European Commission

European Innovation Scoreboard 2021



Innovation

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This report was prepared and coordinated by:
Hugo Hollanders, Nordine Es-Sadki
Maastricht University (Maastricht Economic and Social Research Institute on Innovation and Technology – UNU-MERIT)

With contributions from:
Adriana Rantcheva
Maastricht University (Maastricht Economic and Social Research Institute on Innovation and Technology – UNU-MERIT)

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

Coordinated and guided by:
Roman Arjona, Head of Unit, Xosé-Luís Varela-Irimia, Unit A1, Strategy and Economic Analysis
Mark Nicklas, Head of Unit A3, International Value Chains
Marshall Hsia, Unit D2, Industrial Forum, Alliances, Clusters
Maurits Pino, Unit A4, Strategy and Regulation: Single Market and Industrial Policy
Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs

Athina Karvounaraki, Unit G1, Common R&I Strategy & Foresight Service
Tiago Pereira, Unit G1, Common R&I Strategy & Foresight Service
Directorate-General for Research and Innovation

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More information on the European Union is available on https://europa.eu/

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European **Innovation** Scoreboard 2021



Foreword

"As we will emerge from the pandemic, innovation will be key for the success of our digital and our green agenda."

Ursula von der Leyen, President of the European Commission

The European Union (EU) has been at the forefront of international efforts to tackle the COVID-19 crisis, starting with vaccines, one of the most prominent examples of Europe's leadership in innovation. In fact, EU research funding greatly contributed to the breakthrough developments in vaccines, while EU cooperation on vaccines production facilitated the deployment of mass vaccination for Europe and the rest of the world. Throughout the crisis, European industry and SMEs alike have shown the capacity to reinvent themselves and find innovative solutions – from textile companies reconverting production lines to provide us with protective masks, to family-run restaurants building temporary terraces on our streets.

Investing in innovation is investing in Europe's future and in its ability to be at the technological forefront, always, and in a situation of non-dependence.

The COVID-19 pandemic has created unprecedented challenges and magnified others such as climate change and growing inequalities. Innovation and research are essential to curb the health crisis and its socioeconomic consequences. Innovation and research are at the core of the EU policy agenda for a sustainable, digital and resilient recovery.

NextGenerationEU, worth EUR 750 billion, is contributing to a more inclusive, resilient and better prepared economy and society. This cannot be achieved without reforms and investments in innovation and research.

This year's Scoreboard is released after the adoption of the Commission's update of the EU Industrial Strategy of 5 May 2021. The update takes full account of the new circumstances following the COVID-19 crisis to drive Europe's industrial transformation to a more sustainable, digital, resilient and globally competitive economy. It proposes new measures to strengthen the resilience of our Single Market and addresses the need to better understand and respond to our dependencies in key strategic areas. With SME at its core, the update also offers new measures in support of Europe's transition across industrial ecosystems.

The update of the industrial strategy also stressed that tailored support to enable SMEs and start-ups to embrace the twin transitions is essential, given that SMEs are a primary vehicle of innovation in the various industrial ecosystems.

The EU's commitment to innovation is shown by its 12.5 percent improvement in innovation performance between 2014 and 2021, across all 27 Member States. Globally, South Korea is the most innovative country, performing 21 per cent above the EU in 2021. The EU is however ahead of China, Brazil, South Africa, Russia, and India, while Canada, Australia, the United States, and Japan have a performance lead over the EU.

In support of Europe's global lead in innovation, Horizon Europe is the world's largest research and innovation programme ever, with a budget of over €95.5 billion for 2021-2027. Horizon Europe will promote excellence and provide valuable support to top researchers and innovators to drive the systemic changes needed to ensure a green, healthy and resilient Europe.

The new European Research Area (ERA) will create a single and borderless market for research, innovation and technology across the EU, while boosting the market uptake of research and innovation results. Enabling innovation ecosystems across Europe will be essential to unleash its full innovation potential through stronger creation and diffusion of innovation. Europe needs a landscape where all innovation actors operate in a flexible, effective and collaborative way, drawing on the strengths and diversity of national, regional and local innovation ecosystems.

The goal of the 2021 European Innovation Scoreboard is to provide a state of play of innovation in Europe to support the design and implementation of innovation led policies. The Scoreboard informs policy-makers and help them navigate the evolving global context. We count on you – researchers, innovators, investors, and policy-makers – to accelerate the sustainable recovery for all Europeans, with innovation leading the way for brighter future.



Thierry Breton
European Commissioner for Internal Market



Mariya Gabriel
European Commissioner for Innovation, Research, Culture, Education and Youth

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Executive summary

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

The EIS 2021 report is the first edition published using the revised measurement framework including new indicators capturing digitalisation and sustainable innovation. All results for the EU are for the current 27 Member States. Most of the data used in this report are not recent enough to capture the impact of the Covid-19 pandemic.

Innovation performance has continued to increase for the EU and all Member States

On average, the innovation performance of the EU has increased by 12.5 percentage points since 2014, in particular due to strong performance increases in the following indicators: Broadband penetration, Venture capital expenditures, and International scientific co-publications. Since 2014, innovation performance increased in all EU Member States. Performance has increased the most in Cyprus, Estonia, Greece, Italy and Lithuania. The process of convergence within the EU, where lower performing countries are growing faster than higher performing countries, has continued in 2021.

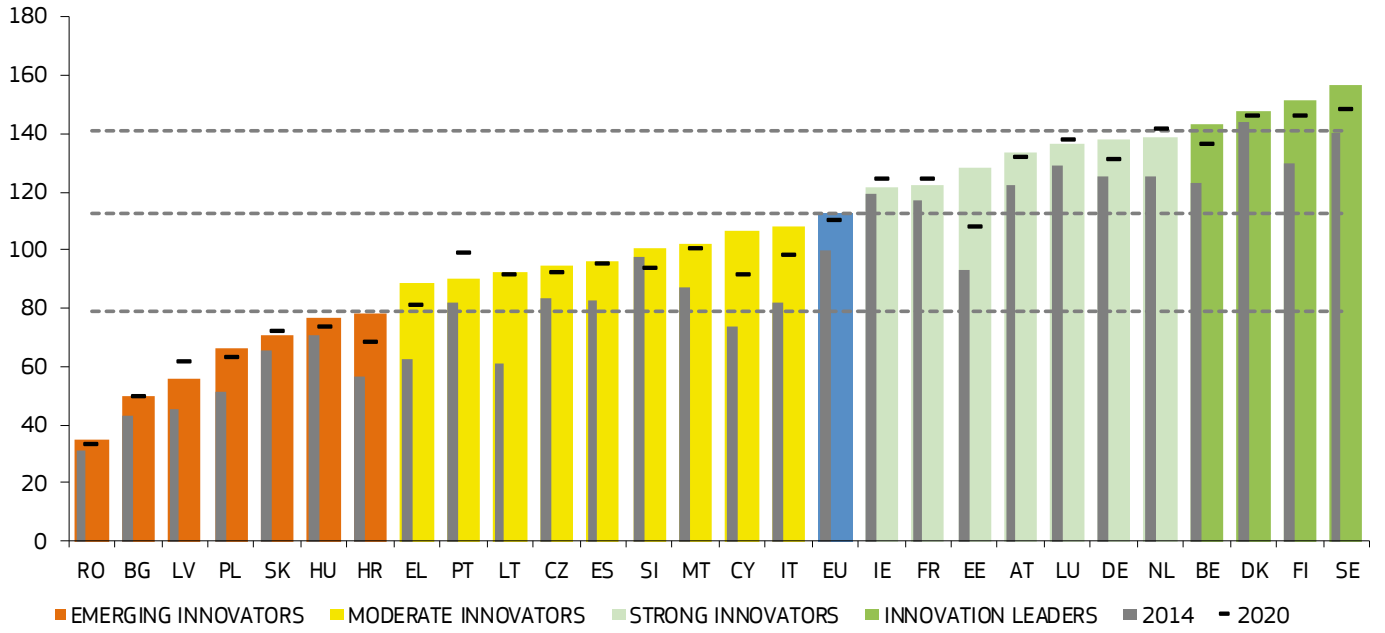
More recently, between 2020 and 2021, performance has improved for 20 Member States, most notably for Cyprus and Estonia, and performance has declined for seven Member States, including France, Ireland, Latvia, Luxembourg, Netherlands, Portugal and Slovakia.

Member States are classified into four performance groups based on their average performance scores

Based on their average performance scores as calculated by a composite indicator, the Summary Innovation Index, Member States fall into four different performance groups (**Figure 1**). In this year's edition, the thresholds for identifying the performance groups have been revised and one performance group has been renamed, making any comparisons with performance groups in previous EIS reports impossible.

Belgium, Denmark, Finland and Sweden are *Innovation Leaders* with innovation performance well above the EU average. Austria, Estonia, France, Germany, Ireland, Luxembourg and the Netherlands are *Strong Innovators* with performance above the EU average. The performance of Cyprus, Czechia, Greece, Italy, Lithuania, Malta, Portugal, Slovenia, and Spain is below the EU average. These countries are *Moderate Innovators*. Bulgaria, Croatia, Hungary, Latvia, Poland, Romania and Slovakia are *Emerging Innovators* with performance well below the EU average.

Figure 1: Performance of EU Member States' innovation systems



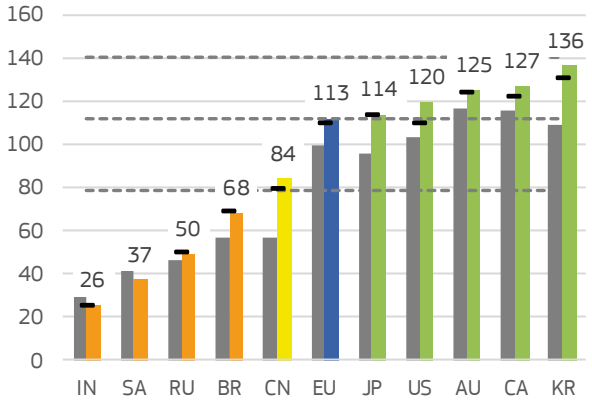
Coloured columns show countries' performance in 2021, using the most recent data for 32 indicators, relative to that of the EU in 2014. The horizontal hyphens show performance in 2020, using the next most recent data, relative to that of the EU in 2014. Grey columns show countries' performance in 2014 relative to that of the EU 2014. For all years, the same measurement methodology has been used. The dashed lines show the threshold values between the performance groups, where the threshold values of 70%, 100%, and 125% have been adjusted upward to reflect the performance increase of the EU between 2014 and 2021.

At the global level, the EU is closing the performance gap to Australia and Canada, two of its global competitors

In global terms, the EU has a performance lead over Brazil, China, India, Russia, and South Africa, and a performance gap with Australia, Canada, Japan, South Korea and the United States (**Figure 2**). Between 2014 and 2021, the EU has improved its relative position towards 6 of its global competitors: the performance gap with Australia and Canada has become smaller and the performance lead over Brazil, India, Russia and South Africa has increased. The EU has seen a worsening of its relative position towards 4 of its global competitors: the performance gap with Japan, South Korea and the United States has increased and the performance lead over China has become smaller.

More recently, between 2020 and 2021, the EU has closed part of its performance gap with Australia and Japan, but Canada, South Korea, and the United States managed to increase their performance lead.

Figure 2: Global performance



Coloured columns show performance in 2021 relative to that of the EU in 2014. The horizontal hyphens show performance in 2020 relative to that of the EU in 2014. Grey columns show performance in 2014 relative to that of the EU in 2014. For all years, the same measurement methodology has been used. The dashed lines show the threshold values between the performance groups, where the threshold values of 70%, 100%, and 125% have been adjusted upward to reflect the performance increase of the EU between 2014 and 2021.

Revision of the measurement framework

New policy developments and methodological issues with the measurement framework have required a revision of the EIS and its regional extension, the Regional Innovation Scoreboard (RIS). The revision process has included a number of reports and virtual workshops to discuss methodological improvements to existing indicators, redefine country performance groups, and identify additional innovation dimensions and indicators to be included in the EIS. The results of the revision process are implemented in the current 2021 editions of both the European Innovation Scoreboard and the Regional Innovation Scoreboard. The results in the current edition are therefore not comparable to those reported in previous editions of the EIS.

For this year's report, also additional indicators are introduced for the set of contextual indicators. The first set of seven indicators presents shares of different types of innovating and non-innovating enterprises, which have been developed using firm-level data from the Community Innovation Survey. The second set of indicators includes three indicators measuring performance on climate change related indicators.

The new EIS measurement framework distinguishes between four main types of activities, capturing 12 innovation dimensions and in total 32 different indicators. Framework conditions capture the main drivers of innovation performance external to the firm and cover three innovation dimensions: Human resources, Attractive research systems, and Digitalisation. Investments capture public and private investment in research and innovation and cover three dimensions: Finance and support, Firm investments, and Use of information technologies. Innovation activities capture the innovation efforts at the level of the enterprise, grouped in three innovation dimensions: Innovators, Linkages, and Intellectual assets. Impacts cover the effects of firms' innovation activities in three innovation dimensions: Employment impacts, Sales impacts, and Environmental sustainability.

1. Introduction

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

New policy developments have required a revision of the measurement framework of the EIS and its regional extension, the Regional Innovation Scoreboard (RIS). The revision process has included a number of reports and (virtual) workshops discussing the following topics:

- Methodological improvements to existing indicators.
- Redefining country performance groups.
- The identification of additional innovation dimensions and indicators to be included in the EIS.
- The identification of indicators and data sources for measuring digital skills[1].
- The identification of indicators and data sources for measuring social innovation[2].
- The identification of indicators and data sources for measuring environmental innovation[3].

The results of the revision process are implemented in the 2021 editions of both the European Innovation Scoreboard and the Regional Innovation Scoreboard.

1.1 Measurement framework

The EIS 2021 distinguishes between four main types of activities – Framework conditions, Investments, Innovation activities, and Impacts – and has 12 innovation dimensions, capturing in total 32 indicators. Each main group includes an equal number of indicators and has an equal weight in the SII. Within each group every indicator has the same weight. Indicators that are included in the measurement framework are presented in **Table 1**. The revisions to the measurement framework introduced in 2021 are described in more detail below.

Table 1: Measurement framework of the European Innovation Scoreboard

FRAMEWORK CONDITIONS

Human resources
1.1.1 New doctorate graduates (in STEM)
1.1.2 Population aged 25-34 with tertiary education
1.1.3 Lifelong learning

Attractive research systems
1.2.1 International scientific co-publications
1.2.2 Top 10% most cited publications
1.2.3 Foreign doctorate students

Digitalisation
1.3.1 Broadband penetration
1.3.2 Individuals who have above basic overall digital skills

INVESTMENTS

Finance and support
2.1.1 R&D expenditure in the public sector
2.1.2 Venture capital expenditures
2.1.3 Direct government funding and government tax support for business R&D

Firm investments
2.2.1 R&D expenditure in the business sector
2.2.2 Non-R&D innovation expenditures
2.2.3 Innovation expenditures per person employed in innovation-active enterprises

Use of information technologies
2.3.1 Enterprises providing training to develop or upgrade ICT skills of their personnel
2.3.2 Employed ICT specialists

INNOVATION ACTIVITIES

Innovators
3.1.1 SMEs with product innovations
3.1.2 SMEs with business process innovations

Linkages
3.2.1 Innovative SMEs collaborating with others
3.2.2 Public-private co-publications
3.2.3 Job-to-job mobility of Human Resources in Science & Technology

Intellectual assets
3.3.1 PCT patent applications
3.3.2 Trademark applications
3.3.3 Design applications

IMPACTS

Employment impacts
4.1.1 Employment in knowledge-intensive activities
4.1.2 Employment in innovative enterprises

Sales impacts
4.2.1 Medium and high-tech product exports
4.2.2 Knowledge-intensive services exports
4.2.3 Sales of product innovations

Environmental sustainability
4.3.1 Resource productivity
4.3.2 Air emissions by fine particulates PM2.5 in Industry
4.3.3 Development of environment-related technologies

[1] https://ec.europa.eu/docsroom/documents/45666 [2] https://ec.europa.eu/docsroom/documents/45665 [3] https://ec.europa.eu/docsroom/documents/45664

Framework conditions captures the main drivers of innovation performance external to the firm and differentiates between three innovation dimensions:

- *Human resources* includes three indicators and measures the availability of a high-skilled and educated workforce. Human resources includes New doctorate graduates in STEM, Population aged 25-34 with completed tertiary education, and Population aged 25-64 involved in lifelong learning activities. Compared to the EIS 2020, the indicator measuring New doctorate graduates is more focused as it only includes graduates in science, technology, engineering, and mathematics (STEM).

- *Attractive research systems* includes three indicators and measures the international competitiveness of the science base by focusing on International scientific co-publications, Most cited publications, and Foreign doctorate students.

  Compared to the EIS 2020, there have been no changes to the indicators.

- *Digitalisation* measures the level of digital technologies and includes two indicators, Broadband penetration among enterprises and (the supply of) Individuals with above basic overall digital skills. This dimension replaces the EIS 2020 dimension on Innovation-friendly environment. The broadband indicator is the same, and the indicator measuring digital skills is new following the recommendation in the Exploratory report. The inclusion of digital skills and the renaming of this dimension aims to improve the measurement of digitalisation and digital skills.

Investments captures investments made in both the public and business sector and differentiates between three innovation dimensions:

- *Finance and support* includes three indicators including private funding (Venture capital investments), R&D expenditures in universities and government research organisations and Direct government funding and government tax support for business R&D.

  Compared to the EIS 2020, the indicator on government support for R&D is new. This indicator is relevant as it captures indirect tax support for business R&D, a support mechanism which is used by an increasing number of countries. In the EU, 21 countries were offering R&D tax relief in 2018, a significant increase compared to only 12 countries offering R&D tax relief in 2000. 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 captured in the official data on R&D expenditures by source of funding. Over time, more and more countries have introduced R&D tax incentives. The OECD has started to collect such data systematically since 2017 and with the support of the European Commission, data are currently being collected on an annual basis and made available in the 'OECD R&D Tax Incentives database'.

- *Firm investments* includes three indicators on R&D and Non-R&D investments that firms make to generate innovations including Business R&D expenditures, Non-R&D innovation expenditures, and Innovation expenditures per person employed.

  Compared to the EIS 2020, the indicator on Innovation expenditures per person employed is new. The indicator measures the monetary input directly related to innovation activities and uses data from the Community Innovation Survey (CIS), controlling for purchasing power differences across Member States.

- *Use of information technologies* captures the use of information technologies including two indicators: Enterprises actively increasing the ICT skills of their personnel and Employed ICT specialists.

  To improve the measurement on the use of information technologies, a new dimension has been included compared to the EIS 2020. Enterprises actively increasing the ICT skills of their personnel was included in previous editions of the EIS but under Framework conditions in the Innovation-friendly environment dimension. The indicator measuring Employed ICT specialists is new and is one of the indicators recommended in the Exploratory report on measuring digital skills. ICT specialists are defined as "workers who have the ability to develop, operate and maintain ICT systems, and for whom ICT constitute the main part of their job".

Innovation activities captures different aspects of innovation in the business sector and differentiates between three innovation dimensions:

- *Innovators* includes two indicators measuring the share of SMEs that have introduced innovations on the market or within their organisations, covering both product and business process innovators.

  Compared to the EIS 2020 the definition of both indicators has changed following the revised questionnaire in the CIS after adopting the recommendations from the 2018 edition of the Oslo Manual on measuring innovation activities. The first indicator now focuses on product innovations, and the second on business process innovation, combining process, marketing and organisational innovations as used in the CIS editions before the latest CIS 2018.

- *Linkages* 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).

  Compared to the EIS 2020, the indicator on Job-to-job mobility of HRST is new. Mobility of skilled personnel affects the degree of knowledge creation, which is one of the key drivers of innovation. Human Resources in Science & Technology (HRST) are people who fulfil one or other of the following conditions: have successfully completed a tertiary level education; 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.

  Compared to the EIS 2020, the definition of the indicator measuring Public-private co-publications has changed. In the EIS 2020, publications were assigned to the country or countries in which the enterprises or other private sector organisations are

located. In the EIS 2021, also those publications assigned to the country or countries in which the public sector organisations are located are included, thus also including co-publications between domestic public sector organisations and foreign enterprises.

- *Intellectual assets* captures different forms of Intellectual Property Rights (IPR) generated by the innovation process, including PCT patent applications, Trademark applications, and Design applications.

  Compared to the EIS 2020, the definition for the indicator measuring Trademark applications has changed. The indicator no longer includes trademark applications applied for at the World Intellectual Property Office (WIPO).

Impacts captures the effects of enterprises' innovation activities and differentiates between three innovation dimensions:

- *Employment impacts* measures the impact on employment and includes two indicators: Employment in knowledge-intensive activities and Employment in innovative enterprises.

  Compared to the EIS 2020, the indicator Employment in innovative enterprises is new. Innovation in enterprises has a profound impact on the employability of workers, but its effect on product- and process-innovation oriented enterprises varies across countries. Business 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 enterprises as well. The indicator captures the employment impact of innovation by measuring the share of employed persons in innovative enterprises in total business sector employment, and uses data from the Community Innovation Survey.

- *Sales impacts* 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.

  Compared to the EIS 2020, there have been no changes to the indicators.

- *Environmental sustainability* captures improvements to reducing the negative impact on the environment including three indicators: Resource productivity, Exposure to Air pollution by fine particulates PM2.5, and the Development of environment-related technologies.

  As the natural environment suffers from the loss of biodiversity, pollution and climate change, environmental innovation gains in importance. To improve the measurement of environmental innovation, a new dimension has been added which consists of three new indicators measuring Environmental sustainability. These indicators were recommended in the Exploratory report on measuring environmental innovation.

  Resource productivity is expressed by the amount of GDP generated per unit of direct material consumed, i.e. GDP / DMC in Euros per kg. 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 and 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 domestically, plus all physical imports minus all physical exports.

  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. The indicator on Air emissions by fine particulate matter PM2.5 in Industry captures average air emissions by Industry. PM2.5 are particles with a diameter of 2.5 micrometres or less and are considered by the World Health Organisation (WHO) as the pollutant with the highest impact on human health.

  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, including environmental management, water-related adaptation, and climate change mitigation technologies. Data are obtained from the OECD Environment Database.

1.2 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 was introduced to the country profiles in the 2017 edition and revised in the 2018 edition. For this year's report, two additional sets of indicators are introduced. The first set of seven indicators (Innovation Profiles) presents shares of different types of innovating and non-innovating enterprises. The second set includes three indicators measuring performance on climate change related indicators. The EIS does not include any indicators on gender as such data are not available for most of the indicators used to measure structural differences. 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 particular indicators. Full definitions of all performance indicators and contextual indicators are provided in the EIS 2021 Methodology Report. The list of contextual indicators, the years for which average performance has been calculated, and data sources used are shown in **Table 2**.

Table 2: Contextual indicators in the European Innovation Scoreboard

	Period	Source
PERFORMANCE AND STRUCTURE OF THE ECONOMY		
GDP per capita (PPS)	Average 2017-2019	Eurostat
Average annual GDP growth (%)	Between 2018 and 2020	Eurostat
Employment share Manufacturing (NACE C) (%)	Average 2018-2020	Eurostat
of which High and Medium high-tech (%)	Average 2018-2020	Eurostat
Employment share Services (NACE G-N) (%)	Average 2018-2020	Eurostat
of which Knowledge-intensive services (%)	Average 2018-2020	Eurostat
Turnover share SMEs (%)	Average 2016-2018	Eurostat
Turnover share large enterprises (%)	Average 2016-2018	Eurostat
Foreign-controlled enterprises – share of value added (%)	Average 2016-2018	Eurostat
BUSINESS AND ENTREPRENEURSHIP		
Enterprise births (10+ employees) (%)	Average 2016-2018	Eurostat
Total early-stage Entrepreneurial Activity (TEA) (%)	Average 2017-2019	Global Entrepreneurship Monitor
FDI net inflows (% GDP)	Average 2017-2019	World Bank, World Development Indicators
Top R&D spending enterprises per 10 million population	Average 2018-2020	EU Industrial R&D Investment Scoreboard
Buyer sophistication (1 to 7 best)	Average 2017-2019	World Economic Forum
INNOVATION PROFILES		
In-house product innovators with market novelties	2018	Eurostat, National Statistical Offices
In-house product innovators without market novelties	2018	Eurostat, National Statistical Offices
In-house business process innovators	2018	Eurostat, National Statistical Offices
Innovators that do not develop innovations themselves	2018	Eurostat, National Statistical Offices
Innovation active non-innovators	2018	Eurostat, National Statistical Offices
Non-innovators with potential to innovate	2018	Eurostat, National Statistical Offices
Non-innovators without disposition to innovate	2018	Eurostat, National Statistical Offices
GOVERNANCE AND POLICY FRAMEWORK		
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 2018-2020	Global Entrepreneurship Monitor
Government procurement of advanced technology products (1 to 7 best)	Average 2017-2019	World Economic Forum
Rule of law (-2.5 to 2.5 best)	Average 2017-2019	World Bank: Worldwide Governance Indicators
CLIMATE CHANGE		
Circular material use rate	Average 2017-2019	Eurostat
Greenhouse gas emissions intensity of energy consumption	Average 2016-2018	European Environment Agency (EEA), Eurostat
Eco-Innovation Index	2019	EC, DG Environment
DEMOGRAPHY		
Population size	Average 2018-2020	Eurostat
Average annual population growth (%)	Between 2018 and 2020	Eurostat
Population density	Average 2017-2019	Eurostat

Performance and structure of the economy

GDP per capita in purchasing power standards[4] 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 2018-2020. 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. In particular, differences in the share of manufacturing industry in GDP, and in the so-called 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. Countries with above-average shares of these industries are expected to perform better on several EIS indicators. For example, for the EU27 on average, 85% of R&D expenditures in manufacturing are accounted for by medium-high and high-technology manufacturing industries[5 6]. 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[7].

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 Canada[8]. 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 early-stage Entrepreneurial activity (TEA), which measures the share of the adult population aged 18–64 years who are in the process of starting a business (a nascent 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 corporate R&D investors from the EU and abroad[9].

Demand is an important driver of innovation. According to the Oslo Manual (2018)[10], 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

[4] The purchasing power standard, abbreviated as 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.

[5] Based on NACE Rev. 2 3-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 2-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).

[6] 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].

[7] 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).

[8] 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.

[9] http://iri.jrc.ec.europa.eu/scoreboard.html

[10] 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://doi.org/10.1787/9789264304604-en

improvement of the production and supply processes in order 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.

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. More simple aggregate indicators of the percentage of 'innovative' enterprises in a particular country, as those currently used in the EIS, most likely provide information of limited value to policy makers. Instead, innovation indicators should differentiate between 'styles' or 'modes' of innovation in order to provide a clear picture of the structure of innovation capabilities within different businesses, economies, and countries (Arundel and Hollanders, 2005)[11].

Building on earlier work by academics and the OECD, Eurostat, UNU-MERIT (Maastricht University), ZEW – Leibniz Centre for European Economic Research, in collaboration with most National Statistical Offices, started work on developing a taxonomy of innovating and non-innovating enterprises based on CIS 2016 micro data. The following characteristics were used to identify six mutually exclusive detailed innovation profiles: The degree of newness of product innovations, own in-house capacities to innovate, and R&D activities. Work has been continued using CIS 2018 micro data taking into account changes in the CIS 2018 questionnaire following the introduction of revised guidelines for measuring innovation in the 2018 Oslo Manual. Where the CIS 2016 differentiated between six Innovation profiles, for the CIS 2018 seven Innovation profiles have been defined. 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 that did not introduce 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.
- 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.

Results for the EU are shown in **Table 3** for all enterprises and for three different size classes, including small (10-49 employees), medium (50-249 employees) and large enterprises (250 or more employees). About 11% of enterprises are In-house innovators with market novelties. These enterprises are most frequent among large enterprises (29%). About 12% of enterprises are In-house innovators without market novelties. These enterprises are also more common among larger enterprises (19%). In-house business process innovators account for 11% of enterprises. There are no significant differences in the relevance of this profile among the different size classes. Innovators that do not develop innovations themselves account for 12% of enterprises. About 3% of enterprises are Innovation active non-innovators. Non-innovators account for more than half of EU enterprises. Non-innovators with potential to innovate account for 20% of all enterprises, and these enterprises are most frequent among the small enterprises (21%). The Non-innovators without disposition to innovate form the largest group accounting for 31% of all enterprises, ranging from only 14% among the large enterprises to 34% among the small enterprises.

The distribution for the number of persons employed is different as the distribution of the different size classes across the Innovation profiles is not equal. In-house innovators with market novelties account for 30% of EU employment. Among the large enterprises this share is 45%, whereas it is less than 10% among the small enterprises. In-house innovators without market novelties account for 17% of EU employment, In-house business process innovators account for 10% of EU employment, and Innovators that do not develop innovations themselves also account for 10% of EU employment. The Innovation active non-innovators account for 3% of EU employment. Non-innovators with potential to innovate account for 12% of all enterprises in the EU, in particular in small enterprises (21%). Non-innovators without disposition to innovate account for 18% of EU employment and more than 30% in small enterprises.

[11] https://cris.maastrichtuniversity.nl/files/64448310/Arundel_Hollanders_EXIS.pdf

Table 3: Distribution of enterprises and employment for seven Innovation profiles in the EU

	Share of enterprises				Share of employment			
	Small	Medium	Large	Total	Small	Medium	Large	Total
In-house product innovators with market novelties	8.5%	16.1%	29.4%	10.7%	9.2%	17.2%	44.8%	29.6%
In-house product innovators without market novelties	11.2%	15.2%	19.4%	12.3%	11.4%	15.6%	19.7%	16.8%
In-house business process innovators	10.7%	12.2%	11.0%	11.0%	11.1%	12.2%	8.6%	10.1%
Innovators that do not develop innovations themselves	11.1%	13.8%	12.0%	11.6%	11.7%	14.0%	7.7%	10.2%
Innovation active non-innovators	3.0%	4.5%	4.3%	3.3%	3.2%	4.6%	2.9%	3.4%
Non-innovators with potential to innovate	21.5%	15.3%	9.3%	19.9%	21.1%	14.4%	5.9%	11.5%
Non-innovators without disposition to innovate	34.0%	22.9%	14.5%	31.3%	32.4%	22.0%	10.4%	18.4%

Governance and policy framework

Institutional and legal differences between countries may make it more difficult to engage in business activities. The World Bank's Doing Business report provides an index, Ease of starting a business, which measures the distance of each economy to the "frontier" economy providing the most lenient regulatory framework for doing business. Countries with more favourable regulatory environments will obtain scores closer to the maximum score of 100.

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. Rule of law captures differences in the extent to which people have confidence in and abide by the rules of society. Rule of law measures differences in the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood 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. In addition to the new innovation dimension on Environmental sustainability and the three indicators captured in this dimension, three additional 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. The circular material use rate is defined as the ratio of the circular use of materials (U) to the overall material use (M). It covers households, the private and the public sector. A higher circular material use rate value indicates more secondary materials substituting for primary raw materials, i.e. avoiding the environmental impacts of extracting primary material. Data for all 27 Member States and the United Kingdom are available from Eurostat.

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. Data source is the European Environment Agency (EEA) and data for all 27 Member States and other countries are available from Eurostat.

The Eco-Innovation index is a composite indicator based on 16 sub-indicators in five thematic areas: eco-innovation inputs, eco-innovation activities, eco-innovation outputs, resource efficiency outcomes and socio-economic outcomes. The overall score of an EU Member State is calculated by the unweighted mean of the 16 sub-indicators. It shows how well individual Member States perform in eco-innovation compared to the EU average, which is equated with 100 (index EU=100). The index is part of the Eco-Innovation Scoreboard (Eco-IS)[12]. For the EIS 2021 results from the 2019 edition of the Eco-IS are used as the 2021 Eco-IS will be published in June after the publication of the EIS 2021.

[12] https://ec.europa.eu/environment/ecoap/indicators/index_en

Demography

Structural data also includes population size and the average annual growth rate of population for 2018-2020. 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 MHT exports and the share of employment in knowledge intensive activities.

1.3 Data sources and data availability

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 cut-off day of 28 April 2021. International sources have been used wherever possible to improve comparability between countries. The data relates to the actual performance in 2020 for eight indicators, 2019 for 11 indicators, 2018 for 11 indicators, 2017 for one indicator, and 2016 for one indicator (these are the most recent years for which data are available, cf. **Annex E**). Data availability is complete for 26 Member States, with data being available for all 32 indicators. For Ireland, data is not available for Job-to-job mobility in Human Resources in Science & Technology.

2. Innovation performance and trends

2.1 Most recent innovation performance

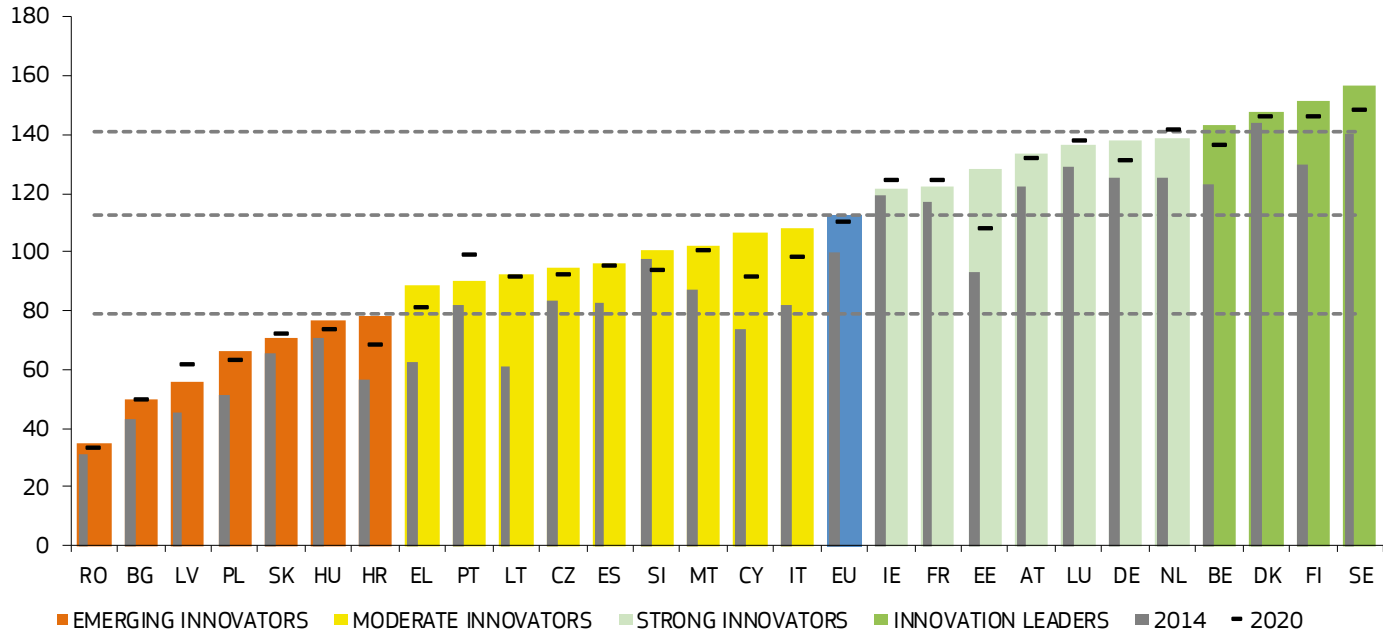
The performance of EU national innovation systems is measured by the Summary Innovation Index, which is a composite indicator obtained by taking an unweighted average of the 32 indicators (cf. **Table 1**)[13]. **Figure 4** shows the scores relative to the performance of the EU in 2014 for all EU Member States in 2021 or the most recent year, 2020, and the reference year 2014. Based on the 2021 results, the Member States fall into four performance groups[14]:

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

The group of Moderate Innovators includes less Member States as in previous EIS reports as the threshold with the next performance group has been increased. The group of Emerging Innovators, which in previous EIS reports was referred to as Modest Innovators, includes more Member States for the same reason.

Figure 3 illustrates that performance in 2021, when compared to 2014, is higher for all Member States. Compared to 2020, performance in 2021 has improved for 19 Member States. **Section 2.3** discusses the performance changes in more detail. As shown on the map in **Figure 4**, the performance groups tend to be geographically concentrated, with the Innovation Leaders and most of the Strong Innovators located in Northern and Western Europe, and most of the Moderate and Emerging Innovators in Southern and Eastern Europe.

Figure 3: Performance of EU Member States' innovation systems

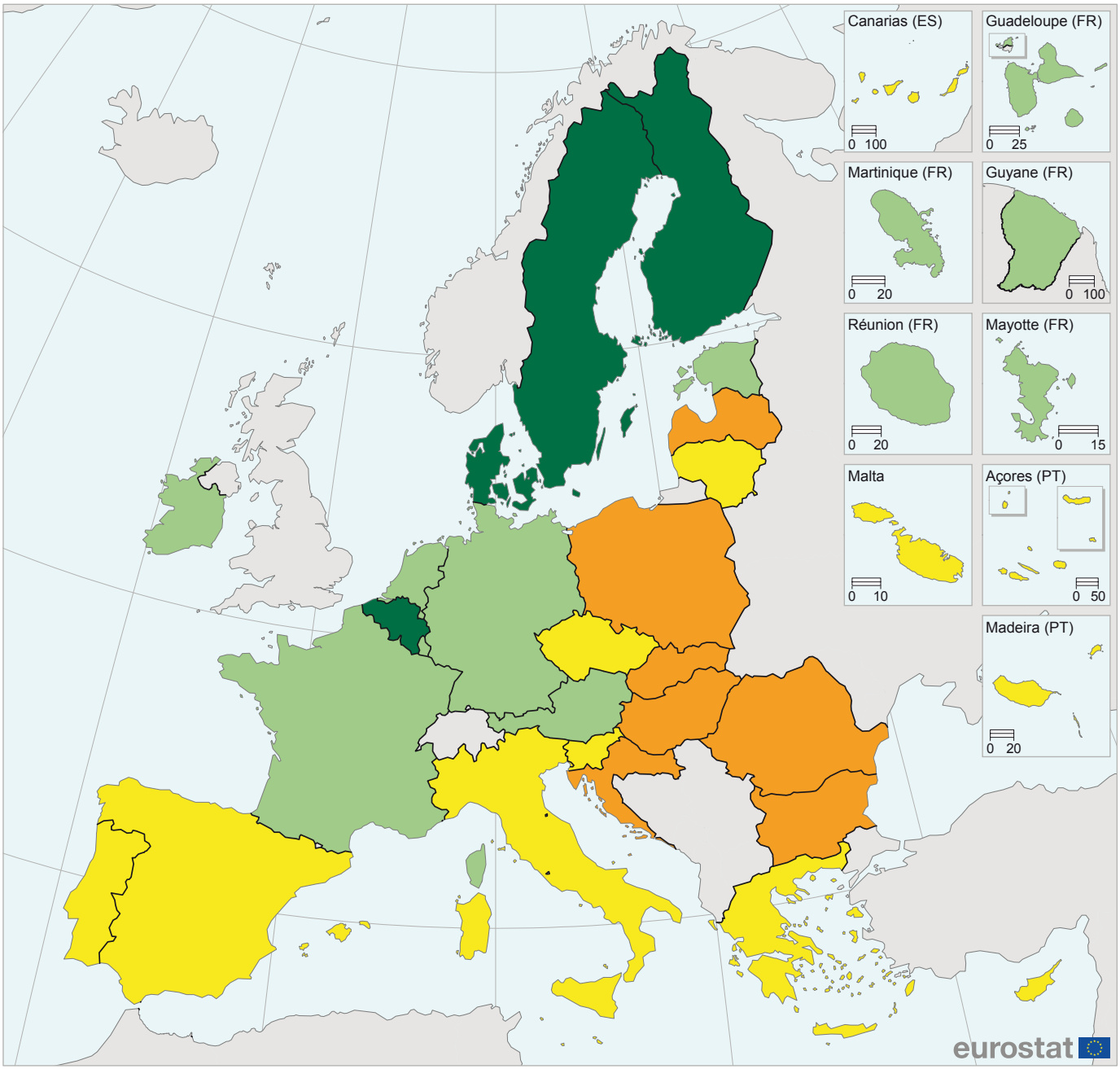


Coloured columns show countries' performance in 2021, using the most recent data for 32 indicators, relative to that of the EU in 2014. The horizontal hyphens show performance in 2020, using the next most recent data, relative to that of the EU in 2014. Grey columns show countries' performance in 2014 relative to that of the EU 2014. For all years, the same measurement methodology has been used. The dashed lines show the threshold values between the performance groups, where the threshold values of 70%, 100%, and 125% have been adjusted upward to reflect the performance increase of the EU between 2014 2021.

[13] Chapter 6 gives a brief explanation of the calculation methodology. The EIS 2021 Methodology Report provides a detailed explanation.

[14] The EIS performance groups are relative performance groups with countries' group membership depending on their performance relative to that of the EU. With the improved EU innovation performance, the absolute thresholds between these groups will also increase over time, explaining why the dashed horizontal lines cross the vertical axis at higher percentage scores.

Figure 4: Map showing the performance of EU Member States' innovation systems

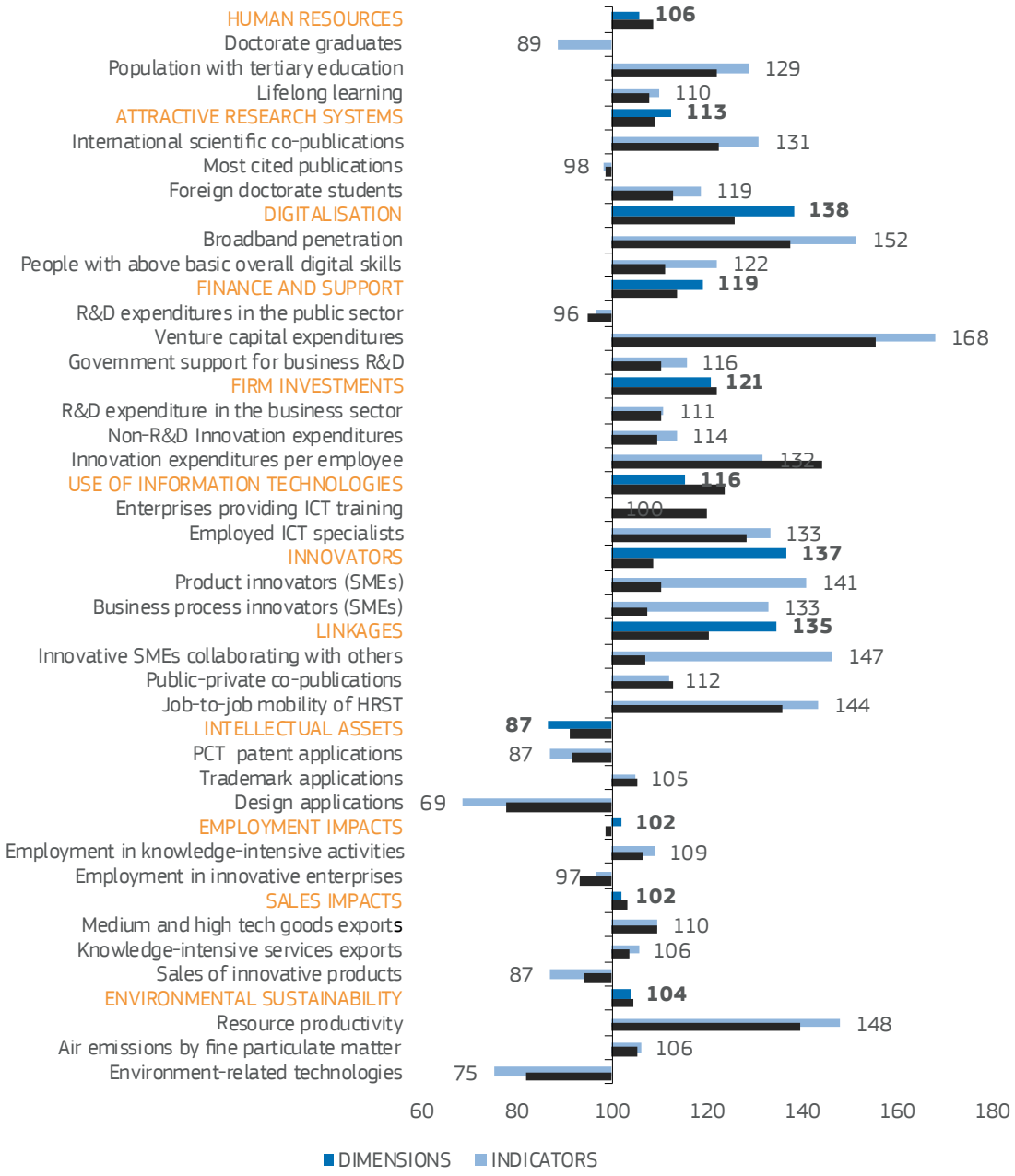


Source: European Commission – Europeanl Innovation Scoreboard 2021

2.2 Performance of the EU innovation system

Performance of the EU innovation system, measured as the weighted average of the performance of the innovation systems of all 27 Member States, has improved by 12.5 percentage points over the last eight years between 2014 and 2021. There are significant differences in performance change for the different dimensions and indicators. **Figure 5** shows the performance for each dimension (dark blue coloured bars) and indicator (light blue coloured bars) in 2021 compared to performance in 2014 and in 2020 (black coloured bars). The difference between the respective blue and black coloured bar shows the change in the most recent year. Performance changes are measured as the relative to EU scores minus 100. Performance has improved strongest in Digitalisation (38%-points), due to a 52% performance increase for Broadband penetration. Performance also improved strongly in Innovators (37%), with strong performance increases for both indicators, and Linkages (35%), due to strong performance increases in two indicators. Performance increased in most other dimensions but at lower rates. Only in Intellectual assets performance decreased (-13%), due to lower performance in both Patent and Design applications. Other indicators showing strong growth include Venture capital expenditures (68%), Resource productivity (48%), Innovative SMEs collaborating with others (47%), Job-to-job mobility of Human Resources in Science and Technology (44%), and Product innovators (41%). Compared to the previous year (black coloured bars), performance has improved strongest in the Innovators and Digitalisation dimensions but decreased in six dimensions.

Figure 5: EU Performance change between 2014 and 2021 by dimension and indicator



Normalised scores in 2021 (blue coloured bars) and 2020 (black coloured bars) relative to those in 2014 (=100)

2.3 Performance changes

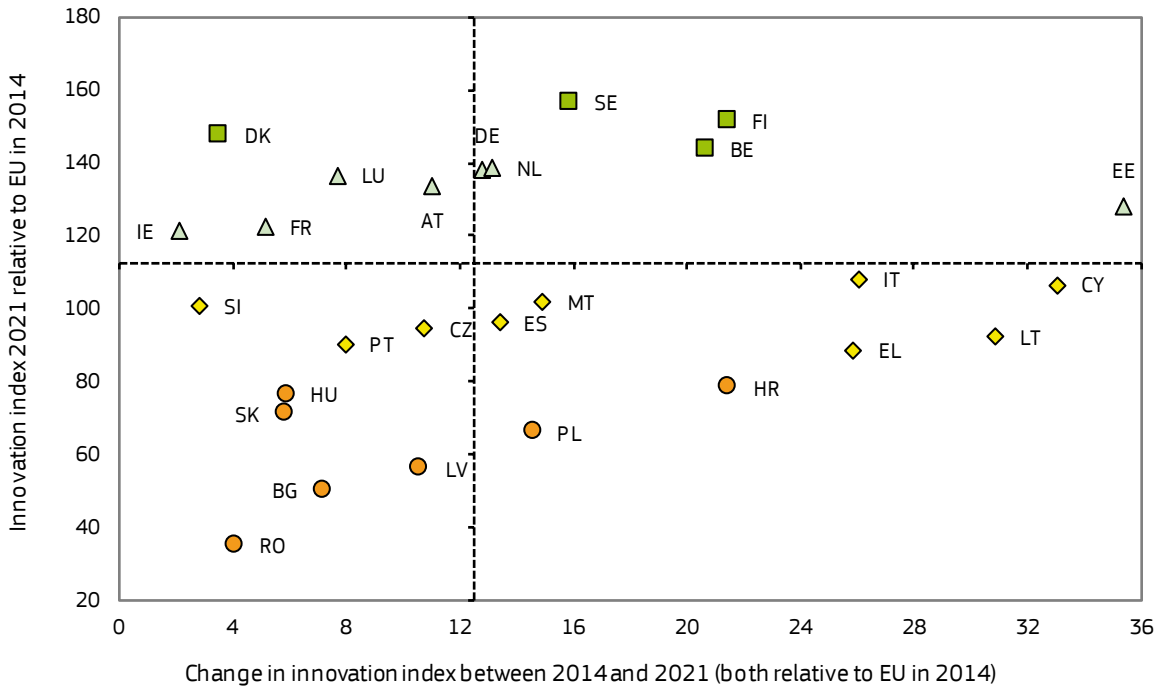
This section discusses performance changes over time for each of the innovation performance groups and the Member States included in each of the groups. For the EU, performance between 2014 and 2021 improved by 12.5 percentage points. Performance improved for all 27 Member States (Figure 6):

- For three Member States performance improved by 30 percentage points or more: Estonia (35.4%-points), Cyprus (33.0%-points) and Lithuania (30.9%-points).
- For five Member States performance improved between 20 and 30 percentage points: Italy (26.1%-points), Greece (25.9%-points), Croatia (21.5%-points), Finland (21.4%-points) and Belgium (20.7%-points)
- For six Member States performance improved between 12.5 (the EU average) and 20 percentage points: Sweden (15.9%-points), Malta (14.9%-points), Poland (14.6%-points), Spain (13.4%-points), Netherlands (13.2%-points) and Germany (12.8%-points).
- For six Member States performance improved between 7 and 12.5 percentage points: Austria (11.0%-points), Czechia (10.7%-points), Latvia (10.6%-points), Portugal (8.0%-points), Luxembourg (7.7%-points), and Bulgaria (7.2%-points).
- For seven Member States performance improved between 0 and 7 percentage points: Hungary (5.9%-points), Slovakia (5.9%-points), France (5.1%-points), Romania (4.1%-points), Denmark (3.6%-points), Slovenia (2.8%-points) and Ireland (2.1%-points).

In past EIS reports, less innovative countries tended to improve their performance faster than more innovative countries; there was a negative link between the level of and the change in performance. The same occurs in the current EIS edition. Between 2014 and 2021, there has been a moderate rate of convergence in innovation performance between Member States, with lower performing countries, on average, improving their level of innovation performance at a higher rate than higher performing countries. This process of convergence has accelerated in 2019 to 2021.[15] The performance ratio between the best performing Innovation Leader and the worst performing Emerging Innovator has slightly declined from 4.64 in 2014 to 4.46 in 2021, confirming that overall convergence has taken place between the Member States but that performance differences are still significant.

Compared to 2020, performance in 2021 has improved for 20 Member States, most notably for Estonia (20.9%-points) and Cyprus (15.6%-points), and performance has declined for seven Member States, Portugal (-8.2%-points), Latvia (-5.5%-points), Ireland (-3.2%-points), Netherlands (-2.5%-points), France (-2.1%-points), Luxembourg (-1.2%-points) and Slovakia (-0.6%-points).

Figure 6: Performance and performance change of EU Member States' innovation systems



The vertical axis shows Member States' performance in 2021 relative to that of the EU in 2014. The horizontal axis shows the change in performance between 2014 and 2021 relative to that of the EU in 2014. The dashed lines show the respective scores for the EU.

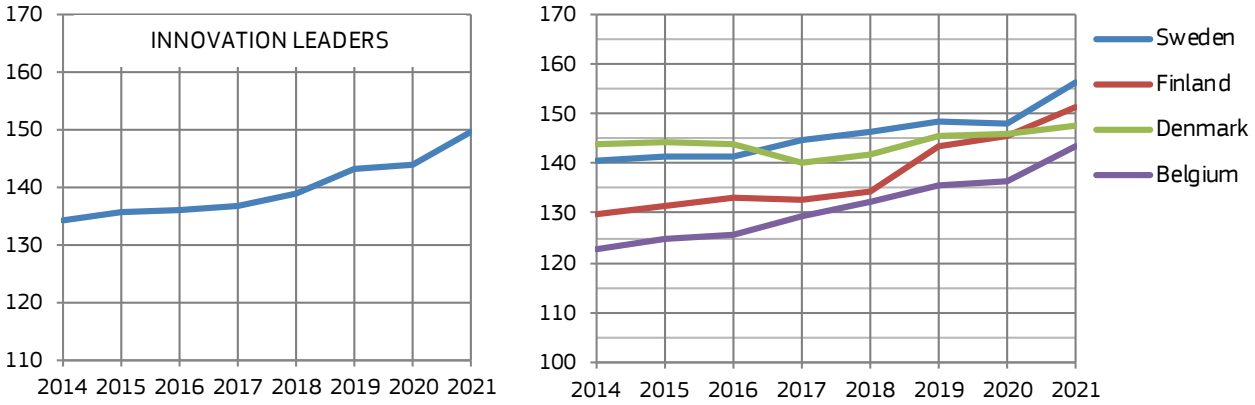
[15] The level of sigma-convergence has declined from 0.354 in 2014 to 0.335 in 2018 and then to 0.307 in 2021

Innovation Leaders

Performance of the Innovation Leaders improved from 2014 onwards, with an acceleration since 2019. Compared to 2014, performance has improved by 15.4 percentage points. Performance has improved the most in Finland (21.4%-points), most notably since 2019. Finland has almost closed the performance gap with Sweden, the best performing EU Member State. Belgium's performance has steadily increased over time resulting in a 20.7%-point increase in 2021 compared to 2014.

Relatively strong annual increases are also observed for Sweden in particularly in 2021 with an 8.4%-point increase in performance compared to 2020. Denmark remained at a very solid performance of around 145 to the EU average and increasing moderately with 3.6%-points on average since 2014. However, it dropped from first to third position over time, mainly due to a better performance increase of Sweden and Finland.

Figure 7: Performance Innovation Leaders

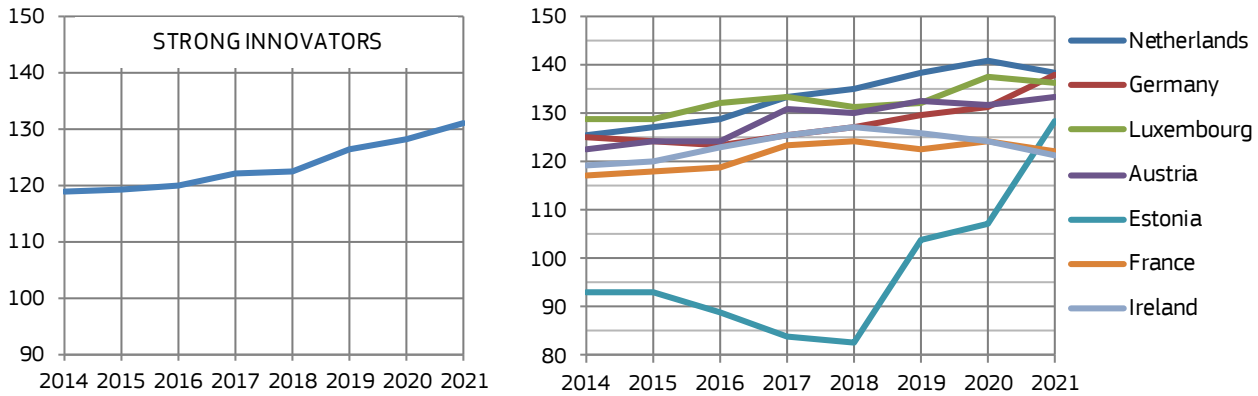


Performance is relative to that of the EU in 2014. The graph on the left shows the average performance of the Innovation Leaders, calculated as the unweighted average of the respective Member States.

