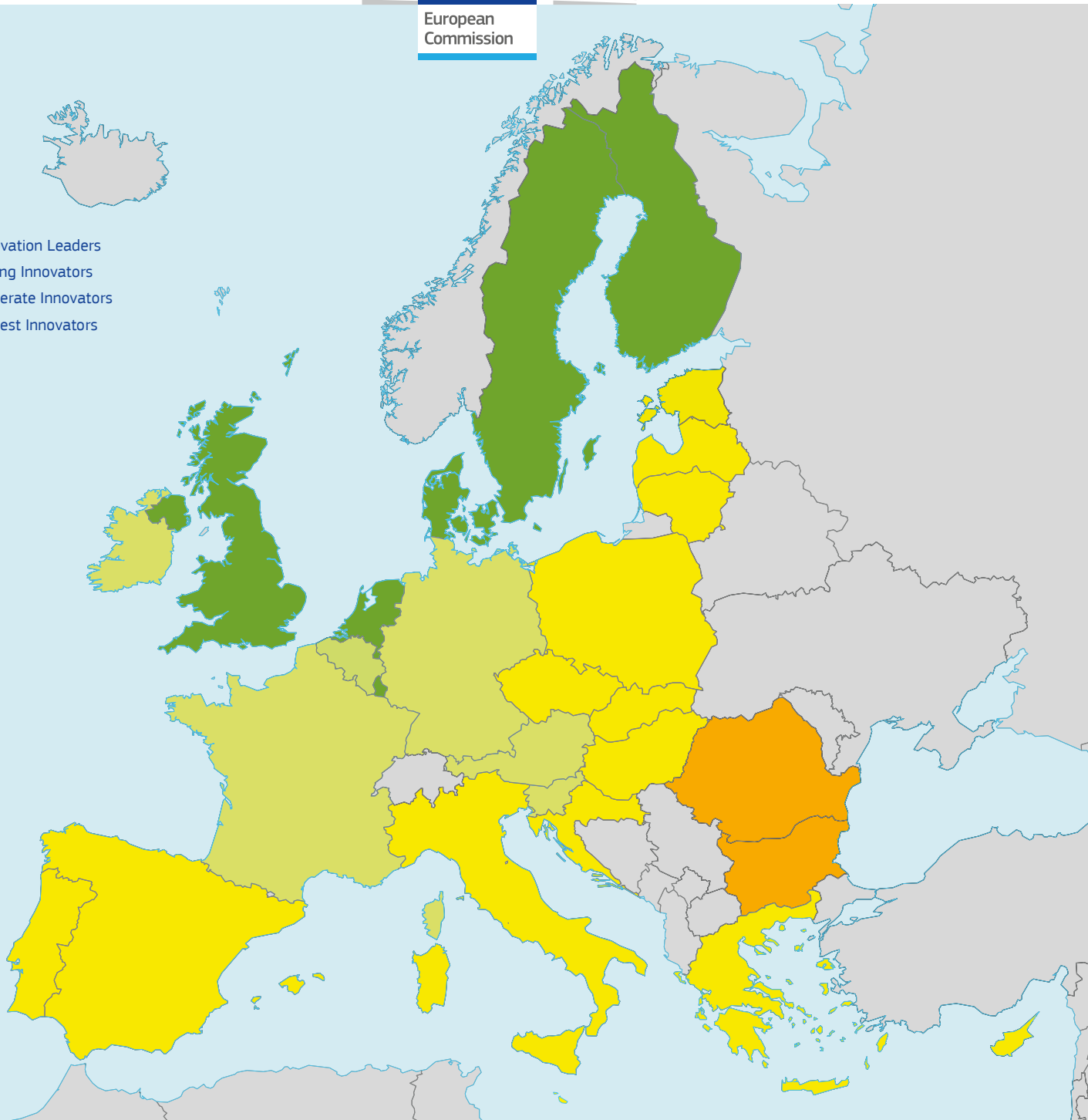European Commission

Innovation Leaders
Strong Innovators
Moderate Innovators
Modest Innovators

European
Innovation Scoreboard
2018

Innovation

European **Innovation**
Scoreboard 2018

Foreword

"Society can only move forward as fast as it innovates. It can only provide lasting prosperity if it makes the most of the knowledge, entrepreneurial spirit and productivity of its people."

(Commission Communication "A renewed European Agenda for Research and Innovation - Europe's chance to shape its future";
contribution to the Informal EU Leaders' meeting on innovation in Sofia on 16 May 2018)

With only 7% of the world's population, Europe has a leading position in industrial sectors such as pharmaceuticals, mechanical engineering and fashion, accounts for 20% of global R&D investments, and yields one third of high-quality scientific publications. It is strong in incremental innovation and moving ahead in Key Enabling Technologies such as photonics and biotechnology.

The European Innovation Scoreboard 2018 shows improving performance and accelerating progress for Europe, and a positive outlook. However, while the Union's innovation gap with the United States, Japan and Canada is foreseen to diminish, South Korea leads and China is catching up very fast. Europe needs to reinforce its efforts to ride the next wave of innovation and move towards cleaner and smarter industry and higher competitiveness, well-being and cohesion.

EU companies spend less on innovation. While business investments and venture capital investments increased in recent years, the EU lags behind the United States in this respect and is home to only a handful of Unicorn start-ups. Digitisation and fast-pace megatrends such as artificial intelligence and the circular economy offer huge opportunities, but also new challenges. As global competition intensifies, Europe must deepen its innovation edge to ensure success.

This is at the heart of the Commission's Communication 'A renewed European agenda for research and innovation - Europe's chance to shape its future', which highlights that Europe needs to step up its efforts in support of the creation and scale-up of breakthrough and disruptive innovations. A European Innovation Council will be piloted by Horizon 2020. The Internal Market and competition policies will be strengthened.

The EU budget for the future (2021-2027) includes EUR 100 billion for Horizon Europe, a sharp increase of resources for the successor of our highly successful Horizon 2020. This will accelerate innovation along the full value chain and support the identification and scale-up of the most promising breakthrough innovations, while connecting science and innovation better with citizens' needs through missions. It will be important to integrate all European regions into innovation-led value chains by helping the wide diffusion of innovation.

In this respect, the Scoreboard reveals that innovation performance strongly diverges across the EU, with uneven progress. Since 2010, it improved in 18 EU Member States and declined in 10.

Small and medium-sized enterprises (SMEs) are engines of innovation, employment and cohesion, and they deserve special attention. Preliminary data suggest that for the EU as a whole, the decreasing trend in the share of SMEs that introduce innovations has recently been reversed. However, in many Member States, SMEs performance is still at pre-crisis levels.

The recently launched VentureEU fund of funds shall boost business investments. Many Member States need to increase their public research and innovation investments and reform their national innovation systems to make them more impactful. The Commission will support them through the Horizon 2020 Policy Support Facility. Equipping Europe for the era of deep-tech innovation requires joint efforts of EU, national, regional, and local actors.

We count on you – researchers, innovators, investors, and policy-makers – to accelerate innovation in Europe. And we are confident that the analysis in the European Innovation Scoreboard 2018 will support the development of policies to enhance innovation in Europe.

Elżbieta Bieńkowska
European Commissioner for
Internal Market, Industry,
Entrepreneurship and SMEs

Carlos Moedas
European Commissioner
for Research,
Science and Innovation

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Executive summary

The annual European Innovation Scoreboard (EIS) provides a comparative assessment of the research and innovation performance of the 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.

This year's EIS reveals that the EU's innovation performance continues to increase and that progress has accelerated in recent years. Further improvement is expected for the near future, but progress remains uneven within the EU.

The EU is catching up with the United States, while it is losing ground vis-à-vis South Korea

At the global level, the EU continues to improve its position vis-à-vis the United States, Japan, and Canada. Relative to South Korea, the EU has been falling behind, but a gradual catch-up process is expected over the coming years. China is catching up at three times the EU's innovation performance growth rate. The EU's performance lead over Brazil, India, Russia, and South Africa remains considerable (***Figure 1***).

Figure 1: Global performance
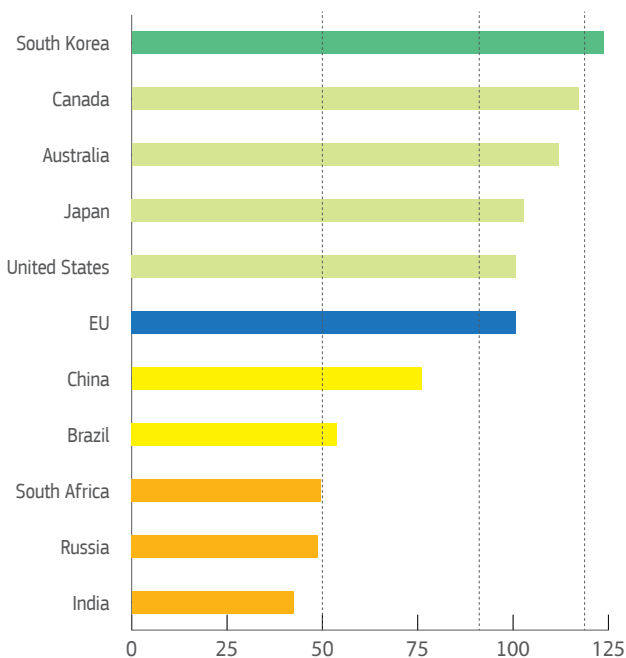
Bars show countries' performance in 2017 relative to that of the EU in 2017. The dashed lines show the threshold values of the performance groups in 2017.

Innovation performance has increased for the EU but not for all Member States

On average, the innovation performance of the EU has increased by 5.8 percentage points since 2010. However, there has been no convergence between EU countries performing at lower levels and those performing at higher levels. Since 2010, innovation performance increased in 18 EU countries and decreased in 10. Performance has increased most in Lithuania, Malta, the Netherlands, and the United Kingdom, and decreased most in Cyprus and Romania.

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

In this year's edition, Luxembourg (previously a Strong Innovator) joins the group of Innovation Leaders, while Germany (in previous editions classified as an Innovation Leader) drops to the group of Strong Innovators. However, overall performance differences between some Innovation Leaders and the top Strong Innovators are small.

Figure 2: Performance of EU Member States' innovation systems
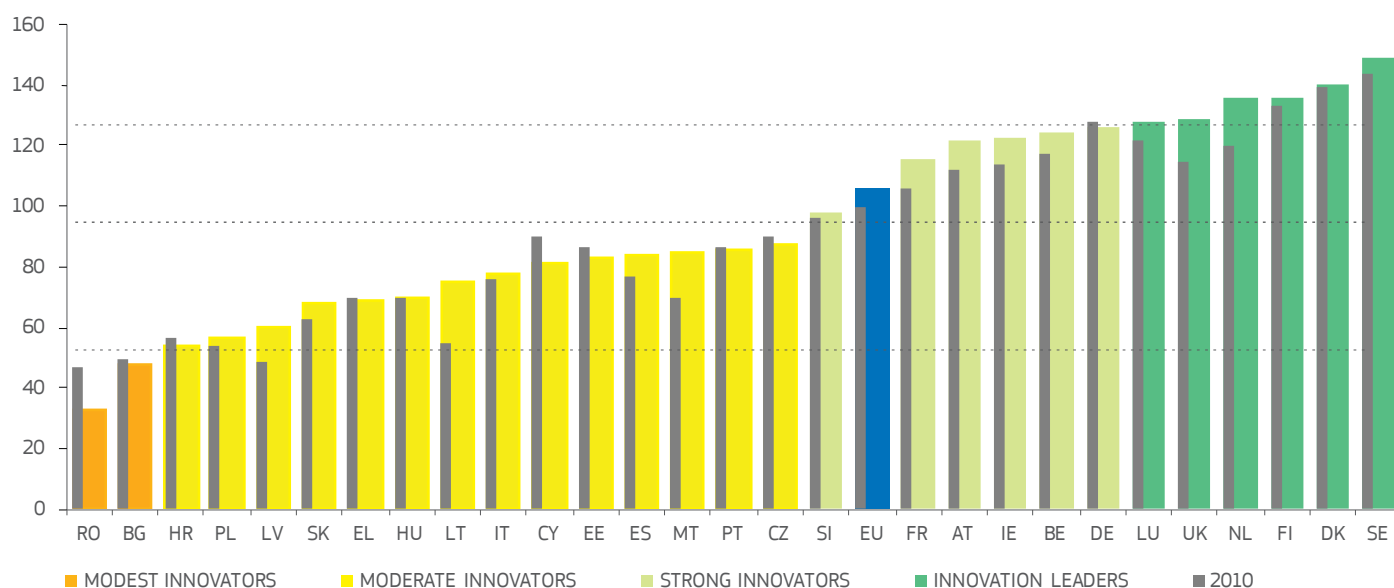
Coloured columns show Member States' performance in 2017, using the most recent data for 27 indicators, relative to that of the EU in 2010. Grey columns show Member States' performance in 2010 relative to that of the EU in 2010. For all years, the same measurement methodology has been used. The dashed lines show the threshold values between the performance groups in 2017, comparing Member States' performance in 2017 relative to that of the EU in 2017.

Performance of innovation systems is measured by average performance on 27 indicators

The EIS measurement framework distinguishes between four main types of indicators and ten innovation dimensions, capturing in total 27 different indicators. Framework conditions capture the main drivers of innovation performance external to the firm and cover three innovation dimensions: *Human resources*, A*ttractive research systems*, as well as *Innovation-friendly environment*. Investments capture public and private investment in research and innovation and cover two dimensions: *Finance and support* and *Firm investments*. Innovation activities capture the innovation efforts at the level of the firm, grouped in three innovation dimensions: *Innovators*, *Linkages*, and *Intellectual assets*. Impacts cover the effects of firms' innovation activities in two innovation dimensions: *Employment impacts* and *Sales impacts*.

Since 2010, progress has been strongest in the *Innovation-friendly environment* (notably Broadband penetration), *Human resources* (notably Doctorate graduates), and *Attractive research systems* (notably International co-publications). It is also encouraging that *Firm investments* and Venture capital expenditures have increased significantly. By contrast, Public R&D expenditures as a share of GDP remain below their 2010 level.

The share of SMEs introducing innovations has decreased over the past decade, but preliminary data from the Community Innovation Survey suggest a positive trend reversal more recently. Along with further increases in Broadband penetration and Venture capital expenditures, business innovation activities are expected to drive an accelerated growth in EU innovation performance in the coming years.

Methodological continuity and refinement

For the 2017 edition of the European Innovation Scoreboard, the main measurement framework was significantly modified. For this year's edition, no changes have been made to the main measurement framework. However, due to data revisions for some indicators, the results for earlier years in this report are not comparable to those reported in the 2017 edition of the EIS. Following a need for additional contextual analyses to better understand performance differences on the innovation indicators used in the main measurement framework, a set of contextual indicators was introduced to the country profiles in the 2017 edition. For this year's report, this list has been modified based on additional analyses and interactions with different stakeholders.

As regards country coverage, this year's report includes for the first time available data for additional Western Balkan countries, which cannot yet be included in the extended European benchmarking (Albania, Bosnia and Herzegovina, Kosovo, and Montenegro).

1. Introduction

The annual European Innovation Scoreboard (EIS) provides a comparative assessment of the research and innovation performance of the 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 in order to boost their innovation performance.

1.1 Measurement framework

The European Innovation Scoreboard 2018[1], the 17th edition since the introduction of the EIS in 2001, follows the methodology of the previous EIS 2017 report. Innovation performance is measured using a composite indicator – the Summary Innovation Index – which summarises the performance of a range of different indicators. The EIS distinguishes between four main types of indicators – Framework conditions, Investments, Innovation activities, and Impacts – and ten innovation dimensions, capturing in total 27 indicators. The measurement framework is presented in **Table 1.**

Framework conditions captures the main drivers of innovation performance external to the firm and differentiates between three innovation dimensions: The *Human resources* dimension includes three indicators and measures the availability of a high-skilled and educated workforce. *Human resources* captures New doctorate graduates, Population aged 25-34 with completed tertiary education, and Population aged 25-64 involved in education and training. *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. *Innovation-friendly environment* captures the environment in which enterprises operate and includes two indicators, Broadband penetration among enterprises and Opportunity-driven entrepreneurship, measuring the degree to which individuals pursue entrepreneurial activities as they see new opportunities, for example resulting from innovation.

Table 1: Measurement framework of the European Innovation Scoreboard

FRAMEWORK CONDITIONS

Human resources

1.1.1 New doctorate graduates
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

Innovation-friendly environment

1.3.1 Broadband penetration
1.3.2 Opportunity-driven entrepreneurship

INVESTMENTS

Finance and support

2.1.1 R&D expenditure in the public sector
2.1.2 Venture capital expenditures

Firm investments

2.2.1 R&D expenditure in the business sector
2.2.2 Non-R&D innovation expenditures
2.2.3 Enterprises providing training to develop or upgrade ICT skills of their personnel

INNOVATION ACTIVITIES

Innovators

3.1.1 SMEs with product or process innovations
3.1.2 SMEs with marketing or organisational innovations
3.1.3 SMEs innovating in-house

Linkages

3.2.1 Innovative SMEs collaborating with others
3.2.2 Public-private co-publications
3.2.3 Private co-funding of public R&D expenditures

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 fast-growing enterprises of innovative sectors

Sales impacts

4.2.1 Medium and high-tech product exports
4.2.2 Knowledge-intensive services exports
4.2.3 Sales of new-to-market and new-to-firm product innovations

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[1] The EIS reports have been published under the name "European Innovation Scoreboard" until 2009, as "Innovation Union Scoreboard" between 2010 and 2015, and again as "European Innovation Scoreboard" from 2016 onwards.

Investments captures investments made in both the public and business sector and differentiates between two innovation dimensions: *Finance and support* includes two indicators and measures the availability of finance for innovation projects by Venture capital expenditures, and the support of governments for research and innovation activities by R&D expenditures in universities and government research organisations. *Firm investments* includes three indicators of both R&D and Non-R&D investments that firms make to generate innovations and the efforts enterprises make to upgrade the ICT skills of their personnel.

Innovation activities captures different aspects of innovation in the business sector and differentiates between three dimensions: *Innovators* includes three indicators measuring the share of firms that have introduced innovations onto the market or within their organisations, covering both product and process innovators, marketing and organisational innovators, and SMEs that innovate in-house. *Linkages* includes three indicators measuring innovation capabilities by looking at collaboration efforts between innovating firms, research collaboration between the private and public sector, and the extent to which the private sector finances public R&D activities. *Intellectual assets* captures different forms of Intellectual Property Rights (IPR) generated in the innovation process, including PCT patent applications, Trademark applications and Design applications.

Impacts captures the effects of firms' innovation activities and differentiates between two innovation dimensions. *Employment impacts* measures the impact on employment and includes two indicators measuring Employment in knowledge-intensive activities and Employment in fast-growing firms in innovative sectors. *Sales impacts* measures the economic impact of innovation and includes three indicators measuring Exports of medium and high-tech products, Exports of knowledge-intensive services and Sales due to innovation activities.

Data revisions and changes to the normalisation process

For the 2017 edition of the European Innovation Scoreboard, the main measurement framework was significantly modified. For this year's edition, no changes have been made to the main measurement framework. However, the results in this year's edition are not comparable to the 2017 edition due to data revisions made by the suppliers of the data. Compared to last year's edition, the following are the most prominent changes:[2]

For 11 indicators, data have been revised for all Member States for at least one year. For nine more indicators, data have been revised for at least one Member State for at least one year. For seven indicators, data have not been revised.

Another change is that for most indicators, the period underlying the time series used in the analysis has changed. As explained in Section 8 on the methodology of the EIS, the innovation index is the unweighted average of normalised scores for all indicators. For the calculation of normalised scores, first the lowest value of an indicator across all countries and all years is deducted from the value in a particular year for each country. This re-calculated value is then divided by the difference between the highest and lowest value across all countries and all years. Compared to the EIS 2017, for most indicators the time period considered has moved forward at least one year, by adding a more recent value at the end of the time series and by removing the oldest value used in the EIS 2017 from the beginning of the time series. A direct result is that for many indicators, the highest (observed in the newly added most recent year) and lowest observed values (observed in the removed oldest year) have changed compared to the EIS 2017. By changing the highest and/or lowest values, even with no data revisions, the normalised scores will be different compared to those in the EIS 2017.

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[2] A more detailed explanation of these changes is provided in the EIS 2018 Methodology Report, available at https://ec.europa.eu/docsroom/documents/29402

1.2 Additional contextual analysis on the impact of structural differences between countries

In response to a need for contextual analyses to better understand performance differences on the innovation indicators used in the main measurement framework, a set of contextual indicators was introduced to the country profiles in the 2017 edition. For this year's report, this list has been modified based on additional analyses and interactions with different stakeholders.[3] The analysis of structural differences by country will be performed in the country profiles. As an introduction, the following sections discuss the relevance of these structural aspects to provide for 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 2018 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**.

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 2015-2017. In economies that grow faster, expanding markets may provide more favourable conditions for enterprises to sell their goods and services.

Of particular importance are differences in economic structures, with differences in the share of manufacturing industry in GDP and in so-called high-tech activities in manufacturing and services being important factors that explain why countries can perform better or worse on indicators like business R&D expenditures, PCT patents, and innovative enterprises. Medium-high and high-tech industries have higher technological intensities than other industries. These industries, on average, will have higher R&D expenditures, more patent applications, and higher

Table 2: Contextual indicators in the European Innovation Scoreboard

	Period	Source
PERFORMANCE AND STRUCTURE OF THE ECONOMY		
GDP per capita (PPS)	Average 2014-2016	Eurostat
Average annual GDP growth (%)	2015-2017	Eurostat
Employment share Manufacturing (NACE C) (%)	Average 2014-2016	Eurostat
of which High and Medium high-tech (%)	Average 2014-2016	Eurostat
Employment share Services (NACE G-N) (%)	Average 2014-2016	Eurostat
of which Knowledge-intensive services (%)	Average 2014-2016	Eurostat
Turnover share SMEs (%)	Average 2013-2015	Eurostat
Turnover share large enterprises (%)	Average 2013-2015	Eurostat
Foreign-controlled enterprises – share of value added (%)	Average 2013-2015	Eurostat
BUSINESS AND ENTREPRENEURSHIP		
Enterprise births (10+ employees) (%)	Average 2013-2015	Eurostat
Total Entrepreneurial Activity (TEA) (%)	Average 2015-2017	Global Entrepreneurship Monitor
FDI net inflows (% GDP)	Average 2014-2016	World Bank: World Development Indicators
Top R&D spending enterprises per 10 mln population	Average 2014-2016	EU Industrial R&D Investment Scoreboard
Buyer sophistication (1 to 7 best)	Average 2015-2017	World Economic Forum
GOVERNANCE AND POLICY FRAMEWORK		
Ease of starting a business (0 to 100 best)	Average 2015-2017	World Bank: Doing Business
Basic-school entrepren. education and training (1 to 5 best)	Average 2015-2017	Global Entrepreneurship Monitor
Govt. procurement of advanced tech products (1 to 7 best)	Average 2014-2016	World Economic Forum
Rule of law (-2.5 to 2.5 best)	Average 2014-2016	World Bank: Worldwide Governance Indicators
DEMOGRAPHY		
Population size (millions)	Average 2015-2017	Eurostat
Average annual population growth (%)	2015-2017	Eurostat
Population density (inhabitants/km²)	Average 2014-2016	Eurostat

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[3] More details on the process of revising the contextual indicators are provided in the EIS Exploratory report "Supplementary analyses and contextualisation of innovation performance data", written by Vladimir Cvijanović, Sirin Elci, Alasdair Reid (EFIS Centre), and Hugo Hollanders (MERIT, Maastricht University). The report is available at https://ec.europa.eu/docsroom/documents/29306

[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.

shares of innovating enterprises. Countries with above-average shares of these industries are expected to perform better on several EIS indicators. For example, for the EU28 on average, 85% of R&D expenditures in manufacturing are accounted for by medium-high and high-technology manufacturing industries[5]. Also, the share of enterprises that introduced a product and/or process innovation is higher in medium-high and high-technology manufacturing industries compared to all core industries covered in the Community Innovation Survey[6]. Foreign ownership, including ownership from both other EU Member States and non-Member States, is important as on average about 40% of business R&D expenditures in EU Member States is made by foreign affiliates, which is significantly higher compared to major international competitors. The indicator measuring 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

Opportunity-driven entrepreneurship provides a measure of opportunities for engaging in new business. The EIS indicator is complemented 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 four-fifths 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[7].

Demand is an important driver of innovation. According to the Oslo Manual (2005)[8], demand factors shape innovation activity in two major ways: for the development of new products, as firms modify and differentiate products to increase sales and market share; and for the improvement of the production and supply processes 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.

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. This indicator complements the EIS indicators covering new business activities or perceived possibilities for new

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[5] Based on NACE Rev. 2 3-digit level, manufacturing industries can be classified as follows: High-technology (HT): Basic pharmaceutical products and pharmaceutical preparations (21); Computer, electronic and optical products (26); Air and spacecraft and related machinery (30.3*); Medium-high-technology (MHT): Chemicals and chemical products (20); Weapons and ammunition (25.4**); 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) and excluding Air and spacecraft and related machinery (30.3); Medical and dental instruments and supplies (32.5***); Medium-low-technology (MLT): Reproduction of recorded media (18.2***); Coke and refined petroleum products (19); Rubber and plastic products (22); Other non-metallic mineral products (23); Basic metals (24); Fabricated metal products, except Manufacture of weapons and ammunition (25) excluding Manufacture of weapons and ammunition (25.4); Building of ships and boats (30.1*); Repair and installation of machinery and equipment (33); Low-technology (LT): Food products (10); Beverages (11); Tobacco products (12); Textiles (13); Wearing apparel (14); Leather and related products (15); Wood and products of wood and cork, except furniture; articles of straw and plaiting materials (16); Paper and paper products (17); Printing and reproduction of recorded media (18) excluding Reproduction of recorded media (18.2); Furniture (31); Other manufacturing (32) excluding 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-high-technology, industries identified with an ** are classified as medium-low-technology, and industries identified with an *** are classified as low-technology (Source: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:High-tech_classification_of_manufacturing_industries).

[6] In accordance with Commission Regulation No 995/2012, the following industries and services are included in the Core target population to be 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).

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

[8] The Oslo Manual is the foremost international source of guidelines for the collection and use of data on innovation activities in industry. OECD/Eurostat (2005), Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, 3rd Edition, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/9789264013100-en

business activities: Employment of fast-growing firms in innovative sectors and Opportunity-driven entrepreneurship.

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.

Demography

Structural data also include population size and the average annual growth rate of population for 2015-2017. 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 25 April 2018. International sources have been used wherever possible to improve comparability between countries. The data relates to actual performance in 2017 for 12 indicators, 2016 for five indicators, 2015 for four indicators, and 2014 for six indicators (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 27 indicators. For Malta, data is missing for Opportunity-driven entrepreneurship as the Global Entrepreneurship Monitor is not carried out in Malta. For Greece, data is missing for the indicators Foreign doctorate students and Employment in fast-growing enterprises in innovative sectors.

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 27 indicators (cf. *Table 1*)[9]. *Figure 3* shows the scores for the Summary Innovation Index for all EU Member States in 2017, i.e. the most recent or 'this year', 2016 (referred to as 'last year'), and the reference year 2010. Based on this year's results, the Member States fall into four performance groups[10]:

- The first group of **Innovation Leaders** includes Member States where performance is more than 20% above the EU average. The Innovation Leaders are Denmark, Finland, Luxembourg, the Netherlands, Sweden, and the United Kingdom;

- The second group of **Strong Innovators** includes Member States with a performance between 90% and 120% of the EU average. Austria, Belgium, France, Germany, Ireland, and Slovenia are Strong Innovators;

- The third group of **Moderate Innovators** includes Member States where performance is between 50% and 90% of the EU average. Croatia, Cyprus, the Czech Republic, Estonia, Greece, Hungary, Italy, Latvia, Lithuania, Malta, Poland, Portugal, Slovakia, and Spain belong to this group;

- The fourth group of **Modest Innovators** includes Member States that show a performance level below 50% of the EU average. This group includes Bulgaria and Romania.

Figure 3 illustrates that performance in 2017 compared to 2010 is higher for 18 Member States. Compared to 2016, performance in 2017 has increased for 20 Member States. Section 2.2 discusses performance changes in more detail.

As shown on the map in *Figure 4*, the performance groups tend to be geographically concentrated. Their average performance decreases with increasing geographical distance from the Innovation Leaders.

Figure 3: Performance of EU Member States' innovation systems
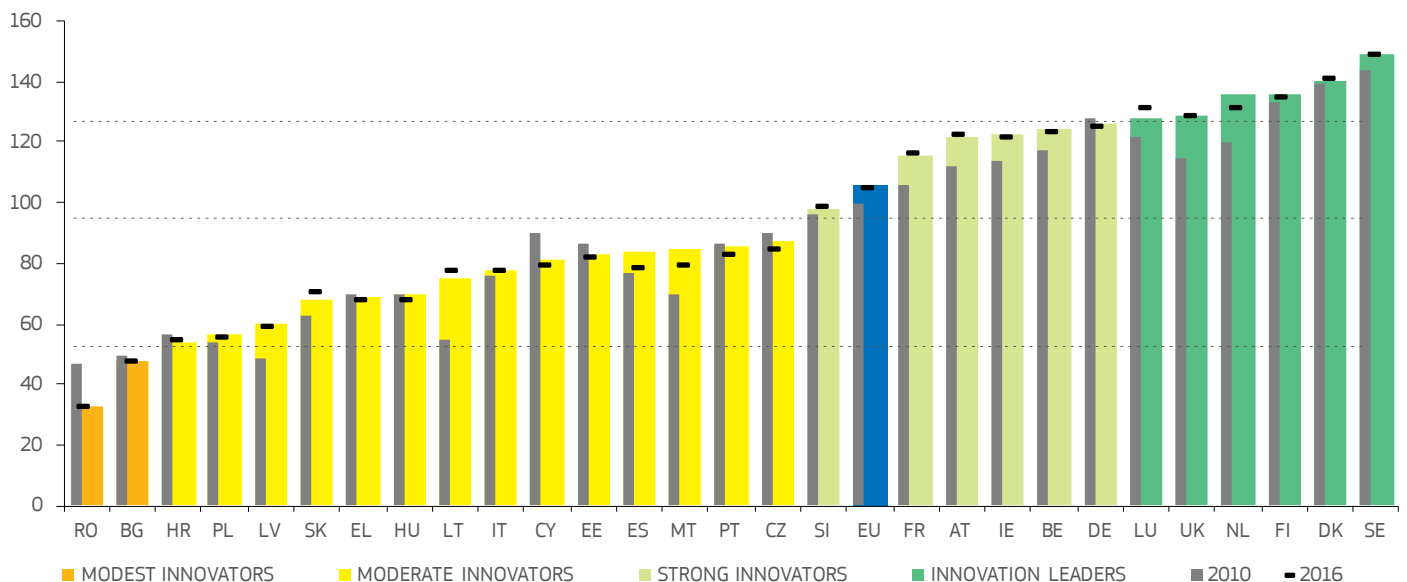
Coloured columns show Member States' performance in 2017, using the most recent data for 27 indicators, relative to that of the EU in 2010. The horizontal hyphens show performance in 2016, using the next most recent data for 27 indicators, relative to that of the EU in 2010. Grey columns show Member States' performance in 2010 relative to that of the EU in 2010. For all years, the same measurement methodology has been used. The dashed lines show the threshold values between the performance groups in 2017, comparing Member States' performance in 2017 relative to that of the EU in 2017.

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[9] Section 8.1 gives a brief explanation of the calculation methodology. The EIS 2018 Methodology Report provides a detailed explanation.

[10] The EIS performance groups are relative performance groups with countries' group membership depending on their performance relative to that of the EU. With a growing EU innovation performance, the absolute thresholds between these groups will also be increasing over time.

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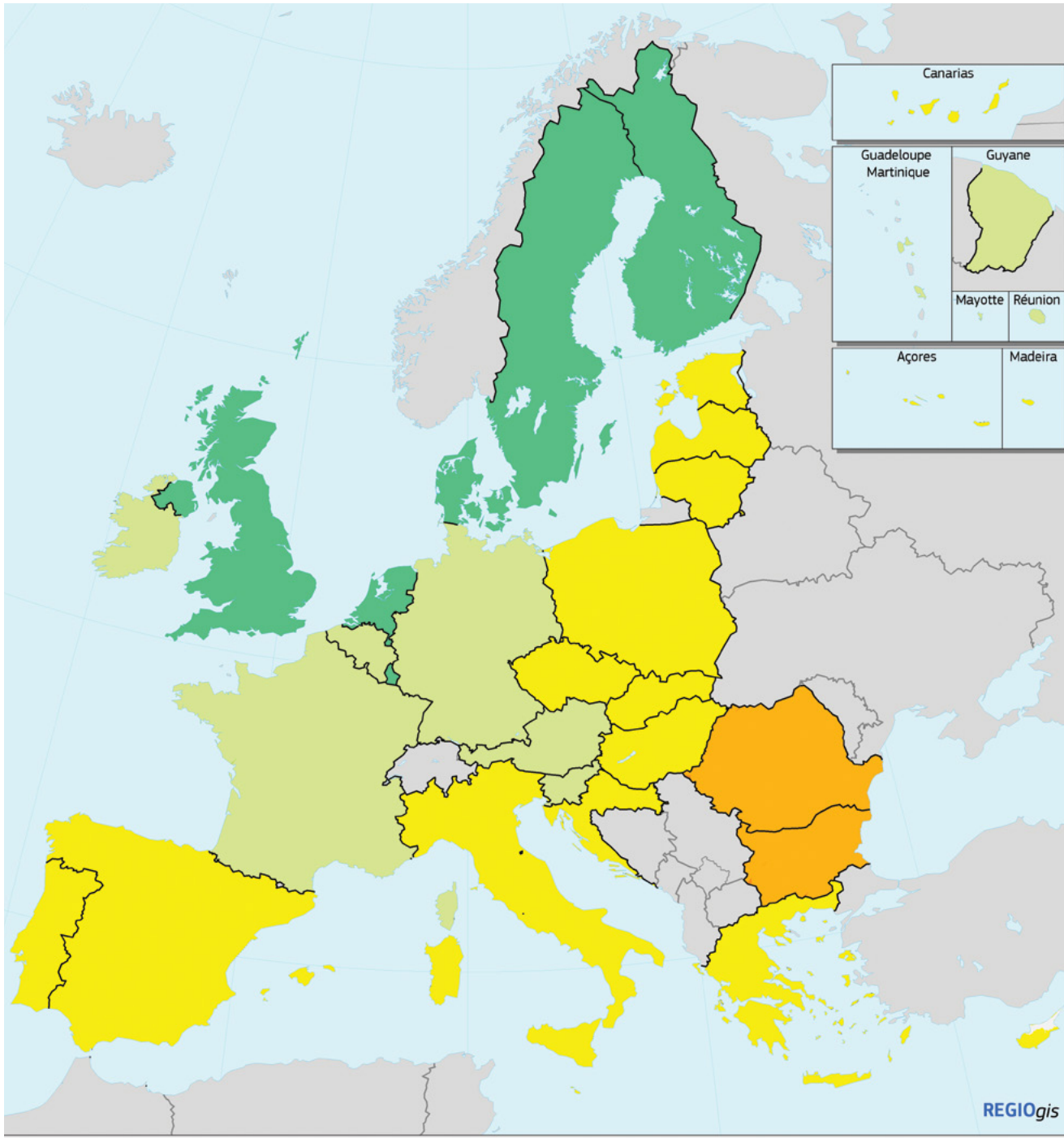
Innovation performance groups

- **Innovation Leader**
- **Strong Innovator**
- **Moderate Innovator**
- **Modest Innovator**

Source: European Commission – European Innovation Scoreboard 2018

0   500 km

© EuroGeographics Association for the administrative boundaries

2.2 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 2010 and 2017 improved by 5.8 percentage points. Performance improved for 18 Member States and worsened for ten Member States (*Figure 5*):

• For six Member States, performance improved by ten percentage points or more: Lithuania (20.1%), the Netherlands (15.9%), Malta (15.2%), United Kingdom (14.0%), Latvia (11.6%), and France (10.1%);

• For six Member States, performance improved between 5 and 10 percentage points: Austria (9.0%), Ireland (8.5%), Spain (7.5%), Belgium (6.8%), Luxembourg (6.6%), and Sweden (5.5%);

• For six Member States, performance improved by less than 5 percentage points: Slovakia (4.8%), Poland (3.2%), Finland (2.8%), Italy (2.0%), Slovenia (1.4%), and Denmark (0.7%);

• For eight Member States, performance declined by up to 5 percentage points: Hungary (-0.1%), Greece (-0.9%), Germany (-1.3%), Portugal (-1.5%), Bulgaria (-1.5%), Croatia (-2.0%), the Czech Republic (-2.9%), and Estonia (-3.2%);

• For two Member States, performance declined by more than 5 percentage points: Cyprus (-9.2%), and Romania (-14.0%).

In the past, less innovative countries tended to improve their performance faster than more innovative countries. There was thus a negative link between the level of and the change in performance. This year's report shows once again that, more recently, the change in performance is generally not related to the level of performance any longer[11]. Between 2010 and 2017, there has been no convergence in innovation performance between Member States performing at lower levels in 2010 and those performing at higher levels.

Compared to 2016, performance in 2017 has improved for 20 Member States, most notably for Spain, Malta, and the Netherlands. Performance has declined for eight Member States, most notably for Luxembourg, Slovakia, and Lithuania.

Figure 5: Performance and change of EU Member States' innovation systems
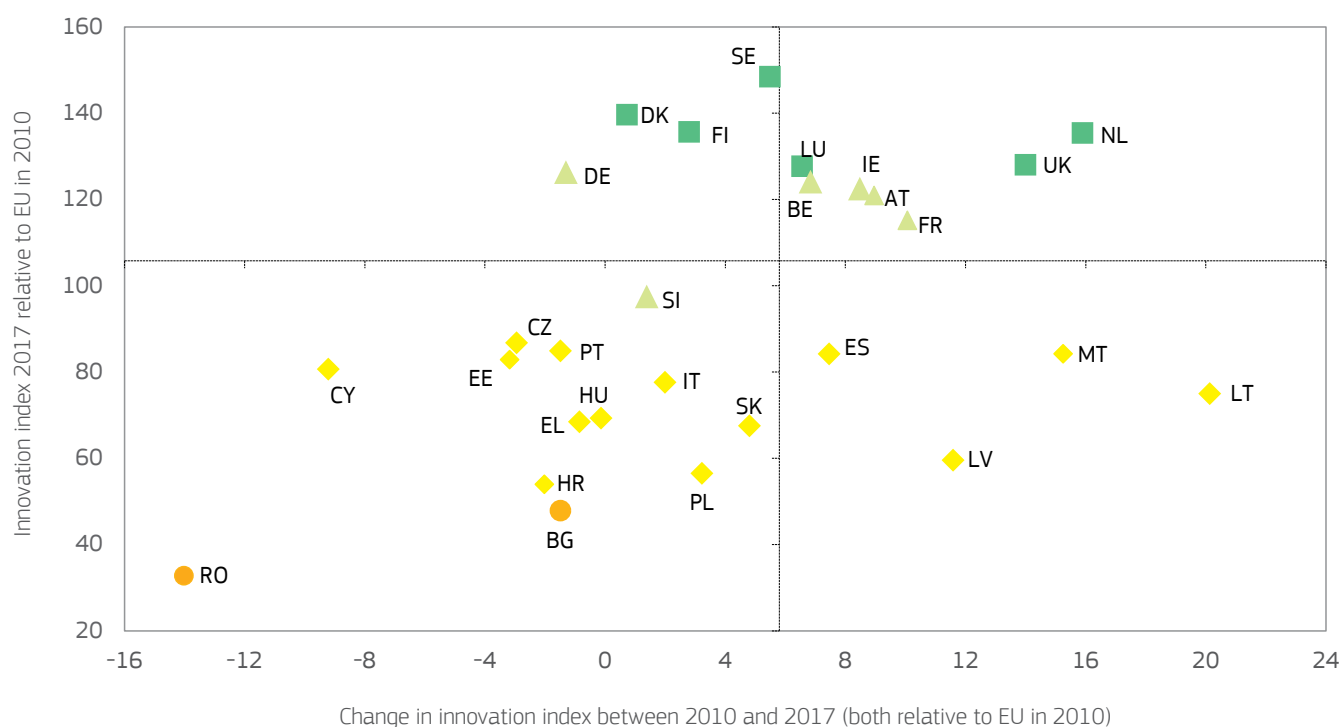
The vertical axis shows Member States' performance in 2017 relative to that of the EU in 2010. The horizontal axis shows the change in performance between 2010 and 2017 relative to that of the EU in 2010. The dashed lines show the respective scores for the EU.

[11] The correlation coefficient between the change and the levels in both 2010 and 2017 is statistically not significant.

Innovation Leaders

Performance of the Innovation Leaders improved until 2013, after which it declined in 2014. Performance improved again in 2015 to 2017, with performance in 2017 being at a peak level. Performance has improved most in the Netherlands and the United Kingdom, with increases of more than 10 percentage points. Strong annual increases are observed for 2012 and 2017 for the Netherlands. Strong annual increases in the United Kingdom are observed in 2014 and 2016. Performance also improved for Luxembourg and Sweden, but at a lower rate of 5 to 7 per-

centage points. For Sweden, performance improved almost every year, with the exception of a decline in 2014. For Luxembourg, performance improved strongly in 2012 and 2015, but declined strongly in 2014 and 2017. For Finland, performance has improved by almost 3 percentage points, with annual performance increases since 2014. For Denmark, performance increased by less than 1 percentage point. Danish performance improved until 2013, after which it almost declined to its 2010 performance level.

Figure 6: Performance Innovation Leaders
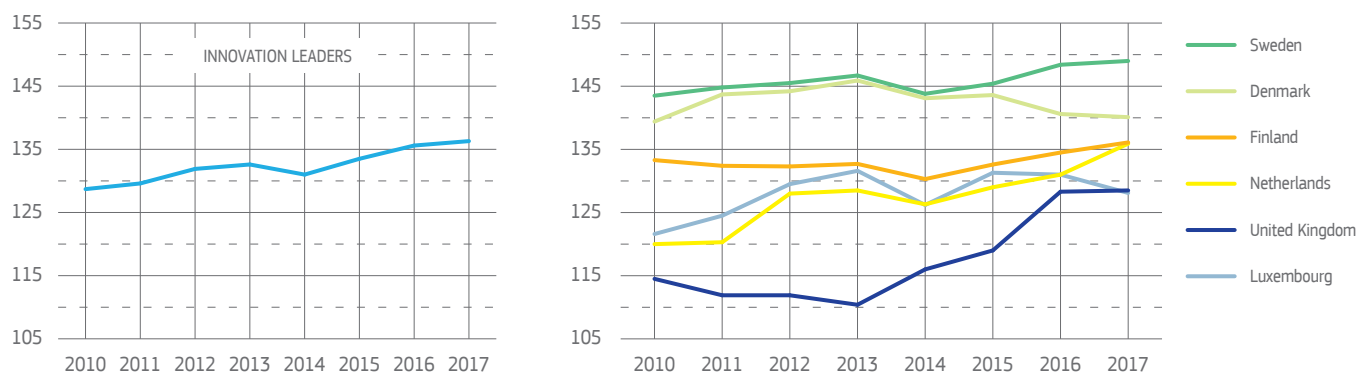
Performance is relative to that of the EU in 2010. The graph on the left shows the average performance of the Innovation Leaders, calculated as the unweighted average of the respective Member States.

Strong Innovators

For the Strong Innovators, performance remained stable until 2014, after which it improved annually, raising average performance by 5.7 percentage points compared to 2010. The performance gap to the Innovation Leaders slightly increased between 2010 and 2017. Performance has improved for all Strong Innovators, except Germany. Performance improved most strongly for France (10.1 percentage points), in particular due to strong increases in 2014-2016. For Austria, performance between 2010 and 2017 increased strongly (9.0 percentage points), in particular due to a strong performance increase in 2016. For Ireland, performance increased strongly in 2016, leading to an overall performance increase compared to 2010 of 8.6 percentage points. For Bel-

gium, performance compared to 2010 increased by 6.8 percentage points, resulting from annual performance increases since 2014 and a strong increase in 2016. For France, performance compared to 2010 increased by 2.6 percentage points, with a strong increase in 2016 being followed by a moderate decline in 2017. For Slovenia, the performance increase compared to 2010 is rather moderate at 1.4 percentage points. For Germany, performance has declined by more than 1 percentage point. Here, a pattern is observed of annual increases followed by annual decreases, which are directly linked to the biennial update of innovation survey data. In 2017, performance once again increased.

Figure 7: Performance Strong Innovators
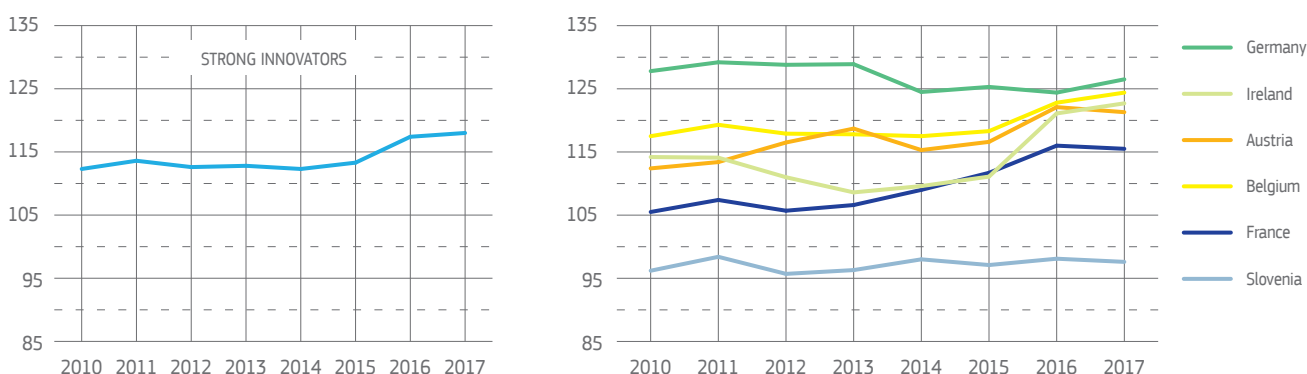
Performance is relative to that of the EU in 2010. The graph on the left shows the average performance of the Innovation Leaders, calculated as the unweighted average of the respective Member States.

Moderate Innovators

For the Moderate Innovators, performance has been increasing in a cyclical pattern, with performance increases in odd-numbered years and performance decreases in even-numbered years. The performance gap to the Strong Innovators did not change between 2010 and 2017. For six Moderate Innovators, performance has increased. For Lithuania, performance improved very strongly by 20.1 percentage points, with performance improvements in most years, in particular in 2015 and 2016. Performance also increased strongly for Malta between 2010 and 2017 (15.2 percentage points), in particular in 2013, 2014 and 2017. For Latvia, performance increased by 11.6 percentage points, with strong performance increases in 2014 and 2015. For Spain, performance increased by 7.5 percentage points, with strong increases in 2016 and 2017. For Slovakia, performance increased by 4.8 percentage points, with performance increasing strongly until 2013, and at more moderate rates in 2015 and 2016. For Poland, annual performance increases since 2015 have led to an overall performance increase of 3.2 percentage points compared to 2010. For Italy, performance increased by 2.0 percentage points, with annual performance increases in 2012, 2014, 2015 and 2017.

For seven Moderate Innovators, performance has declined. For Hungary, the performance decline is marginal at -0.1% percentage point, and performance has been increasing annually since 2013. For Greece, the performance decline is -0.9 percentage points, which is the result of a very strong decline in 2014. For Croatia, performance declined by 2.0 percentage points, with strong performance declines in 2012 and 2014 and a strong increase in 2015. For Portugal, performance declined by 2.8 percentage points, with declining performance between 2010 and 2014 not being fully compensated by increasing performance between 2015 and 2017. For both the Czech Republic and Estonia, performance decreased by 3.1 percentage points. For the Czech Republic, annual performance decreased strongly in 2012. For Estonia, performance improved until 2015, but a strong performance decline in 2016 has lowered the performance level in 2017 below that in 2010. For Cyprus, performance has declined strongly by 9.2 percentage points, with a very strong performance decline in 2014. More recently, performance improved in 2015 and 2017.

Modest Innovators

For the Modest Innovators, performance declined between 2010 and 2017, leading to a widening of the performance gap to the Moderate Innovators. For Bulgaria, performance in 2017 is still below the performance level in 2010, where declining performance in 2011 and 2012 has only partially been met by annual performance increases since 2013. For Romania, performance has declined strongly by 14.0 percentage points but, after five years of declining performance, performance increased again in 2016 and 2017.

Figure 8: Performance Moderate and Modest Innovators
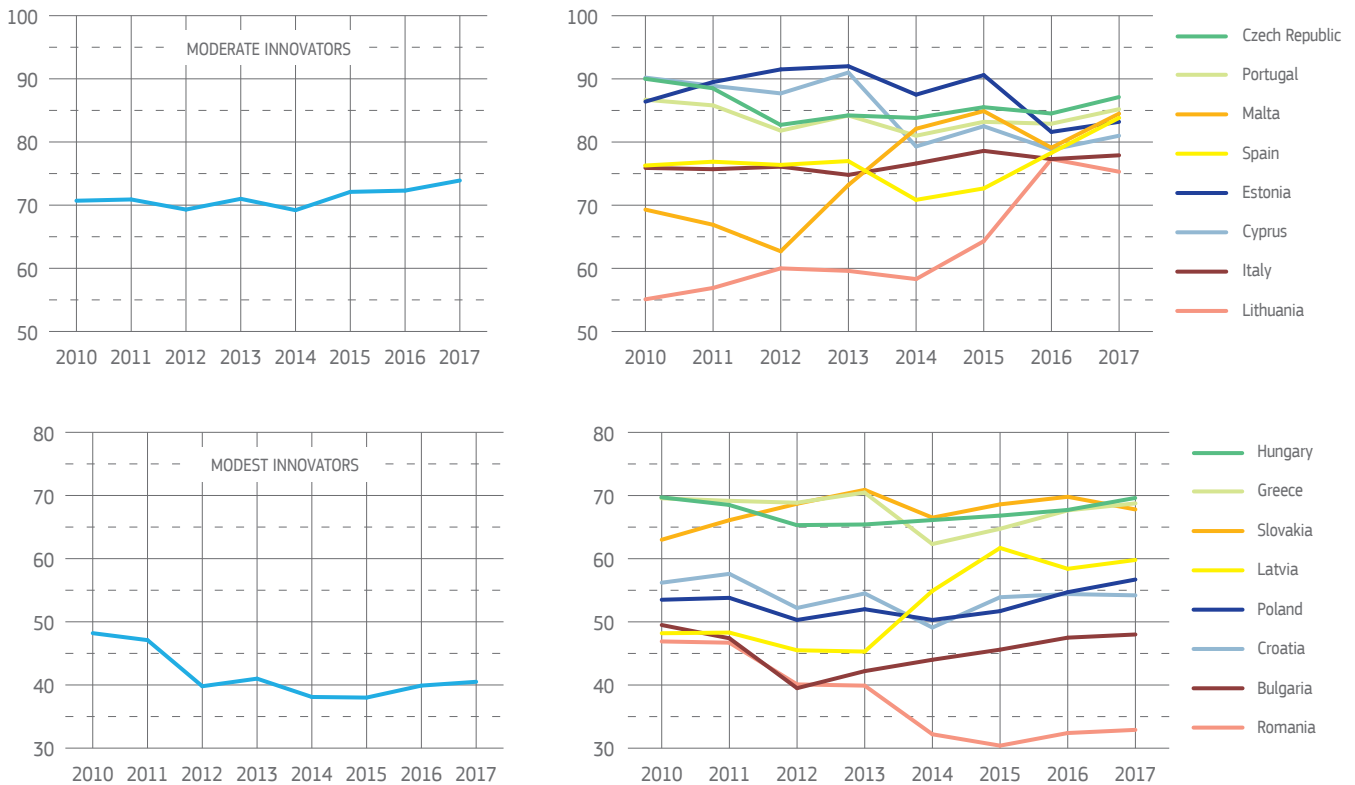
Performance is relative to that of the EU in 2010. The graph on the top-left shows the average performance of the Moderate Innovators, calculated as the unweighted average of the respective Member States. The graph on the bottom-right shows the average performance of the Modest Innovators, calculated as the unweighted average of the respective Member States.

