European Commission

Innovation **Union** Scoreboard 2014

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Cover picture: iStock_000020052023Large © Konradlew

Printed in Belgium

PRINTED ON CHLORINE FREE PAPER

Innovation **Union** Scoreboard 2014

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Executive summary

Innovation Union Scoreboard 2014: impact of economic crisis not as severe as expected. Differences in innovation performance are becoming smaller again although at a modest rate.

Last year's edition showed the impact of the crisis that resulted in the disturbances of the innovation convergence process between the Member States. This year's edition shows that there are again positive signs in Member States as the innovation performance improves and the catching up process of less innovative countries resumes.

Eight innovation dimensions and 25 indicators analyse the performance of the EU innovation system...

The measurement framework used in the Innovation Union Scoreboard distinguishes between 3 main types of indicators and 8 innovation dimensions, capturing in total 25 different indicators.

The Enablers capture the main drivers of innovation performance external to the firm and cover 3 innovation dimensions: *Human resources, Open, excellent and attractive research systems as well as Finance and support*. Firm activities capture the innovation efforts at the level of the firm, grouped in 3 innovation dimensions: *Firm investments, Linkages & entrepreneurship and Intellectual assets*. Outputs cover the effects of firms' innovation activities in 2 innovation dimensions: *Innovators and Economic effects*.

... and the Member States are classified into four performance groups based on their average innovation performance.

Based on the average innovation performance, the Member States fall into four different performance groups:

- Denmark (DK), Finland (FI), Germany (DE) and Sweden (SE) are *"Innovation Leaders"* with innovation performance well above that of the EU average;
- Austria (AT), Belgium (BE), Cyprus (CY), Estonia (EE), France (FR), Ireland (IE), Luxembourg (LU), Netherlands (NL), Slovenia (SI) and the United Kingdom (UK) are *"Innovation followers"* with innovation performance above or close to that of the EU average;
- The performance of Croatia (HR), Czech Republic (CZ), Greece (EL), Hungary (HU), Italy (IT), Lithuania (LT), Malta (MT), Poland (PL), Portugal (PT), Slovakia (SK) and Spain (ES) is below that of the EU average. These countries are *'Moderate innovators'*;
- Bulgaria (BG), Latvia (LV) and Romania (RO) are *"Modest innovators"* with innovation performance well below that of the EU average.

Sweden's innovation system is once more in first position in the EU with the overall ranking remaining relatively stable...

Sweden has once more the best performing innovation system in the EU, followed by Denmark, Germany and Finland Overall, the performance group memberships remained relatively stable compared to the previous IUS edition with Poland being the only country that changed group membership by advancing from the Modest to the Moderate innovators.

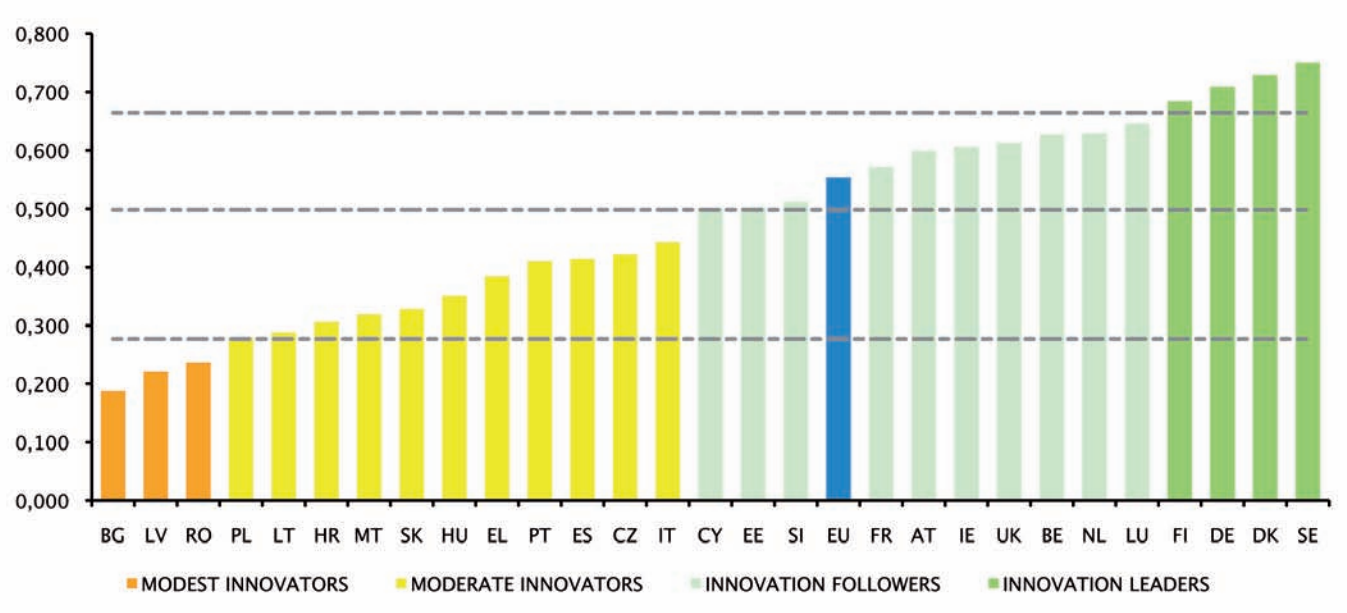
... but with some changes inside the performance groups.