Strong Innovators

For the Strong Innovators, performance did not change much between 2014 and 2016, but it started to increase more strongly in 2017 with a strong increase in 2019 (due to strong performance increases in Estonia and Germany in more recent years). Average performance for the Strong Innovators increased by 12.5 percentage points compared to 2014. The performance gap to the Innovation Leaders remained more or less the same between 2014 and 2020. However, in 2021, the performance gap with the Innovation leaders worsened as performance improved stronger for the Innovation Leaders. Since 2014, performance has improved for all Strong Innovators. The largest performance improvement occurred in Estonia (35.4%-points), followed by the Netherlands (13.2%-points) and Germany (12.8%-points). The strong increase in Estonia is due to two strong performance increases in 2019 and 2021, which results from the highly improved performance for the innovation indicators using CIS data. For Austria, performance between 2014 and 2021 increased (11.0%-points), due to a relatively strong performance increase in 2017. In Luxembourg performance increased relatively strongly in 2016 and 2018 with a total performance increase of 7.7%-points between 2014 and 2021. For France, performance declined in 2021 but compared to 2014 average performance increased by 5.1%-point. For Ireland, performance increased relatively strongly in 2017 but has declined since 2019, leading to an overall performance increase between 2014 and 2021 of 2.1%-points.

Figure 8: Strong Innovators

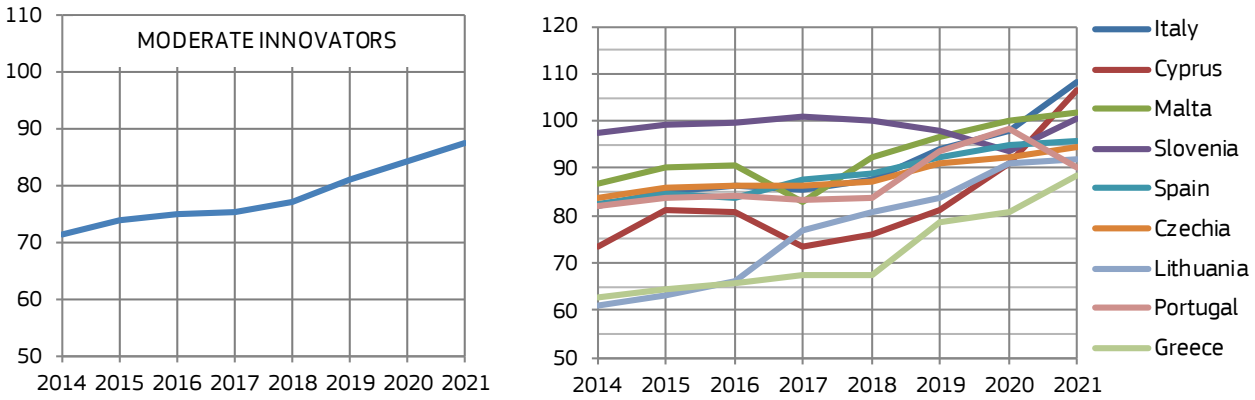


Performance is relative to that of the EU in 2014. The graph on the left shows the average performance of the Strong Innovators, calculated as the unweighted average of the respective Member States.

Moderate Innovators

For the Moderate Innovators, performance has been increasing continuously since 2014, with a growth acceleration in 2019. Compared to 2014, average performance has improved by 16.0 percentage points, which is the highest increase of all performance groups. The performance gap to the Strong Innovators became significantly smaller over time, which is an indication of converging performance between the two groups. For all Moderate Innovators performance has increased and in particularly for four Moderate Innovators, Cyprus, Greece, Italy and Lithuania, performance improved strongly and above 25%-points. For Cyprus performance increased strongly in 2015, after which it declined significantly in 2017, but recovering very strongly again since 2018 and most strongly in 2020 and 2021, leading to an overall performance increase compared to 2014 of 33.0%-points. For Lithuania performance improved very strongly by 30.9%-points, with performance improvements in most years, most strongly in 2017. For Italy performance increased most strongly in 2019 and 2021 leading to an overall performance increase of 26.1%-points. Greece observed a consistent performance increase over time with strong increases in 2019 and 2021, leading to an overall performance increase of 25.9%-points. Performance increased strongly for Malta (14.9%-points), with strong performance increases in 2018 and 2019. For Spain, performance increased strongly by 13.4%-points, with strong increases in 2017 and 2019. For Czechia, performance increased by 10.7%-points, with strong performance increases in 2019 and 2021. Performance increased moderately for Portugal (8.0%-points), with strong performance increases in 2019 and 2020 but a strong decline in 2021. For Slovenia, after a period of performance decline in 2018 to 2020, a strong increase in 2021 has led to an overall performance increase of 2.8%-points compared to 2014. Overall, performance for the Moderate Innovators has been converging over time with the performance ratio between the best and worst performing Moderate Innovator having declined from 1.6 in 2014 to 1.2 in 2021.

Figure 9: Performance Moderate Innovators

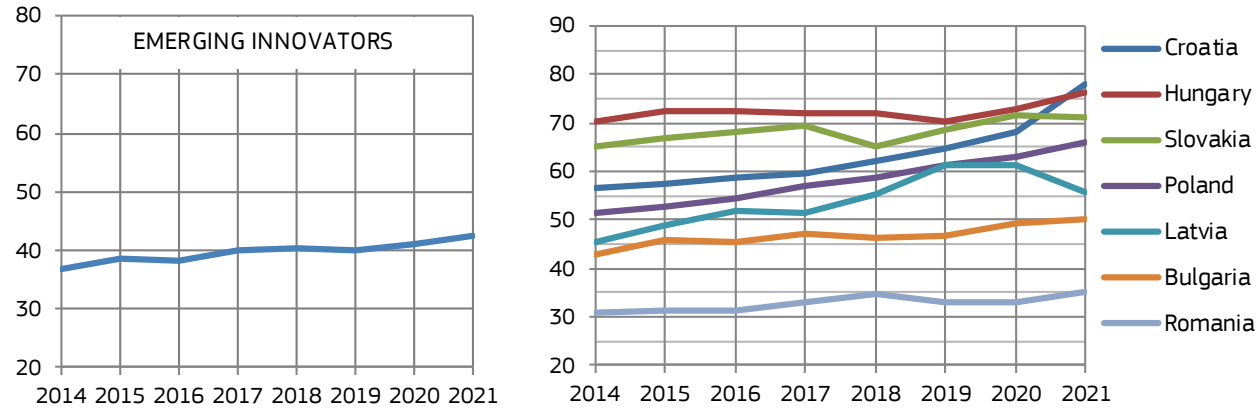


Performance is relative to that of the EU in 2014. The graph on the left shows the average performance of the Moderate Innovators calculated as the unweighted average of the respective Member States.

Emerging Innovators

For the Emerging Innovators, overall performance improved with 5.6 percentage points over time, which is less than half of the average rate of increase for the EU and below that for the other performance groups. The performance gap to the Moderate Innovators widened. Three Emerging Innovators had a strong performance increase over time of more than 10 percentage points, Croatia (21.5%-points), Poland (14.6%-points) and Latvia (10.6%-points). Performance in Croatia has particularly increased in 2021. For Latvia performance has been decreasing in 2020 and 2021. Poland observed a close to 5%-point annual increase in performance since 2019. For Bulgaria, performance increased by 7.2%-points, and for both Hungary and Slovakia with 5.9%-points. For Romania, performance has increased by 4.1%-points.

Figure 10: Performance Emerging Innovators



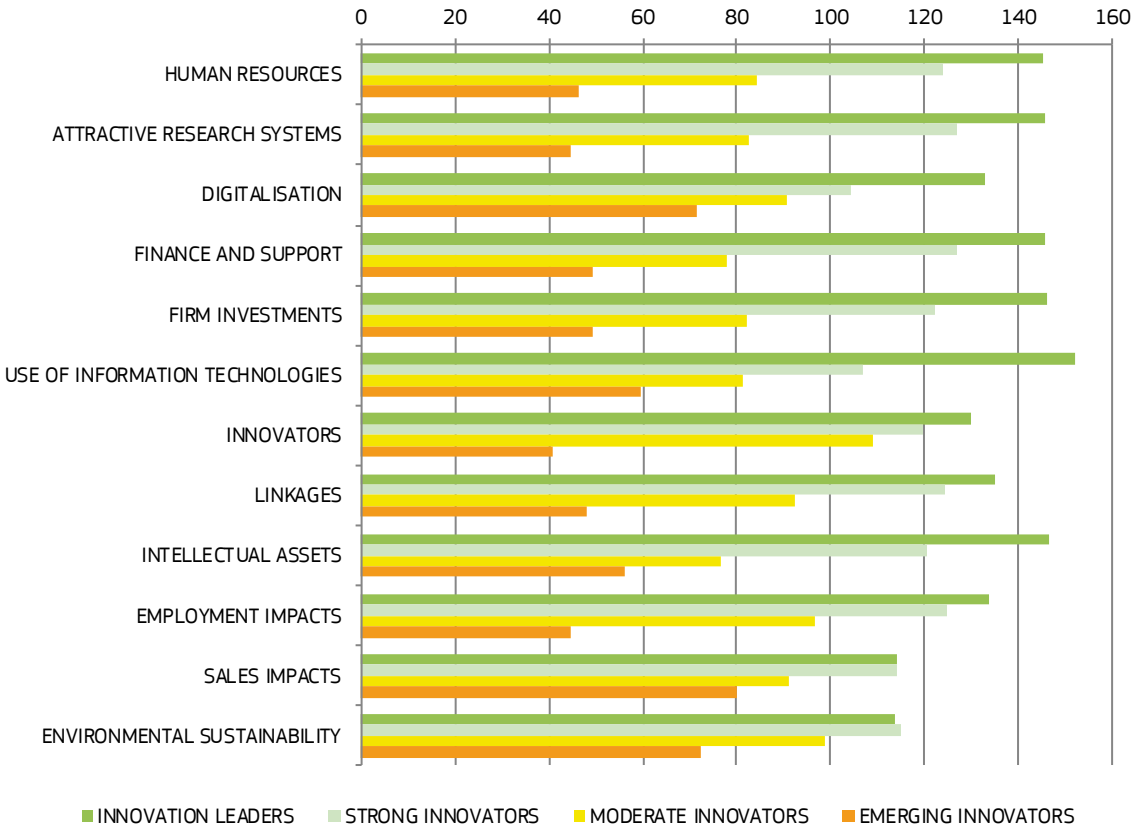
Performance is relative to that of the EU in 2014. The graph on the left shows the average performance of the Emerging Innovators calculated as the unweighted average of the respective Member States.

3. Innovation dimensions

The order of performance groups observed for the Summary Innovation Index also applies to most dimensions. The Innovation Leaders perform best in ten out of twelve dimensions, with the Strong Innovators showing highest performance in *Sales impacts* and *Environmental sustainability* (**Figure 11**). In several innovation dimensions, performance differences vary considerably between the performance groups. The performance difference between the Innovation Leaders and the Strong Innovators in Use of information technologies is 45%-points, and in *Finance and support* and *Intellectual assets* it is between 25 and 30%-points. Performance differences between the Innovation Leaders and the Strong Innovators are small in *Sales impact* and *Environmental sustainability*. Between the Strong and Moderate Innovators, performance differences are high (between 45 and 50%-points) for *Attractive research systems*, *Finance and support* and *Intellectual assets*, and performance differences are relatively small for Innovators. Between the Moderate and Emerging Innovators, performance differences are relatively high (more than 50%-points) for *Innovators* and *Employment impacts*, and performance differences are relatively small for *Sales impacts*.

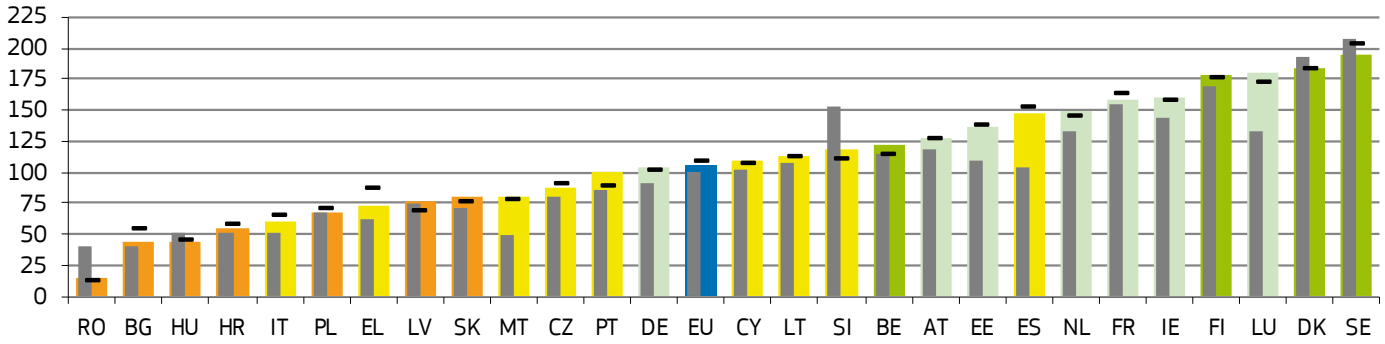
Country rankings in *Human Resources* and *Attractive research systems* come close to the overall classification of performance groups. This also holds, although to a lesser extent, for *Digitalisation* and *Linkages*. The dimensions *Finance and support*, *Innovators*, *Firm investments* and *Sales impacts* deviate the most from the overall classification. The dimensions *Intellectual assets* and *Employment impacts* also deviate from the overall classification, but to a lesser extent. These deviations demonstrate that countries can perform well in particular dimensions, while their overall performance is lower, resulting in becoming a member of a lower innovation performance group. Analogously, a Leading Innovator can perform poorly in a particular dimension but can compensate such relative weaknesses with stronger performance in other dimensions.

Figure 11: Performance groups: innovation performance per dimension



Average scores for each performance group equal 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. Average scores for the performance groups have been adjusted such that their average equals 100 for each dimension.

Human resources



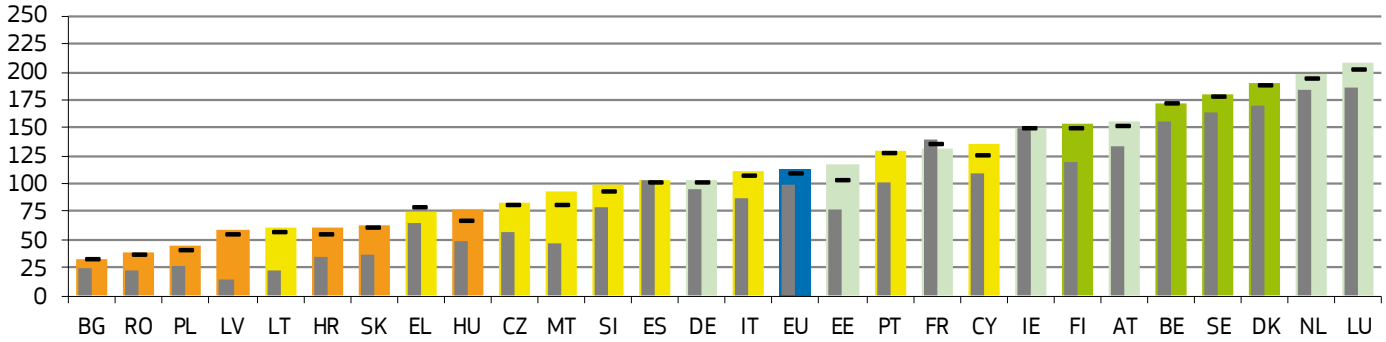
Coloured columns show Member States' performance in 2021, using the most recent data for the indicators in this dimension, relative to that of the EU in 2014. The horizontal hyphens show performance in 2020, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2014. Grey columns show performance in 2014 relative to that of the EU in 2014.

Performance in *Human resources* is largely representative of the overall classification into four performance groups. The top 5 is composed by three Innovation Leaders (Sweden, Denmark, Finland) and two Strong Innovators (Luxembourg and Ireland). All Innovation Leaders perform above the EU average. All Strong Innovators also perform above the EU average, except for Germany. Five Moderate Innovators perform below the EU average, four Moderate Innovators perform above the EU average (Spain, Slovenia, Lithuania and Cyprus).

For 21 Member States, performance has improved between 2014 and 2021. The highest performance increase is for Luxembourg (47.9%), followed by Spain (44.2%), Malta (30.9%) and Estonia (26.9%). For Slovenia (-33.7%), Romania (-25.6%), Sweden (-13.4%), Denmark (-8.1%) and Hungary (-7.4%) performance has decreased. The EU average increased by 6.0% for the period between 2014 and 2021.

In comparison to 2020, performance has improved for 16 Member States, with the highest performance increase for Portugal (11.3%), Belgium (9.1%) and Luxembourg (9.0%). Performance declined for 11 Member States, with the strongest decrease for Greece (-12.9%) and Bulgaria (-9.7%). The EU average decreased by 2.6% between 2020 and 2021.

Attractive research system



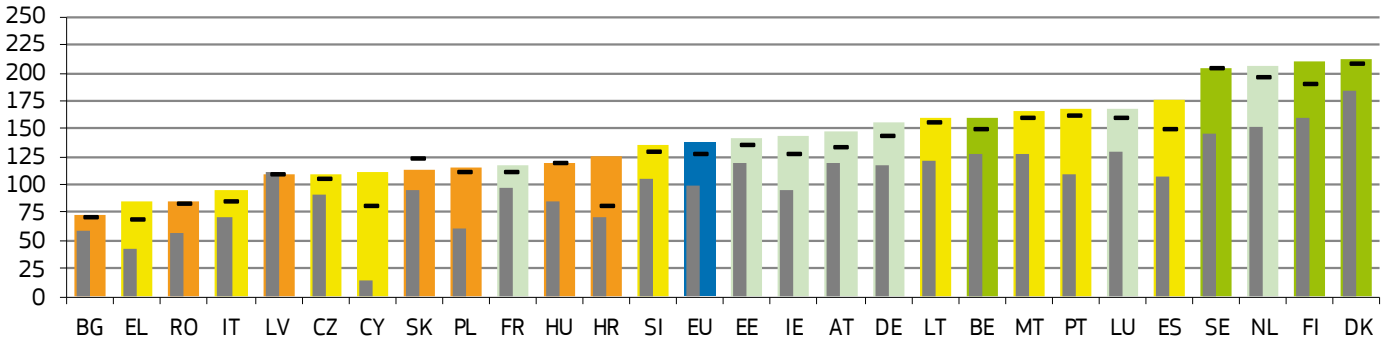
Coloured columns show Member States' performance in 2021, using the most recent data for the indicators in this dimension, relative to that of the EU in 2014. The horizontal hyphens show performance in 2020, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2014. Grey columns show performance in 2014 relative to that of the EU in 2014.

Performance in *Attractive research systems* largely reflects the overall classification into four performance groups. The Innovation Leaders perform well above the EU average. The top 5 is formed by two Strong Innovators, Luxembourg and the Netherlands, and three Innovation Leaders, Belgium, Denmark, and Sweden. Only two Moderate Innovators Portugal and Cyprus, perform above the EU average. The other Moderate Innovators, together with the Emerging Innovators, perform below the EU average.

For 25 Member States, performance has improved between 2014 and 2021. The highest rate of performance increase is for Malta (47.0%), followed by Latvia (45.6%) and Estonia (40.9%). Only for France (-8.4%) and Spain (-1.4%) performance has decreased. The EU average increased by 12.5% between 2014 and 2021.

Compared to 2020, performance has improved for 24 Member States, with the highest rate of performance increase for Estonia (14.7%) and Malta (14.1%). Performance declined for two Member States, for France (-2.8%) and Greece (-1.4%). The EU average increased by 3.6% between 2020 and 2021.

Digitalisation



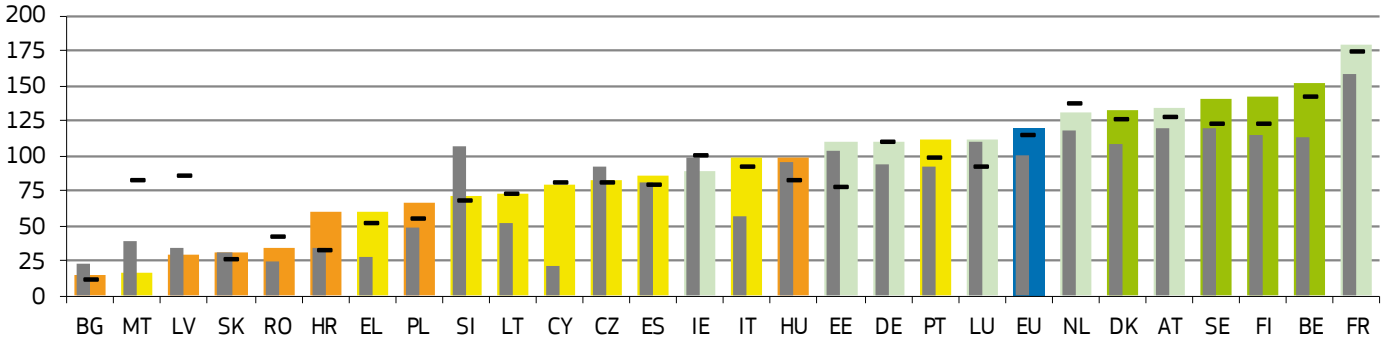
Coloured columns show Member States' performance in 2021, using the most recent data for the indicators in this dimension, relative to that of the EU in 2014. The horizontal hyphens show performance in 2020, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2014. Grey columns show performance in 2014 relative to that of the EU in 2014.

Performance in *Digitalisation* deviates from the overall classification into four performance groups. The top 5 is formed by three Innovation Leaders, one Strong and one Moderate Innovator. All Innovation Leaders perform above the EU average. All Strong Innovators, except France, perform above the EU average. Four Moderate Innovators perform above the EU average, while five Moderate Innovators perform below the EU average. Several Emerging Innovators perform relatively well on this dimension.

For 26 Member States, performance has improved between 2014 and 2021. The highest rate of performance increase is observed in Cyprus (96.5%) and Spain (68.4%). Performance decreased only for Latvia (-2.1%). The EU average increased by 38.3% between 2014 and 2021.

Compared to 2020, performance has improved for 24 Member States, with the highest rate of performance increase for Croatia (46.2%) and Cyprus (31.7%). Performance declined only for Slovakia (10.5%). The EU average has increased by 12.6% between 2020 and 2021.

Finance and support



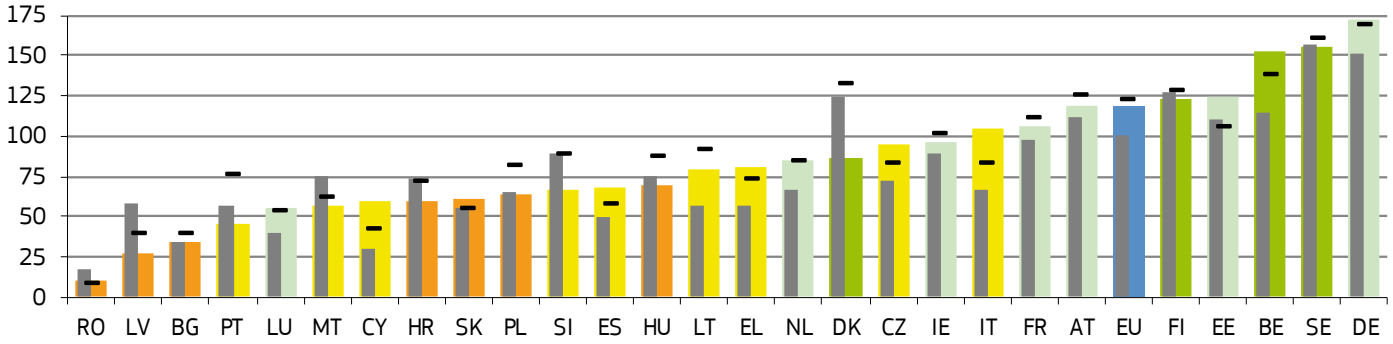
Coloured columns show Member States' performance in 2021, using the most recent data for the indicators in this dimension, relative to that of the EU in 2014. The horizontal hyphens show performance in 2020, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2014. Grey columns show performance in 2014 relative to that of the EU in 2014.

Performance in *Finance and support* reflects to some extent the overall classification into four performance groups. All Innovation Leaders perform above the EU average. The top 5 is formed by three Innovation Leaders and two Strong Innovators. France shows best performance overall. Four Strong Innovators perform below the EU average. All Moderate and Emerging Innovators perform below the EU average.

Performance has increased for 20 Member States. The highest rate of performance increase between 2014 and 2021 is observed in Cyprus (58.5%), Italy (41.7%) and Belgium (38.1%). For seven Member States performance has decreased, in particular for Slovenia (-35.5%) and Malta (-23.6%). The EU average increased by 19.1% between 2014 and 2021.

Compared to 2020, performance has improved in 21 Member States, with the highest rate of performance increase for Estonia (33.5%) and Croatia (27.8%). Performance decreased for five Member States, with the strongest decline for Malta (-65.3%) and Latvia (-55.2%). The EU average increased by 5.4% between 2020 and 2021.

Firm investments



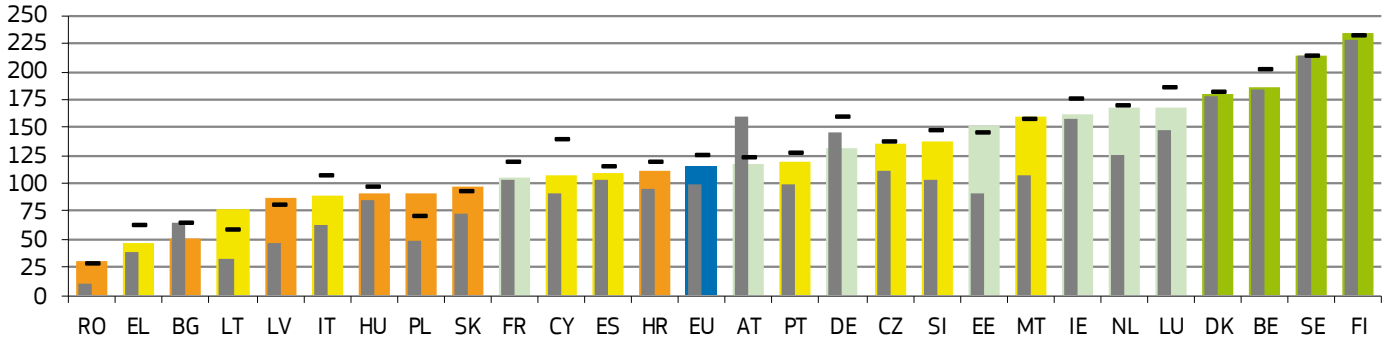
Coloured columns show Member States' performance in 2021, using the most recent data for the indicators in this dimension, relative to that of the EU in 2014. The horizontal hyphens show performance in 2020, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2014. Grey columns show performance in 2014 relative to that of the EU in 2014.

Performance in *Firm Investments* reflects to some extend the overall classification into four performance groups. The top 5 is formed by three Innovation Leaders and two Strong Innovators. As the EU average is high, most Member States perform below the EU. All Innovation Leaders, except for Denmark, perform above the EU average. Only two Strong Innovators – Estonia and Germany – perform above the EU average. All Moderate and Emerging Innovators perform below the EU average, with Czechia and Italy having the highest performance of the Moderate Innovators.

For 16 Member States, performance increased between 2014 and 2021. The highest rate of performance increase is observed in Italy (38.9%), followed by Belgium (38.4%). The EU average increased by 19.3%. For 11 Member States, performance decreased, in particular for Denmark (-38.4%), Latvia (-31.9%) and Slovenia (-22.8%).

Compared to 2020, performance has improved for 12 Member States, with the highest rate of performance increase for Italy (22.7%) and Estonia (19.4%). Performance declined for 15 Member States, with the strongest decline in Denmark (-45.3%), followed by Portugal (-31.4%) and Slovenia (-21.0%). The EU average decreased by -3.1% between 2020 and 2021.

Use of information technologies



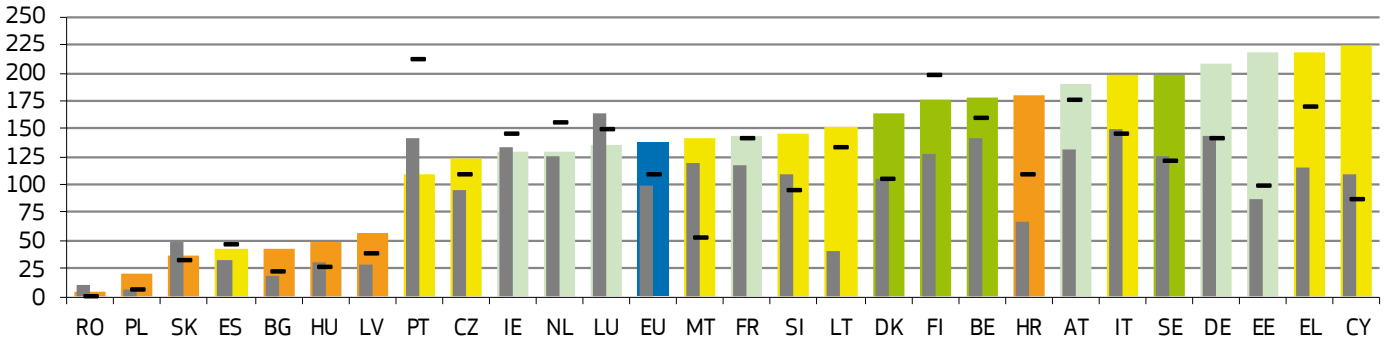
Coloured columns show Member States' performance in 2021, using the most recent data for the indicators in this dimension, relative to that of the EU in 2014. The horizontal hyphens show performance in 2020, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2014. Grey columns show performance in 2014 relative to that of the EU in 2014.

Performance in *Use of information technologies* reflects the overall classification into four performance groups. All Innovation Leaders and one Strong Innovator, Luxembourg, make up the top 5. All Strong Innovators perform above the EU average, except for France. Four Moderate Innovators perform above the EU average, and five of them perform below the EU average. All Emerging Innovators perform below the EU average, of which Croatia shows the highest performance.

For 23 Member States performance increased between 2014 and 2021. The highest rate of performance increase is observed in Estonia (59.5%), Malta (51.5%) and Lithuania (44.4%). The EU average increased by 15.5%. For three Member States, performance decreased, namely Austria (-41.5%), Germany (-13.8%) and Bulgaria (-13.0%).

Compared to 2020, performance has improved for only eight Member States, with the highest rate of performance increase for Poland (20.0%) and Lithuania (19.6). For 17 Member States, performance decreased, with the strongest decline in Cyprus (-32.5%) and Germany (-26.3%). The EU average declined by 8.5% between 2020 and 2021.

Innovators



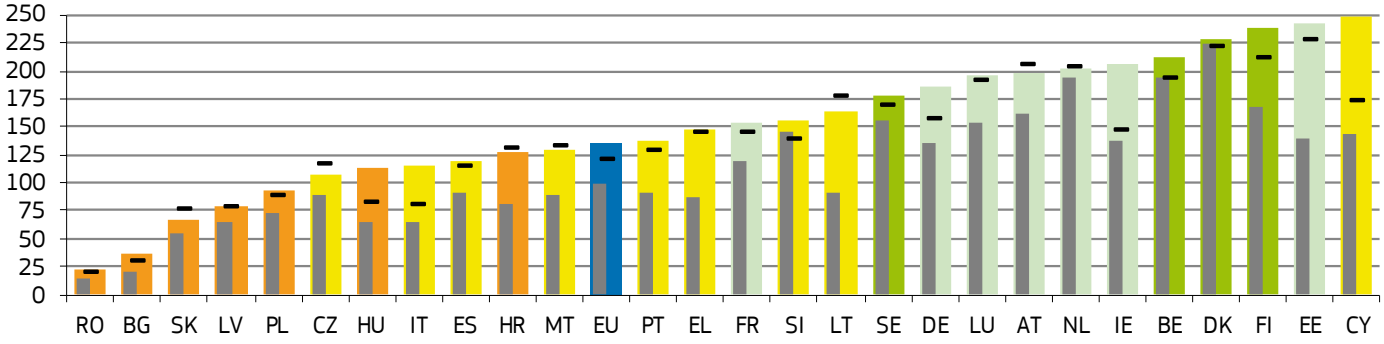
Coloured columns show Member States' performance in 2021, using the most recent data for the indicators in this dimension, relative to that of the EU in 2014. The horizontal hyphens show performance in 2020, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2014. Grey columns show performance in 2014 relative to that of the EU in 2014.

Performance in *Innovators* deviates from the overall classification into four performance groups. All Innovation Leaders perform above the EU average, with only Sweden in the top 5. Four Strong Innovators also perform above the EU average, while three perform below the EU average including Ireland, Luxembourg, and the Netherlands. Six Moderate Innovators perform above the EU average of which Cyprus and Greece take the overall two highest positions. The only Emerging Innovator performing above the EU average is Croatia. There is a strong break in performance between Portugal and Latvia.

For 22 Member States performance increased between 2014 and 2021. The highest rate of performance increase is observed in Estonia (131.5%), Cyprus (113.7%), Croatia (113.2%), Lithuania (110.3%) and Greece (103.6%). For 5 Member States performance declined, and most strongly for Portugal (-33.5%) and Luxembourg (-29.0%). The EU average increased by 36.8% between 2014 and 2021.

Compared to 2020, performance has increased for 21 Member States, and most strongly in Cyprus (138.2%), Estonia (118.6%) and Malta (89.0%). For six Member States performance declined, in particular for Portugal (-103.1%). The EU average increased by 28.0% between 2020 and 2021.

Linkages



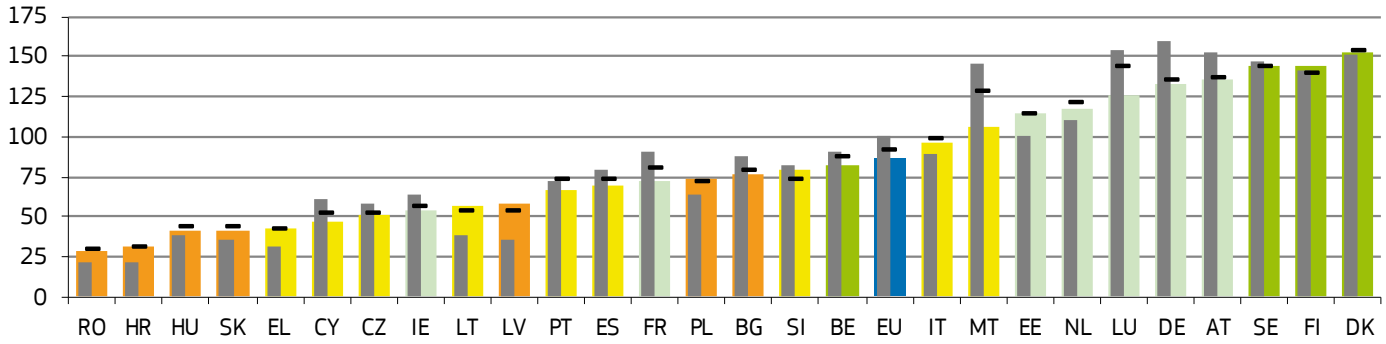
Coloured columns show Member States' performance in 2021, using the most recent data for the indicators in this dimension, relative to that of the EU in 2014. The horizontal hyphens show performance in 2020, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2014. Grey columns show performance in 2014 relative to that of the EU in 2014.

Performance in *Linkages* reflects to some extent the overall classification into four performance groups. All Innovation Leaders and Strong Innovators perform above the EU average. Five Moderate Innovators, with Cyprus being the overall best performing Member State, perform above the EU average. The other four Moderate Innovators and all Emerging Innovators perform below the EU average.

For all 27 Member States performance increased between 2014 and 2021. The highest rate of performance increase is observed in Cyprus (103.5%) and Estonia (101.7%). The EU average increased by 34.8%. The lowest performance increase is observed in Denmark (4.0%) and Romania (6.4%).

Compared to 2020, performance has improved for 21 Member States, with the highest rate of performance increase for Cyprus (74.9%) and Ireland (59.9%). Performance declined for six Member States, with the strongest decline for Lithuania (-14.9%). The EU average increased by 14.3% between 2020 and 2021.

Intellectual assets



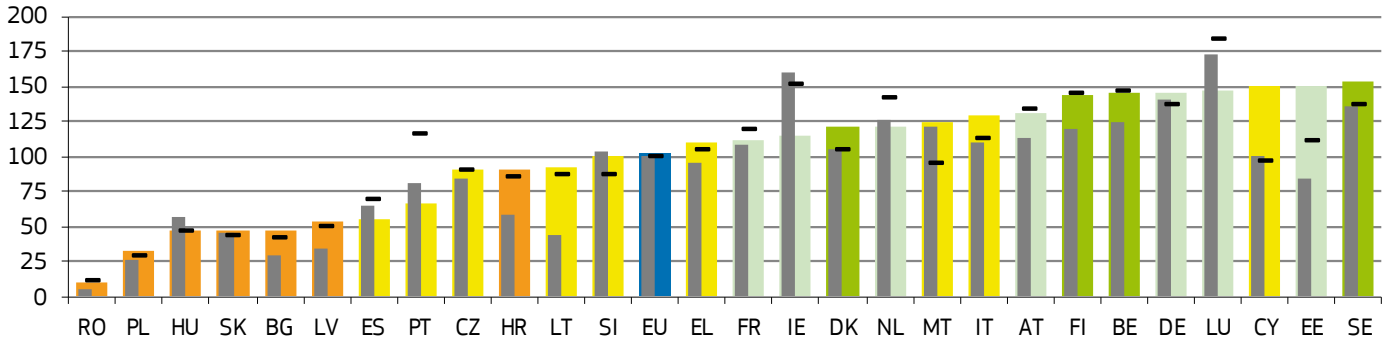
Coloured columns show Member States' performance in 2021, using the most recent data for the indicators in this dimension, relative to that of the EU in 2014. The horizontal hyphens show performance in 2020, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2014. Grey columns show performance in 2014 relative to that of the EU in 2014.

Performance in *Intellectual Assets* deviates to some extent from the overall classification into four performance groups. Denmark, an Innovation Leader, is the overall best performing country, making it to the top 5 together with two other Innovation Leaders, Finland and Sweden, and two Strong Innovators, Austria and Germany. All Innovation Leaders perform above the EU average, except for Belgium. Most Strong Innovators are performing above the EU average, except for France and Ireland. Only two Moderate Innovators, Malta and Italy, are performing above the EU average. All Emerging Innovators perform below the EU average; however, Bulgaria and Poland outperform two Strong Innovators and six Moderate Innovators as a result of relatively large numbers of trademark and design applications.

For 13 Member States, performance has increased between 2014 and 2021. The highest rate of performance increase is observed in Latvia (22.6%) and Lithuania (18.5%). Performance has declined for 14 Member States, most notably for Malta (-39.0%), Germany (-27.8%) and Luxembourg (-27.8%). The EU average has declined by 13.3% between 2014 and 2021.

Compared to 2020, performance has improved for 10 Member States, with the highest rate of performance increase for Slovenia (6.1%) and Finland (5.1%). Performance has declined for 17 Member States, with declining performance on Patent applications for 15 and on Design applications for 13 of these Member States. Strongest declines are for Malta (-22.1%), Luxembourg (-16.7%) and France (-8.2%). The EU average has declined by 4.7% between 2020 and 2021.

Employment impacts



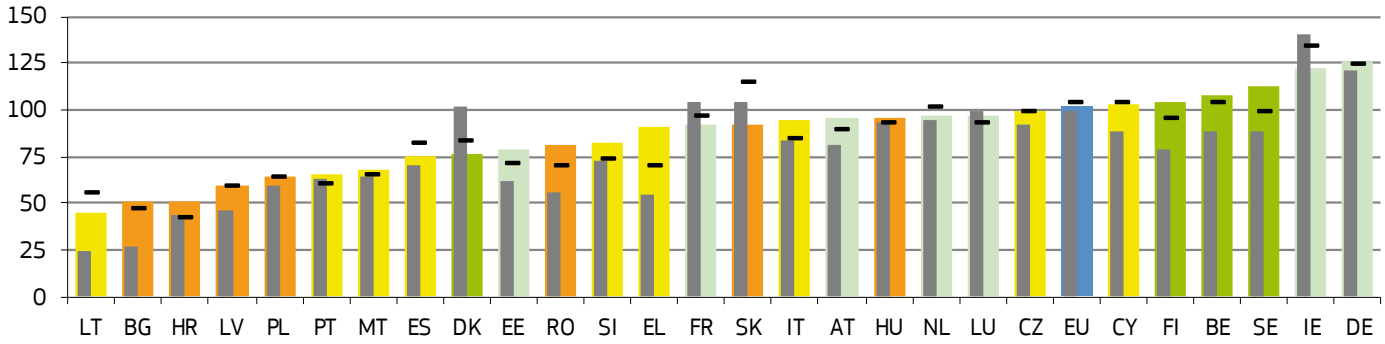
Coloured columns show Member States' performance in 2021, using the most recent data for the indicators in this dimension, relative to that of the EU in 2014. The horizontal hyphens show performance in 2020, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2014. Grey columns show performance in 2014 relative to that of the EU in 2014.

Performance in *Employment impacts* deviates slightly from the overall classification into four performance groups with only one Innovation Leader, Sweden, in the top 5 performing countries. Estonia, a Strong Innovator, and Cyprus, a Moderate Innovator, are the second- and third-best performing countries. All Innovation Leaders and Strong Innovators perform above the EU average, and four Moderate Innovators also perform above the EU average. The Emerging Innovators take up the last six rank positions, only Croatia is performing relatively well.

For 20 Member States, performance has increased between 2014 and 2021. The highest rate of performance increase is observed in Estonia (66.5%), Cyprus (49.4%) and Lithuania (48.2%). Performance decreased for seven Member States, and most strongly in Ireland (-45.8%) and Luxembourg (-25.1). The EU average increased by 1.9% between 2014 and 2021.

Compared to 2020, performance has improved for 17 Member States, and most strongly in Cyprus (54.0%), Estonia (38.9%) and Malta (29.4%). Performance declined for 10 Member States, with the strongest declines for Portugal (-48.8%), Luxembourg (-37.0%) and Ireland (-36.3%). The EU average increased by 3.1% between 2020 and 2021.

Sales impacts



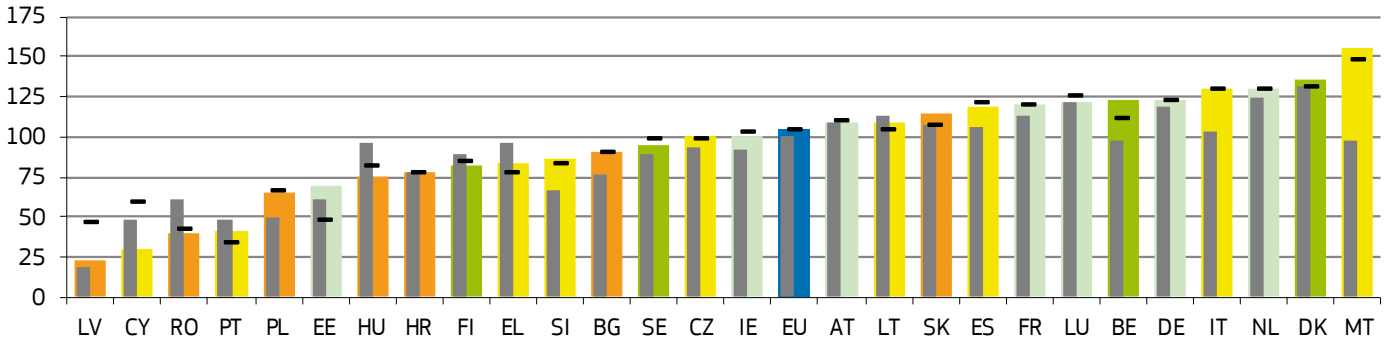
Coloured columns show Member States' performance in 2021, using the most recent data for the indicators in this dimension, relative to that of the EU in 2014. The horizontal hyphens show performance in 2020, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2014. Grey columns show performance in 2014 relative to that of the EU in 2014.

Performance in *Sales impacts* deviates from the overall classification into four performance groups. All Innovation Leaders perform above the EU average, except for Denmark. The top-5 best performing countries include two Strong Innovators, Germany and Ireland, and three Innovation Leaders. All other Strong Innovators perform below the EU average. All Moderate Innovators, except for Cyprus, perform below the EU average. All Emerging Innovators perform below the EU average, yet Hungary outperforms one Innovation Leader and three Strong Innovators. The EU average is relatively high, due to the high score of Germany, the largest EU economy.

Performance between 2014 and 2021 has increased for 22 Member States. The highest rate of performance increase is observed in Greece (37.0%), Finland (26.3%) and Romania (25.5%). For five Member States performance declined, in particular for Denmark (-25.5%) and Ireland (-19.2%). The EU average increased by 1.9% between 2014 and 2021.

Compared to 2020, performance has improved for 19 Member States, with the highest rate of performance increase for Greece (21.7%) and Sweden (14.0%). Performance declined for eight Member States, with the strongest declines for Slovakia (-22.6%), Ireland (-11.7%), and Lithuania (-10.4%). The EU average decreased by 1.4% between 2020 and 2021.

Environmental sustainability



Coloured columns show Member States' performance in 2021, using the most recent data for the indicators in this dimension, relative to that of the EU in 2014. The horizontal hyphens show performance in 2020, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2014. Grey columns show performance in 2014 relative to that of the EU in 2014.

Performance in *Environmental sustainability* deviates from the overall classification into four performance groups. Two Moderate Innovators are included in the top 5, Malta being the overall best performer and Italy. Two Innovation Leaders perform below the EU average, Finland and Sweden. Of the Strong Innovators, five perform above and two perform below the EU average. The Emerging Innovators perform below the EU average, except for Slovakia.

Performance between 2014 and 2021 has increased for 18 Member States. The highest rate of performance increase is observed in Malta (57.9%), Italy (26.3%) and Belgium (25.4%). For seven Member States performance decreased, most strongly in Romania (-21.6%), Hungary (-21.5%) and Cyprus (-17.6%). The EU average increased by 4.1% between 2014 and 2021.

Compared to 2020, performance increased for 15 Member States, most strongly in Estonia (21.1%) and Belgium (12.4%). Performance decreased for 12 Member States, in particular in Cyprus (-29.1%) and Latvia (-23.0%). The EU average slightly decreased by 0.3% between 2020 and 2021.

4. Benchmarking innovation performance with non-EU countries

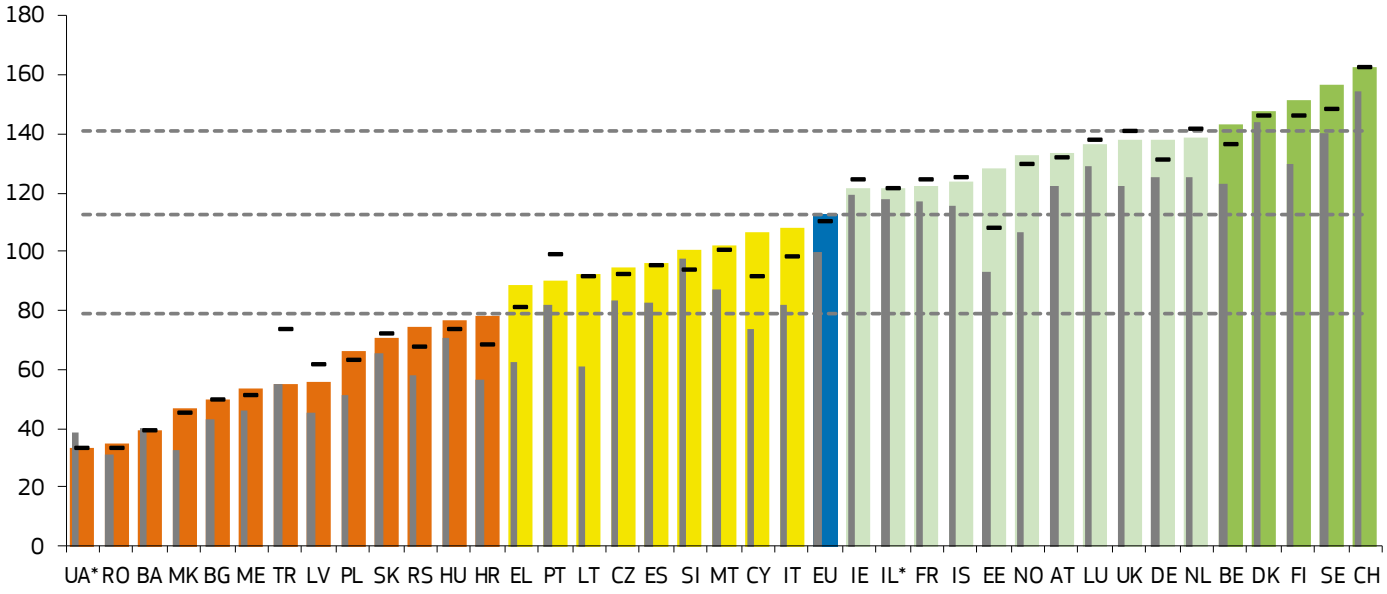
4.1 Benchmarking against other European countries and regional neighbours

This section discusses the results for 11 more European countries or regional neighbours using the same methodology as used for the EU Member States[16]. Compared to previous editions of the EIS, data availability was sufficient to include Bosnia and Herzegovina in the analysis.

Switzerland is the overall Innovation Leader in Europe, outperforming all EU Member States (**Figure 12**). Switzerland's strong performance results from best performance on seven indicators, of which five indicators are included under Framework conditions. Iceland, Israel, Norway, and the United Kingdom are Strong Innovators. Bosnia and Herzegovina, Montenegro[17], North Macedonia, Serbia, Turkey, and Ukraine are Emerging Innovators. The performance groups for all countries are shown on a map in **Figure 13**.

The performance of Norway relative to the EU in 2014 has increased by 25.9%, for Serbia by 16.7%, for the United Kingdom by 15.5%, and for North Macedonia by 14.4%. For the other countries, the performance increase relative to the EU in 2014 was more modest at rates below that of the EU (12.5%). For Iceland performance increased by 7.9%, for Montenegro by 7.8%, for Switzerland by 7.7%, for Israel by 4.1%, and for Turkey by 0.3%. For Bosnia and Herzegovina and Ukraine performance relative to the EU in 2014 even decreased at respectively -1.2% and -5.3%.

Figure 12: Performance of European and neighbouring countries' systems of innovation

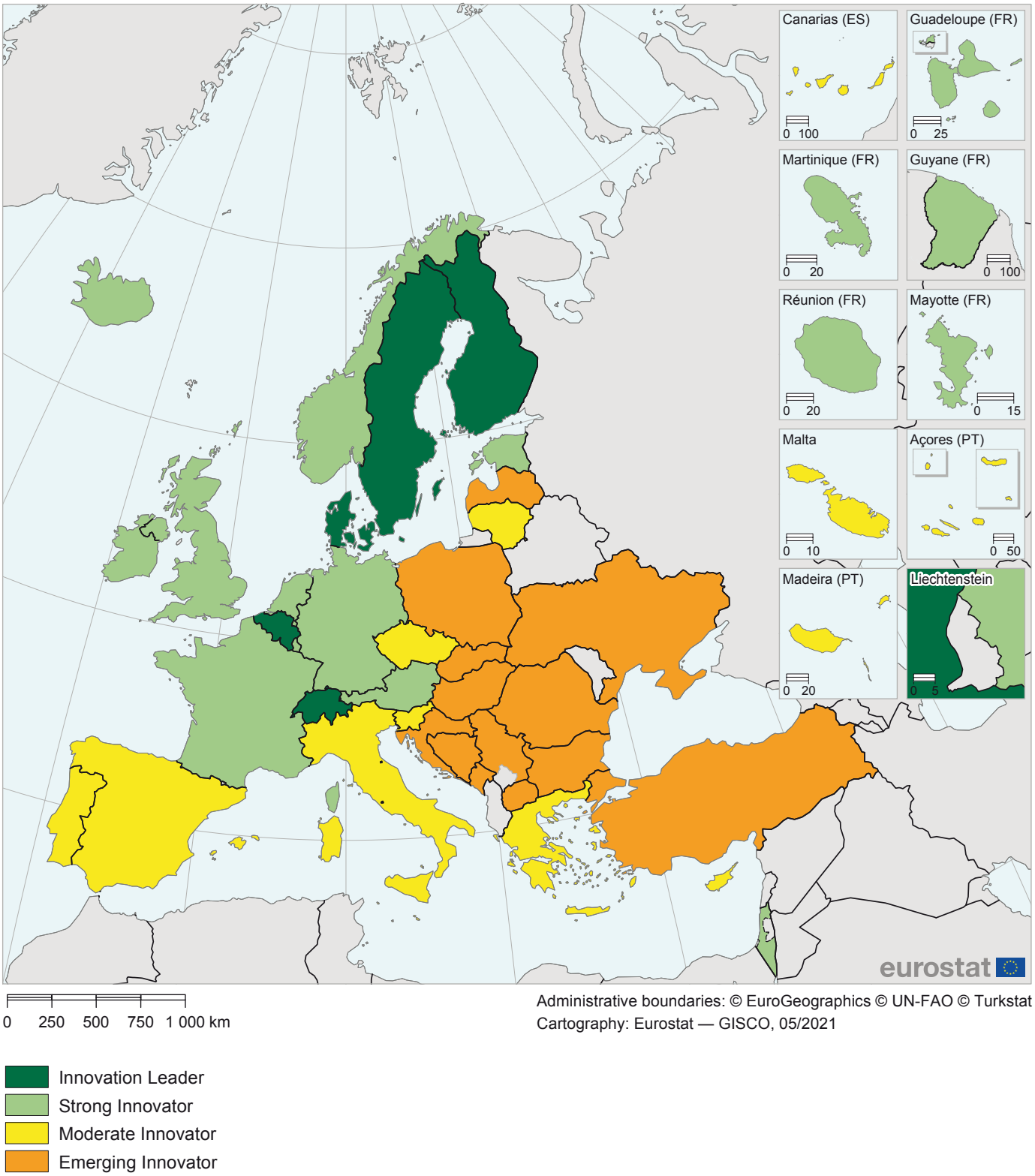


*Coloured columns show countries' performance in 2021, using the most recent data for 32 indicators, relative to that of the EU in 2014. The horizontal hyphens show performance in 2020, using the next most recent data, relative to that of the EU in 2014. Grey columns show countries' performance in 2014 relative to that of the EU 2014. For all years, the same measurement methodology has been used. The dashed lines show the threshold values between the performance groups, where the threshold values of 70%, 100%, and 125% have been adjusted upward to reflect the performance increase of the EU between 2014 and 2021. European and neighbouring countries include Bosnia and Herzegovina (BA), Iceland (IS), Israel (IL), Norway (NO), North Macedonia (MK), Montenegro (ME), Serbia (RS), Switzerland (CH), Turkey (TR), Ukraine (UA), and United Kingdom (UK). * Results for IL and UA are less reliable due to limited data availability.*

[16] Average data availability for this year's report is good with data available for 32 indicators for Norway, Serbia and the United Kingdom, 31 indicators for Iceland, 30 indicators for North Macedonia and Turkey, 29 indicators for Montenegro and Switzerland, and 25 indicators for Bosnia and Herzegovina. Data availability is weak for Ukraine with data for 21 indicators and Israel with data for only 15 indicators.

