# European **Innovation** Scoreboard 2017

# Foreword

Innovation means prosperity. It drives productivity and economic growth, creates opportunities for new and better jobs, enables social mobility and is instrumental in responding to global societal challenges. In times of profound technological and societal transformation, the competitiveness of the European economy and the well-being of European citizens depend – more than ever – on the ability of our businesses to develop and successfully commercialise innovative solutions. Innovation increases efficiency, boosts company productivity and provides huge benefits to consumers.

Creating an ecosystem that allows innovation to thrive and multiply is a shared task of the EU, its Member States, regions and municipalities. The *European Innovation Scoreboard* helps Member States to assess performance, track progress on key aspects and identify policy priorities. For this year's edition, we have revised the measurement framework to better capture digitalisation and entrepreneurship, as drivers that are transforming the nature of innovation and how it spreads. We also adjusted that framework to improve its use for policymaking by better distinguishing between framework conditions, investments in innovation, firms' innovation activities and their impact.

The report reveals that while the innovation performance of the EU is improving, progress is too slow. Many of our global competitors are increasing their innovation performance at a much faster pace, and within the EU, performance gaps remain wide. While we are making good progress in education and research as well as in broadband infrastructure and ICT training, venture capital investments and the number of SMEs introducing innovations are declining strongly. Lifelong learning – essential to empowering citizens in a rapidly changing world – is stagnating.

In essence, Europe still lacks the market-creating innovation that is needed to turn our best ideas into new businesses and high quality jobs. We need to make sure at local, regional, national and EU level that innovative companies – established ones and start-ups alike – have access to the right employees with the right skills, to academic communities, other innovators and business partners, to the right investors and finance, and to the right political support for venturing into new markets in Europe and beyond.

The European Commission's priority actions address the entire innovation ecosystem. For instance, under the New Skills Agenda, we are working to overcome a growing mismatch of skills and to massively improve skills and reorient the European workforce. As part of our Startup and Scaleup initiative, we are launching a Pan-European Venture Capital Fund of Funds, which will provide funding for innovative, high-risk, high-potential projects. This will be complemented by a preparatory action for a European Innovation Council, which will champion breakthrough market-creating innovation and listen, harness and add value to the ideas of Europe's entrepreneurs and innovators. In parallel, we are continuously assessing and improving the innovation-friendliness of the European regulatory framework.

As we seek to make an open, outward-looking EU a destination of choice for global talent and investment and a hub of global value chains, a solid evidence base to guide our policies is more important than ever. We are confident that the *European Innovation Scoreboard 2017* will provide valuable resources for policy-makers to design policies that support innovation and hence jobs and growth in Europe. The *Regional Innovation Scoreboard*, which we are launching together with this report, provides additional insights at regional level. We hope that these reports will provide useful insight to policymakers, companies and researchers, and to anyone who shares our determination to boost innovation in Europe.

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European Commissioner for Internal Market, Industry, Entrepreneurship and SMEs

Carlos Moedas
European Commissioner for Research, Science and Innovation

# TABLE OF CONTENTS

# Executive summary

## European Innovation Scoreboard 2017: a revised measurement framework

This year's edition constitutes a major conceptual advancement of the report. Following developments in policy priorities, economic theory and data availability, the previous measurement framework was in need of adjustment. Its revision for the present edition aims at better aligning the EIS innovation dimensions with evolving policy priorities, improving the quality and timeliness of the indicators, better capturing new and emerging phenomena as digitisation and entrepreneurship, and providing a toolbox with contextual data, which can be used to analyse structural differences between Member States. The revision has benefited from interactions with renowned experts in the field and representatives of EU Member States.

The new measurement framework is composed of ten dimensions, including a new dimension on the innovation-friendly environment. Last year's dimension on economic effects has been split in two separate dimensions measuring the impact of innovation on employment and sales. By deleting three indicators and including five new indicators, the number of indicators has increased from 25 last year to 27 this year. In addition, definitions have been revised for six indicators. Another change is that comparisons between countries and over time are made relative to the performance of the EU in 2010, thereby providing an improved monitoring of performance changes over time.

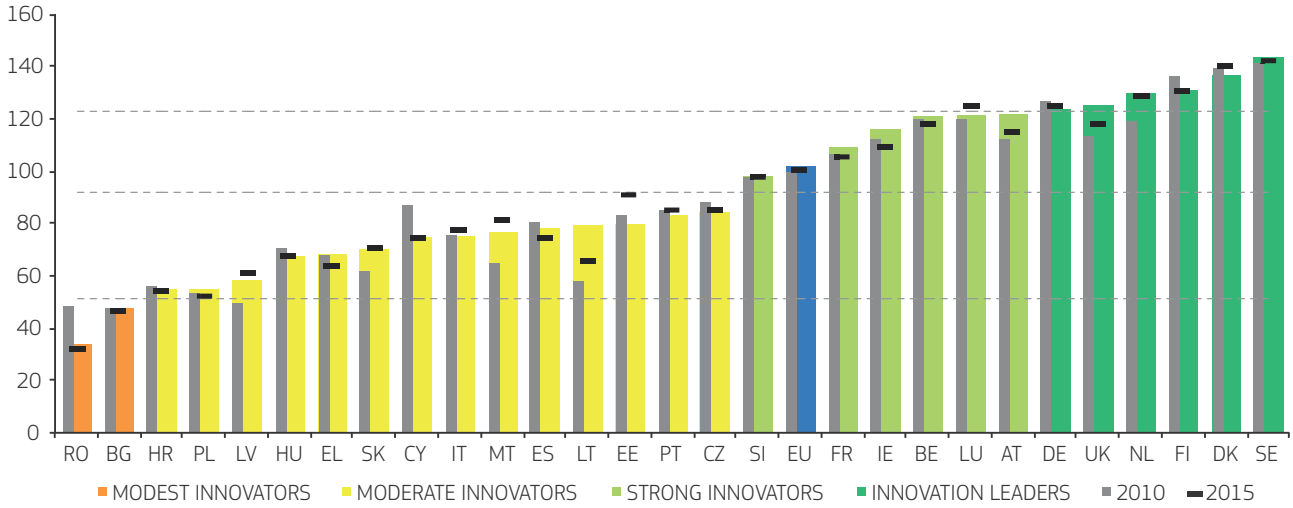
## The EU is catching up with the United States, while it is losing ground vis-à-vis South Korea and Japan

At the global level, the EU is less innovative than Australia, Canada, Japan, South Korea, and the United States. Performance differences with Canada and the United States have become smaller compared to 2010, but those with Japan and South Korea have increased. Japan has improved its performance more than three times as much as the EU, and South Korea has improved its performance more than four times as much as the EU. The EU maintains a performance lead over China, but this lead is decreasing rapidly with China having improved more than seven times faster than the EU. The EU's performance lead over Brazil, India, Russia, and South Africa is considerable.

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

The new 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*, *Attractive 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 effects*.

### Figure 1: Performance of EU Member States' innovation systems




Coloured columns show Member States' performance in 2016, using the most recent data for 27 indicators, relative to that of the EU in 2010. The horizontal hyphens show performance in 2015, 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 2016, comparing Member States' performance in 2016 relative to that of the EU in 2016.

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

Based on their average performance scores as calculated by a composite indicator, the Summary Innovation Index, Member States fall into four different performance groups (**Figure 1**). Denmark, Finland, Germany, the Netherlands, Sweden, and the United Kingdom are *Innovation Leaders* with innovation performance well above that of the EU average. Austria, Belgium, France, Ireland, Luxembourg, and Slovenia are *Strong Innovators* with performance above or close to that of 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 that of the EU average. These countries are *Moderate Innovators*. Bulgaria and Romania are *Modest Innovators* with performance well below that of the EU average.

## Performance has increased for the EU but not for all Member States

Compared to 2010, the innovation performance of the EU has increased by 2 percentage points. At the level of individual Member States, results differ with an increase in performance in 15 countries and a decrease in performance in 13 countries. Performance has increased most in Lithuania, Malta, the Netherlands, and the United Kingdom, and decreased most in Cyprus and Romania.

## Switzerland remains the most innovative country in Europe

Comparing the EU Member States to other European and neighbouring countries, Switzerland remains the most innovative European country. Iceland, Israel and Norway are Strong Innovators performing above the EU average, Serbia and Turkey are Moderate Innovators, and the Former Yugoslav Republic of Macedonia and Ukraine are Modest Innovators.

## In two years' time, EU innovation performance is expected to increase by 2 percentage points

Last year's report introduced, for the first time, a forward-looking analysis of EU innovation performance, discussing more recent developments, trends, and expected changes. This exercise is repeated this year using the revised measurement framework. The analysis explores EU trend performance on 19 indicators, for which a robust calculation of expected short-term changes proved possible. Increasing performance is expected for 12 of these indicators, and decreasing performance for six indicators. Overall, the innovation performance of the EU, relative to its performance in 2010, is expected to increase from 102% this year to 104% in two years' time.

This analysis also includes a trend comparison of the EU with its main competitors. At the global level, the trends observed in recent years can be expected to continue, with the EU catching up with the United States in two years' time, while the EU's performance gap towards Japan and South Korea would increase and its lead over China decrease further.

# 1. A revised measurement framework

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.

For the European Innovation Scoreboard 2017[1], the 16th edition since the introduction of the EIS in 2001, the measurement framework has been significantly revised. A direct consequence of this revision is that results in this year's EIS report cannot be compared to the results in the EIS 2016 report.

## A revised framework

The most recent 2016 European Innovation Scoreboard (EIS) followed the methodology of previous editions. The last major revision of the measurement framework was introduced in 2010 with the launch of the Innovation Union. Following new developments in policy priorities, economic theory and data availability, last year's measurement framework was in need of adjustment. The revision of the framework started in 2016 and benefited from discussions in various forums, including an expert workshop, various meetings of the Enterprise Policy Group (EPG)'s Subgroup on Innovation, a presentation at the European Research and Innovation Area Committee (ERAC)[2] plenary, and a workshop under ERAC auspices.

Notably, for the present 2017 edition, there was a need to: (1) better align the EIS dimensions with changing policy priorities; (2) continuously improve the quality, timeliness and analytical soundness of indicators; (3) ensure that the EIS better captures increasingly important phenomena, including in fields such as digitisation and entrepreneurship, and that it includes indicators on key areas such as human resources, skills and science-business links; and (4) provide a contextual analysis of the data presented, examining the effects of structural differences between Member States, in order to provide an enhanced evidence base for policy-making purposes.

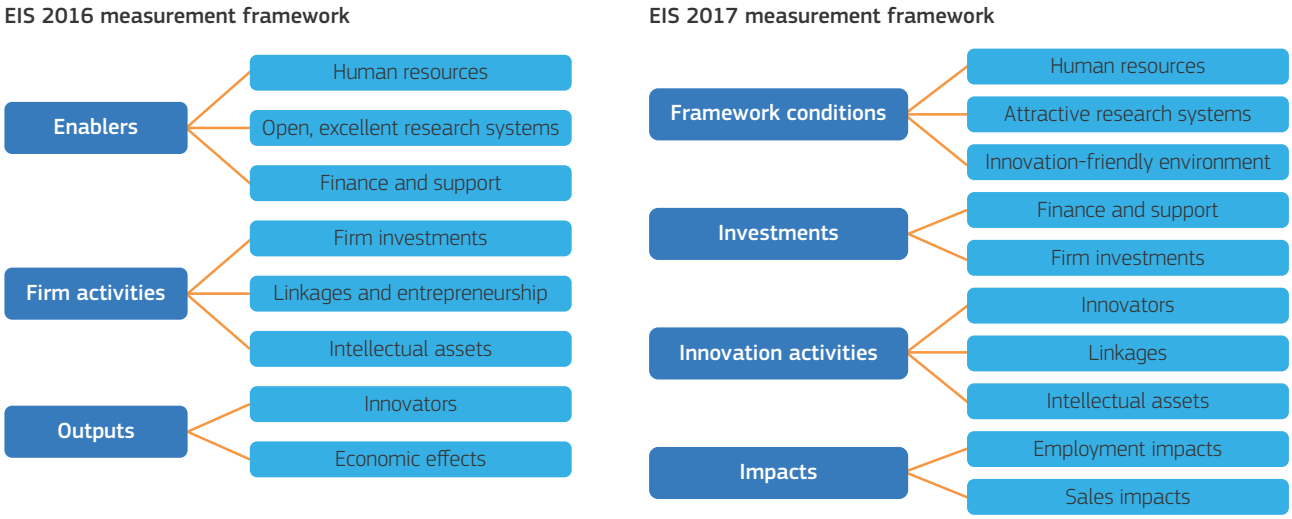
## Changes to the EIS measurement framework: regrouping and addition of dimensions

In the following, the changes to the EIS measurement framework will be briefly discussed. The EIS 2017 Methodology Report includes a more detailed discussion of these changes and the rationale for the new framework. The Methodology Report will also discuss the impact of these changes on the results compared to those in the EIS 2016.

The first change to the measurement framework involves a regrouping of the EIS 2016 innovation dimensions (**Figure 2**). The objective of this regrouping is to better distinguish between framework conditions and investments in innovation, enterprises' innovation activities, and the impact of these activities.

As a second change, one more dimension has been added to better capture the environment in which enterprises operate. Enterprises innovate in response to changes in their environment, in particular to new opportunities to expand their business or to threats from either existing enterprises or new entrants. Results from the Community Innovation Survey show that most enterprises innovate to improve the quality of goods or services, to increase the range of goods or services, or to increase their market share. A lack of internal funds, excessive innovation costs or a lack of external funds, are for most enterprises the most important factors hampering their innovation activities. Also, a lack of qualified

### Figure 2: EIS measurement framework: main groups and dimensions




[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.

[2] http://www.consilium.europa.eu/en/council-eu/preparatory-bodies/european-research-area-innovation-committee/

personnel, markets being dominated by established enterprises, and uncertain demand for innovative goods or services, score high among the factors hindering innovation. An environment which is "innovation-friendly" will act as a catalyst, helping enterprises to innovate or innovate more.

A third change involves splitting the EIS 2016 dimension measuring economic effects in two dimensions, one measuring employment impacts and the other one measuring sales impact.

## Changes to the EIS measurement framework: deleted, revised and new indicators

Within each of the dimensions, performance of the research and innovation system is captured by two or three indicators. **Table 1** summarises the changes made, including the deletion of three indicators, minor revisions to six indicators, and the inclusion of five new indicators. **Annex E** provides more detailed definitions for each indicator.

## Deleted indicators

'Youth with at least upper secondary education' has been removed for several reasons: first, education attainment is already captured by the indicator measuring the share of population with tertiary attainment; second, removing the indicator allowed for the inclusion of an indicator measuring the upgrading of skills during working life, i.e. the new indicator on lifelong learning. 'PCT patent applications in societal challenges' has been removed as it is already included in the indicator measuring all 'PCT patent applications', and including it would lead to a double-counting of patent applications in societal challenges. 'License and patent revenues from abroad' has been removed as these revenues can be considered as exports of knowledge-intensive services. The revenues previously captured by this indicator are now included in the revised indicator on 'Knowledge-intensive services exports'.

## Revised indicators

The share of 'Population having completed tertiary education' has been revised by increasing the age group from 30-34 to 25-34. Broadening the age group will reduce the confidence interval and improve the statistical significance of changes, while still capturing a relatively narrow age group, thereby allowing the indicator to respond faster to policy changes. The revised indicator uses the same age group as the indicator on 'New doctorate graduates'.

'Foreign doctorate students as percentage of total doctorate students' has been revised by not only capturing students with a citizenship of non-EU Member States as in the EIS 2016, but including all students with a citizenship of any foreign country (thus also including other EU Member States). The revision follows the fact that there should be no difference in the value of foreign students to a country's education system based on their country of origin. Broadening the definition will also provide a better benchmark with non-EU Member States, as for these the EIS 2016 indicator already included all foreign students.

## Table 1: EIS measurement framework: indicators

| EIS 2016 measurement framework (indicators removed in red, indicators revised in blue) | EIS 2017 measurement framework (indicators revised in blue, new indicators in green) |
|---|---|
| **ENABLERS** | **FRAMEWORK CONDITIONS** |
| • Human resources | • Human resources |
| ○ 1.1.1 New doctorate graduates | ○ 1.1.1 New doctorate graduates |
| ○ 1.1.2 Population aged 30-34 with tertiary education | ○ 1.1.2 Population aged 25-34 with tertiary education |
| ○ 1.1.3 Youth with at least upper secondary education | ○ 1.1.3 Lifelong learning |
| • Open, excellent research systems | • Attractive research systems |
| ○ 1.2.1 International scientific co-publications | ○ 1.2.1 International scientific co-publications |
| ○ 1.2.2 Top 10% most cited publications | ○ 1.2.2 Top 10% most cited publications |
| ○ 1.2.3 Non-EU doctorate students | ○ 1.2.3 Foreign doctorate students |
| • Finance and support | • Innovation-friendly environment |
| ○ 1.3.1 R&D expenditure in the public sector | ○ 1.3.1 Broadband penetration |
| ○ 1.3.2 Venture capital expenditures | ○ 1.3.2 Opportunity-driven entrepreneurship |
| **FIRM ACTIVITIES** | **INVESTMENTS** |
| • Firm investments | • Finance and support |
| ○ 2.1.1 R&D expenditure in the business sector | ○ 2.1.1 R&D expenditure in the public sector |
| ○ 2.1.2 Non-R&D innovation expenditures | ○ 2.1.2 Venture capital expenditures |
| • Linkages and entrepreneurship | • Firm investments |
| ○ 2.2.1 SMEs innovating in-house | ○ 2.2.1 R&D expenditure in the business sector |
| ○ 2.2.2 Innovative SMEs collaborating with others | ○ 2.2.2 Non-R&D innovation expenditures |
| ○ 2.2.3 Public-private co-publications | ○ 2.2.3 Enterprises providing training to develop or upgrade ICT skills of their personnel |
| • Intellectual assets | **INNOVATION ACTIVITIES** |
| ○ 2.3.1 PCT patent applications | • Innovators |
| ○ 2.3.2 PCT patent applications in societal challenges | ○ 3.1.1 SMEs with product or process innovations |
| ○ 2.3.3 Trademarks applications | ○ 3.1.2 SMEs with marketing or organisational innovations |
| ○ 2.3.4 Design applications | ○ 3.1.3 SMEs innovating in-house |
| **OUTPUTS** | • Linkages |
| • Innovators | ○ 3.2.1 Innovative SMEs collaborating with others |
| ○ 3.1.1 SMEs with product or process innovations | ○ 3.2.2 Public-private co-publications |
| ○ 3.1.2 SMEs with marketing or organisational innovations | ○ 3.2.3 Private co-funding of public R&D expenditures |
| ○ 3.1.3 Employment fast-growing enterprises of innovative sectors | • Intellectual assets |
| • Economic effects | ○ 3.3.1 PCT patent applications |
| ○ 3.2.1 Employment in knowledge-intensive activities | ○ 3.3.2 Trademark applications |
| ○ 3.2.2 Medium and high tech product exports | ○ 3.3.3 Design applications |
| ○ 3.2.3 Knowledge-intensive services exports | **IMPACTS** |
| ○ 3.2.4 Sales of new-to-market and new-to-firm product innovations | • Employment impacts |
| ○ 3.2.5 License and patent revenues from abroad | ○ 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 |

The indicator measuring 'Trademark applications' has been revised and will aggregate data from the European Union Intellectual Property Office (EUIPO) on Community trademark applications, already used in the EIS 2016, with data from the World Intellectual Property Organization (WIPO) on trademark applications applied for under the Madrid Protocol. In the EU, there is a four-tier system for registering trademarks: 1) for protection in one EU Member State only, one can make a trademark application directly at the relevant national IP office. This is the national route. 2) For protection in Belgium, the Netherlands and/or Luxembourg, one can make an application to the Benelux Office of Intellectual Property (BOIP), the only regional-level IP office in the EU, for trademark protection in those three Member States. This is the regional route. 3) For protection in more Member States of the EU, one can apply for an EU trademark from EUIPO – this is the European route. 4) The fourth route to protection in the EU is the international route. One can use a national, regional or EU trademark application to expand protection internationally, to any country that is a signatory of the Madrid Protocol.

'Employment in fast-growing enterprises of innovative sectors' suffered from being excessively complex, making it difficult to explain year-on-year changes in country performance. The indicator originates from the European Commission's Innovation Output Indicator (IOI). The previous indicator was computed by weighting sectoral innovation coefficients with sectoral shares of employment in high-growth enterprises. The revised indicator instead measures more simply the share of employment in high-growth enterprises in the top 50% most innovative sectors within total employment. The top 50% most innovative sectors are selected based on a ranking of innovation coefficients measuring the degree of innovation of each industry at EU level[3].

The indicator measuring 'Knowledge-intensive services exports' has been revised and also includes license and patent revenues from abroad, which was a separate indicator in the EIS 2016.

## New indicators

'Lifelong learning (percentage of population aged 25 to 64 participating in education and training)' captures the share of the adult population involved in training activities and measures the upgrading of skills during working life. 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. Lifelong learning makes workers involved in innovative activities more knowledgeable and efficient. The 25-64 year age group refers to the majority of the labour force outside initial formal education. The indicator was also included in earlier versions of the EIS, but was removed from the 2010 report onwards.

'Broadband penetration (share of enterprises with a maximum contracted download speed of the fastest fixed internet connection of at least 100 Mbps)' captures the increasing digitisation of European economies. Digital innovations are reshaping Europe's economy and industries. Big data, the Internet of Things, and mobile and cloud technologies are expected to be strong drivers of economic growth, job creation and the quality of life. 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.

'Opportunity-driven entrepreneurship' is measured by the Motivational Index from the Global Entrepreneurship Monitor (GEM) and captures the prevalence of opportunity-driven entrepreneurship. Improvement-driven opportunity entrepreneurship is the result of individuals wanting to exploit new innovative products. This type of entrepreneurship is relevant for measuring the performance of innovation systems.

The 'share of enterprises that provide training to develop/upgrade ICT skills of their personnel' captures the upgrading of ICT skills in the business sector. ICT skills are particularly important for innovation in an increasingly digital economy. The share of enterprises providing training in this respect is a proxy for the overall skills development of employees.

'Private co-funding of public R&D (percentage of GDP)' measures public-private co-operation. The share of university and government R&D financed by the business sector captures the importance of external R&D and the role of Public Research Organisations and higher education institutions in an enterprise's innovation activities. A higher share of business funding going to public R&D is expected in economies with a high share of large firms with more linkages to public R&D. In addition, external R&D-industry links are more developed in science-intensive sectors such as semiconductors, computers, communications equipment, drugs, organic chemicals, plastics, petroleum refining, pulp and paper.

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

In addition to changes to the main measurement framework, a need has emerged for additional contextual analyses explaining the impact of structural differences on observed scores. The analysis of structural differences by country will be performed in the country profiles. As an introduction, the following sections discuss the importance of these structural aspects for a better understanding of differences between countries in the performance on particular indicators. Full definitions of these indicators are provided in the EIS 2017 Methodology Report.

## Structure of the economy

Of particular importance are differences in economic structures, with differences in the share of industry in GDP and so-called high-tech activities in manufacturing and services, being important factors that explain why countries can performance 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, patent applications and shares of innovating

[3] Vertesy, D. and Deiss, R., The Innovation Output Indicator 2016. Methodology Update; EUR 27880 EN; doi:10.2788/261409

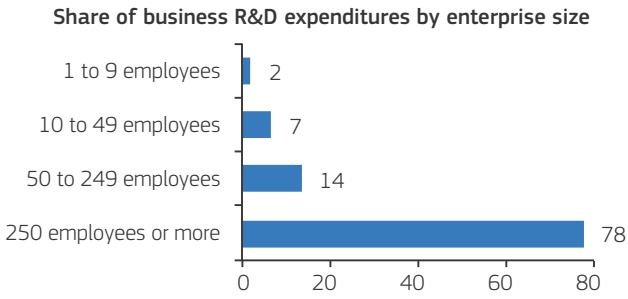
enterprises. Countries with above-average shares of these industries are expected to perform better on several EIS indicators. For example, for the EU28 on average, 85% of R&D expenditures in manufacturing are accounted for by medium-high and high-technology manufacturing industries[4]. Also, the share of enterprises that introduced a product and/or process innovation is higher (53%) in medium-high and high-technology manufacturing industries compared to all core industries (31%) covered in the Community Innovation Survey[5].

## Business indicators

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 (**Figure 3**), 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[6].

Foreign ownership, including ownership from both other EU Member States and non-Member States, is important as about 40% of business R&D expenditures in EU Member States are by foreign affiliates, which is significantly higher compared to major international competitors[7]. The indicator measuring the share of foreign-controlled enterprises serves as a proxy for differences in foreign ownership rates between countries.

### Figure 3: Enterprise size and business R&D expenditures




*Average 2011-2014 data for EU28*

'Opportunity-driven entrepreneurship' is one of the new indicators in the EIS and provides a measure of opportunities for engaging in new business. The EIS indicator is complemented by a contextual indicator measuring the share of new enterprise births in the economy.

Institutional and legal differences between countries may make it more or less difficult to engage in business activities. The World Bank's Doing Business 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 real new business activities or perceived possibilities for new business activities: 'Employment of fast-growing firms in innovative sectors' and 'Opportunity-driven entrepreneurship'.

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[4] 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 machinery and equipment (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).

[5] 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).

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

[7] Average shares for 2011-2015 are 40.8% for the EU (a weighted average of 15 Member States for which data are available), 29.4% for Australia, 35.6% for Canada, 16.1% for the United States, and 5.5% for Japan (own calculation using data from OECD Main Science and Technology Indicators).

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. Higher degrees of Buyer sophistication could explain higher shares of innovative sales as measured by the EIS indicator 'Sales of new-to-market and new-to-firm product innovations'.

## Socio-demographic indicators

Densely populated areas are more likely to be more innovative for several reasons. First, knowledge diffuses more easily when people and enterprises are located closer to each other. Second, in urbanised areas there tends to be a concentration of government and educational services. These provide better training opportunities and also employ above-average shares of highly educated people. Data on urbanisation distinguish between the share of households living in rural areas, towns and suburbs, and cities. For the EU28, higher shares of highly educated people and people involved in lifelong learning are found in more highly urbanised areas.[9] At the regional level, differences in population density and in the degree of urbanisation are even more relevant. Regional data for 220 regions in Europe are available in the Regional Innovation Scoreboard 2017.

Structural data also include population size and GDP per capita in purchasing power standards[10], which is a measure for interpreting real income differences between countries. Other indicators include population size, the share of population aged 15-64 as a proxy for the share of the labour force, and two indicators measuring the change between 2010 and 2015 in GDP and population. In economies that grow faster, expanding markets may provide more favourable conditions for enterprises to sell their goods and services.

## 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 2017. International sources have been used wherever possible in order to improve comparability between countries. The data relates to actual performance in 2016 for 10 indicators, 2015 for eight indicators and 2014 for nine 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 there. For Greece, data is missing for the indicators 'Foreign doctorate students' and 'Employment in fast-growing enterprises in innovative sectors'.

[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

[9] More details are provided in the EIS Methodology Report.

[10] 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.

# 2. Innovation performance and trends

## 2.1 Most recent innovation performance

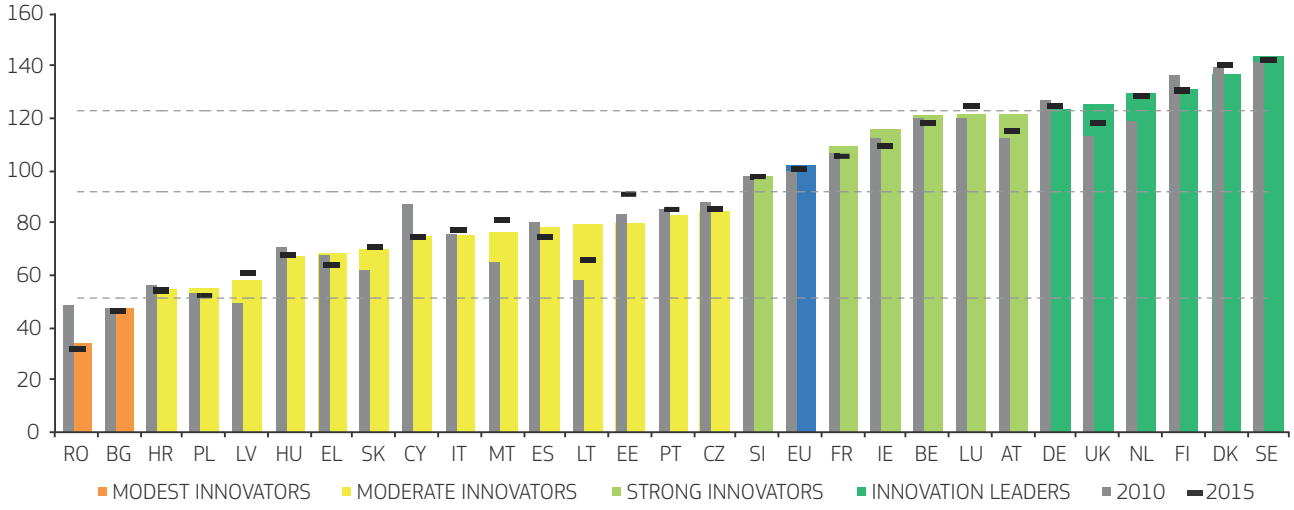
The performance of EU national innovation systems is measured by the Summary Innovation Index, which is a composite indicator obtained by taking an unweighted average of the 27 indicators (cf. **Table 1**)[11]. **Figure 4** shows the scores for the Summary Innovation Index for all EU Member States (country abbreviations and full names are shown in **Annex A**).

Based on this year's results, **the Member States fall into four performance groups**[12]:

- 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, Germany, the Netherlands, Sweden, and the United Kingdom[13].
- The second group of **Strong Innovators** includes Member States with a performance between 90% and 120% of the EU average. Austria, Belgium, France, Ireland, Luxembourg, 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.

As shown on the map in **Figure 5**, the performance groups tend to be geographically concentrated. The most innovative countries are surrounded by different zones of countries. Their average performance decreases with increasing geographical distance from the Innovation Leaders.

### Figure 4: Performance of EU Member States' innovation systems



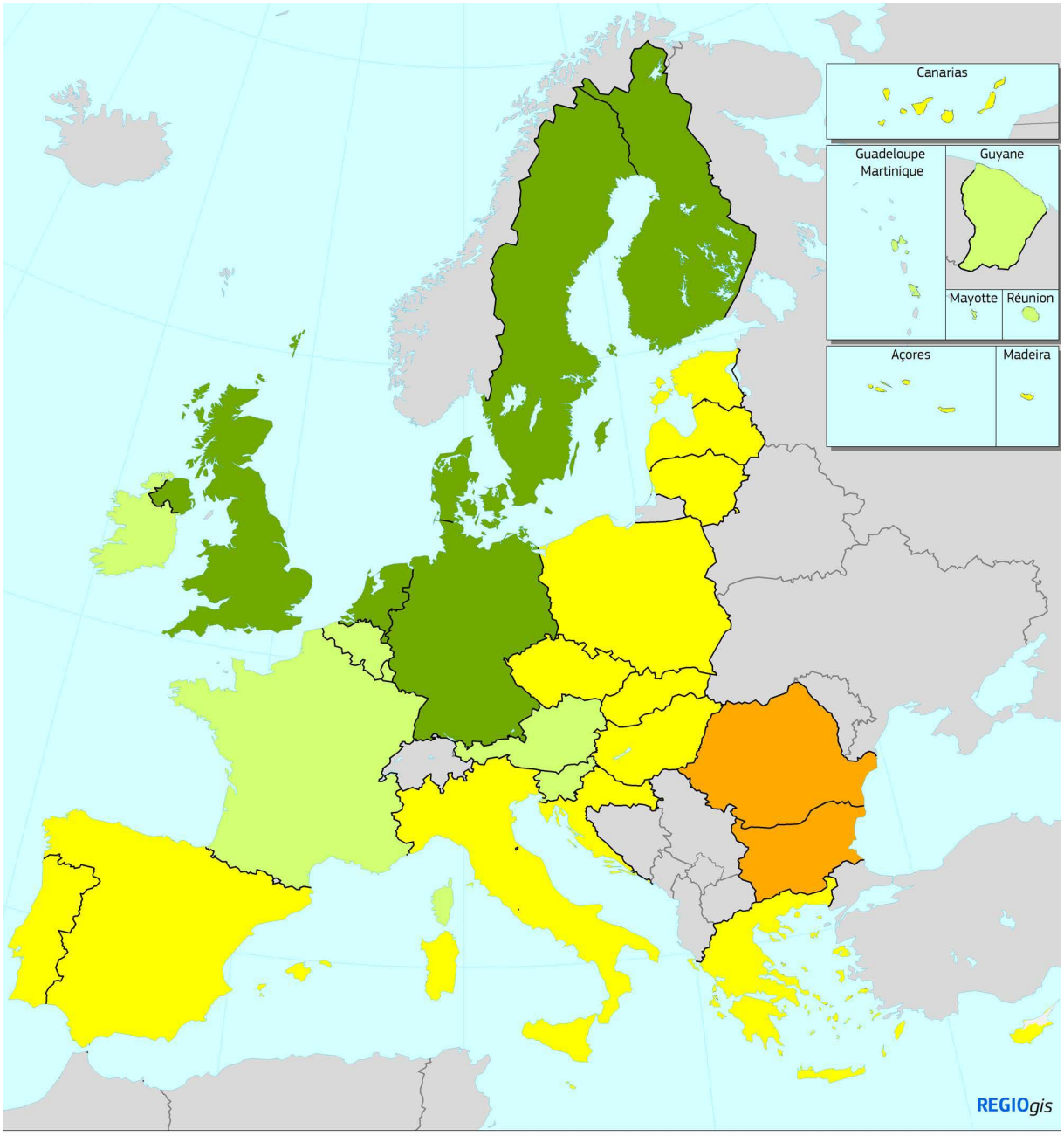

*Coloured columns show Member States' performance in 2016, using the most recent data for 27 indicators, relative to that of the EU in 2010. The horizontal hyphens show performance in 2015, using the next most recent data for 27 indicators, relative to that of the EU in 2010. Grey columns show Member 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 2016, comparing Member States' performance in 2016 relative to that of the EU in 2016. Scores relative to EU 2016 used for determining group membership are shown in **Annex F**.*

[11] Chapter 8 gives a brief explanation of the calculation methodology. The EIS 2017 Methodology Report provides a more detailed explanation.

[12] 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.

[13] The UK was a Strong Innovator in the EIS 2016. The country's advance to the Innovation Leader group in the EIS 2017 is not due to the new measurement framework, as it would still have been a Strong Innovator last year based on the next most recent data in the EIS 2017.

## Figure 5: Map showing the performance of EU Member States' innovation systems



## 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.

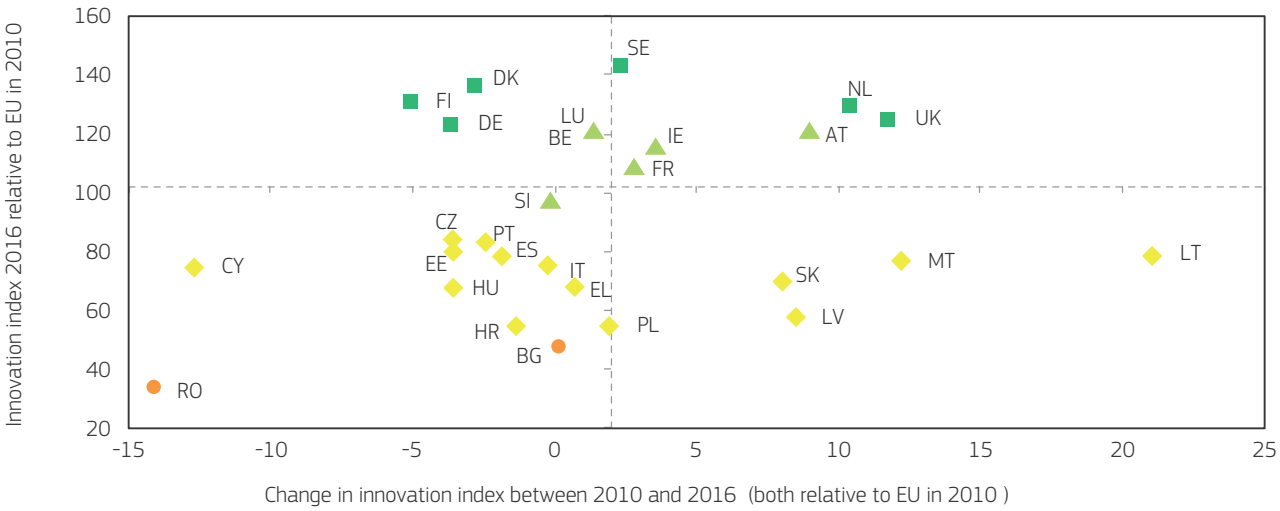
For the EU, performance between 2010 and 2016 improved by 2.0 percentage points. Performance improved for 15 Member States and worsened for 13 Member States (**Figure 6**) (**Annex F** shows the Summary Innovation Index and performance scores relative to the EU average over time):

- For seven Member States, performance improved by 5% or more: Lithuania (21.0%), Malta (12.2%), United Kingdom (11.7%), Netherlands (10.4%), Austria (8.9%), Latvia (8.5%), and Slovakia (8.0%);
- For eight Member States, performance improved by less than 5%: Ireland (3.5%), France (2.8%), Sweden (2.3%), Poland (2.0%), Belgium (1.4%), Luxembourg (1.4%), Greece (0.7%), and Bulgaria (0.1%);
- For 10 Member States, performance declined by up to 5%: Slovenia (-0.2%), Italy (-0.2%), Croatia (-1.4%), Spain (-1.8%), Portugal (-2.4%), Denmark (-2.8%), Hungary (-3.5%), Czech Republic (-3.5%), Estonia (-3.6%), and Germany (-3.7%);
- For three Member States, performance declined by more than 5%: Finland (-5.1%), Cyprus (-12.7%), and Romania (-14.1%).

In past EIS reports, less innovative countries would 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 that the change in performance is not related to the level of performance[14]. Between 2010 and 2016, there has been no convergence in innovation performance between Member States performing at lower levels in 2010 and those performing at higher levels.

Performance for the **Innovation Leaders** improved until 2013, after which it declined in 2014. Performance improved again in 2015 and 2016, but average performance is still below that in 2012. Performance has improved most in the Netherlands and the UK, with increases of more than 10 percentage points. The increase in the Netherlands took place mostly between 2011 and 2012. The increase in the UK is more recent, starting in 2012 and accelerating in 2016. Performance also improved for Sweden, but at a lower rate. For Denmark, Finland, and Germany, performance has declined. Danish performance improved until 2013, after which it declined for three years resulting in an almost 9 percentage point lower relative score in 2016 as compared to 2013. For Germany, a similar pattern is observed with increasing performance until 2013 followed by a decline until 2016. For Finland, the decline already started in 2010 leading to an almost 6 percentage point performance decline until 2014, but performance improved again in 2015 and 2016.

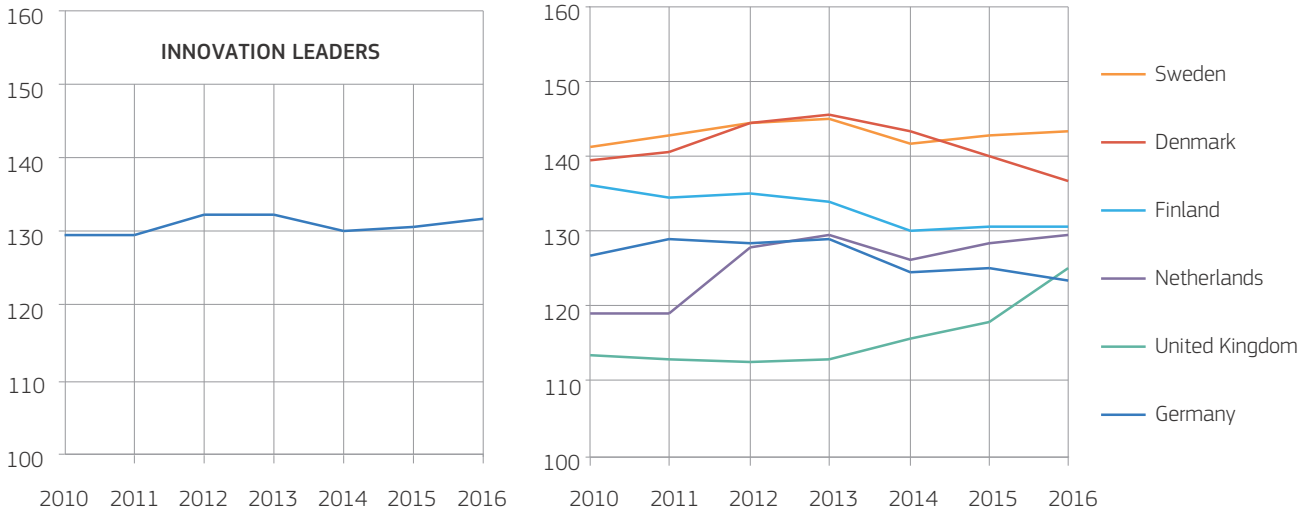
### Figure 6: Change in innovation performance not related to performance levels




*The vertical axis shows Member States' performance in 2016 relative to that of the EU in 2010. The horizontal axis shows the change in performance between 2010 and 2016 relative to that of the EU in 2010. The dashed lines show the respective scores for the EU.*

[14] The correlation coefficient between the change and the levels in both 2010 and 2016 is statistically not significant.

## Figure 7: Performance Innovation Leaders

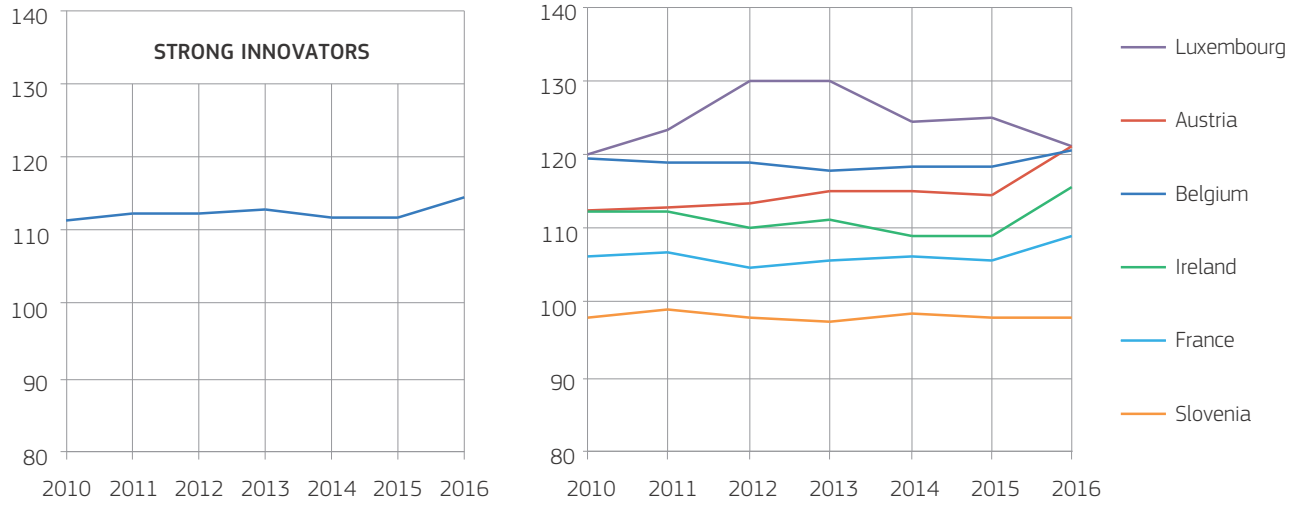



*Performance is relative to that of the EU in 2010. The graph on the left shows the average performance of the Innovation Leaders, calculated as the unweighted average of the respective Member States.*

For the **Strong Innovators**, performance improved until 2013, after which it declined in 2014 and 2015, and increased strongly in 2016, raising average performance by 3 percentage points compared to 2010. The performance gap to the Innovation Leaders narrowed between 2010 and 2016.

Performance has improved for all Strong Innovators, but most strongly for Austria, in particular due to a strong increase in 2016. Also for Ireland, performance increased strongly in 2016 (6.9 percentage points). For Belgium and France, performance in 2016 increased at slightly lower rates, whereas it declined marginally for Slovenia and more strongly for Luxembourg.

## Figure 8: Performance Strong Innovators




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

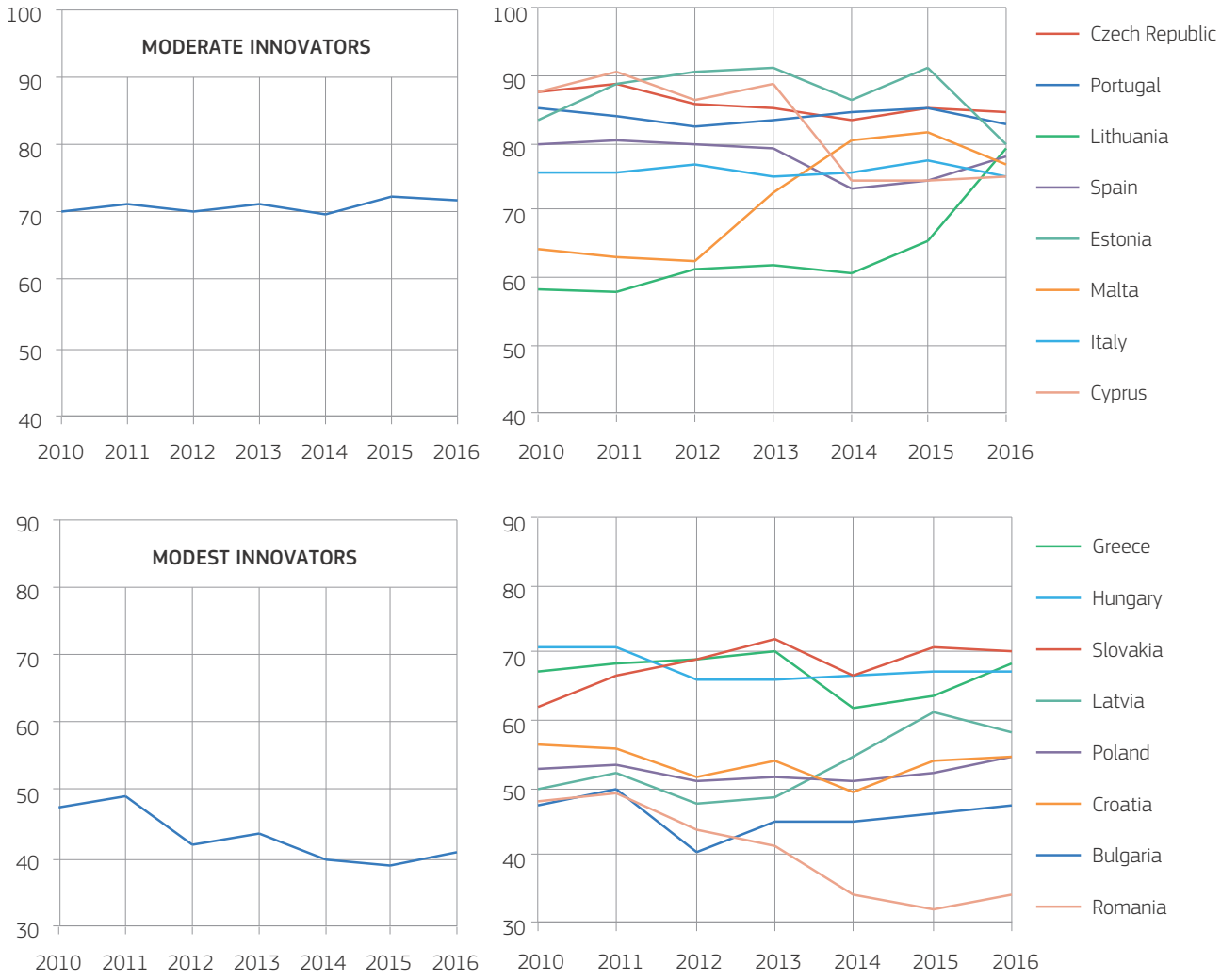
For the **Moderate Innovators**, performance has been increasing in a cyclical pattern, with performance increases in odd-numbered years and performance decreases in even-numbered years. The performance gap to the Strong Innovators widened between 2010 and 2016.

For five Moderate Innovators, performance has increased. For Lithuania, performance improved very strongly by 21.1 percentage points, with performance improvements in most years but in particular in 2016. Performance also increased strongly for Malta between 2010 and 2016, in particular in 2013 and 2014, when performance grew by 9 percentage points on average per year. For both Latvia and Slovakia, performance increased by almost 8 percentage points. For Latvia, strong performance increases in 2014 and 2015 are partly offset by performance declines in 2012 and 2016. For Slovakia, performance increased strongly until 2013, but has declined between 2013 and 2016. For Greece and Poland, performance has increased at more moderate rates.

For Italy, performance in 2016 is just below that in 2010. For Croatia and Spain, performance declined by about 1.5 percentage points, with performance increasing in 2015 and 2016 for both countries. For the Czech Republic, Estonia, and Hungary, performance declined between 3 and 5 percentage points, but performance patterns over time are quite different. For the Czech Republic, annual performance has been changing at relatively moderate rates, with a stronger decline in 2012. For Estonia, performance has been improving up until 2015, followed by a very strong decline of almost 12 percentage points in 2016. For Hungary, a performance decline until 2013 has been followed by a performance increase between 2013 and 2016. For Cyprus, performance has declined most strongly, in particular due to a very strong performance decline in 2014.

For the **Modest Innovators**, performance declined between 2010 and 2016, leading to a widening of the performance gap to the Moderate Innovators. For Bulgaria, performance in 2016 is almost the same as in 2010, where a strong decline in 2012 has almost been matched with performance increases in all other years. For Romania, performance has declined strongly by 14.1 percentage points but, after four years of declining performance, performance increased again in 2016.