As each year, there are several upward and downward movements inside each of the performance groups. Denmark and Germany switched ranks within the Innovation leaders. Within the Innovation followers Luxembourg replaced the Netherlands as the top performer among the Innovation followers and Ireland and Austria switched ranks as well as Estonia and Cyprus. Within the Moderate innovators Italy is the top performer followed by the Czech Republic that has overtaken Spain and Portugal. Hungary and Slovakia as well as Malta and Croatia have switched ranks. Within the Modest innovators Romania and Latvia have switched ranks.

The most innovative countries have balanced innovation systems with strengths in all dimensions....

The most innovative countries perform best on all dimensions: from research and innovation inputs, through business innovation activities up to innovation outputs and economic effects, which reflects a balanced national research and innovation system. The Innovation leaders, followed by the Innovation followers have continuously the smallest variance in their performance across all eight innovation dimensions. This means that in all dimensions the performance of the Innovation

Figure 1: EU Member States' innovation performance



leaders, Sweden, Denmark, Germany and Finland, is not too different. The Innovation leaders are also mostly on top and clearly above the EU average. Only in the second dimension *Open, excellent and attractive research system, Germany scores slightly below the EU average.*

… but some other countries reach top scores in individual dimensions

However, some other countries reach top scores when looking at individual dimensions. Sweden, Finland, Ireland and United Kingdom score best in *Human resources*; Denmark, the Netherlands, Sweden and United Kingdom reach top positions in *Open, excellent and effective research systems*; Estonia, Finland, Sweden and Denmark score top in *Finance and support*; Sweden, Germany, Finland and Slovenia reach highest ranks as regards Firm investments; Denmark, United Kingdom, Belgium and Sweden are top performers in *Linkages and entrepreneurship*; Denmark, Austria, Germany and Sweden reach top positions in Intellectual assets; Germany, Luxembourg, Sweden and Ireland are the highest performers in the Innovators dimension; and Ireland, Germany, Luxembourg and Denmark reach the highest results in *Economic effects*.

Overall, the EU is improving its innovation performance with Portugal, Estonia and Latvia being the innovation growth leaders…

Overall, the EU annual average growth rate of innovation performance reached 1.7% over the analysed eight-year period 2006-2013 with all Member States improving their innovation performance. Portugal, Estonia and Latvia are the innovation growth leaders. The lowest innovation growth rates were recorded in Sweden, the UK and Croatia.

…but the innovation growth differences exist also within the groups.

In the group of Innovation leaders, performance improved strongest for Germany, while Sweden's performance was improving at the lowest rate in this group. Estonia is the highest growing Innovation follower, while the UK was the lowest. In the group of Moderate innovators, Portugal improved the most, while Croatia was improving at the lowest rate. Among the Modest innovators, the highest innovation progress was recorded in Latvia.

However the innovation gap closes slowly...

Altogether, this year's results show that innovation performance among the Member States is converging but the convergence process slowed down. As a consequence the convergence level in innovation performance went back to the level of 2009.

... and considerable differences between Member States exist particularly in knowledge excellence and internationalisation, and business innovation cooperation.

The differences in performance across all Member States are smallest in *Human resources*, where the best performing country (Sweden) is performing more than three times as well as the least performing country Malta. However, particularly large differences are in the international competitiveness of the science base (*Open, excellent and attractive research systems*), and business innovation cooperation as measured by *Linkages & entrepreneurship*. In both dimensions the best performing country (Denmark) is performing more than nine and seven times better than the least performing countries, Latvia and Romania respectively.

While Human resources and openness of the European research system have seen the highest growth in innovation performance...

When looking at individual dimensions, *Open, excellent and attractive research systems* contributed most to the overall innovation performance over the last eight years, followed by growth in *Human resources*. Looking at individual indicators, Community trademarks contributed most to the increase of the innovation performance, followed by Non-EU doctorate graduates and International scientific co-publications. Relatively good performance improvement is also observed in Innovation collaboration of SMEs and commercialisation of knowledge as measured by License and patent revenues from abroad.

...negative growth was observed in business innovation investments and financial support to innovation.

In two dimensions the overall change of performance was negative: *Firm investments* and *Finance and support*. In particular, the positive growth of public R&D expenditures (1.8%) was offset by a continuous decline in venture capital investments (-2.8%). In addition, a positive improvement in Business R&D expenditure (2.0%) was negatively offset by firms' Non-R&D innovation expenditures (-4.7%).

At a wider European level, Switzerland confirmed its top position outperforming all EU Member States...

Taking into account European countries outside the EU, also this year Switzerland confirms its position as the overall Innovation leader by continuously outperforming all EU Member States and by being the best performer in as many as 9 indicators. Iceland is one of the Innovation followers with an above EU-average performance, Norway and Serbia are Moderate innovators and the Former Yugoslav Republic of Macedonia and Turkey are Modest innovators.

...and internationally South Korea and the US defend their positions as top global innovators.

When looking at performance of innovation systems in a global context, South Korea, the US and Japan have a performance lead over the EU. The Unites States and South Korea outperform the EU both by 17% and Japan by 13%. While the gap between the US and Japan is decreasing, it widens with South Korea.

The top innovation leaders US, Japan and South Korea are particularly dominating the EU in indicators capturing business activity as measured by R&D expenditures in the business sector, Public-private co-publications and PCT patents but also in educational attainment as measured by the Share of population having completed tertiary education.

As compared with other key international partners, the EU continues to have a performance lead over Australia and Canada that score at 62% and 79% of the EU level respectively. The performance lead is even larger compared to the BRICS countries (Brazil, Russia, India, China and South Africa). This lead is stable or even increasing for almost all BRICS countries, except for China. China's current innovation performance is at 44% of the EU level, and continues to reduce the gap by improving faster and at a higher rate than the EU.