3. 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 28 Member States, has improved by 5.8 percentage points between 2010 and 2017. There are differences in performance changes for the different dimensions and indicators. **_Figure 9_** shows the change for each dimension and indicator compared to the 2010 performance level in 2017 (the blue coloured bars) and 2016 (the dark coloured bars). The difference between the respective blue and dark coloured bar thus illustrates the change in the most recent year. Performance has improved most (33.8 percentage points) in _Innovation-friendly environment_, with strongly increasing performance in Broadband penetration. Performance has also increased in _Human resources_ (19.3 percentage points) with increasing performance for all three indicators. A strong increase in International scientific co-publications has led to a 13.6 percentage point increase for Attractive research systems. Performance has also increased strongly in _Firm investments_ (11.8 percentage points) with increasing performance for all three indicators. Performance in Finance and support has increased (7.7 percentage points) as a result of increasing Venture capital expenditures. Performance has increased more moderately for _Sales impacts_ (4.1 percentage points). Performance has almost not changed for _Linkages_, _Intellectual assets_, where a strong increase in Trademark applications has been offset by declining performance in PCT patent applications and Design applications, and _Employment impacts_, where an increase in Employment in knowledge-intensive activities has been offset by a decline in Employment in fast-growing firms in innovative sectors. Performance in _Innovators_ has declined, due to declining performance in all three indicators[12].

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[12] The provisional CIS 2016 data, however, show improved expected performance on these indicators (cf. Section 6.3).

Figure 9: EU Performance change between 2010 and 2017 by dimension and indicator

HUMAN RESOURCES	**119.3**
Doctorate graduates	139.4
Tertiary education	113.4
Lifelong learning	102.1
ATTRACTIVE RESEARCH SYSTEMS	**113.6**
International co-publications	162.7
Most cited publications	103.8
Foreign doctorate students	110.7
INNOVATION-FRIENDLY ENVIRONMENT	**133.8**
Broadband penetration	177.8
Opportunity-driven entrepreneurship	107.7
FINANCE AND SUPPORT	**107.7**
Public R&D expenditure	96.5
Venture capital expenditures	122.0
FIRM INVESTMENTS	**111.8**
Business R&D expenditure	111.4
Non-R&D Innovation expenditure	109.3
Upgrading ICT skills	114.3
INNOVATORS	**86.0**
Product/process innovators	81.8
Organisational/marketing innovators	82.8
SMEs innovating in-house	93.3
LINKAGES	**101.0**
Innovative SMEs collaborating with others	100.5
Public-private co-publications	100.9
Private co-funding public R&D	101.4
INTELLECTUAL ASSETS	**100.9**
PCT patent applications	95.8
Trademark applications	113.0
Design applications	96.5
EMPLOYMENT IMPACTS	**100.6**
Employment in knowledge-intensive act.	110.4
Empl. fast-growing firms inn. sectors	93.5
SALES IMPACTS	**104.1**
Medium & high tech product exports	105.9
Knowledge-intensive services exports	104.9
Sales of new to market & firm products	101.1

40   60   80   100   120   140   160   180   200

■ DIMENSIONS   ■ INDICATORS   ■ 2016

Normalised scores in 2017 (blue coloured bars) and 2016 (grey coloured bars) relative to those in 2010 (=100)

4. Innovation dimensions

The order of performance groups observed for the Summary Innovation Index also applies to most dimensions. The Innovation Leaders perform best in seven dimensions, followed by the Strong Innovators, the Moderate Innovators and the Modest Innovators (**Figure 10**). In the *Firm investments*, *Innovators* and *Sales impacts* dimensions, the *Strong Innovators* show the best performance. In other dimensions, performance differences can be small between the country groups. In *Linkages*, the performance difference between the Innovation Leaders and the Strong Innovators is relatively small, compared to the average difference across all dimensions. Between the Strong and Moderate Innovators, performance differences are relatively small for *Innovation-friendly environment* and *Employment impacts*. Between the Moderate and Modest Innovators, performance differences are relatively small for *Innovation-friendly environment*, *Intellectual assets*, *Employment impacts*, and *Sales impacts*. Performance differences between the Innovation Leaders and Strong Innovators are relatively high for *Research systems*, I*nnovation-friendly environment* and *Intellectual assets*. Performance differences between the Strong Innovators and Moderate Innovators are

relatively high for *Firm investments*, *Innovators*, and *Linkages*. Performance differences between the Moderate Innovators and Modest Innovators are relatively high for *Innovators*.

The 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 *Finance and support*, *Innovators* and *Linkages*. The dimensions *Innovation-friendly environment* and *Sales impacts* deviate most from the overall classification. The dimensions *Employment impacts*, *Intellectual assets* and *Firm investments* 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 particular dimensions, but compensate such relative weaknesses with stronger performance in other dimensions.

Figure 10: Performance groups: innovation performance per dimension
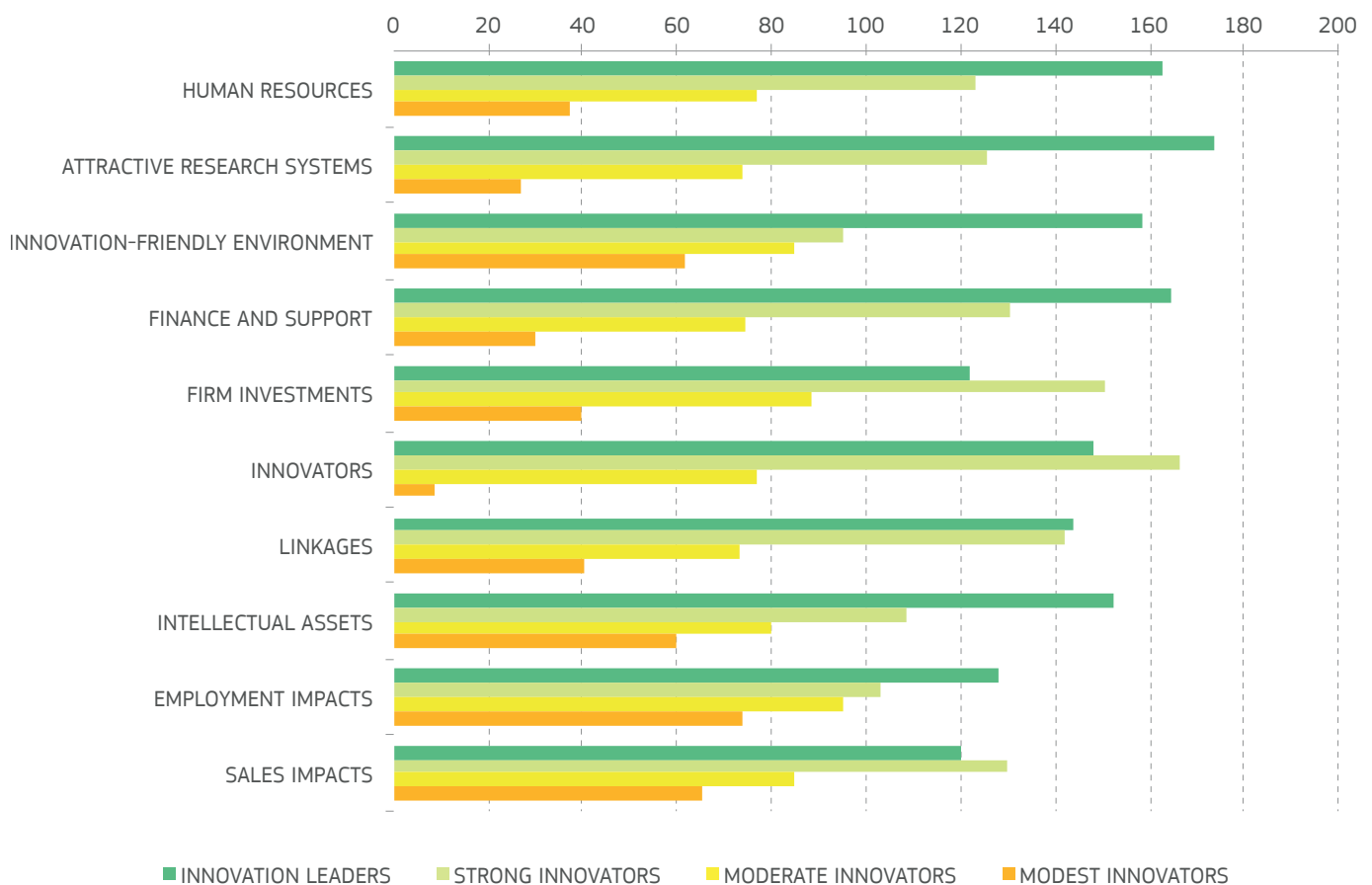
Average scores for each performance group equal the unweighted average of the relative-to-EU scores of the Member States within that group. As these unweighted averages do not take into account differences in country size, results are not directly comparable. Average scores for the performance groups have been adjusted such that their average equals 100 for each dimension.

Human resources
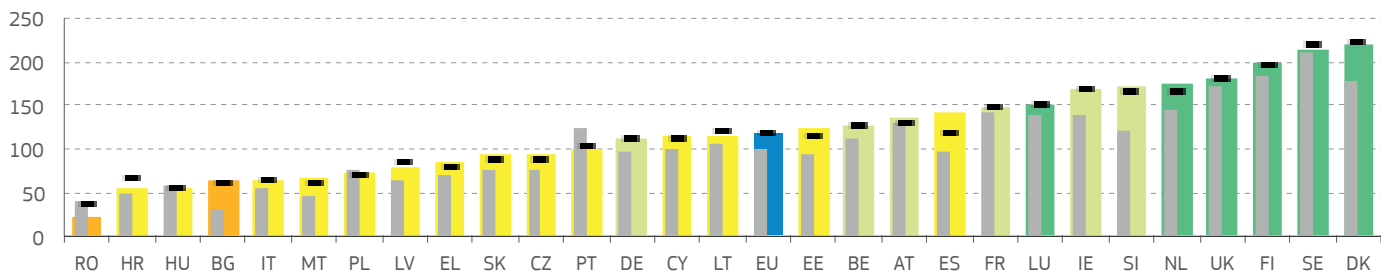
Coloured columns show Member States' performance in 2017, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2016, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2010. Grey columns show performance in 2010 relative to that of the EU in 2010.

Performance in *Human resources* reflects (well) the overall classification into four performance groups. The Innovation Leaders are the best performing countries taking all top 5 positions, with only Luxembourg performing relatively less well. All Strong Innovators, except Germany, perform above the EU average. Most of the Moderate Innovators perform below the EU average, with only Spain and Estonia performing above this average. The Modest Innovators perform least well, with Romania being the worst performer but with Bulgaria performing better than two Moderate Innovators.

For 24 Member States, performance has improved between 2010 and 2017. The highest rate of performance increase is for Slovenia (51.8%), followed by Spain (46.0%) and Denmark (40.9%). For Poland (-2.9%), Hungary (-4.6%), Romania (-18.3%) and Portugal (-23.1%), performance has decreased. The EU average increased by 19.3% between 2010 and 2017.

Compared to 2016, performance has improved for 18 Member States, with the highest rate of performance increase for Spain (24.3%). Performance declined for ten Member States, with the strongest declines for Romania (14.8%) and Croatia (13.1%). The EU average increased by 2.4% between 2016 and 2017.

Attractive research systems

Coloured columns show Member States' performance in 2017, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2016, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2010. Grey columns show performance in 2010 relative to that of the EU in 2010.

Performance in *Attractive research systems* also reflects (well) the overall classification into four performance groups with Innovation Leaders taking all top 5 positions. All Strong Innovators perform above the EU average, except for Germany and Slovenia. Most of the Moderate Innovators perform below the EU average, where only Cyprus, Portugal, and Malta perform above the EU average. The Modest Innovators perform least well, taking the last two positions in the performance ranking.

For all Member States, performance has improved between 2010 and 2017. The highest rate of performance increase is for Malta (110.1%), followed by Luxembourg (61.1%), Sweden (51.7%), and Cyprus (51.3%). The EU average increased by 13.6% between 2010 and 2017.

Compared to 2016, performance has improved for 26 Member States, with the highest rate of performance increase for Malta (71.6%). Performance declined for two Member States: France (-0.9%) and Austria (-0.3%). The EU average increased by 1.2% between 2016 and 2017.

Innovation-friendly environment

Coloured columns show Member States' performance in 2017, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2016, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2010. Grey columns show performance in 2010 relative to that of the EU in 2010.

Performance in *Innovation-friendly environment* reflects (well) the overall classification into four performance groups. The Innovation Leaders are the best performing countries taking all top 5 positions, with only the United Kingdom performing below the EU average. The Strong Innovators are more dispersed, with Belgium, France and Germany performing above the EU average, and Austria, Ireland and Slovenia below the EU average. The Moderate Innovators show a strong performance on this dimension, in particular Portugal, Malta, Lithuania, Spain, Latvia, and Estonia perform above the EU average. For the Modest Innovators, this is a relatively strong innovation dimension, with Bulgaria outperforming three and Romania five Moderate Innovators.

For 24 Member States, performance has improved between 2010 and 2017. The highest rate of performance increase is observed in Finland (96.5%), Poland (88.1%), and Portugal (74.2%). Performance decreased for Slovenia (-3.8%), Austria (-4.2%), Italy (-14.6%) and Belgium (-20.4%). The EU average increased by 33.8% between 2010 and 2017.

Compared to 2016, performance has improved for 26 Member States, with the highest rate of performance increase for Malta (66.2%), the Netherlands (46.5%), and Poland (44.9%). Performance declined for two Member States: Latvia (-20.0%) and Sweden (-3.8%). The EU average increased by 15.6% between 2016 and 2017.

Finance and support

Coloured columns show Member States' performance in 2017, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2016, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2010. Grey columns show performance in 2010 relative to that of the EU in 2010.

Performance in *Finance and support* reflects (well) the overall classification into four performance groups. The Innovation Leaders are the best performing countries behind France, the overall best performing country. Four Strong Innovators perform below the EU average. All Moderate Innovators perform below the EU average. Bulgaria and Romania, both Modest Innovators, close the ranking at the bottom, only Malta is performing worse.

Performance has increased for only 13 Member States. The highest rate of performance increase between 2010 and 2017 is observed in Latvia (70.7%), followed by France (45.2%), the Netherlands (22.6%), and Lux-

embourg (19.9%). For 15 Member States, performance has decreased, in particular for Finland (-57.9%), the Czech Republic (-65.2%), and Bulgaria (-68.0%). The EU average increased by 7.7% between 2010 and 2017.

Compared to 2016, performance has improved for only ten Member States, with the highest rate of performance increase for the United Kingdom (11.7%) and the Netherlands (10.4%). Performance declined for 18 Member States, with the strongest declines for Slovakia (-45.8%), Estonia (-33.9%), and Lithuania (-31.2%). The EU average increased by 3.6% between 2016 and 2017.

Firm investments
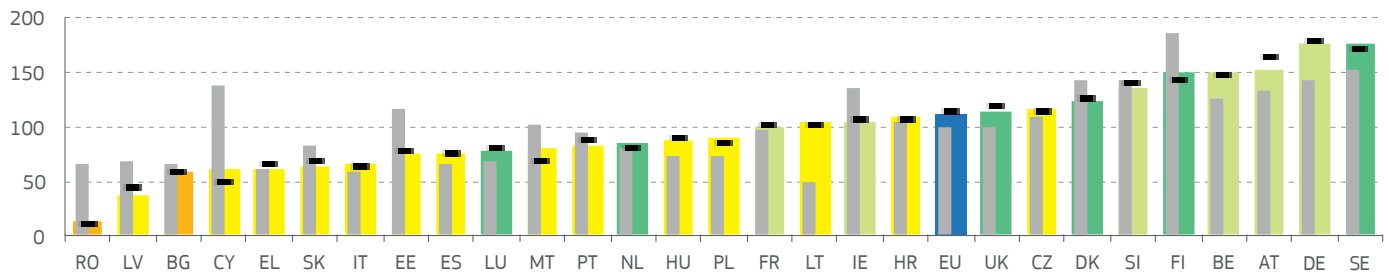
Coloured columns show Member States' performance in 2017, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2016, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2010. Grey columns show performance in 2010 relative to that of the EU in 2010.

Performance in *Firm investments* reflects to some extent the overall classification into four performance groups with two Innovation Leaders in the top 5. The best performing countries are Innovation Leaders and Strong Innovators, together with the Czech Republic, a Moderate Innovator. Sweden is the overall leader, Germany ranks second, and Austria third. Luxembourg and the Netherlands, both Innovation Leaders, perform below the EU average.

For 16 Member States, performance increased between 2010 and 2017. The highest rate of performance increase is observed in Lithuania

(55.3%), followed by Germany (33.4%), Belgium (25.2%), and Sweden (24.7%). The EU average increased by 11.8% between 2010 and 2017. For 12 Member States, performance decreased, most notably in Finland (-36.8%), Estonia (-40.6%), Romania (-51.6%), and Cyprus (-75.9%).

Compared to 2016, performance has improved for only 12 Member States, with the highest rate of performance increase for Malta (12.0%) and Cyprus (11.8%). Performance declined for 16 Member States, with the strongest decline for Austria (-14.1%). The EU average declined by -2.1% between 2016 and 2017.
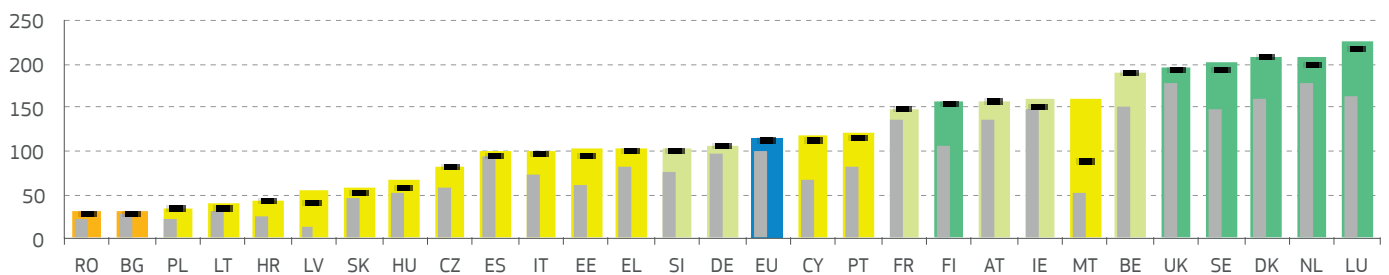
Innovators
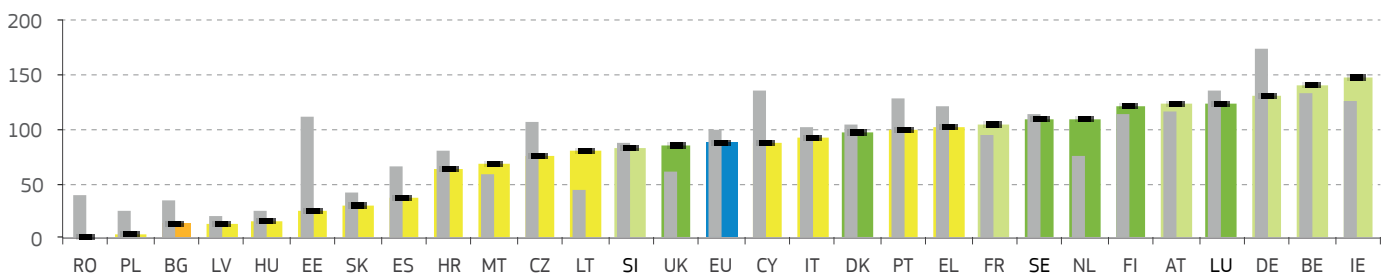
Coloured columns show Member States' performance in 2017, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2016, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2010. Grey columns show performance in 2010 relative to that of the EU in 2010.

Performance in the *Innovators* dimension reflects to some extent the overall classification into four performance groups. Among Innovation Leaders and Strong Innovators, only the United Kingdom and Slovenia perform below the EU average. Ireland is the overall leader, Belgium ranks second, and Germany third; all three countries are Strong Innovators. There are four Moderate Innovators that perform above the EU average on this indicator: Greece, Portugal, Italy, and Cyprus.

For only nine Member States, performance increased between 2010 and 2017. The highest rate of performance increase is observed in Lithuania

(36.2%), followed by the Netherlands (33.7%), the United Kingdom (24.4%), and Ireland (21.4%). For 19 Member States, performance declined, most notably in Romania (-39.1%), Germany (-42.4%), Cyprus (-48.9%), and Estonia (-86.7%). The EU average decreased by 14.0% between 2010 and 2017.[13]

Compared to 2016, performance is the same for all Member States as CIS 2014 data has been used to measure performance in both 2016 and 2017.

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[13] The provisional CIS 2016 data, however, show improved expected performance on these indicators for most countries leading to improved performance in the Innovators dimension in the EIS 2019 (cf. Section 6.3).
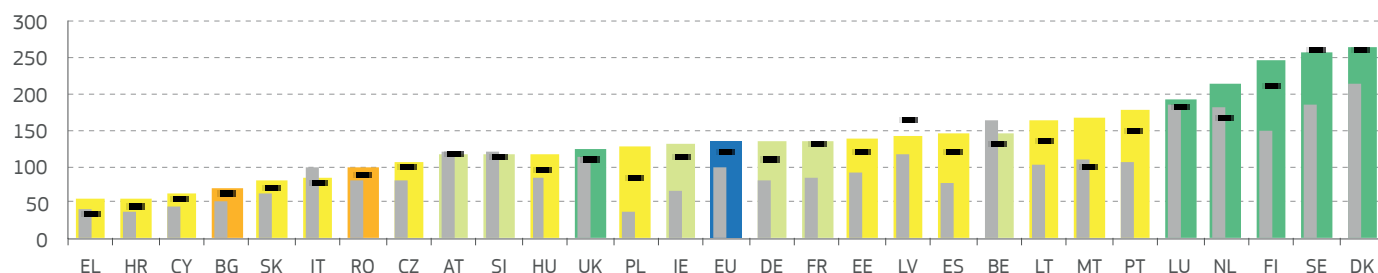
Linkages
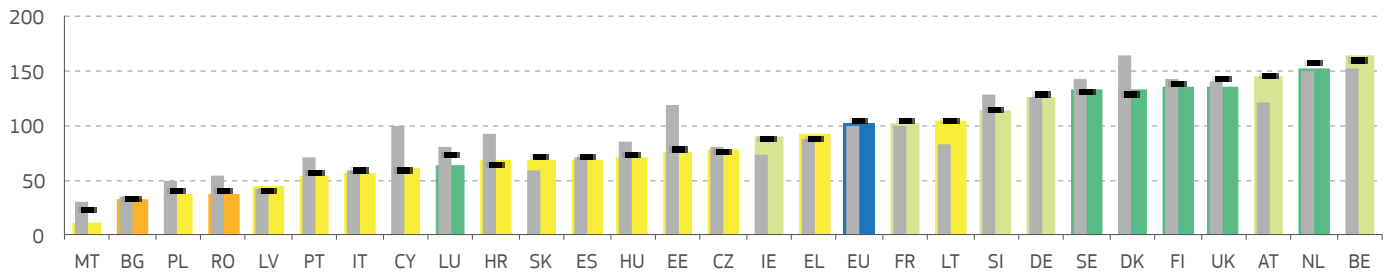
Coloured columns show Member States' performance in 2017, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2016, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2010. Grey columns show performance in 2010 relative to that of the EU in 2010.

Performance in *Linkages* reflects (very) well the overall classification into four performance groups. The Innovation Leaders are represented amongst the top group of countries, together with Strong Innovator countries Belgium, Austria, Germany, and Slovenia. Luxembourg, an Innovation Leader, performs well below the EU average. Ireland, a Strong Innovator, also performs below the EU average. Moderate Innovator Lithuania shows a strong performance above the EU average.

For ten Member States, performance increased between 2010 and 2017. The highest rate of performance increase is observed in Austria

(23.1%), Lithuania (19.6%), and Ireland (17.1%). For 18 Member States, performance declined, in particular for Croatia (-24.5%), Denmark (-31.5%), Cyprus (-38.0%), and Estonia (-42.7%). The EU average increased by 1.0% between 2010 and 2017.

Compared to 2016, performance has improved for only ten Member States, with the highest rate of performance increase for Spain (4.4%). Performance declined for 18 Member States, with the strongest declines for Malta (-10.4%) and Luxembourg (-9.3%). The EU average declined by -1.9% between 2016 and 2017.
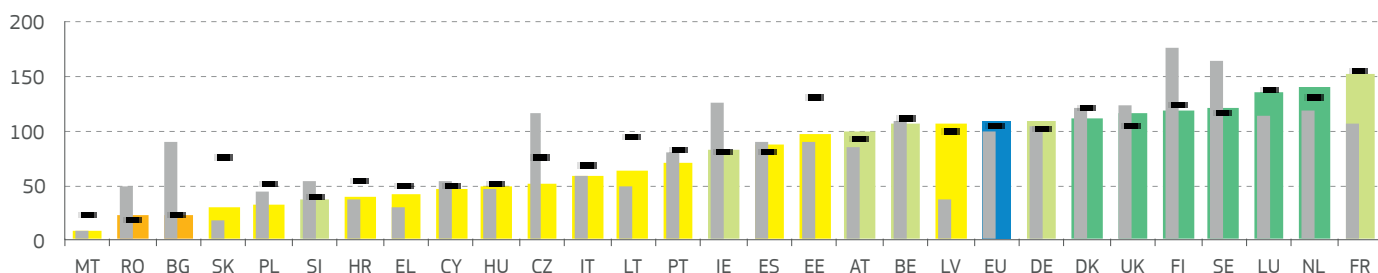
Intellectual assets
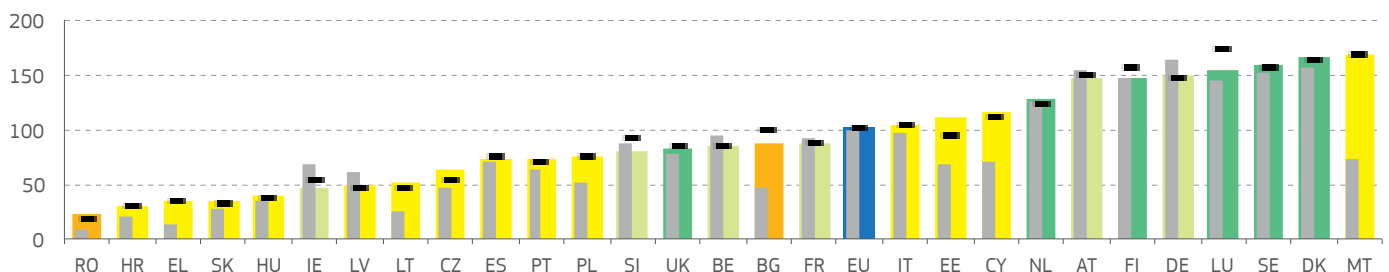
Coloured columns show Member States' performance in 2017, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2016, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2010. Grey columns show performance in 2010 relative to that of the EU in 2010.

Performance in *Intellectual assets* reflects the overall classification into four performance groups less well. Malta, a Moderate Innovator, is the overall best performing country. Three Innovation Leaders and Germany, a Strong Innovator, take up the other top 5 positions, with Denmark ranking second and Sweden third. The United Kingdom, one of the Innovation Leaders, performs below the EU average. Four of the Moderate Innovators perform above the EU average: Malta, Cyprus, Estonia, and Italy. Bulgaria, a Modest Innovator, is performing at a level close to that of the EU average.

For 21 Member States, performance has increased between 2010 and 2017. The highest rate of performance increase is observed in Malta (95.2%), followed by Cyprus (46.1%), Estonia (43.5%), and Bulgaria (40.0%). Performance decreased for seven Member States, most nota-

bly for Latvia (-12.0%), Germany (-15.7%), and Ireland (-20.5%). The EU average has increased by 0.9% between 2010 and 2017.

Compared to 2016, performance has improved for only 14 Member States, with the highest rate of performance increase for Estonia (16.2%) and the Czech Republic (10.4%). Performance declined for 14 Member States, with the strongest declines for Luxembourg (-19.6%) and Bulgaria (-12.2%). The EU average increased by 0.2% between 2016 and 2017.

Employment impacts
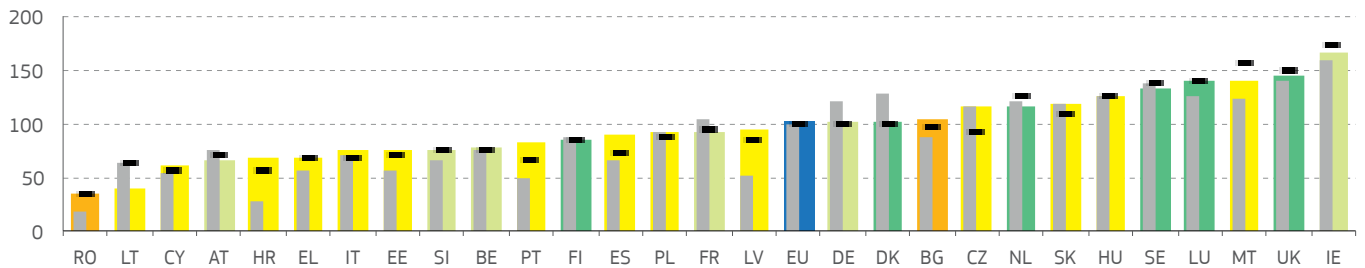
Coloured columns show Member States' performance in 2017, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2016, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2010. Grey columns show performance in 2010 relative to that of the EU in 2010.

Performance in *Employment impacts* reflects the overall classification into four performance groups less well with only three Innovation Leaders in the top 5 positions. Ireland, a Strong Innovator, is the best performing country, followed by the United Kingdom and Malta, a Moderate Innovator. Most of the Innovation Leaders, except Finland, perform above the EU average. Bulgaria, a Modest Innovator, shows a strong performance above the EU average. Strong Innovators Austria, Slovenia, Belgium, and France all perform below the EU average.

For 19 Member States, performance has increased between 2010 and 2017. The highest rate of performance increase is observed in Latvia (42.6%), Croatia (41.6%), and Portugal (33.6%). Performance has declined in nine Member States, most notably in Germany (-19.8%), Lithuania (-22.7%), and Denmark (-27.0%). The EU average has increased by 0.6% between 2010 and 2017.

Compared to 2016, performance has improved for 18 Member States, with the highest rate of performance increase for the Czech Republic (23.6%). Performance declined for ten Member States, with the strongest declines for Lithuania (-23.4%) and Malta (-16.8%). The EU average increased by 1.9% between 2016 and 2017.

Sales impacts
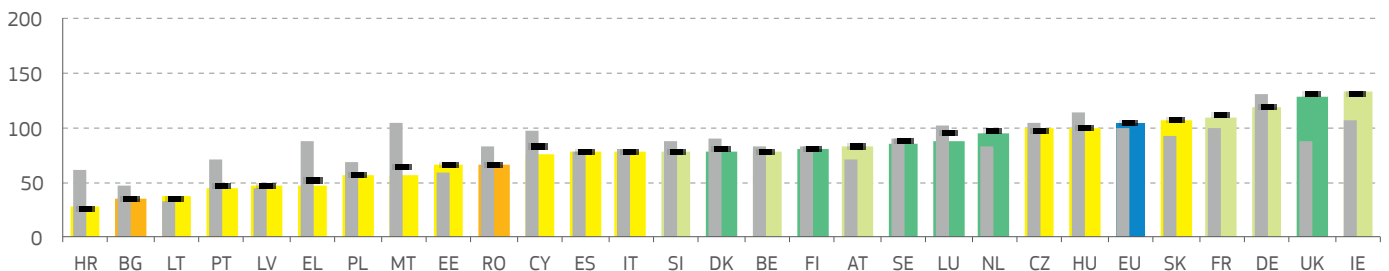
Coloured columns show Member States' performance in 2017, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2016, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2010. Grey columns show performance in 2010 relative to that of the EU in 2010.

Performance in *Sales impacts reflects* the overall classification of performance groups less well. Just one Innovation Leader is in the top 5, while Denmark, Finland, Sweden, Luxembourg, and the Netherlands perform below the EU average.[14] The Strong Innovators are also dispersed: Ireland, Germany, and France are amongst the top 5, whereas Slovenia, Belgium, and Austria perform below the EU average. Of the Moderate Innovators, Slovakia performs above the EU average, and the Czech Republic and Hungary perform just below the EU average.

Performance between 2010 and 2017 has increased for ten Member States. The highest rate of performance increase is observed in the United Kingdom (42.0%) and Ireland (26.8%). For 18 Member States, perfor-

mance has declined, most notably for Croatia (-34.2%), Greece (-40.1%), and Malta (-48.3%). The EU average has increased by 4.1% between 2010 and 2017.

Compared to 2016, performance has improved for only 12 Member States, with the highest rate of performance increase for Ireland (2.7%). Performance declined for 16 Member States, with the strongest declines for Malta (-6.8%) and Cyprus (-6.0%). The EU average declined by -0.5% between 2016 and 2017.

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[14] Compared to the other dimensions, the EU's rank position is relatively high in this dimension. This can be explained by the strong performance of France, Germany and the United Kingdom, which are among the biggest Member States, and which have a strong positive impact on the EU average in Sales impacts.

5. Benchmarking innovation performance with non-EU countries

5.1 Benchmarking against other European countries and regional neighbours

This section discusses the results for eight more European countries or regional neighbours using the same methodology as used for the EU Member States.[15]

Switzerland is the overall Innovation Leader in Europe, outperforming all EU Member States (**Figure 11**). Switzerland's strong performance results from being the best performer on nine indicators, in particular in Attractive research systems, where it has the best performance on all three indicators, Human resources, where it has best performance on two indicators (New doctorate graduates and Lifelong learning), and Innovators, where it has best performance on two indicators (SMEs with marketing or organisational innovations and SMEs innovating in-house). Switzerland's performance relative to the EU in 2010 has improved strongly by 10.1%-points.

Iceland, Israel, and Norway are Strong Innovators. Iceland's performance relative to the EU in 2010 has declined (-0.9%). The performance of Norway relative to the EU in 2010 has increased strongly by 19.5%[16], whereas the relative performance of Israel has declined (-4.5%). Serbia and Turkey are Moderate Innovators, and for both countries performance relative to the EU has increased strongly by 13.3% and 15.1%, respectively. The Former Yugoslav Republic of Macedonia and Ukraine are Modest Innovators. Performance relative to the EU has increased strongly for the Former Yugoslav Republic of Macedonia (12.1%) but decreased for Ukraine (-1.8%). The performance groups for all countries are also shown on the map in **Figure 12.**

Figure 11: Performance of European and neighbouring countries' systems of innovation
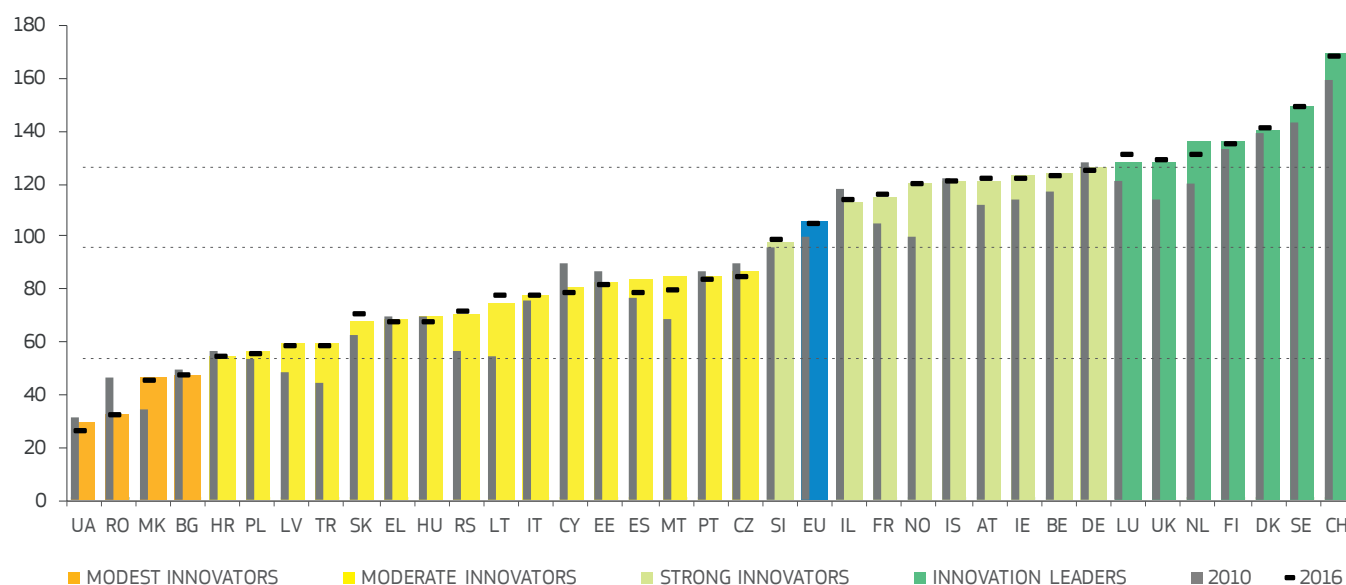
Coloured columns show countries' performance in 2017, using the most recent data for 27 indicators, relative to that of the EU in 2010. The horizontal hyphens show performance in 2016, using the next most recent data for 27 indicators, relative to that of the EU in 2010. Grey columns show countries' performance in 2010 relative to that of the EU in 2010. For all years, the same measurement methodology has been used. The dashed lines show the threshold values between the performance groups in 2017, comparing countries' performance in 2017 relative to that of the EU in 2017.

European and neighbouring countries include: Iceland (IS), Israel (IL), the Former Yugoslav Republic of Macedonia (MK), Norway (NO), Serbia (RS), Switzerland (CH), Turkey (TR) and Ukraine (UA).

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[15] Average data availability for this year's report is good with data available for 27 indicators for Norway, 25 indicators for Switzerland, 24 indicators for the Former Yugoslav Republic of Macedonia and Turkey, 22 indicators for Iceland and Serbia, 21 indicators for Ukraine, and 20 indicators for Israel. Data availability for Israel is below the threshold of 75%, which has been used in previous years to decide whether or not to include a European country in the EIS. In the interest of continuity, Israel is included in the EIS 2018.

[16] For Norway, the sharp increase can largely be explained by a change in the collection of Community Innovation Survey (CIS) data. The average percentage increase over the previous year for the indicators using CIS data is 125%, for the other indicators it is 0.5%. The strong increase in the results for the six indicators using CIS data is caused by the fact that CIS 2014 data were collected in a separate innovation survey, whereas CIS data up until the CIS 2012 were collected in a combined innovation and R&D survey.

Figure 12: Map showing the performance of European and neighbouring countries' innovation systems
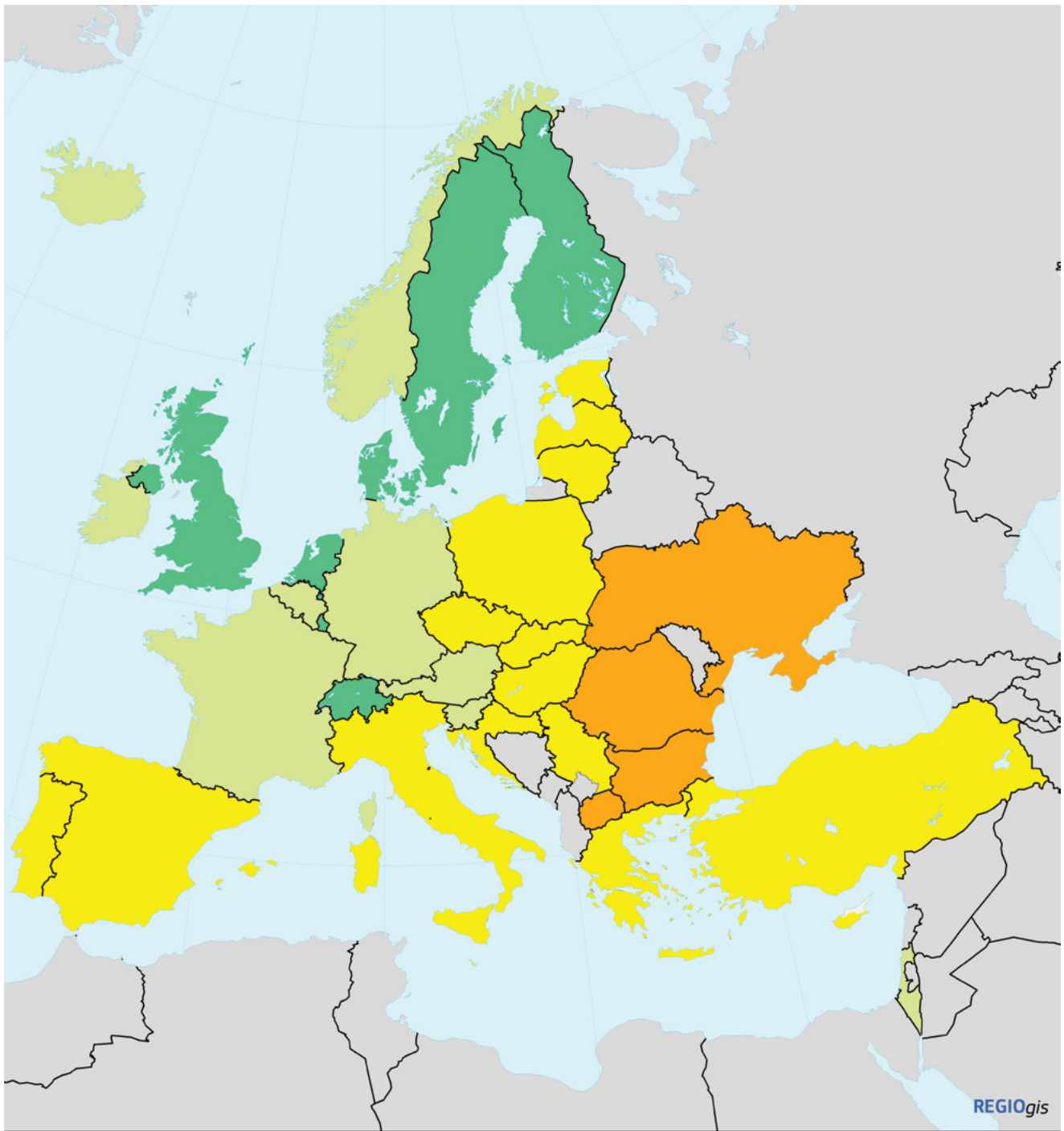
Innovation performance groups

- Innovation Leader
- Strong Innovator
- Moderate Innovator
- Modest Innovator

Source: European Commission – European Innovation Scoreboard 2018

REGIO*gis*

0   500 km

© EuroGeographics Association for the administrative boundaries

5.2 Prospect for including Western Balkan countries

In February 2018, the European Commission adopted a strategy for 'A credible enlargement perspective for and enhanced EU engagement with the Western Balkans', confirming the European future of the region as a geostrategic investment in a stable, strong and united Europe based on common values.[17] The Strategy spells out the priorities and areas of joint reinforced cooperation, addressing the specific challenges facing the Western Balkans, in particular the need for fundamental reforms and good neighbourly relations. The Strategy sets out an Action Plan with six concrete flagship initiatives targeting specific areas of common interest: rule of law, security and migration, socio-economic development, transport and energy connectivity, digital agenda, reconciliation and good neighbourly relations.

Following the adoption of this Strategy, the inclusion of all Western Balkan countries in the European Innovation Scoreboard is foreseen. Three of these countries are already included: Croatia, as one of the 28 Member States, as well as the Former Yugoslav Republic of Macedonia and Serbia. As a rule, countries can only be included if data are available for at least 20 indicators. *Table 3* shows that current data availability from international sources is insufficient to include Albania, Bosnia and Herzegovina, Kosovo[18] or Montenegro. For Bosnia and Herzegovina and Montenegro, data availability from national sources has been checked in detail following official requests from both countries to be included in the European Innovation Scoreboard. For the other three countries, national sources will be checked for the 2019 edition of the EIS.

For Albania, currently data are available from international data sources for eight indicators, but for R&D expenditure in the public sector, the 2008 data available from the UNESCO Institute for Statistics are becoming too old. No additional data are expected to become available from international data sources, and national data sources have not yet been explored. Albania has an innovation survey covering innovation activities in 2011-2012[19], and for the six indicators using innovation survey data, results might become available. The innovation survey data for Albania would, however, be difficult to compare with those of other countries as the CIS covers a three-year reference period, whereas the Albanian innovation survey covers two years only, thereby reducing the share of enterprises with innovation activities.

For Bosnia and Herzegovina, currently data are available from international data sources for 10 indicators. No additional data are expected to become available from international data sources, and national data sources have not yet been explored. Bosnia and Herzegovina has introduced its first innovation survey for the years 2014-2016, and for the six indicators using innovation survey data, results are expected to become available for the EIS 2019, increasing the number of indicators for which data would be available next year to at least 16.

For Kosovo, almost no data are currently available. No additional data are expected to become available from international data sources, and national data sources have not yet been explored. Kosovo has no innovation survey, and for the six indicators using innovation survey data, no results are expected to become available.

For Montenegro, currently data are available from international and national data sources for 15 indicators. No additional data are expected to become available from international data sources. Montenegro has introduced its first innovation survey for the years 2014-2016, and for the six indicators using innovation survey data, results are expected to be available for the EIS 2019, increasing the number of indicators for which data would be available next year to 21, which would be sufficient to include Montenegro in the EIS 2019.

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[17] https://ec.europa.eu/commission/news/strategy-western-balkans-2018-feb-06_en

[18] This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.

[19] http://www.instat.gov.al/en/about-us/activities/other/survey-on-scientific-research-development/

Table 3: Data availability Western Balkan countries

	ALBANIA	BOSNIA AND HERZEGOVINA	KOSOVO	MONTENEGRO
HUMAN RESOURCES				
1.1.1 New doctorate graduates	Not available	Not available	Not available	0.3 (2016)[g]
1.1.2 Population aged 25-34 with tertiary education	Not available	Not available	Not available	34.3 (2016)[g]
1.1.3 Lifelong learning	Not available	Not available	Not available	2.8 (2017)[a]
ATTRACTIVE RESEARCH SYSTEMS				
1.2.1 International scientific co-publications	46.0 (2015)[h]	94.0 (2015)[h]	Not available	266.8 (2015)[h]
1.2.2 Top 10% most cited publications	2.1 (2014)[h]	3.3 (2014)[h]	Not available	3.2 (2014)[h]
1.2.3 Foreign doctorate students as a percentage of all doctorate students	Not available	Not available	Not available	Not available
INNOVATION-FRIENDLY ENVIRONMENT				
1.3.1 Broadband penetration	Not available	Not available	Not available	10.5 (2017)[g]
1.3.2 Opportunity-driven entrepreneurship	Not available	1.2 (2017)[i]	1.3 (2014)[i]	1.0 (2010)[i]
FINANCE AND SUPPORT				
2.1.1 R&D expenditure in the public sector	0.15 (2008)[e]	0.21 (2014)[a]	Not available	0.24 (2015)[a]
2.1.2 Venture capital expenditures	Not available	Not available	Not available	Not available
FIRM INVESTMENTS				
2.2.1 R&D expenditure in the business sector	Not available	0.05 (2014)[a]	Not available	0.11 (2015)[a]
2.2.2 Non-R&D innovation expenditures	*Possibly avail. from innovation survey*	*Expected from first innovation survey*	*Not available, no innovation survey*	*Expected from first innovation survey*
2.2.3 Enterprises providing training to develop or upgrade ICT skills of their personnel	Not available	Not available	Not available	Not available
INNOVATORS				
3.1.1 SMEs with product or process innovations	*Possibly avail. from innovation survey*	*Expected from first innovation survey*	*Not available, no innovation survey*	*Expected from first innovation survey*
3.1.2 SMEs with marketing or organisational innovations	*Possibly avail. from innovation survey*	*Expected from first innovation survey*	*Not available, no innovation survey*	*Expected from first innovation survey*
3.1.3 SMEs innovating in-house	*Possibly avail. from innovation survey*	*Expected from first innovation survey*	*Not available, no innovation survey*	*Expected from first innovation survey*
LINKAGES				
3.2.1 Innovative SMEs collaborating with others	*Possibly avail. from innovation survey*	*Expected from first innovation survey*	Not available, no innovation survey	*Expected from first innovation survey*
3.2.2 Public-private co-publications	0.35 (2013)[h]	1.05 (2014)[h]	Not available	Not available
3.2.3 Private co-funding of public R&D expenditures	Not available	0.016 (2014)[a]	Not available	0.001 (2015)[a]
INTELLECTUAL ASSETS				
3.3.1 PCT patent applications	Not available[c]	Not available[c]	Not available[c]	Not available[c]
3.3.2 Trademark applications (absolute numbers)	10 (2017)[b] 6 (2017)[f]	9 (2017)[b] 31 (2017)[f]	Not available	10 (2017)[b] 7 (2017)[f]
3.3.3 Design applications (absolute numbers)	1 (2016)[b]	1 (2014)[b]	Not available	0 (all years)[b]
EMPLOYMENT IMPACTS				
4.1.1 Employment in knowledge-intensive activities	Not available	Not available	Not available	11.4 (2016)[a]
4.1.2 Employment fast-growing enterprises of innovative sectors	Not available	Not available	Not available	Not available
SALES IMPACTS				
4.2.1 Medium and high-tech product exports	11.2 (2016)[d]	22.4 (2017)[d]	Not available	17.2 (2016)[d]
4.2.2 Knowledge-intensive services exports	22.6 (2016)[d]	14.9 (2015)[d]	Not available	19.8 (2015)[d]
4.2.3 Sales of new-to-market and new-to-firm product innovations	*Possibly avail. from innovation survey*	*Expected from first innovation survey*	*Not available, no innovation survey*	*Expected from first innovation survey*

[a] Eurostat; [b] EUIPO; [c] OECD; [d] UN Comtrade; [e] UNESCO Institute for Statistics (UIS); [f] WIPO; [g] Monstat (Statistical Office of Montenegro); [h] European Commission: Science, Research and Innovation Performance of the EU (SRIP) report 2018: https://ec.europa.eu/info/support-policy-making-eu-and-horizon-2020-associated-countries/srip-report_en; [i] GEM (Global Entrepreneurship Monitor).