## Figure 9: 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

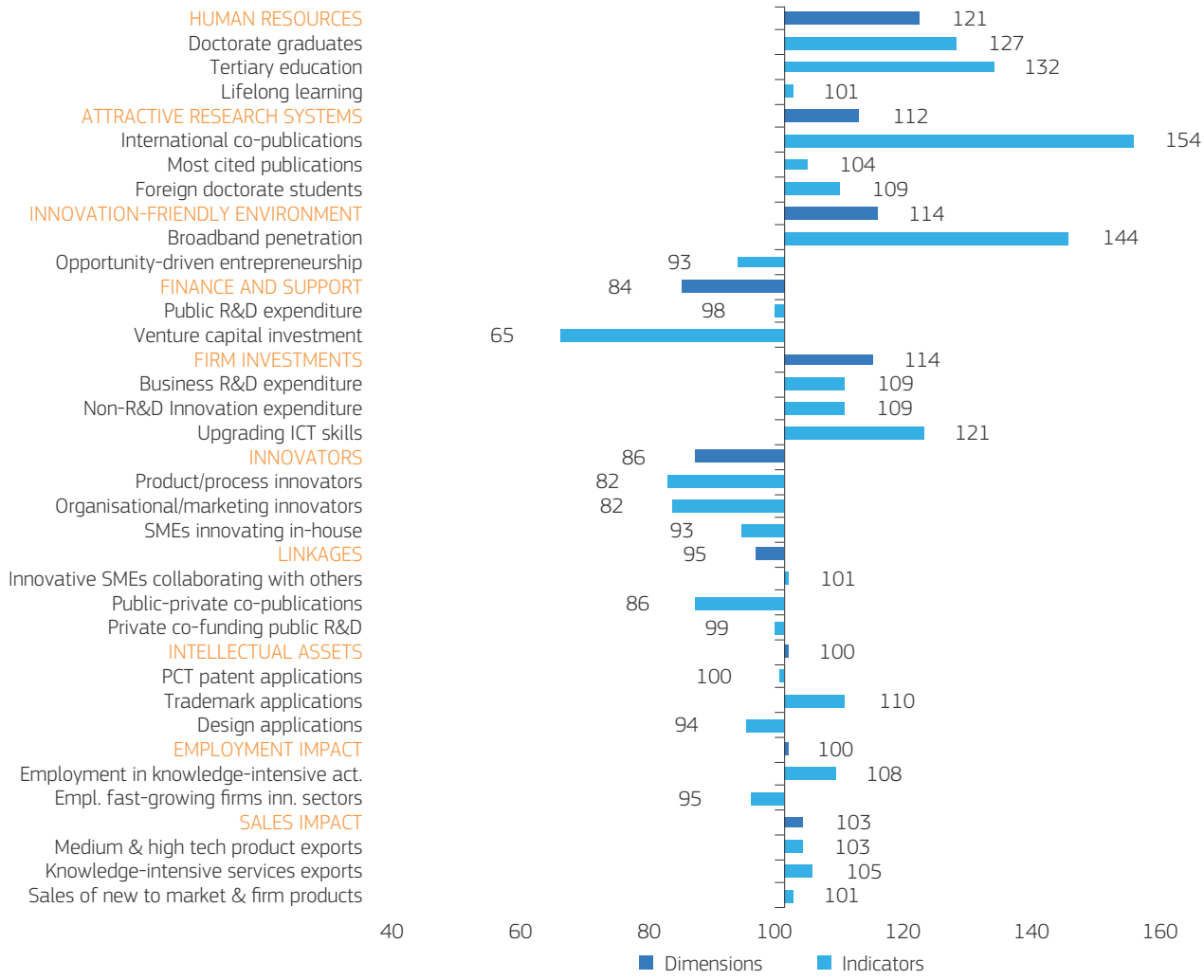
Performance of the EU innovation system has improved by 2.0 percentage points between 2010 and 2016. However, not all elements of the EU innovation system have been improving at the same rate. **Figure 10** shows the improvement for each dimension and indicator compared to the performance of that dimension or indicator in 2010.

Performance has improved most (21.0 percentage points) in *Human resources*, with increasing performance in 'Doctorate graduates' and 'Tertiary education'[15]. Performance in *Innovation-friendly environment* has improved due to a strong improvement in 'Broadband penetration'. Performance for all three indicators captured in *Firm investments* has improved, leading to a 13.6 percentage point performance increase. A 54.2 percentage point increase in 'International scientific co-publications' has been the main driver of the performance increase for *Attractive research systems*.

For *Sales impact*, performance has improved by almost 3 percentage points, with increasing performance for all three indicators. Performance in *Intellectual assets* and *Employment impact* has almost not changed. For *Employment impact*, the increase in 'Employment in knowledge-intensive activities' has been offset by a decline in 'Employment of fast-growing enterprises in innovative sectors'. For *Intellectual assets*, performance has increased for 'Trademark applications' but remained stable or declined for the other two indicators.

Performance has declined for three dimensions. For *Finance and support*, performance in both 'Public R&D expenditures' and 'Venture capital investments' has declined. For *Innovators*, performance has declined for all three indicators. For *Linkages*, performance has declined for 'Public-private co-publications' and remained almost the same for the other two indicators.

## Figure 10: EU Performance change between 2010 and 2016 by dimension and indicator




*Normalised scores in 2016 relative to those in 2010 (=100)*

[15] Performance in Lifelong learning has not improved as due to a break in series in 2013, data are only available for three years, where performance has not changed over these three years.

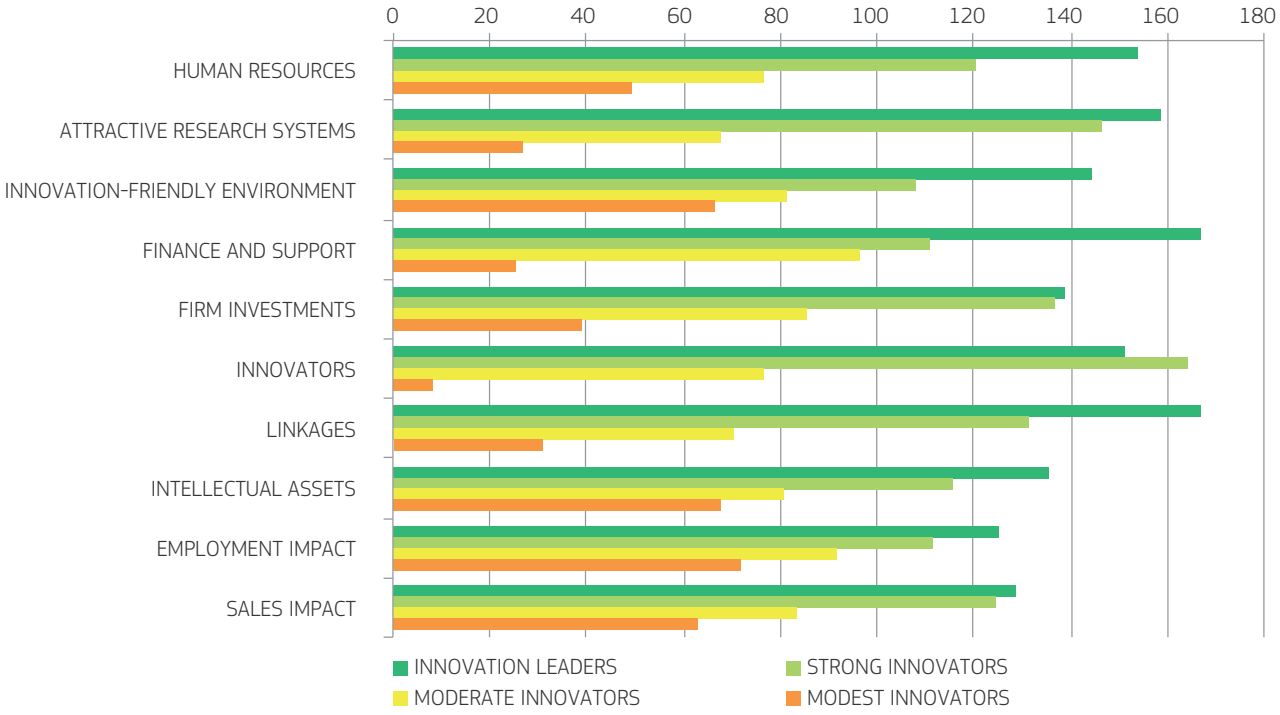
# 4. Innovation dimensions

The order of performance groups observed for the Summary Innovation Index also applies to most dimensions. The Innovation Leaders perform best in all but one dimension, followed by the Strong Innovators, the Moderate Innovators and the Modest Innovators (**Figure 11**) (**Annex G** shows the composite indicator scores for each dimension).

In the *Innovators* dimension, the Strong Innovators show the best performance. In other dimensions, performance differences can be small between the country groups. In *Sales impact* and *Research systems*, the performance difference is relatively small, compared to the average difference between the Innovation Leaders and the Strong Innovators across all dimensions. Between the Strong and Moderate Innovators, performance differences are relatively small for *Finance and support* and *Employment impact*. Between the Moderate and Modest Innovators, performance differences are relatively small for *Intellectual assets*, *Innovation-friendly environment*, *Employment impact*, and *Sales impact*. Performance differences between the Innovation Leaders and Strong Innovators are relatively high for *Finance and support*. Performance differences between the Strong Innovators and Moderate Innovators are relatively high for *Research systems* and *Linkages*. Performance differences between the Moderate Innovators and Modest Innovators are relatively high for *Finance and support* and *Research systems*.

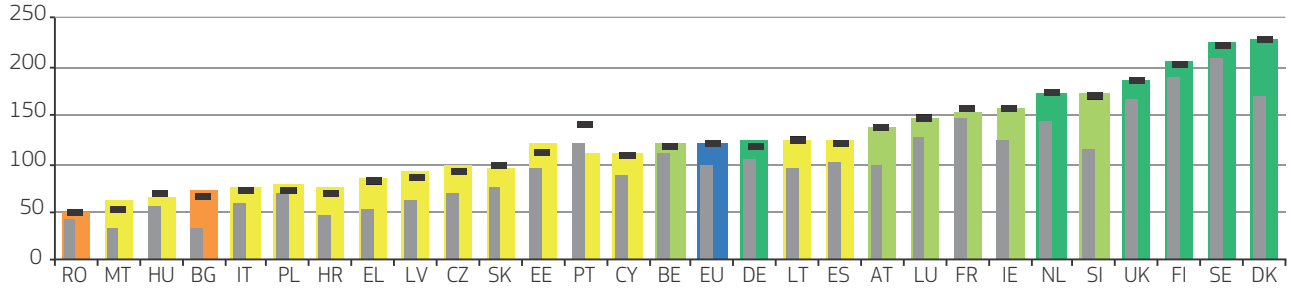
The country rankings in *Human resources* and *Attractive research systems* come close to the overall classification of performance groups. This also holds, although to a lesser extent, for *Finance and support*, *Innovators* and *Linkages*. The dimensions *Innovation-friendly environment* and *Sales impact* 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 being 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 11: Performance groups: innovation performance per dimension**




*Average scores for each performance group equal the unweighted average of the relative-to-EU scores of the Member States within that group. As these unweighted averages do not 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

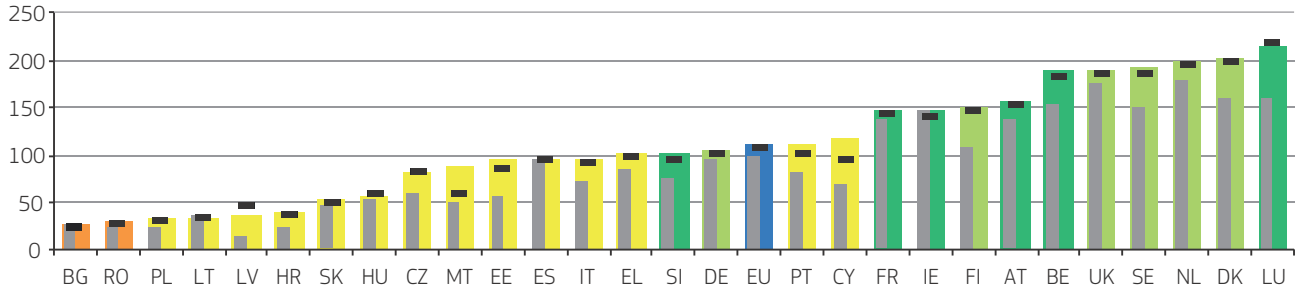



*Coloured columns show Member States' performance in 2016, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2015, using the next most recent data for the indicators in this dimension, relative to that of the 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 four of the top-5 positions, with only Germany performing less well. Except for Belgium, all Strong Innovators perform above the EU average. Most of the Moderate Innovators perform below the EU average, with only Spain and Lithuania performing above the EU average. The Modest Innovators perform least well, with Romania being the worst performer but Bulgaria performing better than two Moderate Innovators.

For all countries except Portugal, performance has improved between 2010 and 2016. The highest rate of performance increase is for Denmark (60.0%), followed by Slovenia (59.7%), Austria (41.1%), Bulgaria (38.1%), and Greece (34.85). For Portugal, performance has decreased by almost 9 percentage points. The EU average increased by 21.0% between 2010 and 2016.

## Attractive research systems

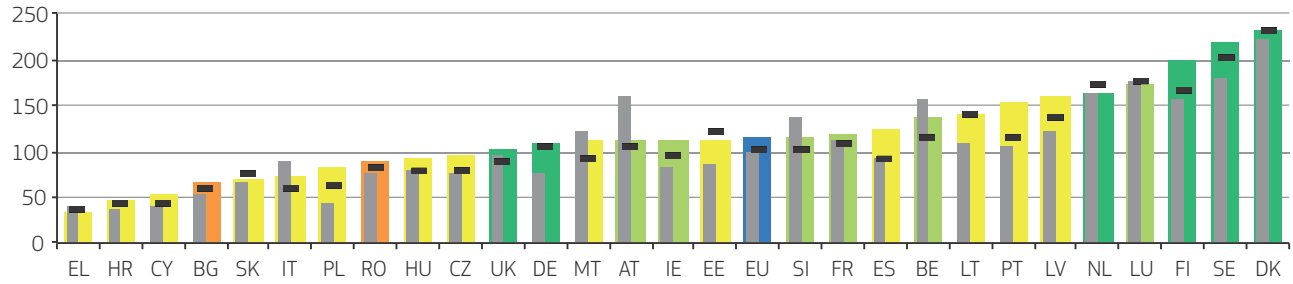



*Coloured columns show Member States' performance in 2016, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2015, using the next most recent data for the indicators in this dimension, relative to that of the 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 four of the top-5 positions. However, the overall best performer is Luxembourg, one of the Strong Innovators. Germany, one of the Innovation Leaders, performs below the EU average. All Strong Innovators perform above the EU average, except for Slovenia. Most of the Moderate Innovators perform below the EU average, where only Cyprus and Portugal perform above the EU average. The Modest Innovators perform least well, taking the last two positions in the performance ranking.

For all countries except Lithuania, performance has improved between 2010 and 2016. The highest rate of performance increase is for Luxembourg (54.0%), followed by Cyprus (48.6%), Sweden (43.7%), Denmark (43.4%), and Finland (43.3%). For Lithuania performance has decreased by almost 2 percentage points. The EU average increased by 11.8% between 2010 and 2016.

## Innovation-friendly environment

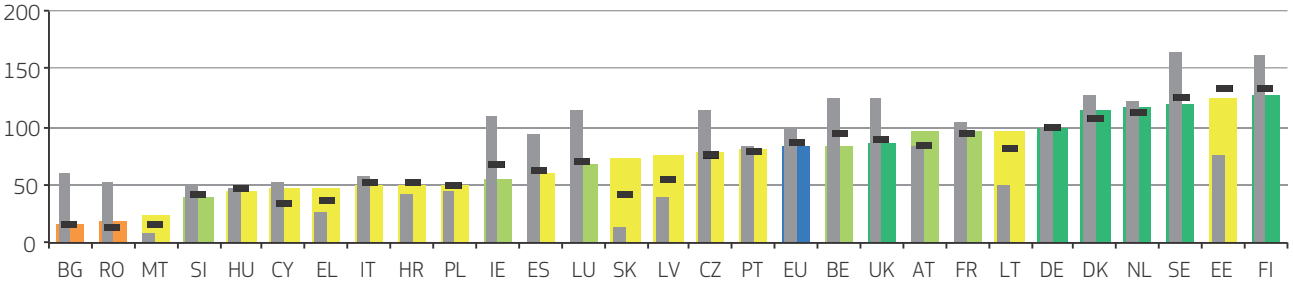



*Coloured columns show Member States' performance in 2016, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2015, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2010. Grey columns show performance in 2010 relative to that of the EU in 2010.*

Performance in *Innovation-friendly environment* does not reflect the overall classification for all countries. Four out of six Innovation Leaders are in the top-5 positions, but Germany and the UK are performing below the EU average. The Strong Innovators are even more dispersed, with Luxembourg in the top-5, Slovenia, France, and Belgium above the EU average, and Austria and Ireland below. The Moderate Innovators show a strong performance on this dimension, in particular Latvia, Portugal, Lithuania, and Spain.

The highest rate of performance increase between 2010 and 2016 is observed in Portugal (50.3%), followed by Finland (41.0%) and Poland (38.9%). Other strong improvements are observed in Sweden, Latvia, Spain, Lithuania, Germany, and Ireland. Austria has had the highest rate of decrease in performance (-50.7%), other strong decreases are observed in Slovenia and Belgium. The EU average increased by 14.3% between 2010 and 2016.

## Finance and support

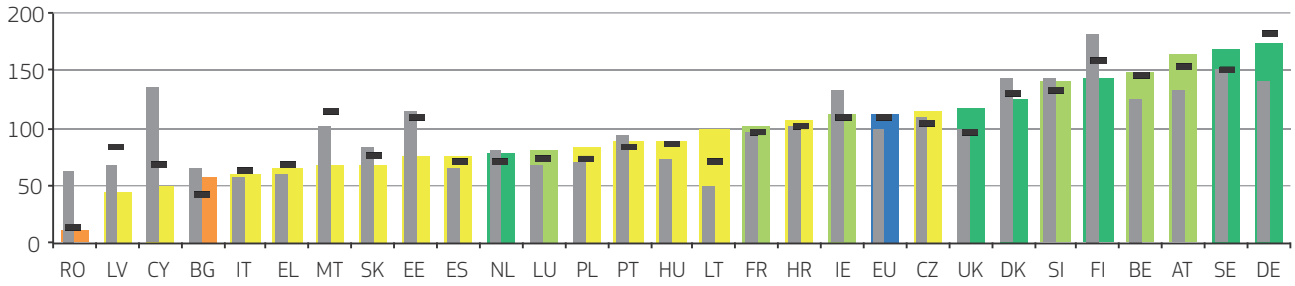



*Coloured columns show Member States' performance in 2016, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2015, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2010. Grey columns show performance in 2010 relative to that of the EU in 2010.*

Performance in *Finance and support* reflects to some extent the overall classification into four performance groups with four Innovation Leaders in the top-5 positions, but the second best performer is Estonia, one of the Moderate Innovators. Three out of the six Strong Innovators perform above the EU average: France, Austria, and Belgium. Most of the Moderate Innovators perform below the EU average, except for Estonia and Lithuania. Bulgaria and Romania, both Modest Innovators, close the ranking at the bottom.

The highest rate of performance increase between 2010 and 2016 is observed in Slovakia (57.9%), followed by Lithuania (48.0%), and Estonia (47.1%). Other strong improvements are observed in Latvia and Greece. Ireland has had the highest rate of decrease in performance (-53.6%). Ten countries show a rate of decrease in performance of more than 30%. The EU average decreased by 16.3% between 2010 and 2016.

## Firm investments

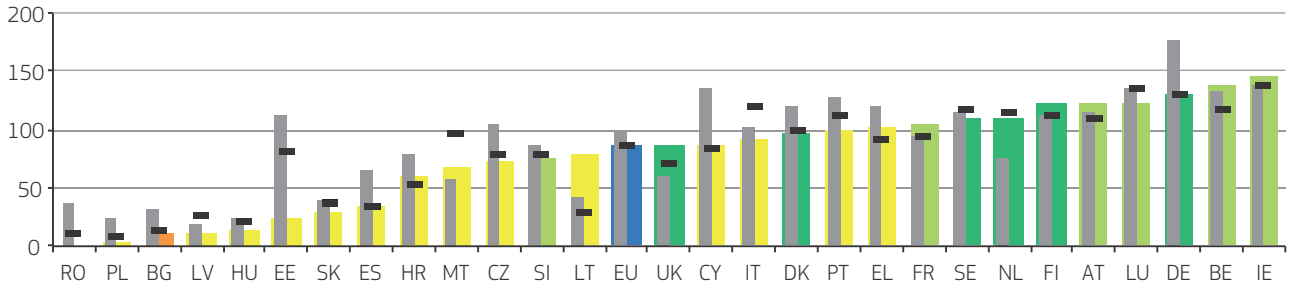



*Coloured columns show Member States' performance in 2016, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2015, using the next most recent data for the indicators in this dimension, relative to that of the 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 three Innovation Leaders in the top-5. The Innovation Leaders and Strong Innovators, except for the Netherlands, are the best performing countries for the *Firm investments* dimension. The Czech Republic, a Moderate Innovator, is amongst the top-10 countries in terms of performance. Germany is the overall leader, Sweden ranks second and Austria third. Luxembourg, France, and Ireland, all Strong Innovators, perform below the EU average.

The highest rate of performance increase between 2010 and 2016 is observed in Lithuania (51.3%), followed by Germany (34.0%) and Austria (32.7%). Other strong improvements are observed in Belgium, the UK, and Sweden. The EU average increased by 13.6% between 2010 and 2016, for 12 Member States performance decreased, most notably Cyprus (-87.4%), Romania (-52.5%), Estonia (-38.8%), and Finland (-38.7%). Other strong decreases are observed in Malta, Latvia, and Ireland.

## Innovators

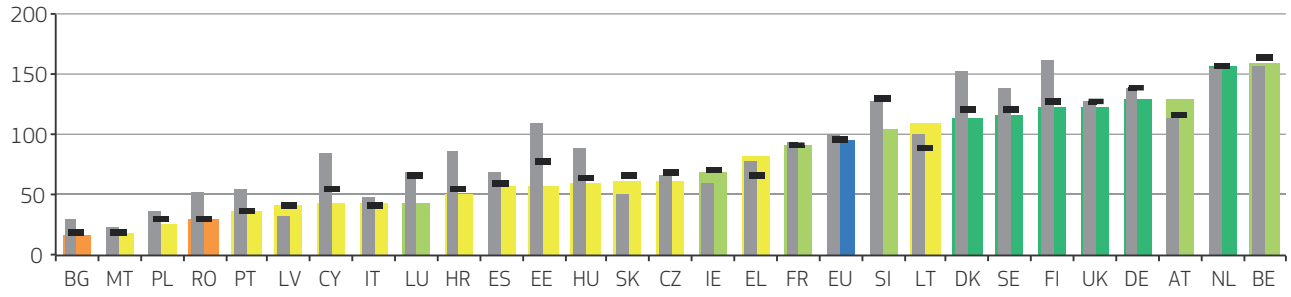



*Coloured columns show Member States' performance in 2016, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2015, using the next most recent data for the indicators in this dimension, relative to that of the 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. Innovation Leaders and Strong Innovators, except for Slovenia, are the best performing countries. Ireland is the overall leader, and Belgium ranks second; both countries are Strong Innovators. Germany, an Innovation Leader, ranks third. There are four Moderate Innovators that perform above the EU average on this indicator: Greece, Portugal, Italy, and Cyprus.

The highest rate of performance increase between 2010 and 2016 is observed in Lithuania (36.4%), followed by the Netherlands (34.0%) and the UK (24.8%). For 19 EU Member States, performance decreased, most notably in Estonia (-87.6%), Cyprus (-49.2%), Germany (-44.6%), and Romania (-38.5%). Other strong decreases are observed in the Czech Republic, Spain, Portugal, Denmark, and Poland. The EU average decreased by 14.5% between 2010 and 2016.

## Linkages

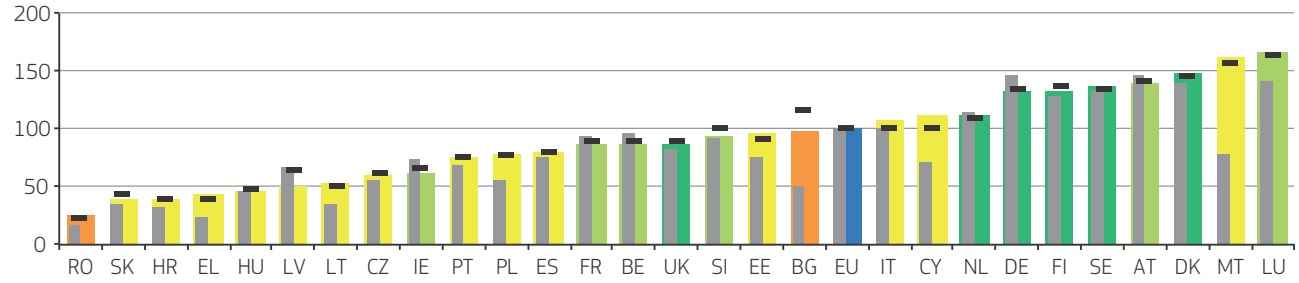



*Coloured columns show Member States' performance in 2016, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2015, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2010. Grey columns show performance in 2010 relative to that of the EU in 2010.*

Performance in the dimension *Linkages* reflects to some extent the overall classification into four performance groups. The Innovation Leaders are represented amongst the top group of countries, together with Strong Innovator countries such as Belgium, which is the overall leader in this dimension, Austria and Slovenia. On the other hand, Luxembourg, also a Strong Innovator, performs well below the EU average. Ireland and France also perform below the EU average. Moderate Innovator Lithuania shows a strong performance above the EU average.

The highest rate of performance increase between 2010 and 2016 is observed in Austria (16.0%), followed by Slovakia (11.3%), and Lithuania (8.7%). For 20 EU Member States, performance decreased, most notably in Estonia (-51.3%), Cyprus (-40.9%), Denmark (-37.9%), and Finland (-37.4%). Other strong decreases are observed in Croatia, Hungary, and Luxembourg. The EU average decreased by 4.7% between 2010 and 2016.

## Intellectual assets

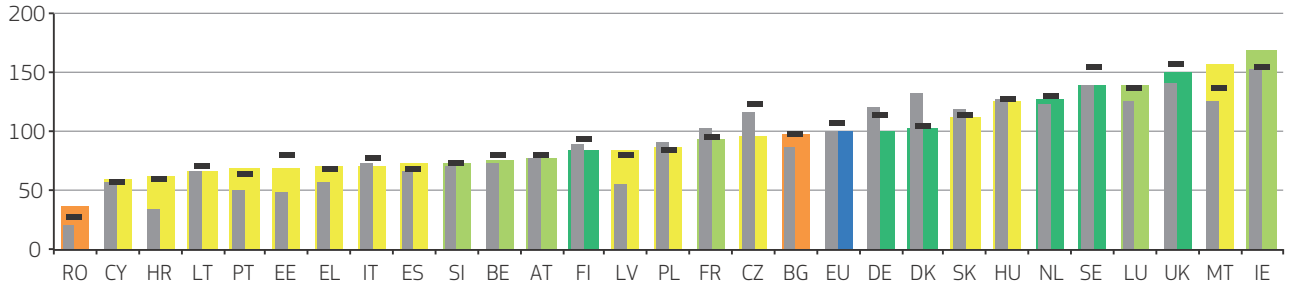



*Coloured columns show Member States' performance in 2016, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2015, using the next most recent data for the indicators in this dimension, relative to that of the EU in 2010. Grey columns show performance in 2010 relative to that of the EU in 2010.*

Performance in the *Intellectual assets* dimension reflects the overall classification into four performance groups less well with only two Innovation Leaders in the top-5 positions. Luxembourg, a Strong Innovator, is the best performing country in *Intellectual assets*, followed by Malta, a Moderate Innovator. Denmark ranks third and Austria fourth. Most of the Innovation Leaders, except the UK, are amongst the leading countries in this dimension. Bulgaria, a Modest Innovator, performs just below the EU average. Strong Innovators Ireland, France, and Belgium all perform below the EU average.

The highest rate of performance increase between 2010 and 2016 is observed in Malta (83.8%), followed by Bulgaria (48.5%) and Cyprus (39.6%). Other high increases over time are observed for Luxembourg, Estonia, and Poland. For 21 Member States performance increased between 2010 and 2016. The EU average has increased by 0.4%. Strong decreases are observed in Latvia (-16.3%), Germany (-13.7%), and Ireland (-11.6%).

## Employment impacts

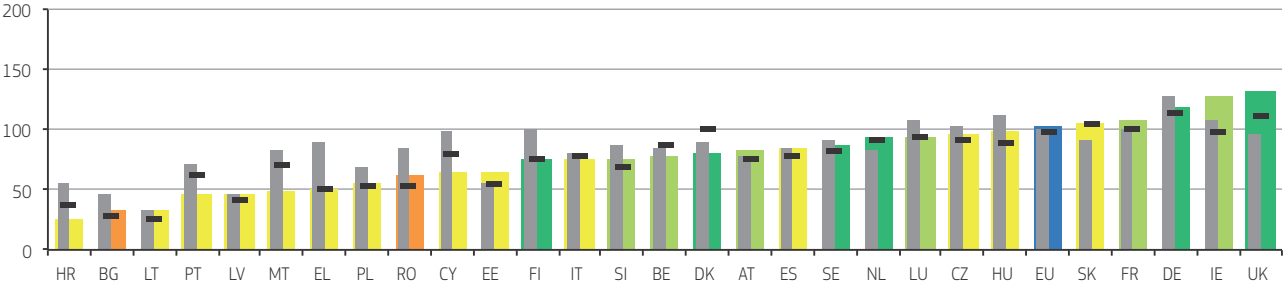



*Coloured columns show Member States' performance in 2016, using the most recent data for the indicators in this dimension, relative to that of the EU in 2010. The horizontal hyphens show performance in 2015, using the next most recent data for the indicators in this dimension, relative to that of the 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 two Innovation Leaders in the top-5 positions. Ireland, a Strong Innovator, is the best performing country in the *Employment impacts* dimension, followed by Malta, a Moderate Innovator, and the United Kingdom ranks third. Most of the Innovation Leaders, except Finland, are amongst the leading countries in this dimension and perform above the EU average. Bulgaria, a Modest Innovator, shows a strong performance just below the EU average. Innovation Leader Finland and Strong Innovators Slovenia, Belgium, Austria, and France all perform below the EU average.

The highest rate of performance increase between 2010 and 2016 is observed in Malta (31.6%), followed by Latvia (29.1%), and Croatia (27.3%). Other strong increases over time are observed for Estonia, Portugal, Ireland, and Romania. For 18 EU Member States, performance increased between 2010 and 2016. The EU average has increased by 0.1%. Strong decreases are observed in Denmark (-29.0%), Germany (-20.8%), and the Czech Republic (-20.3%).

## Sales impacts




*Coloured columns show Member States' performance in 2016, 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 2015, 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 two out of six Innovation Leaders are in the top-5 positions, Finland, Sweden, and the Netherlands perform below the EU average.[16] The Strong Innovators are also dispersed: Ireland and France are amongst the top-5, whereas Slovenia, Belgium, Austria, and Luxembourg perform below the EU average.

The highest rate of performance increase between 2010 and 2016 is observed in the UK (37.8%), followed by Ireland (21.3%), and Slovakia (13.9%). Other strong improvements are observed in the Netherlands, Estonia, and France. Greece has had the highest rate of decrease in performance (-39.0%), other high decreases are observed in Cyprus, Malta, and Croatia. The EU average increased by 2.9% between 2010 and 2016.

[16] 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

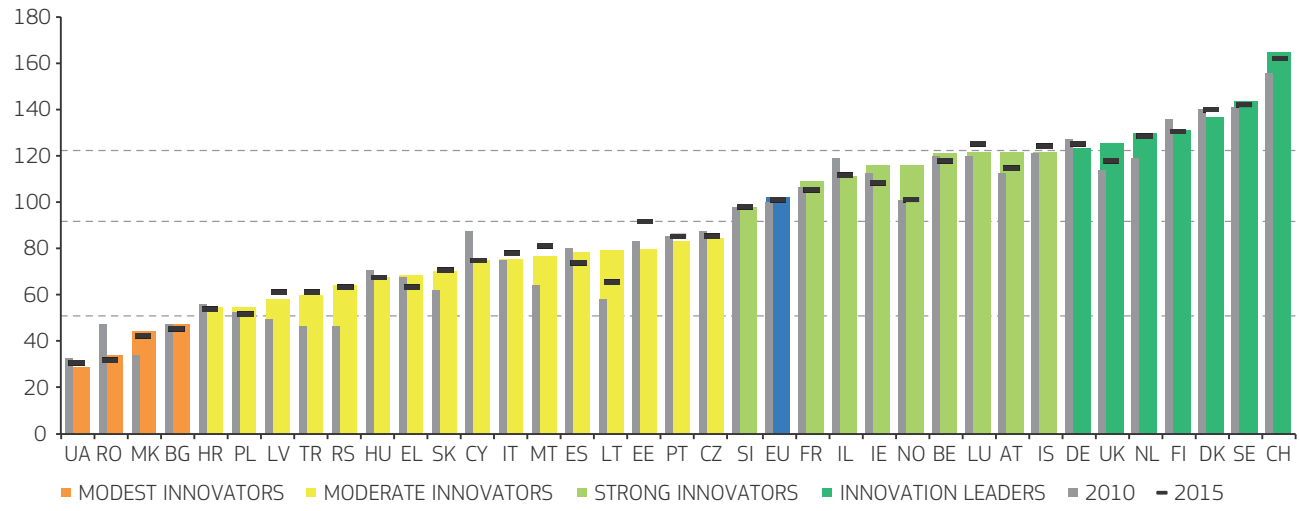
## 5.1 Benchmarking against other European countries and regional neighbours

As discussed in the Introduction, the measurement framework has been revised, and results in this year's report are not comparable to those in last year's report.[17]

Switzerland is the overall Innovation Leader in Europe, outperforming all EU Member States (**Figure 12**). Switzerland's strong performance is linked to being the best performer on as many as ten 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 almost 11%-points.

Iceland, Israel, and Norway are Strong Innovators. Iceland's performance relative to the EU in 2010 has remained stable. The performance of Norway relative to EU in 2010 has increased strongly[18], whereas the relative performance of Israel has declined. Serbia and Turkey are Moderate Innovators, and for both countries performance relative to the EU has increased strongly. The Former Yugoslav Republic of Macedonia and Ukraine are Modest Innovators, where performance relative to the EU has increased strongly for the first but decreased for the latter.

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




*Coloured columns show countries' performance in 2016, using the most recent data for 27 indicators, relative to that of the EU in 2010. The horizontal hyphens show performance in 2015, 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 2016, comparing countries' performance in 2016 relative to that of the EU in 2016. Scores relative to EU 2016 used for determining group membership are shown in **Annex F**.*

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

[17] Average data availability for this year's report is good with data available for 27 indicators for Norway, 25 indicators for the Former Yugoslav Republic of Macedonia and Switzerland, 24 for Turkey, 23 indicators for Serbia, 22 indicators for Iceland, 20 indicators for Israel, and 19 indicators for Ukraine. Data availability for both Israel and Ukraine 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, both countries are included in the EIS 2017.

[18] For Norway, the sharp increase in 2016 is almost entirely due to a change in the collection of CIS data. The average percentage increase over the last 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. More details are available in the EIS 2017 Methodology Report.

## 5.2 Benchmarking against global competitors

This section provides a comparison of the EU to some of its main global economic competitors including Australia, the BRICS countries (Brazil, Russia, India, China, and South Africa), Canada, Japan, South Korea and the United States.

South Korea and Japan have an increasing performance lead over the EU (**Figure 13** and **Figure 14**), Australia has a stable performance lead over the EU, and Canada and the United States have a decreasing performance lead over the EU. The EU has a decreasing performance lead over Brazil, China, India, Russia, and South Africa. (**Annex H** includes the most recent data used and the changes over time).

### Methodology

The economic and population size of most global competitors outweighs that of many of the individual 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 the European countries. Therefore, a more restricted set of 16 indicators (**Table 2**) has been used for the international comparison of the EU with its global competitors. (**Annex H** includes the most recent data used and the changes over time).

The most significant improvement compared to last year is the availability of non-EU data for several of the indicators using innovation survey data. These data were extracted from the OECD, which collected a set of harmonised innovation survey statistics in 2013 and 2015. Data are available for 'Product and/or process innovators', 'Marketing and/or organisational innovators' and 'Innovators that co-operate', and complemented with more recent data from different National Statistical Offices.

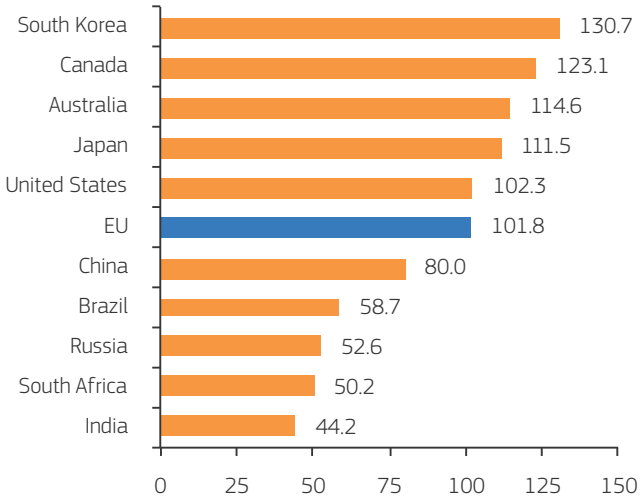
For some indicators, different definitions have been used as compared to the previous chapters:

- 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). Indicator values in the international comparison using only extra-EU trade are higher for the EU compared to those used for the EU in the comparison between Member States;
- For 'Knowledge-intensive services exports', data have been used from the UN Comtrade database using an older EBOPS classification. Aggregate results for the EU are not comparable to those used in the European benchmarking analysis.

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. For the international comparison, these tables also include data on the number of so-called unicorns, i.e. start-ups with a value of more than $1 billion. The countries are ordered following their performance rank order (cf. **Figure 13**).

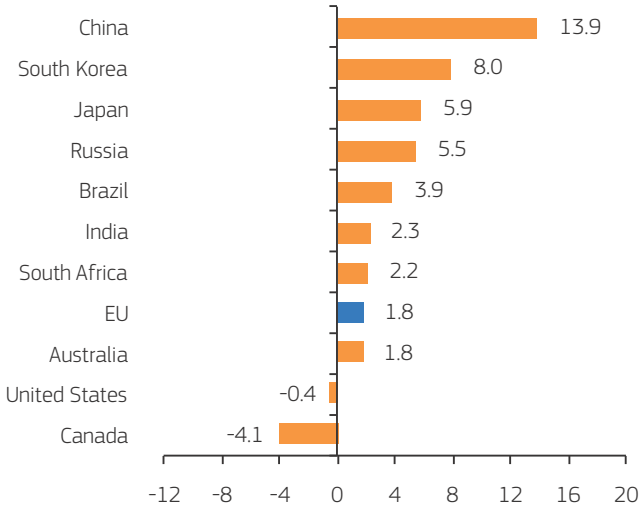
Data have been extracted from various sources including Eurostat, OECD (MSTI, Education at a Glance), different UN data sources including UNESCO Institute for Statistics, United Nations (Comtrade) and UNIDO, Web of Science, World Bank (World Development Indicators) and National Statistical Offices of the countries included in this international comparison.

### Figure 13: Global performance




*Bars show countries' performance in 2016 relative to that of the EU in 2010.*

### Figure 14: Change in global performance



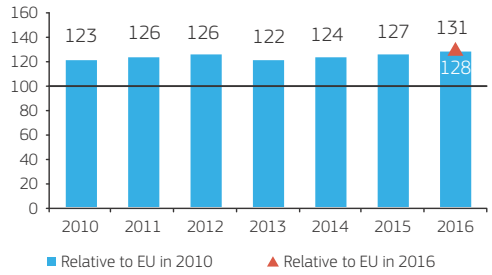

*Change in performance is measured as the difference between the performance in 2016 relative to the EU in 2010 and the performance in 2010 relative to the EU in 2010.*

## Table 2: 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 | 2014 |
| 1.1.2 Population aged 25-64 having completed tertiary education | OECD | 2015 |
| Attractive research systems | | |
| 1.2.1 International scientific co-publications (per million population) | Web of Science* | 2016 |
| 1.2.2 Scientific publications among the top 10% most cited publications worldwide (share of total scientific publications of the country) | Web of Science* | 2014 |
| 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 | 2015 |
| Firm investments | | |
| 2.2.1 R&D expenditure in the business sector (percentage of GDP) | OECD | 2015 |
| **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* | 2015 |
| 3.2.3 Private co-funding of public R&D expenditures (percentage of GDP) | OECD | 2015 |
| Intellectual assets | | |
| 3.3.1 PCT patent applications (per billion GDP) | Patents: OECD<br>GDP: World Bank | 2013 |
| 3.3.2 Trademark applications (per billion GDP) | World Bank | 2015 |
| 3.3.3 Design applications (per billion GDP) | World Bank | 2015 |
| **IMPACTS** | | |
| Employment impacts - No indicator included in international comparison | | |
| Sales effects | | |
| 4.2.1 Medium and high tech product exports (share of total product exports) | United Nations | 2016 |
| 4.2.2 Knowledge-intensive services exports (share of total service exports) | United Nations | 2015 |

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

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 IP applications. Performance increase has been highest in Marketing and organisational innovators.




*Columns show performance scores relative to EU in 2010. The red triangle shows performance relative to EU 2016.*

## Performance in 2010 and 2016

| South Korea | 2010 Rel. to EU | 2016 Rel. to EU | 2010-16 |
|---|---|---|---|
| Doctorate graduates | 68.6 | 87.1 | 18.5 |
| Tertiary education (25-64 year olds) | 143.8 | 141.1 | -2.7 |
| International co-publications | 104.3 | 105.9 | 1.6 |
| Most cited publications | 63.1 | 62.2 | -0.9 |
| R&D expenditure public sector | 114.2 | 126.5 | 12.3 |
| R&D expenditure business sector | 213.0 | 241.8 | 28.8 |
| Product/process innovators | 102.6 | 95.5 | -7.1 |
| Marketing/organisational innovators | 39.8 | 88.0 | 48.2 |
| Innovation collaboration | 102.5 | 19.6 | -82.9 |
| Public-private co-publications | 143.5 | 139.8 | -3.8 |
| Private co-funding public R&D exp. | 107.9 | 117.2 | 9.3 |
| PCT patent applications | 132.3 | 168.4 | 36.0 |
| Trademark applications | 284.0 | 276.7 | -7.3 |
| Design applications | 219.6 | 222.9 | 3.3 |
| Medium & high tech product exports | 121.3 | 121.6 | 0.2 |
| Knowledge-intensive services exports | 96.8 | 102.6 | 5.8 |

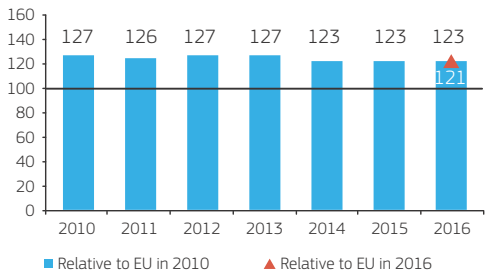
*Best three and worst three indicators highlighted.*

## Structural differences

The relative size of South Korea's manufacturing sector is twice that of the EU. Top R&D spending enterprises spend almost twice as much on R&D as top EU enterprises.

| | KR | EU |
|---|---|---|
| Structure of the economy | | |
| Share of employment in Agriculture, avg 2011-15 | 5.9 | 4.8 |
| Share of employment in Industry, avg 2011-15 | 24.7 | 24.5 |
| Share of employment in Services, avg 2011-15 | 69.4 | 70.7 |
| Share of manufacturing in total value added, 2015 | 29.0 | 14.1 |
| Business indicators | | |
| Top R&D spending firms per 10 mln population, 2011-15 | 13.0 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 311.7 | 165.8 |
| Number of Unicorns (May 2017) | 3 | 19 |
| Buyer sophistication 1-7 (best), 2013-14 | 4.1 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 84.1 | 76.5 |
| Socio-demographic indicators | | |
| GDP per capita, PPP (current int. $), avg 2011-2015 | 33,000 | 36,500 |
| Change in GDP between 2010 and 2015, % | 15.7 | 5.3 |
| Population size, avg 2011-2015, millions | 50.2 | 506.7 |
| Change in population between 2010 and 2015, % | 2.4 | 1.0 |
| Share of population aged 15-64, avg 2011-2015 | 72.9 | 66.0 |

The performance of **Canada** is well above that of the EU, and the country is an Innovation Leader. Performance has decreased since 2010. Canada's relative strengths are in Tertiary education, International co-publications, and Trademark applications. Performance increase has been highest in R&D expenditures in the business sector.




*Columns show performance scores relative to EU in 2010. The red triangle shows performance relative to EU 2016.*

## Performance in 2010 and 2016

| Canada | 2010 Rel. to EU | 2016 Rel. to EU | 2010-16 |
|---|---|---|---|
| Doctorate graduates | 79.2 | 77.7 | -1.6 |
| Tertiary education (25-64 year olds) | 184.1 | 171.1 | -13.0 |
| International co-publications | 191.4 | 181.7 | -9.6 |
| Most cited publications | 114.5 | 114.0 | -0.4 |
| R&D expenditure public sector | 128.2 | 114.2 | -14.0 |
| R&D expenditure business sector | 118.8 | 143.3 | 24.5 |
| Product/process innovators | 163.6 | 170.5 | 6.9 |
| Marketing/organisational innovators | 156.0 | 160.5 | 4.5 |
| Innovation collaboration | n/a | n/a | n/a |
| Public-private co-publications | 128.0 | 86.4 | -41.6 |
| Private co-funding public R&D exp. | 129.6 | 97.8 | -31.8 |
| PCT patent applications | 81.8 | 83.7 | 1.9 |
| Trademark applications | 202.5 | 201.2 | -1.3 |
| Design applications | 65.6 | 70.7 | 5.1 |
| Medium & high tech product exports | 59.0 | 65.7 | 6.7 |
| Knowledge-intensive services exports | 107.5 | 101.6 | -5.8 |

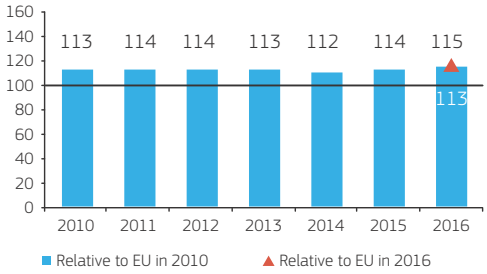
*Best three and worst three indicators highlighted.*

## Structural differences

Notable differences are a lower employment share in industry and a higher employment share in services.

| | CA | EU |
|---|---|---|
| Structure of the economy | | |
| Share of employment in Agriculture, avg 2011-15 | 1.7 | 4.8 |
| Share of employment in Industry, avg 2011-15 | 20.2 | 24.5 |
| Share of employment in Services, avg 2011-15 | 78.0 | 70.7 |
| Share of manufacturing in total value added, 2015 | 9.7 | 14.1 |
| Business indicators | | |
| Top R&D spending firms per 10 mln population, 2011-15 | 6.3 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 174.5 | 165.8 |
| Number of Unicorns (May 2017) | 1 | 19 |
| Buyer sophistication 1-7 (best), 2013-14 | 4.3 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 78.6 | 76.5 |
| Socio-demographic indicators | | |
| GDP per capita, PPP (current int. $), avg 2011-2015 | 43,400 | 36,500 |
| Change in GDP between 2010 and 2015, % | 11.3 | 5.3 |
| Population size, avg 2011-2015, millions | 35.1 | 506.7 |
| Change in population between 2010 and 2015, % | 5.4 | 1.0 |
| Share of population aged 15-64, avg 2011-2015 | 68.6 | 66.0 |

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. Performance increase has been highest in Enterprises with innovative activities.




*Columns show performance scores relative to EU in 2010. The red triangle shows performance relative to EU 2016.*

## Performance in 2010 and 2016

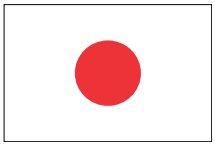
| Australia | 2010 Rel. to EU | 2016 Rel. to EU | 2010-16 |
|---|---|---|---|
| Doctorate graduates | 116.3 | 126.0 | 9.7 |
| Tertiary education (25-64 year olds) | 137.2 | 133.0 | -4.2 |
| International co-publications | 201.1 | 181.7 | -19.4 |
| Most cited publications | 114.7 | 118.1 | 3.4 |
| R&D expenditure public sector | 117.3 | 119.5 | 2.3 |
| R&D expenditure business sector | 124.4 | 97.2 | -27.2 |
| Product/process innovators | 154.2 | 179.3 | 25.0 |
| Marketing/organisational innovators | 126.2 | 141.8 | 15.6 |
| Innovation collaboration | 116.4 | 120.1 | 3.7 |
| Public-private co-publications | 96.3 | 88.2 | -8.1 |
| Private co-funding public R&D exp. | 115.9 | 103.2 | -12.7 |
| PCT patent applications | 86.0 | 78.7 | -7.3 |
| Trademark applications | 252.2 | 242.4 | -9.8 |
| Design applications | 88.0 | 93.0 | 5.0 |
| Medium & high tech product exports | 15.4 | 16.5 | 1.1 |
| Knowledge-intensive services exports | 28.4 | 32.7 | 4.3 |

*Best three and worst three indicators highlighted.*

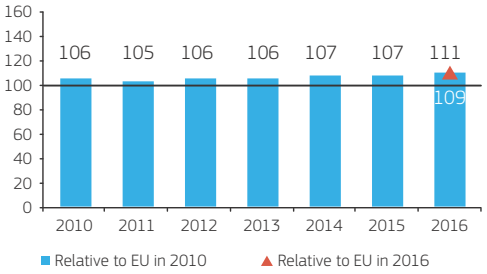
## Structural differences

Australia has a relatively small manufacturing sector. Australia has experienced faster GDP growth and much faster population growth.

| | AU | EU |
|---|---|---|
| **Structure of the economy** | | |
| Share of employment in Agriculture, avg 2011-15 | 2.7 | 4.8 |
| Share of employment in Industry, avg 2011-15 | 20.4 | 24.5 |
| Share of employment in Services, avg 2011-15 | 76.9 | 70.7 |
| Share of manufacturing in total value added, 2015 | 6.1 | 14.1 |
| **Business indicators** | | |
| Top R&D spending firms per 10 mln population, 2011-15 | 6.2 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 205.1 | 165.8 |
| Number of Unicorns (May 2017) | -- | 19 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.7 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 80.3 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPP (current int. $), avg 2011-2015 | 44,500 | 36,500 |
| Change in GDP between 2010 and 2015, % | 13.9 | 5.3 |
| Population size, avg 2011-2015, millions | 23.1 | 506.7 |
| Change in population between 2010 and 2015, % | 8.0 | 1.0 |
| Share of population aged 15-64, avg 2011-2015 | 66.8 | 66.0 |



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 IP applications. Performance increase has been highest in Innovation collaboration and Trademark applications.