Methodological note

The Innovation Union Scoreboard (IUS) 2014 uses the most recent available data from Eurostat and other internationally recognised sources with data referring to 2012 for 11 indicators, 2011 for 4 indicators, 2010 for 9 indicators and 2009 for 1 indicator.

The IUS 2014 gives a comparative assessment of the innovation performance of the EU Member States and the relative strengths and weaknesses of their research and innovation systems. It monitors innovation trends across the EU Member States, including Croatia, from this edition as the 28th Member State, as well as Iceland, the Former Yugoslav Republic of Macedonia, Norway, Serbia, Switzerland and Turkey. It also includes comparisons between the EU and 10 global competitors. Average innovation performance is measured by summarizing performance over equally-weighted 25 indicators in one composite indicator: the Summary Innovation Index. This year, the IUS2014 is accompanied by the Regional Innovation Scoreboard 2014.

1. Introduction

The annual Innovation Union Scoreboard 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.

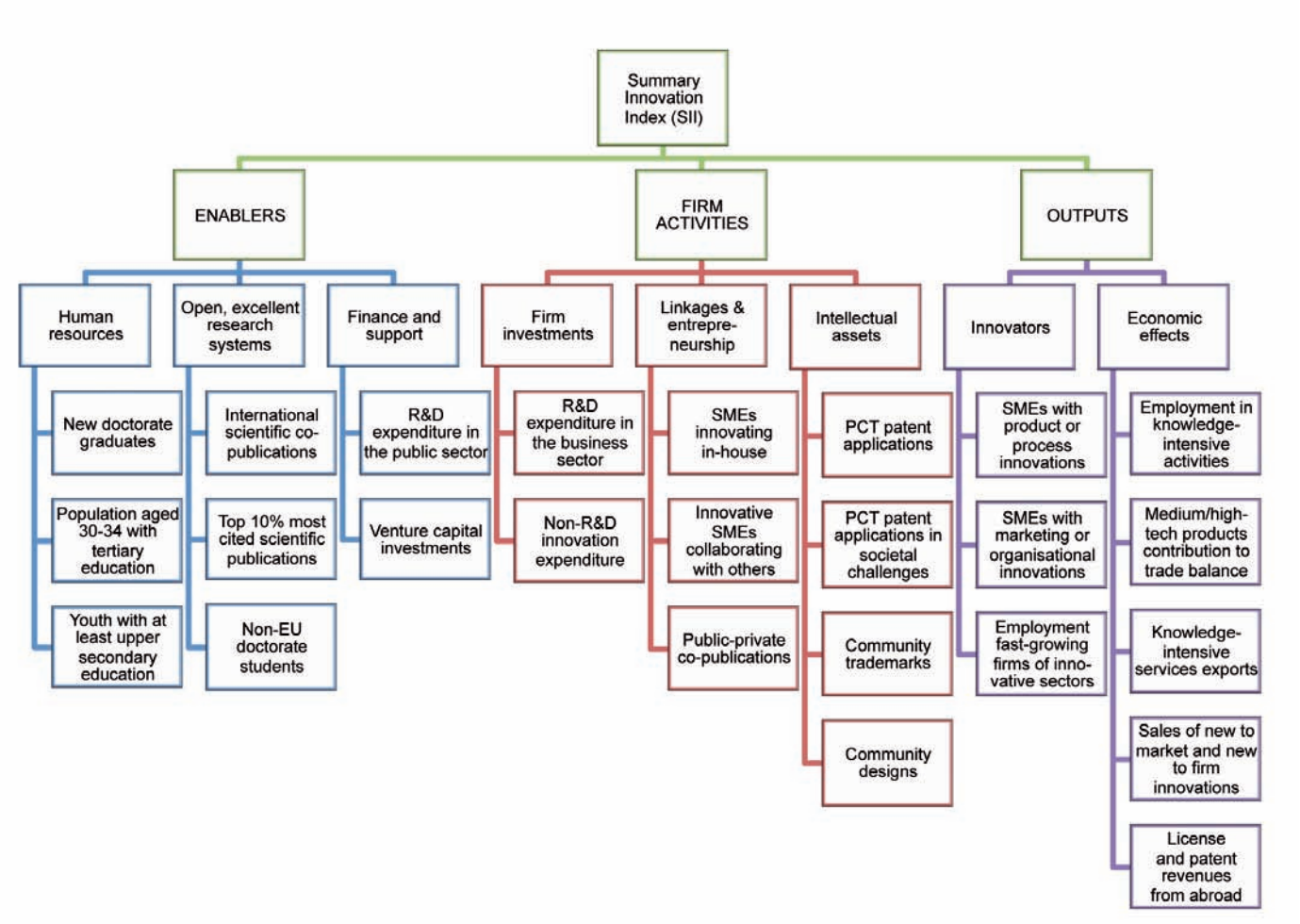
Measurement framework

The Innovation Union Scoreboard 2014, the 13th edition since the introduction of the European Innovation Scoreboard in 2001, follows the methodology of previous editions. Innovation performance is measured using a composite indicator – the Summary Innovation Index – which summarizes the performance of a range of different indicators. The Innovation Union Scoreboard distinguishes between 3 main types of indicators – Enablers, Firm activities and Outputs – and 8 innovation dimensions, capturing in total 25 indicators. The measurement framework is presented in Figure 2 and Table 1.

The **Enablers** capture the main drivers of innovation performance external to the firm and differentiate between 3 innovation dimensions. *'Human resources'* includes 3 indicators and measures the availability of a high-skilled and educated workforce. The indicators capture New doctorate graduates, Population aged 30-34 with completed tertiary education and Population aged 20-24 having completed at least upper secondary education. '*Open, excellent and attractive research systems*' includes 3 indicators and measures the international competitiveness of the science base by focusing on the International scientific co-publications, Most cited publications and Non-EU doctorate students. '*Finance and support*' includes 2 indicators and measures the availability of finance for innovation projects by venture capital investments and the support of governments for research and innovation activities by R&D expenditures by universities and government research organisations.

