-points, respectively. However, performance has decreased for seven Member States, with the strongest declines for Portugal (-63%-points), followed by Luxembourg (-34%-points) and Finland (-26%-points).

Linkages

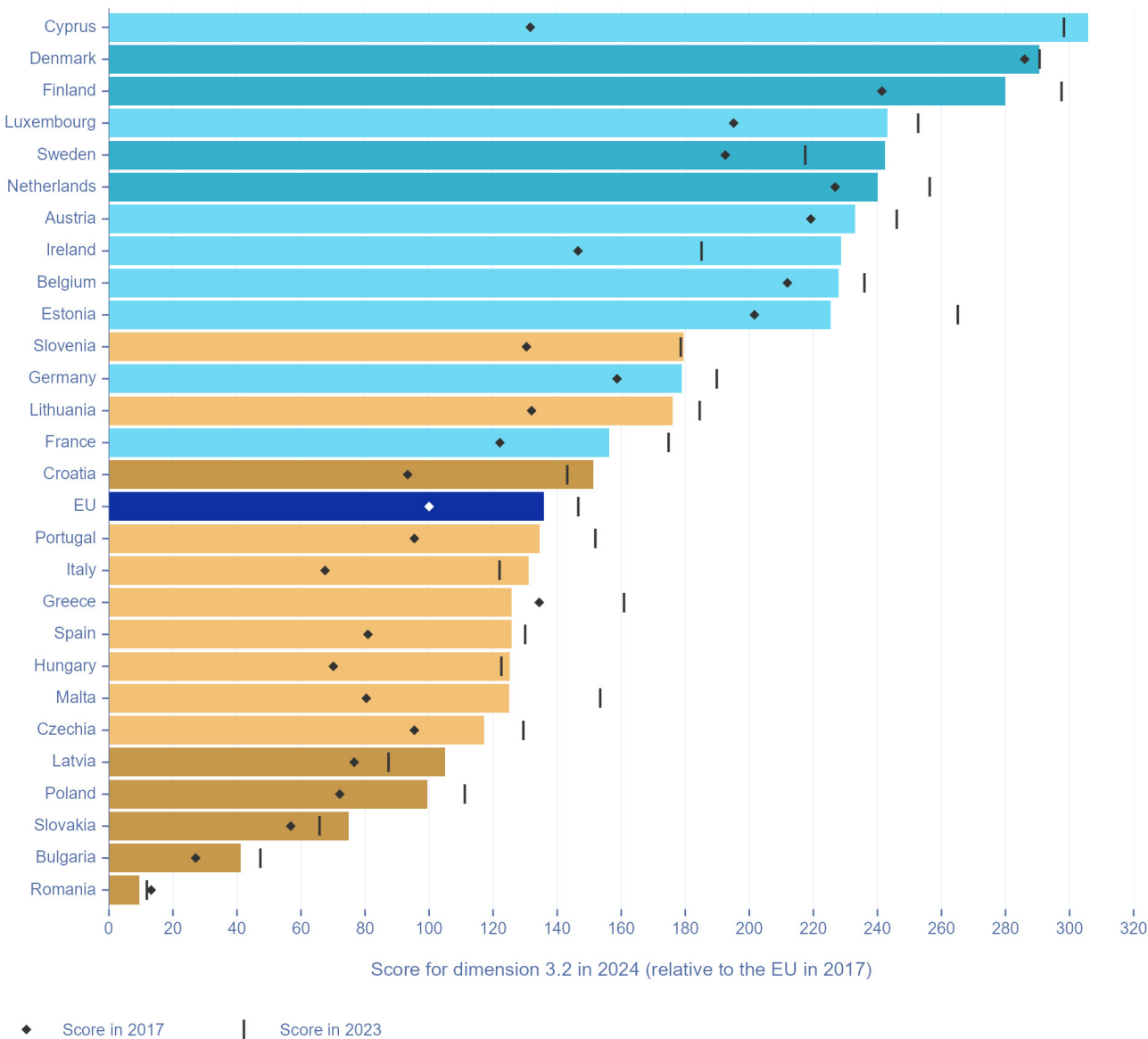
The Linkages dimension includes three indicators measuring innovation capabilities by looking at *Collaboration efforts between innovating firms*, *Research collaboration between the private and public sector*, and *Job-to-job mobility of Human Resources in Science & Technology (HRST)*.

The three best performing Member States in Linkages are one Strong Innovator, Cyprus, and two Innovation Leaders, Denmark and Finland. Their performance surpasses by far all other Member States and the EU average, with scores above 275. Four Emerging Innovators, Romania, Bulgaria, Slovakia and Poland showcases the lowest performances, and are the only countries scoring below the 2017 EU average.

Overall, the scores of Member States in Linkages are particularly high, with 10 countries scoring above 200 (Cyprus, Denmark, Finland, Luxembourg, Sweden, Netherlands, Austria, Ireland, Belgium and Estonia). Despite these multiple outstanding performances, the EU average for the Linkages dimension remains quite low in the ranking, revealing a left-skewed distribution. As a result, all Innovation Leaders and all Strong Innovators perform above the EU average in 2024, as well as two Moderate Innovators, Slovenia and Lithuania, and one Emerging Innovator, Croatia. The rest of Moderate Innovators and Emerging Innovators score under the EU average, with the latter at the bottom of the ranking.

Between 2023 and 2024, the EU average in the Linkages dimension dropped by 11%-points. In 17 Member States, performance decreased, with Estonia (-40%-points) and Greece (-35%-points) experiencing the strongest declines. On the other hand, performance increased slightly in nine Member States and remained stable in Denmark.

Figure 15: Innovation performance of the EU Member States in the Linkages dimension



Note: All performance scores are relative to that of the EU in 2017 for each dimension. Coloured bars represent countries' performance in 2024, while diamonds and vertical bars indicate their performance in 2017 and 2023, respectively. The colours denote each country's overall performance group based on the 2024 SII.

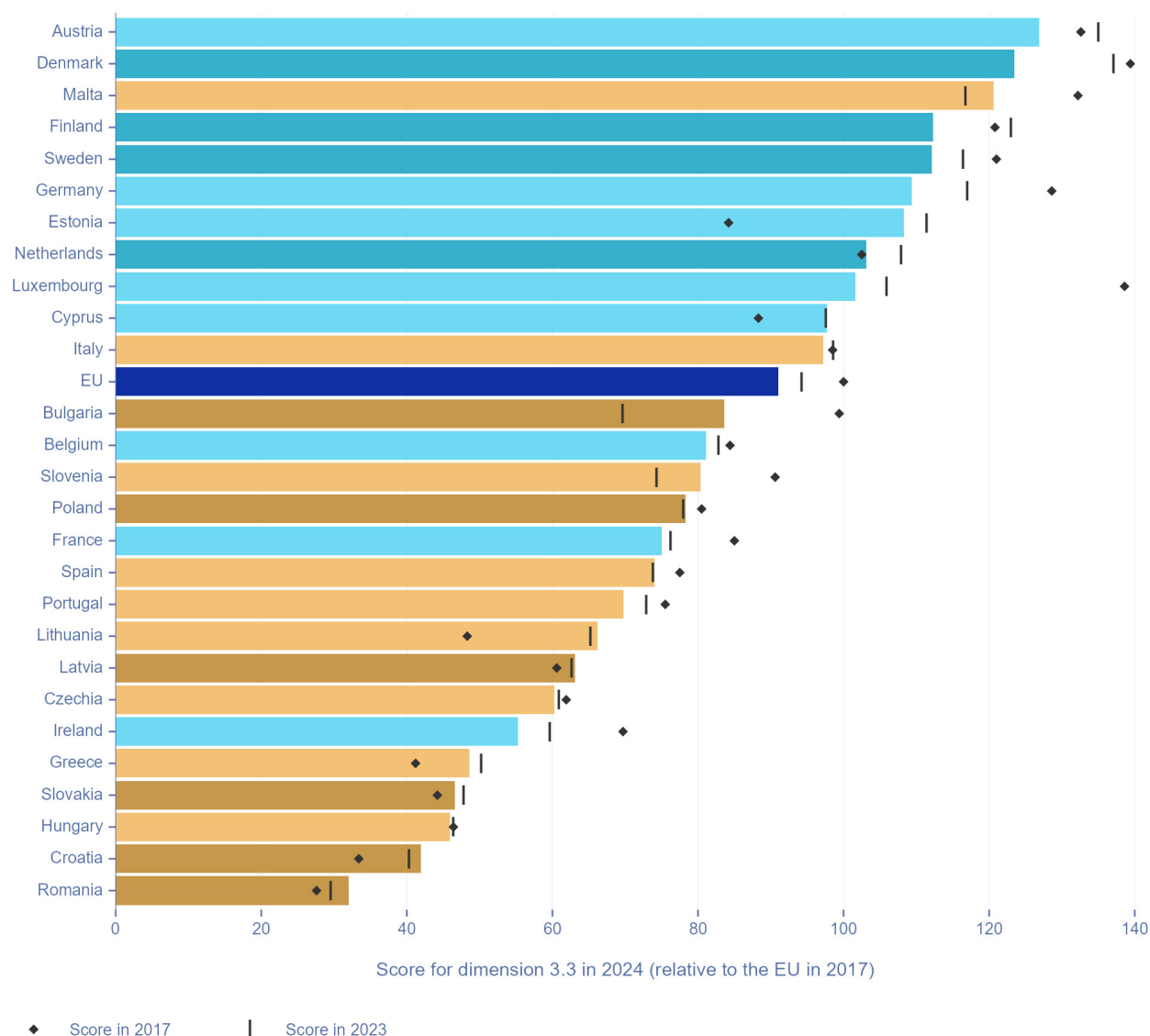
Although there was a broadly negative change between 2023 and 2024, a strong improvement in performance was observed over the longer run. **Between 2017 and 2024, performance in the Linkages dimension improved for almost all Member States**, driving an increase of 36% in the EU performance. The most significant performance increase occurred in Cyprus (174%-points), but a range of Member States increased their performance by more than 40%-points (Ireland, Italy, Croatia, Hungary, Sweden, Slovenia, Luxembourg, Spain, Malta and Lithuania). The only two countries where performance in the Linkages dimension has decreased are Greece (-8%-points) and Romania (-4%-points).

Intellectual assets

The Intellectual assets dimension captures different aspects of Intellectual Property Rights (IPR), as measured by Patent Cooperation Treaty (PCT) patent applications, Trademark applications, and Design applications.

The **three best-performing Member States in the Intellectual Assets dimension are a Strong Innovator, Austria, an Innovation Leader, Denmark, and a Moderate Innovator, Malta**, with Austria moving into the lead over Denmark. The bottom-five is composed of two Moderate Innovators, Hungary and Greece, and three Emerging Innovator, Croatia, Slovakia and Romania, with the latter having the lowest performance in 2024.

Figure 16: Innovation performance of the EU Member States in the Intellectual Assets dimension



Note: All performance scores are relative to that of the EU in 2017 for each dimension. Coloured bars represent countries' performance in 2024, while diamonds and vertical bars indicate their performance in 2017 and 2023, respectively. The colours denote each country's overall performance group based on the 2024 SII.

The strong performances relative to other Member States of the top-three significantly drive the EU average upwards. As a result, **the majority of Member States perform below the EU average**. All Innovation Leaders exceed the EU performance score in 2024. Among Strong Innovators, five perform above the EU average (Austria, Germany, Estonia, Luxembourg and Cyprus), and three perform below (Belgium, France and Ireland). All Moderate Innovators fall behind the EU average, except Malta and Italy. Lastly, all Emerging Innovators score below the EU average.

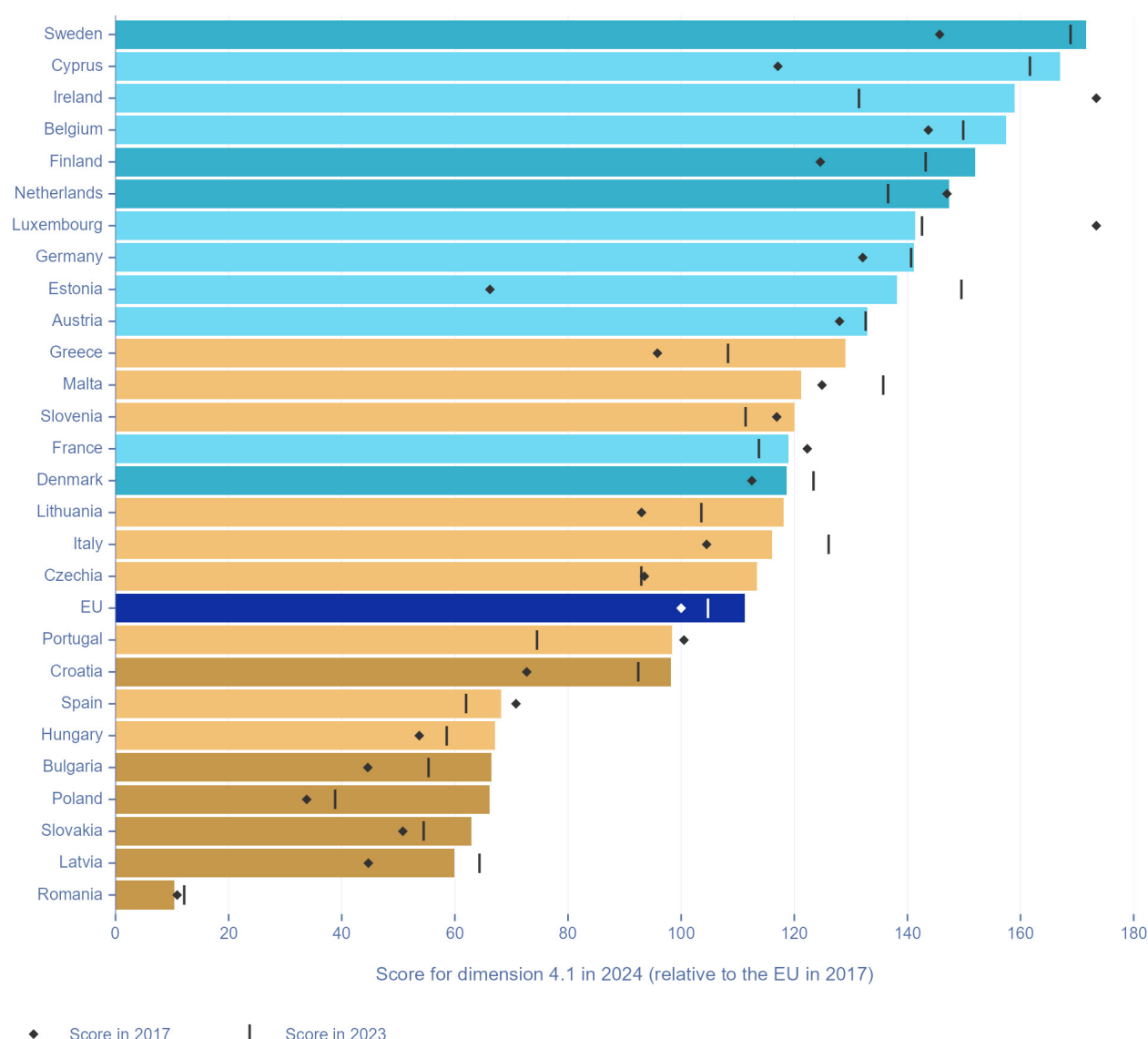
Performance for the Intellectual Assets dimension has remained quite stable between 2023 and 2024. The EU average decreased by 3%-points and most Member States followed the same trend. Only a few Member States have undergone significant evolutions: in Denmark, Finland, Austria and Germany, the score dropped by respectively 14%, 11%, 8% and 8%-points, while Bulgaria and Slovenia improved their performance by 14% and 6%-points, respectively.

Between 2017 and 2024 however, **the EU average dropped by 9%-points, as a result of the decreasing performance of 18 Member States** in this dimension. The largest decreases were observed in Luxembourg (-37%-points), in Germany (-19%-points), in Denmark (-16%-points), in Ireland (-15%-points) and in Bulgaria (-16%-points). Performance has increased in only nine Member States, with Estonia (24%-points) and Lithuania (18%-points) displaying the largest improvements.

Employment Impacts

The Employment Impacts dimension measures the impact on employment of innovation activities and is based on two indicators: *Employment in knowledge-intensive activities* and *Employment in innovative enterprises*.

Figure 17: Innovation performance of the EU Member States in the Employment impacts dimension



With scores 50% above the 2017 EU average, **the best performing Member States for the dimension are two Innovation Leaders, Sweden and Finland, and three Strong Innovators, Cyprus, Ireland and Belgium.** Sweden retains the top position, while Finland enters the top-five. On the other hand, Romania, Latvia, Slovakia, Poland, Bulgaria, Hungary and Spain display scores below 70 on the Employment Impacts dimension. The bottom-five for this dimension is composed of Emerging Innovators, with Romania lagging considerably.

Despite their recent improvements, the **gap between Emerging Innovators and the rest of the Member States** remains and negatively impacts the EU average, allowing a series of countries (17) to outperform it. All Innovation Leaders and Strong Innovators score above the EU average in 2024. Among Moderate Innovators, six perform relatively better than the EU average, and three (Portugal, Spain and Hungary) are falling behind.

Most Member States have increased their performance in the Employment Impacts dimension between 2023 and 2024, leading to a rise in the EU average by 7%-points. The largest progress was observed in Ireland (27%-points), Poland (27%-points), Portugal (24%-points), Greece (21%-points), and Czechia (20%-points). 7 Member States experienced a decline in performance in the Employment Impacts dimension, with Malta (-15%-points) and Estonia (-11%-points) witnessing the sharpest decreases.

Between 2017 and 2024, the EU average increased by 11%-points, driven by an improved performance in 20 Member States, particularly in Estonia (72%-points). Several countries witnessed an increase of more than 20%-points, namely Cyprus, Greece, Poland, Finland, Sweden, Croatia, Lithuania, and Bulgaria. On the other hand, seven Member States experienced a decrease in performance, with the most significant declines in Luxembourg (-32%-points) and Ireland (-15%-points).

Sales Impacts

The Sales Impacts dimension measures the economic impact of innovation and includes three indicators: *Exports of medium and high-tech products*, *Exports of knowledge-intensive services*, and *Sales resulting from innovative products*.

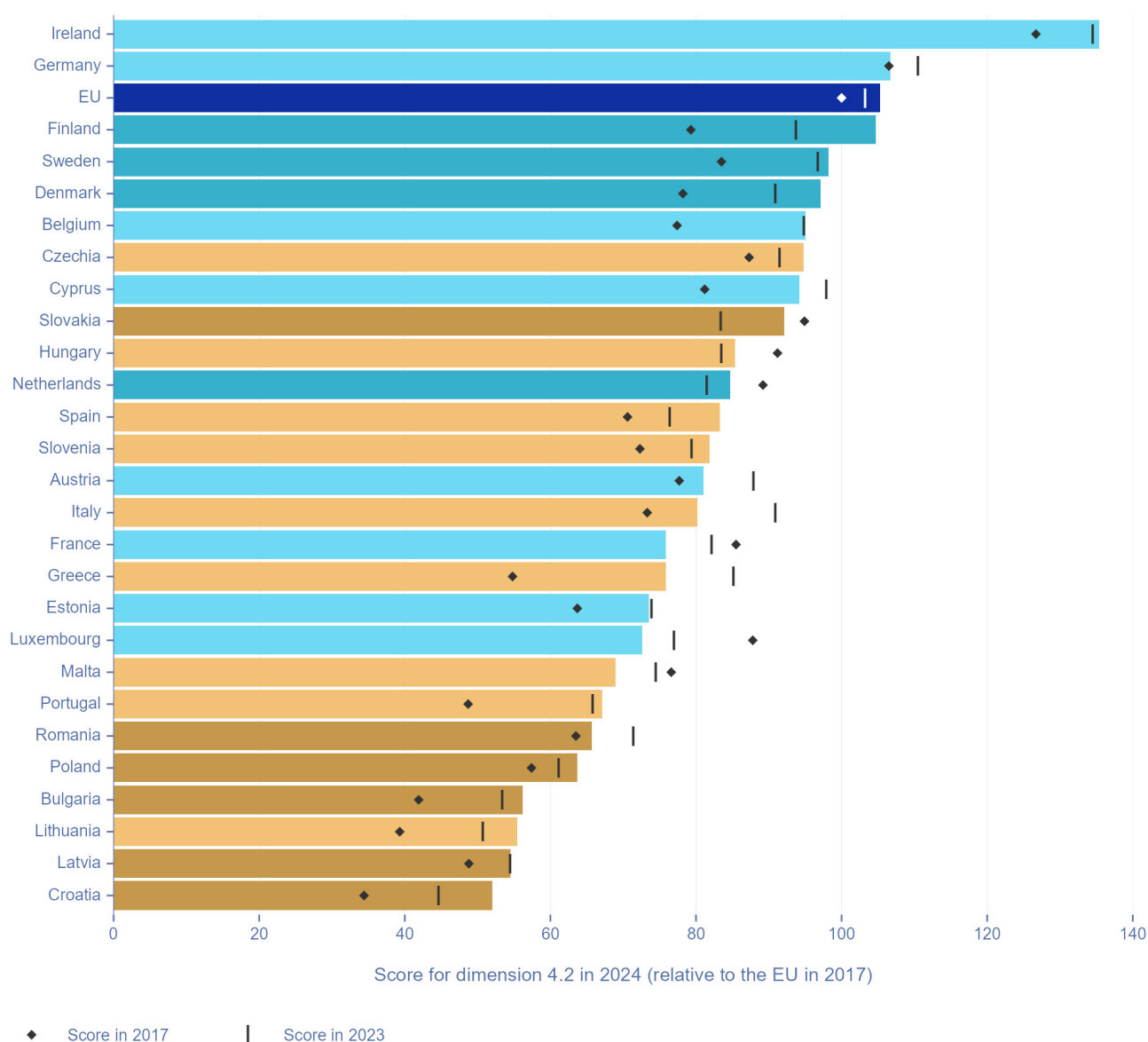
The top-performing Member State for the dimension is Ireland, a Strong Innovator, followed by Germany and Finland. The bottom-five is composed of four Emerging Innovators and one Moderate Innovator. Despite their significant progress in recent years, Croatia, Latvia, Lithuania, Bulgaria and Poland show the lowest performances, with scores remaining 30% below the 2017 EU average.

Only Ireland and Germany, two Strong Innovators, perform above the EU average, which shows the high skewness of the distribution for the Sales Impact dimension. All Innovation Leaders, Moderate and Emerging Innovators score below the EU average.

In comparison with 2023, **the EU average for the Sales Impacts dimension remained quite stable** (2%-points). While 17 Member States increased their performance in this dimension, 10 Member States experienced a decline in performance. The most significant progress was witnessed in Finland (11%-points) and in Slovakia (9%-points), and the strongest declines in Greece (-11%-points) and in Italy (-9%-points).

Between 2017 and 2024, the EU average increased by 5%-points, driven by an improved performance for 21 Member States. Finland (25%-points) has experienced the largest increase, but several Member States display increases of more than 10%-points: Greece, Denmark, Portugal, Belgium, Croatia, Lithuania, Sweden, Bulgaria, Cyprus and Spain. Nevertheless, 6 Member States have witnessed a decrease in their performance, with the largest declines for Luxembourg (-15%-points) and France (-10%-points).

Figure 18: Innovation performance of the EU Member States in the Sales impacts dimension



Note: All performance scores are relative to that of the EU in 2017 for each dimension. Coloured bars represent countries' performance in 2024, while diamonds and vertical bars indicate their performance in 2017 and 2023, respectively. The colours denote each country's overall performance group based on the 2024 SII.

Environmental sustainability

The Environmental sustainability dimension measures the reduction of the negative impact on the environment including three indicators: *Resource productivity*, *Exposure to Air pollution by fine particulates*, and *the Development of environment-related technologies*.

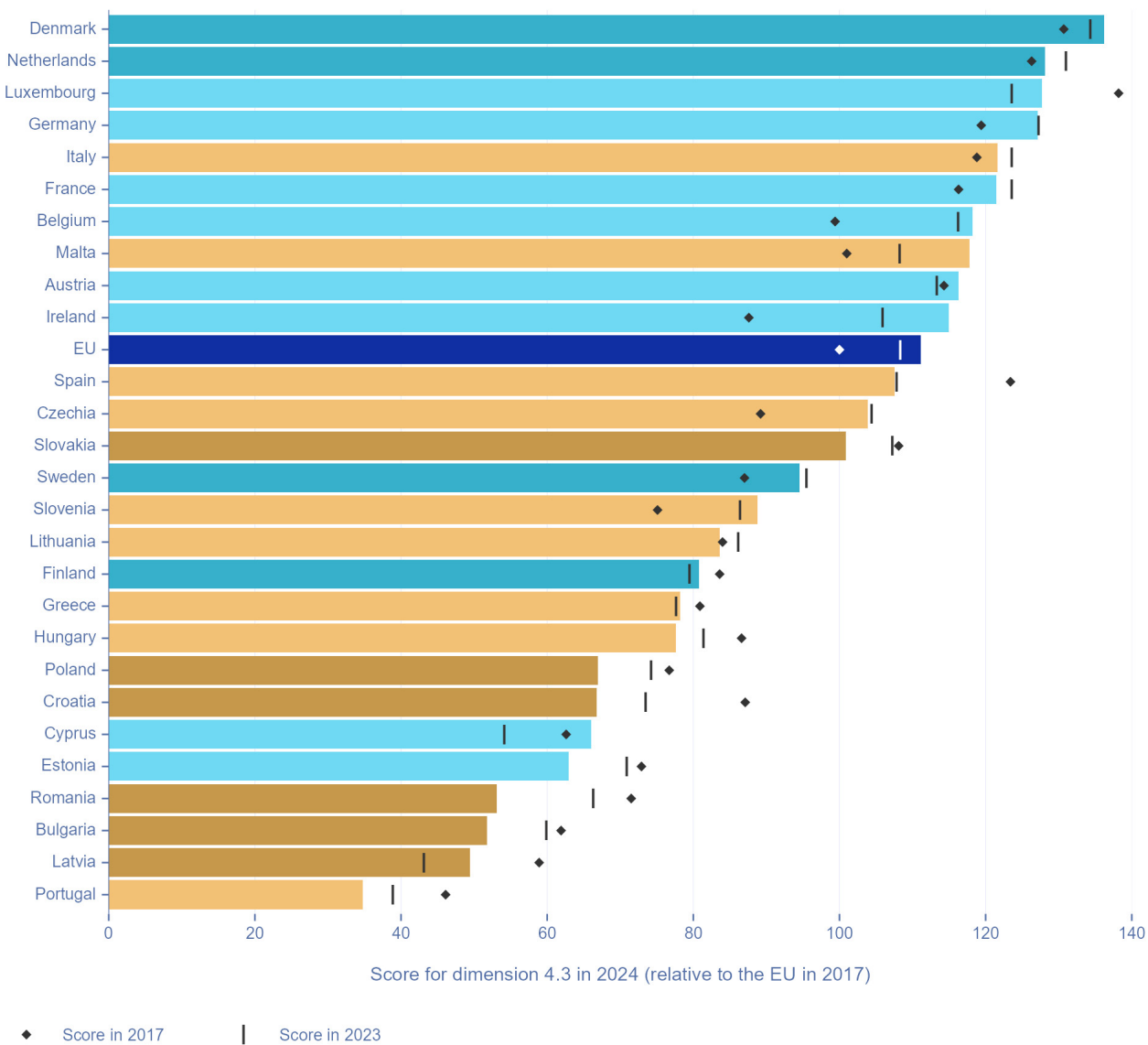
The best performer for this dimension is Denmark, followed by the Netherlands, Luxembourg, Germany, Italy and France, all performing 20% above the 2017 EU average, resulting in a top-five consisting of two Innovation Leaders, two Strong Innovators, and one Moderate Innovator. The bottom-five is composed of one Strong Innovator, Estonia, one Moderate Innovator, Portugal, and three Emerging Innovators, Romania, Bulgaria and Latvia, with Portugal and Latvia performing twice lower than the EU average in 2017.

While Denmark and the Netherlands rank among the top-performing Member States, Sweden and Finland, the other two Innovation Leaders, fall below the EU average in 2024. Among Strong Innovators, six perform above the EU average, while two (Cyprus and Estonia) show scores close to those of Emerging Innovators. Most Moderate Innovators perform below the EU average, except for Italy and Malta. Lastly, all Emerging Innovators are in the bottom half of the ranking. Overall, **there are more countries performing below the EU average (17) than above it (12)**, indicating a slightly right-skewed distribution for this dimension.

Compared to 2023, 11 Member States increased their performance in the Environmental sustainability dimension, with the strongest increases observed in Cyprus (12%-points), Malta (10%-points), and Ireland (9%-points). Performance has remained stable for one Member State and has decreased for 15, with the strongest decline for Romania (-13%-points), followed by Estonia and Bulgaria (both -8%-points). Despite this, the EU average increased by 3%-points.

Between 2017 and 2024, the EU average in this dimension increased by 11%-points. This score has been driven upwards by performance improvements in 13 Member States, with Ireland (27%-points), Belgium (19%-points), Malta (17%-points), Czechia (15%-points) and Slovenia (14%-points) recording the largest increases. On the other hand, the Member States where performance has dropped the most are Croatia (-20%-points), Romania (-18%-points) and Spain (-16%-points).

Figure 19: Innovation performance of the EU Member States in the Environmental sustainability dimension



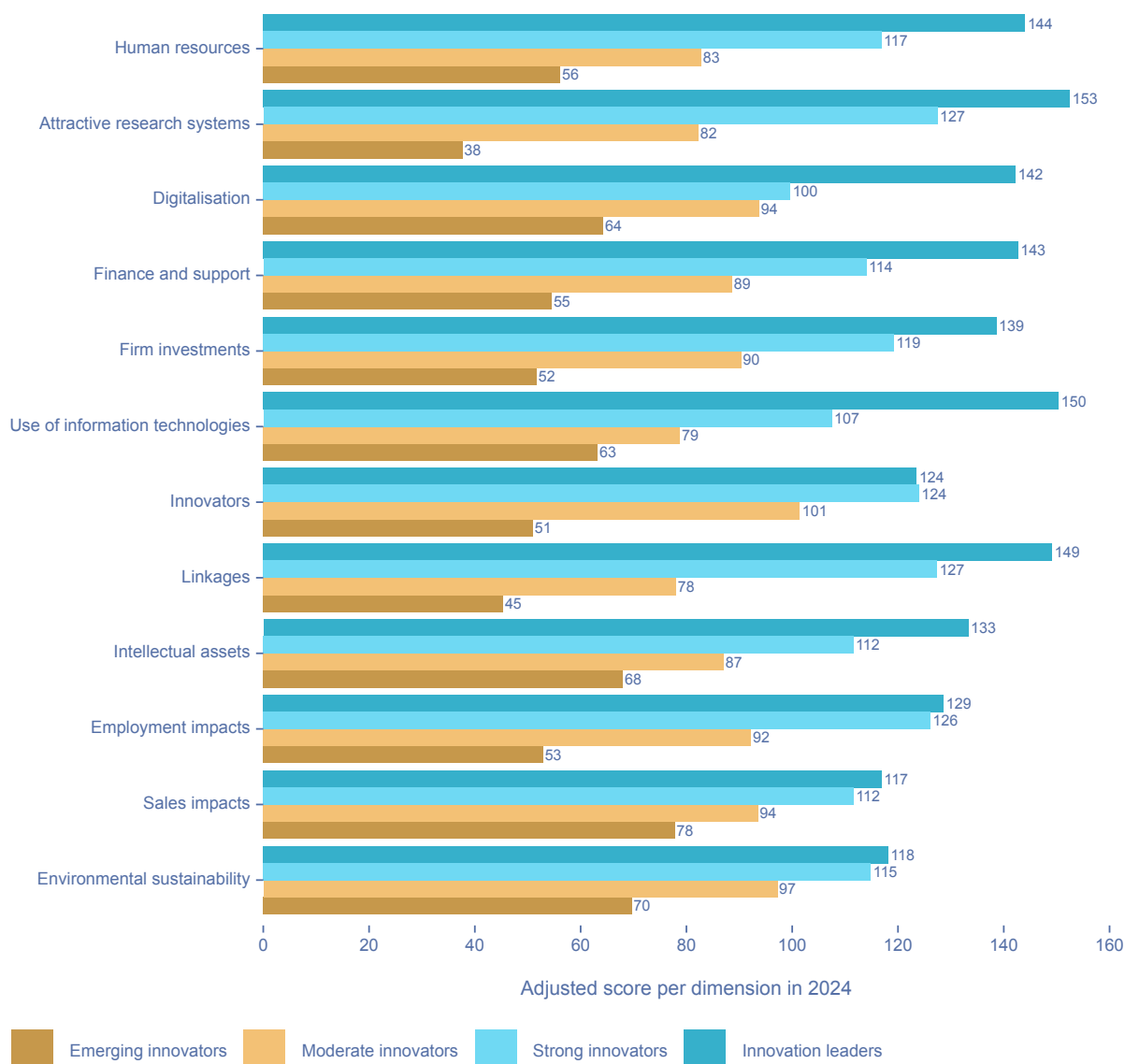
Note: All performance scores are relative to that of the EU in 2017 for each dimension. Coloured bars represent countries' performance in 2024, while diamonds and vertical bars indicate their performance in 2017 and 2023, respectively. The colours denote each country's overall performance group based on the 2024 SII.

3.4. How are innovation groups performing in each dimension and over time?

3.4.1 EU Innovation performance by dimension

In 2024, the average performance difference is 20%-points between the Innovation Leaders and Strong Innovators, 28%-points between the Strong and Moderate Innovators, and 31%-points between the Moderate and Emerging Innovators. Looking at the innovation performance by dimension, as expected, Innovation Leaders have the highest average innovation performance followed by Strong Innovators, Moderate Innovators and Emerging Innovators. The only exception is in the dimension Innovators, in which the Strong Innovators performs the same as the Innovation Leaders.

Figure 20: Innovation performance of the innovation groups per dimension



Note: Average scores for each performance group are defined as the unweighted average of the relative-to-EU scores of the Member States within that group. As these unweighted averages do not consider differences in country size, results are not directly comparable. For this reason, average scores for the performance groups have been adjusted such that the unweighted average of the four groups for each dimension equals 100.

The performance of the Innovation Leaders and the Strong Innovators is also very similar in the dimensions of Environmental Sustainability (3%-points difference), Employment Impacts (3%-points difference), and Sales Impacts (5%-points difference). Strong Innovators outperformed Innovation Leaders in Environmental Sustainability and Sales Impacts in 2023, but fell behind in 2024. The largest performance gaps between the Innovation Leaders and the Strong Innovators are in the Use of information technologies (43%-points) and Digitalisation (42%-points). The performance gap between the Strong and Moderate Innovators is the smallest in Digitalisation (6%-points), Sales Impacts (18%-points) and Environmental Sustainability (18%-points). Nevertheless, the performance differences between the two performance groups remain substantial, exceeding 20%-points in all other innovation dimensions.

The largest performance gaps between the Strong and Moderate Innovators are observed in Linkages (49%-points), Attractive research systems (45%-points), Human Resources and Employment impacts (both 34%-points).

The performance differences between the Moderate and Emerging Innovators are smallest in Use of information technologies (16%-points), Sales Impact (16%-points), and Intellectual Assets (19%-points) dimensions. The Emerging Innovators are lagging Moderate Innovators by more than 20%-points in all other innovation dimensions, with the largest performance differences being in the Attractive research systems (44%-points), Employment Impacts (39%-points), and Firm investments (38%-points) dimensions.

3.4.2 Differences in innovation performance over time

From 2017 to 2024, **Innovation Leaders have shown a steady improvement in innovation performance**, with the most significant growth occurring between 2019 and 2022. Innovation performance reached a peak in 2023 with an increase of 9.9%-points compared to the base year of 2017, however, a slight decline is observed in 2024, reducing the increase to 9.8%-points.

Among the top performers, **Denmark** stands out for sustained improvements between 2017 and 2024, and now tops the Innovation Leaders performance group. Despite losing the leading position, **Sweden** remains a top-performer thanks to a steady growth with the least volatility. **Finland** and the **Netherlands** performed similarly in 2017 and in 2024, but Finland has had the faster progress and outperformed the Netherlands since 2022.

A notable trend of the Innovation Leaders is an **overall increase in R&D investment**, especially by the private sector. All Innovation Leaders show strong improvements in *venture capital expenditures* with performances that increased extensively between 2017 and 2024, by 67%-points in Netherlands up to 117%-points for Denmark. Public investment in R&D also increased in Denmark and the Netherlands through the increase of *direct and indirect government support of business R&D* (53%-points and 11%-points respectively). Furthermore, **collaboration in scientific research has also been a driver for innovation performance** within the Innovation Leaders. They all significantly increased their *public-private co-publications* and their *international co-publications* between 2017 and 2024 and perform on average 3.2 to 4.8 times better than the EU average in these indicators.

Finland and the Netherlands achieved significant progress in business innovation and digitalisation. The former exhibits a remarkable positive change in *broadband penetration* (in enterprises), improving its performance by 93%-points between 2021 and 2024¹², as well as in *sales of innovative products*, which has on average increased by more than 15%-points per year in the five last years. The Netherlands demonstrated notable improvements in *enterprises providing training to develop or upgrade ICT skills* of their personnel with an increase of 70%-points since 2017. Meanwhile, **Sweden performed consistently well in growing SMEs innovation activities**, showing significant improvements in *innovative SMEs collaborating with others* (181%-points), *SMEs introducing business process innovations* (46%-points) and *SMEs introducing product innovations* (43%-points) between 2017 to 2024.

Box 1 Country level observations of Innovation Leaders

Denmark experienced the highest growth of the Innovation Leaders, with an increase of 14%-points between 2017 and 2024. Most progress occurred between 2019 and 2022 (12%-points).

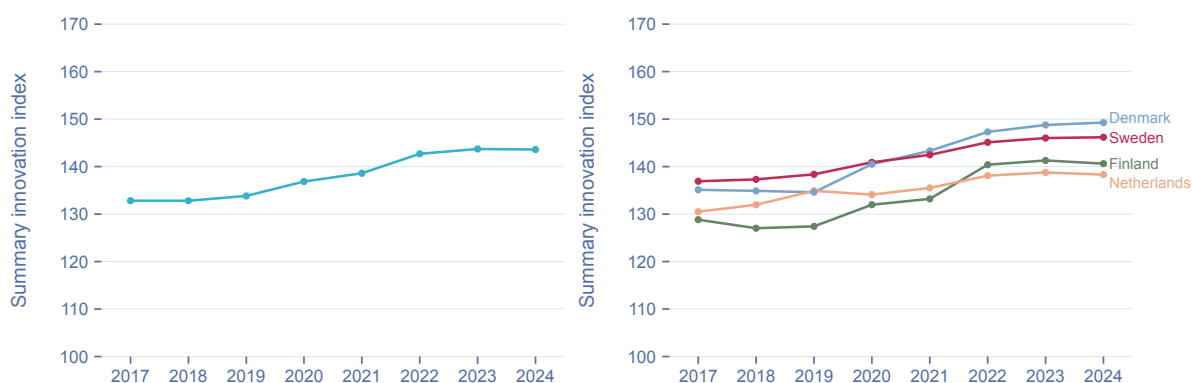
Sweden's innovation performance increased consistently over the years, with the most significant improvement observed between 2020 and 2023. Innovation performance peaked in 2024 with an increase of 9%-points compared to 2017.

Finland demonstrated strong improvement between 2017 and 2024, with a 12%-points gain. Most progress occurred between 2019 and 2022 (14%-points), but there has been a deceleration in innovation performance since 2022, including a decrease in the last year (-0.7%-points).

The Netherlands maintained steady growth with limited volatility, achieving a peak increase of 8%-points in 2023. Despite the slight decrease in 2024 the trend remain positive.

¹² Broadband penetration, calculated as the share of enterprises with a maximum contracted download speed of the fastest fixed internet connection of at least 100 Mb/s, has rapidly increased in Finland over the 2021-2024 period. It went from 47% (close to the EU average) to 76%, one of the highest performances in the EU.

Figure 21: Performance Innovation Leaders



Note: Performance is relative to that of the EU in 2017. The graph on the left shows the average performance of the Innovation Leaders calculated as the unweighted average of the respective Member States. All vertical scales in Figure 21-Figure 24 span a range of 70%-points to allow an easy comparison of the results between the four performance groups.

However, across the Innovation Leaders, there has been a **downward trend for indicators related to education and intellectual property**. *New doctorate graduates* (in STEM) have fallen or remained unchanged for all countries from 2017 to 2024: Denmark -46%-points; Finland -35%-points; Netherlands 0%-points; Sweden -46%-points. The decline in intellectual property indicators is particularly visible through *design applications*: Denmark -52%-points; Finland -33%-points; Sweden -35%-points. In the case of Netherlands, the volatility in design applications is very high, with a drop of 13%-points in the last year only.

From 2017 to 2024, **Strong Innovators demonstrated a steady increase in innovation performance**, with a 11%-points gain, just above the EU average growth. There was a substantial increase of 9%-points between 2019 and 2022, followed by a slowdown in innovation performance in the most recent years. Despite this slight decrease, Strong Innovators maintain their upward trajectory.

The Strong Innovators performance group is composed of Member States following very diverse paths in terms of innovation performance. **Belgium** is the strongest innovator within this group in 2024 after dropping from the Innovation Leaders' group. **Austria** and **Germany** are also top performers among the Strong Innovators, while **Luxembourg** went from outperforming all Strong Innovators until 2019 to ranking 4th in 2024 due the decrease in its innovation score in comparison to 2017. **Cyprus** and **Estonia** experienced remarkable growth in innovation performance throughout the period, jumping from the Moderate Innovators group to the Strong Innovators. On the other hand, **Ireland** and **France** demonstrated only limited improvements in their innovation performance.

The Strong Innovators exhibit notable strengths in their innovation ecosystems. A key positive trend is the significant improvement in *International scientific co-publications*, where performance increased from 21%-points for Germany, up to 207%-points for Cyprus, except for France. *Innovation expenditures per person employed* in innovation-active enterprises also increased among Strong Innovators, driven upward by countries like Belgium, which increased its performance by 75%-points, and Estonia which more than doubled its performance from 2017 (43%-points increase).

Box 2 Country level observations of Strong Innovators

Belgium's innovation performance strongly increased over the 2017-2024 period, despite some fluctuations, including a decline in 2019 (-0.7%-points) and standing still between 2023 and 2024 (-0.2%-points). In 2024, performance stood at 15.1%-points higher than 2017.

Austria's innovation performance has been on an upward trajectory, although it demonstrated some fluctuations over the period, with limited improvements before 2021, a notable increase between 2021 and 2023 (7%-points), and a minor setback in 2024 (-1%-points). Overall, Austria's performance increased by 5%-points between 2017 and 2024.

Ireland's innovation performance remained relatively stable from 2017 to 2023, with minor fluctuations. However, between 2023 and 2024, a positive trend emerged, leading to a 2%-points improvement compared to 2017.

Luxembourg's innovation performance showed volatility over the period, with fluctuations and several declines, such as the -5%-points that occurred in 2022. Luxembourg is the only country to have decreased their score in comparison to 2017, falling by 6%-points, indicating overall deterioration.

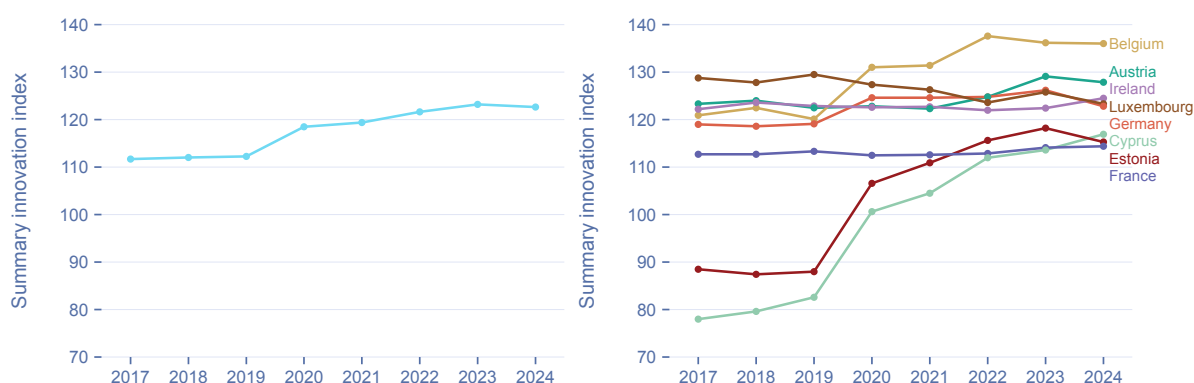
Germany experienced a significant growth between 2019 and 2023 (7%-points), followed by a drop of 4%-points in 2024, suggesting some volatility. This limited the overall improvement over the period to 4%-points.

Cyprus exhibited continuous growth over the 2017-2024 period, with yearly improvements from 2%-points in 2018 to 3%-points in 2024. Each year showed consistent improvement, with the most significant jumps seen between 2019 and 2020 (18%-points). The overall rise of 39%-points is the largest increase in performance than any of the EU countries in comparison to 2017 levels.

Estonia's innovation performance also grew significantly from 2017 to 2024, although it fluctuated initially, with negative values in 2018 and 2019, before seeing a major increase of 18%-points in 2020. The upward trend continued, reaching a peak of 30%-points in 2023, followed by a slight decrease to 27%-points in 2024.

France remained relatively stable with minor changes. The performance gains fluctuated around zero, showing small improvements and setbacks until 2022. From 2023 onwards, there was a positive trend, ending with an increase of 2%-points in 2024, indicating recent improvement.

Figure 22: Performance Strong Innovators



Note: Performance is relative to that of the EU in 2017. The graph on the left shows the average performance of the Strong Innovators calculated as the unweighted average of the respective Member States. All vertical scales in Figure 21-Figure 24 span a range of 70%-points to allow an easy comparison of the results between the four performance groups.

Conversely, **Strong Innovators face several challenges especially under intellectual property aspects**, especially in *Design applications*. In 2017-2024, all Strong Innovators experienced high volatility in this indicator, along with large decreases for Luxembourg (-97%-points), Malta (-63%-points)¹³, and Germany (-51%-points). Although less dramatically, *PCT patent applications* also decreased among all Strong Innovators, except for Luxembourg and Cyprus (11 and 6%-points respectively).

The Moderate Innovators group showed a steady upward trend in innovation performance over the analysed period, with a growth of 11%-points, just above the EU average growth. From 2017 to 2024, there was consistent growth, with an increase in innovation performance every year, including a notable gain of 4%-points between 2019 and 2020. Overall, the Moderate Innovators demonstrated a positive trajectory, suggesting improvements in their innovation ecosystems and capabilities over time.

The Moderate Innovators constitute the largest performance group, with nine Member States, which brings a **certain level of heterogeneity within the group, both in terms of performance and of fluctuations over time**. Among the moderate performers, **Slovenia** has the lead, followed by **Spain, Czechia** and **Italy** that have almost identical innovation performances in 2024. Although **Malta** led the Moderate Innovators from 2019 to 2022, it comes 4th due to a strong decline in innovation performance since 2020. **Portugal's** innovation performance has been stable, but its limited growth widened the gap with the top-performers. On the other hand, some of the lowest performers within the Moderate Innovators groups are catching up thanks to high growth rates, in particular **Greece** and **Lithuania**. Over the years 2017-2024, **Hungary** has remained the lowest ranked Moderate Innovator.

Among the Moderate Innovators, there is a range of positive trends, in particular the development of collaboration in research. *International scientific co-publications* have significantly increased in all Moderate Innovators, from 28%-points in Hungary to 77%-points in Malta. *Public-private co-publications* followed a similar trend, with the

¹³ The small size of Luxembourg and Malta, and the limited amount of design applications registered by these countries are factors that contribute to generate volatility.

largest increase observed in Portugal and Malta with respectively 79 and 78%-points gained compared to the EU average in 2017. Additionally, *Broadband penetration* has also strongly increased in all Moderate Innovators, especially since 2021, with an average increase of 44%-points compared to the EU 2017 performance. *Job-to-job mobility of Human Resources in Science & Technology* has improved as well, but with a high volatility over the years, and to differing extents: while Lithuania gained 138%-points, Italy improved by 17.7%-points.

Box 3 Country level observations of Moderate Innovators

Slovenia's performance significantly decreased between 2017 and 2019 (-5%-points). However, it has been on an upward trend since 2020, increasing by 10%-points compared to its 2017 performance, which points to a recovery and an overall positive trajectory.

Spain experienced consistent growth over the period, starting with a modest increase of 0.8%-points in 2018 and then rising steadily to 3%-points in 2019. Despite a slight set back in 2021, Spain's innovation performance surged by 7%-points in 2022 leading to a 9%-points gain compared to 2017 in 2024.

Czechia demonstrated a steady and significant growth since 2017, with an overall increase of 17%-points, despite a small dip of -2%-points in 2018, which indicates substantial advancements following slight fluctuations.

Italy's innovation performance grew from 2017 to 2022, rising by 2%-points in 2018, reaching a 11%-points gain in 2020 and 16%-points in 2022 (compared to 2017). The progress has slowed down since 2022, but despite a slight dip of 2%-points in 2023, Italy ended with a gain of 15%-points in 2024, indicating sustained improvement.

Malta displays a fluctuating innovation performance. A significant rise is observed between 2017 and 2020, leading to a 16%-points gain compared in 2020 (compared to 2017). However, there has been a decline since then, with a 9%-points drop between 2020 and 2024, leading to an overall improvement of 7%-points in 2024.

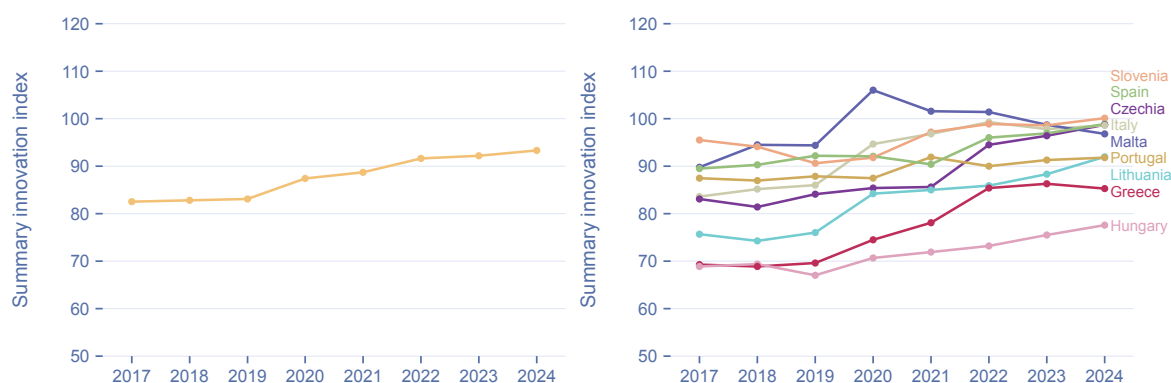
Lithuania experienced strong growth over the 2017-2024 period, despite a slight drop (-1%-points) in 2018. Since 2019, innovation performance saw substantial improvement, with a notable 8%-points increase between 2019 and 2020, and peaked at 16%-points in 2024, reflecting significant progress over the period.

Portugal's innovation performance remained relatively stable, with minor fluctuations, and a limited overall increase of 4%-points over the period. This indicates modest but consistent improvements.

Greece demonstrated a significant growth since 2017, despite a minor dip of -0.4%-points in 2018. Innovation performance peaked in 2023 with a 17%-points gain compared to 2017, followed by a slight decrease to 16%-points in 2024. This trajectory highlights significant progress with a minor recent setback.

Hungary showed some fluctuations, beginning by rising to 0.5%-points in 2018 before dropping to -2%-points in 2019. Since 2019, progress was steady, with consistent yearly performance increases of 1 to 4%-points. Overall, Hungary's performance has increased by 9%-points between 2017 and 2024.

Figure 23: Performance Moderate Innovators



Note: Performance is relative to that of the EU in 2017. The graph on the left shows the average performance of the Moderate Innovators calculated as the unweighted average of the respective Member States. All vertical scales in Figure 21-Figure 24 span a range of 70%-points to allow an easy comparison of the results between the four performance groups.

Conversely, these countries face several challenges, especially related to intellectual property. In most Moderate Innovators there was a decrease from 2017 to 2024 in *design applications*, with a notable decrease in performance of Malta (-65%-points), and of Portugal (36%-points). A similar downward trend occurs in *environment-related technologies*, driven by a drop of 43%-points in Spain and Hungary.

Overall, as the Moderate Innovators constitute a heterogeneous group, **diverging trends co-exist for several innovation indicators**. For example, *the performance for SMEs introducing product innovations and business process innovations* strongly increased in Italy (66%-points gain for the business process) and in Spain (37%-points gain, more than doubling the 2017 performance), while it collapsed in Portugal (-70%-points for product innovations).

The Emerging Innovators group has shown a positive trajectory in innovation performance from 2017 to 2024, gaining 6%-points. Despite a slight decrease of 1%-points in 2018, the group has consistently grown since then, demonstrating notable progress annually. However, while the Emerging Innovators are on an upward trend, **their growth rate in performance is slightly below the EU average**, which may hinder their ability to catch up with other performance groups.

Among Emerging Innovators, **Croatia** leads with a notable progress over time leading to an innovation performance just below the Moderate Innovators threshold. It is followed by **Poland** and **Slovakia**, that both have almost identical performance in 2024. **Latvia**, **Bulgaria** and **Romania** follow a slightly different path, with a stable performance over time due to limited yearly progress. The overall modest but positive trajectory of the Emerging Innovators group therefore results from different trends within the group, with a noticeable two-speed progression.

The Emerging Innovators have shown improvements across several key indicators. The *International scientific co-publications* have increased in all Emerging Innovators, from Croatia which gained 47%-points and outperformed the EU average, to Romania, Poland and Latvia which almost doubled their performance between 2017 and 2024 (16, 29 and 42%-points respectively). Notable improvements also include the number of *foreign doctorate students* that has also risen significantly, with Bulgaria experiencing a 33%-points increase, Croatia a 31%-points, and Romania 13%-points.

Strong improvement is observed in several indicators. All Emerging Innovators increased their performance in *Trademark applications*, Croatia and Latvia having the largest increase, with a 30%-points rise each. *Knowledge-intensive services exports* have improved across all Emerging Innovators as well, ranging from a 5%-points increase in Croatia to a 19%-points increase in Bulgaria. All Emerging Innovators have seen positive changes in *Resource productivity*, with Poland at the forefront with a 24%-points increase, followed by another notable 18%-points increase for both Slovakia and Croatia.

Conversely, the Emerging Innovators face several challenges, especially related to intellectual property. *PCT patent applications* have decreased across the board, ranging from a -0.3%-points decrease in Poland to a -5%-points decrease in Romania. Moreover, *design applications* have decreased significantly across multiple countries, except in Croatia and Romania, with a notable drop of 62%-points in Bulgaria. The development of *environment-related technologies* has also seen a significant decline, with Croatia experiencing an -100%-points decrease, Romania -71%-points, and Poland -68%-points¹⁴. Finally, despite the decrease of the number of **new doctorate graduates in STEM** over the 2017-2024 period (mostly driven by the -23%-points and -35%-points drop in Romania and in Slovakia), an upward trend is observable for this indicator in most Emerging Innovators for 2023-2024.

Box 4 Country level observations of Emerging Innovators

Croatia exhibited the fastest growth in innovation performance, with substantial yearly increases observed between 2019 and 2023 (16%-points in that period). However, due to drops in innovation performance in 2018, 2019 and 2024, the overall progress from 2017 to 2024 is 14%-points.

Poland showcased steady growth over the 2017-2024 period, with significant increases every year, resulting in a total increase of 13%-points, despite a minor dip of -0.3%-points in 2018. This consistent growth indicates robust progress in Poland's innovation performance.

Slovakia experienced significant fluctuations over the period, with a major drop in 2018 (-5%-points), followed by gradual improvements, in particular in 2020 (4%-points). The overall improvement between 2017 and 2024 is 3%-points which suggests a recovery, although modest compared to other countries.