*Columns show performance scores relative to EU in 2010. The red triangle shows performance relative to EU 2016.*

## Performance in 2010 and 2016

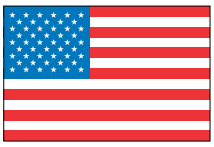
| Japan | 2010 Rel. to EU | 2016 Rel. to EU | 2010-16 |
|---|---|---|---|
| Doctorate graduates | 67.2 | 64.1 | -3.1 |
| Tertiary education (25-64 year olds) | 162.8 | 153.7 | -9.1 |
| International co-publications | 86.4 | 80.8 | -5.6 |
| Most cited publications | 63.9 | 58.5 | -5.4 |
| R&D expenditure public sector | 109.3 | 101.1 | -8.2 |
| R&D expenditure business sector | 246.1 | 227.6 | -18.6 |
| Product/process innovators | 75.3 | 79.4 | 4.1 |
| Marketing/organisational innovators | 94.0 | 98.7 | 4.7 |
| Innovation collaboration | 94.0 | 151.0 | 57.0 |
| Public-private co-publications | 145.4 | 131.5 | -13.8 |
| Private co-funding public R&D exp. | 27.0 | 35.1 | 8.1 |
| PCT patent applications | 149.8 | 168.4 | 18.6 |
| Trademark applications | 92.0 | 137.0 | 45.0 |
| Design applications | 97.9 | 89.2 | -8.7 |
| Medium & high tech product exports | 121.2 | 121.0 | -0.2 |
| Knowledge-intensive services exports | 119.7 | 114.8 | -4.9 |

*Best three and worst three indicators highlighted.*

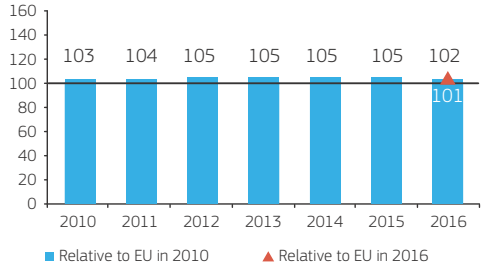
## Structural differences

Japan's top R&D spending firms spend almost 70% more on R&D as compared to EU top R&D spending firms. The structure of the economy is comparable to that of the EU.

| | JP | EU |
|---|---|---|
| **Structure of the economy** | | |
| Share of employment in Agriculture, avg 2011-15 | 4.3 | 4.8 |
| Share of employment in Industry, avg 2011-15 | 25.4 | 24.5 |
| Share of employment in Services, avg 2011-15 | 70.3 | 70.7 |
| Share of manufacturing in total value added, 2015 | 18.8 | 14.1 |
| **Business indicators** | | |
| Top R&D spending firms per 10 mln population, 2011-15 | 27.5 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 277.3 | 165.8 |
| Number of Unicorns (May 2017) | 1 | 19 |
| Buyer sophistication 1-7 (best), 2013-14 | 5.3 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 75.5 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPP (current int. $), avg 2011-2015 | 38,400 | 36,500 |
| Change in GDP between 2010 and 2015, % | 5.0 | 5.3 |
| Population size, avg 2011-2015, millions | 127.4 | 506.7 |
| Change in population between 2010 and 2015, % | -0.9 | 1.0 |
| Share of population aged 15-64, avg 2011-2015 | 62.0 | 66.0 |



The performance of the **United States** is above that of the EU, and the country is a Strong Innovator. Performance has decreased since 2010. Relative strengths are in R&D expenditures and scientific collaboration with the public sector. Performance increase has been highest in Product and process innovations and Design applications.




*Columns show performance scores relative to EU in 2010. The red triangle shows performance relative to EU 2016.*

## Performance in 2010 and 2016

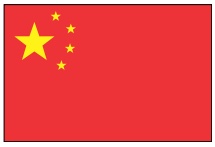
| United States | 2010 Rel. to EU | 2016 Rel. to EU | 2010-16 |
|---|---|---|---|
| Doctorate graduates | 91.5 | 83.6 | -7.9 |
| Tertiary education (25-64 year olds) | 153.3 | 138.4 | -14.9 |
| International co-publications | 129.0 | 127.2 | -1.8 |
| Most cited publications | 140.1 | 132.1 | -8.0 |
| R&D expenditure public sector | 105.6 | 97.6 | -8.0 |
| R&D expenditure business sector | 178.7 | 158.1 | -20.6 |
| Product/process innovators | 65.2 | 71.8 | 6.6 |
| Marketing/organisational innovators | n/a | n/a | n/a |
| Innovation collaboration | n/a | n/a | n/a |
| Public-private co-publications | 178.7 | 181.6 | 2.9 |
| Private co-funding public R&D exp. | 46.2 | 42.1 | -4.1 |
| PCT patent applications | 101.9 | 106.4 | 4.5 |
| Trademark applications | 55.1 | 58.9 | 3.8 |
| Design applications | 48.5 | 54.9 | 6.4 |
| Medium & high tech product exports | 86.1 | 83.9 | -2.2 |
| Knowledge-intensive services exports | 100.2 | 106.1 | 5.9 |

*Best three and worst three indicators highlighted.*

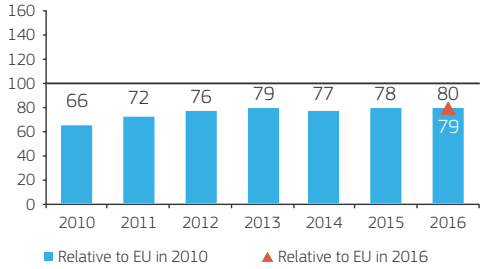
## Structural differences

The US economy has grown twice as fast as the EU. Top R&D spending firms spend about 76% more on R&D. The US has lower respectively higher employment shares in industry and services.

| | US | EU |
|---|---|---|
| Structure of the economy | | |
| Share of employment in Agriculture, avg 2011-15 | 1.6 | 4.8 |
| Share of employment in Industry, avg 2011-15 | 18.3 | 24.5 |
| Share of employment in Services, avg 2011-15 | 80.1 | 70.7 |
| Share of manufacturing in total value added, 2015 | 11.8 | 14.1 |
| Business indicators | | |
| Top R&D spending firms per 10 mln population, 2011-15 | 22.9 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 292.6 | 165.8 |
| Number of Unicorns (May 2017) | 102 | 19 |
| Buyer sophistication 1-7 (best), 2013-14 | 4.5 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 82.5 | 76.5 |
| Socio-demographic indicators | | |
| GDP per capita, PPP (current int. $), avg 2011-2015 | 52,900 | 36,500 |
| Change in GDP between 2010 and 2015, % | 10.9 | 5.3 |
| Population size, avg 2011-2015, millions | 316.5 | 506.7 |
| Change in population between 2010 and 2015, % | 3.9 | 1.0 |
| Share of population aged 15-64, avg 2011-2015 | 66.8 | 66.0 |



The performance of **China** is below that of the EU, and the country is a Moderate Innovator. Performance has increased since 2010. Relative strengths are in R&D expenditures and Trademark and Design applications. Performance increase has also been highest in these business activities.




*Columns show performance scores relative to EU in 2010. The red triangle shows performance relative to EU 2016.*

## Performance in 2010 and 2016

| China | 2010 Rel. to EU | 2016 Rel. to EU | 2010-16 |
|---|---|---|---|
| Doctorate graduates | 12.9 | 11.0 | -1.9 |
| Tertiary education (25-64 year olds) | 27.1 | 35.8 | 8.6 |
| International co-publications | 38.1 | 43.4 | 5.3 |
| Most cited publications | 59.0 | 76.5 | 17.5 |
| R&D expenditure public sector | 64.0 | 68.8 | 4.8 |
| R&D expenditure business sector | 96.6 | 129.2 | 32.6 |
| 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 | 18.6 | 10.8 |
| Private co-funding public R&D exp. | 123.1 | 113.1 | -10.0 |
| PCT patent applications | 46.4 | 72.2 | 25.8 |
| Trademark applications | 165.5 | 279.7 | 114.2 |
| Design applications | 203.7 | 197.3 | -6.3 |
| Medium & high tech product exports | 95.4 | 91.0 | -4.4 |
| Knowledge-intensive services exports | 88.6 | 67.7 | -20.9 |

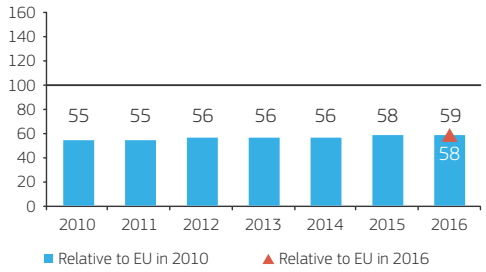
*Best three and worst three indicators highlighted.*

## Structural differences

Agriculture accounts for almost one-third of employment. The relative size of the manufacturing sector is more than twice that of the EU. China has experienced much faster GDP growth.

| | CN | EU |
|---|---|---|
| Structure of the economy | | |
| Share of employment in Agriculture, avg 2011-15 | 31.5 | 4.8 |
| Share of employment in Industry, avg 2011-15 | 29.8 | 24.5 |
| Share of employment in Services, avg 2011-15 | 38.7 | 70.7 |
| Share of manufacturing in total value added, 2015 | 32.8 | 14.1 |
| Business indicators | | |
| Top R&D spending firms per 10 mln population, 2011-15 | 1.4 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 139.6 | 165.8 |
| Number of Unicorns (May 2017) | 46 | 19 |
| Buyer sophistication 1-7 (best), 2013-14 | 4.3 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 64.3 | 76.5 |
| Socio-demographic indicators | | |
| GDP per capita, PPP (current int. $), avg 2011-2015 | 12,400 | 36,500 |
| Change in GDP between 2010 and 2015, % | 46.0 | 5.3 |
| Population size, avg 2011-2015, millions | 1357.5 | 506.7 |
| Change in population between 2010 and 2015, % | 2.5 | 1.0 |
| Share of population aged 15-64, avg 2011-2015 | 73.9 | 66.0 |

The performance of **Brazil** is below that of the EU, and the country is a Moderate Innovator. Performance has increased since 2010. Brazil's relative strengths are in innovation activities and Exports of knowledge-intensive services. Performance increase has been highest in Marketing and organisational innovators.




*Columns show performance scores relative to EU in 2010. The red triangle shows performance relative to EU 2016.*

## Performance in 2010 and 2016

| Brazil | 2010 Rel. to EU | 2016 Rel. to EU | 2010-16 |
|---|---|---|---|
| Doctorate graduates | 23.6 | 24.5 | 0.9 |
| Tertiary education (25-64 year olds) | 64.0 | 41.6 | -22.4 |
| International co-publications | 45.2 | 51.4 | 6.2 |
| Most cited publications | 44.4 | 48.5 | 4.1 |
| R&D expenditure public sector | 82.1 | 90.4 | 8.3 |
| R&D expenditure business sector | 45.6 | 42.5 | -3.2 |
| Product/process innovators | 107.6 | 113.7 | 6.1 |
| Marketing/organisational innovators | 168.4 | 188.6 | 20.1 |
| Innovation collaboration | 48.6 | 48.4 | -0.2 |
| Public-private co-publications | 5.4 | 4.9 | -0.4 |
| Private co-funding public R&D exp. | n/a | n/a | n/a |
| PCT patent applications | 27.6 | 26.8 | -0.8 |
| Trademark applications | 97.7 | 102.0 | 4.3 |
| Design applications | 52.1 | 50.6 | -1.5 |
| Medium & high tech product exports | 40.6 | 43.7 | 3.0 |
| Knowledge-intensive services exports | 103.6 | 113.8 | 10.2 |

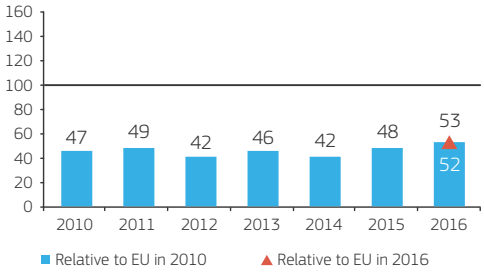
*Best three and worst three indicators highlighted.*

## Structural differences

Brazil has a relatively high share of employment in agriculture. Top R&D spending enterprises spend more on R&D, the result of relatively large enterprises in Oil, Mining and Aerospace.

| | BR | EU |
|---|---|---|
| Structure of the economy | | |
| Share of employment in Agriculture, avg 2011-15 | 12.3 | 4.8 |
| Share of employment in Industry, avg 2011-15 | 20.6 | 24.5 |
| Share of employment in Services, avg 2011-15 | 67.2 | 70.7 |
| Share of manufacturing in total value added, 2015 | 12.2 | 14.1 |
| Business indicators | | |
| Top R&D spending firms per 10 mln population, 2011-15 | 0.4 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 260.4 | 165.8 |
| Number of Unicorns (May 2017) | -- | 19 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.5 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 56.5 | 76.5 |
| Socio-demographic indicators | | |
| GDP per capita, PPP (current int. $), avg 2011-2015 | 15,500 | 36,500 |
| Change in GDP between 2010 and 2015, % | 5.5 | 5.3 |
| Population size, avg 2011-2015, millions | 204.2 | 506.7 |
| Change in population between 2010 and 2015, % | 4.6 | 1.0 |
| Share of population aged 15-64, avg 2011-2015 | 68.7 | 66.0 |

The performance of **Russia** is below that of the EU, and the country is a Moderate Innovator. Performance has increased since 2010. Russia's relative strengths are in Tertiary education, Private co-funding of public R&D, where performance increase has also been highest, and Trademark applications.




*Columns show performance scores relative to EU in 2010. The red triangle shows performance relative to EU 2016.*

## Performance in 2010 and 2016

| Russia | 2010 Rel. to EU | 2016 Rel. to EU | 2010-16 |
|---|---|---|---|
| Doctorate graduates | 93.1 | 76.3 | -16.8 |
| Tertiary education (25-64 year olds) | 199.4 | 165.9 | -33.5 |
| International co-publications | 53.8 | 53.3 | -0.5 |
| Most cited publications | 29.3 | 33.3 | 4.0 |
| R&D expenditure public sector | 63.1 | 66.0 | 2.9 |
| R&D expenditure business sector | 59.5 | 57.8 | -1.7 |
| Product/process innovators | 11.2 | 15.3 | 4.1 |
| Marketing/organisational innovators | 6.0 | 6.9 | 0.9 |
| Innovation collaboration | 6.1 | 9.0 | 2.9 |
| Public-private co-publications | 6.2 | 3.1 | -3.1 |
| Private co-funding public R&D exp. | 114.7 | 139.7 | 25.1 |
| PCT patent applications | 29.5 | 32.7 | 3.3 |
| Trademark applications | 145.3 | 125.8 | -19.5 |
| Design applications | 50.0 | 47.7 | -2.3 |
| Medium & high tech product exports | 14.2 | 21.2 | 6.9 |
| Knowledge-intensive services exports | 86.7 | 94.3 | 7.6 |

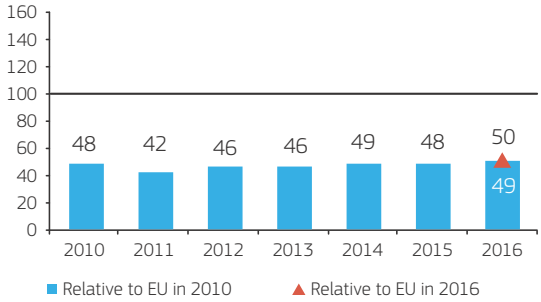
*Best three and worst three indicators highlighted.*

## Structural differences

Top R&D spending enterprises spend more on R&D, the result of relatively large enterprises in Oil and gas, and Defence. Russia's economy has grown at about the same rate as the EU.

| | RU | EU |
|---|---|---|
| Structure of the economy | | |
| Share of employment in Agriculture, avg 2011-15 | 7.1 | 4.8 |
| Share of employment in Industry, avg 2011-15 | 27.5 | 24.5 |
| Share of employment in Services, avg 2011-15 | 65.4 | 70.7 |
| Share of manufacturing in total value added, 2015 | 13.1 | 14.1 |
| Business indicators | | |
| Top R&D spending firms per 10 mln population, 2011-15 | 0.3 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 211.2 | 165.8 |
| Number of Unicorns (May 2017) | -- | 19 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.7 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 73.2 | 76.5 |
| Socio-demographic indicators | | |
| GDP per capita, PPP (current int. $), avg 2011-2015 | 24,600 | 36,500 |
| Change in GDP between 2010 and 2015, % | 6.0 | 5.3 |
| Population size, avg 2011-2015, millions | 143.5 | 506.7 |
| Change in population between 2010 and 2015, % | 0.9 | 1.0 |
| Share of population aged 15-64, avg 2011-2015 | 70.9 | 66.0 |

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 innovation activities. Performance increase has been highest in Marketing and organisational innovators.




*Columns show performance scores relative to EU in 2010. The red triangle shows performance relative to EU 2016.*

## Performance in 2010 and 2016

| South Africa | 2010 Rel. to EU | 2016 Rel. to EU | 2010-16 |
|---|---|---|---|
| Doctorate graduates | 8.4 | 10.7 | 2.3 |
| Tertiary education (25-64 year olds) | 23.7 | 45.3 | 21.6 |
| International co-publications | 61.1 | 68.0 | 6.9 |
| Most cited publications | 74.6 | 67.9 | -6.7 |
| R&D expenditure public sector | 51.8 | 55.7 | 3.9 |
| R&D expenditure business sector | 45.5 | 28.2 | -17.3 |
| Product/process innovators | n/a | n/a | n/a |
| Marketing/organisational innovators | 144.0 | 164.8 | 20.9 |
| Innovation collaboration | 155.6 | 154.9 | -0.7 |
| Public-private co-publications | 8.7 | 4.7 | -4.0 |
| Private co-funding public R&D exp. | 57.6 | 56.7 | -0.9 |
| PCT patent applications | 48.2 | 39.2 | -8.9 |
| Trademark applications | 103.1 | 104.7 | 1.6 |
| Design applications | 67.8 | 60.5 | -7.3 |
| Medium & high tech product exports | 53.5 | 56.4 | 2.9 |
| Knowledge-intensive services exports | 22.6 | 21.8 | -0.7 |

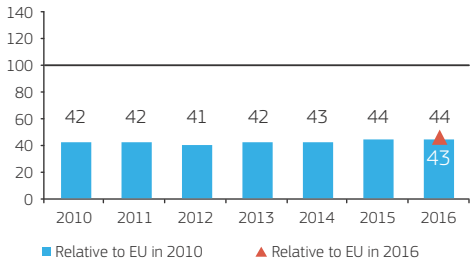
*Best three and worst three indicators highlighted.*

## Structural differences

The structure of South Africa's economy as measured by employment shares is comparable to that of the EU. GDP and population have been growing at faster rates than the EU.

| | SA | EU |
|---|---|---|
| Structure of the economy | | |
| Share of employment in Agriculture, avg 2011-15 | 5.1 | 4.8 |
| Share of employment in Industry, avg 2011-15 | 24.8 | 24.5 |
| Share of employment in Services, avg 2011-15 | 70.1 | 70.7 |
| Share of manufacturing in total value added, 2015 | 12.5 | 14.1 |
| Business indicators | | |
| Top R&D spending firms per 10 mln population, 2011-15 | 0.3 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 73.2 | 165.8 |
| Number of Unicorns (May 2017) | 1 | 19 |
| Buyer sophistication 1-7 (best), 2013-14 | 4.0 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 65.2 | 76.5 |
| Socio-demographic indicators | | |
| GDP per capita, PPP (current int. $), avg 2011-2015 | 12,800 | 36,500 |
| Change in GDP between 2010 and 2015, % | 11.2 | 5.3 |
| Population size, avg 2011-2015, millions | 53.3 | 506.7 |
| Change in population between 2010 and 2015, % | 7.9 | 1.0 |
| Share of population aged 15-64, avg 2011-2015 | 65.0 | 66.0 |

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 Marketing and organisational innovators, where the increase of performance has also been highest, and Exports of knowledge-intensive services.




*Columns show performance scores relative to EU in 2010. The red triangle shows performance relative to EU 2016.*

## Performance in 2010 and 2016

| India | 2010 Rel. to EU | 2016 Rel. to EU | 2010-16 |
|---|---|---|---|
| Doctorate graduates | 6.8 | 5.9 | -0.9 |
| Tertiary education (25-64 year olds) | 36.5 | 30.4 | -6.1 |
| International co-publications | 18.7 | 19.8 | 1.2 |
| Most cited publications | 58.5 | 60.8 | 2.4 |
| R&D expenditure public sector | 82.5 | 76.1 | -6.4 |
| R&D expenditure business sector | 21.4 | 23.8 | 2.4 |
| Product/process innovators | 50.8 | 57.8 | 7.0 |
| Marketing/organisational innovators | 121.8 | 139.5 | 17.7 |
| Innovation collaboration | n/a | n/a | n/a |
| Public-private co-publications | 1.9 | 2.1 | 0.3 |
| Private co-funding public R&D exp. | n/a | n/a | n/a |
| PCT patent applications | 32.9 | 32.1 | -0.8 |
| Trademark applications | 66.5 | 74.5 | 7.9 |
| Design applications | 41.0 | 41.8 | 0.7 |
| Medium & high tech product exports | 42.1 | 48.5 | 6.4 |
| Knowledge-intensive services exports | 120.1 | 122.9 | 2.8 |

*Best three and worst three indicators highlighted.*

## Structural differences

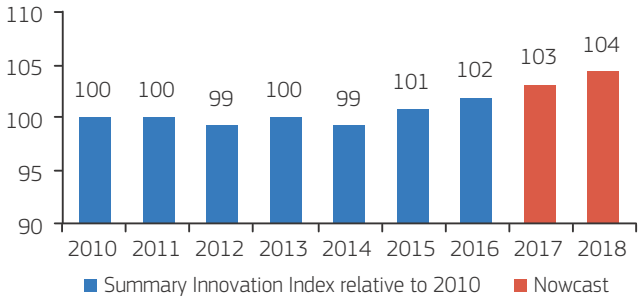
India has a very high share of employment in agriculture. GDP and population have been growing at faster rates than the EU.

| | IN | EU |
|---|---|---|
| Structure of the economy | | |
| Share of employment in Agriculture, avg 2011-15 | 51.1 | 4.8 |
| Share of employment in Industry, avg 2011-15 | 22.4 | 24.5 |
| Share of employment in Services, avg 2011-15 | 26.6 | 70.7 |
| Share of manufacturing in total value added, 2015 | 12.7 | 14.1 |
| Business indicators | | |
| Top R&D spending firms per 10 mln population, 2011-15 | 0.2 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 134.9 | 165.8 |
| Number of Unicorns (May 2017) | 9 | 19 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.8 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 55.3 | 76.5 |
| Socio-demographic indicators | | |
| GDP per capita, PPP (current int. $), avg 2011-2015 | 5,300 | 36,500 |
| Change in GDP between 2010 and 2015, % | 38.6 | 5.3 |
| Population size, avg 2011-2015, millions | 1279.4 | 506.7 |
| Change in population between 2010 and 2015, % | 6.5 | 1.0 |
| Share of population aged 15-64, avg 2011-2015 | 65.0 | 66.0 |

# 6. Expected short-term changes in EU innovation performance

This year's report includes, for the second time, a forward-looking analysis of EU innovation performance discussing more recent developments, trends, and expected changes. The aim is to cover 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 will be more restricted than that in the EIS 2016, as for the six indicators using Community Innovation Survey (CIS) data, the most recent CIS 2014 data have been included in the main benchmarking exercise and 'fast track' CIS 2016 data will not be available until 2018 (cf. Section 6.3).

**Figure 15: Expected EU innovation performance**




In summary, the analysis suggests that EU innovation performance will continue to increase for the majority of indicators, leading to an **increase in EU innovation performance** from 102 this year **to 104 in two years' time** (Figure 15). Of the expected 2 percentage point increase, more than half is the result of an expected increase of 'Broadband penetration' by more than 10%[19].

Table 3 shows a summary of the results for those 19 indicators for which the calculation of relatively reliable short-term changes proved possible. EU innovation performance is expected to increase strongly by at least five percent for five indicators, to increase more moderately between one and five percent for seven indicators, to remain stable for one indicator, and to decrease moderately for six indicators.

Section 6.1 first discusses the accuracy of last year's predictions. Section 6.2 discusses trend performance of the EU compared to four of its main international competitors. Section 6.3 explores EU trend performance for individual indicators, and Section 6.4 provides details on some of the methodologies used for estimating short-term changes. Section 6.5 discusses the possible use of *Big data* for providing more timely and policy-relevant innovation-related indicators.

[19] Assuming that the expected performance on Broadband penetration did not change, the expected EU innovation performance would increase to 103.0 in two years' time.

**Table 3: Changes in two years' time in EU innovation performance**

| | CURRENT SCORE | EXPECTED CHANGE IN TWO YEARS' TIME | METHODOLOGY FOR ESTIMATING EXPECTED CHANGE |
|---|---|---|---|
| Human resources | | | |
| 1.1.2 Population aged 25-34 with tertiary education | 38.2 | 1-5% increase | Linear regression |
| Attractive research systems | | | |
| 1.2.1 International scientific co-publications | 493.6 | >10% increase | Linear regression |
| 1.2.2 Most-cited scientific publications | 10.6 | 1-5% increase | Linear regression |
| 1.2.3 Foreign doctorate students | 25.6 | 1-5% increase | Linear regression |
| Innovation-friendly environment | | | |
| 1.3.1 Broadband penetration | 13.0 | >10% increase | Trend extrapolation |
| 1.3.2 Opportunity-driven entrepreneurship | 3.1 | 1-5% decrease | Linear regression |
| Finance and support | | | |
| 2.1.2 Venture capital investment | 0.063 | 1-5% decrease | More recent data from Invest Europe |
| Firm investments | | | |
| 2.2.1 R&D expenditure in the business sector | 1.30 | 1-5% decrease | Survey on industrial R&D Investment Trends |
| 2.2.2 Non-R&D innovation expenditures | 0.76 | 5-10% increase | Linear regression |
| 2.3.3 Training ICT skills | 22.0 | 5-10% increase | Linear regression |
| Innovators | | | |
| 3.1.1 SMEs with product or process innovations | 30.9 | 1-5% decrease | Linear regression |
| 3.1.2 SMEs with marketing or organisational innovations | 34.9 | 1-5% decrease | Linear regression |
| Linkages | | | |
| 3.2.1 Innovative SMEs collaborating with others | 11.2 | 5-10% increase | Linear regression |
| Intellectual assets | | | |
| 3.3.1 PCT patent applications | 3.70 | No notable change | Econometric model using GDP and R&D |
| 3.3.2 Trademark applications | 7.60 | 1-5% increase | Linear regression |
| 3.3.3 Design applications | 4.33 | 1-5% decrease | Linear regression |
| Employment impact | | | |
| 4.1.1 Employment in knowledge-intensive activities | 14.1 | 1-5% increase | Linear regression |
| Sales impact | | | |
| 4.1.1 Medium and high tech product exports | 56.2 | 1-5% increase | Trend extrapolation |
| 4.1.2 Knowledge-intensive services exports | 69.3 | 1-5% increase | Linear regression |

## 6.1 Looking back at last year's estimates

The EIS 2016 report suggested – over a period of two years – an increase in the EIS innovation index by about 2.5% and a strong increase of more than 10% for four indicators, a more moderate increase between 1% and 10% for 11 indicators, more or less the same performance for two indicators, and a decrease for three indicators. For five indicators, expected two-year changes could not be calculated.

At the time of writing in 2016, it was expected that the EIS 2017 would discuss how accurate these forecasts have been. But with the revised measurement framework introduced in the EIS 2017, a direct comparison with last year's innovation index is not possible, as several of the indicators for which expected changed were provided in the EIS 2016 have been either removed or revised. For 13 indicators included in both the EIS 2016 and EIS 2017 using the same definitions, **Table 4** provides a comparison of the predicted two-year change and the real one-year change achieved since last year.[20] For eight indicators, last year's prediction turned out to be good, for three indicators, it was fairly good, and for two indicators, it was poor. For 'New doctorate graduates', the prediction was poor as this year's unchanged performance is well below last year's estimate of an increase by more than 10% in two years' time. For 'PCT patent applications', performance has declined, whereas no notable change was predicted. 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.

[20] For the following six indicators included in last year's analysis, a comparison is not possible for the following reasons: for 'Population aged 30-34 with tertiary education', the definition this year was changed to include a larger age group 25-34; the indicator Youth aged 20-24 with upper secondary education has been removed; for Non-EU doctorate students, the definition this year covers all foreign students from other Member States and from outside the EU; for Venture capital investment, data is the same as last year; the indicator PCT patent applications in societal challenges has been removed; for the indicator Trademark applications, the definition this year includes not only data from the European Union Intellectual Property Office but also from the World Intellectual Property Office on trademark applications applied for under the Madrid Protocol; the indicator License and patent revenues from abroad has been removed (i.e. it has been integrated in the revised indicator measuring Exports of knowledge-intensive services).

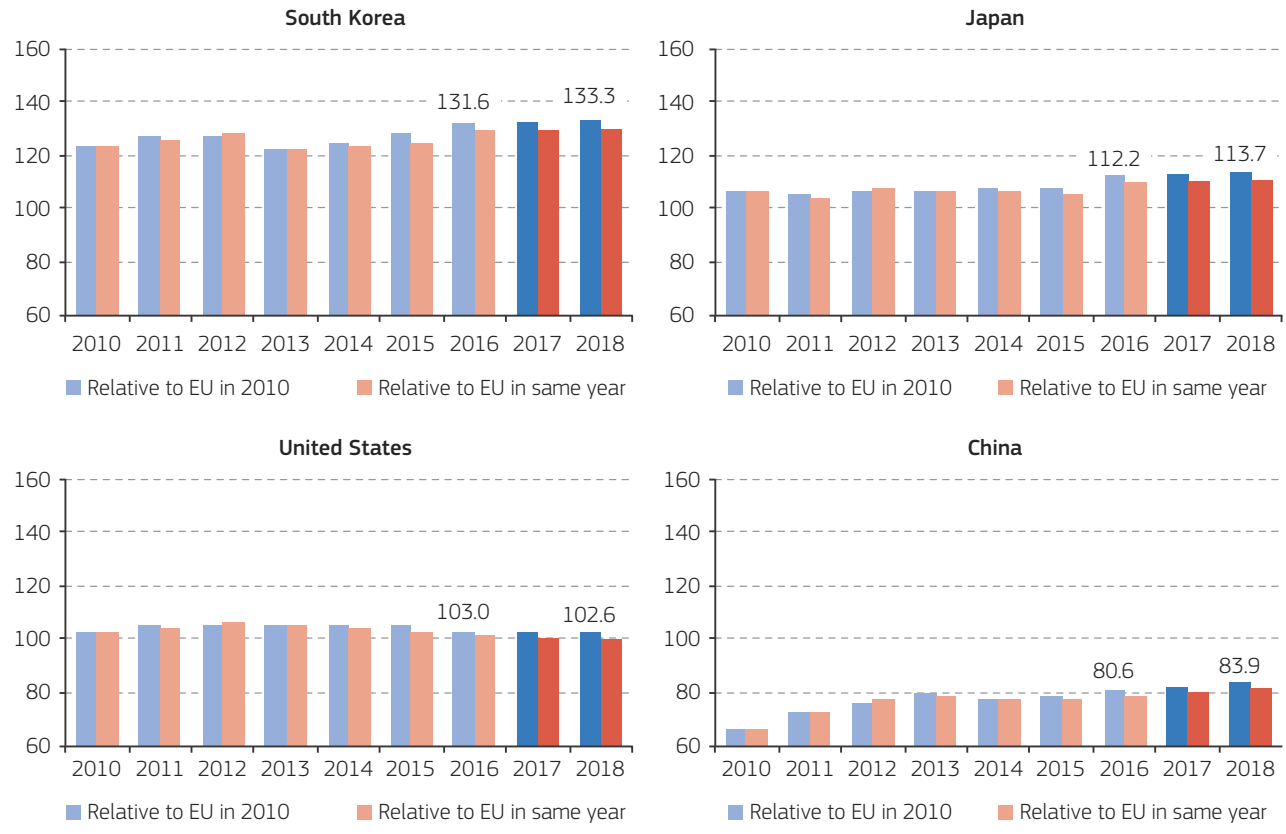
## Table 4: Accuracy of EIS 2016 predictions for short-term changes in EU innovation performance

| | EIS 2016 SCORE | EXPECTED CHANGE IN TWO YEARS' TIME | REVISED SCORE FOR EIS 2016 | EIS 2017 SCORE | REALISED CHANGE IN ONE-YEAR | ACCURACY OF EIS 2016 PREDICTION |
|---|---|---|---|---|---|---|
| New doctorate graduates | 1.84 | >10% increase | 1.85 | 1.85 | No notable change | Poor |
| International scientific co-publications | 459.2 | >10% increase | 463.5 | 493.6 | 1-5% increase | Good |
| Most-cited scientific publications | 10.51 | 1-5% increase | 10.51 | 10.56 | No notable change | Fairly good |
| R&D expenditure in the public sector | 0.72 | 1-5% decrease | 0.73 | 0.71 | 1-5% decrease | Good |
| R&D expenditure in the business sector | 1.30 | 1-5% increase | 1.30 | 1.30 | No notable change | Fairly good |
| Non-R&D innovation expenditures | 0.69 | >10% increase | 0.69 | 0.76 | >10% increase | Good |
| SMEs innovating in-house | 28.7 | No notable change | 28.7 | 28.8 | No notable change | Good |
| Innovative SMEs collaborating with others | 10.3 | 5-10% increase | 10.3 | 11.2 | 5-10% increase | Good |
| PCT patent applications | 3.53 | No notable change | 3.80 | 3.70 | 1-5% decrease | Poor |
| SMEs introducing product or process innovations | 30.6 | 1-5% increase | 30.6 | 30.9 | 1-5% increase | Good |
| SMEs introducing marketing or organisational innovations | 36.2 | 1-5% decrease | 36.2 | 34.9 | 1-5% decrease | Good |
| Employment in knowledge-intensive activities | 13.9 | 1-5% increase | 14.0 | 14. | No notable change | Fairly good |
| Sales of new-to-market and new-to-firm innovations | 12.4 | 5-10% increase | 12.3 | 13.4 | 5-10% increase | Good |

## 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 2016 shows that the EU performance gap towards Japan and South Korea is expected to increase, that the gap towards the United States is expected to decrease, and that the performance lead over China is expected to decrease. Nowcasts for 2017 and 2018 have been calculated for the EU, China, Japan, South Korea, and the United States, using estimates based on nowcasting three-year averages. Details are explained in Section 6.4.

### Figure 16: Expected short-term changes in innovation performance for EU's main competitors



For **South Korea,** the trend analysis foresees an increase in the relative-to-EU performance from 131.6 this year to 133.3 in two years' time, leading to a further increase of South Korea's lead over the EU (**Figure 16**). For **Japan**, the trend analysis foresees an increase of the relative-to-EU performance from 112.2 this year to 113.7 in two years' time, leading to a further increase of Japan's lead over the EU. For the **United States**, the trend analysis foresees a decrease of the relative-to-EU performance from 103.0 this year to 102.6 in two years' time. Following this decrease, the EU gap to the US is expected to close within two years, but only if the assumption of further declining US performance holds true. For **China**, the trend analysis foresees a strong increase of the relative-to-EU performance from 80.6 this year to 83.9 in two years' time. Due to this strong increase, the lead of the EU over China is expected to decrease further.

## 6.3 Short-term changes in EU innovation performance by indicator

This section discusses expected short-term changes for 19 indicators. For 13 of these indicators, changes have been calculated applying a simple linear regression using time series data (see Section 6.4 for more details). For the other indicators, a mix of techniques has been used, which will be discussed in this section.

### Human resources

For 'New doctorate graduates', the EIS 2016 used more recent data on doctoral students to forecast the development for doctorate graduates. This methodology will not be used in the EIS 2017, as last year's forecasts were of poor accuracy (cf. Section 6.1). The results using a linear regression are also of insufficient quality, and no short-term changes have been calculated, assuming that the indicator will have the same value in two years' time as the current value.

'Population aged 25-34 having completed tertiary education' has been increasing every year between 2009 and 2016. Annual change has been 1 percentage point or more until 2012, whereas annual changes have been below 1 percentage point since 2013. A simple linear regression for the same period has been used to estimate an increase from 38.2 to 40.5 in two years' time.

For 'Lifelong learning', the regression results using a linear regression are of insufficient quality. The value of the indicator has been stable between 10.7 and 10.8 between 2013 and 2016[21]. 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 2009 and 2016. A simple linear regression for the same period has been used to estimate an increase from 493.6 to 544.8 in two years' time.

The share of 'Most-cited scientific publications' has been increasing consistently between 2008 and 2015. A simple linear regression for 2008-2015 has been used to estimate an increase from 10.56 to 10.67 in two years' time.

The share of 'Foreign doctorate students' has been increasing for most years except for a one-time decrease between 2012 and 2013. A simple linear regression for 2008-2015 has been used to estimate an increase from 25.6 to 26.2 in two years' time.

### Innovation-friendly environment

For 'Broadband penetration', data are available for three years only. As the number of observations is too small for a linear regression, a simple trend extrapolation has been used instead. The indicator's score was 9.0 in 2014, 11.0 in 2015 and 13.0 in 2016, and it is assumed that this 2 percentage point annual increase will continue, resulting in an expected score of 17.0 in two years' time.

'Opportunity-driven entrepreneurship' has shown a consistent decrease between 2009 and 2015, followed by an increase in 2016. A simple linear regression for the same period would suggest an estimated decrease from 3.14 to 2.87 in two years' time. However, this expected decrease is in contrast with the observed real increase between 2015 and 2016. The strongest decrease was between 2009 and 2012, followed by a more modest decrease between 2012 and 2015. Restricting the regression analysis to this latter period would result in a more modest expected decrease to 3.06 in two years' time.

### Finance and support

The EIS 2016 used data from government budget plans of six Member States[22] to estimate a 0.01 percentage point decrease in two-year's time for 'R&D expenditure in the public sector'. Although the methodology used last year turned out to give relatively accurate results, with a real decrease from 0.73 in 2014 to 0.71 in 2015, this methodology is not applied in the EIS 2017, as it uses budget data of only a few Member States from the two most innovative performance groups. Linear regression results are of insufficient quality, and it has therefore been assumed that the indicator will hold its value in two years' time.

For 'Venture capital investments', 2016 results were published by Invest Europe after the cut-off day of 25 April 2017 for collecting EIS data[23]. For all European countries[24], venture capital expenditures will increase by 1.2% in 2016. Assuming the same percentage increase for 2017 and combining this with a real GDP increase of 0.7% in 2016 and an expected GDP increase of 1.8% in 2017, results in an expected value of the indicator of 0.062 in two years' time. For the EIS, which uses a three-year average for this indicator, this suggests an expected

[21] 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 107 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 10.8 in 2016.

[22] Austria, France, Germany, Italy, Netherlands and United Kingdom.

[23] Invest Europe, 2016 European Private Equity Activity: Statistics on Fundraising, Investments & Divestments, 15 May 2017.

[24] Including EU Member States, but also Bosnia-Herzegovina, the Former Yugoslav Republic of Macedonia, Montenegro, Norway, Serbia, Switzerland and Ukraine.

three-year average of 0.062, a small decline compared to the current three-year average of 0.063.

### Firm investments

For 'R&D expenditures in the business sector as a percentage of GDP', last year's methodology has been used to estimate short-term changes. The 2016 EU Survey on R&D Investment Business Trends[25] shows that larger EU companies expect their R&D expenditures in the EU to increase, on average, by 0.5% for 2016-2017. Nominal GDP has increased by 0.7% in 2016 and is expected to increase by 1.8% in 2017[26]. The EU's business R&D intensity is therefore expected to decrease from 1.30 in 2015 to 1.28 in 2017 or two years' time.

The indicator 'Non-R&D innovation expenditures' uses data from the CIS. In the EIS 2016, provisional CIS 2014 data, made available by National Statistics Offices as part of a 'fast-track' approach[27], were used, but provisional CIS 2016 data are not yet available. Linear regression results for the full period are of insufficient quality, which seems to be the result of differences in performance behaviour after 2009 compared to the period before 2009. Between 2009 (CIS 2008 data) and 2011 (CIS 2010 data), performance declined from 0.70 to 0.57, but since 2011, performance has been increasing at a steady rate from 0.57 in 2011 (CIS 2010 data) to 0.69 in 2013 (CIS 2012 data) to 0.76 in 2015 (CIS 2014) data. Extrapolating this more recent data using a linear regression for these years only results in an expected increase in two years' time from 0.76 to 0.81.

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 2015. A linear regression over this period results in a further increase from 22.0 to 23.8 in two years' time.

### Innovators

All three indicators in this dimension use data from the CIS, and for the same reasons as for 'Non-R&D innovation expenditures', provisional CIS 2016 data are not yet available to repeat the forecasting exercise of last year. However, for two of these indicators, linear regressions provide good estimates. For 'SMEs with product and/or process innovations', performance has been decreasing since 2009 (CIS 2010). A linear regression for the full period has been used to estimate a further decrease from 30.9 to 30.2 in two years' time.

For 'SMEs with marketing and/or organisational innovations', performance has been decreasing since 2009 (CIS 2010). A linear regression for the full period has been used to estimate a further decrease from 34.9 to 33.5 in two years' time.

For 'SMEs innovating in-house', the 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.

### Linkages

The indicator 'Innovative SMEs collaborating with others' uses data from the CIS, and for the same reasons as for 'Non-R&D innovation expenditures', provisional CIS 2016 data are not yet available to repeat the forecasting exercise of last year. Linear regression results for the full period are of insufficient quality, which seems to be the result of different performance behaviour up to and after 2009. Between 2009 (CIS 2008 data) and 2011 (CIS 2010 data), performance declined from 11.2 to 8.9, but since 2011, performance has been increasing at a steady rate from 8.9 in 2011 (CIS 2010 data) to 10.3 in 2013 (CIS 2012 data) to 11.2 in 2015 (CIS 2014) data. Extrapolating this more recent data using a linear regression for these years only results in an expected increase in two years' time from 11.2 to 11.8.

For 'Public-private co-publications', a period of increasing performance until 2011 was followed by a period of decreasing performance. 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 2009-2015. 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[28] 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[29], of which the model assuming a linear logarithmic dependence with GDP and R&D expenditures performs best. 'PCT patent applications per billion GDP' are expected to further decrease from 3.70 to 3.68 in two years' time.

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[25] 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

[26] EU Winter 2017 Economic Forecast: https://ec.europa.eu/info/business-economy-euro/economic-performance-and-forecasts/economic-forecasts/winter-2017-economic-forecast_en

[27] The Community Innovation Survey (CIS) is a survey of innovation activity in enterprises. Each CIS covers a three-year period. The CIS 2012, the most recent CIS available in the EIS 2016, covered the three-year period from the beginning of 2010 to the end of 2012, and the CIS 2014, the most recent CIS available in the EIS 2017, covered 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 data are then made available by Eurostat in October or November of the year following the reference year. For the EIS 2016, final CIS 2014 were not available, but following a request from Eurostat to share provisional CIS 2014 data for the indicators used in the EIS, such data were received from 18 Member States and two other European countries. There provisional data were then used to calculate estimates of expected CIS 2014 aggregate data for the EU. The EIS 2017 uses final CIS 2014 data, but provisional CIS 2016 data will not be available until 2018 as these data are currently being collected.

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

[29] 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. The estimates for the first two models are almost identical, but the second model performs better in predicting the decline in the indicator in 2014.

'Trademark applications per billion GDP' have been increasing between 2010 and 2016 by almost 0.8 percentage points. A linear regression estimates a further increase from 7.60 to 7.86 in two years' time.

'Design applications per billion GDP' have been decreasing between 2010 and 2016 by about 0.3 percentage points. A linear regression estimates a further decrease from 4.33 to 4.31 in two years' time.

### Employment impacts

Between 2008 and 2015, the 'Employment share in knowledge-intensive activities' has increased by over 0.1%-points a year. A linear regression for 2008-2015 has been used to estimate an increase from 14.1 to 14.3 in two years' time.

For 'Employment in fast-growing enterprises of innovative sectors', data are only available for three years. The number of observations is too small for a linear regression, and the indicator's score was 5.0 in 2014, 5.3 in 2015, and 4.8 in 2016. There is no clear trend in this three-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 fluctuated around 54.0 between 2008 and 2013, followed by an increase of 1.2 percentage points in 2014 and 1.8 percentage points in 2015. Extrapolating the increases in 2014 and 2015 would result in an estimated increase to 58.0 in two years' time.

For 'Knowledge-intensive services exports', data are available from 2010 onwards. Between 2010 and 2015, the indicator has increased from 67.0 to 69.3, and a linear regression suggests a further increase to 70.1 in two years' time.

'Sales share due to new-to-market or new-to-firm product innovations' uses data from the CIS, and for the same reasons as for 'Non-R&D innovation expenditures', provisional CIS 2016 data are not yet available to repeat the forecasting exercise of last year. Linear regression results for the full period are of insufficient quality, which seems to be the result of a fluctuating performance behaviour with an increase in 2009 (CIS 2010) and 2011 (CIS 2010) followed by a decrease in 2013 (CIS 2012) followed by an increase in 2015 (CIS 2014). There is no clear trend in this period, and it is assumed that the indicator will be at the same level in two years' time.

## 6.4 Methodology section

### 6.4.1 Nowcasting the innovation index for the EU and some of its major competitors

Nowcasts for 2017 and 2018 have been calculated using the following methodology[30]:

- Step 1: Using the innovation index scores for 2009-2016, three-year averages have been calculated for 2010-2015; e.g., the three-year average for 2010 is the unweighted average of the innovation indexes for 2009-2011.
- Step 2: A linear regression has been estimated on the 2010-2015 three-year averages.
- Step 3: Using the intercept and the slope of the linear regression, estimates for three-year averages have been calculated for 2009-2018.
- Step 4: Adjusted estimates for the three-year averages for 2016-2018 have been calculated, correcting the estimates in Step 3 by adjusting for the difference in 2015 between the three-year average calculated in Step 1 and the estimate calculated in Step 3.
- Step 5: An estimate has been calculated for the innovation index in 2017 by taking the difference between the estimates, as calculated in Step 4, for the three-year averages in 2016 and 2017 and the innovation index score in 2016. Similarly, estimates have been calculated for the innovation index in 2018.
- Step 6: Scores relative to the EU have been calculated by dividing the estimates for the respective country by those for the EU and multiplying by 100, either using the EU score in 2010 or that in 2016.

### 6.4.2 Using linear regression for estimating short-term changes for individual indicators

For 13 indicators discussed in section 6.2, the coefficients of the slope have been used to estimate results for the EU one (T+1) and two years (T+2) from now by adding the slope to the last known value. **Table 5** shows the regression results for these indicators.

[30] This methodology has proven to correctly estimate innovation index scores for 2010-2015. For the EU, the estimated innovation index scores for 2010-2015 are on average 0.3% below the real scores. For the US, estimates are on average the same as real scores, for Japan, estimates are on average 0.1% above real scores, for South Korea, estimates are on average 0.2% below real scores, and for China, estimates are on average 0.3% below real scores.

**Table 5: Nowcasts for ten indicators using linear regressions**

| | SLOPE | ADJUSTED $R^2$ | CURRENT SCORE | EXPECTED SCORE IN TWO YEARS |
|---|---|---|---|---|
| 1.1.2 Population aged 30-34 with tertiary education | 0.876 | 0.9750 | 38.2 | 40.5 |
| 1.2.1 International scientific co-publications | 25.6 | 0.9977 | 493.6 | 544.8 |
| 1.2.2 Most-cited scientific publications | 0.057 | 0.8660 | 10.6 | 10.7 |
| 1.2.3 Foreign doctorate students | 0.324 | 0.6261 | 25.6 | 26.2 |
| 1.3.2 Opportunity-driven entrepreneurship | -0.036 | 0.5178 | 3.1 | 2.9 |
| 2.2.3 Non-R&D innovation expenditures | 0.046 | 0.9586 | 0.76 | 0.81 |
| 2.3.3 Training ICT skills | 0.900 | 0.8007 | 22.0 | 23.8 |
| 3.1.1 SMEs with product or process innovations | -0.670 | .07,488 | 30.9 | 30.2 |
| 3.1.2 SMEs with marketing or organisational innovations | -1.362 | 0.7414 | 34.9 | 33.5 |
| 3.3.2 Trademark applications | 0.129 | 0.8251 | 7.60 | 7.86 |
| 3.3.3 Design applications | -0.038 | 0.6315 | 4.33 | 4.25 |
| 4.1.1 Employment in knowledge-intensive activities | 0.095 | 0.9526 | 14.1 | 14.3 |
| 4.1.2 Knowledge-intensive services exports | 0.285 | 0.6840 | 69.3 | 69.9 |

## 6.5 *Big data* as a statistical source for innovation indicators

*Big data* are perceived to be a possible source for providing more timely and policy-relevant innovation-related indicators. However, it will not be possible in the short run to include any indicators using *Big data* in the main EIS measurement framework. So far, almost all initiatives to develop new indicators using *Big data* are limited to ad-hoc studies for individual countries leading to results which suffer from clear limitations to be compared over time and across countries.