5.3 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 almost 24 per cent above the performance score of the EU in 2017 (*Figure 13*). Canada, Australia, Japan, and the United States also maintain a performance lead over the EU, while the EU has a performance lead over China, Brazil, South Africa, Russia, and India.

Based on relative-to-EU performance in 2017, South Korea would be an Innovation Leader, Canada, Australia, Japan, and the United States would be Strong Innovators, China and Brazil would be Moderate Inno-

vators, and South Africa, Russia, and India would be Modest Innovators. Performance has increased most in China, South Korea, and Australia, and for all three countries, performance has increased at a higher rate compared to the EU. For all other countries, performance has increased at a lower rate compared to the EU (*Figure 14*). For Canada, performance has decreased. Combining current and growth performance shows that South Korea and Australia have an increasing performance lead over the EU, while Canada, Japan, and the United States 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.

Figure 13: Global performance
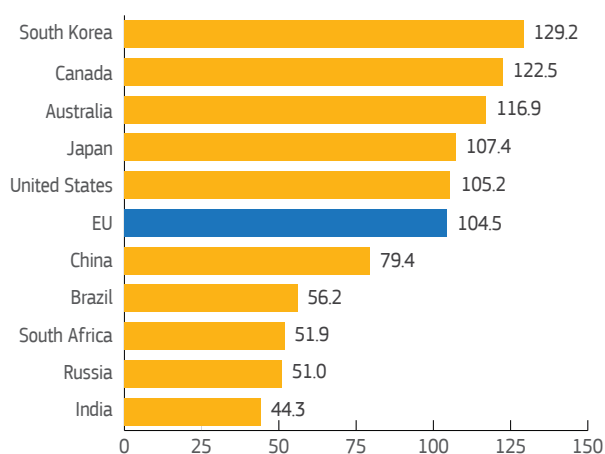
Bars show countries' performance in 2017 relative to that of the EU in 2010.
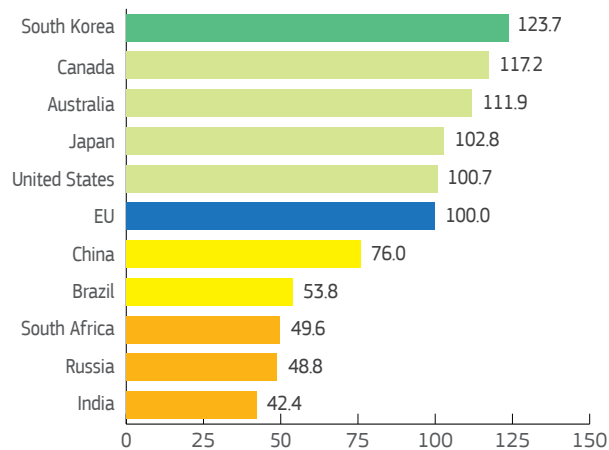
Bars show countries' performance in 2017 relative to that of the EU in 2017.

Figure 14: Change in global performance
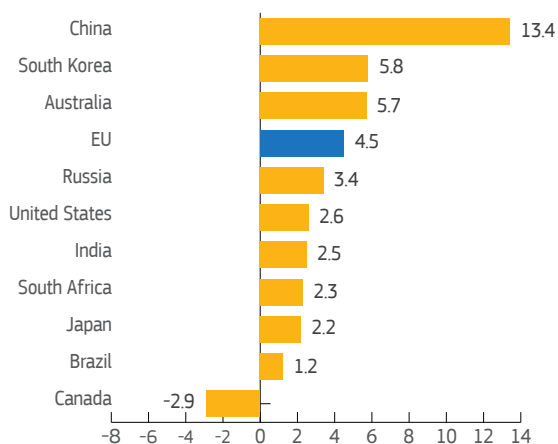
Change in performance is measured as the difference between the performance in 2017 relative to the EU in 2010 and the performance in 2010 relative to the EU in 2010.

Methodology

The economic and population size of most global competitors outweighs that of many of the individual EU Member States, and innovation performance is therefore 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 16 indicators (**Table 4**) has been used for the international comparison of the EU with its global competitors.

For some indicators, different definitions have been used as compared to the previous chapters[20]:

• 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 (so-called intra-EU trade), and only include exports to non-Member States (so-called extra-EU trade);

• For Knowledge-intensive services exports, data have been used from the UN Comtrade database using an older EBOPS classification.

For each of the international competitors, the following pages very briefly discuss the performance of their innovation system compared to the EU, and relative strengths and weaknesses for the different indicators. For each country, a table with structural data is included comparable to those for the European and neighbouring countries in Chapter 7. The countries are ordered according to their performance rank order (cf. **Figure 13**).

Data have been extracted from various sources including Eurostat, OECD (MSTI, Education at a Glance), different UN data sources including UNESCO Institute for Statistics, United Nations (Comtrade) and UNIDO,

Table 4: Indicators used in the international comparison

	DATA SOURCE	YEAR
FRAMEWORK CONDITIONS		
HUMAN RESOURCES		
1.1.1 New doctorate graduates (per 1000 population aged 25-34)	OECD	2015
1.1.2 Population aged 25-64 having completed tertiary education	OECD	2016
ATTRACTIVE RESEARCH SYSTEMS		
1.2.1 International scientific co-publications (per million population)	Web of Science*	2017
1.2.2 Scientific publications among the top 10% most cited publications worldwide (share of total scientific publications of the country)	Web of Science*	2015
INNOVATION-FRIENDLY ENVIRONMENT		
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	2016
FIRM INVESTMENTS		
2.2.1 R&D expenditure in the business sector (percentage of GDP)	OECD, UIS	2016
INNOVATION ACTIVITIES		
INNOVATORS		
3.1.1 SMEs introducing product or process innovations (%-share)	OECD	2014
3.1.2 SMEs introducing marketing or organisational innovations (%-share)	OECD	2014
LINKAGES		
3.2.1 Innovative SMEs collaborating with others (%-share)	OECD	2014
3.2.2 Public-private co-publications (per million population)	Web of Science*	2017
3.2.3 Private co-funding of public R&D expenditures (percentage of GDP)	OECD	2016
INTELLECTUAL ASSETS		
3.3.1 PCT patent applications	Patents: OECD GDP: World Bank	2014
3.3.2 Trademark applications (per billion GDP)	World Bank	2016
3.3.3 Design applications (per billion GDP)	World Bank	2016
IMPACTS		
EMPLOYMENT IMPACTS		
No indicator included in international comparison		
SALES IMPACTS		
4.2.1 Medium and high-tech product exports (share of total product exports)	United Nations	2017
4.2.2 Knowledge-intensive services exports (share of total service exports)	United Nations	2016

Data provided by CWTS (Leiden University) as part of a contract to the European Commission (DG Research and Innovation)

[20] Aggregate results for the EU are therefore not comparable to those used in the European benchmarking analysis.

Web of Science, World Bank (World Development Indicators), and National Statistical Offices of the countries included in this international comparison.

For the international benchmarking, a comparable list of contextual indicators has been used, but 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 so-called Unicorns is included. 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: The relative size of South Korea's manufacturing industry is twice that of the EU. Top R&D spending firms in South Korea spend almost twice as much on R&D, FDI net inflows as a percentage of GDP are much lower, while entrepreneurial activities are at a higher level. Canada's economy shows a lower employment share for industry, and a higher employment share for services. Entrepreneurial activities are also at a higher level. The relative size of Australia's manufacturing industry is less than half that of the EU, while entrepreneurial activities

are at a higher level. Japan's top R&D spending firms spend about 50% more on R&D as compared to EU top R&D spending firms. FDI net inflows as a percentage of GDP are much lower, and Japan is also facing a declining population size. For the United States, entrepreneurial activities are at a higher level, and top R&D spending firms spend almost 80% more on R&D. The number of Unicorns is more than four times that of the EU. China's agricultural sector accounts for almost 30% of total employment, while also the relative size of the manufacturing industry is more than twice that of the EU. Entrepreneurial activities in China are at a higher level. Brazil has a relatively high share of employment in agriculture. Entrepreneurial activities are at a higher level, and top R&D spending firms spend more on R&D. 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. The structure of Russia's economy is comparable to that of the EU. Top R&D spending firms spend less on R&D. India's agricultural sector accounts for almost 50% of total employment, and entrepreneurial activities are at a higher level.

Table 5: Contextual indicators in the international comparison

	Period	Source
PERFORMANCE AND STRUCTURE OF THE ECONOMY		
GDP per capita, PPP (international dollars)	Average 2014-2016	World Development Indicators*
Average annual GDP growth (%)	2014-2016	World Development Indicators*
Employment share in Agriculture (%)	Average 2014-2016	World Development Indicators*
Employment share in Industry (%)	Average 2014-2016	World Development Indicators*
Employment share in Services (%)	2016	World Development Indicators*
Manufacturing – share in total value added **	Average 2013-2015	World Development Indicators*
BUSINESS AND ENTREPRENEURSHIP		
Total early-stage Entrepreneurial Activity (TEA) (%)	Average 2015-2017	Global Entrepreneurship Monitor
FDI net inflows (% GDP)	Average 2014-2016	World Development Indicators*
Top R&D spending enterprises per 10 million population	Average 2015-2017	EU Industrial R&D Investment Scoreboard
Top R&D spending enterprises, average R&D spending, million Euros	Average 2015-2017	EU Industrial R&D Investment Scoreboard
Number of Unicorns	Total	CB Insights (https://www.cbinsights.com/research-unicorn-companies)
Buyer sophistication (1 to 7 best)	Average 2015-2017	World Economic Forum
GOVERNANCE AND POLICY FRAMEWORK		
Ease of starting a business (0 to 100 best)	Average 2015-2017	Doing Business*
Basic-school entrepreneurial education and training (1 to 5 best)	Average 2015-2017	Global Entrepreneurship Monitor
Government procurement of advanced technology products (1 to 7 best)	Average 2014-2016	World Economic Forum
Rule of law (-2.5 to 2.5 best)	Average 2014-2016	Worldwide Governance Indicators*
DEMOGRAPHY		
Population size (millions)	Average 2014-2016	World Development Indicators*
Average annual population growth (%)	2014-2016	World Development Indicators
Population density (inhabitants / km2)	Average 2014-2016	World Development Indicators*

* Database from the World Bank ** Value added data are used in the international comparison as employment data are not available.

The performance of **South Korea** is well above that of the EU, and the country is an Innovation Leader. Performance has increased since 2010. South Korea's relative strengths are in Business R&D expenditures and Intellectual Property applications.
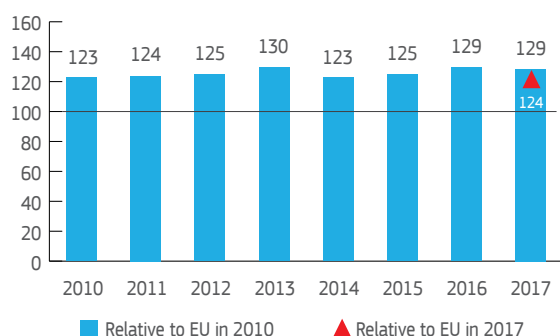
The performance of **Canada** is well above that of the EU, and the country is a Strong Innovator. Performance has decreased since 2010. Canada's relative strengths are in International co-publications, Product and process innovation, and Trademark applications.

Columns show performance relative to EU in 2010. The red triangle shows performance relative to EU in 2017.

Columns show performance relative to EU in 2010. The red triangle shows performance relative to EU in 2017.

Performance in 2010 and 2017 relative to EU in 2010

South Korea	2010	2017	2010-2017
Doctorate graduates	73.5	83.8	10.3
Tertiary education	143.9	143.2	-0.7
International co-publications	106.5	104.6	-2.0
Most cited publications	63.6	62.5	-1.0
R&D expenditure public sector	117.9	129.8	12.0
R&D expenditure business sector	231.1	240.1	9.0
Product/process innovators	104.4	96.4	-8.0
Marketing/organisational innovators	34.7	84.8	50.1
Innovation collaboration	131.9	21.4	-110.5
Public-private co-publications	143.6	156.4	12.8
Private co-funding public R&D exp.	117.8	131.8	14.0
PCT patent applications	129.6	161.7	32.1
Trademark applications	238.4	233.3	-5.0
Design applications	215.3	229.9	14.6
Medium & high tech product exports	117.8	119.8	2.0
Knowledge-intensive services exports	91.6	44.8	-46.9

Best three and worst three indicators highlighted.

Performance in 2010 and 2017 relative to EU in 2010

Canada	2010	2017	2010-2017
Doctorate graduates	77.4	78.4	1.0
Tertiary education	183.3	171.9	-11.4
International co-publications	189.6	183.0	-6.6
Most cited publications	116.3	115.0	-1.3
R&D expenditure public sector	126.0	115.5	-10.5
R&D expenditure business sector	84.7	65.7	-19.0
Product/process innovators	166.6	172.2	5.7
Marketing/organisational innovators	136.0	154.7	18.7
Innovation collaboration	n/a	n/a	n/a
Public-private co-publications	129.7	104.7	-25.0
Private co-funding public R&D exp.	120.1	109.9	-10.2
PCT patent applications	85.9	86.1	0.2
Trademark applications	190.8	178.8	-12.0
Design applications	68.9	73.9	5.0
Medium & high tech product exports	57.2	67.8	10.6
Knowledge-intensive services exports	87.1	82.2	-4.9

Best three and worst three indicators highlighted.

Structural differences	KR	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	35,100	38,500
Average annual GDP growth, %	2.8	2.1
Employment share in Agriculture	5.3	4.6
Employment share in Industry	24.9	24.1
Employment share in Services	69.8	71.3
Manufacturing - share in total value added	29.0	14.1
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	9.6	6.6
FDI net inflows (% GDP)	0.57	3.60
Top R&D spending firms per 10 mln population	14.7	19.7
- average R&D spending, mln Euros	337.0	175.6
Number of Unicorns (April 2018)	3	25
Buyer sophistication 1-7 (best)	5.0	3.7
Governance and policy framework		
Ease of starting a business	83.9	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.8	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.9	3.5
Rule of law (-2.5 to 2.5 best)	1.0	1.2
Demography		
Population size, mln	51.0	509.8
Average annual population growth, %	0.5	0.3
Share of population aged 15-64	73.1	65.4
Population density (inhabitants / km2)	523.2	117.1

Structural differences	CA	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	44,800	38,500
Average annual GDP growth, %	1.2	2.1
Employment share in Agriculture	2.1	4.6
Employment share in Industry	19.7	24.1
Employment share in Services	78.2	71.3
Manufacturing - share in total value added	9.7	14.1
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	16.7	6.6
FDI net inflows (% GDP)	3.07	3.60
Top R&D spending firms per 10 mln population	8.0	19.7
- average R&D spending, mln Euros	158.9	175.6
Number of Unicorns (April 2018)	1	25
Buyer sophistication 1-7 (best)	4.4	3.7
Governance and policy framework		
Ease of starting a business	78.9	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.3	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.5	3.5
Rule of law (-2.5 to 2.5 best)	1.8	1.2
Demography		
Population size, mln	35.9	509.8
Average annual population growth, %	1.0	0.3
Share of population aged 15-64	67.9	65.4
Population density (inhabitants / km2)	3.9	117.1

The performance of **Australia** is above that of the EU, and the country is a Strong Innovator. Performance has increased since 2010. Australia's strengths are in International co-publications, Product and process innovation, and Trademark applications.

The performance of **Japan** is above that of the EU, and the country is a Strong Innovator. Performance has increased since 2010. Japan's relative strengths are in Business R&D expenditures, Innovation collaboration, and Patent applications.

Columns show performance relative to EU in 2010. The red triangle shows performance relative to EU in 2017.

Columns show performance relative to EU in 2010. The red triangle shows performance relative to EU in 2017.

Performance in 2010 and 2017 relative to EU in 2010

Australia	2010	2017	2010-2017
Doctorate graduates	114.7	123.8	9.1
Tertiary education	136.2	133.7	-2.6
International co-publications	206.5	183.9	-22.6
Most cited publications	115.1	117.1	2.1
R&D expenditure public sector	122.7	120.6	-2.2
R&D expenditure business sector	113.5	80.8	-32.7
Product/process innovators	157.0	181.1	24.0
Marketing/organisational innovators	110.0	136.7	26.6
Innovation collaboration	149.8	131.0	-18.7
Public-private co-publications	97.9	80.0	-17.9
Private co-funding public R&D exp.	98.8	108.0	9.2
PCT patent applications	87.9	78.0	-9.9
Trademark applications	260.9	228.3	-32.6
Design applications	92.3	96.7	4.4
Medium & high tech product exports	14.1	19.0	4.9
Knowledge-intensive services exports	29.1	33.4	4.4

Best three and worst three indicators highlighted.

Performance in 2010 and 2017 relative to EU in 2010

Japan	2010	2017	2010-2017
Doctorate graduates	68.8	61.5	-7.3
Tertiary education	162.3	154.3	-8.0
International co-publications	85.6	80.5	-5.1
Most cited publications	63.1	59.4	-3.8
R&D expenditure public sector	99.4	92.4	-7.0
R&D expenditure business sector	213.9	199.1	-14.9
Product/process innovators	76.7	80.2	3.5
Marketing/organisational innovators	82.0	95.2	13.2
Innovation collaboration	120.9	164.7	43.8
Public-private co-publications	146.4	118.4	-28.0
Private co-funding public R&D exp.	26.0	34.6	8.6
PCT patent applications	145.5	161.7	16.2
Trademark applications	90.7	158.6	67.8
Design applications	94.3	91.0	-3.3
Medium & high tech product exports	123.0	118.8	-4.2
Knowledge-intensive services exports	123.5	66.5	-57.0

Best three and worst three indicators highlighted.

Structural differences	AU	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	46,200	38,500
Average annual GDP growth, %	2.6	2.1
Employment share in Agriculture	2.8	4.6
Employment share in Industry	21.8	24.1
Employment share in Services	75.4	71.3
Manufacturing - share in total value added	6.1	14.1
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	13.2	6.6
FDI net inflows (% GDP)	3.14	3.60
Top R&D spending firms per 10 mln population	6.3	19.7
- average R&D spending, mln Euros	207.1	175.6
Number of Unicorns (April 2018)	1	25
Buyer sophistication 1-7 (best)	3.9	3.7
Governance and policy framework		
Ease of starting a business	80.2	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.1	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.4	3.5
Rule of law (-2.5 to 2.5 best)	1.8	1.2
Demography		
Population size, mln	23.8	509.8
Average annual population growth, %	1.4	0.3
Share of population aged 15-64	66.2	65.4
Population density (inhabitants / km2)	3.1	117.1

Structural differences	JP	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	40,700	38,500
Average annual GDP growth, %	1.1	2.1
Employment share in Agriculture	3.8	4.6
Employment share in Industry	26.8	24.1
Employment share in Services	69.4	71.3
Manufacturing - share in total value added	18.8	14.1
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	4.7	6.6
FDI net inflows (% GDP)	0.41	3.60
Top R&D spending firms per 10 mln population	28.3	19.7
- average R&D spending, mln Euros	268.6	175.6
Number of Unicorns (April 2018)	1	25
Buyer sophistication 1-7 (best)	5.0	3.7
Governance and policy framework		
Ease of starting a business	75.4	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.6	1.9
Govt. procurement of advanced tech products (1 to 7 best)	4.0	3.5
Rule of law (-2.5 to 2.5 best)	1.5	1.2
Demography		
Population size, mln	127.1	509.8
Average annual population growth, %	-0.1	0.3
Share of population aged 15-64	61.0	65.4
Population density (inhabitants / km2)	348.7	117.1

The performance of the **United States** is just above that of the EU, and the country is a Strong Innovator. Performance has increased since 2010. Relative strengths are in Tertiary education, Business R&D expenditures, and Public-private co-publications.
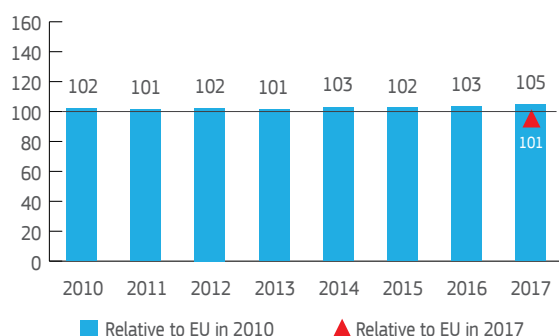
The performance of **China** is below that of the EU, and the country is a Moderate Innovator. Performance has increased strongly since 2010. Relative strengths are in Business R&D expenditures and Trademark and Design applications.

Columns show performance relative to EU in 2010. The red triangle shows performance relative to EU in 2017.

Columns show performance relative to EU in 2010. The red triangle shows performance relative to EU in 2017.
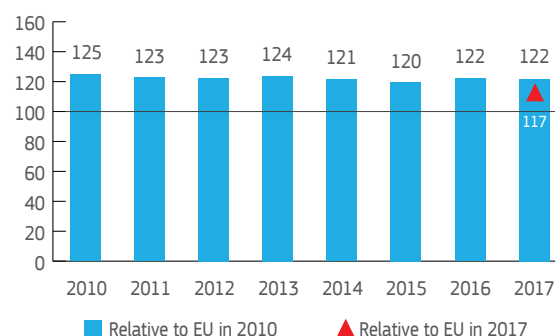
Performance in 2010 and 2017 relative to EU in 2010

United States	2010	2017	2010-2017
Doctorate graduates	96.9	80.8	-16.0
Tertiary education	150.9	139.5	-11.4
International co-publications	128.9	126.6	-2.3
Most cited publications	139.7	130.8	-8.8
R&D expenditure public sector	108.8	100.7	-8.1
R&D expenditure business sector	166.2	157.2	-9.0
Product/process innovators	66.4	72.6	6.2
Marketing/organisational innovators	n/a	n/a	n/a
Innovation collaboration	n/a	n/a	n/a
Public-private co-publications	179.2	169.2	-10.0
Private co-funding public R&D exp.	40.9	42.3	1.4
PCT patent applications	105.2	111.8	6.6
Trademark applications	53.0	55.2	2.2
Design applications	49.4	58.8	9.4
Medium & high tech product exports	84.3	85.7	1.5
Knowledge-intensive services exports	82.6	86.4	3.8

Best three and worst three indicators highlighted.

Performance in 2010 and 2017 relative to EU in 2010

China	2010	2017	2010-2017
Doctorate graduates	13.0	10.8	-2.1
Tertiary education	36.5	39.5	3.0
International co-publications	27.6	36.4	8.8
Most cited publications	68.4	77.4	9.0
R&D expenditure public sector	65.8	70.7	4.9
R&D expenditure business sector	111.9	132.0	20.1
Product/process innovators	n/a	n/a	n/a
Marketing/organisational innovators	n/a	n/a	n/a
Innovation collaboration	n/a	n/a	n/a
Public-private co-publications	7.8	16.7	8.9
Private co-funding public R&D exp.	126.0	119.8	-6.1
PCT patent applications	43.8	67.4	23.5
Trademark applications	181.8	266.0	84.2
Design applications	205.8	208.6	2.8
Medium & high tech product exports	95.3	91.7	-3.6
Knowledge-intensive services exports	91.8	49.4	-42.4

Best three and worst three indicators highlighted.

Structural differences	US	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	56,200	38,500
Average annual GDP growth, %	2.2	2.1
Employment share in Agriculture	1.5	4.6
Employment share in Industry	17.4	24.1
Employment share in Services	81.1	71.3
Manufacturing - share in total value added	11.8	14.1
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	12.7	6.6
FDI net inflows (% GDP)	2.24	3.60
Top R&D spending firms per 10 mln population	25.8	19.7
- average R&D spending, mln Euros	312.8	175.6
Number of Unicorns (April 2018)	114	25
Buyer sophistication 1-7 (best)	4.8	3.7
Governance and policy framework		
Ease of starting a business	82.3	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.1	1.9
Govt. procurement of advanced tech products (1 to 7 best)	4.3	3.5
Rule of law (-2.5 to 2.5 best)	1.6	1.2
Demography		
Population size, mln	320.9	509.8
Average annual population growth, %	0.7	0.3
Share of population aged 15-64	66.1	65.4
Population density (inhabitants / km2)	35.1	117.1

Structural differences	CN	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	14,500	38,500
Average annual GDP growth, %	6.8	2.1
Employment share in Agriculture	28.8	4.6
Employment share in Industry	23.8	24.1
Employment share in Services	47.3	71.3
Manufacturing - share in total value added	32.8	14.1
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	11.0	6.6
FDI net inflows (% GDP)	2.09	3.60
Top R&D spending firms per 10 mln population	2.4	19.7
- average R&D spending, mln Euros	147.1	175.6
Number of Unicorns (April 2018)	64	25
Buyer sophistication 1-7 (best)	4.3	3.7
Governance and policy framework		
Ease of starting a business	63.4	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.8	1.9
Govt. procurement of advanced tech products (1 to 7 best)	4.3	3.5
Rule of law (-2.5 to 2.5 best)	-0.4	1.2
Demography		
Population size, mln	1371.4	509.8
Average annual population growth, %	0.5	0.3
Share of population aged 15-64	72.6	65.4
Population density (inhabitants / km2)	146.1	117.1

The performance of **Brazil** is below that of the EU, and the country is a Moderate Innovator. Performance has decreased recently. Brazil's relative strengths are in the share of enterprises introducing innovations and Trademark applications.

The performance of **South Africa** is below that of the EU, and the country is a Modest Innovator. Performance has increased since 2010. Relative strengths are in the share of enterprises introducing innovations and Trademark applications.

Columns show performance relative to EU in 2010. The red triangle shows performance relative to EU in 2017.
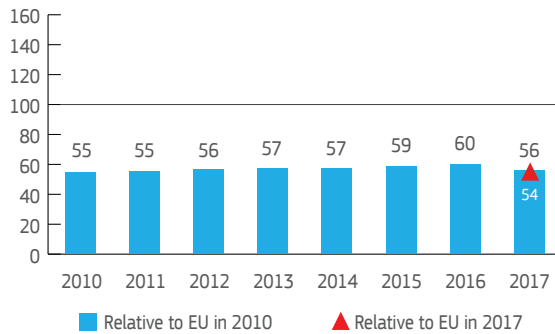
Columns show performance relative to EU in 2010. The red triangle shows performance relative to EU in 2017.
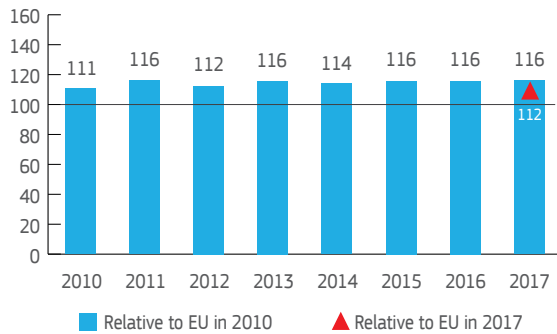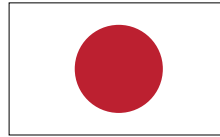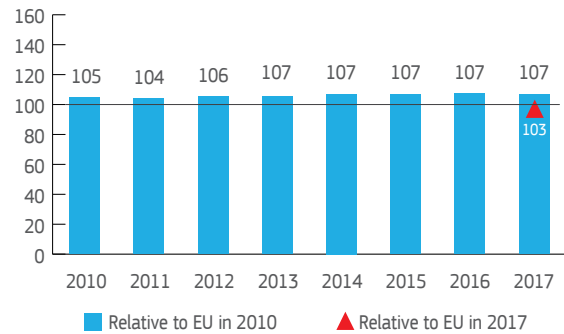
Performance in 2010 and 2017 relative to EU in 2010

Brazil	2010	2017	2010-2017
Doctorate graduates	24.0	23.4	-0.5
Tertiary education	46.0	43.8	-2.2
International co-publications	46.1	51.5	5.4
Most cited publications	46.0	49.8	3.7
R&D expenditure public sector	91.2	93.3	2.2
R&D expenditure business sector	46.3	41.9	-4.5
Product/process innovators	109.6	114.8	5.3
Marketing/organisational innovators	146.9	181.8	34.9
Innovation collaboration	62.6	52.8	-9.8
Public-private co-publications	5.5	5.6	0.1
Private co-funding public R&D exp.	n/a	n/a	n/a
PCT patent applications	26.0	28.0	2.0
Trademark applications	95.7	99.8	4.0
Design applications	52.0	52.4	0.4
Medium & high tech product exports	39.3	47.3	8.1
Knowledge-intensive services exports	103.9	78.3	-25.5

Best three and worst three indicators highlighted.

Performance in 2010 and 2017 relative to EU in 2010

South Africa	2010	2017	2010-2017
Doctorate graduates	8.5	11.0	2.5
Tertiary education	40.5	36.8	-3.7
International co-publications	63.4	68.1	4.7
Most cited publications	67.2	71.6	4.4
R&D expenditure public sector	57.3	57.5	0.3
R&D expenditure business sector	44.8	27.8	-16.9
Product/process innovators	n/a	n/a	n/a
Marketing/organisational innovators	125.5	158.9	33.3
Innovation collaboration	200.1	168.9	-31.2
Public-private co-publications	8.7	6.9	-1.8
Private co-funding public R&D exp.	42.3	58.5	16.2
PCT patent applications	48.1	41.4	-6.7
Trademark applications	106.8	96.7	-10.1
Design applications	0.0	65.2	65.2
Medium & high tech product exports	47.1	63.5	16.4
Knowledge-intensive services exports	19.7	20.6	0.9

Best three and worst three indicators highlighted.

Structural differences	BR	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	15,600	38,500
Average annual GDP growth, %	-3.7	2.1
Employment share in Agriculture	14.9	4.6
Employment share in Industry	21.8	24.1
Employment share in Services	63.3	71.3
Manufacturing - share in total value added	12.2	14.1
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	20.3	6.6
FDI net inflows (% GDP)	4.15	3.60
Top R&D spending firms per 10 mln population	0.4	19.7
- average R&D spending, mln Euros	205.6	175.6
Number of Unicorns (April 2018)	1	25
Buyer sophistication 1-7 (best)	3.4	3.7
Governance and policy framework		
Ease of starting a business	56.9	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.4	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.2	3.5
Rule of law (-2.5 to 2.5 best)	-0.1	1.2
Demography		
Population size, mln	205.9	509.8
Average annual population growth, %	0.8	0.3
Share of population aged 15-64	69.5	65.4
Population density (inhabitants / km2)	24.6	117.1

Structural differences	SA	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	13,100	38,500
Average annual GDP growth, %	0.8	2.1
Employment share in Agriculture	6.0	4.6
Employment share in Industry	26.8	24.1
Employment share in Services	67.2	71.3
Manufacturing - share in total value added	12.5	14.1
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	9.0	6.6
FDI net inflows (% GDP)	0.96	3.60
Top R&D spending firms per 10 mln population	0.3	19.7
- average R&D spending, mln Euros	66.1	175.6
Number of Unicorns (April 2018)	2	25
Buyer sophistication 1-7 (best)	4.0	3.7
Governance and policy framework		
Ease of starting a business	64.8	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.8	1.9
Govt. procurement of advanced tech products (1 to 7 best)	2.9	3.5
Rule of law (-2.5 to 2.5 best)	0.1	1.2
Demography		
Population size, mln	55.0	509.8
Average annual population growth, %	1.6	0.3
Share of population aged 15-64	65.5	65.4
Population density (inhabitants / km2)	45.6	117.1

The performance of **Russia** is below that of the EU, and the country is a Modest Innovator. Performance has increased since 2010. Russia's relative strengths are in Tertiary education, Private co-funding of public R&D, and Trademark applications.
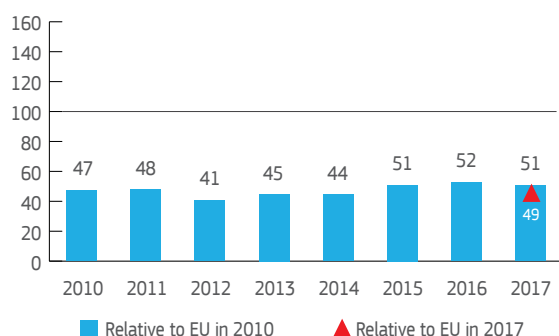
The performance of **India** is below that of the EU, and the country is a Modest Innovator. Performance has increased since 2010. Relative strengths are in Public R&D expenditure, Marketing and organisational innovation, and Exports of knowledge-intensive services.

Columns show performance relative to EU in 2010. The red triangle shows performance relative to EU in 2017.

Columns show performance relative to EU in 2010. The red triangle shows performance relative to EU in 2017.

Performance in 2010 and 2017 relative to EU in 2010

Russia	2010	2017	2010-2017
Doctorate graduates	85.2	60.6	-24.6
Tertiary education	192.5	169.9	-22.6
International co-publications	53.2	54.8	1.5
Most cited publications	28.1	34.0	5.9
R&D expenditure public sector	59.7	66.8	7.1
R&D expenditure business sector	56.6	51.8	-4.8
Product/process innovators	11.4	15.4	4.1
Marketing/organisational innovators	6.1	7.8	1.6
Innovation collaboration	7.8	9.8	2.0
Public-private co-publications	6.1	5.4	-0.7
Private co-funding public R&D exp.	129.7	124.4	-5.3
PCT patent applications	29.8	33.6	3.8
Trademark applications	148.0	130.3	-17.7
Design applications	49.1	50.9	1.8
Medium & high tech product exports	13.4	21.1	7.7
Knowledge-intensive services exports	94.1	95.6	1.5

Best three and worst three indicators highlighted.

Performance in 2010 and 2017 relative to EU in 2010

India	2010	2017	2010-2017
Doctorate graduates	6.9	5.7	-1.2
Tertiary education	35.5	29.9	-5.6
International co-publications	19.0	20.0	1.0
Most cited publications	61.2	60.7	-0.4
R&D expenditure public sector	79.7	78.6	-1.1
R&D expenditure business sector	22.0	23.5	1.5
Product/process innovators	51.7	58.4	6.6
Marketing/organisational innovators	106.2	134.4	28.2
Innovation collaboration	n/a	n/a	n/a
Public-private co-publications	1.8	2.0	0.1
Private co-funding public R&D exp.	n/a	n/a	n/a
PCT patent applications	31.3	33.6	2.2
Trademark applications	75.1	67.9	-7.3
Design applications	40.8	41.9	1.1
Medium & high tech product exports	40.0	51.7	11.7
Knowledge-intensive services exports	119.5	119.1	-0.4

Best three and worst three indicators highlighted.

Structural differences	RU	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	25,100	38,500
Average annual GDP growth, %	-1.5	2.1
Employment share in Agriculture	6.7	4.6
Employment share in Industry	27.3	24.1
Employment share in Services	65.9	71.3
Manufacturing - share in total value added	13.1	14.1
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	6.3	6.6
FDI net inflows (% GDP)	1.37	3.60
Top R&D spending firms per 10 mln population	0.2	19.7
- average R&D spending, mln Euros	120.9	175.6
Number of Unicorns (April 2018)	0	25
Buyer sophistication 1-7 (best)	3.7	3.7
Governance and policy framework		
Ease of starting a business	72.5	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.1	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.3	3.5
Rule of law (-2.5 to 2.5 best)	-0.8	1.2
Demography		
Population size, mln	144.1	509.8
Average annual population growth, %	0.2	0.3
Share of population aged 15-64	69.6	65.4
Population density (inhabitants / km2)	8.8	117.1

Structural differences	IN	EU
Performance and structure of the economy		
GDP per capita, PPP (international $)	6,100	38,500
Average annual GDP growth, %	7.6	2.1
Employment share in Agriculture	45.9	4.6
Employment share in Industry	24.2	24.1
Employment share in Services	29.9	71.3
Manufacturing - share in total value added	12.7	14.1
Business and entrepreneurship		
Total Entrepreneurial Activity (TEA)	10.2	6.6
FDI net inflows (% GDP)	1.92	3.60
Top R&D spending firms per 10 mln population	0.2	19.7
- average R&D spending, mln Euros	169.1	175.6
Number of Unicorns (April 2018)	10	25
Buyer sophistication 1-7 (best)	4.4	3.7
Governance and policy framework		
Ease of starting a business	54.0	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.3	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.8	3.5
Rule of law (-2.5 to 2.5 best)	-0.1	1.2
Demography		
Population size, mln	1309.0	509.8
Average annual population growth, %	1.2	0.3
Share of population aged 15-64	65.7	65.4
Population density (inhabitants / km2)	440.3	117.1

6. Expected short-term changes in EU innovation performance

This year's report includes, for the third time, a forward-looking analysis of EU innovation performance discussing more recent developments, trends, and expected changes. The aim is to address the need for more recent information, since available statistical data for the indicators used for constructing the innovation index are, on average, two to three years old. This year's analysis once again, as in the EIS 2016, will use provisional 'fast-track' data from the 2016 Community Innovation Survey (CIS) (cf. **Section 6.3**).

In summary, the analysis suggests that EU innovation performance will continue to increase for most indicators, leading to an increase in overall EU innovation performance compared to 2010 from 106 in 2017 to 112 in two years' time (**Figure 15**). Of the expected 6.2 percentage point increase, about 40% can be explained by improved performance for the six indicators using provisional CIS 2016 data, and about 20% each in terms of the expected increase of Broadband penetration and Venture capital expenditures.

Table 6 shows a summary of the results for 18 indicators for which the calculation of relatively reliable short-term changes proved possible. EU innovation performance is expected to increase strongly by at least 10 percent for six indicators, to increase between five and 10 percent for one indicator, to increase more moderately between one and five percent for eight indicators, and to remain stable for three indicators. A decrease in performance is not expected for any of the indicators.

Section 6.1 first discusses the accuracy of last year's predictions. Section 6.2 examines trend performance of the EU compared to four of its main international competitors. Section 6.3 discusses the provisional 'fast-track' CIS 2016 data. Section 6.4 explores EU trend performance for individual indicators, and Section 6.5 discusses the possible use of Big data for providing more timely and policy-relevant innovation-related indicators.

Figure 15: Expected EU innovation performance
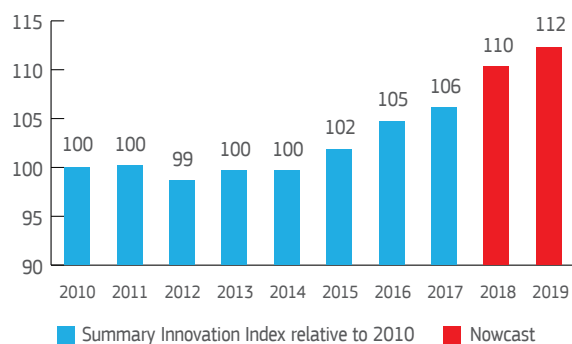
Table 6: Changes in two years' time in EU innovation performance

	CURRENT SCORE	EXPECTED CHANGE IN TWO YEARS' TIME	METHODOLOGY FOR ESTIMATING EXPECTED CHANGE
HUMAN RESOURCES			
1.1.1 Doctorate graduates per 1000 population age 25-34	2.01	5-10% increase	Linear regression
1.1.2 Population aged 25-34 with tertiary education	39.0	1-5% increase	Linear regression
ATTRACTIVE RESEARCH SYSTEMS			
1.2.1 International scientific co-publications	334.0	>10% increase	Linear regression
1.2.2 Most-cited scientific publications	10.6	No notable change	Linear regression
1.2.3 Foreign doctorate students	26.1	1-5% increase	Linear regression
INNOVATION-FRIENDLY ENVIRONMENT			
1.3.1 Broadband penetration	16.0	>10% increase	Linear regression
FINANCE AND SUPPORT			
2.1.2 Venture capital expenditures	0.099	>10% increase	Linear regression
FIRM INVESTMENTS			
2.2.1 R&D expenditure in the business sector	1.32	1-5% increase	Survey on Industrial R&D Investment Trends
2.2.2 Non-R&D innovation expenditures	0.76	>10% increase	CIS 2016 Fast-track data
INNOVATORS			
3.1.1 SMEs with product or process innovations	30.9	>10% increase	CIS 2016 Fast-track data
3.1.2 SMEs with marketing or organisational innovations	34.9	1-5% increase	CIS 2016 Fast-track data
3.1.3 SMEs innovating in-house	28.8	>10% increase	CIS 2016 Fast-track data
LINKAGES			
3.2.1 Innovative SMEs collaborating with others	11.2	No notable change	CIS 2016 Fast-track data
INTELLECTUAL ASSETS			
3.3.1 PCT patent applications	3.53	No notable change	Econometric model using GDP and R&D
3.3.2 Trademark applications	7.86	1-5% increase	Linear regression
EMPLOYMENT IMPACTS			
4.1.1 Employment in knowledge-intensive activities	14.2	1-5% increase	Linear regression
SALES IMPACTS			
4.2.2 Knowledge-intensive services exports	69.2	1-5% increase	Linear regression
4.2.3 Sales of new-to-market and new-to-firm product innovations	13.4	1-5% increase	CIS 2016 Fast-track data

6.1 Looking back at last year's estimates

The EIS 2017 report suggested – over a period of two years – an increase in the EIS innovation index by about 2% and a strong increase of more than 10% for two indicators, a more moderate increase between 1% and 10% for 10 indicators, about the same performance for one indicator, and a decrease for six indicators. For eight indicators, expected two-year changes could not be calculated.

Table 7 provides a comparison of the predicted two-year change and the real one-year change achieved since last year. For five indicators, last year's prediction turned out to be good, for seven indicators it was fairly good, and for three indicators it was poor[21]. For the indicators using CIS data, the same data are used in this year's report, and a comparison of the predicted scores will not be possible until next year. Overall, the average accuracy of the expected changes is sufficiently high to use the same methodology for most indicators in this year's forward-looking analysis.

Table 7: Accuracy of EIS 2017 predictions for short-term changes in EU innovation performance

	EIS 2017 SCORE	EXPECTED CHANGE IN TWO YEARS' TIME	REVISED SCORE FOR EIS 2017	EIS 2018 SCORE	REALISED CHANGE IN ONE-YEAR	ACCURACY OF EIS 2017 PREDICTION
Population aged 25-34 with tertiary education	38.2	1-5% increase	same	39.0	1-5% increase	Good
International scientific co-publications	493.6	>10% increase	501.4	517.5	1-5% increase	Fairly good
Most-cited scientific publications	10.6	1-5% increase	same	10.6	No notable change	Fairly good
Foreign doctorate students	25.6	1-5% increase	same	26.1	1-5% increase	Good
Broadband penetration	13.0	>10% increase	same	16.0	>10% increase	Good
Opportunity-driven entrepreneurship	3.1	1-5% decrease	same	3.3	5-10% increase	Poor
Venture capital expenditures	0.063	1-5% decrease	0.077	0.116	>10% increase	Poor
R&D expenditure in the business sector	1.30	1-5% decrease	131	1.32	No notable change	Fairly good
Non-R&D innovation expenditures	0.76	5-10% increase	same	No update	--	--
Training ICT skills	22.0	5-10% increase	same	21.0	1-5% decrease	Poor
SMEs with product or process innovations	30.9	1-5% decrease	same	No update	--	--
SMEs with marketing or organisational innovations	34.9	1-5% decrease	same	No update	--	--
Innovative SMEs collaborating with others	11.2	5-10% increase	same	No update	--	--
PCT patent applications	3.70	1-5% decrease	same	3.53	1-5% decrease	Good
Trademark applications	7.60	1-5% increase	7.58	7.86	1-5% increase	Good
Design applications	4.33	No notable change	4.34	4.44	1-5% increase	Fairly good
Employment in knowledge-intensive activities	14.1	1-5% increase	14.0	14.1	No notable change	Fairly good
Medium and high-tech product exports	56.2	1-5% increase	same	56.7	No notable change	Fairly good
Knowledge-intensive services exports	69.3	1-5% increase	69.4	69.2	No notable change	Fairly good

[21] For two of these indicators last year a decline was predicted whereas performance has increased.

6.2 EU trend performance compared to China, Japan, South Korea, and the United States

A statistical trend analysis using performance data for 2010 to 2017 shows that the EU performance gap towards Japan and South Korea is expected to narrow. The gap with South Korea is expected to shrink by 0.8 percentage points, and the gap with Japan by 0.6 percentage points (red-coloured numbers in *Figure 16*). The performance gap with the United States is expected to be closed in two years' time, and the EU performance lead over China is expected to decrease by more than 1 percentage point. Nowcasts for 2018 and 2019 have been calculated for the EU, China, Japan, South Korea, and the United States, using estimates based on nowcasting three-year averages for the innovation index scores. Details are explained in the EIS 2018 Methodology Report.

For South Korea, the trend analysis foresees an increase in the relative-to-EU performance in 2010 from 129.2 in 2017 to 130.3 in two years' time (blue coloured number in *Figure 16*). For Japan, the trend analysis foresees an increase of the relative-to-EU performance in 2010 from 107.4 in 2017 to 108.4 in two years' time. For the United States, the trend analysis foresees an increase of the relative-to-EU performance in 2010 from 105.2 in 2017 to 105.9 in two years' time. For China, the trend analysis foresees an increase of the relative-to-EU performance in 2010 from 79.4 in 2017 to 82.0 in two years' time. The EU's performance, based on nowcasting the innovation index, is expected to increase by 1.5 percentage points[22].

Figure 16: Expected short-term changes in innovation performance for main competitors

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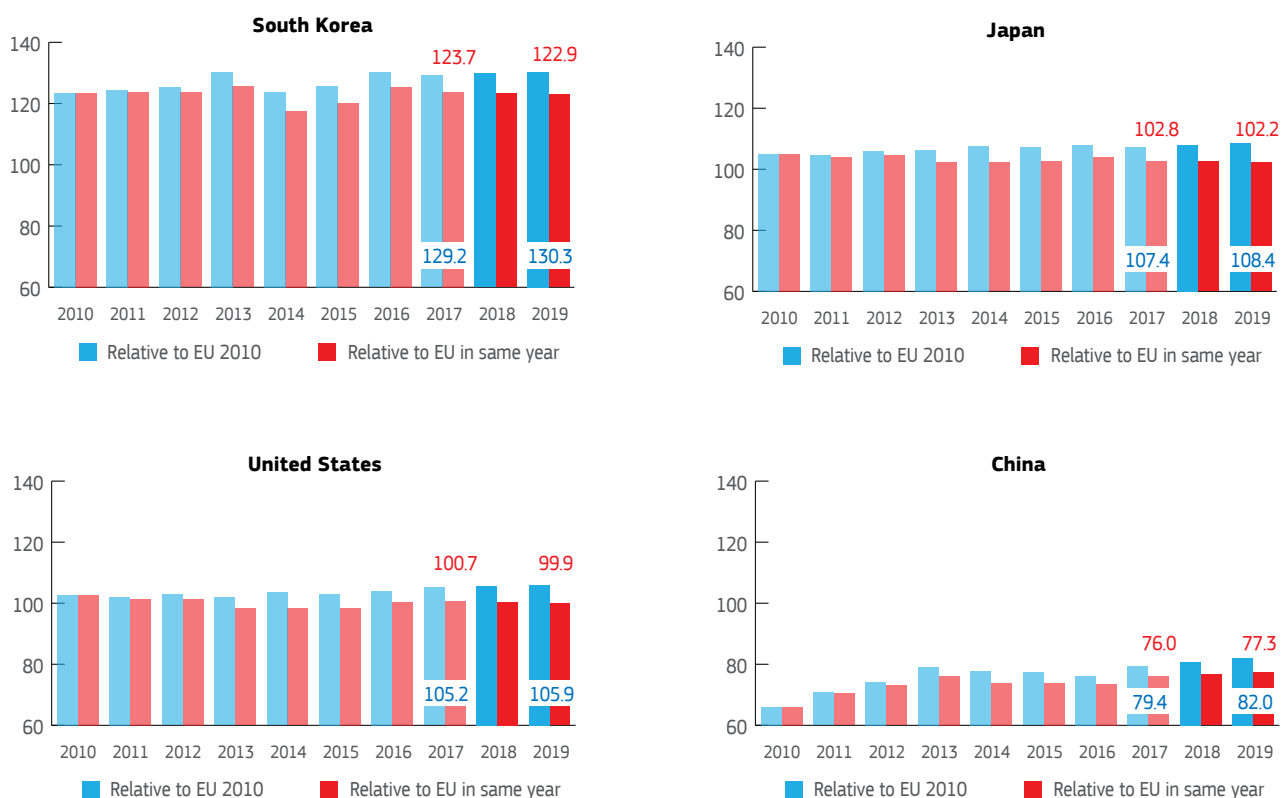
[22] Growth for the EU is different from that in Section 3 as the methodologies for calculating nowcasts are different.

6.3 Provisional CIS 2016 data

The Community Innovation Survey (CIS) is a survey of innovation activity in enterprises. For the CIS 2014, the latest CIS for which final results are available, most questions cover the reference period 2012-2014, i.e. the three-year period from the beginning of 2012 to the end of 2014. According to Commission Regulation No 995/2012, national CIS statistics must be delivered to Eurostat within 18 months of the end of the reference year, i.e. June in even-numbered years (e.g., June 2016 for the CIS 2014). Data are then checked and corrected for detected inconsistencies by Eurostat. Final CIS 2014 data were made available by Eurostat in November 2016. Final CIS 2016 data are expected to be made available by Eurostat in the last quarter of 2018.

Eurostat has made a request to national data providers to share provisional CIS 2016 data for the indicators used in the EIS. Provisional CIS 2016 data for all CIS-based EIS indicators were received from 28 countries, including 25 Member States[23], Norway, Serbia, and Turkey[24], except for the two indicators using expenditure data for Austria, Italy, and Turkey, and SMEs innovating in-house for Turkey (***Table 8***).

An EU aggregate using data for those Member States which shared provisional CIS 2016 data[25] can be compared with the EU aggregate for the same set of Member States using final CIS 2014 data. For the EU, provisional CIS 2016 data scores are higher for five indicators, and almost the same for one indicator (***Figure 17***).