Firm activities capture the innovation efforts at the level of the firm and differentiate between 3 innovation

Figure 2: Measurement framework of the Innovation Union Scoreboard



dimensions. '*Firm investments*' includes 2 indicators of both R&D and Non-R&D investments that firms make in order to generate innovations. '*Linkages & entrepreneurship*' includes 3 indicators measuring innovation capabilities by looking at SMEs that innovate in-house and Collaboration efforts between innovating firms and research collaboration between the Private and public sector. '*Intellectual assets*' captures different forms of Intellectual Property Rights (IPR) generated as a throughput in the innovation process including PCT patent applications, Community trademarks and Community designs.

Outputs capture the effects of firms' innovation activities and differentiate between 2 innovation dimensions. '*Innovators*' includes 3 indicators measuring the share of firms that have introduced innovations onto the market or within their organisations, covering both technological and non-technological innovations and Employment in fast-growing firms of innovative sectors. '*Economic effects*' includes 5 indicators and captures the economic success of innovation in Employment in knowledge-intensive activities, the Contribution of medium and high-tech product exports to the trade balance, Exports of knowledge-intensive services, Sales due to innovation activities and License and patent revenues from selling technologies abroad.

Data sources and data availability

The Innovation Union Scoreboard uses the most recent statistics from Eurostat and other internationally recognised sources such as the OECD and the United Nations as available at the time of analysis with the cut-off day by the end of November 2013. International sources have been used wherever possible in order to improve comparability between countries. The data relates to actual performance in 2009 (1 indicator), 2010 (9 indicators), 2011 (4 indicators) and 2012 (11 indicators) (these are the most recent years for which data are available as highlighted by the underlined years in the last column in Table 1).

Data availability is good for 19 Member States with data being available for all 25 indicators. For 7 Member States (Croatia, Cyprus, Estonia, Latvia, Lithuania, Malta, Slovakia and the UK) data is missing for one indicator and for 1 Member State (Slovenia) data is missing for 2 indicators. For Venture capital investment data is available for 20 Member States.

Changes to the IUS 2013

Although the general methodology of the IUS 2014 remained unchanged there have been three modifications as compared to the IUS 2013. Firstly, the place holder for the 25th indicator has been filled in with Employment in fast-growing firms of innovative sectors. This 25th indicator is a component of the recently published innovation output indicator. At the request of the European Council to benchmark national innovation policies and monitor the EU's performance against its main trading partners, the European Commission has developed a new indicator on innovation output which complements the existing Europe 2020 headline indicator on R&D intensity.[1] This new indicator on innovation output is based on four components using three indicators from the IUS and one new indicator on employment in fast-growing firms of innovative sectors. This last indicator is added to the Innovators dimension in the IUS measurement framework.

Secondly, performance changes over time are, for the first time, analysed over an eight-year period where previous IUS editions were limited to a five-year period. This modification was introduced to better visualise the development of innovation performance over a longer period.

Thirdly, the calculation of growth rates has been modified. In the IUS 2014 average growth performance is calculated as the average annual growth of the Summary Innovation Index whereas in previous IUS editions average growth performance was calculated as the average of the growth rates of the individual indicators. By calculating growth using the innovation index values directly, countries' performance changes can be more easily monitored over time.

Only the first modification has an impact on the ranking of countries. By adding data on Employment in fast-growing firms of innovative sectors there are positive rank changes for Estonia, Ireland and Spain and negative rank changes for Austria, Cyprus and Portugal (cf. Section 6.3 for more details).