As with other indicators that have been developed in the past (e.g., R&D statistics relying on the guidelines in the Frascati Manual and innovation survey statistics relying on the guidelines in the Oslo Manual), a harmonised approach by National Statistical Offices will be needed in the longer run to develop indicators that are directly comparable across countries and that will be made available timely and regularly over time.

An expert workshop was held in February 2017 gathering expert views and opinions on the possible use of *Big data* in the EIS. The workshop presentations included several interesting examples where *Big data* already provides information on innovation, but the information (or data) is limited to local, regional or at best country-level statistics.

Results from one study showed that a web search on R&D-related keywords identified many more enterprises with R&D activities than revealed in official R&D statistics. This result could suggest that in official statistics R&D activities are underreported. Official statistics could use this information to expand their list of known enterprises with R&D activities to better target when sending out R&D or innovation survey questionnaires. A study on the internet economy showed that using *Big data* can identify enterprises with activities related to a particular economic sector outside that sector. Similar studies might be able to identify innovative enterprises in economic sectors not perceived as being innovative and which are not included among the mandatory economic sectors covered in the Community Innovation Survey.

The workshop revealed that some indicators could be constructed using *Big data,* but a lack of a harmonised approach with consistent methodologies ('codebooks') so far impedes the construction of indicators which are comparable across countries. For reports like the EIS, which need to cover all 28 EU Member States, indicators based on *Big data* could only be used if data were available for a sufficient number of countries. Ensuring a large coverage of countries requires an organisation coordinating efforts.

Beyond the construction of new indicators, *Big data* could also be used to provide Nowcasts for some of the traditional innovation indicators by exploiting more recent information, e.g. data available on websites. However, it is not clear if indicators based on *Big data* would relate to (or correlate with) indicators using official data, and without evidence of significant and stable relations, *Big data* results should not be used for Nowcasting official statistics. Instead, the use of *Big data* seems much more promising in enriching existing statistics by offering more detailed analyses. For instance, one of the indicators used in the EIS captures the share of new doctorate graduates without distinguishing between quality and career prospects of these graduates. *Big data* could be used to find such additional and more qualitative information, which could be very useful for policy-makers.

Methodologies of *Big data* analytics for the construction of indicators are still in development and are facing many quality concerns, but this should not stop their further development. Other now commonly accepted statistics faced similar concerns in the past (e.g. Community Innovation Survey data and Bibliometric data), and more experiments are needed so that one can learn from 'failures' to make methodologies more robust. This will facilitate the acceptance of *Big data* statistics by practitioners (including academics) and policy-makers.

A number of ongoing and forthcoming initiatives on *Big data*, including pilot actions, are run by the European Commission. The results of those will feed into the next edition of the European Innovation Scoreboard. In addition, national and international developments around this dynamic field will be closely monitored to fully exploit their potential for future editions of the report. Adequate comparability and quality of the underlying data and indicators will remain essential in this context.

# 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 2016 as compared to the EU performance score in 2010 and relative performance to the EU in 2016 (the data are shown in **Annex F**);
- A table providing a comparison of the respective country's innovation performance in 2010 and 2016 by indicator and dimension relative to that of the EU in 2010. Different colour codes highlight strengths and weaknesses in 2016. The table also includes the performance change between 2010 and 2016 using different font colours showing whether performance has increased or decreased over time[31] (**Annex B** and **Annex C** show for each country and each indicator respectively the most recent data and the performance change over time);
- A table providing data for the contextual indicators which are used as proxies for structural differences between countries. The EIS 2017 Methodology Report provides detailed definitions for these indicators.

[31] 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 tables with an §.

**Belgium** is a **Strong Innovator**. Over time, performance has increased by 1.4% relative to that of the EU in 2010.

## Innovation system

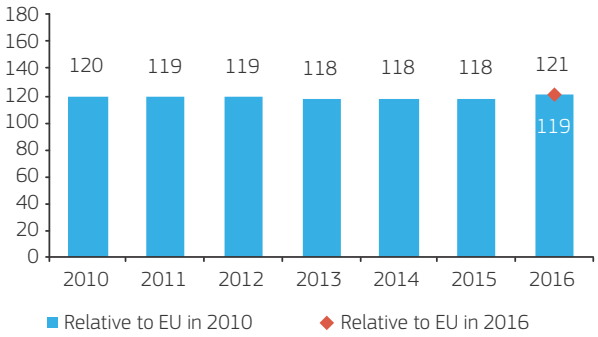
Relative strengths of the innovation system are in Attractive research systems, Linkages, and Firm investments. Relative weaknesses are in Employment impacts, Sales impacts, and Intellectual assets.

## Structural differences

Notable differences are a smaller share of Agriculture & Mining in total employment, a larger share of Public administration in total employment, a larger share of micro enterprises in turnover, a smaller share of foreign controlled enterprises, a higher number of Top R&D spending enterprises but a lower average R&D spending of these enterprises, a smaller share of enterprise births, higher GDP per capita, a higher growth rate of population, and higher population density.

| | BE | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 1.3 | 5.1 |
| - Manufacturing (NACE C) (%) | 13.2 | 15.6 |
| *of which High and Medium high-tech (%)* | *36.6* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 8.6 | 8.6 |
| - Services (NACE G-N) (%) | 67.3 | 63.6 |
| *of which Knowledge-intensive services (%)* | *62.1* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 9.5 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 24.3 | 17.3 |
| - SMEs (10-249 employees) (%) | 39.0 | 38.0 |
| - Large enterprises (250+ employees) (%) | 36.8 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 0.25 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 44.2 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 69.7 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 0.4 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 4.3 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 73.0 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 30,500 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 5.1 | 5.4 |
| Population size, avg 2011-15 (millions) | 11.1 | 505.5 |
| Change in population between 2010 and 2015 (%) | 3.7 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 65.4 | 66.1 |
| Population density, average 2011-15 | 368.5 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 86.6 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*




| Belgium | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | 119.6 | 120.9 | 1.4 |
| **Human resources** | 110.9 | 121.4 | 10.5 |
| New doctorate graduates | 92.3 | 122.0 | 29.7 |
| Population with tertiary education | 103.1 | 106.4 | 3.3 |
| Lifelong learning | 65.3 | 61.1 | -4.2 |
| **Attractive research systems** | 152.2 | 189.7 | 37.5 |
| International scientific co-publications | 323.9 | 467.4 | 143.5 |
| Most cited publications | 121.9 | 127.7 | 5.8 |
| Foreign doctorate students | 134.7 | 180.3 | 45.6 |
| **Innovation-friendly environment** | 157.5 | 136.5 | -21.0 |
| Broadband penetration | 189.9 | 256.6 | 66.7 |
| Opportunity-driven entrepreneurship | 125.4 | 52.5 | -82.8 |
| **Finance and support** | 124.1 | 84.9 | -39.2 |
| R&D expenditure in the public sector | 91.1 | 92.9 | 1.8 |
| Venture capital expenditures | 165.7 | 74.9 | -90.9 |
| **Firm investments** | 124.8 | 148.7 | 23.9 |
| R&D expenditure in the business sector | 110.3 | 149.8 | 39.5 |
| Non-R&D innovation expenditures | 77.4 | 75.4 | -2.0 |
| Enterprises providing ICT training | 178.6 | 207.1 | 28.6 |
| **Innovators** | 132.6 | 139.1 | 6.5 |
| SMEs product/process innovations | 138.2 | 156.5 | 18.3 |
| SMEs marketing/organizational innovations | 114.4 | 118.1 | 3.7 |
| SMEs innovating in-house | 145.7 | 143.4 | -2.2 |
| **Linkages** | 157.4 | 160.4 | 3.0 |
| Innovative SMEs collaborating with others | 210.9 | 217.4 | 6.5 |
| Public-private co-publications | 135.2 | 132.1 | -3.1 |
| Private co-funding of public R&D exp. | 134.7 | 138.1 | 5.4 |
| **Intellectual assets** | 95.5 | 87.7 | -7.8 |
| PCT patent applications | 96.4 | 95.0 | -1.3 |
| Trademark applications | 112.9 | 111.4 | -1.5 |
| Design applications | 81.0 | 59.7 | -21.4 |
| **Employment impacts** | 73.1 | 76.0 | 2.9 |
| Employment in knowledge-intensive activities | 116.7 | 121.8 | 5.1 |
| Employment fast-growing enterprises | 41.2 | 42.6 | 1.4 |
| **Sales impacts** | 84.8 | 77.5 | -7.3 |
| Medium and high tech product exports | 86.9 | 81.7 | -5.1 |
| Knowledge-intensive services exports | 101.4 | 101.7 | 0.2 |
| Sales of new-to-market/firm innovations | 62.8 | 44.1 | -18.8 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

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

## Innovation system

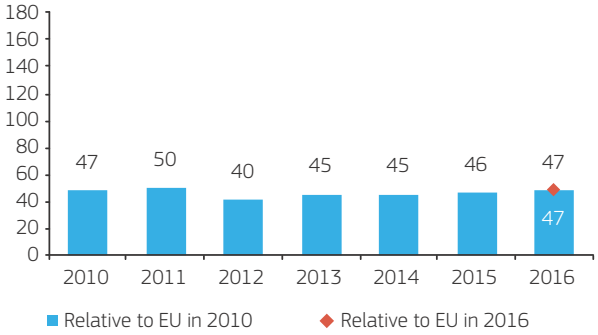
Relative strengths of the innovation system are in Intellectual assets, Employment impacts, and Human resources. Relative weaknesses are in Innovators, Finance and support, and Attractive research systems.

## Structural differences

Notable differences are a larger share of employment in Agriculture & Mining and in Manufacturing, a smaller share of employment in High and Medium high-tech manufacturing and in Knowledge-intensive services, a larger share of Micro enterprises and SMEs in turnover, a smaller share of Large enterprises in turnover, a larger share of foreign controlled enterprises, a larger share of enterprise births, lower GDP per capita, a higher growth rate of GDP, a lower and negative growth rate of population, and lower population density.

| | BG | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 7.6 | 5.1 |
| - Manufacturing (NACE C) (%) | 19.9 | 15.6 |
| *of which High and Medium high-tech (%)* | *18.6* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 9.8 | 8.6 |
| - Services (NACE G-N) (%) | 55.0 | 63.6 |
| *of which Knowledge-intensive services (%)* | *45.1* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 7.7 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 21.4 | 17.3 |
| - SMEs (10-249 employees) (%) | 47.1 | 38.0 |
| - Large enterprises (250+ employees) (%) | 31.6 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 3.85 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | none | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | none | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 2.2 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 2.9 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 73.5 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 11,900 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 8.0 | 5.4 |
| Population size, avg 2011-15 (millions) | 7.3 | 505.5 |
| Change in population between 2010 and 2015 (%) | -3.0 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 67.2 | 66.1 |
| Population density, average 2011-15 | 66.7 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 64.3 | 74.4 |

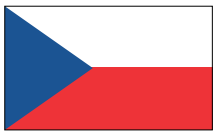
*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*



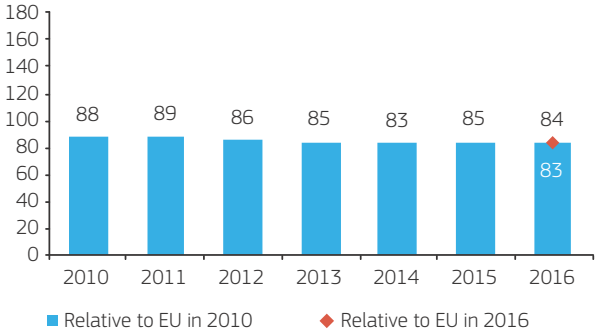

| Bulgaria | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | 47.4 | 47.5 | 0.1 |
| **Human resources** | 33.7 | 71.8 | 38.1 |
| New doctorate graduates | 30.8 | 98.4 | 67.6 |
| Population with tertiary education | 61.8 | 96.7 | 34.9 |
| Lifelong learning | 4.2 | 10.5 | 6.3 |
| **Attractive research systems** | 28.5 | 28.6 | 0.2 |
| International scientific co-publications | 39.1 | 54.4 | 15.3 |
| Most cited publications | 29.2 | 27.5 | -1.7 |
| Foreign doctorate students | 23.6 | 21.1 | -2.5 |
| **Innovation-friendly environment** | 54.6 | 66.4 | 11.8 |
| Broadband penetration | 88.9 | 111.1 | 22.2 |
| Opportunity-driven entrepreneurship | 30.4 | 34.9 | 4.5 |
| **Finance and support** | 59.4 | 16.1 | -43.3 |
| R&D expenditure in the public sector | 32.5 | 16.5 | -16.0 |
| Venture capital expenditures | 93.4 | 15.6 | -77.8 |
| **Firm investments** | 66.5 | 59.0 | -7.4 |
| R&D expenditure in the business sector | 10.7 | 57.9 | 47.2 |
| Non-R&D innovation expenditures | 141.2 | 106.7 | -34.5 |
| Enterprises providing ICT training | 64.3 | 21.4 | -42.9 |
| **Innovators** | 33.0 | 11.6 | -21.5 |
| SMEs product/process innovations | 38.0 | 9.3 | -28.7 |
| SMEs marketing/organizational innovations | 21.4 | 12.4 | -9.0 |
| SMEs innovating in-house | 40.0 | 13.0 | -27.0 |
| **Linkages** | 30.0 | 17.7 | -12.3 |
| Innovative SMEs collaborating with others | 23.1 | 19.1 | -4.0 |
| Public-private co-publications | 24.3 | 6.6 | -17.6 |
| Private co-funding of public R&D exp. | 40.7 | 26.1 | -14.6 |
| **Intellectual assets** | 50.7 | 99.2 | 48.5 |
| PCT patent applications | 29.3 | 41.8 | 12.6 |
| Trademark applications | 106.0 | 130.4 | 24.4 |
| Design applications | 37.1 | 152.5 | 115.5 |
| **Employment impacts** | 87.8 | 97.9 | 10.2 |
| Employment in knowledge-intensive activities | 35.9 | 60.3 | 24.4 |
| Employment fast-growing enterprises | 125.7 | 125.5 | -0.2 |
| **Sales impacts** | 45.9 | 33.5 | -12.4 |
| Medium and high tech product exports | 19.9 | 33.6 | 13.7 |
| Knowledge-intensive services exports | 18.6 | 48.0 | 29.4 |
| Sales of new-to-market/firm innovations | 109.3 | 16.3 | -92.9 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*



The **Czech Republic** is a **Moderate Innovator**. Over time, performance has declined by 3.5% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Firm investments, Employment impacts, and Sales impacts. Relative weaknesses are in Intellectual assets, Linkages, and Innovators.

## Structural differences

Notable differences are a smaller share of employment in Agriculture & Mining, a larger share of employment in Manufacturing, a larger share of employment in Utilities and Construction, a lower number of Top R&D spending enterprises and a lower average R&D spending of these enterprises, a smaller share of enterprise births, a higher growth rate of GDP, a lower growth rate of population, and lower population density.

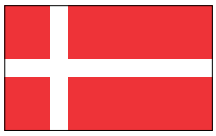
| | CZ | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 3.8 | 5.1 |
| - Manufacturing (NACE C) (%) | 26.6 | 15.6 |
| *of which High and Medium high-tech (%)* | *40.2* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 10.6 | 8.6 |
| - Services (NACE G-N) (%) | 52.6 | 63.6 |
| *of which Knowledge-intensive services (%)* | *54.4* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 6.4 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 18.3 | 17.3 |
| - SMEs (10-249 employees) (%) | 39.3 | 38.0 |
| - Large enterprises (250+ employees) (%) | 42.3 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 1.37 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 3.3 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 24.8 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 1.1 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.4 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 76.7 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 20,500 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 8.1 | 5.4 |
| Population size, avg 2011-15 (millions) | 10.5 | 505.5 |
| Change in population between 2010 and 2015 (%) | 0.7 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 68.4 | 66.1 |
| Population density, average 2011-15 | 136.3 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 63.9 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| Czech Republic | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **87.9** | **84.4** | **-3.5** |
| **Human resources** | **70.7** | **97.4** | **26.6** |
| New doctorate graduates | 92.3 | 113.6 | 21.3 |
| Population with tertiary education | 29.6 | 95.4 | 65.8 |
| Lifelong learning | 92.6 | 80.0 | -12.6 |
| **Attractive research systems** | **60.8** | **82.6** | **21.9** |
| International scientific co-publications | 131.9 | 220.9 | 89.0 |
| Most cited publications | 55.6 | 62.6 | 6.9 |
| Foreign doctorate students | 42.8 | 62.3 | 19.5 |
| **Innovation-friendly environment** | **76.7** | **94.2** | **17.5** |
| Broadband penetration | 88.9 | 111.1 | 22.2 |
| Opportunity-driven entrepreneurship | 68.2 | 82.3 | 14.1 |
| **Finance and support** | **114.7** | **77.5** | **-37.1** |
| R&D expenditure in the public sector | 71.6 | 128.4 | 56.9 |
| Venture capital expenditures | 169.1 | 13.3 | -155.7 |
| **Firm investments** | **108.7** | **114.6** | **5.9** |
| R&D expenditure in the business sector | 60.5 | 88.8 | 28.3 |
| Non-R&D innovation expenditures | 155.4 | 139.5 | -15.9 |
| Enterprises providing ICT training | 121.4 | 121.4 | 0.0 |
| **Innovators** | **105.6** | **73.7** | **-31.8** |
| SMEs product/process innovations | 98.8 | 81.5 | -17.3 |
| SMEs marketing/organizational innovations | 120.6 | 50.6 | -70.0 |
| SMEs innovating in-house | 97.0 | 89.7 | -7.3 |
| **Linkages** | **66.9** | **63.0** | **-3.9** |
| Innovative SMEs collaborating with others | 101.1 | 88.6 | -12.5 |
| Public-private co-publications | 80.5 | 46.5 | -34.0 |
| Private co-funding of public R&D exp. | 27.2 | 56.2 | 29.0 |
| **Intellectual assets** | **54.4** | **60.8** | **6.4** |
| PCT patent applications | 51.0 | 53.9 | 2.9 |
| Trademark applications | 65.0 | 78.1 | 13.2 |
| Design applications | 50.9 | 56.9 | 6.0 |
| **Employment impacts** | **115.8** | **95.4** | **-20.3** |
| Employment in knowledge-intensive activities | 84.6 | 91.0 | 6.4 |
| Employment fast-growing enterprises | 138.5 | 98.6 | -39.9 |
| **Sales impacts** | **102.4** | **95.0** | **-7.5** |
| Medium and high tech product exports | 119.9 | 124.5 | 4.6 |
| Knowledge-intensive services exports | 40.9 | 49.2 | 8.2 |
| Sales of new-to-market/firm innovations | 153.4 | 112.9 | -40.5 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*



**Denmark** is an **Innovation Leader**. Over time, performance has declined by 2.8% relative to that of the EU in 2010.

## Innovation system

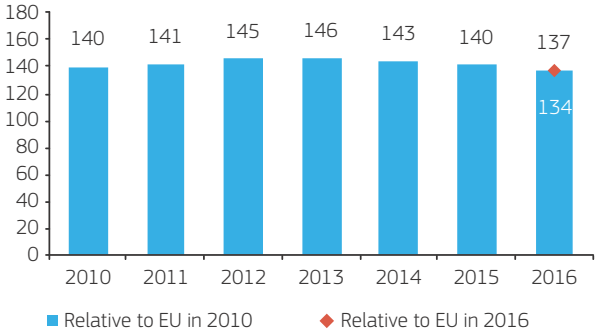
Relative strengths of the innovation system are in Innovation-friendly environment, Human resources, and Attractive research systems. Relative weaknesses are in Sales impacts, Innovators, and Employment impacts.

## Structural differences

Notable differences are a smaller share of employment in Agriculture & Mining, in Manufacturing and in Public administration, a larger share of foreign controlled enterprises, a higher number of Top R&D spending enterprises but a lower average R&D spending of these enterprises, a smaller share of enterprise births, higher GDP per capita, and a higher growth rate of population.

| | DK | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 2.7 | 5.1 |
| - Manufacturing (NACE C) (%) | 12.2 | 15.6 |
| *of which High and Medium high-tech (%)* | *42.1* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 7.1 | 8.6 |
| - Services (NACE G-N) (%) | 72.3 | 63.6 |
| *of which Knowledge-intensive services (%)* | *65.0* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 5.7 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | n/a | 17.3 |
| - SMEs (10-249 employees) (%) | n/a | 38.0 |
| - Large enterprises (250+ employees) (%) | 40.3 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 1.74 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 94.2 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 111.3 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 0.5 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.7 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 84.9 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 31,900 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 5.9 | 5.4 |
| Population size, avg 2011-15 (millions) | 5.6 | 505.5 |
| Change in population between 2010 and 2015 (%) | 2.3 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 64.8 | 66.1 |
| Population density, average 2011-15 | 130.9 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 59.0 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

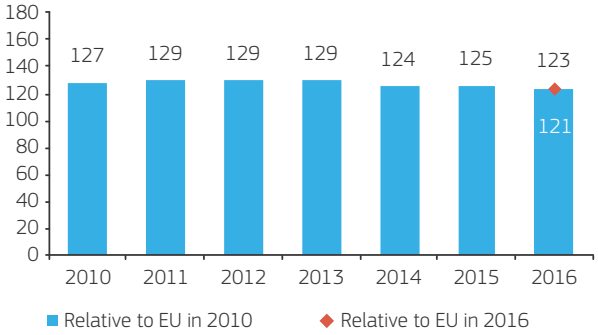



| Denmark | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | 139.5 | 136.7 | **-2.8** |
| **Human resources** | 168.3 | 228.3 | **60.0** |
| New doctorate graduates | 115.4 | 234.1 | 118.7 |
| Population with tertiary education | 128.5 | 178.9 | 50.7 |
| Lifelong learning | 278.9 | 278.9 | 0.0 |
| **Attractive research systems** | 198.6 | 202.0 | **43.4** |
| International scientific co-publications | 427.6 | 649.2 | 221.6 |
| Most cited publications | 134.5 | 127.1 | -7.3 |
| Foreign doctorate students | 83.3 | 136.4 | 53.1 |
| **Innovation-friendly environment** | 221.2 | 229.9 | **8.7** |
| Broadband penetration | 277.8 | 277.8 | 0.0 |
| Opportunity-driven entrepreneurship | 181.3 | 196.1 | 14.8 |
| **Finance and support** | 127.2 | 115.7 | **-11.4** |
| R&D expenditure in the public sector | 131.0 | 156.0 | 24.9 |
| Venture capital expenditures | 118.8 | 61.6 | -57.3 |
| **Firm investments** | 142.0 | 124.1 | **-18.7** |
| R&D expenditure in the business sector | 181.6 | 158.4 | -23.2 |
| Non-R&D innovation expenditures | 66.5 | 30.7 | -35.8 |
| Enterprises providing ICT training | 164.3 | 164.3 | 0.0 |
| **Innovators** | 119.7 | 96.3 | **-23.4** |
| SMEs product/process innovations | 110.7 | 97.9 | -12.8 |
| SMEs marketing/organizational innovations | 100.2 | 100.1 | -0.1 |
| SMEs innovating in-house | 148.3 | 90.8 | -57.5 |
| **Linkages** | 152.6 | 114.8 | **-37.9** |
| Innovative SMEs collaborating with others | 215.5 | 120.7 | -94.8 |
| Public-private co-publications | 204.3 | 200.3 | -4.0 |
| Private co-funding of public R&D exp. | 56.7 | 36.4 | -20.4 |
| **Intellectual assets** | 139.1 | 148.3 | **9.2** |
| PCT patent applications | 139.0 | 128.8 | -10.2 |
| Trademark applications | 134.1 | 151.4 | 17.3 |
| Design applications | 143.2 | 172.3 | 29.2 |
| **Employment impacts** | 132.4 | 103.3 | **-29.0** |
| Employment in knowledge-intensive activities | 129.5 | 129.5 | 0.0 |
| Employment fast-growing enterprises | 134.5 | 84.2 | -50.2 |
| **Sales impacts** | 89.7 | 79.8 | **-9.9** |
| Medium and high tech product exports | 63.4 | 79.8 | 16.4 |
| Knowledge-intensive services exports | 123.3 | 115.7 | -7.5 |
| Sales of new-to-market/firm innovations | 82.0 | 37.7 | -44.2 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Germany** is an **Innovation Leader**. Over time, performance has declined by 3.7% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Firm investments, Innovators, and Intellectual assets. Relative weaknesses are in Finance and support, Employment impacts, and Attractive research systems.

## Structural differences

Notable differences are a smaller share of employment in Agriculture & Mining and a larger share of employment in Manufacturing and particularly in High and Medium high-tech manufacturing, a smaller share of Micro enterprises in turnover, a higher number of Top R&D spending enterprises and a higher average R&D spending of these enterprises, a smaller share of enterprise births, higher GDP per capita, a higher growth rate of GDP, a lower and negative growth rate of population, and higher population density.

| | DE | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 1.7 | 5.1 |
| - Manufacturing (NACE C) (%) | 19.6 | 15.6 |
| *of which High and Medium high-tech (%)* | *49.8* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 8.2 | 8.6 |
| - Services (NACE G-N) (%) | 63.4 | 63.6 |
| *of which Knowledge-intensive services (%)* | *58.3* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 7.1 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 11.3 | 17.3 |
| - SMEs (10-249 employees) (%) | 36.1 | 38.0 |
| - Large enterprises (250+ employees) (%) | 52.5 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 1.19 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 41.8 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 255.7 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 0.6 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 4.3 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 79.9 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 31,400 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 8.2 | 5.4 |
| Population size, avg 2011-15 (millions) | 80.6 | 505.5 |
| Change in population between 2010 and 2015 (%) | -0.7 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 65.9 | 66.1 |
| Population density, average 2011-15 | 226.3 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 80.7 | 74.4 |

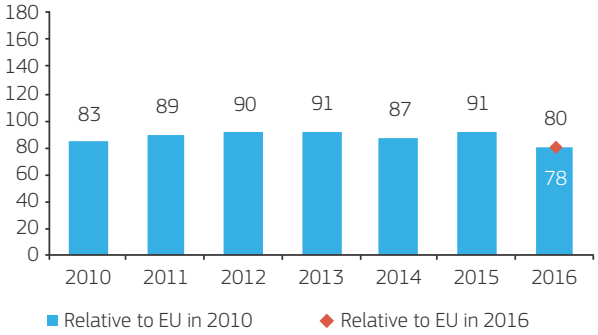
*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| Germany | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | 127.1 | 123.4 | **-3.7** |
| **Human resources** | **104.6** | **124.0** | **19.4** |
| New doctorate graduates | 184.6 | 204.1 | 19.5 |
| Population with tertiary education | 52.0 | 81.6 | 29.6 |
| Lifelong learning | 69.5 | 76.8 | 7.4 |
| **Attractive research systems** | **96.1** | **104.1** | **8.0** |
| International scientific co-publications | 174.6 | 251.6 | 77.0 |
| Most cited publications | 110.5 | 113.4 | 2.8 |
| Foreign doctorate students | 47.2 | 38.2 | -9.0 |
| **Innovation-friendly environment** | **75.5** | **107.0** | **31.5** |
| Broadband penetration | 100.0 | 133.3 | 33.3 |
| Opportunity-driven entrepreneurship | 58.3 | 88.4 | 30.1 |
| **Finance and support** | **100.0** | **99.0** | **-0.9** |
| R&D expenditure in the public sector | 139.4 | 147.9 | 8.9 |
| Venture capital expenditures | 64.0 | 50.7 | -13.3 |
| **Firm investments** | **141.1** | **175.1** | **34.0** |
| R&D expenditure in the business sector | 155.8 | 165.3 | 9.4 |
| Non-R&D innovation expenditures | 128.8 | 192.5 | 63.7 |
| Enterprises providing ICT training | 135.7 | 171.4 | 35.7 |
| **Innovators** | **176.6** | **131.5** | **-44.6** |
| SMEs product/process innovations | 179.5 | 127.6 | -51.8 |
| SMEs marketing/organizational innovations | 176.6 | 131.8 | -44.8 |
| SMEs innovating in-house | 172.1 | 135.0 | -37.1 |
| **Linkages** | **138.7** | **129.7** | **-9.1** |
| Innovative SMEs collaborating with others | 106.1 | 89.3 | -16.8 |
| Public-private co-publications | 134.7 | 112.0 | -12.2 |
| Private co-funding of public R&D exp. | 177.0 | 177.0 | 0.0 |
| **Intellectual assets** | **145.2** | **131.5** | **-13.7** |
| PCT patent applications | 136.6 | 130.8 | -5.8 |
| Trademark applications | 135.2 | 128.9 | -6.3 |
| Design applications | 164.3 | 134.3 | -30.1 |
| **Employment impacts** | **121.5** | **100.7** | **-20.8** |
| Employment in knowledge-intensive activities | 134.4 | 116.7 | -7.7 |
| Employment fast-growing enterprises | 119.4 | 89.0 | -30.4 |
| **Sales impacts** | **128.2** | **117.9** | **-10.3** |
| Medium and high tech product exports | 127.0 | 134.3 | 7.4 |
| Knowledge-intensive services exports | 118.9 | 115.5 | -3.3 |
| Sales of new-to-market/firm innovations | 140.7 | 100.7 | -39.9 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Estonia** is a **Moderate Innovator**. Over time, performance has declined by 3.6% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Finance and support, Human resources, and Innovation-friendly environment. Relative weaknesses are in Innovators, Linkages, and Sales impacts.

## Structural differences

Notable differences are a larger share of employment in Manufacturing but a smaller share in High and Medium high-tech manufacturing, a larger share of employment in Utilities and Construction, a larger share of Micro enterprises and SMEs in turnover, a smaller share of large enterprises in turnover, a smaller share of enterprise births, lower GDP per capita, a higher growth rate of GDP, a lower and negative growth rate of population, and lower population density.

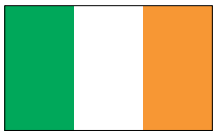
| | EE | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 4.9 | 5.1 |
| - Manufacturing (NACE C) (%) | 18.9 | 15.6 |
| *of which High and Medium high-tech (%)* | *21.0* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 11.3 | 8.6 |
| - Services (NACE G-N) (%) | 58.1 | 63.6 |
| *of which Knowledge-intensive services (%)* | *53.3* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 6.8 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 30.3 | 17.3 |
| - SMEs (10-249 employees) (%) | 47.1 | 38.0 |
| - Large enterprises (250+ employees) (%) | 22.6 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 24.80 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | none | 3.0 |
| - average R&D spending, mln Euros, 2011-15 | none | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 0.9 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.0 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 81.1 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 18,100 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 18.7 | 5.4 |
| Population size, avg 2011-15 (millions) | 1.3 | 505.5 |
| Change in population between 2010 and 2015 (%) | -1.4 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 66.3 | 66.1 |
| Population density, average 2011-15 | 30.3 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 59.0 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

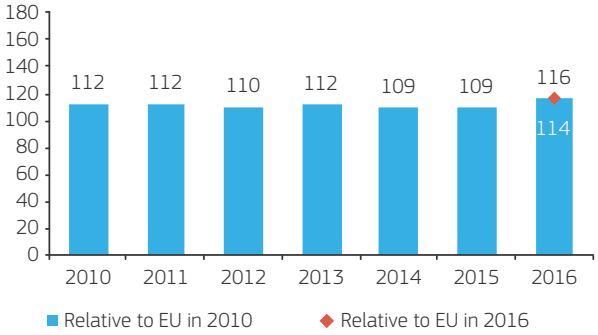
| Estonia | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **83.3** | **79.8** | **-3.6** |
| **Human resources** | **95.6** | **122.1** | **26.5** |
| New doctorate graduates | 53.8 | 67.9 | 14.0 |
| Population with tertiary education | 132.2 | 152.0 | 19.7 |
| Lifelong learning | 103.2 | 152.6 | 49.5 |
| **Attractive research systems** | **56.5** | **93.6** | **37.2** |
| International scientific co-publications | 174.7 | 337.8 | 163.1 |
| Most cited publications | 51.4 | 74.2 | 22.8 |
| Foreign doctorate students | 21.7 | 34.7 | 13.0 |
| **Innovation-friendly environment** | **85.7** | **112.8** | **27.1** |
| Broadband penetration | 88.9 | 133.3 | 44.4 |
| Opportunity-driven entrepreneurship | 83.4 | 98.3 | 14.9 |
| **Finance and support** | **77.4** | **124.4** | **47.1** |
| R&D expenditure in the public sector | 103.6 | 110.7 | 7.1 |
| Venture capital expenditures | 44.3 | 141.8 | 97.5 |
| **Firm investments** | **115.1** | **76.3** | **-38.8** |
| R&D expenditure in the business sector | 51.1 | 57.1 | 6.0 |
| Non-R&D innovation expenditures | 277.8 | 124.7 | -153.1 |
| Enterprises providing ICT training | 50.0 | 57.1 | 7.1 |
| **Innovators** | **111.2** | **23.6** | **-87.6** |
| SMEs product/process innovations | 137.8 | 23.5 | -114.3 |
| SMEs marketing/organizational innovations | 79.7 | 13.3 | -66.3 |
| SMEs innovating in-house | 117.0 | 34.1 | -82.9 |
| **Linkages** | **109.0** | **57.7** | **-51.3** |
| Innovative SMEs collaborating with others | 211.8 | 95.9 | -115.7 |
| Public-private co-publications | 77.9 | 10.0 | -68.0 |
| Private co-funding of public R&D exp. | 51.8 | 67.5 | 15.7 |
| **Intellectual assets** | **75.0** | **96.9** | **21.9** |
| PCT patent applications | 71.9 | 60.6 | -11.3 |
| Trademark applications | 117.2 | 181.2 | 64.0 |
| Design applications | 46.9 | 81.3 | 34.4 |
| **Employment impacts** | **49.3** | **69.9** | **20.6** |
| Employment in knowledge-intensive activities | 52.6 | 89.7 | 37.2 |
| Employment fast-growing enterprises | 46.8 | 55.4 | 8.6 |
| **Sales impacts** | **55.6** | **64.4** | **8.8** |
| Medium and high tech product exports | 41.9 | 65.7 | 23.9 |
| Knowledge-intensive services exports | 57.5 | 56.0 | -1.5 |
| Sales of new-to-market/firm innovations | 70.0 | 72.6 | 2.6 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*



**Ireland** is a **Strong Innovator**. Over time, performance has increased by 3.5% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Employment impacts, Human resources, and Attractive research systems. Relative weaknesses are in Finance and support, Intellectual assets, and Linkages.

## Structural differences

Notable differences are a smaller share of employment in Manufacturing but a larger share in High and Medium high-tech manufacturing, a smaller share of employment in Public administration, a larger share of large enterprises in turnover, a larger share of foreign controlled enterprises, a higher number of Top R&D spending enterprises and a higher average R&D spending of these enterprises, a smaller share of enterprise births, higher GDP per capita, a higher growth rate of GDP[32], a higher growth rate of population, and lower population density.

| | IE | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 5.3 | 5.1 |
| - Manufacturing (NACE C) (%) | 11.4 | 15.6 |
| *of which High and Medium high-tech (%)* | *44.6* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 6.9 | 8.6 |
| - Services (NACE G-N) (%) | 71.0 | 63.6 |
| *of which Knowledge-intensive services (%)* | *60.9* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 5.4 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 15.8 | 17.3 |
| - SMEs (10-249 employees) (%) | 35.7 | 38.0 |
| - Large enterprises (250+ employees) (%) | 54.1 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 2.45 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 66.0 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 246.0 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 0.4 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 4.2 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 79.5 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 32,600 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 36.9 | 5.4 |
| Population size, avg 2011-15 (millions) | 4.6 | 505.5 |
| Change in population between 2010 and 2015 (%) | 1.7 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 66.0 | 66.1 |
| Population density, average 2011-15 | 67.2 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 34.1 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| Ireland | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | 112.2 | 115.7 | 3.5 |
| **Human resources** | 125.4 | 156.7 | 31.3 |
| New doctorate graduates | 107.7 | 178.0 | 70.4 |
| Population with tertiary education | 198.7 | 221.7 | 23.0 |
| Lifelong learning | 61.1 | 54.7 | -6.3 |
| **Attractive research systems** | 146.2 | 148.1 | 2.0 |
| International scientific co-publications | 261.9 | 395.0 | 133.1 |
| Most cited publications | 109.4 | 122.0 | 12.5 |
| Foreign doctorate students | 158.1 | 98.0 | -60.1 |
| **Innovation-friendly environment** | 81.7 | 112.0 | 30.3 |
| Broadband penetration | 111.1 | 166.7 | 55.6 |
| Opportunity-driven entrepreneurship | 60.9 | 73.4 | 12.5 |
| **Finance and support** | 110.2 | 56.5 | -53.6 |
| R&D expenditure in the public sector | 62.7 | 30.7 | -32.0 |
| Venture capital expenditures | 170.0 | 89.1 | -80.9 |
| **Firm investments** | 134.1 | 113.4 | -20.7 |
| R&D expenditure in the business sector | 92.3 | 91.4 | -0.9 |
| Non-R&D innovation expenditures | 151.1 | 61.7 | -89.4 |
| Enterprises providing ICT training | 164.3 | 178.6 | 14.3 |
| **Innovators** | 138.6 | 146.6 | 8.0 |
| SMEs product/process innovations | 130.9 | 145.5 | 14.7 |
| SMEs marketing/organizational innovations | 105.6 | 143.7 | 38.1 |
| SMEs innovating in-house | 179.6 | 150.6 | -29.2 |
| **Linkages** | 60.7 | 68.9 | 8.2 |
| Innovative SMEs collaborating with others | 86.5 | 127.8 | 41.4 |
| Public-private co-publications | 79.5 | 77.1 | -2.3 |
| Private co-funding of public R&D exp. | 23.6 | 13.6 | -10.0 |
| **Intellectual assets** | 74.3 | 62.7 | -11.6 |
| PCT patent applications | 86.3 | 82.0 | -4.4 |
| Trademark applications | 93.5 | 81.8 | -11.8 |
| Design applications | 43.4 | 22.1 | -21.3 |
| **Employment impacts** | 152.6 | 169.4 | 16.7 |
| Employment in knowledge-intensive activities | 176.9 | 180.8 | 3.8 |
| Employment fast-growing enterprises | 134.9 | 161.0 | 26.1 |
| **Sales impacts** | 107.2 | 128.4 | 21.3 |
| Medium and high tech product exports | 91.0 | 92.7 | 1.7 |
| Knowledge-intensive services exports | 149.0 | 149.0 | 0.0 |
| Sales of new-to-market/firm innovations | 77.8 | 147.5 | 69.7 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

[32] This strong increase is due to a revision in Irish GDP. As of 2015, several big economic operators were relocated to Ireland: http://ec.europa.eu/eurostat/documents/24,987/63,90465/Irish_GDP_communication.pdf

**Greece** is a **Moderate Innovator**. Over time, performance has increased by 0.7% relative to that of the EU in 2010.

## Innovation system

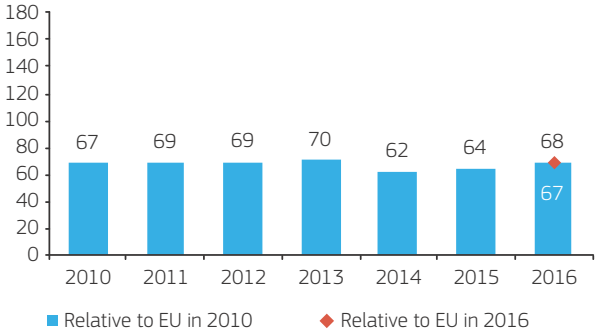
Relative strengths of the innovation system are in Innovators, Attractive research systems, and Human resources. Relative weaknesses are in Innovation-friendly environment, Intellectual assets, and Finance and support.

## Structural differences

Notable differences are a larger share of employment in Agriculture & Mining, a smaller share of employment in Manufacturing, in High and Medium high-tech manufacturing and in Utilities and Construction, a larger share of employment in Public administration, a larger share of micro enterprises in turnover, a smaller share of large enterprises in turnover, a smaller share of foreign controlled enterprises, a lower number of Top R&D spending enterprises and a lower average R&D spending of these enterprises, lower GDP per capita, a lower and negative growth rate of GDP, a lower and negative growth rate of population, and lower population density.

| | EL | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 13.3 | 5.1 |
| - Manufacturing (NACE C) (%) | 9.4 | 15.6 |
| *of which High and Medium high-tech (%)* | *13.6* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 6.3 | 8.6 |
| - Services (NACE G-N) (%) | 62.1 | 63.6 |
| *of which Knowledge-intensive services (%)* | *49.6* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 8.9 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 35.9 | 17.3 |
| - SMEs (10-249 employees) (%) | 36.5 | 38.0 |
| - Large enterprises (250+ employees) (%) | 28.1 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 0.23 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 4.2 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 30.2 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | n/a | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.3 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 68.7 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 19,900 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | -18.4 | 5.4 |
| Population size, avg 2011-15 (millions) | 11.0 | 505.5 |
| Change in population between 2010 and 2015 (%) | -2.3 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 65.3 | 66.1 |
| Population density, average 2011-15 | 83.0 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 68.5 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*




| Greece | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **67.5** | **68.2** | **0.7** |
| **Human resources** | **51.5** | **86.4** | **34.8** |
| New doctorate graduates | 46.2 | 71.2 | 25.0 |
| Population with tertiary education | 82.2 | 150.7 | 68.4 |
| Lifelong learning | 22.1 | 29.5 | 7.4 |
| **Attractive research systems** § | **85.7** | **100.9** | **15.1** |
| International scientific co-publications | 120.8 | 187.4 | 66.7 |
| Most cited publications | 81.0 | 84.2 | 3.1 |
| Foreign doctorate students | N/A | N/A | N/A |
| **Innovation-friendly environment** | **39.6** | **33.6** | **-6.0** |
| Broadband penetration | 22.2 | 22.2 | 0.0 |
| Opportunity-driven entrepreneurship | 51.8 | 41.7 | -10.2 |
| **Finance and support** | **27.5** | **47.3** | **19.8** |
| R&D expenditure in the public sector | 41.4 | 84.0 | 42.6 |
| Venture capital expenditures | 10.0 | 1.0 | -9.0 |
| **Firm investments** | **61.3** | **65.3** | **4.0** |
| R&D expenditure in the business sector | 17.6 | 25.3 | 7.7 |
| Non-R&D innovation expenditures | 105.4 | 109.3 | 3.9 |
| Enterprises providing ICT training | 71.4 | 71.4 | 0.0 |
| **Innovators** | **121.3** | **101.2** | **-20.1** |
| SMEs product/process innovations | 109.4 | 97.7 | -11.6 |
| SMEs marketing/organizational innovations | 139.1 | 100.7 | -38.8 |
| SMEs innovating in-house | 114.7 | 105.3 | -9.4 |
| **Linkages** | **78.6** | **82.3** | **3.7** |
| Innovative SMEs collaborating with others | 121.5 | 136.0 | 14.5 |
| Public-private co-publications | 53.9 | 39.3 | -14.6 |
| Private co-funding of public R&D exp. | 64.7 | 75.3 | 10.6 |
| **Intellectual assets** | **22.6** | **42.9** | **20.3** |
| PCT patent applications | 33.1 | 38.3 | 5.3 |
| Trademark applications | 20.8 | 70.0 | 49.2 |
| Design applications | 9.9 | 28.2 | 18.3 |
| **Employment impacts** § | **57.4** | **70.3** | **13.0** |
| Employment in knowledge-intensive activities | 67.9 | 83.3 | 15.4 |
| Employment fast-growing enterprises | N/A | N/A | N/A |
| **Sales impacts** | **89.7** | **50.7** | **-39.0** |
| Medium and high tech product exports | 21.0 | 10.6 | -10.4 |
| Knowledge-intensive services exports | 88.1 | 54.2 | -33.9 |
| Sales of new-to-market/firm innovations | 174.5 | 95.0 | -79.6 |

*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.*

*§ Due to missing data, the relative dimension score does not necessarily reflect that of the indicators.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Spain** is a **Moderate Innovator**. Over time, performance has declined by 1.8% relative to that of the EU in 2010.

## Innovation system

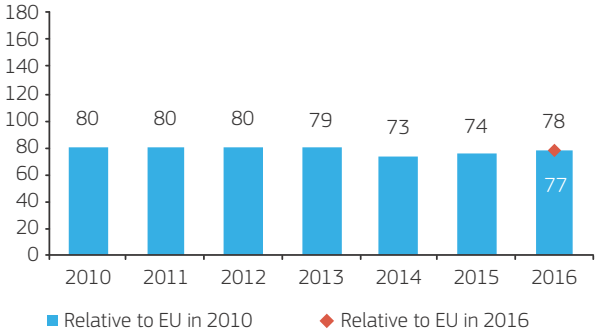
Relative strengths of the innovation system are in Human resources, Innovation-friendly environment, and Attractive research systems. Relative weaknesses are in Innovators, Linkages, and Finance and support.

## Structural differences

Notable differences are a larger share of micro enterprises in turnover, a smaller share of foreign controlled enterprises, a lower and negative growth rate of GDP, a lower and negative growth rate of population, and lower population density.

| | ES | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 4.4 | 5.1 |
| - Manufacturing (NACE C) (%) | 12.5 | 15.6 |
| *of which High and Medium high-tech (%)* | *31.0* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 7.6 | 8.6 |
| - Services (NACE G-N) (%) | 67.9 | 63.6 |
| *of which Knowledge-intensive services (%)* | *51.2* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 7.6 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 23.3 | 17.3 |
| - SMEs (10-249 employees) (%) | 38.2 | 38.0 |
| - Large enterprises (250+ employees) (%) | 38.6 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 0.44 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 7.0 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 197.4 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 1.5 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.4 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 75.7 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 24,400 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | -1.2 | 5.4 |
| Population size, avg 2011-15 (millions) | 46.6 | 505.5 |
| Change in population between 2010 and 2015 (%) | -0.1 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 67.1 | 66.1 |
| Population density, average 2011-15 | 92.8 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 74.4 | 74.4 |

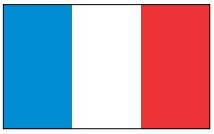
*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*



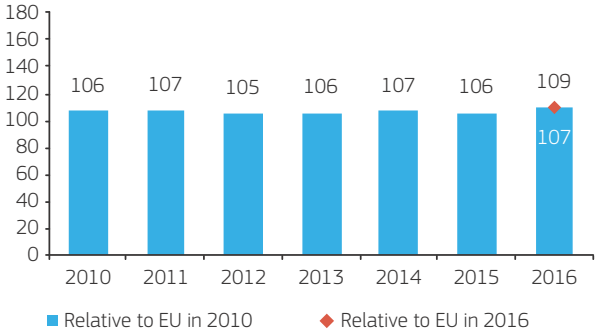

| Spain | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **80.1** | **78.3** | **-1.8** |
| **Human resources** | **100.3** | **124.9** | **24.6** |
| New doctorate graduates | 61.5 | 131.9 | 70.4 |
| Population with tertiary education | 140.1 | 150.7 | 4.6 |
| Lifelong learning | 93.7 | 86.3 | -7.4 |
| **Attractive research systems** | **93.6** | **94.6** | **1.0** |
| International scientific co-publications | 134.8 | 226.1 | 91.3 |
| Most cited publications | 83.8 | 93.2 | 9.3 |
| Foreign doctorate students | 93.4 | 50.2 | -43.2 |
| **Innovation-friendly environment** | **92.3** | **124.4** | **32.1** |
| Broadband penetration | 111.1 | 222.2 | 111.1 |
| Opportunity-driven entrepreneurship | 79.1 | 55.4 | -23.7 |
| **Finance and support** | **95.2** | **60.7** | **-34.5** |
| R&D expenditure in the public sector | 87.6 | 73.3 | -14.2 |
| Venture capital expenditures | 104.8 | 44.6 | -60.1 |
| **Firm investments** | **65.4** | **76.5** | **11.1** |
| R&D expenditure in the business sector | 57.9 | 52.8 | -5.2 |
| Non-R&D innovation expenditures | 58.8 | 43.2 | -15.6 |
| Enterprises providing ICT training | 78.6 | 128.6 | 50.0 |
| **Innovators** | **65.5** | **35.7** | **-29.8** |
| SMEs product/process innovations | 67.2 | 28.9 | -38.3 |
| SMEs marketing/organizational innovations | 66.6 | 49.8 | -16.8 |
| SMEs innovating in-house | 62.6 | 28.0 | -34.6 |
| **Linkages** | **69.2** | **56.6** | **-12.7** |
| Innovative SMEs collaborating with others | 41.5 | 54.9 | 13.4 |
| Public-private co-publications | 66.2 | 49.7 | -16.5 |
| Private co-funding of public R&D exp. | 94.6 | 63.9 | -30.6 |
| **Intellectual assets** | **76.4** | **80.9** | **4.5** |
| PCT patent applications | 60.2 | 65.1 | 4.9 |
| Trademark applications | 106.6 | 126.7 | 20.1 |
| Design applications | 75.1 | 67.0 | -8.1 |
| **Employment impacts** | **67.6** | **74.1** | **6.5** |
| Employment in knowledge-intensive activities | 78.2 | 84.6 | 6.4 |
| Employment fast-growing enterprises | 59.9 | 66.4 | 6.5 |
| **Sales impacts** | **85.3** | **83.9** | **-1.4** |
| Medium and high tech product exports | 83.8 | 79.7 | -4.1 |
| Knowledge-intensive services exports | 51.9 | 51.9 | 0.0 |
| Sales of new-to-market/firm innovations | 126.2 | 126.5 | 0.3 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*



**France** is a **Strong Innovator**. Over time, performance has increased by 2.8% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Human resources, Attractive research systems, and Innovation-friendly environment. Relative weaknesses are in Linkages, Finance, and support and Innovators.