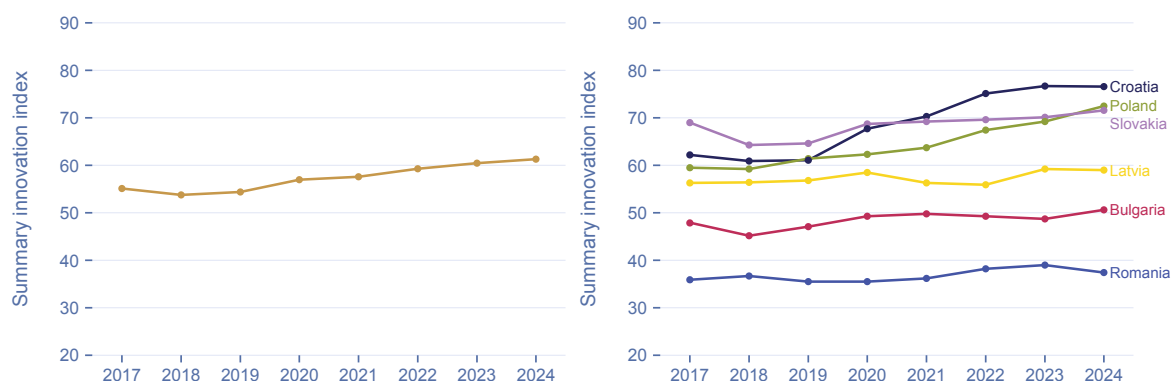
¹⁴ As the environment-related technologies indicator is calculated as the share of total number of patents, its decline is also partially due to the increase in the number of patents related to other types of technologies.

Latvia's innovation performance fluctuated slightly and climbed to a 3%-points gain in 2023 (compared to their 2017 performance) before a minor decrease to 3%-points in 2024.

Bulgaria experienced a drop by -3%-points in 2018, but followed a recovery in the following years, with an overall gain of 3%-points over the 2017-2024 period. Despite minor fluctuations, Bulgaria's innovation performance has been on an upward trend since 2018.

Romania demonstrated continuous improvement between 2020 and 2023 (3%-points), but progress has slowed down in 2024, leading to an overall improvement of 2%-points over the 2017-2024 period, the lowest growth rate among the Member States.

Figure 24: Performance Emerging Innovators



Note: Performance is relative to that of the EU in 2017. The graph on the left shows the average performance of the Emerging Innovators calculated as the unweighted average of the respective Member States. All vertical scales in Figure 21-Figure 24 span a range of 70%-points to allow an easy comparison of the results between the four performance groups.

3.4.3 Reduction of discrepancies in innovation performance

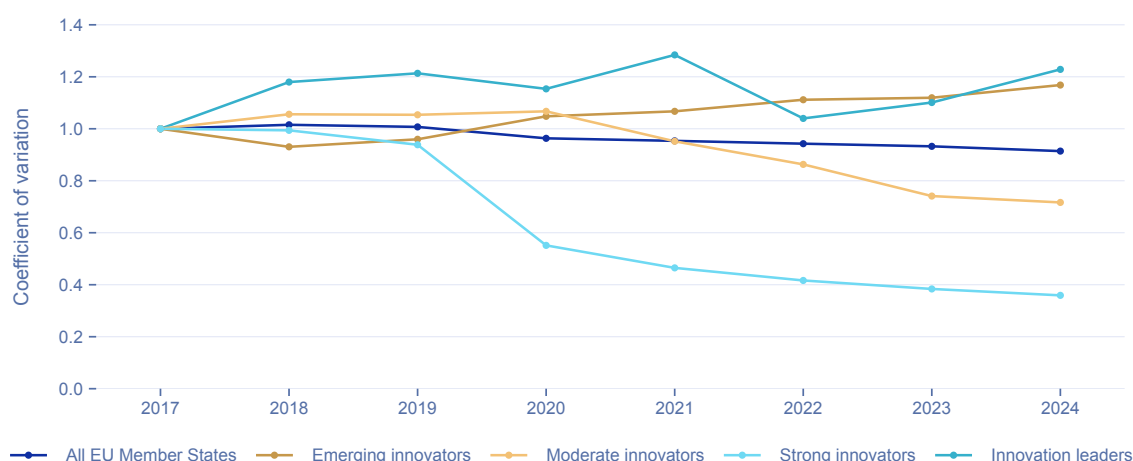
To assess the convergence between EU Member States and within performance groups, the coefficient of variation, i.e. the ratio between the standard deviation of the SII and its mean, was calculated. This ratio indicates whether the innovation performance of Member States is converging, meaning that the countries with lower performance are catching up with other Member States, or if the gap between the top and bottom performers is getting wider. Convergence in innovation is a central question in the EU, as it has multiple implications for economic and social cohesion.

Our analysis suggests a modest positive convergence trend at the EU level over the 2017-2024 period, as reflected by the slight decrease in the coefficient of variation for all EU Member States (Figure 25). However, a more detailed analysis is required to confirm this trend.

This slight convergence in innovation performance is observed in reduced differences within the groups of Strong Innovators and Moderate Innovators. These two performance groups are the largest (with eight and nine Member States respectively) and have been historically heterogeneous in terms of performance. The drop in their coefficient of variation suggests that these groups are becoming less heterogeneous. Within the Strong Innovators, where the decrease in disparities is the largest, the drop is partly due to the rapid improvements of Cyprus and Estonia, which have caught up to the performance levels of other Strong Innovators despite joining this group recently. Within the Moderate Innovators, the enhanced performance of Czechia, Greece, Hungary, and Lithuania, coupled with the decreased performance of Malta, has also led to a greater homogeneity in innovation performance.

However, divergence in innovation performance has increased within the Innovation Leaders and the Emerging Innovators between 2017 and 2024. In other words, at the top and at the bottom of the innovation ranking, disparities have become wider. Within the Emerging Innovators, while the top three performers (Croatia, Poland, Slovakia) have improved their innovation performance, the bottom three (Bulgaria, Latvia, Romania) have remained stable, progressing at a slower rate than the EU average. In the Innovation Leaders, the increase in divergence is driven by the fast and steady performance growth of Denmark and Sweden.

Figure 25: Convergence in innovation performance



Note: Lines show the coefficient of variation of the summary innovation index, defined as the ratio of the standard deviation to the mean, indexed to 2017.

Structural features of the EU economies help to understand the difficulties of the convergence process in innovation performance. The differences and similarities between countries per innovation performance group are briefly described using the EIS measurement framework of structural indicators used for contextualisation of the results.

The **Innovation Leaders** share several key structural indicators. They all have high GDP per capita, robust high-tech employment sectors (35-46%), and strong commitments to sustainability. For instance, Denmark, Finland, and Sweden have circular material use rates of 8%, 2%, and 6% respectively, while the Netherlands leads with 28%. These countries also score high on the Eco-Innovation Index and the Corruption Perceptions Index. Moreover, they prioritise advanced technology in government procurement, further solidifying their positions as Innovation Leaders.

Among the **Strong Innovators**, there are considerable variations across many structural indicators. Notable differences emerge in GDP per capita PPS, with Luxembourg leading at 254, followed by Ireland at 222.67, while Estonia trails at 84. However, Luxembourg has a lower average annual GDP growth at 0.1%, contrasting with Cyprus's highest growth rate of 4%. Employment by sectors varies considerably, with Germany (51%), Austria (39%) and Ireland (39%) having significant employment in high and medium high-tech sectors, while Luxembourg (54%), Cyprus (35%) and Belgium (33%) lean more towards knowledge-intensive services. In terms of innovation, Estonia performs strongly on in-house business process innovators and innovation procurement. Cyprus has a low corruption perception index score of 53, reflecting a high level of perceived corruption, while the score of other Strong Innovators ranges between 71 and 79. Meanwhile, differences in environmental sustainability efforts are evident, with Austria and Germany having lower greenhouse gas emissions intensity compared to Cyprus.

When analysing the structural indicators for **Moderate Innovators**, commonalities include moderate GDP per capita PPS, with Malta and Italy leading with the highest scores (104 and 96.67, respectively). All countries demonstrate moderate average annual GDP growth rates ranging from 1% to 7%. Malta stands out with the highest employment shares in services (45%) and knowledge-intensive services (34%), while Hungary and Czechia lead in high and medium high-tech employment, both with 43% of total employment in manufacturing. Enterprise births are notably high in Malta and Portugal, while foreign-controlled enterprises contribute significantly to value added in Hungary and Czechia. Differences emerge in innovation-related metrics, with Slovenia and Italy generally performing better, particularly in innovation procurement and the eco-innovation index. Hungary faces challenges in corruption perception, scoring the lowest in the Corruption Perceptions Index, while Italy leads in circular material use rate and Malta in FDI net inflows.

The **Emerging Innovators** group shares some commonalities in structural indicators. These countries display low GDP per capita, and annual GDP growth rates of 1-5%. Employment in manufacturing and high-tech sectors, ranges significantly from 16% to 47% of the workforce. There is less heterogeneity in Employment in knowledge-intensive services, with shares between 20% and 26% of total employment in services. While large enterprises contribute substantially to turnover, (45% of business turnover is from large firms in Poland), SMEs also play a crucial role. Foreign controlled-enterprises contribute between 18% and 24% of value added in the countries' respective economies. Entrepreneurial activity and innovation vary, with Croatia having higher inhouse product innovation at 14%. Corruption perception remains a challenge, especially in Bulgaria and Romania, which score around 43 and 46 on the CPI, respectively. Environmental sustainability improvements are unequal, with Slovakia achieving a circular material use rate of 9%, while Romania is lagging behind at 1%.

3.5. How do EU Member States perform compared to neighbouring countries?

The innovation performance of 12 neighbouring (non-EU) countries (Albania, Bosnia and Herzegovina, Iceland, Moldova, Montenegro, North Macedonia, Norway, Serbia, Switzerland, Türkiye, Ukraine and the United Kingdom) compared with that of the EU Member States is examined in this section. The performance progress concerns only the indicators for which data is available for the neighbouring countries and not necessarily the full 32 EIS indicators. Data availability varies across the 12 countries since some, e.g. in the Western Balkans, are still in the process of aligning their statistical methodologies with those of the EU. The neighbouring countries are strategic partners for the EU, with a mix of highly advanced economies and countries seeking to upgrade and modernise their economies, many of which are potential future EU Member States engaged in a pre-accession process.

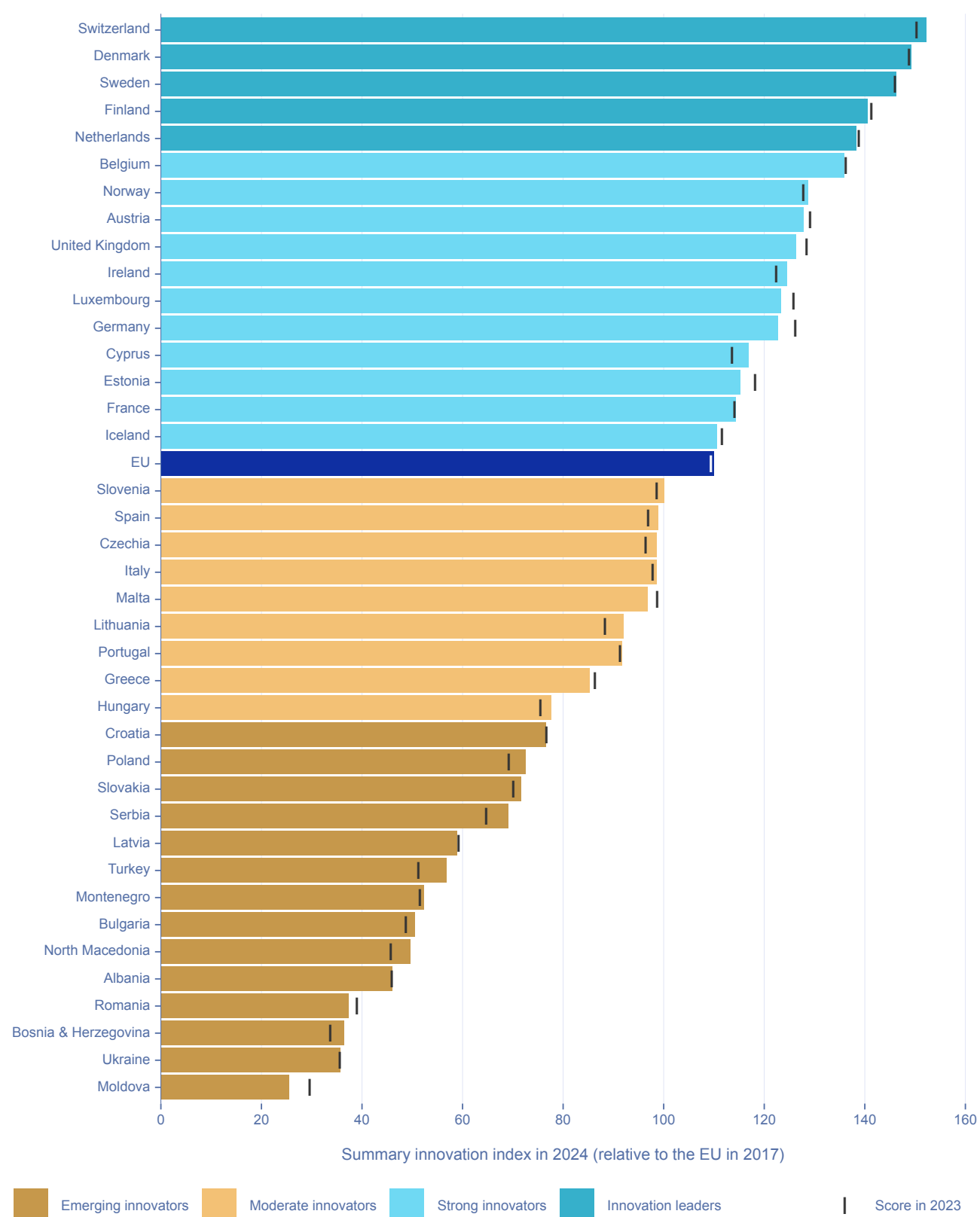
Four of the neighbouring countries score above the EU average in 2024, namely Switzerland, Norway, the UK and Iceland. Switzerland, which ranks first in the enlarged ranking with a 2%-point improvement in scores compared to 2023, is an Innovation Leader outperforming all EU Member States. Norway continued to improve its performance to rank 7th, registering a 1%-point increase compared to 2023. In 2024, the UK declined compared to the previous year losing 2% -points to arrive 9th in the ranking, but still securing 4th place among the Strong Innovators. Iceland's decrease in performance by 1%-point places it last in the Strong Innovators group with the score slightly above the EU average (111%).

The other eight neighbouring countries are in the group of Emerging Innovators with three EU Member States occupying the top three positions in this group. Türkiye witnessed the most dynamic growth of 6%-points in 2024 compared to 2023 securing 6th place among the Emerging Innovators. Serbia outperformed Latvia to rank as the 4th Emerging Innovator and 29th in the extended EIS. Montenegro, Albania and Ukraine had moderate improvements in performance, while North Macedonia and Bosnia and Herzegovina have improved their position by 4% and 3%-points. Moldova entered the EIS for the first time in 2024 and is ranked 39th (with a 'technical' decline of 4%-points compared to 2023). Moldova has demonstrated substantial commitment in collecting data for enough indicators to take part in the EIS.

In the Innovation Leaders' group, the four EU Member States recorded a strong growth over 2017-2024, while Switzerland grew moderately but from a higher base over the period. Among Strong Innovators, Norway was outperformed by Belgium which grew by 15%-points since 2017 heading the group in 2024. The UK is the only neighbouring country that registered a decline in performance over 2017-2024 period with a 0.1%-point decrease. Among Emerging Innovators, North Macedonia (12%-points) showed the fastest growth as a non-EU country over 2017-2024, but it is Croatia (15%-points) that leads the group followed by Poland (13%-points). Overall, the neighbouring countries in the group demonstrated faster growth on average than their EU peers¹⁵, pointing to a catching-up effect. For example, Montenegro (6%-points), Albania (9.9%-points), Bosnia and Herzegovina (6%-points), Serbia (7%-points), Ukraine (4%-points), Türkiye (6%-points) grew faster than Slovakia (3%-points), Latvia (3%-points), Bulgaria (3%-points) and Romania (2%-points). The only exception is Moldova that recorded a modest increase of 0.2%-points since 2017.

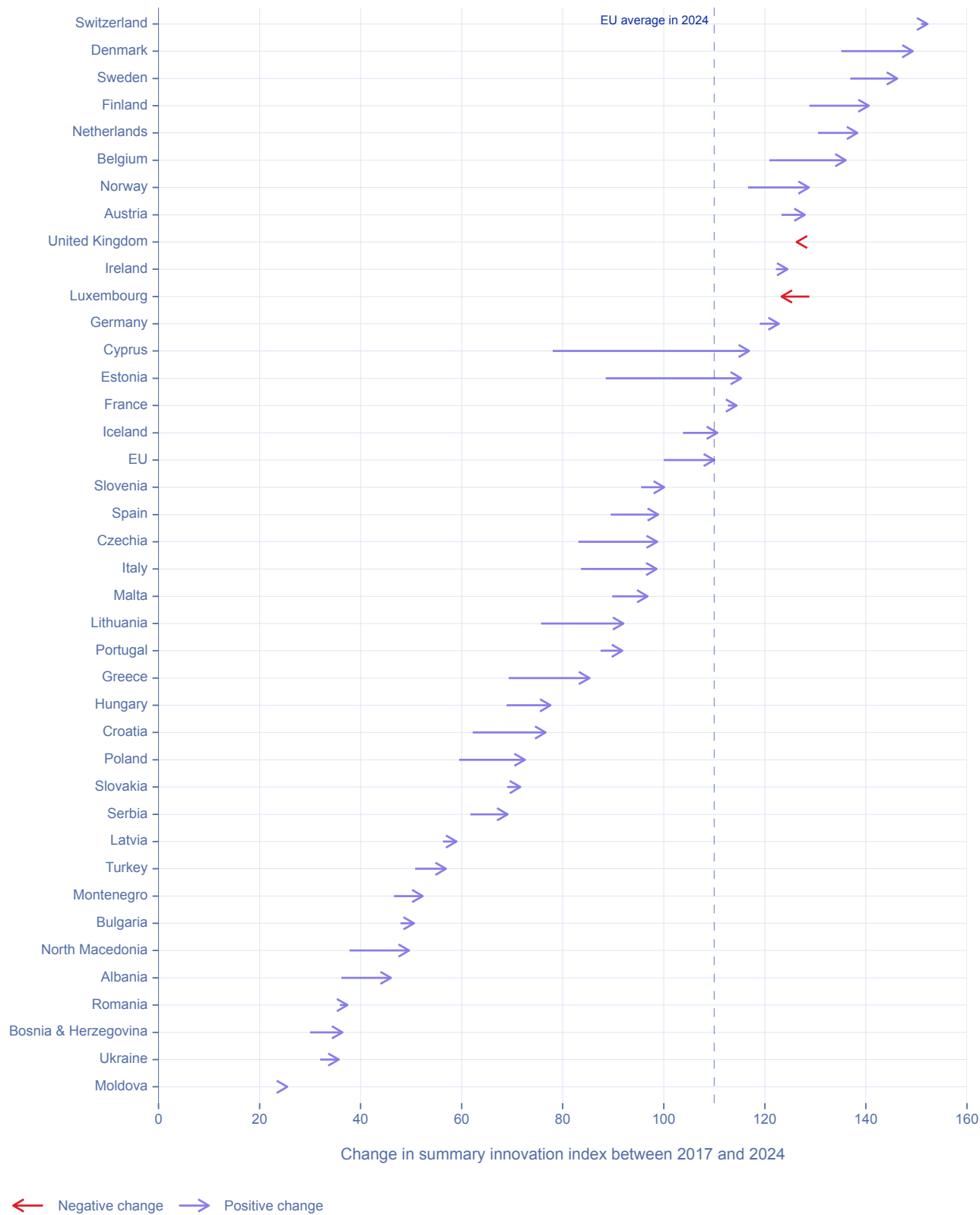
¹⁵ The performance progress concerns only the indicators for which data is available for the neighbouring countries, as it is not the case for all 32 indicators of the EIS (i.e., neighbouring states are in process of harmonising their statistical methodologies with the EU).

Figure 26: Innovation performance of the EU Member States and neighbouring countries (bar chart) (2024 vs 2023)



Note: All performance scores are relative to that of the EU in 2017. Coloured bars show countries' performance in 2024, using the most recent data for 32 indicators. The vertical bars show performance in 2023, using the next most recent data.

Figure 27: Innovation performance change for the EU Member States and neighbouring countries (2024 vs 2017)



Note: Performance change is measured as the difference between 2024 and 2017 scores, relative to that of the EU in 2017.

3.6. What are the strengths and weaknesses of the neighbouring countries compared to the EU?

Compared to the EU Member States, eight out of 12 of the neighbouring countries perform below 70% of the EU average, despite some improvements notably in terms of Attractive Research System and Linkages over the period of 2017-2024. Figure 28 illustrates the performance of EU Member States and neighbouring countries in 2024 for all EIS indicators, relative to the EU average performance. Additional information on trends in performance change as compared to 2017 and 2023 can be found in Figure 39 and Figure 40. The overview of differences in structural indicators for both neighbouring countries and the EU Member States can be found in Annex 2 (Figure 41).

Both the EU Member States and the neighbouring countries have room to catch up on Sales Impacts performing below EU average with a few exceptions across the three indicators. Environment Sustainability is another dimension where the scope for improvement for both groups of states is large, even if Germany is the absolute leader on this dimension and a few EU Member States such as Netherlands, Ireland, Luxembourg, France, and Malta lead the way on *Resource productivity* and *Air emissions* by fine particles indicators. Three EU accession countries, namely North Macedonia, Albania and Bosnia and Herzegovina, join with Denmark on *Environment-related technologies* indicator scoring 125% and above the EU average, the remainder scoring mostly below 70% on the same indicator.

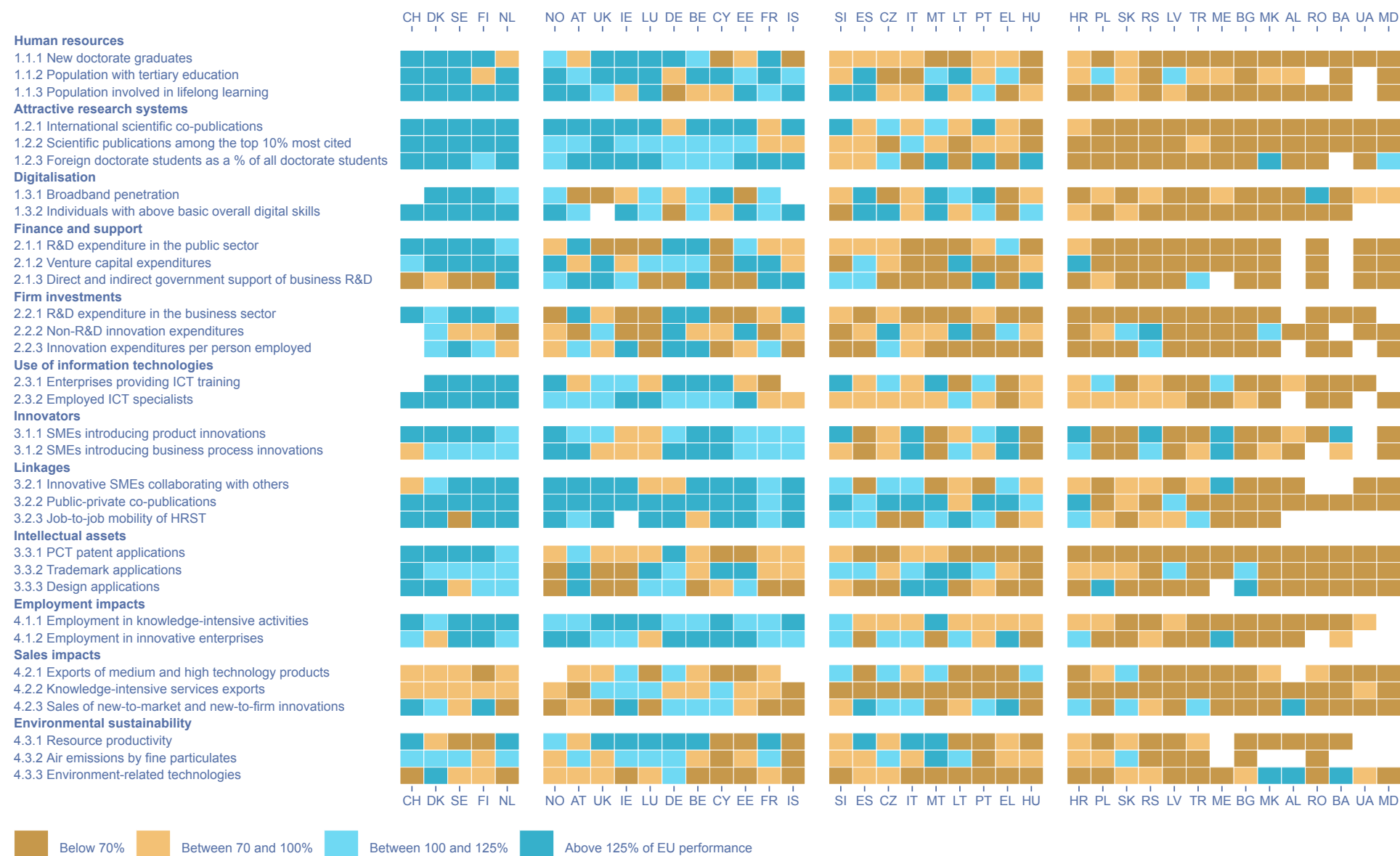
The UK is the only country in the Strong Innovators group which has above 125% performance on Attractive Research System outperforming the EU Member States and this despite the negative change on *Scientific publications among top 10% most cited* and *Foreign doctorate students* indicators since 2017. Luxembourg outperforms Switzerland and Norway on Human Resources dimension scoring way beyond EU average while Norway outperforms the group leader Belgium on Linkages dimension with above 125% results. Iceland performs particularly low on Environment Sustainability dimension, i.e. below 70% of EU average, together with Cyprus which shows equivalent performance on the Finance and Support dimension despite some improvements in this area since 2017.

Croatia is the leader on Linkages and Innovators dimensions and the *Venture capital expenditures* indicator among the Emerging Innovators group demonstrating more than 100% of the EU performance. Serbia leads on two indicators of the Firm Investments dimension within the group performing at the EU level and *higher on Non-R&D innovation expenditure* and *Innovation expenditure per person employed* and registering an overall positive change on this dimension since 2017.

Despite notable improvements on Attractive Research System and Sales Impact dimensions, the EU accession countries have recorded major setbacks or no performance change on Finance and Support and Firm Investments dimensions over 2017-2024 period reflecting the persistent challenge of mobilising sufficient funding for R&D and innovation activities in the context of ongoing structural economic reforms (see country profiles). However, their performance is also marked by important successes as the countries progress in implementing reforms as part of the EU accession process. For instance, in the Western Balkans, Bosnia and Herzegovina scores above 125% of the EU level on *SMEs introducing product innovations* outperforming all EU Member States on this indicator except for Croatia. It also records equivalent results on *Environment-related technologies* outperforming, together with North Macedonia and Albania, the EU Member States in the Emerging Innovators group. At the same time, the country faces significant challenges on the Intellectual Assets dimension in addition to the previously mentioned common challenges facing aspiring EU Member States. Another example of good progress is Montenegro which together with Croatia is the leader among the Emerging Innovators on the Innovators dimension scoring between 100% and 125% and above of EU level. North Macedonia is the only one to score above 125% on the *Foreign doctorate students* indicator, well ahead of the EU Member States in its performance group. However, the country has failed to progress on the Digitalisation dimension since 2017.

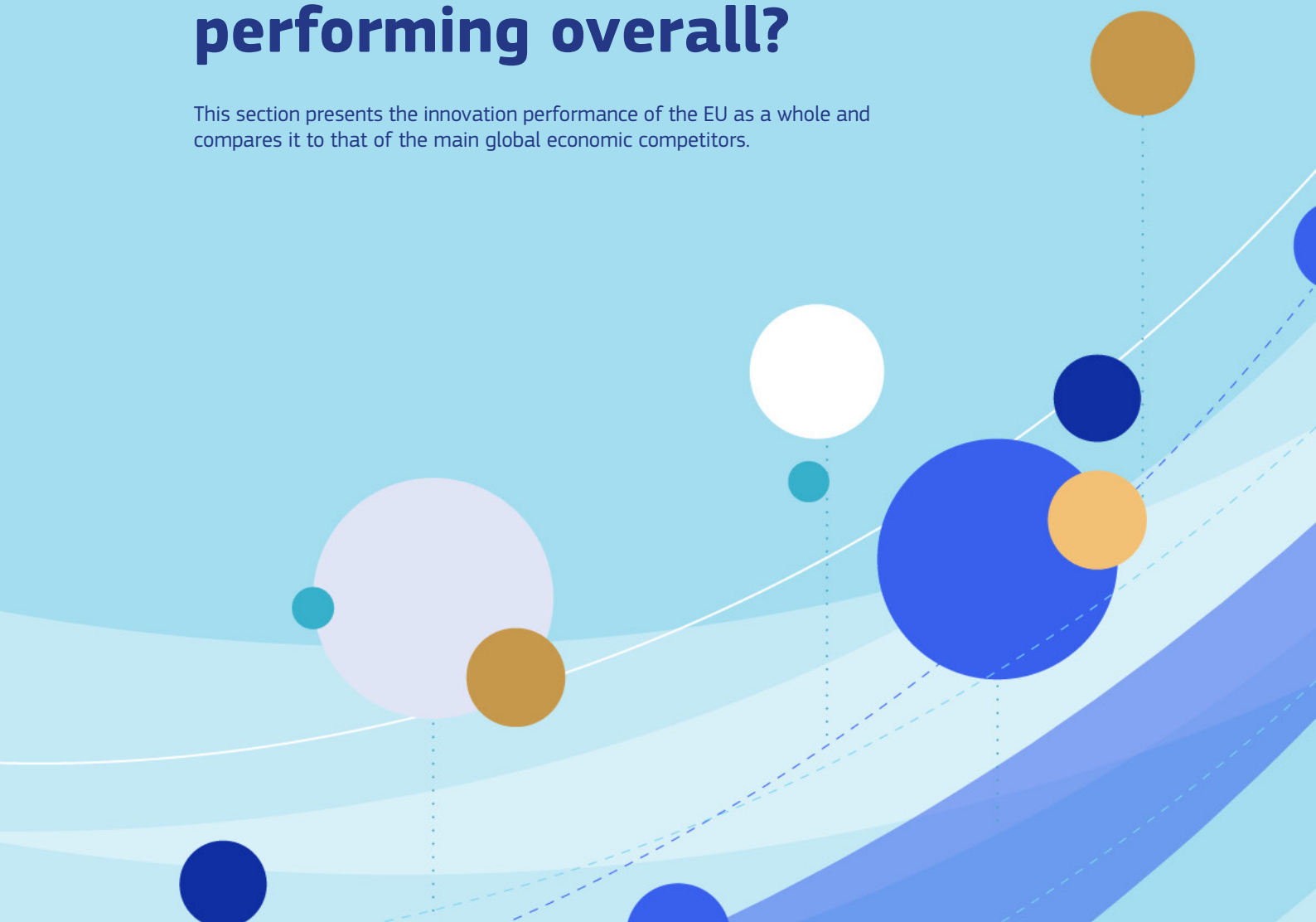
Moldova and Ukraine both have robust levels of *Broadband penetration*, higher than Croatia, Slovakia, Bulgaria and Latvia, and have registered a positive change in performance on *Venture capital expenditures*, *Trademark applications*, and *Knowledge-intensive services exports* over the last eight years. Moldova boasts a strong performance on the *Foreign doctorate students* indicator (100-125% of EU level), due largely to Ukrainian students enrolling due to the war. At the same time, Moldova registered a persistent negative trend in *Firm Investments* over 2017-2024. Ukraine in turn scores between 70% and 100% of EU performance across *Environment-related technologies*, *Knowledge-intensive services exports*, and *Employment in knowledge-intensive activities* indicators, demonstrating the increasing innovativeness of its economy, partly due to the need to respond effectively to war-related challenges. However, the country has been struggling to progress on the Innovators dimension since 2017, the Russian invasion making this particularly challenging in the context of damages to production sites and business relocation abroad.

Figure 28: Performance of EU Member States and neighbouring countries per indicator in 2024, compared to the EU average in 2024



4. How is the EU performing overall?

This section presents the innovation performance of the EU as a whole and compares it to that of the main global economic competitors.



4.1. What is the innovation capacity of the EU and has it improved compared to previous years?

The EU innovation performance for 2024 is equal to 110.0, which means that it has improved by 10%-points between 2017 and 2024. There was a slight increase in the EU performance between 2017 and 2019, followed by a period of more rapid growth from 2019 to 2023. The EU's innovation score remained relatively stable from 2023 to 2024, increasing by only 0.6%-points. Despite the slowing in the last year, the EU remains on an upward trend in terms of innovation performance. However, it should be noted that this improvement in the innovation performance of the EU hides a substantial heterogeneity between individual Member States.

As a composite index, the EU overall innovation score for 2024 consolidates a set of indicators and dimensions displaying heterogeneous trends.

Between 2023 and 2024, performance for the EU has improved in six dimensions and declined in the other six.

The most significant performance increases are observed in the *Use of information technologies* (12%-points), *Employment impacts* (7%-points) and *Digitalisation* (6%-points) dimensions.

The growth in the *Use of information technologies* performance was driven by a jump in *Enterprises providing ICT training*, and, to a lesser extent, by an increase in *Employed ICT specialists*. The share of enterprises providing ICT training rose from 20% of enterprises in 2023, to 22% in 2024. Additionally, ICT specialists made up 5% of total employment in 2024, up from 5% in 2023.

Similarly, the EU has made progress since 2023 in both indicators of the Employment impacts dimension. The *share of employment in knowledge-intensive activities* grew from 15% to 15.2% of total employment, while *employment in innovative enterprises* grew significantly as well, reaching 59% of total employment¹⁶ in 2024.

The performance increase of the EU in the Digitalisation dimension was driven by a notable improvement in the *Broadband penetration* indicator. The share of enterprises in the EU possessing a maximum contracted download speed of at least 100 Mb/s for their fastest fixed internet connection rose from 58% to 60% between 2023 and 2024. The EU also witnessed a slight increase in *Individuals with above basic overall digital skills* indicator, increasing from 26% to 27% of the population aged 16-74.

On the other hand, the EU experienced a significant downturn in the Linkages dimension (-11%-points) since 2023. This is mostly driven by the drop in the *Job-to-job mobility of human resources in science & technology* indicator, which decreased from 8% to 7% of the working age population between 2023 and 2024. *Public-private co-publications per million population* also slightly declined, falling from 142 to 137. Although the decrease is explicit between 2023 and 2024, it represents a slight decline compared to the overall upward trend in this dimension, following several years of consecutive positive improvements. The last indicator of the Linkages dimension, the *share of innovative SMEs collaborating with others* slightly increased from 12% to 13% between 2023 and 2024.

Another dimension that witnessed a considerable decline is the Innovators dimension, with a decrease of 5%-points between 2023 and 2024. Both the share of SMEs introducing product innovations and those introducing business process innovations have dropped over the past year. The decline was most pronounced for *SMEs introducing product innovations*, falling from 27% to 26% of SMEs. The share of *SMEs introducing business process innovations* decreased from 42% to 41% of SMEs.

At the level of individual indicators, the EU performance has since 2023 increased for 14 individual indicators, remained stable for five, and declined for 13

Besides the indicators *Enterprises providing ICT training* (17%-points), *Broadband penetration* (9%-points) and *Employment in innovative enterprises* (8%-points) described in the above paragraphs, the indicators with the strongest performance increase between 2023 and 2024 are *Lifelong learning* (10%-points) and *Population with tertiary education* (7%-points). The *percentage of the population aged 25-64 participating in lifelong learning* rose from 12% to 13% in a year, positively influencing the EU performance in the Human resources dimension. Similarly, the *share of the population aged 25-34 having completed some form of post-secondary education* increased from 42% to 43%.

¹⁶ The share of employment in innovative enterprises is calculated as the number of employed persons in innovative enterprises divided by the total employment for enterprises with 10 or more employees.

After the indicators *Job-to-job mobility of human resources in science & technology* (-23%-points) and *SMEs introducing product innovations* (-8%-points), the most important declines since 2023 occurred for the indicators *Design applications* (-8%-points) and *Non-R&D innovation expenditures* (-7%-points). The number of design applications per billion GDP has reached a low of 3.6 in 2024¹⁷, while *non-R&D innovation expenditures* fell from 0.9% in 2023 to 0.8% of total enterprises turnover in 2024.

Compared to 2017, performance for the EU has improved in all dimensions, except Intellectual Assets.

The decrease in the Intellectual Assets dimension over the 2017-2024 period was driven by a slight decline in *PCT patent applications* and, more importantly, by a significant drop in *Design applications*. From 2017 to 2024, the number of PCT patent applications per billion GDP (in PPS) declined from 3.9 to 3.4, and the number of Design applications per billion GDP (in PPS) fell from 4.7 to 3.6.

Between 2017 and 2024, the EU has improved its performance the most in the dimensions *Linkages* and *Digitalisation*. Regarding the Linkages dimension, the EU's performance has surged by over 30%-points since 2017, and there has been a significant increase across all indicators within this dimension. The *share of innovative SMEs collaborating with others* rose from 9% to 13% of all SMEs between 2017 and 2024. *Public-private co-publication per million population* increased from 114.1 to 136.9, slightly below the highest value of 142.2 reached in 2022. Similarly, *job-to-job mobility of human resources in science & technology* followed a comparable trajectory, starting at 5.4% of the working age population aged 25-64 in 2017, reaching 7.6% in 2023, before falling to 6.8% in 2024.

In terms of the *Digitalisation* dimension, the performance increase of 24%-points since 2017 was primarily driven by the surge in the *Broadband penetration* indicator. As of 2024, 60.2% of enterprises in the EU possess a maximum contracted download speed of at least 100 Mb/s for their fastest fixed internet connection, compared to 46.4% in 2021. The indicator *Individuals with above basic overall digital skills* only saw a marginal increase, increasing from 26.5% to 27.3% of the population aged 16-74.

The EU performance has increased since 2017 for 25 individual indicators, has remained stable for two, and has decreased for five.

The indicators with the strongest decline since 2017 are *Design applications* (-24%-points), followed by *New doctorate graduates* (-11%-points) and *PCT patent applications* (-7%-points).

The number of *new doctorate graduates in STEM* per 1000 population aged 25-34 stood at 0.9 in 2017. Since then, it has experienced a decline, reaching a low of 0.7 in 2022, before bouncing back to 0.8 in 2023 and 2024. This decrease has had a negative impact on the EU's score in the Human Resources dimension, offsetting parts of the improvements observed in *Population with tertiary education* and *Population involved in lifelong learning*.

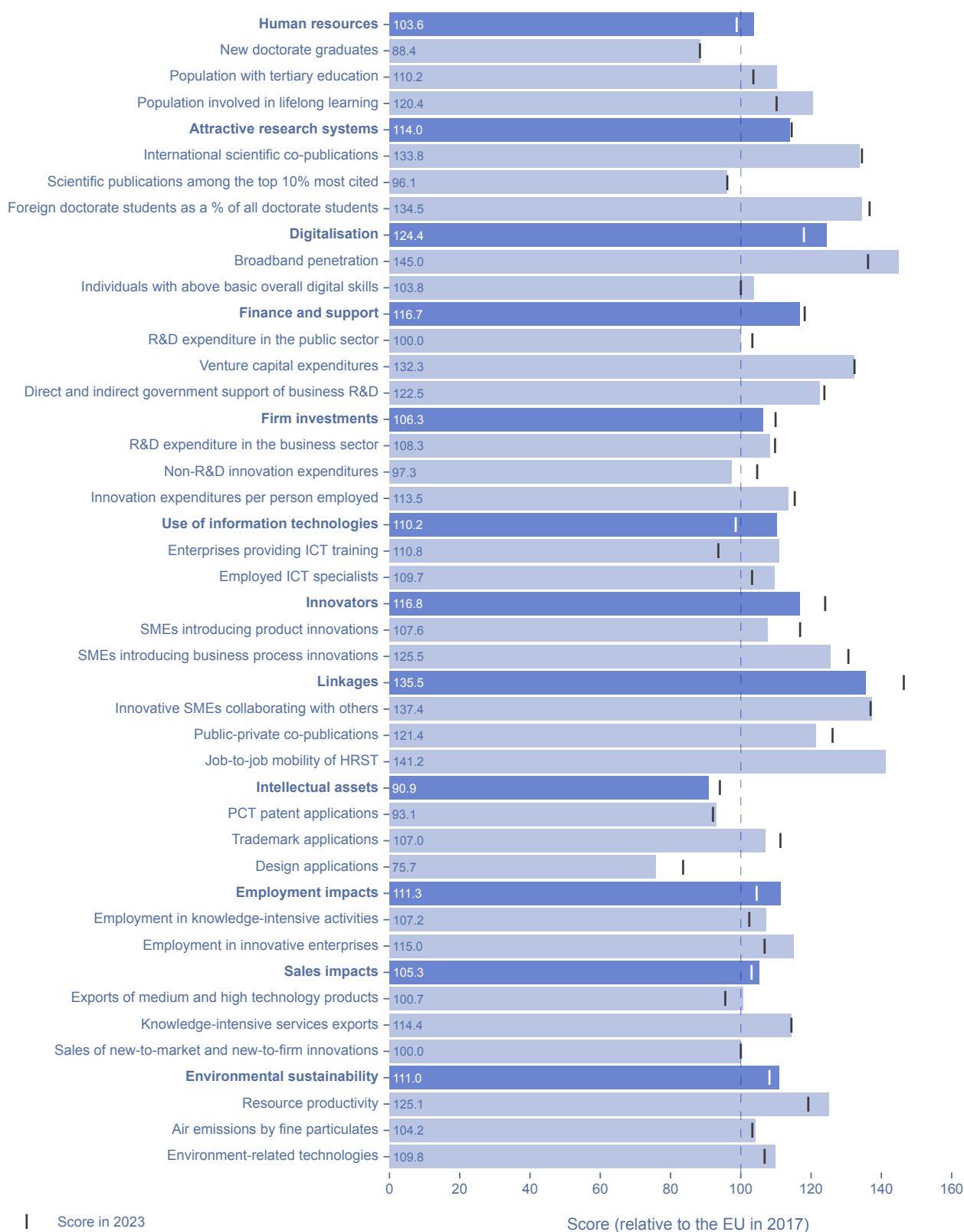
The indicators recording the strongest improvements since 2017 are *Broadband penetration* (45%-points), *Job-to-job mobility of human resources in science & technology* (41%-points), *Innovative SMEs collaborating with others* (39%-points), *Foreign doctorate students* (35%-points), *International scientific co-publications* (34%-points), and *Venture capital expenditures* (32%-points).

The rise in *Foreign doctorate students* and in *International scientific co-publications* between 2017 and 2024 indicate a *growing attractiveness* of EU research systems, despite the minor decline in *Scientific publications among the top-10% cited*. Over this period, the *international scientific co-publications* rose steadily, from 968 to 1268 per million population. The *share of foreign doctorate students* surged from 17.2% in 2017 to a peak of 23.3% in 2022, before falling to 22.7% in 2024. As a result, the EU's performance in the Attractive Research Systems dimension increased by 14%-points between 2017 and 2024.

The EU's *venture capital expenditures* jumped from 0.097% to 0.169% of GDP between 2017 and 2024. This rise significantly contributes to the 17%-points increase of the Finance and support dimension, enhancing the investment conditions favourable to innovation in the EU.

¹⁷ The drop in design applications per billion GDP is partially due to the increase in GDP between 2023 and 2024.

Figure 29: Innovation performance of the EU per dimension and indicator



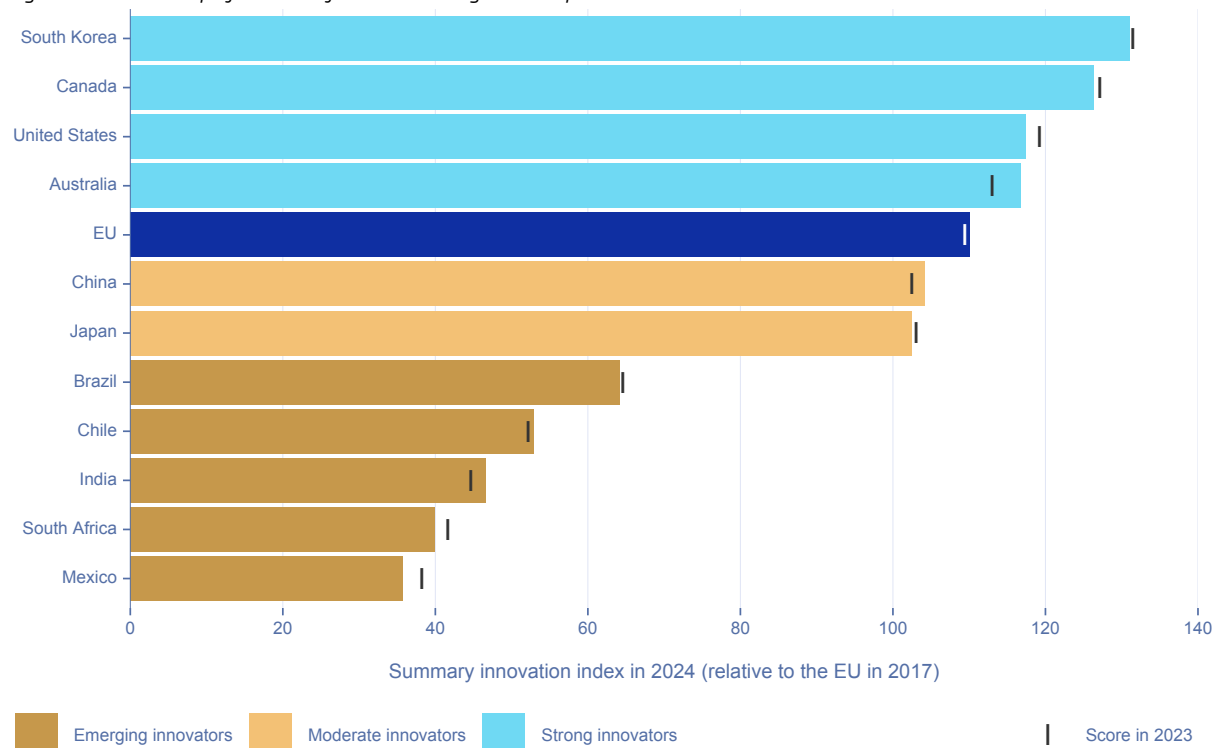
Note: Scores are normalised to the score of the EU in 2017 for each indicator. Dimensions are shown in dark blue while indicators are displayed in light blue.

4.2. How does the EU compare to its global competitors?

The EU is committed to sustaining its competitive advantage against other global powers, placing a strong emphasis on innovation as a driver of productivity¹⁸. This section compares the EU to competitors from North and South America (Brazil, Canada, Chile, Mexico, the United States), Asia (China, India, Japan and South Korea) and Oceania (Australia). Due to limited data availability for the global competitors compared to European countries, a more restricted set of 19 indicators has been used for calculating the summary innovation index (see methodology report).

South Korea remains the most innovative country in 2024 (Figure 30), with an innovation index of 131 (relative to the EU in 2017), outperforming the EU by 21%-points. **Three other competitors – Canada, the United States and Australia – also have a lead over the EU**, similarly to 2023. All four countries are Strong Innovators, as their innovation performance ranges between 100 and 125% of the 2024 EU average. South Korea, as well as Canada and the United States experienced a decrease in performance since 2023, while the EU and Australia improved.

Figure 30: Innovation performance of the EU and its global competitors



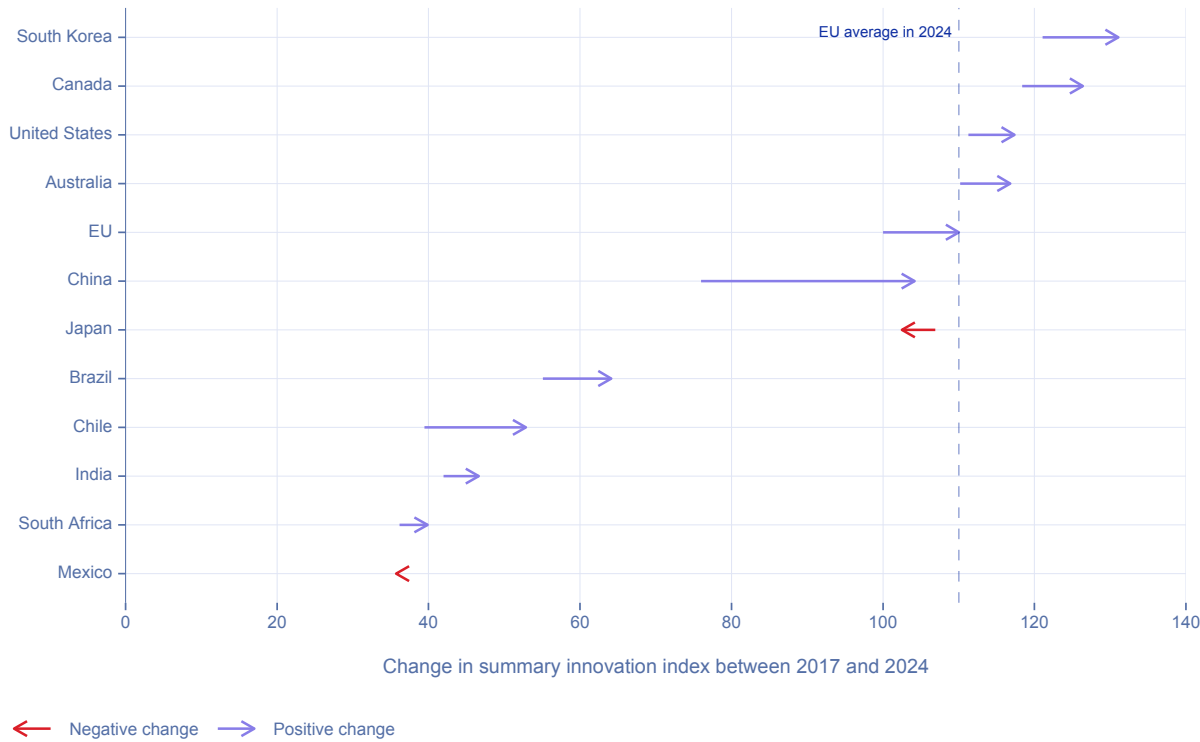
Note: All performance scores are relative to that of the EU in 2017. Coloured bars show countries' performance in 2024 while the vertical bars show performance in 2023. Due to limited data availability for global competitors, scores are calculated using a smaller set of indicators.

On the other hand, the **EU leads China, Japan, Brazil, Chile, India, South Africa and Mexico**. Relative to the EU, Japan and China are considered Moderate Innovators (with performance between 70 and 100% of the 2024 EU average), while Brazil, Chile, India, South Africa and Mexico are classified as Emerging Innovators (below 70%). China has shown a notable increase in innovation performance: it has increased the most since 2017 (28%-points), it has overtaken Japan, and it is catching up with the EU (6%-points difference this year compared to 7%-points in 2023, both relative to the EU in 2017). South Africa and Mexico, the last two Emerging Innovators, have experienced a decrease in innovation performance since last year, placing them even further away from the EU.

With respect to 2023, few global competitors have improved their innovation performance (Figure 30). Australia is catching up with the United States, as it increased its performance while the United States experienced a decline. Australia shows the biggest improvement since last year (4%-points), followed by India (2%-points), China (2%-points), Chile (0.7%-points), and the EU (0.6%-points). All other global competitors have experienced a decrease in innovation performance since 2023, with Mexico recording the largest decline (-3%-points).

Innovation performance has increased between 2017 and 2024, although at varying rates, for the EU and its global competitors apart from Japan (-4%-points) and Mexico (-0.3%-points) (Figure 31). The EU has improved the third most (10%-points), behind China (28%-points) and Chile (13%-points) and tied with South Korea (10%-points).

Figure 31: Performance change between 2017 and 2024 for the EU and global competitors

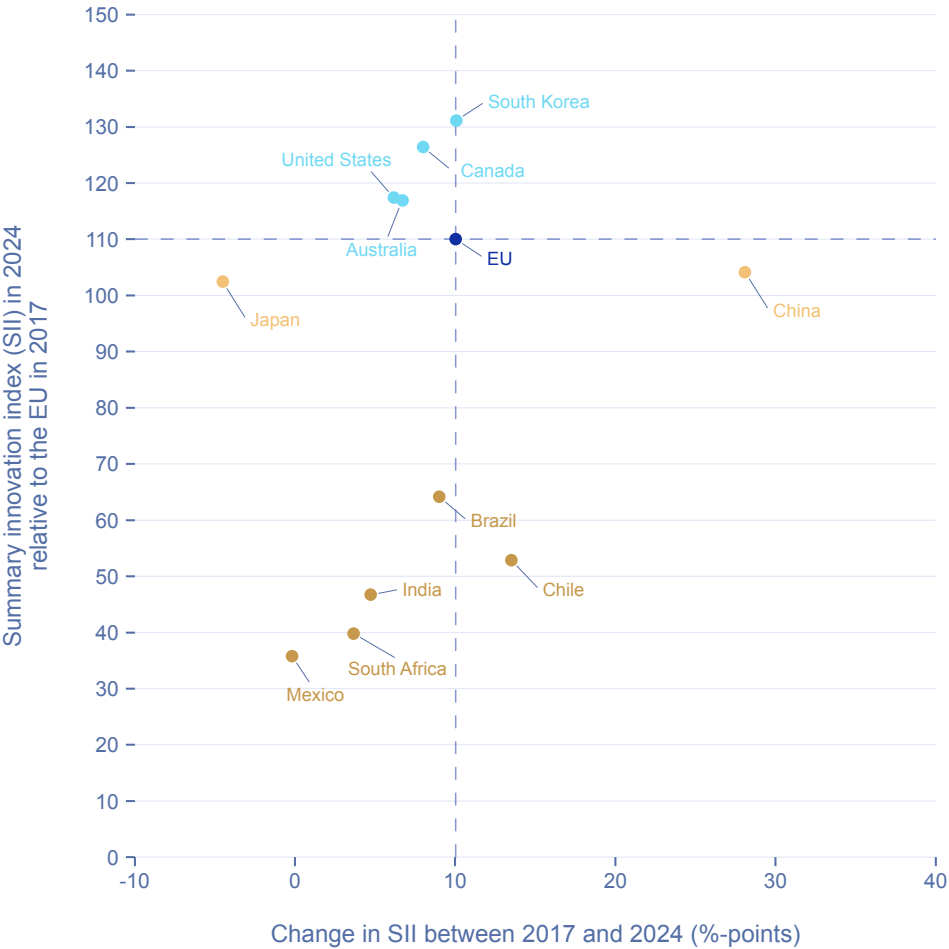


Note: Performance change is measured as the difference between 2024 and 2017 scores, relative to that of the EU in 2017.

Figure 32 compares the EU to its global competitors based on their performance score for 2024 and their change in performance between 2017 and 2024. As indicated by the absence of any country in the top right quadrant of the graph, no global competitor outperforms the EU in both performance and performance change. South Korea, Canada, Australia and the United States are nonetheless performing better than the EU in 2024, as presented before, but they have improved at an equal or slower pace than the EU over the 2017-2024 period.

Figure 32 also highlights the strong progress of China, with a performance score relatively close to the EU's but a solid improvement since 2017. China and Chile stand out as the only two countries which have advanced at a faster pace than the EU between 2017 and 2024. Conversely, Brazil, India, South Africa, and Mexico, depicted on the bottom-left quadrant of the plot, lag significantly behind the EU. Their position indicates slower rates of improvement or, in the case of Mexico, weakening. Finally, although relatively close to the EU, Japan has experienced a strong decline in performance since 2017 and kept declining from 2023 to 2024.

Figure 32: The EU versus its global competitors



Note: The horizontal and vertical lines indicate the score of the EU for each axis. Global countries are coloured based on their overall innovation performance (SII) as per Figure 30. Note that this Figure presents the SII and change in SII relative to the EU in 2017, while the subsequent figures present the score on the y-axis relative to the EU in 2024.

Methodological Note: In Figure 32, Figure 34 and Figure 37, the EU is plotted against its global competitors in terms of performance in 2024 (vertical axis) and performance change from 2017 to 2024 (horizontal axis).

Performance scores (vertical axis) represent a percentage relative to the EU in 2024. For example, a score of 110 means that the country is performing 10% above the EU average in 2024. Performance change (horizontal axis) is measured as the difference between 2024 and 2017 scores, relative to that of the EU in 2017. Please note the use of different reference years for the horizontal (2017) and vertical (2024) axes.