Table 8: Relative performance of provisional CIS 2016 data compared to CIS 2014 data for EU, EU Member States and other European countries

		SMES WITH PRODUCT/ PROCESS INNOVATIONS	SMES WITH ORGANI- SATIONAL/ MARKETING INNOVATIONS	SMES INNOVATING IN-HOUSE	INNOVATIVE SMES COLLABORATING WITH OTHERS	NON-R&D INNOVATION EXPENDITURES	SALES OF NEW- TO-MARKET OR NEW-TO- FIRM PRODUCT INNOVATIONS
EU	European Union	111	105	112	100	114	103
BG	Bulgaria	116	107	123	117	63	125
CZ	Czech Republic	107	122	109	126	79	89
DK	Denmark	135	176	143	188	n/a	n/a
DE	Germany	99	93	97	85	123	105
EE	Estonia	238	135	243	229	225	106
IE	Ireland	83	93	83	83	104	224
EL	Greece	128	115	126	153	126	105
ES	Spain	115	106	100	96	116	121
FR	France	107	109	107	101	95	65
HR	Croatia	121	122	126	145	116	169
IT	Italy	125	112	127	86	n/a	n/a
CY	Cyprus	89	91	93	80	317	275
LV	Latvia	157	113	149	202	129	150
LT	Lithuania	112	139	109	110	100	172
HU	Hungary	119	121	124	95	83	61
MT	Malta	84	84	86	79	263	198
AT	Austria	111	110	110	105	n/a	n/a
PL	Poland	111	98	145	128	90	97
PT	Portugal	133	125	200	126	159	156
RO	Romania	94	83	94	96	50	73
SI	Slovenia	n/a	81	86	93	90	73
SK	Slovakia	117	89	120	97	130	106
FI	Finland	123	120	126	127	230	122
SE	Sweden	95	103	96	98	69	126
UK	United Kingdom	138	83	190	120	163	131
NO	Norway	135	125	119	114	108	118
RS	Serbia	119	95	92	177	497	149
TR	Turkey	132	124	n/a	166	n/a	n/a

Relative performance for provisional CIS 2016 indicator scores has been calculated relative to the CIS 2014 indicator scores (where the relative score is 100 if the provisional CIS 2016 score equals the CIS 2014 score). For Slovenia, a relative performance for SMEs innovating in-house score could not be calculated as CIS 2014 data are not available. For Austria, Italy, and Turkey, data are not available for the two expenditure-based indicators. For Denmark, data are not available for Sales of new-to-market and new-to-firm innovations. For Turkey, data are not available for SMEs innovating in-house.

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[23] Austria, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom.

[24] Results for all countries are included in the respective Country profiles in Section 7.

[25] Fast-track data for Denmark and the United Kingdom were made available too late to include them in the calculation of the EU aggregates.

Figure 17: Expected change in EU performance in 2016 for the indicators using CIS data

Share of SMEs with product and process innovations expected to increase
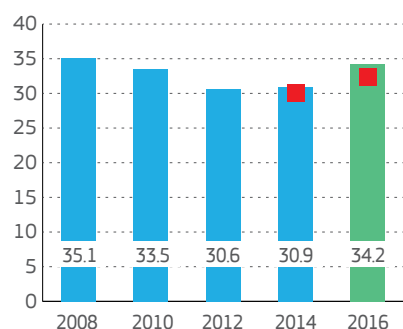
Share of SMEs with marketing and organisational innovations expected to increase
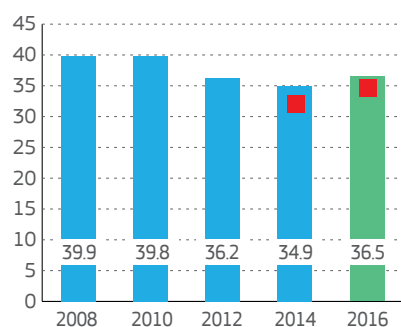
Share of SMEs innovating in-house expected to increase

35.1	33.5	30.6	30.9	34.2
2008	2010	2012	2014	2016

39.9	39.8	36.2	34.9	36.5
2008	2010	2012	2014	2016

30.2	31.6	28.7	28.8	32.1
2008	2010	2012	2014	2016
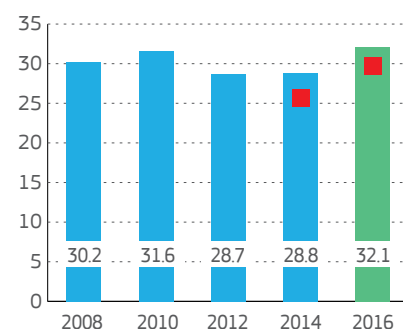
Share of innovative SMEs collaborating expected to remain the same
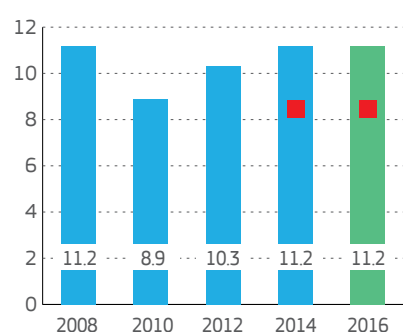
Share of non-R&D innovation expenditures expected to increase
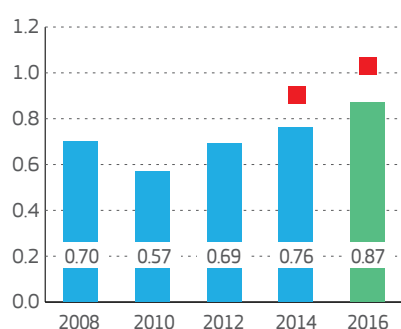
Share of sales due to new-to-market/firm product innovations expected to increase

11.2	8.9	10.3	11.2	11.2
2008	2010	2012	2014	2016

0.70	0.57	0.69	0.76	0.87
2008	2010	2012	2014	2016

13.26	13.37	12.29	13.37	13.71
2008	2010	2012	2014	2016
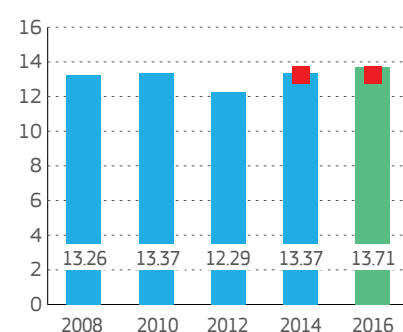
EU averages using data for all Member States shown in blue coloured columns. Data for 2014 and 2016 for the average of those Member States for which provisional CIS 2016 data are available are shown with red coloured dots. The forecast for the EU for 2016, shown in the green coloured column, is calculated by taking the vertical difference between the EU (blue column for 2014) and the CIS 2016 fast-track subgroup of Member States (the red coloured dot on top of the blue column) and repeating this difference for 2016. The EU average using data for Member States having made available provisional CIS 2016 data represents about 80% for SMEs with product and process innovations, about 80% for SMEs with marketing and organisational innovations, about 75% for SMEs innovating in-house, about 65% for Innovative SMEs collaborating with others, about 75% for total EU Non-R&D innovation expenditures, and about 60% for Sales due to new-to-market or new-to-firm product innovations.

The *share of SMEs with product and process innovations* for the EU decreased until 2012, after which it slowly increased in 2014. Based on provisional CIS 2016 data for 23 Member States, the share of product and process innovators is estimated to increase from 30.9 in 2014 to 34.2 in 2016. For 16 Member States, the indicator is expected to increase, in particular for Estonia. For six Member States, it is expected to decrease[26].

The *share of SMEs with marketing and organisational innovations* for the EU fell between 2006 and 2014. Based on provisional CIS 2016 data for 23 Member States, the share of marketing and organisational innovators is estimated to increase again from 34.9 in 2014 to 36.5 in 2016. For 15 Member States, the indicator is expected to increase. For eight Member States, it is expected to decrease.

The *share of SMEs innovating in-house* for the EU declined between 2010 and 2014. Based on provisional CIS 2016 data for 23 Member States, the share of SMEs innovating in-house for the EU is estimated to increase strongly from 28.8 in 2014 to 32.1 in 2016. For 16 Member States, the indicator is expected to increase, in particular for Estonia and Portugal. For seven Member States, it is expected to decrease.

The *share of innovative SMEs collaborating* with others for the EU has mostly increased between 2006 and 2012. Based on provisional CIS 2016 data for 23 Member States, the share of innovative SMEs collaborating is estimated to remain the same. For 12 Member States, the indicator is expected to increase, and for 11 Member States, it is expected to decrease.

The *share of non-R&D innovation expenditures* for the EU has been increasing since 2010. Using provisional CIS 2016 data for 21 Member States, the share of non-R&D innovation expenditure for the EU is estimated to increase from 0.76 in 2014 to 0.87 in 2016. For 12 Member States, the indicator is expected to increase, in particular for Cyprus and Serbia, and for nine Member States, it is expected to decrease.

The s*ales share due to new-to-market or new-to-firm product innovations* for the EU returned to its 2006-2010 level in 2014 after a decline in 2012. Based on provisional CIS 2016 data for 21 Member States, the sales share due to new-to-market and new-to-firm product innovations is estimated to increase from 13.4 in 2014 to 13.7 in 2016. This increase is driven by increasing performance in 15 Member States. For six Member States, performance is expected to decrease.

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[26] For Slovenia, a comparison between the provisional CIS 2016 and CIS 2014 data cannot be made due to missing CIS 2014 data.

6.4 Short-term changes in EU innovation performance by indicator

This section discusses expected short-term changes for 18 indicators. For 10 of these indicators, changes have been calculated applying a simple linear regression using time series data (see the EIS 2018 Methodology Report for more details). For six indicators, fast-track CIS 2016 data have been used, and for two indicators, a mix of techniques has been used, which will be discussed in this section.

Human resources

New doctorate graduates has been increasing from 2011 onwards. A linear regression using data for 2009-2016 has been used to estimate an increase from 2.01 to 2.19 in two years' time. For *Population aged 25-34 having completed tertiary education*, there was a break in series in 2014, and data before 2014 are not comparable to those for 2014-2017. A linear regression using data for 2014-2017 has been used to estimate an increase from 39.0 to 40.2 in two years' time. For *Lifelong learning*, the regression results using a linear regression for 2010-2017 are of insufficient quality. The value of the indicator has been stable between 10.7 and 10.9 between 2013 and 2016[27]. With no reliable expected change and a stable development in the past, it is assumed that the indicator will be at the same level in two years' time.

Attractive research systems

International scientific co-publications has shown a steady increase between 2010 and 2017. A linear regression for the same period has been used to estimate an increase from 517.5 to 570.2 in two years' time. The share of *Most-cited scientific publications* has been increasing consistently between 2008 and 2015, although there was a more significant upward performance shift in 2010 (from 10.27 in 2009 to 10.46) and a small performance decline in 2015 (from 10.59 in 2014 to 10.57). A linear regression for 2008-2015 has been used to estimate an increase from 10.57 to 10.66 in two years' time. The share of *Foreign doctorate students* has increased for most years between 2009 and 2016, except for a one-time decrease between 2012 and 2013. The linear regression using data for 2009-2016 has low predictive power, and it is therefore assumed that the indicator will be at the same level in two years' time.

Innovation-friendly environment

For *Broadband penetration*, data are available for four years only. Although the number of observations is quite small, a linear regression has been used for the years 2014-2017. For the EIS 2017, a trend extrapolation was used, but as the indicator increases consistently over time, results are almost the same. The results from the linear regression show an expected increase from 16.0 to 20.6 in two years' time. *Opportunity-driven entrepreneurship* has shown a consistent decrease be-

tween 2010 and 2015, followed by an increase in 2016 and 2017. A simple linear regression for the same period has low predictive power, and it is therefore assumed that the indicator will be at the same level in two years' time.

Finance and support

R&D expenditure in the public sector has been falling since 2013 after a more stable performance between 2009 and 2013. A linear regression using data for 2009-2016 has only low predictive power, and it has therefore been assumed that the indicator will hold its value in two years' time. *Venture capital expenditures* shows a declining performance from 2010 to 2013 and an increasing performance from 2013 to 2016. A linear regression for 2013-2017 has been used to estimate an increase from 0.116 (three-year average) to 0.146 (three-year average) in two years' time.

Firm investments

For *R&D expenditures in the business sector*, the same methodology as in the EIS 2017 has been used to estimate short-term changes. The 2017 EU Survey on R&D Investment Business Trends[28] shows that larger EU companies expect their R&D expenditures in the EU to increase, on average, by 3.5% per annum for the period 2017-2018. Nominal GDP has increased by 2.8% in 2017 and is expected to increase by 2.3% in 2018[29]. The EU's business R&D intensity is therefore expected to increase from 1.32 in 2016 to 1.34 in two years' time. For *Non-R&D innovation expenditures*, provisional CIS 2016 data show an expected increase from 0.76 in 2014 to 0.87 in two years' time. For *Enterprises providing training to develop or upgrade ICT skills of their personnel*, data are available for 2012 and from 2014 onwards, showing an increase from 19.0 in 2012 to 22.0 in 2016, followed by a decline to 21.0 in 2017. A linear regression has only low predictive power, and it has therefore been assumed that the indicator will hold its value in two years' time.

Innovators

For *SMEs with product and/or process innovations*, provisional CIS 2016 data show an expected increase from 30.9 in 2014 to 34.2 in two years' time. For *SMEs with marketing and/or organisational innovations*, provisional CIS 2016 data show an expected increase from 34.9 in 2014 to 36.5 in two years' time. For *SMEs innovating in-house*, provisional CIS 2016 data show an expected increase from 28.8 in 2014 to 32.1 in two years' time.

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[27] For Lifelong learning, there was a break in series in 2013, resulting in an upward shift of the indicator from 9.2 in 2012 to 10.7 in 2013. Before the break, the indicator had declined from 9.3 in 2009 to 9.2 in 2012. After the break, the indicator has increased from 10.7 in 2013 to 10.9 in 2017.

[28] This survey is carried out by the Industrial Research and Innovation (IRI) action of the European Commission's Joint Research Centre (JRC), Institute for Prospective Technological Studies (IPTS). Survey results are available at http://iri.jrc.ec.europa.eu/survey.html

[29] EU Winter 2018 Economic Forecast: https://ec.europa.eu/info/sites/info/files/economy-finance/ip073_en.pdf

Linkages

For *Innovative SMEs collaborating with others*, provisional CIS 2016 data show that performance in two years' time would be the same as in 2014. For *Public-private co-publications*, performance dropped relatively strongly between 2011 and 2012, followed by a period of increasing performance until 2016. Performance in 2017 once again declined. Regression results using a linear regression are of insufficient quality, and it is assumed that the indicator will be at the same level in two years' time. *Private co-funding of public R&D expenditures* has remained at a stable level of about 0.052 for the period 2009-2014. Performance declined to 0.049 in 2015. Regression results using a linear regression are of insufficient quality, and it is assumed that the indicator will be at the same level in two years' time.

Intellectual assets

A working paper by Eurostat[30] discusses several options for nowcasting patent data, including six econometric models using data on GDP, R&D expenditures, researchers, and human resources in science and technology. Three of these models have been explored[31], of which the model assuming a linear logarithmic dependence on GDP and R&D expenditures performs best. *PCT patent applications per billion GDP* are expected to increase from 3.53 to 3.54 in two years' time. *Trademark applications per billion GDP* have been increasing between 2010 and 2014 and, after a decline in 2015, between 2015 and 2017. A linear regression estimates a further increase from 7.86 to 8.12 in two years' time. *Design applications per billion GDP* have been decreasing between 2010 and 2016, followed by an increase in 2017. Regression results using a linear regression are of insufficient quality, and it is assumed that the indicator will be at the same level in two years' time.

Employment impacts

Between 2010 and 2017, the *Employment share in knowledge-intensive activities* has been increasing every year. A linear regression for 2009-2016 has been used to estimate an increase from 14.2 in 2017 to 14.4 in two years' time. For *Employment in fast-growing enterprises of innovative sectors*, data are only available for four years. The number of observations is too small for a linear regression, and the indicator's score was 5.1 in 2014, 5.2 in 2015, 4.7 in 2016, and 4.8 in 2017. There is no clear trend in this four-year period, and it is assumed that the indicator will be at the same level in two years' time.

Sales impacts

For *Medium and high-tech products exports*, the regression results using a linear regression are of insufficient quality. The value of the indicator declined between 2010 and 2013, followed by an increase of 1.3 percentage points in 2014, and 1.9 percentage points in 2015. After a less strong increase in 2016, the indicator declined in 2017.

With no reliable expected change and a stable development in the past, it is assumed that the indicator will be at the same level in two years' time. For *Knowledge-intensive services exports*, data are available from 2010 onwards. Between 2010 and 2016, the indicator increased from 66.8 to 69.4, followed by a small decrease in 2017. A linear regression for the same period has been used to estimate an increase from 69.4 to 70.1 in two years' time. For *Sales share due to new-to-market or new-to-firm product innovations*, provisional CIS 2016 data show an expected increase from 13.4 in 2014 to 13.7 in two years' time.

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30 Eurostat, Patent Statistics – Working Paper: Methods for Nowcasting Patent Data, Final version, 21 December 2010.

31 The first model assumes that the number of patent applications is linearly dependent on GDP and R&D expenditures, the second model assumes a linear logarithmic dependence between the same variables, and the third model assumes a linear dependence on R&D expenditures only.

6.5 Big data as a statistical source for innovation indicators

Introduction

The Big data revolution and associated innovations in analytical methods and tools (including machine learning and Artificial Intelligence) offer new opportunities to measure and monitor social and economic activities, including some which are of interest for research and innovation (R&I) policymakers. Indicators based on Big data could complement traditional R&I indicators based on business surveys and other official statistics, providing a perspective on R&I activities which is more timely, granular and/or inclusive.[32] However, using new data is not without risks: Big data sources might be less representative, less consistent or less easily interpretable, thereby compromising the quality of indicators based on them, rendering them unsuitable for policy-making.

In one of the exploratory reports produced as part of the *European Innovation Scoreboards* project[33], the potential use of Big data to develop indicators for future editions of the EIS was explored. Based on a state-of-the-art review regarding uses of Big data for innovation policy, a framework for a possible incorporation of Big data-based indicators into the EIS was developed, and exploratory pilots were carried out to gain a better understanding of challenges and relevance-reliability trade-offs. The following summarises the results of each of these activities and possible next steps.

Opportunities and challenges from Big data

The arrival of so-called 'Big data' (datasets with unprecedented volume, variety – including text, networks and images – and velocity) is bringing with it many opportunities to quantitatively measure the economy and society (Cukier and Schonberger, 2013, Salganik, 2017)[34]. Big data combining information 'scraped' from websites, social media, innovation platforms (such as networking sites, coding repositories, and crowdfunding sites), open datasets about research activity and official data could provide detailed, timely and comprehensive information about innovation systems, including new, ambitious frames based on transformative and mission-driven innovation (Schott and Steinmueller, 2016, Mazzucato, 2018).

Natural Language Processing and network analyses use text data to classify innovative projects and organisations into 'bottom-up' taxonomies capturing emerging technologies and disciplines, and to represent them as networks of collaboration that can be strengthened through targeted policy interventions, while interactive data visualisations and dashboards make it possible to present this information in user-friendly ways (Börner, 2015).

Predictive analyses of new data can also help identify real-time (or close to real-time) proxies for policy-relevant indicators. Such nowcasting approaches, which are already being used to monitor key aspects of economic activity such as inflation or unemployment through online price listings and web searches, can also play a role in R&I policy (for examples, see Guzman and Stern, 2016).

The 'Big data explosion' also brings important challenges, for example when new indicators are based on proprietary data of uncertain quality or black box algorithms, which are hard to interpret. There are also significant concerns about the ethical aspects of the Big data revolution, with lack of clarity about what rules apply to the linking and dissemination of personal data available online. Measurement frameworks such as the EIS place a premium on international comparability and temporal consistency, so new data sources which could potentially be incorporated need to be assessed with those dimensions of quality in mind.

Indicator development framework

The methodological framework for constructing new indicators using Big data was influenced by a previous EC-funded project (Data Mining for Research and Innovation policy), as well as Data Science standards [35]. This framework is consistent with state-of-the-art practices and has guided the development of the five pilot indicators.

The framework is an idealised sequence of events to be followed in each pilot, including the following steps:

1. *Policy and subject scoping*: This phase sets out the policy goals for the project and the actors and activities that it seeks to measure, as well as the success criteria;

2. *Data collection*: This includes the identification of data sources and the acquisition of data;

3. *Tools and analysis methods*: Tool requirements definition, tool setup, architecture, etc.;

4. *Data preparation*: Preparation of data definitions, design of the data model, data quality profiling and reporting, data standardisation, data integration;

5. *Analysis*: Data analytics and visualisation, interpretation, and conclusions;

6. *Evaluation*: Creation and validation of reports by key stakeholders, based on the objectives and success criteria set out at the beginning of the project;

7. *Deployment*: Formalisation of scaling and deployment considerations.

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[32] Insofar, new data sources capture innovation activities that have until recently remained 'hidden' from R&I policymakers, such as social innovations and innovations in creative industries.

[33] EIS Exploratory report "Opportunities in data analytics for innovation performance measurement", written by Joel Klinger, Juan Mateos-Garcia, Konstantinos Stathoulopoulos, Chantale Tippett (Nesta), Raphaële Moeremans and Julien Morret (Deloitte). The report is available at https://ec.europa.eu/docsroom/documents/29305

[34] These new approaches seek to connect actors spread across wide-ranging research, industry and society networks in order to tackle grand societal challenges such as climate change, demographic change or economic inequality and regional disparities.

[35] In particular the Cross-industry standard process for data mining (CRISP-DM) method: Shearer C., The CRISP-DM model: the new blueprint for data mining, J Data Warehousing (2000); 5:13—22.

The framework is implemented following an iterative approach that may involve loops between steps rather than a linear sequence. It is important to pay attention at all stages to emerging challenges and difficulties that could increase deployment costs or make indicators less useful for policy.

Pilot summary

Five pilots were carried out to explore some of the Big data opportunities identified in the state-of-the-art review, following the methodological framework described above.

1. Skills supply (from university websites)

This pilot used data scraped from university websites and analysed it with topic modelling methods to generate highly detailed estimates of skills supply in the EU. This analysis could enhance the measurement of skills supply, a critical input for innovation, strengthening the Human resources dimension of the 'Framework conditions' section of the EIS. It could also help nowcast existing indicators based on slower moving data. The pilot started from GRID (Global Research Identifier Database), a database of research institutions with metadata and URLs. A 'shallow' scrape of these universities' websites helped understand their structure (based on the pattern of links between pages). Text mining (topic modelling) algorithms were then used to analyse the text within different sections of the website capturing disciplines, identifying the skills present there. Having trialled this strategy with a single university website, this analysis is now being scaled up to all UK and Italian universities in the GRID data. Estimates of number of graduates with different skills graduating from universities will be obtained by combining these data with information from ETER (the European Tertiary Education Registry).

2. Open digital innovation (from GitHub, an open coding site)

This pilot analysed open digital innovation with data from GitHub, an online collaborative software development platform and code sharing site with more than 24 million users globally. The information resulting from this analysis could feed into several parts of the EIS, including the 'Intellectual assets' and 'Linkages' dimensions as well as the 'SMEs with products and process innovation' indicator of the 'Innovation activities' section. The data were obtained from Git Torrent, a snapshot of GitHub data made periodically available by the platform. These data were queried to identify GitHub users based in EU countries according to their profile, resulting in 500,000 unique users and 4.5 million projects. Clio, an information retrieval system developed by the team, extracted projects related to specific innovation topics such as machine learning and AI, blockchain, robotics, and virtual reality from these data.

3. Access to early-stage finance (from crowd funding sites)

Here, access to finance in the EU was analysed using data from crowdfunding platforms. This pilot could feed into the 'Investments' section of the EIS. The pilot focused on equity crowdfunding platforms which are most frequently used by innovators and entrepreneurs. An initial exploration of a register of crowdfunding sites in the EU revealed platform fragmentation across national and language boundaries. Individual scrapers were written for three platforms in the register, and the resulting data were combined to produce policy-relevant indicators such as the number of projects funded and amounts raised.

4. University spinoffs

This pilot focused on university spinoffs (start-ups established out of universities)[36]. It could complement the 'Attractive research systems', 'Linkages', and 'Finance and support' dimensions of the EIS. This pilot focused on selected universities in the UK and Belgium. While in the case of the UK there is a consolidated database with information about spinoffs, Belgian data had to be obtained directly from universities' websites[37]. The analysis of start-ups relied on a selection of directories covering all of Belgium and a selection of UK cities[38]. It would be possible to build a database based on these sources with information about spinoffs, their age and sector, etc. This database could be cross-referenced with other start-up databases, providing a policy-relevant perspective on the position of spinoffs within the start-up ecosystem.

5. Start-up Ecosystem

This pilot focused on "Digital Innovation Hubs" as a proxy for conditions favouring innovative initiatives and start-ups. These enablers are considered to represent a model for supporting (tech) entrepreneurship and innovation. As such, this indicator could complement the 'Innovation-friendly environment' and 'Firm investments' dimensions of the EIS. This pilot focused on incubators (working environments for entrepreneurs and freelancers which also host events and activities) and accelerators (which in addition to a working space also provide investment and intensive business development and training) circumscribed to Belgium and the UK to facilitate comparisons with the results of pilot 4. A database of "Innovation enablers" was built by crawling different source websites and classifying organisations as either Incubators or Accelerators. Since relevant information is spread across multiple websites, it was necessary to create multiple adaptations in the code.

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[36] Start-ups: A start-up company is an entrepreneurial venture, which is typically a newly emerged, fast-growing business that aims to meet a marketplace need by developing a viable business model around an innovative product, service, process or a platform. Spinoffs: companies created for the exploitation of products or services that are developed using knowledge or technologies generated by academic research. As such, the distinction is that a spinoff is based on university intellectual property, while a start-up not based on university IP, even if founded by university staff or recent graduates – will not be considered a spinoff.

[37] http://www.spinoutsuk.co.uk/

[38] Such as https://london.startups-list.com/ for London, or https://data.startups.be/actors?category=Startup for Belgium.

Conclusions and next steps

The work performed so far suggests that Big data-based indicators could make valuable contributions to the EIS particularly around 'emerging' sectors, technologies and business models that are hard to capture effectively using traditional methods such as surveys. Detailed skills and specific digital technologies of interest to R&I policymakers are two examples of aspects for which information could be gathered through some of the pilots described above. One issue to bear in mind here is that some of these currently interesting technologies may go out of fashion, potentially becoming irrelevant for the EIS. One way to address this would be to segment the EIS into a 'core' of stable indicators and a more flexible set of modules capturing topical technology trends and industries at a higher level of detail. An initial exploration of the data collected also suggested that there is potential for using Big data to nowcast other indicators in the EIS.

Although a scaling-up of these pilots would not be without challenges, potential strategies were identified to achieve comprehensive coverage through global registers (in the skills pilot), dominant platforms with open data strategies (GitHub), and the development of multiple scrapers (crowdfunding). These opportunities illustrate the value of standardisation and data sharing. Going forward, policy-makers, statistical authorities and data analysts will need to devise a suitable division of labour to pursue this strategy.

Work on using Big data to construct new indicators will continue as part of the *European Innovation Scoreboards* project and other EC-funded projects. To the extent possible and depending on data quality, it is foreseen to integrate some of the quantitative evidence generated in future editions of the EIS.

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7. Country profiles

This section provides individual profiles for the EU Member States and eight other European and neighbouring countries (Iceland, Israel, Former Yugoslav Republic of Macedonia, Norway, Serbia, Switzerland, Turkey, and Ukraine). Each profile includes the following information:

- A graph showing the development of the country's innovation index over time between 2010 and 2017 as compared to the EU performance score in 2010 (blue bars) and relative performance to the EU in 2017 (red dot). For all indicators underlying the innovation index, "2017" refers to the most recent data available; depending on data update schedules, the most recent actual performance year by indicator is 2014, 2015, 2016 or 2017; "2010" 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 2010 and 2017 by indicator and dimension relative to that of the EU in 2010 and 2017 (**Annex D** shows the difference between both relative scores for all countries and all indicators). Different colour codes highlight strengths and weaknesses in 2010 and 2017[39];

- A graph showing provisional CIS 2016 data compared to CIS 2014 data as used for this year's calculations;

- A table reporting on progress towards the EU targets for 2020 for R&D expenditures and Tertiary educational attainment (targets are provided in http://ec.europa.eu/eurostat/web/europe-2020-indica-tors/europe-2020-strategy/headline-indicators-scoreboard);

- A box showing links to the Research and Innovation Observatory (RIO) and European Semester country reports. The annual RIO Country Reports analyse and assess the development and performance of national research and innovation systems and related policies in the perspective of EU strategy and goals. The reports also assess the match between national policy priorities and the structural challenges of the respective research and innovation system (https://rio.jrc.ec.europa.eu/). The European Semester provides a framework for the coordination of economic policies across the European Union. It allows EU countries to discuss their economic and budget plans and monitor progress at specific times throughout the year (https://ec.europa.eu/info/business-economy-euro/economic-and-fis-cal-policy-coordination/eu-economic-governance-monitoring-pre-vention-correction/european-semester_en). The European Semester country reports include quantitative and qualitative analyses on framework conditions for innovation.

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[39] For those 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. These potential cases are highlighted in the performance tables with an §.

Belgium is a **Strong Innovator.** Over time, performance has increased relative to that of the EU in 2010.

For Belgium, fast-track CIS 2016 data are not available.

118	119	118	118	118	118	123	124 / 118
2010	2011	2012	2013	2014	2015	2016	2017

■ Relative to EU in 2010   ◆ Relative to EU in 2017
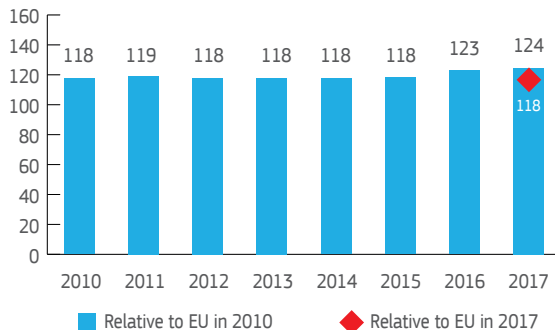
Attractive research systems, Linkages, and Innovators are the strongest innovation dimensions. Sales and Employment impacts are the weakest innovation dimensions.

Structural differences with the EU are shown in the table below. GDP per capita and the value added share of foreign-controlled enterprises are well above the EU average.

Belgium	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	**2017**	**2017**
SUMMARY INNOVATION INDEX	**117.5**	**124.4**	**117.5**
Human resources	**112.5**	**127.1**	**106.5**
New doctorate graduates	92.3	133.2	95.6
Population with tertiary education	163.4	163.4	144.1
Lifelong learning	77.1	77.1	75.5
Attractive research systems	**151.8**	**191.0**	**168.0**
International scientific co-publications	325.8	490.6	301.6
Most cited publications	121.8	127.6	122.9
Foreign doctorate students	134.6	178.1	160.9
Innovation-friendly environment	**164.0**	**143.5**	**107.3**
Broadband penetration	188.9	288.9	162.5
Opportunity-driven entrepreneurship	149.2	57.4	53.3
Finance and support	**108.4**	**107.4**	**99.8**
R&D expenditure in the public sector	91.1	103.5	107.3
Venture capital expenditures	130.6	112.4	92.1
Firm investments	**124.4**	**149.5**	**133.8**
R&D expenditure in the business sector	110.5	147.2	132.2
Non-R&D innovation expenditures	77.4	75.4	69.0
Enterprises providing ICT training	178.6	214.3	187.5
Innovators	**132.5**	**138.8**	**161.3**
SMEs product/process innovations	138.2	156.5	191.3
SMEs marketing/organisational innovations	114.1	117.7	142.0
SMEs innovating in-house	145.7	143.4	153.7
Linkages	**152.9**	**163.4**	**161.8**
Innovative SMEs collaborating with others	210.9	217.4	216.3
Public-private co-publications	130.9	141.1	139.8
Private co-funding of public R&D exp.	118.2	133.0	131.2
Intellectual assets	**93.8**	**84.3**	**83.5**
PCT patent applications	91.7	85.7	89.4
Trademark applications	113.3	116.0	102.6
Design applications	81.1	59.1	61.3
Employment impacts	**75.1**	**78.9**	**78.5**
Employment in knowledge-intensive activities	128.6	128.6	116.5
Employment fast-growing enterprises	37.0	43.4	46.4
Sales impacts	**82.1**	**78.3**	**75.2**
Medium and high tech product exports	83.4	81.7	77.2
Knowledge-intensive services exports	97.5	104.2	99.3
Sales of new-to-market/firm innovations	62.8	44.1	43.6

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

	BE	EU
Performance and structure of the economy		
GDP per capita (PPS)	33,900	28,600
Average annual GDP growth (%)	1.6	2.2
Employment share Manufacturing (NACE C) (%)	12.7	15.5
of which High and Medium high-tech (%)	36.2	37.2
Employment share Services (NACE G-N) (%)	40.3	41.6
of which Knowledge-intensive services (%)	36.3	35.0
Turnover share SMEs (%)	39.2	38.0
Turnover share large enterprises (%)	36.2	44.4
Foreign-controlled enterprises – share of value added (%)	15.0	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.5	1.5
Total Entrepreneurial Activity (TEA) (%)	6.2	6.6
FDI net inflows (% GDP)	-1.0	3.6
Top R&D spending enterprises per 10 mln population	29.1	19.7
Buyer sophistication (1 to 7 best)	4.4	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	72.9	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.0	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.5	3.5
Rule of law (-2.5 to 2.5 best)	1.5	1.2
Demography		
Population size (millions)	11.3	510.1
Average annual population growth (%)	0.5	0.3
Population density (inhabitants/km^2)	371.4	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	2.33	2.49	3.00
Tertiary educational attainment (% of population aged 30-34)	42.7	45.9	47.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/Belgium

European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european -semester-country-report-belgium-en.pdf

Bulgaria is a **Modest Innovator**. Over time, performance has not changed relative to that of the EU in 2010.

Relative to EU in 2010 (bars): 2010: 50, 2011: 47, 2012: 39, 2013: 42, 2014: 44, 2015: 46, 2016: 47, 2017: 48
Relative to EU in 2017 (diamond): 2017: 45

Employment impacts and Intellectual assets are the strongest innovation dimensions. Innovators and Finance and support are the weakest innovation dimensions.

Bulgaria	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	**49.5**	**48.0**	**45.4**
Human resources	**32.0**	**64.7**	**54.2**
New doctorate graduates	30.8	101.3	72.7
Population with tertiary education	56.0	71.6	63.2
Lifelong learning	5.2	12.5	12.2
Attractive research systems	**27.1**	**31.8**	**28.0**
International scientific co-publications	38.5	62.3	38.3
Most cited publications	26.8	28.4	27.4
Foreign doctorate students	23.6	26.0	23.5
Innovation-friendly environment	**50.1**	**70.7**	**52.9**
Broadband penetration	88.9	133.3	75.0
Opportunity-driven entrepreneurship	27.1	33.6	31.2
Finance and support	**90.7**	**22.7**	**21.0**
R&D expenditure in the public sector	32.7	9.7	10.1
Venture capital expenditures	165.0	39.2	32.1
Firm investments	**66.4**	**57.5**	**51.4**
R&D expenditure in the business sector	9.1	45.8	41.2
Non-R&D innovation expenditures	141.2	106.7	97.6
Enterprises providing ICT training	64.3	28.6	25.0
Innovators	**33.6**	**12.3**	**14.3**
SMEs product/process innovations	38.0	9.3	11.3
SMEs marketing/organisational innovations	23.3	14.4	17.4
SMEs innovating in-house	40.0	13.0	13.9
Linkages	**34.1**	**32.3**	**32.0**
Innovative SMEs collaborating with others	23.1	19.1	19.0
Public-private co-publications	27.2	27.1	26.9
Private co-funding of public R&D exp.	52.9	51.2	50.5
Intellectual assets	**46.6**	**86.6**	**85.8**
PCT patent applications	8.9	17.5	18.2
Trademark applications	106.2	127.0	112.4
Design applications	37.1	121.0	125.3
Employment impacts	**87.2**	**103.0**	**102.4**
Employment in knowledge-intensive activities	36.4	58.4	52.9
Employment fast-growing enterprises	123.4	134.8	144.1
Sales impacts	**45.6**	**34.3**	**33.0**
Medium and high tech product exports	18.3	40.6	38.4
Knowledge-intensive services exports	18.7	43.3	41.3
Sales of new-to-market/firm innovations	109.3	16.3	16.2

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 data show improved performance for five indicators and reduced performance for one indicator (Non-R&D innovation expenditures)
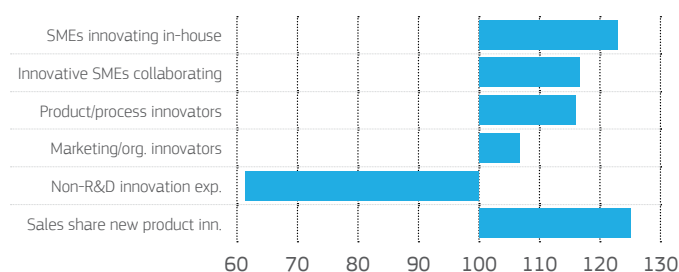
Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. GDP per capita, the employment share of high and medium high-tech manufacturing and the turnover share of SMEs are well below the EU average. The value added share of foreign-controlled enterprises is well above the EU average.

	BG	EU
Performance and structure of the economy		
GDP per capita (PPS)	13,600	28,600
Average annual GDP growth (%)	3.7	2.2
Employment share Manufacturing (NACE C) (%)	19.6	15.5
of which High and Medium high-tech (%)	19.7	37.2
Employment share Services (NACE G-N) (%)	41.1	41.6
of which Knowledge-intensive services (%)	27.1	35.0
Turnover share SMEs (%)	47.1	38.0
Turnover share large enterprises (%)	30.7	44.4
Foreign-controlled enterprises – share of value added (%)	17.7	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	2.1	1.5
Total Entrepreneurial Activity (TEA) (%)	4.0	6.6
FDI net inflows (% GDP)	3.8	3.6
Top R&D spending enterprises per 10 mln population	0.0	19.7
Buyer sophistication (1 to 7 best)	3.2	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	73.2	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.7	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.2	3.5
Rule of law (-2.5 to 2.5 best)	-0.1	1.2
Demography		
Population size (millions)	7.2	510.1
Average annual population growth (%)	-0.7	0.3
Population density (inhabitants/km²)	65.8	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	0.63	0.78	1.50
Tertiary educational attainment (% of population aged 30-34)	29.4	33.1	36.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:

https://rio.jrc.ec.europa.eu/en/country-analysis/Bulgaria

European Semester country report:

https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-bulgaria-en.pdf

The **Czech Republic** is a **Moderate Innovator**. Over time, performance has declined relative to that of the EU in 2010.

Provisional CIS 2016 data show improved performance for four indicators and reduced performance for two indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

Employment impacts and Firm investments are the strongest innovation dimensions. Finance and support and Intellectual assets are the weakest innovation dimensions.

Czech Republic	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	90.0	87.1	82.3
Human resources	76.2	93.5	78.4
New doctorate graduates	92.3	114.4	82.1
Population with tertiary education	45.5	74.6	65.8
Lifelong learning	92.7	90.6	88.8
Attractive research systems	58.5	82.4	72.5
International scientific co-publications	132.1	244.6	150.4
Most cited publications	51.8	57.3	55.2
Foreign doctorate students	42.8	62.3	56.3
Innovation-friendly environment	78.7	106.0	79.2
Broadband penetration	88.9	133.3	75.0
Opportunity-driven entrepreneurship	72.7	89.8	83.3
Finance and support	116.1	50.9	47.3
R&D expenditure in the public sector	73.4	85.8	89.0
Venture capital expenditures	170.9	6.1	5.0
Firm investments	108.4	116.2	103.9
R&D expenditure in the business sector	58.9	86.0	77.2
Non-R&D innovation expenditures	155.4	139.5	127.6
Enterprises providing ICT training	121.4	128.6	112.5
Innovators	105.5	74.1	86.1
SMEs product/process innovations	98.8	81.5	99.6
SMEs marketing/organisational innovations	120.1	51.7	62.5
SMEs innovating in-house	97.0	89.7	96.1
Linkages	80.6	78.4	77.6
Innovative SMEs collaborating with others	101.1	88.6	88.1
Public-private co-publications	81.0	72.3	71.6
Private co-funding of public R&D exp.	59.2	74.7	73.7
Intellectual assets	45.6	63.2	62.7
PCT patent applications	25.2	25.2	26.3
Trademark applications	64.1	77.0	68.2
Design applications	50.8	88.6	91.8
Employment impacts	115.3	115.7	115.1
Employment in knowledge-intensive activities	85.7	93.5	84.7
Employment fast-growing enterprises	136.4	131.6	140.7
Sales impacts	104.2	98.7	94.8
Medium and high tech product exports	124.8	131.6	124.3
Knowledge-intensive services exports	41.1	53.0	50.6
Sales of new-to-market/firm innovations	153.4	112.9	111.7

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Structural differences with the EU are shown in the table below. The employment share in manufacturing and the value added share of foreign-controlled enterprises are well above the EU average.

	CZ	EU
Performance and structure of the economy		
GDP per capita (PPS)	24,900	28,600
Average annual GDP growth (%)	3.4	2.2
Employment share Manufacturing (NACE C) (%)	27.3	15.5
of which High and Medium high-tech (%)	41.4	37.2
Employment share Services (NACE G-N) (%)	35.7	41.6
of which Knowledge-intensive services (%)	33.8	35.0
Turnover share SMEs (%)	40.0	38.0
Turnover share large enterprises (%)	42.4	44.4
Foreign-controlled enterprises – share of value added (%)	24.9	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.8	1.5
Total Entrepreneurial Activity (TEA) (%)	n/a	6.6
FDI net inflows (% GDP)	2.7	3.6
Top R&D spending enterprises per 10 mln population	2.8	19.7
Buyer sophistication (1 to 7 best)	3.0	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	76.3	76.9
Basic-school entrepren. education and training (1 to 5 best)	n/a	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.1	3.5
Rule of law (-2.5 to 2.5 best)	1.1	1.2
Demography		
Population size (millions)	10.6	510.1
Average annual population growth (%)	0.2	0.3
Population density (inhabitants/km²)	136.6	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	1.90	1.68	1.00
Tertiary educational attainment (% of population aged 30-34)	26.7	34.4	32.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/Czech%20Republic
European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-czech-republic-en.pdf

Denmark is an **Innovation Leader.** Over time, performance has remained the same compared to that of the EU in 2010.

Innovation-friendly environment and Human resources are the strongest innovation dimensions. Sales and Employment impacts are the weakest innovation dimensions.

Provisional CIS 2016 data show improved performance for four indicators and reduced performance for one indicator. For the other indicator, fast-track data are not available.

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. GDP per capita is well above the EU average. The employment share in manufacturing is well below the EU average.

Denmark	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	**139.4**	**140.1**	**132.4**
Human resources	**178.9**	**219.8**	**184.2**
New doctorate graduates	115.4	231.4	166.0
Population with tertiary education	160.4	167.2	147.4
Lifelong learning	277.1	267.7	262.2
Attractive research systems	**159.0**	**206.4**	**181.7**
International scientific co-publications	430.1	680.8	418.6
Most cited publications	146.7	137.0	131.9
Foreign doctorate students	83.3	142.1	128.4
Innovation-friendly environment	**214.4**	**264.6**	**197.8**
Broadband penetration	277.8	355.6	200.0
Opportunity-driven entrepreneurship	176.9	210.7	195.6
Finance and support	**121.8**	**110.5**	**102.6**
R&D expenditure in the public sector	133.6	144.3	149.5
Venture capital expenditures	106.6	67.1	55.0
Firm investments	**142.5**	**122.0**	**109.1**
R&D expenditure in the business sector	182.1	161.2	144.7
Non-R&D innovation expenditures	66.5	30.7	28.1
Enterprises providing ICT training	164.3	157.1	137.5
Innovators	**103.8**	**96.3**	**111.9**
SMEs product/process innovations	110.7	97.9	119.7
SMEs marketing/organisational innovations	100.2	100.1	120.9
SMEs innovating in-house	100.9	90.8	97.3
Linkages	**164.1**	**132.6**	**131.3**
Innovative SMEs collaborating with others	215.5	120.7	120.0
Public-private co-publications	197.6	201.3	199.5
Private co-funding of public R&D exp.	75.5	69.4	68.4
Intellectual assets	**157.1**	**167.3**	**165.8**
PCT patent applications	189.6	164.1	171.3
Trademark applications	135.0	163.9	145.0
Design applications	143.3	172.7	179.0
Employment impacts	**128.0**	**101.0**	**100.5**
Employment in knowledge-intensive activities	122.1	122.1	110.6
Employment fast-growing enterprises	132.3	86.0	92.0
Sales impacts	**89.7**	**78.2**	**75.1**
Medium and high tech product exports	63.3	81.1	76.6
Knowledge-intensive services exports	123.1	109.9	104.8
Sales of new-to-market/firm innovations	82.0	37.7	37.3

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Performance and structure of the economy	DK	EU
GDP per capita (PPS)	36,100	28,600
Average annual GDP growth (%)	2.1	2.2
Employment share Manufacturing (NACE C) (%)	11.9	15.5
of which High and Medium high-tech (%)	42.6	37.2
Employment share Services (NACE G-N) (%)	40.7	41.6
of which Knowledge-intensive services (%)	35.6	35.0
Turnover share SMEs (%)	39.8	38.0
Turnover share large enterprises (%)	41.2	44.4
Foreign-controlled enterprises – share of value added (%)	12.2	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.6	1.5
Total Entrepreneurial Activity (TEA) (%)	n/a	6.6
FDI net inflows (% GDP)	1.5	3.6
Top R&D spending enterprises per 10 mln population	58.3	19.7
Buyer sophistication (1 to 7 best)	3.7	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	84.8	76.9
Basic-school entrepren. education and training (1 to 5 best)	n/a	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.4	3.5
Rule of law (-2.5 to 2.5 best)	2.0	1.2
Demography		
Population size (millions)	5.7	510.1
Average annual population growth (%)	0.8	0.3
Population density (inhabitants/km^2)	133.4	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	2.97	2.87	3.00
Tertiary educational attainment (% of population aged 30-34)	43.4	48.6	40.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
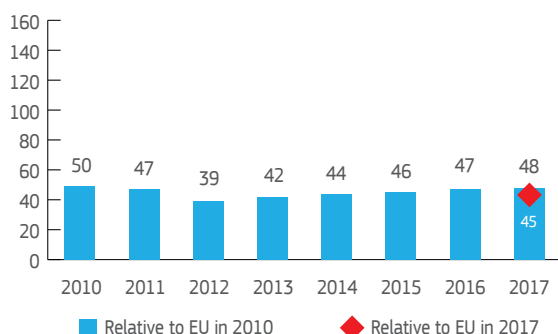https://rio.jrc.ec.europa.eu/en/country-analysis/Denmark
European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-denmark-en.pdf

Germany is a **Strong Innovator**. Over time, performance has remained the same compared to that of the EU in 2010..

| | Relative to EU in 2010 | Relative to EU in 2017 |

Provisional CIS 2016 data show improved performance for two indicators and reduced performance for four indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

Firm investments and Innovators are the strongest innovation dimensions. Attractive research systems and Human resources are the weakest innovation dimensions.

| Germany | Performance relative to EU 2010 in | | Relative to EU 2017 in |
	2010	2017	2017
SUMMARY INNOVATION INDEX	127.8	126.5	119.6
Human resources	98.4	112.6	94.4
New doctorate graduates	184.6	198.2	142.2
Population with tertiary education	34.3	56.0	49.3
Lifelong learning	69.8	76.0	74.5
Attractive research systems	96.1	104.8	92.2
International scientific co-publications	175.3	264.4	162.6
Most cited publications	111.3	112.9	108.7
Foreign doctorate students	47.2	38.2	34.5
Innovation-friendly environment	79.2	134.7	100.7
Broadband penetration	100.0	155.6	87.5
Opportunity-driven entrepreneurship	66.9	122.3	113.6
Finance and support	103.5	109.8	102.0
R&D expenditure in the public sector	128.3	138.9	144.0
Venture capital expenditures	71.6	72.4	59.3
Firm investments	141.4	174.8	156.4
R&D expenditure in the business sector	156.8	170.8	153.4
Non-R&D innovation expenditures	128.8	192.5	176.1
Enterprises providing ICT training	135.7	164.3	143.8
Innovators	173.7	131.3	152.6
SMEs product/process innovations	179.5	127.6	156.1
SMEs marketing/organisational innovations	170.0	131.1	158.2
SMEs innovating in-house	172.1	135.0	144.7
Linkages	125.6	126.4	125.2
Innovative SMEs collaborating with others	106.1	89.3	88.8
Public-private co-publications	119.5	124.7	123.5
Private co-funding of public R&D exp.	152.0	165.8	163.5
Intellectual assets	164.6	148.9	147.6
PCT patent applications	187.4	165.8	173.0
Trademark applications	136.1	131.5	116.3
Design applications	164.6	146.2	151.4
Employment impacts	120.7	100.9	100.3
Employment in knowledge-intensive activities	126.0	118.2	107.1
Employment fast-growing enterprises	116.9	88.5	94.7
Sales impacts	130.2	119.4	114.7
Medium and high tech product exports	132.2	138.8	131.0
Knowledge-intensive services exports	119.1	115.7	110.3
Sales of new-to-market/firm innovations	140.7	100.7	99.6

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Structural differences with the EU are shown in the table below. GDP per capita and the employment shares in manufacturing and in high and medium high-tech manufacturing are well above the EU average.

	DE	EU
Performance and structure of the economy		
GDP per capita (PPS)	35,600	28,600
Average annual GDP growth (%)	2.1	2.2
Employment share Manufacturing (NACE C) (%)	19.4	15.5
of which High and Medium high-tech (%)	50.7	37.2
Employment share Services (NACE G-N) (%)	40.5	41.6
of which Knowledge-intensive services (%)	33.7	35.0
Turnover share SMEs (%)	35.8	38.0
Turnover share large enterprises (%)	52.8	44.4
Foreign-controlled enterprises – share of value added (%)	12.5	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.6	1.5
Total Entrepreneurial Activity (TEA) (%)	4.8	6.6
FDI net inflows (% GDP)	1.2	3.6
Top R&D spending enterprises per 10 mln population	26.8	19.7
Buyer sophistication (1 to 7 best)	4.3	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	79.7	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.6	1.9
Govt. procurement of advanced tech products (1 to 7 best)	4.3	3.5
Rule of law (-2.5 to 2.5 best)	1.8	1.2
Demography		
Population size (millions)	82.0	510.1
Average annual population growth (%)	0.8	0.3
Population density (inhabitants/km²)	229.4	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	2.82	2.94	3.00
Tertiary educational attainment (% of population aged 30-34)	32.9	33.8	42.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/Germany
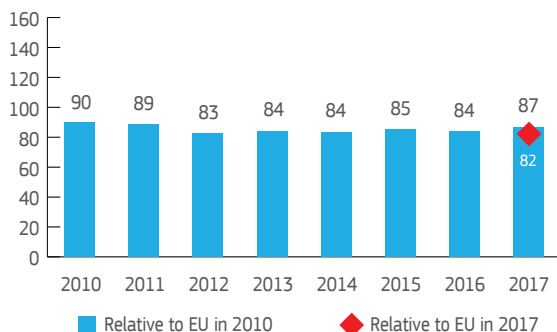**European Semester country report:**
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-germany-en.pdf

Estonia is a **Moderate Innovator**. Over time, performance has declined relative to that of the EU in 2010.
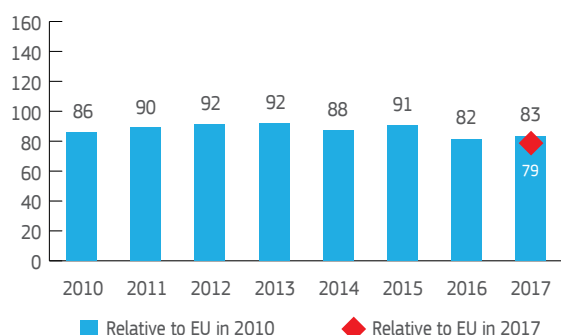
Intellectual assets, Human resources, and Innovation-friendly environment are the strongest innovation dimensions. Innovators and Sales impacts are the weakest innovation dimensions.