[1] *http://europa.eu/rapid/press-release_MEMO-13-782_en.htm*

Table 1: Innovation Union Scoreboard indicators

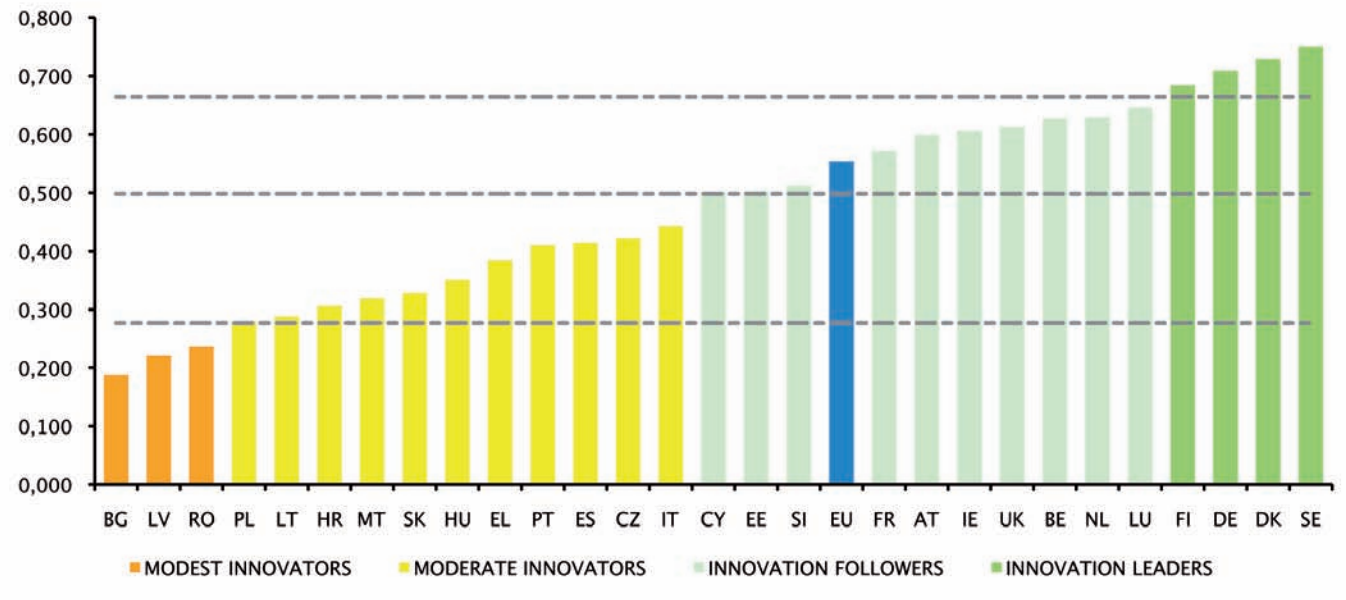
Main type / innovation dimension / indicator	Data source: Numerator	Data source: Denominator	Years covered
ENABLERS			
Human resources			
1.1.1 New doctorate graduates (ISCED 6) per 1000 population aged 25-34	Eurostat	Eurostat	2004 – 2011
1.1.2 Percentage population aged 30-34 having completed tertiary education	Eurostat	Eurostat	2005 – 2012
1.1.3 Percentage youth aged 20-24 having attained at least upper secondary level education	Eurostat	Eurostat	2005 – 2012
Open, excellent and attractive research systems			
1.2.1 International scientific co-publications per million population	Science-Metrix (Scopus)	Eurostat	2005 – 2012
1.2.2 Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	Science-Metrix (Scopus)	Science-Metrix (Scopus)	2004 – 2009
1.2.3 Non-EU doctorate students[2] as a % of all doctorate students	Eurostat	Eurostat	2006 – 2011
Finance and support			
1.3.1 R&D expenditure in the public sector as % of GDP	Eurostat	Eurostat	2005 – 2012
1.3.2 Venture capital investment as % of GDP	Eurostat	Eurostat	2007 – 2012
FIRM ACTIVITIES			
Firm investments			
2.1.1 R&D expenditure in the business sector as % of GDP	Eurostat	Eurostat	2005 – 2012
2.1.2 Non-R&D innovation expenditures as % of turnover	Eurostat (CIS)	Eurostat (CIS)	2004, 2006, 2008, 2010
Linkages & entrepreneurship			
2.2.1 SMEs innovating in-house as % of SMEs	Eurostat (CIS)	Eurostat (CIS)	2004, 2006, 2008, 2010
2.2.2 Innovative SMEs collaborating with others as % of SMEs	Eurostat (CIS)	Eurostat (CIS)	2004, 2006, 2008, 2010
2.2.3 Public-private co-publications per million population	CWTS (Thomson Reuters)	Eurostat	2005 – 2011
Intellectual assets			
2.3.1 PCT patents applications per billion GDP (in PPS€)	OECD	Eurostat	2003 – 2010
2.3.2 PCT patent applications in societal challenges per billion GDP (in PPS€) (environment-related technologies; health)	OECD	Eurostat	2003 – 2010
2.3.3 Community trademarks per billion GDP (in PPS€)	Office for Harmonization in the Internal Market	Eurostat	2005 – 2012
2.3.4 Community designs per billion GDP (in PPS€)	Office for Harmonization in the Internal Market	Eurostat	2005 – 2012
OUTPUTS			
Innovators			
3.1.1 SMEs introducing product or process innovations as % of SMEs	Eurostat (CIS)	Eurostat (CIS)	2004, 2006, 2008, 2010
3.1.2 SMEs introducing marketing or organisational innovations as % of SMEs	Eurostat (CIS)	Eurostat (CIS)	2004, 2006, 2008, 2010
3.1.3 Employment in fast-growing firms of innovative sectors	*Eurostat*	Eurostat	2009, 2010
Economic effects			
3.2.1 Employment in knowledge-intensive activities (manufacturing and services) as % of total employment	Eurostat	Eurostat	2008 – 2012
3.2.2 Contribution of medium and high-tech product exports to the trade balance	United Nations	United Nations	2005 – 2012
3.2.3 Knowledge-intensive services exports as % total service exports	Eurostat	Eurostat	2004 – 2011
3.2.4 Sales of new to market and new to firm innovations as % of turnover	Eurostat (CIS)	Eurostat (CIS)	2004, 2006, 2008, 2010
3.2.5 License and patent revenues from abroad as % of GDP	Eurostat	Eurostat	2005 – 2012

2. Member States' innovation performance

2.1 Innovation performance

The performance of EU national innovation systems is measured by the Summary Innovation Index, which is a composite indicator obtained by an appropriate aggregation of the 25 indicators[3]. Figure 3 shows the performance results for all EU Member States including the newest Member State Croatia.

Figure 3: EU Member States' innovation performance



Note: Average performance is measured using a composite indicator building on data for 25 indicators going from a lowest possible performance of 0 to a maximum possible performance of 1. Average performance reflects performance in 2011/2012 due to a lag in data availability.