The horizontal and vertical dashed lines show the performance of the EU and define four meaningful quadrants on the graphs:

- Top-right quadrant: Competitor performs better than the EU in 2024, and has improved at a faster pace than the EU since 2017.
- Top-left quadrant: Competitor performs better than the EU in 2024, but has improved at a slower pace than the EU since 2017.
- Bottom-right quadrant: Competitor performs worse than the EU in 2024, but has improved at a faster pace than the EU since 2017.
- Left-right quadrant: Competitor performs worse than the EU in 2024, and has improved at a slower pace than the EU since 2017.

Structural indicators comparison: the EU versus its global competitors

To better understand the position of the EU in the global economic landscape, it is essential to compare key structural indicators – such as GDP per capita, population size, and employment shares – with those of its global competitors (Figure 33).

South Korea's population is five times smaller than the EU's, but its GDP per capita is comparable, albeit slightly lower. South Korea has nearly twice the percentage of its population as nascent entrepreneurs or owner-managers compared to the EU and is almost twice as likely to train its population in creating and managing SMEs. Last year, top R&D spending firms in South Korea spent almost three times as much on R&D compared to the EU; however, the gap is now much narrower. South Korea has near ten times less unicorns than the EU, and foreign investments are much lower than the EU's.

Canada presents a slightly higher GDP per capita than the EU, for a population twelve times smaller. Canada's top R&D spending firms spent near half as much than in the EU, but foreign investments are higher. Entrepreneurial activities and education are at a much higher level than in the EU. Employment in agriculture is much lower in Canada than in the EU.

The **United States** have the highest GDP per capita of all global competitors. Entrepreneurial activities are at a much higher level than in the EU. The number of top R&D spending enterprises is three times the EU's, but they spend, on average, a comparable amount towards R&D. FDI net inflows are lower than in the EU. The United States have the highest number of unicorns of all global competitors, more than six times that of the EU.

Australia has the second highest GDP per capita among all global competitors and has the smallest population of all strong global innovators. It receives the most foreign investment (relative to GDP) of all Strong Innovators, albeit comparable to Canada. Compared to the EU, Australia has less top R&D spending enterprises, which also spends less towards R&D, and a low number of unicorns.

China is the largest competitor in terms of population and has a GDP per capita less than half of the EU's. China's agricultural sector is, in relative terms, almost six times bigger compared to the EU. There are half as many top R&D spending firms per million population in China compared to the EU, and these firms spend half as much on R&D as those in the EU.

Japan has a GDP per capita twice as high as China, the other Moderate Innovator. There are more top R&D spending enterprises per capita in Japan than in the EU. However, the percentage of foreign investments in Japan is lower than the EU, and comparable to that of South Korea. Japan is facing a significant decline in population. Entrepreneurial activity and education are comparable to that of the EU.

Entrepreneurial activities are nearly three times as high in **Brazil** as in the EU; however, there are much less top R&D spending firms, and they spend five times less on R&D compared to EU firms. Brazil has a relatively high share of employment in agriculture compared to the EU. Foreign investment is relatively high in Brazil.

Chile has the highest percentage of population who are either a nascent entrepreneur or ownermanager of a new enterprise among all global competitors, more than four times that of the EU. Additionally, Chile receives the most foreign investments among global competitors, nearly three times more than the EU.

India has the lowest GDP per capita of all global competitors, but the highest average annual GDP growth. India's agricultural sector accounts for more than 40% of total employment, the highest of all global competitors. India has the third largest number of unicorns among global competitors, behind the United States and the EU. Entrepreneurial activities and training are higher in India than in the EU.

South Africa's entrepreneurial activities and training are higher than in the EU. Foreign investments are high in South Africa, more than twice that of the EU. South Africa has the lowest number of unicorns.

Mexico has a GDP per capita less than half of that of the EU, but a comparable annual growth. Foreign investments are higher compared to the EU. The number of, and spending from, top R&D enterprises is much lower compared to the EU, as well as the number of unicorns.

Figure 33: The EU versus its global competitors (structural indicators)

	EU	KR	CA	US	AU	CN	JP	BR	CL	IN	ZA	MX
GDP per capita (in thousands)	52.1	48.47	55.13	70.03	58.95	20.27	44.51	17.45	28.68	8.07	14.19	21.5
Average annual GDP growth (2020-2022 average)	4.72	3.46	4.55	3.92	3.18	5.68	1.75	3.94	6.99	8.14	3.3	4.86
Employment share Agriculture	4.15	5.38	1.39	1.68	2.49	23.11	3.14	9.18	6.68	43.87	20.65	12.96
Employment share Industry	24.74	24.57	19.23	19.29	18.91	31.94	23.77	20.49	22.58	24.76	17.65	24.56
Employment share Services	71.11	70.05	79.38	79.03	78.6	44.95	73.09	70.33	70.74	31.36	61.7	62.48
Employment share Knowledge-intensive services	14.86	25.3	9.02	10.67	5.51	27.18	20.05	10.68	9.11	13.98	11.98	20.78
Total early-stage Entrepreneurial Activity (TEA)	6.82	11.84	18.79	16.81		6.4	6.31	19.88	29.32	12.63	12.36	14.87
FDI net inflows	1.86	1.08	2.34	1.43	2.37	1.55	1.03	3.1	5.49	1.76	4.29	2.68
Top R&D spending enterprises per 10 million population	8.41	10.31	7.21	24.36	4.01	4.61	20.02	0.22		0.17		0.08
Top R&D spending enterprises, average R&D spending	528	654	205	539	321	286	452	105		207		124
Number of unicorns	107	14	21	656	9	168	7	17	2	71	1	8
Buyer sophistication	3.65	4.98	4.37	4.8	3.87	4.33	4.98	3.44	3.91	4.37	3.95	3.44
Corruption Perceptions Index	63.56	62.67	74.67	68.33	74.33	44	73	37.33	66.67	39.67	42.67	31
Basic-school entrepreneurial education and training	2.63	4.25	3.69	3.45			2.27	1.94	2.5	5.25	3	1.98
Government procurement of advanced technology products	3.41	3.79	3.37	4.58	3.31	4.41	4.05	2.83	2.87	4.34	3.04	3.06
Rule of law	1	1.13	1.59	1.37	1.59	-0.04	1.52	-0.26	0.84	-0.02	-0.05	-0.77
Population size (in millions)	447	52	38	332	26	1412	126	214	19	1407	59	127
Average annual population growth (2020-2022 average)	-0.04	-0.2	1.21	0.27	0.69	0.04	-0.45	0.5	0.78	0.74	0.92	0.6
Population density	112	530.6	4.3	36.1	3.3	150.2	346.2	25.5	25.9	469.4	48.4	64.8
	EU	KR	CA	US	AU	CN	JP	BR	CL	IN	ZA	MX

EU

Below EU

Above EU

4.3. What are the strengths and weaknesses of the EU compared to its global competitors?

In 2024, the EU maintains a robust position on the global scene, demonstrating strong performance in 10 out of 19 indicators¹⁹ across the four main categories (framework conditions, investments, innovation activities and impacts). Despite showing strong competitiveness in several key indicators, the EU still faces challenges in areas such as the application of trademarks or collaboration among innovative SMEs. This section provides a detailed analysis of how the EU competes with other global competitors in each indicator, illustrating both its strengths and areas for improvement. Overall, the EU demonstrates a strong performance compared the top four global competitors for the following indicators:

- New doctorate graduates
- International scientific co-publications
- R&D expenditure in the public sector
- Direct and indirect government support of business R&D
- Employed ICT specialists
- SMEs introducing product innovations
- SMEs introducing business process innovations
- Exports of medium and high technology products
- Knowledge-intensive services exports
- Environment-related technologies

The EU demonstrates a moderate performance, ranking with the middle four global competitors in 2024, in the following indicators:

- Population with tertiary education
- Scientific publications among the top 10% most cited
- R&D expenditure in the business sector
- Public-private co-publications
- PCT patent applications
- Design applications
- Air emissions by fine particulates

The EU has a weak performance, similar to the bottom four global competitors in 2024, in the following indicators:

- Innovative SMEs collaborating with others
- Trademark applications

The following pages delve into more detailed comparisons for each main category and indicator, contrasting the EU with its global competitors. Figures 34-37 illustrate the position of the EU compared to its global competitors in terms of scores for 2024 and changes since 2017.

¹⁹ Due to limited data availability for global competitors compared to European countries, a more restricted set of 19 indicators has been used for calculating the summary innovation index.

Framework conditions

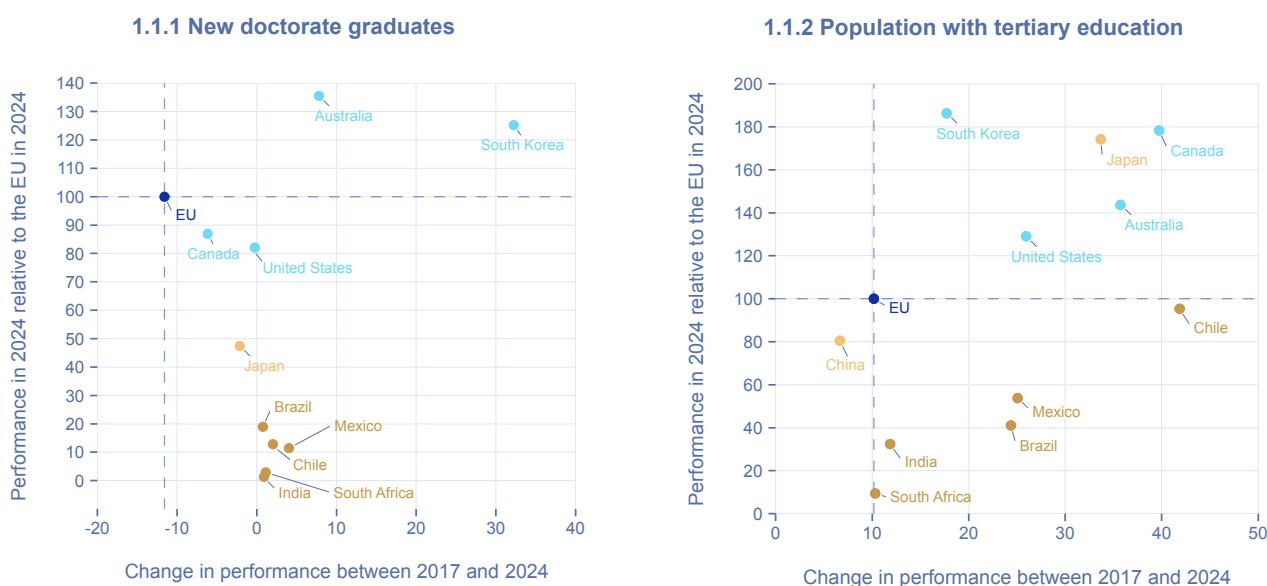
The *Framework Conditions* category measures the availability of a high-skilled and educated workforce, as well as competitiveness in science by focusing on international, high-quality and collaborative publications, all of which are crucial for innovation through knowledge-based activities (Figure 34).

The EU has a high number of individuals graduating with doctoral degrees in science, technology, engineering, or mathematics fields each year relative to its population, ranking third just behind Australia and South Korea. However, the EU has shown the biggest decrease in the number of *new doctorate graduates* since 2017. Canada, Japan, and the United States have also experienced a decrease in performance since 2017, although to a lesser extent than the EU. All other global competitors have improved since 2017, albeit at different paces.

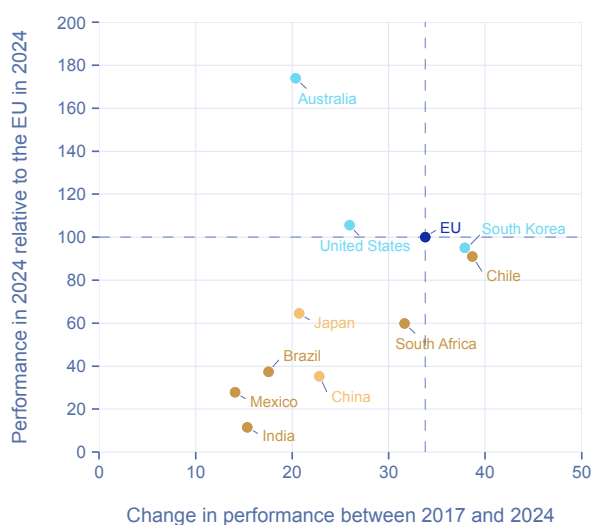
The EU performs moderately for the *Share of population with tertiary education* compared to global competitors. Japan had a strong performance for this indicator, leading over the EU. The EU has improved since 2017, but at the second slowest pace, ahead of China.

The EU demonstrates a strong performance in scientific publications, ranking 4th in publications with at least one co-author abroad, with a notable increase since 2017 reflecting its strong tendency to disseminate research results collaboratively. The EU ranks 5th in the top 10 most cited publications worldwide, i.e. the percentage of EU publications in the top 10% most cited worldwide, indicating that the EU not only disseminates research widely but also provides high-quality sources internationally. A decrease in performance for this indicator has been observed for most countries, including the EU, since 2017; however, China has achieved a significant improvement compared to other competitors.

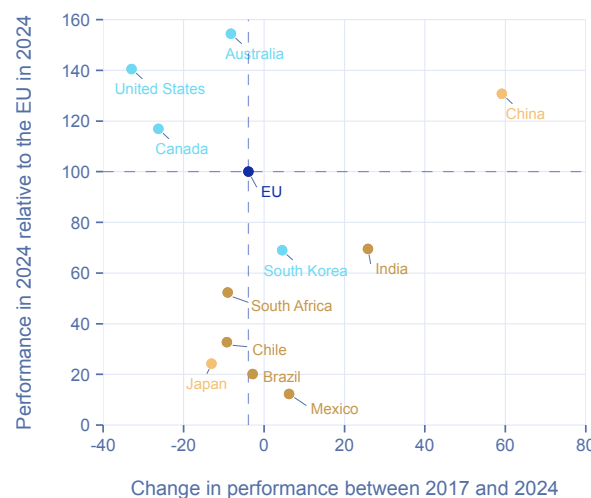
Figure 34: The EU versus its global competitors in framework conditions



1.2.1 International scientific co-publications



1.2.2 Scientific publications among the top 10% most cited



Note: Global countries are coloured based on the overall performance (SII) as per Figure 30. The colouring is therefore the same in all Figures 34-37.

Investments

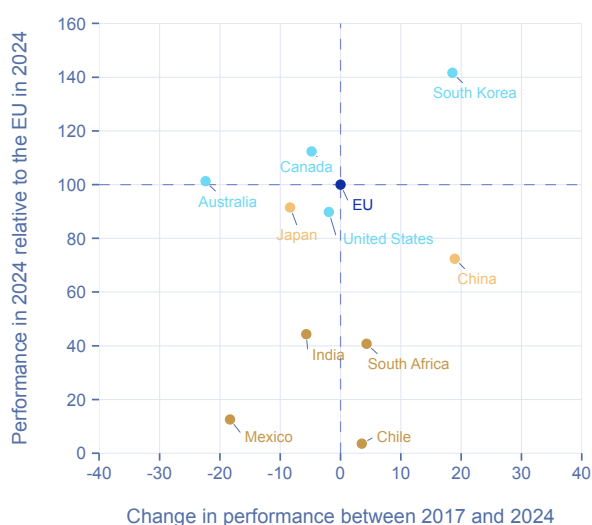
The *Investments category* captures investments made in both the public and business sectors and differentiates between three innovation areas: *finance and support*, *firm investments*, and *ICT labour employment* (Figure 35).

The EU has a strong performance in finance and support overall. It ranks 4th and 5th in public and private R&D expenditures, respectively. South Korea leads in both indicators by a significant margin. The EU has shown the fastest growth in *Direct and indirect government support of business R&D*, especially considering that all its global competitors, apart from the United States, have experienced no growth or a decrease in performance since 2017. This means that the EU has been increasing R&D funding via grants, public procurement and tax incentives since 2017, compared to its competitors. The United States has improved considerably in business R&D expenditure since 2017 and currently ranks 2nd. The EU, on the other hand, ranks 5th with moderate improvements since 2017 for this indicator.

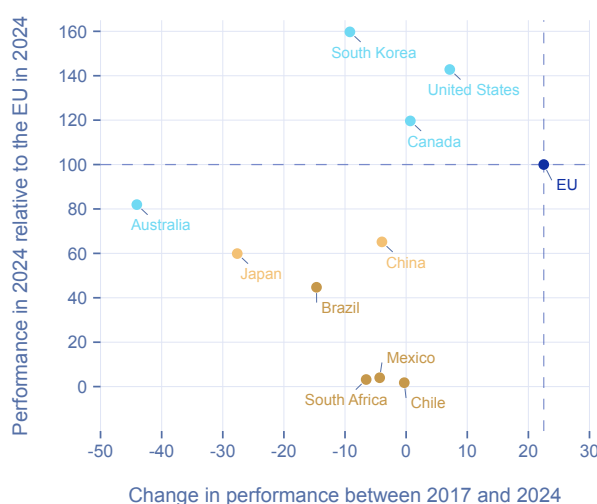
With regard to the number of employed specialists in ICT, the EU shows a strong performance by ranking 3rd, just behind the United States and Japan. Australia is however catching up, with a performance comparable to the EU's but improving at a faster rate.

Figure 35: The EU versus its global competitors in investments

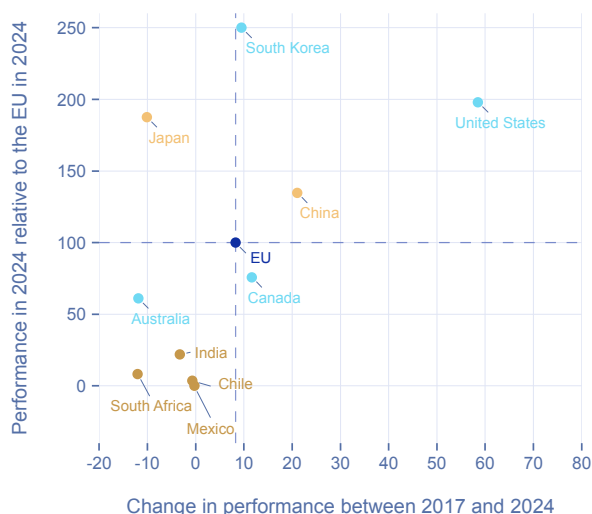
2.1.1 R&D expenditure in the public sector



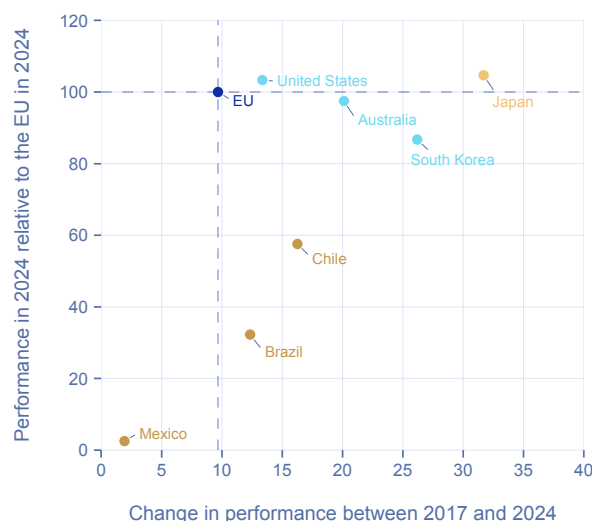
2.1.3 Direct and indirect government support of business R&D



2.2.1 R&D expenditure in the business sector



2.3.2 Employed ICT specialists



Note: Global countries are coloured based on the overall performance (SII) as per Figure 30. The colouring is therefore the same in all Figures 34-37.

Innovation activities

The *Innovation Activities* category encompasses various facets of innovation, including the introduction of products or business process innovations by SMEs, the level of collaboration within the country, and the number of intellectual property rights (Figure 36).

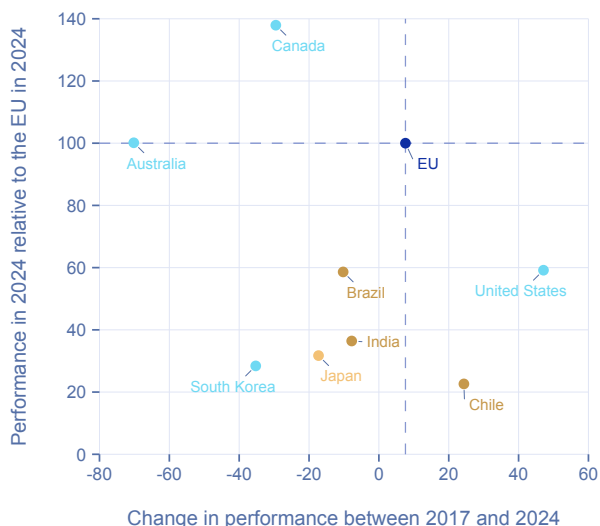
The EU has a significant percentage of SMEs introducing product and business processes to the enterprise or to the market, ranking 2nd and 4th respectively. While most competitors have experienced a slower rate of innovation introduction since 2017, the EU shows a moderate increase for both over time. The United States have improved the most in product innovations, while also having the worst decrease in business process innovations since 2017.

The EU has a weak performance in SME collaboration with other organisations, ranking last. It is however one of two countries, with Chile, that shows an improvement since 2017, while all other countries are collaborating less than in 2017, especially Japan with a significant decrease. However, the EU had moderate *public-private collaboration for scientific publications*, with the 5th best performance in 2024 and the 5th largest improvement since 2017.

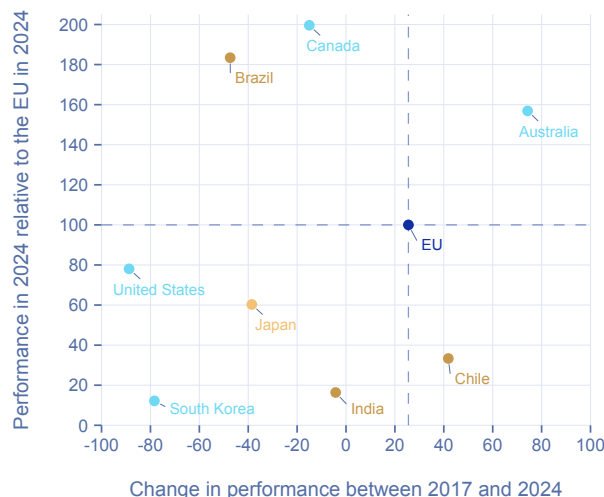
With regard to intellectual property, the EU has a moderate performance in the application of patents and designs, ranking 5th in both in terms of performance in 2024. However, as already mentioned in the EIS 2023, trademarks are the weakest element in the EU's research and innovation, with the third weakest score for that indicator among global competitors. Additionally, the EU shows weak improvement in all three intellectual assets since 2017, ranking last in all of them.

Figure 36: The EU versus its global competitors in innovation activities

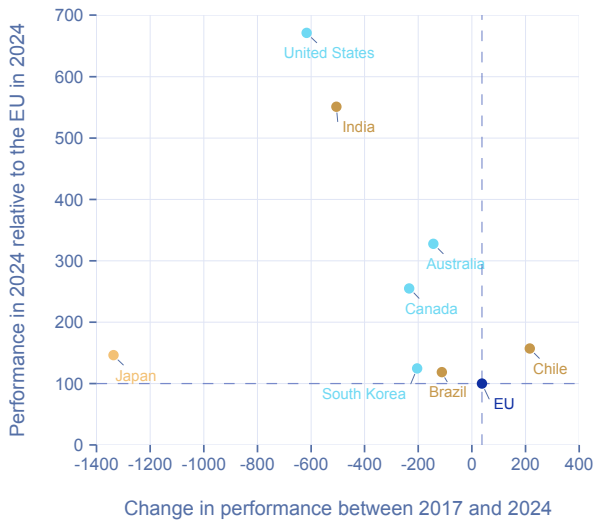
3.1.1 SMEs introducing product innovations



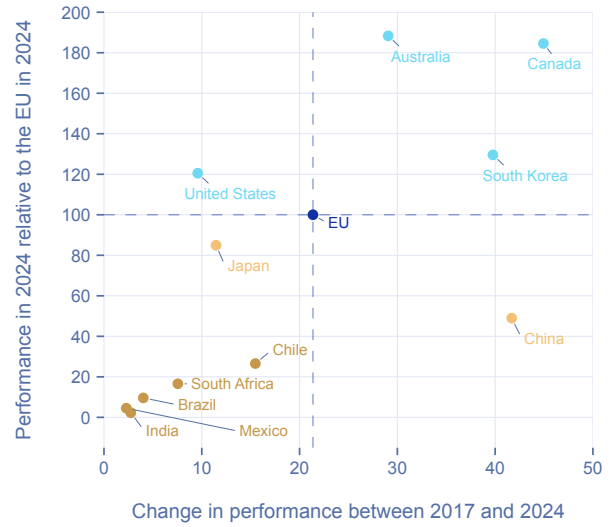
3.1.2 SMEs introducing business process innovations



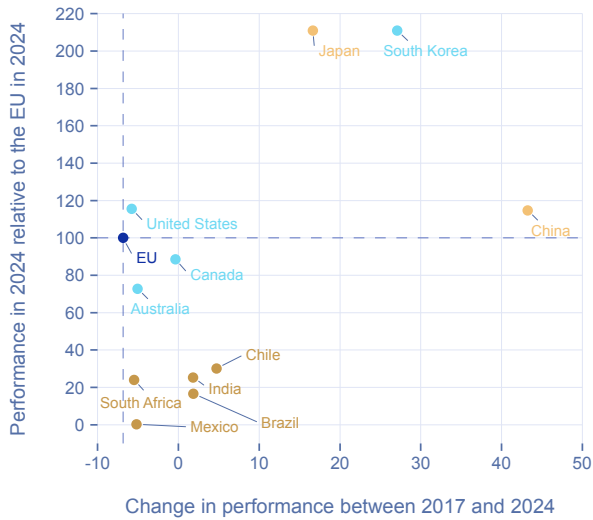
3.2.1 Innovative SMEs collaborating with others



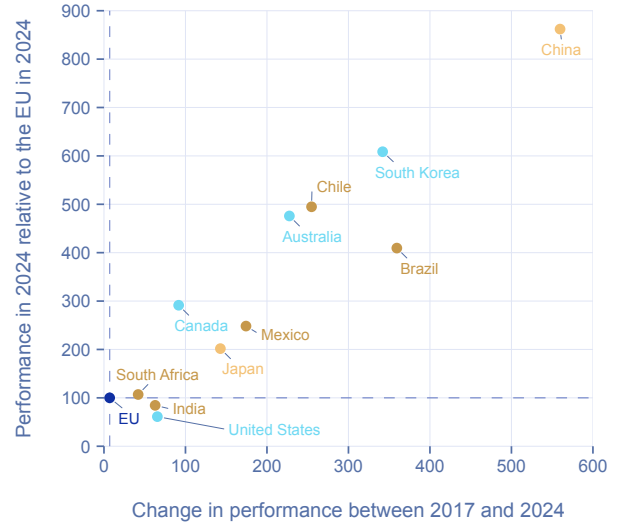
3.2.2 Public-private co-publications



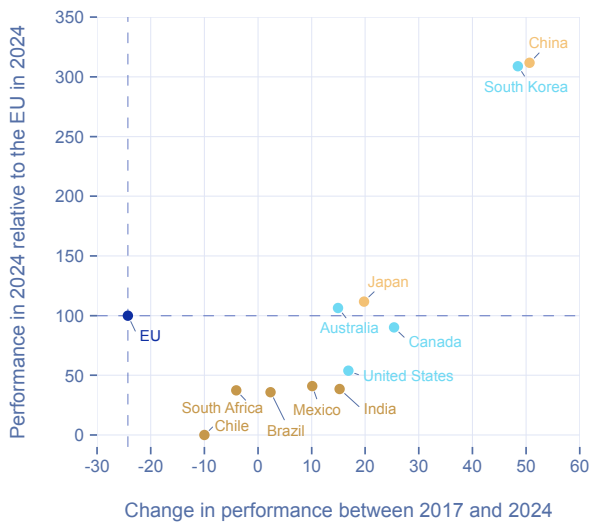
3.3.1 PCT patent applications



3.3.2 Trademark applications



3.3.3 Design applications



Note: Global countries are coloured based on the overall performance (SII) as per Figure 30. The colouring is therefore the same in all Figures 34-37.

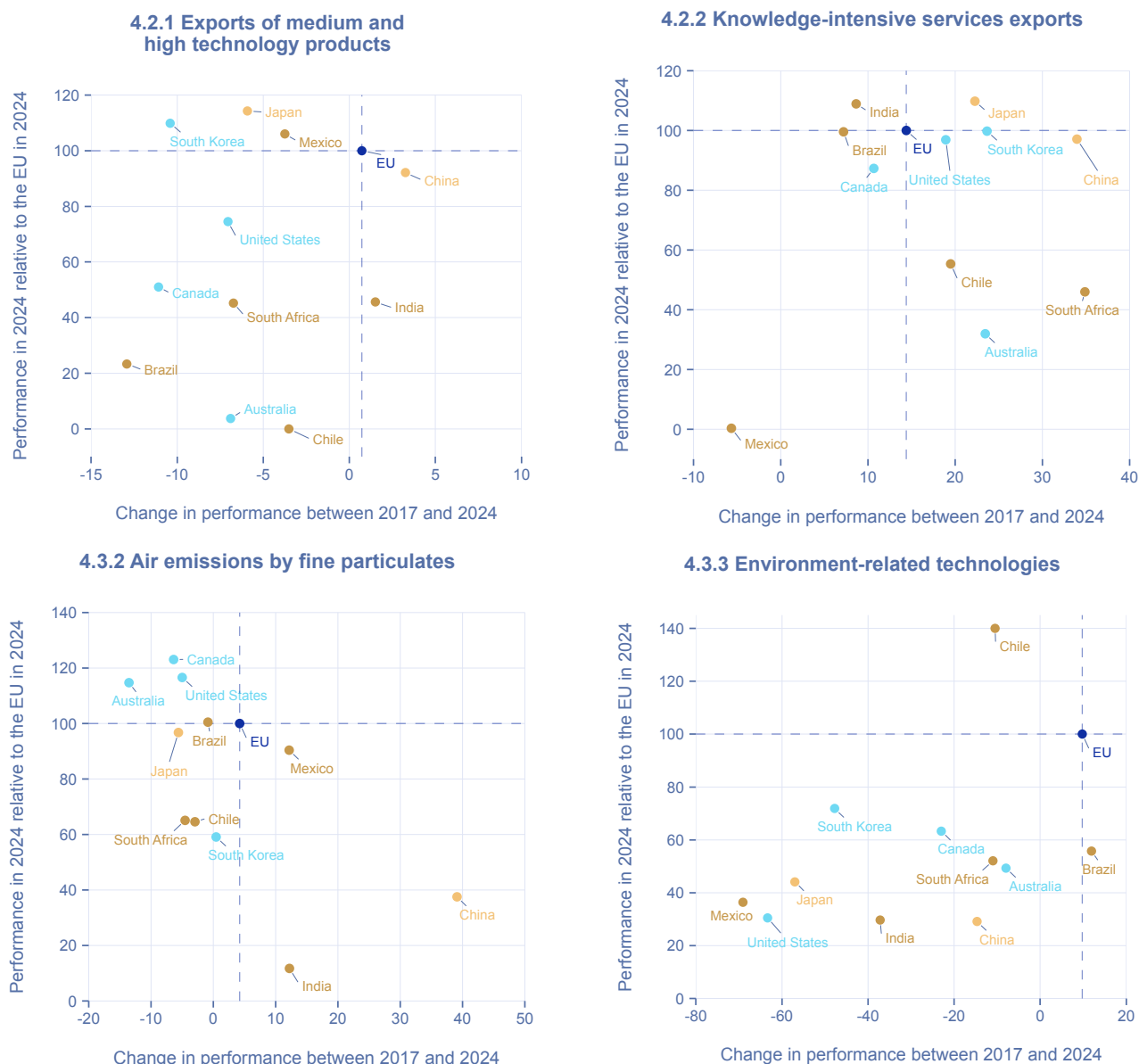
Impacts

The *Impacts* category captures the effects of enterprises' innovation activities. For global competitors, both economic and environmental impacts are assessed (Figure 37).

The EU has a strong performance in the number of technology exports, ranking 4th behind Japan, South Korea and Mexico and showing the third strongest improvement since 2017. The EU also performs strongly in the export of services, ranking 3rd behind Japan and India with a comparable performance to Brazil, South Korea, China and the United States. The EU has only achieved relatively modest improvement since 2017 in knowledge-intensive services exports. Japan has a strong competitiveness in the export of medium and high technology products and knowledge-intensive services, leading in both indicators.

With regard to environmental sustainability, the EU has a moderate performance in air emissions and a strong performance in the development of environment-related technologies. Air pollution in the EU, relative to the amount of manufacturing, is lower than for most global competitors, but worse than in Canada, the United States, Australia and Brazil. Finally, a higher share of EU's patents concerns the environment than all competitors apart from Chile, which leads over the EU by a significant margin.

Figure 37: The EU versus its global competitors in impacts



Note: Global countries are coloured based on the overall performance (SII) as per Figure 30. The colouring is therefore the same in all Figure 34-Figure 37.

5. Navigating the Innovation Landscape: Past, Present, and Future Perspectives



The EIS is one of the longest standing innovation indices in the world. In 2025, the EIS will have been published continuously for a quarter of a century and over the years the annual results have been used to support policy formulation at both European and national levels. This section discusses some key findings on long-term trends in the first sub-section; and takes a forward look in anticipation of the upcoming periodic revision process of the EIS methodological framework.

5.1. Looking back

While for methodological reasons it is not possible to compare one EIS edition with another, a recent report (Hollanders et al, 2024²⁰) provides a detailed trend analysis of the SII and the individual EIS indicators since 2000. The analysis offers an overview of innovation performance over the last two decades (2000-2022) and identifies turning points, which may be of particular interest to national and regional policy makers. The report's findings take into consideration major developments and socio-economic events during the last two decades: the 2008 financial crisis and the subsequent Eurozone debt crisis, EU enlargements, the 2016 Brexit vote and the COVID-19 pandemic. Some key takeaways from the report include:

- The EU, as a whole, has shown a substantial increase over the 22 years, growing from a SII of 82% in 2000 (2015 = 100) to 111% in 2022. Performance increased steadily over time with a decrease only in 2020, notably due to a strong performance decline for nine Member States (including three larger countries: France, Germany and Italy). Since 2000, performance declined for 10 or more Member States in 2001 (#11), 2011 (#13), 2012 (#11), 2013 (#10), and 2022 (#13), but did not impact the direction of the annual EU performance change.
- The report identifies key turning points for EIS indicators which are defined as “any year where at least four consecutive positive (negative) annual changes (including at most one year of no change) are followed by at least four negative (positive) annual changes (including at most one year of no change).” For the EU as a whole, eight upturns and eight downturns were identified for specific indicators. This analysis suggests that many countries and the EU as whole experienced key turning points in innovation indicators following the financial crisis, namely in 2011. For example, 10 countries (seven EU Member States, two other European countries and the United States) and the EU, as a whole, experienced downturns in 2011 concerning *Product Innovators*. This confirms evidence from the literature that periods of financial instability have negative impacts on innovation.
- The benefits of EU accession can be expected to have played a pivotal role in enhancing the innovation landscape of the countries that have joined since 2004. Accession has driven the modernisation of industries and fostered innovation policies and provided access to innovation funding. The availability of EU Cohesion Funds and other EU financial support has enabled significant investments in R&D, education and infrastructure projects. Concerning the direct impact of EU accession on national innovation performance indicators, the long-term analysis suggests, that most of the accession countries have progressed faster than the EU average, which suggest a positive long-term effect, even if they started from a significantly lower level. The effect has been variable with some countries progressing faster than others (e.g. Cyprus or Estonia) and other showing steady progress but remaining well below the EU average (e.g. Poland which remains an Emerging Innovator in the EIS 2024).
- The exception is Romania which experienced only one key turning point immediately after accession (a downturn in Non-R&D innovation expenditures in 2009). The long trends in Romania do not confirm the positive long-term impact observed in other Member States which have acceded since 2000. Romania's performance relative to the EU average did not increase after accession: remaining stable in 2007-2010 and then decreasing so that it stands at 41% of the EU average in 2022 compared to 43% in 2000.
- The impact of the two more recent events (BREXIT and COVID-19) proves harder to measure. Concerning BREXIT, there is no clearly visible effect on the EU, while the UK experienced one positive key turning point in 2018 and two negative key turning points after 2017. The report's authors suggest that long-term impacts may take longer to feed through and, indeed, the 2024 EIS results point to a decline in UK performance.
- The COVID-19 pandemic had a profound economic impact, comparable to the 2008 global financial crisis, disrupting supply chains and with supply and demand shocks reshaping economies. The trend analysis seems to confirm a short-term impact of the COVID-19 pandemic on European innovation systems; however, it remains too early to assess the long-term impact. The pandemic year 2020 was the only one in the history of the last two decades, when the annual change in the EU's innovation index was negative. However, the impact has been uneven with some sectors being boosted and notably digital technologies (telework, e-learning, e-commerce and telemedicine)

20 Hollanders, H., Es-Sadki, N., Bridgeford, M., Alexandre, L., Fuksiewicz, A. (2024) European Innovation Scoreboard – Trend analysis.

and pharmaceutical sectors. Moreover, other studies found that while innovative and noninnovative companies were both affected by the COVID-19 pandemic, innovative firms were less affected²¹.

The findings underline the long-time spans that it requires for innovation performance to improve, but also that 'external' 'shocks' as well as well designed government policy interventions can induce either 'upturns' or 'downturns' in performance. In the upcoming EIS revision, the Long-Term Trends Report provides food for thought on how to capture some of these factors that can influence performance. In particular, it will be instructive to review the structural indicators used to help capture the factors that may influence national innovation performance to ensure they capture financial market shock. Another factor that could be assessed would be the impact of investment, reform and recovery plans (such as those introduced after the 2008 financial crisis and more recently after the COVID-19 pandemic) on favouring innovation investments, etc.

5.2. Looking forward

As noted in the previous section, over the last decades, governments and stakeholders have faced significant shocks. Most recently, the COVID-19 pandemic, followed by Russia's war of aggression against Ukraine, led to significant disruption of energy supplies, with a surge in inflationary pressures and a fall in living standards²². To effectively navigate what has been termed an era of poly-crises²³, with higher levels of systemic uncertainty, Member States need to develop the capacity to effectively address and mitigate the impacts of unexpected and disruptive events. The EIS measurement framework contributes to the evidence base required for understanding how research and innovation (R&I) can support the necessary enhanced resilience and transformation of Europe's socio-economic systems.

Resilience can be defined as the capacity of a system following a shock or multiple shocks to adapt and fundamentally change over time. Growing geopolitical tensions and greater geostrategic and geoeconomic competition, as well as the shocks mentioned above, have highlighted the risks inherent in certain economic dependencies. Such risks, unless properly managed, can challenge the functioning of our societies, economies, strategic interests and ability to act. Therefore, the European Commission adopted a comprehensive Strategy on Economic Security including joint-up action across internal and external policies and a cohesive set of measures at EU and Member State level to assess and manage economic security risks, while maintaining openness and international engagement²⁴. In this context, the EU's open strategic autonomy agenda strives to bolster the resilience of our supply chains by reducing the EU's strategic dependencies²⁵. Strategic dependencies imply reliance on a limited number of actors, significant scarcity within the EU, and low possibilities for domestic substitution for goods and services in critical areas like security, safety, health, and the green and digital transition²⁶.

To withstand poly-crises, it is essential to promote support a strong and resilient economy, the EU's competitiveness and growth, reinforce the Single Market, and strengthen the EU's scientific, technological and industrial bases. Innovation helps reduce strategic dependencies by strengthening internal capacities, diversifying markets and placing the EU at a vantage point in global value chains. Against this backdrop, the Commission's Green Deal Industrial Plan²⁷ aims at enhancing the competitiveness of Europe's net-zero industry while supporting the EU's fast transition to climate neutrality. The Net-Zero Industry Act²⁸ identifies goals for net-zero industrial capacity and provides a regulatory framework suited for its quick deployment, ensuring simplified and fast-track permitting, in support of the scale-up of clean technologies across the Single Market. The Critical Raw Materials Act²⁹ aims at ensuring sufficient access to materials like rare earths, vital for manufacturing key technologies. In this context, it will be interesting to explore in the upcoming EIS revision which indicators help analyse the factors in national innovation systems that impact resilience; as well as what aspects of resilience influence innovation performance.

Developing effective approaches to address societal challenges calls for fundamental transformations, not just technological and business but also institutional and behavioural change, as recognised in the literature on socio-technical transitions³⁰. In the context of the call for transformative innovation policies, there is a need to better monitor

21 Marques Santos, A., Haegeman, K., and Moncada-Paternò-Castello, P. (2021). The impact of Covid-19 and of the earlier crisis on firms' innovation and growth: a comparative analysis. JRC Working Papers on Territorial Modelling and Analysis No. 03/2021, European Commission, Seville, JRC125490

22 OECD (2023), Government at a Glance 2023, OECD Publishing, Paris, <https://doi.org/10.1787/3d5c5d31-en>

23 European Commission, Directorate-General for Research and Innovation, Dixon-Declève, S., Renda, A., Isaksson, D. et al., Transformation in the poly-crisis age, Publications Office of the European Union, 2023, <https://data.europa.eu/doi/10.2777/360282>

24 [An EU approach to enhance economic security \(europa.eu\)](#) and [New initiatives to strengthen economic security \(europa.eu\)](#)

25 European Commission. (2023). Long-term competitiveness of the EU: looking beyond 2030. COM (2023) 168 final.

26 European Commission. (2021) Updating the 2020 New Industrial Strategy: Building a Stronger Single Market for Europe's Recovery; European Commission. (2021). Strategic dependencies and capacities. Commission staff working document, SWD (2021) 352.

27 [Communication: A Green Deal Industrial Plan for the Net-Zero Age | European Commission \(europa.eu\)](#)

28 [The Net-Zero Industry Act \(europa.eu\)](#)

29 [European Critical Raw Materials Act \(europa.eu\)](#)

30 Geels, F. W. (2004). From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory. Research Policy, 33, 897-920. <https://doi.org/10.1016/j.respol.2004.01.015>

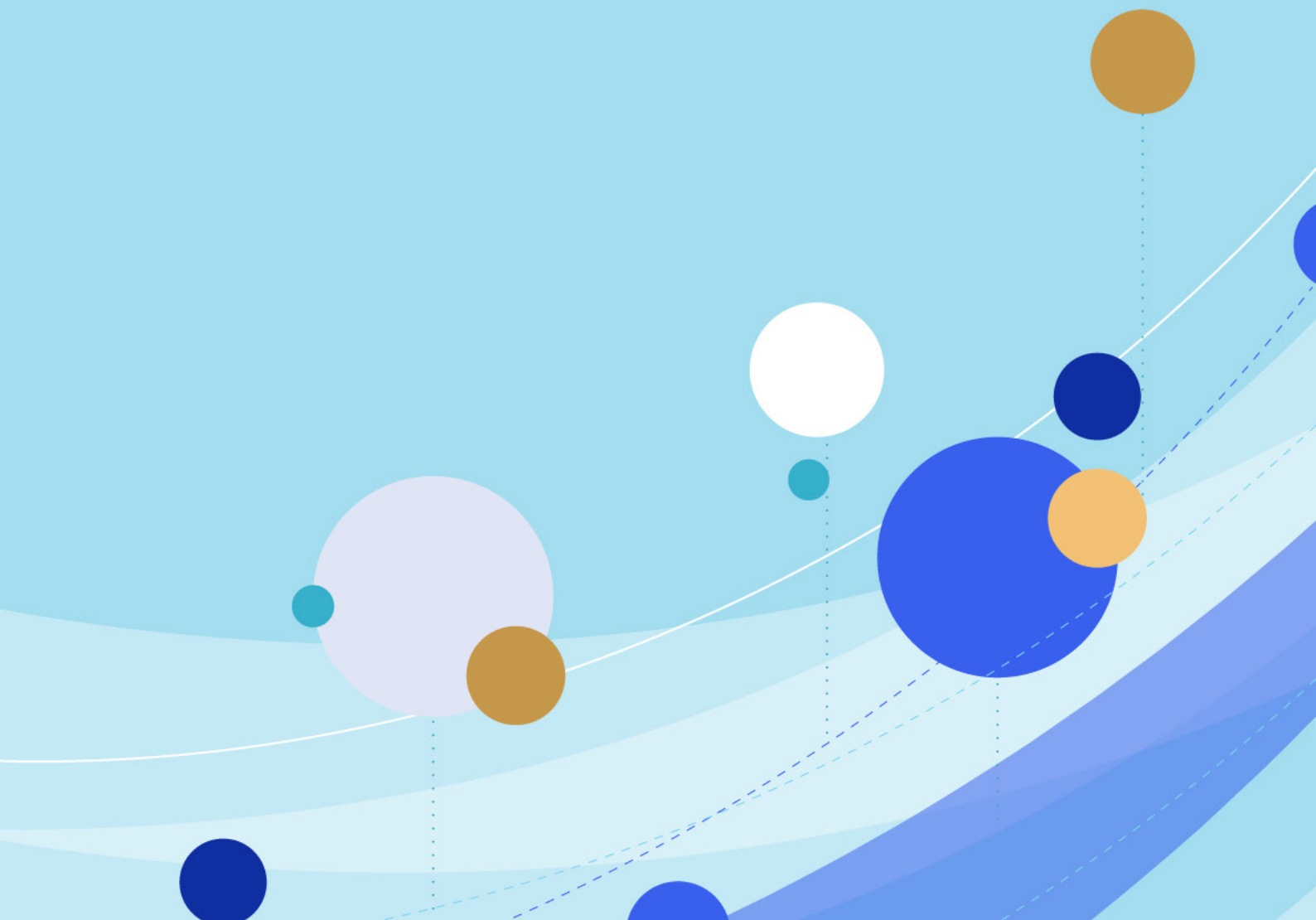
the impact of R&I policies on the achievement of the Sustainable Development Goals (SDGs). Efforts have been made to reflect the contribution of innovation to addressing environmental sustainability in the EIS 2021 report, which adopted a revised measurement framework. To monitor the broader influence of innovation activities and R&I policies on SDGs, it would be pertinent to consider the availability of indicators for the EIS measurement framework that help measure the transformation of key systems (food, energy, mobility, etc.)³¹.

Public sector innovation plays a key role in societal transformation, as it contributes to improved outcomes for citizens by ensuring policies and public services are more responsive and tailored to their needs and better reflecting the changing conditions business innovators face in each Member State. This requires an evolution in the role of government towards a proactive role of public administrations in shaping markets and promoting societal transformations³². At the current time, the EIS does not account for governmental efforts to modernise their administrations to develop the capacity to address societal challenges. Specifically, it overlooks how governments implement policy priorities, effectively react to crises, and manage structural transformations in response to megatrends. In this context, the inclusion of additional indicators in the EIS measurement framework to assess public sector innovation could offer better evidence to understand the factors that enable or hinder system wide innovations.

³¹ European Commission, Directorate-General for Research and Innovation, Barberis Rami, M., Reid, A., Rantcheva, A. et al., R&I contribution to the achievement of the Sustainable Development Goals (SDGs), elaboration of specific topics – Final report, Publications Office of the European Union, 2023, <https://data.europa.eu/doi/10.2777/224833>

³² For instance, the European Commission's Compact programme aims to enhance the European Administrative Space by promoting a common set of overarching principles underpinning the quality of public administration and reinforcing its support for the administrative modernisation of the Member States. This can ultimately contribute to a more effective and efficient use of public resources in support of R&D and innovation.

6. Country profiles





ALBANIA

Emerging InnovatorSummary innovation index (relative to EU in 2017): **46**Rank: **35**Change vs 2023: **▲ 0.1** Change vs 2017: **▲ 9.8**

Albania is an Emerging Innovator with performance at 41.8% of the EU average in 2024. Performance is below the average of the Emerging Innovators (48%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	41.8	9.8	0.1
Human resources	59.3	33.3	4.7
New doctorate graduates	21.4	11.6	11.6
Population with tertiary education	90	88.5	0
Population involved in lifelong learning	69.5	0	0
Attractive research systems	36.1	26.4	-1.8
International scientific co-publications	6.3	8.4	-1.3
Scientific publications among the top 10% most cited	38.5	37	-11.6
Foreign doctorate students as a % of all doctorate students	60	19.8	19.8
Digitalisation	14.2	17.7	8.5
Broadband penetration	12.8	18.6	0
Individuals with above basic overall digital skills	16.1	16.7	16.7
Finance and support	N/A	N/A	N/A
R&D expenditure in the public sector	N/A	N/A	N/A
Venture capital expenditures	N/A	N/A	N/A
Direct and indirect government support of business R&D	N/A	N/A	N/A
Firm investments	12.7	0	0
R&D expenditure in the business sector	N/A	N/A	N/A
Non-R&D innovation expenditures	13.8	0	0
Innovation expenditures per person employed	N/A	N/A	N/A
Use of information technologies	45.6	0	0
Enterprises providing ICT training	92.5	0	0
Employed ICT specialists	0	0	0
Innovators	75.3	-7.2	0
SMEs introducing product innovations	86.2	-9.1	0
SMEs introducing business process innovations	66.3	-5.5	0
Linkages	40.1	-14.2	0.3
Innovative SMEs collaborating with others	69.4	-27.5	0
Public-private co-publications	4.9	3.7	0.8
Job-to-job mobility of HRST	N/A	N/A	N/A
Intellectual assets	5.9	-0.8	-4.7
PCT patent applications	3.4	-11.5	-13.6
Trademark applications	4.2	4.5	-7.3
Design applications	11.6	8.8	8.8
Employment impacts	38	-1	-2.4
Employment in knowledge-intensive activities	27.7	2.8	0
Employment in innovative enterprises	46.9	-4.4	-4.4
Sales impacts	47.5	0.9	-1.6
Exports of medium and high technology products	0	0	0
Knowledge-intensive services exports	6.8	2.4	-4.6
Sales of new-to-market and new-to-firm innovations	187.3	0	0
Environmental sustainability	66.4	28.6	1.4
Resource productivity	50.4	30	5.6
Air emissions by fine particulates	0	0	0
Environment-related technologies	171.9	68.8	0

Relative strengths

- Sales of new-to-market and new-to-firm innovations
- Environment-related technologies
- Enterprises providing ICT training

Relative weaknesses

- Employed ICT specialists
- Exports of medium and high technology products
- Air emissions by fine particulates

Strong increases since 2017

- Population with tertiary education
- Environment-related technologies
- Scientific publications among the top 10% most cited

Strong decreases since 2017

- Innovative SMEs collaborating with others
- PCT patent applications
- SMEs introducing product innovations

Strong increases since 2023

- Foreign doctorate students as a % of all doctorate students
- Individuals with above basic overall digital skills
- New doctorate graduates

Strong decreases since 2023

- PCT patent applications
- Scientific publications among the top 10% most cited
- Trademark applications

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**Strong Innovator** ●Summary innovation index (relative to EU in 2017): **127.9**Rank: **8**

Change vs 2023: ▼ -1.2 Change vs 2017: ▲ 4.6

Austria is a Strong Innovator with performance at 116.3% of the EU average in 2024. Performance is above the average of the Strong Innovators (111.3%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	116.3	4.6	-1.2
Human resources	111.8	3.9	-0.6
New doctorate graduates	100.0	-11.6	-11.6
Population with tertiary education	102.2	6.6	2.4
Population involved in lifelong learning	136.4	25.5	13.2
Attractive research systems	148.9	27.0	2.6
International scientific co-publications	183.3	59.8	-0.1
Scientific publications among the top 10% most cited	108.4	-11.6	1.8
Foreign doctorate students as a % of all doctorate students	181.3	81.9	6.6
Digitalisation	89.6	6.5	7.7
Broadband penetration	67.6	18.5	21.1
Individuals with above basic overall digital skills	120.3	-5.5	-5.5
Finance and support	128.0	26.8	-7.3
R&D expenditure in the public sector	141.0	19.7	-3.3
Venture capital expenditures	80.7	35.4	-2.2
Direct and indirect government support of business R&D	172.3	27.4	-18.9
Firm investments	107.1	1.8	2.5
R&D expenditure in the business sector	150.0	1.5	-3.8
Non-R&D innovation expenditures	65.2	-9.4	2.6
Innovation expenditures per person employed	100.4	14.1	9.2
Use of information technologies	100.9	-27.8	12.2
Enterprises providing ICT training	86.8	-83.4	15.3
Employed ICT specialists	114.7	25.8	9.7
Innovators	127.3	-4.0	0.0
SMEs introducing product innovations	124.3	-12.9	0.0
SMEs introducing business process innovations	129.7	4.4	0.0
Linkages	171.7	13.8	-13.1
Innovative SMEs collaborating with others	136.2	-69.0	0.0
Public-private co-publications	393.7	124.1	4.2
Job-to-job mobility of HRST	110.4	32.4	-32.3
Intellectual assets	139.5	-5.7	-8.2
PCT patent applications	118.6	-3.3	2.9
Trademark applications	133.6	13.1	-7.5
Design applications	179.1	-23.6	-23.2
Employment impacts	119.3	4.9	0.4
Employment in knowledge-intensive activities	109.0	8.5	1.2
Employment in innovative enterprises	128.3	1.7	-0.6
Sales impacts	76.9	3.3	-6.9
Exports of medium and high technology products	88.0	-3.3	2.4
Knowledge-intensive services exports	51.2	7.2	-11.2
Sales of new-to-market and new-to-firm innovations	99.5	8.2	-15.8
Environmental sustainability	104.7	1.9	3.0
Resource productivity	94.2	19.9	5.3
Air emissions by fine particulates	116.1	5.3	1.8
Environment-related technologies	98.6	-17.2	2.8

Relative strengths

- Public-private co-publications
- International scientific co-publications
- Foreign doctorate students as a % of all doctorate students

Relative weaknesses

- Knowledge-intensive services exports
- Non-R&D innovation expenditures
- Broadband penetration

Strong increases since 2017

- Public-private co-publications
- Foreign doctorate students as a % of all doctorate students
- International scientific co-publications

Strong decreases since 2017

- Enterprises providing ICT training
- Innovative SMEs collaborating with others
- Design applications

Strong increases since 2023

- Broadband penetration
- Enterprises providing ICT training
- Population involved in lifelong learning

Strong decreases since 2023

- Job-to-job mobility of HRST
- Design applications
- Direct and indirect government support of business R&D

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BOSNIA AND HERZEGOVINA

Emerging Innovator ●

Summary innovation index (relative to EU in 2017): **36.4**

Rank: **37**

Change vs 2023: ▲ 2.7 Change vs 2017: ▲ 6.4

Bosnia and Herzegovina is an Emerging Innovator with performance at 33.1% of the EU average in 2024. Performance is below the average of the Emerging Innovators (48%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	33.1	6.4	2.7
Human resources	10.3	-0.2	0.3
New doctorate graduates	13.3	4	0
Population with tertiary education	10.3	-3	1.2
Population involved in lifelong learning	6.9	-3	0
Attractive research systems	23.2	8	-8.6
International scientific co-publications	23.1	21.3	0
Scientific publications among the top 10% most cited	20.8	1	-10.6
Foreign doctorate students as a % of all doctorate students	N/A	N/A	N/A
Digitalisation	35.8	25.5	15.9
Broadband penetration	52.8	44.6	25
Individuals with above basic overall digital skills	12.3	6.8	6.8
Finance and support	0	0	0
R&D expenditure in the public sector	0	0	0
Venture capital expenditures	0	0	0
Direct and indirect government support of business R&D	0	0	0
Firm investments	0.8	0	0
R&D expenditure in the business sector	2.1	0	0
Non-R&D innovation expenditures	0	0	0
Innovation expenditures per person employed	0.5	0	0
Use of information technologies	39.8	9.2	7.8
Enterprises providing ICT training	62.6	1.9	5.7
Employed ICT specialists	17.7	16.2	9.7
Innovators	117.6	0	0
SMEs introducing product innovations	165.7	0	0
SMEs introducing business process innovations	78.6	0	0
Linkages	15	7.3	0
Innovative SMEs collaborating with others	N/A	N/A	N/A
Public-private co-publications	27.3	11.4	0
Job-to-job mobility of HRST	N/A	N/A	N/A
Intellectual assets	14.9	7.4	2.4
PCT patent applications	30.7	15.5	8.3
Trademark applications	4.3	2.9	-5
Design applications	1.1	0.4	0.5
Employment impacts	50.8	9.7	5.7
Employment in knowledge-intensive activities	24.7	20.5	12
Employment in innovative enterprises	73.1	0	0
Sales impacts	29.6	8.9	3.2
Exports of medium and high technology products	28.3	15.6	9
Knowledge-intensive services exports	6.8	7.8	-1.1
Sales of new-to-market and new-to-firm innovations	67.7	0	0
Environmental sustainability	89	4.9	3.7
Resource productivity	25.2	13.3	10.1
Air emissions by fine particulates	N/A	N/A	N/A
Environment-related technologies	171.9	0	0