[17] For Montenegro, data for the indicators using CIS data are from a pilot survey and unofficial.

Figure 13: Map showing the performance of European neighbouring countries' innovation systems



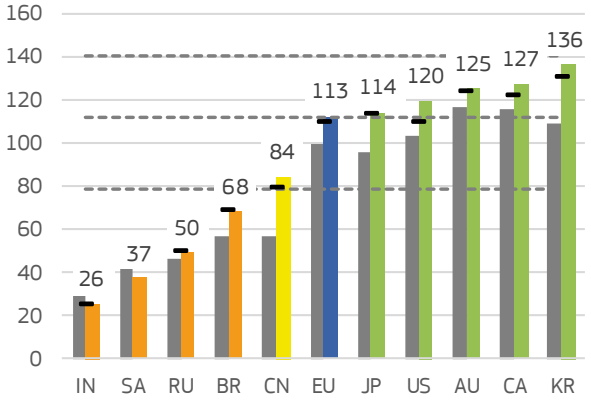
Source: European Commission – European Innovation Scoreboard 2021

Disclaimer: The designations employed and the presentation of material on the map do not imply the expression of any opinion whatsoever on the part of the European Union concerning the legal status of any country, territory or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.The designation shall not be construed as recognition of a State of Palestine and is without prejudice to the individual positions of the Member States on this issue.

4.2 Benchmarking against global competitors

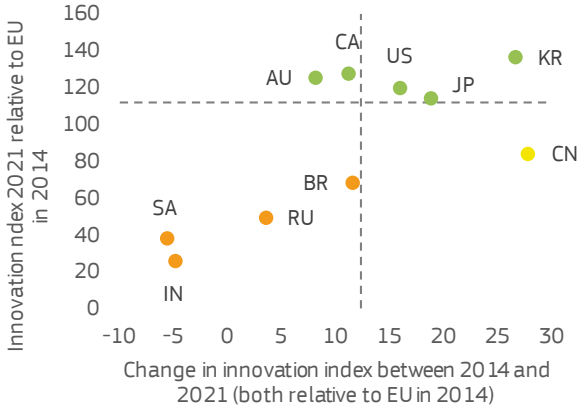
This section provides a comparison of the EU to some of its main global economic competitors including Australia, the BRICS countries (Brazil, Russia, India, China, and South Africa), Canada, Japan, South Korea, and the United States. South Korea is the most innovative country performing 36 per cent above the performance score of the EU in 2014 and 21 per cent above the EU in 2021, which is below the threshold of 25 percent above the EU to be an Innovation Leader (**Figure 14**). Canada, Australia, the United States, and Japan, also have a performance lead over the EU. The EU has a performance lead over China, Brazil, South Africa, Russia, and India. Based on relative-to-EU performance in 2021, Australia, Canada, Japan, South Korea, and the United States would be Strong Innovators, China would be a Moderate Innovator, and Brazil, India, Russia, and South Africa would be Emerging Innovators.

Figure 14: Global performance



Coloured columns show performance in 2021 relative to that of the EU in 2014. The horizontal hyphens show performance in 2020 relative to that of the EU in 2014. Grey columns show performance in 2014 relative to that of the EU in 2014. For all years, the same measurement methodology has been used. The dashed lines show the threshold values between the performance groups, where the threshold values of 70%, 100%, and 125% have been adjusted upward to reflect the performance increase of the EU between 2014 and 2021.

Figure 15: Change in global performance



The vertical axis shows countries' performance in 2021 relative to that of the EU in 2014. The horizontal axis shows the change in performance between 2014 and 2021 relative to that of the EU in 2014. The dashed lines show the respective scores for the EU.

Performance over the time period 2014 to 2021 has increased most in China (27.9%) and South Korea (26.7%) (**Figure 15**). For Japan (19.0%) and the United States (16.0%), performance has also increased at a higher rate compared to the EU (12.5%). For Australia, Brazil, Canada, India, Russia, and South Africa, performance has decreased compared to the EU. Combining current performance and growth rate shows that Japan, South Korea, and the United States have an increasing performance lead over the EU, while Australia and Canada have a decreasing performance lead. The EU has a decreasing performance lead over China, and an increasing performance lead over Brazil, India, Russia, and South Africa.

More recently, between 2020 and 2021, performance has increased strongly for the United States (almost entirely due to a quadrupling of the share of SMEs with product and/or process innovations). Performance has decreased strongly for South Africa (almost entirely due to a strong decline in the Development of environment-related technologies). Between 2020 and 2021, the EU has closed part of its performance gap with Australia and Japan, but Canada, South Korea, and the United States managed to increase their performance lead. China decreased the performance gap to the EU, with the EU increasing its performance lead over Brazil, India, Russia and South Africa.

Methodology

The economic and population size of most global competitors outweighs that of many of the individual EU Member States. Thus, innovation performance is compared to the aggregate of the Member States, i.e. the EU. Data availability is more limited for global competitors than for European countries. Therefore, a more restricted set of 19 indicators (**Table 3**) has been used for the international comparison of the EU with its global competitors. For some indicators, different definitions or even proxy indicators have been used as compared to the previous chapters:

- For Employed ICT specialists, data are not available. The same proxy indicator has been used as in the Regional Innovation Scoreboard: Employment share in information and communication services (NACE J).
- The latest OECD data collection on innovation survey data is from 2019 covering data from 2016 surveys not yet differentiating between product and business process innovators. For two of the indicators using CIS data, the same definitions had to be used as in the EIS 2020. The share of SMEs with product and/or process innovations has been used instead of SMEs with product innovations. The share of SMEs with marketing and/or organisational innovations has been used instead of SMEs with business process innovations.

- For Trademark applications, comparable data on resident and non-resident applications have been used from the World Development Indicators.
- For Design applications, comparable data on resident and non-resident applications have been used from the World Development Indicators.
- For Medium and high-tech product exports and Knowledge-intensive services exports, the data for the EU exclude trade between Member States ('intra-EU trade'), and only include exports to non-Member States ('extra-EU trade').
- For Knowledge-intensive services exports, data have been used from the UN Comtrade database using the older EBOPS 2002 classification and not the latest EBOPS 2010 classification.
- For Air pollution in PM2.5 in Industry, data are not available. The same proxy indicator has been used as in the Regional Innovation Scoreboard: Exposure to air pollution (PM2.5).

Table 4: Indicators used in the international comparison

	DATA SOURCE	DATA NOT AVAILABLE FOR	YEAR
FRAMEWORK CONDITIONS			
HUMAN RESOURCES			
1.1.1 New doctorate graduates (STEM) (per 1,000 population aged 25-34)	OECD – Education at a Glance	CN, SA	2018
1.1.2 Population aged 25-64 having completed tertiary education	OECD – Education at a Glance	IN	2019
ATTRACTIVE RESEARCH SYSTEMS			
1.2.1 International scientific co-publications (per million population)	Scopus[1]	--	2020
1.2.2 Scientific publications among the top 10% most cited publications worldwide (share of total scientific publications of the country)	Scopus[1]	--	2018
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, UIS	--	2019
2.1.3 Direct government funding and government tax support for business R&D	OECD	--	2018
FIRM INVESTMENTS			
2.2.1 R&D expenditure in the business sector (percentage of GDP)	OECD, UIS	BR	2019
USE OF INFORMATION TECHNOLOGIES			
2.3.2 Employment in information and communication services	OECD, UNECE	CA, CN, IN, SA	2019
INNOVATION ACTIVITIES			
INNOVATORS			
3.1.1 SMEs introducing product or process innovations (%-share)	OECD	CN, IN, SA	2016
3.1.2 SMEs introducing marketing or organisational innovations (%-share)	OECD	CN, IN, SA, US	2016
LINKAGES			
3.2.1 Innovative SMEs collaborating with others (%-share)	OECD	CA, CN, IN, SA, US	2016
3.2.2 Public-private co-publications (per million population)	Scopus[1]	--	2020
INTELLECTUAL ASSETS			
3.3.1 PCT patent applications (per billion GDP)	Patents: OECD GDP: World Bank	--	2017
3.3.2 Trademark applications (per billion GDP)	World Bank – WDI[2]	--	2019
3.3.3 Design applications (per billion GDP)	World Bank – WDI[2]	--	2019
IMPACTS			
EMPLOYMENT IMPACTS			
No indicator included in international comparison			
SALES EFFECTS			
4.2.1 Medium and high-tech product exports (share of total product exports)	UN Comtrade	--	2019
4.2.2 Knowledge-intensive services exports (share of total service exports)	UN Comtrade, OECD, JRC	SA	2019
ENVIRONMENTAL SUSTAINABILITY			
4.3.2 Exposure to air pollution (PM2.5)	OECD	--	2019
4.3.3 Development of environment-related technologies, % all technologies	OECD	--	2016

[1] *Data provided by Science-Metrix as part of a contract to the European Commission (DG Research and Innovation);*

[2] *World Development Indicators*

For each of the global competitors, the following pages briefly discuss the performance of their innovation system compared to the EU, and relative strengths and weaknesses for the different indicators. The countries are ordered according to their performance rank order (cf. **Figure 14**). For each country, a table with contextual data is also included, similar to those used for the European and neighbouring countries in Chapter 6.

However, for most indicators measuring Performance and structure of the economy and Demography data have been retrieved from other data sources (cf. **Table 5**). For the international comparison, the number of Unicorns is included in the Business and Entrepreneurship category. Unicorns are start-ups with a value of more than US$1 billion.

The contextual indicators on the following pages show the following differences with the EU: Employment shares across the three broad industries reported, i.e. Agriculture, Industry and Services are quite similar between the EU and South Korea. However, the share of value added of the manufacturing sector is almost twice that of the EU. The EU has a higher share of FDI net inflows as a percentage of GDP than South Korea but top R&D spending firms in South Korea spend more on R&D. Canada's economy shows a lower employment share for industry, and a higher employment share for services. Entrepreneurial activities are also at a much higher level. The relative size of Australia's manufacturing industry is just about one-third that of the EU, however Australian entrepreneurial activities are at a higher level. For the United States, entrepreneurial activities are at a much higher level, and top R&D spending firms spend 60% more on R&D. The number of Unicorns is almost eight times that of the EU. Japan's top R&D spending firms spend more on R&D as compared to EU top R&D spending firms. FDI net inflows as a percentage of GDP are however much lower. China's agricultural sector accounts for almost 26% of total employment, while also the relative size (value added) of the manufacturing industry is almost twice that of the EU. Entrepreneurial activities in China are at a higher level, and the number of Unicorns is more than three times that of the EU. Brazil has a relatively high share of employment in agriculture. Furthermore, entrepreneurial activities and FDI net inflows as a percentage of GDP are at a higher level in Brazil, however top R&D spending firms spend less on R&D and the EU has almost more than four times the number of Unicorns. The structure of Russia's economy is comparable to that of the EU. Top R&D spending firms in Russia spend less on R&D compared to those in the EU. The structure of South Africa's economy as measured by employment shares is comparable to that of the EU. FDI net inflows as a percentage of GDP and R&D spending from Top R&D enterprises are relatively low but entrepreneurial activity is higher in South Africa. India's agricultural sector accounts for almost 45% of total employment, and entrepreneurial activities are at a higher level. The EU however has more Top R&D enterprises per million population and they spend almost 65% more on R&D than the average Top R&D performing enterprise in India.

Table 5: Contextual indicators in the international comparison

	Period	Source
PERFORMANCE AND STRUCTURE OF THE ECONOMY		
GDP per capita, PPP (international dollars)	Average 2017-2019	World Bank – WDI[1]
Average annual GDP growth (%)	2017-2019	World Bank – WDI[1]
Employment share in Agriculture (%)	Average 2017-2019	World Bank – WDI[1]
Employment share in Industry (%)	Average 2017-2019	World Bank – WDI[1]
Employment share in Services (%)	Average 2017-2019	World Bank – WDI[1]
Manufacturing – share in total value added[2]	Average 2018-2020	UNIDO
BUSINESS AND ENTREPRENEURSHIP		
Total early-stage Entrepreneurial Activity (TEA) (%)	Average 2017-2019	Global Entrepreneurship Monitor
FDI net inflows (% GDP)	Average 2017-2019	World Development Indicators[1]
Top R&D spending enterprises per 10 million population	Average 2018-2020	EU Industrial R&D Investment Scoreboard
Top R&D spending enterprises, average R&D spending, million Euros	Average 2018-2020	EU Industrial R&D Investment Scoreboard
Number of Unicorns	All active enterprises May 2021	CB Insights[3]
Buyer sophistication (1 to 7 best)	Average 2017-2019	World Economic Forum
GOVERNANCE AND POLICY FRAMEWORK		
Ease of starting a business (0 to 100 best)	Average 2017-2019	Doing Business
Basic-school entrepreneurial education and training (1 to 5 best)	Average 2017-2019	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 2016-2018	Worldwide Governance Indicators
DEMOGRAPHY		
Population size (millions)	Average 2017-2019	World Bank – WDI[1]
Average annual population growth (%)	2017-2019	World Bank – WDI[1]
Population density (inhabitants / km^2)	Average 2017-2019	World Bank – WDI[1]

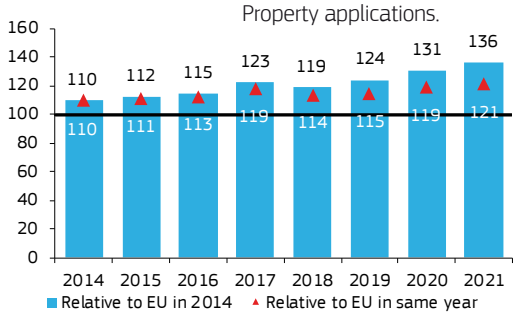
[1] *World Development Indicators*

[2] *Value added data are used as employment data are not available.*

[3] *https://www.cbinsights.com/research-unicorn-companies*



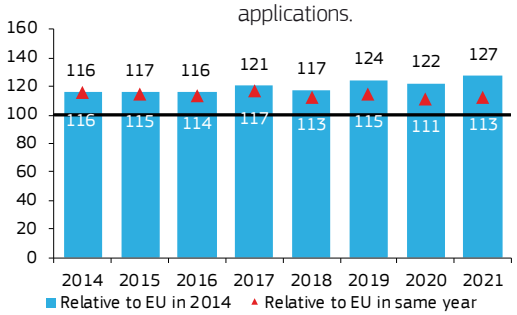
The performance of **South Korea** is well above that of the EU, and the country is a Strong Innovator. Performance has increased since 2014, in particular in 2020. South Korea's relative strengths are in Intellectual Property applications.



Columns show performance relative to EU27 in 2014. The red triangle shows performance relative to EU27 in the same year.



The performance of **Canada** is well above that of the EU, and the country is a Strong Innovator. Performance has increased since 2014. Canada's relative strengths are in International co-publications and Trademark applications.



Columns show performance relative to EU27 in 2014. The red triangle shows performance relative to EU27 in the same year.

Performance in 2014 and 2021 relative to the EU in 2014

South Korea	2014	2021	2014-2021
Doctorate graduates	68.0	110.0	42.0
Tertiary education	186.9	177.2	-9.7
International co-publications	86.0	83.6	-2.4
Most cited publications	79.8	79.4	-0.4
R&D expenditure public sector	112.0	121.2	9.3
Government funding business R&D	242.3	177.7	-64.6
R&D expenditure business sector	244.2	268.3	24.2
Employment in ICT	98.4	99.6	1.2
Product/process innovators	51.6	76.6	25.1
Marketing/organisational innovators	49.5	106.8	57.3
Innovation co-operation	57.5	51.3	-6.3
Public-private co-publications	106.8	106.6	-0.2
PCT patent applications	201.8	308.6	106.8
Trademark applications	257.8	271.8	13.9
Design applications	491.6	467.6	-23.9
Medium & high-tech product exports	129.4	126.5	-2.9
Knowledge-intensive services exports	90.2	87.2	-3.1
Air pollution by fine particulate matter	60.3	49.1	-11.2
Environment-related technologies	83.8	98.7	14.9

Best three and worst three indicators highlighted.

Performance in 2014 and 2021 relative to the EU in 2014

Canada	2014	2021	2014-2021
Doctorate graduates	78.9	100.9	22.0
Tertiary education	162.6	159.8	-2.7
International co-publications	276.0	260.1	-15.9
Most cited publications	129.2	114.9	-14.3
R&D expenditure public sector	119.0	106.1	-12.9
Government funding business R&D	149.3	103.1	-46.1
R&D expenditure business sector	74.3	56.9	-17.5
Employment in ICT	n/a	n/a	n/a
Product/process innovators	169.4	194.6	25.2
Marketing/organisational innovators	154.9	200.0	45.1
Innovation co-operation	n/a	n/a	n/a
Public-private co-publications	180.2	184.7	4.5
PCT patent applications	71.4	69.7	-1.7
Trademark applications	229.5	215.0	-14.6
Design applications	46.2	59.0	12.8
Medium & high-tech product exports	65.5	67.3	1.8
Knowledge-intensive services exports	106.1	97.2	-8.9
Air pollution by fine particulate matter	204.6	190.1	-14.6
Environment-related technologies	88.8	91.0	2.2

Best three and worst three indicators highlighted.

Structural differences

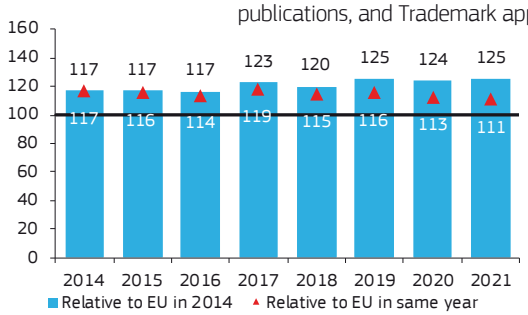
	KR	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	42,900	45,600
Change in GDP, %	2.7	2.2
Employment share in Agriculture	5.0	4.5
Employment share in Industry	25.0	25.0
Employment share in Services	70.0	70.4
Manufacturing - share in total value added	26.5	15.0
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	7.4	6.7
FDI net inflows (% GDP)	0.99	2.02
Top R&D spending firms per million population	12.8	16.2
- average R&D spending, million Euros	401.9	246.0
Number of Unicorns	10	45
Buyer sophistication 1-7 (best)	5.26	3.73
Governance and policy framework		
Ease of starting a business	84.0	76.5
Basic-school entrepreneurial education and training	2.30	1.99
Government procurement of advanced technology products	3.88	3.50
Rule of law (-2.5 to 2.5 best)	1.20	1.05
Demography		
Population size, million	51.6	446.8
Change in population, %	0.3	0.2
Share of population aged 15-64	72.6	64.7
Population density (population / km²)	528.0	111.7

Structural differences

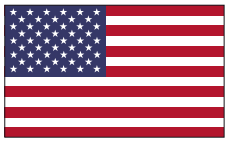
	CA	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	50,400	45,600
Change in GDP, %	0.9	2.2
Employment share in Agriculture	1.5	4.5
Employment share in Industry	19.5	25.0
Employment share in Services	79.0	70.4
Manufacturing - share in total value added	9.2	15.0
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	18.5	6.7
FDI net inflows (% GDP)	1.94	2.02
Top R&D spending firms per million population	7.8	16.2
- average R&D spending, million Euros	159.8	246.0
Number of Unicorns	7	45
Buyer sophistication 1-7 (best)	4.45	3.73
Governance and policy framework		
Ease of starting a business	79.5	76.5
Basic-school entrepreneurial education and training	2.59	1.99
Government procurement of advanced technology products	3.45	3.50
Rule of law (-2.5 to 2.5 best)	1.78	1.05
Demography		
Population size, million	37.1	446.8
Change in population, %	1.2	0.2
Share of population aged 15-64	66.9	64.7
Population density (population / km²)	4.1	111.7



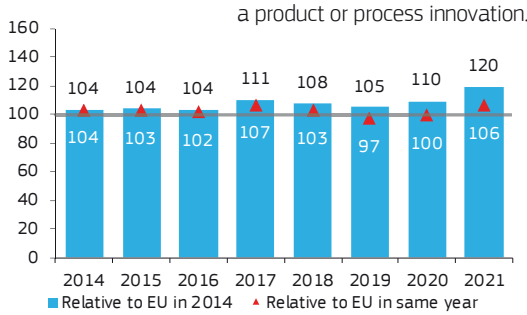
The performance of **Australia** is above that of the EU, and the country is a Strong Innovator. Performance has increased since 2014. Australia's strengths are in International and Public-private co-publications, and Trademark applications.



Columns show performance relative to EU27 in 2014. The red triangle shows performance relative to EU27 in the same year.



The performance of the **United States** is above that of the EU, and the country is a Strong Innovator. Performance has increased in particular in 2021 due to a very strong increase in the share of SMEs that introduced a product or process innovation.



Columns show performance relative to EU27 in 2014. The red triangle shows performance relative to EU27 in the same year.

Performance in 2014 and 2021 relative to the EU in 2014

Australia	2014	2021	2014-2021
Doctorate graduates	94.9	135.4	40.5
Tertiary education	134.6	133.2	-1.4
International co-publications	354.2	391.3	37.2
Most cited publications	136.6	135.1	-1.5
R&D expenditure public sector	121.5	113.4	-8.1
Government funding business R&D	105.4	94.6	-10.8
R&D expenditure business sector	99.4	67.9	-31.5
Employment in ICT	119.9	113.8	-6.1
Product/process innovators	159.7	154.2	-5.5
Marketing/organisational innovators	125.3	117.8	-7.5
Innovation co-operation	75.2	119.6	44.4
Public-private co-publications	174.8	208.1	33.2
PCT patent applications	61.6	61.1	-0.4
Trademark applications	272.5	220.0	-52.5
Design applications	83.0	98.0	15.0
Medium & high-tech product exports	17.4	16.7	-0.7
Knowledge-intensive services exports	39.9	36.8	-3.1
Air pollution by fine particulate matter	222.4	199.7	-22.8
Environment-related technologies	99.1	84.7	-14.4

Best three and worst three indicators highlighted.

Performance in 2014 and 2021 relative to the EU in 2014

United States	2014	2021	2014-2021
Doctorate graduates	67.2	82.7	15.5
Tertiary education	125.5	127.9	2.4
International co-publications	129.1	115.8	-13.3
Most cited publications	149.7	135.1	-14.6
R&D expenditure public sector	98.8	93.7	-5.0
Government funding business R&D	185.9	119.0	-66.9
R&D expenditure business sector	151.8	155.7	3.9
Employment in ICT	121.7	119.2	-2.4
Product/process innovators	67.5	150.3	82.8
Marketing/organisational innovators	n/a	n/a	n/a
Innovation co-operation	n/a	n/a	n/a
Public-private co-publications	148.4	126.1	-22.3
PCT patent applications	100.3	114.7	14.4
Trademark applications	62.8	66.3	3.6
Design applications	25.6	34.6	9.0
Medium & high-tech product exports	94.4	94.1	-0.4
Knowledge-intensive services exports	109.3	105.3	-4.0
Air pollution by fine particulate matter	175.3	175.6	0.2
Environment-related technologies	91.4	87.2	-4.2

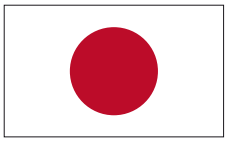
Best three and worst three indicators highlighted.

Structural differences

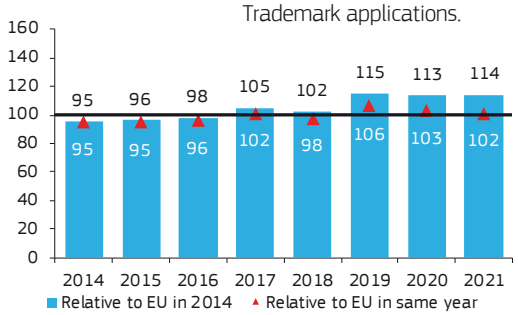
	AU	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	51,100	45,600
Change in GDP, %	0.9	2.2
Employment share in Agriculture	2.6	4.5
Employment share in Industry	19.5	25.0
Employment share in Services	77.9	70.4
Manufacturing - share in total value added	5.6	15.0
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	11.4	6.7
FDI net inflows (% GDP)	3.81	2.02
Top R&D spending firms per million population	5.0	16.2
- average R&D spending, million Euros	229.7	246.0
Number of Unicorns	4	45
Buyer sophistication 1-7 (best)	3.97	3.73
Governance and policy framework		
Ease of starting a business	80.9	76.5
Basic-school entrepreneurial education and training	2.43	1.99
Government procurement of advanced technology products	3.34	3.50
Rule of law (-2.5 to 2.5 best)	1.71	1.05
Demography		
Population size, million	25.0	446.8
Change in population, %	1.6	0.2
Share of population aged 15-64	65.2	64.7
Population density (population / km²)	3.2	111.7

Structural differences

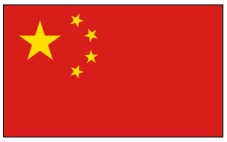
	US	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	62,800	45,600
Change in GDP, %	1.3	2.2
Employment share in Agriculture	1.4	4.5
Employment share in Industry	19.8	25.0
Employment share in Services	78.8	70.4
Manufacturing - share in total value added	11.2	15.0
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	15.6	6.7
FDI net inflows (% GDP)	1.66	2.02
Top R&D spending firms per million population	23.8	16.2
- average R&D spending, million Euros	396.8	246.0
Number of Unicorns	348	45
Buyer sophistication 1-7 (best)	5.02	3.73
Governance and policy framework		
Ease of starting a business	83.7	76.5
Basic-school entrepreneurial education and training	2.56	1.99
Government procurement of advanced technology products	4.52	3.50
Rule of law (-2.5 to 2.5 best)	1.52	1.05
Demography		
Population size, million	326.6	446.8
Change in population, %	0.7	0.2
Share of population aged 15-64	65.5	64.7
Population density (population / km²)	35.6	111.7



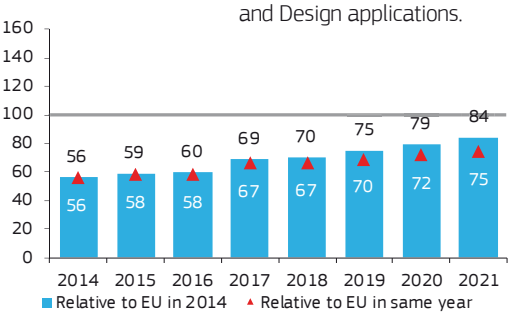
The performance of **Japan** is above that of the EU, and the country is a Strong Innovator. Performance has increased since 2014. Japan's relative strengths are in Business R&D expenditures and Patent and Trademark applications.



Columns show performance relative to EU27 in 2014. The red triangle shows performance relative to EU27 in the same year.



The performance of **China** is below that of the EU, and the country is a Moderate Innovator. Performance has increased strongly since 2014. Relative strengths are in Business R&D expenditures, Trademark and Design applications.



Columns show performance relative to EU27 in 2014. The red triangle shows performance relative to EU27 in the same year.

Performance in 2014 and 2021 relative to the EU in 2014

Japan	2014	2021	2014-2021
Doctorate graduates	24.4	51.7	27.2
Tertiary education	166.8	156.1	-10.7
International co-publications	56.2	51.2	-5.0
Most cited publications	61.8	58.6	-3.3
R&D expenditure public sector	98.8	90.4	-8.4
Government funding business R&D	67.3	82.3	15.0
R&D expenditure business sector	200.0	184.7	-15.3
Employment in ICT	104.2	106.9	2.7
Product/process innovators	78.0	117.4	39.4
Marketing/organisational innovators	93.4	49.5	-43.9
Innovation co-operation	29.6	119.7	90.1
Public-private co-publications	99.0	84.8	-14.2
PCT patent applications	275.5	362.5	87.0
Trademark applications	98.3	216.0	117.7
Design applications	86.3	89.6	3.3
Medium & high-tech product exports	139.7	128.9	-10.8
Knowledge-intensive services exports	122.5	103.0	-19.6
Air pollution by fine particulate matter	116.9	98.7	-18.2
Environment-related technologies	79.8	75.8	-4.0

Best three and worst three indicators highlighted.

Performance in 2014 and 2021 relative to the EU in 2014

China	2014	2021	2014-2021
Doctorate graduates	n/a	n/a	n/a
Tertiary education	32.1	35.6	3.5
International co-publications	12.9	19.2	6.3
Most cited publications	72.8	111.9	39.2
R&D expenditure public sector	63.9	75.4	11.5
Government funding business R&D	78.3	74.5	-3.8
R&D expenditure business sector	118.5	123.0	4.5
Employment in ICT	n/a	n/a	n/a
Product/process innovators	n/a	n/a	n/a
Marketing/organisational innovators	n/a	n/a	n/a
Innovation co-operation	n/a	n/a	n/a
Public-private co-publications	17.1	33.2	16.1
PCT patent applications	36.1	102.5	66.4
Trademark applications	259.4	703.9	444.4
Design applications	549.9	450.6	-99.3
Medium & high-tech product exports	102.7	101.8	-0.9
Knowledge-intensive services exports	100.2	98.0	-2.1
Air pollution by fine particulate matter	26.4	28.2	1.8
Environment-related technologies	65.4	60.8	-4.6

Best three and worst three indicators highlighted.

Structural differences

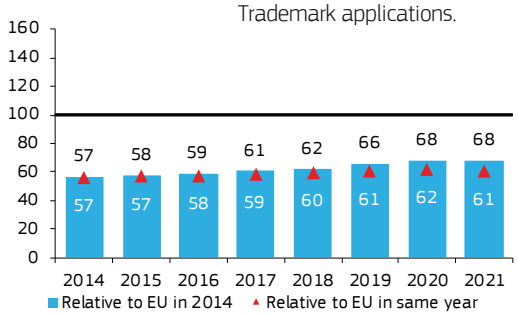
	JP	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	42,500	45,600
Change in GDP, %	1.5	2.2
Employment share in Agriculture	3.4	4.5
Employment share in Industry	24.4	25.0
Employment share in Services	72.1	70.4
Manufacturing - share in total value added	20.9	15.0
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	5.1	6.7
FDI net inflows (% GDP)	0.44	2.02
Top R&D spending firms per million population	25.4	16.2
- average R&D spending, million Euros	335.6	246.0
Number of Unicorns	5	45
Buyer sophistication 1-7 (best)	4.91	3.73
Governance and policy framework		
Ease of starting a business	78.0	76.5
Basic-school entrepreneurial education and training	1.75	1.99
Government procurement of advanced technology products	4.06	3.50
Rule of law (-2.5 to 2.5 best)	1.55	1.05
Demography		
Population size, million	126.5	446.8
Change in population, %	-0.1	0.2
Share of population aged 15-64	59.7	64.7
Population density (population / km²)	347.5	111.7

Structural differences

	CN	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	15,600	45,600
Change in GDP, %	6.3	2.2
Employment share in Agriculture	26.1	4.5
Employment share in Industry	28.0	25.0
Employment share in Services	45.9	70.4
Manufacturing - share in total value added	28.3	15.0
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	9.6	6.7
FDI net inflows (% GDP)	1.47	2.02
Top R&D spending firms per million population	3.6	16.2
- average R&D spending, million Euros	193.4	246.0
Number of Unicorns	138	45
Buyer sophistication 1-7 (best)	4.43	3.73
Governance and policy framework		
Ease of starting a business	72.4	76.5
Basic-school entrepreneurial education and training	2.31	1.99
Government procurement of advanced technology products	4.38	3.50
Rule of law (-2.5 to 2.5 best)	-0.25	1.05
Demography		
Population size, million	1392.3	446.8
Change in population, %	0.6	0.2
Share of population aged 15-64	71.2	64.7
Population density (population / km²)	147.4	111.7



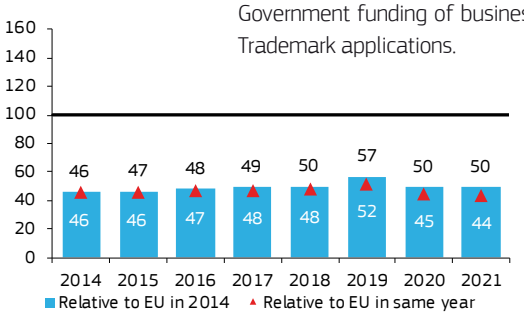
The performance of **Brazil** is below that of the EU, and the country is an Emerging Innovator. Performance has increased since 2014. Brazil's relative strengths are in Marketing and organisational innovation and Trademark applications.



Columns show performance relative to EU27 in 2014. The red triangle shows performance relative to EU27 in the same year.



The performance of **Russia** is well below that of the EU, and the country is an Emerging Innovator. Performance has increased since 2014. Russia's relative strengths are in Tertiary education, Government funding of business R&D and Trademark applications.



Columns show performance relative to EU27 in 2014. The red triangle shows performance relative to EU27 in the same year.

Performance in 2014 and 2021 relative to the EU in 2014

Brazil	2014	2021	2014-2021
Doctorate graduates	19.0	25.8	6.8
Tertiary education	41.3	54.1	12.8
International co-publications	17.9	22.3	4.5
Most cited publications	49.5	56.1	6.5
R&D expenditure public sector	n/a	n/a	n/a
Government funding business R&D	32.3	26.9	-5.4
R&D expenditure business sector	n/a	n/a	n/a
Employment in ICT	47.4	44.7	-2.7
Product/process innovators	103.4	103.8	0.5
Marketing/organisational innovators	164.3	187.9	23.6
Innovation co-operation	57.9	52.3	-5.6
Public-private co-publications	10.5	11.8	1.3
PCT patent applications	8.2	10.8	2.5
Trademark applications	40.0	57.6	17.6
Design applications	9.2	10.4	1.3
Medium & high-tech product exports	40.0	45.9	5.9
Knowledge-intensive services exports	109.7	116.1	6.4
Air pollution by fine particulate matter	113.1	115.5	2.4
Environment-related technologies	96.2	103.2	7.0

Best three and worst three indicators highlighted.

Performance in 2014 and 2021 relative to the EU in 2014

Russia	2014	2021	2014-2021
Doctorate graduates	57.6	36.8	-20.9
Tertiary education	152.5	157.6	5.1
International co-publications	21.5	28.1	6.5
Most cited publications	14.9	25.8	11.0
R&D expenditure public sector	59.7	57.4	-2.3
Government funding business R&D	312.9	243.9	-68.9
R&D expenditure business sector	48.8	45.0	-3.7
Employment in ICT	63.8	56.5	-7.3
Product/process innovators	12.8	12.0	-0.8
Marketing/organisational innovators	2.5	2.9	0.4
Innovation co-operation	8.5	17.0	8.5
Public-private co-publications	12.8	23.9	11.2
PCT patent applications	10.3	12.4	2.0
Trademark applications	153.4	150.4	-3.0
Design applications	28.6	37.7	9.1
Medium & high-tech product exports	19.0	21.9	2.9
Knowledge-intensive services exports	95.6	95.2	-0.4
Air pollution by fine particulate matter	112.2	114.4	2.2
Environment-related technologies	84.4	67.6	-16.8

Best three and worst three indicators highlighted.

Structural differences

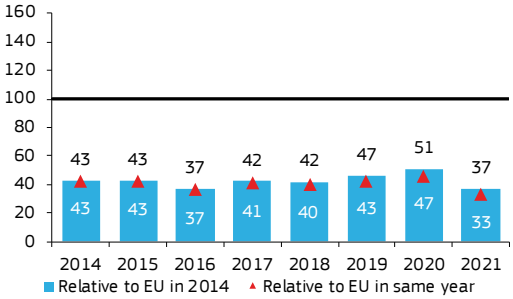
	BR	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	14,900	45,600
Change in GDP, %	-1.8	2.2
Employment share in Agriculture	9.3	4.5
Employment share in Industry	20.2	25.0
Employment share in Services	70.5	70.4
Manufacturing - share in total value added	10.2	15.0
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	20.5	6.7
FDI net inflows (% GDP)	3.61	2.02
Top R&D spending firms per million population	0.3	16.2
- average R&D spending, million Euros	155.2	246.0
Number of Unicorns	12	45
Buyer sophistication 1-7 (best)	3.51	3.73
Governance and policy framework		
Ease of starting a business	57.8	76.5
Basic-school entrepreneurial education and training	1.75	1.99
Government procurement of advanced technology products	2.96	3.50
Rule of law (-2.5 to 2.5 best)	-0.25	1.05
Demography		
Population size, million	209.5	446.8
Change in population, %	0.8	0.2
Share of population aged 15-64	69.7	64.7
Population density (population / km²)	25.0	111.7

Structural differences

	RU	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	28,000	45,600
Change in GDP, %	0.9	2.2
Employment share in Agriculture	5.9	4.5
Employment share in Industry	26.9	25.0
Employment share in Services	67.3	70.4
Manufacturing - share in total value added	12.5	15.0
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	14.2	6.7
FDI net inflows (% GDP)	1.38	2.02
Top R&D spending firms per million population	0.1	16.2
- average R&D spending, million Euros	44.9	246.0
Number of Unicorns	0	45
Buyer sophistication 1-7 (best)	3.56	3.73
Governance and policy framework		
Ease of starting a business	77.4	76.5
Basic-school entrepreneurial education and training	1.95	1.99
Government procurement of advanced technology products	3.33	3.50
Rule of law (-2.5 to 2.5 best)	-0.78	1.05
Demography		
Population size, million	144.4	446.8
Change in population, %	0.1	0.2
Share of population aged 15-64	67.4	64.7
Population density (population / km²)	8.8	111.7



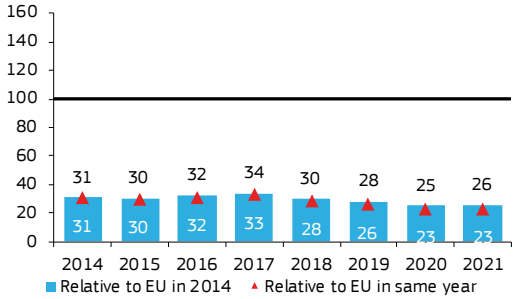
The performance of **South Africa** is well below that of the EU, and the country is an Emerging Innovator. Performance has decreased since 2014. Relative strengths are in Trademark applications.



Columns show performance relative to EU27 in 2014. The red triangle shows performance relative to EU27 in the same year.



The performance of **India** is well below that of the EU, and the country is an Emerging Innovator. Performance has decreased only weakly since 2014. Relative strengths are in Exports.



Columns show performance relative to EU27 in 2014. The red triangle shows performance relative to EU27 in the same year.

Performance in 2014 and 2021 relative to the EU in 2014

South Africa	2014	2021	2014-2021
Doctorate graduates	n/a	n/a	n/a
Tertiary education	11.3	14.1	2.8
International co-publications	30.3	39.3	9.0
Most cited publications	70.3	72.2	1.9
R&D expenditure public sector	55.1	66.5	11.5
Government funding business R&D	11.7	8.2	-3.4
R&D expenditure business sector	26.4	24.5	-1.9
Employment in ICT	n/a	n/a	n/a
Product/process innovators	n/a	n/a	n/a
Marketing/organisational innovators	n/a	n/a	n/a
Innovation co-operation	n/a	n/a	n/a
Public-private co-publications	12.5	16.0	3.5
PCT patent applications	18.7	15.2	-3.5
Trademark applications	129.4	103.5	-25.9
Design applications	46.9	36.8	-10.1
Medium & high-tech product exports	60.7	64.5	3.9
Knowledge-intensive services exports	n/a	n/a	n/a
Air pollution by fine particulate matter	53.6	47.6	-6.0
Environment-related technologies	99.8	73.9	-25.9

Best three and worst three indicators highlighted.

Performance in 2014 and 2021 relative to the EU in 2014

India	2014	2021	2014-2021
Doctorate graduates	3.8	5.2	1.4
Tertiary education	39.6	35.3	-4.3
International co-publications	3.1	4.3	1.2
Most cited publications	60.1	61.1	1.0
R&D expenditure public sector	66.0	59.0	-7.0
Government funding business R&D	n/a	n/a	n/a
R&D expenditure business sector	22.2	17.3	-4.9
Employment in ICT	n/a	n/a	n/a
Product/process innovators	n/a	n/a	n/a
Marketing/organisational innovators	n/a	n/a	n/a
Innovation co-operation	n/a	n/a	n/a
Public-private co-publications	2.5	3.0	0.5
PCT patent applications	13.4	12.5	-1.0
Trademark applications	24.5	28.6	4.1
Design applications	5.8	7.5	1.7
Medium & high-tech product exports	49.3	62.4	13.1
Knowledge-intensive services exports	123.7	111.5	-12.2
Air pollution by fine particulate matter	17.9	16.2	-1.7
Environment-related technologies	85.5	81.9	-3.6

Best three and worst three indicators highlighted.

Structural differences

	SA	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	12,900	45,600
Change in GDP, %	-0.5	2.2
Employment share in Agriculture	5.2	4.5
Employment share in Industry	22.9	25.0
Employment share in Services	71.8	70.4
Manufacturing - share in total value added	15.6	15.0
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	10.9	6.7
FDI net inflows (% GDP)	0.90	2.02
Top R&D spending firms per million population	0.3	16.2
- average R&D spending, million Euros	54.0	246.0
Number of Unicorns	2	45
Buyer sophistication 1-7 (best)	3.96	3.73
Governance and policy framework		
Ease of starting a business	66.3	76.5
Basic-school entrepreneurial education and training	1.70	1.99
Government procurement of advanced technology products	3.02	3.50
Rule of law (-2.5 to 2.5 best)	-0.07	1.05
Demography		
Population size, million	57.8	446.8
Change in population, %	1.4	0.2
Share of population aged 15-64	65.6	64.7
Population density (population / km²)	47.3	111.7

Structural differences

	IN	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	6,600	45,600
Change in GDP, %	6.5	2.2
Employment share in Agriculture	43.3	4.5
Employment share in Industry	25.0	25.0
Employment share in Services	31.7	70.4
Manufacturing - share in total value added	11.7	15.0
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	11.9	6.7
FDI net inflows (% GDP)	1.52	2.02
Top R&D spending firms per million population	0.2	16.2
- average R&D spending, million Euros	157.0	246.0
Number of Unicorns	32	45
Buyer sophistication 1-7 (best)	4.36	3.73
Governance and policy framework		
Ease of starting a business	66.5	76.5
Basic-school entrepreneurial education and training	2.94	1.99
Government procurement of advanced technology products	4.14	3.50
Rule of law (-2.5 to 2.5 best)	0.00	1.05
Demography		
Population size, million	1352.6	446.8
Change in population, %	1.1	0.2
Share of population aged 15-64	66.8	64.7
Population density (population / km²)	452.6	111.7

5. Country profiles

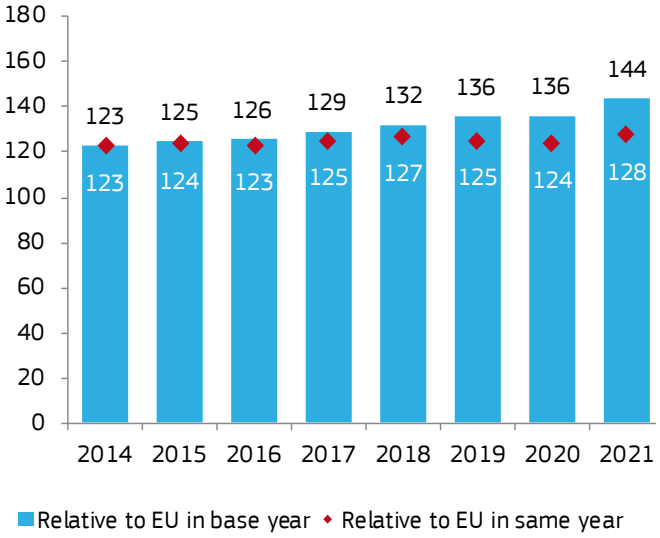
This section provides individual profiles for the EU Member States and 11 other European and neighbouring countries (Bosnia and Herzegovina, Iceland, Israel, Montenegro, North Macedonia, Norway Serbia, Switzerland, Turkey, Ukraine, and United Kingdom). Each profile includes the following information:

- A graph showing the development of the country's innovation index over time between 2014 and 2021 as compared to the EU performance score in 2014 (blue bars) and relative performance to the EU in the same year (red dot). For all indicators underlying the innovation index, "2021" refers to the most recent data available; "2014" refers to data seven years older than the most recent available results.
- A table providing a comparison of the respective country's innovation performance in 2014 and 2021 by indicator and dimension relative to that of the EU in 2014 and 2021 ((**Annex D**) shows the difference between both relative scores for all countries and all indicators). Different colour codes highlight strengths and weaknesses in 2021[17] .
- A table providing data for the contextual indicators, which are used as proxies for structural differences between countries. The EIS 2021 Methodology Report provides detailed definitions for these indicators.

[17] For dimensions where data are missing for at least one indicator, relative scores for the dimension have been calculated compared to the EU dimension score using all indicators. This can result in relative dimension scores which do not match the relative performance scores for the indicators belonging to that dimension, as the dimension score for the country has been calculated using data for less indicators than the dimension score for the EU.



Belgium is an **Innovation Leader**.
Over time, performance relative to the EU has increased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	BE	EU
Performance and structure of the economy		
GDP per capita (PPS)	36,400	30,800
Average annual GDP growth (%)	-2.8	-2.5
Employment share Manufacturing (NACE C) (%)	12.5	16.5
of which High and Medium high-tech (%)	36.9	37.9
Employment share Services (NACE G-N) (%)	40.8	41.2
of which Knowledge-intensive services (%)	37.1	35.1
Turnover share SMEs (%)	39.6	36.5
Turnover share large enterprises (%)	36.6	45.7
Foreign-controlled enterprises – share of value added (%)	12.6	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.6	1.0
Total Entrepreneurial Activity (TEA) (%)	6.2	6.7
FDI net inflows (% GDP)	-7.5	2.0
Top R&D spending enterprises per 10 million population	28.8	16.2
Buyer sophistication (1 to 7 best)	4.4	3.7
Innovation profiles		
In-house product innovators with market novelties	n/a	10.7
In-house product innovators without market novelties	n/a	12.3
In-house business process innovators	n/a	11.0
Innovators that do not develop innovations themselves	n/a	11.6
Innovation active non-innovators	n/a	3.3
Non-innovators with potential to innovate	n/a	19.9
Non-innovators without disposition to innovate	n/a	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	74.0	76.5
Basic school entrepreneurial education and training	2.0	2.0
Govt. procurement of advanced tech. products	3.5	3.5
Rule of law (-2.5 to 2.5 best)	1.4	1.1
Climate change indicators		
Circular material use rate	22.1	11.7
Greenhouse gas emissions intensity of energy consumption	84.7	86.6
Eco-Innovation Index	85.0	100.0
Demography		
Population size	11.5	446.7
Average annual population growth (%)	0.5	0.1
Population density	375.4	108.8

Belgium's strengths are in *Attractive research systems*, *Use of information technologies*, and *Linkages*. The top-3 indicators include Foreign doctorate students, Innovative SMEs collaborating with others, and Enterprises providing ICT training.

The recent increase in innovation performance between 2020 and 2021 is due to strong performance increases in several indicators using innovation survey data, but also in Digital skills, Venture capital, and Resource productivity.

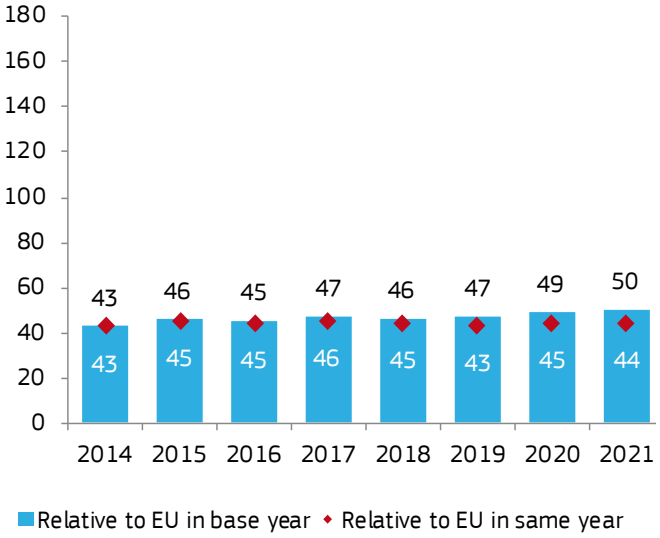
Belgium is showing above average scores on the Climate change related indicators.

Belgium	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**127.5**	**122.8**	**143.5**
Human resources	**115.7**	**114.5**	**122.6**
Doctorate graduates	113.0	88.5	100.0
Population with tertiary education	150.6	181.0	194.2
Lifelong learning	73.7	84.4	81.1
Attractive research systems	**153.4**	**156.6**	**172.7**
International scientific co-publications	134.8	147.6	176.8
Most cited publications	128.4	133.2	126.2
Foreign doctorate students	223.0	217.1	264.8
Digitalisation	**115.1**	**126.7**	**159.2**
Broadband penetration	116.1	130.4	176.1
People with above basic overall digital skills	113.6	122.2	138.9
Finance and support	**126.9**	**113.1**	**151.2**
R&D expenditures in the public sector	120.0	87.7	115.8
Venture capital expenditures	115.4	109.2	194.0
Government support for business R&D	146.6	150.5	169.6
Firm investments	**120.2**	**114.7**	**145.3**
R&D expenditure in the business sector	141.1	121.3	156.7
Non-R&D Innovation expenditures	94.1	82.7	106.9
Innovation expenditures per employee	141.3	133.8	186.5
Use of information technologies	**161.2**	**184.0**	**186.2**
Enterprises providing ICT training	186.7	186.7	186.7
Employed ICT specialists	139.3	181.0	185.7
Innovators	**129.8**	**142.0**	**177.5**
Product innovators (SMEs)	99.4	154.2	140.2
Business process innovators (SMEs)	158.1	131.3	210.4
Linkages	**157.5**	**194.1**	**212.4**
Innovative SMEs collaborating with others	226.6	304.4	332.1
Public-private co-publications	184.7	180.5	207.2
Job-to-job mobility of HRST	91.1	125.6	130.8
Intellectual assets	**94.6**	**90.6**	**82.0**
PCT patent applications	102.1	110.7	88.6
Trademark applications	101.0	93.7	106.0
Design applications	76.6	69.8	52.5
Employment impacts	**142.8**	**123.8**	**145.5**
Employment in knowledge-intensive activities	125.6	132.0	137.3
Employment in innovative enterprises	156.7	118.0	151.3
Sales impacts	**106.3**	**89.0**	**108.3**
Medium and high tech goods exports	84.0	78.9	92.0
Knowledge-intensive services exports	108.7	103.3	115.1
Sales of innovative products	139.9	85.4	121.6
Environmental sustainability	**118.5**	**98.0**	**123.4**
Resource productivity	178.8	130.9	264.9
Air emissions by fine particulate matter	102.7	100.5	109.3
Environment-related technologies	76.4	75.3	57.4

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Bulgaria is an **Emerging Innovator**. Over time, performance relative to the EU has increased slowly.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	BG	EU
Performance and structure of the economy		
GDP per capita (PPS)	15,900	30,800
Average annual GDP growth (%)	0.4	-2.5
Employment share Manufacturing (NACE C) (%)	18.8	16.5
of which High and Medium high-tech (%)	22.2	37.9
Employment share Services (NACE G-N) (%)	41.8	41.2
of which Knowledge-intensive services (%)	28.3	35.1
Turnover share SMEs (%)	46.8	36.5
Turnover share large enterprises (%)	31.0	45.7
Foreign-controlled enterprises – share of value added (%)	17.2	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	2.0	1.0
Total Entrepreneurial Activity (TEA) (%)	4.9	6.7
FDI net inflows (% GDP)	3.2	2.0
Top R&D spending enterprises per 10 million population	0.0	16.2
Buyer sophistication (1 to 7 best)	3.4	3.7
Innovation profiles		
In-house product innovators with market novelties	7.8	10.7
In-house product innovators without market novelties	6.4	12.3
In-house business process innovators	5.0	11.0
Innovators that do not develop innovations themselves	7.6	11.6
Innovation active non-innovators	3.3	3.3
Non-innovators with potential to innovate	15.8	19.9
Non-innovators without disposition to innovate	54.1	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	71.8	76.5
Basic school entrepreneurial education and training	1.9	2.0
Govt. procurement of advanced tech. products	3.3	3.5
Rule of law (-2.5 to 2.5 best)	0.0	1.1
Climate change indicators		
Circular material use rate	2.8	11.7
Greenhouse gas emissions intensity of energy consumption	104.7	86.6
Eco-Innovation Index	34.0	100.0
Demography		
Population size	7.0	446.7
Average annual population growth (%)	-0.7	0.1
Population density	63.9	108.8

Bulgaria's strengths are in *Intellectual assets*, *Environmental sustainability* and *Employment impacts*. The top-3 indicators include Development of environment-related technologies, Design applications, and Trademark applications.

Recent performance has improved for several indicators using innovation survey data. Normalised performance of the share of product innovators increased with 134% and of the share of Business process innovators with 64%. Normalised performance on Lifelong learning and Enterprises providing ICT training declined with more than 30%.

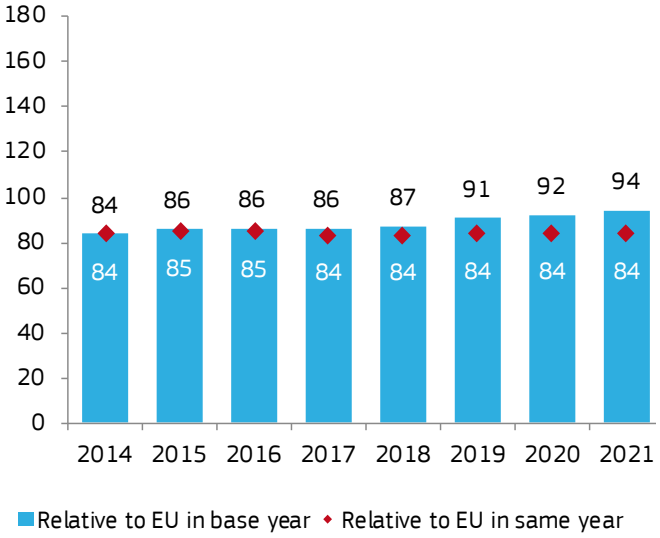
Bulgaria has an above average share of Non-innovators without disposition to innovate and is showing below average scores on the Climate change related indicators.