Estonia	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	2017	2017
SUMMARY INNOVATION INDEX	**86.4**	**83.2**	**78.6**
Human resources	**93.3**	**123.9**	**103.8**
New doctorate graduates	53.8	67.9	48.7
Population with tertiary education	125.4	144.0	127.0
Lifelong learning	103.1	167.7	164.3
Attractive research systems	**59.6**	**101.8**	**89.5**
International scientific co-publications	175.6	356.1	218.9
Most cited publications	58.1	76.4	73.6
Foreign doctorate students	21.7	50.4	45.5
Innovation-friendly environment	**90.3**	**138.9**	**103.8**
Broadband penetration	88.9	188.9	106.3
Opportunity-driven entrepreneurship	91.1	109.3	101.4
Finance and support	**89.3**	**96.5**	**89.6**
R&D expenditure in the public sector	103.5	80.5	83.5
Venture capital expenditures	71.0	117.0	95.8
Firm investments	**116.0**	**75.4**	**67.5**
R&D expenditure in the business sector	50.2	53.7	48.2
Non-R&D innovation expenditures	277.8	124.7	114.0
Enterprises providing ICT training	50.0	57.1	50.0
Innovators	**111.0**	**24.3**	**28.3**
SMEs product/process innovations	137.8	23.5	28.7
SMEs marketing/organisational innovations	80.2	15.4	18.6
SMEs innovating in-house	117.0	34.1	36.5
Linkages	**119.0**	**76.3**	**75.6**
Innovative SMEs collaborating with others	211.5	95.9	95.4
Public-private co-publications	79.7	51.5	51.0
Private co-funding of public R&D exp.	68.2	83.6	82.4
Intellectual assets	**68.2**	**111.6**	**110.6**
PCT patent applications	51.0	27.3	28.4
Trademark applications	117.7	196.3	173.7
Design applications	47.0	127.0	131.6
Employment impacts	**55.5**	**74.9**	**74.5**
Employment in knowledge-intensive activities	61.0	101.3	91.8
Employment fast-growing enterprises	51.5	56.1	60.0
Sales impacts	**59.8**	**65.4**	**62.8**
Medium and high tech product exports	48.1	61.9	58.5
Knowledge-intensive services exports	62.9	62.8	59.9
Sales of new-to-market/firm innovations	70.0	72.6	71.9

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 data show improved performance for all six indicators.

Structural differences with the EU are shown in the table below. The turnover share of SMEs and the value added share of foreign-controlled enterprises are well above the EU average. The employment share in high and medium high-tech manufacturing and the turnover share of large enterprises are well below the EU average.

	EE	EU
Performance and structure of the economy		
GDP per capita (PPS)	21,500	28,600
Average annual GDP growth (%)	3.4	2.2
Employment share Manufacturing (NACE C) (%)	18.6	15.5
of which High and Medium high-tech (%)	19.9	37.2
Employment share Services (NACE G-N) (%)	39.3	41.6
of which Knowledge-intensive services (%)	30.6	35.0
Turnover share SMEs (%)	48.0	38.0
Turnover share large enterprises (%)	22.5	44.4
Foreign-controlled enterprises – share of value added (%)	16.0	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.9	1.5
Total Entrepreneurial Activity (TEA) (%)	16.2	6.6
FDI net inflows (% GDP)	2.2	3.6
Top R&D spending enterprises per 10 mln population	0.0	19.7
Buyer sophistication (1 to 7 best)	3.5	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	80.8	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.8	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.9	3.5
Rule of law (-2.5 to 2.5 best)	1.3	1.2
Demography		
Population size (millions)	1.3	510.1
Average annual population growth (%)	0.0	0.3
Population density (inhabitants/km²)	30.3	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	1.72	1.28	3.00
Tertiary educational attainment (% of population aged 30-34)	42.5	47.4	40.0

1 Sources are provided in the introduction to the country profiles.

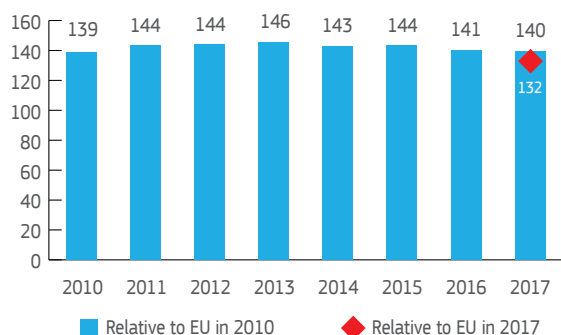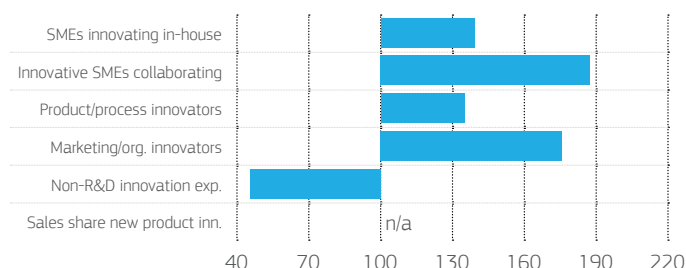**RIO country report:**
https://rio.jrc.ec.europa.eu/en/country-analysis/Estonia
European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-estonia-en.pdf

Ireland is a **Strong Innovator**. Over time, performance has increased relative to that of the EU in 2010.

Legend: ■ Relative to EU in 2010 ◆ Relative to EU in 2017
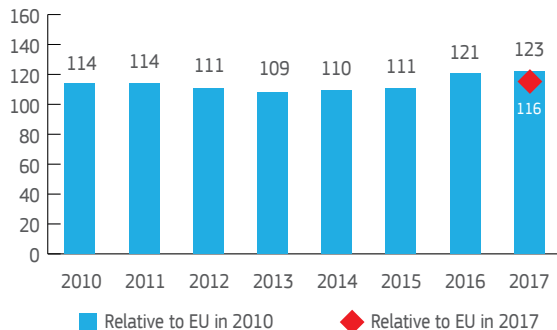
Innovators and Employment impacts are the strongest innovation dimensions. Intellectual assets and Finance and support are the weakest innovation dimensions.

Ireland	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	**114.2**	**122.7**	**115.9**
Human resources	**139.5**	**167.9**	**140.7**
New doctorate graduates	107.7	187.5	134.5
Population with tertiary education	221.6	221.6	195.4
Lifelong learning	81.3	81.3	79.6
Attractive research systems	**146.4**	**160.8**	**141.5**
International scientific co-publications	263.3	415.2	255.3
Most cited publications	109.9	127.4	122.7
Foreign doctorate students	158.1	120.9	109.2
Innovation-friendly environment	**64.4**	**129.3**	**96.6**
Broadband penetration	111.1	200.0	112.5
Opportunity-driven entrepreneurship	36.7	87.3	81.1
Finance and support	**125.3**	**81.6**	**75.8**
R&D expenditure in the public sector	62.8	34.5	35.8
Venture capital expenditures	205.5	142.1	116.5
Firm investments	**134.1**	**104.5**	**93.5**
R&D expenditure in the business sector	92.1	68.5	61.6
Non-R&D innovation expenditures	151.1	61.7	56.4
Enterprises providing ICT training	164.3	178.6	156.3
Innovators	**124.9**	**146.3**	**170.0**
SMEs product/process innovations	130.9	145.5	178.0
SMEs marketing/organisational innovations	105.5	142.7	172.3
SMEs innovating in-house	138.9	150.6	161.5
Linkages	**73.0**	**90.0**	**89.1**
Innovative SMEs collaborating with others	86.5	127.8	127.2
Public-private co-publications	87.8	106.3	105.3
Private co-funding of public R&D exp.	43.0	33.9	33.4
Intellectual assets	**67.8**	**47.3**	**46.9**
PCT patent applications	73.5	48.8	50.9
Trademark applications	93.3	76.9	68.1
Design applications	43.3	23.7	24.5
Employment impacts	**158.1**	**165.7**	**164.8**
Employment in knowledge-intensive activities	193.5	193.5	175.3
Employment fast-growing enterprises	132.8	145.9	156.0
Sales impacts	**106.2**	**132.9**	**127.7**
Medium and high tech product exports	87.2	104.0	98.2
Knowledge-intensive services exports	149.8	149.8	142.8
Sales of new-to-market/firm innovations	77.8	147.5	145.9

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 data show improved performance for two indicators and reduced performance for four indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. GDP per capita and the value added share of foreign-controlled enterprises are well above the EU average. The employment share in manufacturing is well below the EU average.

	IE	EU
Performance and structure of the economy		
GDP per capita (PPS)	47,900	28,600
Average annual GDP growth (%)	6.5	2.2
Employment share Manufacturing (NACE C) (%)	11.5	15.5
of which High and Medium high-tech (%)	44.8	37.2
Employment share Services (NACE G-N) (%)	46.8	41.6
of which Knowledge-intensive services (%)	39.9	35.0
Turnover share SMEs (%)	41.5	38.0
Turnover share large enterprises (%)	38.1	44.4
Foreign-controlled enterprises – share of value added (%)	39.0	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.5	1.5
Total Entrepreneurial Activity (TEA) (%)	9.7	6.6
FDI net inflows (% GDP)	43.2	3.6
Top R&D spending enterprises per 10 mln population	54.1	19.7
Buyer sophistication (1 to 7 best)	4.4	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	79.3	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.1	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.6	3.5
Rule of law (-2.5 to 2.5 best)	1.7	1.2
Demography		
Population size (millions)	4.7	510.1
Average annual population growth (%)	1.1	0.3
Population density (inhabitants/km²)	68.7	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	1.56	1.18	2.00
Tertiary educational attainment (% of population aged 30-34)	52.6	53.3	60.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/Ireland
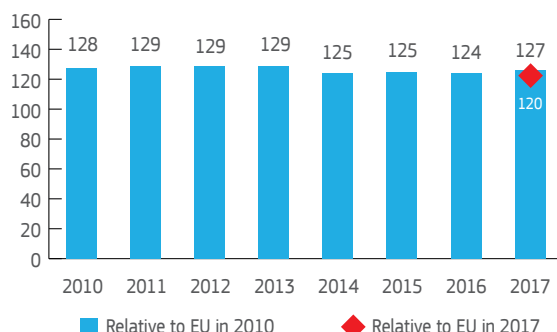**European Semester country report:**
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-ireland-en_1.pdf

Greece is a **Moderate Innovator**. Over time, performance has remained the same relative to that of the EU in 2010.

Relative to EU in 2010 / Relative to EU in 2017

	2010	2011	2012	2013	2014	2015	2016	2017
	70	69	69	71	62	65	68	69 / 65

Innovators, Linkages, and Attractive research systems are the strongest innovation dimensions. Intellectual assets and Finance and support are the weakest innovation dimensions.

Greece	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	**69.6**	**68.8**	**65.0**
Human resources	**70.1**	**84.4**	**70.7**
New doctorate graduates	69.2	71.2	51.1
Population with tertiary education	111.2	139.6	123.0
Lifelong learning	22.9	35.4	34.7
Attractive research systems	**83.2**	**102.3**	**90.0**
International scientific co-publications	120.9	194.0	119.3
Most cited publications	78.6	85.7	82.5
Foreign doctorate students	N/A	N/A	N/A
Innovation-friendly environment	**39.2**	**54.0**	**40.3**
Broadband penetration	22.2	55.6	31.3
Opportunity-driven entrepreneurship	49.3	53.0	49.2
Finance and support	**29.2**	**41.7**	**38.7**
R&D expenditure in the public sector	41.6	73.4	76.1
Venture capital expenditures	13.2	0.9	0.7
Firm investments	**61.0**	**61.2**	**54.7**
R&D expenditure in the business sector	16.1	33.6	30.2
Non-R&D innovation expenditures	105.4	109.3	100.0
Enterprises providing ICT training	71.4	50.0	43.8
Innovators	**120.0**	**101.3**	**117.7**
SMEs product/process innovations	109.4	97.7	119.5
SMEs marketing/organisational innovations	138.5	100.7	121.5
SMEs innovating in-house	111.3	105.3	112.8
Linkages	**86.7**	**91.1**	**90.2**
Innovative SMEs collaborating with others	121.5	136.0	135.3
Public-private co-publications	58.9	51.1	50.6
Private co-funding of public R&D exp.	81.8	89.4	88.1
Intellectual assets	**12.8**	**35.4**	**35.1**
PCT patent applications	11.0	13.3	13.9
Trademark applications	19.0	74.5	65.9
Design applications	9.9	26.6	27.6
Employment impacts	**57.3**	**69.2**	**68.9**
Employment in knowledge-intensive activities	68.8	83.1	75.3
Employment fast-growing enterprises	N/A	N/A	N/A
Sales impacts	**87.5**	**47.4**	**45.6**
Medium and high tech product exports	12.9	4.8	4.5
Knowledge-intensive services exports	88.5	49.9	47.6
Sales of new-to-market/firm innovations	174.5	95.0	93.9

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 data show improved performance for all six indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. GDP per capita, the employment share in high and medium high-tech manufacturing, and the value added share of foreign-controlled enterprises are well below the EU average.

	EL	EU
Performance and structure of the economy		
GDP per capita (PPS)	19,900	28,600
Average annual GDP growth (%)	0.5	2.2
Employment share Manufacturing (NACE C) (%)	9.2	15.5
of which High and Medium high-tech (%)	14.2	37.2
Employment share Services (NACE G-N) (%)	45.8	41.6
of which Knowledge-intensive services (%)	29.1	35.0
Turnover share SMEs (%)	39.1	38.0
Turnover share large enterprises (%)	27.9	44.4
Foreign-controlled enterprises – share of value added (%)	3.8	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	2.2	1.5
Total Entrepreneurial Activity (TEA) (%)	5.8	6.6
FDI net inflows (% GDP)	1.1	3.6
Top R&D spending enterprises per 10 mln population	4.3	19.7
Buyer sophistication (1 to 7 best)	3.3	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	68.6	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.8	1.9
Govt. procurement of advanced tech products (1 to 7 best)	2.6	3.5
Rule of law (-2.5 to 2.5 best)	0.3	1.2
Demography		
Population size (millions)	10.8	510.1
Average annual population growth (%)	-0.4	0.3
Population density (inhabitants/km²)	82.3	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	0.66	1.01	1.20
Tertiary educational attainment (% of population aged 30-34)	34.9	43.4	32.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/Greece
European Semester country report:
Not available

Spain is a **Moderate Innovator**. Over time, performance has increased relative to that of the EU in 2010.

Legend:
- Relative to EU in 2010
- Relative to EU in 2017
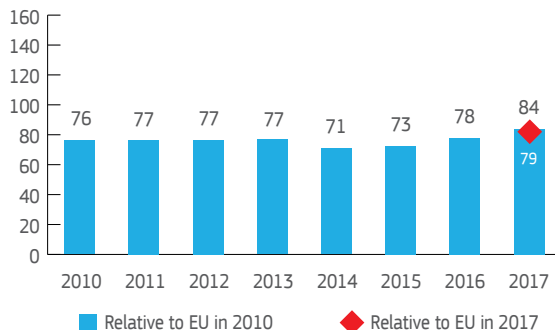
Human resources and Innovation-friendly environment are the strongest innovation dimensions. Innovators, Firm investments, and Linkages are the weakest innovation dimensions.

Spain	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	**2017**	**2017**
SUMMARY INNOVATION INDEX	76.4	83.9	79.3
Human resources	95.6	141.6	118.6
New doctorate graduates	61.5	184.2	132.1
Population with tertiary education	132.1	140.3	123.7
Lifelong learning	93.8	91.7	89.8
Attractive research systems	93.4	98.7	86.9
International scientific co-publications	134.4	236.8	145.6
Most cited publications	83.6	88.7	85.4
Foreign doctorate students	93.4	65.4	59.1
Innovation-friendly environment	78.3	143.5	107.3
Broadband penetration	111.1	277.8	156.3
Opportunity-driven entrepreneurship	58.8	64.0	59.4
Finance and support	90.5	86.4	80.2
R&D expenditure in the public sector	87.6	69.9	72.5
Venture capital expenditures	94.2	107.5	88.1
Firm investments	65.0	75.8	67.8
R&D expenditure in the business sector	57.2	51.9	46.6
Non-R&D innovation expenditures	58.8	43.2	39.5
Enterprises providing ICT training	78.6	128.6	112.5
Innovators	65.7	36.2	42.0
SMEs product/process innovations	67.2	28.9	35.3
SMEs marketing/organisational innovations	67.4	51.0	61.6
SMEs innovating in-house	62.6	28.0	30.0
Linkages	69.8	69.3	68.6
Innovative SMEs collaborating with others	41.5	54.9	54.6
Public-private co-publications	71.8	72.5	71.8
Private co-funding of public R&D exp.	96.2	80.3	79.2
Intellectual assets	70.5	72.9	72.2
PCT patent applications	36.4	39.3	41.0
Trademark applications	106.8	125.8	111.3
Design applications	75.2	64.5	66.9
Employment impacts	65.3	90.7	90.2
Employment in knowledge-intensive activities	77.9	88.3	80.0
Employment fast-growing enterprises	56.3	92.4	98.8
Sales impacts	77.1	76.6	73.6
Medium and high tech product exports	81.3	79.0	74.6
Knowledge-intensive services exports	30.7	31.3	29.9
Sales of new-to-market/firm innovations	126.2	126.5	125.1

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 data show improved performance for five indicators and reduced performance for one indicator.

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. The value added share of foreign-controlled enterprises is well below the EU average.

	ES	EU
Performance and structure of the economy		
GDP per capita (PPS)	26,000	28,600
Average annual GDP growth (%)	3.1	2.2
Employment share Manufacturing (NACE C) (%)	12.4	15.5
of which High and Medium high-tech (%)	31.7	37.2
Employment share Services (NACE G-N) (%)	49.6	41.6
of which Knowledge-intensive services (%)	31.6	35.0
Turnover share SMEs (%)	38.2	38.0
Turnover share large enterprises (%)	38.4	44.4
Foreign-controlled enterprises – share of value added (%)	9.7	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.5	1.5
Total Entrepreneurial Activity (TEA) (%)	5.7	6.6
FDI net inflows (% GDP)	2.7	3.6
Top R&D spending enterprises per 10 mln population	4.7	19.7
Buyer sophistication (1 to 7 best)	3.3	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	74.8	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.9	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.2	3.5
Rule of law (-2.5 to 2.5 best)	0.9	1.2
Demography		
Population size (millions)	46.5	510.1
Average annual population growth (%)	0.1	0.3
Population density (inhabitants/km²)	92.5	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	1.27	1.19	2.00
Tertiary educational attainment (% of population aged 30-34)	42.3	39.7	44.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/Spain

European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-spain-en.pdf

France is a **Strong Innovator**. Over time, performance has increased relative to that of the EU in 2010.
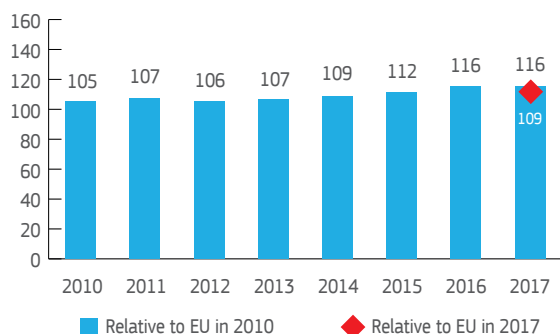
Finance and support and Attractive research systems are the strongest innovation dimensions. Intellectual assets and Firm investments are the weakest innovation dimensions.

France	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	**2017**	**2017**
SUMMARY INNOVATION INDEX	**105.5**	**115.5**	**109.2**
Human resources	**142.1**	**148.5**	**124.4**
New doctorate graduates	100.0	115.1	82.6
Population with tertiary education	153.0	153.0	134.9
Lifelong learning	180.2	183.3	179.6
Attractive research systems	**137.0**	**146.8**	**129.2**
International scientific co-publications	162.9	234.7	144.3
Most cited publications	104.5	108.9	104.9
Foreign doctorate students	174.4	170.6	154.1
Innovation-friendly environment	**85.8**	**135.8**	**101.5**
Broadband penetration	100.0	133.3	75.0
Opportunity-driven entrepreneurship	77.3	137.3	127.5
Finance and support	**106.8**	**152.2**	**141.3**
R&D expenditure in the public sector	108.9	110.6	114.7
Venture capital expenditures	104.2	205.5	168.4
Firm investments	**96.4**	**97.9**	**87.6**
R&D expenditure in the business sector	114.9	121.0	108.6
Non-R&D innovation expenditures	60.3	66.2	60.6
Enterprises providing ICT training	107.1	100.0	87.5
Innovators	**93.7**	**104.4**	**121.4**
SMEs product/process innovations	86.9	101.4	124.1
SMEs marketing/organisational innovations	95.1	105.7	127.6
SMEs innovating in-house	98.7	106.0	113.6
Linkages	**100.4**	**102.4**	**101.5**
Innovative SMEs collaborating with others	123.5	120.5	119.8
Public-private co-publications	101.1	103.3	102.3
Private co-funding of public R&D exp.	76.2	83.3	82.1
Intellectual assets	**93.0**	**86.8**	**86.0**
PCT patent applications	104.6	108.0	112.7
Trademark applications	90.0	90.3	79.9
Design applications	84.3	64.3	66.6
Employment impacts	**102.8**	**92.5**	**92.0**
Employment in knowledge-intensive activities	107.8	114.3	103.5
Employment fast-growing enterprises	99.3	77.0	82.3
Sales impacts	**100.2**	**109.6**	**105.3**
Medium and high tech product exports	108.6	111.0	104.8
Knowledge-intensive services exports	92.0	101.5	96.8
Sales of new-to-market/firm innovations	99.9	117.4	116.1

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 data show improved performance for four indicators and reduced performance for two indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. The employment share in manufacturing and the value added share of foreign-controlled enterprises are well below the EU average.

	FR	EU
Performance and structure of the economy		
GDP per capita (PPS)	30,200	28,600
Average annual GDP growth (%)	1.5	2.2
Employment share Manufacturing (NACE C) (%)	12.3	15.5
of which High and Medium high-tech (%)	36.1	37.2
Employment share Services (NACE G-N) (%)	40.8	41.6
of which Knowledge-intensive services (%)	37.1	35.0
Turnover share SMEs (%)	34.5	38.0
Turnover share large enterprises (%)	44.7	44.4
Foreign-controlled enterprises – share of value added (%)	7.5	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.6	1.5
Total Entrepreneurial Activity (TEA) (%)	4.6	6.6
FDI net inflows (% GDP)	1.1	3.6
Top R&D spending enterprises per 10 mln population	17.1	19.7
Buyer sophistication (1 to 7 best)	4.0	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	75.9	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.8	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.8	3.5
Rule of law (-2.5 to 2.5 best)	1.4	1.2
Demography		
Population size (millions)	66.7	510.1
Average annual population growth (%)	0.4	0.3
Population density (inhabitants/km²)	105.0	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	2.24	2.25	3.00
Tertiary educational attainment (% of population aged 30-34)	37.1	39.7	40.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
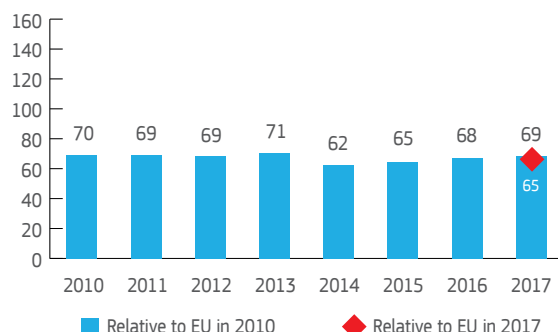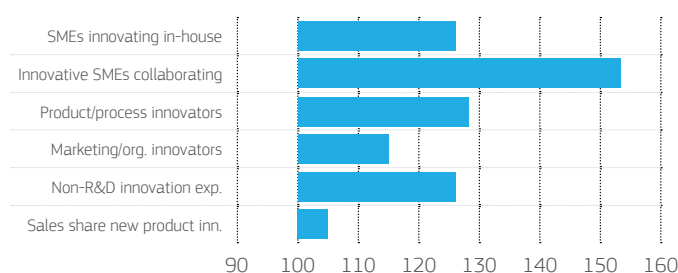https://rio.jrc.ec.europa.eu/en/country-analysis/France
European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-france-en.pdf

Croatia is a **Moderate Innovator**. Over time, performance has declined relative to that of the EU in 2010.

Legend: Relative to EU in 2010 (blue bars: 56, 58, 52, 54, 49, 54, 54, 54); Relative to EU in 2017 (red diamond: 51)

Firm investments and Innovators are the strongest innovation dimensions. Sales impacts and Intellectual assets are the weakest innovation dimensions.

Provisional CIS 2016 data show improved performance for all six indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

- SMEs innovating in-house
- Innovative SMEs collaborating
- Product/process innovators
- Marketing/org. innovators
- Non-R&D innovation exp.
- Sales share new product inn.

Structural differences with the EU are shown in the table below. GDP per capita and the employment share in high and medium high-tech manufacturing are well below the EU average.

Croatia	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	2017	2017
SUMMARY INNOVATION INDEX	56.2	54.2	51.2
Human resources	48.8	53.7	45.0
New doctorate graduates	61.5	75.6	54.2
Population with tertiary education	60.4	66.4	58.6
Lifelong learning	19.8	12.5	12.2
Attractive research systems	24.8	42.3	37.2
International scientific co-publications	85.2	154.0	94.7
Most cited publications	20.6	33.8	32.5
Foreign doctorate students	10.0	16.0	14.4
Innovation-friendly environment	37.9	54.4	40.6
Broadband penetration	11.1	77.8	43.8
Opportunity-driven entrepreneurship	53.8	40.5	37.6
Finance and support	36.6	40.2	37.3
R&D expenditure in the public sector	54.0	54.0	56.0
Venture capital expenditures	14.3	22.5	18.4
Firm investments	104.1	108.1	96.7
R&D expenditure in the business sector	29.2	29.2	26.2
Non-R&D innovation expenditures	126.8	183.4	167.8
Enterprises providing ICT training	164.3	128.6	112.5
Innovators	79.1	62.0	72.1
SMEs product/process innovations	84.3	58.2	71.2
SMEs marketing/organisational innovations	74.5	69.1	83.4
SMEs innovating in-house	78.8	58.4	62.6
Linkages	91.7	67.2	66.5
Innovative SMEs collaborating with others	107.1	55.9	55.6
Public-private co-publications	87.4	65.7	65.1
Private co-funding of public R&D exp.	80.7	80.1	79.0
Intellectual assets	21.4	29.8	29.6
PCT patent applications	18.1	16.5	17.2
Trademark applications	49.7	60.2	53.3
Design applications	3.2	19.5	20.2
Employment impacts	27.4	69.0	68.6
Employment in knowledge-intensive activities	44.2	76.6	69.4
Employment fast-growing enterprises	15.5	63.5	67.9
Sales impacts	60.8	26.7	25.6
Medium and high tech product exports	72.9	58.0	54.8
Knowledge-intensive services exports	5.3	2.8	2.7
Sales of new-to-market/firm innovations	111.3	17.4	17.3

Performance and structure of the economy	HR	EU
GDP per capita (PPS)	17,000	28,600
Average annual GDP growth (%)	3.0	2.2
Employment share Manufacturing (NACE C) (%)	17.0	15.5
of which High and Medium high-tech (%)	19.5	37.2
Employment share Services (NACE G-N) (%)	39.5	41.6
of which Knowledge-intensive services (%)	29.6	35.0
Turnover share SMEs (%)	41.1	38.0
Turnover share large enterprises (%)	40.3	44.4
Foreign-controlled enterprises – share of value added (%)	13.7	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	2.2	1.5
Total Entrepreneurial Activity (TEA) (%)	8.3	6.6
FDI net inflows (% GDP)	3.6	3.6
Top R&D spending enterprises per 10 mln population	0.0	19.7
Buyer sophistication (1 to 7 best)	2.7	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	72.7	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.5	1.9
Govt. procurement of advanced tech products (1 to 7 best)	2.6	3.5
Rule of law (-2.5 to 2.5 best)	0.3	1.2
Demography		
Population size (millions)	4.2	510.1
Average annual population growth (%)	-0.8	0.3
Population density (inhabitants/km²)	74.6	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	0.81	0.85	1.40
Tertiary educational attainment (% of population aged 30-34)	25.6	27.3	35.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/Croatia

European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-croatia-en.pdf

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Italy is a **Moderate Innovator**. Over time, performance has increased relative to that of the EU in 2010.

Relative to EU in 2010 ■ Relative to EU in 2017 ◆
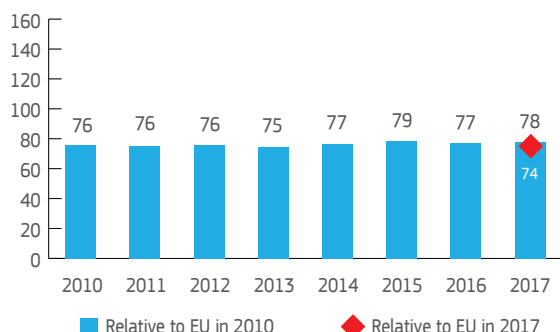
Innovators and Intellectual assets are the strongest innovation dimensions. Human resources and Finance and support are the weakest innovation dimensions.

Provisional CIS 2016 data show improved performance for three indicators and reduced performance for one indicator. There are no fast-track data for the other two indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. The turnover share of large enterprises and the value added share of foreign-controlled enterprises are well below the EU average.

Italy	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	75.9	77.9	73.6
Human resources	55.1	65.2	54.7
New doctorate graduates	107.7	101.6	72.9
Population with tertiary education	3.0	23.1	20.4
Lifelong learning	53.1	70.8	69.4
Attractive research systems	73.4	99.4	87.5
International scientific co-publications	119.4	202.2	124.3
Most cited publications	89.7	102.3	98.6
Foreign doctorate students	34.4	59.8	54.0
Innovation-friendly environment	99.2	84.6	63.2
Broadband penetration	55.6	77.8	43.8
Opportunity-driven entrepreneurship	125.1	88.7	82.3
Finance and support	58.1	59.4	55.1
R&D expenditure in the public sector	66.4	61.1	63.3
Venture capital expenditures	47.4	57.2	46.9
Firm investments	58.6	64.5	57.7
R&D expenditure in the business sector	52.8	61.6	55.3
Non-R&D innovation expenditures	84.6	77.1	70.5
Enterprises providing ICT training	42.9	57.1	50.0
Innovators	101.7	90.8	105.6
SMEs product/process innovations	84.3	89.4	109.3
SMEs marketing/organisational innovations	102.3	81.8	98.8
SMEs innovating in-house	117.6	101.3	108.5
Linkages	57.8	57.1	56.5
Innovative SMEs collaborating with others	48.0	55.4	55.1
Public-private co-publications	82.9	74.4	73.7
Private co-funding of public R&D exp.	40.2	40.0	39.4
Intellectual assets	98.0	104.3	103.4
PCT patent applications	52.9	58.5	61.1
Trademark applications	95.5	119.9	106.1
Design applications	142.1	135.5	140.4
Employment impacts	71.3	74.8	74.4
Employment in knowledge-intensive activities	102.6	103.9	94.1
Employment fast-growing enterprises	48.9	54.0	57.7
Sales impacts	80.6	77.0	74.0
Medium and high tech product exports	88.7	93.7	88.5
Knowledge-intensive services exports	68.3	67.6	64.4
Sales of new-to-market/firm innovations	85.5	68.4	67.6

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

	IT	EU
Performance and structure of the economy		
GDP per capita (PPS)	27,500	28,600
Average annual GDP growth (%)	1.1	2.2
Employment share Manufacturing (NACE C) (%)	18.4	15.5
of which High and Medium high-tech (%)	33.0	37.2
Employment share Services (NACE G-N) (%)	44.8	41.6
of which Knowledge-intensive services (%)	37.1	35.0
Turnover share SMEs (%)	44.1	38.0
Turnover share large enterprises (%)	31.4	44.4
Foreign-controlled enterprises – share of value added (%)	6.5	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.2	1.5
Total Entrepreneurial Activity (TEA) (%)	4.5	6.6
FDI net inflows (% GDP)	0.8	3.6
Top R&D spending enterprises per 10 mln population	7.1	19.7
Buyer sophistication (1 to 7 best)	3.7	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	72.1	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.8	1.9
Govt. procurement of advanced tech products (1 to 7 best)	2.8	3.5
Rule of law (-2.5 to 2.5 best)	0.3	1.2
Demography		
Population size (millions)	60.7	510.1
Average annual population growth (%)	-0.2	0.3
Population density (inhabitants/km²)	201.9	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	1.31	1.29	1.53
Tertiary educational attainment (% of population aged 30-34)	22.5	26.5	26.0

1 Sources are provided in the introduction to the country profiles.

**RIO country report:**
https://rio.jrc.ec.europa.eu/en/country-analysis/Italy
European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-italy-en.pdf

Cyprus is a **Moderate Innovator.** Over time, performance has declined relative to that of the EU in 2010.

Relative to EU in 2010 ■ Relative to EU in 2017 ◆
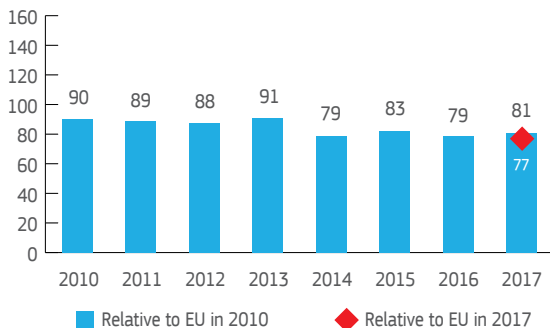
Intellectual assets and Attractive research systems are the strongest innovation dimensions. Finance and support and Innovation-friendly environment are the weakest innovation dimensions.
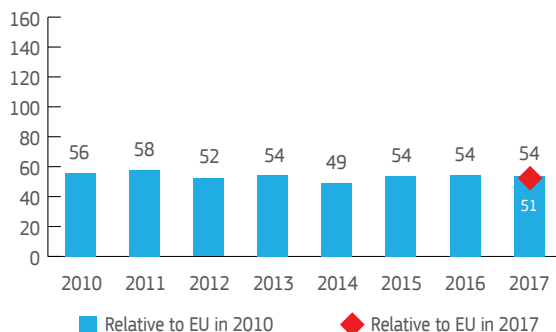
Cyprus	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	90.2	81.0	76.5
Human resources	99.9	114.2	95.7
New doctorate graduates	0.0	34.4	24.7
Population with tertiary education	225.4	241.8	213.2
Lifelong learning	72.9	60.4	59.2
Attractive research systems	67.4	118.7	104.4
International scientific co-publications	203.6	427.0	262.5
Most cited publications	53.9	85.1	82.0
Foreign doctorate students	39.7	60.4	54.5
Innovation-friendly environment	44.3	61.0	45.6
Broadband penetration	0.0	55.6	31.3
Opportunity-driven entrepreneurship	70.5	64.3	59.7
Finance and support	52.6	45.8	42.6
R&D expenditure in the public sector	25.7	20.3	21.1
Venture capital expenditures	87.3	78.5	64.3
Firm investments	136.5	60.6	54.2
R&D expenditure in the business sector	3.9	10.9	9.8
Non-R&D innovation expenditures	270.9	17.0	15.6
Enterprises providing ICT training	164.3	150.0	131.3
Innovators	135.8	87.0	101.1
SMEs product/process innovations	130.5	90.1	110.2
SMEs marketing/organisational innovations	125.1	70.0	84.5
SMEs innovating in-house	151.7	101.1	108.4
Linkages	98.4	60.4	59.8
Innovative SMEs collaborating with others	201.6	105.0	104.5
Public-private co-publications	83.6	72.4	71.7
Private co-funding of public R&D exp.	9.8	2.0	2.0
Intellectual assets	69.4	115.5	114.4
PCT patent applications	11.9	22.3	23.3
Trademark applications	197.5	278.7	246.6
Design applications	26.9	79.9	82.8
Employment impacts	52.9	61.1	60.8
Employment in knowledge-intensive activities	110.4	146.8	132.9
Employment fast-growing enterprises	11.8	0.0	0.0
Sales impacts	96.1	76.1	73.1
Medium and high tech product exports	60.7	99.3	93.8
Knowledge-intensive services exports	104.9	106.4	101.5
Sales of new-to-market/firm innovations	127.7	13.4	13.2

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 data show improved performance for two indicators and reduced performance for four indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. The employment share in services and the turnover share of SMEs are well above the EU average. The employment shares in manufacturing and in high and medium high-tech manufacturing, the turnover share of large enterprises, and the value added share of foreign-controlled enterprises are well below the EU average.

	CY	EU
Performance and structure of the economy		
GDP per capita (PPS)	23,500	28,600
Average annual GDP growth (%)	3.6	2.2
Employment share Manufacturing (NACE C) (%)	7.7	15.5
of which High and Medium high-tech (%)	11.0	37.2
Employment share Services (NACE G-N) (%)	53.4	41.6
of which Knowledge-intensive services (%)	39.8	35.0
Turnover share SMEs (%)	54.5	38.0
Turnover share large enterprises (%)	20.6	44.4
Foreign-controlled enterprises – share of value added (%)	5.3	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.4	1.5
Total Entrepreneurial Activity (TEA) (%)	9.6	6.6
FDI net inflows (% GDP)	17.0	3.6
Top R&D spending enterprises per 10 mln population	3.9	19.7
Buyer sophistication (1 to 7 best)	3.8	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	70.9	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.8	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.3	3.5
Rule of law (-2.5 to 2.5 best)	0.9	1.2
Demography		
Population size (millions)	0.9	510.1
Average annual population growth (%)	0.5	0.3
Population density (inhabitants/km²)	92.3	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	0.48	0.50	0.50
Tertiary educational attainment (% of population aged 30-34)	47.8	54.9	46.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:

https://rio.jrc.ec.europa.eu/en/country-analysis/Cyprus

European Semester country report:

https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-cyprus-en.pdf

Latvia is a **Moderate Innovator**. Over time, performance has increased relative to that of the EU in 2010.

2010	48	
2011	48	
2012	46	
2013	45	
2014	55	
2015	62	
2016	58	
2017	60 / 57	

■ Relative to EU in 2010   ◆ Relative to EU in 2017

Innovation-friendly environment and Finance and support are the strongest innovation dimensions. Innovators and Firm investments are the weakest innovation dimensions.

Latvia	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	**2017**	**2017**
SUMMARY INNOVATION INDEX	**48.2**	**59.8**	**56.5**
Human resources	**64.7**	**79.8**	**66.8**
New doctorate graduates	30.8	38.8	27.9
Population with tertiary education	116.4	132.8	117.1
Lifelong learning	44.8	66.7	65.3
Attractive research systems	**12.6**	**55.8**	**49.1**
International scientific co-publications	20.8	92.9	57.1
Most cited publications	17.8	52.3	50.4
Foreign doctorate students	2.3	47.9	43.2
Innovation-friendly environment	**116.7**	**141.2**	**105.5**
Broadband penetration	200.0	211.1	118.8
Opportunity-driven entrepreneurship	67.3	99.8	92.6
Finance and support	**36.7**	**107.4**	**99.8**
R&D expenditure in the public sector	23.9	31.0	32.1
Venture capital expenditures	53.1	205.5	168.4
Firm investments	**68.7**	**37.5**	**33.5**
R&D expenditure in the business sector	10.0	5.6	5.1
Non-R&D innovation expenditures	182.3	79.7	72.9
Enterprises providing ICT training	35.7	35.7	31.3
Innovators	**20.7**	**12.7**	**14.7**
SMEs product/process innovations	22.9	0.0	0.0
SMEs marketing/organisational innovations	11.6	28.8	34.7
SMEs innovating in-house	27.9	8.4	9.0
Linkages	**42.3**	**44.3**	**43.9**
Innovative SMEs collaborating with others	20.9	15.8	15.7
Public-private co-publications	21.7	16.0	15.8
Private co-funding of public R&D exp.	86.4	104.3	102.8
Intellectual assets	**60.8**	**48.8**	**48.4**
PCT patent applications	20.4	22.3	23.3
Trademark applications	105.6	112.0	99.1
Design applications	64.9	26.1	27.0
Employment impacts	**51.6**	**94.1**	**93.6**
Employment in knowledge-intensive activities	44.2	83.1	75.3
Employment fast-growing enterprises	56.8	102.0	109.0
Sales impacts	**45.1**	**46.3**	**44.4**
Medium and high tech product exports	31.8	43.3	40.9
Knowledge-intensive services exports	74.1	70.6	67.3
Sales of new-to-market/firm innovations	27.1	21.4	21.2

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 data show improved performance for all six indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. The turnover share of SMEs and the value added share of foreign-controlled enterprises are well above the EU average. GDP per capita, the employment share in high and medium high-tech manufacturing, and the turnover share of large enterprises are well below the EU average.

	LV	EU
Performance and structure of the economy		
GDP per capita (PPS)	18,300	28,600
Average annual GDP growth (%)	3.4	2.2
Employment share Manufacturing (NACE C) (%)	13.4	15.5
of which High and Medium high-tech (%)	12.3	37.2
Employment share Services (NACE G-N) (%)	41.7	41.6
of which Knowledge-intensive services (%)	28.3	35.0
Turnover share SMEs (%)	51.2	38.0
Turnover share large enterprises (%)	22.2	44.4
Foreign-controlled enterprises – share of value added (%)	15.7	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	2.0	1.5
Total Entrepreneurial Activity (TEA) (%)	14.2	6.6
FDI net inflows (% GDP)	2.3	3.6
Top R&D spending enterprises per 10 mln population	0.0	19.7
Buyer sophistication (1 to 7 best)	2.9	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	79.3	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.4	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.1	3.5
Rule of law (-2.5 to 2.5 best)	0.9	1.2
Demography		
Population size (millions)	2.0	510.1
Average annual population growth (%)	-0.9	0.3
Population density (inhabitants/km²)	31.6	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	0.61	0.44	1.50
Tertiary educational attainment (% of population aged 30-34)	40.7	45.6	34.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:

https://rio.jrc.ec.europa.eu/en/country-analysis/Latvia

European Semester country report:

https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-latvia-en.pdf

Lithuania is a **Moderate Innovator**. Over time, performance has increased relative to that of the EU in 2010.

| | Relative to EU in 2010 | Relative to EU in 2017 |
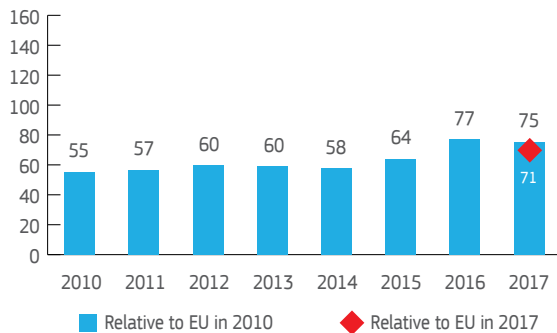
Innovation-friendly environment and Linkages are the strongest innovation dimensions. Attractive research systems and Sales impacts are the weakest innovation dimensions.

Lithuania	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	2017	2017
SUMMARY INNOVATION INDEX	**55.1**	**75.3**	**71.1**
Human resources	**106.9**	**115.5**	**96.8**
New doctorate graduates	61.5	51.1	36.7
Population with tertiary education	214.9	237.3	209.2
Lifelong learning	34.4	50.0	49.0
Attractive research systems	**32.0**	**39.5**	**34.8**
International scientific co-publications	48.2	139.6	85.8
Most cited publications	47.9	29.8	28.7
Foreign doctorate students	3.8	18.8	17.0
Innovation-friendly environment	**103.3**	**164.5**	**123.0**
Broadband penetration	177.8	311.1	175.0
Opportunity-driven entrepreneurship	59.2	77.6	72.1
Finance and support	**47.8**	**64.0**	**59.4**
R&D expenditure in the public sector	82.3	69.9	72.5
Venture capital expenditures	3.5	56.4	46.2
Firm investments	**48.9**	**104.2**	**93.2**
R&D expenditure in the business sector	13.5	22.2	20.0
Non-R&D innovation expenditures	109.1	280.8	256.8
Enterprises providing ICT training	35.7	42.9	37.5
Innovators	**43.5**	**79.7**	**92.6**
SMEs product/process innovations	43.2	93.8	114.7
SMEs marketing/organisational innovations	37.0	45.9	55.4
SMEs innovating in-house	50.5	100.7	107.9
Linkages	**83.4**	**103.0**	**102.0**
Innovative SMEs collaborating with others	68.5	140.3	139.6
Public-private co-publications	46.3	31.0	30.7
Private co-funding of public R&D exp.	139.2	144.0	142.0
Intellectual assets	**25.7**	**51.5**	**51.0**
PCT patent applications	14.8	21.8	22.8
Trademark applications	56.1	107.5	95.1
Design applications	13.0	37.2	38.5
Employment impacts	**62.2**	**39.6**	**39.3**
Employment in knowledge-intensive activities	31.2	51.9	47.1
Employment fast-growing enterprises	84.4	30.7	32.8
Sales impacts	**31.9**	**36.6**	**35.1**
Medium and high tech product exports	36.0	49.6	46.8
Knowledge-intensive services exports	0.3	8.7	8.3
Sales of new-to-market/firm innovations	63.7	53.7	53.1

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 data show improved performance for five indicators and slightly reduced performance for one indicator.

Provisional CIS 2016 vs CIS 2014 (=100)
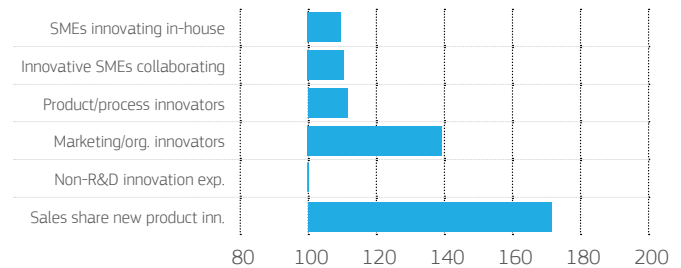
Structural differences with the EU are shown in the table below. The turnover share of SMEs is well above the EU average. GDP per capita, the employment share in high and medium high-tech manufacturing, the employment share in knowledge-intensive services, and the turnover share of large enterprises are well below the EU average.

	LT	EU
Performance and structure of the economy		
GDP per capita (PPS)	21,500	28,600
Average annual GDP growth (%)	3.1	2.2
Employment share Manufacturing (NACE C) (%)	15.3	15.5
of which High and Medium high-tech (%)	13.3	37.2
Employment share Services (NACE G-N) (%)	39.5	41.6
of which Knowledge-intensive services (%)	23.7	35.0
Turnover share SMEs (%)	48.7	38.0
Turnover share large enterprises (%)	33.3	44.4
Foreign-controlled enterprises – share of value added (%)	11.9	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	2.3	1.5
Total Entrepreneurial Activity (TEA) (%)	n/a	6.6
FDI net inflows (% GDP)	1.9	3.6
Top R&D spending enterprises per 10 mln population	0.0	19.7
Buyer sophistication (1 to 7 best)	3.2	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	78.3	76.9
Basic-school entrepren. education and training (1 to 5 best)	n/a	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.0	3.5
Rule of law (-2.5 to 2.5 best)	1.0	1.2
Demography		
Population size (millions)	2.9	510.1
Average annual population growth (%)	-1.3	0.3
Population density (inhabitants/km²)	46.3	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	0.95	0.85	1.90
Tertiary educational attainment (% of population aged 30-34)	51.3	58.2	48.7

1 Sources are provided in the introduction to the country profiles.
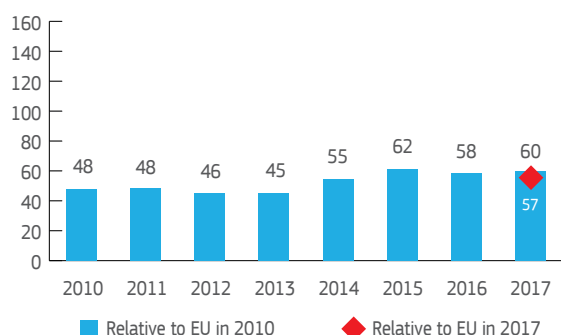
RIO country report:

https://rio.jrc.ec.europa.eu/en/country-analysis/Lithuania

European Semester country report:

https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-lithuania-en.pdf

Luxembourg is an **Innovation Leader**. Over time, performance has increased relative to that of the EU in 2010.

For Luxembourg fast-track CIS 2016 data are not available.

2010	2011	2012	2013	2014	2015	2016	2017
122	125	129	132	126	131	131	128 / 121

- ■ Relative to EU in 2010
- ◆ Relative to EU in 2017

Attractive research systems and Intellectuals assets are the strongest innovation dimensions. Linkages and Firm investments are the weakest innovation dimensions.