Relative strengths

- Environment-related technologies
- SMEs introducing product innovations
- SMEs introducing business process innovations

Relative weaknesses

- R&D expenditure in the public sector
- Venture capital expenditures
- Direct and indirect government support of business R&D

Strong increases since 2017

- Broadband penetration
- International scientific co-publications
- Employment in knowledge-intensive activities

Strong decreases since 2017

- Population with tertiary education
- Population involved in lifelong learning
- R&D expenditure in the public sector

Strong increases since 2023

- Broadband penetration
- Employment in knowledge-intensive activities
- Resource productivity

Strong decreases since 2023

- Scientific publications among the top 10% most cited
- Trademark applications
- Knowledge-intensive services exports

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**BELGIUM****Strong Innovator** ●Summary innovation index (relative to EU in 2017): **136**Rank: **6**Change vs 2023: ▼ **-0.2** Change vs 2017: ▲ **15.1**

Belgium is a Strong Innovator with performance at 123.6% of the EU average in 2024. Performance is above the average of the Strong Innovators (111.3%). Performance is increasing more than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	123.6	15.1	-0.2
Human resources	113.2	0.7	-0.6
New doctorate graduates	113.1	0.0	0.0
Population with tertiary education	137.5	-5.4	-8.4
Population involved in lifelong learning	85.6	9.2	8.2
Attractive research systems	134.6	-24.3	-3.1
International scientific co-publications	179.7	48.5	-2.7
Scientific publications among the top 10% most cited	122.6	-17.2	-2.2
Foreign doctorate students as a % of all doctorate students	112.5	-106.8	-6.1
Digitalisation	107.4	-0.6	0.8
Broadband penetration	109.9	-10.1	-6.8
Individuals with above basic overall digital skills	104.0	8.5	8.5
Finance and support	138.6	43.5	5.6
R&D expenditure in the public sector	127.9	31.2	8.2
Venture capital expenditures	120.4	42.7	7.2
Direct and indirect government support of business R&D	174.0	62.1	-0.4
Firm investments	140.3	41.7	-5.1
R&D expenditure in the business sector	159.0	47.4	0.0
Non-R&D innovation expenditures	87.6	5.2	-15.4
Innovation expenditures per person employed	168.8	74.2	0.0
Use of information technologies	139.1	-0.4	-2.0
Enterprises providing ICT training	160.9	5.7	2.5
Employed ICT specialists	117.6	-6.5	-6.5
Innovators	161.6	48.4	0.0
SMEs introducing product innovations	146.2	3.1	0.0
SMEs introducing business process innovations	173.9	91.0	0.0
Linkages	167.9	15.9	-8.0
Innovative SMEs collaborating with others	206.3	27.0	0.0
Public-private co-publications	270.6	54.5	-2.2
Job-to-job mobility of HRST	93.8	-11.7	-17.6
Intellectual assets	89.1	-3.3	-1.7
PCT patent applications	99.9	-1.8	4.4
Trademark applications	92.4	2.0	-7.8
Design applications	68.0	-9.5	-5.1
Employment impacts	141.2	13.6	7.3
Employment in knowledge-intensive activities	124.7	-1.2	-2.4
Employment in innovative enterprises	155.6	27.2	16.5
Sales impacts	90.2	17.6	0.3
Exports of medium and high technology products	76.1	0.7	6.1
Knowledge-intensive services exports	88.2	5.9	-2.8
Sales of new-to-market and new-to-firm innovations	116.4	60.6	-4.7
Environmental sustainability	106.4	18.8	1.9
Resource productivity	164.5	66.8	25.7
Air emissions by fine particulates	99.2	3.6	0.3
Environment-related technologies	63.2	2.6	-14.5

Relative strengths

- Public-private co-publications
- Innovative SMEs collaborating with others
- International scientific co-publications

Relative weaknesses

- Environment-related technologies
- Design applications
- Exports of medium and high technology products

Strong increases since 2017

- SMEs introducing business process innovations
- Innovation expenditures per person employed
- Resource productivity

Strong decreases since 2017

- Foreign doctorate students as a % of all doctorate students
- Scientific publications among the top 10% most cited
- Job-to-job mobility of HRST

Strong increases since 2023

- Resource productivity
- Employment in innovative enterprises
- Individuals with above basic overall digital skills

Strong decreases since 2023

- Job-to-job mobility of HRST
- Non-R&D innovation expenditures
- Environment-related technologies

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**Emerging Innovator**Summary innovation index (relative to EU in 2017): **50.6**Rank: **33**Change vs 2023: **▲ 1.9** Change vs 2017: **▲ 2.7**

Bulgaria is an Emerging Innovator with performance at 46% of the EU average in 2024. Performance is below the average of the Emerging Innovators (48%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	46.0	2.7	1.9
Human resources	38.7	-1.9	7.7
New doctorate graduates	47.6	-11.6	11.6
Population with tertiary education	60.3	10.8	10.8
Population involved in lifelong learning	3.5	-2.0	-2.0
Attractive research systems	30.4	14.2	7.5
International scientific co-publications	27.6	13.6	-0.3
Scientific publications among the top 10% most cited	24.2	5.7	10.8
Foreign doctorate students as a % of all doctorate students	42.9	33.4	7.1
Digitalisation	47.0	14.7	1.3
Broadband penetration	69.4	29.7	3.0
Individuals with above basic overall digital skills	16.0	-0.4	-0.4
Finance and support	26.9	0.9	2.1
R&D expenditure in the public sector	19.7	-1.6	-3.3
Venture capital expenditures	53.7	8.3	11.7
Direct and indirect government support of business R&D	2.2	-3.9	-1.3
Firm investments	36.7	-10.3	1.5
R&D expenditure in the business sector	33.3	-13.5	0.8
Non-R&D innovation expenditures	63.2	-10.7	1.1
Innovation expenditures per person employed	15.7	-6.7	2.3
Use of information technologies	55.0	11.4	15.7
Enterprises providing ICT training	23.6	6.4	15.3
Employed ICT specialists	85.2	16.1	16.1
Innovators	29.4	4.0	-37.9
SMEs introducing product innovations	44.4	13.6	-41.7
SMEs introducing business process innovations	17.0	-5.2	-34.3
Linkages	30.2	13.7	-6.2
Innovative SMEs collaborating with others	41.0	25.7	-18.8
Public-private co-publications	41.8	22.6	3.6
Job-to-job mobility of HRST	16.6	0.0	0.0
Intellectual assets	91.9	-15.8	14.0
PCT patent applications	38.3	-1.0	-0.6
Trademark applications	118.9	17.9	2.2
Design applications	147.6	-61.5	42.3
Employment impacts	59.7	21.9	11.1
Employment in knowledge-intensive activities	67.4	4.8	4.8
Employment in innovative enterprises	53.1	37.4	16.9
Sales impacts	53.3	14.2	2.7
Exports of medium and high technology products	46.2	6.0	4.7
Knowledge-intensive services exports	60.1	18.7	-3.9
Sales of new-to-market and new-to-firm innovations	54.5	21.4	8.9
Environmental sustainability	46.6	-10.1	-8.2
Resource productivity	14.0	10.9	0.4
Air emissions by fine particulates	37.7	9.8	-17.1
Environment-related technologies	88.5	-55.7	-2.2

Relative strengths

- Design applications
- Trademark applications
- Environment-related technologies

Relative weaknesses

- Direct and indirect government support of business R&D
- Population involved in lifelong learning
- Resource productivity

Strong increases since 2017

- Employment in innovative enterprises
- Foreign doctorate students as a % of all doctorate students
- Broadband penetration

Strong decreases since 2017

- Design applications
- Environment-related technologies
- R&D expenditure in the business sector

Strong increases since 2023

- Design applications
- Employment in innovative enterprises
- Employed ICT specialists

Strong decreases since 2023

- SMEs introducing product innovations
- SMEs introducing business process innovations
- Innovative SMEs collaborating with others

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**Innovator Leader** ●Summary innovation index (relative to EU in 2017): **152.2**Rank: **1**

Change vs 2023: ▲ 1.9 Change vs 2017: ▲ 1.3

Switzerland is an Innovation Leader with performance at 138.4% of the EU average in 2024. Performance is above the average of the Innovation Leaders (132.1%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	138.4	1.3	1.9
Human resources	186.9	11.7	15.8
New doctorate graduates	191.7	0	0
Population with tertiary education	148.9	-1.2	4.8
Population involved in lifelong learning	223.6	46.9	55
Attractive research systems	217.7	0.5	2.1
International scientific co-publications	288.6	3.2	0
Scientific publications among the top 10% most cited	147.2	-10.6	1.3
Foreign doctorate students as a % of all doctorate students	264.4	22.4	5.4
Digitalisation	139	10.9	10.9
Broadband penetration	N/A	N/A	N/A
Individuals with above basic overall digital skills	166	10.8	10.8
Finance and support	91.8	21.1	0
R&D expenditure in the public sector	137.7	8.2	0
Venture capital expenditures	107.3	54.5	0.4
Direct and indirect government support of business R&D	18.2	0.6	-0.6
Firm investments	164.5	13.3	0
R&D expenditure in the business sector	154.1	12.8	0
Non-R&D innovation expenditures	N/A	N/A	N/A
Innovation expenditures per person employed	N/A	N/A	N/A
Use of information technologies	128.5	6.7	0
Enterprises providing ICT training	N/A	N/A	N/A
Employed ICT specialists	126.4	6.4	0
Innovators	113.3	-25.3	0
SMEs introducing product innovations	165.1	27.2	0
SMEs introducing business process innovations	70.9	-75.3	0
Linkages	193.6	11.2	2.5
Innovative SMEs collaborating with others	76	0	0
Public-private co-publications	489	0	0
Job-to-job mobility of HRST	170.8	26.5	5.9
Intellectual assets	152	3.7	1
PCT patent applications	143.1	2	2.4
Trademark applications	130.7	-1.8	0
Design applications	189.8	10.1	0
Employment impacts	126.6	-38.3	-27.3
Employment in knowledge-intensive activities	156.2	-1.2	12.1
Employment in innovative enterprises	101.7	-72.2	-63
Sales impacts	97.8	1.7	8.7
Exports of medium and high technology products	72.6	-0.4	-0.8
Knowledge-intensive services exports	81	-2.9	-8.6
Sales of new-to-market and new-to-firm innovations	164.7	11.4	47.4
Environmental sustainability	116.5	-3.1	1.1
Resource productivity	188.1	4.7	0
Air emissions by fine particulates	122.7	4.1	1.4
Environment-related technologies	42.4	-19.9	1.5

Relative strengths

- Public-private co-publications
- International scientific co-publications
- Foreign doctorate students as a % of all doctorate students

Relative weaknesses

- Direct and indirect government support of business R&D
- Environment-related technologies
- SMEs introducing business process innovations

Strong increases since 2017

- Venture capital expenditures
- Population involved in lifelong learning
- SMEs introducing product innovations

Strong decreases since 2017

- SMEs introducing business process innovations
- Employment in innovative enterprises
- Environment-related technologies

Strong increases since 2023

- Population involved in lifelong learning
- Sales of new-to-market and new-to-firm innovations
- Employment in knowledge-intensive activities

Strong decreases since 2023

- Employment in innovative enterprises
- Knowledge-intensive services exports
- Exports of medium and high technology products

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CYPRUS

Strong Innovator ●Summary innovation index (relative to EU in 2017): **116.9**Rank: **13**

Change vs 2023: ▲ 3.3 Change vs 2017: ▲ 38.9

Cyprus is a Strong Innovator with performance at 106.3% of the EU average in 2024. Performance is below the average of the Strong Innovators (111.3%). Performance is increasing more than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	106.3	38.9	3.3
Human resources	106.4	14.5	5.9
New doctorate graduates	34.5	11.6	0.0
Population with tertiary education	200.5	19.8	14.4
Population involved in lifelong learning	84.7	13.2	5.1
Attractive research systems	163.4	74.4	7.0
International scientific co-publications	288.6	206.7	0.0
Scientific publications among the top 10% most cited	119.5	9.3	13.0
Foreign doctorate students as a % of all doctorate students	118.4	95.7	0.3
Digitalisation	111.3	74.5	26.7
Broadband penetration	126.7	131.6	35.5
Individuals with above basic overall digital skills	89.9	17.8	17.8
Finance and support	39.9	7.5	-11.1
R&D expenditure in the public sector	39.3	9.8	0.0
Venture capital expenditures	59.8	-1.7	-34.5
Direct and indirect government support of business R&D	15.8	14.4	-0.2
Firm investments	45.3	27.1	-11.2
R&D expenditure in the business sector	18.7	15.0	-2.3
Non-R&D innovation expenditures	90.1	44.1	-24.9
Innovation expenditures per person employed	32.3	22.2	-6.5
Use of information technologies	126.0	40.6	22.5
Enterprises providing ICT training	134.5	32.4	19.1
Employed ICT specialists	117.6	48.4	25.8
Innovators	170.6	118.1	0.0
SMEs introducing product innovations	166.5	108.1	0.0
SMEs introducing business process innovations	173.9	127.8	0.0
Linkages	225.4	173.9	7.6
Innovative SMEs collaborating with others	237.3	228.0	0.0
Public-private co-publications	318.5	233.5	18.9
Job-to-job mobility of HRST	177.1	100.0	8.8
Intellectual assets	107.4	9.4	0.0
PCT patent applications	51.0	6.1	6.2
Trademark applications	206.4	0.0	0.0
Design applications	87.6	20.8	-7.9
Employment impacts	149.9	49.8	5.3
Employment in knowledge-intensive activities	167.4	24.1	14.4
Employment in innovative enterprises	135.2	73.5	-3.1
Sales impacts	89.5	13.1	-3.7
Exports of medium and high technology products	65.9	-29.2	-15.0
Knowledge-intensive services exports	103.0	16.4	-6.4
Sales of new-to-market and new-to-firm innovations	106.1	75.5	18.1
Environmental sustainability	59.5	3.5	11.8
Resource productivity	54.9	-3.0	1.4
Air emissions by fine particulates	66.3	-3.1	-7.0
Environment-related technologies	54.1	18.0	47.6

Relative strengths

- Public-private co-publications
- International scientific co-publications
- Innovative SMEs collaborating with others

Relative weaknesses

- Direct and indirect government support of business R&D
- R&D expenditure in the business sector
- Innovation expenditures per person employed

Strong increases since 2017

- Public-private co-publications
- Innovative SMEs collaborating with others
- International scientific co-publications

Strong decreases since 2017

- Exports of medium and high technology products
- Air emissions by fine particulates
- Resource productivity

Strong increases since 2023

- Environment-related technologies
- Broadband penetration
- Employed ICT specialists

Strong decreases since 2023

- Venture capital expenditures
- Non-R&D innovation expenditures
- Exports of medium and high technology products

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CZECH REPUBLIC

Moderate InnovatorSummary innovation index (relative to EU in 2017): **98.7**Rank: **19**Change vs 2023: **▲ 2.3** Change vs 2017: **▲ 15.6**

Czechia is a Moderate Innovator with performance at 89.7% of the EU average in 2024. Performance is above the average of the Moderate Innovators (84.8%). Performance is increasing more than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	89.7	15.6	2.3
Human resources	75.3	8.5	-0.3
New doctorate graduates	100.0	0.0	0.0
Population with tertiary education	48.9	-7.2	-5.4
Population involved in lifelong learning	75.4	41.8	5.1
Attractive research systems	82.0	29.5	4.1
International scientific co-publications	101.1	41.7	-3.9
Scientific publications among the top 10% most cited	49.7	5.6	4.8
Foreign doctorate students as a % of all doctorate students	115.2	70.2	9.6
Digitalisation	94.3	42.1	28.4
Broadband penetration	64.9	33.2	5.5
Individuals with above basic overall digital skills	135.1	50.9	50.9
Finance and support	84.2	9.2	-4.2
R&D expenditure in the public sector	93.4	-29.6	-8.2
Venture capital expenditures	93.7	87.2	0.1
Direct and indirect government support of business R&D	61.8	-24.9	-3.3
Firm investments	115.1	38.8	32.3
R&D expenditure in the business sector	84.7	16.5	0.7
Non-R&D innovation expenditures	160.5	48.2	43.5
Innovation expenditures per person employed	105.6	53.5	55.3
Use of information technologies	94.6	-0.8	-8.1
Enterprises providing ICT training	104.1	8.3	-10.2
Employed ICT specialists	85.2	-9.7	-6.5
Innovators	95.4	11.4	-54.3
SMEs introducing product innovations	99.7	7.6	-52.2
SMEs introducing business process innovations	91.9	15.1	-56.2
Linkages	86.3	21.7	-12.3
Innovative SMEs collaborating with others	108.9	9.4	-14.0
Public-private co-publications	133.9	33.7	-10.9
Job-to-job mobility of HRST	47.9	26.4	-11.8
Intellectual assets	66.3	-1.5	-0.6
PCT patent applications	49.3	-6.9	0.3
Trademark applications	88.5	20.0	2.0
Design applications	68.6	-11.6	-4.1
Employment impacts	101.7	19.7	20.3
Employment in knowledge-intensive activities	89.9	1.2	4.8
Employment in innovative enterprises	112.2	37.0	34.6
Sales impacts	89.9	7.5	3.2
Exports of medium and high technology products	111.9	6.6	5.5
Knowledge-intensive services exports	54.4	15.1	-6.4
Sales of new-to-market and new-to-firm innovations	111.2	-1.1	13.2
Environmental sustainability	93.5	14.6	-0.6
Resource productivity	78.6	28.0	1.4
Air emissions by fine particulates	110.7	12.8	0.3
Environment-related technologies	83.6	6.9	-3.2

Relative strengths

- Non-R&D innovation expenditures
- Individuals with above basic overall digital skills
- Public-private co-publications

Relative weaknesses

- Job-to-job mobility of HRST
- Population with tertiary education
- PCT patent applications

Strong increases since 2017

- Venture capital expenditures
- Foreign doctorate students as a % of all doctorate students
- Innovation expenditures per person employed

Strong decreases since 2017

- R&D expenditure in the public sector
- Direct and indirect government support of business R&D
- Design applications

Strong increases since 2023

- Innovation expenditures per person employed
- Individuals with above basic overall digital skills
- Non-R&D innovation expenditures

Strong decreases since 2023

- SMEs introducing business process innovations
- SMEs introducing product innovations
- Innovative SMEs collaborating with others

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GERMANY

Strong Innovator ●Summary innovation index (relative to EU in 2017): **122.8**Rank: **12**

Change vs 2023: ▼ -3.4 Change vs 2017: ▲ 3.8

Germany is a Strong Innovator with performance at 111.6% of the EU average in 2024. Performance is above the average of the Strong Innovators (111.3%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	111.6	3.8	-3.4
Human resources	94.0	-5.2	-0.9
New doctorate graduates	139.4	-23.1	-11.6
Population with tertiary education	74.4	8.9	10.1
Population involved in lifelong learning	61.9	6.1	2.0
Attractive research systems	101.1	-1.5	-0.8
International scientific co-publications	92.1	20.9	-3.7
Scientific publications among the top 10% most cited	107.1	-10.5	-0.7
Foreign doctorate students as a % of all doctorate students	100.6	-1.9	1.9
Digitalisation	86.4	26.9	5.6
Broadband penetration	100.0	49.9	6.9
Individuals with above basic overall digital skills	67.7	4.2	4.2
Finance and support	95.0	17.6	1.9
R&D expenditure in the public sector	136.1	0.0	0.0
Venture capital expenditures	100.7	50.1	2.0
Direct and indirect government support of business R&D	40.1	5.8	5.0
Firm investments	141.1	4.7	-7.0
R&D expenditure in the business sector	143.7	7.5	1.5
Non-R&D innovation expenditures	135.0	4.5	-6.1
Innovation expenditures per person employed	144.1	1.8	-17.3
Use of information technologies	115.3	-7.8	9.1
Enterprises providing ICT training	128.2	-16.0	22.3
Employed ICT specialists	102.9	0.0	-3.2
Innovators	119.0	13.4	-29.4
SMEs introducing product innovations	104.3	-21.0	-41.4
SMEs introducing business process innovations	130.8	45.8	-18.2
Linkages	131.8	20.3	-11.3
Innovative SMEs collaborating with others	94.0	38.5	-22.0
Public-private co-publications	185.3	30.1	-13.9
Job-to-job mobility of HRST	141.6	0.0	0.0
Intellectual assets	120.2	-19.2	-7.7
PCT patent applications	130.3	-9.8	-1.5
Trademark applications	106.4	5.2	-5.7
Design applications	119.3	-50.8	-17.3
Employment impacts	126.8	9.1	0.6
Employment in knowledge-intensive activities	104.5	10.8	6.0
Employment in innovative enterprises	145.9	7.4	-4.5
Sales impacts	101.3	0.3	-3.8
Exports of medium and high technology products	108.0	-2.9	2.8
Knowledge-intensive services exports	90.2	-0.3	-9.7
Sales of new-to-market and new-to-firm innovations	108.1	5.8	-6.4
Environmental sustainability	114.6	7.9	0.0
Resource productivity	127.7	46.1	6.3
Air emissions by fine particulates	116.0	1.3	0.5
Environment-related technologies	100.2	-13.7	-6.0

Relative strengths

- Public-private co-publications
- Employment in innovative enterprises
- Innovation expenditures per person employed

Relative weaknesses

- Direct and indirect government support of business R&D
- Population involved in lifelong learning
- Individuals with above basic overall digital skills

Strong increases since 2017

- Venture capital expenditures
- Broadband penetration
- Resource productivity

Strong decreases since 2017

- Design applications
- New doctorate graduates
- SMEs introducing product innovations

Strong increases since 2023

- Enterprises providing ICT training
- Population with tertiary education
- Broadband penetration

Strong decreases since 2023

- SMEs introducing product innovations
- Innovative SMEs collaborating with others
- SMEs introducing business process innovations

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**Innovation Leader** ●Summary innovation index (relative to EU in 2017): **149.3**Rank: **2**

Change vs 2023: ▲ 0.5 Change vs 2017: ▲ 14.2

Denmark is an Innovation Leader with performance at 135.7% of the EU average in 2024. Performance is above the average of the Innovation Leaders (132.1%). Performance is increasing more than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	135.7	14.2	0.5
Human resources	158.9	-5.1	-4.9
New doctorate graduates	126.2	-46.3	-11.6
Population with tertiary education	132.0	-0.6	0.0
Population involved in lifelong learning	227.8	56.1	0.0
Attractive research systems	183.9	14.8	1.8
International scientific co-publications	288.6	82.9	0.0
Scientific publications among the top 10% most cited	133.3	-21.9	0.8
Foreign doctorate students as a % of all doctorate students	168.3	32.7	5.9
Digitalisation	147.5	12.1	4.6
Broadband penetration	144.4	14.9	0.0
Individuals with above basic overall digital skills	151.7	8.9	8.9
Finance and support	131.4	52.0	6.4
R&D expenditure in the public sector	159.0	0.0	9.8
Venture capital expenditures	150.6	116.8	7.6
Direct and indirect government support of business R&D	75.3	52.6	0.0
Firm investments	115.6	25.4	0.5
R&D expenditure in the business sector	120.8	-12.1	4.5
Non-R&D innovation expenditures	102.8	46.0	24.7
Innovation expenditures per person employed	122.0	44.7	-29.6
Use of information technologies	147.4	12.6	9.7
Enterprises providing ICT training	162.7	25.5	19.8
Employed ICT specialists	132.4	0.0	0.0
Innovators	121.3	44.6	0.0
SMEs introducing product innovations	130.0	41.6	0.0
SMEs introducing business process innovations	114.1	47.4	0.0
Linkages	214.2	4.7	0.0
Innovative SMEs collaborating with others	118.9	19.7	0.0
Public-private co-publications	489.0	42.7	0.0
Job-to-job mobility of HRST	181.2	-26.5	0.0
Intellectual assets	135.8	-16.0	-13.6
PCT patent applications	140.5	2.6	4.5
Trademark applications	110.8	-0.6	-9.1
Design applications	155.7	-52.0	-40.5
Employment impacts	106.6	6.1	-4.7
Employment in knowledge-intensive activities	118.0	0.0	0.0
Employment in innovative enterprises	97.0	11.7	-9.1
Sales impacts	92.1	18.9	6.2
Exports of medium and high technology products	73.5	0.1	0.2
Knowledge-intensive services exports	96.3	6.8	-8.8
Sales of new-to-market and new-to-firm innovations	115.8	65.2	36.2
Environmental sustainability	122.7	5.5	1.9
Resource productivity	72.1	18.3	7.7
Air emissions by fine particulates	120.3	2.1	0.0
Environment-related technologies	171.9	0.0	0.0

Relative strengths

- Public-private co-publications
- International scientific co-publications
- Population involved in lifelong learning

Relative weaknesses

- Resource productivity
- Exports of medium and high technology products
- Direct and indirect government support of business R&D

Strong increases since 2017

- Venture capital expenditures
- International scientific co-publications
- Sales of new-to-market and new-to-firm innovations

Strong decreases since 2017

- Design applications
- New doctorate graduates
- Job-to-job mobility of HRST

Strong increases since 2023

- Sales of new-to-market and new-to-firm innovations
- Non-R&D innovation expenditures
- Enterprises providing ICT training

Strong decreases since 2023

- Design applications
- Innovation expenditures per person employed
- New doctorate graduates

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**Strong Innovator**Summary innovation index (relative to EU in 2017): **115.3**Rank: **14**

Change vs 2023: ▼ -2.9 Change vs 2017: ▲ 26.8

Estonia is a Strong Innovator with performance at 104.8% of the EU average in 2024. Performance is below the average of the Strong Innovators (111.3%). Performance is increasing more than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	104.8	26.8	-2.9
Human resources	127.4	23.0	9.6
New doctorate graduates	100.0	23.2	11.6
Population with tertiary education	102.2	1.8	-2.4
Population involved in lifelong learning	188.0	48.9	21.4
Attractive research systems	134.6	66.9	10.1
International scientific co-publications	168.8	82.2	-5.7
Scientific publications among the top 10% most cited	108.1	29.0	12.2
Foreign doctorate students as a % of all doctorate students	145.0	135.4	19.9
Digitalisation	95.5	32.4	21.9
Broadband penetration	69.0	32.9	11.7
Individuals with above basic overall digital skills	132.3	31.9	31.9
Finance and support	101.8	23.0	3.3
R&D expenditure in the public sector	106.6	0.0	3.3
Venture capital expenditures	150.6	70.5	0.0
Direct and indirect government support of business R&D	35.8	1.2	7.3
Firm investments	94.1	35.6	-14.8
R&D expenditure in the business sector	66.7	24.1	0.8
Non-R&D innovation expenditures	147.1	41.0	-35.5
Innovation expenditures per person employed	74.6	42.5	-10.0
Use of information technologies	118.1	24.3	7.1
Enterprises providing ICT training	79.3	33.1	11.5
Employed ICT specialists	155.9	16.2	3.3
Innovators	109.1	35.7	-18.1
SMEs introducing product innovations	117.5	49.9	11.6
SMEs introducing business process innovations	102.0	21.9	-46.5
Linkages	166.1	23.6	-39.9
Innovative SMEs collaborating with others	165.1	-59.7	-66.1
Public-private co-publications	192.0	64.2	-7.5
Job-to-job mobility of HRST	156.2	76.5	-32.3
Intellectual assets	119.0	24.0	-3.1
PCT patent applications	60.0	-1.8	-2.1
Trademark applications	199.7	64.5	4.2
Design applications	123.9	26.2	-10.1
Employment impacts	123.9	71.7	-11.5
Employment in knowledge-intensive activities	110.2	7.3	10.9
Employment in innovative enterprises	136.1	131.0	-31.7
Sales impacts	69.7	9.8	-0.5
Exports of medium and high technology products	58.2	-2.2	13.6
Knowledge-intensive services exports	76.0	31.2	-0.7
Sales of new-to-market and new-to-firm innovations	78.6	-0.7	-22.3
Environmental sustainability	56.7	-9.9	-8.0
Resource productivity	26.4	19.1	5.4
Air emissions by fine particulates	87.2	65.3	19.0
Environment-related technologies	42.3	-142.2	-57.8

Relative strengths

- Trademark applications
- Public-private co-publications
- Population involved in lifelong learning

Relative weaknesses

- Resource productivity
- Direct and indirect government support of business R&D
- Environment-related technologies

Strong increases since 2017

- Foreign doctorate students as a % of all doctorate students
- Employment in innovative enterprises
- International scientific co-publications

Strong decreases since 2017

- Environment-related technologies
- Innovative SMEs collaborating with others
- Exports of medium and high technology products

Strong increases since 2023

- Individuals with above basic overall digital skills
- Population involved in lifelong learning
- Foreign doctorate students as a % of all doctorate students

Strong decreases since 2023

- Innovative SMEs collaborating with others
- Environment-related technologies
- SMEs introducing business process innovations

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**Moderate Innovator**Summary innovation index (relative to EU in 2017): **85.3**Rank: **24**

Change vs 2023: ▼ -1 Change vs 2017: ▲ 16

Greece is a Moderate Innovator with performance at 77.5% of the EU average in 2024. Performance is below the average of the Moderate Innovators (84.8%). Performance is increasing more than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	77.5	16.0	-1.0
Human resources	74.1	10.1	-1.5
New doctorate graduates	86.9	23.1	0.0
Population with tertiary education	107.6	1.8	-4.2
Population involved in lifelong learning	20.4	-1.0	-1.0
Attractive research systems	67.7	13.5	2.1
International scientific co-publications	92.8	40.9	1.2
Scientific publications among the top 10% most cited	91.9	5.3	0.3
Foreign doctorate students as a % of all doctorate students	7.3	6.3	7.1
Digitalisation	50.5	2.5	9.1
Broadband penetration	37.5	12.7	26.1
Individuals with above basic overall digital skills	68.7	-7.5	-7.5
Finance and support	74.4	33.4	6.1
R&D expenditure in the public sector	103.3	18.1	-1.6
Venture capital expenditures	57.3	35.3	2.5
Direct and indirect government support of business R&D	61.9	53.3	22.0
Firm investments	72.8	22.5	-0.6
R&D expenditure in the business sector	47.9	30.8	3.0
Non-R&D innovation expenditures	108.3	9.7	-4.9
Innovation expenditures per person employed	67.0	27.7	0.3
Use of information technologies	38.7	-4.2	2.7
Enterprises providing ICT training	48.3	-8.9	8.9
Employed ICT specialists	29.4	0.0	-3.2
Innovators	183.0	67.1	-9.8
SMEs introducing product innovations	203.2	86.1	-10.3
SMEs introducing business process innovations	166.4	49.0	-9.5
Linkages	92.8	-8.4	-34.8
Innovative SMEs collaborating with others	104.2	-119.9	-79.2
Public-private co-publications	153.1	75.9	2.4
Job-to-job mobility of HRST	58.4	47.1	-14.7
Intellectual assets	53.4	7.3	-1.7
PCT patent applications	42.9	1.5	0.4
Trademark applications	93.6	27.4	-2.1
Design applications	25.5	-0.9	-4.0
Employment impacts	115.8	33.2	20.8
Employment in knowledge-intensive activities	71.9	-3.6	0.0
Employment in innovative enterprises	153.3	66.7	39.6
Sales impacts	72.1	21.2	-9.2
Exports of medium and high technology products	22.9	2.5	4.4
Knowledge-intensive services exports	66.8	13.4	-11.0
Sales of new-to-market and new-to-firm innovations	159.2	61.6	-28.1
Environmental sustainability	70.5	-2.6	0.7
Resource productivity	83.3	45.9	11.7
Air emissions by fine particulates	77.3	14.7	4.3
Environment-related technologies	49.3	-66.8	-13.5

Relative strengths

- SMEs introducing product innovations
- SMEs introducing business process innovations
- Sales of new-to-market and new-to-firm innovations

Relative weaknesses

- Foreign doctorate students as a % of all doctorate students
- Population involved in lifelong learning
- Exports of medium and high technology products

Strong increases since 2017

- SMEs introducing product innovations
- Public-private co-publications
- Employment in innovative enterprises

Strong decreases since 2017

- Innovative SMEs collaborating with others
- Environment-related technologies
- Enterprises providing ICT training

Strong increases since 2023

- Employment in innovative enterprises
- Broadband penetration
- Direct and indirect government support of business R&D

Strong decreases since 2023

- Innovative SMEs collaborating with others
- Sales of new-to-market and new-to-firm innovations
- Job-to-job mobility of HRST

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SPAIN

Moderate InnovatorSummary innovation index (relative to EU in 2017): **98.9**Rank: **18**Change vs 2023: **▲ 2** Change vs 2017: **▲ 9.4**

Spain is a Moderate Innovator with performance at 89.9% of the EU average in 2024. Performance is above the average of the Moderate Innovators (84.8%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	89.9	9.4	2.0
Human resources	124.3	1.1	5.1
New doctorate graduates	100.0	-23.2	0.0
Population with tertiary education	148.4	21.0	10.8
Population involved in lifelong learning	125.4	15.3	6.1
Attractive research systems	90.2	11.9	0.2
International scientific co-publications	93.5	34.2	2.1
Scientific publications among the top 10% most cited	89.8	-5.2	-2.1
Foreign doctorate students as a % of all doctorate students	88.3	29.3	4.3
Digitalisation	144.9	29.7	6.9
Broadband penetration	142.2	56.7	11.4
Individuals with above basic overall digital skills	148.7	2.6	2.6
Finance and support	103.9	28.8	2.0
R&D expenditure in the public sector	82.0	8.2	0.0
Venture capital expenditures	114.9	47.1	-0.5
Direct and indirect government support of business R&D	116.4	37.1	7.2
Firm investments	61.8	12.3	-2.7
R&D expenditure in the business sector	53.5	12.8	1.5
Non-R&D innovation expenditures	82.2	17.8	-2.5
Innovation expenditures per person employed	52.0	5.7	-7.7
Use of information technologies	89.3	1.9	3.5
Enterprises providing ICT training	90.3	-6.4	3.8
Employed ICT specialists	88.2	9.7	3.3
Innovators	53.6	13.7	-1.5
SMEs introducing product innovations	58.0	37.0	-3.7
SMEs introducing business process innovations	49.9	-8.3	0.5
Linkages	92.8	44.9	-4.4
Innovative SMEs collaborating with others	69.7	31.0	20.6
Public-private co-publications	116.4	40.1	-3.2
Job-to-job mobility of HRST	102.1	58.8	-26.5
Intellectual assets	81.3	-3.5	0.2
PCT patent applications	68.7	-0.6	4.7
Trademark applications	110.3	1.9	-5.1
Design applications	69.2	-11.8	-1.5
Employment impacts	61.3	-2.6	6.3
Employment in knowledge-intensive activities	80.9	6.0	2.4
Employment in innovative enterprises	44.6	-10.4	9.7
Sales impacts	79.0	12.6	6.9
Exports of medium and high technology products	66.5	-5.5	4.1
Knowledge-intensive services exports	33.5	8.5	-18.3
Sales of new-to-market and new-to-firm innovations	170.5	47.0	45.6
Environmental sustainability	96.8	-15.8	-0.2
Resource productivity	136.9	3.0	11.2
Air emissions by fine particulates	86.3	-7.4	2.9
Environment-related technologies	74.5	-43.3	-14.0

Relative strengths

- Sales of new-to-market and new-to-firm innovations
- Individuals with above basic overall digital skills
- Population with tertiary education

Relative weaknesses

- Knowledge-intensive services exports
- Employment in innovative enterprises
- SMEs introducing business process innovations

Strong increases since 2017

- Job-to-job mobility of HRST
- Broadband penetration
- Venture capital expenditures

Strong decreases since 2017

- Environment-related technologies
- New doctorate graduates
- Design applications

Strong increases since 2023

- Sales of new-to-market and new-to-firm innovations
- Innovative SMEs collaborating with others
- Broadband penetration

Strong decreases since 2023

- Job-to-job mobility of HRST
- Knowledge-intensive services exports
- Environment-related technologies

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Innovation Leader ●

Summary innovation index (relative to EU in 2017): **140.6**

Rank: **4**

Change vs 2023: ▼ **-0.7** Change vs 2017: ▲ **11.8**

Finland is an Innovation Leader with performance at 127.8% of the EU average in 2024. Performance is below the average of the Innovation Leaders (132.1%). Performance is increasing more than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	127.8	11.8	-0.7
Human resources	136.0	-21.1	4.2
New doctorate graduates	126.2	-34.7	11.6
Population with tertiary education	78.8	-5.4	-9.0
Population involved in lifelong learning	212.6	-18.3	9.2
Attractive research systems	150.0	29.5	0.5
International scientific co-publications	219.5	68.7	-6.9
Scientific publications among the top 10% most cited	126.6	4.2	0.2
Foreign doctorate students as a % of all doctorate students	123.6	49.3	7.8
Digitalisation	162.3	52.2	13.4
Broadband penetration	134.8	93.1	14.9
Individuals with above basic overall digital skills	200.4	11.5	11.5
Finance and support	111.1	26.3	0.8
R&D expenditure in the public sector	132.8	0.0	3.3
Venture capital expenditures	150.6	83.7	0.0
Direct and indirect government support of business R&D	37.0	-1.8	-2.1
Firm investments	108.7	11.3	-2.6
R&D expenditure in the business sector	136.7	7.5	-3.0
Non-R&D innovation expenditures	73.6	13.9	-8.8
Innovation expenditures per person employed	111.4	13.2	4.9
Use of information technologies	185.2	4.3	0.0
Enterprises providing ICT training	188.0	1.9	0.0
Employed ICT specialists	182.3	6.5	0.0
Innovators	124.6	-25.4	-31.4
SMEs introducing product innovations	139.8	-43.9	-23.3
SMEs introducing business process innovations	112.2	-7.5	-38.8
Linkages	206.4	38.8	-17.4
Innovative SMEs collaborating with others	214.4	47.8	-29.3
Public-private co-publications	367.7	28.9	-20.8
Job-to-job mobility of HRST	133.3	35.3	-5.9
Intellectual assets	123.5	-8.4	-10.6
PCT patent applications	143.1	0.0	0.0
Trademark applications	110.5	8.5	-9.2
Design applications	106.5	-32.8	-25.7
Employment impacts	136.4	27.3	8.7
Employment in knowledge-intensive activities	130.4	13.3	4.9
Employment in innovative enterprises	141.8	40.3	12.4
Sales impacts	99.4	25.4	11.1
Exports of medium and high technology products	67.3	6.3	7.1
Knowledge-intensive services exports	99.4	6.4	-6.3
Sales of new-to-market and new-to-firm innovations	150.9	81.5	40.9
Environmental sustainability	72.8	-2.8	1.4
Resource productivity	14.1	8.2	4.3
Air emissions by fine particulates	99.0	10.3	2.7
Environment-related technologies	90.3	-30.5	-3.1

Relative strengths

- Public-private co-publications
- International scientific co-publications
- Innovative SMEs collaborating with others

Relative weaknesses

- Resource productivity
- Direct and indirect government support of business R&D
- Exports of medium and high technology products

Strong increases since 2017

- Broadband penetration
- Venture capital expenditures
- Sales of new-to-market and new-to-firm innovations

Strong decreases since 2017

- SMEs introducing product innovations
- New doctorate graduates
- Design applications

Strong increases since 2023

- Sales of new-to-market and new-to-firm innovations
- Broadband penetration
- Employment in innovative enterprises

Strong decreases since 2023

- SMEs introducing business process innovations
- Innovative SMEs collaborating with others
- Design applications

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**Strong Innovator**

Summary innovation index (relative to EU in 2017): **114.4**
Rank: **15**

Change vs 2023: **▲ 0.3** Change vs 2017: **▲ 1.7**

France is a Strong Innovator with performance at 104% of the EU average in 2024. Performance is below the average of the Strong Innovators (111.3%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	104.0	1.7	0.3
Human resources	135.8	13.4	21.7
New doctorate graduates	139.4	0.0	34.8
Population with tertiary education	147.8	9.6	9.0
Population involved in lifelong learning	117.8	39.8	16.3
Attractive research systems	105.9	-8.1	-3.1
International scientific co-publications	74.7	5.5	-2.8
Scientific publications among the top 10% most cited	87.9	-11.6	-1.7
Foreign doctorate students as a % of all doctorate students	162.8	-13.4	-6.6
Digitalisation	110.1	4.0	4.0
Broadband penetration	107.2	10.8	10.8
Individuals with above basic overall digital skills	114.2	-2.8	-2.8
Finance and support	142.2	13.0	-0.6
R&D expenditure in the public sector	95.1	-8.2	-1.6
Venture capital expenditures	150.6	51.0	0.0
Direct and indirect government support of business R&D	187.8	0.0	0.0
Firm investments	88.8	-6.3	-4.2
R&D expenditure in the business sector	96.5	-0.8	-2.3
Non-R&D innovation expenditures	49.4	-27.2	-23.5
Innovation expenditures per person employed	117.1	10.2	14.9
Use of information technologies	77.9	3.5	6.7
Enterprises providing ICT training	58.0	0.0	0.0
Employed ICT specialists	97.1	6.5	13.0
Innovators	111.7	5.8	4.3
SMEs introducing product innovations	109.2	5.8	3.6
SMEs introducing business process innovations	113.6	5.6	5.0
Linkages	115.3	34.1	-18.4
Innovative SMEs collaborating with others	122.1	18.1	-7.7
Public-private co-publications	107.0	-1.5	-9.6
Job-to-job mobility of HRST	112.5	64.7	-32.4
Intellectual assets	82.4	-10.1	-1.2
PCT patent applications	98.5	-12.7	-1.7
Trademark applications	70.7	-0.8	-1.0
Design applications	69.7	-13.7	-0.6
Employment impacts	106.9	-3.1	5.4
Employment in knowledge-intensive activities	110.2	3.6	3.6
Employment in innovative enterprises	104.3	-9.5	6.8
Sales impacts	72.1	-9.6	-6.2
Exports of medium and high technology products	84.5	-9.4	4.0
Knowledge-intensive services exports	77.1	4.7	-6.8
Sales of new-to-market and new-to-firm innovations	44.6	-29.5	-21.3
Environmental sustainability	109.4	5.0	-2.1
Resource productivity	138.3	35.0	-4.8
Air emissions by fine particulates	104.7	2.9	-0.5
Environment-related technologies	89.3	-15.5	-2.4

Relative strengths

- Direct and indirect government support of business R&D
- Foreign doctorate students as a % of all doctorate students
- Venture capital expenditures

Relative weaknesses

- Sales of new-to-market and new-to-firm innovations
- Non-R&D innovation expenditures
- Enterprises providing ICT training

Strong increases since 2017

- Job-to-job mobility of HRST
- Venture capital expenditures
- Population involved in lifelong learning

Strong decreases since 2017

- Sales of new-to-market and new-to-firm innovations
- Non-R&D innovation expenditures
- Environment-related technologies

Strong increases since 2023

- New doctorate graduates
- Population involved in lifelong learning
- Innovation expenditures per person employed

Strong decreases since 2023

- Job-to-job mobility of HRST
- Non-R&D innovation expenditures
- Sales of new-to-market and new-to-firm innovations

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CROATIA

Emerging Innovator ●Summary innovation index (relative to EU in 2017): **76.6**Rank: **26**Change vs 2023: ▼ **-0.1** Change vs 2017: ▲ **14.4**

Croatia is an Emerging Innovator with performance at 69.6% of the EU average in 2024. Performance is above the average of the Emerging Innovators (48%). Performance is increasing more than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	69.6	14.4	-0.1
Human resources	71.0	4.9	9.8
New doctorate graduates	86.9	11.6	23.1
Population with tertiary education	76.0	0.0	0.0
Population involved in lifelong learning	45.8	0.0	0.0
Attractive research systems	48.6	29.2	-0.6
International scientific co-publications	79.6	46.8	-6.9
Scientific publications among the top 10% most cited	41.5	21.4	2.1
Foreign doctorate students as a % of all doctorate students	31.8	30.9	-0.5
Digitalisation	67.1	22.7	-5.2
Broadband penetration	50.8	73.6	17.6
Individuals with above basic overall digital skills	90.1	-27.5	-27.5
Finance and support	81.4	42.5	-9.4
R&D expenditure in the public sector	86.9	41.0	-1.6
Venture capital expenditures	135.5	94.9	-19.9
Direct and indirect government support of business R&D	7.7	-16.2	-8.5
Firm investments	44.5	-15.7	-5.4
R&D expenditure in the business sector	51.3	27.0	15.0
Non-R&D innovation expenditures	63.4	-62.2	-25.7
Innovation expenditures per person employed	19.7	-13.4	-6.6
Use of information technologies	87.9	-12.3	-6.8
Enterprises providing ICT training	90.8	-24.9	-13.4
Employed ICT specialists	85.2	0.0	0.0
Innovators	131.3	54.5	0.0
SMEs introducing product innovations	145.4	82.0	0.0
SMEs introducing business process innovations	119.8	28.5	0.0
Linkages	111.5	58.0	8.0
Innovative SMEs collaborating with others	99.6	30.8	0.0
Public-private co-publications	158.6	87.2	9.0
Job-to-job mobility of HRST	102.1	67.6	14.7
Intellectual assets	46.1	8.6	1.7
PCT patent applications	36.8	-3.6	-3.4
Trademark applications	70.5	30.3	5.1
Design applications	33.7	7.1	5.5
Employment impacts	88.1	25.5	5.7
Employment in knowledge-intensive activities	70.8	0.0	0.0
Employment in innovative enterprises	103.0	48.7	11.1
Sales impacts	49.4	17.6	7.4
Exports of medium and high technology products	52.5	-1.9	12.0
Knowledge-intensive services exports	13.6	4.7	-2.2
Sales of new-to-market and new-to-firm innovations	100.4	66.4	13.2
Environmental sustainability	60.3	-20.2	-6.6
Resource productivity	83.2	17.7	16.5
Air emissions by fine particulates	75.9	13.9	4.1
Environment-related technologies	17.6	-100.0	-40.9

Relative strengths

- Public-private co-publications
- SMEs introducing product innovations
- Venture capital expenditures

Relative weaknesses

- Direct and indirect government support of business R&D
- Knowledge-intensive services exports
- Environment-related technologies

Strong increases since 2017

- Venture capital expenditures
- Public-private co-publications
- SMEs introducing product innovations

Strong decreases since 2017

- Environment-related technologies
- Non-R&D innovation expenditures
- Individuals with above basic overall digital skills

Strong increases since 2023

- New doctorate graduates
- Broadband penetration
- Resource productivity

Strong decreases since 2023

- Environment-related technologies
- Individuals with above basic overall digital skills
- Non-R&D innovation expenditures

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HUNGARY

Moderate Innovator ●

Summary innovation index (relative to EU in 2017): **77.6**

Rank: **25**

Change vs 2023: ▲ 2.1 Change vs 2017: ▲ 8.7

Hungary is a Moderate Innovator with performance at 70.5% of the EU average in 2024. Performance is below the average of the Moderate Innovators (84.8%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	70.5	8.7	2.1
Human resources	47.8	7.9	-0.2
New doctorate graduates	47.6	11.6	0.0
Population with tertiary education	25.5	-21.0	-15.0
Population involved in lifelong learning	72.9	37.7	17.4
Attractive research systems	77.3	47.4	2.1
International scientific co-publications	60.2	27.7	4.6
Scientific publications among the top 10% most cited	53.5	14.1	-1.7
Foreign doctorate students as a % of all doctorate students	130.7	138.7	8.1
Digitalisation	86.9	36.3	24.2
Broadband penetration	75.0	43.3	18.9
Individuals with above basic overall digital skills	103.5	29.3	29.3
Finance and support	81.2	-9.4	-1.2
R&D expenditure in the public sector	42.6	4.9	-3.3
Venture capital expenditures	73.6	1.4	-12.9
Direct and indirect government support of business R&D	136.4	-43.2	14.9
Firm investments	70.3	-3.5	2.9
R&D expenditure in the business sector	66.7	-10.5	-18.0
Non-R&D innovation expenditures	89.4	-7.8	13.6
Innovation expenditures per person employed	56.5	8.7	14.7
Use of information technologies	79.2	13.0	8.5
Enterprises providing ICT training	75.9	16.6	14.0
Employed ICT specialists	82.3	9.7	3.2
Innovators	45.3	18.8	-11.0
SMEs introducing product innovations	60.0	22.4	-12.6
SMEs introducing business process innovations	33.4	15.5	-9.5
Linkages	92.3	55.1	2.5
Innovative SMEs collaborating with others	73.1	42.8	-7.0
Public-private co-publications	117.3	44.7	0.5
Job-to-job mobility of HRST	97.9	70.6	11.7
Intellectual assets	50.4	-0.5	-0.7
PCT patent applications	58.8	-4.8	1.9
Trademark applications	66.4	10.3	-3.1
Design applications	19.2	-3.6	-1.9
Employment impacts	60.2	13.2	8.5
Employment in knowledge-intensive activities	86.6	1.2	0.0
Employment in innovative enterprises	38.0	24.5	16.2
Sales impacts	81.1	-5.8	1.9
Exports of medium and high technology products	113.7	-1.2	8.9
Knowledge-intensive services exports	63.3	12.7	1.7
Sales of new-to-market and new-to-firm innovations	57.1	-38.2	-8.8
Environmental sustainability	69.8	-9.1	-3.9
Resource productivity	67.5	22.5	10.9
Air emissions by fine particulates	91.7	-2.9	-1.1
Environment-related technologies	41.8	-43.4	-19.8

Relative strengths

- Direct and indirect government support of business R&D
- Foreign doctorate students as a % of all doctorate students
- Public-private co-publications

Relative weaknesses

- Design applications
- Population with tertiary education
- SMEs introducing business process innovations

Strong increases since 2017

- Foreign doctorate students as a % of all doctorate students
- Job-to-job mobility of HRST
- Public-private co-publications

Strong decreases since 2017

- Environment-related technologies
- Direct and indirect government support of business R&D
- Sales of new-to-market and new-to-firm innovations

Strong increases since 2023

- Individuals with above basic overall digital skills
- Broadband penetration
- Population involved in lifelong learning

Strong decreases since 2023

- Environment-related technologies
- R&D expenditure in the business sector
- Population with tertiary education

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**Strong Innovator**

Summary innovation index (relative to EU in 2017): **124.5**
Rank: **10**

Change vs 2023: **▲ 2.1** Change vs 2017: **▲ 2.3**

Ireland is a Strong Innovator with performance at 113.2% of the EU average in 2024. Performance is above the average of the Strong Innovators (111.3%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	113.2	2.3	2.1
Human resources	147.4	1.5	6.2
New doctorate graduates	139.4	11.6	11.6
Population with tertiary education	200.5	0	0
Population involved in lifelong learning	95.8	-13.2	5.1
Attractive research systems	153	36.8	1.1
International scientific co-publications	188	80.6	-2
Scientific publications among the top 10% most cited	118.4	-3.4	-1.1
Foreign doctorate students as a % of all doctorate students	175.3	84.3	8
Digitalisation	128.4	26.7	15.4
Broadband penetration	97.9	35.2	12.4
Individuals with above basic overall digital skills	170.8	18.4	18.4
Finance and support	64.4	-41.9	-4.6
R&D expenditure in the public sector	13.1	-21.3	-3.3
Venture capital expenditures	77.5	-20	-7.1
Direct and indirect government support of business R&D	108.9	-96.6	-3.5
Firm investments	86.5	1.6	-2.7
R&D expenditure in the business sector	50.7	-6	-9
Non-R&D innovation expenditures	40.4	-35.5	-35.3
Innovation expenditures per person employed	166.6	49.6	39
Use of information technologies	123.1	-24.5	-13.7
Enterprises providing ICT training	104.6	-46.5	-24.2
Employed ICT specialists	141.1	-3.3	-3.3
Innovators	93.5	-19.5	-31.2
SMEs introducing product innovations	97.9	-14.2	-21.2
SMEs introducing business process innovations	89.7	-24.6	-40.8
Linkages	168.5	81.9	43.5
Innovative SMEs collaborating with others	178.7	117.5	78.8
Public-private co-publications	250.8	56.2	0.3
Job-to-job mobility of HRST	N/A	N/A	N/A
Intellectual assets	60.7	-14.5	-4.4
PCT patent applications	71.9	-13.8	4.9
Trademark applications	69.2	-20.8	-8.3
Design applications	33.7	-10.3	-13.2
Employment impacts	142.6	-14.6	27.5
Employment in knowledge-intensive activities	188.8	-4.8	1.2
Employment in innovative enterprises	103.7	-23.3	51.6
Sales impacts	128.6	8.7	1
Exports of medium and high technology products	102.6	20.5	4.1
Knowledge-intensive services exports	117.8	1.5	-2
Sales of new-to-market and new-to-firm innovations	187.3	0	0
Environmental sustainability	103.6	27.4	9.3
Resource productivity	158	99.8	30.5
Air emissions by fine particulates	118.5	15.6	1.7
Environment-related technologies	33.2	-13.6	2.6

Relative strengths

- Public-private co-publications
- Population with tertiary education
- Employment in knowledge-intensive activities

Relative weaknesses

- R&D expenditure in the public sector
- Environment-related technologies
- Design applications

Strong increases since 2017

- Innovative SMEs collaborating with others
- Resource productivity
- Foreign doctorate students as a % of all doctorate students

Strong decreases since 2017

- Direct and indirect government support of business R&D
- Enterprises providing ICT training
- Non-R&D innovation expenditures

Strong increases since 2023

- Innovative SMEs collaborating with others
- Employment in innovative enterprises
- Innovation expenditures per person employed

Strong decreases since 2023

- SMEs introducing business process innovations
- Non-R&D innovation expenditures
- Enterprises providing ICT training

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**Strong Innovator**Summary innovation index (relative to EU in 2017): **110.6**Rank: **16**

Change vs 2023: ▼ -1 Change vs 2017: ▲ 6.8

Iceland is a Strong Innovator with performance at 100.5% of the EU average in 2024. Performance is below the average of the Strong Innovators (132.1%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	100.5	6.8	-1
Human resources	120.4	-0.5	-11.1
New doctorate graduates	60.7	-23.1	-34.7
Population with tertiary education	101.6	11.4	19.2
Population involved in lifelong learning	212.6	22.5	-10.2
Attractive research systems	178.6	22.5	0.5
International scientific co-publications	288.6	0	0
Scientific publications among the top 10% most cited	99.8	5.3	-13.6
Foreign doctorate students as a % of all doctorate students	202.4	81.4	31.9
Digitalisation	146.5	0	0
Broadband penetration	N/A	N/A	N/A
Individuals with above basic overall digital skills	175	0	0
Finance and support	117.2	53.3	0
R&D expenditure in the public sector	100	-1.6	-9.8
Venture capital expenditures	77.2	42	12.4
Direct and indirect government support of business R&D	187.8	145.8	0
Firm investments	88	12.6	-2.3
R&D expenditure in the business sector	130.6	36.1	-6.7
Non-R&D innovation expenditures	82.4	0	0
Innovation expenditures per person employed	47.8	0	0
Use of information technologies	92.6	16.5	9.8
Enterprises providing ICT training	N/A	N/A	N/A
Employed ICT specialists	91.2	16.1	9.7
Innovators	106.2	-4.3	0
SMEs introducing product innovations	111.2	-25.8	0
SMEs introducing business process innovations	102.2	16.5	0
Linkages	222.2	-4	0
Innovative SMEs collaborating with others	185.5	-10.7	0
Public-private co-publications	487.6	-1.7	-1.7
Job-to-job mobility of HRST	143.7	0	0
Intellectual assets	61.2	-24.4	-2
PCT patent applications	80.6	-17.1	-13.3
Trademark applications	70.9	-75.1	-3.5
Design applications	19.4	6	14
Employment impacts	129.5	2.2	5.8
Employment in knowledge-intensive activities	138.2	21.7	12.1
Employment in innovative enterprises	122.3	-15.8	0
Sales impacts	28.3	-5.4	-7.7
Exports of medium and high technology products	0	0	0
Knowledge-intensive services exports	50.3	-15.6	-22.4
Sales of new-to-market and new-to-firm innovations	39.3	0	0
Environmental sustainability	42.3	14.1	8
Resource productivity	31.3	36.8	22.5
Air emissions by fine particulates	52.3	-1.5	4.8
Environment-related technologies	38.8	18.2	1.1

Relative strengths

- Public-private co-publications
- International scientific co-publications
- Population involved in lifelong learning

Relative weaknesses

- Exports of medium and high technology products
- Design applications
- Resource productivity

Strong increases since 2017

- Direct and indirect government support of business R&D
- Foreign doctorate students as a % of all doctorate students
- Venture capital expenditures