As a result, based on this year's Summary Innovation Index, **the Member States fall into the following four performance groups**:

- The first group of **Innovation leaders** includes Member States in which the innovation performance is well above that of the EU, i.e. more than 20% above the EU average. These are Denmark, Finland, Germany and Sweden, which confirms the top position of these countries as compared with last year's edition of the Innovation Union Scoreboard.
- The second group of **Innovation followers** includes Member States with a performance close to that of the EU average i.e. less than 20% above, or more than 90% of the EU average. Austria, Belgium, Cyprus, Estonia, France, Ireland, Luxembourg, Netherlands, Slovenia and the UK are the Innovation followers.
- The third group of **Moderate innovators** includes Member States where the innovation performance is below that of the EU average at relative performance rates between 50% and 90% of the EU average. Croatia, Czech Republic, Greece, Hungary, Italy, Lithuania, Malta, Poland, Portugal, Slovakia and Spain belong to the group of Moderate innovators.
- The fourth group of **Modest innovators** includes Member States that show an innovation performance level well below that of the EU average, i.e. less than 50% of the EU average. This group includes Bulgaria, Latvia, and Romania.

Summing up, compared to the IUS 2013 edition there has been one change in group membership[4]: after dropping from the Moderate to the Modest innovators last year, Poland has returned to the group of Moderate innovators by achieving an innovation performance slightly above 50% of the EU average.

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[2] *For non-EU countries the indicator measures the share of non-domestic doctoral students.*

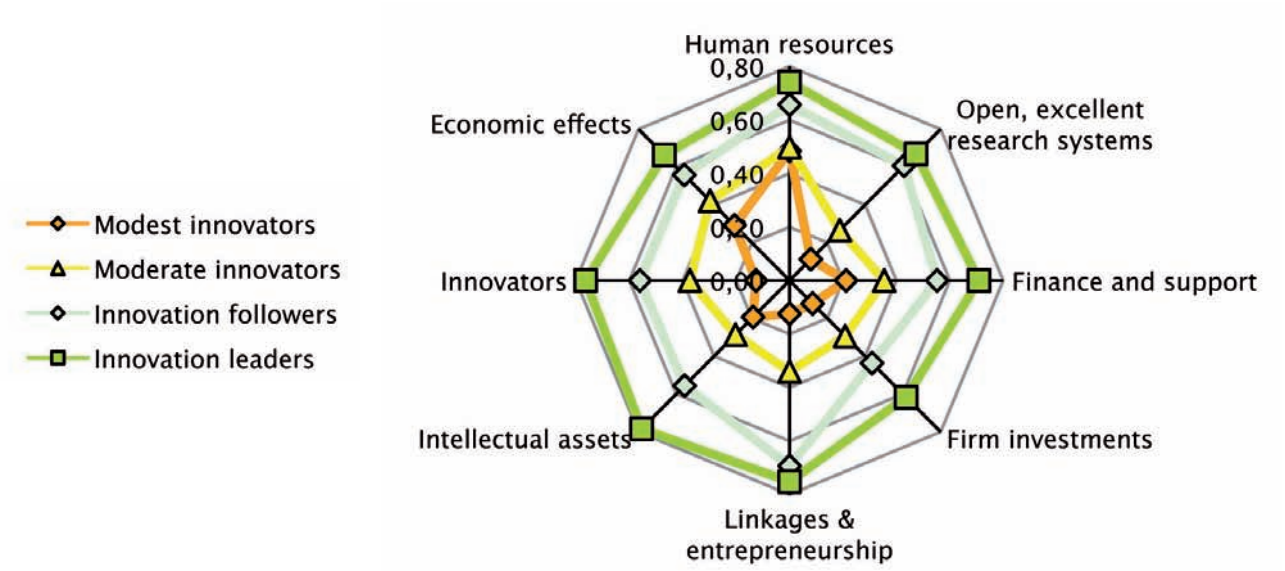
[3] *Section 6.1 gives a brief explanation of the calculation methodology. The IUS 2010 Methodology report provides a detailed explanation.*

[4] *The IUS 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 thresholds between these groups will thus also be increasing over time.*

2.2 Innovation dimensions

Where the previous section introduced four performance groups based on countries' average performance for 25 innovation indicators, a more interesting pattern emerges when a comparison in performance across the eight innovation dimensions is made (Figure 4). The performance order based on the Summary Innovation Index is also observed for the individual dimensions. The Innovation leaders perform best on all dimensions, followed by the Innovation followers, the Moderate innovators and the Modest innovators. Only in a few cases performance differences are small: for Human resources between the Innovation leaders and followers and between the Moderate and Modest innovators, for Open, excellent and effective research systems and Linkages & entrepreneurship between the Innovation leaders and followers and for Intellectual assets between the Moderate and Modest innovators. These results show that the Innovation leaders and followers share similar relative performance patterns as do the Moderate and modest innovators.

Figure 4: Country groups: innovation performance per dimension



Variance in performance is a measure for the spread in performance across different countries[5] and it shows how large differences are between Member States when looking at individual strengths and weaknesses Performance differences between Member States across the 8 dimensions are smallest within the Innovation leaders (0.29%) and largest within the Modest innovators (1.43%) (1st row in Table 2), confirming that **to achieve a high level of performance countries need a balanced innovation system performing well across all dimensions**.

The 1st column in Table 2 also shows that the spread in performance across all Member States is smallest in Human resources (1.82%) and Economic effects (2.19%). In these two dimensions performance differences between Member States are relatively small (also cf. Figures 5 and 12). This shows e.g. that there are no clear shortages in the supply of highly skilled labour across the Member States. The spread in performance is largest in Open, excellent and attractive research systems (5.88%) and Linkages & entrepreneurship (5.59%). In these two dimensions the performance differences between Member States are relatively high (also cf. Figures 6 and 9). The quality of the research system e.g. is very high in a few Member States and at the same time very low in other Member States.