Bulgaria	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**44.5**	**42.9**	**50.1**
Human resources	**41.2**	**39.4**	**43.7**
Doctorate graduates	48.1	42.6	42.6
Population with tertiary education	57.1	62.0	73.6
Lifelong learning	11.1	8.9	12.2
Attractive research systems	**28.5**	**24.7**	**32.0**
International scientific co-publications	36.3	33.7	47.6
Most cited publications	16.1	15.2	15.8
Foreign doctorate students	38.9	33.1	46.3
Digitalisation	**52.1**	**59.0**	**72.0**
Broadband penetration	80.8	89.4	122.5
People with above basic overall digital skills	9.1	22.2	11.1
Finance and support	**11.9**	**23.0**	**14.1**
R&D expenditures in the public sector	16.4	8.8	15.8
Venture capital expenditures	12.7	79.6	21.4
Government support for business R&D	5.9	2.8	6.8
Firm investments	**30.0**	**33.5**	**36.2**
R&D expenditure in the business sector	36.2	25.2	40.2
Non-R&D Innovation expenditures	42.6	68.2	48.4
Innovation expenditures per employee	11.5	14.1	15.2
Use of information technologies	**44.6**	**64.4**	**51.5**
Enterprises providing ICT training	13.3	66.7	13.3
Employed ICT specialists	71.4	61.9	95.2
Innovators	**31.8**	**19.1**	**43.6**
Product innovators (SMEs)	47.4	16.1	66.9
Business process innovators (SMEs)	17.3	21.6	23.0
Linkages	**26.5**	**20.9**	**35.8**
Innovative SMEs collaborating with others	27.4	14.7	40.1
Public-private co-publications	46.2	27.2	51.8
Job-to-job mobility of HRST	14.3	20.5	20.5
Intellectual assets	**88.4**	**88.0**	**76.6**
PCT patent applications	17.1	10.3	14.8
Trademark applications	112.0	94.9	117.6
Design applications	132.5	149.7	90.8
Employment impacts	**46.7**	**28.6**	**47.6**
Employment in knowledge-intensive activities	59.8	38.7	65.3
Employment in innovative enterprises	36.3	21.4	35.0
Sales impacts	**49.8**	**27.4**	**50.8**
Medium and high tech goods exports	46.5	26.5	50.9
Knowledge-intensive services exports	54.7	31.2	57.9
Sales of innovative products	48.4	23.9	42.1
Environmental sustainability	**87.5**	**76.9**	**91.1**
Resource productivity	10.4	2.2	15.4
Air emissions by fine particulate matter	59.0	72.0	62.7
Environment-related technologies	229.3	127.4	172.3

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Czechia is a **Moderate Innovator**. Over time, performance relative to the EU has remained the same.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	CZ	EU
Performance and structure of the economy		
GDP per capita (PPS)	28,400	30,800
Average annual GDP growth (%)	n/a	-2.5
Employment share Manufacturing (NACE C) (%)	27.3	16.5
of which High and Medium high-tech (%)	41.9	37.9
Employment share Services (NACE G-N) (%)	35.8	41.2
of which Knowledge-intensive services (%)	35.8	35.1
Turnover share SMEs (%)	38.1	36.5
Turnover share large enterprises (%)	44.7	45.7
Foreign-controlled enterprises – share of value added (%)	23.1	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.5	1.0
Total Entrepreneurial Activity (TEA) (%)	7.3	6.7
FDI net inflows (% GDP)	4.6	2.0
Top R&D spending enterprises per 10 million population	1.3	16.2
Buyer sophistication (1 to 7 best)	3.0	3.7
Innovation profiles		
In-house product innovators with market novelties	13.2	10.7
In-house product innovators without market novelties	9.8	12.3
In-house business process innovators	12.6	11.0
Innovators that do not develop innovations themselves	8.6	11.6
Innovation active non-innovators	2.6	3.3
Non-innovators with potential to innovate	17.3	19.9
Non-innovators without disposition to innovate	35.9	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	76.4	76.5
Basic school entrepreneurial education and training	n/a	2.0
Govt. procurement of advanced tech. products	3.1	3.5
Rule of law (-2.5 to 2.5 best)	1.1	1.1
Climate change indicators		
Circular material use rate	8.1	11.7
Greenhouse gas emissions intensity of energy consumption	77.6	86.6
Eco-Innovation Index	96.0	100.0
Demography		
Population size	10.7	446.7
Average annual population growth (%)	0.4	0.1
Population density	137.7	108.8

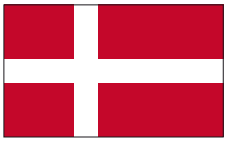
Czechia's strengths are in *Use of information technologies*, *Sales impacts* and *Environmental sustainability*. The top-3 indicators include Enterprises providing ICT training, Exports of medium and high-tech goods, and Air emissions by fine particulate matter.

The recent increase in innovation performance between 2020 and 2021 is due to strong performance increases in several indicators using innovation survey data, Broadband penetration, and Venture capital.

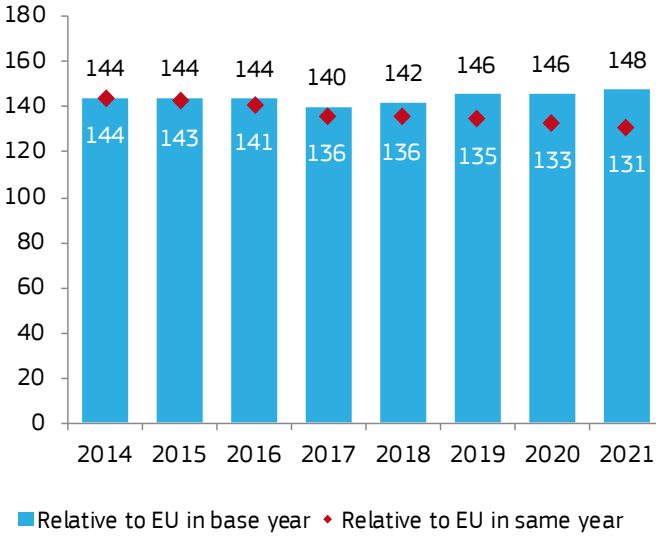
Czechia has an above average share of In-house product innovators with market novelties and is showing close to average scores on the Climate change related indicators.

Czechia	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**83.9**	**83.7**	**94.4**
Human resources	**81.9**	**80.7**	**86.8**
Doctorate graduates	113.0	88.5	100.0
Population with tertiary education	56.4	50.4	72.7
Lifelong learning	72.7	101.1	80.0
Attractive research systems	**74.2**	**56.9**	**83.5**
International scientific co-publications	94.3	82.7	123.6
Most cited publications	43.9	34.1	43.2
Foreign doctorate students	98.3	71.6	116.8
Digitalisation	**79.4**	**91.7**	**109.8**
Broadband penetration	80.8	89.4	122.5
People with above basic overall digital skills	77.3	94.4	94.4
Finance and support	**69.5**	**92.3**	**82.8**
R&D expenditures in the public sector	101.8	112.3	98.2
Venture capital expenditures	22.3	13.7	37.5
Government support for business R&D	80.7	120.1	93.4
Firm investments	**73.2**	**71.8**	**88.4**
R&D expenditure in the business sector	81.6	71.7	90.6
Non-R&D Innovation expenditures	109.6	96.7	124.6
Innovation expenditures per employee	56.0	52.1	73.9
Use of information technologies	**117.3**	**111.6**	**135.6**
Enterprises providing ICT training	133.3	113.3	133.3
Employed ICT specialists	103.6	109.5	138.1
Innovators	**89.7**	**94.2**	**122.7**
Product innovators (SMEs)	83.3	106.7	117.5
Business process innovators (SMEs)	95.6	83.2	127.3
Linkages	**79.5**	**89.5**	**107.1**
Innovative SMEs collaborating with others	94.9	137.6	139.0
Public-private co-publications	113.4	98.0	127.1
Job-to-job mobility of HRST	48.2	48.7	69.2
Intellectual assets	**59.7**	**57.9**	**51.7**
PCT patent applications	24.0	20.1	20.8
Trademark applications	79.5	77.4	83.4
Design applications	69.8	72.2	47.8
Employment impacts	**88.7**	**84.2**	**90.3**
Employment in knowledge-intensive activities	90.2	93.3	98.7
Employment in innovative enterprises	87.4	77.8	84.4
Sales impacts	**97.8**	**92.5**	**99.6**
Medium and high tech goods exports	127.1	124.4	139.4
Knowledge-intensive services exports	54.5	48.9	57.7
Sales of innovative products	111.8	102.3	97.2
Environmental sustainability	**95.9**	**93.5**	**99.9**
Resource productivity	75.5	62.1	111.8
Air emissions by fine particulate matter	114.7	106.3	121.9
Environment-related technologies	85.9	95.7	64.5

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Denmark is an **Innovation Leader**. Over time, performance relative to the EU has decreased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	DK	EU
Performance and structure of the economy		
GDP per capita (PPS)	39,900	30,800
Average annual GDP growth (%)	-0.3	-2.5
Employment share Manufacturing (NACE C) (%)	11.2	16.5
of which High and Medium high-tech (%)	42.7	37.9
Employment share Services (NACE G-N) (%)	41.5	41.2
of which Knowledge-intensive services (%)	35.1	35.1
Turnover share SMEs (%)	n/a	36.5
Turnover share large enterprises (%)	46.3	45.7
Foreign-controlled enterprises – share of value added (%)	11.3	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.4	1.0
Total Entrepreneurial Activity (TEA) (%)	5.5	6.7
FDI net inflows (% GDP)	1.5	2.0
Top R&D spending enterprises per 10 million population	77.0	16.2
Buyer sophistication (1 to 7 best)	3.9	3.7
Innovation profiles		
In-house product innovators with market novelties	n/a	10.7
In-house product innovators without market novelties	n/a	12.3
In-house business process innovators	n/a	11.0
Innovators that do not develop innovations themselves	n/a	11.6
Innovation active non-innovators	n/a	3.3
Non-innovators with potential to innovate	n/a	19.9
Non-innovators without disposition to innovate	n/a	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	85.0	76.5
Basic school entrepreneurial education and training	n/a	2.0
Govt. procurement of advanced tech. products	3.5	3.5
Rule of law (-2.5 to 2.5 best)	1.9	1.1
Climate change indicators		
Circular material use rate	8.0	11.7
Greenhouse gas emissions intensity of energy consumption	69.4	86.6
Eco-Innovation Index	146.0	100.0
Demography		
Population size	5.8	446.7
Average annual population growth (%)	0.4	0.1
Population density	137.9	108.8

Denmark's strengths are in *Attractive research systems*, *Intellectual assets* and *Human resources*. The top-3 indicators include International scientific co-publications, Public-private co-publications, and Lifelong learning.

The decline in performance in the last four years is mostly due to reduced performance in Sales of innovative products and Innovation expenditures per employee. Strong performance increases are observed for Venture capital, Non-R&D innovation expenditures, and Business process innovators.

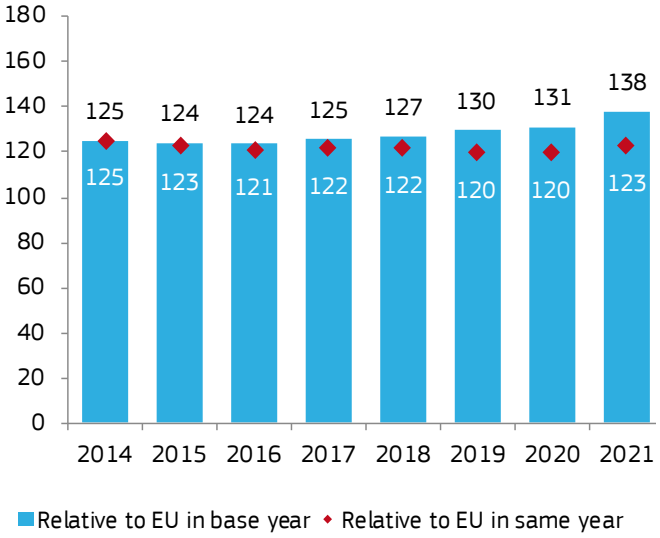
Denmark is showing above average scores on the Climate change related indicators.

Denmark	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**131.1**	**144.0**	**147.5**
Human resources	**174.0**	**192.4**	**184.4**
Doctorate graduates	151.9	146.0	134.5
Population with tertiary education	141.7	176.9	182.6
Lifelong learning	246.5	288.9	271.1
Attractive research systems	**169.0**	**169.4**	**190.2**
International scientific co-publications	182.4	182.4	239.2
Most cited publications	143.5	154.3	141.1
Foreign doctorate students	194.5	184.6	231.0
Digitalisation	**152.9**	**184.6**	**211.4**
Broadband penetration	133.5	158.1	202.5
People with above basic overall digital skills	181.8	216.7	222.2
Finance and support	**111.6**	**108.2**	**132.9**
R&D expenditures in the public sector	161.8	145.6	156.1
Venture capital expenditures	126.1	132.4	212.1
Government support for business R&D	39.5	40.2	45.6
Firm investments	**90.5**	**125.2**	**109.4**
R&D expenditure in the business sector	125.5	149.6	139.4
Non-R&D Innovation expenditures	62.0	51.6	70.4
Innovation expenditures per employee	36.0	159.5	47.6
Use of information technologies	**155.8**	**177.8**	**180.0**
Enterprises providing ICT training	166.7	166.7	166.7
Employed ICT specialists	146.4	190.5	195.2
Innovators	**119.2**	**105.0**	**163.2**
Product innovators (SMEs)	113.4	104.9	160.0
Business process innovators (SMEs)	124.7	105.1	165.9
Linkages	**169.1**	**224.0**	**228.0**
Innovative SMEs collaborating with others	115.4	172.3	169.1
Public-private co-publications	258.9	243.7	290.3
Job-to-job mobility of HRST	155.4	246.2	223.1
Intellectual assets	**176.4**	**151.5**	**152.9**
PCT patent applications	197.1	183.4	171.1
Trademark applications	122.8	115.1	128.9
Design applications	233.9	159.2	160.3
Employment impacts	**119.0**	**105.0**	**121.2**
Employment in knowledge-intensive activities	124.4	126.7	136.0
Employment in innovative enterprises	114.7	89.7	110.7
Sales impacts	**75.3**	**102.2**	**76.7**
Medium and high tech goods exports	86.5	72.4	94.8
Knowledge-intensive services exports	114.5	131.7	121.3
Sales of innovative products	0.0	106.3	0.0
Environmental sustainability	**130.7**	**132.1**	**136.0**
Resource productivity	63.6	73.8	94.2
Air emissions by fine particulate matter	125.6	127.7	133.5
Environment-related technologies	218.4	172.3	164.1

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Germany is a **Strong Innovator**.
Over time, performance relative to the EU has decreased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	DE	EU
Performance and structure of the economy		
GDP per capita (PPS)	37,800	30,800
Average annual GDP growth (%)	-2.3	-2.5
Employment share Manufacturing (NACE C) (%)	19.4	16.5
of which High and Medium high-tech (%)	52.0	37.9
Employment share Services (NACE G-N) (%)	39.6	41.2
of which Knowledge-intensive services (%)	35.7	35.1
Turnover share SMEs (%)	34.1	36.5
Turnover share large enterprises (%)	54.9	45.7
Foreign-controlled enterprises – share of value added (%)	12.6	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.7	1.0
Total Entrepreneurial Activity (TEA) (%)	6.0	6.7
FDI net inflows (% GDP)	3.2	2.0
Top R&D spending enterprises per 10 million population	26.1	16.2
Buyer sophistication (1 to 7 best)	4.6	3.7
Innovation profiles		
In-house product innovators with market novelties	9.9	10.7
In-house product innovators without market novelties	15.4	12.3
In-house business process innovators	13.2	11.0
Innovators that do not develop innovations themselves	25.2	11.6
Innovation active non-innovators	4.0	3.3
Non-innovators with potential to innovate	17.9	19.9
Non-innovators without disposition to innovate	14.2	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	79.5	76.5
Basic school entrepreneurial education and training	2.0	2.0
Govt. procurement of advanced tech. products	4.6	3.5
Rule of law (-2.5 to 2.5 best)	1.6	1.1
Climate change indicators		
Circular material use rate	11.9	11.7
Greenhouse gas emissions intensity of energy consumption	92.3	86.6
Eco-Innovation Index	123.0	100.0
Demography		
Population size	83.0	446.7
Average annual population growth (%)	0.2	0.1
Population density	234.6	108.8

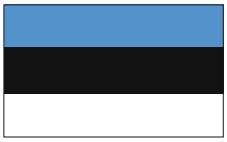
Germany's strengths are in *Intellectual assets*, *Innovators* and *Employment impacts*. The top-3 indicators include PCT patent applications, Employment in innovative enterprises, and Design applications.

The most recent performance increase is due to improved performance on the indicators using innovation survey data, and most strongly for Innovative SMEs collaborating with others, and Product and Business process innovators.

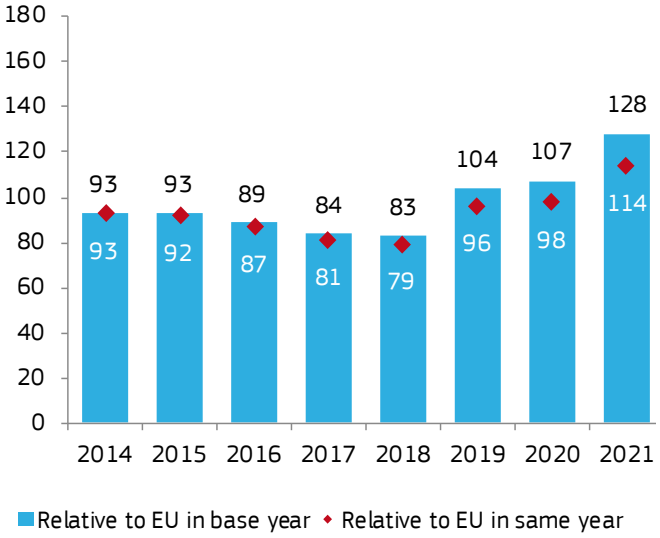
Germany has an above average share of Innovators that do not develop innovations themselves and is showing close to average scores on the Climate change related indicators.

Germany	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**122.6**	**125.2**	**137.9**
Human resources	**98.2**	**91.4**	**104.1**
Doctorate graduates	151.9	134.5	134.5
Population with tertiary education	60.9	38.0	78.5
Lifelong learning	73.7	77.8	81.1
Attractive research systems	**91.6**	**94.5**	**103.1**
International scientific co-publications	92.2	102.1	120.9
Most cited publications	107.4	115.2	105.6
Foreign doctorate students	63.3	41.4	75.1
Digitalisation	**111.9**	**117.3**	**154.8**
Broadband penetration	95.6	94.9	144.9
People with above basic overall digital skills	136.4	144.4	166.7
Finance and support	**92.2**	**94.2**	**109.9**
R&D expenditures in the public sector	147.3	133.3	142.1
Venture capital expenditures	81.1	69.3	136.4
Government support for business R&D	40.8	58.3	47.2
Firm investments	**141.4**	**151.1**	**170.8**
R&D expenditure in the business sector	151.8	150.4	168.5
Non-R&D Innovation expenditures	141.5	152.5	160.8
Innovation expenditures per employee	141.3	150.8	186.5
Use of information technologies	**114.3**	**145.8**	**132.0**
Enterprises providing ICT training	126.7	173.3	126.7
Employed ICT specialists	103.6	114.3	138.1
Innovators	**152.0**	**143.3**	**208.0**
Product innovators (SMEs)	147.3	180.2	207.9
Business process innovators (SMEs)	156.5	110.9	208.2
Linkages	**137.8**	**136.0**	**185.8**
Innovative SMEs collaborating with others	124.6	136.4	182.7
Public-private co-publications	148.5	149.4	166.5
Job-to-job mobility of HRST	141.1	125.6	202.6
Intellectual assets	**153.1**	**160.5**	**132.7**
PCT patent applications	208.6	222.4	181.0
Trademark applications	110.2	116.8	115.7
Design applications	155.8	148.9	106.7
Employment impacts	**143.0**	**140.4**	**145.6**
Employment in knowledge-intensive activities	113.4	128.0	124.0
Employment in innovative enterprises	166.7	149.2	161.0
Sales impacts	**123.3**	**121.6**	**125.6**
Medium and high tech goods exports	125.9	134.5	138.0
Knowledge-intensive services exports	114.3	126.6	121.0
Sales of innovative products	131.8	98.7	114.6
Environmental sustainability	**118.6**	**118.5**	**123.4**
Resource productivity	122.3	117.2	181.2
Air emissions by fine particulate matter	123.3	128.0	131.1
Environment-related technologies	105.6	107.2	79.3

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Estonia is a **Strong Innovator**.
Over time, performance relative to the EU has increased strongly.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	EE	EU
Performance and structure of the economy		
GDP per capita (PPS)	25,200	30,800
Average annual GDP growth (%)	0.6	-2.5
Employment share Manufacturing (NACE C) (%)	18.2	16.5
of which High and Medium high-tech (%)	22.7	37.9
Employment share Services (NACE G-N) (%)	40.7	41.2
of which Knowledge-intensive services (%)	32.9	35.1
Turnover share SMEs (%)	47.1	36.5
Turnover share large enterprises (%)	20.5	45.7
Foreign-controlled enterprises – share of value added (%)	13.3	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.1	1.0
Total Entrepreneurial Activity (TEA) (%)	19.4	6.7
FDI net inflows (% GDP)	5.6	2.0
Top R&D spending enterprises per 10 million population	0.0	16.2
Buyer sophistication (1 to 7 best)	3.7	3.7
Innovation profiles		
In-house product innovators with market novelties	13.2	10.7
In-house product innovators without market novelties	26.7	12.3
In-house business process innovators	13.1	11.0
Innovators that do not develop innovations themselves	13.1	11.6
Innovation active non-innovators	4.7	3.3
Non-innovators with potential to innovate	12.3	19.9
Non-innovators without disposition to innovate	16.9	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	80.7	76.5
Basic school entrepreneurial education and training	3.0	2.0
Govt. procurement of advanced tech. products	3.7	3.5
Rule of law (-2.5 to 2.5 best)	1.3	1.1
Climate change indicators		
Circular material use rate	13.8	11.7
Greenhouse gas emissions intensity of energy consumption	94.6	86.6
Eco-Innovation Index	73.0	100.0
Demography		
Population size	1.3	446.7
Average annual population growth (%)	0.4	0.1
Population density	30.4	108.8

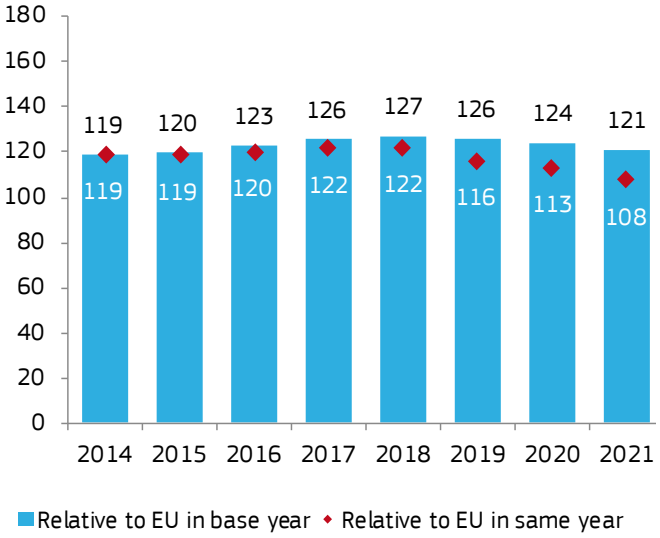
Estonia's strengths are in *Linkages*, *Innovators* and *Intellectual assets*. The top-3 indicators include Trademark applications., Innovative SMEs collaborating with others, and Non-R&D innovation expenditures.
The very strong performance improvements since 2018 are almost entirely due to improved performance on the indicators using innovation survey data, in particular for Product innovators (an almost fivefold increase from 10.2% to 48.9%) and Business process innovators (an almost triple increase from 18.0% to 52.5%).
Estonia has an above average share of In-house product innovators without market novelties and is showing close to average scores on the Climate change related indicators.

Estonia	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**114.0**	**92.9**	**128.3**
Human resources	**128.8**	**109.6**	**136.4**
Doctorate graduates	87.0	77.0	77.0
Population with tertiary education	121.8	138.8	157.0
Lifelong learning	194.9	132.2	214.4
Attractive research systems	**104.6**	**76.8**	**117.8**
International scientific co-publications	131.8	108.9	172.8
Most cited publications	89.8	72.7	88.3
Foreign doctorate students	92.2	44.5	109.5
Digitalisation	**102.5**	**119.4**	**141.8**
Broadband penetration	86.0	89.4	130.4
People with above basic overall digital skills	127.3	155.6	155.6
Finance and support	**92.0**	**103.3**	**109.7**
R&D expenditures in the public sector	101.8	122.8	98.2
Venture capital expenditures	151.0	113.5	253.9
Government support for business R&D	20.8	69.3	24.1
Firm investments	**95.5**	**110.6**	**115.3**
R&D expenditure in the business sector	57.4	91.3	63.8
Non-R&D Innovation expenditures	194.2	168.1	220.7
Innovation expenditures per employee	83.0	83.8	109.5
Use of information technologies	**131.1**	**91.9**	**151.4**
Enterprises providing ICT training	80.0	60.0	80.0
Employed ICT specialists	175.0	128.6	233.3
Innovators	**159.1**	**86.2**	**217.7**
Product innovators (SMEs)	169.3	81.4	238.8
Business process innovators (SMEs)	149.7	90.5	199.2
Linkages	**179.3**	**140.0**	**241.7**
Innovative SMEs collaborating with others	237.4	192.3	347.8
Public-private co-publications	154.0	119.8	172.7
Job-to-job mobility of HRST	151.8	117.9	217.9
Intellectual assets	**131.6**	**100.4**	**114.0**
PCT patent applications	52.5	68.2	45.6
Trademark applications	187.6	131.6	196.9
Design applications	135.5	98.1	92.8
Employment impacts	**147.6**	**83.8**	**150.4**
Employment in knowledge-intensive activities	103.7	70.7	113.3
Employment in innovative enterprises	182.9	93.1	176.6
Sales impacts	**76.9**	**62.4**	**78.3**
Medium and high tech goods exports	60.6	70.3	66.4
Knowledge-intensive services exports	69.0	60.4	73.1
Sales of innovative products	115.3	54.5	100.3
Environmental sustainability	**66.1**	**61.3**	**68.8**
Resource productivity	17.2	6.3	25.5
Air emissions by fine particulate matter	33.2	0.0	35.4
Environment-related technologies	182.8	172.3	137.3

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Ireland is a **Strong Innovator**.
Over time, performance relative to the EU has decreased strongly, in particular in the last three years.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	IE	EU
Performance and structure of the economy		
GDP per capita (PPS)	58,400	30,800
Average annual GDP growth (%)	3.2	-2.5
Employment share Manufacturing (NACE C) (%)	11.2	16.5
of which High and Medium high-tech (%)	34.5	37.9
Employment share Services (NACE G-N) (%)	46.5	41.2
of which Knowledge-intensive services (%)	40.2	35.1
Turnover share SMEs (%)	30.9	36.5
Turnover share large enterprises (%)	53.6	45.7
Foreign-controlled enterprises – share of value added (%)	44.3	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.9	1.0
Total Entrepreneurial Activity (TEA) (%)	10.3	6.7
FDI net inflows (% GDP)	17.5	2.0
Top R&D spending enterprises per 10 million population	62.6	16.2
Buyer sophistication (1 to 7 best)	4.3	3.7
Innovation profiles		
In-house product innovators with market novelties	n/a	10.7
In-house product innovators without market novelties	n/a	12.3
In-house business process innovators	n/a	11.0
Innovators that do not develop innovations themselves	n/a	11.6
Innovation active non-innovators	n/a	3.3
Non-innovators with potential to innovate	n/a	19.9
Non-innovators without disposition to innovate	n/a	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	79.8	76.5
Basic school entrepreneurial education and training	2.2	2.0
Govt. procurement of advanced tech. products	3.5	3.5
Rule of law (-2.5 to 2.5 best)	1.4	1.1
Climate change indicators		
Circular material use rate	1.6	11.7
Greenhouse gas emissions intensity of energy consumption	84.9	86.6
Eco-Innovation Index	97.0	100.0
Demography		
Population size	4.9	446.7
Average annual population growth (%)	1.4	0.1
Population density	70.9	108.8

Ireland's strengths are in *Linkages*, *Human resources* and *Attractive research systems*. The top-3 indicators include Population with tertiary education, Innovative SMEs collaborating with others, and Employment in knowledge-intensive activities.

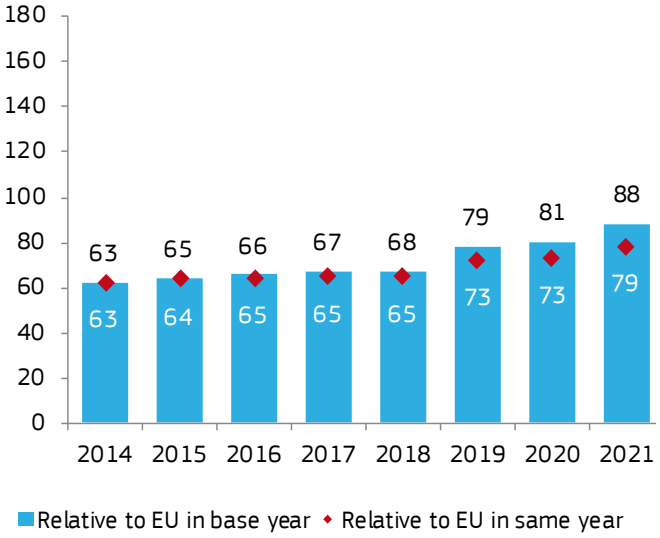
The decline in innovation performance in the last two years is due to reduced performance on Government support for business R&D, Business R&D expenditures, Employment in innovative enterprises, Sales of innovative products, and Environment-related technologies. Ireland is showing below average scores on the Climate change related indicators due to a low score on the Circular material use rate.

Ireland	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**107.8**	**119.2**	**121.3**
Human resources	**151.1**	**142.9**	**160.2**
Doctorate graduates	126.0	100.0	111.5
Population with tertiary education	202.6	255.4	261.2
Lifelong learning	118.2	90.0	130.0
Attractive research systems	**133.6**	**149.5**	**150.4**
International scientific co-publications	133.2	134.7	174.7
Most cited publications	117.2	118.8	115.2
Foreign doctorate students	162.6	232.9	193.1
Digitalisation	**104.1**	**95.0**	**144.0**
Broadband penetration	97.8	100.0	148.3
People with above basic overall digital skills	113.6	88.9	138.9
Finance and support	**75.1**	**98.8**	**89.5**
R&D expenditures in the public sector	18.2	47.4	17.5
Venture capital expenditures	121.1	121.1	203.7
Government support for business R&D	93.2	153.5	107.8
Firm investments	**81.4**	**89.7**	**98.3**
R&D expenditure in the business sector	32.6	84.3	36.2
Non-R&D Innovation expenditures	60.7	55.3	69.0
Innovation expenditures per employee	133.6	122.4	176.3
Use of information technologies	**140.8**	**157.7**	**162.6**
Enterprises providing ICT training	146.7	133.3	146.7
Employed ICT specialists	135.7	185.7	181.0
Innovators	**94.0**	**132.6**	**128.6**
Product innovators (SMEs)	96.4	126.6	136.0
Business process innovators (SMEs)	91.8	137.9	122.1
Linkages	**152.4**	**137.6**	**205.5**
Innovative SMEs collaborating with others	182.7	142.5	267.7
Public-private co-publications	173.6	165.1	194.7
Job-to-job mobility of HRST	N/A	N/A	N/A
Intellectual assets	**62.5**	**64.0**	**54.2**
PCT patent applications	56.9	66.4	49.3
Trademark applications	75.1	101.1	78.8
Design applications	49.9	25.2	34.2
Employment impacts	**112.6**	**160.5**	**114.7**
Employment in knowledge-intensive activities	178.0	201.3	194.7
Employment in innovative enterprises	60.1	131.7	58.1
Sales impacts	**119.7**	**141.1**	**121.9**
Medium and high tech goods exports	109.5	84.9	120.0
Knowledge-intensive services exports	152.1	161.1	161.1
Sales of innovative products	89.6	191.3	77.9
Environmental sustainability	**97.1**	**91.7**	**101.1**
Resource productivity	115.1	104.6	170.5
Air emissions by fine particulate matter	122.7	120.0	130.5
Environment-related technologies	29.7	47.8	22.3

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Greece is a **Moderate Innovator**.
Over time, performance relative to the EU has increased strongly, in particular in the last three years.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	EL	EU
Performance and structure of the economy		
GDP per capita (PPS)	20,600	30,800
Average annual GDP growth (%)	-3.2	-2.5
Employment share Manufacturing (NACE C) (%)	9.5	16.5
of which High and Medium high-tech (%)	16.3	37.9
Employment share Services (NACE G-N) (%)	46.1	41.2
of which Knowledge-intensive services (%)	28.2	35.1
Turnover share SMEs (%)	39.4	36.5
Turnover share large enterprises (%)	35.0	45.7
Foreign-controlled enterprises – share of value added (%)	4.5	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	2.4	1.0
Total Entrepreneurial Activity (TEA) (%)	6.5	6.7
FDI net inflows (% GDP)	1.7	2.0
Top R&D spending enterprises per 10 million population	2.8	16.2
Buyer sophistication (1 to 7 best)	3.3	3.7
Innovation profiles		
In-house product innovators with market novelties	16.7	10.7
In-house product innovators without market novelties	20.5	12.3
In-house business process innovators	12.8	11.0
Innovators that do not develop innovations themselves	8.5	11.6
Innovation active non-innovators	1.8	3.3
Non-innovators with potential to innovate	31.8	19.9
Non-innovators without disposition to innovate	7.9	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	67.6	76.5
Basic school entrepreneurial education and training	1.9	2.0
Govt. procurement of advanced tech. products	2.6	3.5
Rule of law (-2.5 to 2.5 best)	0.1	1.1
Climate change indicators		
Circular material use rate	3.4	11.7
Greenhouse gas emissions intensity of energy consumption	82.0	86.6
Eco-Innovation Index	75.0	100.0
Demography		
Population size	10.7	446.7
Average annual population growth (%)	-0.1	0.1
Population density	82.4	108.8

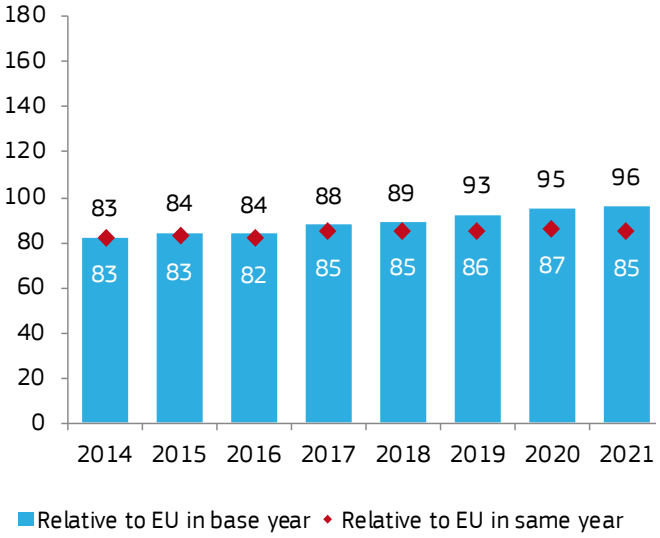
Greece's strengths are in *Innovators*, *Linkages* and *Employment impacts*. The top-3 indicators include Sales of innovative products, Innovative SMEs collaborating with others, and Product innovators.
The strong increase in innovation performance since 2018 is due to improved performance for Broadband penetration, Venture capital, Product innovators, Job-to-job mobility of HRST, and Medium and high-tech goods exports.
Greece has above average shares of In-house product innovators and is showing close to average scores on the Climate change related indicators.

Greece	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**78.6**	**62.6**	**88.5**
Human resources	**68.6**	**62.0**	**72.7**
Doctorate graduates	48.1	42.6	42.6
Population with tertiary education	119.2	123.1	153.7
Lifelong learning	30.3	26.7	33.3
Attractive research systems	**67.3**	**65.4**	**75.8**
International scientific co-publications	84.6	85.2	111.0
Most cited publications	88.8	79.6	87.3
Foreign doctorate students	5.8	10.4	6.9
Digitalisation	**60.8**	**42.1**	**84.2**
Broadband penetration	59.0	44.7	89.4
People with above basic overall digital skills	63.6	38.9	77.8
Finance and support	**50.3**	**27.1**	**59.9**
R&D expenditures in the public sector	90.9	47.4	87.7
Venture capital expenditures	29.1	4.9	48.9
Government support for business R&D	25.6	15.0	29.7
Firm investments	**63.8**	**56.3**	**77.1**
R&D expenditure in the business sector	38.3	15.0	42.5
Non-R&D Innovation expenditures	106.6	111.3	121.2
Innovation expenditures per employee	66.1	53.4	87.3
Use of information technologies	**40.8**	**39.1**	**47.1**
Enterprises providing ICT training	46.7	40.0	46.7
Employed ICT specialists	35.7	38.1	47.6
Innovators	**160.0**	**115.3**	**218.9**
Product innovators (SMEs)	162.3	75.6	229.1
Business process innovators (SMEs)	157.7	150.3	209.9
Linkages	**109.1**	**86.5**	**147.1**
Innovative SMEs collaborating with others	174.8	148.1	256.1
Public-private co-publications	112.9	91.9	126.7
Job-to-job mobility of HRST	58.9	38.5	84.6
Intellectual assets	**48.7**	**30.8**	**42.2**
PCT patent applications	19.0	11.2	16.5
Trademark applications	87.9	63.6	92.3
Design applications	22.8	15.8	15.7
Employment impacts	**107.7**	**95.2**	**109.7**
Employment in knowledge-intensive activities	79.3	89.3	86.7
Employment in innovative enterprises	130.5	99.3	126.0
Sales impacts	**89.7**	**54.5**	**91.4**
Medium and high tech goods exports	30.1	2.5	33.0
Knowledge-intensive services exports	67.9	83.5	71.9
Sales of innovative products	220.1	88.3	191.3
Environmental sustainability	**80.9**	**95.7**	**84.2**
Resource productivity	95.1	67.3	140.9
Air emissions by fine particulate matter	62.1	65.6	66.0
Environment-related technologies	98.4	151.1	73.9

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Spain is a **Moderate Innovator**.
Over time, performance relative to the EU has increased.



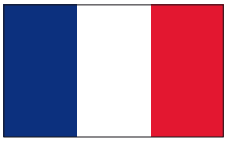
Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	ES	EU
Performance and structure of the economy		
GDP per capita (PPS)	28,300	30,800
Average annual GDP growth (%)	-5.3	-2.5
Employment share Manufacturing (NACE C) (%)	12.6	16.5
of which High and Medium high-tech (%)	31.8	37.9
Employment share Services (NACE G-N) (%)	48.5	41.2
of which Knowledge-intensive services (%)	31.4	35.1
Turnover share SMEs (%)	38.4	36.5
Turnover share large enterprises (%)	40.0	45.7
Foreign-controlled enterprises – share of value added (%)	9.8	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.4	1.0
Total Entrepreneurial Activity (TEA) (%)	6.2	6.7
FDI net inflows (% GDP)	2.7	2.0
Top R&D spending enterprises per 10 million population	4.4	16.2
Buyer sophistication (1 to 7 best)	3.5	3.7
Innovation profiles		
In-house product innovators with market novelties	6.2	10.7
In-house product innovators without market novelties	7.1	12.3
In-house business process innovators	10.6	11.0
Innovators that do not develop innovations themselves	3.5	11.6
Innovation active non-innovators	2.8	3.3
Non-innovators with potential to innovate	43.2	19.9
Non-innovators without disposition to innovate	26.6	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	77.8	76.5
Basic school entrepreneurial education and training	2.0	2.0
Govt. procurement of advanced tech. products	3.2	3.5
Rule of law (-2.5 to 2.5 best)	1.0	1.1
Climate change indicators		
Circular material use rate	9.6	11.7
Greenhouse gas emissions intensity of energy consumption	83.8	86.6
Eco-Innovation Index	104.0	100.0
Demography		
Population size	47.0	446.7
Average annual population growth (%)	0.7	0.1
Population density	93.2	108.8

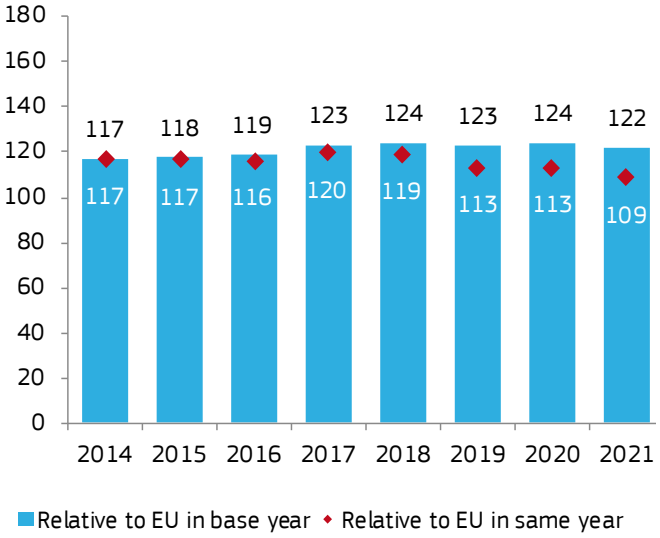
Spain's strengths are in *Human resources*, *Digitalisation*, and *Environmental sustainability*. The top-3 indicators include Doctorate graduates, Resource productivity, and Sales of innovative products.
Recent performance has not changed. Improvements for Tertiary education, Non-R&D innovation expenditures, Innovation expenditures per employee, Product innovators, and Job-to-job mobility of HRST, have been offset by reduced performance for Business process innovators, PCT patent, Trademark and Design applications, and Environment-related technologies.
Spain has an above average share of Non-innovators with potential to innovate and is showing close to average scores on the Climate change related indicators.

Spain	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**85.3**	**82.6**	**96.0**
Human resources	**139.8**	**103.9**	**148.1**
Doctorate graduates	164.9	77.0	146.0
Population with tertiary education	145.5	146.3	187.6
Lifelong learning	98.0	102.2	107.8
Attractive research systems	**90.9**	**103.8**	**102.3**
International scientific co-publications	88.4	88.5	115.9
Most cited publications	92.7	93.1	91.1
Foreign doctorate students	91.5	145.5	108.6
Digitalisation	**127.2**	**107.6**	**176.0**
Broadband penetration	130.2	100.0	197.5
People with above basic overall digital skills	122.7	116.7	150.0
Finance and support	**72.6**	**81.3**	**86.5**
R&D expenditures in the public sector	65.5	75.4	63.2
Venture capital expenditures	102.6	85.3	172.5
Government support for business R&D	50.1	86.6	58.0
Firm investments	**52.1**	**49.0**	**62.9**
R&D expenditure in the business sector	46.1	50.4	51.2
Non-R&D Innovation expenditures	71.0	42.4	80.6
Innovation expenditures per employee	57.8	52.9	76.3
Use of information technologies	**94.2**	**102.7**	**108.9**
Enterprises providing ICT training	100.0	113.3	100.0
Employed ICT specialists	89.3	90.5	119.0
Innovators	**30.5**	**33.4**	**41.8**
Product innovators (SMEs)	28.9	13.0	40.8
Business process innovators (SMEs)	32.0	51.4	42.6
Linkages	**88.5**	**91.2**	**119.3**
Innovative SMEs collaborating with others	52.1	63.9	76.4
Public-private co-publications	108.0	95.3	121.1
Job-to-job mobility of HRST	103.6	107.7	148.7
Intellectual assets	**79.9**	**78.7**	**69.2**
PCT patent applications	43.3	49.4	37.5
Trademark applications	112.0	115.5	117.6
Design applications	72.3	68.4	49.5
Employment impacts	**54.5**	**65.5**	**55.5**
Employment in knowledge-intensive activities	80.5	86.7	88.0
Employment in innovative enterprises	33.6	50.5	32.4
Sales impacts	**74.4**	**70.5**	**75.8**
Medium and high tech goods exports	72.7	79.1	79.7
Knowledge-intensive services exports	28.0	27.4	29.6
Sales of innovative products	144.4	110.3	125.5
Environmental sustainability	**114.3**	**105.8**	**119.0**
Resource productivity	159.3	142.5	236.0
Air emissions by fine particulate matter	94.0	93.2	100.0
Environment-related technologies	98.3	100.2	73.8

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



France is a **Strong Innovator**.
Over time, performance relative to the EU has decreased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	FR	EU
Performance and structure of the economy		
GDP per capita (PPS)	32,300	30,800
Average annual GDP growth (%)	-3.7	-2.5
Employment share Manufacturing (NACE C) (%)	11.8	16.5
of which High and Medium high-tech (%)	35.7	37.9
Employment share Services (NACE G-N) (%)	41.2	41.2
of which Knowledge-intensive services (%)	38.4	35.1
Turnover share SMEs (%)	29.1	36.5
Turnover share large enterprises (%)	52.2	45.7
Foreign-controlled enterprises – share of value added (%)	7.1	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.5	1.0
Total Entrepreneurial Activity (TEA) (%)	5.0	6.7
FDI net inflows (% GDP)	1.8	2.0
Top R&D spending enterprises per 10 million population	16.7	16.2
Buyer sophistication (1 to 7 best)	4.1	3.7
Innovation profiles		
In-house product innovators with market novelties	20.2	10.7
In-house product innovators without market novelties	6.2	12.3
In-house business process innovators	8.9	11.0
Innovators that do not develop innovations themselves	12.0	11.6
Innovation active non-innovators	3.8	3.3
Non-innovators with potential to innovate	12.9	19.9
Non-innovators without disposition to innovate	36.0	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	76.5	76.5
Basic school entrepreneurial education and training	1.7	2.0
Govt. procurement of advanced tech. products	3.8	3.5
Rule of law (-2.5 to 2.5 best)	1.4	1.1
Climate change indicators		
Circular material use rate	19.5	11.7
Greenhouse gas emissions intensity of energy consumption	81.4	86.6
Eco-Innovation Index	107.0	100.0
Demography		
Population size	67.2	446.7
Average annual population growth (%)	0.2	0.1
Population density	105.9	108.8

France's strengths are in *Human resources*, *Finance and support* and *Attractive research systems*. The top-3 indicators include Foreign doctorate students, Lifelong learning, and Government support for business R&D.

The recent decline in innovation performance is due to reduced performance on Doctorate graduates, Enterprises providing ICT training, Business process innovators, Trademark and Design applications, Employment in innovative enterprises, Sales of innovative products, and Environment-related technologies.

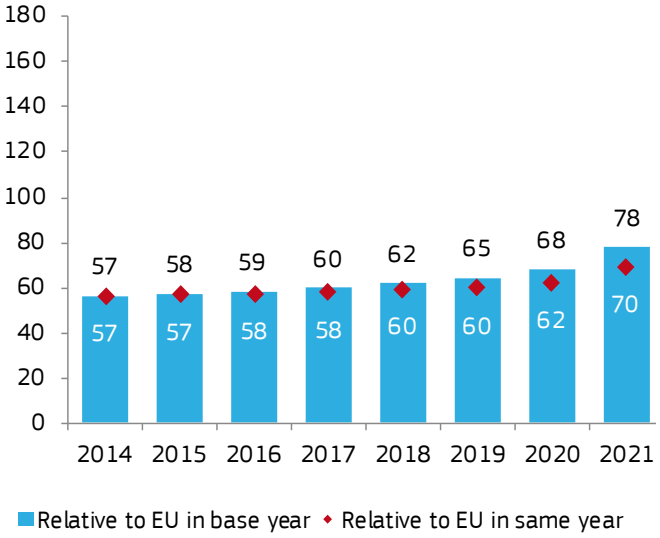
France has an above average share of In-house product innovators with market novelties and is showing above average scores on the Climate change related indicators.

France	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**108.7**	**117.2**	**122.3**
Human resources	**148.6**	**155.3**	**157.5**
Doctorate graduates	113.0	123.0	100.0
Population with tertiary education	155.8	169.4	200.8
Lifelong learning	187.9	194.4	206.7
Attractive research systems	**116.4**	**139.3**	**131.0**
International scientific co-publications	85.9	96.7	112.6
Most cited publications	89.9	103.3	88.4
Foreign doctorate students	205.2	269.3	243.7
Digitalisation	**85.1**	**97.2**	**117.7**
Broadband penetration	75.2	94.9	114.0
People with above basic overall digital skills	100.0	100.0	122.2
Finance and support	**150.0**	**158.2**	**178.7**
R&D expenditures in the public sector	98.2	100.0	94.7
Venture capital expenditures	174.1	192.7	292.8
Government support for business R&D	184.4	213.4	213.4
Firm investments	**90.0**	**97.0**	**108.7**
R&D expenditure in the business sector	98.6	109.4	109.4
Non-R&D Innovation expenditures	56.9	52.3	64.7
Innovation expenditures per employee	104.4	120.3	137.8
Use of information technologies	**90.3**	**103.6**	**104.4**
Enterprises providing ICT training	66.7	106.7	66.7
Employed ICT specialists	110.7	100.0	147.6
Innovators	**105.1**	**118.2**	**143.8**
Product innovators (SMEs)	114.6	101.4	161.7
Business process innovators (SMEs)	96.2	133.0	128.0
Linkages	**113.5**	**119.0**	**153.0**
Innovative SMEs collaborating with others	110.3	135.4	161.7
Public-private co-publications	113.0	125.2	126.7
Job-to-job mobility of HRST	116.1	102.6	166.7
Intellectual assets	**83.2**	**90.6**	**72.1**
PCT patent applications	119.6	118.4	103.8
Trademark applications	64.7	78.8	68.0
Design applications	70.2	77.8	48.1
Employment impacts	**109.5**	**108.5**	**111.6**
Employment in knowledge-intensive activities	113.4	110.7	124.0
Employment in innovative enterprises	106.4	107.0	102.7
Sales impacts	**90.2**	**103.9**	**91.9**
Medium and high tech goods exports	100.0	109.7	109.7
Knowledge-intensive services exports	90.9	98.3	96.3
Sales of innovative products	72.9	103.0	63.4
Environmental sustainability	**114.9**	**113.5**	**119.6**
Resource productivity	143.8	153.8	213.1
Air emissions by fine particulate matter	104.5	110.6	111.2
Environment-related technologies	99.8	93.1	75.0

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Croatia is an **Emerging Innovator.**
Over time, performance relative to the EU has increased strongly.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	HR	EU
Performance and structure of the economy		
GDP per capita (PPS)	19,700	30,800
Average annual GDP growth (%)	-2.2	-2.5
Employment share Manufacturing (NACE C) (%)	17.7	16.5
of which High and Medium high-tech (%)	19.8	37.9
Employment share Services (NACE G-N) (%)	40.1	41.2
of which Knowledge-intensive services (%)	31.9	35.1
Turnover share SMEs (%)	42.8	36.5
Turnover share large enterprises (%)	37.6	45.7
Foreign-controlled enterprises – share of value added (%)	13.0	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	2.5	1.0
Total Entrepreneurial Activity (TEA) (%)	9.7	6.7
FDI net inflows (% GDP)	2.2	2.0
Top R&D spending enterprises per 10 million population	0.0	16.2
Buyer sophistication (1 to 7 best)	2.8	3.7
Innovation profiles		
In-house product innovators with market novelties	9.7	10.7
In-house product innovators without market novelties	13.0	12.3
In-house business process innovators	7.8	11.0
Innovators that do not develop innovations themselves	7.1	11.6
Innovation active non-innovators	0.3	3.3
Non-innovators with potential to innovate	25.3	19.9
Non-innovators without disposition to innovate	36.9	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	73.1	76.5
Basic school entrepreneurial education and training	1.7	2.0
Govt. procurement of advanced tech. products	2.5	3.5
Rule of law (-2.5 to 2.5 best)	0.3	1.1
Climate change indicators		
Circular material use rate	4.9	11.7
Greenhouse gas emissions intensity of energy consumption	90.3	86.6
Eco-Innovation Index	72.0	100.0
Demography		
Population size	4.1	446.7
Average annual population growth (%)	-0.6	0.1
Population density	73.3	108.8

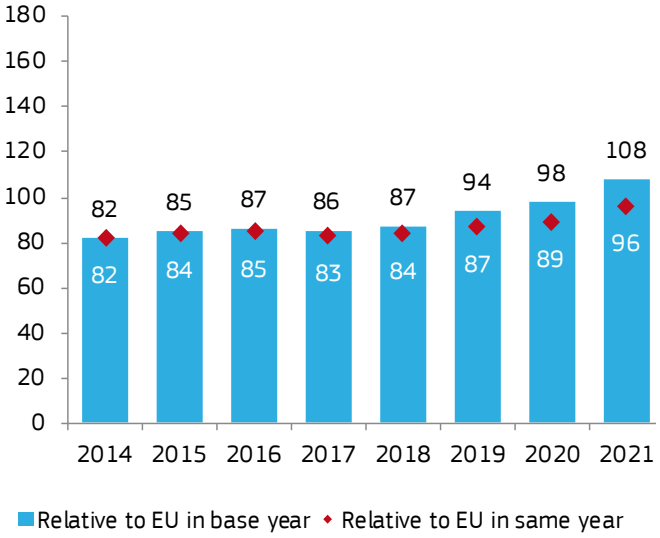
Croatia's strengths are in *Innovators*, *Use of information technologies*, and *Linkages*. The top-3 indicators include Product innovators, Business process innovators, and Enterprises providing ICT training.
The strong performance increase between 2020 and 2021 is due to performance increases for several indicators using innovation survey data, Digital skills, and Venture capital.
Croatia has below average shares of In-house business process innovators and Innovators that do not develop innovations themselves.
Croatia is showing below average scores on the Climate change related indicators.

Croatia	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**69.5**	**56.7**	**78.2**
Human resources	**51.7**	**50.6**	**54.8**
Doctorate graduates	48.1	54.0	42.6
Population with tertiary education	75.0	66.9	96.7
Lifelong learning	26.3	26.7	28.9
Attractive research systems	**53.3**	**34.7**	**59.9**
International scientific co-publications	81.9	66.7	107.4
Most cited publications	32.6	24.2	32.1
Foreign doctorate students	48.7	15.8	57.9
Digitalisation	**90.6**	**70.2**	**125.4**
Broadband penetration	72.2	31.6	109.5
People with above basic overall digital skills	118.2	116.7	144.4
Finance and support	**50.1**	**34.6**	**59.7**
R&D expenditures in the public sector	70.9	40.4	68.4
Venture capital expenditures	72.5	62.3	121.9
Government support for business R&D	3.6	7.4	4.2
Firm investments	**54.1**	**74.1**	**65.4**
R&D expenditure in the business sector	34.8	22.8	38.6
Non-R&D Innovation expenditures	107.0	118.7	121.6
Innovation expenditures per employee	23.8	89.3	31.5
Use of information technologies	**95.8**	**95.2**	**110.7**
Enterprises providing ICT training	120.0	120.0	120.0
Employed ICT specialists	75.0	66.7	100.0
Innovators	**131.8**	**67.1**	**180.3**
Product innovators (SMEs)	143.0	49.1	201.8
Business process innovators (SMEs)	121.3	83.0	161.3
Linkages	**95.1**	**81.7**	**128.2**
Innovative SMEs collaborating with others	103.2	82.4	151.2
Public-private co-publications	113.2	94.0	126.9
Job-to-job mobility of HRST	78.6	71.8	112.8
Intellectual assets	**35.7**	**20.8**	**30.9**
PCT patent applications	15.0	21.6	13.0
Trademark applications	61.8	35.7	64.8
Design applications	19.5	5.4	13.3
Employment impacts	**88.9**	**58.0**	**90.6**
Employment in knowledge-intensive activities	74.4	64.0	81.3
Employment in innovative enterprises	100.6	53.7	97.1
Sales impacts	**50.4**	**43.8**	**51.3**
Medium and high tech goods exports	58.7	56.1	64.3
Knowledge-intensive services exports	7.5	5.3	7.9
Sales of innovative products	98.7	73.3	85.8
Environmental sustainability	**75.3**	**78.5**	**78.4**
Resource productivity	79.5	81.8	117.7
Air emissions by fine particulate matter	71.8	62.1	76.3
Environment-related technologies	76.9	97.4	57.8

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Italy is a **Moderate Innovator**.
Over time, performance relative to the EU has increased strongly.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	IT	EU
Performance and structure of the economy		
GDP per capita (PPS)	29,800	30,800
Average annual GDP growth (%)	-4.1	-2.5
Employment share Manufacturing (NACE C) (%)	18.6	16.5
of which High and Medium high-tech (%)	33.8	37.9
Employment share Services (NACE G-N) (%)	45.0	41.2
of which Knowledge-intensive services (%)	37.3	35.1
Turnover share SMEs (%)	41.9	36.5
Turnover share large enterprises (%)	31.0	45.7
Foreign-controlled enterprises – share of value added (%)	6.7	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.1	1.0
Total Entrepreneurial Activity (TEA) (%)	3.8	6.7
FDI net inflows (% GDP)	1.1	2.0
Top R&D spending enterprises per 10 million population	6.4	16.2
Buyer sophistication (1 to 7 best)	3.8	3.7
Innovation profiles		
In-house product innovators with market novelties	10.0	10.7
In-house product innovators without market novelties	22.3	12.3
In-house business process innovators	16.0	11.0
Innovators that do not develop innovations themselves	8.4	11.6
Innovation active non-innovators	5.2	3.3
Non-innovators with potential to innovate	7.4	19.9
Non-innovators without disposition to innovate	30.8	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	73.0	76.5
Basic school entrepreneurial education and training	2.0	2.0
Govt. procurement of advanced tech. products	2.9	3.5
Rule of law (-2.5 to 2.5 best)	0.3	1.1
Climate change indicators		
Circular material use rate	18.8	11.7
Greenhouse gas emissions intensity of energy consumption	84.9	86.6
Eco-Innovation Index	112.0	100.0
Demography		
Population size	60.0	446.7
Average annual population growth (%)	-0.7	0.1
Population density	202.6	108.8

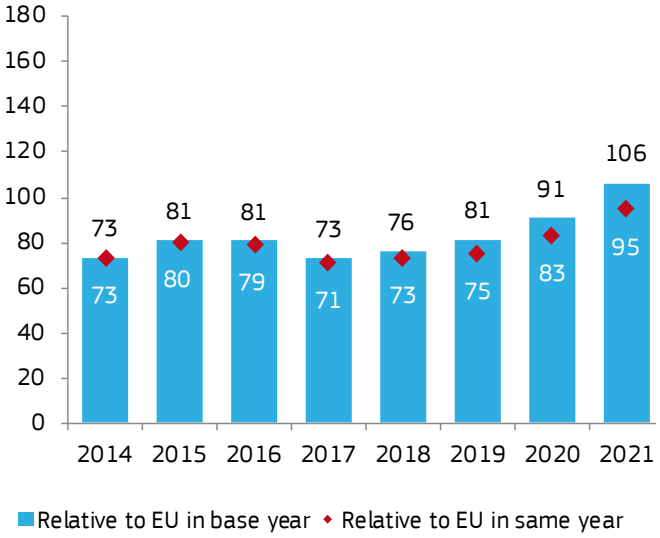
Italy's strengths are in *Innovators*, *Employment impacts* and *Environmental sustainability*. The top-3 indicators include Resource productivity, Sales of innovative products, and Design applications.
The strong increase between 2019 and 2021 is due to improved performance on the indicators using innovation survey data and Broadband penetration.
Italy has above average shares of In-house product innovators without market novelties and In-house business process innovators. Italy is showing above average scores on the Climate change related indicators.