Strong decreases since 2017

- Trademark applications
- SMEs introducing product innovations
- New doctorate graduates

Strong increases since 2023

- Foreign doctorate students as a % of all doctorate students
- Resource productivity
- Population with tertiary education

Strong decreases since 2023

- New doctorate graduates
- Knowledge-intensive services exports
- Scientific publications among the top 10% most cited

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**Moderate Innovator**Summary innovation index (relative to EU in 2017): **98.6**Rank: **20**Change vs 2023: **▲ 0.8** Change vs 2017: **▲ 15**

Italy is a Moderate Innovator with performance at 89.6% of the EU average in 2024. Performance is above the average of the Moderate Innovators (84.8%). Performance is increasing more than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	89.6	15.0	0.8
Human resources	73.8	13.8	13.0
New doctorate graduates	100.0	11.6	11.6
Population with tertiary education	32.0	13.7	8.4
Population involved in lifelong learning	89.9	17.4	20.4
Attractive research systems	93.2	13.5	3.9
International scientific co-publications	88.9	39.5	0.6
Scientific publications among the top 10% most cited	123.7	12.9	0.6
Foreign doctorate students as a % of all doctorate students	49.4	-8.9	14.0
Digitalisation	75.7	24.7	3.4
Broadband penetration	73.9	50.5	8.2
Individuals with above basic overall digital skills	78.1	-1.3	-1.3
Finance and support	64.9	12.9	1.6
R&D expenditure in the public sector	67.2	1.6	-1.7
Venture capital expenditures	68.9	3.9	4.4
Direct and indirect government support of business R&D	57.1	39.1	2.7
Firm investments	69.8	7.2	-19.3
R&D expenditure in the business sector	51.3	-3.8	-6.1
Non-R&D innovation expenditures	86.8	3.6	-26.1
Innovation expenditures per person employed	73.9	23.8	-26.8
Use of information technologies	80.8	26.8	15.1
Enterprises providing ICT training	82.2	44.6	24.2
Employed ICT specialists	79.4	9.7	6.5
Innovators	151.3	47.8	37.7
SMEs introducing product innovations	152.1	28.2	33.4
SMEs introducing business process innovations	150.3	66.1	41.6
Linkages	96.5	63.4	9.1
Innovative SMEs collaborating with others	123.9	113.9	23.9
Public-private co-publications	154.2	68.8	0.7
Job-to-job mobility of HRST	50.0	17.7	0.0
Intellectual assets	106.8	-1.4	-1.4
PCT patent applications	82.5	1.8	4.0
Trademark applications	104.3	12.5	-7.1
Design applications	148.5	-16.2	-3.9
Employment impacts	104.2	11.5	-9.9
Employment in knowledge-intensive activities	97.8	4.8	4.8
Employment in innovative enterprises	110.0	17.8	-23.4
Sales impacts	76.1	6.8	-10.8
Exports of medium and high technology products	78.6	-2.2	4.4
Knowledge-intensive services exports	56.2	2.1	-16.2
Sales of new-to-market and new-to-firm innovations	103.5	27.7	-27.4
Environmental sustainability	109.5	3.0	-1.9
Resource productivity	180.3	34.0	-2.9
Air emissions by fine particulates	98.4	1.7	0.6
Environment-related technologies	59.9	-20.7	-5.1

Relative strengths

- Resource productivity
- Public-private co-publications
- SMEs introducing product innovations

Relative weaknesses

- Population with tertiary education
- Foreign doctorate students as a % of all doctorate students
- Job-to-job mobility of HRST

Strong increases since 2017

- Innovative SMEs collaborating with others
- Public-private co-publications
- SMEs introducing business process innovations

Strong decreases since 2017

- Environment-related technologies
- Design applications
- Foreign doctorate students as a % of all doctorate students

Strong increases since 2023

- SMEs introducing business process innovations
- SMEs introducing product innovations
- Enterprises providing ICT training

Strong decreases since 2023

- Sales of new-to-market and new-to-firm innovations
- Innovation expenditures per person employed
- Non-R&D innovation expenditures

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LITHUANIA

Moderate Innovator

Summary innovation index (relative to EU in 2017): **92**
Rank: **22**

Change vs 2023: **▲ 3.7** Change vs 2017: **▲ 16.3**

Lithuania is a Moderate Innovator with performance at 83.6% of the EU average in 2024. Performance is below the average of the Moderate Innovators (84.8%). Performance is increasing more than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	83.6	16.3	3.7
Human resources	107.2	5.6	4.3
New doctorate graduates	60.7	0.0	0.0
Population with tertiary education	177.7	-0.6	-4.8
Population involved in lifelong learning	82.2	22.4	22.4
Attractive research systems	58.0	37.1	8.1
International scientific co-publications	71.2	46.3	1.0
Scientific publications among the top 10% most cited	62.7	34.2	9.8
Foreign doctorate students as a % of all doctorate students	38.6	35.3	10.5
Digitalisation	97.7	11.1	10.0
Broadband penetration	100.4	9.1	7.2
Individuals with above basic overall digital skills	93.9	12.9	12.9
Finance and support	82.1	21.1	6.1
R&D expenditure in the public sector	65.6	-39.3	-6.5
Venture capital expenditures	137.6	92.7	17.3
Direct and indirect government support of business R&D	32.7	25.9	11.7
Firm investments	86.7	12.4	15.5
R&D expenditure in the business sector	31.9	15.8	-3.0
Non-R&D innovation expenditures	172.6	4.3	29.2
Innovation expenditures per person employed	66.3	17.4	21.6
Use of information technologies	75.2	25.6	6.4
Enterprises providing ICT training	46.6	15.3	-3.8
Employed ICT specialists	102.9	35.5	16.1
Innovators	96.7	-5.4	-24.4
SMEs introducing product innovations	85.6	-15.8	-42.0
SMEs introducing business process innovations	105.7	4.3	-7.9
Linkages	130.0	44.2	-8.3
Innovative SMEs collaborating with others	92.9	-62.7	-34.1
Public-private co-publications	74.0	39.3	7.6
Job-to-job mobility of HRST	183.3	138.2	5.9
Intellectual assets	72.8	17.9	1.0
PCT patent applications	39.1	-8.1	-1.1
Trademark applications	136.2	67.3	7.3
Design applications	56.3	12.9	-1.1
Employment impacts	106.0	25.1	14.4
Employment in knowledge-intensive activities	97.8	21.7	15.6
Employment in innovative enterprises	113.1	28.1	13.2
Sales impacts	52.6	16.1	4.7
Exports of medium and high technology products	49.2	3.5	3.7
Knowledge-intensive services exports	33.7	24.9	-2.8
Sales of new-to-market and new-to-firm innovations	87.7	24.0	16.5
Environmental sustainability	75.3	-0.4	-2.5
Resource productivity	48.5	2.8	6.4
Air emissions by fine particulates	102.8	16.6	2.0
Environment-related technologies	61.9	-27.5	-16.3

Relative strengths

- Job-to-job mobility of HRST
- Population with tertiary education
- Non-R&D innovation expenditures

Relative weaknesses

- R&D expenditure in the business sector
- Direct and indirect government support of business R&D
- Knowledge-intensive services exports

Strong increases since 2017

- Job-to-job mobility of HRST
- Venture capital expenditures
- Trademark applications

Strong decreases since 2017

- Innovative SMEs collaborating with others
- R&D expenditure in the public sector
- Environment-related technologies

Strong increases since 2023

- Non-R&D innovation expenditures
- Population involved in lifelong learning
- Innovation expenditures per person employed

Strong decreases since 2023

- SMEs introducing product innovations
- Innovative SMEs collaborating with others
- Environment-related technologies

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**Strong Innovator** ●Summary innovation index (relative to EU in 2017): **123.3**Rank: **11**

Change vs 2023: ▼ -2.5 Change vs 2017: ▼ -5.5

Luxembourg is a Strong Innovator with performance at 112.1% of the EU average in 2024. Performance is above the average of the Strong Innovators (111.3%). Performance is decreasing, compared to the EU growth of (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	112.1	-5.5	-2.5
Human resources	168.7	26.8	13.0
New doctorate graduates	178.6	81.1	46.3
Population with tertiary education	192.9	-8.4	-4.8
Population involved in lifelong learning	128.7	-17.4	-19.4
Attractive research systems	202.3	23.9	-12.4
International scientific co-publications	283.8	116.5	-2.5
Scientific publications among the top 10% most cited	115.6	-4.3	-22.2
Foreign doctorate students as a % of all doctorate students	264.4	0.0	0.0
Digitalisation	115.4	5.4	-4.6
Broadband penetration	124.9	28.7	8.5
Individuals with above basic overall digital skills	102.3	-17.6	-17.6
Finance and support	64.4	-18.2	-7.1
R&D expenditure in the public sector	59.0	-18.0	-4.9
Venture capital expenditures	103.6	-31.7	-16.3
Direct and indirect government support of business R&D	21.8	-3.4	-0.1
Firm investments	43.8	2.6	-6.6
R&D expenditure in the business sector	31.9	-12.0	-2.2
Non-R&D innovation expenditures	50.2	16.2	-1.6
Innovation expenditures per person employed	50.8	4.1	-16.6
Use of information technologies	140.2	4.3	2.3
Enterprises providing ICT training	96.6	-21.7	4.5
Employed ICT specialists	182.3	29.0	0.0
Innovators	84.1	-33.9	0.0
SMEs introducing product innovations	87.8	-36.4	0.0
SMEs introducing business process innovations	80.8	-31.6	0.0
Linkages	179.2	47.9	-9.7
Innovative SMEs collaborating with others	82.5	7.3	0.0
Public-private co-publications	437.9	192.3	-10.0
Job-to-job mobility of HRST	154.1	14.7	-17.7
Intellectual assets	111.7	-36.9	-4.4
PCT patent applications	80.6	10.9	9.9
Trademark applications	165.5	-40.7	-15.3
Design applications	101.5	-96.4	-14.3
Employment impacts	127.0	-32.0	-1.2
Employment in knowledge-intensive activities	193.3	0.0	0.0
Employment in innovative enterprises	70.6	-61.4	-2.5
Sales impacts	68.9	-15.2	-4.4
Exports of medium and high technology products	62.0	-14.6	3.8
Knowledge-intensive services exports	104.5	-10.3	-1.8
Sales of new-to-market and new-to-firm innovations	24.6	-22.7	-21.1
Environmental sustainability	115.0	-10.5	4.2
Resource productivity	175.5	5.9	4.1
Air emissions by fine particulates	103.6	6.6	-0.6
Environment-related technologies	75.0	-48.4	10.7

Relative strengths

- Public-private co-publications
- International scientific co-publications
- Foreign doctorate students as a % of all doctorate students

Relative weaknesses

- Direct and indirect government support of business R&D
- Sales of new-to-market and new-to-firm innovations
- R&D expenditure in the business sector

Strong increases since 2017

- Public-private co-publications
- International scientific co-publications
- New doctorate graduates

Strong decreases since 2017

- Design applications
- Employment in innovative enterprises
- Environment-related technologies

Strong increases since 2023

- New doctorate graduates
- Environment-related technologies
- PCT patent applications

Strong decreases since 2023

- Scientific publications among the top 10% most cited
- Sales of new-to-market and new-to-firm innovations
- Population involved in lifelong learning

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**Emerging Innovator**

Summary innovation index (relative to EU in 2017): **59**
Rank: **30**

Change vs 2023: ▼ -0.2 Change vs 2017: ▲ 2.7

Latvia is an Emerging Innovator with performance at 53.6% of the EU average in 2024. Performance is above the average of the Emerging Innovators (48%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	53.6	2.7	-0.2
Human resources	74.9	-0.2	1.1
New doctorate graduates	34.5	-11.6	0.0
Population with tertiary education	110.9	-2.4	-4.7
Population involved in lifelong learning	82.2	21.4	10.2
Attractive research systems	48.9	23.1	0.8
International scientific co-publications	60.9	42.0	1.6
Scientific publications among the top 10% most cited	38.9	14.6	1.4
Foreign doctorate students as a % of all doctorate students	53.5	24.4	-1.2
Digitalisation	54.9	-18.8	-13.7
Broadband penetration	55.7	-5.2	4.9
Individuals with above basic overall digital skills	53.9	-32.2	-32.2
Finance and support	40.7	-13.6	-0.8
R&D expenditure in the public sector	59.0	1.6	1.6
Venture capital expenditures	53.6	-45.8	-0.8
Direct and indirect government support of business R&D	3.3	1.3	-4.4
Firm investments	26.6	-6.4	-6.7
R&D expenditure in the business sector	16.0	9.0	-0.7
Non-R&D innovation expenditures	57.7	-26.1	-15.8
Innovation expenditures per person employed	9.8	-2.1	-3.2
Use of information technologies	73.3	18.6	-5.1
Enterprises providing ICT training	58.0	17.8	-10.2
Employed ICT specialists	88.2	19.4	0.0
Innovators	47.0	11.9	4.2
SMEs introducing product innovations	42.1	8.7	1.6
SMEs introducing business process innovations	50.9	14.8	6.6
Linkages	77.3	28.3	17.4
Innovative SMEs collaborating with others	51.3	16.0	9.4
Public-private co-publications	105.4	66.7	1.5
Job-to-job mobility of HRST	87.5	20.6	32.3
Intellectual assets	69.4	2.5	0.5
PCT patent applications	53.6	-2.0	6.5
Trademark applications	106.9	30.0	1.6
Design applications	52.8	-13.3	-8.4
Employment impacts	53.8	15.2	-4.3
Employment in knowledge-intensive activities	74.2	10.8	0.0
Employment in innovative enterprises	36.5	19.2	-8.4
Sales impacts	51.8	5.6	0.1
Exports of medium and high technology products	41.2	-3.1	5.9
Knowledge-intensive services exports	66.5	13.8	5.3
Sales of new-to-market and new-to-firm innovations	45.7	8.5	-16.4
Environmental sustainability	44.4	-9.6	6.3
Resource productivity	50.9	1.4	-1.3
Air emissions by fine particulates	42.2	17.2	3.9
Environment-related technologies	41.5	-56.9	15.6

Relative strengths

- Population with tertiary education
- Trademark applications
- Public-private co-publications

Relative weaknesses

- Relative weaknesses
- Direct and indirect government support of business R&D
- Innovation expenditures per person employed
- R&D expenditure in the business sector

Strong increases since 2017

- Public-private co-publications
- International scientific co-publications
- Trademark applications

Strong decreases since 2017

- Environment-related technologies
- Venture capital expenditures
- Individuals with above basic overall digital skills

Strong increases since 2023

- Job-to-job mobility of HRST
- Environment-related technologies
- Population involved in lifelong learning

Strong decreases since 2023

- Individuals with above basic overall digital skills
- Sales of new-to-market and new-to-firm innovations
- Non-R&D innovation expenditures

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MOLDOVA

Emerging Innovator ●

Summary innovation index (relative to EU in 2017): **25.5**

Rank: **39**

Change vs 2023: ▼ -4.1 Change vs 2017: ▲ 0.3

Moldova is an Emerging Innovator with performance at 23.2% of the EU average in 2024. Performance is below the average of the Emerging Innovators (48%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	23.2	0.3	-4.1
Human resources	18.1	3.2	0.2
New doctorate graduates	8.8	-7.6	0.5
Population with tertiary education	41.8	18	0
Population involved in lifelong learning	2.3	2.8	0
Attractive research systems	37.5	15.8	-7.8
International scientific co-publications	5.8	6.9	0.2
Scientific publications among the top 10% most cited	11.6	-3.5	-9.1
Foreign doctorate students as a % of all doctorate students	107.7	66.6	-11.4
Digitalisation	103.2	10	0
Broadband penetration	88.8	10	0
Individuals with above basic overall digital skills	N/A	N/A	N/A
Finance and support	17.7	12.1	0.2
R&D expenditure in the public sector	11	-9.3	0.7
Venture capital expenditures	37.9	50.1	0
Direct and indirect government support of business R&D	0.9	-0.7	0
Firm investments	18.3	-4.1	-0.9
R&D expenditure in the business sector	0	-1.5	0
Non-R&D innovation expenditures	58.7	-10.9	-3.4
Innovation expenditures per person employed	0.5	-0.3	0.6
Use of information technologies	39.1	36	0
Enterprises providing ICT training	N/A	N/A	N/A
Employed ICT specialists	38.5	35.1	0
Innovators	16.5	17.7	5.2
SMEs introducing product innovations	18.4	18.2	4.8
SMEs introducing business process innovations	15	17.4	5.5
Linkages	23	-27.9	0
Innovative SMEs collaborating with others	36.8	-56.6	-3.2
Public-private co-publications	8.5	10.3	4.9
Job-to-job mobility of HRST	N/A	N/A	N/A
Intellectual assets	17.8	4.8	-1.5
PCT patent applications	25	9.1	-2.4
Trademark applications	20.9	4.7	-3.3
Design applications	2.8	-0.7	0.9
Employment impacts	0	-31.2	-14.6
Employment in knowledge-intensive activities	0	0	0
Employment in innovative enterprises	0	-59.9	-28.1
Sales impacts	24.3	-1.8	-1.2
Exports of medium and high technology products	23.4	2.1	7.4
Knowledge-intensive services exports	36.3	1.2	-8.8
Sales of new-to-market and new-to-firm innovations	7.2	-12.3	-4.7
Environmental sustainability	7.4	-47.4	-54.2
Resource productivity	N/A	N/A	N/A
Air emissions by fine particulates	N/A	N/A	N/A
Environment-related technologies	8.1	-51.3	-58.7

Relative strengths

- Foreign doctorate students as a % of all doctorate students
- Broadband penetration
- Non-R&D innovation expenditures

Relative weaknesses

- R&D expenditure in the business sector
- Employment in knowledge-intensive activities
- Employment in innovative enterprises

Strong increases since 2017

- Foreign doctorate students as a % of all doctorate students
- Venture capital expenditures
- Employed ICT specialists

Strong decreases since 2017

- Employment in innovative enterprises
- Innovative SMEs collaborating with others
- Environment-related technologies

Strong increases since 2023

- Exports of medium and high technology products
- SMEs introducing business process innovations
- Public-private co-publications

Strong decreases since 2023

- Environment-related technologies
- Employment in innovative enterprises
- Foreign doctorate students as a % of all doctorate students

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MONTENEGRO

Emerging Innovator ●

Summary innovation index (relative to EU in 2017): **52.3**

Rank: **32**

Change vs 2023: ▲ 0.8 Change vs 2017: ▲ 5.7

Montenegro is an Emerging Innovator with performance at 47.5% of the EU average in 2024. Performance is below the average of the Emerging Innovators (48%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	47.5	5.7	0.8
Human resources	34.4	11.1	0
New doctorate graduates	2.5	2.2	0
Population with tertiary education	85.3	36.5	0
Population involved in lifelong learning	14.5	-6.1	0
Attractive research systems	49.6	-4.6	6
International scientific co-publications	56.1	40.6	-0.4
Scientific publications among the top 10% most cited	47.2	-3.9	11.4
Foreign doctorate students as a % of all doctorate students	47.1	-48.1	0
Digitalisation	54.7	42.8	13.8
Broadband penetration	73.9	79.5	21.2
Individuals with above basic overall digital skills	28	6.2	6.2
Finance and support	12.5	6.7	0
R&D expenditure in the public sector	29.5	9.8	0
Venture capital expenditures	6.3	8.4	0
Direct and indirect government support of business R&D	0	0	0
Firm investments	23.8	2.2	0
R&D expenditure in the business sector	10.4	6	0
Non-R&D innovation expenditures	35	0	0
Innovation expenditures per person employed	27.4	0	0
Use of information technologies	69.4	14.7	-6.6
Enterprises providing ICT training	107.5	16.6	-13.4
Employed ICT specialists	32.4	12.9	0
Innovators	170.3	0	0
SMEs introducing product innovations	213.9	0	0
SMEs introducing business process innovations	134.6	0	0
Linkages	73.5	-16.3	-4.4
Innovative SMEs collaborating with others	146.5	0	0
Public-private co-publications	33.1	13.9	-7.5
Job-to-job mobility of HRST	29.2	-44.1	-5.9
Intellectual assets	8.9	-10.1	1.2
PCT patent applications	18.8	-16.4	8.2
Trademark applications	2.5	-12.8	-9.3
Design applications	0	0	0
Employment impacts	100.5	3.6	0
Employment in knowledge-intensive activities	64.1	7.3	0
Employment in innovative enterprises	131.7	0	0
Sales impacts	20.9	2.7	-0.7
Exports of medium and high technology products	8.6	1.8	0
Knowledge-intensive services exports	13.5	5.9	-1.8
Sales of new-to-market and new-to-firm innovations	52.2	0	0
Environmental sustainability	52.3	48.1	0
Resource productivity	N/A	N/A	N/A
Air emissions by fine particulates	N/A	N/A	N/A
Environment-related technologies	57.1	51.9	0

Relative strengths

- SMEs introducing product innovations
- Innovative SMEs collaborating with others
- SMEs introducing business process innovations

Relative weaknesses

- Direct and indirect government support of business R&D
- Design applications
- New doctorate graduates

Strong increases since 2017

- Broadband penetration
- Environment-related technologies
- International scientific co-publications

Strong decreases since 2017

- Foreign doctorate students as a % of all doctorate students
- Job-to-job mobility of HRST
- PCT patent applications

Strong increases since 2023

- Broadband penetration
- Scientific publications among the top 10% most cited
- PCT patent applications

Strong decreases since 2023

- Enterprises providing ICT training
- Trademark applications
- Public-private co-publications

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NORTH MACEDONIA

Emerging Innovator ●

Summary innovation index (relative to EU in 2017): **49.6**

Rank: **34**

Change vs 2023: ▲ 3.9 Change vs 2017: ▲ 11.9

North Macedonia is an Emerging Innovator with performance at 45.1% of the EU average in 2024. Performance is below the average of the Emerging Innovators (48%). Performance is increasing more than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	45.1	11.8	3.9
Human resources	36	9.8	4.9
New doctorate graduates	21.4	0	11.6
Population with tertiary education	70.6	32.9	0
Population involved in lifelong learning	13.6	-3.1	0
Attractive research systems	79.7	40.9	3.6
International scientific co-publications	25.9	21.2	0.1
Scientific publications among the top 10% most cited	44.3	36	3.7
Foreign doctorate students as a % of all doctorate students	185.1	70.1	6.6
Digitalisation	37.1	-0.9	0
Broadband penetration	51	-1.7	0
Individuals with above basic overall digital skills	17.7	0	0
Finance and support	14.5	-0.7	0.2
R&D expenditure in the public sector	26.2	-13.1	0
Venture capital expenditures	10.4	7.8	0.5
Direct and indirect government support of business R&D	5.4	6.6	0
Firm investments	42.1	0.6	0
R&D expenditure in the business sector	4.2	1.5	0
Non-R&D innovation expenditures	115.7	0	0
Innovation expenditures per person employed	14.8	0	0
Use of information technologies	30.9	5.7	-3.5
Enterprises providing ICT training	35.6	-5.1	-7
Employed ICT specialists	26.4	16.1	0
Innovators	63.2	0	0
SMEs introducing product innovations	49.6	0	0
SMEs introducing business process innovations	74.1	0	0
Linkages	49.4	40.2	-18.9
Innovative SMEs collaborating with others	44.7	0	0
Public-private co-publications	27.7	25.1	-5.4
Job-to-job mobility of HRST	62.5	82.3	-41.2
Intellectual assets	21.5	3.8	5.4
PCT patent applications	30.1	0.8	8.5
Trademark applications	27.6	13.2	6.4
Design applications	1.1	0.8	0.4
Employment impacts	31.6	6.9	0
Employment in knowledge-intensive activities	15.8	14.5	0
Employment in innovative enterprises	45	0	0
Sales impacts	59.6	14.2	1.3
Exports of medium and high technology products	99.4	10.1	1.1
Knowledge-intensive services exports	42.6	29.3	2.4
Sales of new-to-market and new-to-firm innovations	22.8	0	0
Environmental sustainability	87.4	34.8	48.9
Resource productivity	51.4	29.4	14
Air emissions by fine particulates	N/A	N/A	N/A
Environment-related technologies	144.4	51.6	94.6

Relative strengths

- Foreign doctorate students as a % of all doctorate students
- Environment-related technologies
- Non-R&D innovation expenditures

Relative weaknesses

- Design applications
- R&D expenditure in the business sector
- Direct and indirect government support of business R&D

Strong increases since 2017

- Job-to-job mobility of HRST
- Foreign doctorate students as a % of all doctorate students
- Environment-related technologies

Strong decreases since 2017

- R&D expenditure in the public sector
- Enterprises providing ICT training
- Population involved in lifelong learning

Strong increases since 2023

- Environment-related technologies
- Resource productivity
- New doctorate graduates

Strong decreases since 2023

- Job-to-job mobility of HRST
- Enterprises providing ICT training
- Public-private co-publications

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**Moderate Innovator**Summary innovation index (relative to EU in 2017): **96.8**Rank: **21**Change vs 2023: ▼ **-1.9** Change vs 2017: ▲ **7**

Malta is a Moderate Innovator with performance at 88% of the EU average in 2024. Performance is above the average of the Moderate Innovators (84.8%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	88.0	7.0	-1.9
Human resources	87.3	13.6	16.4
New doctorate graduates	21.4	0.0	0.0
Population with tertiary education	117.3	20.3	22.7
Population involved in lifelong learning	131.3	27.5	35.7
Attractive research systems	144.6	23.1	-3.3
International scientific co-publications	123.9	76.8	-6.9
Scientific publications among the top 10% most cited	80.7	11.3	-3.3
Foreign doctorate students as a % of all doctorate students	264.4	0.0	0.0
Digitalisation	137.3	33.6	15.3
Broadband penetration	134.3	60.9	24.1
Individuals with above basic overall digital skills	141.5	6.7	6.7
Finance and support	14.9	-13.8	0.0
R&D expenditure in the public sector	18.0	-19.7	0.0
Venture capital expenditures	22.9	-0.3	0.8
Direct and indirect government support of business R&D	1.6	-20.6	-0.8
Firm investments	45.0	10.4	-9.1
R&D expenditure in the business sector	29.2	6.8	3.0
Non-R&D innovation expenditures	72.9	9.5	-27.3
Innovation expenditures per person employed	36.0	15.3	-3.2
Use of information technologies	115.5	8.9	-2.7
Enterprises providing ICT training	134.5	21.6	4.4
Employed ICT specialists	97.1	-3.2	-9.6
Innovators	51.8	5.6	-23.1
SMEs introducing product innovations	45.5	-2.7	-15.9
SMEs introducing business process innovations	56.9	13.5	-29.7
Linkages	92.0	44.2	-28.7
Innovative SMEs collaborating with others	41.5	30.4	-23.4
Public-private co-publications	135.3	77.5	-10.5
Job-to-job mobility of HRST	116.6	41.2	-41.2
Intellectual assets	132.6	-11.7	3.8
PCT patent applications	74.8	22.5	11.7
Trademark applications	206.4	0.0	0.0
Design applications	143.1	-64.9	-3.3
Employment impacts	108.6	-3.8	-14.7
Employment in knowledge-intensive activities	160.7	9.6	1.2
Employment in innovative enterprises	64.8	-15.9	-28.8
Sales impacts	65.4	-7.7	-5.5
Exports of medium and high technology products	100.6	-12.3	7.2
Knowledge-intensive services exports	41.2	-22.2	-7.2
Sales of new-to-market and new-to-firm innovations	47.1	19.5	-23.8
Environmental sustainability	106.1	16.9	9.6
Resource productivity	126.9	47.9	28.9
Air emissions by fine particulates	125.0	7.3	-0.2
Environment-related technologies	60.8	5.5	8.2

Relative strengths

- Foreign doctorate students as a % of all doctorate students
- Trademark applications
- Employment in knowledge-intensive activities

Relative weaknesses

- Direct and indirect government support of business R&D
- R&D expenditure in the public sector
- New doctorate graduates

Strong increases since 2017

- Public-private co-publications
- International scientific co-publications
- Broadband penetration

Strong decreases since 2017

- Design applications
- Knowledge-intensive services exports
- Direct and indirect government support of business R&D

Strong increases since 2023

- Population involved in lifelong learning
- Resource productivity
- Broadband penetration

Strong decreases since 2023

- Job-to-job mobility of HRST
- SMEs introducing business process innovations
- Employment in innovative enterprises

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NETHERLANDS

Innovation Leader ●Summary innovation index (relative to EU in 2017): **138.3**Rank: **5**Change vs 2023: ▼ **-0.5** Change vs 2017: ▲ **7.8**

Netherlands is an Innovation Leader with performance at 125.7% of the EU average in 2024. Performance is below the average of the Innovation Leaders (132.1%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	125.7	7.8	-0.5
Human resources	151.3	-2.6	-3.6
New doctorate graduates	86.9	0.0	0.0
Population with tertiary education	161.9	-6.6	-11.4
Population involved in lifelong learning	215.1	-2.1	0.0
Attractive research systems	184.3	24.9	-0.8
International scientific co-publications	197.1	53.7	-4.1
Scientific publications among the top 10% most cited	154.5	-10.6	0.2
Foreign doctorate students as a % of all doctorate students	220.1	76.0	0.0
Digitalisation	154.4	13.0	-2.5
Broadband penetration	121.3	25.7	-4.9
Individuals with above basic overall digital skills	200.4	0.0	0.0
Finance and support	126.6	22.8	-2.7
R&D expenditure in the public sector	101.6	-5.0	-5.0
Venture capital expenditures	141.3	67.4	-0.8
Direct and indirect government support of business R&D	137.8	11.3	-2.2
Firm investments	78.6	11.4	1.7
R&D expenditure in the business sector	105.5	13.5	4.5
Non-R&D innovation expenditures	38.7	0.0	0.0
Innovation expenditures per person employed	86.9	21.2	0.0
Use of information technologies	150.4	37.5	11.6
Enterprises providing ICT training	138.5	70.1	33.8
Employed ICT specialists	161.7	6.4	-9.7
Innovators	108.5	-10.5	0.0
SMEs introducing product innovations	111.0	-40.7	0.0
SMEs introducing business process innovations	106.4	17.9	0.0
Linkages	177.0	13.5	-15.9
Innovative SMEs collaborating with others	150.1	43.4	0.0
Public-private co-publications	322.7	54.6	-11.7
Job-to-job mobility of HRST	139.6	-32.3	-32.3
Intellectual assets	113.3	0.5	-4.7
PCT patent applications	122.3	-8.9	1.5
Trademark applications	106.1	3.8	-5.2
Design applications	106.9	10.3	-12.5
Employment impacts	132.3	0.4	10.8
Employment in knowledge-intensive activities	157.4	4.8	-3.6
Employment in innovative enterprises	111.2	-3.7	23.9
Sales impacts	80.4	-4.4	3.2
Exports of medium and high technology products	75.9	0.7	7.2
Knowledge-intensive services exports	93.9	-2.7	-3.7
Sales of new-to-market and new-to-firm innovations	66.8	-15.0	6.0
Environmental sustainability	115.3	1.7	-3.0
Resource productivity	188.1	26.7	0.0
Air emissions by fine particulates	104.1	2.2	0.2
Environment-related technologies	64.1	-18.9	-9.8

Relative strengths

- Public-private co-publications
- Foreign doctorate students as a % of all doctorate students
- Population involved in lifelong learning

Relative weaknesses

- Non-R&D innovation expenditures
- Environment-related technologies
- Sales of new-to-market and new-to-firm innovations

Strong increases since 2017

- Foreign doctorate students as a % of all doctorate students
- Enterprises providing ICT training
- Venture capital expenditures

Strong decreases since 2017

- SMEs introducing product innovations
- Job-to-job mobility of HRST
- Environment-related technologies

Strong increases since 2023

- Enterprises providing ICT training
- Employment in innovative enterprises
- Exports of medium and high technology products

Strong decreases since 2023

- Job-to-job mobility of HRST
- Design applications
- Public-private co-publications

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**Strong Innovator** ●Summary innovation index (relative to EU in 2017): **128.7**Rank: **7**

Change vs 2023: ▲ 0.9 Change vs 2017: ▲ 12

Norway is a Strong Innovator with performance at 117% of the EU average in 2024. Performance is above the average of the Strong Innovators (111.3%). Performance is increasing more than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	117.0	12.0	0.9
Human resources	153.6	14.8	4.5
New doctorate graduates	113.1	11.6	0.0
Population with tertiary education	173.3	9.6	6.0
Population involved in lifelong learning	178.7	26.5	10.2
Attractive research systems	155.4	25.6	3.4
International scientific co-publications	275.9	116.5	6.7
Scientific publications among the top 10% most cited	119.1	-7.1	0.4
Foreign doctorate students as a % of all doctorate students	102.7	13.6	6.3
Digitalisation	147.2	31.7	17.5
Broadband penetration	109.0	27.4	-1.3
Individuals with above basic overall digital skills	200.4	36.2	36.2
Finance and support	119.2	25.9	-17.8
R&D expenditure in the public sector	96.7	-29.5	-31.2
Venture capital expenditures	149.4	86.0	3.0
Direct and indirect government support of business R&D	108.4	36.4	-23.0
Firm investments	77.0	-1.1	-0.1
R&D expenditure in the business sector	58.4	-12.0	-12.0
Non-R&D innovation expenditures	90.3	2.1	7.2
Innovation expenditures per person employed	84.2	7.3	4.9
Use of information technologies	141.3	-12.3	7.1
Enterprises providing ICT training	168.4	-21.7	7.6
Employed ICT specialists	114.7	-3.2	6.4
Innovators	161.0	5.8	0.0
SMEs introducing product innovations	194.1	5.4	0.0
SMEs introducing business process innovations	134.1	6.1	0.0
Linkages	242.8	55.4	-6.9
Innovative SMEs collaborating with others	239.2	77.8	0.0
Public-private co-publications	477.0	108.4	-2.3
Job-to-job mobility of HRST	150.0	11.8	-14.7
Intellectual assets	58.3	2.8	-1.4
PCT patent applications	95.6	1.2	5.0
Trademark applications	47.9	10.6	-8.1
Design applications	10.6	-0.9	-4.3
Employment impacts	129.1	22.0	1.4
Employment in knowledge-intensive activities	116.9	6.0	0.0
Employment in innovative enterprises	139.8	36.4	2.8
Sales impacts	45.9	-5.1	-6.8
Exports of medium and high technology products	0.0	-10.3	0.0
Knowledge-intensive services exports	94.8	-1.9	-7.7
Sales of new-to-market and new-to-firm innovations	43.1	-1.0	-16.3
Environmental sustainability	92.3	10.6	17.4
Resource productivity	109.3	44.8	46.2
Air emissions by fine particulates	79.6	4.3	3.1
Environment-related technologies	94.0	-7.7	15.1

Relative strengths

- Public-private co-publications
- International scientific co-publications
- Innovative SMEs collaborating with others

Relative weaknesses

- Exports of medium and high technology products
- Design applications
- Sales of new-to-market and new-to-firm innovations

Strong increases since 2017

- International scientific co-publications
- Public-private co-publications
- Venture capital expenditures

Strong decreases since 2017

- R&D expenditure in the public sector
- Enterprises providing ICT training
- R&D expenditure in the business sector

Strong increases since 2023

- Resource productivity
- Individuals with above basic overall digital skills
- Environment-related technologies

Strong decreases since 2023

- R&D expenditure in the public sector
- Direct and indirect government support of business R&D
- Sales of new-to-market and new-to-firm innovations

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**Emerging Innovator** ●Summary innovation index (relative to EU in 2017): **72.5**Rank: **27**

Change vs 2023: ▲ 3.3 Change vs 2017: ▲ 13

Poland is an Emerging Innovator with performance at 65.9% of the EU average in 2024. Performance is above the average of the Emerging Innovators (48%). Performance is increasing more than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	65.9	13.0	3.3
Human resources	72.2	16.8	16.2
New doctorate graduates	34.5	0.0	11.6
Population with tertiary education	117.3	26.9	27.5
Population involved in lifelong learning	65.3	31.6	9.2
Attractive research systems	37.5	18.6	-7.8
International scientific co-publications	44.7	28.9	1.0
Scientific publications among the top 10% most cited	51.6	19.2	4.3
Foreign doctorate students as a % of all doctorate students	9.2	8.3	-41.8
Digitalisation	80.1	18.4	4.6
Broadband penetration	88.1	39.4	11.7
Individuals with above basic overall digital skills	68.8	-2.7	-2.7
Finance and support	61.7	15.7	-4.6
R&D expenditure in the public sector	62.3	-4.9	-4.9
Venture capital expenditures	46.4	-1.2	-9.3
Direct and indirect government support of business R&D	80.2	64.5	0.9
Firm investments	62.2	-4.8	0.4
R&D expenditure in the business sector	63.9	36.9	4.5
Non-R&D innovation expenditures	83.6	-44.4	-6.2
Innovation expenditures per person employed	40.9	-8.5	3.3
Use of information technologies	99.1	51.0	31.4
Enterprises providing ICT training	113.3	84.1	44.0
Employed ICT specialists	85.2	19.3	19.3
Innovators	45.5	34.9	0.0
SMEs introducing product innovations	43.1	29.7	0.0
SMEs introducing business process innovations	47.5	40.1	0.0
Linkages	73.3	27.2	-11.9
Innovative SMEs collaborating with others	49.3	27.0	0.0
Public-private co-publications	56.6	29.3	-2.4
Job-to-job mobility of HRST	100.0	26.5	-26.4
Intellectual assets	85.9	-2.4	0.2
PCT patent applications	40.6	-0.3	2.9
Trademark applications	92.8	12.9	0.5
Design applications	151.0	-16.8	-3.5
Employment impacts	59.3	32.2	27.3
Employment in knowledge-intensive activities	73.0	16.9	15.6
Employment in innovative enterprises	47.8	46.4	38.0
Sales impacts	60.4	6.2	2.5
Exports of medium and high technology products	75.1	0.1	4.1
Knowledge-intensive services exports	49.0	11.8	-3.8
Sales of new-to-market and new-to-firm innovations	55.0	8.5	8.7
Environmental sustainability	60.3	-9.8	-7.3
Resource productivity	49.6	23.9	6.5
Air emissions by fine particulates	77.2	12.0	-2.5
Environment-related technologies	46.8	-68.3	-25.4

Relative strengths

- Design applications
- Population with tertiary education
- Enterprises providing ICT training

Relative weaknesses

- Foreign doctorate students as a % of all doctorate students
- New doctorate graduates
- PCT patent applications

Strong increases since 2017

- Enterprises providing ICT training
- Direct and indirect government support of business R&D
- Employment in innovative enterprises

Strong decreases since 2017

- Environment-related technologies
- Non-R&D innovation expenditures
- Design applications

Strong increases since 2023

- Enterprises providing ICT training
- Employment in innovative enterprises
- Population with tertiary education

Strong decreases since 2023

- Foreign doctorate students as a % of all doctorate students
- Job-to-job mobility of HRST
- Environment-related technologies

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PORTUGAL

Moderate Innovator ●

Summary innovation index (relative to EU in 2017): **91.8**

Rank: **23**

Change vs 2023: ▲ 0.5 Change vs 2017: ▲ 4.3

Portugal is a Moderate Innovator with performance at 83.5% of the EU average in 2024. Performance is below the average of the Moderate Innovators (84.8%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	83.5	4.3	0.5
Human resources	97.6	-5.3	2.2
New doctorate graduates	100.0	0.0	11.6
Population with tertiary education	88.0	-25.8	-9.6
Population involved in lifelong learning	105.1	11.2	1.0
Attractive research systems	115.7	21.8	-3.3
International scientific co-publications	135.9	60.2	-2.9
Scientific publications among the top 10% most cited	82.6	-18.9	-5.3
Foreign doctorate students as a % of all doctorate students	149.7	75.8	1.1
Digitalisation	129.0	24.6	7.5
Broadband penetration	142.0	43.4	8.8
Individuals with above basic overall digital skills	111.3	6.2	6.2
Finance and support	97.3	23.2	-7.5
R&D expenditure in the public sector	78.7	-8.2	-6.5
Venture capital expenditures	51.0	-18.2	-4.4
Direct and indirect government support of business R&D	177.2	115.8	-12.9
Firm investments	56.1	3.1	4.5
R&D expenditure in the business sector	70.8	36.1	4.5
Non-R&D innovation expenditures	65.1	-23.8	3.2
Innovation expenditures per person employed	32.1	-5.1	6.0
Use of information technologies	99.3	3.7	5.7
Enterprises providing ICT training	107.5	7.6	5.1
Employed ICT specialists	91.2	0.0	6.5
Innovators	101.7	-63.0	-0.9
SMEs introducing product innovations	104.8	-69.6	9.0
SMEs introducing business process innovations	99.0	-57.1	-10.5
Linkages	99.2	39.1	-17.4
Innovative SMEs collaborating with others	67.3	-12.5	25.8
Public-private co-publications	151.3	78.5	-2.4
Job-to-job mobility of HRST	104.2	64.7	-61.7
Intellectual assets	76.7	-5.7	-3.2
PCT patent applications	54.8	6.5	0.2
Trademark applications	105.9	14.7	-6.6
Design applications	79.4	-37.6	-4.8
Employment impacts	88.2	-2.2	23.7
Employment in knowledge-intensive activities	75.3	1.2	3.6
Employment in innovative enterprises	99.6	-5.1	42.4
Sales impacts	63.6	18.3	1.2
Exports of medium and high technology products	59.4	7.9	4.1
Knowledge-intensive services exports	37.5	-4.8	-14.4
Sales of new-to-market and new-to-firm innovations	111.8	66.8	18.4
Environmental sustainability	31.4	-11.4	-4.1
Resource productivity	56.3	15.1	-0.8
Air emissions by fine particulates	6.9	7.0	0.9
Environment-related technologies	42.1	-59.0	-13.9

Relative strengths

- Direct and indirect government support of business R&D
- Public-private co-publications
- Foreign doctorate students as a % of all doctorate students

Relative weaknesses

- Air emissions by fine particulates
- Innovation expenditures per person employed
- Knowledge-intensive services exports

Strong increases since 2017

- Direct and indirect government support of business R&D
- Public-private co-publications
- Foreign doctorate students as a % of all doctorate students

Strong decreases since 2017

- SMEs introducing product innovations
- Environment-related technologies
- SMEs introducing business process innovations

Strong increases since 2023

- Employment in innovative enterprises
- Innovative SMEs collaborating with others
- Sales of new-to-market and new-to-firm innovations

Strong decreases since 2023

- Job-to-job mobility of HRST
- Knowledge-intensive services exports
- Environment-related technologies

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**Emerging Innovator** ●Summary innovation index (relative to EU in 2017): **37.4**Rank: **36**Change vs 2023: ▼ **-1.6** Change vs 2017: ▲ **1.5**

Romania is an Emerging Innovator with performance at 34% of the EU average in 2024. Performance is below the average of the Emerging Innovators (48%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	34.0	1.5	-1.6
Human resources	26.9	-4.9	3.4
New doctorate graduates	34.5	-23.2	0.0
Population with tertiary education	0.0	0.0	0.0
Population involved in lifelong learning	48.3	18.3	13.2
Attractive research systems	37.7	24.6	1.3
International scientific co-publications	25.7	15.8	-1.0
Scientific publications among the top 10% most cited	59.6	33.8	3.1
Foreign doctorate students as a % of all doctorate students	14.3	12.8	-0.9
Digitalisation	92.8	36.9	5.4
Broadband penetration	144.4	73.2	9.7
Individuals with above basic overall digital skills	21.3	1.1	1.1
Finance and support	20.4	-6.5	-1.7
R&D expenditure in the public sector	8.2	-18.0	-1.6
Venture capital expenditures	38.5	10.0	-3.2
Direct and indirect government support of business R&D	12.2	-8.9	0.0
Firm investments	14.1	-7.9	-3.8
R&D expenditure in the business sector	16.6	5.2	-0.8
Non-R&D innovation expenditures	14.0	-33.5	-13.6
Innovation expenditures per person employed	11.5	4.5	3.2
Use of information technologies	28.7	10.6	5.7
Enterprises providing ICT training	21.8	21.7	18.5
Employed ICT specialists	35.3	0.0	-6.5
Innovators	2.7	3.1	0.4
SMEs introducing product innovations	5.9	6.3	0.8
SMEs introducing business process innovations	0.0	0.0	0.0
Linkages	6.9	-3.6	-2.6
Innovative SMEs collaborating with others	0.0	-7.0	-3.9
Public-private co-publications	38.6	19.6	-4.1
Job-to-job mobility of HRST	0.0	-11.8	0.0
Intellectual assets	35.2	4.4	2.5
PCT patent applications	22.4	-5.4	1.7
Trademark applications	63.1	19.3	4.5
Design applications	24.6	5.4	2.0
Employment impacts	9.3	-0.6	-1.8
Employment in knowledge-intensive activities	20.2	-1.2	-3.6
Employment in innovative enterprises	0.0	0.0	0.0
Sales impacts	62.3	2.1	-5.8
Exports of medium and high technology products	84.7	0.8	5.7
Knowledge-intensive services exports	56.1	13.0	-2.2
Sales of new-to-market and new-to-firm innovations	36.7	-10.3	-28.8
Environmental sustainability	47.8	-18.5	-13.1
Resource productivity	13.5	1.3	4.2
Air emissions by fine particulates	68.7	7.2	-0.9
Environment-related technologies	50.5	-71.4	-44.9

Relative strengths

- Broadband penetration
- Exports of medium and high technology products
- Air emissions by fine particulates

Relative weaknesses

- Population with tertiary education
- SMEs introducing business process innovations
- Innovative SMEs collaborating with others

Strong increases since 2017

- Broadband penetration
- Scientific publications among the top 10% most cited
- Enterprises providing ICT training

Strong decreases since 2017

- Environment-related technologies
- Non-R&D innovation expenditures
- New doctorate graduates

Strong increases since 2023

- Enterprises providing ICT training
- Population involved in lifelong learning
- Broadband penetration

Strong decreases since 2023

- Environment-related technologies
- Sales of new-to-market and new-to-firm innovations
- Non-R&D innovation expenditures

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**Emerging Innovator** ●Summary innovation index (relative to EU in 2017): **69.1**Rank: **29**

Change vs 2023: ▲ 4.4 Change vs 2017: ▲ 7.4

Serbia is an Emerging Innovator with performance at 62.8% of the EU average in 2024. Performance is above the average of the Emerging Innovators (48%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	62.8	7.4	4.4
Human resources	48.6	-4.9	0.0
New doctorate graduates	47.6	-11.6	0.0
Population with tertiary education	54.4	0.0	0.0
Population involved in lifelong learning	43.3	0.0	0.0
Attractive research systems	43.4	10.1	3.4
International scientific co-publications	51.9	30.0	-0.3
Scientific publications among the top 10% most cited	50.7	6.5	5.8
Foreign doctorate students as a % of all doctorate students	24.4	-0.1	1.5
Digitalisation	64.1	51.9	11.2
Broadband penetration	87.6	108.4	27.0
Individuals with above basic overall digital skills	31.4	-4.4	-4.4
Finance and support	42.7	14.0	-0.4
R&D expenditure in the public sector	68.9	-1.6	0.0
Venture capital expenditures	43.6	45.8	-1.1
Direct and indirect government support of business R&D	10.8	0.0	0.0
Firm investments	102.4	-8.9	-0.8
R&D expenditure in the business sector	26.4	12.1	-2.2
Non-R&D innovation expenditures	183.6	24.8	0.0
Innovation expenditures per person employed	108.5	-68.5	0.0
Use of information technologies	92.0	-32.5	19.0
Enterprises providing ICT training	98.9	-66.2	38.9
Employed ICT specialists	85.2	0.0	0.0
Innovators	135.7	57.4	57.4
SMEs introducing product innovations	171.0	58.8	58.8
SMEs introducing business process innovations	106.9	55.9	55.9
Linkages	77.8	36.9	6.5
Innovative SMEs collaborating with others	92.2	34.3	34.3
Public-private co-publications	50.1	15.7	-4.8
Job-to-job mobility of HRST	77.1	50.0	-11.8
Intellectual assets	21.9	2.1	-2.3
PCT patent applications	31.6	0.7	-5.3
Trademark applications	26.1	8.5	-1.4
Design applications	1.5	-1.4	0.5
Employment impacts	71.7	-0.4	0.0
Employment in knowledge-intensive activities	68.6	0.0	0.0
Employment in innovative enterprises	74.6	-0.6	0.0
Sales impacts	64.8	14.6	3.3
Exports of medium and high technology products	57.1	2.2	6.1
Knowledge-intensive services exports	56.6	17.0	2.6
Sales of new-to-market and new-to-firm innovations	90.1	31.5	0.0
Environmental sustainability	31.1	-15.8	-11.7
Resource productivity	9.3	0.5	4.8
Air emissions by fine particulates	8.5	-11.8	7.4
Environment-related technologies	81.8	-35.2	-52.7

Relative strengths

- Non-R&D innovation expenditures
- SMEs introducing product innovations
- Innovation expenditures per person employed

Relative weaknesses

- Design applications
- Air emissions by fine particulates
- Resource productivity

Strong increases since 2017

- Broadband penetration
- SMEs introducing product innovations
- SMEs introducing business process innovations

Strong decreases since 2017

- Innovation expenditures per person employed
- Enterprises providing ICT training
- Environment-related technologies

Strong increases since 2023

- SMEs introducing product innovations
- SMEs introducing business process innovations
- Enterprises providing ICT training

Strong decreases since 2023

- Environment-related technologies
- Job-to-job mobility of HRST
- PCT patent applications

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Innovation Leader ●

Summary innovation index (relative to EU in 2017): **146.2**

Rank: **3**

Change vs 2023: ▲ 0.2 Change vs 2017: ▲ 9.3

Sweden is an Innovation Leader with performance at 132.9% of the EU average in 2024. Performance is above the average of the Innovation Leaders (132.1%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	132.9	9.3	0.2
Human resources	173.1	-10.3	8.1
New doctorate graduates	139.4	-46.3	11.6
Population with tertiary education	159.7	28.7	10.1
Population involved in lifelong learning	227.8	0.0	0.0
Attractive research systems	166.1	10.1	-0.8
International scientific co-publications	239.3	55.6	-3.4
Scientific publications among the top 10% most cited	127.0	-12.9	0.2
Foreign doctorate students as a % of all doctorate students	161.3	19.3	-0.2
Digitalisation	138.4	1.8	1.8
Broadband penetration	137.7	0.0	0.0
Individuals with above basic overall digital skills	139.5	3.7	3.7
Finance and support	115.4	26.3	-6.3
R&D expenditure in the public sector	126.2	-9.9	-6.6
Venture capital expenditures	143.8	101.5	-9.0
Direct and indirect government support of business R&D	67.8	-8.5	-2.8
Firm investments	131.2	-18.6	-4.7
R&D expenditure in the business sector	159.0	6.8	0.0
Non-R&D innovation expenditures	73.5	-47.6	-7.7
Innovation expenditures per person employed	155.2	-15.5	-6.5
Use of information technologies	175.2	5.3	6.6
Enterprises providing ICT training	167.9	10.8	13.4
Employed ICT specialists	182.3	0.0	0.0
Innovators	132.3	44.4	-17.0
SMEs introducing product innovations	155.2	42.9	-8.3
SMEs introducing business process innovations	113.5	45.8	-25.3
Linkages	178.6	49.6	25.0
Innovative SMEs collaborating with others	239.2	181.1	157.7
Public-private co-publications	389.0	47.3	-14.8
Job-to-job mobility of HRST	41.6	-61.8	-70.6
Intellectual assets	123.2	-8.9	-4.3
PCT patent applications	143.1	0.0	0.0
Trademark applications	120.6	10.0	-5.3
Design applications	94.2	-35.3	-9.1
Employment impacts	153.9	25.6	2.7
Employment in knowledge-intensive activities	178.7	18.1	0.0
Employment in innovative enterprises	133.3	32.9	5.2
Sales impacts	93.3	14.8	1.6
Exports of medium and high technology products	87.2	1.1	8.4
Knowledge-intensive services exports	96.8	6.6	0.2
Sales of new-to-market and new-to-firm innovations	97.4	47.3	-7.7
Environmental sustainability	85.0	7.5	-1.1
Resource productivity	53.5	3.1	-2.2
Air emissions by fine particulates	106.8	11.7	5.2
Environment-related technologies	84.2	5.0	-8.9

Relative strengths

- Public-private co-publications
- International scientific co-publications
- Innovative SMEs collaborating with others

Relative weaknesses

- Job-to-job mobility of HRST
- Resource productivity
- Direct and indirect government support of business R&D

Strong increases since 2017

- Innovative SMEs collaborating with others
- Venture capital expenditures
- International scientific co-publications

Strong decreases since 2017

- Job-to-job mobility of HRST
- Non-R&D innovation expenditures
- New doctorate graduates

Strong increases since 2023

- Innovative SMEs collaborating with others
- Enterprises providing ICT training
- New doctorate graduates

Strong decreases since 2023

- Job-to-job mobility of HRST
- SMEs introducing business process innovations
- Public-private co-publications

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**Moderate Innovator**

Summary innovation index (relative to EU in 2017): **100.1**
Rank: **17**

Change vs 2023: **▲ 1.5** Change vs 2017: **▲ 4.6**

Slovenia is a Moderate Innovator with performance at 91% of the EU average in 2024. Performance is above the average of the Moderate Innovators (84.8%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	91.0	4.6	1.5
Human resources	113.8	-29.0	4.9
New doctorate graduates	100.0	-69.5	11.6
Population with tertiary education	86.9	0.0	0.0
Population involved in lifelong learning	160.1	0.0	0.0
Attractive research systems	102.0	37.3	-1.6
International scientific co-publications	152.0	51.0	-5.7
Scientific publications among the top 10% most cited	76.4	10.1	-3.9
Foreign doctorate students as a % of all doctorate students	96.7	84.5	7.0
Digitalisation	77.9	20.3	-1.2
Broadband penetration	88.1	44.3	1.3
Individuals with above basic overall digital skills	63.8	-3.8	-3.8
Finance and support	74.2	4.6	2.7
R&D expenditure in the public sector	78.7	13.1	8.2
Venture capital expenditures	45.6	27.2	-1.6
Direct and indirect government support of business R&D	104.7	-33.8	-0.4
Firm investments	59.5	-33.6	-5.9
R&D expenditure in the business sector	100.0	-14.3	-6.0
Non-R&D innovation expenditures	27.2	-73.1	-6.7
Innovation expenditures per person employed	46.0	-12.6	-5.4
Use of information technologies	103.5	-14.9	-1.6
Enterprises providing ICT training	137.4	3.2	20.4
Employed ICT specialists	70.6	-32.3	-22.6
Innovators	120.2	52.7	-1.5
SMEs introducing product innovations	151.7	92.1	5.7
SMEs introducing business process innovations	94.6	15.3	-8.2
Linkages	132.3	49.2	1.0
Innovative SMEs collaborating with others	103.1	6.8	-4.9
Public-private co-publications	245.1	68.0	-29.8
Job-to-job mobility of HRST	110.4	76.5	20.6
Intellectual assets	88.3	-10.3	6.1
PCT patent applications	76.0	-23.8	5.7
Trademark applications	118.5	19.2	0.6
Design applications	74.5	-15.8	10.9
Employment impacts	107.6	3.0	8.5
Employment in knowledge-intensive activities	102.2	-21.7	-15.7
Employment in innovative enterprises	112.5	25.6	30.7
Sales impacts	77.7	9.5	2.4
Exports of medium and high technology products	106.9	19.2	10.9
Knowledge-intensive services exports	37.8	6.2	-5.4
Sales of new-to-market and new-to-firm innovations	93.9	-1.1	-0.1
Environmental sustainability	79.9	13.6	2.3
Resource productivity	88.1	28.3	1.5
Air emissions by fine particulates	93.3	14.6	3.6
Environment-related technologies	54.1	0.6	1.3

Relative strengths

- Public-private co-publications
- Population involved in lifelong learning
- International scientific co-publications

Relative weaknesses

- Non-R&D innovation expenditures
- Knowledge-intensive services exports
- Venture capital expenditures

Strong increases since 2017

- SMEs introducing product innovations
- Foreign doctorate students as a % of all doctorate students
- Job-to-job mobility of HRST

Strong decreases since 2017

- Non-R&D innovation expenditures
- New doctorate graduates
- Direct and indirect government support of business R&D

Strong increases since 2023

- Employment in innovative enterprises
- Job-to-job mobility of HRST
- Enterprises providing ICT training

Strong decreases since 2023

- Public-private co-publications
- Employed ICT specialists
- Employment in knowledge-intensive activities

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**Emerging Innovator** ●Summary innovation index (relative to EU in 2017): **71.6**Rank: **28**