## Structural differences

Notable differences are a smaller share of employment in Agriculture & Mining, a larger share of employment in Public administration, a larger share of micro enterprises in turnover, a smaller share of foreign controlled enterprises, a lower average R&D spending of Top R&D spending enterprises, a smaller share of enterprise births, and a higher growth rate of population.

| | FR | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 3.0 | 5.1 |
| - Manufacturing (NACE C) (%) | 12.7 | 15.6 |
| *of which High and Medium high-tech (%)* | *36.2* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 8.5 | 8.6 |
| - Services (NACE G-N) (%) | 66.3 | 63.6 |
| *of which Knowledge-intensive services (%)* | *62.0* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 9.5 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 21.7 | 17.3 |
| - SMEs (10-249 employees) (%) | 34.9 | 38.0 |
| - Large enterprises (250+ employees) (%) | 42.0 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 0.74 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 28.7 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 234.9 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 0.9 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.9 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 76.3 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 27,600 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 4.8 | 5.4 |
| Population size, avg 2011-15 (millions) | 65.7 | 505.5 |
| Change in population between 2010 and 2015 (%) | 2.8 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 63.8 | 66.1 |
| Population density, average 2011-15 | 103.9 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 70.2 | 74.4 |

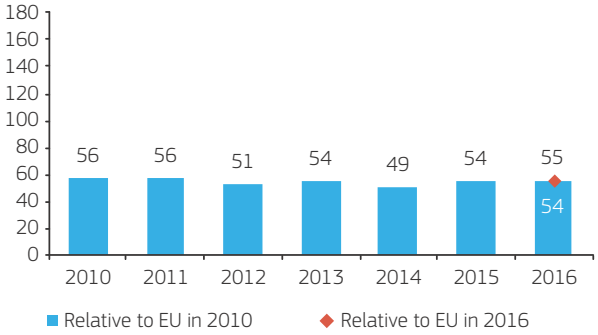
*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| France | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **106.4** | **109.2** | **2.8** |
| **Human resources** | **145.4** | **155.0** | **9.6** |
| New doctorate graduates | 100.0 | 115.1 | 15.1 |
| Population with tertiary education | 161.8 | 170.4 | 8.6 |
| Lifelong learning | 181.1 | 185.3 | 4.2 |
| **Attractive research systems** | **136.6** | **147.0** | **10.4** |
| International scientific co-publications | 162.4 | 224.9 | 62.5 |
| Most cited publications | 104.2 | 111.5 | 7.3 |
| Foreign doctorate students | 174.4 | 170.6 | -3.8 |
| **Innovation-friendly environment** | **110.5** | **119.1** | **8.7** |
| Broadband penetration | 100.0 | 100.0 | 0.0 |
| Opportunity-driven entrepreneurship | 117.9 | 132.6 | 14.8 |
| **Finance and support** | **105.6** | **96.0** | **-9.6** |
| R&D expenditure in the public sector | 108.9 | 103.6 | -5.3 |
| Venture capital expenditures | 101.4 | 86.6 | -14.9 |
| **Firm investments** | **96.6** | **101.1** | **4.5** |
| R&D expenditure in the business sector | 114.6 | 122.3 | 7.7 |
| Non-R&D innovation expenditures | 60.3 | 66.2 | 6.0 |
| Enterprises providing ICT training | 107.1 | 107.1 | 0.0 |
| **Innovators** | **93.6** | **104.4** | **10.9** |
| SMEs product/process innovations | 86.9 | 101.4 | 14.6 |
| SMEs marketing/organizational innovations | 95.0 | 105.8 | 10.8 |
| SMEs innovating in-house | 98.7 | 106.0 | 7.3 |
| **Linkages** | **93.9** | **91.5** | **-2.4** |
| Innovative SMEs collaborating with others | 123.5 | 120.5 | -3.1 |
| Public-private co-publications | 100.5 | 92.4 | -8.1 |
| Private co-funding of public R&D exp. | 64.0 | 67.0 | 2.9 |
| **Intellectual assets** | **93.6** | **87.6** | **-6.0** |
| PCT patent applications | 102.6 | 106.0 | 3.4 |
| Trademark applications | 90.2 | 87.9 | -2.2 |
| Design applications | 84.2 | 62.5 | -21.6 |
| **Employment impacts** | **103.9** | **94.0** | **-9.9** |
| Employment in knowledge-intensive activities | 106.4 | 109.0 | 2.6 |
| Employment fast-growing enterprises | 102.0 | 83.1 | -18.9 |
| **Sales impacts** | **100.3** | **108.5** | **8.3** |
| Medium and high tech product exports | 109.0 | 109.5 | 0.5 |
| Knowledge-intensive services exports | 91.6 | 100.0 | 8.4 |
| Sales of new-to-market/firm innovations | 99.9 | 117.4 | 17.5 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Croatia** is a **Moderate Innovator**. Over time, performance has declined by 1.4% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Firm investments, Human resources, and Employment impacts. Relative weaknesses are in Intellectual assets, Attractive research systems, and Innovators.

## Structural differences

Notable differences are a larger share of employment in Agriculture & Mining, a smaller share of employment in High and Medium high-tech manufacturing, a larger share of foreign controlled enterprises, a lower share of enterprise births, lower buyer sophistication, lower GDP per capita, a lower and negative growth rate of GDP, a lower and negative growth rate of population, and lower population density.

| | HR | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 11.5 | 5.1 |
| - Manufacturing (NACE C) (%) | 17.2 | 15.6 |
| *of which High and Medium high-tech (%)* | *20.6* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 9.8 | 8.6 |
| - Services (NACE G-N) (%) | 54.9 | 63.6 |
| *of which Knowledge-intensive services (%)* | *51.6* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 6.5 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 18.3 | 17.3 |
| - SMEs (10-249 employees) (%) | 41.0 | 38.0 |
| - Large enterprises (250+ employees) (%) | 41.2 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 2.75 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | none | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | none | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 2.3 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 2.7 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 73.0 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 15,500 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | -2.4 | 5.4 |
| Population size, avg 2011-15 (millions) | 4.3 | 505.5 |
| Change in population between 2010 and 2015 (%) | -1.8 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 66.8 | 66.1 |
| Population density, average 2011-15 | 75.0 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 68.4 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| Croatia | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **56.1** | **54.7** | **-1.4** |
| **Human resources** | **45.2** | **77.3** | **32.2** |
| New doctorate graduates | 61.5 | 105.6 | 44.1 |
| Population with tertiary education | 50.7 | 98.0 | 47.4 |
| Lifelong learning | 18.9 | 18.9 | 0.0 |
| **Attractive research systems** | **25.0** | **40.2** | **15.2** |
| International scientific co-publications | 85.4 | 144.5 | 59.2 |
| Most cited publications | 20.4 | 33.5 | 13.0 |
| Foreign doctorate students | 10.0 | 12.7 | 2.6 |
| **Innovation-friendly environment** | **35.6** | **47.9** | **12.4** |
| Broadband penetration | 11.1 | 66.7 | 55.6 |
| Opportunity-driven entrepreneurship | 52.8 | 34.7 | -18.1 |
| **Finance and support** | **42.6** | **50.9** | **8.3** |
| R&D expenditure in the public sector | 60.9 | 46.7 | -14.2 |
| Venture capital expenditures | 19.6 | 56.2 | 36.6 |
| **Firm investments** | **103.3** | **107.6** | **4.3** |
| R&D expenditure in the business sector | 27.0 | 35.6 | 8.6 |
| Non-R&D innovation expenditures | 129.6 | 186.4 | 56.6 |
| Enterprises providing ICT training | 164.3 | 121.4 | -42.9 |
| **Innovators** | **79.0** | **61.7** | **-17.2** |
| SMEs product/process innovations | 84.3 | 58.2 | -26.0 |
| SMEs marketing/organizational innovations | 73.9 | 68.3 | -5.6 |
| SMEs innovating in-house | 78.8 | 58.4 | -20.4 |
| **Linkages** | **86.3** | **50.8** | **-35.6** |
| Innovative SMEs collaborating with others | 107.1 | 55.9 | -51.1 |
| Public-private co-publications | 78.7 | 31.3 | -47.4 |
| Private co-funding of public R&D exp. | 75.9 | 63.2 | -12.7 |
| **Intellectual assets** | **31.9** | **39.7** | **7.8** |
| PCT patent applications | 42.5 | 41.1 | -1.3 |
| Trademark applications | 50.8 | 64.5 | 13.7 |
| Design applications | 3.2 | 18.7 | 15.6 |
| **Employment impacts** | **34.7** | **62.0** | **27.3** |
| Employment in knowledge-intensive activities | 55.1 | 76.9 | 21.8 |
| Employment fast-growing enterprises | 19.8 | 51.1 | 31.3 |
| **Sales impacts** | **55.7** | **24.9** | **-30.8** |
| Medium and high tech product exports | 63.3 | 52.7 | -10.6 |
| Knowledge-intensive services exports | 0.5 | 2.7 | 2.3 |
| Sales of new-to-market/firm innovations | 111.3 | 17.4 | -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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Italy** is a **Moderate Innovator**. Over time, performance has declined by 0.2% relative to that of the EU in 2010.

## Innovation system

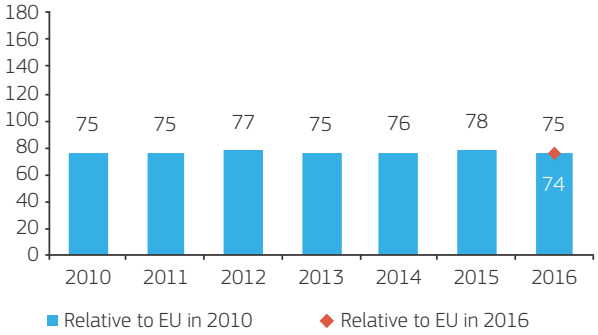
Relative strengths of the innovation system are in Intellectual assets, Attractive research systems, and Innovators. Relative weaknesses are in Linkages, Finance and support, and Firm investments.

## Structural differences

Notable differences are a smaller share of employment in Agriculture & Mining, a larger share of micro enterprises in turnover, a smaller share of large enterprises in turnover, a smaller share of foreign controlled enterprises, a lower number of Top R&D spending enterprises, a smaller share of enterprise births, a lower and negative growth rate of GDP, a higher growth rate of population, and higher population density.

| | IT | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 3.8 | 5.1 |
| - Manufacturing (NACE C) (%) | 18.5 | 15.6 |
| *of which High and Medium high-tech (%)* | *32.2* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 8.7 | 8.6 |
| - Services (NACE G-N) (%) | 63.0 | 63.6 |
| *of which Knowledge-intensive services (%)* | *55.6* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 6.0 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 25.2 | 17.3 |
| - SMEs (10-249 employees) (%) | 43.1 | 38.0 |
| - Large enterprises (250+ employees) (%) | 31.2 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 0.33 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 12.1 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 185.4 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 1.1 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.8 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 72.3 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 25,400 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | -3.2 | 5.4 |
| Population size, avg 2011-15 (millions) | 60.0 | 505.5 |
| Change in population between 2010 and 2015 (%) | 2.7 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 64.9 | 66.1 |
| Population density, average 2011-15 | 200.9 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 78.5 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

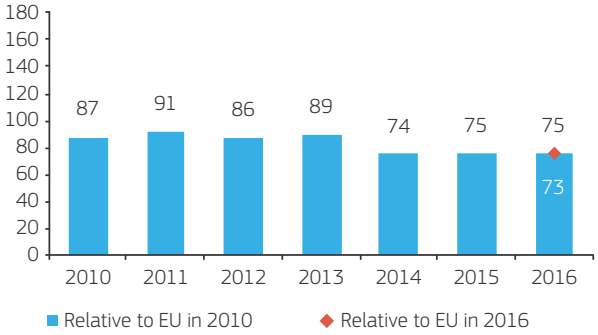



| Italy | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **75.4** | **75.1** | **-0.2** |
| **Human resources** | **60.3** | **75.8** | **15.5** |
| New doctorate graduates | 107.7 | 102.2 | -5.5 |
| Population with tertiary education | 17.8 | 49.3 | 31.6 |
| Lifelong learning | 52.6 | 74.7 | 22.1 |
| **Attractive research systems** | **73.3** | **95.1** | **21.8** |
| International scientific co-publications | 119.2 | 189.4 | 70.1 |
| Most cited publications | 88.8 | 99.3 | 10.4 |
| Foreign doctorate students | 34.4 | 55.5 | 21.0 |
| **Innovation-friendly environment** | **88.3** | **72.1** | **-16.2** |
| Broadband penetration | 55.6 | 55.6 | 0.0 |
| Opportunity-driven entrepreneurship | 111.4 | 83.8 | -27.6 |
| **Finance and support** | **57.4** | **50.1** | **-7.3** |
| R&D expenditure in the public sector | 66.2 | 71.6 | 5.3 |
| Venture capital expenditures | 46.2 | 23.0 | -23.2 |
| **Firm investments** | **58.7** | **61.9** | **3.2** |
| R&D expenditure in the business sector | 53.6 | 61.4 | 7.7 |
| Non-R&D innovation expenditures | 84.6 | 77.1 | -7.5 |
| Enterprises providing ICT training | 42.9 | 50.0 | 7.1 |
| **Innovators** | **101.5** | **90.6** | **-10.8** |
| SMEs product/process innovations | 84.3 | 89.4 | 5.1 |
| SMEs marketing/organizational innovations | 102.3 | 81.4 | -20.9 |
| SMEs innovating in-house | 117.6 | 101.3 | -16.3 |
| **Linkages** | **48.6** | **44.2** | **-4.4** |
| Innovative SMEs collaborating with others | 48.0 | 55.4 | 7.4 |
| Public-private co-publications | 80.9 | 59.4 | -21.5 |
| Private co-funding of public R&D exp. | 21.3 | 21.9 | 0.6 |
| **Intellectual assets** | **100.8** | **106.3** | **5.6** |
| PCT patent applications | 73.2 | 76.4 | 3.2 |
| Trademark applications | 95.5 | 115.9 | 20.4 |
| Design applications | 141.9 | 139.4 | -2.6 |
| **Employment impacts** | **73.6** | **71.4** | **-2.2** |
| Employment in knowledge-intensive activities | 102.6 | 105.1 | 2.6 |
| Employment fast-growing enterprises | 52.5 | 46.8 | -5.6 |
| **Sales impacts** | **81.3** | **75.9** | **-5.4** |
| Medium and high tech product exports | 90.7 | 91.5 | 0.8 |
| Knowledge-intensive services exports | 68.0 | 66.2 | -1.8 |
| Sales of new-to-market/firm innovations | 85.5 | 68.4 | -17.1 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Cyprus** is a **Moderate Innovator**. Over time, performance has declined by 12.7% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Attractive research systems, Human resources, and Intellectual assets. Relative weaknesses are in Linkages, Finance and support, and Firm investments.

## Structural differences

Notable differences are a smaller share of employment in Agriculture & Mining, a smaller share of employment in Manufacturing and High and Medium high-tech manufacturing, a larger share of employment in Utilities and Construction, a larger share of micro enterprises and SMEs in turnover, a smaller share of large enterprises in turnover, a smaller share of foreign controlled enterprises, a lower number of Top R&D spending enterprises and a lower average R&D spending of these enterprises, a lower and negative growth rate of GDP, a higher growth rate of population, and lower population density.

| | CY | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 3.7 | 5.1 |
| - Manufacturing (NACE C) (%) | 7.7 | 15.6 |
| *of which High and Medium high-tech (%)* | *10.7* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 10.5 | 8.6 |
| - Services (NACE G-N) (%) | 70.5 | 63.6 |
| *of which Knowledge-intensive services (%)* | *55.6* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 7.6 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 24.0 | 17.3 |
| - SMEs (10-249 employees) (%) | 55.8 | 38.0 |
| - Large enterprises (250+ employees) (%) | 20.3 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 0.66 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 3.3 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 13.7 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 1.4 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.8 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 72.7 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 23,000 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | -8.5 | 5.4 |
| Population size, avg 2011-15 (millions) | 0.9 | 505.5 |
| Change in population between 2010 and 2015 (%) | 3.4 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 70.1 | 66.1 |
| Population density, average 2011-15 | 92.8 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 75.1 | 74.4 |

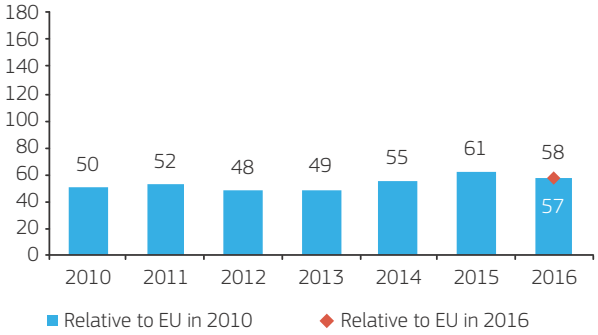
*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| Cyprus | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **87.5** | **74.8** | **-12.7** |
| **Human resources** | **89.8** | **111.2** | **21.4** |
| New doctorate graduates | 0.0 | 27.0 | 27.0 |
| Population with tertiary education | 197.4 | 242.1 | 44.7 |
| Lifelong learning | 72.6 | 60.0 | -12.6 |
| **Attractive research systems** | **67.6** | **116.2** | **48.6** |
| International scientific co-publications | 260.9 | 433.5 | 172.6 |
| Most cited publications | 53.6 | 99.7 | 46.1 |
| Foreign doctorate students | 39.7 | 47.8 | 8.1 |
| **Innovation-friendly environment** | **38.9** | **52.7** | **13.8** |
| Broadband penetration | 0.0 | 33.3 | 33.3 |
| Opportunity-driven entrepreneurship | 66.4 | 66.4 | 0.0 |
| **Finance and support** | **53.4** | **46.7** | **-6.7** |
| R&D expenditure in the public sector | 25.4 | 25.4 | 0.0 |
| Venture capital expenditures | 88.8 | 73.7 | -15.2 |
| **Firm investments** | **136.4** | **49.0** | **-87.4** |
| R&D expenditure in the business sector | 5.6 | 4.7 | -0.9 |
| Non-R&D innovation expenditures | 270.9 | 17.0 | -253.9 |
| Enterprises providing ICT training | 164.3 | 121.4 | -42.9 |
| **Innovators** | **135.9** | **86.7** | **-49.2** |
| SMEs product/process innovations | 130.5 | 90.1 | -40.4 |
| SMEs marketing/organizational innovations | 125.7 | 69.3 | -56.5 |
| SMEs innovating in-house | 151.7 | 101.1 | -50.5 |
| **Linkages** | **84.7** | **43.8** | **-40.9** |
| Innovative SMEs collaborating with others | 201.6 | 105.0 | -96.6 |
| Public-private co-publications | 64.9 | 36.5 | -28.4 |
| Private co-funding of public R&D exp. | 6.0 | 0.0 | -6.0 |
| **Intellectual assets** | **71.6** | **111.2** | **39.6** |
| PCT patent applications | 34.5 | 46.4 | 11.8 |
| Trademark applications | 195.2 | 275.8 | 80.6 |
| Design applications | 26.9 | 72.5 | 45.7 |
| **Employment impacts** | **56.4** | **60.0** | **3.5** |
| Employment in knowledge-intensive activities | 111.5 | 135.9 | 24.4 |
| Employment fast-growing enterprises | 16.2 | 4.5 | -11.7 |
| **Sales impacts** | **98.1** | **63.5** | **-34.6** |
| Medium and high tech product exports | 67.9 | 67.0 | -0.9 |
| Knowledge-intensive services exports | 104.0 | 102.8 | -1.2 |
| Sales of new-to-market/firm innovations | 127.7 | 13.4 | -114.4 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Latvia** is a **Moderate Innovator**. Over time, performance has increased by 8.5% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Innovation-friendly environment, Human resources, and Employment impacts. Relative weaknesses are in Innovators, Attractive research systems, and Linkages.

## Structural differences

Notable differences are a larger share of employment in Agriculture & Mining, a smaller share of employment in High and Medium high-tech manufacturing, a larger share of micro enterprises and SMEs in turnover, a smaller share of large enterprises in turnover, a larger share of foreign controlled enterprises, lower GDP per capita, a higher growth rate of GDP, a lower and negative growth rate of population, and lower population density.

| | LV | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 8.5 | 5.1 |
| - Manufacturing (NACE C) (%) | 13.6 | 15.6 |
| *of which High and Medium high-tech (%)* | *11.4* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 9.6 | 8.6 |
| - Services (NACE G-N) (%) | 61.5 | 63.6 |
| *of which Knowledge-intensive services (%)* | *51.2* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 6.8 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 26.1 | 17.3 |
| - SMEs (10-249 employees) (%) | 51.4 | 38.0 |
| - Large enterprises (250+ employees) (%) | 22.5 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 6.13 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | none | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | none | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 2.0 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.1 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 80.6 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 16,200 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 19.2 | 5.4 |
| Population size, avg 2011-15 (millions) | 2.0 | 505.5 |
| Change in population between 2010 and 2015 (%) | -6.3 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 66.7 | 66.1 |
| Population density, average 2011-15 | 32.4 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 62.4 | 74.4 |

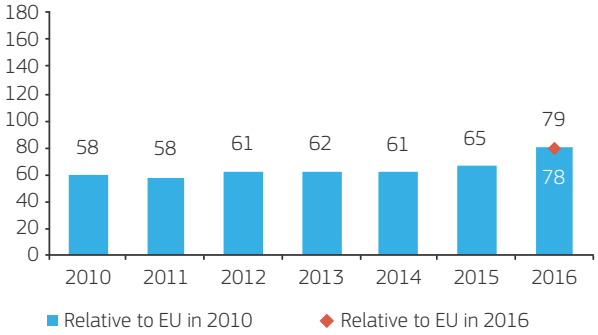
*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| Latvia | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | 49.6 | 58.1 | 8.5 |
| **Human resources** | 61.9 | 93.2 | 31.3 |
| New doctorate graduates | 30.8 | 54.5 | 23.7 |
| Population with tertiary education | 109.2 | 157.9 | 48.7 |
| Lifelong learning | 44.2 | 64.2 | 20.0 |
| **Attractive research systems** | 14.1 | 37.6 | 23.5 |
| International scientific co-publications | 21.4 | 75.5 | 54.1 |
| Most cited publications | 20.5 | 28.7 | 8.3 |
| Foreign doctorate students | 2.3 | 36.9 | 34.6 |
| **Innovation-friendly environment** | 122.7 | 160.1 | 37.4 |
| Broadband penetration | 233.0 | 277.4 | 44.4 |
| Opportunity-driven entrepreneurship | 68.1 | 100.5 | 32.4 |
| **Finance and support** | 39.4 | 75.9 | 36.6 |
| R&D expenditure in the public sector | 23.6 | 55.6 | 32.0 |
| Venture capital expenditures | 59.3 | 101.6 | 42.3 |
| **Firm investments** | 68.5 | 44.0 | -24.5 |
| R&D expenditure in the business sector | 11.6 | 10.7 | -0.9 |
| Non-R&D innovation expenditures | 182.2 | 79.7 | -102.6 |
| Enterprises providing ICT training | 35.7 | 50.0 | 14.3 |
| **Innovators** | 20.0 | 11.9 | -8.1 |
| SMEs product/process innovations | 22.9 | 0.0 | -22.9 |
| SMEs marketing/organizational innovations | 9.5 | 27.0 | 17.5 |
| SMEs innovating in-house | 27.9 | 8.4 | -19.5 |
| **Linkages** | 33.3 | 41.4 | 8.1 |
| Innovative SMEs collaborating with others | 20.9 | 15.8 | -5.1 |
| Public-private co-publications | 20.5 | 0.1 | -20.3 |
| Private co-funding of public R&D exp. | 54.3 | 97.7 | 43.4 |
| **Intellectual assets** | 66.2 | 49.8 | -16.3 |
| PCT patent applications | 44.8 | 28.7 | -16.1 |
| Trademark applications | 105.4 | 102.6 | -2.8 |
| Design applications | 64.9 | 37.9 | -26.9 |
| **Employment impacts** | 55.4 | 84.5 | 29.1 |
| Employment in knowledge-intensive activities | 48.7 | 69.2 | 20.5 |
| Employment fast-growing enterprises | 60.4 | 95.7 | 35.4 |
| **Sales impacts** | 47.2 | 46.7 | -0.6 |
| Medium and high tech product exports | 38.1 | 43.6 | 5.4 |
| Knowledge-intensive services exports | 73.8 | 71.5 | -2.3 |
| Sales of new-to-market/firm innovations | 27.1 | 21.4 | -5.7 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Lithuania** is a **Moderate Innovator**. Over time, performance has increased by 21.0% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Innovation-friendly environment, Human resources, and Linkages. Relative weaknesses are in Sales impacts, Attractive research systems, and Intellectual assets.

## Structural differences

Notable differences are a larger share of employment in Agriculture & Mining, a smaller share of employment in High and Medium high-tech manufacturing, a larger share of SMEs in turnover, a smaller share of large enterprises in turnover, a larger share of foreign controlled enterprises, a larger share of enterprise births, lower GDP per capita, a higher growth rate of GDP, a lower and negative growth rate of population, and lower population density.

| | LT | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 9.0 | 5.1 |
| - Manufacturing (NACE C) (%) | 15.4 | 15.6 |
| *of which High and Medium high-tech (%)* | *12.1* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 9.4 | 8.6 |
| - Services (NACE G-N) (%) | 60.2 | 63.6 |
| *of which Knowledge-intensive services (%)* | *50.0* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 6.0 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 17.0 | 17.3 |
| - SMEs (10-249 employees) (%) | 48.2 | 38.0 |
| - Large enterprises (250+ employees) (%) | 34.7 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 2.23 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | none | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | none | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 2.4 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.2 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 78.8 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 18,100 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 20.1 | 5.4 |
| Population size, avg 2011-15 (millions) | 3.0 | 505.5 |
| Change in population between 2010 and 2015 (%) | -7.0 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 67.0 | 66.1 |
| Population density, average 2011-15 | 47.2 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 42.6 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| Lithuania | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **58.3** | **79.4** | **21.0** |
| **Human resources** | **96.2** | **124.0** | **27.8** |
| New doctorate graduates | 61.5 | 70.7 | 9.1 |
| Population with tertiary education | 183.3 | 240.1 | 56.6 |
| Lifelong learning | 33.7 | 50.5 | 16.8 |
| **Attractive research systems** | **36.5** | **34.6** | **-1.9** |
| International scientific co-publications | 48.8 | 119.7 | 70.8 |
| Most cited publications | 56.1 | 26.6 | -29.5 |
| Foreign doctorate students | 3.8 | 15.9 | 12.1 |
| **Innovation-friendly environment** | **107.0** | **138.9** | **31.9** |
| Broadband penetration | 177.4 | 233.0 | 55.6 |
| Opportunity-driven entrepreneurship | 57.0 | 72.3 | 15.3 |
| **Finance and support** | **49.2** | **97.2** | **48.0** |
| R&D expenditure in the public sector | 82.2 | 107.1 | 24.9 |
| Venture capital expenditures | 7.5 | 84.8 | 77.2 |
| **Firm investments** | **49.0** | **100.3** | **51.3** |
| R&D expenditure in the business sector | 15.0 | 21.9 | 6.9 |
| Non-R&D innovation expenditures | 109.1 | 280.6 | 171.6 |
| Enterprises providing ICT training | 35.7 | 35.7 | 0.0 |
| **Innovators** | **43.0** | **79.4** | **36.4** |
| SMEs product/process innovations | 43.2 | 93.8 | 50.6 |
| SMEs marketing/organizational innovations | 35.5 | 44.5 | 9.0 |
| SMEs innovating in-house | 50.5 | 100.7 | 50.2 |
| **Linkages** | **99.9** | **108.6** | **8.7** |
| Innovative SMEs collaborating with others | 68.5 | 140.3 | 71.8 |
| Public-private co-publications | 39.1 | 2.4 | -36.7 |
| Private co-funding of public R&D exp. | 177.9 | 173.9 | -3.9 |
| **Intellectual assets** | **34.9** | **52.9** | **18.0** |
| PCT patent applications | 38.5 | 46.4 | 7.9 |
| Trademark applications | 57.0 | 93.0 | 36.0 |
| Design applications | 13.0 | 30.9 | 17.9 |
| **Employment impacts** | **66.7** | **66.6** | **-0.2** |
| Employment in knowledge-intensive activities | 38.5 | 51.3 | 12.8 |
| Employment fast-growing enterprises | 87.4 | 77.7 | -9.7 |
| **Sales impacts** | **32.2** | **33.5** | **1.4** |
| Medium and high tech product exports | 37.0 | 43.0 | 5.9 |
| Knowledge-intensive services exports | 0.3 | 6.7 | 6.4 |
| Sales of new-to-market/firm innovations | 63.7 | 53.7 | -10.0 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Luxembourg** is a **Strong Innovator**. Over time, performance has increased by 1.4% relative to that of the EU in 2010.

## Innovation system

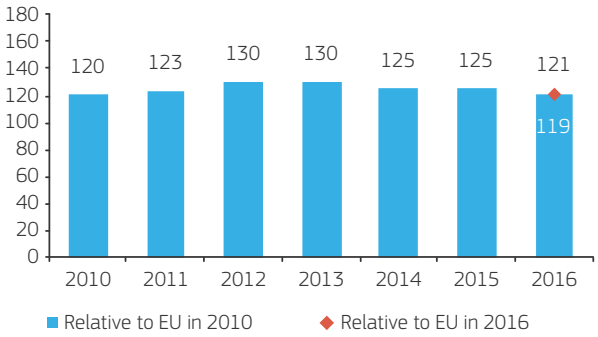
Relative strengths of the innovation system are in Attractive research systems, Innovation-friendly environment, and Intellectual assets. Relative weaknesses are in Linkages, Finance and support, and Sales impacts.

## Structural differences

Notable differences are a smaller share of employment in Agriculture & Mining, in Manufacturing and in High and Medium high-tech manufacturing, a larger share of employment in Knowledge-intensive services and in Public administration, a larger share of SMEs in turnover, a smaller share of large enterprises in turnover, a larger share of foreign controlled enterprises, a higher number of Top R&D spending enterprises but a lower average R&D spending of these enterprises, a smaller share of enterprise births, higher buyer sophistication, higher GDP per capita, a higher growth rate of GDP, a higher growth rate of population, and higher population density.

| | LU | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 1.3 | 5.1 |
| - Manufacturing (NACE C) (%) | 5.4 | 15.6 |
| *of which High and Medium high-tech (%)* | *17.9* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 6.9 | 8.6 |
| - Services (NACE G-N) (%) | 68.3 | 63.6 |
| *of which Knowledge-intensive services (%)* | *73.5* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 18.1 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 14.8 | 17.3 |
| - SMEs (10-249 employees) (%) | 57.3 | 38.0 |
| - Large enterprises (250+ employees) (%) | 27.9 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 29.47 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 388.7 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 35.4 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 1.1 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 4.7 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 68.8 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 67,200 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 15.2 | 5.4 |
| Population size, avg 2011-15 (millions) | 0.5 | 505.5 |
| Change in population between 2010 and 2015 (%) | 12.1 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 68.9 | 66.1 |
| Population density, average 2011-15 | 210.2 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 62.0 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*




| Luxembourg | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | 120.0 | 121.4 | **1.4** |
| **Human resources** | 128.3 | 147.0 | **18.7** |
| New doctorate graduates | 46.2 | 62.4 | 16.3 |
| Population with tertiary education | 171.7 | 219.7 | 48.0 |
| Lifelong learning | 179.8 | 164.2 | -12.6 |
| **Attractive research systems** | 161.2 | 215.1 | **54.0** |
| International scientific co-publications | 280.5 | 572.4 | 291.9 |
| Most cited publications | 83.2 | 115.8 | 32.6 |
| Foreign doctorate students | 231.4 | 231.4 | 0.0 |
| **Innovation-friendly environment** | 174.7 | 172.9 | **-1.9** |
| Broadband penetration | 144.4 | 233.3 | 88.9 |
| Opportunity-driven entrepreneurship | 196.1 | 130.2 | -65.9 |
| **Finance and support** | **114.5** | **69.3** | **-45.3** |
| R&D expenditure in the public sector | 46.7 | 85.8 | 39.1 |
| Venture capital expenditures | 200.2 | 48.5 | -151.7 |
| **Firm investments** | **68.4** | **81.5** | **13.1** |
| R&D expenditure in the business sector | 58.8 | 55.4 | -3.4 |
| Non-R&D innovation expenditures | 24.5 | 4.9 | -19.6 |
| Enterprises providing ICT training | 114.3 | 171.4 | 57.1 |
| **Innovators** | 135.2 | 122.6 | **-12.6** |
| SMEs product/process innovations | 127.3 | 107.8 | -19.5 |
| SMEs marketing/organizational innovations | 145.2 | 150.1 | 4.9 |
| SMEs innovating in-house | 132.6 | 109.1 | -23.5 |
| **Linkages** | **69.7** | **44.2** | **-25.4** |
| Innovative SMEs collaborating with others | 111.7 | 80.0 | -31.6 |
| Public-private co-publications | 92.8 | 42.4 | -50.4 |
| Private co-funding of public R&D exp. | 15.4 | 16.5 | 1.1 |
| **Intellectual assets** | 141.0 | 166.8 | **25.8** |
| PCT patent applications | 67.3 | 71.8 | 4.4 |
| Trademark applications | 275.8 | 275.8 | 0.0 |
| Design applications | 137.0 | 211.3 | 74.3 |
| **Employment impacts** | 126.1 | 139.8 | **13.6** |
| Employment in knowledge-intensive activities | 220.5 | 217.9 | -2.6 |
| Employment fast-growing enterprises | 57.2 | 82.7 | 25.5 |
| **Sales impacts** | **108.0** | **94.4** | **-13.7** |
| Medium and high tech product exports | 114.3 | 91.7 | -22.5 |
| Knowledge-intensive services exports | 145.5 | 149.0 | 3.4 |
| Sales of new-to-market/firm innovations | 56.6 | 33.6 | -23.0 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Hungary** is a **Moderate Innovator**. Over time, performance has declined by 3.5% relative to that of the EU in 2010.

## Innovation system

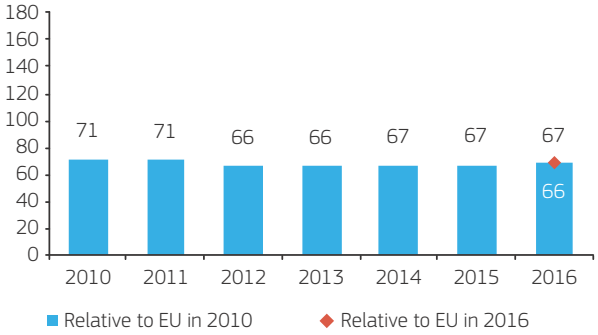
Relative strengths of the innovation system are in Employment impacts, Sales impacts, and Innovation-friendly environment. Relative weaknesses are in Innovators, Finance and support, and Intellectual assets.

## Structural differences

Notable differences are a larger share of employment in Manufacturing and in Public administration, a larger share of foreign controlled enterprises, a lower number of Top R&D spending enterprises and a lower average R&D spending of these enterprises, a larger share of enterprise births, lower buyer sophistication, lower GDP per capita, a higher growth rate of GDP, and a lower and negative growth rate of population.

| | HU | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 5.1 | 5.1 |
| - Manufacturing (NACE C) (%) | 21.2 | 15.6 |
| *of which High and Medium high-tech (%)* | *41.2* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 8.8 | 8.6 |
| - Services (NACE G-N) (%) | 55.9 | 63.6 |
| *of which Knowledge-intensive services (%)* | *53.2* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 8.9 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 20.4 | 17.3 |
| - SMEs (10-249 employees) (%) | 36.6 | 38.0 |
| - Large enterprises (250+ employees) (%) | 43.4 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 3.47 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 1.8 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 108.8 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 1.8 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 2.7 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 73.1 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 17,000 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 9.7 | 5.4 |
| Population size, avg 2011-15 (millions) | 9.9 | 505.5 |
| Change in population between 2010 and 2015 (%) | -1.6 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 68.3 | 66.1 |
| Population density, average 2011-15 | 106.5 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 65.8 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

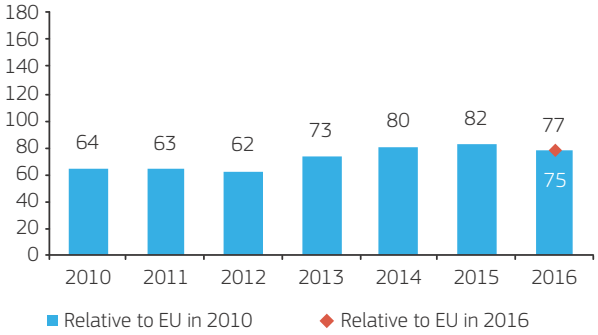



| Hungary | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **70.9** | **67.4** | **-3.5** |
| **Human resources** | **55.9** | **64.8** | **8.9** |
| New doctorate graduates | 53.8 | 58.5 | 4.6 |
| Population with tertiary education | 52.6 | 80.9 | 28.3 |
| Lifelong learning | 62.1 | 53.7 | -8.4 |
| **Attractive research systems** | **54.4** | **55.5** | **1.1** |
| International scientific co-publications | 87.9 | 137.6 | 49.7 |
| Most cited publications | 63.6 | 53.1 | -10.5 |
| Foreign doctorate students | 29.3 | 29.8 | 0.5 |
| **Innovation-friendly environment** | **78.9** | **93.4** | **14.5** |
| Broadband penetration | 100.0 | 133.3 | 33.3 |
| Opportunity-driven entrepreneurship | 63.9 | 65.2 | 1.3 |
| **Finance and support** | **48.6** | **44.4** | **-4.2** |
| R&D expenditure in the public sector | 55.6 | 34.3 | -21.3 |
| Venture capital expenditures | 39.8 | 57.2 | 17.5 |
| **Firm investments** | **72.3** | **88.9** | **16.6** |
| R&D expenditure in the business sector | 53.6 | 84.5 | 30.9 |
| Non-R&D innovation expenditures | 106.1 | 107.1 | 1.0 |
| Enterprises providing ICT training | 64.3 | 78.6 | 14.3 |
| **Innovators** | **24.4** | **14.4** | **-10.0** |
| SMEs product/process innovations | 21.2 | 13.7 | -7.5 |
| SMEs marketing/organizational innovations | 32.4 | 14.0 | -18.4 |
| SMEs innovating in-house | 19.5 | 15.5 | -3.9 |
| **Linkages** | **89.7** | **60.4** | **-29.3** |
| Innovative SMEs collaborating with others | 59.7 | 50.0 | -9.6 |
| Public-private co-publications | 76.9 | 76.5 | -0.4 |
| Private co-funding of public R&D exp. | 125.3 | 54.9 | -70.4 |
| **Intellectual assets** | **45.9** | **46.9** | **1.0** |
| PCT patent applications | 60.5 | 59.6 | -0.9 |
| Trademark applications | 52.3 | 59.5 | 7.2 |
| Design applications | 21.4 | 20.1 | -1.3 |
| **Employment impacts** | 128.0 | 126.7 | **-1.3** |
| Employment in knowledge-intensive activities | 89.7 | 83.3 | -6.4 |
| Employment fast-growing enterprises | 166.4 | 168.9 | 2.5 |
| **Sales impacts** | **111.8** | **98.0** | **-13.8** |
| Medium and high tech product exports | 143.1 | 139.8 | -3.3 |
| Knowledge-intensive services exports | 62.9 | 59.9 | -3.0 |
| Sales of new-to-market/firm innovations | 131.4 | 92.1 | -39.2 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Malta** is a **Moderate Innovator**. Over time, performance has increased by 12.2% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Intellectual assets, Employment impacts, and Innovation-friendly environment. Relative weaknesses are in Linkages, Finance and support, and Sales impacts.

## Structural differences

Notable differences are a smaller share of employment in Agriculture & Mining, a larger share of employment in Public administration, a larger share of micro enterprises in turnover, a smaller share of large enterprises in turnover, a smaller share of foreign controlled enterprises, a lower average R&D spending of Top R&D spending enterprises, a higher growth rate of GDP, a higher growth rate of population, and higher population density.

| | MT | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 1.5 | 5.1 |
| - Manufacturing (NACE C) (%) | 13.4 | 15.6 |
| *of which High and Medium high-tech (%)* | *29.4* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 8.2 | 8.6 |
| - Services (NACE G-N) (%) | 68.1 | 63.6 |
| *of which Knowledge-intensive services (%)* | *56.5* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 8.8 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 34.5 | 17.3 |
| - SMEs (10-249 employees) (%) | 44.5 | 38.0 |
| - Large enterprises (250+ employees) (%) | 21.0 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 0.62 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 34.7 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 29.5 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 1.4 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.9 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 65.0 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 22,100 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 26.8 | 5.4 |
| Population size, avg 2011-15 (millions) | 0.4 | 505.5 |
| Change in population between 2010 and 2015 (%) | 3.7 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 68.2 | 66.1 |
| Population density, average 2011-15 | 1402.9 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 92.2 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

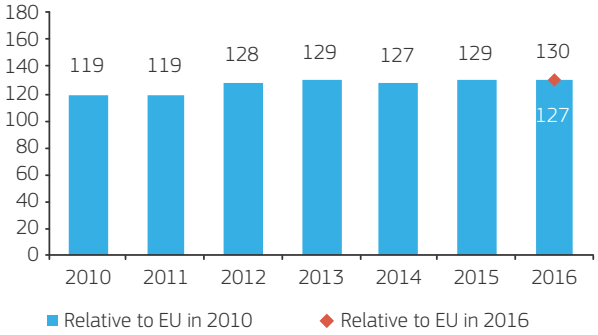
| Malta | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **64.4** | **76.5** | **12.2** |
| **Human resources** | **32.4** | **63.4** | **31.0** |
| New doctorate graduates | 7.7 | 21.2 | 13.5 |
| Population with tertiary education | 40.8 | 104.6 | 63.8 |
| Lifelong learning | 52.6 | 66.3 | 13.7 |
| **Attractive research systems** | **50.1** | **87.8** | **37.7** |
| International scientific co-publications | 55.4 | 175.1 | 119.7 |
| Most cited publications | 56.1 | 90.9 | 34.8 |
| Foreign doctorate students | 39.6 | 52.2 | 12.5 |
| **Innovation-friendly environment** § | **119.5** | **110.3** | **-9.2** |
| Broadband penetration | 144.4 | 133.3 | -11.1 |
| Opportunity-driven entrepreneurship | N/A | N/A | N/A |
| **Finance and support** | **8.3** | **23.1** | **14.8** |
| R&D expenditure in the public sector | 5.8 | 41.4 | 35.5 |
| Venture capital expenditures | 11.3 | 0.0 | -11.3 |
| **Firm investments** | **102.2** | **67.7** | **-34.5** |
| R&D expenditure in the business sector | 26.2 | 29.6 | 3.4 |
| Non-R&D innovation expenditures | 159.0 | 42.0 | -117.0 |
| Enterprises providing ICT training | 135.7 | 128.6 | -7.1 |
| **Innovators** | **56.9** | **67.6** | **10.7** |
| SMEs product/process innovations | 60.4 | 63.8 | 3.3 |
| SMEs marketing/organizational innovations | 50.2 | 68.1 | 17.9 |
| SMEs innovating in-house | 60.4 | 70.9 | 10.5 |
| **Linkages** | **22.6** | **18.7** | **-3.9** |
| Innovative SMEs collaborating with others | 40.0 | 29.9 | -10.1 |
| Public-private co-publications | 28.0 | 27.1 | -0.9 |
| Private co-funding of public R&D exp. | 3.6 | 2.2 | -1.4 |
| **Intellectual assets** | **78.3** | **162.1** | **83.8** |
| PCT patent applications | 57.6 | 61.0 | 3.4 |
| Trademark applications | 138.5 | 215.9 | 77.4 |
| Design applications | 14.2 | 211.3 | 197.1 |
| **Employment impacts** | **124.9** | **156.5** | **31.6** |
| Employment in knowledge-intensive activities | 132.1 | 162.9 | 30.8 |
| Employment fast-growing enterprises | 119.6 | 151.8 | 32.2 |
| **Sales impacts** | **81.7** | **47.9** | **-33.8** |
| Medium and high tech product exports | 107.9 | 104.2 | -3.8 |
| Knowledge-intensive services exports | 22.5 | 22.5 | 0.0 |
| Sales of new-to-market/firm innovations | 119.3 | 9.7 | -109.6 |

*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.*

*§ Due to missing data, the relative dimension score does not necessarily reflect that of the indicators.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

The **Netherlands** is an **Innovation Leader**. Over time, performance has increased by 10.4% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Attractive research systems, Human resources, and Linkages. Relative weaknesses are in Firm investments, Sales impacts, and Intellectual assets.

## Structural differences

Notable differences are a smaller share of employment in Agriculture & Mining, Manufacturing, High and Medium high-tech manufacturing and Utilities and Construction, a larger share of SMEs in turnover, a higher number of Top R&D spending enterprises and a higher average R&D spending of these enterprises, higher GDP per capita, a lower growth rate of GDP, a higher growth rate of population, and higher population density.

| | NL | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 2.6 | 5.1 |
| - Manufacturing (NACE C) (%) | 10.2 | 15.6 |
| *of which High and Medium high-tech (%)* | *28.9* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 6.4 | 8.6 |
| - Services (NACE G-N) (%) | 74.1 | 63.6 |
| *of which Knowledge-intensive services (%)* | *63.5* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 6.7 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 14.6 | 17.3 |
| - SMEs (10-249 employees) (%) | 48.6 | 38.0 |
| - Large enterprises (250+ employees) (%) | 36.8 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 1.14 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 46.0 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 271.5 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 1.2 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 4.3 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 76.4 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 32,500 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 3.8 | 5.4 |
| Population size, avg 2011-15 (millions) | 16.8 | 505.5 |
| Change in population between 2010 and 2015 (%) | 2.0 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 66.1 | 66.1 |
| Population density, average 2011-15 | 498.7 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 88.7 | 74.4 |

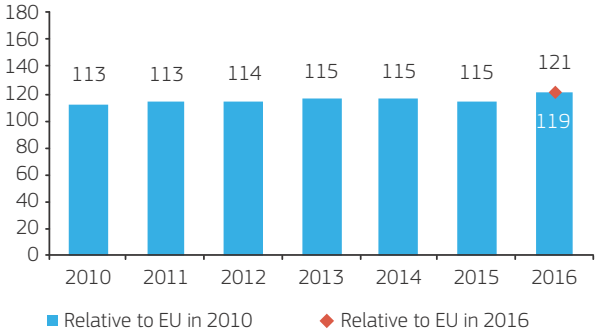
*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| Netherlands | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **119.1** | **129.5** | **10.4** |
| **Human resources** | **143.9** | **173.3** | **29.4** |
| New doctorate graduates | 115.4 | 158.4 | 43.1 |
| Population with tertiary education | 140.1 | 172.3 | 32.2 |
| Lifelong learning | 175.8 | 185.3 | 9.5 |
| **Attractive research systems** | **179.3** | **198.3** | **19.0** |
| International scientific co-publications | 343.1 | 522.5 | 179.5 |
| Most cited publications | 140.9 | 139.7 | -1.2 |
| Foreign doctorate students | 164.8 | 155.9 | -8.9 |
| **Innovation-friendly environment** | **161.8** | **164.4** | **2.6** |
| Broadband penetration | 156.7 | 234.4 | 77.8 |
| Opportunity-driven entrepreneurship | 158.4 | 107.9 | -50.4 |
| **Finance and support** | **122.7** | **117.9** | **-4.8** |
| R&D expenditure in the public sector | 121.5 | 132.2 | 10.7 |
| Venture capital expenditures | 124.0 | 100.1 | -24.4 |
| **Firm investments** | **80.9** | **79.7** | **-1.2** |
| R&D expenditure in the business sector | 92.3 | 94.0 | 1.7 |
| Non-R&D innovation expenditures | 69.2 | 10.2 | -59.0 |
| Enterprises providing ICT training | 78.6 | 121.4 | 42.9 |
| **Innovators** | **75.6** | **109.6** | **34.0** |
| SMEs product/process innovations | 84.7 | 133.5 | 48.8 |
| SMEs marketing/organizational innovations | 60.6 | 74.1 | 13.5 |
| SMEs innovating in-house | 81.9 | 122.0 | 40.1 |
| **Linkages** | **154.5** | **156.6** | **2.0** |
| Innovative SMEs collaborating with others | 118.0 | 163.1 | 45.1 |
| Public-private co-publications | 166.2 | 149.3 | -16.9 |
| Private co-funding of public R&D exp. | 177.9 | 161.0 | -16.9 |
| **Intellectual assets** | **114.7** | **112.5** | **-2.2** |
| PCT patent applications | 127.5 | 126.3 | -1.2 |
| Trademark applications | 128.7 | 131.4 | 2.7 |
| Design applications | 86.7 | 79.4 | -7.3 |
| **Employment impacts** | **122.2** | **127.8** | **5.5** |
| Employment in knowledge-intensive activities | 146.2 | 151.3 | 5.1 |
| Employment fast-growing enterprises | 104.7 | 110.6 | 5.9 |
| **Sales impacts** | **81.5** | **93.2** | **11.7** |
| Medium and high tech product exports | 67.9 | 81.6 | 13.6 |
| Knowledge-intensive services exports | 116.8 | 120.0 | 3.3 |
| Sales of new-to-market/firm innovations | 56.4 | 75.7 | 19.3 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Austria** is a **Strong Innovator**. Over time, performance has increased by 8.9% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Firm investments, Attractive research systems, and Intellectual assets. Relative weaknesses are in Employment impacts, Sales impacts, and Finance and support.