Italy	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**96.0**	**82.0**	**108.1**
Human resources	**56.2**	**51.9**	**59.6**
Doctorate graduates	74.0	77.0	65.5
Population with tertiary education	25.0	33.3	32.2
Lifelong learning	72.7	63.3	80.0
Attractive research systems	**99.6**	**86.7**	**112.0**
International scientific co-publications	91.5	85.0	120.0
Most cited publications	113.9	97.6	112.0
Foreign doctorate students	86.0	66.2	102.1
Digitalisation	**68.7**	**71.4**	**95.1**
Broadband penetration	75.2	70.7	114.0
People with above basic overall digital skills	59.1	72.2	72.2
Finance and support	**82.5**	**56.5**	**98.2**
R&D expenditures in the public sector	60.0	63.2	57.9
Venture capital expenditures	50.9	75.0	85.7
Government support for business R&D	140.2	34.5	162.2
Firm investments	**77.7**	**66.3**	**93.8**
R&D expenditure in the business sector	61.0	61.4	67.7
Non-R&D Innovation expenditures	107.0	78.6	121.6
Innovation expenditures per employee	97.9	61.3	129.3
Use of information technologies	**76.9**	**62.2**	**88.8**
Enterprises providing ICT training	66.7	33.3	66.7
Employed ICT specialists	85.7	95.2	114.3
Innovators	**144.2**	**149.3**	**197.3**
Product innovators (SMEs)	134.5	139.9	189.7
Business process innovators (SMEs)	153.3	157.6	204.0
Linkages	**86.2**	**64.4**	**116.2**
Innovative SMEs collaborating with others	118.9	47.6	174.3
Public-private co-publications	119.3	104.5	133.7
Job-to-job mobility of HRST	42.9	46.2	61.5
Intellectual assets	**110.4**	**89.3**	**95.6**
PCT patent applications	68.1	57.8	59.1
Trademark applications	109.3	93.7	114.7
Design applications	159.2	113.0	109.1
Employment impacts	**126.5**	**110.3**	**128.8**
Employment in knowledge-intensive activities	104.9	101.3	114.7
Employment in innovative enterprises	143.9	116.6	138.9
Sales impacts	**93.2**	**83.3**	**95.0**
Medium and high tech goods exports	85.3	91.3	93.5
Knowledge-intensive services exports	61.8	75.7	65.5
Sales of innovative products	151.7	81.7	131.9
Environmental sustainability	**124.6**	**103.5**	**129.8**
Resource productivity	196.1	161.0	290.4
Air emissions by fine particulate matter	104.0	100.8	110.6
Environment-related technologies	78.6	72.7	59.0

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Cyprus is a **Moderate Innovator**.
Over time, performance relative to the EU has increased strongly.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	CY	EU
Performance and structure of the economy		
GDP per capita (PPS)	27,700	30,800
Average annual GDP growth (%)	-2.3	-2.5
Employment share Manufacturing (NACE C) (%)	7.3	16.5
of which High and Medium high-tech (%)	12.1	37.9
Employment share Services (NACE G-N) (%)	53.5	41.2
of which Knowledge-intensive services (%)	39.0	35.1
Turnover share SMEs (%)	n/a	36.5
Turnover share large enterprises (%)	22.7	45.7
Foreign-controlled enterprises – share of value added (%)	5.8	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.2	1.0
Total Entrepreneurial Activity (TEA) (%)	7.8	6.7
FDI net inflows (% GDP)	36.6	2.0
Top R&D spending enterprises per 10 million population	0.0	16.2
Buyer sophistication (1 to 7 best)	3.9	3.7
Innovation profiles		
In-house product innovators with market novelties	n/a	10.7
In-house product innovators without market novelties	n/a	12.3
In-house business process innovators	n/a	11.0
Innovators that do not develop innovations themselves	n/a	11.6
Innovation active non-innovators	n/a	3.3
Non-innovators with potential to innovate	n/a	19.9
Non-innovators without disposition to innovate	n/a	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	72.8	76.5
Basic school entrepreneurial education and training	2.1	2.0
Govt. procurement of advanced tech. products	3.1	3.5
Rule of law (-2.5 to 2.5 best)	0.8	1.1
Climate change indicators		
Circular material use rate	2.7	11.7
Greenhouse gas emissions intensity of energy consumption	96.9	86.6
Eco-Innovation Index	56.0	100.0
Demography		
Population size	0.9	446.7
Average annual population growth (%)	1.4	0.1
Population density	94.5	108.8

Cyprus' strengths are in *Linkages*, *Innovators*, and *Employment impacts*. The top-3 indicators include International scientific co-publications, Innovative SMEs collaborating with others, and Population with tertiary education.

The strong performance improvement between 2019 and 2021 is due to very strong increases in several indicators, including Venture capital, Broadband penetration, Product innovators, and Innovative SMEs collaborating with others.

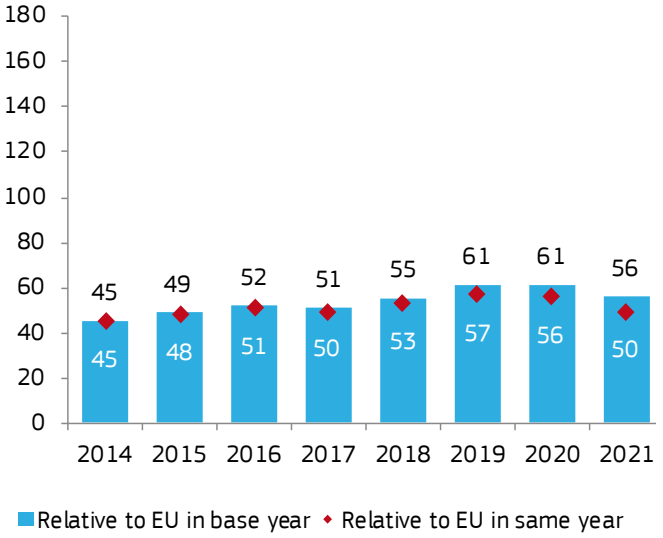
Cyprus is showing below average scores on the Climate change related indicators.

Cyprus	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**94.6**	**73.4**	**106.5**
Human resources	**102.6**	**101.6**	**108.7**
Doctorate graduates	35.1	19.6	31.1
Population with tertiary education	212.8	249.6	274.4
Lifelong learning	50.5	75.6	55.6
Attractive research systems	**119.6**	**109.4**	**134.6**
International scientific co-publications	177.1	140.3	232.3
Most cited publications	96.4	112.8	94.8
Foreign doctorate students	78.8	62.9	93.6
Digitalisation	**80.7**	**15.1**	**111.6**
Broadband penetration	86.0	0.0	130.4
People with above basic overall digital skills	72.7	33.3	88.9
Finance and support	**67.0**	**21.3**	**79.8**
R&D expenditures in the public sector	21.8	22.8	21.1
Venture capital expenditures	180.8	38.9	304.1
Government support for business R&D	2.3	6.9	2.7
Firm investments	**41.8**	**30.3**	**50.5**
R&D expenditure in the business sector	14.9	1.6	16.5
Non-R&D Innovation expenditures	109.6	79.4	124.5
Innovation expenditures per employee	36.9	19.6	48.6
Use of information technologies	**92.4**	**91.6**	**106.7**
Enterprises providing ICT training	133.3	113.3	133.3
Employed ICT specialists	57.1	66.7	76.2
Innovators	**163.5**	**110.0**	**223.7**
Product innovators (SMEs)	169.3	83.8	238.8
Business process innovators (SMEs)	158.1	133.1	210.4
Linkages	**183.9**	**144.4**	**248.0**
Innovative SMEs collaborating with others	237.4	185.7	347.8
Public-private co-publications	181.3	113.2	203.3
Job-to-job mobility of HRST	146.4	138.5	210.3
Intellectual assets	**54.1**	**61.4**	**46.9**
PCT patent applications	17.8	8.4	15.5
Trademark applications	68.9	135.8	72.3
Design applications	72.5	35.1	49.7
Employment impacts	**147.2**	**100.5**	**149.9**
Employment in knowledge-intensive activities	140.2	149.3	153.3
Employment in innovative enterprises	152.8	66.0	147.5
Sales impacts	**100.7**	**88.5**	**102.5**
Medium and high tech goods exports	96.1	71.5	105.3
Knowledge-intensive services exports	106.5	110.2	112.8
Sales of innovative products	99.7	85.2	86.7
Environmental sustainability	**29.1**	**47.9**	**30.3**
Resource productivity	54.6	29.5	80.9
Air emissions by fine particulate matter	28.8	40.2	30.6
Environment-related technologies	0.0	68.8	0.0

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Latvia is an **Emerging Innovator**.
Over time, performance relative to the EU has increased strongly up until 2020 and decreased in 2021.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	LV	EU
Performance and structure of the economy		
GDP per capita (PPS)	21,100	30,800
Average annual GDP growth (%)	-0.2	-2.5
Employment share Manufacturing (NACE C) (%)	12.8	16.5
of which High and Medium high-tech (%)	14.1	37.9
Employment share Services (NACE G-N) (%)	41.9	41.2
of which Knowledge-intensive services (%)	28.9	35.1
Turnover share SMEs (%)	53.8	36.5
Turnover share large enterprises (%)	22.4	45.7
Foreign-controlled enterprises – share of value added (%)	14.6	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.8	1.0
Total Entrepreneurial Activity (TEA) (%)	14.8	6.7
FDI net inflows (% GDP)	2.9	2.0
Top R&D spending enterprises per 10 million population	0.0	16.2
Buyer sophistication (1 to 7 best)	3.1	3.7
Innovation profiles		
In-house product innovators with market novelties	11.4	10.7
In-house product innovators without market novelties	3.9	12.3
In-house business process innovators	6.6	11.0
Innovators that do not develop innovations themselves	8.6	11.6
Innovation active non-innovators	2.4	3.3
Non-innovators with potential to innovate	24.5	19.9
Non-innovators without disposition to innovate	42.6	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	80.2	76.5
Basic school entrepreneurial education and training	2.6	2.0
Govt. procurement of advanced tech. products	2.9	3.5
Rule of law (-2.5 to 2.5 best)	1.0	1.1
Climate change indicators		
Circular material use rate	5.0	11.7
Greenhouse gas emissions intensity of energy consumption	84.7	86.6
Eco-Innovation Index	86.0	100.0
Demography		
Population size	1.9	446.7
Average annual population growth (%)	-0.7	0.1
Population density	30.4	108.8

Latvia's strengths are in *Use of information technologies*, *Human resources* and *Digitalisation*. The top-3 indicators include Population with tertiary education, Trademark applications and Enterprises providing ICT training.

The relative strong decrease in innovation performance between 2020 and 2021 is the result of a sharp decline in Venture capital investments (from 0.215% to 0.019% of GDP) and Development of environment-related technologies (from 12.4 to 5.1).

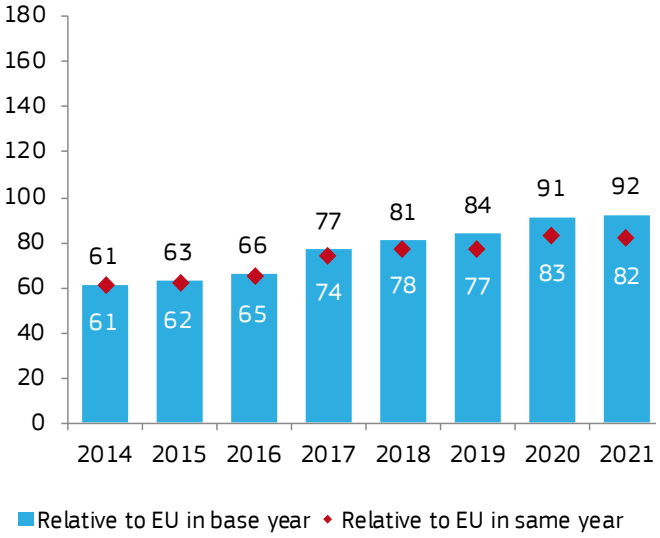
Latvia has above average shares of Non-innovators with potential to innovate and Non-innovators without disposition to innovate. Latvia is showing below average scores on the Climate change related indicators.

Latvia	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**49.6**	**45.3**	**55.9**
Human resources	**71.7**	**75.0**	**76.0**
Doctorate graduates	22.1	42.6	19.6
Population with tertiary education	128.2	128.9	165.3
Lifelong learning	65.7	70.0	72.2
Attractive research systems	**53.0**	**14.1**	**59.7**
International scientific co-publications	68.9	37.0	90.4
Most cited publications	40.1	6.0	39.4
Foreign doctorate students	53.2	2.2	63.2
Digitalisation	**78.9**	**111.1**	**109.1**
Broadband penetration	86.0	134.2	130.4
People with above basic overall digital skills	68.2	83.3	83.3
Finance and support	**25.0**	**34.0**	**29.7**
R&D expenditures in the public sector	52.7	57.9	50.9
Venture capital expenditures	13.5	26.8	22.7
Government support for business R&D	5.0	6.4	5.8
Firm investments	**27.2**	**58.8**	**32.9**
R&D expenditure in the business sector	8.5	7.9	9.4
Non-R&D Innovation expenditures	57.3	154.8	65.1
Innovation expenditures per employee	10.4	32.7	13.8
Use of information technologies	**75.4**	**45.8**	**87.1**
Enterprises providing ICT training	80.0	40.0	80.0
Employed ICT specialists	71.4	52.4	95.2
Innovators	**41.3**	**28.7**	**56.6**
Product innovators (SMEs)	42.3	13.2	59.7
Business process innovators (SMEs)	40.4	42.3	53.8
Linkages	**58.3**	**65.4**	**78.6**
Innovative SMEs collaborating with others	45.7	43.7	66.9
Public-private co-publications	78.9	40.2	88.4
Job-to-job mobility of HRST	55.4	100.0	79.5
Intellectual assets	**67.4**	**35.8**	**58.4**
PCT patent applications	26.0	13.9	22.5
Trademark applications	104.3	73.3	109.5
Design applications	58.2	18.3	39.9
Employment impacts	**52.4**	**33.6**	**53.4**
Employment in knowledge-intensive activities	64.6	61.3	70.7
Employment in innovative enterprises	42.6	14.0	41.2
Sales impacts	**58.3**	**45.8**	**59.4**
Medium and high tech goods exports	41.4	36.2	45.3
Knowledge-intensive services exports	70.7	69.0	74.8
Sales of innovative products	68.3	30.7	59.4
Environmental sustainability	**22.3**	**19.0**	**23.2**
Resource productivity	59.0	66.1	87.4
Air emissions by fine particulate matter	0.0	0.0	0.0
Environment-related technologies	19.6	15.5	14.8

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Lithuania is a **Moderate Innovator**. Over time, performance relative to the EU has increased strongly.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	LT	EU
Performance and structure of the economy		
GDP per capita (PPS)	25,100	30,800
Average annual GDP growth (%)	1.8	-2.5
Employment share Manufacturing (NACE C) (%)	15.9	16.5
of which High and Medium high-tech (%)	15.2	37.9
Employment share Services (NACE G-N) (%)	40.6	41.2
of which Knowledge-intensive services (%)	27.1	35.1
Turnover share SMEs (%)	49.1	36.5
Turnover share large enterprises (%)	32.2	45.7
Foreign-controlled enterprises – share of value added (%)	12.6	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.4	1.0
Total Entrepreneurial Activity (TEA) (%)	11.3	6.7
FDI net inflows (% GDP)	2.6	2.0
Top R&D spending enterprises per 10 million population	0.0	16.2
Buyer sophistication (1 to 7 best)	3.3	3.7
Innovation profiles		
In-house product innovators with market novelties	14.7	10.7
In-house product innovators without market novelties	10.1	12.3
In-house business process innovators	11.2	11.0
Innovators that do not develop innovations themselves	12.4	11.6
Innovation active non-innovators	2.1	3.3
Non-innovators with potential to innovate	15.0	19.9
Non-innovators without disposition to innovate	34.5	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	81.1	76.5
Basic school entrepreneurial education and training	n/a	2.0
Govt. procurement of advanced tech. products	3.0	3.5
Rule of law (-2.5 to 2.5 best)	1.0	1.1
Climate change indicators		
Circular material use rate	4.3	11.7
Greenhouse gas emissions intensity of energy consumption	103.4	86.6
Eco-Innovation Index	82.0	100.0
Demography		
Population size	2.8	446.7
Average annual population growth (%)	-0.3	0.1
Population density	44.8	108.8

Lithuania's strengths are in *Linkages*, *Digitalisation* and *Innovators*. The top-3 indicators includes Population with tertiary education, Environment-related technologies, and Job-to-job mobility of HRST.

The strong increase in innovation performance in 2017 was due to improved performance on the indicators using innovation survey data. Between 2020 and 2021 performance did not change, with improved performance in both *Use of information technologies* indicators being offset with reduced performance in the indicators using innovation survey expenditure data.

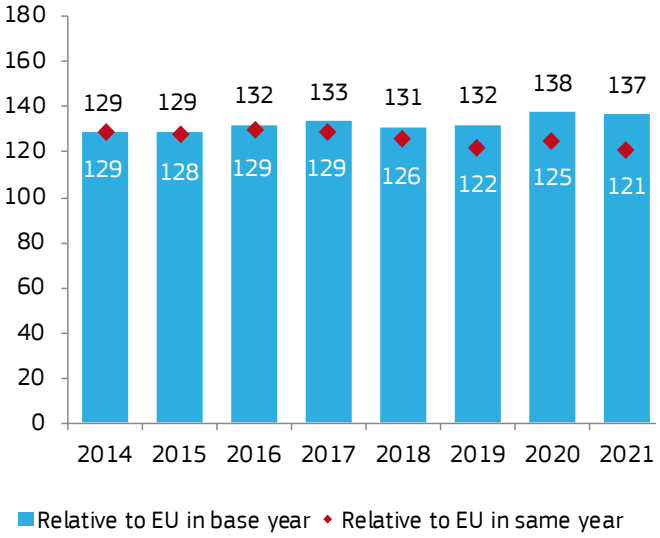
Lithuania has an above average share of In-house product innovators with market novelties and is showing below average scores on the Climate change related indicators.

Lithuania	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**81.8**	**61.2**	**92.1**
Human resources	**106.3**	**106.8**	**112.7**
Doctorate graduates	48.1	54.0	42.6
Population with tertiary education	201.3	238.0	259.5
Lifelong learning	61.6	50.0	67.8
Attractive research systems	**53.2**	**23.1**	**59.9**
International scientific co-publications	80.1	51.6	105.0
Most cited publications	41.5	16.7	40.8
Foreign doctorate students	35.7	0.0	42.4
Digitalisation	**114.8**	**122.0**	**158.7**
Broadband penetration	121.6	126.5	184.4
People with above basic overall digital skills	104.5	116.7	127.8
Finance and support	**61.8**	**51.4**	**73.6**
R&D expenditures in the public sector	69.1	84.2	66.7
Venture capital expenditures	98.2	44.4	165.1
Government support for business R&D	16.4	11.5	19.0
Firm investments	**70.5**	**56.8**	**85.1**
R&D expenditure in the business sector	27.0	15.0	29.9
Non-R&D Innovation expenditures	143.1	131.9	162.6
Innovation expenditures per employee	46.0	38.4	60.8
Use of information technologies	**66.1**	**32.0**	**76.4**
Enterprises providing ICT training	60.0	26.7	60.0
Employed ICT specialists	71.4	38.1	95.2
Innovators	**110.4**	**40.7**	**151.1**
Product innovators (SMEs)	108.0	20.4	152.4
Business process innovators (SMEs)	112.6	58.7	149.8
Linkages	**120.8**	**91.6**	**162.9**
Innovative SMEs collaborating with others	110.8	83.3	162.4
Public-private co-publications	77.8	47.7	87.2
Job-to-job mobility of HRST	153.6	130.8	220.5
Intellectual assets	**65.3**	**38.1**	**56.6**
PCT patent applications	17.2	12.8	14.9
Trademark applications	115.7	81.2	121.4
Design applications	43.1	18.0	29.5
Employment impacts	**90.0**	**43.4**	**91.6**
Employment in knowledge-intensive activities	64.6	45.3	70.7
Employment in innovative enterprises	110.3	42.1	106.5
Sales impacts	**44.3**	**24.3**	**45.1**
Medium and high tech goods exports	57.9	38.4	63.5
Knowledge-intensive services exports	4.4	0.1	4.6
Sales of innovative products	79.3	34.6	68.9
Environmental sustainability	**104.6**	**113.6**	**108.9**
Resource productivity	47.8	58.1	70.8
Air emissions by fine particulate matter	113.1	100.3	120.2
Environment-related technologies	155.7	163.6	117.0

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Luxembourg is a **Strong Innovator**. Over time, performance relative to the EU has decreased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	LU	EU
Performance and structure of the economy		
GDP per capita (PPS)	80,600	30,800
Average annual GDP growth (%)	-1.3	-2.5
Employment share Manufacturing (NACE C) (%)	4.2	16.5
of which High and Medium high-tech (%)	18.5	37.9
Employment share Services (NACE G-N) (%)	47.5	41.2
of which Knowledge-intensive services (%)	60.5	35.1
Turnover share SMEs (%)	47.1	36.5
Turnover share large enterprises (%)	39.6	45.7
Foreign-controlled enterprises – share of value added (%)	19.3	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.9	1.0
Total Entrepreneurial Activity (TEA) (%)	10.0	6.7
FDI net inflows (% GDP)	-15.0	2.0
Top R&D spending enterprises per 10 million population	255.2	16.2
Buyer sophistication (1 to 7 best)	5.0	3.7
Innovation profiles		
In-house product innovators with market novelties	n/a	10.7
In-house product innovators without market novelties	n/a	12.3
In-house business process innovators	n/a	11.0
Innovators that do not develop innovations themselves	n/a	11.6
Innovation active non-innovators	n/a	3.3
Non-innovators with potential to innovate	n/a	19.9
Non-innovators without disposition to innovate	n/a	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	69.6	76.5
Basic school entrepreneurial education and training	2.5	2.0
Govt. procurement of advanced tech. products	4.7	3.5
Rule of law (-2.5 to 2.5 best)	1.8	1.1
Climate change indicators		
Circular material use rate	11.1	11.7
Greenhouse gas emissions intensity of energy consumption	92.1	86.6
Eco-Innovation Index	165.0	100.0
Demography		
Population size	0.6	446.7
Average annual population growth (%)	2.0	0.1
Population density	235.2	108.8

Luxembourg's strengths are in *Attractive research systems*, *Human resources* and *Intellectual assets*. The top-3 indicators include Foreign doctorate students, Trademark applications, and International scientific co-publications.

The increase in innovation performance between 2019 and 2020 was due to a strong increase in Doctorate graduates and Job-to-job mobility of HRST. The decrease in 2021 is mainly caused by a strong decline in Employment in innovative enterprises.

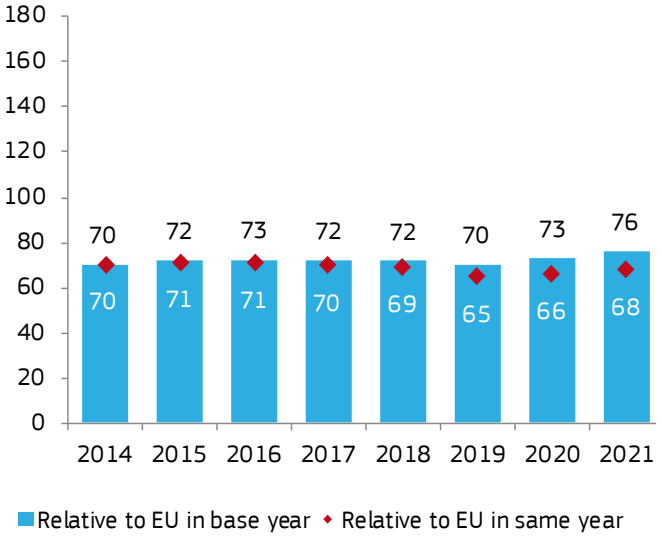
Luxembourg is showing above average scores on the Climate change related indicators.

Luxembourg	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**121.3**	**128.8**	**136.5**
Human resources	**170.6**	**132.8**	**180.8**
Doctorate graduates	126.0	42.6	111.5
Population with tertiary education	207.1	219.0	266.9
Lifelong learning	183.8	190.0	202.2
Attractive research systems	**184.5**	**185.2**	**207.7**
International scientific co-publications	173.0	185.6	226.8
Most cited publications	128.9	104.9	126.7
Foreign doctorate students	297.3	353.1	353.1
Digitalisation	**122.0**	**130.3**	**168.8**
Broadband penetration	121.6	114.0	184.4
People with above basic overall digital skills	122.7	150.0	150.0
Finance and support	**94.2**	**110.1**	**112.2**
R&D expenditures in the public sector	74.5	66.7	71.9
Venture capital expenditures	180.8	304.1	304.1
Government support for business R&D	28.3	33.3	32.7
Firm investments	**45.1**	**39.8**	**54.5**
R&D expenditure in the business sector	39.0	51.2	43.3
Non-R&D Innovation expenditures	29.7	9.8	33.7
Innovation expenditures per employee	65.0	52.4	85.8
Use of information technologies	**145.3**	**147.0**	**167.9**
Enterprises providing ICT training	106.7	113.3	106.7
Employed ICT specialists	178.6	185.7	238.1
Innovators	**98.6**	**163.8**	**134.9**
Product innovators (SMEs)	100.0	140.7	141.1
Business process innovators (SMEs)	97.2	184.2	129.3
Linkages	**145.2**	**153.8**	**195.8**
Innovative SMEs collaborating with others	105.6	101.9	154.8
Public-private co-publications	198.1	172.4	222.1
Job-to-job mobility of HRST	142.9	176.9	205.1
Intellectual assets	**145.8**	**154.1**	**126.4**
PCT patent applications	55.9	49.9	48.5
Trademark applications	192.6	202.2	202.2
Design applications	175.8	198.9	120.5
Employment impacts	**144.5**	**172.2**	**147.2**
Employment in knowledge-intensive activities	229.3	229.3	250.7
Employment in innovative enterprises	76.5	131.8	73.8
Sales impacts	**95.6**	**99.5**	**97.4**
Medium and high tech goods exports	77.8	88.6	85.3
Knowledge-intensive services exports	148.7	148.4	157.4
Sales of innovative products	48.4	55.6	42.1
Environmental sustainability	**116.9**	**121.6**	**121.8**
Resource productivity	184.6	248.6	273.4
Air emissions by fine particulate matter	90.1	71.0	95.8
Environment-related technologies	86.5	111.0	65.0

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Hungary is an **Emerging Innovator**. Over time, performance relative to the EU has decreased.



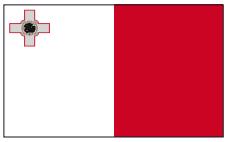
Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	HU	EU
Performance and structure of the economy		
GDP per capita (PPS)	22,000	30,800
Average annual GDP growth (%)	-0.1	-2.5
Employment share Manufacturing (NACE C) (%)	22.1	16.5
of which High and Medium high-tech (%)	44.1	37.9
Employment share Services (NACE G-N) (%)	35.6	41.2
of which Knowledge-intensive services (%)	30.0	35.1
Turnover share SMEs (%)	38.4	36.5
Turnover share large enterprises (%)	42.4	45.7
Foreign-controlled enterprises – share of value added (%)	25.3	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.4	1.0
Total Entrepreneurial Activity (TEA) (%)	7.9	6.7
FDI net inflows (% GDP)	-19.1	2.0
Top R&D spending enterprises per 10 million population	1.0	16.2
Buyer sophistication (1 to 7 best)	3.2	3.7
Innovation profiles		
In-house product innovators with market novelties	9.5	10.7
In-house product innovators without market novelties	6.5	12.3
In-house business process innovators	3.2	11.0
Innovators that do not develop innovations themselves	6.3	11.6
Innovation active non-innovators	3.0	3.3
Non-innovators with potential to innovate	44.9	19.9
Non-innovators without disposition to innovate	26.6	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	73.1	76.5
Basic school entrepreneurial education and training	1.5	2.0
Govt. procurement of advanced tech. products	2.8	3.5
Rule of law (-2.5 to 2.5 best)	0.5	1.1
Climate change indicators		
Circular material use rate	6.9	11.7
Greenhouse gas emissions intensity of energy consumption	79.3	86.6
Eco-Innovation Index	54.0	100.0
Demography		
Population size	9.8	446.7
Average annual population growth (%)	0.0	0.1
Population density	107.2	108.8

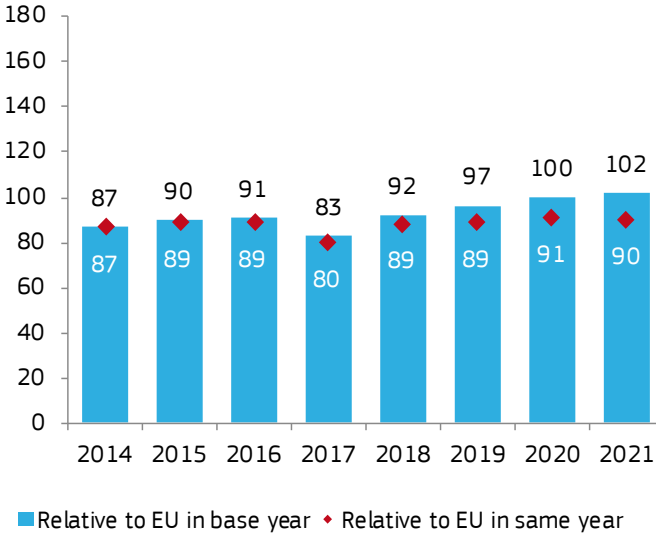
Hungary's strengths are in *Sales impacts*, *Digitalisation* and *Linkages*. The top-3 indicators include Government support for business R&D, Medium and high-tech goods exports, and Foreign doctorate students. The strong performance improvement between 2019 and 2021 is the result of improved performance on Foreign doctorate students, Broadband penetration, Venture capital, Government support for business R&D, Product and Business process innovators, Innovative SMEs collaborating with others, and Job-to-job mobility of HRST.
Hungary has an above average share of Non-innovators with potential to innovate and is showing below average scores on the Climate change related indicators.

Hungary	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**67.9**	**70.5**	**76.4**
Human resources	**42.0**	**52.0**	**44.5**
Doctorate graduates	35.1	31.1	31.1
Population with tertiary education	43.6	68.6	56.2
Lifelong learning	49.5	68.9	54.4
Attractive research systems	**68.0**	**48.1**	**76.6**
International scientific co-publications	65.5	64.2	85.9
Most cited publications	49.6	39.5	48.7
Foreign doctorate students	103.6	45.6	123.0
Digitalisation	**86.4**	**84.6**	**119.5**
Broadband penetration	95.6	94.9	144.9
People with above basic overall digital skills	72.7	72.2	88.9
Finance and support	**83.4**	**95.1**	**99.4**
R&D expenditures in the public sector	32.7	40.4	31.6
Venture capital expenditures	73.9	53.6	124.3
Government support for business R&D	151.0	199.0	174.7
Firm investments	**64.2**	**74.8**	**77.6**
R&D expenditure in the business sector	75.2	61.4	83.5
Non-R&D Innovation expenditures	59.2	93.4	67.3
Innovation expenditures per employee	42.2	73.3	55.6
Use of information technologies	**78.1**	**85.8**	**90.2**
Enterprises providing ICT training	73.3	73.3	73.3
Employed ICT specialists	82.1	100.0	109.5
Innovators	**35.7**	**29.8**	**48.8**
Product innovators (SMEs)	56.3	13.1	79.4
Business process innovators (SMEs)	16.4	44.5	21.8
Linkages	**83.5**	**65.0**	**112.5**
Innovative SMEs collaborating with others	79.8	58.2	116.9
Public-private co-publications	99.3	82.9	111.4
Job-to-job mobility of HRST	76.8	56.4	110.3
Intellectual assets	**48.1**	**38.0**	**41.7**
PCT patent applications	37.3	43.0	32.4
Trademark applications	69.6	56.0	73.0
Design applications	27.9	15.8	19.1
Employment impacts	**46.0**	**56.6**	**46.8**
Employment in knowledge-intensive activities	79.3	90.7	86.7
Employment in innovative enterprises	19.2	32.4	18.6
Sales impacts	**94.6**	**93.2**	**96.4**
Medium and high tech goods exports	131.0	134.8	143.5
Knowledge-intensive services exports	68.0	65.9	72.0
Sales of innovative products	72.9	71.1	63.4
Environmental sustainability	**72.2**	**96.7**	**75.2**
Resource productivity	42.9	105.3	63.5
Air emissions by fine particulate matter	95.4	103.5	101.4
Environment-related technologies	64.6	82.9	48.5

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Malta is a **Moderate Innovator**.
Over time, performance relative to the EU has increased



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	MT	EU
Performance and structure of the economy		
GDP per capita (PPS)	30,800	30,800
Average annual GDP growth (%)	-3.9	-2.5
Employment share Manufacturing (NACE C) (%)	11.2	16.5
of which High and Medium high-tech (%)	29.3	37.9
Employment share Services (NACE G-N) (%)	47.6	41.2
of which Knowledge-intensive services (%)	39.6	35.1
Turnover share SMEs (%)	47.3	36.5
Turnover share large enterprises (%)	15.0	45.7
Foreign-controlled enterprises – share of value added (%)	16.2	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	2.1	1.0
Total Entrepreneurial Activity (TEA) (%)	n/a	6.7
FDI net inflows (% GDP)	29.7	2.0
Top R&D spending enterprises per 10 million population	13.5	16.2
Buyer sophistication (1 to 7 best)	3.7	3.7
Innovation profiles		
In-house product innovators with market novelties	11.0	10.7
In-house product innovators without market novelties	8.9	12.3
In-house business process innovators	8.9	11.0
Innovators that do not develop innovations themselves	3.5	11.6
Innovation active non-innovators	0.7	3.3
Non-innovators with potential to innovate	19.2	19.9
Non-innovators without disposition to innovate	47.7	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	65.6	76.5
Basic school entrepreneurial education and training	n/a	2.0
Govt. procurement of advanced tech. products	3.7	3.5
Rule of law (-2.5 to 2.5 best)	1.0	1.1
Climate change indicators		
Circular material use rate	7.2	11.7
Greenhouse gas emissions intensity of energy consumption	59.7	86.6
Eco-Innovation Index	73.0	100.0
Demography		
Population size	0.5	446.7
Average annual population growth (%)	4.0	0.1
Population density	1,620.0	108.8

Malta's strengths are in *Environmental sustainability*, *Use of information technologies* and *Intellectual assets*. The top-3 indicators include Trademark applications, Environment-related technologies, and Employment in knowledge-intensive activities.

The strong performance decline in 2017 was due to reduced performance on several of the indicators using data from the CIS 2014 innovation survey. Performance improvements since have been strongest in Broadband penetration, Foreign doctorate students, and Innovative SMEs collaborating with others.

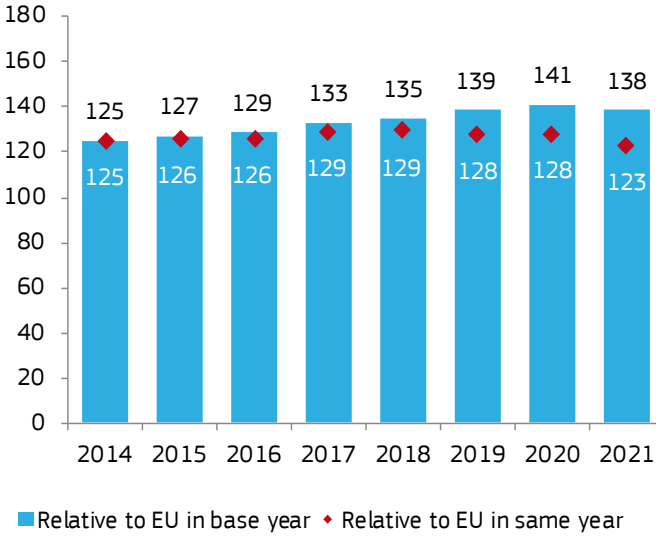
Malta has below average shares of In-house product innovators without market novelties and Innovators that do not develop innovations themselves. Malta is showing close to average scores on the Climate change related indicators.

Malta	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**90.4**	**86.9**	**101.8**
Human resources	**76.3**	**50.0**	**80.9**
Doctorate graduates	22.1	8.1	19.6
Population with tertiary education	106.4	62.0	137.2
Lifelong learning	111.1	107.8	122.2
Attractive research systems	**83.6**	**47.1**	**94.0**
International scientific co-publications	97.9	79.0	128.3
Most cited publications	61.5	42.4	60.5
Foreign doctorate students	101.7	16.3	120.8
Digitalisation	**120.1**	**127.8**	**166.1**
Broadband penetration	112.3	114.0	170.3
People with above basic overall digital skills	131.8	144.4	161.1
Finance and support	**13.2**	**39.3**	**15.8**
R&D expenditures in the public sector	7.3	29.8	7.0
Venture capital expenditures	4.7	53.4	7.9
Government support for business R&D	28.8	42.5	33.3
Firm investments	**48.7**	**75.1**	**58.9**
R&D expenditure in the business sector	22.7	33.9	25.2
Non-R&D Innovation expenditures	91.0	140.8	103.5
Innovation expenditures per employee	37.6	63.7	49.6
Use of information technologies	**138.1**	**108.0**	**159.5**
Enterprises providing ICT training	153.3	106.7	153.3
Employed ICT specialists	125.0	109.5	166.7
Innovators	**103.2**	**118.8**	**141.2**
Product innovators (SMEs)	107.9	100.6	152.3
Business process innovators (SMEs)	98.8	134.8	131.5
Linkages	**96.2**	**89.9**	**129.6**
Innovative SMEs collaborating with others	63.3	51.1	92.7
Public-private co-publications	91.0	72.5	102.0
Job-to-job mobility of HRST	123.2	130.8	176.9
Intellectual assets	**122.6**	**145.2**	**106.2**
PCT patent applications	41.5	20.9	36.0
Trademark applications	192.6	202.2	202.2
Design applications	107.6	198.9	73.7
Employment impacts	**121.9**	**121.0**	**124.2**
Employment in knowledge-intensive activities	153.7	146.7	168.0
Employment in innovative enterprises	96.5	102.8	93.1
Sales impacts	**66.6**	**64.1**	**67.8**
Medium and high tech goods exports	91.0	104.7	99.7
Knowledge-intensive services exports	30.1	10.2	31.9
Sales of innovative products	79.0	74.9	68.6
Environmental sustainability	**150.1**	**98.3**	**156.3**
Resource productivity	131.9	158.1	195.4
Air emissions by fine particulate matter	118.1	127.3	125.6
Environment-related technologies	229.3	25.8	172.3

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



The Netherlands is a **Strong Innovator**. Over time, performance relative to the EU has decreased, in particular due to a relatively strong decrease in 2021.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	NL	EU
Performance and structure of the economy		
GDP per capita (PPS)	39,800	30,800
Average annual GDP growth (%)	-1.7	-2.5
Employment share Manufacturing (NACE C) (%)	10.1	16.5
of which High and Medium high-tech (%)	31.1	37.9
Employment share Services (NACE G-N) (%)	46.7	41.2
of which Knowledge-intensive services (%)	40.9	35.1
Turnover share SMEs (%)	47.1	36.5
Turnover share large enterprises (%)	37.4	45.7
Foreign-controlled enterprises – share of value added (%)	14.7	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.7	1.0
Total Entrepreneurial Activity (TEA) (%)	10.9	6.7
FDI net inflows (% GDP)	-0.4	2.0
Top R&D spending enterprises per 10 million population	29.9	16.2
Buyer sophistication (1 to 7 best)	4.5	3.7
Innovation profiles		
In-house product innovators with market novelties	n/a	10.7
In-house product innovators without market novelties	n/a	12.3
In-house business process innovators	n/a	11.0
Innovators that do not develop innovations themselves	n/a	11.6
Innovation active non-innovators	n/a	3.3
Non-innovators with potential to innovate	n/a	19.9
Non-innovators without disposition to innovate	n/a	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	76.1	76.5
Basic school entrepreneurial education and training	3.4	2.0
Govt. procurement of advanced tech. products	4.0	3.5
Rule of law (-2.5 to 2.5 best)	1.8	1.1
Climate change indicators		
Circular material use rate	29.1	11.7
Greenhouse gas emissions intensity of energy consumption	95.4	86.6
Eco-Innovation Index	110.0	100.0
Demography		
Population size	17.3	446.7
Average annual population growth (%)	0.7	0.1
Population density	504.1	108.8

The Netherlands' strengths are in *Attractive research systems*, *Linkages* and *Use of information technologies*. The top-3 indicators include Foreign doctorate students, Public-private co-publications, and International scientific co-publications.

The performance decrease in 2021 is the result of reduced performance on Sales of innovative products, Product innovators, Employment in innovative enterprises, PCT patent applications, and Government support for business R&D.

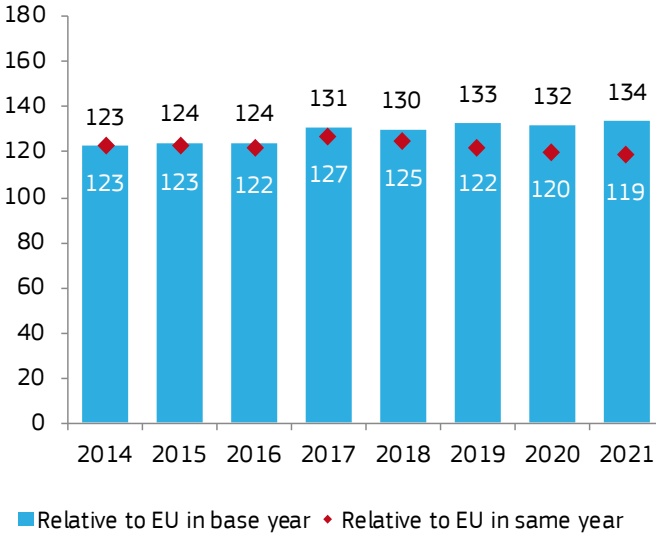
The Netherlands is showing above average scores on the Climate change related indicators.

Netherlands	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**123.1**	**125.3**	**138.5**
Human resources	**141.2**	**133.4**	**149.7**
Doctorate graduates	87.0	77.0	77.0
Population with tertiary education	162.2	169.4	209.1
Lifelong learning	187.9	188.9	206.7
Attractive research systems	**176.0**	**184.5**	**198.1**
International scientific co-publications	154.4	162.1	202.5
Most cited publications	158.7	168.3	156.0
Foreign doctorate students	236.5	246.8	280.9
Digitalisation	**148.6**	**152.6**	**205.5**
Broadband penetration	123.4	122.5	187.1
People with above basic overall digital skills	186.4	188.9	227.8
Finance and support	**110.0**	**118.2**	**131.0**
R&D expenditures in the public sector	94.5	115.8	91.2
Venture capital expenditures	137.5	108.6	231.2
Government support for business R&D	99.5	128.2	115.1
Firm investments	**69.8**	**67.1**	**84.3**
R&D expenditure in the business sector	100.0	81.1	111.0
Non-R&D Innovation expenditures	13.4	18.9	15.2
Innovation expenditures per employee	86.7	91.7	114.5
Use of information technologies	**145.0**	**126.1**	**167.5**
Enterprises providing ICT training	126.7	86.7	126.7
Employed ICT specialists	160.7	171.4	214.3
Innovators	**94.3**	**124.5**	**129.1**
Product innovators (SMEs)	90.6	160.6	127.9
Business process innovators (SMEs)	97.8	92.6	130.1
Linkages	**150.5**	**194.6**	**203.0**
Innovative SMEs collaborating with others	119.3	174.9	174.8
Public-private co-publications	208.2	206.2	233.5
Job-to-job mobility of HRST	139.3	200.0	200.0
Intellectual assets	**135.5**	**110.5**	**117.4**
PCT patent applications	161.3	150.5	140.0
Trademark applications	114.1	107.3	119.7
Design applications	139.0	78.4	95.3
Employment impacts	**119.6**	**125.4**	**121.8**
Employment in knowledge-intensive activities	147.6	152.0	161.3
Employment in innovative enterprises	97.2	106.5	93.8
Sales impacts	**94.8**	**94.3**	**96.5**
Medium and high tech goods exports	84.6	68.5	92.7
Knowledge-intensive services exports	125.9	127.2	133.3
Sales of innovative products	66.7	89.0	58.0
Environmental sustainability	**124.8**	**124.7**	**129.9**
Resource productivity	196.1	233.2	290.4
Air emissions by fine particulate matter	108.9	108.9	115.8
Environment-related technologies	70.2	80.7	52.7

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Austria is a **Strong Innovator**.
Over time, performance relative to the EU has decreased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	AT	EU
Performance and structure of the economy		
GDP per capita (PPS)	39,200	30,800
Average annual GDP growth (%)	-3.1	-2.5
Employment share Manufacturing (NACE C) (%)	15.9	16.5
of which High and Medium high-tech (%)	38.8	37.9
Employment share Services (NACE G-N) (%)	42.3	41.2
of which Knowledge-intensive services (%)	32.7	35.1
Turnover share SMEs (%)	45.1	36.5
Turnover share large enterprises (%)	33.0	45.7
Foreign-controlled enterprises – share of value added (%)	14.5	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.2	1.0
Total Entrepreneurial Activity (TEA) (%)	10.9	6.7
FDI net inflows (% GDP)	0.1	2.0
Top R&D spending enterprises per 10 million population	36.9	16.2
Buyer sophistication (1 to 7 best)	3.8	3.7
Innovation profiles		
In-house product innovators with market novelties	21.0	10.7
In-house product innovators without market novelties	9.5	12.3
In-house business process innovators	18.6	11.0
Innovators that do not develop innovations themselves	9.7	11.6
Innovation active non-innovators	3.7	3.3
Non-innovators with potential to innovate	13.9	19.9
Non-innovators without disposition to innovate	23.5	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	78.7	76.5
Basic school entrepreneurial education and training	1.7	2.0
Govt. procurement of advanced tech. products	3.4	3.5
Rule of law (-2.5 to 2.5 best)	1.9	1.1
Climate change indicators		
Circular material use rate	11.5	11.7
Greenhouse gas emissions intensity of energy consumption	84.7	86.6
Eco-Innovation Index	130.0	100.0
Demography		
Population size	8.9	446.7
Average annual population growth (%)	0.4	0.1
Population density	107.2	108.8

Austria's strengths are in *Intellectual assets*, *Linkages* and *Attractive research systems*. The top-3 indicators include Public-private co-publications, Design applications, and International scientific co-publications.

The increase in performance in 2017 was due to improved performance on several of the indicators using data from the CIS 2014 innovation survey. In 2021 performance increases on Job-to-job mobility of HRST, Sales of innovative products, and Broadband penetration, have been offset by performance reductions on Non-R&D innovation expenditures and Innovative SMEs collaborating with others.

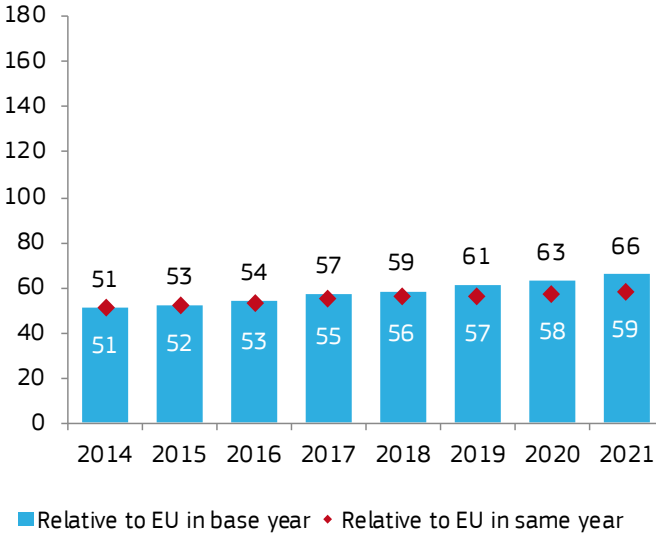
Austria has an above average share of In-house product innovators with market novelties and is showing close to average scores on the Climate change related indicators.

Austria	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**118.7**	**122.6**	**133.6**
Human resources	**120.6**	**118.6**	**127.8**
Doctorate graduates	113.0	100.0	100.0
Population with tertiary education	114.1	120.7	147.1
Lifelong learning	139.4	147.8	153.3
Attractive research systems	**137.8**	**133.2**	**155.1**
International scientific co-publications	143.6	150.1	188.4
Most cited publications	109.6	111.8	107.7
Foreign doctorate students	178.5	156.6	212.0
Digitalisation	**106.1**	**120.3**	**146.8**
Broadband penetration	86.0	109.5	130.4
People with above basic overall digital skills	136.4	133.3	166.7
Finance and support	**112.6**	**120.5**	**134.2**
R&D expenditures in the public sector	140.0	117.5	135.1
Venture capital expenditures	34.9	52.6	58.6
Government support for business R&D	160.8	172.2	186.0
Firm investments	**100.9**	**111.8**	**122.0**
R&D expenditure in the business sector	154.6	157.5	171.7
Non-R&D Innovation expenditures	43.0	64.4	48.9
Innovation expenditures per employee	92.5	104.2	122.1
Use of information technologies	**101.5**	**158.7**	**117.3**
Enterprises providing ICT training	86.7	193.3	86.7
Employed ICT specialists	114.3	119.0	152.4
Innovators	**138.3**	**132.1**	**189.2**
Product innovators (SMEs)	120.1	115.3	169.4
Business process innovators (SMEs)	155.4	146.9	206.7
Linkages	**146.8**	**162.7**	**197.9**
Innovative SMEs collaborating with others	133.3	185.4	195.4
Public-private co-publications	218.6	207.4	245.1
Job-to-job mobility of HRST	114.3	112.8	164.1
Intellectual assets	**157.5**	**152.1**	**136.5**
PCT patent applications	158.3	153.8	137.4
Trademark applications	136.0	135.3	142.7
Design applications	189.0	167.1	129.5
Employment impacts	**128.8**	**112.9**	**131.1**
Employment in knowledge-intensive activities	112.2	113.3	122.7
Employment in innovative enterprises	142.0	112.6	137.1
Sales impacts	**93.7**	**80.9**	**95.4**
Medium and high tech goods exports	102.8	108.2	112.7
Knowledge-intensive services exports	56.2	58.4	59.5
Sales of innovative products	132.8	72.0	115.4
Environmental sustainability	**104.5**	**108.9**	**108.8**
Resource productivity	92.3	95.4	136.8
Air emissions by fine particulate matter	120.2	117.5	127.8
Environment-related technologies	90.4	105.8	67.9

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Poland is an **Emerging Innovator.**
Over time, performance relative to the EU has increased strongly.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	PL	EU
Performance and structure of the economy		
GDP per capita (PPS)	22,000	30,800
Average annual GDP growth (%)	1.0	-2.5
Employment share Manufacturing (NACE C) (%)	20.6	16.5
of which High and Medium high-tech (%)	27.9	37.9
Employment share Services (NACE G-N) (%)	35.2	41.2
of which Knowledge-intensive services (%)	31.1	35.1
Turnover share SMEs (%)	33.8	36.5
Turnover share large enterprises (%)	44.2	45.7
Foreign-controlled enterprises – share of value added (%)	14.5	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.8	1.0
Total Entrepreneurial Activity (TEA) (%)	6.5	6.7
FDI net inflows (% GDP)	2.5	2.0
Top R&D spending enterprises per 10 million population	0.9	16.2
Buyer sophistication (1 to 7 best)	3.4	3.7
Innovation profiles		
In-house product innovators with market novelties	5.2	10.7
In-house product innovators without market novelties	6.6	12.3
In-house business process innovators	6.7	11.0
Innovators that do not develop innovations themselves	3.4	11.6
Innovation active non-innovators	1.7	3.3
Non-innovators with potential to innovate	15.0	19.9
Non-innovators without disposition to innovate	61.3	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	77.1	76.5
Basic school entrepreneurial education and training	1.7	2.0
Govt. procurement of advanced tech. products	3.0	3.5
Rule of law (-2.5 to 2.5 best)	0.5	1.1
Climate change indicators		
Circular material use rate	9.8	11.7
Greenhouse gas emissions intensity of energy consumption	90.0	86.6
Eco-Innovation Index	59.0	100.0
Demography		
Population size	38.0	446.7
Average annual population growth (%)	0.0	0.1
Population density	123.6	108.8

Poland's strengths are in *Digitalisation*, *Intellectual assets* and *Use of information technologies*. The top-3 indicators include Design applications, Population with tertiary education, and Environment-related technologies.

The performance increase in the last two years is mostly due to strong improvements in Product and Business process innovators, Broadband penetration, Employment in innovative enterprises, and Public R&D expenditures.