Change vs 2023: ▲ 1.5 Change vs 2017: ▲ 2.6

Slovakia is an Emerging Innovator with performance at 65.1% of the EU average in 2024. Performance is above the average of the Emerging Innovators (48%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	65.1	2.6	1.5
Human resources	78.6	-20.3	-9.6
New doctorate graduates	73.8	-34.8	-11.6
Population with tertiary education	82.0	1.8	4.2
Population involved in lifelong learning	80.5	-23.5	-23.5
Attractive research systems	50.7	19.2	3.9
International scientific co-publications	64.5	25.9	1.5
Scientific publications among the top 10% most cited	38.6	12.5	3.4
Foreign doctorate students as a % of all doctorate students	57.4	27.8	7.1
Digitalisation	66.8	18.8	5.9
Broadband penetration	60.2	33.9	7.8
Individuals with above basic overall digital skills	75.9	3.9	3.9
Finance and support	46.8	-9.2	6.5
R&D expenditure in the public sector	49.2	-67.2	3.3
Venture capital expenditures	44.7	13.5	1.2
Direct and indirect government support of business R&D	46.7	48.8	17.3
Firm investments	58.8	17.7	1.3
R&D expenditure in the business sector	36.1	18.0	3.8
Non-R&D innovation expenditures	100.7	16.2	-1.7
Innovation expenditures per person employed	44.3	18.7	1.6
Use of information technologies	71.3	-11.2	-4.1
Enterprises providing ICT training	59.7	-19.8	-5.1
Employed ICT specialists	82.3	-3.2	-3.2
Innovators	45.5	15.2	-1.2
SMEs introducing product innovations	48.4	15.2	6.4
SMEs introducing business process innovations	43.3	15.5	-7.8
Linkages	55.1	18.1	9.0
Innovative SMEs collaborating with others	71.5	12.0	20.4
Public-private co-publications	85.4	30.1	1.5
Job-to-job mobility of HRST	29.2	17.7	3.0
Intellectual assets	51.2	2.4	-1.3
PCT patent applications	40.5	-2.9	2.0
Trademark applications	80.3	21.5	2.3
Design applications	36.2	-5.5	-7.9
Employment impacts	56.4	12.0	8.3
Employment in knowledge-intensive activities	65.2	2.4	-1.2
Employment in innovative enterprises	49.1	20.9	17.1
Sales impacts	87.4	-2.9	8.6
Exports of medium and high technology products	115.4	3.8	9.4
Knowledge-intensive services exports	41.2	12.3	-7.9
Sales of new-to-market and new-to-firm innovations	115.3	-33.9	30.2
Environmental sustainability	90.9	-7.1	-6.2
Resource productivity	78.3	17.9	6.2
Air emissions by fine particulates	101.8	9.9	-1.6
Environment-related technologies	87.1	-52.3	-23.4

Relative strengths

- Exports of medium and high technology products
- Sales of new-to-market and new-to-firm innovations
- Air emissions by fine particulates

Relative weaknesses

- Job-to-job mobility of HRST
- R&D expenditure in the business sector
- Design applications

Strong increases since 2017

- Direct and indirect government support of business R&D
- Broadband penetration
- Public-private co-publications

Strong decreases since 2017

- R&D expenditure in the public sector
- Environment-related technologies
- New doctorate graduates

Strong increases since 2023

- Sales of new-to-market and new-to-firm innovations
- Innovative SMEs collaborating with others
- Direct and indirect government support of business R&D

Strong decreases since 2023

- Population involved in lifelong learning
- Environment-related technologies
- New doctorate graduates

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**Emerging Innovator** ●Summary innovation index (relative to EU in 2017): **56.9**Rank: **31**

Change vs 2023: ▲ 5.7 Change vs 2017: ▲ 6.1

Türkiye is an Emerging Innovator with performance at 51.7% of the EU average in 2024. Performance is above the average of the Emerging Innovators (48%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	51.7	6.1	5.7
Human resources	60.3	18.2	9.6
New doctorate graduates	34.5	23.2	11.6
Population with tertiary education	92.4	18.6	9.0
Population involved in lifelong learning	54.2	9.1	7.1
Attractive research systems	49.3	23.8	8.0
International scientific co-publications	14.3	14.8	2.7
Scientific publications among the top 10% most cited	76.1	29.3	5.4
Foreign doctorate students as a % of all doctorate students	39.5	20.4	18.9
Digitalisation	38.6	18.1	7.7
Broadband penetration	46.1	33.2	12.4
Individuals with above basic overall digital skills	28.3	3.3	3.3
Finance and support	62.4	31.2	3.3
R&D expenditure in the public sector	63.9	3.2	-5.0
Venture capital expenditures	11.9	9.0	1.0
Direct and indirect government support of business R&D	124.0	97.7	17.9
Firm investments	48.1	4.9	-5.0
R&D expenditure in the business sector	53.5	24.8	-3.8
Non-R&D innovation expenditures	51.1	-10.8	-10.8
Innovation expenditures per person employed	39.4	-0.7	-0.7
Use of information technologies	33.1	3.6	15.9
Enterprises providing ICT training	64.4	4.4	32.4
Employed ICT specialists	2.9	3.2	0.0
Innovators	72.6	-61.4	10.8
SMEs introducing product innovations	67.7	-66.6	0.7
SMEs introducing business process innovations	76.5	-56.6	20.3
Linkages	77.0	-21.1	-3.3
Innovative SMEs collaborating with others	73.2	-13.3	36.2
Public-private co-publications	13.5	8.5	0.3
Job-to-job mobility of HRST	106.2	-41.2	-38.2
Intellectual assets	30.7	6.4	1.6
PCT patent applications	57.1	13.5	3.6
Trademark applications	18.9	6.9	1.8
Design applications	1.8	-3.2	-0.8
Employment impacts	30.4	-19.4	7.1
Employment in knowledge-intensive activities	9.0	4.8	4.8
Employment in innovative enterprises	48.4	-41.8	9.0
Sales impacts	68.0	14.6	13.1
Exports of medium and high technology products	56.1	-3.3	0.0
Knowledge-intensive services exports	44.4	10.6	2.2
Sales of new-to-market and new-to-firm innovations	124.1	48.8	48.8
Environmental sustainability	43.3	8.9	1.6
Resource productivity	70.3	25.0	11.8
Air emissions by fine particulates	34.3	12.4	7.3
Environment-related technologies	31.1	-8.8	-14.7

Relative strengths

- Sales of new-to-market and new-to-firm innovations
- Direct and indirect government support of business R&D
- Job-to-job mobility of HRST

Relative weaknesses

- Design applications
- Employed ICT specialists
- Employment in knowledge-intensive activities

Strong increases since 2017

- Direct and indirect government support of business R&D
- Sales of new-to-market and new-to-firm innovations
- Broadband penetration

Strong decreases since 2017

- SMEs introducing product innovations
- SMEs introducing business process innovations
- Employment in innovative enterprises

Strong increases since 2023

- Sales of new-to-market and new-to-firm innovations
- Innovative SMEs collaborating with others
- Enterprises providing ICT training

Strong decreases since 2023

- Job-to-job mobility of HRST
- Environment-related technologies
- Non-R&D innovation expenditures

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UKRAINE

Emerging InnovatorSummary innovation index (relative to EU in 2017): **35.7**Rank: **38**Change vs 2023: **▲ 0.1** Change vs 2017: **▲ 3.7**

Ukraine is an Emerging Innovator with performance at 32.5% of the EU average in 2024. Performance is below the average of the Emerging Innovators (48%). Performance is increasing less than the EU (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	32.5	3.7	0.1
Human resources	29.8	-7.7	0
New doctorate graduates	27.8	-6.1	0
Population with tertiary education	N/A	N/A	N/A
Population involved in lifelong learning	N/A	N/A	N/A
Attractive research systems	13	11.2	3.9
International scientific co-publications	6.1	6.5	0
Scientific publications among the top 10% most cited	17.8	14.4	10.1
Foreign doctorate students as a % of all doctorate students	11.4	7.6	-6.9
Digitalisation	115.6	5.2	0
Broadband penetration	99.5	5.2	0
Individuals with above basic overall digital skills	N/A	N/A	N/A
Finance and support	28.4	12.6	-2
R&D expenditure in the public sector	4.9	-4.9	-4.9
Venture capital expenditures	64.6	45.6	0
Direct and indirect government support of business R&D	11	0	0
Firm investments	30.2	-1.1	-1.1
R&D expenditure in the business sector	9.7	-2.3	-2.3
Non-R&D innovation expenditures	54.2	0.2	0.2
Innovation expenditures per person employed	N/A	N/A	N/A
Use of information technologies	21.5	-3.9	0
Enterprises providing ICT training	21.8	-3.8	0
Employed ICT specialists	N/A	N/A	N/A
Innovators	0	0	0
SMEs introducing product innovations	0	0	0
SMEs introducing business process innovations	0	0	0
Linkages	21.4	4.4	0
Innovative SMEs collaborating with others	31.3	0	0
Public-private co-publications	14.3	14.2	0
Job-to-job mobility of HRST	N/A	N/A	N/A
Intellectual assets	20	2.7	1.2
PCT patent applications	34.4	-1.4	-0.6
Trademark applications	16.6	14.5	5.6
Design applications	0.5	-1.5	-0.3
Employment impacts	73.7	0	0
Employment in knowledge-intensive activities	80.1	0	0
Employment in innovative enterprises	N/A	N/A	N/A
Sales impacts	34.8	6.1	0.5
Exports of medium and high technology products	8.6	-19.4	-5.6
Knowledge-intensive services exports	81.8	37.9	5.5
Sales of new-to-market and new-to-firm innovations	3.1	3.1	3.1
Environmental sustainability	71.5	-10.7	-3
Resource productivity	N/A	N/A	N/A
Air emissions by fine particulates	N/A	N/A	N/A
Environment-related technologies	78.3	-11.5	-3.3

Relative strengths

- Broadband penetration
- Knowledge-intensive services exports
- Employment in knowledge-intensive activities

Relative weaknesses

- SMEs introducing product innovations
- SMEs introducing business process innovations
- Design applications

Strong increases since 2017

- Venture capital expenditures
- Knowledge-intensive services exports
- Trademark applications

Strong decreases since 2017

- Exports of medium and high technology products
- Environment-related technologies
- New doctorate graduates

Strong increases since 2023

- Scientific publications among the top 10% most cited
- Trademark applications
- Knowledge-intensive services exports

Strong decreases since 2023

- Foreign doctorate students as a % of all doctorate students
- Exports of medium and high technology products
- R&D expenditure in the public sector

Footnote: The first data column shows scores relative to the EU in 2024, with colour codes indicating performance levels. The subsequent columns show performance changes over time, with scores relative to the EU in 2017, coloured in purple for positive change and red for negative change. As reference years differ between the first column (2024) and the last two columns (2017), scores cannot be directly compared or subtracted across these columns.



UNITED KINGDOM

Strong Innovator ●Summary innovation index (relative to EU in 2017): **126.3**Rank: **9**

Change vs 2023: ▼ -2.1 Change vs 2017: ▼ -0.1

United Kingdom is a Strong Innovator with performance at 114.8% of the EU average in 2024. Performance is above the average of the Strong Innovators (111.3%). Performance is decreasing, compared to the EU growth of (+10%).

Indicator	Performance relative to the EU in 2024	Performance change 2017-2024	Performance change 2023-2024
SUMMARY INNOVATION INDEX	114.8	-0.1	-2.1
Human resources	136.9	-3.4	0
New doctorate graduates	155.8	-21.2	0
Population with tertiary education	134.2	13.8	0
Population involved in lifelong learning	116.9	4.1	0
Attractive research systems	162	9.6	0.5
International scientific co-publications	159.7	57	0
Scientific publications among the top 10% most cited	148	-0.8	0.7
Foreign doctorate students as a % of all doctorate students	186.5	-11.4	0
Digitalisation	31.4	0	0
Broadband penetration	27	0	0
Individuals with above basic overall digital skills	N/A	N/A	N/A
Finance and support	132.6	29.5	0
R&D expenditure in the public sector	67.2	0	0
Venture capital expenditures	150.6	72.5	0
Direct and indirect government support of business R&D	187.8	22.3	0
Firm investments	84.4	5.8	13
R&D expenditure in the business sector	79.9	7.6	0
Non-R&D innovation expenditures	101.3	9.1	38.6
Innovation expenditures per person employed	73.7	0	0
Use of information technologies	115.8	-5.3	0
Enterprises providing ICT training	107.5	-21	0
Employed ICT specialists	123.5	9.7	0
Innovators	99.1	0.7	0
SMEs introducing product innovations	110.3	-14.1	0
SMEs introducing business process innovations	89.9	14.7	0
Linkages	215.5	21.3	0
Innovative SMEs collaborating with others	239.2	0	0
Public-private co-publications	219.3	55.9	0
Job-to-job mobility of HRST	193.7	23.5	0
Intellectual assets	71.7	-21.5	-7.2
PCT patent applications	96.8	-4.2	2.9
Trademark applications	69.9	-25.7	-10.4
Design applications	33.6	-41	-17.8
Employment impacts	141.3	14	-3.4
Employment in knowledge-intensive activities	172.1	38.7	0
Employment in innovative enterprises	115.6	-8.5	-6.3
Sales impacts	83.8	-29.3	-18.5
Exports of medium and high technology products	81.6	-11.1	0
Knowledge-intensive services exports	100.8	2.8	-10.1
Sales of new-to-market and new-to-firm innovations	60.7	-102.2	-59.4
Environmental sustainability	111.3	5.7	0.3
Resource productivity	188.1	37.9	0
Air emissions by fine particulates	85.1	3.5	0
Environment-related technologies	76.6	-16.9	0.6

Relative strengths

- Innovative SMEs collaborating with others
- Public-private co-publications
- Job-to-job mobility of HRST

Relative weaknesses

- Broadband penetration
- Design applications
- Sales of new-to-market and new-to-firm innovations

Strong increases since 2017

- Venture capital expenditures
- International scientific co-publications
- Public-private co-publications

Strong decreases since 2017

- Sales of new-to-market and new-to-firm innovations
- Design applications
- Trademark applications

Strong increases since 2023

- Non-R&D innovation expenditures
- PCT patent applications
- Scientific publications among the top 10% most cited

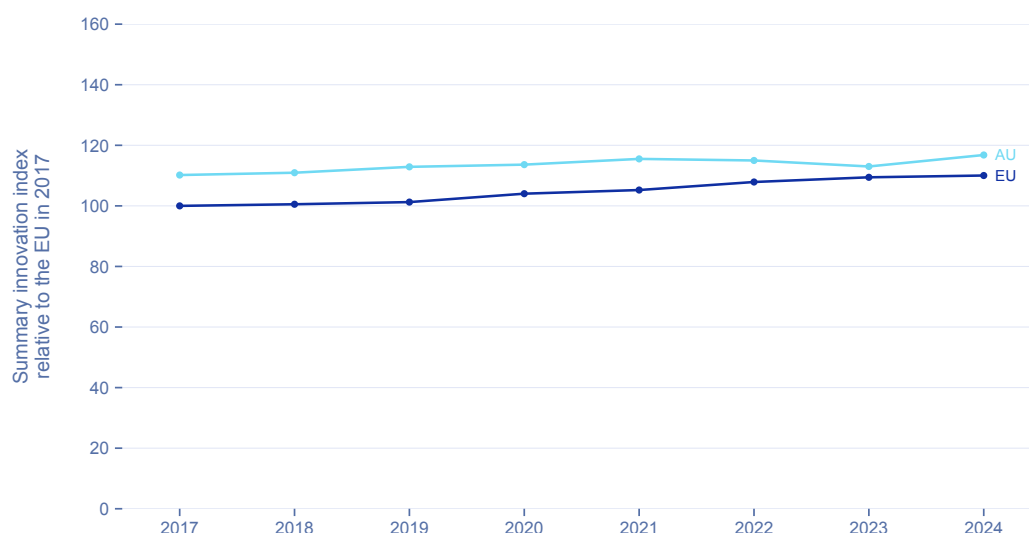
Strong decreases since 2023

- Sales of new-to-market and new-to-firm innovations
- Design applications
- Trademark applications

Footnote: The first data column shows scores relative to the EU in 2024, with colour codes indicating performance levels. The subsequent columns show performance changes over time, with scores relative to the EU in 2017, coloured in purple for positive change and red for negative change. As reference years differ between the first column (2024) and the last two columns (2017), scores cannot be directly compared or subtracted across these columns.



Australia is the fourth most innovative global competitor, classified as a Strong Innovator with a performance level at 106.2% of that of the EU in 2024. Australia has improved the most from 2023 to 2024 (+3.8%-points), and has shown good improvement since 2017 (+6.6%-points). The country's strengths lie in *Innovative SMEs collaborating with others*, *Public-private co-publications*, and *Trademark applications*. Australia's weaknesses are in the *Exports of medium and high technology products*, *Knowledge-intensive services exports*, and *Environment-related technologies*. The country's relative strengths over other global competitors can be seen in Figures 34-37.



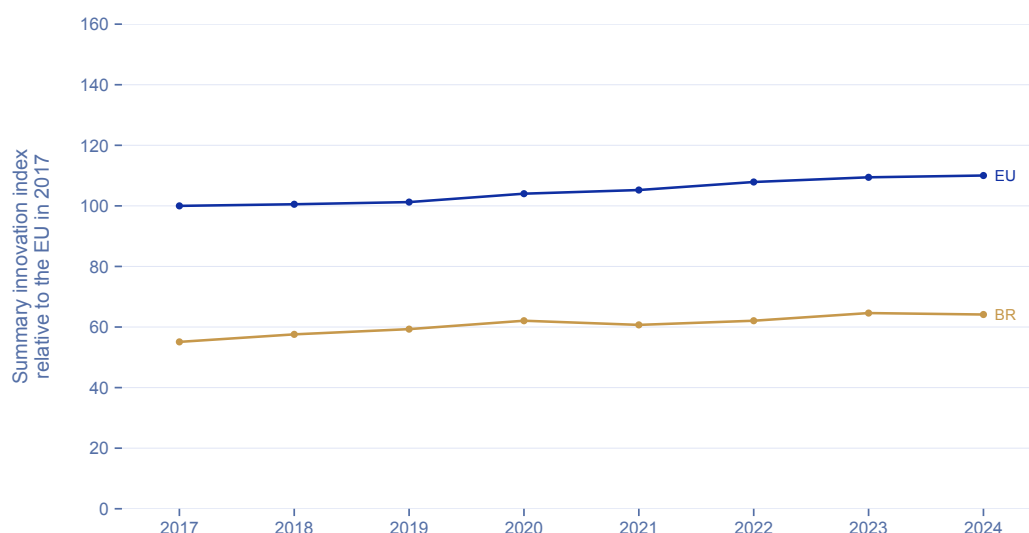
Performance in 2024 relative to the EU in 2024 and change in performance between 2017 and 2024

Australia	2024	Change	Structural differences	AU	EU
New doctorate graduates	135.5	7.8	Performance and structure of the economy		
Population with tertiary education	143.6	35.7	GDP per capita	58952.8	52102.6
International scientific co-publications	173.9	20.4	Average annual GDP growth	3.2	4.7
Scientific publications among the top 10% most cited	154.4	-8.2	Employment share Agriculture	2.5	4.1
R&D expenditure in the public sector	101.3	-22.4	Employment share Industry	18.9	24.7
Direct and indirect government support of business R&D	81.9	-44.1	Employment share Services	78.6	71.1
R&D expenditure in the business sector	61.0	-11.9	Employment share Knowledge-intensive services	5.5	14.9
Employed ICT specialists	97.5	20.1	Business and entrepreneurship		
SMEs introducing product innovations	100.1	-70.2	Total early-stage Entrepreneurial Activity (TEA)		6.8
SMEs introducing business process innovations	156.9	74.3	FDI net inflows	2.4	1.9
Innovative SMEs collaborating with others	327.5	-143.8	Top R&D spending enterprises per 10 million population	4	8.4
Public-private co-publications	188.3	29.1	Top R&D spending enterprises, average R&D spending	321.4	528
PCT patent applications	72.8	-5.0	Number of unicorns	9	107
Trademark applications	475.9	227.5	Buyer sophistication	3.9	3.6
Design applications	106.4	14.9	Governance and policy framework		
Exports of medium and high technology products	3.7	-6.9	Corruption Perceptions Index	74.3	63.6
Knowledge-intensive services exports	32.0	23.4	Basic-school entrepreneurial education and training		2.6
Air emissions by fine particulates	114.7	-13.5	Government procurement of advanced technology products	3.3	3.4
Environment-related technologies	49.3	-8.0	Rule of law	1.6	1
			Demography		
			Population size	25.8	447.4
			Average annual population growth	0.7	0
			Population density	3.3	112

Footnote: The top three scores and the three largest improvements are highlighted in purple. The bottom three scores and the three smallest improvements (or largest decreases) are highlighted in red.



Brazil is a global Emerging Innovator, with a performance level at 58.3% of that of the EU in 2024. Brazil's performance has been increasing significantly since 2017 (+9.0%-points), but has decreased in the last year (-0.5%-points). The country's strengths lie in *Trademark applications*, *SMEs introducing business process innovations*, and *Innovative SMEs collaborating with others*. Brazil's weaknesses are in *Public-private co-publications*, *PCT patent applications*, and *New doctorate graduates*. The country's relative strengths over other global competitors can be seen in Figures 34-37.



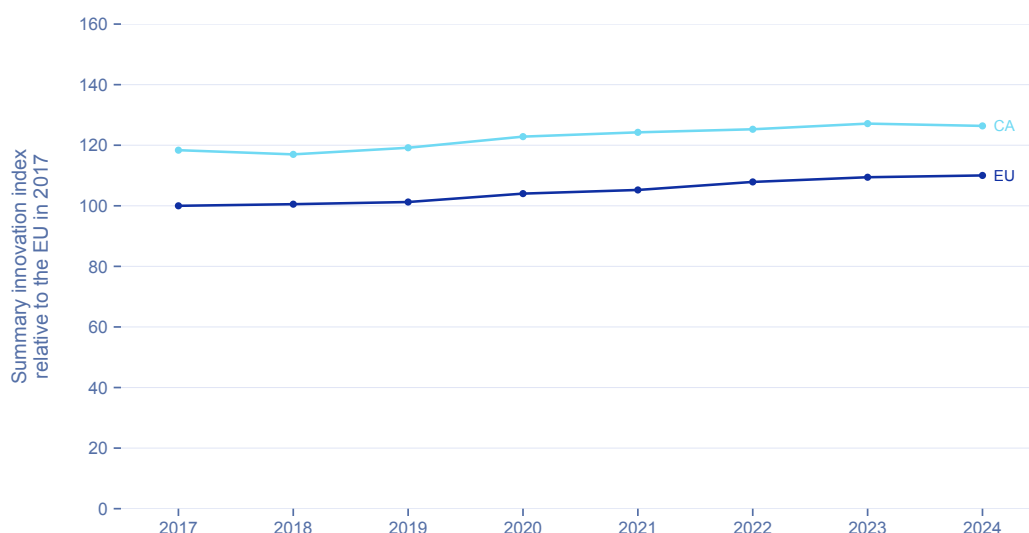
Performance in 2024 relative to the EU in 2024 and change in performance between 2017 and 2024

Brazil	2024	Change	Structural differences	BR	EU
New doctorate graduates	18.9	0.8	Performance and structure of the economy		
Population with tertiary education	41.0	24.4	GDP per capita	17447.5	52102.6
International scientific co-publications	37.4	17.5	Average annual GDP growth	3.9	4.7
Scientific publications among the top 10% most cited	20.1	-2.9	Employment share Agriculture	9.2	4.1
R&D expenditure in the public sector			Employment share Industry	20.5	24.7
Direct and indirect government support of business R&D	44.7	-14.7	Employment share Services	70.3	71.1
R&D expenditure in the business sector			Employment share Knowledge-intensive services	10.7	14.9
Employed ICT specialists	32.3	12.3	Business and entrepreneurship		
SMEs introducing product innovations	58.6	-10.2	Total early-stage Entrepreneurial Activity (TEA)	19.9	6.8
SMEs introducing business process innovations	183.4	-47.4	FDI net inflows	3.1	1.9
Innovative SMEs collaborating with others	118.8	-112.2	Top R&D spending enterprises per 10 million population	0.2	8.4
Public-private co-publications	9.6	4.0	Top R&D spending enterprises, average R&D spending	105.1	528
PCT patent applications	16.7	1.9	Number of unicorns	17	107
Trademark applications	409.5	359.4	Buyer sophistication	3.4	3.6
Design applications	35.9	2.3	Governance and policy framework		
Exports of medium and high technology products	23.3	-12.9	Corruption Perceptions Index	37.3	63.6
Knowledge-intensive services exports	99.6	7.2	Basic-school entrepreneurial education and training	1.9	2.6
Air emissions by fine particulates	100.5	-0.9	Government procurement of advanced technology products	2.8	3.4
Environment-related technologies	55.7	11.9	Rule of law	-0.3	1
			Demography		
			Population size	214.3	447.4
			Average annual population growth	0.5	0
			Population density	25.5	112

Footnote: The top three scores and the three largest improvements are highlighted in purple. The bottom three scores and the three smallest improvements (or largest decreases) are highlighted in red.



Canada is the second most innovative global competitor, classified as a Strong Innovator with a performance level at 114.9% of that of the EU in 2024. Despite a decrease in performance compared to 2023 (-0.8%-points), Canada has shown good improvement since 2017 (+8.0%-points). The country's strengths lie in *Trademark applications*, *Innovative SMEs collaborating with others*, and *SMEs introducing business process innovations*. Canada's weaknesses are the *Exports of medium and high technology products*, *Environment-related technologies*, and *R&D expenditure in the business sector*. The country's relative strengths over other global competitors can be seen in Figures 34-37.



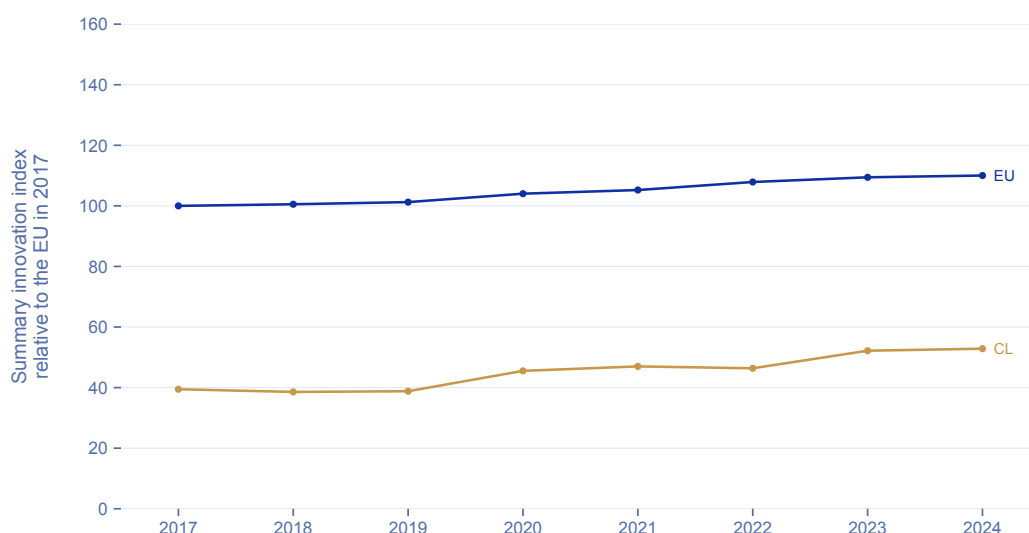
Performance in 2024 relative to the EU in 2024 and change in performance between 2017 and 2024

Canada	2024	Change	Structural differences	CA	EU
New doctorate graduates	86.9	-6.2	Performance and structure of the economy		
Population with tertiary education	178.3	39.7	GDP per capita	55131.9	52102.6
International scientific co-publications	171.7	51.7	Average annual GDP growth	4.6	4.7
Scientific publications among the top 10% most cited	116.9	-26.3	Employment share Agriculture	1.4	4.1
R&D expenditure in the public sector	112.3	-4.8	Employment share Industry	19.2	24.7
Direct and indirect government support of business R&D	119.6	0.7	Employment share Services	79.4	71.1
R&D expenditure in the business sector	75.8	11.6	Employment share Knowledge-intensive services	9	14.9
Employed ICT specialists			Business and entrepreneurship		
SMEs introducing product innovations	137.9	-29.5	Total early-stage Entrepreneurial Activity (TEA)	18.8	6.8
SMEs introducing business process innovations	199.6	-15.0	FDI net inflows	2.3	1.9
Innovative SMEs collaborating with others	255.0	-234.2	Top R&D spending enterprises per 10 million population	7.2	8.4
Public-private co-publications	184.6	44.9	Top R&D spending enterprises, average R&D spending	205.1	528
PCT patent applications	88.6	-0.4	Number of unicorns	21	107
Trademark applications	291.4	91.6	Buyer sophistication	4.4	3.6
Design applications	90.1	25.4	Governance and policy framework		
Exports of medium and high technology products	51.0	-11.1	Corruption Perceptions Index	74.7	63.6
Knowledge-intensive services exports	87.3	10.7	Basic-school entrepreneurial education and training	3.7	2.6
Air emissions by fine particulates	123.1	-6.4	Government procurement of advanced technology products	3.4	3.4
Environment-related technologies	63.3	-23.0	Rule of law	1.6	1
			Demography		
			Population size	38.4	447.4
			Average annual population growth	1.2	0
			Population density	4.3	112

Footnote: The top three scores and the three largest improvements are highlighted in purple. The bottom three scores and the three smallest improvements (or largest decreases) are highlighted in red.



Chile is a global Emerging Innovator, with a performance level at 48.0% of that of the EU in 2024. Chile's performance has been increasing significantly since 2017 (+13.3%-points), and has continued to do so in the last year (+0.6%-points). The country's strengths lie in *Trademark applications*, *Innovative SMEs collaborating with others*, and *Environment-related technologies*. Chile's weaknesses are in *Design applications*, *Exports of medium and high technology products*, and *Direct and indirect government support of business R&D*. The country's relative strengths over other global competitors can be seen in Figures 34-37.



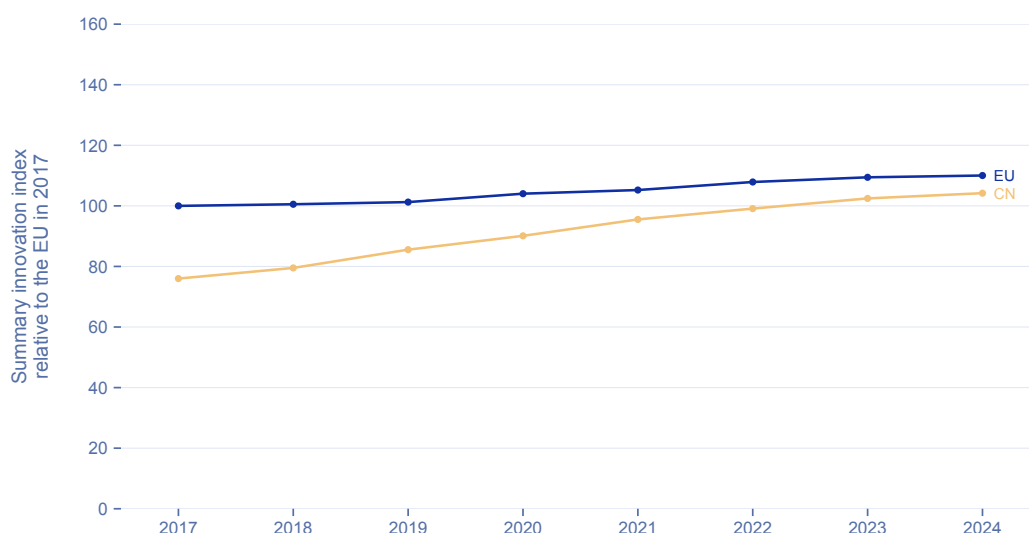
Performance in 2024 relative to the EU in 2024 and change in performance between 2017 and 2024

Chile	2024	Change	Structural differences	CL	EU
New doctorate graduates	12.8	2.0	Performance and structure of the economy		
Population with tertiary education	95.3	41.9	GDP per capita	28683.2	52102.6
International scientific co-publications	91.0	38.7	Average annual GDP growth	7	4.7
Scientific publications among the top 10% most cited	32.7	-9.2	Employment share Agriculture	6.7	4.1
R&D expenditure in the public sector	3.5	3.5	Employment share Industry	22.6	24.7
Direct and indirect government support of business R&D	1.8	-0.3	Employment share Services	70.7	71.1
R&D expenditure in the business sector	3.5	-0.7	Employment share Knowledge-intensive services	9.1	14.9
Employed ICT specialists	57.6	16.3	Business and entrepreneurship		
SMEs introducing product innovations	22.6	24.3	Total early-stage Entrepreneurial Activity (TEA)	29.3	6.8
SMEs introducing business process innovations	33.3	41.8	FDI net inflows	5.5	1.9
Innovative SMEs collaborating with others	157.0	215.8	Top R&D spending enterprises per 10 million population		8.4
Public-private co-publications	26.6	15.5	Top R&D spending enterprises, average R&D spending		528
PCT patent applications	30.2	4.7	Number of unicorns	2	107
Trademark applications	494.8	254.7	Buyer sophistication	3.9	3.6
Design applications	0.0	-10.0	Governance and policy framework		
Exports of medium and high technology products	0.0	-3.5	Corruption Perceptions Index	66.7	63.6
Knowledge-intensive services exports	55.3	19.5	Basic-school entrepreneurial education and training	2.5	2.6
Air emissions by fine particulates	64.6	-2.9	Government procurement of advanced technology products	2.9	3.4
Environment-related technologies	140.1	-10.5	Rule of law	0.8	1
			Demography		
			Population size	19.5	447.4
			Average annual population growth	0.8	0
			Population density	25.9	112

Footnote: The top three scores and the three largest improvements are highlighted in purple. The bottom three scores and the three smallest improvements (or largest decreases) are highlighted in red.



China is a global Moderate Innovator, with a performance level at 94.7% of that of the EU in 2024. China has shown the most significant improvement since 2017 (+28.2%-points) and has continued to improve after 2023 (+1.7%-points). The country's strengths lie in *Trademark applications*, *Design applications*, and *R&D expenditure in the business sector*. China's weaknesses are in *Environment-related technologies*, *International scientific co-publications*, and *Air emissions by fine particulates*. The country's relative strengths over other global competitors can be seen in Figures 34–37.



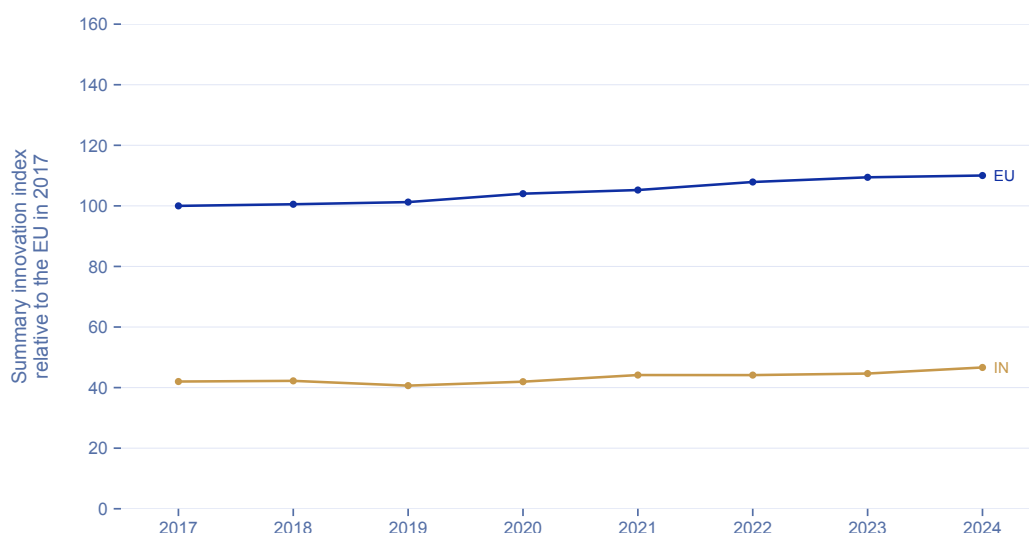
Performance in 2024 relative to the EU in 2024 and change in performance between 2017 and 2024

China	2024	Change	Structural differences	CN	EU
New doctorate graduates			Performance and structure of the economy		
Population with tertiary education	80.5	6.7	GDP per capita	20265.9	52102.6
International scientific co-publications	35.3	22.8	Average annual GDP growth	5.7	4.7
Scientific publications among the top 10% most cited	130.8	59.1	Employment share Agriculture	23.1	4.1
R&D expenditure in the public sector	72.4	19.0	Employment share Industry	31.9	24.7
Direct and indirect government support of business R&D	65.2	-4.0	Employment share Services	44.9	71.1
R&D expenditure in the business sector	134.8	21.0	Employment share Knowledge-intensive services	27.2	14.9
Employed ICT specialists			Business and entrepreneurship		
SMEs introducing product innovations			Total early-stage Entrepreneurial Activity (TEA)	6.4	6.8
SMEs introducing business process innovations			FDI net inflows	1.6	1.9
Innovative SMEs collaborating with others			Top R&D spending enterprises per 10 million population	4.6	8.4
Public-private co-publications	49.0	41.7	Top R&D spending enterprises, average R&D spending	286	528
PCT patent applications	114.8	43.2	Number of unicorns	168	107
Trademark applications	862.1	559.7	Buyer sophistication	4.3	3.6
Design applications	311.9	50.7	Governance and policy framework		
Exports of medium and high technology products	92.2	3.3	Corruption Perceptions Index	44	63.6
Knowledge-intensive services exports	97.1	34.0	Basic-school entrepreneurial education and training		2.6
Air emissions by fine particulates	37.5	39.1	Government procurement of advanced technology products	4.4	3.4
Environment-related technologies	29.1	-14.7	Rule of law	0	1
			Demography		
			Population size	1411.9	447.4
			Average annual population growth	0	0
			Population density	150.2	112

Footnote: The top three scores and the three largest improvements are highlighted in purple. The bottom three scores and the three smallest improvements (or largest decreases) are highlighted in red.



India is a global Emerging Innovator, with a performance level at 42.4% of that of the EU in 2024. India's performance has been increasing since 2017 (+4.6%-points), and has continued to do so in the last year (+2.0%-points). The country's strengths lie in *Innovative SMEs collaborating with others*, *Trademark applications* and *Knowledge-intensive services exports*. India's weaknesses are in *New doctorate graduates*, *Public-private co-publications*, and *International scientific co-publications*. The country's relative strengths over other global competitors can be seen in Figures 34-37.



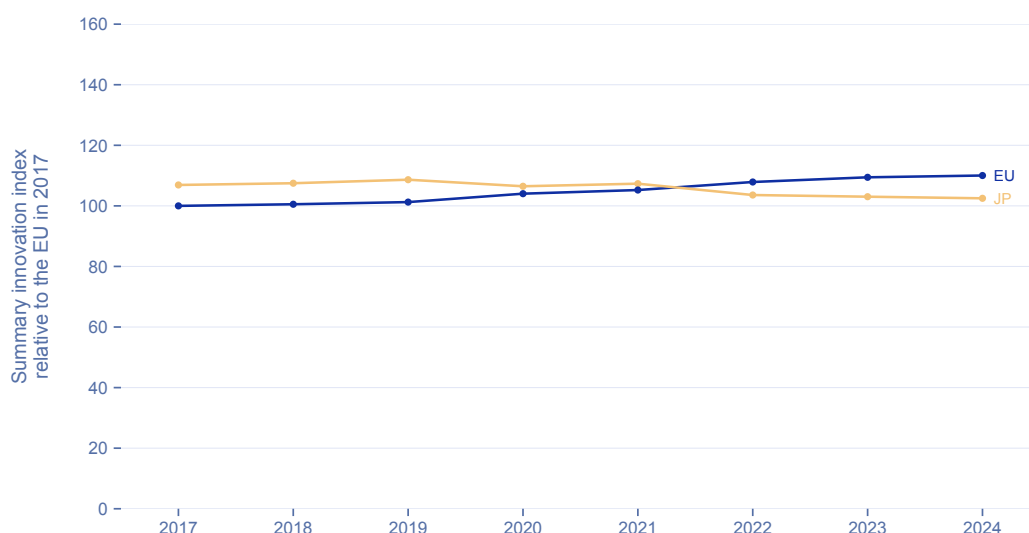
Performance in 2024 relative to the EU in 2024 and change in performance between 2017 and 2024

India	2024	Change	Structural differences	IN	EU
New doctorate graduates	1.3	0.9	Performance and structure of the economy		
Population with tertiary education	32.4	11.8	GDP per capita	8068.5	52102.6
International scientific co-publications	11.5	15.4	Average annual GDP growth	8.1	4.7
Scientific publications among the top 10% most cited	69.6	25.8	Employment share Agriculture	43.9	4.1
R&D expenditure in the public sector	44.3	-5.7	Employment share Industry	24.8	24.7
Direct and indirect government support of business R&D			Employment share Services	31.4	71.1
R&D expenditure in the business sector	22.0	-3.3	Employment share Knowledge-intensive services	14	14.9
Employed ICT specialists			Business and entrepreneurship		
SMEs introducing product innovations	36.4	-7.8	Total early-stage Entrepreneurial Activity (TEA)	12.6	6.8
SMEs introducing business process innovations	16.4	-4.2	FDI net inflows	1.8	1.9
Innovative SMEs collaborating with others	551.0	-506.0	Top R&D spending enterprises per 10 million population	0.2	8.4
Public-private co-publications	2.3	2.7	Top R&D spending enterprises, average R&D spending	207	528
PCT patent applications	25.3	1.8	Number of unicorns	71	107
Trademark applications	84.5	62.8	Buyer sophistication	4.4	3.6
Design applications	38.5	15.2	Governance and policy framework		
Exports of medium and high technology products	45.6	1.5	Corruption Perceptions Index	39.7	63.6
Knowledge-intensive services exports	108.9	8.6	Basic-school entrepreneurial education and training	5.2	2.6
Air emissions by fine particulates	11.7	12.2	Government procurement of advanced technology products	4.3	3.4
Environment-related technologies	29.7	-37.2	Rule of law	0	1
			Demography		
			Population size	1407	447.4
			Average annual population growth	0.7	0
			Population density	469.4	112

Footnote: The top three scores and the three largest improvements are highlighted in purple. The bottom three scores and the three smallest improvements (or largest decreases) are highlighted in red.



Japan is a global Moderate Innovator, with a performance level at 93.2% of that of the EU in 2024. Japan's performance has been decreasing since 2017 (-4.4%-points), including a further decline from 2023 (-0.5%-points). The country's strengths lie in *PCT patent applications*, *Trademark applications*, and *R&D expenditure in the business sector*. Japan's weaknesses are in *Scientific publications among the top 10% most cited*, *SMEs introducing product innovations*, and *Environment-related technologies*. The country's relative strengths over other global competitors can be seen in Figures 34-37.



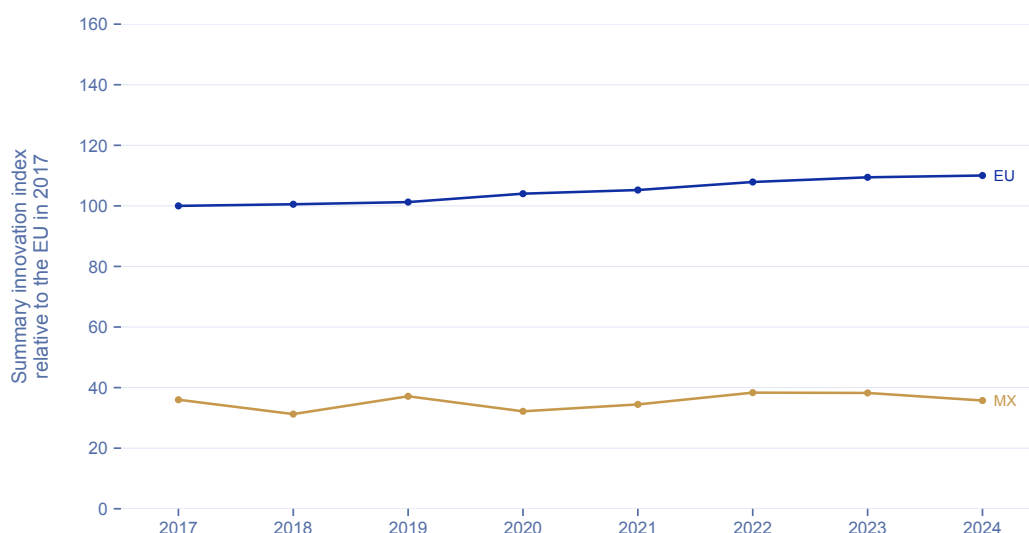
Performance in 2024 relative to the EU in 2024 and change in performance between 2017 and 2024

Japan	2024	Change	Structural differences	JP	EU
New doctorate graduates	47.4	-2.1	Performance and structure of the economy		
Population with tertiary education	174.2	33.7	GDP per capita	44507.8	52102.6
International scientific co-publications	64.5	20.7	Average annual GDP growth	1.8	4.7
Scientific publications among the top 10% most cited	24.2	-13.0	Employment share Agriculture	3.1	4.1
R&D expenditure in the public sector	91.5	-8.4	Employment share Industry	23.8	24.7
Direct and indirect government support of business R&D	59.9	-27.6	Employment share Services	73.1	71.1
R&D expenditure in the business sector	187.5	-10.1	Employment share Knowledge-intensive services	20	14.9
Employed ICT specialists	104.7	31.7	Business and entrepreneurship		
SMEs introducing product innovations	31.7	-17.3	Total early-stage Entrepreneurial Activity (TEA)	6.3	6.8
SMEs introducing business process innovations	60.3	-38.5	FDI net inflows	1	1.9
Innovative SMEs collaborating with others	146.3	-1,337.4	Top R&D spending enterprises per 10 million population	20	8.4
Public-private co-publications	84.9	11.5	Top R&D spending enterprises, average R&D spending	451.8	528
PCT patent applications	211.0	16.7	Number of unicorns	7	107
Trademark applications	201.7	142.8	Buyer sophistication	5	3.6
Design applications	111.9	19.8	Governance and policy framework		
Exports of medium and high technology products	114.3	-5.9	Corruption Perceptions Index	73	63.6
Knowledge-intensive services exports	109.8	22.3	Basic-school entrepreneurial education and training	2.3	2.6
Air emissions by fine particulates	96.8	-5.6	Government procurement of advanced technology products	4	3.4
Environment-related technologies	44.1	-57.0	Rule of law	1.5	1
			Demography		
			Population size	125.7	447.4
			Average annual population growth	-0.5	0
			Population density	346.2	112

Footnote: The top three scores and the three largest improvements are highlighted in purple. The bottom three scores and the three smallest improvements (or largest decreases) are highlighted in red.



Mexico is a global Emerging Innovator, with a performance level at 32.5% of that of the EU in 2024. Mexico's performance has been decreasing since 2017 (-0.3%-points), with a significant decline observed in the last year (-2.5%-points). The country's strengths lie *Trademark applications, Exports of medium and high technology products, and Air emissions by fine particulates*. Mexico's weaknesses are in *R&D expenditure in the business sector, PCT patent applications, and Knowledge-intensive services exports*. The country's relative strengths over other global competitors can be seen in Figures 34-37.



Performance in 2024 relative to the EU in 2024 and change in performance between 2017 and 2024

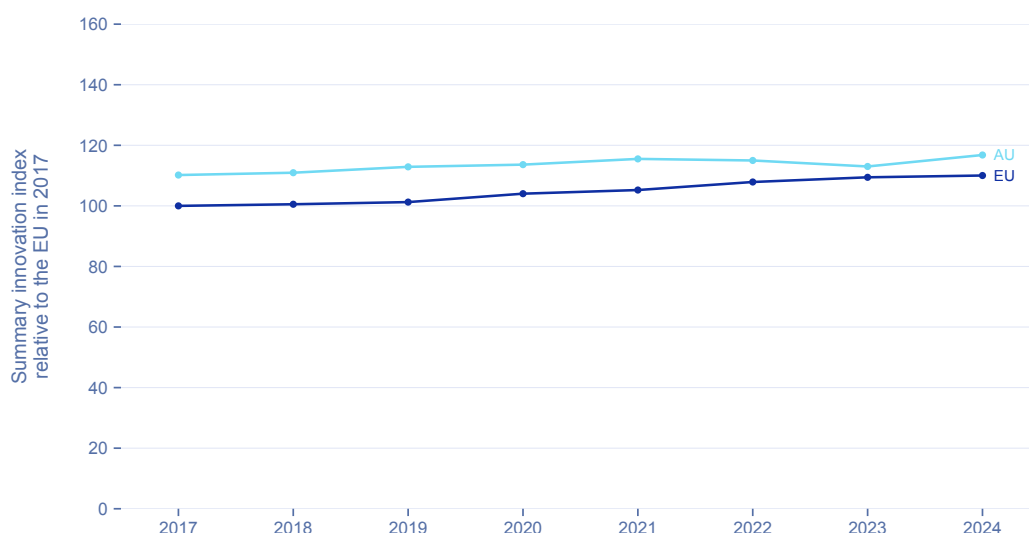
Mexico	2024	Change	Structural differences	MX	EU
New doctorate graduates	11.4	4.0	Performance and structure of the economy		
Population with tertiary education	53.7	25.1	GDP per capita	21498.5	52102.6
International scientific co-publications	27.8	14.1	Average annual GDP growth	4.9	4.7
Scientific publications among the top 10% most cited	12.3	6.3	Employment share Agriculture	13	4.1
R&D expenditure in the public sector	12.6	-18.3	Employment share Industry	24.6	24.7
Direct and indirect government support of business R&D	4.0	-4.3	Employment share Services	62.5	71.1
R&D expenditure in the business sector	0.0	-0.3	Employment share Knowledge-intensive services	20.8	14.9
Employed ICT specialists	2.5	1.9	Business and entrepreneurship		
SMEs introducing product innovations			Total early-stage Entrepreneurial Activity (TEA)	14.9	6.8
SMEs introducing business process innovations			FDI net inflows	2.7	1.9
Innovative SMEs collaborating with others			Top R&D spending enterprises per 10 million population	0.1	8.4
Public-private co-publications	4.5	2.3	Top R&D spending enterprises, average R&D spending	124.1	528
PCT patent applications	0.2	-5.2	Number of unicorns	8	107
Trademark applications	248.3	174.2	Buyer sophistication	3.4	3.6
Design applications	41.0	10.1	Governance and policy framework		
Exports of medium and high technology products	106.0	-3.8	Corruption Perceptions Index	31	63.6
Knowledge-intensive services exports	0.3	-5.7	Basic-school entrepreneurial education and training	2	2.6
Air emissions by fine particulates	90.4	12.2	Government procurement of advanced technology products	3.1	3.4
Environment-related technologies	36.4	-69.1	Rule of law	-0.8	1
			Demography		
			Population size	126.7	447.4
			Average annual population growth	0.6	0
			Population density	64.8	112

Footnote: The top three scores and the three largest improvements are highlighted in purple. The bottom three scores and the three smallest improvements (or largest decreases) are highlighted in red.



SOUTH AFRICA

South Africa is a global Emerging Innovator, with a performance level at 36.2% of that of the EU in 2024. South Africa's performance has been increasing since 2017 (+3.7%-points), albeit relatively slowly, and has decreased in the last year (-1.8%-points). The country's strengths lie in *Trademark applications*, *Air emissions by fine particulates*, and *International scientific co-publications*. South Africa's weaknesses are in *New doctorate graduates*, *Direct and indirect government support of business R&D*, and *R&D expenditure in the business sector*. The country's relative strengths over other global competitors can be seen in Figures 34-37.



Performance in 2024 relative to the EU in 2024 and change in performance between 2017 and 2024

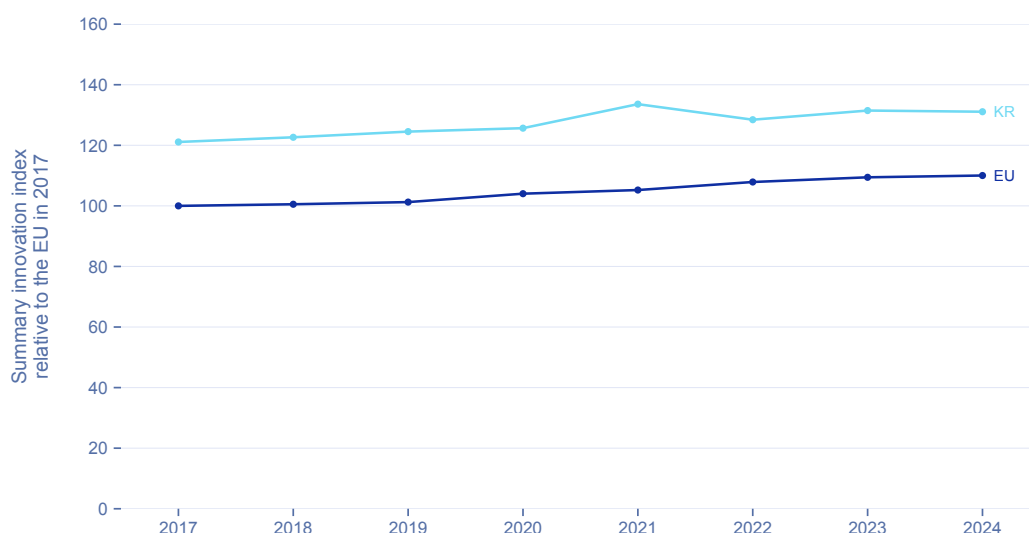
South Africa	2024	Change	Structural differences	ZA	EU
New doctorate graduates	2.8	1.1	Performance and structure of the economy		
Population with tertiary education	9.4	10.3	GDP per capita	14188.6	52102.6
International scientific co-publications	59.8	31.6	Average annual GDP growth	3.3	4.7
Scientific publications among the top 10% most cited	52.3	-9.1	Employment share Agriculture	20.7	4.1
R&D expenditure in the public sector	40.8	4.3	Employment share Industry	17.7	24.7
Direct and indirect government support of business R&D	3.2	-6.5	Employment share Services	61.7	71.1
R&D expenditure in the business sector	8.2	-12.0	Employment share Knowledge-intensive services	12	14.9
Employed ICT specialists			Business and entrepreneurship		
SMEs introducing product innovations			Total early-stage Entrepreneurial Activity (TEA)	12.4	6.8
SMEs introducing business process innovations			FDI net inflows	4.3	1.9
Innovative SMEs collaborating with others			Top R&D spending enterprises per 10 million population		8.4
Public-private co-publications	16.6	7.6	Top R&D spending enterprises, average R&D spending		528
PCT patent applications	24.1	-5.5	Number of unicorns	1	107
Trademark applications	106.9	42.0	Buyer sophistication	4	3.6
Design applications	37.5	-4.1	Governance and policy framework		
Exports of medium and high technology products	45.2	-6.7	Corruption Perceptions Index	42.7	63.6
Knowledge-intensive services exports	46.0	34.9	Basic-school entrepreneurial education and training	3	2.6
Air emissions by fine particulates	65.1	-4.5	Government procurement of advanced technology products	3	3.4
Environment-related technologies	52.1	-11.0	Rule of law	-0.1	1
			Demography		
			Population size	59.4	447.4
			Average annual population growth	0.9	0
			Population density	48.4	112

Footnote: The top three scores and the three largest improvements are highlighted in purple. The bottom three scores and the three smallest improvements (or largest decreases) are highlighted in red.



SOUTH KOREA

South Korea remains the most innovative global competitor, classified as a Strong Innovator with a performance level at 119.1% of that of the EU in 2024. Despite a decrease in performance compared to 2023 (-0.4%-points), South Korea has shown significant improvement since 2017 (+10.0%-points). The country's strengths lie in *Trademark applications*, *Design applications*, and *R&D expenditure in the business sector*. South Korea's weaknesses are in *Air emissions by fine particulates*, *SMEs introducing product innovations*, and *SMEs introducing business process innovations*. The country's relative strengths over other global competitors can be seen in Figures 34-37.