Luxembourg	Performance relative to EU 2010 in 2010	Performance relative to EU 2010 in 2017	Relative to EU 2017 in 2017
SUMMARY INNOVATION INDEX	**121.6**	**128.1**	**121.1**
Human resources	**137.3**	**150.3**	**126.0**
New doctorate graduates	46.2	83.1	59.6
Population with tertiary education	197.8	204.5	180.3
Lifelong learning	176.0	167.7	164.3
Attractive research systems	**163.7**	**224.8**	**197.8**
International scientific co-publications	282.4	576.0	354.1
Most cited publications	85.4	133.3	128.4
Foreign doctorate students	234.3	234.3	211.6
Innovation-friendly environment	**186.1**	**192.0**	**143.5**
Broadband penetration	144.4	277.8	156.3
Opportunity-driven entrepreneurship	210.7	141.1	131.0
Finance and support	**114.4**	**134.3**	**124.7**
R&D expenditure in the public sector	43.4	78.8	81.7
Venture capital expenditures	205.5	205.5	168.4
Firm investments	**67.4**	**77.1**	**68.9**
R&D expenditure in the business sector	57.2	51.9	46.6
Non-R&D innovation expenditures	24.5	4.9	4.5
Enterprises providing ICT training	114.3	164.3	143.8
Innovators	**134.9**	**122.3**	**142.2**
SMEs product/process innovations	127.3	107.8	131.8
SMEs marketing/organisational innovations	144.2	148.9	179.8
SMEs innovating in-house	132.6	109.1	117.0
Linkages	**80.1**	**62.8**	**62.2**
Innovative SMEs collaborating with others	111.7	80.0	79.6
Public-private co-publications	94.5	79.5	78.8
Private co-funding of public R&D exp.	32.4	27.1	26.7
Intellectual assets	**145.1**	**154.4**	**153.0**
PCT patent applications	44.2	47.5	49.6
Trademark applications	278.7	278.7	246.6
Design applications	139.3	161.1	166.9
Employment impacts	**124.4**	**139.4**	**138.6**
Employment in knowledge-intensive activities	223.4	211.7	191.8
Employment fast-growing enterprises	53.8	87.8	93.8
Sales impacts	**100.6**	**88.2**	**84.8**
Medium and high tech product exports	93.0	73.8	69.7
Knowledge-intensive services exports	146.1	149.8	142.8
Sales of new-to-market/firm innovations	56.6	33.6	33.2

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Structural differences with the EU are shown in the table below. GDP per capita, the employment share in knowledge-intensive services, the turnover share of SMEs and the value added share of foreign-controlled enterprises are well above the EU average. The employment shares in manufacturing and in high and medium high-tech manufacturing, and the turnover share of large enterprises are well below the EU average

	LU	EU
Performance and structure of the economy		
GDP per capita (PPS)	75,700	28,600
Average annual GDP growth (%)	2.7	2.2
Employment share Manufacturing (NACE C) (%)	5.1	15.5
of which High and Medium high-tech (%)	20.7	37.2
Employment share Services (NACE G-N) (%)	46.2	41.6
of which Knowledge-intensive services (%)	59.2	35.0
Turnover share SMEs (%)	55.1	38.0
Turnover share large enterprises (%)	29.9	44.4
Foreign-controlled enterprises – share of value added (%)	22.3	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.1	1.5
Total Entrepreneurial Activity (TEA) (%)	9.5	6.6
FDI net inflows (% GDP)	19.2	3.6
Top R&D spending enterprises per 10 mln population	272.4	19.7
Buyer sophistication (1 to 7 best)	4.9	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	68.8	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.0	1.9
Govt. procurement of advanced tech products (1 to 7 best)	4.6	3.5
Rule of law (-2.5 to 2.5 best)	1.8	1.2
Demography		
Population size (millions)	0.6	510.1
Average annual population growth (%)	2.4	0.3
Population density (inhabitants/km²)	220.2	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	1.30	1.24	2.30
Tertiary educational attainment (% of population aged 30-34)	52.5	54.5	66.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/Luxembourg

European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-luxembourg-en.pdf

Hungary is a **Moderate Innovato**r. Over time, performance has declined relative to that of the EU in 2010

- Relative to EU in 2010
- ◆ Relative to EU in 2017
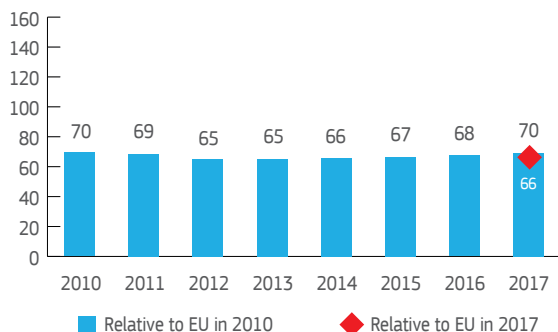
Employment and Sales impacts are the strongest innovation dimensions. Innovators and Intellectual assets are the weakest innovation dimensions.

Hungary	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	**2017**	**2017**
SUMMARY INNOVATION INDEX	69.7	69.6	65.7
Human resources	59.2	54.6	45.7
New doctorate graduates	53.8	62.4	44.8
Population with tertiary education	61.9	47.8	42.1
Lifelong learning	62.5	53.1	52.0
Attractive research systems	52.0	66.4	58.4
International scientific co-publications	87.8	141.6	87.0
Most cited publications	59.2	60.5	58.3
Foreign doctorate students	29.3	48.9	44.2
Innovation-friendly environment	85.0	117.9	88.1
Broadband penetration	100.0	177.8	100.0
Opportunity-driven entrepreneurship	76.1	82.4	76.5
Finance and support	45.8	50.0	46.4
R&D expenditure in the public sector	55.7	23.9	24.8
Venture capital expenditures	33.1	83.4	68.4
Firm investments	72.2	87.5	78.3
R&D expenditure in the business sector	52.8	73.8	66.3
Non-R&D innovation expenditures	106.1	107.1	98.0
Enterprises providing ICT training	64.3	85.7	75.0
Innovators	25.0	15.1	17.6
SMEs product/process innovations	21.2	13.7	16.7
SMEs marketing/organisational innovations	34.0	16.0	19.4
SMEs innovating in-house	19.5	15.5	16.6
Linkages	85.8	70.2	69.5
Innovative SMEs collaborating with others	59.7	50.0	49.8
Public-private co-publications	82.4	85.8	85.0
Private co-funding of public R&D exp.	116.0	73.5	72.5
Intellectual assets	35.0	39.5	39.2
PCT patent applications	36.6	36.4	38.0
Trademark applications	51.0	62.5	55.3
Design applications	21.3	25.1	26.0
Employment impacts	125.7	124.9	124.3
Employment in knowledge-intensive activities	85.7	76.6	69.4
Employment fast-growing enterprises	154.2	159.4	170.4
Sales impacts	113.4	99.0	95.1
Medium and high tech product exports	147.8	139.6	131.8
Knowledge-intensive services exports	63.1	63.6	60.7
Sales of new-to-market/firm innovations	131.4	92.1	91.2

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 data show improved performance for three indicators and reduced performance for three indicators

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. The employment share in manufacturing and the value added share of foreign-controlled enterprises are well above the EU average. GDP per capita is well below the EU average.

	HU	EU
Performance and structure of the economy		
GDP per capita (PPS)	19,400	28,600
Average annual GDP growth (%)	3.1	2.2
Employment share Manufacturing (NACE C) (%)	21.6	15.5
of which High and Medium high-tech (%)	42.7	37.2
Employment share Services (NACE G-N) (%)	36.5	41.6
of which Knowledge-intensive services (%)	29.7	35.0
Turnover share SMEs (%)	37.6	38.0
Turnover share large enterprises (%)	43.5	44.4
Foreign-controlled enterprises – share of value added (%)	30.3	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	2.1	1.5
Total Entrepreneurial Activity (TEA) (%)	7.9	6.6
FDI net inflows (% GDP)	19.8	3.6
Top R&D spending enterprises per 10 mln population	1.0	19.7
Buyer sophistication (1 to 7 best)	3.0	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	72.7	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.5	1.9
Govt. procurement of advanced tech products (1 to 7 best)	2.9	3.5
Rule of law (-2.5 to 2.5 best)	0.5	1.2
Demography		
Population size (millions)	9.8	510.1
Average annual population growth (%)	-0.3	0.3
Population density (inhabitants/km²)	106.5	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	1.39	1.21	1.80
Tertiary educational attainment (% of population aged 30-34)	32.3	32.3	34.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/Hungary
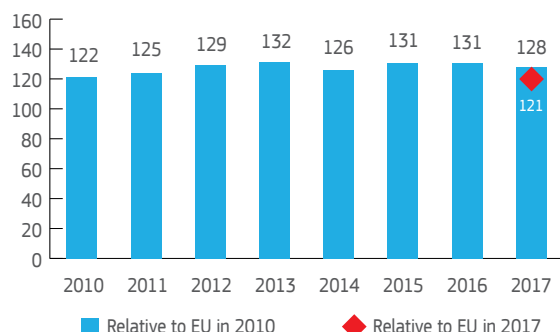**European Semester country report:**
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-hungary-en.pdf

Malta is a **Moderate Innovator.** Over time, performance has increased relative to that of the EU in 2010.

Relative to EU in 2010 ■ Relative to EU in 2017 ◆
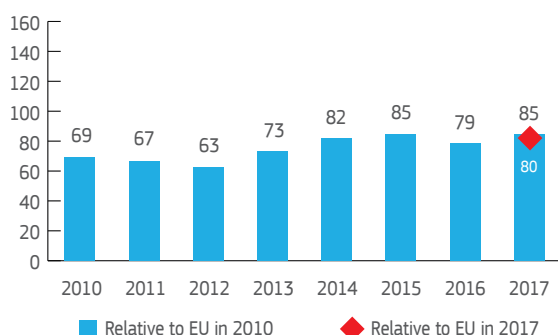
Intellectual assets and Attractive research systems are the strongest innovation dimensions. Finance and support and Linkages are the weakest innovation dimensions.

Provisional CIS 2016 data show improved performance for the two expenditure indicators and reduced performance for four indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. The turnover share of large enterprises is well below the EU average.

Malta	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	69.3	84.5	79.9
Human resources	46.3	66.5	55.8
New doctorate graduates	7.7	38.2	27.4
Population with tertiary education	45.5	72.4	63.8
Lifelong learning	93.8	93.8	91.8
Attractive research systems	50.9	161.0	141.7
International scientific co-publications	54.9	190.3	117.0
Most cited publications	57.8	105.3	101.4
Foreign doctorate students	39.6	230.3	208.0
Innovation-friendly environment	107.5	165.4	123.6
Broadband penetration	144.4	222.2	125.0
Opportunity-driven entrepreneurship	N/A	N/A	N/A
Finance and support	8.5	7.5	6.9
R&D expenditure in the public sector	6.2	13.3	13.8
Venture capital expenditures	11.4	0.0	0.0
Firm investments	101.9	79.8	71.4
R&D expenditure in the business sector	24.9	30.1	27.0
Non-R&D innovation expenditures	159.0	42.0	38.4
Enterprises providing ICT training	135.7	164.3	143.8
Innovators	57.3	67.9	79.0
SMEs product/process innovations	60.4	63.8	78.0
SMEs marketing/organisational innovations	51.4	68.9	83.1
SMEs innovating in-house	60.4	70.9	76.0
Linkages	30.5	11.9	11.8
Innovative SMEs collaborating with others	40.0	29.9	29.7
Public-private co-publications	42.5	0.0	0.0
Private co-funding of public R&D exp.	7.8	6.7	6.6
Intellectual assets	73.2	168.3	166.8
PCT patent applications	33.6	35.5	37.1
Trademark applications	200.7	278.7	246.6
Design applications	14.2	209.9	217.4
Employment impacts	122.0	140.5	139.7
Employment in knowledge-intensive activities	128.6	164.9	149.4
Employment fast-growing enterprises	117.3	123.1	131.6
Sales impacts	105.1	56.8	54.5
Medium and high tech product exports	101.0	120.1	113.4
Knowledge-intensive services exports	97.1	33.0	31.4
Sales of new-to-market/firm innovations	119.3	9.7	9.6

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

	MT	EU
Performance and structure of the economy		
GDP per capita (PPS)	26,300	28,600
Average annual GDP growth (%)	6.0	2.2
Employment share Manufacturing (NACE C) (%)	12.6	15.5
of which High and Medium high-tech (%)	30.0	37.2
Employment share Services (NACE G-N) (%)	46.4	41.6
of which Knowledge-intensive services (%)	35.2	35.0
Turnover share SMEs (%)	45.0	38.0
Turnover share large enterprises (%)	17.6	44.4
Foreign-controlled enterprises – share of value added (%)	13.3	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.7	1.5
Total Entrepreneurial Activity (TEA) (%)	n/a	6.6
FDI net inflows (% GDP)	17.4	3.6
Top R&D spending enterprises per 10 mln population	22.7	19.7
Buyer sophistication (1 to 7 best)	3.5	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	63.8	76.9
Basic-school entrepren. education and training (1 to 5 best)	n/a	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.8	3.5
Rule of law (-2.5 to 2.5 best)	1.1	1.2
Demography		
Population size (millions)	0.5	510.1
Average annual population growth (%)	2.3	0.3
Population density (inhabitants/km²)	1477.8	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	0.77	0.61	2.00
Tertiary educational attainment (% of population aged 30-34)	26.0	30.5	33.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/Malta
**European Semester country report:**
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-malta-en.pdf

The **Netherlands** is an **Innovation Leader**. Over time, performance has increased relative to that of the EU in 2010.

For the Netherlands, fast-track CIS 2016 data are not available.

	2010	2011	2012	2013	2014	2015	2016	2017
Relative to EU in 2010	120	120	128	128	126	129	131	136 / 128

■ Relative to EU in 2010   ◆ Relative to EU in 2017

Attractive research systems and Innovation-friendly environment are the strongest innovation dimensions. Firm investments and Sales impacts are the weakest innovation dimensions.

Netherlands	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	**120.0**	**135.9**	**128.5**
Human resources	**146.1**	**174.4**	**146.1**
New doctorate graduates	115.4	167.6	120.2
Population with tertiary education	153.0	170.1	150.0
Lifelong learning	175.0	187.5	183.7
Attractive research systems	**179.0**	**207.5**	**182.6**
International scientific co-publications	345.2	546.0	335.7
Most cited publications	148.8	151.4	145.8
Foreign doctorate students	164.8	170.8	154.3
Innovation-friendly environment	**182.3**	**213.3**	**159.4**
Broadband penetration	166.7	300.0	168.8
Opportunity-driven entrepreneurship	191.6	162.0	150.3
Finance and support	**117.5**	**140.2**	**130.2**
R&D expenditure in the public sector	121.2	126.6	131.2
Venture capital expenditures	112.8	157.7	129.2
Firm investments	**80.8**	**85.4**	**76.4**
R&D expenditure in the business sector	92.1	97.4	87.4
Non-R&D innovation expenditures	69.2	10.2	9.3
Enterprises providing ICT training	78.6	135.7	118.8
Innovators	**75.8**	**109.5**	**127.3**
SMEs product/process innovations	84.7	133.5	163.3
SMEs marketing/organisational innovations	61.5	74.8	90.2
SMEs innovating in-house	81.9	122.0	130.7
Linkages	**150.6**	**152.6**	**151.2**
Innovative SMEs collaborating with others	118.0	163.1	162.2
Public-private co-publications	160.0	157.3	155.8
Private co-funding of public R&D exp.	173.2	136.9	135.0
Intellectual assets	**125.1**	**127.7**	**126.6**
PCT patent applications	162.5	157.8	164.7
Trademark applications	129.5	134.4	118.9
Design applications	86.8	94.5	97.9
Employment impacts	**121.2**	**115.9**	**115.3**
Employment in knowledge-intensive activities	148.1	148.1	134.1
Employment fast-growing enterprises	102.1	93.0	99.4
Sales impacts	**82.6**	**95.5**	**91.7**
Medium and high tech product exports	69.0	86.1	81.2
Knowledge-intensive services exports	118.8	122.0	116.3
Sales of new-to-market/firm innovations	56.4	75.7	74.9

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Structural differences with the EU are shown in the table below. GDP per capita and the turnover share of SMEs are well above the EU average. The employment share in manufacturing is well below the EU average.

	NL	EU
Performance and structure of the economy		
GDP per capita (PPS)	36,800	28,600
Average annual GDP growth (%)	2.7	2.2
Employment share Manufacturing (NACE C) (%)	10.2	15.5
of which High and Medium high-tech (%)	29.9	37.2
Employment share Services (NACE G-N) (%)	46.3	41.6
of which Knowledge-intensive services (%)	39.8	35.0
Turnover share SMEs (%)	48.0	38.0
Turnover share large enterprises (%)	37.3	44.4
Foreign-controlled enterprises – share of value added (%)	14.7	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.1	1.5
Total Entrepreneurial Activity (TEA) (%)	9.4	6.6
FDI net inflows (% GDP)	17.5	3.6
Top R&D spending enterprises per 10 mln population	28.6	19.7
Buyer sophistication (1 to 7 best)	4.4	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	76.2	76.9
Basic-school entrepren. education and training (1 to 5 best)	3.2	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.9	3.5
Rule of law (-2.5 to 2.5 best)	1.9	1.2
Demography		
Population size (millions)	17.0	510.1
Average annual population growth (%)	0.5	0.3
Population density (inhabitants/km^2)	500.6	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	1.95	2.03	2.50
Tertiary educational attainment (% of population aged 30-34)	43.2	47.1	40.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/Netherlands
European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-netherland-en.pdf

Austria is a **Strong Innovator**. Over time, performance has increased relative to that of the EU in 2010.

Relative to EU in 2010 ◼
Relative to EU in 2017 ◆

Provisional CIS 2016 show improved performance for four indicators. There are no fast-track data for the other two indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

Intellectual assets and Linkages are the strongest innovation dimensions. Employment and Sales impacts are the weakest innovation dimensions.

Austria	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	**112.4**	**121.3**	**114.7**
Human resources	**129.1**	**134.6**	**112.8**
New doctorate graduates	146.2	130.4	93.6
Population with tertiary education	109.0	123.1	108.6
Lifelong learning	132.3	153.1	150.0
Attractive research systems	**137.0**	**157.4**	**138.5**
International scientific co-publications	291.7	458.9	282.1
Most cited publications	113.6	110.7	106.6
Foreign doctorate students	116.9	120.1	108.5
Innovation-friendly environment	**120.2**	**116.0**	**86.7**
Broadband penetration	133.3	144.4	81.3
Opportunity-driven entrepreneurship	112.4	99.2	92.1
Finance and support	**83.7**	**98.8**	**91.8**
R&D expenditure in the public sector	117.7	126.6	131.2
Venture capital expenditures	40.1	63.3	51.8
Firm investments	**131.9**	**150.7**	**134.8**
R&D expenditure in the business sector	150.7	188.2	169.0
Non-R&D innovation expenditures	61.0	61.5	56.3
Enterprises providing ICT training	171.4	185.7	162.5
Innovators	**115.7**	**122.1**	**141.9**
SMEs product/process innovations	119.0	124.0	151.6
SMEs marketing/organisational innovations	109.6	120.8	145.8
SMEs innovating in-house	118.9	121.6	130.3
Linkages	**121.8**	**144.9**	**143.5**
Innovative SMEs collaborating with others	135.4	193.3	192.3
Public-private co-publications	134.5	143.1	141.8
Private co-funding of public R&D exp.	94.1	97.7	96.3
Intellectual assets	**155.3**	**147.5**	**146.2**
PCT patent applications	118.5	127.3	132.9
Trademark applications	171.5	166.7	147.5
Design applications	177.5	151.9	157.4
Employment impacts	**74.9**	**66.0**	**65.6**
Employment in knowledge-intensive activities	111.7	120.8	109.4
Employment fast-growing enterprises	48.7	26.9	28.7
Sales impacts	**70.3**	**82.8**	**79.6**
Medium and high tech product exports	98.8	109.7	103.6
Knowledge-intensive services exports	33.0	51.8	49.4
Sales of new-to-market/firm innovations	80.1	87.3	86.4

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Data in red show a decline in performance compared to 2010.
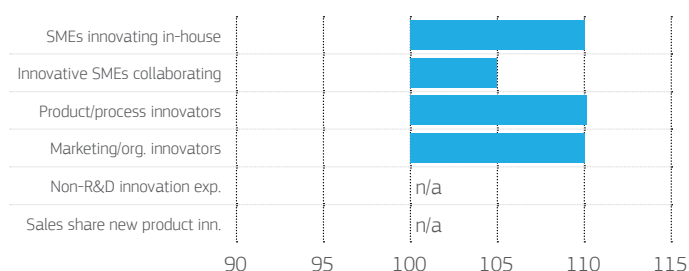
Structural differences with the EU are shown in the table below. GDP per capita, the turnover share of SMEs, and the value added share of foreign-controlled enterprises are well above the EU average. The turnover share of large enterprises is well below the EU average.

	AT	EU
Performance and structure of the economy		
GDP per capita (PPS)	37,000	28,600
Average annual GDP growth (%)	2.2	2.2
Employment share Manufacturing (NACE C) (%)	15.9	15.5
of which High and Medium high-tech (%)	38.0	37.2
Employment share Services (NACE G-N) (%)	41.6	41.6
of which Knowledge-intensive services (%)	32.1	35.0
Turnover share SMEs (%)	48.7	38.0
Turnover share large enterprises (%)	33.9	44.4
Foreign-controlled enterprises – share of value added (%)	15.0	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.4	1.5
Total Entrepreneurial Activity (TEA) (%)	9.6	6.6
FDI net inflows (% GDP)	-3.2	3.6
Top R&D spending enterprises per 10 mln population	33.0	19.7
Buyer sophistication (1 to 7 best)	3.8	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	78.7	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.4	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.5	3.5
Rule of law (-2.5 to 2.5 best)	1.9	1.2
Demography		
Population size (millions)	8.7	510.1
Average annual population growth (%)	1.1	0.3
Population density (inhabitants/km²)	104.8	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	2.95	3.09	3.76
Tertiary educational attainment (% of population aged 30-34)	21.9	40.5	38.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/Austria
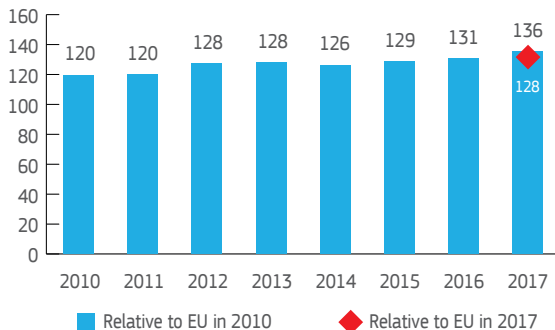**European Semester country report:**
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-austria-en.pdf

Poland is a **Moderate Innovator**. Over time, performance has increased relative to that of the EU in 2010.

Legend: ■ Relative to EU in 2010   ◆ Relative to EU in 2017
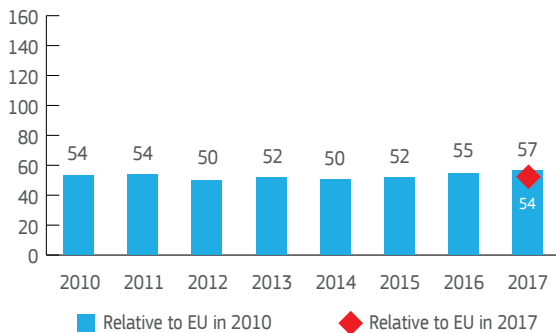
Innovation-friendly environment and Employment impacts are the strongest innovation dimensions. Innovators and Attractive research systems are the weakest innovation dimensions.

Poland	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	**53.5**	**56.7**	**53.6**
Human resources	**75.1**	**72.2**	**60.5**
New doctorate graduates	46.2	33.3	23.9
Population with tertiary education	140.3	147.8	130.3
Lifelong learning	33.3	30.2	29.6
Attractive research systems	**21.7**	**33.4**	**29.4**
International scientific co-publications	44.0	86.4	53.1
Most cited publications	24.9	38.7	37.3
Foreign doctorate students	9.4	7.5	6.8
Innovation-friendly environment	**39.1**	**127.2**	**95.1**
Broadband penetration	77.8	144.4	81.3
Opportunity-driven entrepreneurship	16.2	117.0	108.6
Finance and support	**44.6**	**33.2**	**30.8**
R&D expenditure in the public sector	57.5	29.2	30.3
Venture capital expenditures	28.0	38.2	31.3
Firm investments	**72.1**	**90.6**	**81.0**
R&D expenditure in the business sector	12.6	51.1	45.9
Non-R&D innovation expenditures	190.7	188.8	172.7
Enterprises providing ICT training	35.7	50.0	43.8
Innovators	**25.6**	**2.9**	**3.4**
SMEs product/process innovations	24.3	5.9	7.3
SMEs marketing/organisational innovations	27.7	3.0	3.6
SMEs innovating in-house	24.8	0.0	0.0
Linkages	**47.9**	**37.9**	**37.6**
Innovative SMEs collaborating with others	52.1	23.0	22.9
Public-private co-publications	34.2	36.6	36.2
Private co-funding of public R&D exp.	58.5	54.5	53.8
Intellectual assets	**52.0**	**75.2**	**74.5**
PCT patent applications	9.6	18.8	19.6
Trademark applications	50.7	80.5	71.2
Design applications	92.6	124.2	128.7
Employment impacts	**91.6**	**92.5**	**91.9**
Employment in knowledge-intensive activities	42.9	59.7	54.1
Employment fast-growing enterprises	126.4	115.8	123.8
Sales impacts	**67.4**	**55.3**	**53.1**
Medium and high tech product exports	90.4	83.9	79.2
Knowledge-intensive services exports	45.2	45.8	43.7
Sales of new-to-market/firm innovations	66.2	32.7	32.3

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 data show improved performance for three indicators and reduced performance for three indicators

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. The employment share in manufacturing is well above the EU average. GDP per capita and the employment share in high and medium high-tech manufacturing are well below the EU average.

	PL	EU
Performance and structure of the economy		
GDP per capita (PPS)	19,400	28,600
Average annual GDP growth (%)	3.7	2.2
Employment share Manufacturing (NACE C) (%)	19.7	15.5
of which High and Medium high-tech (%)	27.6	37.2
Employment share Services (NACE G-N) (%)	34.8	41.6
of which Knowledge-intensive services (%)	29.6	35.0
Turnover share SMEs (%)	35.1	38.0
Turnover share large enterprises (%)	44.1	44.4
Foreign-controlled enterprises – share of value added (%)	14.5	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.9	1.5
Total Entrepreneurial Activity (TEA) (%)	9.6	6.6
FDI net inflows (% GDP)	3.4	3.6
Top R&D spending enterprises per 10 mln population	0.4	19.7
Buyer sophistication (1 to 7 best)	3.3	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	76.8	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.6	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.1	3.5
Rule of law (-2.5 to 2.5 best)	0.8	1.2
Demography		
Population size (millions)	38.0	510.1
Average annual population growth (%)	0.0	0.3
Population density (inhabitants/km²)	123.9	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	0.87	0.97	1.70
Tertiary educational attainment (% of population aged 30-34)	40.5	45.6	45.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
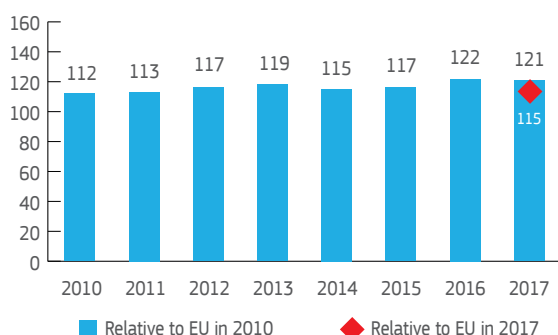https://rio.jrc.ec.europa.eu/en/country-analysis/Poland
European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-poland-en_1.pdf

Portugal is a **Moderate Innovator**. Over time, performance has declined relative to that of the EU in 2010.

Relative to EU in 2010 ■ Relative to EU in 2017 ◆
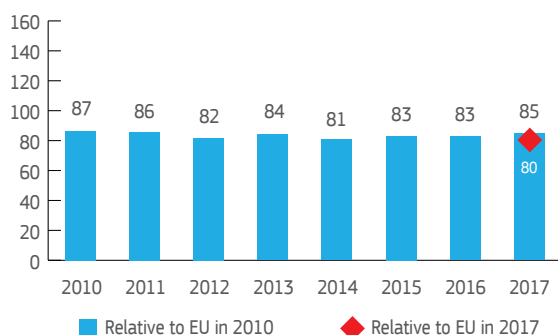
Innovation-friendly environment and Innovators are the strongest innovation dimensions. Sales impacts and Linkages are the weakest innovation dimensions.

Portugal	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	**2017**	**2017**
SUMMARY INNOVATION INDEX	**86.7**	**85.2**	**80.5**
Human resources	**123.1**	**100.0**	**83.8**
New doctorate graduates	200.0	131.0	94.0
Population with tertiary education	56.7	76.1	67.1
Lifelong learning	108.3	90.6	88.8
Attractive research systems	**81.4**	**120.9**	**106.4**
International scientific co-publications	146.0	301.2	185.2
Most cited publications	86.6	85.8	82.6
Foreign doctorate students	51.6	108.9	98.3
Innovation-friendly environment	**104.0**	**178.2**	**133.2**
Broadband penetration	144.4	355.6	200.0
Opportunity-driven entrepreneurship	80.0	73.0	67.8
Finance and support	**80.3**	**70.1**	**65.1**
R&D expenditure in the public sector	92.9	85.8	89.0
Venture capital expenditures	64.0	50.0	41.0
Firm investments	**94.5**	**83.5**	**74.7**
R&D expenditure in the business sector	61.6	49.3	44.3
Non-R&D innovation expenditures	95.6	90.0	82.4
Enterprises providing ICT training	128.6	114.3	100.0
Innovators	**127.8**	**99.9**	**116.1**
SMEs product/process innovations	154.2	129.9	158.8
SMEs marketing/organisational innovations	113.2	92.7	112.0
SMEs innovating in-house	117.6	78.8	84.4
Linkages	**70.0**	**54.9**	**54.3**
Innovative SMEs collaborating with others	121.4	65.7	65.4
Public-private co-publications	56.8	57.3	56.8
Private co-funding of public R&D exp.	32.5	41.2	40.6
Intellectual assets	**64.5**	**74.0**	**73.4**
PCT patent applications	16.5	25.7	26.8
Trademark applications	75.8	115.9	102.5
Design applications	101.0	87.8	91.0
Employment impacts	**49.2**	**82.8**	**82.3**
Employment in knowledge-intensive activities	44.2	63.6	57.6
Employment fast-growing enterprises	52.9	96.5	103.2
Sales impacts	**70.3**	**44.9**	**43.1**
Medium and high tech product exports	48.3	54.1	51.0
Knowledge-intensive services exports	47.4	47.6	45.4
Sales of new-to-market/firm innovations	122.8	30.9	30.6

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 show improved performance for all six indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. GDP per capita and the employment share in high and medium high-tech manufacturing are well below the EU average

	PT	EU
Performance and structure of the economy		
GDP per capita (PPS)	22,000	28,600
Average annual GDP growth (%)	2.1	2.2
Employment share Manufacturing (NACE C) (%)	17.0	15.5
of which High and Medium high-tech (%)	18.0	37.2
Employment share Services (NACE G-N) (%)	41.0	41.6
of which Knowledge-intensive services (%)	31.0	35.0
Turnover share SMEs (%)	n/a	38.0
Turnover share large enterprises (%)	n/a	44.4
Foreign-controlled enterprises – share of value added (%)	10.2	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.7	1.5
Total Entrepreneurial Activity (TEA) (%)	8.8	6.6
FDI net inflows (% GDP)	3.8	3.6
Top R&D spending enterprises per 10 mln population	4.8	19.7
Buyer sophistication (1 to 7 best)	3.6	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	77.0	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.8	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.6	3.5
Rule of law (-2.5 to 2.5 best)	1.1	1.2
Demography		
Population size (millions)	10.3	510.1
Average annual population growth (%)	-0.3	0.3
Population density (inhabitants/km²)	112.9	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	1.33	1.27	2.70
Tertiary educational attainment (% of population aged 30-34)	30.0	33.9	40.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/Portugal
European Semestercountry report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-portugal-en.pdf

Romania is a **Modest Innovator**. Over time, performance has declined relative to that of the EU in 2010.
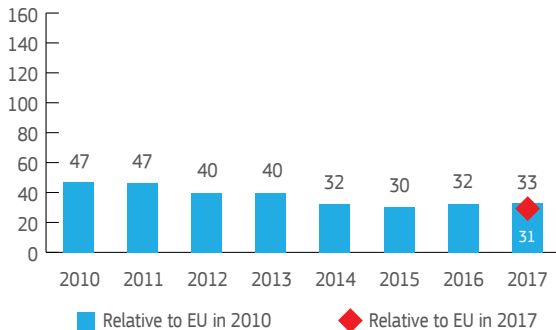
Innovation-friendly environment and Sales impacts are the strongest innovation dimensions. Innovators and Firm investments are the weakest innovation dimensions.

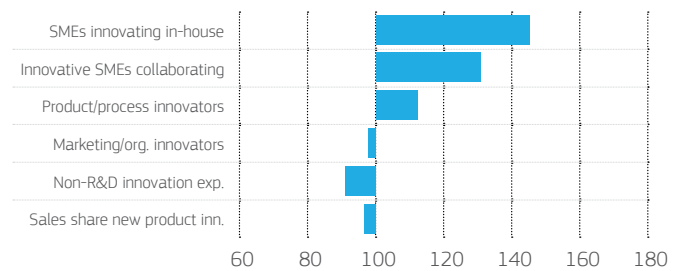| Romania	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	2017	2017
SUMMARY INNOVATION INDEX	46.9	32.9	31.1
Human resources	40.7	22.5	18.8
New doctorate graduates	100.0	49.9	35.8
Population with tertiary education	11.9	13.4	11.8
Lifelong learning	3.1	0.0	0.0
Attractive research systems	22.8	29.7	26.1
International scientific co-publications	22.7	46.8	28.8
Most cited publications	30.2	35.6	34.3
Foreign doctorate students	12.3	15.3	13.8
Innovation-friendly environment	81.1	96.8	72.3
Broadband penetration	122.2	188.9	106.3
Opportunity-driven entrepreneurship	56.7	42.2	39.1
Finance and support	48.3	22.4	20.8
R&D expenditure in the public sector	27.4	9.7	10.1
Venture capital expenditures	75.1	38.6	31.6
Firm investments	64.9	13.3	11.9
R&D expenditure in the business sector	11.8	19.6	17.6
Non-R&D innovation expenditures	209.4	21.3	19.5
Enterprises providing ICT training	0.0	0.0	0.0
Innovators	39.1	0.0	0.0
SMEs product/process innovations	26.4	0.0	0.0
SMEs marketing/organisational innovations	52.0	0.0	0.0
SMEs innovating in-house	38.0	0.0	0.0
Linkages	53.7	38.1	37.7
Innovative SMEs collaborating with others	10.7	5.8	5.8
Public-private co-publications	46.2	30.4	30.1
Private co-funding of public R&D exp.	105.3	79.1	78.0
Intellectual assets	8.6	22.5	22.3
PCT patent applications	4.2	5.9	6.1
Trademark applications	14.3	35.4	31.3
Design applications	8.4	28.4	29.4
Employment impacts	18.8	34.7	34.6
Employment in knowledge-intensive activities	3.9	26.0	23.5
Employment fast-growing enterprises	29.5	41.0	43.8
Sales impacts	83.4	66.6	64.0
Medium and high tech product exports	90.1	103.4	97.7
Knowledge-intensive services exports	48.8	57.9	55.2
Sales of new-to-market/firm innovations	115.9	33.2	32.9

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 data show reduced performance for all six indicators, in particular for Non-R&D innovation expenditures.

Provisional CIS 2016 vs CIS 2014 (=100)
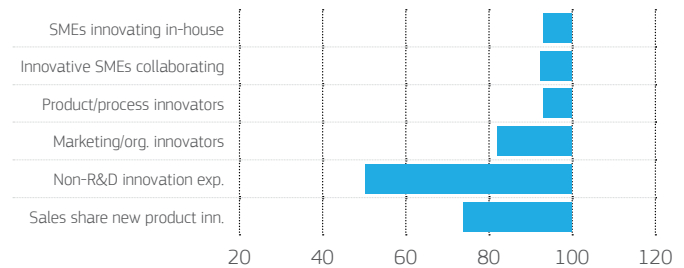
Structural differences with the EU are shown in the table below. The value added share of foreign-controlled enterprises is well above the EU average. GDP per capita and the employment shares in services and in knowledge-intensive services are well below the EU average.

	RO	EU
Performance and structure of the economy		
GDP per capita (PPS)	16,200	28,600
Average annual GDP growth (%)	5.9	2.2
Employment share Manufacturing (NACE C) (%)	18.5	15.5
of which High and Medium high-tech (%)	30.0	37.2
Employment share Services (NACE G-N) (%)	29.7	41.6
of which Knowledge-intensive services (%)	27.4	35.0
Turnover share SMEs (%)	42.4	38.0
Turnover share large enterprises (%)	41.6	44.4
Foreign-controlled enterprises – share of value added (%)	18.1	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	3.1	1.5
Total Entrepreneurial Activity (TEA) (%)	10.8	6.6
FDI net inflows (% GDP)	2.4	3.6
Top R&D spending enterprises per 10 mln population	0.3	19.7
Buyer sophistication (1 to 7 best)	2.8	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	74.3	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.4	1.9
Govt. procurement of advanced tech products (1 to 7 best)	2.9	3.5
Rule of law (-2.5 to 2.5 best)	0.2	1.2
Demography		
Population size (millions)	19.8	510.1
Average annual population growth (%)	-0.6	0.3
Population density (inhabitants/km²)	85.6	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	0.39	0.48	2.00
Tertiary educational attainment (% of population aged 30-34)	22.9	26.3	26.7

1 Sources are provided in the introduction to the country profiles.

**RIO country report:**
https://rio.jrc.ec.europa.eu/en/country-analysis/Romania
European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-romania-en.pdf

Slovenia is a **Strong Innovator**. Over time, performance has increased relative to that of the EU in 2010.

Provisional CIS 2016 show reduced performance for five indicators. For Product/process innovators a comparison with 2014 is not possible due to missing 2014 data.

Provisional CIS 2016 vs CIS 2014 (=100)

Human resources and Firm investments are the strongest innovation dimensions. Finance and support, Sales and Employment impacts are the weakest innovation dimensions.

Slovenia	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	**96.2**	**97.6**	**92.2**
Human resources	**119.6**	**171.4**	**143.6**
New doctorate graduates	100.0	235.9	169.2
Population with tertiary education	106.0	154.5	136.2
Lifelong learning	159.4	113.5	111.2
Attractive research systems	**75.1**	**102.5**	**90.2**
International scientific co-publications	230.9	375.7	231.0
Most cited publications	65.2	80.1	77.1
Foreign doctorate students	35.6	40.5	36.5
Innovation-friendly environment	**121.1**	**117.3**	**87.7**
Broadband penetration	144.4	177.8	100.0
Opportunity-driven entrepreneurship	107.3	81.4	75.6
Finance and support	**53.5**	**36.0**	**33.4**
R&D expenditure in the public sector	85.8	59.3	61.5
Venture capital expenditures	12.1	6.1	5.0
Firm investments	**143.1**	**135.3**	**121.0**
R&D expenditure in the business sector	152.4	128.0	114.9
Non-R&D innovation expenditures	114.5	118.5	108.4
Enterprises providing ICT training	157.1	157.1	137.5
Innovators	**86.8**	**82.2**	**95.6**
SMEs product/process innovations	82.3	89.1	109.0
SMEs marketing/organisational innovations	98.1	77.1	93.0
SMEs innovating in-house	79.7	81.0	86.8
Linkages	**127.7**	**113.4**	**112.3**
Innovative SMEs collaborating with others	130.8	119.9	119.2
Public-private co-publications	137.7	118.2	117.1
Private co-funding of public R&D exp.	113.7	101.4	100.0
Intellectual assets	**88.1**	**80.9**	**80.2**
PCT patent applications	80.6	44.7	46.6
Trademark applications	134.7	147.7	130.7
Design applications	60.0	64.7	67.0
Employment impacts	**66.8**	**75.8**	**75.4**
Employment in knowledge-intensive activities	93.5	103.9	94.1
Employment fast-growing enterprises	47.8	55.7	59.5
Sales impacts	**86.6**	**78.1**	**75.0**
Medium and high tech product exports	103.9	106.8	100.9
Knowledge-intensive services exports	31.8	37.2	35.5
Sales of new-to-market/firm innovations	130.1	91.8	90.8

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Structural differences with the EU are shown in the table below. The employment share in manufacturing and the turnover share of SMEs are well above the EU average. The turnover share of large enterprises is well below the EU average.

	SI	EU
Performance and structure of the economy		
GDP per capita (PPS)	23,500	28,600
Average annual GDP growth (%)	4.1	2.2
Employment share Manufacturing (NACE C) (%)	24.0	15.5
of which High and Medium high-tech (%)	38.7	37.2
Employment share Services (NACE G-N) (%)	35.7	41.6
of which Knowledge-intensive services (%)	34.8	35.0
Turnover share SMEs (%)	46.8	38.0
Turnover share large enterprises (%)	31.9	44.4
Foreign-controlled enterprises – share of value added (%)	13.7	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	1.1	1.5
Total Entrepreneurial Activity (TEA) (%)	6.9	6.6
FDI net inflows (% GDP)	3.1	3.6
Top R&D spending enterprises per 10 mln population	17.8	19.7
Buyer sophistication (1 to 7 best)	3.3	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	74.9	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.8	1.9
Govt. procurement of advanced tech products (1 to 7 best)	2.7	3.5
Rule of law (-2.5 to 2.5 best)	1.0	1.2
Demography		
Population size (millions)	2.1	510.1
Average annual population growth (%)	0.1	0.3
Population density (inhabitants/km²)	102.4	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	2.58	2.00	3.00
Tertiary educational attainment (% of population aged 30-34)	40.1	46.8	40.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/Slovenia
**European Semester country report:**
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-slovenia-en.pdf

Slovakia is a **Moderate Innovator**. Over time, performance has increased relative to that of the EU in 2010.

- Relative to EU in 2010 ◆ Relative to EU in 2017
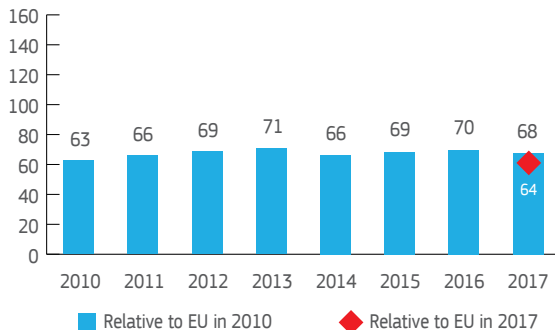
Employment and Sales impacts are the strongest innovation dimensions. Finance and support and Innovators are the weakest innovation dimensions.

Slovakia	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	**63.0**	**67.8**	**64.0**
Human resources	**76.9**	**92.6**	**77.6**
New doctorate graduates	146.2	157.6	113.1
Population with tertiary education	44.8	84.3	74.3
Lifelong learning	31.3	24.0	23.5
Attractive research systems	**47.1**	**57.4**	**50.5**
International scientific co-publications	85.5	135.5	83.3
Most cited publications	49.7	52.1	50.1
Foreign doctorate students	30.1	38.2	34.5
Innovation-friendly environment	**64.2**	**79.3**	**59.3**
Broadband penetration	100.0	133.3	75.0
Opportunity-driven entrepreneurship	43.0	47.4	44.0
Finance and support	**17.0**	**29.7**	**27.6**
R&D expenditure in the public sector	22.1	41.6	43.1
Venture capital expenditures	10.5	14.5	11.9
Firm investments	**83.4**	**63.7**	**57.0**
R&D expenditure in the business sector	12.6	31.0	27.8
Non-R&D innovation expenditures	102.1	78.9	72.2
Enterprises providing ICT training	142.9	85.7	75.0
Innovators	**40.8**	**29.2**	**33.9**
SMEs product/process innovations	30.8	20.8	25.4
SMEs marketing/organisational innovations	60.6	40.5	48.9
SMEs innovating in-house	30.3	25.6	27.4
Linkages	**58.3**	**68.7**	**68.0**
Innovative SMEs collaborating with others	45.8	72.4	72.0
Public-private co-publications	60.0	50.6	50.2
Private co-funding of public R&D exp.	69.0	84.7	83.6
Intellectual assets	**27.8**	**35.6**	**35.3**
PCT patent applications	9.2	13.7	14.3
Trademark applications	47.0	68.0	60.2
Design applications	30.7	31.7	32.9
Employment impacts	**118.4**	**119.2**	**118.6**
Employment in knowledge-intensive activities	61.0	63.6	57.6
Employment fast-growing enterprises	159.4	158.9	169.9
Sales impacts	**92.8**	**105.4**	**101.2**
Medium and high tech product exports	121.5	133.7	126.2
Knowledge-intensive services exports	36.0	31.6	30.2
Sales of new-to-market/firm innovations	125.0	157.8	156.1

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 data show improved performance for four indicators and reduced performance for two indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. The employment share in manufacturing and the value added share of foreign-controlled enterprises are well above the EU average. GDP per capita and the employment share in knowledge-intensive services are well below the EU average.

	SK	EU
Performance and structure of the economy		
GDP per capita (PPS)	22,000	28,600
Average annual GDP growth (%)	3.3	2.2
Employment share Manufacturing (NACE C) (%)	24.2	15.5
of which High and Medium high-tech (%)	42.4	37.2
Employment share Services (NACE G-N) (%)	34.4	41.6
of which Knowledge-intensive services (%)	27.9	35.0
Turnover share SMEs (%)	35.6	38.0
Turnover share large enterprises (%)	44.0	44.4
Foreign-controlled enterprises – share of value added (%)	19.2	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	2.1	1.5
Total Entrepreneurial Activity (TEA) (%)	10.3	6.6
FDI net inflows (% GDP)	1.8	3.6
Top R&D spending enterprises per 10 mln population	0.0	19.7
Buyer sophistication (1 to 7 best)	2.9	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	75.1	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.0	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.1	3.5
Rule of law (-2.5 to 2.5 best)	0.6	1.2
Demography		
Population size (millions)	5.4	510.1
Average annual population growth (%)	0.1	0.3
Population density (inhabitants/km²)	110.9	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	0.82	0.79	1.20
Tertiary educational attainment (% of population aged 30-34)	26.9	33.6	40.0

1 Sources are provided in the introduction to the country profiles.

RIO country report:
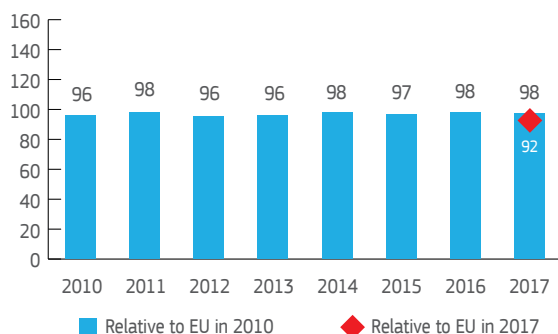https://rio.jrc.ec.europa.eu/en/country-analysis/Slovakia
European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-slovakia-en.pdf

Finland is an **Innovation Leader**. Over time, performance has increased relative to that of the EU in 2010.

| | Relative to EU in 2010 | Relative to EU in 2017 |

Innovation-friendly environment and Human resources are the strongest innovation dimensions. Sales and Employment impacts are the weakest innovation dimensions.
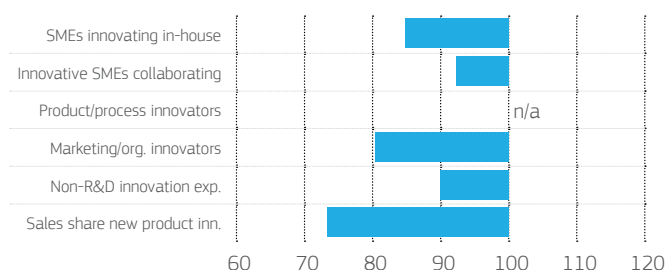
Provisional CIS 2016 show improved performance for all six indicators, in particular for Non-R&D innovation expenditures.

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. All indicators are close to the EU average.

FInland	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	**133.3**	**136.1**	**128.7**
Human resources	**184.3**	**197.1**	**165.2**
New doctorate graduates	207.7	205.6	147.5
Population with tertiary education	123.1	123.1	108.6
Lifelong learning	228.1	274.0	268.4
Attractive research systems	**107.4**	**156.6**	**137.8**
International scientific co-publications	339.4	556.6	342.2
Most cited publications	99.2	107.0	103.0
Foreign doctorate students	39.1	89.7	81.0
Innovation-friendly environment	**149.3**	**245.7**	**183.7**
Broadband penetration	233.3	355.6	200.0
Opportunity-driven entrepreneurship	99.4	180.6	167.7
Finance and support	**176.7**	**118.7**	**110.3**
R&D expenditure in the public sector	158.4	133.6	138.5
Venture capital expenditures	200.1	99.6	81.6
Firm investments	**185.0**	**148.1**	**132.5**
R&D expenditure in the business sector	222.3	154.2	138.4
Non-R&D innovation expenditures	77.3	36.1	33.0
Enterprises providing ICT training	235.7	235.7	206.3
Innovators	**112.3**	**121.7**	**141.4**
SMEs product/process innovations	128.8	138.5	169.4
SMEs marketing/organisational innovations	71.3	90.9	109.7
SMEs innovating in-house	138.2	136.9	146.7
Linkages	**143.2**	**133.9**	**132.6**
Innovative SMEs collaborating with others	141.4	156.2	155.4
Public-private co-publications	149.1	145.8	144.5
Private co-funding of public R&D exp.	138.6	98.3	96.9
Intellectual assets	**146.7**	**148.1**	**146.7**
PCT patent applications	223.7	201.4	210.2
Trademark applications	112.9	159.4	141.0
Design applications	99.8	89.5	92.7
Employment impacts	**86.7**	**83.9**	**83.5**
Employment in knowledge-intensive activities	123.4	136.4	123.5
Employment fast-growing enterprises	60.5	46.5	49.7
Sales impacts	**82.0**	**80.8**	**77.6**
Medium and high tech product exports	72.5	71.9	67.9
Knowledge-intensive services exports	56.4	107.0	102.1
Sales of new-to-market/firm innovations	123.1	60.6	59.9

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

	FI	EU
Performance and structure of the economy		
GDP per capita (PPS)	31,400	28,600
Average annual GDP growth (%)	2.4	2.2
Employment share Manufacturing (NACE C) (%)	13.5	15.5
of which High and Medium high-tech (%)	36.0	37.2
Employment share Services (NACE G-N) (%)	39.9	41.6
of which Knowledge-intensive services (%)	38.8	35.0
Turnover share SMEs (%)	39.8	38.0
Turnover share large enterprises (%)	44.9	44.4
Foreign-controlled enterprises – share of value added (%)	10.5	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.3	1.5
Total Entrepreneurial Activity (TEA) (%)	6.7	6.6
FDI net inflows (% GDP)	3.2	3.6
Top R&D spending enterprises per 10 mln population	71.9	19.7
Buyer sophistication (1 to 7 best)	4.6	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	80.8	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.3	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.9	3.5
Rule of law (-2.5 to 2.5 best)	2.1	1.2
Demography		
Population size (millions)	5.4	510.1
Average annual population growth (%)	0.1	0.3
Population density (inhabitants/km^2)	110.9	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	3.29	2.75	4.00
Tertiary educational attainment (% of population aged 30-34)	45.1	45.3	42.0

*1 Sources are provided in the introduction to the country profiles.*

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/Finland
European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-finland-en.pdf

Sweden is an **Innovation Leader.** Over time, performance has increased relative to that of the EU in 2010.