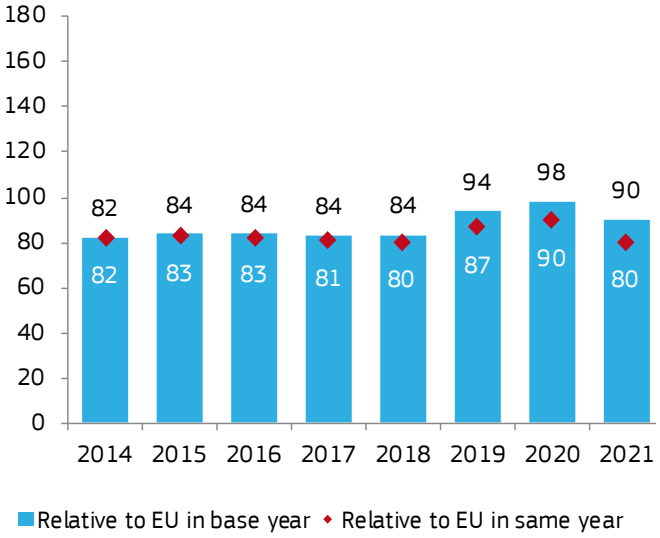
Poland has an above average share of Non-innovators without disposition to innovate and is showing below average scores on the Climate change related indicators.

Poland	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**58.5**	**51.3**	**65.9**
Human resources	**63.9**	**68.2**	**67.7**
Doctorate graduates	22.1	19.6	19.6
Population with tertiary education	126.3	155.4	162.8
Lifelong learning	39.4	53.3	43.3
Attractive research systems	**39.4**	**25.6**	**44.3**
International scientific co-publications	53.2	39.5	69.7
Most cited publications	44.3	22.8	43.6
Foreign doctorate students	11.3	13.8	13.5
Digitalisation	**83.1**	**60.9**	**114.9**
Broadband penetration	102.2	83.7	154.9
People with above basic overall digital skills	54.5	33.3	66.7
Finance and support	**56.0**	**49.2**	**66.7**
R&D expenditures in the public sector	56.4	64.9	54.4
Venture capital expenditures	36.8	58.0	61.9
Government support for business R&D	75.1	21.6	86.9
Firm investments	**60.1**	**64.6**	**72.7**
R&D expenditure in the business sector	55.3	22.0	61.4
Non-R&D Innovation expenditures	77.4	126.5	87.9
Innovation expenditures per employee	36.5	57.4	48.2
Use of information technologies	**78.5**	**48.9**	**90.7**
Enterprises providing ICT training	86.7	33.3	86.7
Employed ICT specialists	71.4	66.7	95.2
Innovators	**15.1**	**5.6**	**20.7**
Product innovators (SMEs)	21.3	2.9	30.0
Business process innovators (SMEs)	9.4	8.0	12.6
Linkages	**68.8**	**72.8**	**92.7**
Innovative SMEs collaborating with others	27.9	35.0	40.8
Public-private co-publications	63.4	41.9	71.1
Job-to-job mobility of HRST	101.8	123.1	146.2
Intellectual assets	**84.4**	**63.9**	**73.2**
PCT patent applications	15.1	13.3	13.1
Trademark applications	88.7	74.4	93.1
Design applications	155.5	98.4	106.6
Employment impacts	**31.3**	**26.1**	**31.9**
Employment in knowledge-intensive activities	59.8	53.3	65.3
Employment in innovative enterprises	8.6	6.8	8.3
Sales impacts	**63.6**	**60.0**	**64.8**
Medium and high tech goods exports	80.7	86.5	88.5
Knowledge-intensive services exports	53.9	45.8	57.0
Sales of innovative products	49.2	41.9	42.8
Environmental sustainability	**62.2**	**49.3**	**64.8**
Resource productivity	43.3	18.1	64.1
Air emissions by fine particulate matter	50.8	40.5	54.0
Environment-related technologies	105.1	79.2	79.0

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Portugal is a **Moderate Innovator**.
Over time, performance relative to the EU has increased up until 2020 and decreased strongly in 2021.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	PT	EU
Performance and structure of the economy		
GDP per capita (PPS)	24,200	30,800
Average annual GDP growth (%)	-2.8	-2.5
Employment share Manufacturing (NACE C) (%)	17.2	16.5
of which High and Medium high-tech (%)	19.4	37.9
Employment share Services (NACE G-N) (%)	41.3	41.2
of which Knowledge-intensive services (%)	31.7	35.1
Turnover share SMEs (%)	n/a	36.5
Turnover share large enterprises (%)	n/a	45.7
Foreign-controlled enterprises – share of value added (%)	10.3	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.4	1.0
Total Entrepreneurial Activity (TEA) (%)	12.9	6.7
FDI net inflows (% GDP)	4.2	2.0
Top R&D spending enterprises per 10 million population	4.5	16.2
Buyer sophistication (1 to 7 best)	3.7	3.7
Innovation profiles		
In-house product innovators with market novelties	12.1	10.7
In-house product innovators without market novelties	10.4	12.3
In-house business process innovators	6.3	11.0
Innovators that do not develop innovations themselves	7.5	11.6
Innovation active non-innovators	1.5	3.3
Non-innovators with potential to innovate	46.2	19.9
Non-innovators without disposition to innovate	15.9	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	76.5	76.5
Basic school entrepreneurial education and training	1.9	2.0
Govt. procurement of advanced tech. products	3.5	3.5
Rule of law (-2.5 to 2.5 best)	1.1	1.1
Climate change indicators		
Circular material use rate	2.1	11.7
Greenhouse gas emissions intensity of energy consumption	86.2	86.6
Eco-Innovation Index	100.0	100.0
Demography		
Population size	10.3	446.7
Average annual population growth (%)	0.0	0.1
Population density	113.1	108.8

Portugal's strengths are in *Attractive research systems*, *Digitalisation* and *Use of information technologies*. The top-3 indicators include Foreign doctorate students, International scientific co-publications, and Job-to-job mobility of HRST.

The recent decline in innovation performance is due to reduced performance on the indicators using innovation survey data, hiding strong performance increases on Tertiary education, Government support for business R&D, ICT specialists, Job-to-job mobility of HRST, and Environment-related technologies.

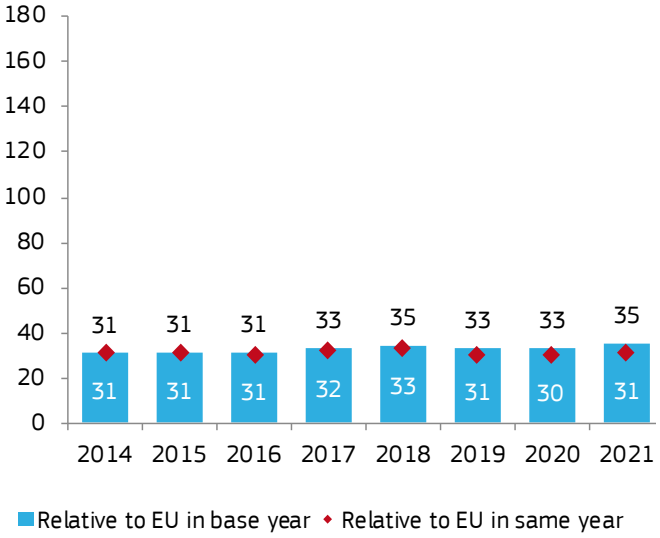
Portugal has below average shares of In-house business process innovators and Innovators that do not develop innovations themselves and is showing below average scores on the Climate change related indicators.

Portugal	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**80.2**	**82.3**	**90.3**
Human resources	**94.6**	**85.7**	**100.3**
Doctorate graduates	100.0	88.5	88.5
Population with tertiary education	87.2	62.8	112.4
Lifelong learning	97.0	106.7	106.7
Attractive research systems	**115.6**	**101.6**	**130.1**
International scientific co-publications	119.6	110.1	156.8
Most cited publications	89.3	100.3	87.8
Foreign doctorate students	155.7	93.6	184.9
Digitalisation	**121.9**	**110.2**	**168.6**
Broadband penetration	133.5	114.0	202.5
People with above basic overall digital skills	104.5	105.6	127.8
Finance and support	**94.1**	**91.6**	**112.1**
R&D expenditures in the public sector	83.6	87.7	80.7
Venture capital expenditures	73.8	98.7	124.1
Government support for business R&D	126.6	91.8	146.5
Firm investments	**50.1**	**56.5**	**60.6**
R&D expenditure in the business sector	48.9	50.4	54.3
Non-R&D Innovation expenditures	42.2	82.2	48.0
Innovation expenditures per employee	25.0	42.1	33.0
Use of information technologies	**103.5**	**99.2**	**119.6**
Enterprises providing ICT training	120.0	140.0	120.0
Employed ICT specialists	89.3	52.4	119.0
Innovators	**79.2**	**141.8**	**108.4**
Product innovators (SMEs)	92.5	115.5	130.6
Business process innovators (SMEs)	66.7	165.0	88.8
Linkages	**102.4**	**91.3**	**138.1**
Innovative SMEs collaborating with others	59.2	73.7	86.8
Public-private co-publications	114.5	89.6	128.4
Job-to-job mobility of HRST	126.8	105.1	182.1
Intellectual assets	**76.7**	**72.5**	**66.5**
PCT patent applications	28.7	17.9	24.9
Trademark applications	107.7	90.3	113.0
Design applications	83.8	103.3	57.4
Employment impacts	**65.2**	**81.7**	**66.4**
Employment in knowledge-intensive activities	65.9	44.0	72.0
Employment in innovative enterprises	64.7	108.4	62.4
Sales impacts	**64.8**	**63.3**	**66.0**
Medium and high tech goods exports	63.7	49.6	69.9
Knowledge-intensive services exports	37.4	52.5	39.6
Sales of innovative products	106.2	94.0	92.3
Environmental sustainability	**38.9**	**48.9**	**40.5**
Resource productivity	54.7	47.7	81.1
Air emissions by fine particulate matter	0.0	0.0	0.0
Environment-related technologies	90.7	112.1	68.1

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Romania is an **Emerging Innovator**. Over time, performance relative to the EU has remained the same.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	RO	EU
Performance and structure of the economy		
GDP per capita (PPS)	20,400	30,800
Average annual GDP growth (%)	0.4	-2.5
Employment share Manufacturing (NACE C) (%)	18.8	16.5
of which High and Medium high-tech (%)	33.9	37.9
Employment share Services (NACE G-N) (%)	32.4	41.2
of which Knowledge-intensive services (%)	26.8	35.1
Turnover share SMEs (%)	42.0	36.5
Turnover share large enterprises (%)	42.7	45.7
Foreign-controlled enterprises – share of value added (%)	15.9	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	2.2	1.0
Total Entrepreneurial Activity (TEA) (%)	10.8	6.7
FDI net inflows (% GDP)	2.9	2.0
Top R&D spending enterprises per 10 million population	0.0	16.2
Buyer sophistication (1 to 7 best)	2.8	3.7
Innovation profiles		
In-house product innovators with market novelties	2.4	10.7
In-house product innovators without market novelties	5.0	12.3
In-house business process innovators	3.5	11.0
Innovators that do not develop innovations themselves	3.4	11.6
Innovation active non-innovators	0.2	3.3
Non-innovators with potential to innovate	29.4	19.9
Non-innovators without disposition to innovate	56.0	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	73.0	76.5
Basic school entrepreneurial education and training	2.4	2.0
Govt. procurement of advanced tech. products	2.5	3.5
Rule of law (-2.5 to 2.5 best)	0.4	1.1
Climate change indicators		
Circular material use rate	1.6	11.7
Greenhouse gas emissions intensity of energy consumption	86.3	86.6
Eco-Innovation Index	57.0	100.0
Demography		
Population size	19.4	446.7
Average annual population growth (%)	-0.5	0.1
Population density	83.7	108.8

Romania's strengths are in *Sales impacts*, *Digitalisation* and *Environmental sustainability*. The top-3 indicators include Medium and high-tech goods exports, Broadband penetration, and Venture capital expenditures.

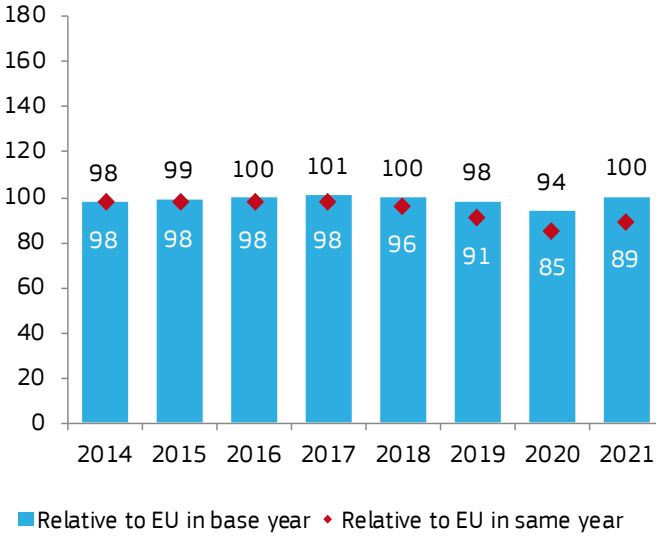
Recent performance increases are observed for International scientific co-publications, Most-cited publications, Foreign doctorate students, Broadband penetration, and Innovative SMEs collaborating with others. Romania has an above share of Non-innovators without disposition to innovate and is showing below average scores on the Climate change related indicators.

Romania	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**31.2**	**31.0**	**35.1**
Human resources	**13.2**	**39.6**	**14.0**
Doctorate graduates	22.1	77.0	19.6
Population with tertiary education	10.9	13.2	14.0
Lifelong learning	4.0	5.6	4.4
Attractive research systems	**35.0**	**22.3**	**39.4**
International scientific co-publications	36.1	30.0	47.4
Most cited publications	40.5	19.8	39.8
Foreign doctorate students	24.0	17.7	28.5
Digitalisation	**61.8**	**57.4**	**85.5**
Broadband penetration	100.0	104.9	151.7
People with above basic overall digital skills	4.5	0.0	5.6
Finance and support	**28.7**	**24.7**	**34.2**
R&D expenditures in the public sector	3.6	21.1	3.5
Venture capital expenditures	72.6	28.3	122.0
Government support for business R&D	12.5	27.3	14.5
Firm investments	**7.2**	**17.1**	**8.7**
R&D expenditure in the business sector	16.3	11.0	18.1
Non-R&D Innovation expenditures	0.0	40.4	0.0
Innovation expenditures per employee	6.3	4.7	8.4
Use of information technologies	**26.1**	**11.1**	**30.2**
Enterprises providing ICT training	6.7	0.0	6.7
Employed ICT specialists	42.9	23.8	57.1
Innovators	**3.8**	**9.7**	**5.2**
Product innovators (SMEs)	7.8	0.0	11.0
Business process innovators (SMEs)	0.0	18.2	0.0
Linkages	**16.0**	**15.1**	**21.5**
Innovative SMEs collaborating with others	13.4	0.0	19.7
Public-private co-publications	46.2	35.9	51.8
Job-to-job mobility of HRST	0.0	10.3	0.0
Intellectual assets	**32.8**	**22.0**	**28.4**
PCT patent applications	6.3	4.7	5.5
Trademark applications	56.9	47.0	59.8
Design applications	26.1	12.6	17.9
Employment impacts	**10.3**	**4.4**	**10.5**
Employment in knowledge-intensive activities	23.2	10.7	25.3
Employment in innovative enterprises	0.0	0.0	0.0
Sales impacts	**79.9**	**55.9**	**81.4**
Medium and high tech goods exports	100.8	92.1	110.4
Knowledge-intensive services exports	61.3	46.7	64.9
Sales of innovative products	72.4	19.4	63.0
Environmental sustainability	**38.2**	**61.4**	**39.8**
Resource productivity	10.6	7.7	15.7
Air emissions by fine particulate matter	66.4	59.9	70.6
Environment-related technologies	19.5	95.3	14.7

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Slovenia is a **Moderate Innovator**. Over time, performance relative to the EU has decreased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	SI	EU
Performance and structure of the economy		
GDP per capita (PPS)	26,900	30,800
Average annual GDP growth (%)	-2.0	-2.5
Employment share Manufacturing (NACE C) (%)	25.4	16.5
of which High and Medium high-tech (%)	40.7	37.9
Employment share Services (NACE G-N) (%)	36.0	41.2
of which Knowledge-intensive services (%)	36.1	35.1
Turnover share SMEs (%)	44.7	36.5
Turnover share large enterprises (%)	33.9	45.7
Foreign-controlled enterprises – share of value added (%)	14.3	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.6	1.0
Total Entrepreneurial Activity (TEA) (%)	7.0	6.7
FDI net inflows (% GDP)	2.6	2.0
Top R&D spending enterprises per 10 million population	9.6	16.2
Buyer sophistication (1 to 7 best)	3.4	3.7
Innovation profiles		
In-house product innovators with market novelties	14.9	10.7
In-house product innovators without market novelties	12.8	12.3
In-house business process innovators	5.5	11.0
Innovators that do not develop innovations themselves	14.0	11.6
Innovation active non-innovators	1.5	3.3
Non-innovators with potential to innovate	32.9	19.9
Non-innovators without disposition to innovate	18.4	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	76.4	76.5
Basic school entrepreneurial education and training	2.1	2.0
Govt. procurement of advanced tech. products	2.6	3.5
Rule of law (-2.5 to 2.5 best)	1.1	1.1
Climate change indicators		
Circular material use rate	10.0	11.7
Greenhouse gas emissions intensity of energy consumption	87.8	86.6
Eco-Innovation Index	94.0	100.0
Demography		
Population size	2.1	446.7
Average annual population growth (%)	0.7	0.1
Population density	103.1	108.8

Slovenia's strengths are in *Use of information technologies, Linkages* and *Human resources*. The top-3 indicators include Public-private co-publications, International scientific co-publications, and Enterprises providing ICT training.

The recent performance increase is due to strong improvements for Product innovators, Venture capital, and Sales of innovative products.

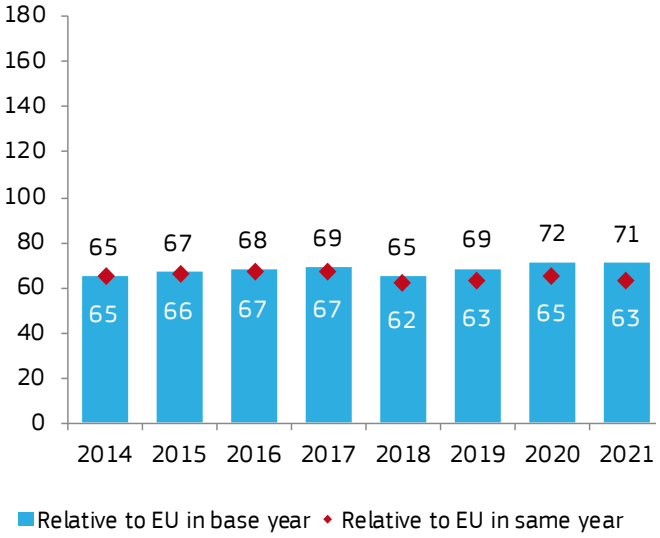
Slovenia has an above average share of In-house product innovators with market novelties and is showing close to average scores on the Climate change related indicators.

Slovenia	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**89.3**	**97.6**	**100.5**
Human resources	**111.8**	**152.2**	**118.5**
Doctorate graduates	100.0	180.4	88.5
Population with tertiary education	130.1	117.4	167.8
Lifelong learning	104.0	143.3	114.4
Attractive research systems	**87.9**	**79.8**	**99.0**
International scientific co-publications	128.7	132.0	168.8
Most cited publications	75.7	55.7	74.4
Foreign doctorate students	51.8	63.8	61.6
Digitalisation	**98.7**	**105.1**	**136.5**
Broadband penetration	97.8	114.0	148.3
People with above basic overall digital skills	100.0	94.4	122.2
Finance and support	**60.2**	**107.2**	**71.7**
R&D expenditures in the public sector	61.8	77.2	59.6
Venture capital expenditures	4.4	14.5	7.5
Government support for business R&D	115.2	213.4	133.3
Firm investments	**64.0**	**89.6**	**77.4**
R&D expenditure in the business sector	103.5	148.8	115.0
Non-R&D Innovation expenditures	7.6	66.9	8.6
Innovation expenditures per employee	49.6	49.0	65.5
Use of information technologies	**118.5**	**102.2**	**136.9**
Enterprises providing ICT training	140.0	100.0	140.0
Employed ICT specialists	100.0	104.8	133.3
Innovators	**106.6**	**109.5**	**145.8**
Product innovators (SMEs)	130.9	107.2	184.8
Business process innovators (SMEs)	83.9	111.6	111.6
Linkages	**115.3**	**145.2**	**155.4**
Innovative SMEs collaborating with others	110.9	176.7	162.5
Public-private co-publications	176.8	178.5	198.3
Job-to-job mobility of HRST	82.1	97.4	117.9
Intellectual assets	**91.4**	**82.0**	**79.2**
PCT patent applications	80.8	90.4	70.1
Trademark applications	118.7	93.9	124.6
Design applications	62.1	62.9	42.6
Employment impacts	**99.2**	**103.2**	**101.1**
Employment in knowledge-intensive activities	108.5	112.0	118.7
Employment in innovative enterprises	91.8	96.9	88.6
Sales impacts	**80.8**	**72.3**	**82.3**
Medium and high tech goods exports	106.3	102.6	116.5
Knowledge-intensive services exports	33.6	34.1	35.6
Sales of innovative products	106.9	77.9	93.0
Environmental sustainability	**82.6**	**66.2**	**86.0**
Resource productivity	90.3	82.6	133.8
Air emissions by fine particulate matter	82.2	84.3	87.4
Environment-related technologies	74.4	33.2	55.9

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Slovakia is an **Emerging Innovator**. Over time, performance relative to the EU has decreased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	SK	EU
Performance and structure of the economy		
GDP per capita (PPS)	21,700	30,800
Average annual GDP growth (%)	-1.3	-2.5
Employment share Manufacturing (NACE C) (%)	24.7	16.5
of which High and Medium high-tech (%)	45.1	37.9
Employment share Services (NACE G-N) (%)	34.3	41.2
of which Knowledge-intensive services (%)	30.8	35.1
Turnover share SMEs (%)	34.9	36.5
Turnover share large enterprises (%)	42.5	45.7
Foreign-controlled enterprises – share of value added (%)	21.2	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.5	1.0
Total Entrepreneurial Activity (TEA) (%)	12.4	6.7
FDI net inflows (% GDP)	n/a	2.0
Top R&D spending enterprises per 10 million population	0.0	16.2
Buyer sophistication (1 to 7 best)	3.0	3.7
Innovation profiles		
In-house product innovators with market novelties	5.3	10.7
In-house product innovators without market novelties	3.6	12.3
In-house business process innovators	5.5	11.0
Innovators that do not develop innovations themselves	4.5	11.6
Innovation active non-innovators	2.7	3.3
Non-innovators with potential to innovate	29.5	19.9
Non-innovators without disposition to innovate	49.0	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	75.4	76.5
Basic school entrepreneurial education and training	1.8	2.0
Govt. procurement of advanced tech. products	3.1	3.5
Rule of law (-2.5 to 2.5 best)	0.6	1.1
Climate change indicators		
Circular material use rate	5.4	11.7
Greenhouse gas emissions intensity of energy consumption	83.9	86.6
Eco-Innovation Index	62.0	100.0
Demography		
Population size	5.5	446.7
Average annual population growth (%)	0.1	0.1
Population density	111.8	108.8

Slovakia's strengths are in *Environmental sustainability, Sales impacts* and *Use of information technologies*. The top-3 indicators include Environment-related technologies, Medium and high-tech goods exports, and Air emissions by fine particulate matter.

In recent years performance increases for Tertiary education, International scientific co-publications, Most-cited publications, Venture capital, Government support for business R&D, ICT specialists, and Environment-related technologies, have been offset by reduced performance for Digital skills, Enterprises providing ICT training, Design applications, and Sales of innovative products.

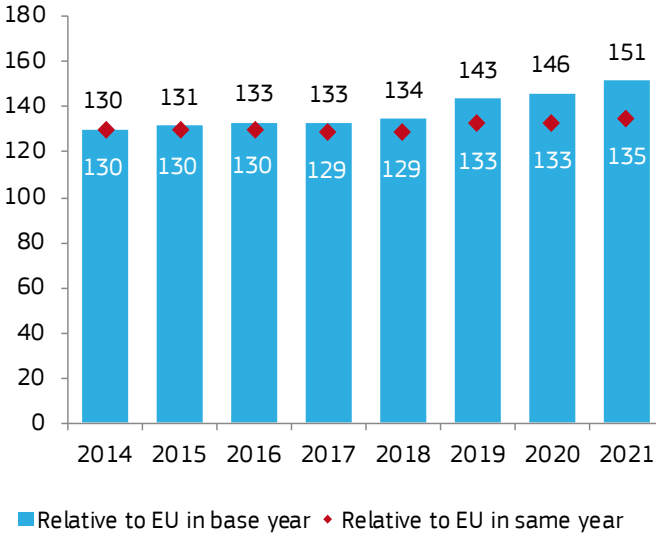
Slovakia has above average shares of Non-innovators and is showing below average scores on the Climate change related indicators.

Slovakia	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**63.1**	**65.1**	**71.0**
Human resources	**74.9**	**70.9**	**79.4**
Doctorate graduates	87.0	111.5	77.0
Population with tertiary education	98.7	49.6	127.3
Lifelong learning	27.3	25.6	30.0
Attractive research systems	**56.5**	**36.8**	**63.5**
International scientific co-publications	77.1	62.4	101.1
Most cited publications	42.6	15.7	41.8
Foreign doctorate students	51.6	48.3	61.3
Digitalisation	**81.2**	**94.7**	**112.3**
Broadband penetration	80.8	94.9	122.5
People with above basic overall digital skills	81.8	94.4	100.0
Finance and support	**25.5**	**31.1**	**30.4**
R&D expenditures in the public sector	36.4	50.9	35.1
Venture capital expenditures	14.9	11.3	25.0
Government support for business R&D	24.1	17.9	27.8
Firm investments	**48.2**	**55.6**	**58.2**
R&D expenditure in the business sector	28.4	22.0	31.5
Non-R&D Innovation expenditures	93.0	103.5	105.7
Innovation expenditures per employee	42.1	50.6	55.6
Use of information technologies	**83.8**	**73.8**	**96.8**
Enterprises providing ICT training	73.3	80.0	73.3
Employed ICT specialists	92.9	66.7	123.8
Innovators	**27.2**	**49.1**	**37.2**
Product innovators (SMEs)	29.9	36.1	42.2
Business process innovators (SMEs)	24.6	60.6	32.8
Linkages	**49.1**	**54.6**	**66.2**
Innovative SMEs collaborating with others	63.1	72.9	92.4
Public-private co-publications	75.6	65.6	84.8
Job-to-job mobility of HRST	23.2	33.3	33.3
Intellectual assets	**48.3**	**36.0**	**41.8**
PCT patent applications	18.0	13.8	15.6
Trademark applications	75.9	59.2	79.7
Design applications	40.4	32.9	27.7
Employment impacts	**46.2**	**44.7**	**47.1**
Employment in knowledge-intensive activities	64.6	58.7	70.7
Employment in innovative enterprises	31.4	34.9	30.4
Sales impacts	**90.5**	**104.9**	**92.2**
Medium and high tech goods exports	129.7	127.4	142.2
Knowledge-intensive services exports	41.7	37.5	44.1
Sales of innovative products	96.2	155.4	83.6
Environmental sustainability	**110.4**	**107.5**	**114.9**
Resource productivity	73.5	77.5	108.9
Air emissions by fine particulate matter	103.3	92.9	109.9
Environment-related technologies	166.3	144.0	125.0

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Finland is an **Innovation Leader**.
Over time, performance relative to the EU has increased, in particular in the last three years.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	FI	EU
Performance and structure of the economy		
GDP per capita (PPS)	34,300	30,800
Average annual GDP growth (%)	-0.9	-2.5
Employment share Manufacturing (NACE C) (%)	13.1	16.5
of which High and Medium high-tech (%)	37.1	37.9
Employment share Services (NACE G-N) (%)	40.2	41.2
of which Knowledge-intensive services (%)	41.3	35.1
Turnover share SMEs (%)	39.8	36.5
Turnover share large enterprises (%)	44.7	45.7
Foreign-controlled enterprises – share of value added (%)	10.4	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.6	1.0
Total Entrepreneurial Activity (TEA) (%)	6.7	6.7
FDI net inflows (% GDP)	3.1	2.0
Top R&D spending enterprises per 10 million population	62.2	16.2
Buyer sophistication (1 to 7 best)	4.6	3.7
Innovation profiles		
In-house product innovators with market novelties	22.9	10.7
In-house product innovators without market novelties	10.0	12.3
In-house business process innovators	12.8	11.0
Innovators that do not develop innovations themselves	9.9	11.6
Innovation active non-innovators	6.2	3.3
Non-innovators with potential to innovate	4.3	19.9
Non-innovators without disposition to innovate	33.8	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	80.1	76.5
Basic school entrepreneurial education and training	2.4	2.0
Govt. procurement of advanced tech. products	3.9	3.5
Rule of law (-2.5 to 2.5 best)	2.0	1.1
Climate change indicators		
Circular material use rate	5.9	11.7
Greenhouse gas emissions intensity of energy consumption	74.8	86.6
Eco-Innovation Index	145.0	100.0
Demography		
Population size	5.5	446.7
Average annual population growth (%)	0.1	0.1
Population density	18.1	108.8

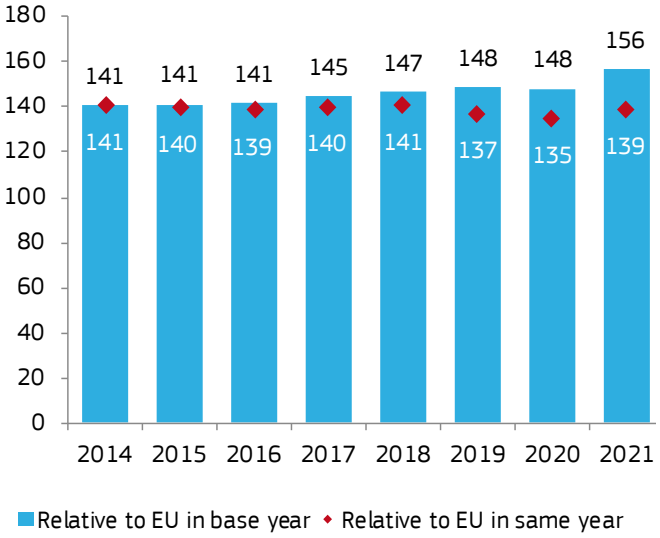
Finland's strengths are in *Use of information technologies*, *Intellectual assets* and *Linkages*. The top-3 indicators include Lifelong learning, PCT patent applications, and International scientific co-publications.
The performance increase between 2019 and 2021 is the result of improved performance for Venture capital from (0.121% to 0.254% of GDP), Sales of innovative products, and Resource productivity.
Finland has an above average share of In-house product innovators with market novelties and is showing close to average scores on the Climate change related indicators.

Finland	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**134.5**	**129.9**	**151.4**
Human resources	**169.0**	**168.5**	**179.1**
Doctorate graduates	138.9	134.5	123.0
Population with tertiary education	116.7	136.4	150.4
Lifelong learning	278.8	262.2	306.7
Attractive research systems	**137.1**	**118.6**	**154.3**
International scientific co-publications	161.7	163.5	212.0
Most cited publications	126.4	112.0	124.2
Foreign doctorate students	121.2	75.3	143.9
Digitalisation	**152.7**	**159.8**	**211.2**
Broadband penetration	130.2	144.9	197.5
People with above basic overall digital skills	186.4	177.8	227.8
Finance and support	**119.5**	**115.6**	**142.3**
R&D expenditures in the public sector	138.2	150.9	133.3
Venture capital expenditures	180.8	130.5	304.1
Government support for business R&D	35.5	56.8	41.1
Firm investments	**104.0**	**126.7**	**125.7**
R&D expenditure in the business sector	126.2	180.3	140.2
Non-R&D Innovation expenditures	68.3	52.7	77.6
Innovation expenditures per employee	107.8	132.5	142.3
Use of information technologies	**203.5**	**228.4**	**235.1**
Enterprises providing ICT training	220.0	220.0	220.0
Employed ICT specialists	189.3	238.1	252.4
Innovators	**128.4**	**127.6**	**175.6**
Product innovators (SMEs)	131.0	144.7	184.9
Business process innovators (SMEs)	125.9	112.6	167.5
Linkages	**177.5**	**166.8**	**239.4**
Innovative SMEs collaborating with others	237.4	172.6	347.8
Public-private co-publications	204.7	209.2	229.5
Job-to-job mobility of HRST	117.9	130.8	169.2
Intellectual assets	**167.2**	**141.8**	**144.9**
PCT patent applications	254.9	225.2	221.2
Trademark applications	121.4	105.3	127.5
Design applications	138.3	103.9	94.8
Employment impacts	**140.5**	**119.9**	**143.1**
Employment in knowledge-intensive activities	135.4	130.7	148.0
Employment in innovative enterprises	144.7	112.3	139.7
Sales impacts	**103.0**	**78.5**	**104.9**
Medium and high tech goods exports	73.6	59.1	80.7
Knowledge-intensive services exports	120.4	96.3	127.4
Sales of innovative products	126.4	83.0	109.9
Environmental sustainability	**79.3**	**89.7**	**82.6**
Resource productivity	30.3	24.6	44.8
Air emissions by fine particulate matter	95.7	97.0	101.8
Environment-related technologies	106.9	118.9	80.3

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Sweden is an **Innovation Leader**.
Over time, performance relative to the EU has decreased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	SE	EU
Performance and structure of the economy		
GDP per capita (PPS)	37,000	30,800
Average annual GDP growth (%)	-1.6	-2.5
Employment share Manufacturing (NACE C) (%)	10.0	16.5
of which High and Medium high-tech (%)	43.0	37.9
Employment share Services (NACE G-N) (%)	41.1	41.2
of which Knowledge-intensive services (%)	45.3	35.1
Turnover share SMEs (%)	36.6	36.5
Turnover share large enterprises (%)	46.5	45.7
Foreign-controlled enterprises – share of value added (%)	13.4	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.4	1.0
Total Entrepreneurial Activity (TEA) (%)	7.5	6.7
FDI net inflows (% GDP)	3.2	2.0
Top R&D spending enterprises per 10 million population	76.0	16.2
Buyer sophistication (1 to 7 best)	4.6	3.7
Innovation profiles		
In-house product innovators with market novelties	13.3	10.7
In-house product innovators without market novelties	14.0	12.3
In-house business process innovators	9.7	11.0
Innovators that do not develop innovations themselves	21.9	11.6
Innovation active non-innovators	1.7	3.3
Non-innovators with potential to innovate	3.7	19.9
Non-innovators without disposition to innovate	35.8	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	82.1	76.5
Basic school entrepreneurial education and training	2.5	2.0
Govt. procurement of advanced tech. products	4.0	3.5
Rule of law (-2.5 to 2.5 best)	1.9	1.1
Climate change indicators		
Circular material use rate	6.8	11.7
Greenhouse gas emissions intensity of energy consumption	71.4	86.6
Eco-Innovation Index	143.0	100.0
Demography		
Population size	10.2	446.7
Average annual population growth (%)	1.0	0.1
Population density	25.0	108.8

Sweden's strengths are in *Use of information technologies, Human resources* and *Attractive research systems*. The top-3 indicators include Lifelong learning, PCT patent applications, and International scientific co-publications.

The strong performance increase between 2020 and 2021 is due to improved performance for the indicators using innovation survey data and Venture capital.

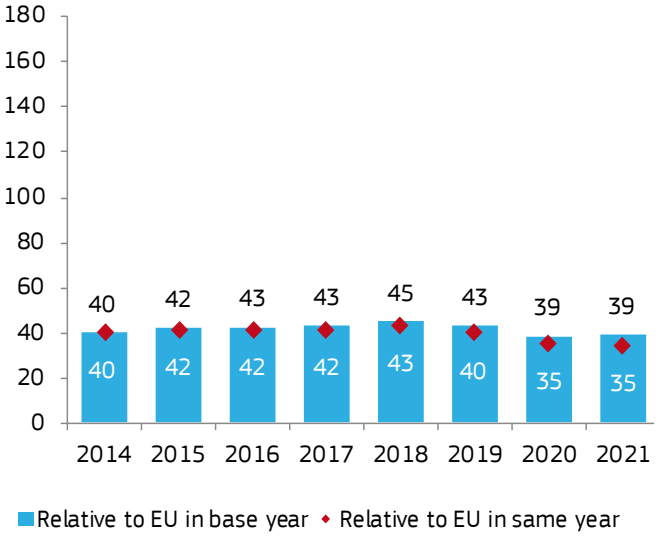
Sweden has above average shares of In-house product innovators with market novelties and Innovators that do not develop innovations themselves. Sweden is showing close to average scores on the Climate change related indicators.

Sweden	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**139.0**	**140.5**	**156.5**
Human resources	**183.6**	**208.0**	**194.6**
Doctorate graduates	138.9	157.4	123.0
Population with tertiary education	157.7	196.7	203.3
Lifelong learning	278.8	306.7	306.7
Attractive research systems	**160.3**	**163.2**	**180.4**
International scientific co-publications	172.4	180.9	226.1
Most cited publications	133.0	137.0	130.7
Foreign doctorate students	190.7	195.7	226.5
Digitalisation	**147.4**	**146.6**	**203.9**
Broadband penetration	133.5	148.3	202.5
People with above basic overall digital skills	168.2	144.4	205.6
Finance and support	**117.7**	**119.9**	**140.2**
R&D expenditures in the public sector	141.8	150.9	136.8
Venture capital expenditures	130.7	109.3	219.9
Government support for business R&D	76.8	85.2	88.8
Firm investments	**130.8**	**156.6**	**158.0**
R&D expenditure in the business sector	169.5	169.3	188.2
Non-R&D Innovation expenditures	66.7	103.0	75.8
Innovation expenditures per employee	141.3	186.5	186.5
Use of information technologies	**185.0**	**213.7**	**213.7**
Enterprises providing ICT training	180.0	180.0	180.0
Employed ICT specialists	189.3	252.4	252.4
Innovators	**145.0**	**125.3**	**198.4**
Product innovators (SMEs)	162.1	153.8	228.7
Business process innovators (SMEs)	129.0	100.2	171.7
Linkages	**132.0**	**156.2**	**178.0**
Innovative SMEs collaborating with others	127.4	151.5	186.8
Public-private co-publications	228.2	228.1	255.9
Job-to-job mobility of HRST	78.6	105.1	112.8
Intellectual assets	**166.5**	**147.5**	**144.3**
PCT patent applications	259.5	225.2	225.2
Trademark applications	125.7	114.6	131.9
Design applications	123.8	111.1	84.9
Employment impacts	**151.0**	**135.9**	**153.8**
Employment in knowledge-intensive activities	162.2	174.7	177.3
Employment in innovative enterprises	142.0	108.5	137.1
Sales impacts	**111.1**	**88.4**	**113.1**
Medium and high tech goods exports	97.0	96.7	106.4
Knowledge-intensive services exports	120.6	120.0	127.7
Sales of innovative products	120.4	40.0	104.7
Environmental sustainability	**90.8**	**88.9**	**94.5**
Resource productivity	51.5	78.0	76.2
Air emissions by fine particulate matter	105.3	102.3	111.9
Environment-related technologies	110.5	78.3	83.0

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Bosnia and Herzegovina is an **Emerging Innovator**. Over time, performance relative to the EU has decreased, in particular in the last two years.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	BA	EU
Performance and structure of the economy		
GDP per capita (PPS)	10,060	30,800
Average annual GDP growth (%)	-1.5	-2.5
Employment share Manufacturing (NACE C) (%)	18.0	16.5
of which High and Medium high-tech (%)	n/a	37.9
Employment share Services (NACE G-N) (%)	29.3	41.2
of which Knowledge-intensive services (%)	n/a	35.1
Turnover share SMEs (%)	n/a	36.5
Turnover share large enterprises (%)	n/a	45.7
Foreign-controlled enterprises – share of value added (%)	9.4	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	n/a	1.0
Total Entrepreneurial Activity (TEA) (%)	4.0	6.7
FDI net inflows (% GDP)	2.8	2.0
Top R&D spending enterprises per 10 million population	0.0	16.2
Buyer sophistication (1 to 7 best)	2.5	3.7
Innovation profiles		
In-house product innovators with market novelties	n/a	10.7
In-house product innovators without market novelties	n/a	12.3
In-house business process innovators	n/a	11.0
Innovators that do not develop innovations themselves	n/a	11.6
Innovation active non-innovators	n/a	3.3
Non-innovators with potential to innovate	n/a	19.9
Non-innovators without disposition to innovate	n/a	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	65.4	76.5
Basic school entrepreneurial education and training	2.1	2.0
Govt. procurement of advanced tech. products	1.9	3.5
Rule of law (-2.5 to 2.5 best)	-0.2	1.1
Climate change indicators		
Circular material use rate	n/a	11.7
Greenhouse gas emissions intensity of energy consumption	n/a	86.6
Demography		
Population size	3.4	446.7
Average annual population growth (%)	-0.9	0.1
Population density	65.5	108.8

Bosnia and Herzegovina's strengths are in *Innovators*, *Employment impacts* and *Use of information technologies*. The top-3 indicators include Product innovators, Business process innovators, and Employment in innovative enterprises.

Innovation performance has decreased in the last two years due to reduced performance on Tertiary education, Public R&D expenditures, Design applications, and Environment-related technologies.

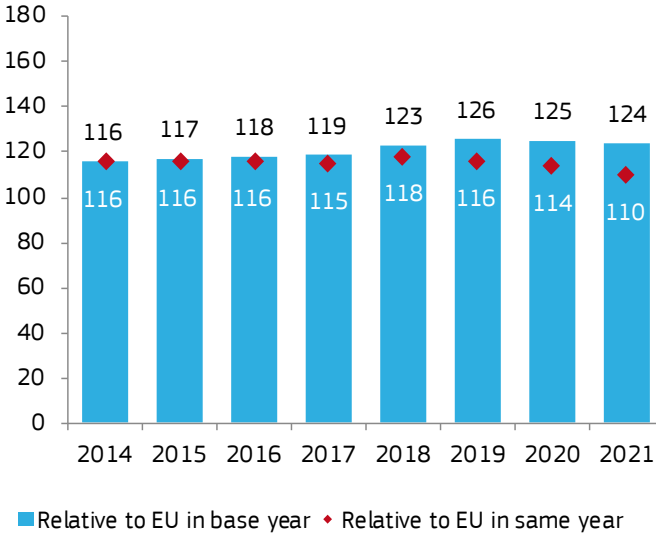
Performance did improve strongly for Medium and high-tech goods exports.

Bosnia and Herzegovina	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**34.6**	**40.2**	**39.0**
Human resources	**8.5**	**6.7**	**9.0**
Doctorate graduates	14.2	4.6	12.6
Population with tertiary education	2.0	0.0	2.5
Lifelong learning	9.1	17.8	10.0
Attractive research systems	**61.7**	**34.1**	**69.5**
International scientific co-publications	81.9	66.7	107.4
Most cited publications	31.8	6.9	31.3
Foreign doctorate students	N/A	N/A	N/A
Digitalisation	**39.5**	**54.7**	**54.7**
Broadband penetration	65.9	100.0	100.0
People with above basic overall digital skills	0.0	0.0	0.0
Finance and support	**1.2**	**2.0**	**1.4**
R&D expenditures in the public sector	0.0	0.0	0.0
Venture capital expenditures	N/A	N/A	N/A
Government support for business R&D	2.5	4.2	2.9
Firm investments	**0.2**	**3.1**	**0.3**
R&D expenditure in the business sector	1.4	8.7	1.6
Non-R&D Innovation expenditures	0.0	0.0	0.0
Innovation expenditures per employee	0.0	0.0	0.0
Use of information technologies	**61.7**	**78.4**	**71.2**
Enterprises providing ICT training	66.7	73.3	66.7
Employed ICT specialists	N/A	N/A	N/A
Innovators	**112.0**	**153.3**	**153.3**
Product innovators (SMEs)	147.1	207.5	207.5
Business process innovators (SMEs)	79.3	105.5	105.5
Linkages	**24.3**	**14.4**	**32.8**
Innovative SMEs collaborating with others	N/A	N/A	N/A
Public-private co-publications	31.8	15.7	35.7
Job-to-job mobility of HRST	N/A	N/A	N/A
Intellectual assets	**26.7**	**14.0**	**23.1**
PCT patent applications	3.3	5.8	2.8
Trademark applications	61.8	35.7	64.8
Design applications	0.0	0.0	0.0
Employment impacts	**85.3**	**86.9**	**86.9**
Employment in knowledge-intensive activities	N/A	N/A	N/A
Employment in innovative enterprises	76.9	74.2	74.2
Sales impacts	**26.7**	**20.8**	**27.2**
Medium and high tech goods exports	19.5	5.7	21.4
Knowledge-intensive services exports	1.6	0.0	1.7
Sales of innovative products	75.1	65.3	65.3
Environmental sustainability	**27.8**	**91.6**	**29.0**
Resource productivity	16.1	20.2	23.9
Air emissions by fine particulate matter	N/A	N/A	N/A
Environment-related technologies	55.1	163.5	41.4

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Iceland is a **Strong Innovator**.
Over time, performance relative to the EU has decreased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	IS	EU
Performance and structure of the economy		
GDP per capita (PPS)	40,100	30,800
Average annual GDP growth (%)	-3.8	-2.5
Employment share Manufacturing (NACE C) (%)	7.7	16.5
of which High and Medium high-tech (%)	31.0	37.9
Employment share Services (NACE G-N) (%)	38.5	41.2
of which Knowledge-intensive services (%)	38.7	35.1
Turnover share SMEs (%)	n/a	36.5
Turnover share large enterprises (%)	n/a	45.7
Foreign-controlled enterprises – share of value added (%)	n/a	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.0	1.0
Total Entrepreneurial Activity (TEA) (%)	n/a	6.7
FDI net inflows (% GDP)	-19.9	2.0
Top R&D spending enterprises per 10 million population	9.3	16.2
Buyer sophistication (1 to 7 best)	4.1	3.7
Innovation profiles		
In-house product innovators with market novelties	n/a	10.7
In-house product innovators without market novelties	n/a	12.3
In-house business process innovators	n/a	11.0
Innovators that do not develop innovations themselves	n/a	11.6
Innovation active non-innovators	n/a	3.3
Non-innovators with potential to innovate	n/a	19.9
Non-innovators without disposition to innovate	n/a	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	79.0	76.5
Basic school entrepreneurial education and training	n/a	2.0
Govt. procurement of advanced tech. products	3.6	3.5
Rule of law (-2.5 to 2.5 best)	1.7	1.1
Climate change indicators		
Circular material use rate	n/a	11.7
Greenhouse gas emissions intensity of energy consumption	47.3	86.6
Demography		
Population size	0.4	446.7
Average annual population growth (%)	2.2	0.1
Population density	3.5	108.8

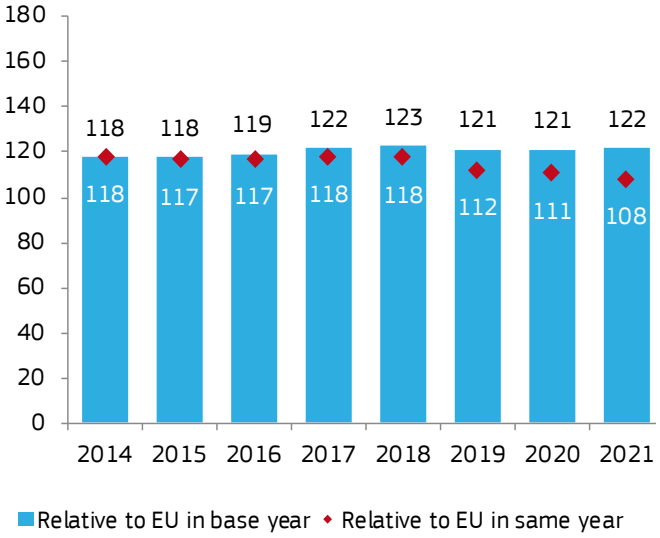
Iceland's strengths are in *Linkages*, *Attractive research systems* and *Finance and support*. The top-3 indicators include International scientific co-publications, Public-private co-publications, and Lifelong learning.
In the most recent years innovation performance is declining, which is mostly due to reduced performance for Doctorate graduates, Business R&D expenditures, Product and Business process innovators, Job-to-job mobility of HRST, Design applications, and Employment in knowledge-intensive activities.
Iceland is showing a above average performance on Greenhouse gas emissions.

Iceland	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**109.9**	**115.8**	**123.7**
Human resources	**132.6**	**139.1**	**140.5**
Doctorate graduates	48.1	54.0	42.6
Population with tertiary education	157.7	140.5	203.3
Lifelong learning	215.2	282.2	236.7
Attractive research systems	**157.6**	**166.5**	**177.4**
International scientific co-publications	211.4	277.2	277.2
Most cited publications	101.6	107.6	99.8
Foreign doctorate students	179.4	148.9	213.0
Digitalisation	**148.6**	**173.1**	**205.5**
Broadband penetration	114.2	114.0	173.2
People with above basic overall digital skills	200.0	244.4	244.4
Finance and support	**156.7**	**113.4**	**186.7**
R&D expenditures in the public sector	150.9	101.8	145.6
Venture capital expenditures	N/A	N/A	N/A
Government support for business R&D	158.2	93.0	183.0
Firm investments	**61.3**	**69.8**	**74.0**
R&D expenditure in the business sector	77.3	70.9	85.8
Non-R&D Innovation expenditures	67.9	77.2	77.2
Innovation expenditures per employee	47.7	62.9	62.9
Use of information technologies	**147.8**	**122.2**	**170.7**
Enterprises providing ICT training	186.7	133.3	186.7
Employed ICT specialists	114.3	109.5	152.4
Innovators	**101.7**	**159.0**	**139.1**
Product innovators (SMEs)	95.4	184.3	134.6
Business process innovators (SMEs)	107.6	136.6	143.1
Linkages	**197.3**	**251.6**	**266.0**
Innovative SMEs collaborating with others	191.5	256.1	280.7
Public-private co-publications	293.5	329.1	329.1
Job-to-job mobility of HRST	144.6	189.7	207.7
Intellectual assets	**64.2**	**82.1**	**55.6**
PCT patent applications	110.7	81.2	96.1
Trademark applications	68.9	135.8	72.3
Design applications	5.1	30.0	3.5
Employment impacts	**127.8**	**150.3**	**130.1**
Employment in knowledge-intensive activities	119.5	157.3	130.7
Employment in innovative enterprises	134.4	145.3	129.8
Sales impacts	**34.0**	**40.3**	**34.7**
Medium and high tech goods exports	0.0	0.0	0.0
Knowledge-intensive services exports	68.4	89.0	72.5
Sales of innovative products	40.6	35.3	35.3
Environmental sustainability	**68.2**	**58.3**	**71.0**
Resource productivity	74.1	108.0	109.7
Air emissions by fine particulate matter	59.8	55.5	63.6
Environment-related technologies	76.7	32.4	57.6

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Israel is a **Strong Innovator**.
Over time, performance relative to the EU has decreased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	IL	EU
Performance and structure of the economy		
GDP per capita (PPS)	28,550	30,800
Average annual GDP growth (%)	-1.3	-2.5
Employment share Manufacturing (NACE C) (%)	10.8	16.5
of which High and Medium high-tech (%)	n/a	37.9
Employment share Services (NACE G-N) (%)	42.1	41.2
of which Knowledge-intensive services (%)	n/a	35.1
Turnover share SMEs (%)	n/a	36.5
Turnover share large enterprises (%)	n/a	45.7
Foreign-controlled enterprises – share of value added (%)	n/a	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	n/a	1.0
Total Entrepreneurial Activity (TEA) (%)	12.7	6.7
FDI net inflows (% GDP)	5.2	2.0
Top R&D spending enterprises per 10 million population	348.3	16.2
Buyer sophistication (1 to 7 best)	4.2	3.7
Innovation profiles		
In-house product innovators with market novelties	n/a	10.7
In-house product innovators without market novelties	n/a	12.3
In-house business process innovators	n/a	11.0
Innovators that do not develop innovations themselves	n/a	11.6
Innovation active non-innovators	n/a	3.3
Non-innovators with potential to innovate	n/a	19.9
Non-innovators without disposition to innovate	n/a	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	75.3	76.5
Basic school entrepreneurial education and training	2.1	2.0
Govt. procurement of advanced tech. products	4.4	3.5
Rule of law (-2.5 to 2.5 best)	1.0	1.1
Climate change indicators		
Circular material use rate	22.1	11.7
Greenhouse gas emissions intensity of energy consumption	84.7	86.6
Demography		
Population size	8.7	446.7
Average annual population growth (%)	2.0	0.1
Population density	402.7	108.8

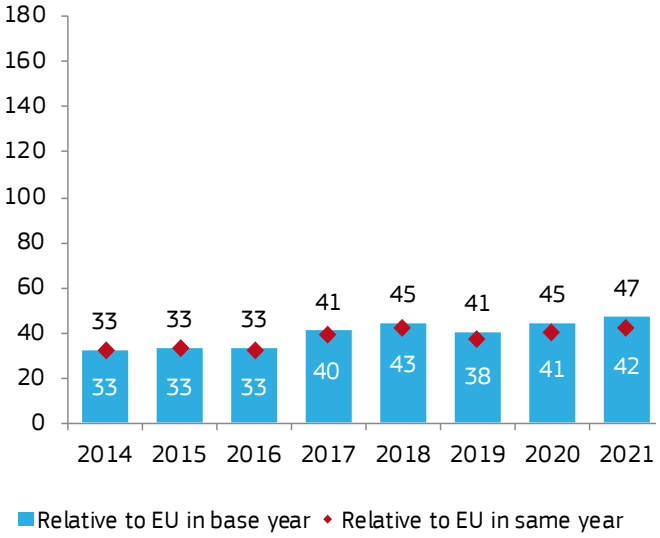
For Israel data availability is limited with data missing for more than half of the indicators. The country Is still included in the EIS for historical reasons but if data availability does not improve the country is likely to be excluded from future EIS reports.
Due to limited data availability a discussion of strengths or recent developments has only limited value and is therefore excluded.