Performance in 2024 relative to the EU in 2024 and change in performance between 2017 and 2024

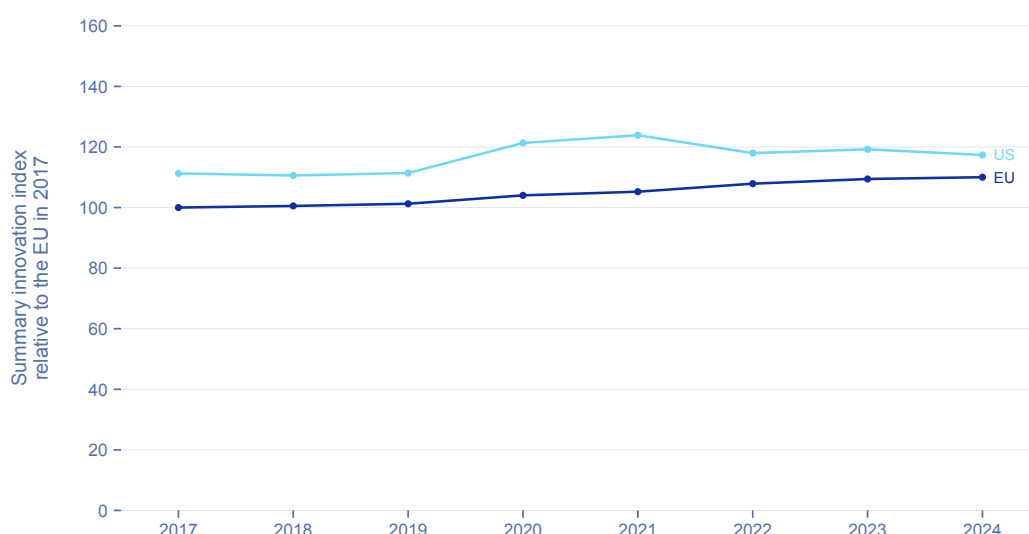
South Korea	2024	Change	Structural differences	KR	EU
New doctorate graduates	125.2	32.2	Performance and structure of the economy		
Population with tertiary education	186.3	17.7	GDP per capita	48467.9	52102.6
International scientific co-publications	95.1	37.9	Average annual GDP growth	3.5	4.7
Scientific publications among the top 10% most cited	69.0	4.5	Employment share Agriculture	5.4	4.1
R&D expenditure in the public sector	141.6	18.6	Employment share Industry	24.6	24.7
Direct and indirect government support of business R&D	159.7	-9.2	Employment share Services	70	71.1
R&D expenditure in the business sector	250.0	9.5	Employment share Knowledge-intensive services	25.3	14.9
Employed ICT specialists	86.7	26.2	Business and entrepreneurship		
SMEs introducing product innovations	28.4	-35.3	Total early-stage Entrepreneurial Activity (TEA)	11.8	6.8
SMEs introducing business process innovations	12.2	-78.4	FDI net inflows	1.1	1.9
Innovative SMEs collaborating with others	124.8	-203.9	Top R&D spending enterprises per 10 million population	10.3	8.4
Public-private co-publications	129.6	39.8	Top R&D spending enterprises, average R&D spending	654.5	528
PCT patent applications	211.0	27.1	Number of unicorns	14	107
Trademark applications	608.6	342.0	Buyer sophistication	5	3.6
Design applications	309.0	48.5	Governance and policy framework		
Exports of medium and high technology products	109.9	-10.4	Corruption Perceptions Index	62.7	63.6
Knowledge-intensive services exports	99.8	23.6	Basic-school entrepreneurial education and training	4.2	2.6
Air emissions by fine particulates	59.1	0.4	Government procurement of advanced technology products	3.8	3.4
Environment-related technologies	71.8	-47.7	Rule of law	1.1	1
			Demography		
			Population size	51.7	447.4
			Average annual population growth	-0.2	0
			Population density	530.6	112

Footnote: The top three scores and the three largest improvements are highlighted in purple. The bottom three scores and the three smallest improvements (or largest decreases) are highlighted in red.



UNITED STATES

The United States is the third most innovative global competitor, classified as a Strong Innovator with a performance level at 106.7% of that of the EU in 2024. Despite a decrease in performance compared to 2023 (-1.9%-points), the United States has shown moderate improvement since 2017 (+6.1%-points). The country's strengths lie in *Innovative SMEs collaborating with others*, *R&D expenditure in the business sector*, and *Direct and indirect government support of business R&D*. The United States' weaknesses are in *Environment-related technologies*, *Design applications*, and *SMEs introducing product innovations*. The country's relative strengths over other global competitors can be seen in Figures 34-37.

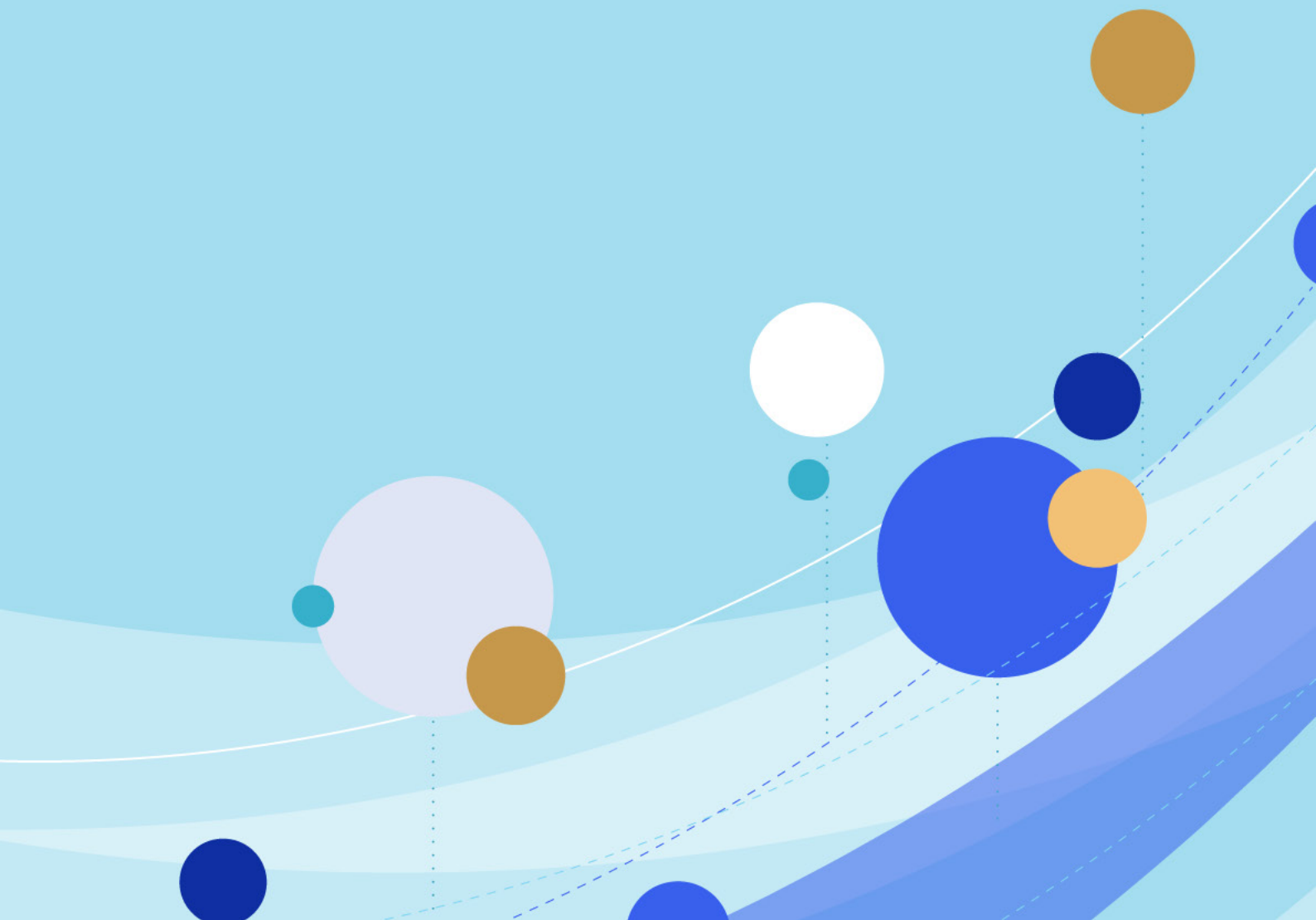


Performance in 2024 relative to the EU in 2024 and change in performance between 2017 and 2024

United States	2024	Change	Structural differences	US	EU
New doctorate graduates	82.1	-0.3	Performance and structure of the economy		
Population with tertiary education	129.0	25.9	GDP per capita	70025.9	52102.6
International scientific co-publications	105.6	26.0	Average annual GDP growth	3.9	4.7
Scientific publications among the top 10% most cited	140.6	-33.0	Employment share Agriculture	1.7	4.1
R&D expenditure in the public sector	89.8	-1.9	Employment share Industry	19.3	24.7
Direct and indirect government support of business R&D	142.8	7.1	Employment share Services	79	71.1
R&D expenditure in the business sector	198.0	58.5	Employment share Knowledge-intensive services	10.7	14.9
Employed ICT specialists	103.4	13.4	Business and entrepreneurship		
SMEs introducing product innovations	59.2	47.1	Total early-stage Entrepreneurial Activity (TEA)	16.8	6.8
SMEs introducing business process innovations	78.0	-88.7	FDI net inflows	1.4	1.9
Innovative SMEs collaborating with others	671.1	-616.3	Top R&D spending enterprises per 10 million population	24.4	8.4
Public-private co-publications	120.5	9.6	Top R&D spending enterprises, average R&D spending	539.4	528
PCT patent applications	115.6	-5.8	Number of unicorns	656	107
Trademark applications	61.2	65.5	Buyer sophistication	4.8	3.6
Design applications	53.8	16.8	Governance and policy framework		
Exports of medium and high technology products	74.5	-7.1	Corruption Perceptions Index	68.3	63.6
Knowledge-intensive services exports	96.9	18.9	Basic-school entrepreneurial education and training	3.4	2.6
Air emissions by fine particulates	116.6	-5.0	Government procurement of advanced technology products	4.6	3.4
Environment-related technologies	30.5	-63.4	Rule of law	1.4	1
			Demography		
			Population size	332.3	447.4
			Average annual population growth	0.3	0
			Population density	36.1	112

Footnote: The top three scores and the three largest improvements are highlighted in purple. The bottom three scores and the three smallest improvements (or largest decreases) are highlighted in red.

7. Methodology



7.1. Data sources, data availability and comparison with the EIS 2023

The EIS uses the most recent statistics from Eurostat and other internationally recognised sources, such as the OECD and the United Nations, available at the time of analysis, with the cutoff date set end of April 2024. International sources have been used to improve comparability between countries.

The data relates to the actual performance in 2023 for 10 indicators, 2022 for 11 indicators, 2021 for four indicators, 2020 for six indicators and 2019 for one indicator (these are the most recent years for which data are available, see Annex E). Data availability is complete for 26 Member States. For Ireland, data is not available for Job-to-job mobility in Human Resources in Science & Technology.

Provisional data are used to ensure the utilisation of the most recent data for calculating Member States' innovation performance as in previous versions of the EIS report. However, provisional data can be different from the final data, and these differences may have an impact on the results.

Breaks in the data series are reported for 17 indicators counting at least one break for each country and including EU, neighbouring and global competitors. For EU 27 breaks are reported for 14 indicators out of the 17. The top five indicators with the highest number of countries experiencing such breaks include:

- Percentage population aged 25-34 having completed tertiary education
- ICT specialists (as a percentage of total employment)
- Lifelong learning
- Job-to-job mobility of Human Resources in Science & Technology
- Employment in knowledge-intensive activities (percentage of total employment)

To address the lack of comparability across years, performance changes over time for indicators impacted by breaks are based on the most recent data only. Performance changes for the Summary Innovation Index (SII), which measures Member States' average innovation performance, are, therefore, on average, smaller than what they would have been if there had been no breaks in series or new data series.

It must be stressed that comparisons with results from the EIS 2023 report are not possible, not even for the same years in both reports. Although the methodology in this year's report is the same as in the EIS 2023, results for the same year, e.g. 2023 in the EIS 2023 and 2023 in this year's report, are different due to several reasons:

- By adding new data at the end of the time series for each indicator and removing data at the start of the time series, the highest and lowest data scores used for calculating normalised scores across all countries and all years for an indicator can change, directly impacting these normalised scores.
- Timeliness refers to the year for which the most recent data are available. For the EIS 2024 seven indicators have been updated with two additional years and 16 with one additional year compared to their availability in 2023.
- Breaks in series for indicators and individual countries impact the most recent year used. As explained above this applies to 17 indicators where a break in the series impacts at least one country.

Consequently, one should only use the results for all years in this report to compare performance over time. More details on data sources, timeliness and breaks are provided in the EIS Methodology Report 2024.

7.2. Methodology for calculating innovation indexes

The overall performance of each national innovation system is summarised by a composite indicator, the Summary Innovation Index (SII). The methodology used for calculating the SII is outlined below. 'All countries' include all EU Member States, other European and global competitors.

European benchmark

Step 1: Setting reference years

For each indicator, a reference year is identified based on data availability for all countries for which data availability

is at least 75%. For most indicators, this reference year will be lagging one or two years behind the year to which the EIS refers (see Annex E).

Step 2: Imputing for missing values

If data for an intermediate year are not available, the missing values are replaced with the previous year's values. If data are unavailable at the beginning of the time series, the missing values are replaced with the next available year's values. If data are missing for all years, no data are imputed, and, hence, the indicator does not contribute to the SII.

Step 3: Identifying and replacing outliers

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

Step 4: Transforming data if data are highly skewed

Most of the indicators are fractional indicators with values between 0% and 100%. Some indicators are unbound indicators, where values are not limited to an upper threshold. These indicators can be highly volatile and can have skewed data distributions (where most countries show low performance levels, and a few countries show exceptionally high levels of performance). For these indicators where the degree of skewness across the full eight-year period is above one, data have been transformed using a square root transformation. For the following indicators data have been transformed: Air emissions in fine particulates in industry, Non-R&D innovation expenditures, PCT patent applications, Trademark applications, and Venture capital expenditures. A square root transformation uses the square root of the indicator value instead of the original value.

Step 5: Determining Maximum and Minimum scores

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

Step 6: Calculating re-scaled scores

Re-scaled scores of the country scores (after correcting for outliers and a possible transformation of the data) for all years are calculated by first subtracting the Minimum score and then dividing by the difference between the Maximum and Minimum score. The maximum re-scaled score is thus equal to 1, and the minimum re-scaled score is equal to 0. For positive and negative outliers, the re-scaled score is equal to 1 or 0, respectively.

Step 7: Calculating composite innovation indexes

For each year, a composite SII is calculated as the unweighted average of the re-scaled scores for all indicators where all indicators receive the same weight (1/32 if data are available for all 32 indicators).

Step 8: Calculating relative to EU performance scores

Performance scores relative to the EU are then calculated as the SII of the respective country divided by the SII of the EU multiplied by 100. Relative performance scores are calculated for the full eight-year period compared to the performance of the EU in 2017 and for the latest year also to that of the EU in 2024. For the definition of the performance groups, only the performance scores relative to the EU in 2024 have been used.

Performance group membership

For determining performance group membership, the EIS uses the following classification scheme with corresponding values for EIS 2024:

- Innovation Leaders are all countries with a relative performance in 2024 above 125% of the EU average in 2024 (corresponding to a score of 137.4 when indexed to EU 2017).
- Strong Innovators are all countries with a relative performance in 2024 between 100% and 125% of the EU average in 2024 (corresponding to a range of scores from 110.0 to 137.4 when indexed to EU 2017).

- Moderate Innovators are all countries with a relative performance in 2024 between 70% and 100% of the EU average in 2024 (corresponding to a range of scores from 77.0 to 109.9 when indexed to EU 2017).
- Emerging Innovators are all countries with a relative performance in 2024 below 70% of the EU average in 2024 (corresponding to a score below 77.0 when indexed to EU 2017).

International benchmark

The methodology for calculating average innovation performance for the EU and its major global competitors is comparable to that used for calculating average innovation performance for the EU Member States but using a smaller set of countries and a smaller set of indicators.

Automation

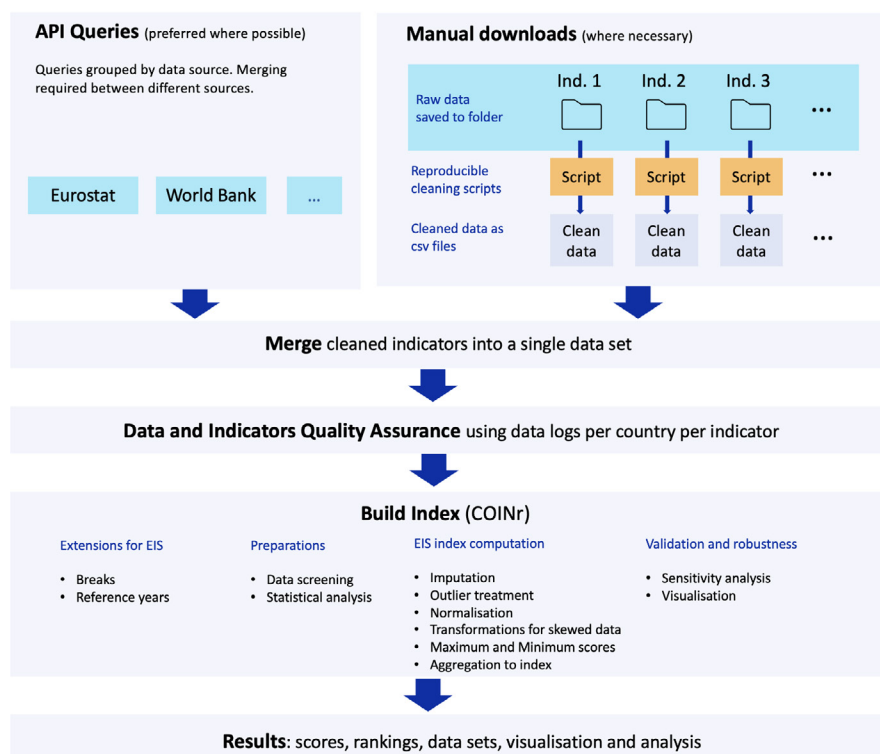
The data collection and calculation process for the EIS has been automated for the 2024 release. The approach is summarised in Figure 38 below.

The construction of the summary index for 2024 has been performed using the COINr package³³ adapted and extended to the EIS following the 2023 methodology. COINr is an open-source R package recently developed by the European Commission's Competence Centre for Composite Indicators and Scoreboards³⁴, and implements international guidelines and best practices in composite indicator construction.³⁵ It allows highly detailed and flexible construction and analysis of composite indicators, including imputation, normalisation, outlier treatment and sensitivity analysis.

This approach provides a highly replicable and easy to follow data pipeline which feeds into the COINr package and automatically provides the main outputs of the EIS. Since the data collection, processing and outputs are largely based on code (using the R software), all code is packaged together and hosted on GitHub which also facilitates the auditing process.

To ensure the accuracy of calculations and the correct application of the methodology, the EIS results for 2023 were reproduced using the COINr package as a validation step, before calculating the updated index for 2024 using the latest data.

Figure 38: EIS automation process



³³ See: <https://bluefoxr.github.io/COINr/>

³⁴ <https://composite-indicators.jrc.ec.europa.eu/>

³⁵ Nardo M, Saisana M, Saltelli A, Tarantola S, HoNmann A, Giovannini E. Handbook on Constructing Composite Indicators: Methodology and User Guide. Paris (France): OECD publishing; 2008. JRC47008. <https://publications.jrc.ec.europa.eu/repository/handle/JRC47008>

7.3. Contextual analysis on the impact of structural differences between countries

In response to a need for contextual analyses to better understand performance differences between the innovation indicators used in the main measurement framework, a set of contextual indicators is included in the country profiles available on the EIS website and online tool. As an introduction, the following sections discuss the relevance of these structural aspects to provide a better understanding of differences between countries in the performance of individual indicators. Full definitions of all performance indicators and contextual indicators are provided in the EIS 2024 Methodology Report. The list of contextual indicators, the years for which average performance has been calculated, and data sources used are shown in Table 1.

Table 1 Structural indicators in the European Innovation Scoreboard

	Period	Source
PERFORMANCE AND STRUCTURE OF THE ECONOMY		
GDP per capita (PPS)	Average 2021-2023	Eurostat
Average annual GDP growth (%)	Between 2021 and 2023	Eurostat
Employment share Manufacturing (NACE C) (%)	Average 2020-2022	Eurostat
of which High and Medium high tech (%)	Average 2020-2022	Eurostat
Employment share Services (NACE G-N) (%)	Average 2020-2022	Eurostat
of which Knowledge-intensive sectors (%)	Average 2020-2022	Eurostat
Turnover share SMEs (%)	Average 2018-2020	Eurostat
Turnover share large companies (%)	Average 2018-2021	Eurostat
Foreign-controlled enterprises - share of value added (%)	Average 2018-2022	Eurostat
BUSINESS AND ENTREPRENEURSHIP		
Enterprise births (10+ employees) (%)	Average 2018-2020	Eurostat
Total early-stage Entrepreneurial Activity (TEA) (%)	Average 2020-2022	Global Entrepreneurship Monitor
FDI net inflows (% GDP)	Average 2021-2023	World Bank: World Development Indicators
Top R&D spending enterprises per 10 million population	Average 2021-2023	EU Industrial R&D Investment Scoreboard
Buyer sophistication (1 to 7 best)	Average 2018-2020	World Economic Forum
INNOVATION PROFILES		
In-house product innovators with market novelties	2018-2020	Eurostat, National Statistical Offices
In-house product innovators without market novelties	2018-2020	Eurostat, National Statistical Offices
In-house business process innovators	2018-2020	Eurostat, National Statistical Offices
Innovators that do not develop innovations themselves	2018-2020	Eurostat, National Statistical Offices
Innovation active non-innovators	2018-2020	Eurostat, National Statistical Offices
Non-innovators with potential to innovate	2018-2020	Eurostat, National Statistical Offices
Non-innovators without disposition to innovate	2018-2020	Eurostat, National Statistical Offices
GOVERNANCE AND POLICY FRAMEWORK		
Innovation procurement as a share of total public procurement	2022	Tenders Electronic Daily and National Public Procurement data
Corruption Perceptions Index	Average 2021-2023	Transparency International
Basic-school entrepreneurial education and training (1 to 5 best)	Average 2020-2022	Global Entrepreneurship Monitor
Government procurement of advanced technology products (1 to 7 best)	Average 2018-2020	World Economic Forum
Rule of law (-2.5 to 2.5 best)	Average 2020-2022	World Bank: Worldwide Governance Indicators
CLIMATE CHANGE		
Circular material use rate	Average 2020-2022	Eurostat

	Period	Source
Greenhouse gas emissions intensity of energy consumption	Average 2019-2021	European Environment Agency (EEA), Eurostat
Eco-Innovation Index	2022	EC, DG Environment

DEMOGRAPHY

Population size (millions)	Average 2021-2023	Eurostat
Average annual population growth (%)	Between 2021 and 2023	Eurostat
Population density (inhabitants / km ²)	Average 2020-2022	Eurostat

Performance and structure of the economy

GDP per capita in purchasing power standards (PPS)³⁶ is a measure for interpreting real income differences between countries. Higher income can increase the demand for new innovative goods and services. Economic growth is captured by the average annual growth rate of GDP for 2021-2023. In economies that grow faster, increasing demand may provide more favourable conditions for enterprises to sell their goods and services.

Differences in economic structures are important. Differences in the share of manufacturing industry in GDP, and in high-tech activities in manufacturing and services, are important factors that explain why countries can perform better or worse on indicators like business R&D expenditures, PCT patents, and innovative enterprises. Medium-high and high-tech industries have higher technological intensities than other industries. These industries, on average, will have higher R&D expenditures, more patent applications, and higher shares of innovative enterprises. Countries with above-average shares of these industries are expected to perform better on several EIS indicators. For example, for the EU on average, 85% of R&D expenditures in manufacturing are accounted for by medium-high and high-technology manufacturing industries^{37 38}. Also, the share of enterprises that introduced a product and/or business process innovation is higher in medium-high and high- technology manufacturing industries compared to all core industries covered in the Community Innovation Survey.³⁹

Foreign ownership, including ownership from both other EU Member States and non-Member States, is important as, on average, about 30% of business R&D expenditures in EU Member States is made by foreign affiliates, which is significantly higher compared to Japan and the United States and comparable to Australia and Canada⁴⁰. The share of foreign-controlled enterprises in value-added serves as a proxy for differences in the impact of foreign ownership on the economy.

Business and entrepreneurship

Entrepreneurship is important for introducing new innovations on the market. The degree of entrepreneurship is measured by two contextual indicators measuring the share of new enterprise births in the economy and total entrepreneurial activity. The former is measured by the share of new enterprise birth in the economy. The latter is measured by the adult population aged 18-64 years who are in the process of starting a business (a nascent

³⁶ The purchasing power standard (PPS) is an artificial currency unit. Theoretically, one PPS can buy the same amount of goods and services in each country. However, price differences across borders mean that different amounts of national currency units are needed for the same goods and services depending on the country. PPS are derived by dividing any economic aggregate of a country in national currency by its respective purchasing power parities. PPS is the technical term used by Eurostat for the common currency in which national accounts aggregates are expressed when adjusted for price level differences using PPPs. Thus, PPPs can be interpreted as the exchange rate of the PPS against the Euro.

³⁷ Based on NACE Rev. 2 three-digit level, manufacturing industries can be classified into high-technology, medium-high technology, medium-low-technology, and low-technology. The high-technology and medium-high technology industries include: Chemicals and chemical products (20); Basic pharmaceutical products and pharmaceutical preparations (21); Weapons and ammunition (25.4*); Computer, electronic and optical products (26); Electrical equipment (27); Machinery and equipment not elsewhere classified (28); Motor vehicles, trailers and semi-trailers (29); Other transport equipment (30) excluding Building of ships and boats (30.1); Air and spacecraft and related machinery (30.3); and Medical and dental instruments and supplies (32.5**). If data are only available at the NACE Rev. 2 two-digit level, industries identified with an * are classified as medium-low-technology, and industries identified with an ** are classified as low-technology, and thus excluded from the high-technology and medium-high technology industries (Source: <http://ec.europa.eu/eurostat/statistics-explained/index.php/> Glossary: High-tech classification_of_manufacturing_industries).

³⁸ Average results for 2015-2017 for 24 Member States for which data are available for at least one year. Data were extracted from Eurostat (Business enterprise R&D expenditure in high-tech sectors - NACE Rev. 2 [htec_sti_exp2]).

³⁹ In accordance with Commission Regulation No 995/2012, the following industries and services are included in the Core target population covered in the CIS: Core Industry (excluding construction): Mining and quarrying (B), Manufacturing (C) (10-12: Manufacture of food products, beverages and tobacco; 13-15: Manufacture of textiles, wearing apparel, leather and related products; 16-18: Manufacture of wood, paper, printing and reproduction; 20: Manufacture of chemicals and chemical products; 21: Manufacture of basic pharmaceutical products and pharmaceutical preparations; 19-22 Manufacture of petroleum, chemical, pharmaceutical, rubber and plastic products; 23: Manufacture of other non-metallic mineral products; 24: Manufacture of basic metals; 25: Manufacture of fabricated metal products, except machinery and equipment; 26: Manufacture of computer, electronic and optical products; 25-30: Manufacture of fabricated metal products (except machinery and equipment), computer, electronic and optical products, electrical equipment, motor vehicles and other transport equipment; 31-33: Manufacture of furniture, jewellery, musical instruments, toys; repair and installation of machinery and equipment, Electricity, gas, steam and air conditioning supply (D), Water supply, sewerage, waste management and remediation activities (E) (36: Water collection, treatment and supply; 37-39: Sewerage, waste management, remediation activities), Core Services: Wholesale trade, except of motor vehicles and motorcycles (46), Transport and storage (H) (49-51: Land transport and transport via pipelines, water transport and air transport; 52-53: Warehousing and support activities for transportation and postal and courier activities); Information and communication (J) (58: Publishing activities; 61: Telecommunications; 62: Computer programming, consultancy and related activities; 63: Information service activities), Financial and insurance activities (K) (64: Financial service activities, except insurance and pension funding; 65: Insurance, reinsurance and pension funding, except compulsory social security; 66: Activities auxiliary to financial services and insurance activities), Professional, scientific and technical activities (M) (71-73: Architectural and engineering activities; technical testing and analysis; Scientific research and development; Advertising and market research).

⁴⁰ Average results for 2010-2016 for 14 Member States for which data were available (Austria, Belgium, Czechia, Finland, France, Germany, Hungary, Ireland, Italy, Netherlands, Poland, Slovenia Spain, and Sweden). Source of the data: OECD Main Science and Technology Indicators, Volume 2018 Issue 2

entrepreneur) or who started a business which is not older than 42 months at the time of the respective survey (owner-manager of a new business).

Inflows of new technologies are important as they add to a country's economic and technological capacities. Inward Foreign direct investment (FDI) can have a positive impact on innovation performance, although there are differences depending on the complexity of the receiving industry, political and economic framework conditions as well as the quality of the institutions of the receiving countries. Inward FDI flows are measured over a three-year period, as average net inflows of investments to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor.

Enterprise characteristics are important for explaining differences in R&D spending and innovation activities. Large enterprises, defined as enterprises with 250 or more employees, account for almost 80 percent of EU business R&D expenditures, whereas SMEs, defined as enterprises with 10 to 249 employees, account for only one-fifth. The presence of large R&D spending enterprises is captured by the EU Industrial R&D Investment Scoreboard, which provides economic and financial data and analysis of the top 1000 corporate R&D investors from the EU and top 2500 corporate R&D investors elsewhere in the world⁴¹.

Demand is an important driver of innovation. According to the Oslo Manual⁴², demand factors shape innovation activity in two major ways: for the development of new products, as firms modify and differentiate products to increase sales and market share and for the improvement of the production and supply processes to reduce costs and lower prices. A robust indicator measuring the demand for innovation is currently not available. The Executive Opinion Survey of the World Economic Forum includes an indicator that provides a measure of the preferences of individual consumers for innovative products. The degree of Buyer sophistication measures, on a scale from 1 (low) to 7 (high), whether buyers focus more on price or quality of products and services, with higher quality being the result of product innovations.

Innovation profiles

Innovation is a highly diverse activity. Enterprises can innovate through product or business process innovation, with the latter including process, marketing and organisational innovation. Enterprises can adopt new technologies developed by other enterprises or they engage in intensive in-house research and innovation activities. The capabilities needed by enterprises to innovate are very different in kind and size. Building on earlier work by academics and the OECD, Eurostat, UNU-MERIT (Maastricht University), ZEW – Leibniz Centre for European Economic Research, in collaboration with national statistical offices, developed a taxonomy of innovating and non-innovating enterprises based on CIS micro data. The following characteristics were used to identify seven mutually exclusive detailed innovation profiles: The degree of novelty of product innovations, own in-house capacities to innovate, and R&D activities. Of these, four innovation profiles capture different types of enterprises that have introduced an innovation (product or business process) and three innovation profiles capture non-innovators, of which one profile captures non-innovators with innovation activities, one profile captures non-innovators with an interest in innovation, while the other captures non-innovators without any innovation activities or interest:

- In-house product innovators with market novelties, including all enterprises that introduced a product innovation that was developed by the enterprise and that was not previously offered by competitors.
- In-house product innovators without market novelties, including all enterprises that introduced a product innovation that was developed by the enterprise but that is only new to the enterprise itself.
- In-house business process innovators, including all enterprises without a product innovation, but that did introduce a business process innovation that was developed by the enterprise.
- Innovators that do not develop innovations themselves, including all enterprises that introduced an innovation of any kind but did not develop it themselves (enterprises without significant own innovation capabilities).
- Innovation active non-innovators, including all enterprises that did not introduce any innovation but that either had ongoing or abandoned innovation activities.
- Non-innovators with potential to innovate, including all enterprises that did not introduce any innovation, and which had no ongoing or abandoned innovation activities but that did consider to innovate.

⁴¹ <https://ec.europa.eu/newsroom/rtd/items.813043/en>

⁴² The Oslo Manual is the foremost international source of guidelines for the collection and use of data on innovation activities in industry. OECD/Eurostat (2018), Oslo Manual: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition, OECD Publishing, Paris. DOI: <https://www.oecd.org/science/oslo-manual-2018-9789264304604-en.htm>

- Non-innovators without disposition to innovate, including all other enterprises, those that neither introduced an innovation nor had any ongoing or abandoned innovation activities nor considered to innovate.

Data on Innovation profiles should not be interpreted as “more is better.” Instead, the data should be used to better understand differences in the composition of different types of enterprises in a country, thereby helping policy makers to design policies that better target different enterprises.

Governance and policy framework

Institutional and legal differences between countries may make it more difficult to engage in business activities. The Corruption Perceptions Index is a composite index based on a combination of surveys and assessments of corruption from 13 different sources and scores, and ranks countries based on how corrupt a country's public sector is perceived to be, with a score of 0 representing a very high level of corruption and a score of 100 representing a low level of corruption. The CPI is published by Transparency International, and the data are included in the EU Sustainable Development Goals indicator set to monitor progress on SDG Goal 16 on Peace, justice and strong institutions.

Entrepreneurial skills are important for successfully transforming ideas and inventions into innovations. These skills can be acquired on the job but also by formal schooling. Basic-school entrepreneurial education and training measures the extent to which training in creating or managing SMEs is incorporated within the education and training system at primary and secondary levels.

Governments play an important role in enhancing the innovation capacities of an economy. Government procurement of advanced technology products measures the extent to which government procurement decisions foster technological innovation – from 1 (not at all) to 7 (extremely effectively).

Trust is important for creating a business environment for undertaking risky innovative activities. Measures of the rule of law capture differences in the extent to which people have confidence in and abide by the rules of society. The Rule of law Index measures differences in the quality of contract enforcement, property rights, the police, the judicial system, as well as the prevalence of crime and violence.

Climate change

As the natural environment increasingly suffers from the loss of biodiversity, pollution and climate change, the relationship between innovation performance and environment sustainability grows in importance. EU level policy developments, such as the European Green Deal and the Recovery plan for Europe, underline the need to take account of the pivotal role of research and innovation in contributing to societal challenges. Three indicators are included in the Contextual indicators relevant for measuring climate change and the role of innovation.

The circular material use rate measures, in percentages, the share of material recovered and fed back into the economy – thus saving extraction of primary raw materials – in overall material use. It covers households, the private and the public sector. A higher circular material use rate indicates more secondary materials substituting for primary raw materials, thereby avoiding the environmental impacts of extracting primary material.

Greenhouse gas emissions intensity of energy consumption is an indicator that is part of the EU Sustainable Development Goals (SDG) indicator set. It is used to monitor progress towards Goal 13 on climate action and SDG 7 on affordable and clean energy. The indicator is calculated as the ratio between energy related GHG emissions and gross inland consumption of energy. It expresses how many tonnes CO₂ equivalents of energy related GHGs are being emitted in a certain economy per unit of energy that is being consumed. Lower scores on this indicator imply an improvement in environmental performance.

Demography

Structural data also includes population size and the average annual growth rate of population for 2021-2023. Increasing demand following an increasing population may provide more favourable conditions for enterprises to sell their goods and services. Densely populated areas are more likely to be more innovative for several reasons. Firstly, knowledge diffuses more easily when people and enterprises are located closer to each other. Secondly, in more densely populated areas there tends to be a concentration of government and educational services. Densely populated areas provide better training opportunities and employ above-average shares of highly educated people. Furthermore, the amount of natural assets per capita tends to decline with population density. This positively impacts on the share of Medium and high-tech product exports and the share of employment in knowledge intensive activities.

Figure 39: Performance change between 2017 and 2024 per indicator for EU Member States and neighbouring countries



Figure 40: Performance change between 2023 and 2024 per indicator for EU Member States and neighbouring countries

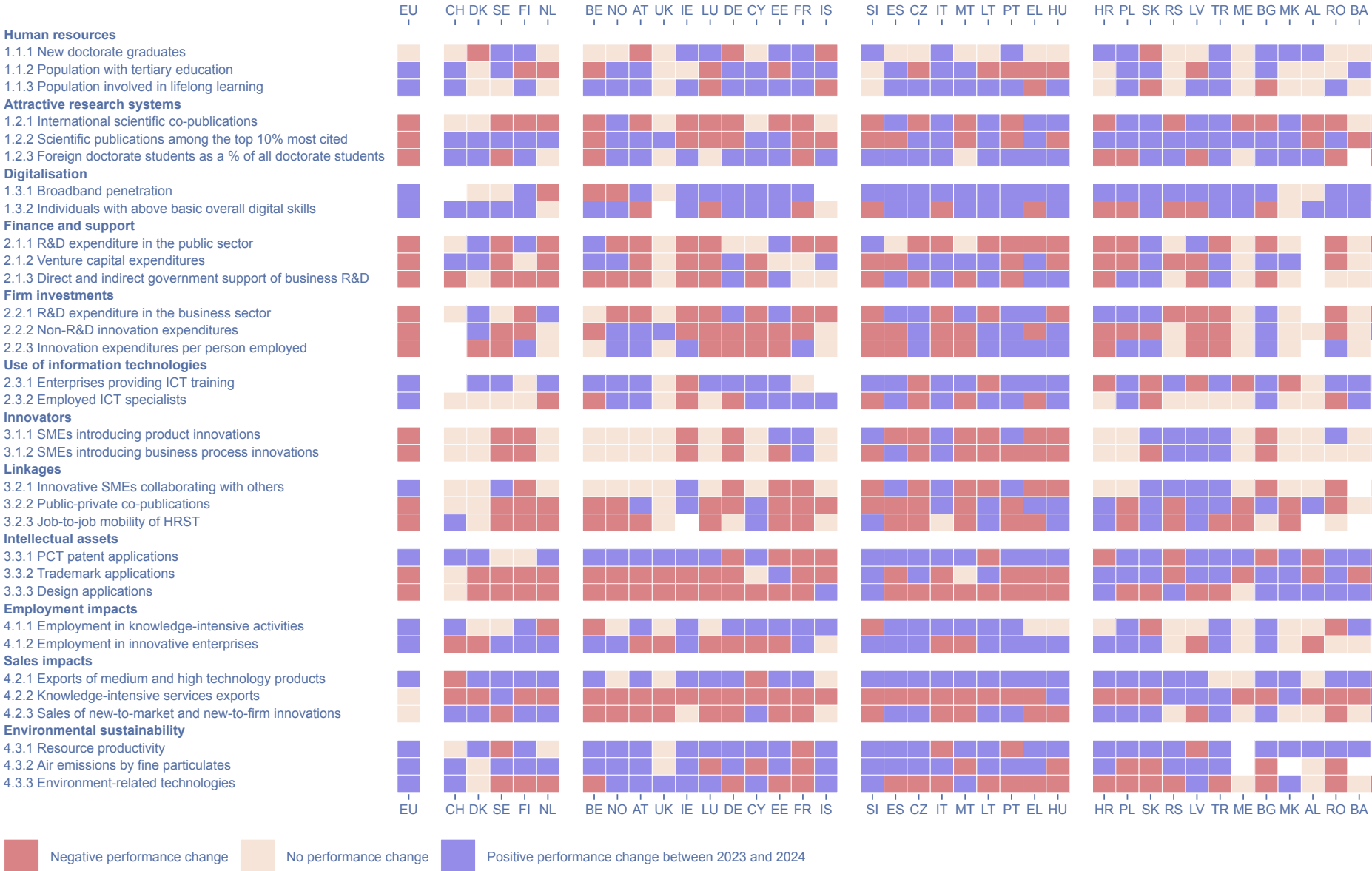


Figure 41: Differences in structural indicators between EU Member States and neighbouring countries



ANNEX A: COUNTRY ABBREVIATIONS

AL	Albania	IT	Italy
AT	Austria	JP	Japan
AU	Australia	KR	South Korea
BA	Bosnia and Herzegovina	LT	Lithuania
BE	Belgium	LU	Luxembourg
BG	Bulgaria	LV	Latvia
BR	Brazil	MD	Moldova
CA	Canada	ME	Montenegro
CH	Switzerland	MK	North Macedonia
CL	Chile	MT	Malta
CN	China	MX	Mexico
CY	Cyprus	NL	Netherlands
CZ	Czechia	NO	Norway
DE	Germany	PL	Poland
DK	Denmark	PT	Portugal
EL	Greece	RO	Romania
EE	Estonia	RS	Serbia
ES	Spain	SE	Sweden
FI	Finland	SI	Slovenia
FR	France	SK	Slovakia
HR	Croatia	TR	Türkiye
HU	Hungary	UA	Ukraine
IE	Ireland	UK	United Kingdom
IN	India	US	United States
IS	Iceland	ZA	South Africa

ANNEX B: PERFORMANCE PER INDICATOR

Available on the EIS website.

ANNEX C: INDICATOR VALUES BY EUROPEAN COUNTRY IN 2024

Indicator	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	EU	FI	FR	HR	HU	IE	IT	LT	LU	LV
Framework conditions																				
Human resources																				
1.1.1 New doctorate graduates	0.8	0.9	0.4	0.3	0.8	1.1	1	0.8	0.7	0.8	0.8	1	1.1	0.7	0.4	1.1	0.8	0.5	1.4	0.3
1.1.2 Population completed tertiary education	43.5	50	35.8	61.6	33.7	38.4	49	43.5	44.5	52	43.1	39.2	51.9	38.7	29.4	62.7	30.6	57.4	60.2	45.1
1.1.3 Lifelong learning	17.1	11.1	1.4	11	9.9	8.3	30.5	23.2	3.4	15.8	12.8	26.1	14.9	6.4	9.6	12.3	11.6	10.7	16.2	10.7
Attractive research systems																				
1.2.1 International Scientific co-publications	2255.5	2213.3	408.7	3765.6	1281.2	1173.6	3711.5	2085.1	1182.4	1190.7	1267.7	2685.9	967.3	1025.5	796.2	2311.5	1136.3	925.7	3448.8	803.5
1.2.2 Scientific publications among top 10% most cited	10.5	11.7	3.4	11.4	5.5	10.4	12.6	10.5	9.1	8.9	9.8	12.0	8.8	4.8	5.9	11.3	11.8	6.6	11.1	4.6
1.2.3 Foreign doctorate students	40.0	25.3	10.4	26.6	25.9	22.8	37.2	32.3	2.8	20.1	22.7	27.7	36.1	8.1	29.2	38.8	11.8	9.5	91.0	12.7
Digitalisation																				
1.3.1 Broadband penetration	45.8	64.6	46.6	72.1	44.6	60.2	86.0	46.4	32.4	79.0	60.2	75.7	63.4	38.3	49.1	59.3	48.6	60.4	71.3	40.5
1.3.2 Individuals with above basic overall digital skills	32.0	28.3	7.7	25.0	35.5	19.8	39.4	34.8	20.0	38.7	27.3	53.6	30.6	25.0	28.1	43.8	22.2	25.9	27.9	16.6
Investments																				
Finance and support																				
2.1.1 R&D expenditure in the public sector	1.0	0.9	0.2	0.4	0.7	1.0	1.1	0.8	0.8	0.6	0.7	0.9	0.7	0.7	0.4	0.2	0.5	0.5	0.5	0.5
2.1.2 Venture capital investments	0.1	0.2	0.0	0.1	0.1	0.2	0.4	1.0	0.1	0.2	0.2	0.4	0.4	0.3	0.1	0.1	0.1	0.3	0.2	0.0
2.1.3 Direct and indirect government support for business R&D	0.3	0.3	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.4	0.0	0.3	0.2	0.1	0.1	0.0	0.0
Firm investments																				
2.2.1 R&D expenditure in the business sector	2.2	2.5	0.5	0.3	1.3	2.1	1.8	1.0	0.7	0.8	1.5	2.0	1.4	0.8	1.0	0.8	0.8	0.5	0.5	0.3
2.2.2 Non-R&D innovation expenditure	0.4	0.6	0.4	0.7	1.8	1.3	0.8	1.6	0.9	0.6	0.8	0.5	0.2	0.4	0.6	0.2	0.6	2.1	0.2	0.3
2.2.3 Innovation expenditures per person employed	7533.7	14771.1	1347.6	2564.4	7914.9	10725.1	9112.3	5649.7	5090.7	3999.3	7505.0	8335.5	8751.3	1645.3	4327.6	12366.1	5596.7	5037.0	3910.4	912.2
Use of information technologies																				
2.3.1 Enterprises providing ICT trainin	20.1	33	9.1	28.4	23.1	27.3	33.3	18.8	13.4	20.7	22.4	39.8	15.1	20.8	18.2	23.2	19.3	13.1	21.8	15.1
2.3.2 Employed ICT specialists	5.3	5.4	4.3	5.4	4.3	4.9	5.9	6.7	2.4	4.4	4.8	7.6	4.7	4.3	4.2	6.2	4.1	4.9	8	4.4
Innovation Activities																				
Innovators																				
3.1.1 SMEs with product innovations	30.4	34.7	c	38.8	c	c	31.5	c	c	c	25.5	c	c	34.6	c	c	c	c	23.1	c
3.1.2 SMEs with business process innovations	50.2	63.4	c	64.9	c	c	45.5	c	c	c	41.2	c	c	47.2	c	c	c	c	35.5	c
Linkages																				
3.2.1 Innovative SMEs collaborating with others	16.4	24.3	c	27.8	c	c	14.5	c	c	c	12.4	c	c	12.3	c	c	c	c	10.4	c
3.2.2 Public-private co-publications	517.8	358.1	61.4	420.3	180.8	247.6	750.8	256.2	205.9	158.2	136.9	484.0	146.1	212.9	159.4	332.5	207.2	103.2	575.1	143.9
3.2.3 Job-to-job mobility of Human Resources in S&T	7.3	6.5	2.8	10.5	4.3	8.8	10.7	9.5	4.8	6.9	6.8	8.4	7.4	6.9	6.7	na	4.4	10.8	9.4	6.2
Intellectual assets																				
3.3.1 PCT patent applications	4.8	3.4	0.5	0.9	0.8	5.8	6.7	1.2	0.6	1.6	3.4	7.5	3.3	0.5	1.2	1.8	2.3	0.5	2.2	1.0
3.3.2 Trademark applications	11.2	6.0	9.2	37.7	5.6	7.6	8.2	23.0	6.2	8.1	6.9	8.1	3.9	3.9	3.6	3.8	7.4	11.6	16.4	7.7
3.3.3 Design applications	6.4	2.4	5.3	3.1	2.5	4.3	5.6	4.4	0.9	2.5	3.6	3.8	2.5	1.2	0.7	1.2	5.3	2.0	3.6	1.9
Impacts																				
Employment impacts																				
4.1.1 Employment in knowledge-intensive activities	16.0	17.4	12.3	21.2	14.3	15.6	16.8	16.1	12.7	13.5	15.2	17.9	16.1	12.6	14.0	23.1	15.0	15.0	27.7	12.9
4.1.2 Employment in innovative enterprises	68.4	77.3	44.1	70.7	63.2	74.1	58.3	70.9	76.5	41.3	59.3	72.8	60.6	60.2	39.2	60.4	62.5	63.5	49.7	38.7
Economic effects																				
4.2.1 Medium & high-tech product exports	56.2	50.2	35.2	45.1	68.2	66.2	48.9	41.2	23.5	45.4	62.2	45.8	54.4	38.4	69.1	63.5	51.4	36.7	43.1	32.7
4.2.2 Knowledge-intensive services exports	48.4	73.2	54.3	83.2	50.5	74.6	78.7	65.1	58.8	36.5	81.2	80.8	65.8	23.1	56.5	93.2	51.7	36.6	84.3	58.7
4.2.3 Sales of new-to-market and new-to-enterprise innovations	13.0	15.1	7.4	13.8	14.4	14.0	15.0	10.4	20.3	21.7	13.0	19.3	6.2	13.1	7.8	42.4	13.5	11.5	3.8	6.3
Environmental sustainability																				
4.3.1 Resource productivity	2.2	3.4	0.8	1.5	1.9	2.7	1.8	1.0	2.0	2.9	2.3	0.8	2.9	2.0	1.7	3.2	3.6	1.4	3.5	1.4
4.3.2 Air emissions in fine particulates (PM2.5) in Industry	0.0	0.1	0.4	0.2	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.0	0.2	0.1	0.0	0.1	0.1	0.1	0.4
4.3.3 Development of environment-related technologies	14.0	10.1	12.8	9.0	12.3	14.1	23.1	7.8	8.5	11.3	14.1	13.0	12.9	5.0	7.7	6.7	9.7	9.9	11.4	7.7

Note: The new Community Innovation Survey (CIS) 2022 data will be found in Eurostat <https://ec.europa.eu>

ANNEX C: INDICATOR VALUES BY EUROPEAN COUNTRY IN 2024

Indicator	MT	NL	PL	PT	RO	SE	SI	SK	AL	BA	CH	IS	MD	ME	MK	NO	RS	TR	UA	UK
Framework conditions																				
Human resources																				
1.1.1 New doctorate graduates	0.2	0.7	0.3	0.8	0.3	1.1	0.8	0.6	0.2	0.1	1.8	0.5	0.1	0.1	0.2	0.9	0.4	0.3	0.2	1.2
1.1.2 Population completed tertiary education	46.3	54.5	46.3	40.9	22.5	54.1	40.7	39.8	41.3	26.6	52.1	43.4	32.4	40.4	37.7	56.6	34.7	41.7	n.a	49.4
1.1.3 Lifelong learning	16.5	26.4	8.7	13.4	6.7	38.8	19.9	10.5	9.2	1.8	27.4	26.1	1.3	2.7	2.6	22.1	6.1	7.4	n.a	14.8
Attractive research systems																				
1.2.1 International Scientific co-publications	1551.5	2419.9	611.1	1693.4	386.0	2921.3	1885.2	846.0	155.7	355.3	4228.1	4067.0	150.4	745.9	389.1	3356.0	696.7	251.1	153.1	1976.6
1.2.2 Scientific publications among top 10% most cited	8.2	14.4	5.7	8.3	6.4	12.1	7.8	4.6	4.6	3.1	13.8	9.8	2.3	5.3	5.1	11.4	5.6	7.8	2.8	13.8
1.2.3 Foreign doctorate students	75.1	48.3	3.2	33.3	4.3	35.8	21.9	13.5	14.1	n.a	57.8	44.5	24.3	11.3	40.8	23.2	6.5	9.7	3.7	41.1
Digitalisation																				
1.3.1 Broadband penetration	75.5	69.7	54.9	78.9	82.2	77.0	54.9	42.5	21.4	39.2	n.a	n.a	55.22	48.6	38.4	64.2	54.7	36.2	60	27.7
1.3.2 Individuals with above basic overall digital skills	37.0	54.5	20.1	29.9	9.0	36.5	18.9	21.7	7.77	6.88	42.69	44.77	n.a	10.55	8.15	50.71	11.32	10.61	n.a	n.a
Investments																				
Finance and support																				
2.1.1 R&D expenditure in the public sector	0.2	0.7	0.5	0.6	0.2	0.9	0.6	0.4	n.a	0.1	1.0	0.7	0.2	0.3	0.3	0.7	0.5	0.5	0.2	0.5
2.1.2 Venture capital investments	0.0	0.3	0.0	0.0	0.0	0.3	0.0	0.0	n.a	0.0	0.2	0.1	0.0	0.0	0.0	0.4	0.0	0.0	0.1	0.4
2.1.3 Direct and indirect government support for business R&D	0.0	0.3	0.1	0.3	0.0	0.1	0.2	0.1	n.a	0.0	0.0	0.5	0.0	0.0	0.0	0.2	0.0	0.2	0.0	0.5
Firm investments																				
2.2.1 R&D expenditure in the business sector	0.5	1.6	1.0	1.1	0.3	2.5	1.5	0.6	n.a	0.1	2.3	1.9	0.0	0.2	0.1	0.9	0.4	0.8	0.2	1.2
2.2.2 Non-R&D innovation expenditure	0.5	0.2	0.6	0.4	0.0	0.5	0.1	0.8	0.0	0.0	n.a	0.6	0.3	0.1	1.0	0.7	8.9	0.3	0.3	0.8
2.2.3 Innovation expenditures per person employed	2835.6	6541.8	3183.9	2543.8	1037.8	11530.7	3560.8	3438.3	n.a	237.2	n.a	3695.7	241.0	2201.4	1282.3	6348.7	8121.6	3077.1	n.a	5583.0
Use of information technologies																				
2.3.1 Enterprises providing ICT trainin	28.4	29.1	24.7	23.7	8.8	34.2	28.9	15.4	21.1	15.9	n.a	n.a	n.a	23.7	11.2	34.3	22.2	16.2	8.8	23.7
2.3.2 Employed ICT specialists	4.7	6.9	4.3	4.5	2.6	8.7	3.8	4.2	0.9	2.0	5.7	4.5	2.7	2.5	2.3	5.3	4.3	1.5	n.a	5.6
Innovation Activities																				
Innovators																				
3.1.1 SMEs with product innovations	c	27.7	14.2	c	c	c	c	c	22.8	38.6	38.5	27.8	9.3	c	15.5	44.3	c	c	4.4	27.6
3.1.2 SMEs with business process innovations	c	43.1	25.5	c	c	c	c	c	31.1	34.8	32.5	41.9	15.7	c	33.5	51.5	c	c	5.9	38.2
Linkages																				
3.2.1 Innovative SMEs collaborating with others	c	18.0	6.7	c	c	c	c	c	8.9	n.a	9.7	22.0	5.3	c	6.2	31.8	c	c	4.7	35.7
3.2.2 Public-private co-publications	182.6	425.6	80.6	203.5	57.4	511.6	325.0	118.1	13.8	42.7	831.2	639.6	18.3	50.3	43.2	625.8	72.3	24.8	25.8	291.6
3.2.3 Job-to-job mobility of Human Resources in S&T	7.6	8.7	6.8	7.0	1.4	4.0	7.3	3.4	n.a	n.a	10.2	8.9	n.a	3.4	5.0	9.2	5.7	7.1	n.a	11.3
Intellectual assets																				
3.3.1 PCT patent applications	1.9	5.1	0.6	1.0	0.2	8.6	2.0	0.6	0.0	0.3	7.4	2.2	0.2	0.1	0.3	3.1	0.3	1.1	0.4	3.2
3.3.2 Trademark applications	46.7	7.6	6.1	7.6	3.3	9.4	9.2	4.8	0.3	0.3	10.8	3.9	0.8	0.2	1.1	2.2	1.0	0.7	0.6	3.9
3.3.3 Design applications	5.1	3.8	5.4	2.9	0.9	3.4	2.7	1.3	0.4	0.0	6.8	0.7	0.1	0.0	0.0	0.4	0.1	0.1	0.0	1.2
Impacts																				
Employment impacts																				
4.1.1 Employment in knowledge-intensive activities	20.6	20.3	12.8	13.0	8.1	22.2	15.4	12.1	8.8	8.5	20.2	18.6	4.9	12.0	7.7	16.7	12.4	7.1	13.4	21.6
4.1.2 Employment in innovative enterprises	47.8	62.9	42.3	59.1	12.3	70.0	63.3	42.8	42.0	50.5	59.8	66.5	26.8	69.5	41.5	72.2	51.0	42.6	n.a	64.3
Economic effects																				
4.2.1 Medium & high-tech product exports	62.5	50.1	49.7	41.8	54.5	55.8	65.6	69.9	5.2	26.2	48.4	9.4	23.7	16.3	61.9	9.6	40.7	40.2	16.3	53.0
4.2.2 Knowledge-intensive services exports	41.6	77.1	46.9	39.2	51.7	79.1	39.4	41.6	18.5	18.5	68.5	47.8	38.3	23.0	42.6	77.7	52.0	43.8	69.0	81.7
4.2.3 Sales of new-to-market and new-to-enterprise innovations	6.5	8.9	7.5	14.5	5.2	12.7	12.3	14.9	40.1	9.1	21.0	5.6	1.6	7.2	3.5	6.0	11.8	16.0	1.1	8.2
Environmental sustainability																				
4.3.1 Resource productivity	2.7	4.5	1.4	1.5	0.8	1.5	2.1	1.9	1.4	1.0	4.5	1.1	n.a	n.a	1.4	2.4	0.7	1.8	n.a	3.8
4.3.2 Air emissions in fine particulates (PM2.5) in Industry	0.0	0.0	0.2	0.7	0.2	0.0	0.1	0.1	2083.3	n.a	0.0	0.3	n.a	n.a	n.a	0.1	0.7	0.5	n.a	0.1
4.3.3 Development of environment-related technologies	9.8	10.2	8.2	7.7	8.6	12.4	9.0	12.7	28.6	37.3	7.8	7.4	4.0	9.4	19.0	13.4	12.1	6.5	11.7	11.5

c: confidential

Note: The new Community Innovation Survey (CIS) 2022 data will be found in Eurostat <https://ec.europa.eu>