Relative to EU in 2010   Relative to EU in 2017
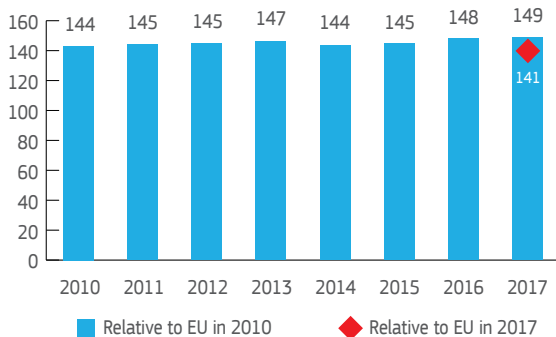
Innovation-friendly environment and Human resources are the strongest innovation dimensions. Sales impacts and Finance and support are the weakest innovation dimensions.

Sweden	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	2017	2017
SUMMARY INNOVATION INDEX	**143.5**	**149.0**	**140.8**
Human resources	**209.8**	**214.3**	**179.6**
New doctorate graduates	223.1	193.4	138.8
Population with tertiary education	165.7	176.1	155.3
Lifelong learning	245.8	284.4	278.6
Attractive research systems	**148.9**	**200.6**	**176.5**
International scientific co-publications	419.0	680.8	418.6
Most cited publications	111.1	121.8	117.3
Foreign doctorate students	109.9	147.6	133.3
Innovation-friendly environment	**186.2**	**254.8**	**190.5**
Broadband penetration	244.4	355.6	200.0
Opportunity-driven entrepreneurship	151.7	195.2	181.2
Finance and support	**162.6**	**120.1**	**111.6**
R&D expenditure in the public sector	149.6	146.0	151.4
Venture capital expenditures	179.4	86.9	71.2
Firm investments	**151.8**	**176.5**	**157.9**
R&D expenditure in the business sector	210.1	193.5	173.8
Non-R&D innovation expenditures	105.9	169.6	155.2
Enterprises providing ICT training	128.6	164.3	143.8
Innovators	**114.2**	**109.1**	**126.8**
SMEs product/process innovations	123.5	122.7	150.0
SMEs marketing/organisational innovations	89.1	83.6	100.9
SMEs innovating in-house	131.0	122.1	130.9
Linkages	**141.9**	**132.3**	**131.0**
Innovative SMEs collaborating with others	153.5	123.5	122.8
Public-private co-publications	172.1	180.3	178.6
Private co-funding of public R&D exp.	97.2	88.7	87.5
Intellectual assets	**152.6**	**158.0**	**156.6**
PCT patent applications	223.7	223.7	233.5
Trademark applications	124.9	151.1	133.7
Design applications	106.7	101.6	105.3
Employment impacts	**137.2**	**132.1**	**131.4**
Employment in knowledge-intensive activities	144.2	166.2	150.6
Employment fast-growing enterprises	132.2	107.8	115.2
Sales impacts	**90.7**	**85.5**	**82.1**
Medium and high tech product exports	97.0	99.6	94.0
Knowledge-intensive services exports	111.1	112.8	107.6
Sales of new-to-market/firm innovations	59.5	37.0	36.6

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 data show improved performance for two indicators and reduced performance for four indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. GDP per capita, the employment share in knowledge-intensive services, and the value added share of foreign-controlled enterprises are well above the EU average. The employment share in manufacturing is well below the EU average.

	SE	EU
Performance and structure of the economy		
GDP per capita (PPS)	35,500	28,600
Average annual GDP growth (%)	2.8	2.2
Employment share Manufacturing (NACE C) (%)	10.5	15.5
of which High and Medium high-tech (%)	41.7	37.2
Employment share Services (NACE G-N) (%)	41.3	41.6
of which Knowledge-intensive services (%)	43.6	35.0
Turnover share SMEs (%)	38.2	38.0
Turnover share large enterprises (%)	42.7	44.4
Foreign-controlled enterprises – share of value added (%)	15.1	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.4	1.5
Total Entrepreneurial Activity (TEA) (%)	7.3	6.6
FDI net inflows (% GDP)	1.1	3.6
Top R&D spending enterprises per 10 mln population	83.8	19.7
Buyer sophistication (1 to 7 best)	4.6	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	81.6	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.4	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.9	3.5
Rule of law (-2.5 to 2.5 best)	2.0	1.2
Demography		
Population size (millions)	9.9	510.1
Average annual population growth (%)	1.3	0.3
Population density (inhabitants/km²)	24.1	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	3.31	3.25	4.00
Tertiary educational attainment (% of population aged 30-34)	48.3	51.1	45.0

1 Sources are provided in the introduction to the country profiles.

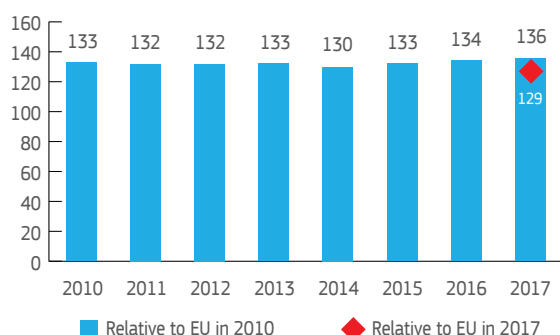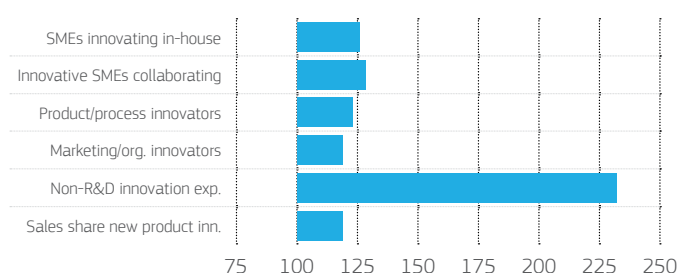**RIO country report:**
https://rio.jrc.ec.europa.eu/en/country-analysis/Sweden
European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-sweden-en.pdf

The **United Kingdom** is an **Innovation Leader**. Over time, performance has increased relative to that of the EU in 2010.

Provisional CIS 2016 show improved performance for five indicators and reduced performance for one indicator.

Provisional CIS 2016 vs CIS 2014 (=100)

Attractive research systems and Human resources are the strongest innovation dimensions. Intellectual assets and Innovation-friendly environment are the weakest innovation dimensions.

United Kingdom	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	**114.5**	**128.5**	**121.5**
Human resources	**170.5**	**180.6**	**151.4**
New doctorate graduates	153.8	221.6	159.0
Population with tertiary education	164.2	175.4	154.6
Lifelong learning	197.9	137.5	134.7
Attractive research systems	**177.8**	**196.8**	**173.2**
International scientific co-publications	245.6	405.9	249.6
Most cited publications	144.0	156.1	150.3
Foreign doctorate students	202.7	183.0	165.3
Innovation-friendly environment	**111.4**	**123.4**	**92.2**
Broadband penetration	88.9	144.4	81.3
Opportunity-driven entrepreneurship	124.7	111.0	103.0
Finance and support	**123.3**	**115.8**	**107.6**
R&D expenditure in the public sector	84.1	64.6	67.0
Venture capital expenditures	173.7	181.5	148.7
Firm investments	**98.7**	**113.9**	**101.9**
R&D expenditure in the business sector	88.6	94.8	85.1
Non-R&D innovation expenditures	33.3	95.2	87.1
Enterprises providing ICT training	164.3	150.0	131.3
Innovators	**61.2**	**85.6**	**99.5**
SMEs product/process innovations	65.0	89.0	108.8
SMEs marketing/organisational innovations	69.8	118.7	143.3
SMEs innovating in-house	48.8	48.8	52.3
Linkages	**139.1**	**134.8**	**133.5**
Innovative SMEs collaborating with others	217.4	217.4	216.3
Public-private co-publications	123.1	127.3	126.1
Private co-funding of public R&D exp.	77.4	59.3	58.4
Intellectual assets	**78.5**	**82.3**	**81.5**
PCT patent applications	92.3	83.0	86.7
Trademark applications	89.1	102.0	90.2
Design applications	57.6	66.7	69.1
Employment impacts	**140.3**	**144.8**	**144.0**
Employment in knowledge-intensive activities	150.6	166.2	150.6
Employment fast-growing enterprises	132.9	129.5	138.5
Sales impacts	**86.3**	**128.3**	**123.2**
Medium and high tech product exports	98.5	107.3	101.3
Knowledge-intensive services exports	112.7	109.9	104.8
Sales of new-to-market/firm innovations	41.1	174.5	172.7

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Data in red show a decline in performance compared to 2010.

Structural differences with the EU are shown in the table below. The turnover share of large enterprises and the value added share of foreign-controlled enterprises are well above the EU average. The employment share in manufacturing is well below the EU average.

	UK	EU
Performance and structure of the economy		
GDP per capita (PPS)	30,900	28,600
Average annual GDP growth (%)	1.8	2.2
Employment share Manufacturing (NACE C) (%)	9.7	15.5
of which High and Medium high-tech (%)	38.0	37.2
Employment share Services (NACE G-N) (%)	44.7	41.6
of which Knowledge-intensive services (%)	39.7	35.0
Turnover share SMEs (%)	31.6	38.0
Turnover share large enterprises (%)	54.9	44.4
Foreign-controlled enterprises – share of value added (%)	17.3	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	3.8	1.5
Total Entrepreneurial Activity (TEA) (%)	8.0	6.6
FDI net inflows (% GDP)	5.0	3.6
Top R&D spending enterprises per 10 mln population	42.9	19.7
Buyer sophistication (1 to 7 best)	4.7	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	82.7	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.0	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.8	3.5
Rule of law (-2.5 to 2.5 best)	1.8	1.2
Demography		
Population size (millions)	65.4	510.1
Average annual population growth (%)	0.7	0.3
Population density (inhabitants/km²)	268.5	117.1

EU targets for 2020

Indicator	2013	Latest	Target[1]
Gross domestic expenditure on R&D (% of GDP)	1.65	1.69	n/a
Tertiary educational attainment (% of population aged 30-34)	47.4	48.5	n/a

1 Sources are provided in the introduction to the country profiles.

RIO country report:
https://rio.jrc.ec.europa.eu/en/country-analysis/United%20Kingdom
European Semester country report:
https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-united-kingdom-en.pdf

Iceland is a **Strong Innovator**. Over time, performance has remained the same relative to that of the EU in 2010.

For Iceland, fast-track CIS 2016 data are not available.

| | Relative to EU in 2010 | Relative to EU in 2017 |
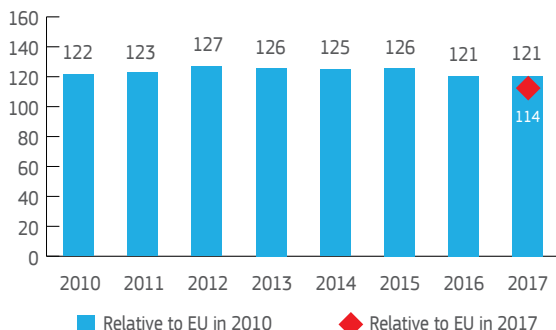
Innovation-friendly environment and Attractive research systems are the strongest innovation dimensions. Sales impacts and Intellectual assets are the weakest innovation dimensions.
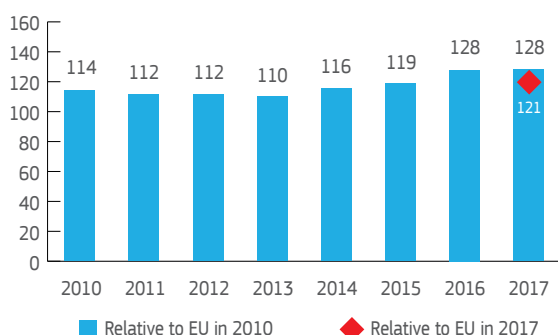
Iceland	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	**2017**	**2017**
SUMMARY INNOVATION INDEX	**121.7**	**120.8**	**114.2**
Human resources	132.7	150.3	125.9
New doctorate graduates	38.5	53.8	38.6
Population with tertiary education	126.9	177.6	156.6
Lifelong learning	253.1	234.4	229.6
Attractive research systems	**161.4**	**188.1**	**165.5**
International scientific co-publications	653.4	680.8	418.6
Most cited publications	87.2	106.7	102.8
Foreign doctorate students	97.8	134.4	121.4
Innovation-friendly environment	**264.6**	**264.6**	**197.8**
Broadband penetration	N/A	N/A	N/A
Opportunity-driven entrepreneurship	210.7	210.7	195.6
Finance and support	**124.3**	**122.3**	**113.6**
R&D expenditure in the public sector	110.6	108.9	112.8
Venture capital expenditures	N/A	N/A	N/A
Firm investments	**133.5**	**134.5**	**120.3**
R&D expenditure in the business sector	81.7	110.5	99.2
Non-R&D innovation expenditures	N/A	N/A	N/A
Enterprises providing ICT training	171.4	142.9	125.0
Innovators	**149.1**	**123.6**	**143.6**
SMEs product/process innovations	181.9	139.4	170.5
SMEs marketing/organisational innovations	120.4	110.5	133.3
SMEs innovating in-house	N/A	N/A	N/A
Linkages	**156.5**	**158.2**	**156.7**
Innovative SMEs collaborating with others	163.1	194.7	193.7
Public-private co-publications	201.3	201.3	199.5
Private co-funding of public R&D exp.	100.9	74.1	73.1
Intellectual assets	**60.2**	**57.8**	**57.3**
PCT patent applications	66.5	86.4	90.2
Trademark applications	106.3	93.2	82.4
Design applications	19.6	4.2	4.4
Employment impacts	**139.5**	**147.1**	**146.3**
Employment in knowledge-intensive activities	167.5	176.6	160.0
Employment fast-growing enterprises	N/A	N/A	N/A
Sales impacts	**55.3**	**36.6**	**35.1**
Medium and high tech product exports	0.0	0.0	0.0
Knowledge-intensive services exports	84.7	80.2	76.5
Sales of new-to-market/firm innovations	86.4	28.9	28.6

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Structural differences with the EU are shown in the table below. GDP per capita is well above the EU average. The employment shares in manufacturing and in high and medium high-tech manufacturing are well below the EU average.

	IS	EU
Performance and structure of the economy		
GDP per capita (PPS)	35,400	28,600
Average annual GDP growth (%)	5.5	2.2
Employment share Manufacturing (NACE C) (%)	10.5	15.5
of which High and Medium high-tech (%)	15.8	37.2
Employment share Services (NACE G-N) (%)	44.0	41.6
of which Knowledge-intensive services (%)	39.4	35.0
Turnover share SMEs (%)	n/a	38.0
Turnover share large enterprises (%)	n/a	44.4
Foreign-controlled enterprises – share of value added (%)	n/a	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	n/a	1.5
Total Entrepreneurial Activity (TEA) (%)	n/a	6.6
FDI net inflows (% GDP)	1.8	3.6
Top R&D spending enterprises per 10 mln population	30.4	19.7
Buyer sophistication (1 to 7 best)	4.1	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	78.8	76.9
Basic-school entrepren. education and training (1 to 5 best)	n/a	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.6	3.5
Rule of law (-2.5 to 2.5 best)	1.6	1.2
Demography		
Population size (millions)	0.3	510.1
Average annual population growth (%)	1.4	0.3
Population density (inhabitants/km²)	3.3	117.1

RIO country report:

https://rio.jrc.ec.europa.eu/en/country-analysis/Iceland

Israel is a **Strong Innovator**. Over time, performance has declined relative to that of the EU in 2010.

| | Relative to EU in 2010 | Relative to EU in 2017 |
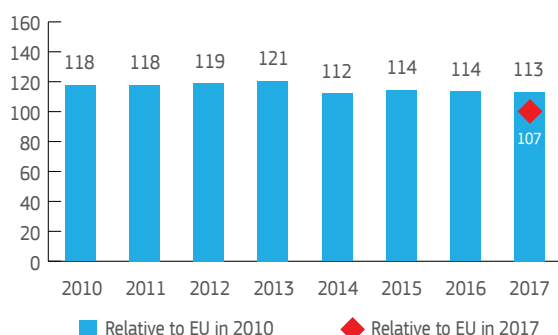
Firm investments and Employment impacts are the strongest innovation dimensions. Finance and support and Innovation-friendly environment are the weakest innovation dimensions.
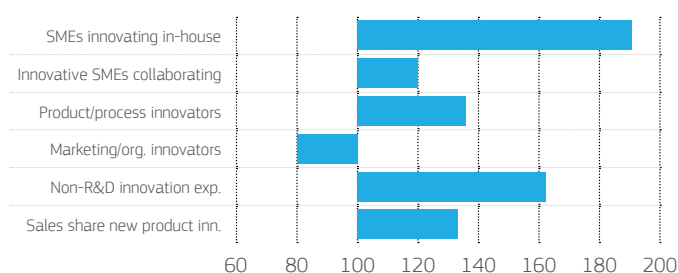
Israel	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	**117.9**	**113.4**	**107.2**
Human resources	**93.9**	**105.1**	**88.1**
New doctorate graduates	87.8	98.2	70.5
Population with tertiary education	N/A	N/A	N/A
Lifelong learning	N/A	N/A	N/A
Attractive research systems	**117.2**	**130.6**	**115.0**
International scientific co-publications	235.4	297.4	182.8
Most cited publications	94.9	97.4	93.8
Foreign doctorate students	N/A	N/A	N/A
Innovation-friendly environment	**97.9**	**112.3**	**83.9**
Broadband penetration	N/A	N/A	N/A
Opportunity-driven entrepreneurship	77.9	89.4	83.0
Finance and support	**49.9**	**45.6**	**42.3**
R&D expenditure in the public sector	83.2	73.8	76.5
Venture capital expenditures	7.1	9.3	7.6
Firm investments	**243.9**	**243.9**	**218.2**
R&D expenditure in the business sector	222.3	222.3	199.6
Non-R&D innovation expenditures	N/A	N/A	N/A
Enterprises providing ICT training	N/A	N/A	N/A
Innovators	**116.0**	**74.6**	**86.7**
SMEs product/process innovations	82.2	44.3	54.2
SMEs marketing/organisational innovations	170.0	116.8	141.0
SMEs innovating in-house	93.4	60.6	64.9
Linkages	**158.9**	**141.2**	**139.9**
Innovative SMEs collaborating with others	159.5	117.3	116.7
Public-private co-publications	102.4	91.1	90.3
Private co-funding of public R&D exp.	220.3	220.3	217.2
Intellectual assets	**89.6**	**103.2**	**102.3**
PCT patent applications	223.7	223.7	233.5
Trademark applications	15.5	51.9	45.9
Design applications	19.5	28.8	29.9
Employment impacts	**186.1**	**186.1**	**185.0**
Employment in knowledge-intensive activities	223.4	223.4	202.4
Employment fast-growing enterprises	N/A	N/A	N/A
Sales impacts	**85.5**	**95.9**	**92.1**
Medium and high tech product exports	96.7	102.1	96.4
Knowledge-intensive services exports	82.6	97.7	93.1
Sales of new-to-market/firm innovations	75.7	86.5	85.6

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Data in red show a decline in performance compared to 2010.

Structural differences with the EU are shown in the table below. The employment share in manufacturing is well below the EU average.

	IL	EU
Performance and structure of the economy		
GDP per capita (PPS)	26,200	28,600
Average annual GDP growth (%)	3.1	2.2
Employment share Manufacturing (NACE C) (%)	10.0	15.5
of which High and Medium high-tech (%)	n/a	37.2
Employment share Services (NACE G-N) (%)	44.4	41.6
of which Knowledge-intensive services (%)	n/a	35.0
Turnover share SMEs (%)	n/a	38.0
Turnover share large enterprises (%)	n/a	44.4
Foreign-controlled enterprises – share of value added (%)	n/a	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	n/a	1.5
Total Entrepreneurial Activity (TEA) (%)	12.0	6.6
FDI net inflows (% GDP)	3.2	3.6
Top R&D spending enterprises per 10 mln population	27.4	19.7
Buyer sophistication (1 to 7 best)	4.1	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	71.6	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.9	1.9
Govt. procurement of advanced tech products (1 to 7 best)	4.4	3.5
Rule of law (-2.5 to 2.5 best)	1.1	1.2
Demography		
Population size (millions)	8.2	510.1
Average annual population growth (%)	1.1	0.3
Population density (inhabitants/km²)	379.8	117.1

RIO country report:

https://rio.jrc.ec.europa.eu/en/country-analysis/Israel

The **Former Yugoslav Republic of Macedonia** is a **Modest Innovator**. Over time, performance has increased relative to that of the EU in 2010.

For the Former Yugoslav Republic of Macedonia, fast-track CIS 2016 data are not available.

	2010	2011	2012	2013	2014	2015	2016	2017
Relative to EU in 2010	34	37	37	40	42	43	45	47
Relative to EU in 2017								44

Attractive research systems and Innovators are the strongest innovation dimensions. Sales impacts and Intellectual assets are the weakest innovation dimensions

Structural differences with the EU are shown in the table below. The employment share in manufacturing is well above the EU average. GDP per capita and the employment share in services are well below the EU average.

Former Yugoslav Republic of Macedonia	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	**34.4**	**46.5**	**44.0**
Human resources	**24.0**	**42.8**	**35.8**
New doctorate graduates	15.4	42.6	30.6
Population with tertiary education	32.1	68.7	60.5
Lifelong learning	25.0	12.5	12.2
Attractive research systems	**6.1**	**76.2**	**67.1**
International scientific co-publications	11.8	36.2	22.2
Most cited publications	5.6	50.8	48.9
Foreign doctorate students	4.7	126.3	114.0
Innovation-friendly environment	**33.1**	**53.7**	**40.1**
Broadband penetration	88.9	122.2	68.8
Opportunity-driven entrepreneurship	0.0	13.1	12.2
Finance and support	**0.0**	**32.8**	**30.5**
R&D expenditure in the public sector	0.0	29.2	30.3
Venture capital expenditures	N/A	N/A	N/A
Firm investments	**61.0**	**69.7**	**62.4**
R&D expenditure in the business sector	1.2	4.8	4.3
Non-R&D innovation expenditures	132.7	132.7	121.4
Enterprises providing ICT training	64.3	85.7	75.0
Innovators	**78.5**	**55.0**	**63.9**
SMEs product/process innovations	117.5	59.0	72.2
SMEs marketing/organisational innovations	68.9	58.8	71.0
SMEs innovating in-house	51.4	47.3	50.7
Linkages	**49.4**	**44.1**	**43.7**
Innovative SMEs collaborating with others	84.2	59.0	58.6
Public-private co-publications	15.6	29.0	28.7
Private co-funding of public R&D exp.	N/A	N/A	N/A
Intellectual assets	**5.8**	**14.3**	**14.2**
PCT patent applications	5.3	2.2	2.3
Trademark applications	13.2	47.1	41.6
Design applications	0.6	1.0	1.0
Employment impacts	**16.2**	**6.5**	**6.5**
Employment in knowledge-intensive activities	19.5	7.8	7.1
Employment fast-growing enterprises	N/A	N/A	N/A
Sales impacts	**31.6**	**46.3**	**44.5**
Medium and high tech product exports	44.5	114.3	107.9
Knowledge-intensive services exports	31.7	15.9	15.1
Sales of new-to-market/firm innovations	16.4	1.6	1.5

Performance and structure of the economy	FYROM	EU
Performance and structure of the economy		
GDP per capita (PPS)	10,100	28,600
Average annual GDP growth (%)	1.5	2.2
Employment share Manufacturing (NACE C) (%)	19.3	15.5
of which High and Medium high-tech (%)	n/a	37.2
Employment share Services (NACE G-N) (%)	30.3	41.6
of which Knowledge-intensive services (%)	n/a	35.0
Turnover share SMEs (%)	n/a	38.0
Turnover share large enterprises (%)	n/a	44.4
Foreign-controlled enterprises – share of value added (%)	n/a	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	n/a	1.5
Total Entrepreneurial Activity (TEA) (%)	n/a	6.6
FDI net inflows (% GDP)	n/a	3.6
Top R&D spending enterprises per 10 mln population	0.0	19.7
Buyer sophistication (1 to 7 best)	1.8	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	80.0	76.9
Basic-school entrepren. education and training (1 to 5 best)	n/a	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.9	3.5
Rule of law (-2.5 to 2.5 best)	n/a	1.2
Demography		
Population size (millions)	2.1	510.1
Average annual population growth (%)	0.1	0.3
Population density (inhabitants/km²)	82.3	117.1

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Norway is a **Strong Innovator**. Over time, performance has increased relative to that of the EU in 2010.
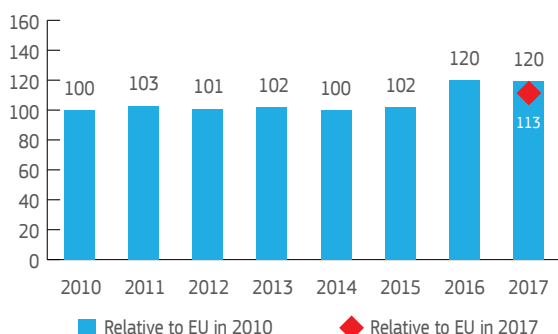
Attractive research systems, Innovation-friendly environment, and Human resources are the strongest innovation dimensions. Intellectual assets and Sales impacts are the weakest innovation dimensions.

Norway	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	**100.2**	**119.7**	**113.1**
Human resources	**162.3**	**171.1**	**143.4**
New doctorate graduates	115.4	139.3	99.9
Population with tertiary education	197.0	182.8	161.2
Lifelong learning	178.1	195.8	191.8
Attractive research systems	**150.8**	**166.4**	**146.4**
International scientific co-publications	371.5	634.9	390.3
Most cited publications	116.6	105.7	101.8
Foreign doctorate students	123.6	91.6	82.7
Innovation-friendly environment	**141.5**	**192.7**	**144.0**
Broadband penetration	144.4	233.3	131.3
Opportunity-driven entrepreneurship	139.7	168.6	156.5
Finance and support	**114.8**	**147.0**	**136.5**
R&D expenditure in the public sector	119.5	140.7	145.9
Venture capital expenditures	108.9	155.0	127.0
Firm investments	**108.3**	**139.6**	**124.9**
R&D expenditure in the business sector	73.8	90.4	81.2
Non-R&D innovation expenditures	0.0	87.2	79.8
Enterprises providing ICT training	235.7	235.7	206.3
Innovators	**73.4**	**119.7**	**139.1**
SMEs product/process innovations	73.2	125.5	153.5
SMEs marketing/organisational innovations	69.0	111.2	134.3
SMEs innovating in-house	78.0	122.8	131.6
Linkages	**124.1**	**137.5**	**136.2**
Innovative SMEs collaborating with others	119.0	178.9	178.0
Public-private co-publications	148.8	143.0	141.7
Private co-funding of public R&D exp.	102.1	89.6	88.4
Intellectual assets	**46.5**	**45.2**	**44.8**
PCT patent applications	77.6	72.2	75.4
Trademark applications	44.6	56.7	50.1
Design applications	18.7	11.3	11.7
Employment impacts	**95.2**	**95.4**	**94.9**
Employment in knowledge-intensive activities	118.2	126.0	114.1
Employment fast-growing enterprises	78.7	73.6	78.7
Sales impacts	**45.8**	**51.9**	**49.8**
Medium and high tech product exports	0.0	0.0	0.0
Knowledge-intensive services exports	118.8	123.3	117.6
Sales of new-to-market/firm innovations	14.7	29.8	29.5

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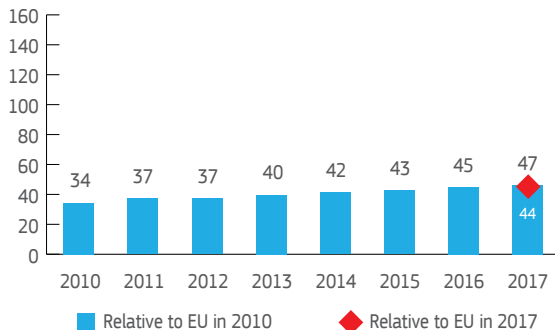
Data in red show a decline in performance compared to 2010.

Provisional CIS 2016 show improved performance for all six indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. GDP per capita and the value added share of foreign-controlled enterprises are well above the EU average. The employment share in manufacturing is well below the EU average.

	NO	EU
Performance and structure of the economy		
GDP per capita (PPS)	46,200	28,600
Average annual GDP growth (%)	1.5	2.2
Employment share Manufacturing (NACE C) (%)	8.5	15.5
of which High and Medium high-tech (%)	34.6	37.2
Employment share Services (NACE G-N) (%)	38.7	41.6
of which Knowledge-intensive services (%)	38.7	35.0
Turnover share SMEs (%)	38.2	38.0
Turnover share large enterprises (%)	39.2	44.4
Foreign-controlled enterprises – share of value added (%)	16.1	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.8	1.5
Total Entrepreneurial Activity (TEA) (%)	5.7	6.6
FDI net inflows (% GDP)	-0.7	3.6
Top R&D spending enterprises per 10 mln population	22.0	19.7
Buyer sophistication (1 to 7 best)	4.5	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	82.6	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.4	1.9
Govt. procurement of advanced tech products (1 to 7 best)	4.1	3.5
Rule of law (-2.5 to 2.5 best)	2.0	1.2
Demography		
Population size (millions)	5.2	510.1
Average annual population growth (%)	0.9	0.3
Population density (inhabitants/km²)	17.0	117.1

RIO country report:

https://rio.jrc.ec.europa.eu/en/country-analysis/Norway

Serbia is a **Moderate Innovator**. Over time, performance has increased relative to that of the EU in 2010.

	2010	2011	2012	2013	2014	2015	2016	2017
Relative to EU in 2010	57	56	69	72	74	75	72	70

Relative to EU in 2010 · Relative to EU in 2017 (66)
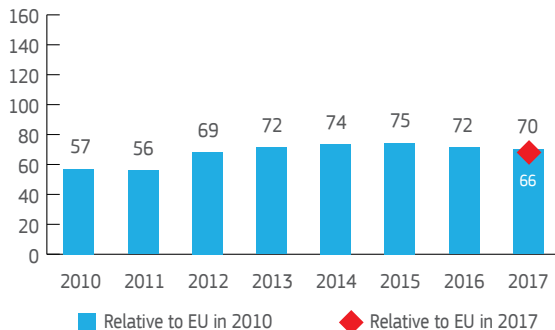
Firm investments, Linkages, and Employment impacts are the strongest innovation dimensions. Innovation-friendly environment and Intellectual assets are the weakest innovation dimensions.

Provisional CIS 2016 data show improved performance for four indicators and reduced performance for two indicators.

Provisional CIS 2016 vs CIS 2014 (=100)

Structural differences with the EU are shown in the table below. GDP per capita and the employment share in services are well below the EU average.

Serbia	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	**2017**	**2017**
SUMMARY INNOVATION INDEX	57.1	70.3	66.5
Human resources	28.0	76.5	64.1
New doctorate graduates	26.2	71.5	51.3
Population with tertiary education	N/A	N/A	N/A
Lifelong learning	N/A	N/A	N/A
Attractive research systems	30.0	37.2	32.7
International scientific co-publications	46.3	106.0	65.2
Most cited publications	32.9	27.7	26.7
Foreign doctorate students	20.2	27.0	24.4
Innovation-friendly environment	24.8	24.8	18.5
Broadband penetration	33.3	33.3	18.8
Opportunity-driven entrepreneurship	N/A	N/A	N/A
Finance and support	67.3	40.6	37.7
R&D expenditure in the public sector	103.9	69.9	72.5
Venture capital expenditures	20.4	3.0	2.4
Firm investments	78.0	132.3	118.3
R&D expenditure in the business sector	6.9	24.9	22.3
Non-R&D innovation expenditures	116.1	280.8	256.8
Enterprises providing ICT training	121.4	121.4	106.3
Innovators	47.7	72.3	84.1
SMEs product/process innovations	27.7	70.5	86.2
SMEs marketing/organisational innovations	25.6	75.9	91.7
SMEs innovating in-house	89.0	70.4	75.4
Linkages	96.6	94.9	94.0
Innovative SMEs collaborating with others	23.1	37.3	37.1
Public-private co-publications	51.6	33.6	33.3
Private co-funding of public R&D exp.	220.3	220.3	217.2
Intellectual assets	27.2	24.4	24.2
PCT patent applications	N/A	N/A	N/A
Trademark applications	64.7	54.8	48.5
Design applications	0.0	2.6	2.7
Employment impacts	62.8	94.0	93.5
Employment in knowledge-intensive activities	75.5	112.9	102.2
Employment fast-growing enterprises	N/A	N/A	N/A
Sales impacts	50.4	60.9	58.5
Medium and high tech product exports	33.4	72.4	68.4
Knowledge-intensive services exports	52.7	60.8	58.0
Sales of new-to-market/firm innovations	67.9	47.4	46.9

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Data in red show a decline in performance compared to 2010.

	RS	EU
Performance and structure of the economy		
GDP per capita (PPS)	10,400	28,600
Average annual GDP growth (%)	2.3	2.2
Employment share Manufacturing (NACE C) (%)	16.6	15.5
of which High and Medium high-tech (%)	n/a	37.2
Employment share Services (NACE G-N) (%)	31.3	41.6
of which Knowledge-intensive services (%)	n/a	35.0
Turnover share SMEs (%)	n/a	38.0
Turnover share large enterprises (%)	n/a	44.4
Foreign-controlled enterprises – share of value added (%)	n/a	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	n/a	1.5
Total Entrepreneurial Activity (TEA) (%)	n/a	6.6
FDI net inflows (% GDP)	5.6	3.6
Top R&D spending enterprises per 10 mln population	0.0	19.7
Buyer sophistication (1 to 7 best)	2.3	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	69.3	76.9
Basic-school entrepren. education and training (1 to 5 best)	n/a	1.9
Govt. procurement of advanced tech products (1 to 7 best)	2.8	3.5
Rule of law (-2.5 to 2.5 best)	-0.1	1.2
Demography		
Population size (millions)	7.1	510.1
Average annual population growth (%)	-0.5	0.3
Population density (inhabitants/km²)	81.5	117.1

Switzerland is an **Innovation Leader**. Over time, performance has increased relative to that of the EU in 2010.

For Switzerland, fast-track CIS 2016 data are not available.

■ Relative to EU in 2010	◆ Relative to EU in 2017
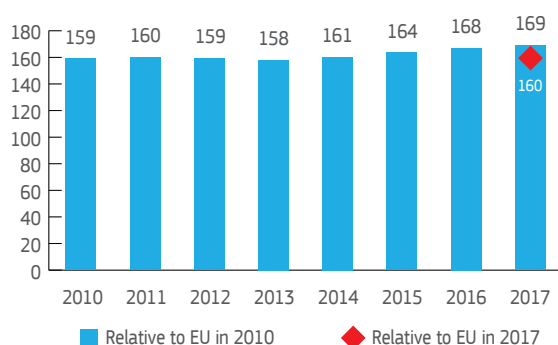
Attractive research systems and Firm investments are the strongest innovation dimensions. Sales impacts, Finance and support, and Employment impacts are the weakest innovation dimensions.

Structural differences with the EU are shown in the table below. GDP per capita and the employment share in knowledge-intensive services are well above the EU average.

Switzerland	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	**2017**	**2017**
SUMMARY INNOVATION INDEX	**159.4**	**169.4**	**160.1**
Human resources	**221.1**	**236.4**	**198.1**
New doctorate graduates	235.9	235.9	169.2
Population with tertiary education	152.2	196.3	173.0
Lifelong learning	284.4	284.4	278.6
Attractive research systems	**235.2**	**251.6**	**221.4**
International scientific co-publications	647.1	680.8	418.6
Most cited publications	160.2	160.2	154.2
Foreign doctorate students	200.5	234.3	211.6
Innovation-friendly environment	**162.4**	**193.9**	**144.9**
Broadband penetration	n/a	n/a	n/a
Opportunity-driven entrepreneurship	129.3	154.4	143.3
Finance and support	**98.3**	**126.4**	**117.4**
R&D expenditure in the public sector	105.3	137.2	142.2
Venture capital expenditures	89.3	112.5	92.2
Firm investments	**183.5**	**234.8**	**210.0**
R&D expenditure in the business sector	195.2	205.7	184.7
Non-R&D innovation expenditures	176.1	280.8	256.8
Enterprises providing ICT training	n/a	n/a	n/a
Innovators	**147.0**	**160.7**	**186.8**
SMEs product/process innovations	181.9	156.0	190.7
SMEs marketing/organisational innovations	170.0	170.0	205.2
SMEs innovating in-house	90.7	155.9	167.1
Linkages	**128.5**	**142.1**	**140.8**
Innovative SMEs collaborating with others	82.2	75.7	75.3
Public-private co-publications	201.3	201.3	199.5
Private co-funding of public R&D exp.	95.8	144.6	142.6
Intellectual assets	**184.4**	**164.7**	**163.3**
PCT patent applications	193.1	175.4	183.1
Trademark applications	224.2	206.8	182.9
Design applications	146.3	123.0	127.5
Employment impacts	**110.0**	**118.1**	**117.4**
Employment in knowledge-intensive activities	184.4	203.9	184.7
Employment fast-growing enterprises	56.9	56.9	60.8
Sales impacts	**129.7**	**114.6**	**110.0**
Medium and high tech product exports	123.6	85.7	80.9
Knowledge-intensive services exports	97.5	102.4	97.6
Sales of new-to-market/firm innovations	174.5	162.9	161.1

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Data in red show a decline in performance compared to 2010.

	CH	EU
Performance and structure of the economy		
GDP per capita (PPS)	46,900	28,600
Average annual GDP growth (%)	1.2	2.2
Employment share Manufacturing (NACE C) (%)	13.1	15.5
of which High and Medium high-tech (%)	44.5	37.2
Employment share Services (NACE G-N) (%)	45.1	41.6
of which Knowledge-intensive services (%)	45.3	35.0
Turnover share SMEs (%)	n/a	38.0
Turnover share large enterprises (%)	n/a	44.4
Foreign-controlled enterprises – share of value added (%)	n/a	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	0.2	1.5
Total Entrepreneurial Activity (TEA) (%)	8.0	6.6
FDI net inflows (% GDP)	4.9	3.6
Top R&D spending enterprises per 10 mln population	66.8	19.7
Buyer sophistication (1 to 7 best)	5.0	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	76.1	76.9
Basic-school entrepren. education and training (1 to 5 best)	2.5	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.9	3.5
Rule of law (-2.5 to 2.5 best)	2.0	1.2
Demography		
Population size (millions)	8.3	510.1
Average annual population growth (%)	1.1	0.3
Population density (inhabitants/km²)	207.3	117.1

RIO country report:

https://rio.jrc.ec.europa.eu/en/country-analysis/Switzerland

Turkey is a **Moderate Innovator**. Over time, performance has increased relative to that of the EU in 2010.
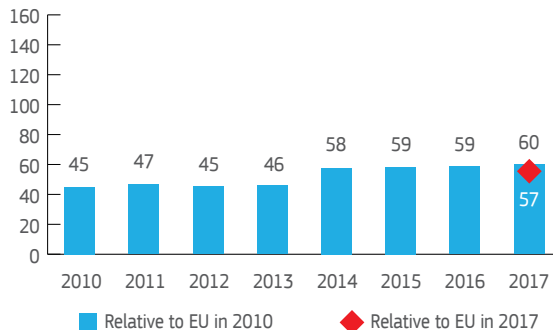
Firm investments and Innovators are the strongest innovation dimensions. Intellectual assets and Employment impacts are the weakest innovation dimensions.

Provisional CIS 2016 data show improved performance for three indicators. For SMEs innovating in-house a comparison with 2014 is not possible due to missing 2014 data. There are no fast-track data for the other two indicators.

Provisional CIS 2016 vs CIS 2014 (=100)
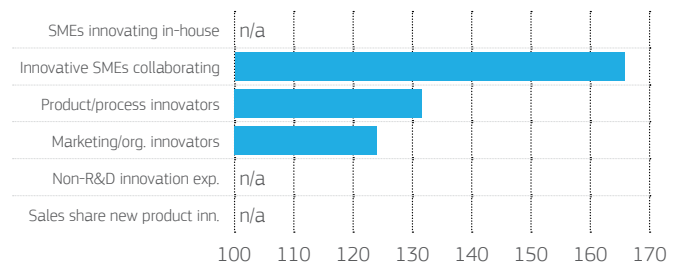
Structural differences with the EU are shown in the table below. The employment share in manufacturing is well above the EU average. The employment share in high and medium high-tech manufacturing and the employment shares in services and in knowledge-intensive services are well below the EU average.

Turkey	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	45.0	60.1	56.8
Human resources	16.9	37.5	31.4
New doctorate graduates	7.7	15.8	11.4
Population with tertiary education	0.0	50.0	44.1
Lifelong learning	47.9	49.0	48.0
Attractive research systems	36.7	43.3	38.1
International scientific co-publications	85.2	154.0	94.7
Most cited publications	42.9	34.6	33.3
Foreign doctorate students	11.3	17.6	15.9
Innovation-friendly environment	85.4	112.5	84.1
Broadband penetration	155.6	188.9	106.3
Opportunity-driven entrepreneurship	43.8	67.3	62.5
Finance and support	64.6	56.7	52.7
R&D expenditure in the public sector	57.5	50.4	52.3
Venture capital expenditures	N/A	N/A	N/A
Firm investments	21.3	140.8	126.0
R&D expenditure in the business sector	24.0	34.5	31.0
Non-R&D innovation expenditures	18.8	280.8	256.8
Enterprises providing ICT training	N/A	N/A	N/A
Innovators	101.1	83.8	97.5
SMEs product/process innovations	75.8	84.6	103.4
SMEs marketing/organisational innovations	135.2	102.0	123.1
SMEs innovating in-house	90.6	64.8	69.5
Linkages	57.7	64.3	63.7
Innovative SMEs collaborating with others	40.9	51.1	50.9
Public-private co-publications	23.1	22.4	22.2
Private co-funding of public R&D exp.	112.5	123.4	121.7
Intellectual assets	5.8	9.0	9.0
PCT patent applications	11.8	19.7	20.6
Trademark applications	0.0	4.6	4.1
Design applications	4.5	2.3	2.4
Employment impacts	0.0	10.8	10.8
Employment in knowledge-intensive activities	0.0	13.0	11.8
Employment fast-growing enterprises	N/A	N/A	N/A
Sales impacts	36.8	55.9	53.6
Medium and high tech product exports	51.8	68.1	64.3
Knowledge-intensive services exports	16.9	28.9	27.6
Sales of new-to-market/firm innovations	42.4	72.8	72.0

Performance and structure of the economy	TR	EU
GDP per capita (PPS)	15,700	28,600
Average annual GDP growth (%)	4.6	2.2
Employment share Manufacturing (NACE C) (%)	19.3	15.5
of which High and Medium high-tech (%)	13.5	37.2
Employment share Services (NACE G-N) (%)	30.3	41.6
of which Knowledge-intensive services (%)	21.0	35.0
Turnover share SMEs (%)	n/a	38.0
Turnover share large enterprises (%)	n/a	44.4
Foreign-controlled enterprises – share of value added (%)	n/a	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	5.4	1.5
Total Entrepreneurial Activity (TEA) (%)	16.1	6.6
FDI net inflows (% GDP)	1.6	3.6
Top R&D spending enterprises per 10 mln population	0.9	19.7
Buyer sophistication (1 to 7 best)	3.5	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	68.2	76.9
Basic-school entrepren. education and training (1 to 5 best)	1.6	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.7	3.5
Rule of law (-2.5 to 2.5 best)	-0.1	1.2
Demography		
Population size (millions)	78.8	510.1
Average annual population growth (%)	1.4	0.3
Population density (inhabitants/km²)	101.8	117.1

RIO country report:

https://rio.jrc.ec.europa.eu/en/country-analysis/Turkey

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Ukraine is a **Modest Innovator**. Over time, performance has declined relative to that of the EU in 2010.

31	31	29	29	28	30	26	29 / 28
2010	2011	2012	2013	2014	2015	2016	2017

■ Relative to EU in 2010   ◆ Relative to EU in 2017
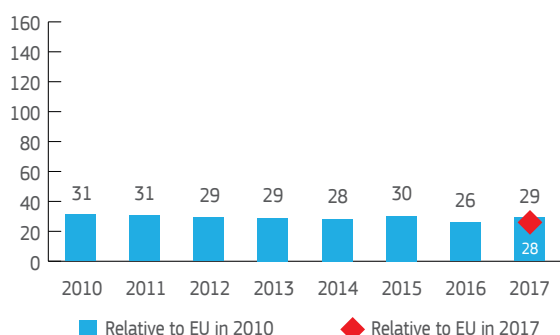
Human resources and Employment impacts are the strongest innovation dimensions. Linkages and Innovation-friendly environment are the weakest innovation dimensions.

Ukraine	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	*2017*	*2017*
SUMMARY INNOVATION INDEX	**31.2**	**29.4**	**27.8**
Human resources	**65.8**	**131.6**	**110.3**
New doctorate graduates	61.5	123.1	88.3
Population with tertiary education	N/A	N/A	N/A
Lifelong learning	N/A	N/A	N/A
Attractive research systems	**18.4**	**22.3**	**19.6**
International scientific co-publications	0.0	5.3	3.2
Most cited publications	18.5	21.6	20.8
Foreign doctorate students	24.5	29.2	26.4
Innovation-friendly environment	**5.7**	**5.5**	**4.1**
Broadband penetration	7.7	7.4	4.2
Opportunity-driven entrepreneurship	N/A	N/A	N/A
Finance and support	**24.5**	**16.7**	**15.5**
R&D expenditure in the public sector	41.1	14.1	14.6
Venture capital expenditures	3.2	20.0	16.4
Firm investments	**70.7**	**44.8**	**40.1**
R&D expenditure in the business sector	37.0	29.5	26.4
Non-R&D innovation expenditures	116.1	66.1	60.4
Enterprises providing ICT training	N/A	N/A	N/A
Innovators	**18.2**	**16.0**	**18.6**
SMEs product/process innovations	0.0	0.0	0.0
SMEs marketing/organisational innovations	2.4	0.0	0.0
SMEs innovating in-house	51.4	47.3	50.7
Linkages	**12.5**	**9.6**	**9.5**
Innovative SMEs collaborating with others	5.0	3.0	3.0
Public-private co-publications	19.1	15.4	15.3
Private co-funding of public R&D exp.	N/A	N/A	N/A
Intellectual assets	**7.9**	**13.4**	**13.3**
PCT patent applications	7.6	14.8	15.5
Trademark applications	18.5	18.1	16.0
Design applications	0.1	8.5	8.8
Employment impacts	**69.2**	**77.9**	**77.5**
Employment in knowledge-intensive activities	83.1	93.5	84.7
Employment fast-growing enterprises	N/A	N/A	N/A
Sales impacts	**45.4**	**32.8**	**31.5**
Medium and high tech product exports	59.6	28.3	26.7
Knowledge-intensive services exports	55.8	64.0	61.1
Sales of new-to-market/firm innovations	16.4	1.6	1.5

Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.

Data in red show a decline in performance compared to 2010.

Structural differences with the EU are shown in the table below. GDP per capita is well below the EU average.

	UA	EU
Performance and structure of the economy		
GDP per capita (PPS)	6,600	28,600
Average annual GDP growth (%)	-7.9	2.2
Employment share Manufacturing (NACE C) (%)	12.4	15.5
of which High and Medium high-tech (%)	n/a	37.2
Employment share Services (NACE G-N) (%)	33.8	41.6
of which Knowledge-intensive services (%)	n/a	35.0
Turnover share SMEs (%)	n/a	38.0
Turnover share large enterprises (%)	n/a	44.4
Foreign-controlled enterprises – share of value added (%)	n/a	12.5
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	n/a	1.5
Total Entrepreneurial Activity (TEA) (%)	n/a	6.6
FDI net inflows (% GDP)	2.6	3.6
Top R&D spending enterprises per 10 mln population	0.0	19.7
Buyer sophistication (1 to 7 best)	3.2	3.7
Governance and policy framework		
Ease of starting a business (0 to 100 best)	62.8	76.9
Basic-school entrepren. education and training (1 to 5 best)	n/a	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.0	3.5
Rule of law (-2.5 to 2.5 best)	-0.8	1.2
Demography		
Population size (millions)	42.7	510.1
Average annual population growth (%)	-0.4	0.3
Population density (inhabitants/km²)	78.2	117.1

8. European Innovation Scoreboard methodology

The overall performance of each country's innovation system has been summarised in a composite indicator, the Summary Innovation Index. Full details on the EIS methodology are available in the EIS 2018 Methodology Report[40]. The methodology used for calculating the Summary Innovation Index is explained below. "All countries" include all Member States and other European and neighbouring countries included in Section 5.1.

European benchmark

Step 1: 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 2: 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 3: Imputing for missing values

Reference year data are then used for "2017", 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	"2017"	"2016"	"2015"	"2014"	"2013"
Available data	N/A	45	40	35	30
Use most recent year	45	45	40	35	30

Year-in-between missing	"2017"	"2016"	"2015"	"2014"	"2013"
Available data	50	N/A	40	35	30
Substitute with previous year	50	40	40	35	30

Beginning-of-period missing	"2017"	"2016"	"2015"	"2014"	"2013"
Available data	50	45	40	35	N/A
Substitute with next available year	50	45	40	35	35

Step 4: 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 5: 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: Opportunity-driven entrepreneurship, Public-private co-publications, Private co-funding of public R&D expenditures, and Trademark applications. A square root transformation means using the square root of the indicator value instead of the original value.

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 (1/27 if data are available for all 27 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 2010 and for the latest year also to that of the EU in 2017. For the definition of the performance groups, only the performance scores relative to the EU in 2017 have been used.

International benchmark

The methodology for calculating average innovation performance for the EU and its major global competitors is the same as 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 2017 more than 20% above the EU average in 2017;

- Strong Innovators are all countries with a relative performance in 2017 between 90% and 120% of the EU average in 2017;

- Moderate Innovators are all countries with a relative performance in 2017 between 50% and 90% of the EU average in 2017;

- Modest Innovators are all countries with a relative performance in 2017 below 50% of the EU average in 2017.