Israel	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**108.1**	**117.6**	**121.7**
Human resources	**127.5**	**128.7**	**135.2**
Doctorate graduates	79.9	78.3	70.7
Population with tertiary education	155.3	174.0	200.2
Lifelong learning	N/A	N/A	N/A
Attractive research systems	**113.0**	**130.5**	**127.2**
International scientific co-publications	104.5	114.3	137.1
Most cited publications	95.1	111.9	93.5
Foreign doctorate students	N/A	N/A	N/A
Digitalisation	**N/A**	**N/A**	**N/A**
Broadband penetration	N/A	N/A	N/A
People with above basic overall digital skills	N/A	N/A	N/A
Finance and support	**73.4**	**84.5**	**87.5**
R&D expenditures in the public sector	74.4	75.7	71.8
Venture capital expenditures	N/A	N/A	N/A
Government support for business R&D	69.9	69.5	80.9
Firm investments	**166.1**	**200.7**	**200.7**
R&D expenditure in the business sector	169.5	188.2	188.2
Non-R&D Innovation expenditures	N/A	N/A	N/A
Innovation expenditures per employee	N/A	N/A	N/A
Use of information technologies	**N/A**	**N/A**	**N/A**
Enterprises providing ICT training	N/A	N/A	N/A
Employed ICT specialists	N/A	N/A	N/A
Innovators	**N/A**	**N/A**	**N/A**
Product innovators (SMEs)	N/A	N/A	N/A
Business process innovators (SMEs)	N/A	N/A	N/A
Linkages	**92.1**	**116.9**	**124.2**
Innovative SMEs collaborating with others	N/A	N/A	N/A
Public-private co-publications	120.7	127.4	135.4
Job-to-job mobility of HRST	N/A	N/A	N/A
Intellectual assets	**111.3**	**92.1**	**96.4**
PCT patent applications	259.5	225.2	225.2
Trademark applications	53.6	43.5	56.3
Design applications	32.3	22.3	22.2
Employment impacts	**204.1**	**207.9**	**207.9**
Employment in knowledge-intensive activities	229.3	250.7	250.7
Employment in innovative enterprises	N/A	N/A	N/A
Sales impacts	**123.1**	**101.3**	**125.4**
Medium and high tech goods exports	113.4	96.4	124.3
Knowledge-intensive services exports	102.9	92.4	109.0
Sales of innovative products	N/A	N/A	N/A
Environmental sustainability	**32.8**	**61.5**	**34.2**
Resource productivity	N/A	N/A	N/A
Air emissions by fine particulate matter	N/A	N/A	N/A
Environment-related technologies	43.6	58.9	32.8

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



North Macedonia is an **Emerging Innovator**. Over time, performance relative to the EU has increased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	MK	EU
Performance and structure of the economy		
GDP per capita (PPS)	11,100	30,800
Average annual GDP growth (%)	1.9	-2.5
Employment share Manufacturing (NACE C) (%)	19.9	16.5
of which High and Medium high-tech (%)	24.8	37.9
Employment share Services (NACE G-N) (%)	32.3	41.2
of which Knowledge-intensive services (%)	21.5	35.1
Turnover share SMEs (%)	44.9	36.5
Turnover share large enterprises (%)	31.8	45.7
Foreign-controlled enterprises – share of value added (%)	n/a	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	n/a	1.0
Total Entrepreneurial Activity (TEA) (%)	6.2	6.7
FDI net inflows (% GDP)	4.0	2.0
Top R&D spending enterprises per 10 million population	0.0	16.2
Buyer sophistication (1 to 7 best)	2.9	3.7
Innovation profiles		
In-house product innovators with market novelties	n/a	10.7
In-house product innovators without market novelties	n/a	12.3
In-house business process innovators	n/a	11.0
Innovators that do not develop innovations themselves	n/a	11.6
Innovation active non-innovators	n/a	3.3
Non-innovators with potential to innovate	n/a	19.9
Non-innovators without disposition to innovate	n/a	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	80.6	76.5
Basic school entrepreneurial education and training	2.1	2.0
Govt. procurement of advanced tech. products	2.7	3.5
Rule of law (-2.5 to 2.5 best)	-0.2	1.1
Climate change indicators		
Circular material use rate	n/a	11.7
Greenhouse gas emissions intensity of energy consumption	n/a	86.6
Demography		
Population size	2.1	446.7
Average annual population growth (%)	0.0	0.1
Population density	83.4	108.8

North Macedonia's strengths are in *Attractive research systems*, *Sales impacts* and *Innovators*. The top-3 indicators include Foreign doctorate students, Medium and high-tech goods exports, and Non-R&D innovation expenditures.

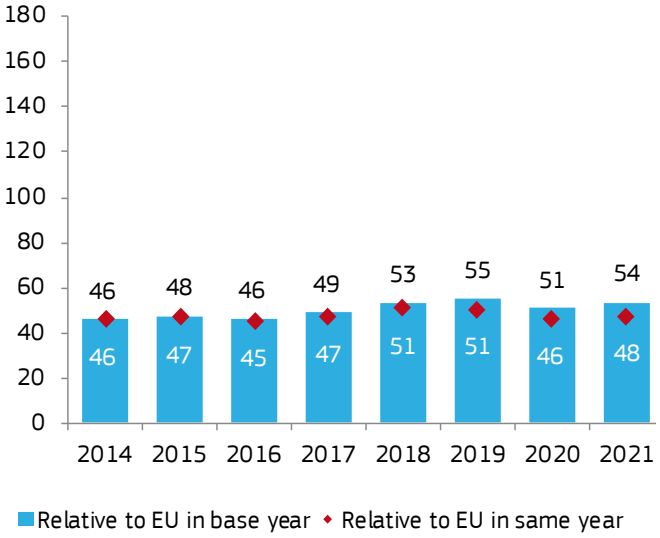
Reent performance improvements are the result of increased performance for Tertiary education, Lifelong learning, International scientific co-publications, Digital skills, Government support for business R&D, ICT specialists, Job-to-job mobility of HRST, Medium and high-tech goods exports, and Knowledge-intensive services exports.

North Macedonia	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**41.9**	**32.7**	**47.1**
Human resources	**36.0**	**28.4**	**38.2**
Doctorate graduates	9.1	19.6	8.1
Population with tertiary education	76.9	35.5	99.2
Lifelong learning	19.2	35.6	21.1
Attractive research systems	**67.3**	**20.8**	**75.8**
International scientific co-publications	30.8	18.7	40.4
Most cited publications	21.9	20.6	21.5
Foreign doctorate students	197.6	24.0	234.7
Digitalisation	**52.4**	**58.3**	**72.5**
Broadband penetration	69.2	83.7	104.9
People with above basic overall digital skills	27.3	27.8	33.3
Finance and support	**9.5**	**21.2**	**11.3**
R&D expenditures in the public sector	14.5	31.6	14.0
Venture capital expenditures	N/A	N/A	N/A
Government support for business R&D	3.4	0.2	3.9
Firm investments	**35.7**	**42.4**	**43.1**
R&D expenditure in the business sector	3.5	2.4	3.9
Non-R&D Innovation expenditures	109.6	124.5	124.5
Innovation expenditures per employee	12.7	16.8	16.8
Use of information technologies	**36.9**	**36.5**	**42.7**
Enterprises providing ICT training	46.7	60.0	46.7
Employed ICT specialists	28.6	9.5	38.1
Innovators	**56.2**	**71.7**	**76.9**
Product innovators (SMEs)	37.2	58.2	52.5
Business process innovators (SMEs)	74.0	83.7	98.4
Linkages	**55.6**	**37.6**	**75.0**
Innovative SMEs collaborating with others	44.7	77.5	65.5
Public-private co-publications	30.4	19.0	34.0
Job-to-job mobility of HRST	78.6	23.1	112.8
Intellectual assets	**10.9**	**7.8**	**9.4**
PCT patent applications	8.9	0.0	7.7
Trademark applications	19.2	22.1	20.1
Design applications	0.6	0.6	0.4
Employment impacts	**31.5**	**32.1**	**32.1**
Employment in knowledge-intensive activities	15.9	17.3	17.3
Employment in innovative enterprises	44.1	42.5	42.5
Sales impacts	**62.8**	**41.5**	**64.0**
Medium and high tech goods exports	119.3	78.0	130.8
Knowledge-intensive services exports	27.2	21.0	28.8
Sales of innovative products	20.7	18.0	18.0
Environmental sustainability	**32.5**	**9.1**	**33.8**
Resource productivity	41.2	24.8	61.0
Air emissions by fine particulate matter	N/A	N/A	N/A
Environment-related technologies	38.0	2.7	28.6

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Montenegro is an **Emerging Innovator**. Over time, performance relative to the EU has increased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	ME	EU
Performance and structure of the economy		
GDP per capita (PPS)	14,900	30,800
Average annual GDP growth (%)	4.9	-2.5
Employment share Manufacturing (NACE C) (%)	5.9	16.5
of which High and Medium high-tech (%)	n/a	37.9
Employment share Services (NACE G-N) (%)	48.7	41.2
of which Knowledge-intensive services (%)	28.3	35.1
Turnover share SMEs (%)	n/a	36.5
Turnover share large enterprises (%)	n/a	45.7
Foreign-controlled enterprises – share of value added (%)	n/a	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	n/a	1.0
Total Entrepreneurial Activity (TEA) (%)	n/a	6.7
FDI net inflows (% GDP)	n/a	2.0
Top R&D spending enterprises per 10 million population	0.0	16.2
Buyer sophistication (1 to 7 best)	3.2	3.7
Innovation profiles		
In-house product innovators with market novelties	10.1	10.7
In-house product innovators without market novelties	4.0	12.3
In-house business process innovators	3.8	11.0
Innovators that do not develop innovations themselves	2.3	11.6
Innovation active non-innovators	0.4	3.3
Non-innovators with potential to innovate	24.5	19.9
Non-innovators without disposition to innovate	54.9	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	73.8	76.5
Basic school entrepreneurial education and training	n/a	2.0
Govt. procurement of advanced tech. products	n/a	3.5
Rule of law (-2.5 to 2.5 best)	n/a	1.1
Climate change indicators		
Circular material use rate	n/a	11.7
Greenhouse gas emissions intensity of energy consumption	n/a	86.6
Demography		
Population size	0.6	446.7
Average annual population growth (%)	0.0	0.1
Population density	45.7	108.8

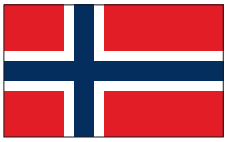
Montenegro's strengths are in *Innovators*, *Employment impacts* and *Use of information technologies*. The top-3 indicators include Product innovators, Employment in innovative enterprises, and Enterprises providing ICT training.

Performance has declined in the most recent years, mostly due to performance reductions in ICT specialists, Job-to-job mobility of HRST, PCT patent and Trademark applications, and Environment-related technologies.

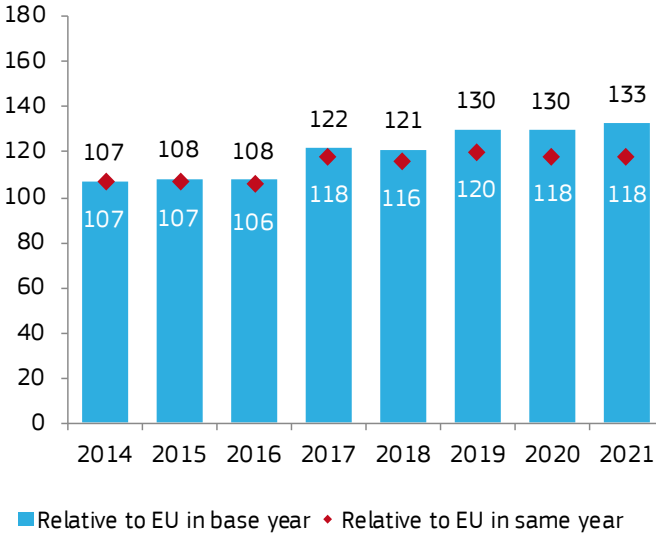
Montenegro has a below average share of Innovators but a relatively large share of In-house product innovators with market novelties.

Montenegro	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**47.8**	**46.0**	**53.7**
Human resources	**41.3**	**25.7**	**43.8**
Doctorate graduates	4.2	0.0	3.7
Population with tertiary education	99.4	72.7	128.1
Lifelong learning	16.2	16.7	17.8
Attractive research systems	**70.9**	**57.0**	**79.8**
International scientific co-publications	71.9	46.8	94.3
Most cited publications	62.6	33.0	61.5
Foreign doctorate students	83.9	120.5	99.6
Digitalisation	**60.7**	**61.5**	**83.9**
Broadband penetration	86.0	89.4	130.4
People with above basic overall digital skills	22.7	27.8	27.8
Finance and support	**12.1**	**0.0**	**14.4**
R&D expenditures in the public sector	21.8	0.0	21.1
Venture capital expenditures	N/A	N/A	N/A
Government support for business R&D	0.5	0.0	0.6
Firm investments	**15.7**	**18.7**	**18.9**
R&D expenditure in the business sector	9.9	10.2	11.0
Non-R&D Innovation expenditures	8.8	10.0	10.0
Innovation expenditures per employee	25.7	33.9	33.9
Use of information technologies	**78.2**	**74.7**	**90.3**
Enterprises providing ICT training	140.0	106.7	140.0
Employed ICT specialists	25.0	38.1	33.3
Innovators	**135.3**	**185.2**	**185.2**
Product innovators (SMEs)	167.4	236.2	236.2
Business process innovators (SMEs)	105.4	140.2	140.2
Linkages	**47.3**	**63.2**	**63.7**
Innovative SMEs collaborating with others	72.7	106.5	106.5
Public-private co-publications	47.5	28.0	53.2
Job-to-job mobility of HRST	28.6	59.0	41.0
Intellectual assets	**7.6**	**10.2**	**6.6**
PCT patent applications	0.0	17.6	0.0
Trademark applications	18.3	14.0	19.2
Design applications	0.0	0.0	0.0
Employment impacts	**114.3**	**107.1**	**116.5**
Employment in knowledge-intensive activities	75.6	60.0	82.7
Employment in innovative enterprises	145.4	140.4	140.4
Sales impacts	**16.2**	**15.1**	**16.5**
Medium and high tech goods exports	3.6	0.0	4.0
Knowledge-intensive services exports	2.8	3.3	3.0
Sales of innovative products	56.4	49.0	49.0
Environmental sustainability	**0.0**	**0.0**	**0.0**
Resource productivity	N/A	N/A	N/A
Air emissions by fine particulate matter	N/A	N/A	N/A
Environment-related technologies	0.0	0.0	0.0

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Norway is a **Strong Innovator**.
Over time, performance relative to the EU has increased strongly, in particular in 2017 and 2019.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	NO	EU
Performance and structure of the economy		
GDP per capita (PPS)	46,600	30,800
Average annual GDP growth (%)	-0.6	-2.5
Employment share Manufacturing (NACE C) (%)	12.7	16.5
of which High and Medium high-tech (%)	46.5	37.9
Employment share Services (NACE G-N) (%)	44.9	41.2
of which Knowledge-intensive services (%)	47.3	35.1
Turnover share SMEs (%)	n/a	36.5
Turnover share large enterprises (%)	n/a	45.7
Foreign-controlled enterprises – share of value added (%)	12.6	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.2	1.0
Total Entrepreneurial Activity (TEA) (%)	8.4	6.7
FDI net inflows (% GDP)	0.6	2.0
Top R&D spending enterprises per 10 million population	6.0	16.2
Buyer sophistication (1 to 7 best)	4.4	3.7
Innovation profiles		
In-house product innovators with market novelties	n/a	10.7
In-house product innovators without market novelties	n/a	12.3
In-house business process innovators	n/a	11.0
Innovators that do not develop innovations themselves	n/a	11.6
Innovation active non-innovators	n/a	3.3
Non-innovators with potential to innovate	n/a	19.9
Non-innovators without disposition to innovate	n/a	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	82.7	76.5
Basic school entrepreneurial education and training	3.2	2.0
Govt. procurement of advanced tech. products	4.1	3.5
Rule of law (-2.5 to 2.5 best)	2.0	1.1
Climate change indicators		
Circular material use rate	n/a	11.7
Greenhouse gas emissions intensity of energy consumption	90.5	86.6
Demography		
Population size	5.3	446.7
Average annual population growth (%)	0.7	0.1
Population density	17.2	108.8

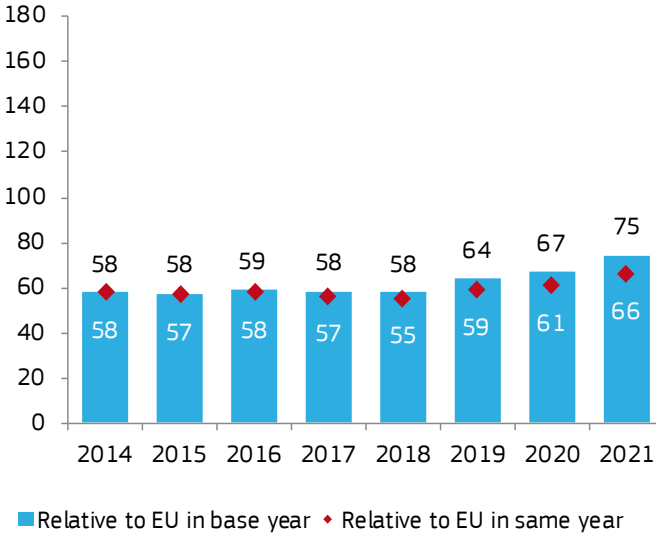
Norway's strengths are in *Employment impacts*, *Linkages* and *Attractive research systems*. The top-3 indicators include International scientific co-publications, Innovative SMEs collaborating with others, and Employment in knowledge-intensive activities.
The strong performance increases in 2017 and 2019 are due to improved performance for the indicators using innovation survey data. More recently performance has been decreasing, albeit at a low rate. The decrease is amongst others due to reduced performance on Venture capital and Enterprises providing ICT training.

Norway	Relative to EU 2021 in 2021		Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**118.0**		**106.9**	**132.8**
Human resources	**153.7**		**170.3**	**162.9**
Doctorate graduates	100.0		111.5	88.5
Population with tertiary education	185.3		218.2	238.8
Lifelong learning	185.9		216.7	204.4
Attractive research systems	**139.8**		**160.9**	**157.3**
International scientific co-publications	179.9		171.4	236.0
Most cited publications	122.9		131.0	120.8
Foreign doctorate students	112.6		210.0	133.7
Digitalisation	**129.5**		**149.6**	**179.1**
Broadband penetration	88.5		89.4	134.2
People with above basic overall digital skills	190.9		222.2	233.3
Finance and support	**111.4**		**97.2**	**132.7**
R&D expenditures in the public sector	136.4		105.3	131.6
Venture capital expenditures	58.9		89.4	99.1
Government support for business R&D	136.4		91.7	157.8
Firm investments	**75.7**		**54.1**	**91.4**
R&D expenditure in the business sector	74.5		63.0	82.7
Non-R&D Innovation expenditures	68.6		30.0	78.0
Innovation expenditures per employee	79.5		64.4	104.9
Use of information technologies	**125.8**		**190.7**	**145.3**
Enterprises providing ICT training	126.7		220.0	126.7
Employed ICT specialists	125.0		157.1	166.7
Innovators	**157.3**		**62.7**	**215.2**
Product innovators (SMEs)	169.3		73.3	238.8
Business process innovators (SMEs)	146.1		53.4	194.4
Linkages	**177.3**		**149.7**	**239.0**
Innovative SMEs collaborating with others	237.4		88.7	347.8
Public-private co-publications	170.4		164.6	191.1
Job-to-job mobility of HRST	137.5		182.1	197.4
Intellectual assets	**60.7**		**47.8**	**52.6**
PCT patent applications	101.3		99.2	87.9
Trademark applications	56.9		40.7	59.8
Design applications	21.1		9.4	14.5
Employment impacts	**172.4**		**93.9**	**175.6**
Employment in knowledge-intensive activities	197.6		128.0	216.0
Employment in innovative enterprises	152.2		69.7	146.9
Sales impacts	**58.6**		**48.2**	**59.7**
Medium and high tech goods exports	0.0		0.0	0.0
Knowledge-intensive services exports	121.1		115.0	128.3
Sales of innovative products	65.1		32.1	56.6
Environmental sustainability	**112.7**		**130.7**	**117.3**
Resource productivity	196.1		290.4	290.4
Air emissions by fine particulate matter	79.6		72.5	84.6
Environment-related technologies	75.2		110.5	56.5

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Serbia is an **Emerging Innovator.** Over time, performance relative to the EU has increased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	RS	EU
Performance and structure of the economy		
GDP per capita (PPS)	12,300	30,800
Average annual GDP growth (%)	2.0	-2.5
Employment share Manufacturing (NACE C) (%)	18.8	16.5
of which High and Medium high-tech (%)	25.5	37.9
Employment share Services (NACE G-N) (%)	36.5	41.2
of which Knowledge-intensive services (%)	36.5	35.1
Turnover share SMEs (%)	45.2	36.5
Turnover share large enterprises (%)	n/a	45.7
Foreign-controlled enterprises – share of value added (%)	n/a	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.8	1.0
Total Entrepreneurial Activity (TEA) (%)	n/a	6.7
FDI net inflows (% GDP)	7.1	2.0
Top R&D spending enterprises per 10 million population	0.0	16.2
Buyer sophistication (1 to 7 best)	2.5	3.7
Innovation profiles		
In-house product innovators with market novelties	11.5	10.7
In-house product innovators without market novelties	16.5	12.3
In-house business process innovators	6.7	11.0
Innovators that do not develop innovations themselves	18.9	11.6
Innovation active non-innovators	0.1	3.3
Non-innovators with potential to innovate	21.6	19.9
Non-innovators without disposition to innovate	24.7	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	74.4	76.5
Basic school entrepreneurial education and training	n/a	2.0
Govt. procurement of advanced tech. products	2.8	3.5
Rule of law (-2.5 to 2.5 best)	-0.2	1.1
Climate change indicators		
Circular material use rate	n/a	11.7
Greenhouse gas emissions intensity of energy consumption	n/a	86.6
Demography		
Population size	7.0	446.7
Average annual population growth (%)	-0.5	0.1
Population density	91.0	108.8

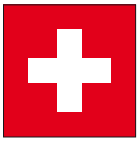
Serbia's strengths are in *Innovators*, *Firm investments* and *Employment impacts*. The top-3 indicators include Non-R&D innovation expenditures, Product innovators, and Employment in innovative enterprises.

The improvement in innovation performance in the last two years is the result of improved performance for Broadband penetration, Venture capital, Product and Business process innovators, Design applications, and Employment in innovative enterprises.

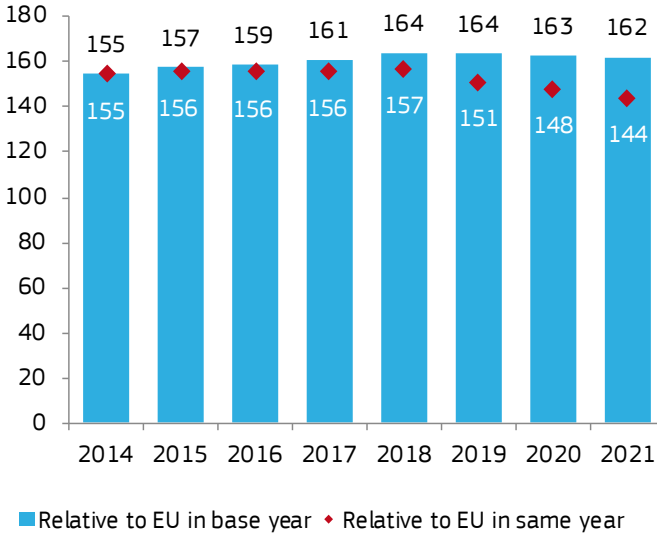
Serbia has above average shares of In-house product innovators without market novelties and Innovators that do not develop innovations themselves.

Serbia	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**66.2**	**57.8**	**74.5**
Human resources	**54.0**	**32.0**	**57.2**
Doctorate graduates	61.1	31.1	54.0
Population with tertiary education	61.5	27.3	79.3
Lifelong learning	34.3	38.9	37.8
Attractive research systems	**44.7**	**36.0**	**50.3**
International scientific co-publications	59.8	50.5	78.5
Most cited publications	35.9	29.9	35.2
Foreign doctorate students	38.6	30.2	45.9
Digitalisation	**68.4**	**37.5**	**94.7**
Broadband penetration	80.8	54.8	122.5
People with above basic overall digital skills	50.0	16.7	61.1
Finance and support	**30.4**	**26.1**	**36.2**
R&D expenditures in the public sector	65.5	57.9	63.2
Venture capital expenditures	7.0	0.0	11.7
Government support for business R&D	14.4	1.1	16.7
Firm investments	**105.2**	**123.0**	**127.1**
R&D expenditure in the business sector	21.3	12.6	23.6
Non-R&D Innovation expenditures	206.1	234.2	234.2
Innovation expenditures per employee	109.1	144.0	144.0
Use of information technologies	**62.7**	**78.3**	**72.4**
Enterprises providing ICT training	73.3	113.3	73.3
Employed ICT specialists	53.6	38.1	71.4
Innovators	**136.7**	**112.2**	**187.0**
Product innovators (SMEs)	165.8	104.3	234.0
Business process innovators (SMEs)	109.5	119.2	145.7
Linkages	**76.8**	**65.0**	**103.6**
Innovative SMEs collaborating with others	96.5	84.1	141.4
Public-private co-publications	58.6	44.6	65.8
Job-to-job mobility of HRST	73.2	66.7	105.1
Intellectual assets	**13.0**	**11.2**	**11.3**
PCT patent applications	0.0	8.8	0.0
Trademark applications	26.8	24.6	28.1
Design applications	6.8	0.1	4.7
Employment impacts	**102.7**	**61.4**	**104.6**
Employment in knowledge-intensive activities	48.8	45.3	53.3
Employment in innovative enterprises	145.9	72.8	140.9
Sales impacts	**76.5**	**60.2**	**77.9**
Medium and high tech goods exports	68.5	65.7	75.1
Knowledge-intensive services exports	67.8	57.8	71.8
Sales of innovative products	102.3	55.7	88.9
Environmental sustainability	**36.1**	**64.7**	**37.6**
Resource productivity	5.0	4.2	7.4
Air emissions by fine particulate matter	0.0	8.8	0.0
Environment-related technologies	138.1	172.3	103.7

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Switzerland is an **Innovation Leader**.
Over time, performance relative to the EU has decreased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	CH	EU
Performance and structure of the economy		
GDP per capita (PPS)	49,400	30,800
Average annual GDP growth (%)	-1.7	-2.5
Employment share Manufacturing (NACE C) (%)	9.3	16.5
of which High and Medium high-tech (%)	41.1	37.9
Employment share Services (NACE G-N) (%)	44.9	41.2
of which Knowledge-intensive services (%)	41.0	35.1
Turnover share SMEs (%)	29.6	36.5
Turnover share large enterprises (%)	54.1	45.7
Foreign-controlled enterprises – share of value added (%)	n/a	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	4.1	1.0
Total Entrepreneurial Activity (TEA) (%)	8.5	6.7
FDI net inflows (% GDP)	3.4	2.0
Top R&D spending enterprises per 10 million population	22.8	16.2
Buyer sophistication (1 to 7 best)	5.0	3.7
Innovation profiles		
In-house product innovators with market novelties	n/a	10.7
In-house product innovators without market novelties	n/a	12.3
In-house business process innovators	n/a	11.0
Innovators that do not develop innovations themselves	n/a	11.6
Innovation active non-innovators	n/a	3.3
Non-innovators with potential to innovate	n/a	19.9
Non-innovators without disposition to innovate	n/a	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	76.6	76.5
Basic school entrepreneurial education and training	2.4	2.0
Govt. procurement of advanced tech. products	3.8	3.5
Rule of law (-2.5 to 2.5 best)	1.9	1.1
Climate change indicators		
Circular material use rate	n/a	11.7
Greenhouse gas emissions intensity of energy consumption	n/a	86.6
Demography		
Population size	8.5	446.7
Average annual population growth (%)	0.7	0.1
Population density	213.6	108.8

Switzerland's strengths are in *Attractive research systems*, *Human resources* and *Intellectual assets*. The top-3 indicators include International scientific co-publications, Foreign doctorate students, and Lifelong learning.

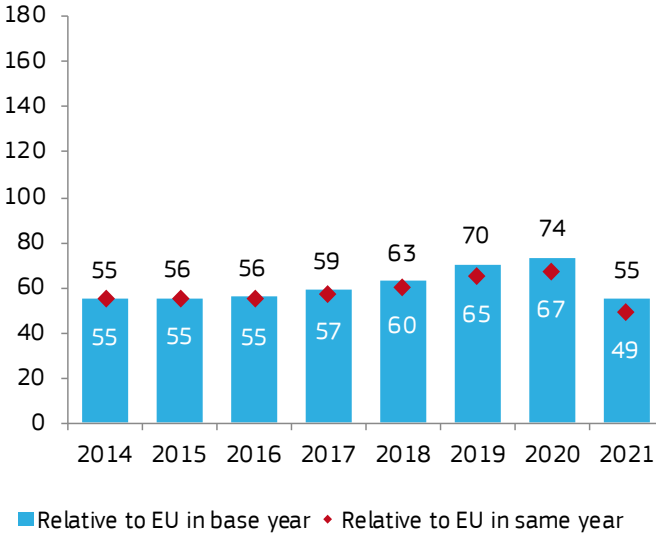
Most recently innovation performance has declined, mostly due to reduced performance for Government support for business R&D, Employment in knowledge-intensive activities, Knowledge-intensive services exports, and Environment-related technologies.

Switzerland	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**144.2**	**154.6**	**162.3**
Human resources	**210.1**	**199.8**	**222.6**
Doctorate graduates	203.8	157.4	180.4
Population with tertiary education	164.1	168.6	211.6
Lifelong learning	278.8	306.7	306.7
Attractive research systems	**208.0**	**220.2**	**234.1**
International scientific co-publications	211.4	234.9	277.2
Most cited publications	153.8	166.1	151.2
Foreign doctorate students	297.3	314.9	353.1
Digitalisation	**152.9**	**156.5**	**211.4**
Broadband penetration	133.5	102.0	202.5
People with above basic overall digital skills	181.8	222.2	222.2
Finance and support	**79.2**	**70.0**	**94.4**
R&D expenditures in the public sector	63.6	117.5	61.4
Venture capital expenditures	160.4	60.2	269.8
Government support for business R&D	14.2	11.9	16.4
Firm investments	**78.5**	**187.3**	**94.9**
R&D expenditure in the business sector	80.9	175.6	89.8
Non-R&D Innovation expenditures	N/A	N/A	N/A
Innovation expenditures per employee	N/A	N/A	N/A
Use of information technologies	**168.9**	**159.7**	**195.2**
Enterprises providing ICT training	N/A	N/A	N/A
Employed ICT specialists	157.1	171.4	209.5
Innovators	**132.6**	**196.9**	**181.5**
Product innovators (SMEs)	122.7	221.6	173.1
Business process innovators (SMEs)	141.9	175.1	188.8
Linkages	**160.2**	**192.4**	**216.0**
Innovative SMEs collaborating with others	76.3	99.6	111.8
Public-private co-publications	293.5	287.2	329.1
Job-to-job mobility of HRST	142.9	187.2	205.1
Intellectual assets	**177.3**	**155.7**	**153.6**
PCT patent applications	221.7	210.3	192.4
Trademark applications	132.3	140.3	138.9
Design applications	195.2	122.6	133.8
Employment impacts	**170.1**	**183.6**	**173.3**
Employment in knowledge-intensive activities	164.6	192.0	180.0
Employment in innovative enterprises	174.6	177.6	168.5
Sales impacts	**103.5**	**104.0**	**105.4**
Medium and high tech goods exports	91.3	66.3	100.0
Knowledge-intensive services exports	101.2	102.3	107.2
Sales of innovative products	126.9	155.5	110.3
Environmental sustainability	**125.3**	**127.7**	**130.5**
Resource productivity	196.1	227.7	290.4
Air emissions by fine particulate matter	126.6	131.6	134.6
Environment-related technologies	40.3	63.4	30.3

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Turkey is an **Emerging Innovator.**
Over time, performance relative to the EU has decreased, in particular in 2021.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	TR	EU
Performance and structure of the economy		
GDP per capita (PPS)	19,400	30,800
Average annual GDP growth (%)	0.1	-2.5
Employment share Manufacturing (NACE C) (%)	18.5	16.5
of which High and Medium high-tech (%)	19.7	37.9
Employment share Services (NACE G-N) (%)	34.4	41.2
of which Knowledge-intensive services (%)	19.9	35.1
Turnover share SMEs (%)	n/a	36.5
Turnover share large enterprises (%)	n/a	45.7
Foreign-controlled enterprises – share of value added (%)	n/a	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	3.5	1.0
Total Entrepreneurial Activity (TEA) (%)	14.2	6.7
FDI net inflows (% GDP)	1.4	2.0
Top R&D spending enterprises per 10 million population	0.2	16.2
Buyer sophistication (1 to 7 best)	3.5	3.7
Innovation profiles		
In-house product innovators with market novelties	11.9	10.7
In-house product innovators without market novelties	7.7	12.3
In-house business process innovators	8.6	11.0
Innovators that do not develop innovations themselves	1.7	11.6
Innovation active non-innovators	6.1	3.3
Non-innovators with potential to innovate	36.0	19.9
Non-innovators without disposition to innovate	28.1	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	74.3	76.5
Basic school entrepreneurial education and training	1.8	2.0
Govt. procurement of advanced tech. products	3.5	3.5
Rule of law (-2.5 to 2.5 best)	-0.3	1.1
Climate change indicators		
Circular material use rate	n/a	11.7
Greenhouse gas emissions intensity of energy consumption	90.8	86.6
Demography		
Population size	82.0	446.7
Average annual population growth (%)	1.4	0.1
Population density	106.2	108.8

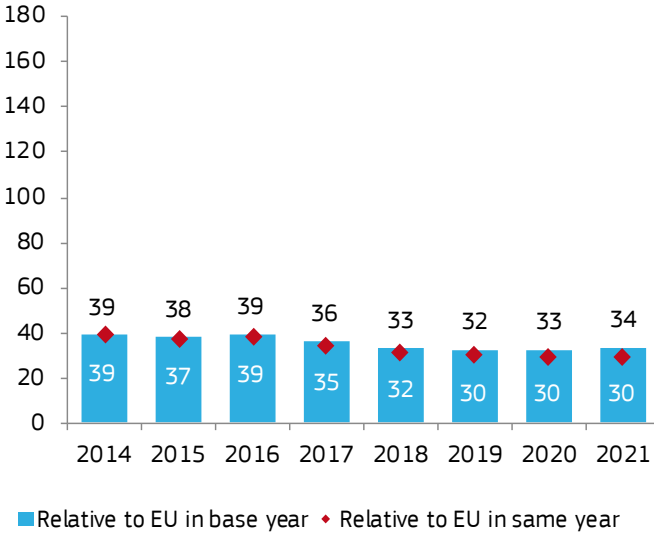
Turkey's strengths are in *Digitalisation*, *Sales impacts* and *Linkages*. The top-3 indicators include Job-to-job mobility of HRST, Government support for business R&D, and Broadband penetration.
The strong decline in innovation performance is 2021 is due to reduced performance on the indicators using innovation survey data, Enterprises providing ICT training, Job-to-job mobility of HRST, PCT patent and Design applications, and Environment-related technologies.

Turkey	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**49.1**	**55.0**	**55.3**
Human resources	**44.9**	**17.6**	**47.6**
Doctorate graduates	22.1	8.1	19.6
Population with tertiary education	66.0	0.0	85.1
Lifelong learning	48.5	53.3	53.3
Attractive research systems	**41.0**	**28.6**	**46.2**
International scientific co-publications	17.9	4.8	23.5
Most cited publications	57.7	47.5	56.7
Foreign doctorate students	44.5	19.3	52.8
Digitalisation	**83.2**	**72.3**	**115.1**
Broadband penetration	93.3	118.3	141.4
People with above basic overall digital skills	68.2	16.7	83.3
Finance and support	**64.6**	**57.0**	**76.9**
R&D expenditures in the public sector	36.4	49.1	35.1
Venture capital expenditures	N/A	N/A	N/A
Government support for business R&D	94.6	49.5	109.4
Firm investments	**62.5**	**94.4**	**75.5**
R&D expenditure in the business sector	44.7	26.0	49.6
Non-R&D Innovation expenditures	42.7	234.2	48.5
Innovation expenditures per employee	38.6	50.9	50.9
Use of information technologies	**22.3**	**35.6**	**25.8**
Enterprises providing ICT training	40.0	66.7	40.0
Employed ICT specialists	7.1	0.0	9.5
Innovators	**56.7**	**104.9**	**77.6**
Product innovators (SMEs)	60.1	63.6	84.8
Business process innovators (SMEs)	53.6	141.2	71.3
Linkages	**66.5**	**80.3**	**89.7**
Innovative SMEs collaborating with others	41.0	40.1	60.1
Public-private co-publications	17.1	7.3	19.2
Job-to-job mobility of HRST	114.3	164.1	164.1
Intellectual assets	**15.9**	**11.4**	**13.8**
PCT patent applications	22.9	17.0	19.9
Trademark applications	19.2	13.1	20.2
Design applications	3.0	4.8	2.1
Employment impacts	**25.9**	**51.2**	**26.3**
Employment in knowledge-intensive activities	9.8	0.0	10.7
Employment in innovative enterprises	38.8	87.5	37.5
Sales impacts	**66.2**	**82.8**	**67.4**
Medium and high tech goods exports	76.9	53.7	84.3
Knowledge-intensive services exports	41.5	23.6	43.9
Sales of innovative products	84.3	191.3	73.3
Environmental sustainability	**49.7**	**28.6**	**51.7**
Resource productivity	60.8	43.8	90.1
Air emissions by fine particulate matter	N/A	N/A	N/A
Environment-related technologies	60.7	28.9	45.6

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



Ukraine is an **Emerging Innovator**. Over time, performance relative to the EU has decreased.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

	UA	EU
Performance and structure of the economy		
GDP per capita (PPS)	6,440	30,800
Average annual GDP growth (%)	-1.9	-2.5
Employment share Manufacturing (NACE C) (%)	12.5	16.5
of which High and Medium high-tech (%)	n/a	37.9
Employment share Services (NACE G-N) (%)	34.5	41.2
of which Knowledge-intensive services (%)	n/a	35.1
Turnover share SMEs (%)	n/a	36.5
Turnover share large enterprises (%)	n/a	45.7
Foreign-controlled enterprises – share of value added (%)	n/a	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	n/a	1.0
Total Entrepreneurial Activity (TEA) (%)	n/a	6.7
FDI net inflows (% GDP)	3.2	2.0
Top R&D spending enterprises per 10 million population	0.0	16.2
Buyer sophistication (1 to 7 best)	3.3	3.7
Innovation profiles		
In-house product innovators with market novelties	n/a	10.7
In-house product innovators without market novelties	n/a	12.3
In-house business process innovators	n/a	11.0
Innovators that do not develop innovations themselves	n/a	11.6
Innovation active non-innovators	n/a	3.3
Non-innovators with potential to innovate	n/a	19.9
Non-innovators without disposition to innovate	n/a	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	69.1	76.5
Basic school entrepreneurial education and training	n/a	2.0
Govt. procurement of advanced tech. products	3.0	3.5
Rule of law (-2.5 to 2.5 best)	-0.7	1.1
Climate change indicators		
Circular material use rate	n/a	11.7
Greenhouse gas emissions intensity of energy consumption	n/a	86.6
Demography		
Population size	42.0	446.7
Average annual population growth (%)	-0.6	0.1
Population density	77.4	108.8

For Ukraine data availability is limited with data missing for 12 indicators. The country Is still included in the EIS for historical reasons but if data availability does not improve the country is likely to be excluded from future EIS reports.

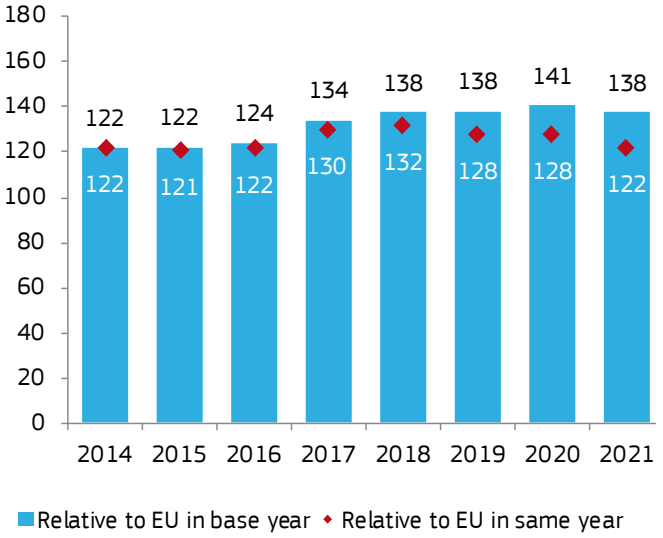
Due to limited data availability a discussion of strengths or recent developments has only limited value and is therefore excluded.

Ukraine	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**29.8**	**38.9**	**33.6**
Human resources	**31.8**	**45.2**	**33.7**
Doctorate graduates	28.5	33.8	25.3
Population with tertiary education	N/A	N/A	N/A
Lifelong learning	N/A	N/A	N/A
Attractive research systems	**17.3**	**8.9**	**19.5**
International scientific co-publications	12.1	0.0	15.8
Most cited publications	10.4	0.0	10.2
Foreign doctorate students	36.8	38.9	43.7
Digitalisation	**72.0**	**106.1**	**99.7**
Broadband penetration	60.1	97.0	91.1
People with above basic overall digital skills	N/A	N/A	N/A
Finance and support	**17.7**	**32.2**	**21.1**
R&D expenditures in the public sector	2.9	28.2	2.8
Venture capital expenditures	24.5	27.4	41.3
Government support for business R&D	27.7	41.0	32.1
Firm investments	**41.0**	**50.8**	**49.6**
R&D expenditure in the business sector	16.0	29.2	17.8
Non-R&D Innovation expenditures	82.3	82.3	93.5
Innovation expenditures per employee	N/A	N/A	N/A
Use of information technologies	**23.4**	**31.3**	**27.1**
Enterprises providing ICT training	25.3	29.3	25.3
Employed ICT specialists	N/A	N/A	N/A
Innovators	**N/A**	**N/A**	**N/A**
Product innovators (SMEs)	N/A	N/A	N/A
Business process innovators (SMEs)	N/A	N/A	N/A
Linkages	**10.1**	**3.0**	**13.7**
Innovative SMEs collaborating with others	4.5	6.6	6.6
Public-private co-publications	21.0	0.4	23.6
Job-to-job mobility of HRST	N/A	N/A	N/A
Intellectual assets	**9.8**	**4.5**	**8.5**
PCT patent applications	12.9	14.1	11.2
Trademark applications	13.0	0.0	13.6
Design applications	1.6	0.3	1.1
Employment impacts	**78.2**	**68.6**	**79.6**
Employment in knowledge-intensive activities	87.8	82.7	96.0
Employment in innovative enterprises	N/A	N/A	N/A
Sales impacts	**37.5**	**45.6**	**38.2**
Medium and high tech goods exports	24.0	49.7	26.4
Knowledge-intensive services exports	66.0	62.3	69.9
Sales of innovative products	18.5	20.3	16.0
Environmental sustainability	**44.4**	**124.6**	**46.3**
Resource productivity	N/A	N/A	N/A
Air emissions by fine particulate matter	N/A	N/A	N/A
Environment-related technologies	59.0	119.3	44.3

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.



The **United Kingdom** is a **Strong Innovator**. Over time, performance relative to the EU has remained the same.



Structural differences with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators

	UK	EU
Performance and structure of the economy		
GDP per capita (PPS)	32,600	30,800
Average annual GDP growth (%)	0.7	-2.5
Employment share Manufacturing (NACE C) (%)	9.4	16.5
of which High and Medium high-tech (%)	15.9	37.9
Employment share Services (NACE G-N) (%)	42.8	41.2
of which Knowledge-intensive services (%)	44.2	35.1
Turnover share SMEs (%)	n/a	36.5
Turnover share large enterprises (%)	n/a	45.7
Foreign-controlled enterprises – share of value added (%)	14.8	11.8
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.6	1.0
Total Entrepreneurial Activity (TEA) (%)	8.7	6.7
FDI net inflows (% GDP)	4.0	2.0
Top R&D spending enterprises per 10 million population	0.0	16.2
Buyer sophistication (1 to 7 best)	4.7	3.7
Innovation profiles		
In-house product innovators with market novelties	n/a	10.7
In-house product innovators without market novelties	n/a	12.3
In-house business process innovators	n/a	11.0
Innovators that do not develop innovations themselves	n/a	11.6
Innovation active non-innovators	n/a	3.3
Non-innovators with potential to innovate	n/a	19.9
Non-innovators without disposition to innovate	n/a	31.3
Governance and policy framework		
Ease of starting a business (0 to 100 best)	83.4	76.5
Basic school entrepreneurial education and training	2.1	2.0
Govt. procurement of advanced tech. products	3.8	3.5
Rule of law (-2.5 to 2.5 best)	1.6	1.1
Climate change indicators		
Circular material use rate	16.2	11.7
Greenhouse gas emissions intensity of energy consumption	84.7	86.6
Eco-Innovation Index	118.0	100.0
Demography		
Population size	66.6	446.7
Average annual population growth (%)	0.6	0.1
Population density	182.1	108.8

The United Kingdom's strengths are in *Linkages*, *Attractive research systems* and *Human resources*. The top-3 indicators include Foreign doctorate students, Doctorate graduates, and Innovative SMEs collaborating with others.

The recent decline in innovation performance is the result of reduced performance for several of the indicators using innovation survey data, PCT patent applications, Trademark and Design applications, and Environment-related technologies.

The United Kingdom is showing above average scores on the Climate change related indicators.

United Kingdom	Relative to EU 2021 in 2021	Relative to EU 2014 in 2014	Relative to EU 2014 in 2021
SUMMARY INNOVATION INDEX	**122.3**	**122.2**	**137.7**
Human resources	**167.4**	**168.2**	**177.4**
Doctorate graduates	203.8	157.4	180.4
Population with tertiary education	150.0	181.8	193.4
Lifelong learning	140.4	171.1	154.4
Attractive research systems	**161.4**	**173.8**	**181.6**
International scientific co-publications	132.9	131.5	174.3
Most cited publications	149.1	140.3	146.5
Foreign doctorate students	222.8	297.9	264.6
Digitalisation	**125.8**	**126.9**	**174.1**
Broadband penetration	88.5	89.4	134.2
People with above basic overall digital skills	181.8	172.2	222.2
Finance and support	**152.8**	**103.7**	**182.1**
R&D expenditures in the public sector	100.0	64.9	96.5
Venture capital expenditures	180.8	154.6	304.1
Government support for business R&D	184.4	120.9	213.4
Firm investments	**79.2**	**62.7**	**95.6**
R&D expenditure in the business sector	110.6	74.8	122.8
Non-R&D Innovation expenditures	54.2	41.6	61.6
Innovation expenditures per employee	73.2	67.6	96.7
Use of information technologies	**157.3**	**154.2**	**181.7**
Enterprises providing ICT training	153.3	126.7	153.3
Employed ICT specialists	160.7	185.7	214.3
Innovators	**45.4**	**93.7**	**62.1**
Product innovators (SMEs)	81.9	107.7	115.6
Business process innovators (SMEs)	11.2	81.4	14.9
Linkages	**175.7**	**220.2**	**236.9**
Innovative SMEs collaborating with others	201.7	279.0	295.5
Public-private co-publications	159.9	154.1	179.3
Job-to-job mobility of HRST	166.1	228.2	238.5
Intellectual assets	**87.1**	**84.9**	**75.5**
PCT patent applications	96.9	96.4	84.1
Trademark applications	87.5	99.0	91.8
Design applications	75.5	61.0	51.7
Employment impacts	**149.8**	**142.2**	**152.6**
Employment in knowledge-intensive activities	170.7	158.7	186.7
Employment in innovative enterprises	133.1	130.5	128.5
Sales impacts	**115.5**	**110.5**	**117.6**
Medium and high tech goods exports	90.8	84.2	99.5
Knowledge-intensive services exports	127.7	141.4	135.2
Sales of innovative products	138.6	108.5	120.5
Environmental sustainability	**77.5**	**90.0**	**80.7**
Resource productivity	44.6	75.4	66.1
Air emissions by fine particulate matter	87.7	94.6	93.2
Environment-related technologies	97.6	92.9	73.3

The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

6. European Innovation Scoreboard methodology

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 (cf. **Annex E**).

Step 2: Imputing for missing values

Reference year data are then used for "2021", etc. If data for a year-in-between are not available, missing values are replaced with the value for the previous year. If data are not available at the beginning of the time series, missing values are replaced with the next available year. The following examples clarify this step and show how 'missing' data are imputed. If data are missing for all years, no data will be imputed (the indicator will not contribute to the Summary Innovation Index).

Latest year missing	"2021"	"2020"	"2019"	"2018"	"2017"
Available data	N/A	45	40	35	30
Use most recent year	**45**	45	40	35	30
Year-in-between missing	"2021"	"2020"	"2019"	"2018"	"2017"
Available data	50	N/A	40	35	30
Substitute with previous year	50	**40**	40	35	30
Beginning-of-period missing	"2021"	"2020"	"2019"	"2018"	"2017"
Available data	50	45	40	35	N/A
Substitute with next available year	50	45	40	35	**35**

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: International scientific co-publications, Broadband penetration, Non-R&D innovation expenditures, Public-private co-publications, Trademark applications, and Air emissions by fine particulates (PM2.5). A square root transformation means using 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 Summary Innovation Index is calculated as the unweighted average of the re-scaled scores for all indicators where all indicators receive the same weight (1/32 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 2014 and for the latest year also to that of the EU in 2021. For the definition of the performance groups, only the performance scores relative to the EU in 2021 have been used.

International benchmark

The methodology for calculating average innovation performance for the EU and its major global competitors is similar to that used for calculating average innovation performance for the EU Member States but using a smaller set of countries and a smaller set of indicators.

Performance group membership

For determining performance group membership, the EIS uses the following classification scheme:

- Innovation Leaders are all countries with a relative performance in 2021 above 125% of the EU average in 2021.
- Strong Innovators are all countries with a relative performance in 2021 between 100% and 125% of the EU average in 2021.
- Moderate Innovators are all countries with a relative performance in 2021 between 70% and 100% of the EU average in 2021.
- Emerging Innovators are all countries with a relative performance in 2021 below 70% of the EU average in 2021.