## Structural differences

Notable differences are a larger share of SMEs in turnover, a lower share of large enterprises in turnover, a higher number of Top R&D spending enterprises but a lower average R&D spending of these enterprises, higher GDP per capita, and higher population density.

| | AT | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 4.7 | 5.1 |
| - Manufacturing (NACE C) (%) | 15.8 | 15.6 |
| *of which High and Medium high-tech (%)* | *36.8* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 9.9 | 8.6 |
| - Services (NACE G-N) (%) | 62.7 | 63.6 |
| *of which Knowledge-intensive services (%)* | *54.4* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 6.8 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 17.1 | 17.3 |
| - SMEs (10-249 employees) (%) | 48.8 | 38.0 |
| - Large enterprises (250+ employees) (%) | 34.1 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 3.16 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 49.7 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 35.7 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 1.5 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.7 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 78.9 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 32,900 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 5.4 | 5.4 |
| Population size, avg 2011-15 (millions) | 8.5 | 505.5 |
| Change in population between 2010 and 2015 (%) | 2.7 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 67.5 | 66.1 |
| Population density, average 2011-15 | 103.1 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 63.8 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| Austria | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **112.5** | **121.5** | **8.9** |
| **Human resources** | **97.5** | **138.6** | **41.1** |
| New doctorate graduates | 140.2 | 130.7 | -15.5 |
| Population with tertiary education | 17.1 | 142.1 | 125.0 |
| Lifelong learning | 133.4 | 144.2 | 11.6 |
| **Attractive research systems** | **137.1** | **157.6** | **20.5** |
| International scientific co-publications | 290.0 | 442.2 | 152.7 |
| Most cited publications | 113.3 | 116.9 | 3.6 |
| Foreign doctorate students | 116.9 | 114.9 | -2.1 |
| **Innovation-friendly environment** | **161.2** | **110.5** | **-50.7** |
| Broadband penetration | 133.3 | 133.3 | 0.0 |
| Opportunity-driven entrepreneurship | 180.8 | 94.4 | -86.5 |
| **Finance and support** | **84.6** | **95.9** | **11.2** |
| R&D expenditure in the public sector | 117.8 | 130.2 | 12.4 |
| Venture capital expenditures | 42.8 | 52.5 | 9.7 |
| **Firm investments** | **132.4** | **165.1** | **32.7** |
| R&D expenditure in the business sector | 150.7 | 185.0 | 34.3 |
| Non-R&D innovation expenditures | 61.0 | 61.5 | 0.5 |
| Enterprises providing ICT training | 171.4 | 228.6 | 57.1 |
| **Innovators** | **115.9** | **122.3** | **6.4** |
| SMEs product/process innovations | 119.0 | 124.0 | 5.0 |
| SMEs marketing/organizational innovations | 109.9 | 121.3 | 11.4 |
| SMEs innovating in-house | 118.9 | 121.6 | 2.7 |
| **Linkages** | **113.9** | **129.8** | **16.0** |
| Innovative SMEs collaborating with others | 135.4 | 193.3 | 57.9 |
| Public-private co-publications | 130.1 | 127.9 | -2.2 |
| Private co-funding of public R&D exp. | 82.3 | 79.5 | -2.8 |
| **Intellectual assets** | **146.6** | **139.7** | **-6.8** |
| PCT patent applications | 109.4 | 115.5 | 6.0 |
| Trademark applications | 170.4 | 163.4 | -7.0 |
| Design applications | 178.3 | 154.3 | -24.0 |
| **Employment impacts** | **77.3** | **78.5** | **1.2** |
| Employment in knowledge-intensive activities | 111.5 | 114.1 | 2.6 |
| Employment fast-growing enterprises | 52.3 | 52.5 | 0.2 |
| **Sales impacts** | **77.8** | **82.7** | **4.9** |
| Medium and high tech product exports | 97.5 | 106.6 | 9.0 |
| Knowledge-intensive services exports | 55.6 | 54.1 | -1.5 |
| Sales of new-to-market/firm innovations | 80.1 | 87.3 | 7.2 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Poland** is a **Moderate Innovator**. Over time, performance has increased by 2.0% relative to that of the EU in 2010.

## Innovation system

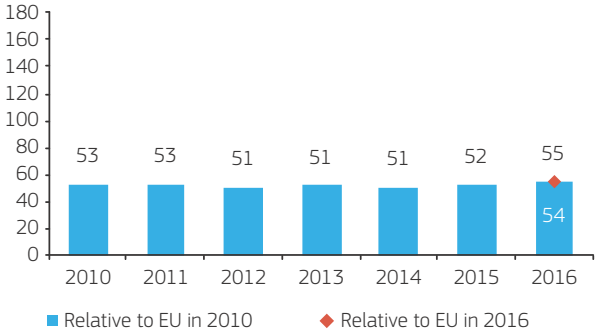
Relative strengths of the innovation system are in Employment impacts, Firm investments, and Innovation-friendly environment. Relative weaknesses are in Innovators, Linkages, and Attractive research systems.

## Structural differences

Notable differences are a larger share of employment in Agriculture & Mining and Manufacturing, a smaller share of employment in High and Medium high-tech manufacturing and Services, a larger share of foreign controlled enterprises, a lower number of Top R&D spending enterprises and a lower average R&D spending of these enterprises, lower GDP per capita, a higher growth rate of GDP, and a lower growth rate of population.

| | PL | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 13.6 | 5.1 |
| - Manufacturing (NACE C) (%) | 19.0 | 15.6 |
| *of which High and Medium high-tech (%)* | *26.5* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 9.9 | 8.6 |
| - Services (NACE G-N) (%) | 50.7 | 63.6 |
| *of which Knowledge-intensive services (%)* | *52.1* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 6.7 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 20.3 | 17.3 |
| - SMEs (10-249 employees) (%) | 35.5 | 38.0 |
| - Large enterprises (250+ employees) (%) | 44.2 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 9.23 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 1.0 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 11.2 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 1.8 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.2 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 77.8 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 17,000 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 16.1 | 5.4 |
| Population size, avg 2011-15 (millions) | 38.0 | 505.5 |
| Change in population between 2010 and 2015 (%) | 0.0 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 70.4 | 66.1 |
| Population density, average 2011-15 | 122.6 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 63.9 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*




| Poland | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **52.8** | **54.8** | **2.0** |
| **Human resources** | **69.4** | **77.4** | **8.0** |
| New doctorate graduates | 46.2 | 32.9 | -13.2 |
| Population with tertiary education | 123.9 | 166.1 | 42.1 |
| Lifelong learning | 32.6 | 26.3 | -6.3 |
| **Attractive research systems** | **22.7** | **33.0** | **10.3** |
| International scientific co-publications | 44.5 | 79.8 | 35.3 |
| Most cited publications | 26.5 | 39.2 | 12.6 |
| Foreign doctorate students | 9.4 | 7.4 | -2.0 |
| **Innovation-friendly environment** | **44.8** | **83.7** | **38.9** |
| Broadband penetration | 77.8 | 122.2 | 44.4 |
| Opportunity-driven entrepreneurship | 21.5 | 56.5 | 35.0 |
| **Finance and support** | **46.0** | **51.2** | **5.3** |
| R&D expenditure in the public sector | 57.4 | 68.0 | 10.7 |
| Venture capital expenditures | 31.6 | 30.1 | -1.5 |
| **Firm investments** | **71.8** | **85.1** | **13.3** |
| R&D expenditure in the business sector | 14.1 | 38.2 | 24.0 |
| Non-R&D innovation expenditures | 130.7 | 128.8 | -1.8 |
| Enterprises providing ICT training | 35.7 | 50.0 | 14.3 |
| **Innovators** | **25.0** | **2.2** | **-22.8** |
| SMEs product/process innovations | 24.3 | 5.9 | -18.4 |
| SMEs marketing/organizational innovations | 25.9 | 0.6 | -25.3 |
| SMEs innovating in-house | 24.8 | 0.0 | -24.8 |
| **Linkages** | **37.4** | **26.8** | **-10.6** |
| Innovative SMEs collaborating with others | 52.1 | 23.0 | -29.1 |
| Public-private co-publications | 19.2 | 22.7 | 3.5 |
| Private co-funding of public R&D exp. | 40.9 | 33.3 | -7.6 |
| **Intellectual assets** | **56.0** | **77.9** | **21.9** |
| PCT patent applications | 31.3 | 39.6 | 8.3 |
| Trademark applications | 51.8 | 79.7 | 27.9 |
| Design applications | 92.5 | 128.1 | 35.6 |
| **Employment impacts** | **92.2** | **88.0** | **-4.2** |
| Employment in knowledge-intensive activities | 42.3 | 55.1 | 12.8 |
| Employment fast-growing enterprises | 128.6 | 111.9 | -16.7 |
| **Sales impacts** | **68.5** | **55.2** | **-13.4** |
| Medium and high tech product exports | 93.3 | 84.2 | -9.1 |
| Knowledge-intensive services exports | 45.0 | 44.4 | -0.7 |
| Sales of new-to-market/firm innovations | 66.2 | 32.7 | -33.5 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Portugal** is a **Moderate Innovator**. Over time, performance has declined by 2.4% relative to that of the EU in 2010.

## Innovation system

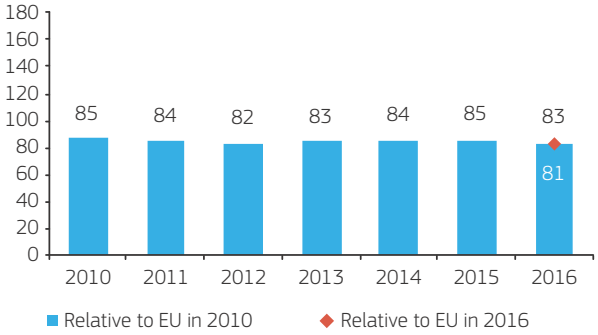
Relative strengths of the innovation system are in Innovation-friendly environment, Attractive research systems, and Human resources. Relative weaknesses are in Linkages, Sales impacts, and Employment impacts.

## Structural differences

Notable differences are a larger share of employment in Agriculture & Mining, a lower share of employment in High and Medium high-tech manufacturing, a larger share of micro enterprises and SMEs in turnover, a smaller share of large enterprises in turnover, a smaller share of foreign controlled enterprises, a lower number of Top R&D spending enterprises and a lower average R&D spending of these enterprises, lower GDP per capita, a lower and negative growth rate of GDP, and a lower and negative growth rate of population.

| | PT | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 8.6 | 5.1 |
| - Manufacturing (NACE C) (%) | 16.7 | 15.6 |
| *of which High and Medium high-tech (%)* | *17.3* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 8.2 | 8.6 |
| - Services (NACE G-N) (%) | 59.8 | 63.6 |
| *of which Knowledge-intensive services (%)* | *53.7* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 6.8 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 24.1 | 17.3 |
| - SMEs (10-249 employees) (%) | 48.1 | 38.0 |
| - Large enterprises (250+ employees) (%) | 30.7 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 0.65 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 8.7 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 47.1 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 1.7 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.5 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 77.4 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 19,400 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | -4.5 | 5.4 |
| Population size, avg 2011-15 (millions) | 10.5 | 505.5 |
| Change in population between 2010 and 2015 (%) | -1.9 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 65.8 | 66.1 |
| Population density, average 2011-15 | 113.3 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 74.3 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

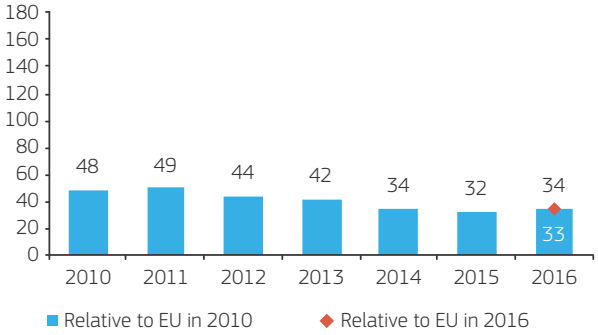



| Portugal | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **85.4** | **83.0** | **-2.4** |
| **Human resources** | **120.3** | **111.6** | **-9.0** |
| New doctorate graduates | 200.0 | 131.0 | -69.0 |
| Population with tertiary education | 48.7 | 111.2 | 62.5 |
| Lifelong learning | 108.4 | 88.4 | -20.0 |
| **Attractive research systems** | **80.7** | **112.4** | **31.7** |
| International scientific co-publications | 145.7 | 284.3 | 138.6 |
| Most cited publications | 84.8 | 85.5 | 0.8 |
| Foreign doctorate students | 51.6 | 90.0 | 38.4 |
| **Innovation-friendly environment** | **103.3** | **153.6** | **50.3** |
| Broadband penetration | 144.4 | 277.8 | 133.3 |
| Opportunity-driven entrepreneurship | 74.2 | 66.0 | -8.2 |
| **Finance and support** | **84.1** | **81.7** | **-2.4** |
| R&D expenditure in the public sector | 92.9 | 89.3 | -3.6 |
| Venture capital expenditures | 73.1 | 72.0 | -1.0 |
| **Firm investments** | **94.9** | **88.6** | **-6.3** |
| R&D expenditure in the business sector | 62.2 | 49.3 | -12.9 |
| Non-R&D innovation expenditures | 95.6 | 90.0 | -5.6 |
| Enterprises providing ICT training | 128.6 | 128.6 | 0.0 |
| **Innovators** | **127.2** | **100.2** | **-26.9** |
| SMEs product/process innovations | 154.2 | 129.9 | -24.3 |
| SMEs marketing/organizational innovations | 113.5 | 92.6 | -21.0 |
| SMEs innovating in-house | 114.4 | 78.8 | -35.6 |
| **Linkages** | **55.8** | **38.0** | **-17.8** |
| Innovative SMEs collaborating with others | 121.4 | 65.7 | -55.7 |
| Public-private co-publications | 45.0 | 34.9 | -10.1 |
| Private co-funding of public R&D exp. | 11.4 | 18.1 | 6.7 |
| **Intellectual assets** | **69.0** | **75.9** | **6.9** |
| PCT patent applications | 41.2 | 43.4 | 2.3 |
| Trademark applications | 76.2 | 105.1 | 28.8 |
| Design applications | 100.9 | 97.2 | -3.7 |
| **Employment impacts** | **50.7** | **69.4** | **18.7** |
| Employment in knowledge-intensive activities | 43.6 | 66.7 | 23.1 |
| Employment fast-growing enterprises | 55.9 | 71.4 | 15.5 |
| **Sales impacts** | **72.1** | **45.5** | **-26.6** |
| Medium and high tech product exports | 49.7 | 49.2 | -0.5 |
| Knowledge-intensive services exports | 51.9 | 54.1 | 2.2 |
| Sales of new-to-market/firm innovations | 122.8 | 30.9 | -91.9 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Romania** is a **Modest Innovator**. Over time, performance has declined by 14.1% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Innovation-friendly environment, Sales impacts, and Human resources. Relative weaknesses are in Innovators, Firm investments, and Finance and support.

## Structural differences

Notable differences are a larger share of employment in Agriculture & Mining, a lower share of employment in High and Medium high-tech manufacturing, Services and Public administration, a larger share of foreign controlled enterprises, a lower number of Top R&D spending enterprises and a lower average R&D spending of these enterprises, a larger share of enterprise births, lower GDP per capita, a higher growth rate of GDP, a lower and negative growth rate of population, and lower population density.

| | RO | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 29.3 | 5.1 |
| - Manufacturing (NACE C) (%) | 18.1 | 15.6 |
| *of which High and Medium high-tech (%)* | *27.6* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 9.5 | 8.6 |
| - Services (NACE G-N) (%) | 38.1 | 63.6 |
| *of which Knowledge-intensive services (%)* | *46.9* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 5.0 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 16.5 | 17.3 |
| - SMEs (10-249 employees) (%) | 41.5 | 38.0 |
| - Large enterprises (250+ employees) (%) | 42.0 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 5.31 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 0.3 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 11.0 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 3.4 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.0 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 74.3 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 13,500 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 12.8 | 5.4 |
| Population size, avg 2011-15 (millions) | 20.0 | 505.5 |
| Change in population between 2010 and 2015 (%) | -2.1 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 67.9 | 66.1 |
| Population density, average 2011-15 | 87.9 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 54.4 | 74.4 |

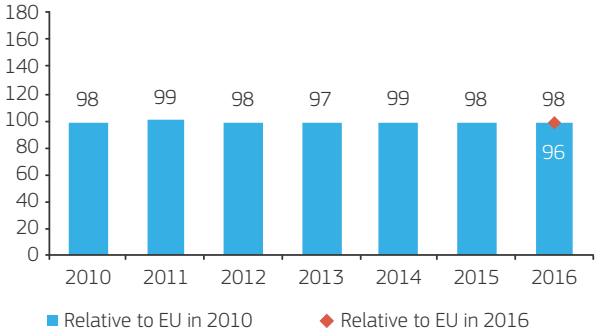
*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| Romania | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **47.9** | **33.8** | **-14.1** |
| **Human resources** | **42.3** | **49.8** | **7.4** |
| New doctorate graduates | 100.0 | 96.4 | -3.6 |
| Population with tertiary education | 17.1 | 44.1 | 27.0 |
| Lifelong learning | 2.1 | 0.0 | -2.1 |
| **Attractive research systems** | **23.4** | **30.0** | **6.5** |
| International scientific co-publications | 23.4 | 47.6 | 24.2 |
| Most cited publications | 31.1 | 40.1 | 9.0 |
| Foreign doctorate students | 12.3 | 9.0 | -3.4 |
| **Innovation-friendly environment** | **74.9** | **89.8** | **14.9** |
| Broadband penetration | 122.2 | 144.4 | 22.2 |
| Opportunity-driven entrepreneurship | 41.5 | 51.2 | 9.7 |
| **Finance and support** | **52.6** | **18.1** | **-34.6** |
| R&D expenditure in the public sector | 27.1 | 21.8 | -5.3 |
| Venture capital expenditures | 84.8 | 13.3 | -71.5 |
| **Firm investments** | **64.4** | **11.9** | **-52.5** |
| R&D expenditure in the business sector | 13.3 | 15.9 | 2.6 |
| Non-R&D innovation expenditures | 209.4 | 21.3 | -188.1 |
| Enterprises providing ICT training | 0.0 | 0.0 | 0.0 |
| **Innovators** | **38.5** | **0.0** | **-38.5** |
| SMEs product/process innovations | 26.4 | 0.0 | -26.4 |
| SMEs marketing/organizational innovations | 50.8 | 0.0 | -50.8 |
| SMEs innovating in-house | 38.0 | 0.0 | -38.0 |
| **Linkages** | **52.3** | **29.4** | **-22.9** |
| Innovative SMEs collaborating with others | 10.7 | 5.8 | -4.9 |
| Public-private co-publications | 39.3 | 15.0 | -24.3 |
| Private co-funding of public R&D exp. | 97.5 | 61.1 | -36.4 |
| **Intellectual assets** | **15.9** | **24.9** | **9.0** |
| PCT patent applications | 21.1 | 26.7 | 5.6 |
| Trademark applications | 16.6 | 31.3 | 14.8 |
| Design applications | 8.5 | 17.5 | 9.0 |
| **Employment impacts** | **21.0** | **37.0** | **16.0** |
| Employment in knowledge-intensive activities | 3.8 | 19.2 | 15.4 |
| Employment fast-growing enterprises | 33.6 | 50.0 | 16.4 |
| **Sales impacts** | **84.8** | **62.2** | **-22.7** |
| Medium and high tech product exports | 87.1 | 93.4 | 6.4 |
| Knowledge-intensive services exports | 56.0 | 54.7 | -1.3 |
| Sales of new-to-market/firm innovations | 115.9 | 33.2 | -82.7 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Slovenia** is a **Strong Innovator**. Over time, performance has declined by 0.2% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Human resources, Firm investments, and Innovation-friendly environment. Relative weaknesses are in Finance and support, Sales impacts, and Innovators.

## Structural differences

Notable differences are a larger share of employment in Agriculture & Mining and Manufacturing, a larger share of micro enterprises and SMEs in turnover, a smaller share of large enterprises in turnover, a larger share of foreign controlled enterprises, a lower number of Top R&D spending enterprises and a lower average R&D spending of these enterprises, a smaller share of enterprise births, lower buyer sophistication, a lower growth rate of GDP, and a lower growth rate of population.

| | SI | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 8.4 | 5.1 |
| - Manufacturing (NACE C) (%) | 23.0 | 15.6 |
| *of which High and Medium high-tech (%)* | *37.0* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 8.0 | 8.6 |
| - Services (NACE G-N) (%) | 54.2 | 63.6 |
| *of which Knowledge-intensive services (%)* | *57.1* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 6.3 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 20.8 | 17.3 |
| - SMEs (10-249 employees) (%) | 47.1 | 38.0 |
| - Large enterprises (250+ employees) (%) | 32.1 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 4.37 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 21.3 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 40.6 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 1.1 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 2.9 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 76.1 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 21,300 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 2.2 | 5.4 |
| Population size, avg 2011-15 (millions) | 2.1 | 505.5 |
| Change in population between 2010 and 2015 (%) | 0.8 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 68.4 | 66.1 |
| Population density, average 2011-15 | 102.2 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 53.4 | 74.4 |

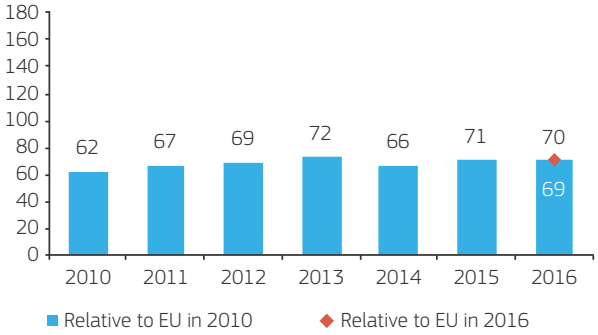
*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| Slovenia | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **98.0** | **97.8** | **-0.2** |
| **Human resources** | **113.2** | **172.9** | **59.7** |
| New doctorate graduates | 100.0 | 234.1 | 134.1 |
| Population with tertiary education | 86.8 | 163.8 | 77.0 |
| Lifelong learning | 153.8 | 109.5 | -50.5 |
| **Attractive research systems** | **76.3** | **101.6** | **25.3** |
| International scientific co-publications | 229.7 | 371.6 | 141.8 |
| Most cited publications | 66.7 | 80.8 | 14.1 |
| Foreign doctorate students | 35.6 | 35.6 | -0.1 |
| **Innovation-friendly environment** | 138.3 | **114.3** | **-24.0** |
| Broadband penetration | 144.4 | 177.8 | 33.3 |
| Opportunity-driven entrepreneurship | 134.0 | 69.5 | -64.6 |
| **Finance and support** | **50.9** | **40.4** | **-10.5** |
| R&D expenditure in the public sector | 85.8 | 66.2 | -19.5 |
| Venture capital expenditures | 6.8 | 7.7 | 0.9 |
| **Firm investments** | 143.0 | 141.0 | **-2.0** |
| R&D expenditure in the business sector | 151.5 | 142.9 | -8.6 |
| Non-R&D innovation expenditures | 114.5 | 118.5 | 4.0 |
| Enterprises providing ICT training | 157.1 | 157.1 | 0.0 |
| **Innovators** | **86.8** | **76.6** | **-10.2** |
| SMEs product/process innovations | 82.3 | 72.2 | -10.1 |
| SMEs marketing/organizational innovations | 98.1 | 76.5 | -21.6 |
| SMEs innovating in-house | 79.7 | 81.0 | 1.3 |
| **Linkages** | 129.0 | **105.7** | **-23.2** |
| Innovative SMEs collaborating with others | 130.8 | 119.9 | -11.0 |
| Public-private co-publications | 144.9 | 106.2 | -38.7 |
| Private co-funding of public R&D exp. | 113.7 | 93.8 | -20.0 |
| **Intellectual assets** | **91.2** | **93.6** | **2.4** |
| PCT patent applications | 90.1 | 89.9 | -0.2 |
| Trademark applications | 133.8 | 137.9 | 4.1 |
| Design applications | 60.0 | 64.6 | 4.6 |
| **Employment impacts** | **71.3** | **74.3** | **2.9** |
| Employment in knowledge-intensive activities | 98.7 | 102.6 | 3.8 |
| Employment fast-growing enterprises | 51.4 | 53.6 | 2.3 |
| **Sales impacts** | **87.8** | **75.7** | **-12.1** |
| Medium and high tech product exports | 107.2 | 102.3 | -5.0 |
| Knowledge-intensive services exports | 31.7 | 34.6 | 2.9 |
| Sales of new-to-market/firm innovations | 130.1 | 91.8 | -38.3 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Slovakia** is a **Moderate Innovator**. Over time, performance has increased by 8.0% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Employment impacts, Sales impacts, and Human resources. Relative weaknesses are in Innovators, Intellectual assets, and Attractive research systems.

## Structural differences

Notable differences are a smaller share of employment in Agriculture & Mining, a larger share of employment in Manufacturing, Utilities and Construction and Public administration, a smaller share of foreign controlled enterprises, a larger share of enterprise births, lower buyer sophistication, lower GDP per capita, a higher growth rate of GDP, and a lower growth rate of population.

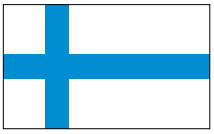
| | SK | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 3.7 | 5.1 |
| - Manufacturing (NACE C) (%) | 24.0 | 15.6 |
| *of which High and Medium high-tech (%)* | *41.4* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 12.0 | 8.6 |
| - Services (NACE G-N) (%) | 51.7 | 63.6 |
| *of which Knowledge-intensive services (%)* | *51.6* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 8.6 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 18.2 | 17.3 |
| - SMEs (10-249 employees) (%) | 36.7 | 38.0 |
| - Large enterprises (250+ employees) (%) | 45.2 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 0.87 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | none | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | none | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 2.1 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 2.7 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 75.6 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 19,300 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 13.0 | 5.4 |
| Population size, avg 2011-15 (millions) | 5.4 | 505.5 |
| Change in population between 2010 and 2015 (%) | 0.6 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 71.4 | 66.1 |
| Population density, average 2011-15 | 110.5 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 57.6 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

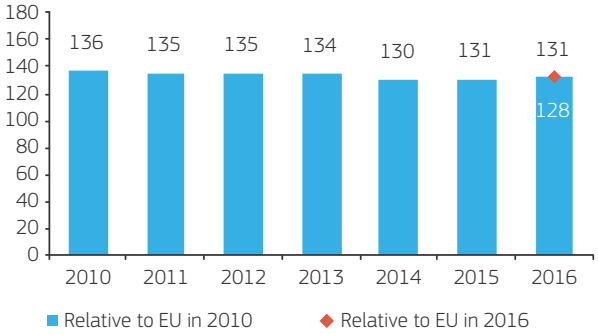
| Slovakia | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **62.0** | **70.0** | **8.0** |
| **Human resources** | **74.8** | **96.5** | **21.8** |
| New doctorate graduates | 140.2 | 127.6 | 11.4 |
| Population with tertiary education | 38.8 | 100.7 | 61.8 |
| Lifelong learning | 30.5 | 17.9 | -12.6 |
| **Attractive research systems** | **45.8** | **52.5** | **6.7** |
| International scientific co-publications | 85.9 | 124.8 | 38.9 |
| Most cited publications | 46.7 | 44.5 | -2.2 |
| Foreign doctorate students | 30.1 | 38.2 | 8.1 |
| **Innovation-friendly environment** | **66.9** | **70.4** | **3.5** |
| Broadband penetration | 100.0 | 100.0 | 0.0 |
| Opportunity-driven entrepreneurship | 43.6 | 49.5 | 5.9 |
| **Finance and support** | **14.5** | **72.4** | **57.9** |
| R&D expenditure in the public sector | 21.8 | 123.1 | 101.3 |
| Venture capital expenditures | 5.3 | 8.5 | 3.1 |
| **Firm investments** | **84.1** | **69.4** | **-14.6** |
| R&D expenditure in the business sector | 14.1 | 26.2 | 12.0 |
| Non-R&D innovation expenditures | 102.1 | 78.9 | -23.2 |
| Enterprises providing ICT training | 142.9 | 107.1 | -35.7 |
| **Innovators** | **40.4** | **28.6** | **-11.8** |
| SMEs product/process innovations | 30.8 | 20.8 | -10.0 |
| SMEs marketing/organizational innovations | 59.6 | 39.1 | -20.5 |
| SMEs innovating in-house | 30.3 | 25.6 | -4.7 |
| **Linkages** | **51.1** | **62.4** | **11.3** |
| Innovative SMEs collaborating with others | 45.8 | 72.4 | 26.6 |
| Public-private co-publications | 61.3 | 45.7 | -15.6 |
| Private co-funding of public R&D exp. | 46.7 | 68.6 | 21.9 |
| **Intellectual assets** | **34.9** | **38.6** | **3.8** |
| PCT patent applications | 30.4 | 34.8 | 4.4 |
| Trademark applications | 48.2 | 65.7 | 17.6 |
| Design applications | 30.7 | 23.1 | -7.6 |
| **Employment impacts** | **118.5** | **111.8** | **-6.7** |
| Employment in knowledge-intensive activities | 60.3 | 55.1 | -5.1 |
| Employment fast-growing enterprises | 161.0 | 134.2 | -7.9 |
| **Sales impacts** | **91.7** | **105.6** | **13.9** |
| Medium and high tech product exports | 118.3 | 131.1 | 12.8 |
| Knowledge-intensive services exports | 35.8 | 34.6 | -1.1 |
| Sales of new-to-market/firm innovations | 125.0 | 157.8 | 32.8 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*



**Finland** is an **Innovation Leader**. Over time, performance has declined by 5.1% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Human resources, Innovation-friendly environment, and Attractive research systems. Relative weaknesses are in Sales impacts, Employment impacts, and Innovators.

## Structural differences

Notable differences are a smaller share of employment in Public administration, a higher number of Top R&D spending enterprises but a lower average R&D spending of these enterprises, a smaller share of enterprise births, higher buyer sophistication, a lower growth rate of GDP, a higher growth rate of population, and lower population density.

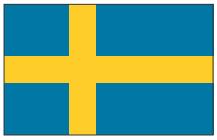
| | FI | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 4.5 | 5.1 |
| - Manufacturing (NACE C) (%) | 14.1 | 15.6 |
| *of which High and Medium high-tech (%)* | *36.2* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 8.1 | 8.6 |
| - Services (NACE G-N) (%) | 68.8 | 63.6 |
| *of which Knowledge-intensive services (%)* | *64.5* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 4.5 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 15.5 | 17.3 |
| - SMEs (10-249 employees) (%) | 37.4 | 38.0 |
| - Large enterprises (250+ employees) (%) | 47.1 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 1.26 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 124.6 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 114.5 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 0.5 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 4.6 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 80.8 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 29,100 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 0.0 | 5.4 |
| Population size, avg 2011-15 (millions) | 5.4 | 505.5 |
| Change in population between 2010 and 2015 (%) | 2.2 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 64.8 | 66.1 |
| Population density, average 2011-15 | 17.9 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 63.9 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

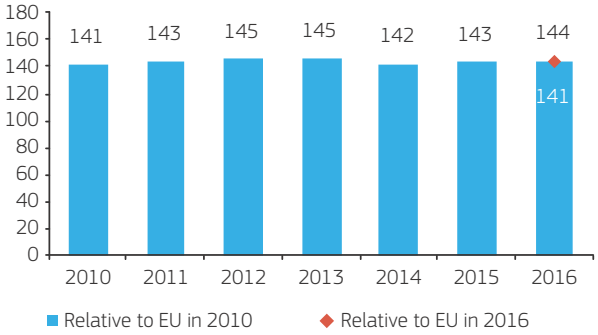
| Finland | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | 136.1 | 130.9 | **-5.1** |
| **Human resources** | 190.3 | 203.7 | **13.4** |
| New doctorate graduates | 207.7 | 206.0 | -1.7 |
| Population with tertiary education | 130.8 | 140.7 | 9.9 |
| Lifelong learning | 229.4 | 265.3 | 35.8 |
| **Attractive research systems** | 108.6 | 151.8 | **43.3** |
| International scientific co-publications | 336.3 | 524.5 | 188.1 |
| Most cited publications | 100.4 | 106.6 | 6.3 |
| Foreign doctorate students | 39.1 | 84.2 | 45.1 |
| **Innovation-friendly environment** | 157.9 | 198.9 | **41.0** |
| Broadband penetration | 233.3 | 277.8 | 44.4 |
| Opportunity-driven entrepreneurship | 104.6 | 143.2 | 38.6 |
| **Finance and support** | 161.4 | 127.6 | **-33.8** |
| R&D expenditure in the public sector | 158.1 | 140.3 | -17.8 |
| Venture capital expenditures | 164.7 | 110.8 | -54.1 |
| **Firm investments** | 181.6 | 142.9 | **-38.7** |
| R&D expenditure in the business sector | 217.4 | 164.4 | -53.2 |
| Non-R&D innovation expenditures | 77.3 | 36.1 | -41.2 |
| Enterprises providing ICT training | 228.6 | 207.1 | -21.4 |
| **Innovators** | 112.2 | 121.8 | **9.6** |
| SMEs product/process innovations | 126.8 | 136.5 | 9.7 |
| SMEs marketing/organizational innovations | 70.6 | 90.7 | 20.1 |
| SMEs innovating in-house | 136.2 | 135.0 | -1.2 |
| **Linkages** | 161.3 | 123.9 | **-37.4** |
| Innovative SMEs collaborating with others | 141.4 | 156.2 | 14.8 |
| Public-private co-publications | 164.3 | 134.5 | -29.9 |
| Private co-funding of public R&D exp. | 175.0 | 88.5 | -86.6 |
| **Intellectual assets** | 127.6 | 132.9 | **5.3** |
| PCT patent applications | 136.8 | 129.5 | -7.3 |
| Trademark applications | 112.5 | 149.8 | 37.3 |
| Design applications | 99.7 | 97.7 | -2.1 |
| **Employment impacts** | 88.4 | 83.7 | **-4.7** |
| Employment in knowledge-intensive activities | 121.8 | 128.2 | 6.4 |
| Employment fast-growing enterprises | 64.0 | 51.1 | -12.8 |
| **Sales impacts** | 99.6 | 74.7 | **-24.9** |
| Medium and high tech product exports | 89.0 | 71.0 | -17.9 |
| Knowledge-intensive services exports | 90.6 | 90.6 | 0.0 |
| Sales of new-to-market/firm innovations | 123.1 | 60.6 | -62.6 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*



**Sweden** is an **Innovation Leader**. Over time, performance has increased by 2.3% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Human resources, Innovation-friendly environment, and Attractive research systems. Relative weaknesses are in Sales impacts, Innovators, and Linkages.

## Structural differences

Notable differences are a smaller share of employment in Agriculture & Mining and Manufacturing, a larger share of foreign controlled enterprises, a higher number of Top R&D spending enterprises but a lower average R&D spending of these enterprises, a smaller share of enterprise births, higher buyer sophistication, higher GDP per capita, a higher growth rate of GDP, a higher growth rate of population, and lower population density.

| | SE | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 2.2 | 5.1 |
| - Manufacturing (NACE C) (%) | 11.2 | 15.6 |
| *of which High and Medium high-tech (%)* | *39.6* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 7.7 | 8.6 |
| - Services (NACE G-N) (%) | 72.6 | 63.6 |
| *of which Knowledge-intensive services (%)* | *67.8* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 6.3 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 18.6 | 17.3 |
| - SMEs (10-249 employees) (%) | 38.6 | 38.0 |
| - Large enterprises (250+ employees) (%) | 42.1 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 1.82 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 138.8 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 113.3 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 0.3 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 4.5 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 82.1 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 32,100 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 10.7 | 5.4 |
| Population size, avg 2011-15 (millions) | 9.6 | 505.5 |
| Change in population between 2010 and 2015 (%) | 4.4 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 64.0 | 66.1 |
| Population density, average 2011-15 | 23.6 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 61.9 | 74.4 |

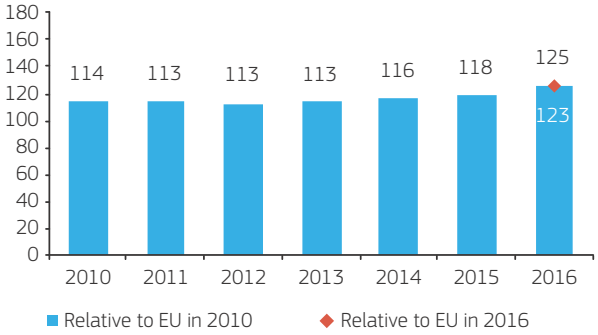
*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| Sweden | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | 141.3 | 143.6 | **2.3** |
| **Human resources** | 208.2 | 224.9 | **16.8** |
| New doctorate graduates | 223.1 | 208.5 | -14.5 |
| Population with tertiary education | 159.2 | 192.1 | 32.9 |
| Lifelong learning | 247.4 | 283.2 | 35.8 |
| **Attractive research systems** | 148.9 | 192.7 | **43.7** |
| International scientific co-publications | 410.1 | 643.2 | 233.1 |
| Most cited publications | 110.1 | 117.1 | 7.1 |
| Foreign doctorate students | 109.9 | 139.1 | 29.2 |
| **Innovation-friendly environment** | 179.4 | 217.2 | **37.8** |
| Broadband penetration | 244.4 | 277.8 | 33.3 |
| Opportunity-driven entrepreneurship | 133.5 | 174.5 | 40.9 |
| **Finance and support** | 163.7 | 119.8 | **-43.9** |
| R&D expenditure in the public sector | 149.8 | 148.0 | -1.8 |
| Venture capital expenditures | 181.2 | 84.2 | -97.0 |
| **Firm investments** | 151.3 | 168.8 | **17.4** |
| R&D expenditure in the business sector | 208.2 | 192.7 | -15.5 |
| Non-R&D innovation expenditures | 105.9 | 169.6 | 63.8 |
| Enterprises providing ICT training | 128.6 | 142.9 | 14.3 |
| **Innovators** | 114.2 | 109.1 | **-5.1** |
| SMEs product/process innovations | 123.5 | 122.7 | -0.8 |
| SMEs marketing/organizational innovations | 88.8 | 83.2 | -5.7 |
| SMEs innovating in-house | 131.0 | 122.1 | -8.9 |
| **Linkages** | 139.4 | 116.4 | **-22.9** |
| Innovative SMEs collaborating with others | 153.5 | 123.5 | -30.0 |
| Public-private co-publications | 187.2 | 161.9 | -25.3 |
| Private co-funding of public R&D exp. | 86.7 | 71.6 | -15.1 |
| **Intellectual assets** | 132.7 | 135.9 | **3.3** |
| PCT patent applications | 136.8 | 136.8 | 0.0 |
| Trademark applications | 124.2 | 143.2 | 19.0 |
| Design applications | 106.6 | 102.3 | -4.3 |
| **Employment impacts** | 138.2 | 139.1 | **1.0** |
| Employment in knowledge-intensive activities | 143.6 | 162.8 | 19.2 |
| Employment fast-growing enterprises | 134.2 | 121.8 | -12.4 |
| **Sales impacts** | 91.9 | 86.6 | **-5.2** |
| Medium and high tech product exports | 100.4 | 98.8 | -1.7 |
| Knowledge-intensive services exports | 110.7 | 116.5 | 5.8 |
| Sales of new-to-market/firm innovations | 59.5 | 37.0 | -22.4 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

The **United Kingdom** is an **Innovation Leader**. Over time, performance has increased by 11.7% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Attractive research systems, Human resources, and Employment impacts. Relative weaknesses are in Innovators, Finance and support, and Intellectual assets.

## Structural differences

Notable differences are a smaller share of employment in Agriculture & Mining and Manufacturing, a smaller share of micro enterprises in turnover, a larger share of large enterprises in turnover, a higher number of Top R&D spending enterprises but a lower average R&D spending of these enterprises, a larger share of enterprise births, higher buyer sophistication, a higher growth rate of GDP, a higher growth rate of population, and higher population density.

| | UK | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 1.6 | 5.1 |
| - Manufacturing (NACE C) (%) | 9.8 | 15.6 |
| *of which High and Medium high-tech (%)* | *38.2* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 8.7 | 8.6 |
| - Services (NACE G-N) (%) | 73.6 | 63.6 |
| *of which Knowledge-intensive services (%)* | *63.3* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 6.3 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 13.0 | 17.3 |
| - SMEs (10-249 employees) (%) | 31.2 | 38.0 |
| - Large enterprises (250+ employees) (%) | 55.8 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 1.21 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 62.3 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 100.2 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 3.6 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 4.6 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 82.7 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 26,700 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 10.4 | 5.4 |
| Population size, avg 2011-15 (millions) | 63.9 | 505.5 |
| Change in population between 2010 and 2015 (%) | 3.8 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 65.2 | 66.1 |
| Population density, average 2011-15 | 264.7 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 86.5 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| United Kingdom | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | 113.6 | 125.3 | 11.7 |
| **Human resources** | 167.5 | 185.3 | 17.8 |
| New doctorate graduates | 153.8 | 217.6 | 63.7 |
| Population with tertiary education | 154.6 | 191.4 | 36.8 |
| Lifelong learning | 130.9 | 136.9 | -60.0 |
| **Attractive research systems** | 177.4 | 190.6 | 13.2 |
| International scientific co-publications | 244.3 | 379.4 | 135.2 |
| Most cited publications | 143.1 | 148.9 | 5.8 |
| Foreign doctorate students | 202.7 | 183.0 | -19.7 |
| **Innovation-friendly environment** | 94.0 | 103.0 | 9.0 |
| Broadband penetration | 88.9 | 111.1 | 22.2 |
| Opportunity-driven entrepreneurship | 97.5 | 97.2 | -0.3 |
| **Finance and support** | 124.4 | 87.1 | -37.3 |
| R&D expenditure in the public sector | 85.8 | 71.6 | -14.2 |
| Venture capital expenditures | 173.1 | 106.7 | -66.4 |
| **Firm investments** | 99.7 | 118.9 | 19.2 |
| R&D expenditure in the business sector | 89.7 | 94.0 | 4.3 |
| Non-R&D innovation expenditures | 33.3 | 95.2 | 61.9 |
| Enterprises providing ICT training | 164.3 | 164.3 | 0.0 |
| **Innovators** | 61.0 | 85.8 | 24.8 |
| SMEs product/process innovations | 65.0 | 89.0 | 24.0 |
| SMEs marketing/organizational innovations | 69.1 | 119.1 | 50.1 |
| SMEs innovating in-house | 48.8 | 48.8 | 0.0 |
| **Linkages** | 128.5 | 124.0 | -4.6 |
| Innovative SMEs collaborating with others | 217.4 | 217.4 | 0.0 |
| Public-private co-publications | 127.0 | 109.1 | -17.9 |
| Private co-funding of public R&D exp. | 57.2 | 60.3 | 3.1 |
| **Intellectual assets** | 81.5 | 87.8 | 6.3 |
| PCT patent applications | 94.4 | 93.6 | -0.8 |
| Trademark applications | 89.7 | 106.3 | 16.6 |
| Design applications | 57.8 | 65.9 | 8.0 |
| **Employment impacts** | 140.5 | 151.6 | 11.2 |
| Employment in knowledge-intensive activities | 147.4 | 162.8 | 15.4 |
| Employment fast-growing enterprises | 133.4 | 141.5 | 8.1 |
| **Sales impacts** | 95.0 | 132.8 | 37.8 |
| Medium and high tech product exports | 103.4 | 98.9 | -4.5 |
| Knowledge-intensive services exports | 132.4 | 132.2 | -0.2 |
| Sales of new-to-market/firm innovations | 41.1 | 174.5 | 133.4 |

*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.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Iceland** is a **Strong Innovator**. Over time, performance has increased by 0.2% relative to that of the EU in 2010.

## Innovation system

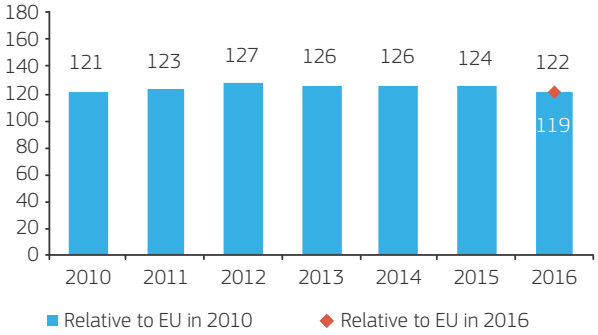
Relative strengths of the innovation system are in Innovation-friendly environment, Attractive research systems, and Employment impacts. Relative weaknesses are in Sales impacts, Intellectual assets, and Finance and support.

## Structural differences

Notable differences are a smaller share of employment in Manufacturing, High and Medium high-tech manufacturing and Public administration, a higher number of Top R&D spending enterprises but a lower average R&D spending of these enterprises, a higher growth rate of GDP, a higher growth rate of population, and lower population density.

| | IS | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 4.9 | 5.1 |
| - Manufacturing (NACE C) (%) | 11.1 | 15.6 |
| *of which High and Medium high-tech (%)* | *13.8* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 7.2 | 8.6 |
| - Services (NACE G-N) (%) | 72.2 | 63.6 |
| *of which Knowledge-intensive services (%)* | *64.9* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 4.7 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | n/a | 17.3 |
| - SMEs (10-249 employees) (%) | n/a | 38.0 |
| - Large enterprises (250+ employees) (%) | n/a | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | n/a | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 46.6 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 52.7 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | n/a | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.8 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 78.9 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 29,400 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 14.4 | 5.4 |
| Population size, avg 2011-15 (millions) | 0.3 | 505.5 |
| Change in population between 2010 and 2015 (%) | 3.6 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 66.4 | 66.1 |
| Population density, average 2011-15 | 3.2 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 93.9 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*



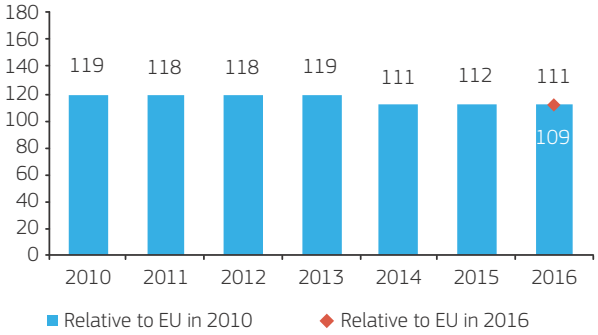

| Iceland | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | 121.4 | 121.7 | **0.2** |
| **Human resources** | 130.4 | 150.1 | **19.7** |
| New doctorate graduates | 38.5 | 53.8 | 15.4 |
| Population with tertiary education | 119.1 | 166.4 | 47.4 |
| Lifelong learning | 254.7 | 247.4 | -7.4 |
| **Attractive research systems** | 164.6 | 183.0 | **18.3** |
| International scientific co-publications | 649.2 | 649.2 | 0.0 |
| Most cited publications | 91.4 | 96.3 | 4.9 |
| Foreign doctorate students | 97.8 | 142.1 | 44.3 |
| **Innovation-friendly environment** § | 225.3 | 229.9 | **4.6** |
| Broadband penetration | N/A | N/A | N/A |
| Opportunity-driven entrepreneurship | 132.1 | 136.1 | 3.9 |
| **Finance and support** § | 123.5 | 123.5 | **0.0** |
| R&D expenditure in the public sector | 110.7 | 110.7 | 0.0 |
| Venture capital expenditures | N/A | N/A | N/A |
| **Firm investments** § | 134.9 | 140.7 | **5.8** |
| R&D expenditure in the business sector | 82.0 | 119.7 | 37.8 |
| Non-R&D innovation expenditures | N/A | N/A | N/A |
| Enterprises providing ICT training | 171.4 | 142.9 | -28.6 |
| **Innovators** § | 151.1 | 125.0 | **-26.1** |
| SMEs product/process innovations | 181.9 | 139.4 | -42.5 |
| SMEs marketing/organizational innovations | 120.9 | 110.7 | -10.2 |
| SMEs innovating in-house | N/A | N/A | N/A |
| **Linkages** | 150.7 | 146.6 | **-4.1** |
| Innovative SMEs collaborating with others | 163.1 | 194.7 | 31.7 |
| Public-private co-publications | 206.8 | 206.8 | 0.0 |
| Private co-funding of public R&D exp. | 92.4 | 55.4 | -37.0 |
| **Intellectual assets** | **68.5** | **73.0** | **4.5** |
| PCT patent applications | 83.1 | 93.4 | 10.3 |
| Trademark applications | 106.4 | 128.7 | 22.3 |
| Design applications | 19.7 | 2.7 | -16.9 |
| **Employment impacts** § | 134.2 | 152.6 | **18.4** |
| Employment in knowledge-intensive activities | 169.0 | 190.8 | 21.8 |
| Employment fast-growing enterprises | N/A | N/A | N/A |
| **Sales impacts** | **59.0** | **42.9** | **-16.1** |
| Medium and high tech product exports | 0.0 | 0.0 | 0.0 |
| Knowledge-intensive services exports | 96.3 | 99.1 | 2.8 |
| Sales of new-to-market/firm innovations | 86.4 | 28.9 | -57.6 |

*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.*

*§ Due to missing data, the relative dimension score does not necessarily reflect that of the indicators.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Israel** is a **Strong Innovator**. Over time, performance has declined by 8.1% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Firm investments, Employment impacts, and Intellectual assets. Relative weaknesses are in Finance and support, Innovators, and Linkages.