Annex A: Country abbreviations

AT	Austria	IT	Italy
AU	Australia	JP	Japan
BE	Belgium	KR	South Korea
BG	Bulgaria	LT	Lithuania
BR	Brazil	LU	Luxembourg
CA	Canada	LV	Latvia
CH	Switzerland	MK	Former Yugoslav Republic of Macedonia
CN	China	MT	Malta
CY	Cyprus	NL	Netherlands
CZ	Czech Republic	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/29403

Annex C: Current performance

	EU28	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT
FRAMEWORK CONDITIONS																			
Human resources																			
1.1.1 New doctorate graduates	2.0	1.9	1.5	1.7	3.2	2.8	1.1	2.6	1.1	2.6	1.7	1.2	1.5	0.6	0.7	0.9	1.3	1.0	0.7
1.1.2 Population completed tertiary education	39.0	45.7	33.4	33.8	46.2	31.3	43.1	53.5	42.5	42.6	44.3	32.7	26.9	57.0	41.6	55.6	51.2	30.2	33.5
1.1.3 Lifelong learning	10.9	8.5	2.3	9.8	26.8	8.4	17.2	8.9	4.5	9.9	18.7	2.3	7.9	6.9	7.5	5.9	17.2	6.2	10.1
Attractive research systems																			
1.2.1 International scientific co-publications	517	1468	227	755	2346	812	1078	1249	608	732	726	492	632	1283	315	451	1715	456	597
1.2.2 Scientific publications among top 10% most cited	10.6	12.6	4.2	6.6	13.4	11.3	8.2	12.6	9.0	9.3	11.0	4.6	10.4	9.0	6.2	4.3	13.1	6.9	10.7
1.2.3 Foreign doctorate students	26.1	41.8	6.3	14.8	33.4	9.1	12.0	28.4	n/a	15.5	40.1	3.9	14.2	14.3	11.4	4.6	87.0	11.6	54.0
Innovation-friendly environment																			
1.3.1 Broadband penetration	16.0	26.0	12.0	12.0	42.0	14.0	17.0	18.0	5.0	25.0	12.0	7.0	7.0	5.0	19.0	28.0	25.0	16.0	20.0
1.3.2 Opportunity-driven entrepreneurship	3.3	1.6	1.0	2.7	11.1	4.0	3.4	2.6	1.5	1.8	4.6	1.2	2.6	1.8	3.0	2.2	4.8	2.4	n/a
INVESTMENTS																			
Finance and support																			
2.1.1 R&D expenditure in the public sector	0.70	0.74	0.21	0.64	0.97	0.94	0.61	0.35	0.57	0.55	0.78	0.46	0.50	0.27	0.33	0.55	0.60	0.29	0.23
2.1.2 Venture capital expenditures	0.116	0.107	0.037	0.006	0.064	0.069	0.111	0.135	0.001	0.102	0.240	0.021	0.055	0.075	0.285	0.054	0.352	0.079	0.000
Firm investments																			
2.2.1 R&D expenditure in the business sector	1.32	1.73	0.57	1.03	1.89	2.00	0.66	0.83	0.43	0.64	1.43	0.38	0.75	0.17	0.11	0.30	0.64	0.89	0.39
2.2.2 Non-R&D innovation expenditures	0.76	0.56	0.74	0.94	0.29	1.26	0.85	0.47	0.76	0.36	0.50	1.20	0.57	0.21	0.58	2.01	0.13	0.75	0.36
2.2.3 Enterprises providing ICT training	21.0	35.0	9.0	23.0	27.0	28.0	13.0	30.0	12.0	23.0	19.0	23.0	13.0	26.0	10.0	11.0	28.0	17.0	28.0
INNOVATION ACTIVITIES																			
Innovators																			
3.1.1 SMEs with product or process innovations	30.9	48.3	14.0	30.8	34.7	41.6	17.4	45.7	34.6	18.6	35.5	25.4	32.7	32.8	11.9	33.7	37.0	15.1	26.7
3.1.2 SMEs with marketing or organisational innovations	34.9	45.1	14.8	25.7	40.0	49.1	15.0	52.5	40.1	25.5	41.6	30.8	34.6	31.1	19.0	24.0	54.3	15.2	30.8
3.1.3 SMEs innovating in-house	28.8	39.8	11.2	28.0	28.2	37.9	15.8	41.3	31.4	14.5	31.5	21.1	30.5	30.5	10.2	30.4	32.2	11.7	23.9
Linkages																			
3.2.1 Innovative SMEs collaborating with others	11.2	28.6	3.1	10.0	13.2	10.1	10.8	13.9	14.8	6.7	13.2	6.8	6.7	11.7	2.8	15.2	9.2	6.2	4.2
3.2.2 Public-private co-publications	40.9	80.0	3.0	21.0	162.8	62.4	10.6	45.4	10.5	21.1	42.8	17.3	22.2	21.1	1.0	3.9	25.4	29.6	0.0
3.2.3 Private co-funding of public R&D expenditures	0.05	0.08	0.02	0.03	0.03	0.12	0.04	0.01	0.04	0.03	0.04	0.03	0.01	0.00	0.05	0.09	0.01	0.03	0.00
Intellectual assets																			
3.3.1 PCT patent applications	3.53	3.16	0.64	0.93	6.05	6.11	1.01	1.80	0.49	1.45	3.98	0.61	2.16	0.82	0.82	0.81	1.75	1.34	1.31
3.3.2 Trademark applications	7.86	8.11	9.10	5.09	12.79	9.51	16.55	5.08	4.92	8.99	6.04	4.00	8.46	43.15	7.77	7.39	37.70	4.15	40.88
3.3.3 Design applications	4.44	2.72	5.56	4.07	7.94	6.72	5.84	1.09	1.22	2.97	2.96	0.90	6.23	3.67	1.20	1.71	7.40	1.15	13.05
IMPACTS																			
Employment impacts																			
4.1.1 Employment in knowledge-intensive activities	14.2	15.6	10.2	12.9	15.1	14.8	13.5	20.6	12.1	12.5	14.5	11.6	13.7	17.0	12.1	9.7	22.0	11.6	18.4
4.1.2 Employment fast-growing firms innovative sectors	4.8	2.7	6.6	6.5	4.5	4.6	3.2	7.1	n/a	4.8	4.1	3.5	3.1	0.1	5.2	2.1	4.6	8.7	6.1
Sales impacts																			
4.2.1 Medium & high tech product exports	56.7	48.2	33.8	65.7	48.0	68.2	41.2	56.0	21.2	47.2	58.5	39.9	52.4	54.4	34.7	36.9	45.4	68.5	61.6
4.2.2 Knowledge-intensive services exports	69.2	68.9	39.0	43.8	71.7	74.6	48.6	94.2	42.2	33.1	67.6	19.1	50.9	70.0	52.4	22.0	92.6	49.0	33.9
4.2.3 Sales of new-to-market and new-to-firm innovations	13.37	7.60	4.80	14.57	6.96	13.34	10.49	18.07	12.75	15.94	15.02	4.91	10.06	4.49	5.31	8.57	6.54	12.47	4.12

	EU28	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK	IS	IL	NO	MK	RS	CH	TR	UA
FRAMEWORK CONDITIONS																			
Human resources																			
1.1.1 New doctorate graduates	2.0	2.4	1.9	0.6	1.9	0.8	3.5	2.2	2.9	2.7	3.1	0.9	1.5	2.0	0.8	1.1	3.4	0.4	1.8
1.1.2 Population completed tertiary education	39.0	46.6	40.3	43.6	34.0	25.6	44.5	35.1	40.3	47.4	47.3	47.6	n/a	48.3	33.0	n/a	50.1	30.5	n/a
1.1.3 Lifelong learning	10.9	19.1	15.8	4.0	9.8	1.1	12.0	3.4	27.4	30.4	14.3	23.6	n/a	19.9	2.3	n/a	31.2	5.8	n/a
Attractive research systems																			
1.2.1 International scientific co-publications	517	1628	1376	297	919	182	1135	439	1659	2019	1222	2799	908	1886	151	353	2946	492	61
1.2.2 Scientific publications among top 10% most cited	10.6	14.6	11.1	5.1	9.0	4.8	8.6	6.2	10.8	12.1	15.0	10.8	10.0	10.7	6.1	4.1	15.3	4.7	6.1
1.2.3 Foreign doctorate students	26.1	40.1	28.3	2.0	25.6	3.8	9.7	9.1	21.1	34.7	42.9	31.6	n/a	21.6	29.7	6.5	54.9	4.3	7.0
Innovation-friendly environment																			
1.3.1 Broadband penetration	16.0	27.0	13.0	13.0	32.0	17.0	16.0	12.0	32.0	39.0	13.0	n/a	n/a	21.0	11.0	3.0	n/a	17.0	0.7
1.3.2 Opportunity-driven entrepreneurship	3.3	5.9	3.0	3.7	2.1	1.2	2.4	1.3	6.9	7.8	3.5	10.0	2.6	6.3	0.6	n/a	5.5	1.9	n/a
INVESTMENTS																			
Finance and support																			
2.1.1 R&D expenditure in the public sector	0.70	0.87	0.87	0.32	0.64	0.21	0.49	0.39	0.91	0.98	0.52	0.77	0.57	0.95	0.32	0.55	0.93	0.44	0.23
2.1.2 Venture capital expenditures	0.116	0.150	0.060	0.036	0.048	0.037	0.006	0.014	0.095	0.083	0.173	n/a	0.009	0.148	n/a	0.003	0.107	n/a	0.019
Firm investments																			
2.2.1 R&D expenditure in the business sector	1.32	1.16	2.20	0.63	0.61	0.27	1.51	0.40	1.81	2.26	1.13	1.31	3.64	1.08	0.10	0.33	2.40	0.44	0.38
2.2.2 Non-R&D innovation expenditures	0.76	0.16	0.47	1.24	0.64	0.23	0.81	0.58	0.32	1.12	0.67	n/a	n/a	0.63	0.90	1.79	2.01	2.70	0.50
2.2.3 Enterprises providing ICT training	21.0	24.0	31.0	12.0	21.0	4.0	27.0	17.0	38.0	28.0	26.0	25.0	n/a	40.0	17.0	22.0	n/a	n/a	n/a
INNOVATION ACTIVITIES																			
Innovators																			
3.1.1 SMEs with product or process innovations	30.9	42.9	40.7	13.3	42.1	4.9	32.6	16.7	44.1	40.4	32.6	44.3	22.2	41.1	25.6	28.3	48.1	31.5	7.4
3.1.2 SMEs with marketing or organisational innovations	34.9	32.5	46.1	11.4	37.8	8.8	33.2	22.4	37.3	35.1	45.4	43.0	44.9	43.3	27.8	32.9	62.0	40.5	10.5
3.1.3 SMEs innovating in-house	28.8	35.0	35.0	8.3	25.6	4.5	26.1	13.9	38.3	35.1	19.0	n/a	21.6	35.2	18.7	23.8	42.5	22.5	18.7
Linkages																			
3.2.1 Innovative SMEs collaborating with others	11.2	17.5	20.5	3.5	7.8	1.8	13.2	8.4	16.8	13.5	24.7	20.6	12.9	19.0	7.1	4.9	8.7	6.3	1.5
3.2.2 Public-private co-publications	40.9	99.3	82.3	5.4	13.2	3.7	56.1	10.3	85.4	130.6	65.1	183.2	33.3	82.2	3.4	4.5	260.6	2.0	1.0
3.2.3 Private co-funding of public R&D expenditures	0.05	0.08	0.05	0.02	0.01	0.03	0.05	0.04	0.05	0.04	0.02	0.03	0.57	0.04	n/a	0.19	0.09	0.07	n/a
Intellectual assets																			
3.3.1 PCT patent applications	3.53	5.82	4.70	0.69	0.95	0.22	1.65	0.51	7.43	9.08	3.06	3.19	9.83	2.66	0.08	n/a	6.47	0.73	0.55
3.3.2 Trademark applications	7.86	9.78	13.09	5.33	8.10	2.64	11.09	4.49	12.30	11.44	6.95	6.26	3.52	3.79	3.24	3.68	17.87	1.34	1.85
3.3.3 Design applications	4.44	4.34	6.98	5.71	4.04	1.31	2.97	1.46	4.11	4.67	3.07	0.19	1.32	0.52	0.04	0.12	5.66	0.11	0.39
IMPACTS																			
Employment impacts																			
4.1.1 Employment in knowledge-intensive activities	14.2	17.1	15.0	10.3	10.6	7.7	13.7	10.6	16.2	18.5	18.5	19.3	26.9	15.4	6.3	14.4	21.4	6.7	12.9
4.1.2 Employment fast-growing firms innovative sectors	4.8	4.8	1.9	5.8	5.0	2.6	3.2	7.7	2.8	5.5	6.4	n/a	n/a	4.0	n/a	n/a	3.2	n/a	n/a
Sales impacts																			
4.2.1 Medium & high tech product exports	56.7	49.7	58.0	49.0	38.5	55.8	57.0	66.4	44.7	54.5	57.1	10.2	55.3	14.3	59.6	44.9	49.6	43.4	29.4
4.2.2 Knowledge-intensive services exports	69.2	77.7	43.1	40.2	41.1	46.2	36.0	33.2	70.3	73.2	71.7	57.1	65.7	78.3	25.5	47.6	68.0	31.9	49.2
4.2.3 Sales of new-to-market and new-to-firm innovations	13.37	10.81	11.98	6.45	6.27	6.51	12.44	19.12	9.27	6.89	20.81	6.07	11.90	6.16	3.30	7.94	19.62	10.51	3.30

Annex D: Performance change

Performance change is measured as the difference between performance in 2017 relative to the EU average in 2010 and performance in 2010 relative to the EU average in 2010 (the relative performance scores in both years are shown in the first table on the Country profiles).

	EU28	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT
FRAMEWORK CONDITIONS																			
Human resources																			
1.1.1 New doctorate graduates	39.4	40.9	70.5	22.1	116.0	13.5	14.0	79.8	2.0	122.6	15.1	14.0	-6.1	34.4	8.1	-10.4	37.0	8.6	30.6
1.1.2 Population completed tertiary education	13.4	0.0	15.7	29.1	6.7	21.6	18.7	0.0	28.4	8.2	0.0	6.0	20.1	16.4	16.4	22.4	6.7	-14.2	26.9
1.1.3 Lifelong learning	2.1	0.0	7.3	-2.1	-9.4	6.3	64.6	0.0	12.5	-2.1	3.1	-7.3	17.7	-12.5	21.9	15.6	-8.3	-9.4	0.0
Attractive research systems																			
1.2.1 International scientific co-publications	63	165	24	113	251	89	180	152	73	102	72	69	83	223	72	91	294	54	135
1.2.2 Scientific publications among top 10% most cited	3.8	5.8	1.6	5.5	-9.7	1.6	18.3	17.5	7.0	5.1	4.5	13.1	12.7	31.2	34.5	-18.0	47.9	1.3	47.5
1.2.3 Foreign doctorate students	10.7	43.5	2.4	19.5	58.9	-9.0	28.6	-37.2	n/a	-27.9	-3.8	5.9	25.3	20.7	45.6	15.0	0.0	19.6	190.7
Innovation-friendly environment																			
1.3.1 Broadband penetration	77.8	100.0	44.4	44.4	77.8	55.6	100.0	88.9	33.3	166.7	33.3	66.7	22.2	55.6	11.1	133.3	133.3	77.8	77.8
1.3.2 Opportunity-driven entrepreneurship	7.7	-91.8	6.5	17.1	33.8	55.4	18.1	50.7	3.8	5.2	60.0	-13.3	-36.5	-6.2	32.5	18.5	-69.6	6.3	n/a
INVESTMENTS																			
Finance and support																			
2.1.1 R&D expenditure in the public sector	-3.5	12.4	-23.0	12.4	10.6	10.6	-23.0	-28.3	31.9	-17.7	1.8	0.0	-5.3	-5.3	7.1	-12.4	35.4	-31.9	7.1
2.1.2 Venture capital expenditures	22.0	-18.3	-125.8	-164.8	-39.4	0.8	46.0	-63.4	-12.4	13.4	101.3	8.1	9.8	-8.8	152.4	52.8	0.0	50.3	-11.4
Firm investments																			
2.2.1 R&D expenditure in the business sector	11.4	36.7	36.7	27.1	-21.0	14.0	3.5	-23.6	17.5	-5.2	6.1	0.0	8.7	7.0	-4.4	8.7	-5.2	21.0	5.2
2.2.2 Non-R&D innovation expenditures	9.3	-2.0	-34.5	-15.9	-35.8	63.7	-153.1	-89.4	3.9	-15.6	6.0	56.6	-7.5	-253.9	-102.6	171.6	-19.6	1.0	-117.0
2.2.3 Enterprises providing ICT training	14.3	35.7	-35.7	7.1	-7.1	28.6	7.1	14.3	-21.4	50.0	-7.1	-35.7	14.3	-14.3	0.0	7.1	50.0	21.4	28.6
INNOVATION ACTIVITIES																			
Innovators																			
3.1.1 SMEs with product or process innovations	-18.2	18.3	-28.7	-17.3	-12.8	-51.8	-114.3	14.7	-11.6	-38.3	14.6	-26.0	5.1	-40.4	-22.9	50.6	-19.5	-7.5	3.3
3.1.2 SMEs with marketing or organisational innovations	-17.2	3.6	-8.8	-68.4	-0.1	-38.9	-64.8	37.2	-37.8	-16.4	10.5	-5.5	-20.4	-55.1	17.1	8.8	4.8	-18.0	17.5
3.1.3 SMEs innovating in-house	-6.7	-2.2	-27.0	-7.3	-10.1	-37.1	-82.9	11.7	-6.0	-34.6	7.3	-20.4	-16.3	-50.5	-19.5	50.2	-23.5	-3.9	10.5
Linkages																			
3.2.1 Innovative SMEs collaborating with others	0.5	6.5	-4.0	-12.5	-94.8	-16.8	-115.7	41.4	14.5	13.4	-3.1	-51.1	7.4	-96.6	-5.1	71.8	-31.6	-9.6	-10.1
3.2.2 Public-private co-publications	0.9	10.2	0.0	-8.8	3.7	5.2	-28.2	18.4	-7.8	0.7	2.2	-21.7	-8.5	-11.2	-5.7	-15.2	-15.0	3.5	-42.5
3.2.3 Private co-funding of public R&D expenditures	1.4	14.8	-1.7	15.5	-6.1	13.8	15.4	-9.1	7.5	-15.9	7.1	-0.5	-0.2	-7.8	17.8	4.8	-5.3	-42.5	-1.2
Intellectual assets																			
3.3.1 PCT patent applications	-4.2	-6.0	8.6	0.0	-25.5	-21.6	-23.7	-24.7	2.4	2.9	3.3	-1.7	5.6	10.4	1.9	7.0	3.3	-0.2	1.9
3.3.2 Trademark applications	13.0	2.6	20.8	13.0	29.0	-4.6	78.6	-16.3	55.5	19.0	0.2	10.5	24.5	81.2	6.4	51.4	0.0	11.5	78.0
3.3.3 Design applications	-3.5	-22.0	83.8	37.7	29.4	-18.4	80.0	-19.6	16.7	-10.7	-19.9	16.3	-6.6	53.0	-38.9	24.2	21.8	3.8	195.7
IMPACTS																			
Employment impacts																			
4.1.1 Employment in knowledge-intensive activities	10.4	0.0	22.1	7.8	0.0	-7.8	40.3	0.0	14.3	10.4	6.5	32.5	1.3	36.4	39.0	20.8	-11.7	-9.1	36.4
4.1.2 Employment fast-growing firms innovative sectors	-6.5	6.5	11.4	-4.8	-46.3	-28.4	4.6	13.2	n/a	36.1	-22.3	48.1	5.1	-11.8	45.1	-53.7	34.0	5.3	5.8
Sales impacts																			
4.2.1 Medium & high tech product exports	5.9	-1.6	22.3	6.9	17.9	6.6	13.8	16.8	-8.1	-2.3	2.4	-14.9	5.0	38.6	11.5	13.5	-19.2	-8.2	19.1
4.2.2 Knowledge-intensive services exports	4.9	6.7	24.6	11.9	-13.1	-3.4	-0.1	0.0	-38.6	0.6	9.5	-2.5	-0.7	1.5	-3.5	8.4	3.7	0.5	-644.1
4.2.3 Sales of new-to-market and new-to-firm innovations	1.1	-18.8	-92.9	-40.5	-44.2	-39.9	2.6	69.7	-79.6	0.3	17.5	-93.9	-17.1	-114.4	-5.7	-10.0	-23.0	-39.2	-109.6

Performance change is measured as the difference between performance in 2017 relative to the EU average in 2010 and performance in 2010 relative to the EU average in 2010 (the relative performance scores in both years are shown in the first table on the Country profiles).

	EU28	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK	IS	IL	MK	NO	RS	CH	TR	UA
FRAMEWORK CONDITIONS																			
Human resources																			
1.1.1 New doctorate graduates	39.4	52.2	-15.8	-12.8	-69.0	-50.1	135.9	11.4	-2.1	-29.6	67.7	15.4	10.5	27.2	23.9	45.4	0.0	8.2	61.5
1.1.2 Population completed tertiary education	13.4	17.2	14.2	7.5	19.4	1.5	48.5	39.6	0.0	10.4	11.2	50.7	n/a	36.6	-14.2	n/a	44.0	50.0	n/a
1.1.3 Lifelong learning	2.1	12.5	20.8	-3.1	-17.7	-3.1	-45.8	-7.3	45.8	38.5	-60.4	-18.8	n/a	-12.5	17.7	n/a	0.0	1.0	n/a
Attractive research systems																			
1.2.1 International scientific co-publications	63	201	167	42	155	24	145	50	217	262	160	27	62	24	263	60	34	69	5
1.2.2 Scientific publications among top 10% most cited	3.8	2.6	-3.0	13.9	-0.8	5.4	14.9	2.4	7.7	10.8	12.1	19.5	2.5	45.2	-10.9	-5.2	0.0	-8.2	3.1
1.2.3 Foreign doctorate students	10.7	6.0	3.2	-1.9	57.2	3.0	4.8	8.1	50.6	37.7	-19.7	36.6	n/a	121.5	-32.0	6.8	33.8	6.2	4.7
Innovation-friendly environment																			
1.3.1 Broadband penetration	77.8	133.3	111	66.7	211.1	66.7	33.3	33.3	122.2	111.1	55.6	n/a	n/a	33.3	88.9	0.0	n/a	33.3	-0.2
1.3.2 Opportunity-driven entrepreneurship	7.7	-29.6	-13.2	100.8	-7.0	-14.5	-25.9	4.4	81.2	43.4	-13.7	0.0	11.5	13.1	28.9	n/a	25.1	23.5	n/a
INVESTMENTS																			
Finance and support																			
2.1.1 R&D expenditure in the public sector	-3.5	5.3	8.9	-28.3	-7.1	-17.7	-26.6	19.5	-24.8	-3.5	-19.5	-1.8	-9.4	29.2	21.2	-34.0	31.9	-7.1	-27.0
2.1.2 Venture capital expenditures	22.0	44.9	23.1	10.2	-14.0	-36.5	-6.0	4.0	-100.5	-92.5	7.8	n/a	2.2	n/a	46.1	-17.4	23.2	n/a	16.8
Firm investments																			
2.2.1 R&D expenditure in the business sector	11.4	5.2	37.6	38.4	-12.2	7.9	-24.5	18.3	-68.2	-16.6	6.1	28.8	0.0	3.5	16.6	18.0	10.5	10.5	-7.6
2.2.2 Non-R&D innovation expenditures	9.3	-59.0	0.5	-1.8	-5.6	-188.1	4.0	-23.2	-41.2	63.8	61.9	n/a	n/a	0.0	87.2	164.7	104.7	261.9	-50.0
2.2.3 Enterprises providing ICT training	14.3	57.1	14.3	14.3	-14.3	0.0	0.0	-57.1	0.0	35.7	-14.3	-28.6	n/a	21.4	0.0	0.0	n/a	n/a	n/a
INNOVATION ACTIVITIES																			
Innovators																			
3.1.1 SMEs with product or process innovations	-18.2	48.8	5.0	-18.4	-24.3	-26.4	6.8	-10.0	9.7	-0.8	24.0	-42.5	-37.9	-58.5	52.3	42.9	-25.9	8.7	0.0
3.1.2 SMEs with marketing or organisational innovations	-17.2	13.2	11.1	-24.7	-20.5	-52.0	-21.1	-20.1	19.6	-5.5	48.9	-10.0	-53.1	-10.1	42.2	50.3	0.0	-33.2	-2.4
3.1.3 SMEs innovating in-house	-6.7	40.1	2.7	-24.8	-38.9	-38.0	1.3	-4.7	-1.2	-8.9	0.0	n/a	-32.9	-4.1	44.8	-18.6	65.2	-25.8	-4.1
Linkages																			
3.2.1 Innovative SMEs collaborating with others	0.5	45.1	57.9	-29.1	-55.7	-4.9	-11.0	26.6	14.8	-30.0	0.0	31.7	-42.1	-25.3	59.9	14.2	-6.5	10.2	-2.0
3.2.2 Public-private co-publications	0.9	-2.7	8.6	2.3	0.5	-15.8	-19.5	-9.4	-3.3	8.2	4.3	0.0	-11.3	13.4	-5.8	-17.9	0.0	-0.7	-3.6
3.2.3 Private co-funding of public R&D expenditures	1.4	-36.3	3.6	-3.9	8.8	-26.2	-12.2	15.8	-40.4	-8.5	-18.1	-26.7	0.0	n/a	-12.5	0.0	48.8	10.9	n/a
Intellectual assets																			
3.3.1 PCT patent applications	-4.2	-4.7	8.8	9.2	9.2	1.7	-35.9	4.5	-22.3	0.0	-9.2	20.0	0.0	-3.1	-5.3	n/a	-17.7	7.9	7.2
3.3.2 Trademark applications	13.0	4.9	-4.8	29.7	40.1	21.1	13.0	21.0	46.5	26.2	12.9	-13.1	36.4	33.9	12.1	-9.9	-17.4	4.6	-0.4
3.3.3 Design applications	-3.5	7.7	-25.6	31.6	-13.1	20.0	4.6	1.0	-10.3	-5.1	9.1	-15.4	9.3	0.3	-7.4	2.6	-23.3	-2.1	8.3
IMPACTS																			
Employment impacts																			
4.1.1 Employment in knowledge-intensive activities	10.4	0.0	9.1	16.9	19.5	22.1	10.4	2.6	13.0	22.1	15.6	9.1	0.0	-11.7	7.8	37.4	19.5	13.0	10.4
4.1.2 Employment fast-growing firms innovative sectors	-6.5	-9.1	-21.8	-10.6	43.6	11.5	7.9	-0.5	-14.0	-24.4	-3.3	n/a	n/a	n/a	-5.1	n/a	0.0	n/a	n/a
Sales impacts																			
4.2.1 Medium & high tech product exports	5.9	17.0	10.9	-6.5	5.7	13.4	2.9	12.2	-0.6	2.6	8.8	0.0	5.5	69.9	0.0	39.1	-37.9	16.3	-31.3
4.2.2 Knowledge-intensive services exports	4.9	3.2	18.8	0.6	0.2	9.1	5.4	-4.4	50.7	1.7	-2.8	-4.5	15.1	-15.9	4.5	8.2	4.9	12.0	8.2
4.2.3 Sales of new-to-market and new-to-firm innovations	1.1	19.3	7.2	-33.5	-91.9	-82.7	-38.3	32.8	-62.6	-22.4	133.4	-57.6	10.9	-14.8	15.1	-20.4	-11.7	30.4	-14.8

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 per 1000 population aged 25-34	Number of doctorate graduates Eurostat	Population between and including 25 and 34 years Eurostat	2016 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.
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	2017 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	2017 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 EU28) Web of Science *	Total population Eurostat	2017 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 Web of Science *	Total number of scientific publications Web of Science *	2015 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	2016 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.
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)	2017 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.

INDICATOR	DEFINITION NUMERATOR Source	DEFINITION DENOMINATOR Source	MOST RECENT YEAR FOR WHICH DATA ARE AVAILABLE INTERPRETATION
1.3.2 Opportunity-driven entrepreneurship (Motivational index)	This index is calculated as the ratio between the share of persons involved in improvement-driven entrepreneurship and the share of persons involved in necessity-driven entrepreneurship. Global Entrepreneurship Monitor (GEM) Comment: Three-year averages have been used.		2017 Data from GEM distinguish between two types of entrepreneurship: 1) improvement-driven entrepreneurship and 2) necessity-driven entrepreneurship. The first includes persons involved in TEA (Total Early-Stage Entrepreneurial Activity) who (i) claim to be driven by opportunity as opposed to finding no other option for work; and (ii) who indicate the main driver for being involved in this opportunity is being independent or increasing their income, rather than just maintaining their income; the second includes persons involved in TEA who are involved in entrepreneurship because they had no other option for work. Countries with high relative prevalence of improvement-driven opportunity entrepreneurship appear to be primarily innovation-driven countries. In these countries, opportunities may be expected to be more abundant, and individuals may have more alternatives to make a living. GEM has constructed the Motivational index to measure the relative degree of improvement-driven entrepreneurship.
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	2016 R&D expenditure represents one of the major drivers of economic growth in a knowledge-based economy. As such, trends in the R&D expenditure indicator provide key indications of the future competitiveness and wealth of the EU. Research and development spending is essential for making the transition to a knowledge-based economy as well as for improving production technologies and stimulating growth.
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	2017 The amount of venture capital is a proxy for the relative dynamism of new business creation. In particular for enterprises using or developing new (risky) technologies, venture capital is often the only available means of financing their (expanding) business.
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	2016 The indicator captures the formal creation of new knowledge within firms. It is particularly important in the science-based sectors (pharmaceuticals, chemicals and some areas of electronics) where most new knowledge is created in or near R&D laboratories.
2.2.2 Non-R&D innovation expenditures (percentage of turnover)	Sum of total innovation expenditure for enterprises, excluding intramural and extramural R&D expenditures Eurostat (Community Innovation Survey)	Total turnover for all enterprises Eurostat (Community Innovation Survey)	2014 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.

INDICATOR	DEFINITION NUMERATOR Source	DEFINITION DENOMINATOR Source	MOST RECENT YEAR FOR WHICH DATA ARE AVAILABLE INTERPRETATION
2.2.3 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)	2017 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.
3.1.1 SMEs introducing product or process innovations (percentage of SMEs)	Number of Small and medium-sized enterprises (SMEs) who introduced at least one product innovation or process innovation either new to the enterprise or new to their market. 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. A process innovation is the implementation of a new or significantly improved production process, distribution method, or supporting activity Eurostat (Community Innovation Survey)	Total number of Small and medium-sized enterprises Eurostat (Community Innovation Survey)	2014 Technological innovation, as measured by the introduction of new products (goods or services) and processes, is a key ingredient to innovation in manufacturing activities. Higher shares of technological innovators should reflect a higher level of innovation activities.
3.1.2 SMEs introducing marketing or organisational innovations (percentage of SMEs)	Number of Small and medium-sized enterprises (SMEs) who introduced at least one new organisational innovation or marketing innovation. An organisational innovation is a new organisational method in an enterprise's business practices (including knowledge management), workplace organisation or external relations that has not been previously used by the enterprise. A marketing innovation is the implementation of a new marketing concept or strategy that differs significantly from an enterprise's existing marketing methods and which has not been used before Eurostat (Community Innovation Survey)	Total number of Small and medium-sized enterprises Eurostat (Community Innovation Survey)	2014 The Community Innovation Survey mainly asks firms about their technological innovation. Many firms, in particular in the services sectors, innovate through other non-technological forms of innovation. Examples of these are marketing and organisational innovations. This indicator captures the extent to which SMEs innovate through non-technological innovation.
3.1.3 SMEs innovating in-house (percentage of SMEs)	Number of Small and medium-sized enterprises (SMEs) with in-house innovation activities. In-house innovating enterprises are defined as enterprises which have introduced product or process innovations either themselves or in co-operation with other enterprises or organisations Eurostat (Community Innovation Survey)	Total number of Small and medium-sized enterprises Eurostat (Community Innovation Survey)	2014 This indicator measures the degree to which SMEs, that have introduced any new or significantly improved products or production processes, have innovated in-house. The indicator is limited to SMEs, because almost all large firms innovate and because countries with an industrial structure weighted towards larger firms tend to do better.

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)	2014 This indicator measures the degree to which SMEs are involved in innovation co-operation. Complex innovations, in particular in ICT, often depend on the ability to draw on diverse sources of information and knowledge, or to collaborate 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. Publications are assigned to the country in which the business companies or other private sector organisations are located. Web of Science *	Total population Eurostat	2017 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 Private co-funding of public R&D expenditures (percentage of GDP)	All R&D expenditures in the government sector (GOVERD) and the higher education sector (HERD) financed by the business sector Eurostat, OECD	Gross Domestic Product Eurostat, OECD	2015 This indicator measures public-private co-operation. University and government R&D financed by the business sector are expected to explicitly serve the more short-term research needs of the business sector.
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	2015 The capacity of firms to develop new products will determine their competitive advantage. One measure of the rate of new product innovation is the number of patents. This indicator measures the number of PCT patent applications.
3.3.2 Trademarks applications per billion GDP (in PPS)	Number of trademark applications applied for at EUIPO plus number of trademark applications applied for at WIPO ("yearly Madrid applications by origin") European Union Intellectual Property Office (EUIPO), World Intellectual Property Organization (WIPO) Comment: Two-year averages have been used.	Gross Domestic Product in Purchasing Power Standard Eurostat	2017 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 Designs 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	2017 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	2017 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 fast-growing enterprises (percentage of total employment)	Number of employees in high-growth enterprises in 50% 'most innovative' industries[41] Eurostat	Total employment for enterprises with 10 or more employees Eurostat	2015 This indicator provides an indication of the dynamism of fast-growing firms in innovative sectors as compared to all fast-growing business activities. It captures the capacity of a country to transform rapidly its economy to respond to new needs and to take advantage of emerging demand.
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 MS, UN ComTrade for non-MS	2017 The indicator measures the technological compe-titiveness 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[42] Eurostat	Total value of services exports Eurostat	2016 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-firm innovations as percentage of turnover	Sum of total turnover of new or significantly improved products, either new-to-the-firm or new-to-the-market, for all enterprises Eurostat (Community Innovation Survey)	Total turnover for all enterprises Eurostat (Community Innovation Survey)	2014 This indicator measures the turnover of new or significantly improved products and includes both products which are only new to the firm and products which are also new to the market. The indicator thus captures both the creation of state-of-the-art technologies (new-to-market products) and the diffusion of these technologies (new-to-firm products).

[41] Defined as B06 (Extraction of crude petroleum and natural gas), B09 (Mining support service activities), C11 (Manufacture of beverages), C12 (Manufacture of tobacco products), C19 (Manufacture of coke and refined petroleum product), C20 (Manufacture of chemicals and chemical products), C21 (Manufacture of basic pharmaceutical products and pharmaceutical preparations), C26 (Manufacture of computer, electronic and optical products), C27 (Manufacture of electrical equipment), C28 (Manufacture of machinery and equipment n.e.c.), C29 (Manufacture of motor vehicles, trailers and semi-trailers), C30 (Manufacture of other transport equipment), C32 (Other manufacturing), D35 (Electricity, gas, steam and air conditioning supply) and E39 (Remediation activities and other waste management services).

[42] 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)

Annex F: Summary Innovation Index (SII) time series

	SUMMARY INNOVATION INDEX								RELATIVE TO EU IN 2010								... IN 2017
	2010	2011	2012	2013	2014	2015	2016	2017	2010	2011	2012	2013	2014	2015	2016	2017	2017
EU28	0.477	0.478	0.471	0.476	0.476	0.485	0.498	0.504	100.0	100.3	98.8	99.9	99.8	101.8	104.6	105.8	100.0
BE	0.560	0.569	0.562	0.562	0.560	0.564	0.585	0.593	117.5	119.3	117.9	117.8	117.5	118.3	122.8	124.4	117.5
BG	0.236	0.226	0.188	0.201	0.210	0.217	0.226	0.229	49.5	47.4	39.5	42.2	44.0	45.6	47.5	48.0	45.4
CZ	0.429	0.422	0.394	0.401	0.399	0.408	0.403	0.415	90.0	88.5	82.7	84.2	83.8	85.5	84.5	87.1	82.3
DK	0.665	0.685	0.688	0.695	0.682	0.684	0.670	0.668	139.4	143.7	144.2	145.9	143.1	143.6	140.6	140.1	132.4
DE	0.609	0.616	0.614	0.615	0.594	0.598	0.593	0.603	127.8	129.2	128.8	128.9	124.5	125.3	124.4	126.5	119.6
EE	0.412	0.427	0.436	0.439	0.417	0.432	0.389	0.397	86.4	89.5	91.5	92.0	87.5	90.6	81.6	83.2	78.6
IE	0.544	0.544	0.529	0.518	0.523	0.530	0.578	0.585	114.2	114.1	111.0	108.6	109.6	111.1	121.1	122.7	115.9
EL	0.332	0.330	0.329	0.336	0.297	0.309	0.323	0.328	69.6	69.2	68.9	70.5	62.4	64.8	67.7	68.8	65.0
ES	0.364	0.367	0.365	0.367	0.339	0.347	0.374	0.400	76.4	77.0	76.5	77.1	71.0	72.8	78.4	83.9	79.3
FR	0.503	0.512	0.504	0.508	0.520	0.532	0.553	0.551	105.5	107.4	105.7	106.6	109.0	111.7	116.0	115.5	109.2
HR	0.268	0.275	0.249	0.260	0.234	0.257	0.259	0.258	56.2	57.6	52.2	54.5	49.1	53.9	54.4	54.2	51.2
IT	0.362	0.361	0.363	0.357	0.365	0.375	0.369	0.371	75.9	75.7	76.1	74.8	76.6	78.6	77.3	77.9	73.6
CY	0.430	0.424	0.418	0.434	0.378	0.393	0.376	0.386	90.2	88.9	87.7	91.0	79.3	82.5	78.8	81.0	76.5
LV	0.230	0.230	0.217	0.216	0.262	0.294	0.278	0.285	48.2	48.3	45.5	45.3	54.9	61.7	58.4	59.8	56.5
LT	0.263	0.271	0.286	0.284	0.278	0.306	0.369	0.359	55.1	56.9	60.0	59.6	58.3	64.3	77.3	75.3	71.1
LU	0.580	0.594	0.617	0.627	0.602	0.626	0.624	0.611	121.6	124.5	129.5	131.6	126.2	131.3	131.0	128.1	121.1
HU	0.332	0.327	0.311	0.312	0.315	0.318	0.323	0.332	69.7	68.5	65.3	65.4	66.1	66.8	67.7	69.6	65.7
MT	0.330	0.319	0.299	0.349	0.392	0.405	0.377	0.403	69.3	66.9	62.7	73.2	82.1	84.9	79.1	84.5	79.9
NL	0.572	0.574	0.610	0.612	0.602	0.615	0.625	0.648	120.0	120.3	128.0	128.5	126.3	129.0	131.0	135.9	128.5
AT	0.536	0.541	0.556	0.566	0.550	0.556	0.582	0.579	112.4	113.4	116.5	118.7	115.3	116.6	122.1	121.3	114.7
PL	0.255	0.256	0.240	0.248	0.240	0.247	0.261	0.270	53.5	53.8	50.3	52.0	50.3	51.7	54.7	56.7	53.6
PT	0.413	0.409	0.390	0.402	0.386	0.397	0.395	0.406	86.7	85.8	81.8	84.2	81.0	83.2	82.9	85.2	80.5
RO	0.224	0.223	0.191	0.190	0.153	0.145	0.154	0.157	46.9	46.7	40.1	39.9	32.2	30.4	32.4	32.9	31.1
SI	0.459	0.469	0.456	0.459	0.467	0.463	0.468	0.465	96.2	98.4	95.7	96.3	98.0	97.1	98.1	97.6	92.2
SK	0.300	0.315	0.328	0.338	0.317	0.327	0.333	0.323	63.0	66.1	68.7	70.9	66.5	68.6	69.8	67.8	64.0
FI	0.636	0.631	0.631	0.632	0.621	0.632	0.641	0.649	133.3	132.4	132.3	132.7	130.3	132.6	134.5	136.1	128.7
SE	0.684	0.690	0.694	0.700	0.686	0.693	0.708	0.710	143.5	144.8	145.5	146.7	143.8	145.4	148.4	149.0	140.8
UK	0.546	0.533	0.534	0.526	0.553	0.568	0.612	0.613	114.5	111.9	111.9	110.4	116.0	119.0	128.3	128.5	121.5
IS	0.580	0.587	0.606	0.601	0.597	0.602	0.576	0.576	121.7	123.2	127.2	126.2	125.3	126.2	120.9	120.8	114.2
IL	0.562	0.564	0.569	0.576	0.535	0.545	0.542	0.541	117.9	118.3	119.4	120.8	112.3	114.4	113.7	113.4	107.2
MK	0.164	0.178	0.177	0.189	0.198	0.204	0.215	0.222	34.4	37.3	37.2	39.7	41.5	42.8	45.0	46.5	44.0
NO	0.478	0.492	0.482	0.487	0.477	0.488	0.572	0.571	100.2	103.1	101.1	102.1	100.0	102.3	120.0	119.7	113.1
RS	0.272	0.268	0.327	0.341	0.353	0.356	0.341	0.335	57.1	56.2	68.6	71.5	74.0	74.8	71.5	70.3	66.5
CH	0.760	0.764	0.760	0.755	0.766	0.782	0.799	0.808	159.4	160.3	159.5	158.5	160.8	164.0	167.6	169.4	160.1
TR	0.214	0.223	0.217	0.219	0.275	0.279	0.280	0.286	45.0	46.8	45.5	45.9	57.8	58.6	58.7	60.1	56.8
UA	0.149	0.146	0.140	0.138	0.135	0.145	0.124	0.140	31.2	30.7	29.4	28.9	28.4	30.4	25.9	29.4	27.8

Annex G: Performance scores per dimension

Performance is measured relative to that of the EU in 2017.

	HUMAN RESOURCES	RESEARCH SYSTEMS	INNOVATION-FRIENDLY ENVIRONMENT	FINANCE AND SUPPORT	FIRM INVESTMENTS	INNOVATORS	LINKAGES	INTELLECTUAL ASSETS	EMPLOYMENT IMPACTS	SALES IMPACTS
	2017	2017	2017	2017	2017	2017	2017	2017	2017	2017
EU28	100	100	100	100	100	100	100	100	100	100
BE	106.5	168.0	107.3	99.8	133.8	161.3	161.8	83.5	78.5	75.2
BG	54.2	28.0	52.9	21.0	51.4	14.3	32.0	85.8	102.4	33.0
CZ	78.4	72.5	79.2	47.3	103.9	86.1	77.6	62.7	115.1	94.8
DK	184.2	181.7	197.8	102.6	109.1	111.9	131.3	165.8	100.5	75.1
DE	94.4	92.2	100.7	102.0	156.4	152.6	125.2	147.6	100.3	114.7
EE	103.8	89.5	103.8	89.6	67.5	28.3	75.6	110.6	74.5	62.8
IE	140.7	141.5	96.6	75.8	93.5	170.0	89.1	46.9	164.8	127.7
EL	70.7	90.0	40.3	38.7	54.7	117.7	90.2	35.1	68.9	45.6
ES	118.6	86.9	107.3	80.2	67.8	42.0	68.6	72.2	90.2	73.6
FR	124.4	129.2	101.5	141.3	87.6	121.4	101.5	86.0	92.0	105.3
HR	45.0	37.2	40.6	37.3	96.7	72.1	66.5	29.6	68.6	25.6
IT	54.7	87.5	63.2	55.1	57.7	105.6	56.5	103.4	74.4	74.0
CY	95.7	104.4	45.6	42.6	54.2	101.1	59.8	114.4	60.8	73.1
LV	66.8	49.1	105.5	99.8	33.5	14.7	43.9	48.4	93.6	44.4
LT	96.8	34.8	123.0	59.4	93.2	92.6	102.0	51.0	39.3	35.1
LU	126.0	197.8	143.5	124.7	68.9	142.2	62.2	153.0	138.6	84.8
HU	45.7	58.4	88.1	46.4	78.3	17.6	69.5	39.2	124.3	95.1
MT	55.8	141.7	123.6	6.9	71.4	79.0	11.8	166.8	139.7	54.5
NL	146.1	182.6	159.4	130.2	76.4	127.3	151.2	126.6	115.3	91.7
AT	112.8	138.5	86.7	91.8	134.8	141.9	143.5	146.2	65.6	79.6
PL	60.5	29.4	95.1	30.8	81.0	3.4	37.6	74.5	91.9	53.1
PT	83.8	106.4	133.2	65.1	74.7	116.1	54.3	73.4	82.3	43.1
RO	18.8	26.1	72.3	20.8	11.9	0.0	37.7	22.3	34.6	64.0
SI	143.6	90.2	87.7	33.4	121.0	95.6	112.3	80.2	75.4	75.0
SK	77.6	50.5	59.3	27.6	57.0	33.9	68.0	35.3	118.6	101.2
FI	165.2	137.8	183.7	110.3	132.5	141.4	132.6	146.7	83.5	77.6
SE	179.6	176.5	190.5	111.6	157.9	126.8	131.0	156.6	131.4	82.1
UK	151.4	173.2	92.2	107.6	101.9	99.5	133.5	81.5	144.0	123.2
IS	125.9	165.5	197.8	113.6	120.3	143.6	156.7	57.3	146.3	35.1
IL	88.1	115.0	83.9	42.3	218.2	86.7	139.9	102.3	185.0	92.1
NO	143.4	146.4	144.0	136.5	124.9	139.1	136.2	44.8	94.9	49.8
MK	35.8	67.1	40.1	30.5	62.4	63.9	43.7	14.2	6.5	44.5
RS	64.1	32.7	18.5	37.7	118.3	84.1	94.0	24.2	93.5	58.5
CH	198.1	221.4	144.9	117.4	210.0	186.8	140.8	163.3	117.4	110.0
TR	31.4	38.1	84.1	52.7	126.0	97.5	63.7	9.0	10.8	53.6
UA	110.3	19.6	4.1	15.5	40.1	18.6	9.5	13.3	77.5	31.5

Annex H: International data

Performance in 2017 relative to EU in 2010	AU	BR	CA	CN	IN	JP	KR	RU	SA	US
	2017	2017	2017	2017	2017	2017	2017	2017	2017	2017
1.1.1 New doctorate graduates	123.8	23.4	78.4	10.8	5.7	61.5	83.8	60.6	11.0	80.8
1.1.2 Population completed tertiary education	133.7	43.8	171.9	39.5	29.9	154.3	143.2	169.9	36.8	139.5
1.2.1 International scientific co-publications	183.9	51.5	183.0	36.4	20.0	80.5	104.6	54.8	68.1	126.6
1.2.2 Scientific publications among top 10% most cited	117.1	49.8	115.0	77.4	60.7	59.4	62.5	34.0	71.6	130.8
2.1.1 R&D expenditure in the public sector	120.6	93.3	115.5	70.7	78.6	92.4	129.8	66.8	57.5	100.7
2.2.1 R&D expenditure in the business sector	80.8	41.9	65.7	132.0	23.5	199.1	240.1	51.8	27.8	157.2
3.1.1 SMEs with product or process innovations	181.1	114.8	172.2	n/a	58.4	80.2	96.4	15.4	n/a	72.6
3.1.2 SMEs with marketing or organisational innovations	136.7	181.8	154.7	n/a	134.4	95.2	84.8	7.8	158.9	n/a
3.2.1 Innovative SMEs collaborating with others	131.0	52.8	n/a	n/a	n/a	164.7	21.4	9.8	168.9	n/a
3.2.2 Public-private co-publications	80.0	5.6	104.7	16.7	2.0	118.4	156.4	5.4	6.9	169.2
3.2.3 Private co-funding of public R&D expenditures	108.0	n/a	109.9	119.8	n/a	34.6	131.8	124.4	58.5	42.3
3.3.1 PCT patent applications	78.0	28.0	86.1	67.4	33.6	161.7	161.7	33.6	41.4	111.8
3.3.2 Trademark applications	228.3	99.8	178.8	266.0	67.9	158.6	233.3	130.3	96.7	55.2
3.3.3 Design applications	96.7	52.4	73.9	208.6	41.9	91.0	229.9	50.9	65.2	58.8
4.2.1 Medium & high tech product exports	19.0	47.3	67.8	91.7	51.7	118.8	119.8	21.1	63.5	85.7
4.2.2 Knowledge-intensive services exports	33.4	78.3	82.2	49.4	119.1	66.5	44.8	95.6	20.6	86.4

Change in performance (2010–2017)	AU	BR	CA	CN	IN	JP	KR	RU	SA	US
1.1.1 New doctorate graduates	9.1	-0.5	1.0	-2.1	-1.2	-7.3	10.3	-24.6	2.5	-16.0
1.1.2 Population completed tertiary education	-2.6	-2.2	-11.4	3.0	-5.6	-8.0	-0.7	-22.6	-3.7	-11.4
1.2.1 International scientific co-publications	-22.6	5.4	-6.6	8.8	1.0	-5.1	-2.0	1.5	4.7	-2.3
1.2.2 Scientific publications among top 10% most cited	2.1	3.7	-1.3	9.0	-0.4	-3.8	-1.0	5.9	4.4	-8.8
2.1.1 R&D expenditure in the public sector	-2.2	2.2	-10.5	4.9	-1.1	-7.0	12.0	7.1	0.3	-8.1
2.2.1 R&D expenditure in the business sector	-32.7	-4.5	-19.0	20.1	1.5	-14.9	9.0	-4.8	-16.9	-9.0
3.1.1 SMEs with product or process innovations	24.0	5.3	5.7	n/a	6.6	3.5	-8.0	4.1	n/a	6.2
3.1.2 SMEs with marketing or organisational innovations	26.6	34.9	18.7	n/a	28.2	13.2	50.1	1.6	33.3	n/a
3.2.1 Innovative SMEs collaborating with others	-18.7	-9.8	n/a	n/a	n/a	43.8	-110.5	2.0	-31.2	n/a
3.2.2 Public-private co-publications	-17.9	0.1	-25.0	8.9	0.1	-28.0	12.8	-0.7	-1.8	-10.0
3.2.3 Private co-funding of public R&D expenditures	9.2	n/a	-10.2	-6.1	n/a	8.6	14.0	-5.3	16.2	1.4
3.3.1 PCT patent applications	-9.9	2.0	0.2	23.5	2.2	16.2	32.1	3.8	-6.7	6.6
3.3.2 Trademark applications	-32.6	4.0	-12.0	84.2	-7.3	67.8	-5.0	-17.7	-10.1	2.2
3.3.3 Design applications	4.4	0.4	5.0	2.8	1.1	-3.3	14.6	1.8	65.2	9.4
4.2.1 Medium & high tech product exports	4.9	8.1	10.6	-3.6	11.7	-4.2	2.0	7.7	16.4	1.5
4.2.2 Knowledge-intensive services exports	4.4	-25.5	-4.9	-42.4	-0.4	-57.0	-46.9	1.5	0.9	3.8

Performance change is measured as the difference between performance in 2017 relative to the EU average in 2010 and performance in 2010 relative to the EU average in 2010 (the results are the same as those shown in the final column in the performance tables in the country profiles in Section 5.3)

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