Annex A: Country abbreviations

AT	Austria	IT	Italy
AU	Australia	JP	Japan
BA	Bosnia and Herzegovina	KR	South Korea
BE	Belgium	LT	Lithuania
BG	Bulgaria	LU	Luxembourg
BR	Brazil	LV	Latvia
CA	Canada	MK	North Macedonia
CH	Switzerland	MT	Malta
CN	China	ME	Montenegro
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	RU	Russia
FI	Finland	SA	South Africa
FR	France	SE	Sweden
HR	Croatia	SI	Slovenia
HU	Hungary	SK	Slovakia
IE	Ireland	TR	Turkey
IL	Israel	UA	Ukraine
IN	India	UK	United Kingdom
IS	Iceland	US	United States

Annex B: Performance per indicator

Available on the EIS website: https://ec.europa.eu/docsroom/documents/45894

Annex C: Current performance

	EU	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL
FRAMEWORK CONDITIONS																				
Human resources																				
1.1.1 New doctorate graduates	0.8	0.9	0.4	0.9	1.2	1.2	0.7	1.0	0.4	1.3	0.9	0.4	0.6	0.3	0.2	0.4	1.0	0.3	0.2	0.7
1.1.2 Population completed tertiary education	39.4	47.3	32.7	32.6	45.9	33.3	42.8	55.4	42.4	46.5	48.1	35.5	27.7	60.3	43.8	55.2	56.1	30.6	40.4	49.1
1.1.3 Lifelong learning	10.8	8.2	2.0	8.1	25.3	8.2	20.2	12.6	3.9	10.6	19.5	3.5	8.1	5.9	7.4	7.0	19.1	5.8	11.9	19.5
Attractive research systems																				
1.2.1 International scientific co-publications	1204	1913	330	1103	3147	1067	1845	1878	943	1004	963	900	1056	2994	709	872	2878	663	1166	2384
1.2.2 Scientific publications among top 10% most cited	9.9	12.4	2.6	5.0	13.7	10.5	9.0	11.4	8.9	9.2	9.0	4.0	11.1	9.6	4.7	4.8	12.4	5.5	6.5	15.0
1.2.3 Foreign doctorate students	18.7	41.5	7.4	18.4	36.2	11.9	17.3	30.3	1.3	17.2	38.2	9.2	16.1	14.8	10.1	6.8	85.9	19.4	19.0	44.0
Digitalisation																				
1.3.1 Broadband penetration	23.0	31.0	15.0	15.0	62.0	21.0	17.0	22.0	8.0	39.0	13.0	12.0	13.0	17.0	17.0	34.0	34.0	21.0	29.0	35.0
1.3.2 Individuals who have above basic overall digital skills	31.0	34.0	11.0	26.0	49.0	39.0	37.0	34.0	23.0	36.0	31.0	35.0	22.0	25.0	24.0	32.0	36.0	25.0	38.0	50.0
INVESTMENTS																				
Finance and support																				
2.1.1 R&D expenditure in the public sector	0.73	0.84	0.27	0.74	1.07	0.99	0.74	0.28	0.68	0.54	0.72	0.57	0.51	0.30	0.47	0.56	0.59	0.36	0.22	0.70
2.1.2 Venture capital expenditures	0.141	0.162	0.018	0.031	0.177	0.114	0.212	0.170	0.041	0.144	0.245	0.102	0.072	0.427	0.019	0.138	0.260	0.104	0.007	0.193
2.1.3 Direct and indirect government support for business R&D	0.16	0.24	0.01	0.13	0.06	0.07	0.03	0.15	0.04	0.08	0.40	0.01	0.23	0.00	0.01	0.03	0.05	0.25	0.05	0.16
Firm investments																				
2.2.1 R&D expenditure in the business sector	1.46	2.04	0.56	1.20	1.82	2.19	0.86	0.51	0.59	0.70	1.44	0.54	0.91	0.26	0.17	0.43	0.60	1.11	0.37	1.46
2.2.2 Non-R&D innovation expenditures	0.90	0.83	0.35	1.01	0.50	1.46	2.36	0.49	0.98	0.59	0.46	0.98	0.98	1.01	0.46	1.48	0.26	0.48	0.79	0.16
2.2.3 Innovation expenditures per person employed	7484	11806	1197	4357	2938	11819	6275	9872	5077	4488	7798	2072	7338	2997	1120	3649	4995	3374	3050	6540
Use of information technologies																				
2.3.1 Enterprises providing ICT trainig	20.0	33.0	7.0	25.0	30.0	24.0	17.0	27.0	12.0	20.0	15.0	23.0	15.0	25.0	17.0	14.0	21.0	16.0	28.0	24.0
2.3.2 Employed ICT specialists	3.9	5.0	3.1	4.0	5.2	4.0	6.0	4.9	2.1	3.6	4.2	3.2	3.5	2.7	3.1	3.1	6.1	3.4	4.6	5.6
INNOVATION ACTIVITIES																				
Innovators																				
3.1.1 SMEs with product innovations	28.7	28.6	17.7	25.2	31.5	38.7	48.9	28.0	41.8	13.8	31.8	37.8	36.0	48.2	16.6	30.4	28.7	19.5	30.4	26.8
3.1.2 SMEs with business process innovations	40.0	56.8	19.2	38.9	46.2	54.2	52.5	37.9	54.5	22.9	39.0	45.3	53.4	65.6	25.0	43.2	39.3	19.0	39.7	39.4
Linkages																				
3.2.1 Innovative SMEs collaborating with others	12.3	26.4	4.2	11.7	14.0	15.0	27.6	21.5	20.6	7.0	13.5	12.7	14.4	43.1	6.3	13.5	12.9	10.1	8.2	14.5
3.2.2 Public-private co-publications	127.4	341.7	45.2	154.4	614.1	237.5	252.1	307.6	153.5	143.2	153.6	154.0	167.0	331.1	90.2	88.4	384.9	126.1	110.8	419.4
3.2.3 Job-to-job mobility of Human Resources in S&T	7.6	7.1	2.8	4.7	10.7	9.9	10.5	n/a	5.3	7.8	8.5	6.4	4.4	10.2	5.1	10.6	10.0	6.3	8.9	9.8
Intellectual assets																				
3.3.1 PCT patent applications	2.96	3.03	0.51	0.71	5.84	6.18	1.56	1.68	0.56	1.28	3.54	0.44	2.02	0.53	0.77	0.51	1.65	1.11	1.23	4.78
3.3.2 Trademark applications	6.24	6.35	7.58	4.27	8.89	7.37	18.94	3.89	5.03	7.58	3.07	2.86	7.27	3.39	6.71	8.01	21.01	3.44	40.44	7.82
3.3.3 Design applications	3.32	2.55	4.40	2.32	7.77	5.17	4.50	1.66	0.76	2.40	2.33	0.65	5.29	2.41	1.93	1.43	5.84	0.93	3.57	4.62
IMPACTS																				
Employment impacts																				
4.1.1 Employment in knowledge-intensive activities	13.9	16.0	10.6	13.1	15.9	15.0	14.2	20.3	12.2	12.3	15.0	11.8	14.3	17.2	11.0	11.0	25.7	12.2	18.3	17.8
4.1.2 Employment in innovative enterprises	56.9	72.6	39.3	53.4	61.0	75.4	79.9	45.9	65.4	38.6	58.7	57.1	69.1	71.5	41.1	59.8	50.4	34.6	56.0	56.1
Sales impacts																				
4.2.1 Medium & high-tech product exports	57.1	50.7	35.7	68.0	51.7	67.5	41.4	60.9	29.2	46.2	57.1	40.6	51.3	55.6	33.7	40.3	48.2	69.5	53.5	50.9
4.2.2 Knowledge-intensive services exports	67.3	71.5	44.9	44.8	74.4	74.3	52.0	93.5	51.4	31.7	62.8	21.6	48.4	70.5	52.8	20.1	91.3	51.5	32.8	80.0
4.2.3 Sales of new-to-market/new-to-enterprise innovations	11.60	15.65	6.34	12.80	1.42	14.84	13.16	10.54	23.81	16.11	8.84	11.47	16.86	11.57	8.37	9.49	6.35	8.84	9.46	8.21
Environmental sustainability																				
4.3.1 Resource productivity	2.20	3.44	0.78	1.81	1.62	2.55	0.89	2.44	2.12	3.13	2.89	1.87	3.71	1.48	1.55	1.37	3.53	1.30	2.70	4.55
4.3.2 Air emissions by fine particulates (PM2.5) in industry	0.075	0.067	0.266	0.035	0.015	0.019	0.444	0.020	0.247	0.096	0.061	0.194	0.063	0.480	0.881	0.039	0.111	0.091	0.028	0.049
4.3.3 Development of environmental-related technologies	11.20	9.42	20.94	10.13	20.12	11.62	17.44	5.90	11.08	11.07	11.18	9.46	9.58	0.00	5.14	15.40	10.18	8.53	22.81	8.95

	EU	AT	PL	PT	RO	SI	SK	FI	SE	BA	IS	IL*	MK	ME	NO	RS	CH	TR	UA*	UK
FRAMEWORK CONDITIONS																				
Human resources																				
1.1.1 New doctorate graduates	0.8	0.9	0.2	0.8	0.2	0.8	0.7	1.1	1.1	0.1	0.4	0.6	0.1	0.1	0.8	0.5	1.8	0.2	0.2	1.6
1.1.2 Population completed tertiary education	39.4	41.6	43.5	37.4	25.5	44.1	39.2	42.0	48.4	24.1	48.4	48.0	35.8	39.3	52.7	33.4	49.4	34.1	n/a	47.2
1.1.3 Lifelong learning	10.8	14.7	4.8	10.5	1.3	11.2	3.6	29.0	34.3	1.8	22.2	n/a	2.8	2.5	19.3	4.3	32.3	5.7	n/a	14.8
Attractive research systems																				
1.2.1 International scientific co-publications	1204	2119	508	1582	328	1777	826	2572	2862	900	36416	1287	280	751	3075	589	4048	179	141	1869
1.2.2 Scientific publications among top 10% most cited	9.9	10.7	5.0	9.0	4.7	7.8	4.9	12.2	12.7	3.9	10.0	9.5	3.1	6.6	11.9	4.3	14.6	6.2	2.1	14.1
1.2.3 Foreign doctorate students	18.7	33.3	2.3	29.0	4.6	9.8	9.8	22.7	35.5	n/a	33.4	n/a	36.8	15.7	21.1	7.4	55.9	8.4	7.0	41.5
Digitalisation																				
1.3.1 Broadband penetration	23.0	17.0	24.0	41.0	23.0	22.0	15.0	39.0	59.0	10.0	30.0	n/a	11.0	17.0	18.0	15.0	43.6	20.0	8.3	18.0
1.3.2 Individuals who have above basic overall digital skills	31.0	39.0	21.0	32.0	10.0	31.0	27.0	50.0	46.0	8.0	62.0	n/a	15.0	14.0	51.0	20.0	49.0	24.0	n/a	49.0
INVESTMENTS																				
Finance and support																				
2.1.1 R&D expenditure in the public sector	0.73	0.95	0.49	0.64	0.20	0.52	0.38	0.94	0.96	0.12	1.01	0.59	0.26	0.30	0.93	0.54	0.53	0.38	0.20	0.73
2.1.2 Venture capital expenditures	0.141	0.049	0.052	0.104	0.102	0.006	0.021	0.254	0.184	n/a	n/a	n/a	n/a	n/a	0.083	0.010	0.225	n/a	0.034	0.316
2.1.3 Direct and indirect government support for business R&D	0.16	0.26	0.12	0.21	0.02	0.19	0.04	0.06	0.13	0.00	0.26	0.11	0.01	0.00	0.22	0.02	0.02	0.15	0.05	0.33
Firm investments																				
2.2.1 R&D expenditure in the business sector	1.46	2.23	0.83	0.74	0.28	1.51	0.45	1.83	2.44	0.07	1.14	3.91	0.10	0.19	1.10	0.35	1.19	0.68	0.28	1.61
2.2.2 Non-R&D innovation expenditures	0.90	0.35	0.65	0.34	0.10	0.14	0.82	0.56	0.55	0.01	0.56	n/a	1.01	0.14	0.56	3.93	n/a	0.35	0.70	0.44
2.2.3 Innovation expenditures per person employed	7484	6952	2974	2155	829	3905	3371	8040	11955	237	3767	n/a	1282	2205	6026	8129	n/a	3120	n/a	5583
Use of information technologies																				
2.3.1 Enterprises providing ICT trainig	20.0	18.0	18.0	23.0	6.0	26.0	16.0	38.0	32.0	15.0	33.0	n/a	12.0	26.0	24.0	16.0	n/a	11.0	8.8	28.0
2.3.2 Employed ICT specialists	3.9	4.3	3.1	3.6	2.3	3.9	3.7	6.8	7.0	n/a	4.3	n/a	1.9	1.8	4.6	2.6	5.5	1.3	n/a	5.6
INNOVATION ACTIVITIES																				
Innovators																				
3.1.1 SMEs with product innovations	28.7	32.9	12.2	27.2	9.4	35.2	14.0	35.2	41.8	38.6	27.8	n/a	15.5	42.9	44.8	42.6	33.5	20.3	n/a	24.9
3.1.2 SMEs with business process innovations	40.0	53.9	17.3	31.6	7.6	35.9	21.1	46.5	47.3	34.8	41.9	n/a	33.5	41.3	51.6	42.4	50.5	28.3	n/a	17.7
Linkages																				
3.2.1 Innovative SMEs collaborating with others	12.3	16.0	4.3	7.8	2.7	13.5	8.2	27.6	15.4	n/a	22.5	n/a	6.2	9.3	28.0	11.9	9.7	5.8	1.7	23.6
3.2.2 Public-private co-publications	127.4	456.1	67.0	156.8	45.2	317.3	85.0	407.2	491.8	30.3	6116.6	170.3	28.9	46.6	298.2	60.5	768.5	18.1	21.0	268.1
3.2.3 Job-to-job mobility of Human Resources in S&T	7.6	8.4	7.7	9.1	1.6	6.6	3.3	8.6	6.4	n/a	10.1	n/a	6.4	3.6	9.7	6.1	10.0	8.4	n/a	11.3
Intellectual assets																				
3.3.1 PCT patent applications	2.96	4.69	0.45	0.85	0.19	2.39	0.53	7.55	8.92	0.10	3.28	9.01	0.26	0.00	3.00	0.00	6.57	0.68	0.38	2.87
3.3.2 Trademark applications	6.24	10.63	5.11	7.08	2.52	8.38	3.96	8.72	9.26	2.86	3.39	2.31	0.62	0.59	2.52	0.90	10.13	0.63	0.43	4.99
3.3.3 Design applications	3.32	6.28	5.16	2.78	0.87	2.06	1.34	4.59	4.11	0.00	0.17	1.07	0.02	0.00	0.70	0.23	6.48	0.10	0.05	2.51
IMPACTS																				
Employment impacts																				
4.1.1 Employment in knowledge-intensive activities	13.9	14.9	10.6	11.1	7.6	14.6	11.0	16.8	19.0	n/a	15.5	33.5	7.0	11.9	21.9	9.7	19.2	6.5	12.9	19.7
4.1.2 Employment in innovative enterprises	56.9	68.6	31.6	47.2	15.4	54.7	38.0	69.3	68.6	50.5	66.5	n/a	41.5	69.5	71.4	69.6	77.6	40.0	n/a	66.1
Sales impacts																				
4.2.1 Medium & high-tech product exports	57.1	58.3	49.4	42.6	57.4	59.6	69.0	46.6	55.9	24.9	8.2	62.5	64.9	18.6	14.6	44.5	53.6	47.9	26.7	53.5
4.2.2 Knowledge-intensive services exports	67.3	45.7	44.5	36.4	48.2	34.5	38.5	77.3	77.5	18.7	51.7	68.7	31.4	19.3	77.7	51.4	67.9	38.4	50.5	80.9
4.2.3 Sales of new-to-market/new-to-enterprise innovations	11.60	14.93	6.43	12.23	8.79	12.30	11.21	14.29	13.68	9.06	5.56	n/a	3.52	7.16	8.04	11.83	14.33	10.00	3.30	15.53
Environmental sustainability																				
4.3.1 Resource productivity	2.20	2.08	1.30	1.48	0.79	2.04	1.78	1.10	1.43	0.87	1.79	n/a	1.27	n/a	4.46	0.70	3.84	1.58	n/a	1.32
4.3.2 Air emissions by fine particulates (PM2.5) in industry	0.075	0.024	0.318	0.866	0.223	0.144	0.065	0.090	0.059	n/a	0.261	n/a	n/a	n/a	0.156	0.802	0.014	n/a	n/a	0.120
4.3.3 Development of environmental-related technologies	11.20	10.47	11.58	10.50	5.13	9.27	16.20	11.72	11.99	7.81	9.44	6.95	6.53	3.66	9.33	14.07	6.70	8.24	8.11	11.02

Annex D: Performance change

Performance change is measured as the difference between performance in 2021 relative to the EU in 2014 and performance in 2014 relative to the EU in 2014.

	EU	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL
FRAMEWORK CONDITIONS																				
Human resources																				
1.1.1 New doctorate graduates	-11.5	11.5	0.0	11.5	-11.5	0.0	0.0	11.5	0.0	68.9	-23.0	-11.5	-11.5	11.5	-23.0	-11.5	68.9	0.0	11.5	0.0
1.1.2 Population completed tertiary education	28.9	13.2	11.6	22.3	5.8	40.5	18.2	5.8	30.6	41.3	31.4	29.8	28.9	24.8	36.4	21.5	47.9	-12.4	75.2	39.7
1.1.3 Lifelong learning	10.0	-3.3	3.3	-21.1	-17.8	3.3	82.2	40.0	6.7	5.6	12.2	2.2	16.7	-20.0	2.2	17.8	12.2	-14.4	14.4	17.8
Attractive research systems																				
1.2.1 International scientific co-publications	31.1	29.1	13.9	40.9	56.8	18.7	63.9	40.0	25.8	27.4	16.0	40.8	35.0	91.9	53.4	53.5	41.2	21.8	49.4	40.4
1.2.2 Scientific publications among top 10% most cited	-1.7	-7.0	0.6	9.1	-13.2	-9.6	15.5	-3.6	7.6	-2.0	-14.9	7.8	14.4	-18.0	33.4	24.1	21.8	9.2	18.1	-12.3
1.2.3 Foreign doctorate students	18.8	47.8	13.1	45.2	46.4	33.7	65.1	-39.8	-3.5	-36.9	-25.6	42.1	35.9	30.7	61.1	42.4	0.0	77.5	104.5	34.1
Digitalisation																				
1.3.1 Broadband penetration	51.7	45.7	33.0	33.0	44.4	50.0	40.9	48.3	44.7	97.5	19.1	77.9	43.3	130.4	-3.8	57.9	70.4	50.0	56.3	64.6
1.3.2 Individuals who have above basic overall digital skills	22.2	16.7	-11.1	0.0	5.6	22.2	0.0	50.0	38.9	33.3	22.2	27.8	0.0	55.6	0.0	11.1	0.0	16.7	16.7	38.9
INVESTMENTS																				
Finance and support																				
2.1.1 R&D expenditure in the public sector	-3.5	28.1	7.0	-14.0	10.5	8.8	-24.6	-29.8	40.4	-12.3	-5.3	28.1	-5.3	-1.8	-7.0	-17.5	5.3	-8.8	-22.8	-24.6
2.1.2 Venture capital expenditures	68.2	84.8	-58.2	23.8	79.7	67.1	140.4	82.6	44.0	87.2	100.1	59.6	10.6	265.1	-4.1	120.7	0.0	70.6	-45.5	122.7
2.1.3 Direct and indirect government support for business R&D	15.7	19.1	4.0	-26.8	5.4	-11.1	-45.2	-45.7	14.7	-28.6	0.0	-3.2	127.7	-4.2	-0.6	7.5	-0.6	-24.3	-9.3	-13.1
Firm investments																				
2.2.1 R&D expenditure in the business sector	11.0	35.4	15.0	18.9	-10.2	18.1	-27.6	-48.0	27.6	0.8	0.0	15.7	6.3	15.0	1.6	15.0	-7.9	22.0	-8.7	29.9
2.2.2 Non-R&D innovation expenditures	13.6	24.2	-19.8	27.8	18.8	8.3	52.6	13.7	9.9	38.2	12.4	2.8	43.0	45.1	-89.7	30.7	24.0	-26.2	-37.3	-3.7
2.2.3 Innovation expenditures per person employed	32.0	52.8	1.1	21.8	-112.0	35.8	25.7	53.9	33.9	23.5	17.5	-57.8	67.9	29.0	-18.9	22.4	33.4	-17.6	-14.1	22.8
Use of information technologies																				
2.3.1 Enterprises providing ICT trainig	0.0	0.0	-53.3	20.0	0.0	-46.7	20.0	13.3	6.7	-13.3	-40.0	0.0	33.3	20.0	40.0	33.3	-6.7	0.0	46.7	40.0
2.3.2 Employed ICT specialists	33.3	4.8	33.3	28.6	4.8	23.8	104.8	-4.8	9.5	28.6	47.6	33.3	19.0	9.5	42.9	57.1	52.4	9.5	57.1	42.9
INNOVATION ACTIVITIES																				
Innovators																				
3.1.1 SMEs with product innovations	41.1	-13.9	50.8	10.9	55.1	27.7	157.5	9.4	153.4	27.8	60.3	152.8	49.8	155.0	46.5	132.1	0.5	66.3	51.7	-32.7
3.1.2 SMEs with business process innovations	33.0	79.2	1.3	44.1	60.8	97.3	108.7	-15.8	59.6	-8.8	-5.0	78.3	46.4	77.3	11.5	91.1	-54.9	-22.8	-3.3	37.5
Linkages																				
3.2.1 Innovative SMEs collaborating with others	46.5	27.7	25.4	1.4	-3.2	46.3	155.5	125.2	108.0	12.5	26.2	68.7	126.7	162.1	23.2	79.1	52.9	58.7	41.6	-0.1
3.2.2 Public-private co-publications	12.1	26.7	24.6	29.1	46.6	17.2	52.9	29.6	34.8	25.8	1.5	32.9	29.2	90.1	48.3	39.5	49.7	28.5	29.6	27.3
3.2.3 Job-to-job mobility of Human Resources in S&T	43.6	5.1	0.0	20.5	-23.1	76.9	100.0	n/a	46.2	41.0	64.1	41.0	15.4	71.8	-20.5	89.7	28.2	53.8	46.2	0.0
Intellectual assets																				
3.3.1 PCT patent applications	-13.2	-22.1	4.5	0.7	-12.3	-41.4	-22.6	-17.1	5.3	-11.9	-14.6	-8.5	1.3	7.1	8.7	2.1	-1.4	-10.6	15.1	-10.5
3.3.2 Trademark applications	5.0	12.3	22.6	6.1	13.9	-1.1	65.4	-22.4	28.6	2.1	-10.8	29.1	21.1	-63.5	36.1	40.3	0.0	17.0	0.0	12.4
3.3.3 Design applications	-31.5	-17.2	-58.9	-24.3	1.1	-42.2	-5.2	9.0	-0.2	-18.8	-29.7	7.9	-3.8	14.6	21.6	11.6	-78.4	3.3	-125.2	16.9
IMPACTS																				
Employment impacts																				
4.1.1 Employment in knowledge-intensive activities	9.3	5.3	26.7	5.3	9.3	-4.0	42.7	-6.7	-2.7	1.3	13.3	17.3	13.3	4.0	9.3	25.3	21.3	-4.0	21.3	9.3
4.1.2 Employment in innovative enterprises	-3.4	33.3	13.6	6.6	21.1	11.8	83.4	-73.6	26.6	-18.1	-4.2	43.4	22.3	81.5	27.2	64.4	-57.9	-13.8	-9.6	-12.7
Sales impacts																				
4.2.1 Medium & high-tech product exports	9.6	13.1	24.4	14.9	22.4	3.5	-3.8	35.1	30.6	0.7	0.0	8.2	2.3	33.8	9.2	25.1	-3.3	8.7	-5.0	24.2
4.2.2 Knowledge-intensive services exports	5.9	11.8	26.7	8.8	-10.4	-5.6	12.7	0.0	-11.6	2.3	-2.0	2.6	-10.3	2.6	5.8	4.6	9.0	6.1	21.7	6.1
4.2.3 Sales of new-to-market/new-to-enterprise innovations	-13.1	36.2	18.1	-5.1	-106.3	15.9	45.7	-113.4	103.0	15.2	-39.6	12.5	50.2	1.4	28.7	34.3	-13.5	-7.7	-6.2	-31.0
Environmental sustainability																				
4.3.1 Resource productivity	48.1	134.0	13.3	49.7	20.4	64.0	19.2	65.9	73.6	93.5	59.3	36.0	129.4	51.4	21.4	12.7	24.9	-41.9	37.3	57.2
4.3.2 Air emissions by fine particulates (PM2.5) in industry	6.3	8.8	-9.3	15.6	5.8	3.1	35.4	10.5	0.4	6.8	0.5	14.2	9.7	-9.6	0.0	19.9	24.8	-2.0	-1.6	7.0
4.3.3 Development of environmental-related technologies	-24.9	-17.8	44.9	-31.2	-8.2	-27.9	-34.9	-25.4	-77.1	-26.4	-18.1	-39.6	-13.7	-68.8	-0.7	-46.6	-46.0	-34.4	146.5	-28.0

Performance change is measured as the difference between performance in 2021 relative to the EU in 2014 and performance in 2014 relative to the EU in 2014.

	EU	AT	PL	PT	RO	SI	SK	FI	SE	BA	IS	IL*	MK	ME	NO	RS	CH	TR	UA*	UK
FRAMEWORK CONDITIONS																				
Human resources																				
1.1.1 New doctorate graduates	-11.5	0.0	0.0	0.0	-57.4	-91.9	-34.5	-11.5	-34.5	8.0	-11.5	-7.6	-11.5	3.7	-23.0	23.0	23.0	11.5	-8.6	23.0
1.1.2 Population completed tertiary education	28.9	26.4	7.4	49.6	0.8	50.4	77.7	14.0	6.6	2.5	62.8	26.3	63.6	55.4	20.7	52.1	43.0	85.1	n/a	11.6
1.1.3 Lifelong learning	10.0	5.6	-10.0	0.0	-1.1	-28.9	4.4	44.4	0.0	-7.8	-45.6	n/a	-14.4	1.1	-12.2	-1.1	0.0	0.0	n/a	-16.7
Attractive research systems																				
1.2.1 International scientific co-publications	31.1	38.3	30.2	46.7	17.4	36.8	38.7	48.6	45.1	40.8	0.0	22.8	21.7	47.5	64.6	28.0	42.3	18.7	15.8	42.8
1.2.2 Scientific publications among top 10% most cited	-1.7	-4.1	20.7	-12.5	20.1	18.7	26.1	12.2	-6.3	24.4	-7.8	-18.4	0.9	28.5	-10.2	5.3	-14.9	9.2	10.2	6.3
1.2.3 Foreign doctorate students	18.8	55.4	-0.3	91.3	10.7	-2.3	13.1	68.6	30.8	n/a	64.1	n/a	210.7	-20.8	-76.3	15.6	38.2	33.5	4.8	-33.2
Digitalisation																				
1.3.1 Broadband penetration	51.7	20.8	71.3	88.5	46.8	34.3	27.6	52.6	54.2	0.0	59.2	n/a	21.2	40.9	44.7	67.7	100.5	23.1	-5.8	44.7
1.3.2 Individuals who have above basic overall digital skills	22.2	33.3	33.3	22.2	5.6	27.8	5.6	50.0	61.1	0.0	0.0	n/a	5.6	0.0	11.1	44.4	0.0	66.7	n/a	50.0
INVESTMENTS																				
Finance and support																				
2.1.1 R&D expenditure in the public sector	-3.5	17.5	-10.5	-7.0	-17.5	-17.5	-15.8	-17.5	-14.0	0.0	43.9	-3.9	-17.5	21.1	26.3	5.3	-56.1	-14.0	-25.4	31.6
2.1.2 Venture capital expenditures	68.2	6.0	4.0	25.3	93.7	-7.1	13.7	173.5	110.6	n/a	n/a	n/a	n/a	n/a	9.6	11.7	209.5	n/a	13.9	149.5
2.1.3 Direct and indirect government support for business R&D	15.7	13.9	65.3	54.7	-12.8	-80.1	9.9	-15.7	3.7	-1.3	90.0	11.5	3.8	0.6	66.2	15.6	4.5	59.9	-9.0	92.5
Firm investments																				
2.2.1 R&D expenditure in the business sector	11.0	14.2	39.4	3.9	7.1	-33.9	9.4	-40.2	18.9	-7.1	15.0	0.0	1.6	0.8	19.7	11.0	-85.8	23.6	-11.4	48.0
2.2.2 Non-R&D innovation expenditures	13.6	-15.6	-38.6	-34.2	-40.4	-58.3	2.2	24.9	-27.2	0.0	0.0	n/a	0.0	0.0	48.0	0.0	n/a	-185.6	11.3	20.0
2.2.3 Innovation expenditures per person employed	32.0	17.9	-9.2	-9.1	3.7	16.5	5.0	9.8	0.0	0.0	0.0	n/a	0.0	0.0	40.5	0.0	n/a	0.0	n/a	29.1
Use of information technologies																				
2.3.1 Enterprises providing ICT trainig	0.0	-106.7	53.3	-20.0	6.7	40.0	-6.7	0.0	0.0	-6.7	53.3	n/a	-13.3	33.3	-93.3	-40.0	n/a	-26.7	-4.0	26.7
2.3.2 Employed ICT specialists	33.3	33.3	28.6	66.7	33.3	28.6	57.1	14.3	0.0	n/a	42.9	n/a	28.6	-4.8	9.5	33.3	38.1	9.5	n/a	28.6
INNOVATION ACTIVITIES																				
Innovators																				
3.1.1 SMEs with product innovations	41.1	54.1	27.1	15.0	11.0	77.6	6.1	40.2	74.9	0.0	-49.7	n/a	-5.7	0.0	165.6	129.7	-48.5	21.1	n/a	7.9
3.1.2 SMEs with business process innovations	33.0	59.9	4.5	-76.2	-18.2	0.0	-27.8	54.9	71.5	0.0	6.5	n/a	14.7	0.0	141.0	26.4	13.7	-69.9	n/a	-66.4
Linkages																				
3.2.1 Innovative SMEs collaborating with others	46.5	10.0	5.9	13.1	19.7	-14.2	19.5	175.3	35.3	n/a	24.6	n/a	-12.1	0.0	259.2	57.2	12.2	20.0	0.0	16.5
3.2.2 Public-private co-publications	12.1	37.7	29.2	38.8	15.9	19.8	19.3	20.4	27.8	20.0	0.0	7.9	15.1	25.3	26.5	21.1	42.0	11.8	23.2	25.2
3.2.3 Job-to-job mobility of Human Resources in S&T	43.6	51.3	23.1	76.9	-10.3	20.5	0.0	38.5	7.7	n/a	17.9	n/a	89.7	-17.9	15.4	38.5	17.9	0.0	n/a	10.3
Intellectual assets																				
3.3.1 PCT patent applications	-13.2	-16.4	-0.2	7.1	0.7	-20.2	1.9	-4.1	0.0	-3.0	14.9	0.0	7.7	-17.6	-11.3	-8.8	-17.9	3.0	-3.0	-12.3
3.3.2 Trademark applications	5.0	7.4	18.8	22.8	12.8	30.7	20.5	22.1	17.3	29.1	-63.5	12.8	-2.0	5.2	19.1	3.5	-1.4	7.1	13.6	-7.2
3.3.3 Design applications	-31.5	-37.6	8.2	-45.9	5.3	-20.3	-5.2	-9.1	-26.3	0.0	-26.6	-0.1	-0.2	0.0	5.1	4.6	11.3	-2.7	0.8	-9.2
IMPACTS																				
Employment impacts																				
4.1.1 Employment in knowledge-intensive activities	9.3	9.3	12.0	28.0	14.7	6.7	12.0	17.3	2.7	n/a	-26.7	0.0	0.0	22.7	88.0	8.0	-12.0	10.7	13.3	28.0
4.1.2 Employment in innovative enterprises	-3.4	24.5	1.5	-46.0	0.0	-8.3	-4.5	27.4	28.7	0.0	-15.5	n/a	0.0	0.0	77.2	68.1	-9.0	-50.0	n/a	-2.1
Sales impacts																				
4.2.1 Medium & high-tech product exports	9.6	4.5	2.0	20.3	18.3	13.9	14.8	21.5	9.6	15.6	0.0	27.9	52.7	4.0	0.0	9.3	33.8	30.6	-23.4	15.3
4.2.2 Knowledge-intensive services exports	5.9	1.1	11.2	-12.9	18.2	1.5	6.7	31.2	7.8	1.7	-16.5	16.5	7.8	-0.4	13.3	14.0	4.9	20.3	7.6	-6.2
4.2.3 Sales of new-to-market/new-to-enterprise innovations	-13.1	43.4	0.9	-1.6	43.6	15.0	-71.8	26.9	64.7	0.0	0.0	n/a	0.0	0.0	24.4	33.2	-45.2	-118.0	-4.3	12.0
Environmental sustainability																				
4.3.1 Resource productivity	48.1	41.3	46.0	33.3	8.0	51.2	31.4	20.3	-1.7	3.6	1.8	n/a	36.3	n/a	0.0	3.1	62.7	46.3	n/a	-9.3
4.3.2 Air emissions by fine particulates (PM2.5) in industry	6.3	10.3	13.5	0.0	10.7	3.1	16.9	4.8	9.6	n/a	8.0	n/a	n/a	n/a	12.1	-8.8	3.0	n/a	n/a	-1.3
4.3.3 Development of environmental-related technologies	-24.9	-37.9	-0.2	-43.9	-80.6	22.8	-19.0	-38.6	4.7	-122.1	25.2	-26.2	25.9	0.0	-54.0	-68.5	-33.1	16.8	-75.0	-19.5

Annex E: Definitions of indicators

INDICATOR	DEFINITION NUMERATOR Source	DEFINITION DENOMINATOR Source	MOST RECENT YEAR FOR WHICH DATA ARE AVAILABLE INTERPRETATION
1.1.1 New doctorate graduates in science, technology, engineering, and mathematics (STEM) per 1,000 population aged 25-34	Number of doctorate graduates in science, technology, engineering, and mathematics (STEM) Eurostat	Population between and including 25 and 34 years Eurostat	2018 The indicator is a measure of the supply of new second-stage tertiary graduates in all fields of training (ISCED 8). For most countries, ISCED 8 captures PhD graduates. There is a complex relation between STEM-graduates and innovation in the private sector. STEM-graduates do well as an employee within firms with many of them taking up managerial positions. However, non-STEM graduates are more likely to be involved in entrepreneurial activities. Graduates with a STEM-background who have completed a non-STEM study next to their core curriculum, show as much entrepreneurial activity as non-STEM graduates.
1.1.2 Percentage population aged 25-34 having completed tertiary education	Number of persons in age class with some form of post-secondary education Eurostat	Population between and including 25 and 34 years Eurostat	2019 This is a general indicator of the supply of advanced skills. It is not limited to science and technical fields, because the adoption of innovations in many areas, in particular in the service sectors, depends on a wide range of skills. The indicator focuses on a 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. Lifelong learning	The target population for lifelong learning statistics refers to all persons in private households aged between 25 and 64 years. The information collected 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 (LFS) Eurostat	Total population of the same age group, excluding those who did not answer the question concerning participation in (formal and non-formal) education and training Eurostat	2019 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 based abroad (where abroad is non-EU for the EU27) Scopus *	Total population Eurostat	2020 International scientific co-publications are a proxy for the quality of scientific research as collaboration increases scientific productivity
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 *	2018 The indicator is a measure for the efficiency of the research system, as highly cited publications are assumed to be of higher quality. There could be a bias towards small or English-speaking countries given the coverage of Scopus' publication data.
1.2.3 Foreign doctorate students as a percentage of all doctorate students	Number of doctorate students from foreign countries Eurostat	Total number of doctorate students Eurostat	2018 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	DEFINITION DENOMINATOR Source	MOST RECENT YEAR FOR WHICH DATA ARE AVAILABLE INTERPRETATION
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	2019 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.
1.3.2 Individuals who have above basic overall digital skills (% share)	Number of individuals with above basic overall digital skills Eurostat: EU survey on the ICT usage in households and by individuals	Total number of individuals aged 16 to 74 Eurostat	2019 Above basic overall digital skills represents 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)	All R&D expenditures in the government sector (GOVERD) and the higher education sector (HERD) Eurostat	Gross Domestic Product Eurostat	2019 Research and development (R&D) expenditure represents one of the major drivers of economic growth in a knowledge-based economy. As such, trends in the R&D expenditure indicator provide key indications of the future competitiveness and wealth of the EU. 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 Invest Europe Comment: Three-year averages have been used	Gross Domestic Product Eurostat	2020 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 R&D Tax Incentive Database, http://oe.cd/rdtax, December 2020.		2018 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 collect data on such systematically since 2017 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 2018, a significant increase compared to only 12 countries offering R&D tax relief in 2000.

INDICATOR	DEFINITION NUMERATOR Source	DEFINITION DENOMINATOR Source	MOST RECENT YEAR FOR WHICH DATA ARE AVAILABLE INTERPRETATION
2.2.1 R&D expenditure in the business sector (percentage of GDP)	All R&D expenditures in the business sector (BERD) Eurostat	Gross Domestic Product Eurostat	2019 Iindicator 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)	2018 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 Standards (PPS) Eurostat (Community Innovation Survey)	Total employment in innovative enterprises in all size classes Eurostat (Community Innovation Survey)	2018 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	Number of enterprises that provided any type of training to develop ICT related skills of their personnel Eurostat, Community Survey of ICT Usage and E-commerce in Enterprises	All enterprises Eurostat, Community Survey of ICT Usage and E-commerce in Enterprises	2020 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)	Number of employed ICT specialists Eurostat	Total employment Eurostat	2019 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[1]).
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 enterprises Eurostat (Community Innovation Survey)	2018 Product innovation is a key ingredient to innovation as they can create new markers 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 either new to the enterprise or new to their market Eurostat (Community Innovation Survey)	Total number of Small and medium-sized enterprises Eurostat (Community Innovation Survey)	2018 Many firms innovate not by improving new products but by improving their business processes. Business process innovations include process, marketing and organisational innovations.

[1] https://ec.europa.eu/eurostat/cache/metadata/Annexes/isoc_skslf_esms_an1.pdf

INDICATOR	DEFINITION NUMERATOR Source	DEFINITION DENOMINATOR Source	MOST RECENT YEAR FOR WHICH DATA ARE AVAILABLE INTERPRETATION
3.2.1 Innovative SMEs collaborating with others (percentage of SMEs)	Number of Small and medium-sized enterprises with innovation co-operation activities, i.e. those firms that had any co-operation agreements on innovation activities with other enterprises or institutions in the three years of the survey period Eurostat (Community Innovation Survey)	Total number of Small and medium-sized enterprises Eurostat (Community Innovation Survey)	2018 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 co-authored research publications. The definition of the "private sector" excludes the private medical and health sector. Scopus *	Total population Eurostat	2020 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 Eurostat: Job-to-job mobility of HRST by sex [hrst_fl_mobsex]	Working age population aged 25-64 Eurostat	2019 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, at international phase, designating the European Patent Office (EPO). Patent counts are based on the priority date, the inventor's country of residence and fractional counts. OECD	Gross Domestic Product in Purchasing Power Standard Eurostat	2017 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 Trademark applications per billion GDP (in PPS)	Number of trademarks applied for at EUIPO European Union Intellectual Property Office (EUIPO) Comment: Two-year averages have been used	Gross Domestic Product in Purchasing Power Standard Eurostat	2020 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.
3.3.3 Design applications per billion GDP (in PPS)	Number of individual designs applied for at EUIPO European Union Intellectual Property Office (EUIPO) Comment: Two-year averages have been used	Gross Domestic Product in Purchasing Power Standard Eurostat	2020 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.

INDICATOR	DEFINITION NUMERATOR Source	DEFINITION DENOMINATOR Source	MOST RECENT YEAR FOR WHICH DATA ARE AVAILABLE INTERPRETATION
4.1.1 Employment in knowledge-intensive activities (percentage of total employment)	Number of employed persons in knowledge-intensive activities in business industries. Knowledge-intensive activities are defined, based on EU Labour Force Survey data, as all NACE Rev.2 industries at 2-digit level where at least 33% of employment has a higher education degree (ISCED 5-8). Eurostat	Total employment Eurostat	2019 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 ('Enterprises that have either introduced an innovation or have any kind of innovation activity (including enterprises with abandoned/ suspended or on-going innovation activities)) Eurostat (Community Innovation Survey)	Total employment for enterprises with 10 or more employees Eurostat (Community Innovation Survey)	2018 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	Value of medium and high-tech exports, in national currency and current prices, including exports of the following SITC Rev.3 products: 266, 267, 512, 513, 525, 533, 54, 553, 554, 562, 57, 58, 591, 593, 597, 598, 629, 653, 671, 672, 679, 71, 72, 731, 733, 737, 74, 751, 752, 759, 76, 77, 78, 79, 812, 87, 88 and 891 Eurostat (ComExt) for Member States, UN ComTrade for non-EU countries	Value of total product exports Eurostat (ComExt) for Member States, UN ComTrade for non-EU countries	2020 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	Exports of knowledge-intensive services is 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[2] Eurostat	Total value of services exports Eurostat	2019 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.
4.2.3 Sales of new-to-market and new-to-enterprise innovations as percentage of turnover	Sum of total turnover of new or significantly improved products, either new-to-the-enterprise or new-to-the-market, for all enterprises Eurostat (Community Innovation Survey)	Total turnover for all enterprises Eurostat (Community Innovation Survey)	2018 This indicator measures the turnover of new or significantly improved products and includes both products which are only new to the enterprise 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-enterprise products).

[2] SC1 (Sea transport), SC2 (Air transport), SC3A (Space transport), SF (Insurance and pension services), SG (Financial services), SH (Charges for the use of intellectual property), SI (Telecommunications, computer, and information services), SJ (Other business services) and SK1 (Audio-visual and related services)

INDICATOR	DEFINITION NUMERATOR Source	DEFINITION DENOMINATOR Source	MOST RECENT YEAR FOR WHICH DATA ARE AVAILABLE INTERPRETATION
4.3.1 Resource productivity	Resource productivity is expressed by the amount of GDP generated per unit of direct material consumed, i.e. GDP / DMC in euros per kg Eurostat: Resource productivity [env_ac_rp]		2019 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, Air emissions accounts by NACE Rev. 2 activity [env_ac_ainah_r2]	Value added in the Manufacturing sector - Chain linked volumes (2010), million euro Eurostat	2018 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/EC[3] on ambient air quality and cleaner air, while the World Health Organisation (WHO[4]) 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 Green Growth database Comment: Two-year averages have been used	Total number of patents	2016 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[5]), including environmental management, water-related 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[6].

* Data provided by Science-Metrix as part of a contract to European Commission (DG Research and Innovation).

[3] https://ec.europa.eu/eurostat/cache/metadata/Annexes/isoc_skslf_esms_an1.pdf

[4] https://www.who.int/en/

[5] http://www.oecd.org/environment/consumption-innovation/ENV-tech%20search%20strategies,%20version%20for%200E

[6] https://www.oecd-ilibrary.org/environment/data/oecd-environment-statistics_env-data-en

Annex F: Summary Innovation Index (SII) time series

	SUMMARY INNOVATION INDEX								RELATIVE TO EU IN 2014								... IN 2021
	2014	2015	2016	2017	2018	2019	2020	2021	2014	2015	2016	2017	2018	2019	2020	2021	2021
EU27	0.467	0.473	0.477	0.482	0.487	0.506	0.513	0.526	100.0	101.1	102.1	103.2	104.2	108.2	109.8	112.5	100.0
BE	0.574	0.584	0.588	0.604	0.618	0.634	0.637	0.671	122.8	124.9	125.8	129.2	132.3	135.6	136.3	143.5	127.5
BG	0.200	0.215	0.213	0.220	0.217	0.219	0.230	0.234	42.9	45.9	45.5	47.1	46.5	46.9	49.1	50.1	44.5
CZ	0.391	0.402	0.404	0.403	0.407	0.425	0.431	0.441	83.7	86.0	86.5	86.3	87.1	91.0	92.1	94.4	83.9
DK	0.673	0.674	0.673	0.656	0.664	0.681	0.683	0.689	144.0	144.3	143.9	140.3	142.0	145.6	146.0	147.5	131.1
DE	0.585	0.582	0.577	0.587	0.594	0.606	0.613	0.645	125.2	124.4	123.5	125.5	127.1	129.5	131.2	137.9	122.6
EE	0.434	0.434	0.415	0.392	0.386	0.486	0.502	0.600	92.9	92.9	88.7	83.8	82.7	104.0	107.3	128.3	114.0
IE	0.557	0.561	0.574	0.587	0.595	0.589	0.582	0.567	119.2	120.0	122.8	125.6	127.2	125.9	124.5	121.3	107.8
EL	0.293	0.302	0.308	0.314	0.316	0.367	0.377	0.414	62.6	64.5	65.9	67.3	67.6	78.5	80.6	88.5	78.6
ES	0.386	0.395	0.392	0.411	0.416	0.432	0.444	0.449	82.6	84.4	83.8	87.8	89.1	92.5	95.1	96.0	85.3
FR	0.548	0.551	0.556	0.577	0.580	0.574	0.582	0.572	117.2	117.9	118.9	123.5	124.1	122.8	124.4	122.3	108.7
HR	0.265	0.269	0.274	0.279	0.290	0.302	0.319	0.366	56.7	57.6	58.7	59.8	62.0	64.6	68.3	78.2	69.5
IT	0.383	0.398	0.405	0.400	0.409	0.440	0.457	0.505	82.0	85.1	86.5	85.6	87.4	94.0	97.7	108.1	96.0
CY	0.343	0.380	0.377	0.342	0.356	0.380	0.425	0.498	73.4	81.3	80.7	73.3	76.2	81.3	90.9	106.5	94.6
LV	0.212	0.228	0.243	0.240	0.259	0.287	0.287	0.261	45.3	48.9	52.1	51.4	55.4	61.4	61.4	55.9	49.6
LT	0.286	0.295	0.309	0.359	0.378	0.391	0.427	0.430	61.2	63.1	66.1	76.8	80.9	83.7	91.3	92.1	81.8
LU	0.602	0.603	0.618	0.624	0.614	0.618	0.644	0.638	128.8	129.1	132.2	133.5	131.3	132.3	137.7	136.5	121.3
HU	0.330	0.338	0.340	0.337	0.337	0.329	0.341	0.357	70.5	72.3	72.6	72.1	72.0	70.4	73.0	76.4	67.9
MT	0.406	0.421	0.425	0.388	0.432	0.451	0.469	0.476	86.9	90.0	90.8	82.9	92.3	96.5	100.3	101.8	90.4
NL	0.586	0.596	0.602	0.623	0.631	0.648	0.659	0.647	125.3	127.4	128.8	133.3	134.9	138.6	141.0	138.5	123.1
AT	0.573	0.581	0.580	0.611	0.609	0.619	0.616	0.625	122.6	124.3	124.1	130.8	130.2	132.5	131.7	133.6	118.7
PL	0.240	0.246	0.254	0.267	0.274	0.286	0.295	0.308	51.3	52.6	54.3	57.2	58.7	61.2	63.2	65.9	58.5
PT	0.384	0.392	0.394	0.390	0.391	0.439	0.460	0.422	82.3	83.8	84.2	83.5	83.6	93.8	98.4	90.3	80.2
RO	0.145	0.146	0.146	0.154	0.162	0.155	0.155	0.164	31.0	31.2	31.3	33.0	34.6	33.1	33.1	35.1	31.2
SI	0.456	0.464	0.466	0.471	0.467	0.458	0.439	0.470	97.6	99.3	99.6	100.9	100.0	98.1	93.8	100.5	89.3
SK	0.304	0.313	0.319	0.324	0.304	0.321	0.335	0.332	65.1	67.1	68.3	69.4	65.0	68.6	71.6	71.0	63.1
FI	0.607	0.615	0.622	0.620	0.629	0.670	0.681	0.708	129.9	131.5	133.1	132.7	134.5	143.4	145.8	151.4	134.5
SE	0.657	0.661	0.661	0.677	0.685	0.694	0.692	0.731	140.5	141.4	141.5	144.8	146.5	148.5	148.1	156.5	139.0
BA	0.188	0.197	0.199	0.201	0.210	0.202	0.181	0.182	40.2	42.1	42.5	43.0	45.0	43.2	38.7	39.0	34.6
IS	0.541	0.548	0.553	0.555	0.576	0.587	0.585	0.578	115.8	117.3	118.3	118.6	123.2	125.5	125.1	123.7	109.9
IL*	0.550	0.551	0.558	0.569	0.573	0.568	0.567	0.569	117.6	117.8	119.4	121.8	122.6	121.5	121.4	121.7	108.1
MK	0.153	0.156	0.156	0.192	0.208	0.190	0.208	0.220	32.7	33.3	33.5	41.0	44.6	40.7	44.6	47.1	41.9
ME	0.215	0.223	0.217	0.229	0.248	0.257	0.238	0.251	46.0	47.6	46.4	48.9	53.1	54.9	50.9	53.7	47.8
NO	0.500	0.506	0.504	0.568	0.566	0.608	0.607	0.621	106.9	108.2	107.7	121.6	121.2	130.0	129.8	132.8	118.0
RS	0.270	0.270	0.276	0.273	0.270	0.299	0.313	0.348	57.8	57.7	59.1	58.4	57.8	63.9	67.0	74.5	66.2
CH	0.723	0.736	0.742	0.751	0.766	0.765	0.760	0.759	154.6	157.5	158.7	160.8	163.8	163.7	162.6	162.3	144.2
TR	0.257	0.261	0.261	0.277	0.294	0.329	0.344	0.258	55.0	55.7	55.9	59.2	62.8	70.4	73.5	55.3	49.1
UA*	0.182	0.177	0.184	0.168	0.155	0.152	0.153	0.157	38.9	37.9	39.3	35.9	33.1	32.4	32.8	33.6	29.8
UK	0.571	0.572	0.581	0.628	0.643	0.647	0.658	0.643	122.2	122.4	124.3	134.3	137.5	138.4	140.7	137.7	122.3

* Results for IL and UA are less reliable due to limited data availability.

Annex G: Performance scores per dimension

Performance is measured relative to that of the EU in 2021.

	HUMAN RESOURCES	ATTRACTIVE RESEARCH SYSTEMS	DIGITALISATION	FINANCE AND SUPPORT	FIRM INVESTMENTS	INFORMATION TECHNOLOGIES	INNOVATORS	LINKAGES	INTELLECTUAL ASSETS	EMPLOYMENT IMPACTS	SALES IMPACTS	ENVIRONMENTAL SUSTAINABILITY
	2021	2021	2021	2021	2021	2021	2021	2021	2021	2021	2021	2021
EU	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
BE	115.7	153.4	115.1	126.9	128.4	161.2	129.8	157.5	94.6	142.8	106.3	118.5
BG	41.2	28.5	52.1	11.9	28.1	44.6	31.8	26.5	88.4	46.7	49.8	87.5
CZ	81.9	74.2	79.4	69.5	79.1	117.3	89.7	79.5	59.7	88.7	97.8	95.9
DK	174.0	169.0	152.9	111.6	72.7	155.8	119.2	169.1	176.4	119.0	75.3	130.7
DE	98.2	91.6	111.9	92.2	144.8	114.3	152.0	137.8	153.1	143.0	123.3	118.6
EE	128.8	104.6	102.5	92.0	104.8	131.1	159.1	179.3	131.6	147.6	76.9	66.1
IE	151.1	133.6	104.1	75.1	80.4	140.8	94.0	152.4	62.5	112.6	119.7	97.1
EL	68.6	67.3	60.8	50.3	67.9	40.8	160.0	109.1	48.7	107.7	89.7	80.9
ES	139.8	90.9	127.2	72.6	57.5	94.2	30.5	88.5	79.9	54.5	74.4	114.3
FR	148.6	116.4	85.1	150.0	89.6	90.3	105.1	113.5	83.2	109.5	90.2	114.9
HR	51.7	53.3	90.6	50.1	50.1	95.8	131.8	95.1	35.7	88.9	50.4	75.3
IT	56.2	99.6	68.7	82.5	88.2	76.9	144.2	86.2	110.4	126.5	93.2	124.6
CY	102.6	119.6	80.7	67.0	49.4	92.4	163.5	183.9	54.1	147.2	100.7	29.1
LV	71.7	53.0	78.9	25.0	22.5	75.4	41.3	58.3	67.4	52.4	58.3	22.3
LT	106.3	53.2	114.8	61.8	66.1	66.1	110.4	120.8	65.3	90.0	44.3	104.6
LU	170.6	184.5	122.0	94.2	46.8	145.3	98.6	145.2	145.8	144.5	95.6	116.9
HU	42.0	68.0	86.4	83.4	57.7	78.1	35.7	83.5	48.1	46.0	94.6	72.2
MT	76.3	83.6	120.1	13.2	47.2	138.1	103.2	96.2	122.6	121.9	66.6	150.1
NL	141.2	176.0	148.6	110.0	71.2	145.0	94.3	150.5	135.5	119.6	94.8	124.8
AT	120.6	137.8	106.1	112.6	99.6	101.5	138.3	146.8	157.5	128.8	93.7	104.5
PL	63.9	39.4	83.1	56.0	53.9	78.5	15.1	68.8	84.4	31.3	63.6	62.2
PT	94.6	115.6	121.9	94.1	37.6	103.5	79.2	102.4	76.7	65.2	64.8	38.9
RO	13.2	35.0	61.8	28.7	7.9	26.1	3.8	16.0	32.8	10.3	79.9	38.2
SI	111.8	87.9	98.7	60.2	56.0	118.5	106.6	115.3	91.4	99.2	80.8	82.6
SK	74.9	56.5	81.2	25.5	51.4	83.8	27.2	49.1	48.3	46.2	90.5	110.4
FI	169.0	137.1	152.7	119.5	103.1	203.5	128.4	177.5	167.2	140.5	103.0	79.3
SE	183.6	160.3	147.4	117.7	130.3	185.0	145.0	132.0	166.5	151.0	111.1	90.8
BA	8.5	61.7	39.5	1.2	0.5	61.7	112.0	24.3	26.7	85.3	26.7	27.8
IS	132.6	157.6	148.6	156.7	63.0	147.8	101.7	197.3	64.2	127.8	34.0	68.2
IL*	127.5	113.0	N/A	73.4	168.3	N/A	N/A	92.1	111.3	204.1	123.1	32.8
RS	36.0	67.3	52.4	9.5	36.0	36.9	56.2	55.6	10.9	31.5	62.8	32.5
NO	41.3	70.9	60.7	12.1	15.9	78.2	135.3	47.3	7.6	114.3	16.2	0.0
MK	153.7	139.8	129.5	111.4	74.9	125.8	157.3	177.3	60.7	172.4	58.6	112.7
ME	54.0	44.7	68.4	30.4	106.4	62.7	136.7	76.8	13.0	102.7	76.5	36.1
CH	210.1	208.0	152.9	79.2	80.3	168.9	132.6	160.2	177.3	170.1	103.5	125.3
TR	44.9	41.0	83.2	64.6	41.7	22.3	56.7	66.5	15.9	25.9	66.2	49.7
UA*	31.8	17.3	72.0	17.7	41.6	23.4	N/A	10.1	9.8	78.2	37.5	44.4
UK	167.4	161.4	125.8	152.8	80.4	157.3	45.4	175.7	87.1	149.8	115.5	77.5

* Results for IL and UA are less reliable due to limited data availability.

Annex H: International data

Performance in 2021 relative to EU in 2014	AU	BR	CA	CN	IN	JP	KR	RU	SA	US
	2021	2021	2021	2021	2021	2021	2021	2021	2021	2021
1.1.1 New doctorate graduates	135.4	25.8	100.9	n/a	5.2	51.7	110.0	36.8	n/a	82.7
1.1.2 Population completed tertiary education	133.2	54.1	159.8	35.6	35.3	156.1	177.2	157.6	14.1	127.9
1.2.1 International scientific co-publications	391.3	22.3	260.1	19.2	4.3	51.2	83.6	28.1	39.3	115.8
1.2.2 Scientific publications among top 10% most cited	135.1	56.1	114.9	111.9	61.1	58.6	79.4	25.8	72.2	135.1
2.1.1 R&D expenditure in the public sector	113.4	n/a	106.1	75.4	59.0	90.4	121.2	57.4	66.5	93.7
2.1.2 Direct & indirect government funding of business R&D	94.6	26.9	103.1	74.5	n/a	82.3	177.7	243.9	8.2	119.0
2.2.1 R&D expenditure in the business sector	67.9	n/a	56.9	123.0	17.3	184.7	268.3	45.0	24.5	155.7
2.3.2 Employment in ICT	113.8	44.7	n/a	n/a	n/a	106.9	99.6	56.5	n/a	119.2
3.1.1 SMEs with product innovations	154.2	103.8	194.6	n/a	n/a	117.4	76.6	12.0	n/a	150.3
3.1.2 SMEs with business process innovations	117.8	187.9	200.0	n/a	n/a	49.5	106.8	2.9	n/a	n/a
3.2.1 Innovative SMEs collaborating with others	119.6	52.3	n/a	n/a	n/a	119.7	51.3	17.0	n/a	n/a
3.2.2 Public-private co-publications	208.1	11.8	184.7	33.2	3.0	84.8	106.6	23.9	16.0	126.1
3.3.1 PCT patent applications	61.1	10.8	69.7	102.5	12.5	362.5	308.6	12.4	15.2	114.7
3.3.2 Trademark applications	220.0	57.6	215.0	703.9	28.6	216.0	271.8	150.4	103.5	66.3
3.3.3 Design applications	98.0	10.4	59.0	450.6	7.5	89.6	467.6	37.7	36.8	34.6
4.2.1 Medium & high-tech product exports	16.7	45.9	67.3	101.8	62.4	128.9	126.5	21.9	64.5	94.1
4.2.2 Knowledge-intensive services exports	36.8	116.1	97.2	98.0	111.5	103.0	87.2	95.2	n/a	105.3
4.3.2 Air pollution by fine particulates in Industry	199.7	115.5	190.1	28.2	16.2	98.7	49.1	114.4	47.6	175.6
4.3.3. Environment-related technologies	84.7	103.2	91.0	60.8	81.9	75.8	98.7	67.6	73.9	87.2

Change in performance (2014-2021)

Performance change is measured as the difference between performance in 2021 relative to the EU in 2014 and performance in 2014 relative to the EU in 2014 (the results are the same as those shown in the final column in the performance tables in the country profiles in **Section 4.2**).

	AU	BR	CA	CN	IN	JP	KR	RU	SA	US
1.1.1 New doctorate graduates	40.5	6.8	22.0	n/a	1.4	27.2	42.0	-20.9	n/a	15.5
1.1.2 Population completed tertiary education	-1.4	12.8	-2.7	3.5	-4.3	-10.7	-9.7	5.1	2.8	2.4
1.2.1 International scientific co-publications	37.2	4.5	-15.9	6.3	1.2	-5.0	-2.4	6.5	9.0	-13.3
1.2.2 Scientific publications among top 10% most cited	-1.5	6.5	-14.3	39.2	1.0	-3.3	-0.4	11.0	1.9	-14.6
2.1.1 R&D expenditure in the public sector	-8.1	n/a	-12.9	11.5	-7.0	-8.4	9.3	-2.3	11.5	-5.0
2.1.2 Direct & indirect government funding of business R&D	-10.8	-5.4	-46.1	-3.8	n/a	15.0	-64.6	-68.9	-3.4	-66.9
2.2.1 R&D expenditure in the business sector	-31.5	n/a	-17.5	4.5	-4.9	-15.3	24.2	-3.7	-1.9	3.9
2.3.2 Employment in ICT	-6.1	-2.7	n/a	n/a	n/a	2.7	1.2	-7.3	n/a	-2.4
3.1.1 SMEs with product innovations	-5.5	0.5	25.2	n/a	n/a	39.4	25.1	-0.8	n/a	82.8
3.1.2 SMEs with business process innovations	-7.5	23.6	45.1	n/a	n/a	-43.9	57.3	0.4	n/a	n/a
3.2.1 Innovative SMEs collaborating with others	44.4	-5.6	n/a	n/a	n/a	90.1	-6.3	8.5	n/a	n/a
3.2.2 Public-private co-publications	33.2	1.3	4.5	16.1	0.5	-14.2	-0.2	11.2	3.5	-22.3
3.3.1 PCT patent applications	-0.4	2.5	-1.7	66.4	-1.0	87.0	106.8	2.0	-3.5	14.4
3.3.2 Trademark applications	-52.5	17.6	-14.6	444.4	4.1	117.7	13.9	-3.0	-25.9	3.6
3.3.3 Design applications	15.0	1.3	12.8	-99.3	1.7	3.3	-23.9	9.1	-10.1	9.0
4.2.1 Medium & high-tech product exports	-0.7	5.9	1.8	-0.9	13.1	-10.8	-2.9	2.9	3.9	-0.4
4.2.2 Knowledge-intensive services exports	-3.1	6.4	-8.9	-2.1	-12.2	-19.6	-3.1	-0.4	n/a	-4.0
4.3.2 Air pollution by fine particulates in Industry	-22.8	2.4	-14.6	1.8	-1.7	-18.2	-11.2	2.2	-6.0	0.2
4.3.3. Environment-related technologies	-14.4	7.0	2.2	-4.6	-3.6	-4.0	14.9	-16.8	-25.9	-4.2

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