## Structural differences

Notable differences are a smaller share of employment in Industry, a lower average R&D spending of Top R&D spending enterprises, a higher growth rate of GDP, a higher growth rate of population, and higher population density.

| | IL | EU |
|---|---|---|
| **Structure of the economy** | | |
| Share of employment in Agriculture, avg 2011-15 | 1.3 | 4.8 |
| Share of employment in Industry, avg 2011-15 | 17.9 | 24.4 |
| Share of employment in Services, avg 2011-15 | 79.0 | 70.2 |
| **Business indicators** | | |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 24.1 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 118.1 | 165.8 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.8 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 71.7 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 24,600 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 18.7 | 5.4 |
| Population size, avg 2011-15 (millions) | 8.1 | 505.5 |
| Change in population between 2010 and 2015 (%) | 9.9 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 61.5 | 66.1 |
| Population density, average 2011-15 | 372.8 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 92.0 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| Israel | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | 119.2 | 111.0 | -8.1 |
| **Human resources** § | 94.3 | 105.5 | 11.2 |
| New doctorate graduates | 87.8 | 98.2 | 10.5 |
| Population with tertiary education | N/A | N/A | N/A |
| Lifelong learning | N/A | N/A | N/A |
| **Attractive research systems** § | 119.0 | 129.9 | 10.9 |
| International scientific co-publications | 234.1 | 301.0 | 66.8 |
| Most cited publications | 96.0 | 93.7 | -2.4 |
| Foreign doctorate students | N/A | N/A | N/A |
| **Innovation-friendly environment** § | 86.2 | 104.2 | 18.0 |
| Broadband penetration | N/A | N/A | N/A |
| Opportunity-driven entrepreneurship | 73.5 | 88.9 | 15.4 |
| **Finance and support** | 49.5 | 47.3 | -2.2 |
| R&D expenditure in the public sector | 83.2 | 77.4 | -5.7 |
| Venture capital expenditures | 7.0 | 9.2 | 2.2 |
| **Firm investments** § | 239.4 | 239.4 | 0.0 |
| R&D expenditure in the business sector | 217.6 | 217.6 | 0.0 |
| Non-R&D innovation expenditures | N/A | N/A | N/A |
| Enterprises providing ICT training | N/A | N/A | N/A |
| **Innovators** | 117.9 | 74.4 | -43.5 |
| SMEs product/process innovations | 82.2 | 44.3 | -37.9 |
| SMEs marketing/organizational innovations | 176.6 | 117.2 | -59.3 |
| SMEs innovating in-house | 93.4 | 60.6 | -32.9 |
| **Linkages** | 122.8 | 94.9 | -27.9 |
| Innovative SMEs collaborating with others | 159.5 | 117.3 | -42.1 |
| Public-private co-publications | 102.6 | 72.9 | -29.7 |
| Private co-funding of public R&D exp. | 110.1 | 95.5 | -14.6 |
| **Intellectual assets** | 125.9 | 131.7 | 5.8 |
| PCT patent applications | 136.8 | 136.8 | 0.0 |
| Trademark applications | 207.9 | 210.8 | 2.8 |
| Design applications | 21.6 | 37.5 | 15.9 |
| **Employment impacts** § | 186.1 | 186.1 | 0.0 |
| Employment in knowledge-intensive activities | 220.5 | 220.5 | 0.0 |
| Employment fast-growing enterprises | N/A | N/A | N/A |
| **Sales impacts** | 93.5 | 97.3 | 3.7 |
| Medium and high tech product exports | 95.2 | 96.1 | 0.9 |
| Knowledge-intensive services exports | 107.0 | 107.6 | 0.6 |
| Sales of new-to-market/firm innovations | 75.7 | 86.5 | 10.9 |

*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.*

*§ Due to missing data, the relative dimension score does not necessarily reflect that of the indicators.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

The **Former Yugoslav Republic of Macedonia (FYROM)** is a **Modest Innovator**. Over time, performance has increased by 10.4% relative to that of the EU in 2010.

## Innovation system

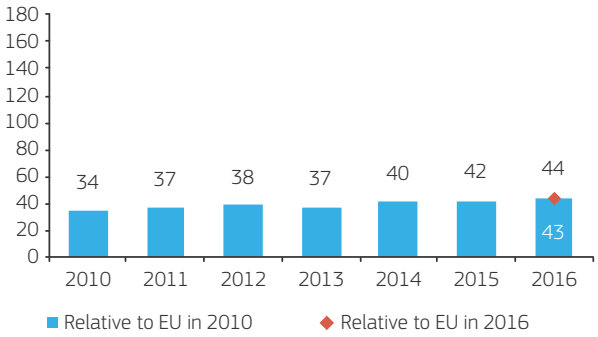
Relative strengths of the innovation system are in Sales impacts, Firm investment, and Innovation-friendly environment. Relative weaknesses are in Finance and support, Employment impacts, and Intellectual assets.

## Structural differences

Notable differences are a larger share of employment in Industry, a smaller share of employment in Services, lower buyer sophistication, lower GDP per capita, a higher growth rate of GDP, a lower growth rate of population, and lower population density.

| | MK | EU |
|---|---|---|
| **Structure of the economy** | | |
| Share of employment in Agriculture, avg 2011-15 | 18.2 | 4.8 |
| Share of employment in Industry, avg 2011-15 | 30.2 | 24.4 |
| Share of employment in Services, avg 2011-15 | 53.6 | 70.2 |
| **Business indicators** | | |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | none | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | none | 165.8 |
| Buyer sophistication 1-7 (best), 2013-14 | 2.8 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 81.7 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 3600 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 12.5 | 5.4 |
| Population size, avg 2011-15 (millions) | 2.1 | 505.5 |
| Change in population between 2010 and 2015 (%) | 0.8 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 70.8 | 66.1 |
| Population density, average 2011-15 | 82.2 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 57.0 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*




| Former Yugoslav Republic of Macedonia (FYROM) | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **33.8** | **44.2** | **10.4** |
| **Human resources** | **21.1** | **49.3** | **28.2** |
| New doctorate graduates | 15.4 | 33.1 | 17.7 |
| Population with tertiary education | 24.3 | 92.8 | 68.4 |
| Lifelong learning | 24.2 | 17.9 | -6.3 |
| **Attractive research systems** | **14.7** | **25.3** | **10.6** |
| International scientific co-publications | 12.6 | 35.5 | 22.9 |
| Most cited publications | 22.0 | 27.7 | 5.7 |
| Foreign doctorate students | 4.7 | 18.1 | 13.4 |
| **Innovation-friendly environment** | **34.7** | **61.7** | **27.0** |
| Broadband penetration | 77.8 | 122.2 | 44.4 |
| Opportunity-driven entrepreneurship | 4.2 | 18.9 | 14.7 |
| **Finance and support** | **0.0** | **2.8** | **2.8** |
| R&D expenditure in the public sector | 0.1 | 5.1 | 5.0 |
| Venture capital expenditures | 0.0 | 0.0 | 0.0 |
| **Firm investments** | **60.7** | **67.9** | **7.2** |
| R&D expenditure in the business sector | 1.5 | 0.8 | -0.7 |
| Non-R&D innovation expenditures | 132.7 | 132.7 | 0.0 |
| Enterprises providing ICT training | 64.3 | 85.7 | 21.4 |
| **Innovators** | **66.2** | **66.2** | **0.0** |
| SMEs product/process innovations | 117.5 | 117.5 | 0.0 |
| SMEs marketing/organizational innovations | 68.2 | 68.2 | 0.0 |
| SMEs innovating in-house | 13.5 | 13.5 | 0.0 |
| **Linkages** § | **38.6** | **41.2** | **2.5** |
| Innovative SMEs collaborating with others | 84.2 | 84.2 | 0.0 |
| Public-private co-publications | 0.0 | 5.3 | 5.3 |
| Private co-funding of public R&D exp. | N/A | N/A | N/A |
| **Intellectual assets** | **13.8** | **13.9** | **0.2** |
| PCT patent applications | 22.8 | 14.7 | -8.1 |
| Trademark applications | 15.0 | 29.6 | 14.5 |
| Design applications | 0.6 | 1.0 | 0.3 |
| **Employment impacts** § | **16.2** | **8.7** | **-7.6** |
| Employment in knowledge-intensive activities | 19.2 | 10.3 | -9.0 |
| Employment fast-growing enterprises | N/A | N/A | N/A |
| **Sales impacts** | **46.2** | **70.6** | **24.4** |
| Medium and high tech product exports | 33.0 | 104.9 | 71.9 |
| Knowledge-intensive services exports | 42.3 | 38.5 | -3.8 |
| Sales of new-to-market/firm innovations | 66.8 | 66.8 | 0.0 |

*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.*

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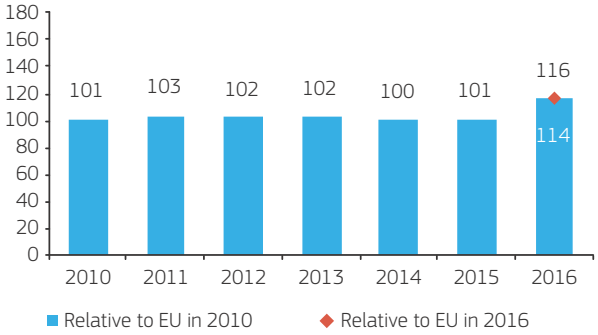
*Change highlighted in green is positive; change highlighted in light red is negative.*

**Norway** is a **Strong Innovator**. Over time, performance has increased by 14.7% relative to that of the EU in 2010.




## Innovation system

Relative strengths of the innovation system are in Innovation-friendly environment, Human resources, and Attractive research systems. Relative weaknesses are in Intellectual assets, Sales impacts, and Employment impacts.

## Structural differences

Notable differences are a smaller share of employment in Manufacturing, a larger share of micro enterprises in turnover, a larger share of foreign controlled enterprises, a lower average R&D spending among Top R&D spending enterprises, a smaller share of enterprise births, higher GDP per capita, a higher growth rate of GDP, a higher growth rate of population, and lower population density.

| | NO | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 4.8 | 5.1 |
| - Manufacturing (NACE C) (%) | 9.0 | 15.6 |
| *of which High and Medium high-tech (%)* | *33.2* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 8.8 | 8.6 |
| - Services (NACE G-N) (%) | 71.4 | 63.6 |
| *of which Knowledge-intensive services (%)* | *67.0* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 6.1 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 24.3 | 17.3 |
| - SMEs (10-249 employees) (%) | 35.5 | 38.0 |
| - Large enterprises (250+ employees) (%) | 39.3 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | 2.29 | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 32.4 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 93.7 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 0.6 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 4.3 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 82.8 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 48,500 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 8.5 | 5.4 |
| Population size, avg 2011-15 (millions) | 5.0 | 505.5 |
| Change in population between 2010 and 2015 (%) | 6.3 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 66.0 | 66.1 |
| Population density, average 2011-15 | 30.9 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 57.0 | 69.3 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*

| Norway | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **101.1** | **115.8** | **14.7** |
| **Human resources** | **125.5** | **178.0** | **22.5** |
| New doctorate graduates | 115.4 | 139.3 | 23.9 |
| Population with tertiary education | 177.0 | 204.6 | 27.6 |
| Lifelong learning | 179.3 | 193.7 | 14.7 |
| **Attractive research systems** | **151.3** | **162.6** | **11.3** |
| International scientific co-publications | 369.0 | 588.0 | 219.0 |
| Most cited publications | 116.8 | 110.0 | -6.8 |
| Foreign doctorate students | 123.6 | 87.0 | -36.6 |
| **Innovation-friendly environment** | **159.6** | **202.3** | **42.7** |
| Broadband penetration | 144.4 | 211.1 | 66.7 |
| Opportunity-driven entrepreneurship | 170.3 | 196.1 | 25.8 |
| **Finance and support** | **116.2** | **107.0** | **-9.2** |
| R&D expenditure in the public sector | 119.5 | 128.4 | 8.9 |
| Venture capital expenditures | 111.9 | 80.0 | -31.9 |
| **Firm investments** | **107.0** | **136.8** | **29.8** |
| R&D expenditure in the business sector | 74.2 | 88.0 | 13.7 |
| Non-R&D innovation expenditures | 0.0 | 87.2 | 87.2 |
| Enterprises providing ICT training | 226.6 | 226.6 | 0.0 |
| **Innovators** | **73.1** | **119.9** | **46.7** |
| SMEs product/process innovations | 73.2 | 125.5 | 52.3 |
| SMEs marketing/organizational innovations | 68.2 | 111.5 | 43.3 |
| SMEs innovating in-house | 78.0 | 122.8 | 44.8 |
| **Linkages** | **120.2** | **118.6** | **-1.6** |
| Innovative SMEs collaborating with others | 119.0 | 178.9 | 59.9 |
| Public-private co-publications | 151.4 | 100.8 | -50.6 |
| Private co-funding of public R&D exp. | 94.4 | 84.6 | -9.8 |
| **Intellectual assets** | **55.3** | **50.0** | **-5.3** |
| PCT patent applications | 87.8 | 85.5 | -2.4 |
| Trademark applications | 45.8 | 42.4 | -3.4 |
| Design applications | 18.7 | 8.1 | -10.6 |
| **Employment impacts** | **96.1** | **106.3** | **10.2** |
| Employment in knowledge-intensive activities | 111.5 | 121.8 | 10.3 |
| Employment fast-growing enterprises | 84.9 | 95.0 | 10.1 |
| **Sales impacts** | **44.4** | **50.4** | **6.0** |
| Medium and high tech product exports | 0.0 | 0.0 | 0.0 |
| Knowledge-intensive services exports | 115.3 | 119.8 | 4.5 |
| Sales of new-to-market/firm innovations | 14.7 | 29.8 | 15.1 |

*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.*

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*Change highlighted in green is positive; change highlighted in light red is negative.*

**Serbia** is a **Moderate Innovator**. Over time, performance has increased by 17.3% relative to that of the EU in 2010.

## Innovation system

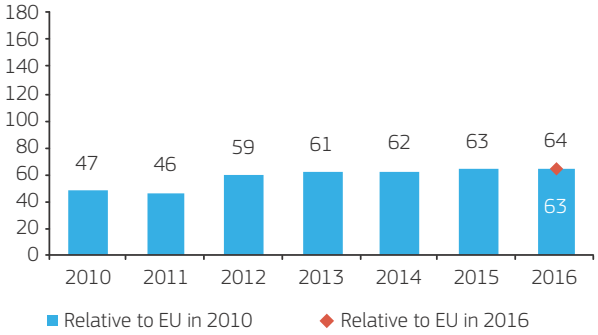
Relative strengths of the innovation system are in Firm investments, Employment impacts, and Innovators. Relative weaknesses are in Intellectual assets, Innovation-friendly environment, and Linkages.

## Structural differences

Notable differences are a smaller share of employment in Services, lower buyer sophistication, lower GDP per capita, a lower growth rate of GDP, a lower and negative growth rate of population, and lower population density.

| | RS | EU |
|---|---|---|
| **Structure of the economy** | | |
| Share of employment in Agriculture, avg 2011-15 | 20.8 | 4.8 |
| Share of employment in Industry, avg 2011-15 | 25.6 | 24.4 |
| Share of employment in Services, avg 2011-15 | 53.6 | 70.2 |
| **Business indicators** | | |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | none | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | none | 165.8 |
| Buyer sophistication 1-7 (best), 2013-14 | 2.4 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 72.3 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 9000 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 1.8 | 5.4 |
| Population size, avg 2011-15 (millions) | 7.2 | 505.5 |
| Change in population between 2010 and 2015 (%) | -2.6 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 67.9 | 66.1 |
| Population density, average 2011-15 | 81.9 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 55.4 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*




| Serbia | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | 46.8 | 64.2 | 17.3 |
| **Human resources** § | 28.1 | 76.8 | 48.7 |
| New doctorate graduates | 26.2 | 71.5 | 45.4 |
| Population with tertiary education | N/A | N/A | N/A |
| Lifelong learning | N/A | N/A | N/A |
| **Attractive research systems** | 30.5 | 44.1 | 13.6 |
| International scientific co-publications | 46.8 | 97.8 | 51.0 |
| Most cited publications | 33.7 | 42.7 | 9.0 |
| Foreign doctorate students | 20.2 | 27.0 | 6.8 |
| **Innovation-friendly environment** | 39.2 | 37.0 | -2.2 |
| Broadband penetration | 33.3 | 33.3 | 0.0 |
| Opportunity-driven entrepreneurship | 43.4 | 39.5 | -3.8 |
| **Finance and support** | 66.9 | 43.9 | -23.0 |
| R&D expenditure in the public sector | 103.9 | 78.7 | -25.2 |
| Venture capital expenditures | 20.2 | 0.0 | -20.2 |
| **Firm investments** | 78.5 | 130.2 | 51.7 |
| R&D expenditure in the business sector | 8.5 | 21.9 | 13.4 |
| Non-R&D innovation expenditures | 116.1 | 280.8 | 164.7 |
| Enterprises providing ICT training | 121.4 | 121.4 | 0.0 |
| **Innovators** | 46.8 | 81.2 | 34.4 |
| SMEs product/process innovations | 27.7 | 70.6 | 42.9 |
| SMEs marketing/organizational innovations | 23.8 | 87.7 | 63.8 |
| SMEs innovating in-house | 89.0 | 85.1 | -3.9 |
| **Linkages** | 31.0 | 42.6 | 11.6 |
| Innovative SMEs collaborating with others | 23.1 | 73.2 | 50.1 |
| Public-private co-publications | 37.4 | 25.8 | -11.6 |
| Private co-funding of public R&D exp. | 32.0 | 32.0 | 0.0 |
| **Intellectual assets** § | 24.1 | 22.7 | -1.4 |
| PCT patent applications | N/A | N/A | N/A |
| Trademark applications | 65.4 | 59.3 | -6.1 |
| Design applications | 0.0 | 1.7 | 1.7 |
| **Employment impacts** § | 71.6 | 94.0 | 22.4 |
| Employment in knowledge-intensive activities | 84.9 | 111.4 | 26.5 |
| Employment fast-growing enterprises | N/A | N/A | N/A |
| **Sales impacts** | 45.4 | 65.3 | 19.9 |
| Medium and high tech product exports | 20.0 | 55.8 | 35.8 |
| Knowledge-intensive services exports | 52.5 | 52.9 | 0.5 |
| Sales of new-to-market/firm innovations | 67.9 | 91.2 | 23.4 |

*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.*

*§ Due to missing data, the relative dimension score does not necessarily reflect that of the indicators.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Switzerland** is **an Innovation Leader**. Over time, performance has increased by 9.2% relative to that of the EU in 2010.

## Innovation system

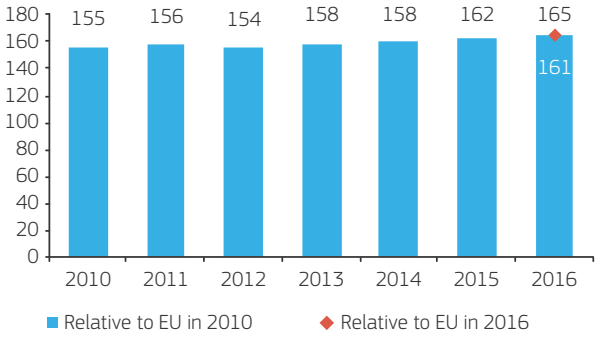
Relative strengths of the innovation system are in Attractive research systems, Human resources, and Firm investments. Relative weaknesses are in Finance and support, Sales impacts, and Employment impacts.

## Structural differences

Notable differences are a smaller share of employment in Agriculture & Mining, a larger share of employment in High and Medium high-tech manufacturing, a smaller share of employment in Public administration, a smaller share of micro enterprises in turnover, a higher number of Top R&D spending enterprises and a higher average R&D spending of these enterprises, a smaller share of enterprise births, higher buyer sophistication, higher GDP per capita, a higher growth rate of GDP, a higher growth rate of population, and higher population density.

| | CH | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 3.5 | 5.1 |
| - Manufacturing (NACE C) (%) | 13.6 | 15.6 |
| *of which High and Medium high-tech (%)* | *45.5* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 7.3 | 8.6 |
| - Services (NACE G-N) (%) | 70.4 | 63.6 |
| *of which Knowledge-intensive services (%)* | *65.6* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 5.3 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro enterprises (0-9 employees) (%) | 8.5 | 17.3 |
| - SMEs (10-249 employees) (%) | n/a | 38.0 |
| - Large enterprises (250+ employees) (%) | n/a | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | n/a | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 98.8 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 444.8 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | 0.2 | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 5.0 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 76.1 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 39,900 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 7.7 | 5.4 |
| Population size, avg 2011-15 (millions) | 8.0 | 505.5 |
| Change in population between 2010 and 2015 (%) | 5.8 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 67.7 | 66.1 |
| Population density, average 2011-15 | 204.8 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 73.8 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*




| Switzerland | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | 155.4 | 164.6 | **9.2** |
| **Human resources** | 217.7 | 242.3 | **24.6** |
| New doctorate graduates | 234.1 | 234.1 | 0.0 |
| Population with tertiary education | 144.7 | 215.8 | 71.1 |
| Lifelong learning | 283.2 | 283.2 | 0.0 |
| **Attractive research systems** | 234.5 | 246.2 | **11.7** |
| International scientific co-publications | 640.4 | 640.2 | 6.9 |
| Most cited publications | 157.5 | 157.2 | -0.3 |
| Foreign doctorate students | 200.1 | 231.4 | 30.9 |
| **Innovation-friendly environment** § | 189.6 | 154.0 | **-35.6** |
| Broadband penetration | N/A | N/A | N/A |
| Opportunity-driven entrepreneurship | 161.7 | 131.4 | -30.3 |
| **Finance and support** | 91.6 | 105.5 | **13.9** |
| R&D expenditure in the public sector | 92.9 | 133.8 | 40.9 |
| Venture capital expenditures | 89.9 | 69.8 | -20.1 |
| **Firm investments** § | 168.8 | 215.8 | **47.0** |
| R&D expenditure in the business sector | 170.4 | 174.7 | 4.3 |
| Non-R&D innovation expenditures | 176.1 | 280.8 | 104.7 |
| Enterprises providing ICT training | N/A | N/A | N/A |
| **Innovators** | 149.8 | 162.9 | **13.2** |
| SMEs product/process innovations | 181.9 | 156.0 | -25.9 |
| SMEs marketing/organizational innovations | 176.6 | 176.6 | 0.0 |
| SMEs innovating in-house | 90.7 | 155.9 | 65.2 |
| **Linkages** | 123.3 | 154.8 | **31.5** |
| Innovative SMEs collaborating with others | 82.2 | 75.7 | -6.5 |
| Public-private co-publications | 206.8 | 206.8 | 0.0 |
| Private co-funding of public R&D exp. | 85.2 | 174.8 | 89.6 |
| **Intellectual assets** | 163.3 | 151.0 | **-12.3** |
| PCT patent applications | 142.3 | 134.2 | -8.1 |
| Trademark applications | 221.8 | 203.3 | -18.4 |
| Design applications | 146.9 | 133.5 | -13.4 |
| **Employment impacts** | 111.7 | 123.6 | **11.9** |
| Employment in knowledge-intensive activities | 186.1 | 214.3 | 28.2 |
| Employment fast-growing enterprises | 60.4 | 60.4 | 0.0 |
| **Sales impacts** | 128.7 | 111.5 | **-17.2** |
| Medium and high tech product exports | 121.3 | 82.1 | -39.2 |
| Knowledge-intensive services exports | 97.3 | 98.1 | 0.8 |
| Sales of new-to-market/firm innovations | 174.5 | 162.5 | -11.7 |

*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.*

*§ Due to missing data, the relative dimension score does not necessarily reflect that of the indicators.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Turkey** is a **Moderate Innovator**. Over time, performance has increased by 13.2% relative to that of the EU in 2010.

## Innovation system

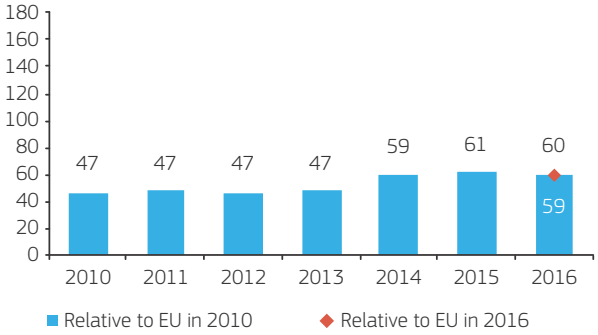
Relative strengths of the innovation system are in Firm investments, Innovation-friendly environment, and Innovators. Relative weaknesses are in Employment impacts, Intellectual assets, and Attractive research systems.

## Structural differences

Notable differences are a larger share of employment in Agriculture & Mining and Manufacturing, a smaller share of employment in High and Medium high-tech manufacturing, Services and Knowledge-intensive services, a lower number of Top R&D spending enterprises and a lower average R&D spending of these enterprises, lower GDP per capita, a higher growth rate of GDP, a higher growth rate of population, and a lower degree of urbanisation.

| | TR | EU |
|---|---|---|
| **Structure of the economy** | | |
| Composition of employment, average 2011-15 | | |
| - Agriculture & Mining (NACE A-B) (%) | 24.0 | 5.1 |
| - Manufacturing (NACE C) (%) | 18.7 | 15.6 |
| *of which High and Medium high-tech (%)* | *16.1* | *36.4* |
| - Utilities and Construction (NACE D-F) (%) | 7.1 | 8.6 |
| - Services (NACE G-N) (%) | 44.4 | 63.6 |
| *of which Knowledge-intensive services (%)* | *39.1* | *58.0* |
| - Public administration, etc. (NACE O-U) (%) | 5.8 | 7.1 |
| **Business indicators** | | |
| Composition of turnover, average 2011-2014 | | |
| - Micro + SMEs (1-249 employees) (%) | 63.8 | 55.4 |
| - Large enterprises (250+ employees) (%) | 36.2 | 44.1 |
| Share of foreign controlled enterprises, 2014 (%) | n/a | 1.18 |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | 1.3 | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | 62.2 | 165.8 |
| Enterprise births (10+ empl.) (%), avg 2012-14 | n/a | 1.5 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.5 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 67.2 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 13,400 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | 40.9 | 5.4 |
| Population size, avg 2011-15 (millions) | 75.7 | 505.5 |
| Change in population between 2010 and 2015 (%) | 7.1 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 67.5 | 66.1 |
| Population density, average 2011-15 | 99.0 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 55.4 | 69.3 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*




| Turkey | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | **46.5** | **59.7** | **13.2** |
| **Human resources** | **16.8** | **45.7** | **29.0** |
| New doctorate graduates | 7.7 | 15.8 | 8.2 |
| Population with tertiary education | 0.0 | 74.3 | 74.3 |
| Lifelong learning | 47.4 | 48.4 | 1.1 |
| **Attractive research systems** | **27.3** | **27.2** | **-0.1** |
| International scientific co-publications | 3.2 | 17.3 | 14.1 |
| Most cited publications | 44.3 | 36.3 | -8.0 |
| Foreign doctorate students | 11.3 | 17.6 | 6.2 |
| **Innovation-friendly environment** | **88.5** | **110.9** | **22.4** |
| Broadband penetration | 133.4 | 177.6 | 22.2 |
| Opportunity-driven entrepreneurship | 41.2 | 63.7 | 22.5 |
| **Finance and support** § | **69.9** | **69.9** | **0.0** |
| R&D expenditure in the public sector | 62.7 | 62.7 | 0.0 |
| Venture capital expenditures | N/A | N/A | N/A |
| **Firm investments** § | **22.9** | **142.1** | **119.2** |
| R&D expenditure in the business sector | 27.0 | 40.8 | 13.7 |
| Non-R&D innovation expenditures | 18.8 | 280.6 | 261.9 |
| Enterprises providing ICT training | N/A | N/A | N/A |
| **Innovators** | **98.4** | **83.9** | **-14.5** |
| SMEs product/process innovations | 75.8 | 84.6 | 8.7 |
| SMEs marketing/organizational innovations | 154.1 | 102.0 | -34.1 |
| SMEs innovating in-house | 82.4 | 64.8 | -17.6 |
| **Linkages** | **65.1** | **62.9** | **-2.2** |
| Innovative SMEs collaborating with others | 40.9 | 51.1 | 10.2 |
| Public-private co-publications | 13.5 | 7.2 | -6.3 |
| Private co-funding of public R&D exp. | 129.4 | 120.5 | -8.9 |
| **Intellectual assets** | **17.3** | **21.5** | **4.2** |
| PCT patent applications | 35.4 | 47.4 | 12.0 |
| Trademark applications | 2.2 | 0.0 | -2.2 |
| Design applications | 4.5 | 3.0 | -1.4 |
| **Employment impacts** § | **0.0** | **9.7** | **9.7** |
| Employment in knowledge-intensive activities | 0.0 | 11.5 | 11.5 |
| Employment fast-growing enterprises | N/A | N/A | N/A |
| **Sales impacts** | **38.1** | **47.8** | **9.7** |
| Medium and high tech product exports | 51.9 | 51.3 | -0.6 |
| Knowledge-intensive services exports | 20.3 | 22.9 | 2.6 |
| Sales of new-to-market/firm innovations | 42.4 | 72.8 | 30.4 |

*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.*

*§ Due to missing data, the relative dimension score does not necessarily reflect that of the indicators.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

**Ukraine** is a **Modest Innovator**. Over time, performance has declined by 4.2% relative to that of the EU in 2010.

## Innovation system

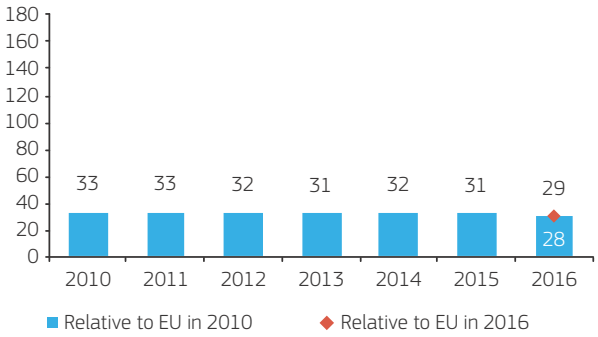
Relative strengths of the innovation system are in Employment impacts, Human resources, and Firm investments. Relative weaknesses are in Linkages, Attractive research systems, and Innovators.

## Structural differences

Notable differences are lower GDP per capita, a lower and negative growth rate of GDP, a lower and negative growth rate of population, and lower population density.

| | UA | EU |
|---|---|---|
| **Structure of the economy** | | |
| Share of employment in Agriculture, avg 2011-15 | 18.0 | 4.8 |
| Share of employment in Industry, avg 2011-15 | 25.4 | 24.4 |
| Share of employment in Services, avg 2011-15 | 56.4 | 70.2 |
| **Business indicators** | | |
| Top R&D spending enterprises | | |
| - average number per 10 mln population, 2011-15 | none | 29.9 |
| - average R&D spending, mln Euros, 2011-15 | none | 165.8 |
| Buyer sophistication 1-7 (best), 2013-14 | 3.4 | 3.6 |
| Ease of starting a business, Doing Business 2017 | 63.9 | 76.5 |
| **Socio-demographic indicators** | | |
| GDP per capita, PPS, avg 2011-13 | 2700 | 25,400 |
| Change in GDP between 2010 and 2015, (%) | -11.0 | 5.4 |
| Population size, avg 2011-15 (millions) | 45.4 | 505.5 |
| Change in population between 2010 and 2015 (%) | -1.6 | 1.1 |
| Population aged 15-64, avg 2011-2015 (%) | 70.1 | 66.1 |
| Population density, average 2011-15 | 78.4 | 116.4 |
| Degree of urbanisation, average 2011-15 (%) | 69.3 | 74.4 |

*Values in green show performance above 120% of EU, values in red show performance below 80% of EU.*




| Ukraine | Performance relative to EU 2010 in | | Change 2010-2016 |
|---|---|---|---|
| | 2010 | 2016 | |
| **SUMMARY INNOVATION INDEX** | 33.1 | 28.9 | -4.2 |
| **Human resources** § | 66.1 | 66.1 | 0.0 |
| New doctorate graduates | 61.5 | 61.5 | 0.0 |
| Population with tertiary education | N/A | N/A | N/A |
| Lifelong learning | N/A | N/A | N/A |
| **Attractive research systems** § | 13.0 | 14.9 | 1.9 |
| International scientific co-publications | 0.7 | 5.6 | 4.9 |
| Most cited publications | 16.6 | 17.8 | 1.2 |
| Foreign doctorate students | N/A | N/A | N/A |
| **Innovation-friendly environment** | N/A | N/A | N/A |
| Broadband penetration | N/A | N/A | N/A |
| Opportunity-driven entrepreneurship | N/A | N/A | N/A |
| **Finance and support** | 23.9 | 19.0 | -4.8 |
| R&D expenditure in the public sector | 41.2 | 32.5 | -8.7 |
| Venture capital expenditures | 2.1 | 2.1 | 0.0 |
| **Firm investments** § | 70.5 | 46.8 | -23.7 |
| R&D expenditure in the business sector | 38.3 | 33.9 | -4.4 |
| Non-R&D innovation expenditures | 116.1 | 66.1 | -50.0 |
| Enterprises providing ICT training | N/A | N/A | N/A |
| **Innovators** | 17.1 | 15.7 | -1.4 |
| SMEs product/process innovations | 0.0 | 0.0 | 0.0 |
| SMEs marketing/organizational innovations | 0.0 | 0.0 | 0.0 |
| SMEs innovating in-house | 51.4 | 47.3 | -4.1 |
| **Linkages** § | 5.7 | 4.6 | -1.0 |
| Innovative SMEs collaborating with others | 5.0 | 3.0 | -2.0 |
| Public-private co-publications | 7.0 | 6.8 | -0.2 |
| Private co-funding of public R&D exp. | N/A | N/A | N/A |
| **Intellectual assets** | 16.8 | 23.6 | 6.8 |
| PCT patent applications | 27.7 | 38.1 | 10.4 |
| Trademark applications | 19.3 | 17.3 | -2.0 |
| Design applications | 0.1 | 8.8 | 8.7 |
| **Employment impacts** § | 69.3 | 77.9 | 8.7 |
| Employment in knowledge-intensive activities | 82.1 | 92.3 | 10.3 |
| Employment fast-growing enterprises | N/A | N/A | N/A |
| **Sales impacts** | 47.0 | 33.1 | -13.9 |
| Medium and high tech product exports | 56.8 | 26.0 | -30.8 |
| Knowledge-intensive services exports | 63.1 | 67.4 | 4.4 |
| Sales of new-to-market/firm innovations | 16.4 | 1.6 | -14.8 |

*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.*

*§ Due to missing data, the relative dimension score does not necessarily reflect that of the indicators.*

*Change highlighted in green is positive; change highlighted in light red is negative.*

# 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 2017 Methodology Report[33]. The methodology used for calculating the Summary Innovation Index is as follows:

## 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 "2016", etc. If data for a year-in-between is 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).

Step 4: Determining Maximum and Minimum scores

The Maximum score is the highest score found for the whole time period within all countries excluding positive outliers. Similarly, the Minimum score is the lowest score found for the whole time 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 performance levels). 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, PCT patent applications, and Trademarks. 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.

| **Latest year missing** | "2016" | "2015" | "2014" | "2013" | "2012" |
|---|---|---|---|---|---|
| Available data | N/A | 45 | 40 | 35 | 30 |
| Use most recent year | **45** | 45 | 40 | 35 | 30 |
| | | | | | |
| **Year-in-between missing** | "2016" | "2015" | "2014" | "2013" | "2012" |
| Available data | 50 | N/A | 40 | 35 | 30 |
| Substitute with previous year | 50 | **40** | 40 | 35 | 30 |
| | | | | | |
| **Beginning-of-period missing** | "2016" | "2015" | "2014" | "2013" | "2012" |
| Available data | 50 | 45 | 40 | 35 | N/A |
| Substitute with next available year | 50 | 45 | 40 | 35 | **35** |

[33] http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards

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 2016. For the definition of the performance groups, only the performance scores relative to the EU in 2016 have been used.

## International benchmark

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

## Performance group membership

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

- *Innovation Leaders* are all countries with a relative performance in 2016 more than 20% above the EU average in 2016;
- *Strong Innovators* are all countries with a relative performance in 2016 between 90% and 120% of the EU average in 2016;
- *Moderate Innovators* are all countries with a relative performance in 2016 between 50% and 90% of the EU average in 2016;
- *Modest Innovators* are all countries with a relative performance in 2016 below 50% of the EU average in 2016.

# 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: http://ec.europa.eu/docsroom/documents/23604.

# 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 (2015) | 1.8 | 1.8 | 1.5 | 1.7 | 3.2 | 2.9 | 1.1 | 2.5 | 1.1 | 1.9 | 1.7 | 1.6 | 1.5 | 0.6 | 0.9 | 1.1 | 1.0 | 1.0 | 0.5 |
| 1.1.2 Population completed tertiary education (2016) | 38.2 | 44.3 | 32.8 | 32.6 | 45.3 | 30.5 | 41.2 | 51.8 | 41.0 | 41.0 | 44.0 | 33.0 | 25.6 | 56.3 | 42.1 | 54.9 | 51.5 | 30.4 | 34.0 |
| 1.1.3 Lifelong learning (2016) | 10.8 | 7.0 | 2.2 | 8.8 | 27.7 | 8.5 | 15.7 | 6.4 | 4.0 | 9.4 | 18.8 | 3.0 | 8.3 | 6.9 | 7.3 | 6.0 | 16.8 | 6.3 | 7.5 |
| Attractive research systems | | | | | | | | | | | | | | | | | | | |
| 1.2.1 International scientific co-publications (2016) | 494 | 1408 | 202 | 688 | 2229 | 778 | 1030 | 1197 | 591 | 701 | 700 | 466 | 596 | 1140 | 264 | 393 | 1715 | 445 | 555 |
| 1.2.2 Scientific publications among top 10% most cited (2014) | 10.6 | 12.6 | 4.0 | 7.0 | 13.4 | 11.4 | 8.0 | 12.1 | 8.9 | 9.7 | 11.2 | 4.5 | 10.2 | 10.2 | 4.1 | 4.0 | 11.6 | 6.2 | 9.5 |
| 1.2.3 Foreign doctorate students (2015) | 25.6 | 42.3 | 5.1 | 14.8 | 32.1 | 9.1 | 8.3 | 23.1 | n/a | 11.9 | 40.1 | 3.2 | 13.2 | 11.4 | 8.8 | 3.9 | 87.0 | 7.2 | 12.4 |
| Innovation-friendly environment | | | | | | | | | | | | | | | | | | | |
| 1.3.1 Broadband penetration (2016) | 13.0 | 23.0 | 10.0 | 10.0 | 31.0 | 12.0 | 12.0 | 15.0 | 2.0 | 20.0 | 9.0 | 6.0 | 5.0 | 3.0 | 22.0 | 21.0 | 21.0 | 12.0 | 12.0 |
| 1.3.2 Opportunity-driven entrepreneurship (2016) | 3.1 | 1.5 | 1.0 | 2.7 | 11.1 | 2.9 | 3.4 | 2.3 | 1.2 | 1.6 | 5.3 | 1.0 | 2.7 | 2.0 | 3.5 | 2.2 | 5.2 | 2.0 | n/a |
| **INVESTMENTS** | | | | | | | | | | | | | | | | | | | |
| Finance and support | | | | | | | | | | | | | | | | | | | |
| 2.1.1 R&D expenditure in the public sector (2015) | 0.71 | 0.68 | 0.25 | 0.88 | 1.15 | 0.93 | 0.78 | 0.33 | 0.63 | 0.57 | 0.74 | 0.42 | 0.56 | 0.30 | 0.47 | 0.76 | 0.64 | 0.35 | 0.39 |
| 2.1.2 Venture capital investments (2015) | 0.063 | 0.072 | 0.015 | 0.013 | 0.059 | 0.049 | 0.136 | 0.086 | 0.001 | 0.043 | 0.083 | 0.054 | 0.022 | 0.071 | 0.098 | 0.081 | 0.047 | 0.055 | 0.000 |
| Firm investments | | | | | | | | | | | | | | | | | | | |
| 2.2.1 R&D expenditure in the business sector (2015) | 1.30 | 1.77 | 0.70 | 1.06 | 1.87 | 1.95 | 0.69 | 1.09 | 0.32 | 0.64 | 1.45 | 0.44 | 0.74 | 0.08 | 0.15 | 0.28 | 0.67 | 1.01 | 0.37 |
| 2.2.2 Non-R&D innovation expenditure (2014) | 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 (2016) | 22.0 | 34.0 | 8.0 | 22.0 | 28.0 | 29.0 | 13.0 | 30.0 | 15.0 | 23.0 | 20.0 | 22.0 | 12.0 | 22.0 | 12.0 | 10.0 | 29.0 | 16.0 | 23.0 |
| **INNOVATION ACTIVITIES** | | | | | | | | | | | | | | | | | | | |
| Innovators | | | | | | | | | | | | | | | | | | | |
| 3.1.1 SMEs with product or process innovations (2014) | 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 (2014) | 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 (2014) | 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 (2014) | 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 (2015) | 28.7 | 61.0 | 1.1 | 10.2 | 132.0 | 45.3 | 1.5 | 23.5 | 7.9 | 11.4 | 32.2 | 5.7 | 15.2 | 7.1 | 0.5 | 0.7 | 8.9 | 23.2 | 4.7 |
| 3.2.3 Private co-funding of public R&D expenditures (2015) | 0.05 | 0.07 | 0.01 | 0.03 | 0.02 | 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 (2014) | 3.70 | 3.35 | 0.65 | 1.08 | 6.14 | 6.35 | 1.36 | 2.49 | 0.55 | 1.57 | 4.17 | 0.63 | 2.17 | 0.80 | 0.31 | 0.80 | 1.91 | 1.32 | 1.38 |
| 3.3.2 Trademark applications (2016) | 7.60 | 7.75 | 9.49 | 5.14 | 11.60 | 9.34 | 14.97 | 5.40 | 4.58 | 9.13 | 5.85 | 4.22 | 8.14 | 41.39 | 7.01 | 6.24 | 38.51 | 3.91 | 40.00 |
| 3.3.3 Design applications (2016) | 4.33 | 2.75 | 7.02 | 2.62 | 7.93 | 6.18 | 3.74 | 1.02 | 1.30 | 3.08 | 2.88 | 0.86 | 6.41 | 3.34 | 1.75 | 1.42 | 12.40 | 0.93 | 21.00 |
| **IMPACTS** | | | | | | | | | | | | | | | | | | | |
| Employment impacts | | | | | | | | | | | | | | | | | | | |
| 4.1.1 Employment in knowledge-intensive activities (2016) | 14.1 | 15.2 | 10.4 | 12.8 | 15.8 | 14.8 | 12.7 | 19.8 | 12.2 | 12.3 | 14.2 | 11.7 | 13.9 | 16.3 | 11.1 | 9.7 | 22.7 | 12.2 | 18.4 |
| 4.1.2 Employment fast-growing firms innovative sectors (2014) | 4.8 | 2.5 | 6.1 | 5.0 | 4.3 | 4.5 | 3.0 | 8.8 | n/a | 3.5 | 4.3 | 2.8 | 2.7 | 0.8 | 4.8 | 4.0 | 4.2 | 7.6 | 7.3 |
| Economic effects | | | | | | | | | | | | | | | | | | | |
| 4.2.1 Medium & high tech product exports (2016) | 56.2 | 48.5 | 31.0 | 64.1 | 47.8 | 67.6 | 42.7 | 52.5 | 22.7 | 47.8 | 58.6 | 38.0 | 52.1 | 43.2 | 34.7 | 34.5 | 52.2 | 69.6 | 56.7 |
| 4.2.2 Knowledge-intensive services exports (2015) | 69.3 | 67.9 | 41.4 | 42.0 | 74.8 | 74.7 | 45.4 | 94.0 | 44.4 | 43.3 | 67.0 | 19.0 | 50.4 | 68.4 | 53.0 | 21.0 | 91.2 | 47.3 | 28.8 |
| 4.2.3 Sales of new-to-market/new-to-firm innovations (2014) | 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 | MK | NO | RS | CH | TR | UA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FRAMEWORK CONDITIONS** | | | | | | | | | | | | | | | | | | | |
| Human resources | | | | | | | | | | | | | | | | | | | |
| 1.1.1 New doctorate graduates (2015) | 1.8 | 2.3 | 1.9 | 0.6 | 1.9 | 1.5 | 3.5 | 2.2 | 2.9 | 2.9 | 3.0 | 0.9 | 1.5 | 0.6 | 2.0 | 1.1 | 3.4 | 0.4 | 1.0 |
| 1.1.2 Population completed tertiary education (2016) | 38.2 | 45.2 | 39.7 | 43.5 | 35.0 | 24.8 | 43.0 | 33.4 | 40.7 | 47.3 | 47.2 | 43.4 | n/a | 32.2 | 49.2 | n/a | 50.9 | 29.4 | n/a |
| 1.1.3 Lifelong learning (2016) | 10.8 | 18.8 | 14.9 | 3.7 | 9.6 | 1.2 | 11.6 | 2.9 | 26.4 | 29.6 | 14.4 | 24.7 | n/a | 2.9 | 19.6 | n/a | 32.9 | 5.8 | n/a |
| Attractive research systems | | | | | | | | | | | | | | | | | | | |
| 1.2.1 International scientific co-publications (2016) | 494 | 1569 | 1336 | 277 | 873 | 182 | 1128 | 408 | 1576 | 1939 | 1151 | 2911 | 922 | 147 | 1760 | 329 | 2798 | 94 | 60 |
| 1.2.2 Scientific publications among top 10% most cited (2014) | 10.6 | 14.3 | 11.7 | 5.0 | 9.0 | 5.1 | 8.6 | 5.5 | 10.8 | 11.7 | 14.5 | 9.9 | 9.7 | 4.1 | 11.1 | 5.3 | 15.2 | 4.8 | 3.2 |
| 1.2.3 Foreign doctorate students (2015) | 25.6 | 36.6 | 27.0 | 1.9 | 21.2 | 2.3 | 8.5 | 9.1 | 19.9 | 32.7 | 42.9 | 33.4 | n/a | 4.4 | 20.5 | 6.5 | 54.3 | 4.3 | n/a |
| Innovation-friendly environment | | | | | | | | | | | | | | | | | | | |
| 1.3.1 Broadband penetration (2016) | 13.0 | 22.0 | 12.0 | 11.0 | 25.0 | 13.0 | 16.0 | 9.0 | 26.0 | 32.0 | 10.0 | n/a | n/a | 11.0 | 19.0 | 3.0 | n/a | 16.0 | n/a |
| 1.3.2 Opportunity-driven entrepreneurship (2016) | 3.1 | 3.9 | 3.2 | 1.6 | 2.0 | 1.5 | 2.1 | 1.4 | 6.0 | 8.2 | 3.3 | 10.0 | 2.9 | 0.6 | 12.9 | 1.1 | 5.2 | 1.9 | n/a |
| **INVESTMENTS** | | | | | | | | | | | | | | | | | | | |
| Finance and support | | | | | | | | | | | | | | | | | | | |
| 2.1.1 R&D expenditure in the public sector (2015) | 0.71 | 0.90 | 0.89 | 0.54 | 0.66 | 0.28 | 0.53 | 0.85 | 0.95 | 0.99 | 0.56 | 0.78 | 0.59 | 0.19 | 0.88 | 0.60 | 0.91 | 0.51 | 0.34 |
| 2.1.2 Venture capital investments (2015) | 0.063 | 0.096 | 0.051 | 0.029 | 0.069 | 0.013 | 0.007 | 0.008 | 0.107 | 0.081 | 0.103 | n/a | 0.009 | 0.000 | 0.077 | 0.000 | 0.067 | n/a | 0.002 |
| Firm investments | | | | | | | | | | | | | | | | | | | |
| 2.2.1 R&D expenditure in the business sector (2015) | 1.30 | 1.12 | 2.18 | 0.47 | 0.60 | 0.21 | 1.69 | 0.33 | 1.94 | 2.27 | 1.12 | 1.42 | 3.47 | 0.03 | 1.05 | 0.28 | 2.06 | 0.50 | 0.42 |
| 2.2.2 Non-R&D innovation expenditure (2014) | 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 | 0.90 | 0.63 | 1.79 | 2.01 | 2.70 | 0.50 |
| 2.2.3 Enterprises providing ICT training (2016) | 22.0 | 22.0 | 37.0 | 12.0 | 23.0 | 5.0 | 27.0 | 20.0 | 34.0 | 25.0 | 28.0 | 25.0 | n/a | 17.0 | 42.0 | 22.0 | n/a | n/a | n/a |
| **INNOVATION ACTIVITIES** | | | | | | | | | | | | | | | | | | | |
| Innovators | | | | | | | | | | | | | | | | | | | |
| 3.1.1 SMEs with product or process innovations (2014) | 30.9 | 42.9 | 40.7 | 13.3 | 42.1 | 4.9 | 28.7 | 16.7 | 44.1 | 40.4 | 32.6 | 44.3 | 22.2 | 39.2 | 41.1 | 28.3 | 48.1 | 31.5 | 7.4 |
| 3.1.2 SMEs with marketing or organisational innovations (2014) | 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 | 30.8 | 43.3 | 36.4 | 62.0 | 40.5 | 10.5 |
| 3.1.3 SMEs innovating in-house (2014) | 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 | 11.3 | 35.2 | 27.0 | 42.5 | 22.5 | 18.7 |
| Linkages | | | | | | | | | | | | | | | | | | | |
| 3.2.1 Innovative SMEs collaborating with others (2014) | 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 | 9.6 | 19.0 | 8.5 | 8.7 | 6.3 | 1.5 |
| 3.2.2 Public-private co-publications (2015) | 28.7 | 72.7 | 57.6 | 3.7 | 6.7 | 2.3 | 41.2 | 10.0 | 63.1 | 88.7 | 43.2 | 170.2 | 21.4 | 1.0 | 37.5 | 4.4 | 183.1 | 1.2 | 1.1 |
| 3.2.3 Private co-funding of public R&D expenditures (2015) | 0.05 | 0.08 | 0.04 | 0.02 | 0.01 | 0.03 | 0.05 | 0.04 | 0.05 | 0.04 | 0.03 | 0.03 | 0.05 | n/a | 0.04 | 0.02 | 0.09 | 0.06 | n/a |
| Intellectual assets | | | | | | | | | | | | | | | | | | | |
| 3.3.1 PCT patent applications (2014) | 3.70 | 5.91 | 4.95 | 0.58 | 0.70 | 0.26 | 3.00 | 0.45 | 8.29 | 9.58 | 3.25 | 3.24 | 12.01 | 0.08 | 2.71 | n/a | 6.68 | 0.84 | 0.54 |
| 3.3.2 Trademark applications (2016) | 7.60 | 9.58 | 12.91 | 5.25 | 7.21 | 2.37 | 10.21 | 4.30 | 11.44 | 10.75 | 7.32 | 9.32 | 18.72 | 2.29 | 2.93 | 3.90 | 17.76 | 1.11 | 1.75 |
| 3.3.3 Design applications (2016) | 4.33 | 3.65 | 7.10 | 5.90 | 4.47 | 0.81 | 2.97 | 1.06 | 4.50 | 4.71 | 3.03 | 0.13 | 1.73 | 0.04 | 0.37 | 0.08 | 6.15 | 0.14 | 0.41 |
| **IMPACTS** | | | | | | | | | | | | | | | | | | | |
| Employment impacts | | | | | | | | | | | | | | | | | | | |
| 4.1.1 Employment in knowledge-intensive activities (2016) | 14.1 | 17.5 | 14.6 | 10.0 | 10.9 | 7.2 | 13.7 | 10.0 | 15.7 | 18.4 | 18.4 | 19.8 | 26.9 | 6.5 | 15.2 | 14.4 | 22.1 | 6.6 | 12.9 |
| 4.1.2 Employment fast-growing firms innovative sectors (2014) | 4.8 | 5.5 | 2.9 | 5.5 | 3.7 | 2.8 | 3.0 | 7.4 | 2.8 | 6.0 | 6.9 | n/a | n/a | n/a | 4.8 | n/a | 3.3 | n/a | n/a |
| Economic effects | | | | | | | | | | | | | | | | | | | |
| 4.2.1 Medium & high tech product exports (2016) | 56.2 | 48.5 | 57.6 | 49.4 | 36.7 | 52.8 | 56.0 | 66.5 | 44.6 | 54.7 | 54.8 | 10.6 | 53.7 | 56.9 | 17.0 | 39.1 | 48.6 | 37.5 | 28.3 |
| 4.2.2 Knowledge-intensive services exports (2015) | 69.3 | 76.9 | 44.4 | 39.6 | 44.4 | 44.7 | 34.8 | 34.8 | 62.4 | 75.2 | 82.9 | 66.6 | 70.8 | 36.7 | 76.8 | 43.8 | 66.1 | 29.0 | 51.0 |
| 4.2.3 Sales of new-to-market/new-to-firm innovations (2014) | 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 | 9.90 | 6.16 | 12.38 | 19.62 | 10.51 | 3.30 |