[5] *The variance of a data set is the arithmetic average of the squared differences between the values and the mean or average value and it is a measure of the spread of the distribution about the mean. If all countries would have the same performance level variance would be 0%. Variance would be highest (25%) if half of all countries would share the highest possible normalised score of 1 and the other half would share the lowest possible normalised score of 0. High levels of variance thus signal large differences in performance across countries, whereas low levels of variance signal small differences in performance across countries. There are no statistical rules for identifying high versus low levels of variance as variance e.g. also depends on the numbers of countries included in the sample (it is e.g. more likely to observe a higher spread in performance comparing a larger group of countries).*

Table 2: Spread in performance in the different innovation dimensions across and within performance groups

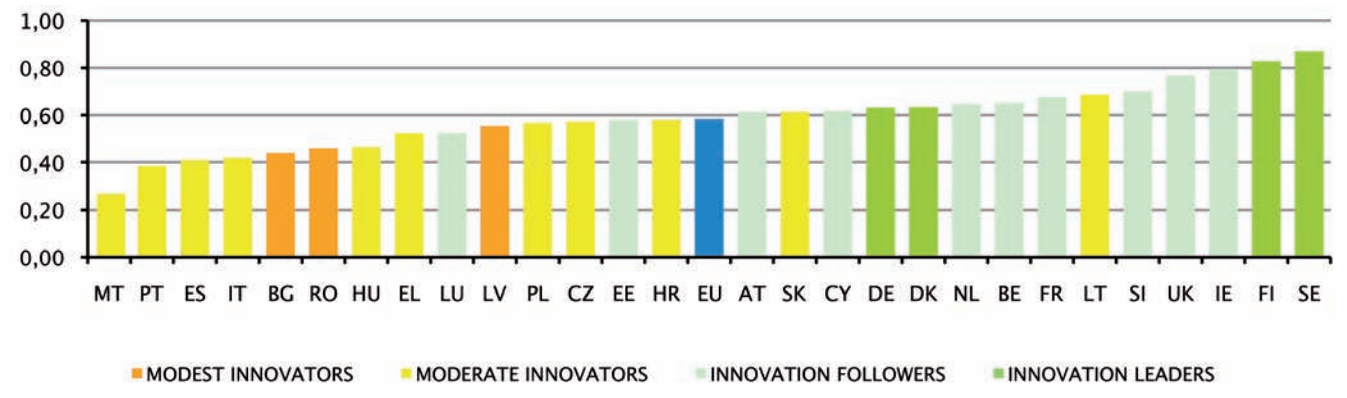
		Variance among			
		INNOVATION LEADERS	INNOVATION FOLLOWERS	MODERATE INNOVATORS	MODEST INNOVATORS
Across all 8 dimensions		Low 0.29%	Medium 0.53%	Medium 0.52%	High 1.43%
	Variance across all Member States				
Human resources	Low (1.82%)	--	--	--	--
Research systems	High (5.88%)	--	--	--	--
Finance and support	Medium (3.77%)	--	--	--	--
Firm investments	Low (2.41%)	--	--	--	--
Linkages & entrepreneurship	High (5.59%)	--	--	--	--
Intellectual assets	High (4.82%)	--	--	--	--
Innovators	High (4.77%)	--	--	--	--
Economic effects	Low (2.19%)	--	--	--	--

Human resources (Enablers)

In the first dimension Human resources Finland and Sweden, two of the Innovation leaders, perform best, closely followed by Ireland and the UK (Figure 5). A high share of the workforce in these countries has the skills needed to participate in and further develop the knowledge-based economy. Most of the Innovation leaders and followers perform above the EU average, except for Estonia and Luxembourg. Most of the Modest and Moderate innovators perform below the EU average, except Lithuania and Slovakia. Lithuania's strong performance is explained by its above average performance in tertiary education and youth education. Slovakia's strong performance is explained by its above average performance in doctorate graduates and youth education.

The spread in performance within the different performance groups (as compared by the spread in performance across all 8 dimensions) is relatively low for the Innovation followers and of medium level for the other performance groups.

Figure 5: Member States' performance in Human resources

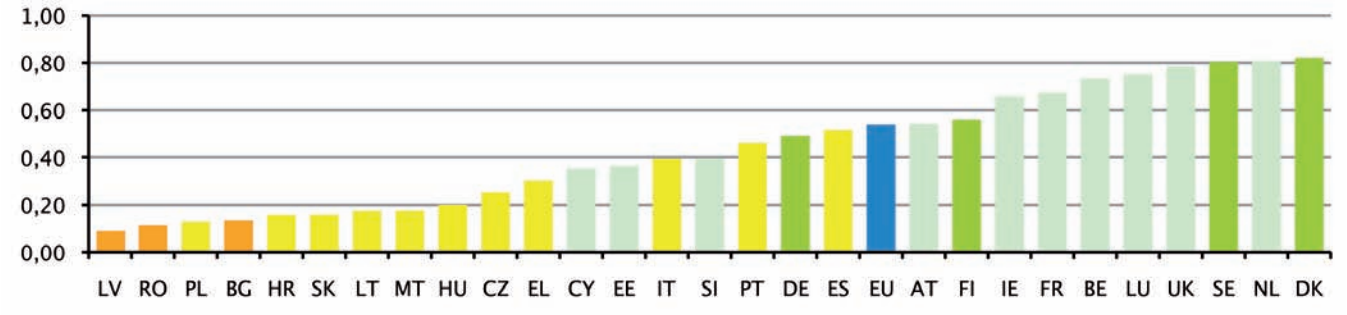


Open, excellent and effective research systems (Enablers)

In Open, excellent and effective research systems dimension the Innovation leaders and followers are performing the best (Figure 6). Denmark is the overall leader followed closely by the Netherlands, Sweden and the UK. This means that the innovation systems in these countries are open for cooperation with partners from abroad, researchers are well networked at international level and the quality of research output is very high. The performance of Germany, one of the Innovation leaders, is relatively weak, in particular due to a relatively low share of non-EU doctorate students. All the Modest and Moderate innovators perform below the EU average, only Spain and Portugal manage to get relatively close to the EU average.