ANNEX D: PERFORMANCE PER INDICATOR

Indicator	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	EU	FI	FR	HR	HU	IE	IT	LT	LU	LV
Framework conditions																				
Human resources																				
1.1.1 New doctorate graduates	-11.6	0	-11.6	11.6	0	-23.1	-46.3	23.2	23.1	-23.2	-11.6	-34.7	0	11.6	11.6	11.6	11.6	0	81.1	-11.6
1.1.2 Population completed tertiary education	6.6	-5.4	10.8	19.8	-7.2	8.9	-0.6	1.8	1.8	21	10.2	-5.4	9.6	0	-21	0	13.7	-0.6	-8.4	-2.4
1.1.3 Lifelong learning	25.5	9.2	-2	13.2	41.8	6.1	56.1	48.9	-1	15.3	20.4	-18.3	39.8	0	37.7	-13.2	17.4	22.4	-17.4	21.4
Attractive research systems																				
1.2.1 International Scientific co-publications	59.8	48.5	13.6	206.7	41.7	20.9	82.9	82.2	40.9	34.2	33.8	68.7	5.5	46.8	27.7	80.6	39.5	46.3	116.5	42
1.2.2 Scientific publications among top 10% most cited	-11.6	-17.2	5.7	9.3	5.6	-10.5	-21.9	29	5.3	-5.2	-3.9	4.2	-11.6	21.4	14.1	-3.4	12.9	34.2	-4.3	14.6
1.2.3 Foreign doctorate students	81.9	-106.8	33.4	95.7	70.2	-1.9	32.7	135.4	6.3	29.3	34.5	49.3	-13.4	30.9	138.7	84.3	-8.9	35.3	0	24.4
Digitalisation																				
1.3.1 Broadband penetration	18.5	-10.1	29.7	131.6	33.2	49.9	14.9	32.9	12.7	56.7	45	93.1	10.8	73.6	43.3	35.2	50.5	9.1	28.7	-5.2
1.3.2 Individuals with above basic overall digital skills	-5.5	8.5	-0.4	17.8	50.9	4.2	8.9	31.9	-7.5	2.6	3.8	11.5	-2.8	-27.5	29.3	18.4	-1.3	12.9	-17.6	-32.2
Investments																				
Finance and support																				
2.1.1 R&D expenditure in the public sector	19.7	31.2	-1.6	9.8	-29.6	0	0	0	18.1	8.2	0	0	-8.2	41	4.9	-21.3	1.6	-39.3	-18	1.6
2.1.2 Venture capital investments	35.4	42.7	8.3	-1.7	87.2	50.1	116.8	70.5	35.3	47.1	32.3	83.7	51	94.9	1.4	-20	3.9	92.7	-31.7	-45.8
2.1.3 Direct and indirect government support for business R&D	27.4	62.1	-3.9	14.4	-24.9	5.8	52.6	1.2	53.3	37.1	22.5	-1.8	0	-16.2	-43.2	-96.6	39.1	25.9	-3.4	1.3
Firm investments																				
2.2.1 R&D expenditure in the business sector	1.5	47.4	-13.5	15	16.5	7.5	-12.1	24.1	30.8	12.8	8.3	7.5	-0.8	27	-10.5	-6	-3.8	15.8	-12	9
2.2.2 Non-R&D innovation expenditure	-9.4	5.2	-10.7	44.1	48.2	4.5	46	41	9.7	17.8	-2.7	13.9	-27.2	-62.2	-7.8	-35.5	3.6	4.3	16.2	-26.1
2.2.3 Innovation expenditures per person employed	14.1	74.2	-6.7	22.2	53.5	1.8	44.7	42.5	27.7	5.7	13.5	13.2	10.2	-13.4	8.7	49.6	23.8	17.4	4.1	-2.1
Use of information technologies																				
2.3.1 Enterprises providing ICT trainin	-83.4	5.7	6.4	32.4	8.3	-16	25.5	33.1	-8.9	-6.4	10.8	1.9	0	-24.9	16.6	-46.5	44.6	15.3	-21.7	17.8
2.3.2 Employed ICT specialists	25.8	-6.5	16.1	48.4	-9.7	0	0	16.2	0	9.7	9.7	6.5	6.5	0	9.7	-3.3	9.7	35.5	29	19.4
Innovation Activities																				
Innovators																				
3.1.1 SMEs with product innovations	-12.9	3.1	13.6	108.1	7.6	-21	41.6	49.9	86.1	37	7.6	-43.9	5.8	82	22.4	-14.2	28.2	-15.8	-36.4	8.7
3.1.2 SMEs with business process innovations	4.4	91	-5.2	127.8	15.1	45.8	47.4	21.9	49	-8.3	25.5	-7.5	5.6	28.5	15.5	-24.6	66.1	4.3	-31.6	14.8
Linkages																				
3.2.1 Innovative SMEs collaborating with others	-69	27	25.7	228	9.4	38.5	19.7	-59.7	-119.9	31	37.4	47.8	18.1	30.8	42.8	117.5	113.9	-62.7	7.3	16
3.2.2 Public-private co-publications	124.1	54.5	22.6	233.5	33.7	30.1	42.7	64.2	75.9	40.1	21.4	28.9	-1.5	87.2	44.7	56.2	68.8	39.3	192.3	66.7
3.2.3 Job-to-job mobility of Human Resources in S&T	32.4	-11.7	0	100	26.4	0	-26.5	76.5	47.1	58.8	41.2	35.3	64.7	67.6	70.6		17.7	138.2	14.7	20.6
Intellectual assets																				
3.3.1 PCT patent applications	-3.3	-1.8	-1	6.1	-6.9	-9.8	2.6	-1.8	1.5	-0.6	-6.9	0	-12.7	-3.6	-4.8	-13.8	1.8	-8.1	10.9	-2
3.3.2 Trademark applications	13.1	2	17.9	0	20	5.2	-0.6	64.5	27.4	1.9	7	8.5	-0.8	30.3	10.3	-20.8	12.5	67.3	-40.7	30
3.3.3 Design applications	-23.6	-9.5	-61.5	20.8	-11.6	-50.8	-52	26.2	-0.9	-11.8	-24.3	-32.8	-13.7	7.1	-3.6	-10.3	-16.2	12.9	-96.4	-13.3
Impacts																				
Employment impacts																				
4.1.1 Employment in knowledge-intensive activities	8.5	-1.2	4.8	24.1	1.2	10.8	0	7.3	-3.6	6	7.2	13.3	3.6	0	1.2	-4.8	4.8	21.7	0	10.8
4.1.2 Employment in innovative enterprises	1.7	27.2	37.4	73.5	37	7.4	11.7	131	66.7	-10.4	15	40.3	-9.5	48.7	24.5	-23.3	17.8	28.1	-61.4	19.2
Economic effects																				
4.2.1 Medium & high-tech product exports	-3.3	0.7	6	-29.2	6.6	-2.9	0.1	-2.2	2.5	-5.5	0.7	6.3	-9.4	-1.9	-1.2	20.5	-2.2	3.5	-14.6	-3.1
4.2.2 Knowledge-intensive services exports	7.2	5.9	18.7	16.4	15.1	-0.3	6.8	31.2	13.4	8.5	14.4	6.4	4.7	4.7	12.7	1.5	2.1	24.9	-10.3	13.8
4.2.3 Sales of new-to-market and new-to-enterprise innovayions	8.2	60.6	21.4	75.5	-1.1	5.8	65.2	-0.7	61.6	47	0	81.5	-29.5	66.4	-38.2	0	27.7	24	-22.7	8.5
Environmental sustainability																				
4.3.1 Resource productivity	19.9	66.8	10.9	-3	28	46.1	18.3	19.1	45.9	3	25.1	8.2	35	17.7	22.5	99.8	34	2.8	5.9	1.4
4.3.2 Air emissions in fine particulates (PM2.5) in Industry	5.3	3.6	9.8	-3.1	12.8	1.3	2.1	65.3	14.7	-7.4	4.2	10.3	2.9	13.9	-2.9	15.6	1.7	16.6	6.6	17.2
4.3.3 Development of environment-related technologies	-17.2	2.6	-55.7	18	6.9	-13.7	0	-142.2	-66.8	-43.3	9.8	-30.5	-15.5	-100	-43.4	-13.6	-20.7	-27.5	-48.4	-56.9

Indicator	MT	NL	PL	PT	RO	SE	SI	SK	AL	BA	CH	IS	MD	ME	MK	NO	RS	TR	UA	UK
Framework conditions																				
Human resources																				
1.1.1 New doctorate graduates	0	0	0	0	-23.2	-46.3	-69.5	-34.8	11.6	4	0	-23.1	-7.6	2.2	0	11.6	-11.6	23.2	-6.1	-21.2
1.1.2 Population completed tertiary education	20.3	-6.6	26.9	-25.8	0	28.7	0	1.8	88.5	-3	-1.2	11.4	18	36.5	32.9	9.6	0	18.6		13.8
1.1.3 Lifelong learning	27.5	-2.1	31.6	11.2	18.3	0	0	-23.5	0	-3	46.9	22.5	2.8	-6.1	-3.1	26.5	0	9.1		4.1
Attractive research systems																				
1.2.1 International Scientific co-publications	76.8	53.7	28.9	60.2	15.8	55.6	51	25.9	8.4	21.3	3.2	0	6.9	40.6	21.2	116.5	30	14.8	6.5	57
1.2.2 Scientific publications among top 10% most cited	11.3	-10.6	19.2	-18.9	33.8	-12.9	10.1	12.5	37	1	-10.6	5.3	-3.5	-3.9	36	-7.1	6.5	29.3	14.4	-0.8
1.2.3 Foreign doctorate students	0	76	8.3	75.8	12.8	19.3	84.5	27.8	19.8		22.4	81.4	66.6	-48.1	70.1	13.6	-0.1	20.4	7.6	-11.4
Digitalisation																				
1.3.1 Broadband penetration	60.9	25.7	39.4	43.4	73.2	0	44.3	33.9	18.6	44.6			10	79.5	-1.7	27.4	108.4	33.2	5.2	0
1.3.2 Individuals with above basic overall digital skills	6.7	0	-2.7	6.2	1.1	3.7	-3.8	3.9	16.7	6.8	10.8	0		6.2	0	36.2	-4.4	3.3		
Investments																				
Finance and support																				
2.1.1 R&D expenditure in the public sector	-19.7	-5	-4.9	-8.2	-18	-9.9	13.1	-67.2		0	8.2	-1.6	-9.3	9.8	-13.1	-29.5	-1.6	3.2	-4.9	0
2.1.2 Venture capital investments	-0.3	67.4	-1.2	-18.2	10	101.5	27.2	13.5		0	54.5	42	50.1	8.4	7.8	86	45.8	9	45.6	72.5
2.1.3 Direct and indirect government support for business R&D	-20.6	11.3	64.5	115.8	-8.9	-8.5	-33.8	48.8		0	0.6	145.8	-0.7	0	6.6	36.4	0	97.7	0	22.3
Firm investments																				
2.2.1 R&D expenditure in the business sector	6.8	13.5	36.9	36.1	5.2	6.8	-14.3	18		0	12.8	36.1	-1.5	6	1.5	-12	12.1	24.8	-2.3	7.6
2.2.2 Non-R&D innovation expenditure	9.5	0	-44.4	-23.8	-33.5	-47.6	-73.1	16.2	0	0		0	-10.9	0	0	2.1	24.8	-10.8	0.2	9.1
2.2.3 Innovation expenditures per person employed	15.3	21.2	-8.5	-5.1	4.5	-15.5	-12.6	18.7		0		0	-0.3	0	0	7.3	-68.5	-0.7		0
Use of information technologies																				
2.3.1 Enterprises providing ICT trainin	21.6	70.1	84.1	7.6	21.7	10.8	3.2	-19.8	0	1.9				16.6	-5.1	-21.7	-66.2	4.4	-3.8	-21
2.3.2 Employed ICT specialists	-3.2	6.4	19.3	0	0	0	-32.3	-3.2	0	16.2	6.4	16.1	35.1	12.9	16.1	-3.2	0	3.2		9.7
Innovation Activities																				
Innovators																				
3.1.1 SMEs with product innovations	-2.7	-40.7	29.7	-69.6	6.3	42.9	92.1	15.2	-9.1	0	27.2	-25.8	18.2	0	0	5.4	58.8	-66.6	0	-14.1
3.1.2 SMEs with business process innovations	13.5	17.9	40.1	-57.1	0	45.8	15.3	15.5	-5.5	0	-75.3	16.5	17.4	0	0	6.1	55.9	-56.6	0	14.7
Linkages																				
3.2.1 Innovative SMEs collaborating with others	30.4	43.4	27	-12.5	-7	181.1	6.8	12	-27.5		0	-10.7	-56.6	0	0	77.8	34.3	-13.3	0	0
3.2.2 Public-private co-publicatons	77.5	54.6	29.3	78.5	19.6	47.3	68	30.1	3.7	11.4	0	-1.7	10.3	13.9	25.1	108.4	15.7	8.5	14.2	55.9
3.2.3 Job-to-job mobility of Human Resources in S&T	41.2	-32.3	26.5	64.7	-11.8	-61.8	76.5	17.7			26.5	0		-44.1	82.3	11.8	50	-41.2		23.5
Intellectual assets																				
3.3.1 PCT patent applications	22.5	-8.9	-0.3	6.5	-5.4	0	-23.8	-2.9	-11.5	15.5	2	-17.1	9.1	-16.4	0.8	1.2	0.7	13.5	-1.4	-4.2
3.3.2 Trademark applications	0	3.8	12.9	14.7	19.3	10	19.2	21.5	4.5	2.9	-1.8	-75.1	4.7	-12.8	13.2	10.6	8.5	6.9	14.5	-25.7
3.3.3 Design applications	-64.9	10.3	-16.8	-37.6	5.4	-35.3	-15.8	-5.5	8.8	0.4	10.1	6	-0.7	0	0.8	-0.9	-1.4	-3.2	-1.5	-41
Impacts																				
Employment impacts																				
4.1.1 Employment in knowledge-intensive activities	9.6	4.8	16.9	1.2	-1.2	18.1	-21.7	2.4	2.8	20.5	-1.2	21.7	0	7.3	14.5	6	0	4.8	0	38.7
4.1.2 Employment in innovative enterprises	-15.9	-3.7	46.4	-5.1	0	32.9	25.6	20.9	-4.4	0	-72.2	-15.8	-59.9	0	0	36.4	-0.6	-41.8		-8.5
Economic effects																				
4.2.1 Medium & high-tech product exports	-12.3	0.7	0.1	7.9	0.8	1.1	19.2	3.8	0	15.6	-0.4	0	2.1	1.8	10.1	-10.3	2.2	-3.3	-19.4	-11.1
4.2.2 Knowledge-intensive services exports	-22.2	-2.7	11.8	-4.8	13	6.6	6.2	12.3	2.4	7.8	-2.9	-15.6	1.2	5.9	29.3	-1.9	17	10.6	37.9	2.8
4.2.3 Sales of new-to-market and new-to-enterprise innovayions	19.5	-15	8.5	66.8	-10.3	47.3	-1.1	-33.9	0	0	11.4	0	-12.3	0	0	-1	31.5	48.8	3.1	-102.2
Environmental sustainability																				
4.3.1 Resource productivity	47.9	26.7	23.9	15.1	1.3	3.1	28.3	17.9	30	13.3	4.7	36.8			29.4	44.8	0.5	25		37.9
4.3.2 Air emissions in fine particulates (PM2.5) in Industry	7.3	2.2	12	7	7.2	11.7	14.6	9.9	0		4.1	-1.5				4.3	-11.8	12.4		3.5
4.3.3 Development of environment-related technologies	5.5	-18.9	-68.3	-59	-71.4	5	0.6	-52.3	68.8	0	-19.9	18.2	-51.3	51.9	51.6	-7.7	-35.2	-8.8	-11.5	-16.9

ANNEX E: ANNEX E - INDICATORS - DEFINITIONS, DATA SOURCES, INTERPRETATION

Indicator	Definition numerator	Source numerator	Definition denominator	Source denominator	Most recent year for which data are available	Interpretation of last year
1.1.1 New doctorate graduates in science, technology, engineering, and mathematics (STEM) per 1000 population aged 25-34	Number of graduates at doctoral level, in science, technology, engineering, and mathematics (STEM)	Eurostat	Population between and including 25 and 34 years	Eurostat	2022	The indicator is a measure of the supply of new secondstage tertiary graduates in all fields of training (ISCED 8). For most countries, ISCED 8 captures PhD graduates. There is a complex relation between STEM-graduates and innovation in the private sector. STEM-graduates do well as employees within firms with many of them taking up managerial positions.
1.1.2 Percentage population aged 25-34 having completed tertiary education	Number of persons in age class 25-34 with some form of tertiary education (ISCED levels 5-8)	Eurostat	Population between and including 25 and 34 years	Eurostat	2023	This is a general indicator of the supply of advanced skills. It is not limited to science and technical fields, because the adoption of innovations in many areas depends on a wide range of skills. The indicator focuses on a younger age cohort of the population, aged 25 to 34, and will therefore easily and quickly reflect changes in educational policies leading to more tertiary graduates.
1.1.3 Percentage population aged 25-64 participating in lifelong learning	The target population for lifelong learning statistics refers to all persons in private households aged between 25 and 64 years. The information relates to all education or training, whether or not relevant to the respondent's current or possible future job. Data are collected through the EU Labour Force Survey	Eurostat	Total population of the same age group, excluding those who did not answer to the question concerning participation in (formal and non-formal) education and training	Eurostat	2023	Lifelong learning encompasses all purposeful learning activity, whether formal, non-formal or informal, undertaken on an ongoing basis with the aim of improving knowledge, skills and competence. The intention or aim to learn is the critical point that distinguishes these activities from non-learning activities, such as cultural or sporting activities.
1.2.1 International scientific co-publications per million population	Number of scientific publications with at least one co-author abroad (where abroad is non-EU for the EU)	Scopus	Total population	Eurostat	2023	International scientific co-publications are a proxy for the quality of scientific research as collaboration increases scientific productivity. For individual countries all publications with at least one co-author outside the country are included, For the EU only publications with at least one co-author in a non-EU Member State are included.
1.2.2 Scientific publications among the top-10% most cited publications worldwide as percentage of total scientific publications of the country	Number of scientific publications among the top-10% most cited publications worldwide	Scopus	Total number of scientific publications	Scopus	2021	The indicator is a measure for the quality of the research system, as highly cited publications are assumed to be of higher quality. There could be a bias towards small or English-speaking countries given the coverage of Scopus' publication data.
1.2.3 Foreign doctorate students as a percentage of all doctorate students	Number of mobile students from abroad enrolled in doctorate programs (ISCED level 8)	Eurostat	Number of students enrolled in doctorate programs (ISCED level 8)	Eurostat	2021	The share of foreign doctorate students reflects the mobility of students as an effective way of diffusing knowledge. Attracting high-skilled foreign doctorate students will secure a continuous supply of researchers.

Indicator	Definition numerator	Source numerator	Definition denominator	Source denominator	Most recent year for which data are available	Interpretation of last year
1.3.1 Broadband penetration	Number of enterprises with a maximum contracted download speed of the fastest fixed internet connection of at least 100 Mb/s	Eurostat, Community Survey of ICT Usage and E-commerce in Enterprises	All enterprises	Eurostat, Community Survey of ICT Usage and E-commerce in Enterprises	2023	Realising Europe's full e-potential depends on creating the conditions for electronic commerce and the Internet to flourish. This indicator captures the relative use of this e-potential by the share of enterprises that have access to fast broadband. Data on the speed of mobile connections is not available, the indicator on the speed of fixed internet access is the most suitable proxy.
1.3.2 Individuals who have above basic overall digital skills (% share)	Number of individuals with above basic overall digital skills (all five component indicators are at above basic level)	Eurostat, EU survey on the ICT usage in households and by individuals	Total number of individuals aged 16 to 74	Eurostat	2023	Above basic overall digital skills represent the highest level of the overall digital skills indicator, which is a composite indicator based on selected activities performed by individuals aged 16-74 on the internet in four specific areas (information, communication, problem solving, content creation) during the previous 3 months
2.1.1 R&D expenditure in the public sector (percentage of GDP)	Gross domestic expenditure on R&D (GERD) performed by the government sector (GOVERD) and the higher education sector (HERD)	Eurostat	Gross Domestic Product	Eurostat	2022	Research and development (R&D) expenditure represents one of the major drivers of economic growth in a knowledgebased economy. As such, trends in the R&D expenditure indicator provide key indications of the future. competitiveness and wealth of the EU. R&D spending is essential for making the transition to a knowledge-based economy as well as for improving production technologies and stimulating growth.
2.1.2 Venture capital (percentage of GDP)	Venture capital expenditures is defined as private equity being raised for investment in companies. Management buyouts, management buy-ins, and venture purchase of quoted shares are excluded. Venture capital includes early stage (seed + start-up) and expansion and replacement capital. Three-year averages have been used.	Invest Europe	Gross Domestic Product	Eurostat	2023	The amount of venture capital is a proxy for the relative dynamism of new business creation. For enterprises using or developing new (risky) technologies, venture capital is often the only available means of financing their (expanding) business
2.1.3 Direct government funding and government tax support for business R&D (percentage of GDP)	Sum of GTARD as a percentage of GDP and Direct funding of BERD as a percentage of GDP	OECD	(empty in 2023)	(empty in 2023)	2021	Public financing of R&D can take two forms: Direct funding for R&D through instruments such as grants and public procurement, and Indirect support through the tax system. Direct funding is well captured in the official data on R&D expenditure by source of fund, differentiating between the following sources: Business enterprise sector, Government sector, Higher education sector, Private non-profit sector, and Abroad. Data on R&D funded by the Government sector are available from Eurostat (EU Member States and other European countries), OECD (OECD member states) and UIS (global coverage). Over time, more and more countries have introduced R&D tax incentives. The OECD has started to systematically collect data on R&D tax incentives since 2018 and with the support of the EC data are currently being collected on an annual basis and made available in the 'OECD R&D Tax Incentives database'. In the EU, 21 countries were offering R&D tax relief in 2019, a significant increase compared to only 12 countries offering R&D tax relief in 2000.

Indicator	Definition numerator	Source numerator	Definition denominator	Source denominator	Most recent year for which data are available	Interpretation of last year
2.2.1 R&D expenditure in the business sector (percentage of GDP)	Gross domestic expenditure on R&D (GERD) performed by the business sector (BERD)	Eurostat	Gross Domestic Product	Eurostat	2022	The indicator captures the formal creation of new knowledge within firms. It is particularly important in the science-based sectors (pharmaceuticals, chemicals and some areas of electronics) where most new knowledge is created in or near R&D laboratories.
2.2.2 Non-R&D innovation expenditures (percentage of turnover)	Sum of total innovation expenditure by enterprises in all size classes, excluding intramural and extramural R&D expenditures	Eurostat - Community Innovation Survey	Total turnover for all enterprises	Eurostat - Community Innovation Survey	2020	This indicator measures non-R&D innovation expenditure as a percentage of total turnover. Several of the components of innovation expenditure, such as investment in equipment and machinery and the acquisition of patents and licenses, measure the diffusion of new production technology and ideas.
2.2.3 Innovation expenditures per person employed	Sum of total innovation expenditure by enterprises in all size classes, in Purchasing Power Standard (PPS)	Eurostat - Community Innovation Survey	Total employment in innovative enterprises in all size classes	Eurostat - Community Innovation Survey	2020	The indicator measures the monetary input directly related to innovation activities.
2.3.1 Enterprises providing training to develop or upgrade ICT skills of their personnel	Percentage of enterprises that provided training to develop/upgrade ICT skills of their personnel	Eurostat	All enterprises	Eurostat, Community Survey of ICT Usage and E-commerce in Enterprises	2022	ICT skills are particularly important for innovation in an increasingly digital economy. The share of enterprises providing training in that respect is a proxy for the overall skills development of employees.
2.3.2 ICT specialists (as a percentage of total employment)	Employed ICT specialists as a percentage of total employment	Eurostat	Total employment	Eurostat	2023	Eurostat defines ICT specialists as «workers who have the ability to develop, operate and maintain ICT systems, and for whom ICT constitute the main part of their job». Operationalised in terms of ISCO codes, this definition converts into a statistical definition of ICT specialists as follow: from 2011 onwards - corresponding to the application of the ISCO-08, Eurostat and OECD adopted a joint approach to define the occupations to be treated as ICT specialists (OECD, 2015).
3.1.1 SMEs introducing product innovations (percentage of SMEs)	Number of Small and Medium sized Enterprises (SMEs) who introduced at least one product innovation. A product innovation is the market introduction of a new or significantly improved good or service with respect to its capabilities, user friendliness, components, or sub-systems	Eurostat - Community Innovation Survey	Total number of Small and Medium sized Entreprises (SMEs)	Eurostat - Community Innovation Survey	2020	Product innovation is a key ingredient to innovation as they can create new markets and improve competitiveness. Higher shares of product innovators reflect a higher level of innovation activities.
3.1.2 SMEs introducing business process innovations (percentage of SMEs))	Number of Small and Medium sized Enterprises (SMEs) who introduced at least one business process innovation (new or improved business process)	Eurostat - Community Innovation Survey	Total number of Small and Medium sized Entreprises (SMEs)	Eurostat - Community Innovation Survey	2020	Many firms innovate not by improving new products but by improving their business processes. Business process innovations include process, marketing and organisational innovations.

Indicator	Definition numerator	Source numerator	Definition denominator	Source denominator	Most recent year for which data are available	Interpretation of last year
3.2.1 Innovative SMEs collaborating with others (percentage of SMEs)	Number of innovation-active Small and Medium sized Enterprises (SMEs) that co-operated on business activities with other enterprises or organisations	Eurostat - Community Innovation Survey	Total number of Small and Medium sized Enterprises (SMEs)	Eurostat - Community Innovation Survey	2020	This indicator measures the degree to which SMEs are involved in innovation co-operation. Complex innovations often depend on the ability to draw on diverse sources of information and knowledge, or to collaborate in the development of an innovation. This indicator measures the flow of knowledge between public research institutions and firms, and between firms and other firms. The indicator is limited to SMEs, because almost all large firms are involved in innovation co-operation.
3.2.2 Public-private co-publications per million population	Number of public-private coauthored research publications. The definition of the «private sector» excludes the private medical and health sector. Publications are assigned to the country in which the business companies or other private sector organisations are located.	Scopus	Total population	Eurostat	2023	This indicator captures public-private research linkages and active collaboration activities between business sector researchers and public sector researchers resulting in academic publications.
3.2.3 Job-to-job mobility of Human Resources in Science & Technology	Job-to-job mobility of Human Resources in Science & Technology as a percentage of the working age population aged 25 to 64	Eurostat	Working age population aged 25-64	Eurostat	2020	Human Resources in Science & Technology (HRST) are people who fulfil one or other of the following conditions: 1) have successfully completed a tertiary level education; 2) not formally qualified as above but employed in a S&T occupation where the above qualifications are normally required. Job-to-job mobility in this context is defined as the movement of individuals between one job and another from one year to the next. It does not include inflows into the labour market from a situation of unemployment or inactivity.
3.3.1 PCT patent applications per billion GDP (in PPS)	Number of patent applications filed under the PCT	OECD	Gross Domestic Product, in Purchasing Power Standard (PPS)	Eurostat	2020	The capacity of firms to develop new products will determine their competitive advantage. One measure of the rate of new product innovation is the number of patents. This indicator measures the number of PCT patent applications.
3.3.2 Trademarks applications per billion GDP (in PPS)	Number of trademark applications applied for at EUIPO	European Union Intellectual Property Office (EUIPO)	Gross Domestic Product, in Purchasing Power Standard (PPS)	Eurostat	2023	Trademarks are an important innovation indicator, especially for the service sector. The Community trademark gives its proprietor a uniform right applicable in all Member States of the European Union through a single procedure which simplifies trademark policies at European level. It fulfils the three essential functions of a trademark: it identifies the origin of goods and services, guarantees consistent quality through evidence of the company's commitment vis-à-vis the consumer, and it is a form of communication, a basis for publicity and advertising.

Indicator	Definition numerator	Source numerator	Definition denominator	Source denominator	Most recent year for which data are available	Interpretation of last year
3.3.3 Designs applications per billion GDP (in PPS)	Number of individual designs applied for at EUIPO	European Union Intellectual Property Office (EUIPO)	Gross Domestic Product, in Purchasing Power Standard (PPS)	Eurostat	2023	A design is the outward appearance of a product or part of it resulting from the lines, contours, colours, shape, texture, materials and/or its ornamentation. A product can be any industrial or handicraft item including packaging, graphic symbols and typographic typefaces but excluding computer programmes. It also includes products that are composed of multiple components, which may be disassembled and reassembled. Community design protection is directly enforceable in each Member State, and it provides both the option of an unregistered and a registered Community design right for one area encompassing all Member States.
4.1.1 Employment in knowledge-intensive activities (percentage of total employment)	Percentage of employed persons in knowledge-intensive activities in business industries	Eurostat	Total employment	Eurostat	2023	Knowledge-intensive activities provide services directly to consumers, such as telecommunications, and provide inputs to the innovative activities of other firms in all sectors of the economy.
4.1.2 Employment in innovative enterprises	Number of employed persons in innovative enterprises	Eurostat - Community Innovation Survey	Total employment for enterprises with 10 employees or more	Eurostat - Community Innovation Survey	2020	Innovation in enterprises has a profound impact on the employability of workers, but its effect in product- and process-innovation oriented firms varies across countries. Firm innovation proves to be specifically important during a time of economic recession. Although high-skilled employees are less affected by a recession than low-skilled employees, a notable positive effect is observed for low-skilled employees in innovative firms as well.
4.2.1 Exports of medium and high technology products as a share of total product exports	Sum of the trade value of medium and high-tech product exports. Medium and high-tech products are defined as the following SITC Rev.4 product categories: 266, 267, 512, 513, 525, 533, 54, 553, 554, 562, 57, 58, 591, 593, 597, 598, 629, 653, 671, 672, 679, 71, 72, 731, 733, 737, 74, 751, 752, 759, 76, 77, 78, 79, 812, 87, 88 and 891	Eurostat, UNComtrade	Total value of all product exports	Eurostat, UNComtrade	2023	The indicator measures the technological competitiveness of the EU, i.e. the ability to commercialise the results of research and development (R&D) and innovation in international markets. It also reflects product specialisation by country. Creating, exploiting and commercialising new technologies are vital for the competitiveness of a country in the modern economy. Medium and high technology products are key drivers for economic growth, productivity and welfare, and are generally a source of high value added and well-paid employment.
4.2.2 Knowledge-intensive services exports as percentage of total services exports	Value of knowledge-intensive service exports. Knowledge-intensive services are defined as the sum of credits in EBOPS 2010 (Extended Balance of Payments Services Classification) items SC1, SC2, SC3A, SF, SG, SH, SI, SJ and SK1	Eurostat, UNCTAD	Total value of all service exports	Eurostat, UNCTAD	2022	The indicator measures the competitiveness of the knowledge-intensive services sector. Competitiveness enhancing measures and innovation strategies can be mutually reinforcing for the growth of employment, export shares and turnover at the firm level. It reflects the ability of an economy, notably resulting from innovation, to export services with high levels of value added, and successfully take part in knowledge-intensive global value chains.

Indicator	Definition numerator	Source numerator	Definition denominator	Source denominator	Most recent year for which data are available	Interpretation of last year
4.2.3 Sales of new-to-market and new-to-enterprise innovations as percentage of turnover	Turnover from new or significantly improved products for all enterprises	Eurostat - Community Innovation Survey	Total turnover for all enterprises	Eurostat - Community Innovation Survey	2020	This indicator measures the turnover of new or significantly improved products and includes both products which are only new to the firm and products which are also new to the market. The indicator thus captures both the creation of state-of-the-art technologies (new-to-market products) and the diffusion of these technologies (new-to-firm products).
4.3.1 Resource productivity	Resource productivity is expressed by the amount of GDP (in Purchasing Power Standard (PPS) generated per unit of direct material consumed (in kilograms)	Eurostat	(empty in 2023)	(empty in 2023)	2022	Resource productivity is a measure of the total amount of materials directly used by an economy (measured as domestic material consumption (DMC)) in relation to GDP. It provides insights into whether decoupling between the use of natural resources and economic growth is taking place. Resource productivity (GDP/DMC) is the EU sustainable development indicator for policy evaluation. Domestic material consumption (DMC) measures the total amount of materials directly used by an economy and is defined as the annual quantity of raw materials extracted from the domestic territory, plus all physical imports minus all physical exports.
4.3.2 Air emissions by fine particulate matter (PM2.5) in Industry	Air emissions by fine particulate matter (PM2.5) in the Manufacturing sector in Tonnes	Eurostat	Value added in the Manufacturing sector - Chain linked volumes (2010), million euro	Eurostat	2021	Air pollution may be anthropogenic (human-induced) or of natural origin. Air pollution has the potential to harm both human health and the environment: particulate matter (PM), nitrogen dioxide and ground-level ozone are known to pose particular health risks. Long-term and peak exposures to these pollutants may be associated, among other impacts, with cardiovascular and respiratory diseases or an increased incidence of cancer. This indicator captures average concentration levels of fine particulate matter (PM2.5 — particles with a diameter of 2.5 micrometres or less) to which the population is exposed. The EU set an annual limit of 25 µg/m ³ for fine particulate matter in Directive 2008/50/EC27 on ambient air quality and cleaner air, while the World Health Organisation (WHO28) set a more stringent, but non-binding guideline value, whereby annual mean concentrations should not exceed 10 µg/m ³ in order to protect human health. PM2.5 is considered by the WHO as the pollutant with the highest impact on human health.
4.3.3 Development of environment-related technologies, percentage of all technologies	Number of environment-related inventions	OECD	Total number of patents	OECD	2019	The number of environment-related inventions is expressed as a percentage of all domestic inventions (in all technologies). Indicators of technology development are constructed by measuring inventive activity using patent data across a wide range of environment-related technological domains (ENVTECH), including environmental management, waterrelated adaptation, and climate change mitigation technologies. The counts used include only higher-value inventions (with patent family size ≥ 2). Data are obtained from the Patents: Technology development dataset of the OECD Environment Database.

ANNEX F: SUMMARY INNOVATION INDEX (SII) TIME SERIES: NORMALISED SCORES, RELATIVE TO EU SCORES, AND CHANGE OVER TIME

	2017	2018	2019	2020	2021	2022	2023	2024	2017	2018	2019	2020	2021	2022	2023	2024	Change between 2017 and 2024
EU	0.50	0.51	0.51	0.52	0.53	0.54	0.55	0.55	100	100.5	101.2	104	105.2	107.9	109.4	110	10
AT	0.62	0.62	0.62	0.62	0.61	0.63	0.65	0.64	123.3	124	122.5	122.8	122.3	124.8	129.1	127.9	4.6
BE	0.61	0.62	0.60	0.66	0.66	0.69	0.68	0.68	120.9	122.5	120.1	131	131.4	137.6	136.2	136	15.1
BG	0.24	0.23	0.24	0.25	0.25	0.25	0.24	0.25	47.9	45.2	47.1	49.3	49.8	49.3	48.7	50.6	2.7
CY	0.39	0.40	0.42	0.51	0.52	0.56	0.57	0.59	78	79.6	82.6	100.6	104.5	112	113.6	116.9	38.9
CZ	0.42	0.41	0.42	0.43	0.43	0.47	0.48	0.50	83.1	81.4	84.1	85.4	85.6	94.5	96.4	98.7	15.6
DE	0.60	0.60	0.60	0.63	0.63	0.63	0.63	0.62	119	118.6	119.1	124.6	124.6	124.8	126.2	122.8	3.8
DK	0.68	0.68	0.68	0.71	0.72	0.74	0.75	0.75	135.1	134.9	134.6	140.5	143.3	147.3	148.8	149.3	14.2
EE	0.44	0.44	0.44	0.54	0.56	0.58	0.59	0.58	88.5	87.4	88	106.6	110.9	115.6	118.2	115.3	26.8
EL	0.35	0.35	0.35	0.37	0.39	0.43	0.43	0.43	69.3	68.9	69.6	74.5	78.1	85.4	86.3	85.3	16
ES	0.45	0.45	0.46	0.46	0.45	0.48	0.49	0.50	89.5	90.3	92.2	92.1	90.4	96	96.9	98.9	9.4
FI	0.65	0.64	0.64	0.66	0.67	0.71	0.71	0.71	128.8	127	127.4	132	133.2	140.4	141.3	140.6	11.8
FR	0.57	0.57	0.57	0.56	0.57	0.57	0.57	0.57	112.7	112.7	113.3	112.5	112.6	112.9	114.1	114.4	1.7
HR	0.31	0.31	0.31	0.34	0.35	0.38	0.39	0.38	62.2	60.9	61.1	67.7	70.3	75.1	76.7	76.6	14.4
HU	0.35	0.35	0.34	0.36	0.36	0.37	0.38	0.39	68.9	69.4	67	70.7	71.9	73.2	75.5	77.6	8.7
IE	0.61	0.62	0.62	0.62	0.62	0.61	0.61	0.63	122.2	123.6	122.9	122.6	122.7	122	122.4	124.5	2.3
IT	0.42	0.43	0.43	0.48	0.49	0.50	0.49	0.50	83.6	85.2	86	94.7	96.8	99.3	97.8	98.6	15
LT	0.38	0.37	0.38	0.42	0.43	0.43	0.44	0.46	75.7	74.3	76	84.2	85	85.9	88.3	92	16.3
LU	0.65	0.64	0.65	0.64	0.63	0.62	0.63	0.62	128.8	127.8	129.5	127.4	126.3	123.6	125.8	123.3	-5.5
LV	0.28	0.28	0.29	0.29	0.28	0.28	0.30	0.30	56.3	56.4	56.8	58.5	56.3	55.9	59.2	59	2.7
MT	0.45	0.47	0.47	0.53	0.51	0.51	0.50	0.49	89.8	94.5	94.4	106	101.6	101.4	98.7	96.8	7
NL	0.66	0.66	0.68	0.67	0.68	0.69	0.70	0.69	130.5	132	134.9	134.1	135.5	138.1	138.8	138.3	7.8
PL	0.30	0.30	0.31	0.31	0.32	0.34	0.35	0.36	59.5	59.2	61.4	62.3	63.7	67.4	69.2	72.5	13
PT	0.44	0.44	0.44	0.44	0.46	0.45	0.46	0.46	87.5	87	87.9	87.5	91.9	90	91.3	91.8	4.3
RO	0.18	0.18	0.18	0.18	0.18	0.19	0.20	0.19	35.9	36.7	35.5	35.5	36.2	38.2	39	37.4	1.5
SE	0.69	0.69	0.70	0.71	0.72	0.73	0.73	0.73	136.9	137.3	138.4	140.9	142.5	145.1	146	146.2	9.3
SI	0.48	0.47	0.46	0.46	0.49	0.50	0.50	0.50	95.5	94.1	90.6	91.8	97.2	98.9	98.6	100.1	4.6
SK	0.35	0.32	0.32	0.35	0.35	0.35	0.35	0.36	69	64.3	64.6	68.7	69.2	69.6	70.1	71.6	2.6
AL	0.18	0.21	0.19	0.20	0.22	0.22	0.23	0.23	36.2	41.7	38.4	39.5	43.8	43.9	45.9	46	9.8
BA	0.15	0.16	0.15	0.14	0.14	0.15	0.17	0.18	30	31.2	29.7	27	27.4	30.8	33.7	36.4	6.4
CH	0.76	0.76	0.77	0.76	0.77	0.76	0.76	0.76	150.9	151.9	152.4	151.5	152.7	151.4	150.3	152.2	1.3
IS	0.52	0.51	0.50	0.52	0.54	0.54	0.56	0.56	103.8	100.8	99.9	103	106.6	107	111.6	110.6	6.8
MD	0.13	0.15	0.16	0.15	0.15	0.17	0.15	0.13	25.2	30	32.5	28.9	30.5	33.3	29.6	25.5	0.3
ME	0.23	0.24	0.25	0.24	0.26	0.26	0.26	0.26	46.6	48.1	49.2	48.5	51.6	52.5	51.5	52.3	5.7
MK	0.19	0.19	0.19	0.21	0.21	0.21	0.23	0.25	37.8	38.8	38.1	41.5	42.4	42.2	45.7	49.6	11.8
NO	0.59	0.59	0.59	0.61	0.62	0.64	0.64	0.65	116.7	117.1	117.2	122.4	123.8	127.2	127.8	128.7	12
RS	0.31	0.30	0.31	0.31	0.32	0.32	0.33	0.35	61.7	59.3	60.9	62.4	64	63.1	64.7	69.1	7.4
TR	0.26	0.27	0.27	0.25	0.26	0.26	0.26	0.29	50.8	52.8	54.3	50.7	51.1	51.7	51.2	56.9	6.1
UA	0.16	0.16	0.16	0.16	0.16	0.18	0.18	0.18	32	31.4	31.7	31.3	31.8	35.2	35.6	35.7	3.7
UK	0.64	0.64	0.65	0.64	0.65	0.65	0.65	0.63	126.4	127.7	128.5	127.8	129.2	130	128.4	126.3	-0.1

ANNEX G: PERFORMANCE SCORES BY EUROPEAN COUNTRY PER DIMENSION IN 2024

Country	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
EU	103.6	114	124.4	116.7	106.3	110.2	116.8	135.5	90.9	111.3	105.3	111
AT	115.8	169.7	111.5	149.4	113.9	111.2	148.7	232.6	126.8	132.8	81	116.2
BE	117.3	153.4	133.6	161.7	149.1	153.3	188.8	227.5	81	157.1	95	118.1
BG	40.1	34.7	58.5	31.4	39	60.6	34.3	40.9	83.5	66.4	56.1	51.7
CY	110.2	186.3	138.4	46.6	48.2	138.8	199.3	305.4	97.6	166.8	94.2	66
CZ	78	93.5	117.3	98.3	122.4	104.3	111.4	117	60.3	113.2	94.7	103.8
DE	97.4	115.3	107.5	110.9	150	127.1	139	178.6	109.3	141.1	106.7	127.2
DK	164.6	209.6	183.5	153.3	122.9	162.4	141.7	290.2	123.4	118.6	97	136.2
EE	132	153.4	118.8	118.8	100	130.2	127.4	225	108.2	137.9	73.4	62.9
EL	76.8	77.2	62.8	86.8	77.4	42.7	213.7	125.7	48.5	128.9	75.9	78.2
ES	128.8	102.8	180.2	121.3	65.7	98.4	62.6	125.7	73.9	68.2	83.2	107.5
FI	140.9	171	201.9	129.7	115.5	204.1	145.5	279.7	112.3	151.8	104.7	80.8
FR	140.7	120.7	137	165.9	94.4	85.9	130.5	156.2	74.9	119	75.9	121.4
HR	73.6	55.4	83.5	95	47.3	96.9	153.4	151.1	41.9	98	52	66.9
HU	49.5	88.1	108.1	94.8	74.7	87.3	52.9	125	45.8	67	85.4	77.5
IE	152.7	174.4	159.7	75.1	91.9	135.7	109.2	228.3	55.2	158.7	135.4	115
IT	76.5	106.2	94.2	75.7	74.2	89	176.7	130.8	97.1	116	80.1	121.6
LT	111.1	66.1	121.5	95.8	92.2	82.9	113	176.1	66.2	118	55.4	83.6
LU	174.8	230.6	143.6	75.1	46.6	154.5	98.2	242.8	101.5	141.3	72.6	127.7
LV	77.6	55.7	68.3	47.5	28.3	80.8	54.9	104.7	63.1	59.9	54.5	49.3
MT	90.4	164.8	170.8	17.4	47.8	127.3	60.5	124.6	120.5	120.9	68.9	117.8
NL	156.7	210.1	192.1	147.7	83.6	165.7	126.7	239.9	103	147.2	84.7	128
PL	74.8	42.7	99.6	72	66.1	109.2	53.1	99.3	78.1	66	63.6	66.9
PT	101.1	131.9	160.5	113.6	59.6	109.4	118.8	134.4	69.7	98.2	67	34.8
RO	27.9	43	115.4	23.8	15	31.6	3.1	9.4	32	10.3	65.6	53.1
SE	179.3	189.4	172.2	134.7	139.5	193.1	154.5	242	112	171.3	98.2	94.4
SI	117.9	116.3	96.9	86.6	63.2	114.1	140.4	179.3	80.3	119.8	81.8	88.7
SK	81.4	57.8	83.1	54.6	62.5	78.6	53.1	74.6	46.5	62.8	92	100.9
AL	61.4	41.2	17.7	0	13.5	50.2	87.9	54.3	5.4	42.3	50	73.7
BA	10.7	26.4	44.5	0	0.9	43.9	137.4	20.3	13.5	56.5	31.2	98.8
CH	193.6	248.2	172.9	107.1	174.9	141.6	132.3	262.3	138.2	140.9	103	129.3
IS	124.7	203.6	182.3	136.8	93.5	102	124	301.1	55.6	144.1	29.8	47
MD	18.8	42.7	128.4	20.7	19.5	43.1	19.3	31.2	16.2	0	25.6	8.2
ME	35.6	56.5	68.1	14.6	25.3	76.5	198.9	99.6	8.1	111.9	22	58
MK	37.3	90.9	46.1	16.9	44.8	34.1	73.8	67	19.5	35.2	62.8	97
NO	159.1	177.2	183.1	139.1	81.8	155.7	188.1	329	53	143.7	48.3	102.4
RS	50.3	49.5	79.7	49.8	108.8	101.4	158.5	105.4	19.9	79.8	68.2	34.5
TR	62.5	56.2	48	72.8	51.1	36.5	84.8	104.3	27.9	33.8	71.6	48.1
UA	30.9	14.8	143.8	33.1	32.1	23.7	0	29	18.2	82	36.6	79.4
UK	141.8	184.7	39	154.8	89.7	127.6	115.7	292	65.2	157.3	88.2	123.5

ANNEX H: INDICATORS AND DATA SOURCES: COMPARISON WITH GLOBAL COMPETITORS

Indicator	Data source	Data not available for	Most recent year
FRAMEWORK CONDITIONS			
Human resources			
1.1.1 New doctorate graduates in science, technology, engineering, and mathematics (STEM) per 1000 population aged 25-34	OECD	CN, IN, ZA	2021
1.1.2 Percentage population aged 25-34 having completed tertiary education	OECD, National Bureau of Statistics of China	-	2022
Attractive research systems			
1.2.1 International scientific co-publications per million population	Scopus	-	2023
1.2.2 Scientific publications among the top-10% most cited publications worldwide as percentage of total scientific publications of the country	Scopus	-	2021
Digitalisation - No indicator included in international comparison			
INVESTMENTS			
Finance and support			
2.1.1 R&D expenditure in the public sector (percentage of GDP)	OECD	BR, IN	2022
2.1.3 Direct government funding and government tax support for business R&D (percentage of GDP)	OECD	IN	2021
Firm investments			
2.2.1 R&D expenditure in the business sector (percentage of GDP)	OECD	BR, IN	2022
Use of information technologies			
2.3.2 ICT specialists (as a percentage of total employment)	OECD, UNECE	CA, CN, IN, ZA	2022
INNOVATION ACTIVITIES			
Innovators			
3.1.1 SMEs introducing product innovations (percentage of SMEs)	OECD	CN, ZA	2020
3.1.2 SMEs introducing business process innovations (percentage of SMEs)	OECD	CN, MX, ZA	2020
Linkages			
3.2.1 Innovative SMEs collaborating with others (percentage of SMEs)	OECD	CN, MX, ZA	2020
3.2.2 Public-private co-publications per million population	Scopus	-	2023
Intellectual assets			
3.3.1 PCT patent applications per billion GDP (in PPS)	OECD, World Bank	-	2020
3.3.2 Trademarks applications per billion GDP (in PPS)	World Bank	-	2021
3.3.3 Designs applications per billion GDP (in PPS)	World Bank	-	2021
IMPACTS			
Employment impacts - No indicator included in international comparison			
Sales effects			
4.2.1 Exports of medium and high technology products as a share of total product exports	UNComtrade	-	2023
4.2.2 Knowledge-intensive services exports as percentage of total services exports	UNCTAD	-	2023
Environmental sustainability			
4.3.2 Air emissions by fine particulate matter (PM2.5) in Industry	OECD	-	2020
4.3.3 Development of environment-related technologies, percentage of all technologies	OECD	-	2019

ANNEX I: CONTEXTUAL INDICATORS AND DATA SOURCES: COMPARISON WITH GLOBAL COMPETITORS

Contextual indicator	Period	Source
PERFORMANCE AND STRUCTURE OF THE ECONOMY		
GDP per capita, PPP (international dollars)	Average 2020-2022	World Bank - World Development Indicators
Average annual GDP growth (%)	2020-2022	World Bank - World Development Indicators
Employment share in Agriculture (%)	Average 2020-2022	World Bank - World Development Indicators
Employment share in Industry (%)	Average 2020-2022	World Bank - World Development Indicators
Employment share in Services (%)	Average 2020-2022	World Bank - World Development Indicators
Manufacturing – share in total value-added (note: Value added data are used as employment data are not available)	Average 2020-2022	World Bank - World Bank national accounts data, and OECD National Accounts data files
BUSINESS AND ENTREPRENEURSHIP		
Total early-stage Entrepreneurial Activity (TEA) (%)	Average 2021-2023	Global Entrepreneurship Monitor
FDI net inflows (% GDP)	Average 2020-2022	World Development Indicators
Top R&D spending enterprises per 10 million population	Average 2020-2022	EU Industrial R&D Investment Scoreboard
Top R&D spending enterprises, average R&D spending, million Euros	Average 2020-2022	EU Industrial R&D Investment Scoreboard
Number of Unicorns	March 2024	CBS Insights: https://www.cbinsights.com/research-unicorn-companies
Buyer sophistication (1 to 7 best)	Average 2015-2017	World Economic Forum
GOVERNANCE AND POLICY FRAMEWORK		
Corruption perception index	Average 2021-2023	Transparency International
Ease of starting a business (0 to 100 best)	Average 2018-2020	World Bank - Doing Business
Basic-school entrepreneurial education and training (1 to 5 best)	Average 2021-2023	Global Entrepreneurship Monitor
Government procurement of advanced technology products (1 to 7 best)	Average 2015-2017	World Economic Forum
Rule of law (-2.5 to 2.5 best)	Average 2020-2022	World Bank - Worldwide Governance Indicators
DEMOGRAPHY		
Population size (millions)	Average 2020-2022	World Bank - World Development Indicators
Average annual population growth (%)	2020-2022	World Bank - World Development Indicators
Population density (inhabitants / km2)	Average 2019-2021	World Bank - World Development Indicators

ANNEX J: PERFORMANCE DATA GLOBAL COMPETITORS

Country Code	KR	CA	US	AU	CN	JP	BR	CL	IN	ZA	MX
Summery Innovation Index	119.15	114.87	106.67	106.15	94.70	93.16	58.29	48.03	42.39	36.24	32.48
1.1.1 New doctorate graduates	125.21	86.89	82.05	135.47		47.44	18.95	12.82	1.28	2.85	11.40
1.1.2 Population completed tertiary education	186.33	178.28	129.03	143.63	80.52	174.16	41.01	95.32	32.40	9.36	53.75
1.2.1 International scientific co-publications	95.13	171.65	105.57	173.91	35.30	64.52	37.39	90.96	11.48	59.83	27.83
1.2.2 Scientific publications among top 10% most cited	69.04	116.90	140.57	154.45	130.78	24.20	20.11	32.74	69.57	52.31	12.28
2.1.1 R&D expenditure in the public sector	141.64	112.32	89.80	101.27	72.38	91.50		3.54	44.33	40.79	12.61
2.1.2 Direct & indirect government funding business R&D	159.74	119.65	142.81	81.95	65.18	59.90	44.73	1.76		3.19	3.99
2.2.1 R&D expenditure in the business sector	250.00	75.75	198.00	61.00	134.75	187.50		3.50	22.00	8.25	0.00
2.3.2 Employment in ICT	86.70		103.35	97.49		104.71	32.25	57.59			2.51
3.1.1 SMEs with product innovations	28.41	137.93	59.17	100.14		31.72	58.62	22.62	36.41		
3.1.2 SMEs with business process innovations	12.18	199.60	78.04	156.89		60.28	183.43	33.33	16.37		
3.2.1 Innovative SMEs collaborating with others	124.83	255.03	671.14	327.52		146.31	118.79	157.05	551.01		
3.2.2 Public-private co-publications	129.57	184.56	120.53	188.32	48.96	84.93	9.60	26.55	2.26	16.57	4.52
3.3.1 PCT patent applications	210.97	88.61	115.61	72.78	114.77	210.97	16.67	30.17	25.32	24.05	0.21
3.3.2 Trademark applications	608.62	291.38	61.21	475.86	862.07	201.72	409.48	494.83	84.48	106.90	248.28
3.3.3 Design applications	308.97	90.06	53.85	106.41	311.86	111.86	35.90	0.00	38.46	37.50	41.03
4.2.1 Medium & high-tech product exports	109.87	51.02	74.49	3.73	92.18	114.32	23.35	0.00	45.61	45.25	106.02
4.2.2 Knowledge-intensive services exports	99.78	87.31	96.88	31.96	97.10	109.80	99.55	55.35	108.91	45.99	0.33
4.3.2 Air pollution in PM 2.5	59.10	123.07	116.58	114.71	37.53	96.76	100.50	64.59	11.72	65.09	90.40
4.3.3 Environment-related technologies	71.85	63.31	30.53	49.30	29.13	44.12	55.74	140.06	29.69	52.10	36.41

Country Code	KR	CA	US	AU	CN	JP	BR	CL	IN	ZA	MX
Summery Innovation Index	-1.95	-3.49	-4.61	-4.03	18.70	-13.75	3.20	8.58	0.39	0.06	-3.52
1.1.1 New doctorate graduates	46.75	3.90	9.26	23.51	0.00	3.36	2.95	3.50	1.03	1.46	5.35
1.1.2 Population completed tertiary education	-1.27	21.60	12.80	21.11	-1.54	15.95	20.21	32.15	8.54	9.36	19.59
1.2.1 International scientific co-publications	5.75	-6.27	-9.72	-38.40	10.89	-1.08	4.91	7.94	11.48	11.42	4.68
1.2.2 Scientific publications among top 10% most cited	7.19	-21.75	-27.50	-2.19	64.23	-12.10	-2.08	-7.93	28.56	-7.01	6.73
2.1.1 R&D expenditure in the public sector	18.57	-4.77	-1.94	-22.37	18.96	-8.36	0.00	3.54	-5.67	4.33	-18.31
2.1.2 Direct & indirect government funding business R&D	-45.17	-26.25	-25.02	-62.52	-18.64	-41.12	-24.74	-0.70	0.00	-7.26	-5.23
2.2.1 R&D expenditure in the business sector	-11.17	5.36	42.13	-16.93	9.89	-25.63	0.00	-0.97	-5.09	-12.70	-0.28
2.3.2 Employment in ICT	17.80	0.00	3.35	10.68	0.00	21.57	9.21	10.68	0.00	0.00	1.68
3.1.1 SMEs with product innovations	-37.42	-40.00	42.62	-77.80	0.00	-19.70	-14.69	22.62	-10.56	0.00	0.00
3.1.2 SMEs with business process innovations	-81.48	-65.96	-108.66	34.23	0.00	-53.92	-94.21	33.33	-8.41	0.00	0.00
3.2.1 Innovative SMEs collaborating with others	-250.55	-329.58	-867.32	-266.33	0.00	-1392.15	-156.59	157.05	-712.07	0.00	0.00
3.2.2 Public-private co-publications	12.08	5.49	-16.17	-11.18	31.23	-6.69	1.97	9.80	2.26	4.01	1.32
3.3.1 PCT patent applications	41.55	5.69	2.12	-0.06	51.10	31.11	3.00	6.79	3.55	-3.83	-5.18
3.3.2 Trademark applications	299.43	71.26	61.21	194.25	499.43	128.74	330.75	220.11	56.90	34.48	156.90
3.3.3 Design applications	123.45	47.21	29.91	40.73	126.33	46.92	11.04	-10.02	24.55	5.03	20.06
4.2.1 Medium & high-tech product exports	-11.20	-11.45	-7.59	-6.92	2.59	-6.75	-13.10	-3.51	1.18	-7.05	-4.52
4.2.2 Knowledge-intensive services exports	9.29	-1.90	4.98	18.85	19.98	6.46	-7.13	11.51	-7.03	28.25	-5.71
4.3.2 Air pollution in PM 2.5	-2.05	-11.58	-9.92	-18.39	37.53	-9.69	-5.11	-5.68	11.72	-7.28	8.35
4.3.3 Environment-related technologies	-54.75	-29.14	-66.35	-12.77	-17.50	-61.30	6.48	-24.15	-40.09	-16.04	-72.62

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