# Annex D: Performance change

Performance change is measured between the most recent year (as shown in Annex C) and the situation six years earlier.

| | 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 | 26.7 | 29.7 | 67.6 | 21.3 | 118.7 | 19.5 | 14.0 | 70.4 | 25.0 | 70.4 | 15.1 | 44.1 | -5.5 | 27.0 | 23.7 | 9.1 | 16.3 | 4.6 | 13.5 |
| 1.1.2 Population completed tertiary education | 32.2 | 3.3 | 34.9 | 65.8 | 50.7 | 29.6 | 19.7 | 23.0 | 68.4 | 4.6 | 8.6 | 47.4 | 31.6 | 44.7 | 48.7 | 56.6 | 48.0 | 28.3 | 63.8 |
| 1.1.3 Lifelong learning | 1.1 | -4.2 | 6.3 | -12.6 | 0.0 | 7.4 | 49.5 | -6.3 | 7.4 | -7.4 | 4.2 | 0.0 | 22.1 | -12.6 | 20.0 | 16.8 | -12.6 | -8.4 | 13.7 |
| Attractive research systems | | | | | | | | | | | | | | | | | | | |
| 1.2.1 International scientific co-publications | 54 | 144 | 15 | 89 | 222 | 77 | 163 | 133 | 67 | 91 | 63 | 59 | 70 | 173 | 54 | 71 | 292 | 50 | 120 |
| 1.2.2 Scientific publications among top 10% most cited | 3.6 | 5.8 | -1.7 | 6.9 | -7.3 | 2.8 | 22.8 | 12.5 | 3.1 | 9.3 | 7.3 | 13.0 | 10.4 | 46.1 | 8.3 | -29.5 | 32.6 | -10.5 | 34.8 |
| 1.2.3 Foreign doctorate students | 8.6 | 45.6 | -2.5 | 19.5 | 53.1 | -9.0 | 13.0 | -60.1 | n/a | -43.2 | -3.8 | 2.6 | 21.0 | 8.1 | 34.6 | 12.1 | 0.0 | 0.5 | 12.5 |
| Innovation-friendly environment | | | | | | | | | | | | | | | | | | | |
| 1.3.1 Broadband penetration | 44.4 | 66.7 | 22.2 | 22.2 | 0.0 | 33.3 | 44.4 | 55.6 | 0.0 | 111.1 | 0.0 | 55.6 | 0.0 | 33.3 | 44.4 | 55.6 | 88.9 | 33.3 | -11.1 |
| 1.3.2 Opportunity-driven entrepreneurship | -7.0 | -82.8 | 4.5 | 14.1 | 14.8 | 30.1 | 14.9 | 12.5 | -10.2 | -23.7 | 14.8 | -18.1 | -27.6 | 0.0 | 32.4 | 15.3 | -65.9 | 1.3 | n/a |
| **INVESTMENTS** | | | | | | | | | | | | | | | | | | | |
| Finance and support | | | | | | | | | | | | | | | | | | | |
| 2.1.1 R&D expenditure in the public sector | -1.8 | 1.8 | -16.0 | 56.9 | 24.9 | 8.9 | 7.1 | -32.0 | 42.6 | -14.2 | -5.3 | -14.2 | 5.3 | 0.0 | 32.0 | 24.9 | 39.1 | -21.3 | 35.5 |
| 2.1.2 Venture capital investments | -34.6 | -90.9 | -77.8 | -155.7 | -57.3 | -13.3 | 97.5 | -80.9 | -9.0 | -60.1 | -14.9 | 36.6 | -23.2 | -15.2 | 42.3 | 77.2 | -151.7 | 17.5 | -11.3 |
| Firm investments | | | | | | | | | | | | | | | | | | | |
| 2.2.1 R&D expenditure in the business sector | 9.4 | 39.5 | 47.2 | 28.3 | -23.2 | 9.4 | 6.0 | -0.9 | 7.7 | -5.2 | 7.7 | 8.6 | 7.7 | -0.9 | -0.9 | 6.9 | -3.4 | 30.9 | 3.4 |
| 2.2.2 Non-R&D innovation expenditure | 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 | 21.4 | 28.6 | -42.9 | 0.0 | 0.0 | 35.7 | 7.1 | 14.3 | 0.0 | 50.0 | 0.0 | -42.9 | 7.1 | -42.9 | 14.3 | 0.0 | 57.1 | 14.3 | -7.1 |
| **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 | -17.6 | 3.7 | -9.0 | -70.0 | -0.1 | -44.8 | -66.3 | 38.1 | -38.8 | -16.8 | 10.8 | -5.6 | -20.9 | -56.5 | 17.5 | 9.0 | 4.9 | -18.4 | 17.9 |
| 3.1.3 SMEs innovating in-house | -6.7 | -2.2 | -27.0 | -7.3 | -57.5 | -37.1 | -82.9 | -29.2 | -9.4 | -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 | -13.5 | -3.1 | -17.6 | -34.0 | -4.0 | -12.2 | -68.0 | -2.3 | -14.6 | -16.5 | -8.1 | -47.4 | -21.5 | -28.4 | -20.3 | -36.7 | -50.4 | -0.4 | -0.9 |
| 3.2.3 Private co-funding of public R&D expenditures | -1.3 | 5.4 | -14.6 | 29.0 | -20.4 | 0.0 | 15.7 | -10.0 | 10.6 | -30.6 | 2.9 | -12.7 | 0.6 | -6.0 | 43.4 | -3.9 | 1.1 | -70.4 | -1.4 |
| Intellectual assets | | | | | | | | | | | | | | | | | | | |
| 3.3.1 PCT patent applications | -0.2 | -1.3 | 12.6 | 2.9 | -10.2 | -5.8 | -11.3 | -4.4 | 5.3 | 4.9 | 3.4 | -1.3 | 3.2 | 11.8 | -16.1 | 7.9 | 4.4 | -0.9 | 3.4 |
| 3.3.2 Trademark applications | 9.7 | -1.5 | 24.4 | 13.2 | 17.3 | -6.3 | 64.0 | -11.8 | 49.2 | 20.1 | -2.2 | 13.7 | 20.4 | 80.6 | -2.8 | 36.0 | 0.0 | 7.2 | 77.4 |
| 3.3.3 Design applications | -6.0 | -21.4 | 115.5 | 6.0 | 29.2 | -30.1 | 34.4 | -21.3 | 18.3 | -8.1 | -21.6 | 15.6 | -2.6 | 45.7 | -26.9 | 17.9 | 74.3 | -1.3 | 197.1 |
| **IMPACTS** | | | | | | | | | | | | | | | | | | | |
| Employment impacts | | | | | | | | | | | | | | | | | | | |
| 4.1.1 Employment in knowledge-intensive activities | 7.7 | 5.1 | 24.4 | 6.4 | 0.0 | -7.7 | 37.2 | 3.8 | 15.4 | 6.4 | 2.6 | 21.8 | 2.6 | 24.4 | 20.5 | 12.8 | -2.6 | -6.4 | 30.8 |
| 4.1.2 Employment fast-growing firms innovative sectors | -5.4 | 1.4 | -0.2 | -39.9 | -50.2 | -30.4 | 8.6 | 26.1 | n/a | 6.5 | -18.9 | 31.3 | -5.6 | -11.7 | 35.4 | -9.7 | 25.5 | 2.5 | 32.2 |
| Economic effects | | | | | | | | | | | | | | | | | | | |
| 4.2.1 Medium & high tech product exports | 2.8 | -5.1 | 13.7 | 4.6 | 16.4 | 7.4 | 23.9 | 1.7 | -10.4 | -4.1 | 0.5 | -10.6 | 0.8 | -0.9 | 5.4 | 5.9 | -22.5 | -3.3 | -3.8 |
| 4.2.2 Knowledge-intensive services exports | 4.6 | 0.2 | 29.4 | 8.2 | -7.5 | -3.3 | -1.5 | 0.0 | -33.9 | 0.0 | 8.4 | 2.3 | -1.8 | -1.2 | -2.3 | 6.4 | 3.4 | -3.0 | 0.0 |
| 4.2.3 Sales of new-to-market/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 |

| | 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 | 26.7 | 43.1 | -15.5 | -13.2 | -69.0 | -3.6 | 134.1 | 11.4 | -1.7 | -14.5 | 63.7 | 15.4 | 10.5 | 17.7 | 23.9 | 45.4 | 0.0 | 8.2 | 0.0 |
| 1.1.2 Population completed tertiary education | 32.2 | 32.2 | 125.0 | 42.1 | 62.5 | 27.0 | 77.0 | 61.8 | 9.9 | 32.9 | 36.8 | 47.4 | n/a | 68.4 | 27.6 | n/a | 71.1 | 74.3 | n/a |
| 1.1.3 Lifelong learning | 1.1 | 9.5 | 11.6 | -6.3 | -20.0 | -2.1 | -50.5 | -12.6 | 35.8 | 35.8 | -60.0 | -7.4 | n/a | -6.3 | 14.7 | n/a | 0.0 | 1.1 | n/a |
| Attractive research systems | | | | | | | | | | | | | | | | | | | |
| 1.2.1 International scientific co-publications | 54 | 179 | 153 | 35 | 139 | 24 | 142 | 39 | 188 | 233 | 135 | 0 | 67 | 23 | 219 | 51 | 7 | 14 | 5 |
| 1.2.2 Scientific publications among top 10% most cited | 3.6 | -1.2 | 3.6 | 12.6 | 0.8 | 9.0 | 14.1 | -2.2 | 6.3 | 7.1 | 5.8 | 4.9 | -2.4 | 5.7 | -6.8 | 9.0 | -0.3 | -8.0 | 1.2 |
| 1.2.3 Foreign doctorate students | 8.6 | -8.9 | -2.1 | -2.0 | 38.4 | -3.4 | -0.1 | 8.1 | 45.1 | 29.2 | -19.7 | 44.3 | n/a | 13.4 | -36.6 | 6.8 | 30.9 | 6.2 | n/a |
| Innovation-friendly environment | | | | | | | | | | | | | | | | | | | |
| 1.3.1 Broadband penetration | 44.4 | 77.8 | 0.0 | 44.4 | 133.3 | 22.2 | 33.3 | 0.0 | 44.4 | 33.3 | 22.2 | n/a | n/a | 44.4 | 66.7 | 0.0 | n/a | 22.2 | n/a |
| 1.3.2 Opportunity-driven entrepreneurship | -7.0 | -50.4 | -86.5 | 35.0 | -8.2 | 9.7 | -64.6 | 5.9 | 38.6 | 40.9 | -0.3 | 3.9 | 15.4 | 14.7 | 25.8 | -3.8 | -30.3 | 22.5 | n/a |
| **INVESTMENTS** | | | | | | | | | | | | | | | | | | | |
| Finance and support | | | | | | | | | | | | | | | | | | | |
| 2.1.1 R&D expenditure in the public sector | -1.8 | 10.7 | 12.4 | 10.7 | -3.6 | -5.3 | -19.5 | 101.3 | -17.8 | -1.8 | -14.2 | 0.0 | -5.7 | 5.0 | 8.9 | -25.2 | 40.9 | 0.0 | -8.7 |
| 2.1.2 Venture capital investments | -34.6 | -24.4 | 9.7 | -1.5 | -1.0 | -71.5 | 0.9 | 3.1 | -54.1 | -97.0 | -66.4 | n/a | 2.2 | 0.0 | -31.9 | -20.2 | -20.1 | n/a | 0.0 |
| Firm investments | | | | | | | | | | | | | | | | | | | |
| 2.2.1 R&D expenditure in the business sector | 9.4 | 1.7 | 34.3 | 24.0 | -12.9 | 2.6 | -8.6 | 12.0 | -53.2 | -15.5 | 4.3 | 37.8 | 0.0 | -0.7 | 13.7 | 13.4 | 4.3 | 13.7 | -4.4 |
| 2.2.2 Non-R&D innovation expenditure | 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 | 21.4 | 42.9 | 57.1 | 14.3 | 0.0 | 0.0 | 0.0 | -35.7 | -21.4 | 14.3 | 0.0 | -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 | -10.1 | -10.0 | 9.7 | -0.8 | 24.0 | -42.5 | -37.9 | 0.0 | 52.3 | 42.9 | -25.9 | 8.7 | 0.0 |
| 3.1.2 SMEs with marketing or organisational innovations | -17.6 | 13.5 | 11.4 | -25.3 | -21.0 | -50.8 | -21.6 | -20.5 | 20.1 | -5.7 | 50.1 | -10.2 | -59.3 | 0.0 | 43.3 | 63.8 | 0.0 | -34.1 | 0.0 |
| 3.1.3 SMEs innovating in-house | -6.7 | 40.1 | 2.7 | -24.8 | -35.6 | -38.0 | 1.3 | -4.7 | -1.2 | -8.9 | 0.0 | n/a | -32.9 | 0.0 | 44.8 | -3.9 | 65.2 | -17.6 | -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 | 0.0 | 59.9 | 50.1 | -6.5 | 10.2 | -2.0 |
| 3.2.2 Public-private co-publications | -13.5 | -16.9 | -2.2 | 3.5 | -10.1 | -24.3 | -38.7 | -15.6 | -29.9 | -25.3 | -17.9 | 0.0 | -29.7 | 5.3 | -50.6 | -11.6 | 0.0 | -6.3 | -0.2 |
| 3.2.3 Private co-funding of public R&D expenditures | -1.3 | -16.9 | -2.8 | -7.6 | 6.7 | -36.4 | -20.0 | 21.9 | -86.6 | -15.1 | 3.1 | -37.0 | -14.6 | n/a | -9.8 | 0.0 | 89.6 | -8.9 | n/a |
| Intellectual assets | | | | | | | | | | | | | | | | | | | |
| 3.3.1 PCT patent applications | -0.2 | -1.2 | 6.0 | 8.3 | 2.3 | 5.6 | -0.2 | 4.4 | -7.3 | 0.0 | -0.8 | 10.3 | 0.0 | -8.1 | -2.4 | n/a | -8.1 | 12.0 | 10.4 |
| 3.3.2 Trademark applications | 9.7 | 2.7 | -7.0 | 27.9 | 28.8 | 14.8 | 4.1 | 17.6 | 37.3 | 19.0 | 16.6 | 22.3 | 2.8 | 14.5 | -3.4 | -6.1 | -18.4 | -2.2 | -2.0 |
| 3.3.3 Design applications | -6.0 | -7.3 | -24.0 | 35.6 | -3.7 | 9.0 | 4.6 | -7.6 | -2.1 | -4.3 | 8.0 | -16.9 | 15.9 | 0.3 | -10.6 | 1.7 | -13.4 | -1.4 | 8.7 |
| **IMPACTS** | | | | | | | | | | | | | | | | | | | |
| Employment impacts | | | | | | | | | | | | | | | | | | | |
| 4.1.1 Employment in knowledge-intensive activities | 7.7 | 5.1 | 2.6 | 12.8 | 23.1 | 15.4 | 3.8 | -5.1 | 6.4 | 19.2 | 15.4 | 21.8 | 0.0 | -9.0 | 10.3 | 26.5 | 28.2 | 11.5 | 10.3 |
| 4.1.2 Employment fast-growing firms innovative sectors | -5.4 | 5.9 | 0.2 | -16.7 | 15.5 | 16.4 | 2.3 | -7.9 | -12.8 | -12.4 | 8.1 | n/a | n/a | n/a | 10.1 | n/a | 0.0 | n/a | n/a |
| Economic effects | | | | | | | | | | | | | | | | | | | |
| 4.2.1 Medium & high tech product exports | 2.8 | 13.6 | 9.0 | -9.1 | -0.5 | 6.4 | -5.0 | 12.8 | -17.9 | -1.7 | -4.5 | 0.0 | 0.9 | 71.9 | 0.0 | 35.8 | -39.2 | -0.6 | -30.8 |
| 4.2.2 Knowledge-intensive services exports | 4.6 | 3.3 | -1.5 | -0.7 | 2.2 | -1.3 | 2.9 | -1.1 | 0.0 | 5.8 | -0.2 | 2.8 | 0.6 | -3.8 | 4.5 | 0.5 | 0.8 | 2.6 | 4.4 |
| 4.2.3 Sales of new-to-market/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 | 0.0 | 15.1 | 23.4 | -11.7 | 30.4 | -14.8 |

# Annex E: Definitions of indicators

| INDICATOR | DEFINITION NUMERATOR | DEFINITION DENOMINATOR | MOST RECENT YEAR FOR WHICH DATA ARE AVAILABLE | INTERPRETATION |
|---|---|---|---|---|
| | Source | Source | | |
| 1.1.1 New doctorate graduates per 1000 population aged 25-34 | Number of doctorate graduates<br>Eurostat | Population between and including 25 and 34 years<br>Eurostat | 2015 | 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<br>Eurostat | Population between and including 25 and 34 years<br>Eurostat | 2016 | 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). The reference period for the participation in education and training is the four weeks preceding the interview as is usual in the LFS.<br>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<br>Eurostat | 2016 | 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)<br>Web of Science * | Total population<br>Eurostat | 2016 | 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<br>Web of Science * | Total number of scientific publications<br>Web of Science * | 2014 | 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<br>Eurostat | Total number of doctorate students<br>Eurostat | 2015 | The share of foreign doctorate students reflects the mobility of students as an effective way of diffusing knowledge. Attracting high-skilled foreign doctorate students will secure a continuous supply of researchers. |

| INDICATOR | DEFINITION NUMERATOR | DEFINITION DENOMINATOR | MOST RECENT YEAR FOR WHICH DATA ARE AVAILABLE | INTERPRETATION |
|---|---|---|---|---|
| | Source | Source | | |
| 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<br>Eurostat, Community Survey of ICT Usage and E-commerce in Enterprises | Total number of enterprises<br>Eurostat, Community Survey of ICT Usage and E-commerce in Enterprises | 2016 | Realising Europe's full e-potential depends on creating the conditions for electronic commerce and the Internet to flourish. This indicator captures the relative use of this e-potential by the share of enterprises that have access to fast broadband. |
| 1.3.2 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.<br>Global Entrepreneurship Monitor (GEM) | | 2016 | 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.<br>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.<br>GEM has constructed the Motivational index to measure the relative degree of improvement-driven entrepreneurship.<br>Comment: Three-year averages have been used |
| 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)<br>Eurostat | Gross Domestic Product<br>Eurostat | 2015 | 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 investment 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.<br>Invest Europe | Gross Domestic Product<br>Eurostat | 2015 | 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.<br>Comment: Three-year averages have been used |
| 2.2.1 R&D expenditure in the business sector (percentage of GDP) | All R&D expenditures in the business sector (BERD)<br>Eurostat | Gross Domestic Product<br>Eurostat | 2015 | 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. |

| INDICATOR | DEFINITION NUMERATOR | DEFINITION DENOMINATOR | MOST RECENT YEAR FOR WHICH DATA ARE AVAILABLE | INTERPRETATION |
|---|---|---|---|---|
| | Source | Source | | |
| 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<br>Eurostat (Community Innovation Survey) | Total turnover for all enterprises<br>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. |
| 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<br>Eurostat, Community Survey of ICT Usage and E-commerce in Enterprises | Total number of enterprises<br>Eurostat, Community Survey of ICT Usage and E-commerce in Enterprises | 2016 | 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 SMEs who introduced a new product or a new process to one of their markets<br>Eurostat (Community Innovation Survey) | Total number of SMEs<br>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 SMEs who introduced a new marketing innovation or organisational innovation to one of their markets<br>Eurostat (Community Innovation Survey) | Total number of SMEs<br>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 SMEs with in-house innovation activities. Innovative enterprises are defined as enterprises which have introduced new products or processes either in-house or in combination with other firms<br>Eurostat (Community Innovation Survey) | Total number of SMEs<br>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. |
| 3.2.1 Innovative SMEs collaborating with others (percentage of SMEs) | Number of SMEs 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<br>Eurostat (Community Innovation Survey) | Total number of SMEs<br>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/countries in which the business companies or other private sector organisations are located.<br>Web of Science * | Total population<br>Eurostat | 2015 | This indicator captures public-private research linkages and active collaboration activities between business sector researchers and public sector researchers resulting in academic publications. |

| INDICATOR | DEFINITION NUMERATOR | DEFINITION DENOMINATOR | MOST RECENT YEAR FOR WHICH DATA ARE AVAILABLE | INTERPRETATION |
|---|---|---|---|---|
| | Source | Source | | |
| 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; both GOVERD and HERD according to Frascati Manual definitions<br>Eurostat, OECD | Gross Domestic Product<br>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.<br>OECD | Gross Domestic Product in Purchasing Power Standard<br>Eurostat | 2014 | The capacity of firms to develop new products will determine their competitive advantage. One indicator 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")<br>European Union Intellectual Property Office (EUIPO), World Intellectual Property Office (WIPO) | Gross Domestic Product in Purchasing Power Standard<br>Eurostat | 2015 | 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.<br>*Comment: two-year averages have been used* |
| 3.3.3 Designs applications per billion GDP (in PPS) | Number of individual designs applied for at EUIPO<br>European Union Intellectual Property Office (EUIPO) | Gross Domestic Product in Purchasing Power Standard<br>Eurostat | 2015 | 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.<br>*Comment: two-year averages have been used* |
| 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)<br>Eurostat | Total employment<br>Eurostat | 2016 | 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. |

| INDICATOR | DEFINITION NUMERATOR | DEFINITION DENOMINATOR | MOST RECENT YEAR FOR WHICH DATA ARE AVAILABLE | INTERPRETATION |
|---|---|---|---|---|
| | Source | Source | | |
| 4.1.2 Employment in fast-growing enterprises (percentage of total employment) | Number of employees in high-growth enterprises in 50% 'most innovative' industries[34] Eurostat ** | Total employment for enterprises with 10 or more employees Eurostat | 2014 | 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 | 2015 | The indicator measures the technological competitiveness of the EU, i.e. the ability to commercialise the results of research and development (R&D) and innovation in international markets. It also reflects product specialisation by country. Creating, exploiting and commercialising new technologies are vital for the competitiveness of a country in the modern economy. Medium and high technology products are key drivers for economic growth, productivity and welfare, and are generally a source of high value added and well-paid employment. |
| 4.2.2 Knowledge-intensive services exports as percentage of total services exports | Exports of knowledge-intensive services is defined as the sum of credits in EBOPS 2010 (Extended Balance of Payments Services Classification) items SC1, SC2, SC3A, SF, SG, SH, SI, SJ and SK1[35] Eurostat ** | Total value of services exports (S) Eurostat | 2015 | 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). |

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

** Calculations by European Commission (Joint Research Centre). More details on the definitions and calculations are provided in the EIS 2017 Methodology Report.

[34] 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).

[35] 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 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2016 |
| EU28 | 0.493 | 0.496 | 0.489 | 0.495 | 0.489 | 0.497 | 0.503 | 100.0 | 100.4 | 99.2 | 100.3 | 99.2 | 100.7 | 102.0 | 100.0 |
| | | | | | | | | | | | | | | | |
| BE | 0.590 | 0.588 | 0.587 | 0.582 | 0.583 | 0.584 | 0.597 | 119.6 | 119.1 | 119.1 | 117.9 | 118.2 | 118.3 | 120.9 | 118.6 |
| BG | 0.234 | 0.245 | 0.199 | 0.223 | 0.223 | 0.227 | 0.234 | 47.4 | 49.7 | 40.4 | 45.2 | 45.2 | 46.0 | 47.5 | 46.6 |
| CZ | 0.434 | 0.439 | 0.423 | 0.421 | 0.412 | 0.421 | 0.416 | 87.9 | 89.1 | 85.8 | 85.3 | 83.4 | 85.3 | 84.4 | 82.7 |
| DK | 0.688 | 0.693 | 0.713 | 0.718 | 0.708 | 0.691 | 0.675 | 139.5 | 140.6 | 144.6 | 145.6 | 143.5 | 140.1 | 136.7 | 134.1 |
| DE | 0.627 | 0.635 | 0.635 | 0.636 | 0.614 | 0.617 | 0.609 | 127.1 | 128.8 | 128.7 | 128.9 | 124.5 | 125.0 | 123.4 | 121.0 |
| EE | 0.411 | 0.439 | 0.446 | 0.451 | 0.427 | 0.450 | 0.393 | 83.3 | 89.0 | 90.3 | 91.3 | 86.6 | 91.2 | 79.8 | 78.2 |
| IE | 0.554 | 0.553 | 0.543 | 0.550 | 0.538 | 0.537 | 0.571 | 112.2 | 112.2 | 110.1 | 111.6 | 109.1 | 108.9 | 115.7 | 113.5 |
| EL | 0.333 | 0.338 | 0.341 | 0.346 | 0.304 | 0.315 | 0.337 | 67.5 | 68.5 | 69.1 | 70.1 | 61.7 | 63.8 | 68.2 | 66.9 |
| ES | 0.395 | 0.397 | 0.393 | 0.389 | 0.361 | 0.367 | 0.386 | 80.1 | 80.4 | 79.8 | 79.0 | 73.2 | 74.3 | 78.3 | 76.8 |
| FR | 0.525 | 0.527 | 0.517 | 0.522 | 0.526 | 0.522 | 0.539 | 106.4 | 106.8 | 104.8 | 105.9 | 106.5 | 105.8 | 109.2 | 107.1 |
| HR | 0.277 | 0.276 | 0.254 | 0.265 | 0.243 | 0.267 | 0.270 | 56.1 | 55.9 | 51.5 | 53.7 | 49.3 | 54.1 | 54.7 | 53.6 |
| IT | 0.372 | 0.372 | 0.378 | 0.370 | 0.374 | 0.383 | 0.371 | 75.4 | 75.4 | 76.7 | 75.0 | 75.9 | 77.6 | 75.1 | 73.7 |
| CY | 0.432 | 0.448 | 0.426 | 0.437 | 0.367 | 0.368 | 0.369 | 87.5 | 90.9 | 86.4 | 88.6 | 74.4 | 74.7 | 74.8 | 73.3 |
| LV | 0.244 | 0.257 | 0.235 | 0.241 | 0.270 | 0.302 | 0.287 | 49.6 | 52.0 | 47.6 | 48.8 | 54.8 | 61.2 | 58.1 | 57.0 |
| LT | 0.288 | 0.286 | 0.302 | 0.304 | 0.299 | 0.323 | 0.391 | 58.3 | 57.9 | 61.2 | 61.6 | 60.7 | 65.4 | 79.4 | 77.8 |
| LU | 0.592 | 0.609 | 0.641 | 0.641 | 0.615 | 0.616 | 0.599 | 120.0 | 123.5 | 129.9 | 129.9 | 124.8 | 124.8 | 121.4 | 119.1 |
| HU | 0.350 | 0.349 | 0.325 | 0.326 | 0.329 | 0.332 | 0.332 | 70.9 | 70.7 | 65.9 | 66.0 | 66.6 | 67.2 | 67.4 | 66.1 |
| MT | 0.318 | 0.311 | 0.307 | 0.359 | 0.397 | 0.403 | 0.378 | 64.4 | 62.9 | 62.2 | 72.7 | 80.4 | 81.6 | 76.5 | 75.1 |
| NL | 0.588 | 0.589 | 0.631 | 0.638 | 0.624 | 0.635 | 0.639 | 119.1 | 119.3 | 127.9 | 129.3 | 126.5 | 128.6 | 129.5 | 127.1 |
| AT | 0.555 | 0.557 | 0.561 | 0.567 | 0.568 | 0.566 | 0.599 | 112.5 | 113.0 | 113.8 | 115.0 | 115.1 | 114.7 | 121.5 | 119.1 |
| PL | 0.261 | 0.263 | 0.251 | 0.254 | 0.251 | 0.257 | 0.270 | 52.8 | 53.4 | 50.9 | 51.4 | 50.9 | 52.2 | 54.8 | 53.7 |
| PT | 0.421 | 0.415 | 0.407 | 0.411 | 0.417 | 0.419 | 0.409 | 85.4 | 84.1 | 82.5 | 83.2 | 84.5 | 85.0 | 83.0 | 81.4 |
| RO | 0.236 | 0.242 | 0.217 | 0.205 | 0.168 | 0.157 | 0.167 | 47.9 | 49.1 | 43.9 | 41.6 | 34.1 | 31.9 | 33.8 | 33.1 |
| SI | 0.483 | 0.490 | 0.483 | 0.480 | 0.487 | 0.483 | 0.482 | 98.0 | 99.3 | 97.9 | 97.4 | 98.7 | 98.0 | 97.8 | 95.9 |
| SK | 0.306 | 0.329 | 0.340 | 0.357 | 0.328 | 0.348 | 0.345 | 62.0 | 66.7 | 68.9 | 72.4 | 66.4 | 70.6 | 70.0 | 68.6 |
| FI | 0.671 | 0.664 | 0.667 | 0.660 | 0.642 | 0.645 | 0.646 | 136.1 | 134.7 | 135.2 | 133.9 | 130.1 | 130.8 | 130.9 | 128.4 |
| SE | 0.697 | 0.705 | 0.714 | 0.716 | 0.698 | 0.703 | 0.708 | 141.3 | 142.8 | 144.7 | 145.1 | 141.5 | 142.6 | 143.6 | 140.9 |
| UK | 0.560 | 0.558 | 0.556 | 0.557 | 0.570 | 0.583 | 0.618 | 113.6 | 113.1 | 112.7 | 112.8 | 115.5 | 118.1 | 125.3 | 122.9 |
| | | | | | | | | | | | | | | | |
| IS | 0.599 | 0.605 | 0.625 | 0.623 | 0.622 | 0.614 | 0.600 | 121.4 | 122.7 | 126.6 | 126.2 | 126.1 | 124.5 | 121.7 | 119.3 |
| IL | 0.588 | 0.580 | 0.581 | 0.586 | 0.547 | 0.552 | 0.548 | 119.2 | 117.6 | 117.8 | 118.8 | 110.8 | 111.9 | 111.0 | 108.9 |
| MK | 0.167 | 0.181 | 0.188 | 0.182 | 0.200 | 0.208 | 0.218 | 33.8 | 36.6 | 38.2 | 36.8 | 40.5 | 42.1 | 44.2 | 43.4 |
| NO | 0.499 | 0.510 | 0.502 | 0.504 | 0.494 | 0.499 | 0.571 | 101.1 | 103.5 | 101.8 | 102.2 | 100.0 | 101.1 | 115.8 | 113.6 |
| RS | 0.231 | 0.228 | 0.289 | 0.299 | 0.307 | 0.310 | 0.317 | 46.8 | 46.3 | 58.5 | 60.7 | 62.2 | 62.8 | 64.2 | 62.9 |
| CH | 0.767 | 0.772 | 0.762 | 0.780 | 0.781 | 0.798 | 0.812 | 155.4 | 156.4 | 154.4 | 158.1 | 158.3 | 161.8 | 164.6 | 161.5 |
| UA | 0.163 | 0.163 | 0.157 | 0.153 | 0.159 | 0.154 | 0.142 | 33.1 | 33.0 | 31.7 | 31.1 | 32.2 | 31.3 | 28.9 | 28.3 |
| TR | 0.229 | 0.232 | 0.231 | 0.231 | 0.292 | 0.300 | 0.294 | 46.5 | 47.1 | 46.7 | 46.9 | 59.3 | 60.9 | 59.7 | 58.5 |

# Annex G: Performance scores per dimension

| | Human resources | Research systems | Innovation-friendly environment | Finance and support | Firm invest-ments | Innovators | Linkages | Intellec-tual assets | Employ-ment impacts | Sales impacts |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 |
| EU28 | 0.481 | 0.451 | 0.497 | 0.473 | 0.475 | 0.478 | 0.479 | 0.493 | 0.538 | 0.664 |
| | | | | | | | | | | |
| BE | 0.483 | 0.766 | 0.594 | 0.480 | 0.621 | 0.776 | 0.805 | 0.431 | 0.408 | 0.500 |
| BG | 0.286 | 0.116 | 0.289 | 0.091 | 0.247 | 0.064 | 0.089 | 0.487 | 0.526 | 0.216 |
| CZ | 0.387 | 0.334 | 0.410 | 0.438 | 0.479 | 0.411 | 0.316 | 0.299 | 0.513 | 0.613 |
| DK | 0.908 | 0.815 | 1.000 | 0.654 | 0.519 | 0.537 | 0.576 | 0.728 | 0.555 | 0.515 |
| DE | 0.493 | 0.420 | 0.465 | 0.559 | 0.732 | 0.733 | 0.651 | 0.646 | 0.541 | 0.761 |
| EE | 0.486 | 0.378 | 0.491 | 0.703 | 0.319 | 0.131 | 0.290 | 0.476 | 0.376 | 0.416 |
| IE | 0.623 | 0.598 | 0.487 | 0.319 | 0.474 | 0.817 | 0.346 | 0.308 | 0.910 | 0.829 |
| EL | 0.344 | 0.407 | 0.146 | 0.267 | 0.273 | 0.564 | 0.413 | 0.211 | 0.378 | 0.327 |
| ES | 0.497 | 0.382 | 0.541 | 0.343 | 0.320 | 0.199 | 0.284 | 0.397 | 0.398 | 0.541 |
| FR | 0.617 | 0.593 | 0.518 | 0.543 | 0.422 | 0.582 | 0.459 | 0.430 | 0.505 | 0.700 |
| HR | 0.308 | 0.162 | 0.209 | 0.288 | 0.449 | 0.344 | 0.255 | 0.195 | 0.333 | 0.161 |
| IT | 0.301 | 0.384 | 0.314 | 0.283 | 0.258 | 0.505 | 0.222 | 0.522 | 0.384 | 0.490 |
| CY | 0.442 | 0.469 | 0.229 | 0.264 | 0.204 | 0.483 | 0.220 | 0.546 | 0.322 | 0.410 |
| LV | 0.371 | 0.152 | 0.696 | 0.429 | 0.184 | 0.067 | 0.208 | 0.245 | 0.454 | 0.301 |
| LT | 0.493 | 0.140 | 0.604 | 0.549 | 0.419 | 0.443 | 0.545 | 0.260 | 0.358 | 0.217 |
| LU | 0.585 | 0.868 | 0.752 | 0.391 | 0.341 | 0.683 | 0.222 | 0.819 | 0.751 | 0.609 |
| HU | 0.258 | 0.224 | 0.406 | 0.251 | 0.371 | 0.080 | 0.303 | 0.230 | 0.681 | 0.632 |
| MT | 0.252 | 0.354 | 0.480 | 0.130 | 0.283 | 0.377 | 0.094 | 0.796 | 0.841 | 0.309 |
| NL | 0.689 | 0.800 | 0.715 | 0.666 | 0.333 | 0.611 | 0.786 | 0.552 | 0.686 | 0.601 |
| AT | 0.551 | 0.636 | 0.481 | 0.542 | 0.690 | 0.682 | 0.652 | 0.686 | 0.422 | 0.534 |
| PL | 0.308 | 0.133 | 0.364 | 0.289 | 0.356 | 0.012 | 0.134 | 0.383 | 0.473 | 0.356 |
| PT | 0.444 | 0.454 | 0.668 | 0.462 | 0.370 | 0.559 | 0.191 | 0.373 | 0.373 | 0.294 |
| RO | 0.198 | 0.121 | 0.390 | 0.102 | 0.050 | 0.000 | 0.148 | 0.122 | 0.199 | 0.401 |
| SI | 0.688 | 0.410 | 0.497 | 0.228 | 0.589 | 0.427 | 0.531 | 0.460 | 0.399 | 0.489 |
| SK | 0.384 | 0.212 | 0.306 | 0.409 | 0.290 | 0.159 | 0.313 | 0.190 | 0.601 | 0.681 |
| FI | 0.810 | 0.613 | 0.865 | 0.721 | 0.597 | 0.679 | 0.622 | 0.653 | 0.449 | 0.482 |
| SE | 0.895 | 0.778 | 0.945 | 0.677 | 0.705 | 0.608 | 0.584 | 0.668 | 0.748 | 0.559 |
| UK | 0.737 | 0.769 | 0.448 | 0.492 | 0.497 | 0.478 | 0.622 | 0.431 | 0.815 | 0.857 |
| | | | | | | | | | | |
| IS | 0.597 | 0.739 | 1.000 | 0.698 | 0.588 | 0.697 | 0.736 | 0.358 | 0.820 | 0.277 |
| IL | 0.420 | 0.524 | 0.453 | 0.267 | 1.000 | 0.415 | 0.476 | 0.647 | 1.000 | 0.628 |
| RS | 0.306 | 0.178 | 0.161 | 0.248 | 0.544 | 0.453 | 0.214 | 0.112 | 0.505 | 0.421 |
| NO | 0.708 | 0.656 | 0.880 | 0.605 | 0.572 | 0.668 | 0.595 | 0.246 | 0.571 | 0.325 |
| MK | 0.196 | 0.102 | 0.268 | 0.016 | 0.284 | 0.369 | 0.207 | 0.068 | 0.047 | 0.456 |
| CH | 0.964 | 0.994 | 0.670 | 0.596 | 0.901 | 0.908 | 0.777 | 0.742 | 0.664 | 0.720 |
| UA | 0.263 | 0.060 | n/a | 0.108 | 0.195 | 0.088 | 0.023 | 0.116 | 0.419 | 0.214 |
| TR | 0.182 | 0.110 | 0.482 | 0.395 | 0.594 | 0.468 | 0.316 | 0.106 | 0.052 | 0.308 |

# Annex H: International data

## Indicator values (2016)

| | EU | AU | BR | CA | CN | IN | JP | KR | RU | SA | US |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.1.1 New doctorate graduates | 1.88 | 2.37 | 0.46 | 1.46 | 0.21 | 0.11 | 1.20 | 1.64 | 1.43 | 0.20 | 1.57 |
| 1.1.2 Population completed tertiary education | 32.2 | 42.9 | 13.4 | 55.2 | 11.5 | 9.8 | 49.5 | 45.5 | 53.5 | 14.6 | 44.6 |
| 1.2.1 International scientific co-publications | 316.0 | 1043.4 | 83.4 | 1043.4 | 59.5 | 12.4 | 206.1 | 354.7 | 89.9 | 146.3 | 511.2 |
| 1.2.2 Scientific publications among top 10% most cited | 10.56 | 12.47 | 5.12 | 12.04 | 8.08 | 6.42 | 6.18 | 6.57 | 3.51 | 7.17 | 13.95 |
| 2.1.1 R&D expenditure in the public sector | 0.70 | 0.83 | 0.63 | 0.80 | 0.48 | 0.53 | 0.70 | 0.88 | 0.46 | 0.39 | 0.68 |
| 2.2.1 R&D expenditure in the business sector | 1.22 | 1.19 | 0.52 | 1.76 | 1.58 | 0.29 | 2.79 | 2.96 | 0.71 | 0.35 | 1.94 |
| 3.1.1 SMEs with product or process innovations | 30.9 | 55.4 | 35.1 | 52.7 | n/a | 17.9 | 24.5 | 29.5 | 4.7 | n/a | 22.2 |
| 3.1.2 SMEs with marketing or organisational innovations | 34.9 | 49.5 | 65.8 | 56.0 | n/a | 48.7 | 34.5 | 30.7 | 2.4 | 57.5 | n/a |
| 3.2.1 Innovative SMEs collaborating with others | 11.2 | 13.5 | 5.4 | n/a | n/a | n/a | 16.9 | 2.2 | 1.0 | 17.4 | n/a |
| 3.2.2 Public-private co-publications | 28.7 | 25.3 | 1.4 | 24.8 | 5.3 | 0.6 | 37.7 | 40.1 | 0.9 | 1.3 | 52.1 |
| 3.2.3 Private co-funding of public R&D expenditures | 0.05 | 0.05 | n/a | 0.05 | 0.06 | n/a | 0.02 | 0.06 | 0.07 | 0.03 | 0.02 |
| 3.3.1 PCT patent applications | 2.71 | 1.68 | 0.19 | 1.90 | 1.41 | 0.28 | 7.67 | 7.67 | 0.29 | 0.42 | 3.07 |
| 3.3.2 Trademark applications | 4.87 | 11.79 | 4.96 | 9.79 | 13.61 | 3.62 | 6.67 | 13.46 | 6.12 | 5.09 | 2.87 |
| 3.3.3 Design applications | 0.74 | 0.64 | 0.19 | 0.37 | 2.87 | 0.13 | 0.59 | 3.66 | 0.17 | 0.27 | 0.22 |
| 4.2.1 Medium & high tech product exports | 61.2 | 10.1 | 26.7 | 40.2 | 55.7 | 29.7 | 74.1 | 74.4 | 13.0 | 34.5 | 51.4 |
| 4.2.2 Knowledge-intensive services exports | 69.3 | 22.7 | 78.8 | 70.4 | 46.9 | 85.2 | 79.5 | 71.1 | 65.4 | 15.1 | 73.5 |

## Performance in 2016 relative to EU in 2010

| | AU | BR | CA | CN | IN | JP | KR | RU | SA | US |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.1.1 New doctorate graduates | 126.0 | 24.5 | 77.7 | 11.0 | 5.9 | 64.1 | 87.1 | 76.3 | 10.7 | 83.6 |
| 1.1.2 Population completed tertiary education | 133.0 | 41.6 | 171.1 | 35.8 | 30.4 | 153.7 | 141.1 | 165.9 | 45.3 | 138.4 |
| 1.2.1 International scientific co-publications | 181.7 | 51.4 | 181.7 | 43.4 | 19.8 | 80.8 | 105.9 | 53.3 | 68.0 | 127.2 |
| 1.2.2 Scientific publications among top 10% most cited | 118.1 | 48.5 | 114.0 | 76.5 | 60.8 | 58.5 | 62.2 | 33.3 | 67.9 | 132.1 |
| 2.1.1 R&D expenditure in the public sector | 119.5 | 90.4 | 114.2 | 68.8 | 76.1 | 101.1 | 126.5 | 66.0 | 55.7 | 97.6 |
| 2.2.1 R&D expenditure in the business sector | 97.2 | 42.5 | 143.3 | 129.2 | 23.8 | 227.6 | 241.8 | 57.8 | 28.2 | 158.1 |
| 3.1.1 SMEs with product or process innovations | 179.3 | 113.7 | 170.5 | n/a | 57.8 | 79.4 | 95.5 | 15.3 | n/a | 71.8 |
| 3.1.2 SMEs with marketing or organisational innovations | 141.8 | 188.6 | 160.5 | n/a | 139.5 | 98.7 | 88.0 | 6.9 | 164.8 | n/a |
| 3.2.1 Innovative SMEs collaborating with others | 120.1 | 48.4 | n/a | n/a | n/a | 151.0 | 19.6 | 9.0 | 154.9 | n/a |
| 3.2.2 Public-private co-publications | 88.2 | 4.9 | 86.4 | 18.6 | 2.1 | 131.5 | 139.8 | 3.1 | 4.7 | 181.6 |
| 3.2.3 Private co-funding of public R&D expenditures | 103.2 | n/a | 97.8 | 113.1 | n/a | 35.1 | 117.2 | 139.7 | 56.7 | 42.1 |
| 3.3.1 PCT patent applications | 78.7 | 26.8 | 83.7 | 72.2 | 32.1 | 168.4 | 168.4 | 32.7 | 39.2 | 106.4 |
| 3.3.2 Trademark applications | 242.4 | 102.0 | 201.2 | 279.7 | 74.5 | 137.0 | 276.7 | 125.8 | 104.7 | 58.9 |
| 3.3.3 Design applications | 93.0 | 50.6 | 70.7 | 197.3 | 41.8 | 89.2 | 222.9 | 47.7 | 60.5 | 54.9 |
| 4.2.1 Medium & high tech product exports | 16.5 | 43.7 | 65.7 | 91.0 | 48.5 | 121.0 | 121.6 | 21.2 | 56.4 | 83.9 |
| 4.2.2 Knowledge-intensive services exports | 32.7 | 113.8 | 101.6 | 67.7 | 122.9 | 114.8 | 102.6 | 94.3 | 21.8 | 106.1 |

## Change in performance (2010-2016)

| | AU | BR | CA | CN | IN | JP | KR | RU | SA | US |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.1.1 New doctorate graduates | 9.7 | 0.9 | -1.6 | -1.9 | -0.9 | -3.1 | 18.5 | -16.8 | 2.3 | -7.9 |
| 1.1.2 Population completed tertiary education | -4.2 | -22.4 | -13.0 | 8.6 | -6.1 | -9.1 | -2.7 | -33.5 | 21.6 | -14.9 |
| 1.2.1 International scientific co-publications | -19.4 | 6.2 | -9.6 | 5.3 | 1.2 | -5.6 | 1.6 | -0.5 | 6.9 | -1.8 |
| 1.2.2 Scientific publications among top 10% most cited | 3.4 | 4.1 | -0.4 | 17.5 | 2.4 | -5.4 | -0.9 | 4.0 | -6.7 | -8.0 |
| 2.1.1 R&D expenditure in the public sector | 2.3 | 8.3 | -14.0 | 4.8 | -6.4 | -8.2 | 12.3 | 2.9 | 3.9 | -8.0 |
| 2.2.1 R&D expenditure in the business sector | -27.2 | -3.2 | 24.5 | 32.6 | 2.4 | -18.6 | 28.8 | -1.7 | -17.3 | -20.6 |
| 3.1.1 SMEs with product or process innovations | 25.0 | 6.1 | 6.9 | n/a | 7.0 | 4.1 | -7.1 | 4.1 | n/a | 6.6 |
| 3.1.2 SMEs with marketing or organisational innovations | 15.6 | 20.1 | 4.5 | n/a | 17.7 | 4.7 | 48.2 | 0.9 | 20.9 | n/a |
| 3.2.1 Innovative SMEs collaborating with others | 3.7 | -0.2 | n/a | n/a | n/a | 57.0 | -82.9 | 2.9 | -0.7 | n/a |
| 3.2.2 Public-private co-publications | -8.1 | -0.4 | -41.6 | 10.8 | 0.3 | -13.8 | -3.8 | -3.1 | -4.0 | 2.9 |
| 3.2.3 Private co-funding of public R&D expenditures | -12.7 | n/a | -31.8 | -10.0 | n/a | 8.1 | 9.3 | 25.1 | -0.9 | -4.1 |
| 3.3.1 PCT patent applications | -7.3 | -0.8 | 1.9 | 25.8 | -0.8 | 18.6 | 36.0 | 3.3 | -8.9 | 4.5 |
| 3.3.2 Trademark applications | -9.8 | 4.3 | -1.3 | 114.2 | 7.9 | 45.0 | -7.3 | -19.5 | 1.6 | 3.8 |
| 3.3.3 Design applications | 5.0 | -1.5 | 5.1 | -6.3 | 0.7 | -8.7 | 3.3 | -2.3 | -7.3 | 6.4 |
| 4.2.1 Medium & high tech product exports | 1.1 | 3.0 | 6.7 | -4.4 | 6.4 | -0.2 | 0.2 | 6.9 | 2.9 | -2.2 |
| 4.2.2 Knowledge-intensive services exports | 4.3 | 10.2 | -5.8 | -20.9 | 2.8 | -4.9 | 5.8 | 7.6 | -0.7 | 5.9 |