Performance differences between all Member States are quite high for this dimension. Within the different performance groups the spread in performance is relatively high for the Innovation leaders, Innovation followers and Moderate innovators. Within the Innovation leaders Germany and Finland perform at a much lower level than Denmark and Sweden. Within the Innovation followers the high spread in performance is also shown by the fact that the best performing country (Netherlands) is performing twice as high as the least performing country (Cyprus). Within the Moderate innovators the best performing country (Spain) is even performing four times as high as the worst performing country (Poland).

Figure 6: Member States' performance in Open, excellent and effective research systems

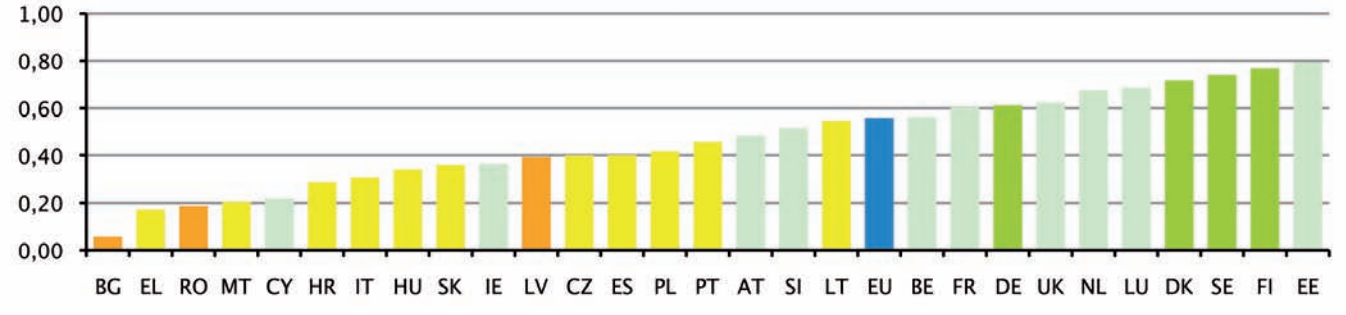


Finance and support (Enablers)

In Finance and support the Innovation leaders and followers are performing the best (Figure 7). Estonia, an innovation follower, is the overall leader in this dimension followed closely by Denmark, Finland and Sweden. These countries are characterised by a public sector which is well endowed to perform R&D activities and by the availability of risk capital for private firms to develop new technologies. Estonia's strong performance has to be interpreted with care as the score for this dimension is based on one indicator only (R&D expenditures in the public sector) as data on venture capital investments are not available. All the Modest and Moderate innovators perform below the EU average, with Lithuania being the best among the Moderate innovators approaching closely the EU average for this dimension.

The spread in performance is relatively high for the Innovation followers and Modest innovators. Within the Innovation followers the best performing country (Estonia) is performing almost four times as high as the least performing country (Cyprus). Within the Modest innovators the best performing country (Latvia) is even performing almost seven times as high as the least performing country (Bulgaria). These relatively high performance differences show that countries are not equally developed and that for some countries overall innovation performance could be improved by further developing their strength in this dimension.

Figure 7: Member States' performance in Finance and support

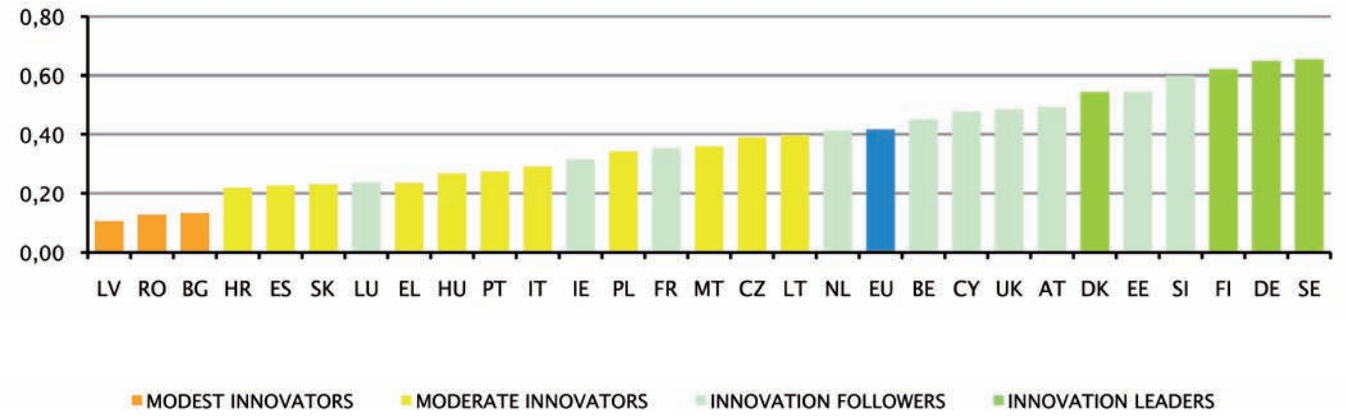


Firm investments (Firm Activities)

In the dimension Firm investments the Innovation leaders and followers are performing the best (Figure 8). Germany and Sweden are the overall leaders followed closely by Finland and Slovenia. In these countries companies invest much more in innovation activities, both for science-based R&D activities and non-R&D innovation activities including investments in advanced equipment and machinery. The performance of Luxembourg, one of the Innovation followers, is relatively weak, in particular due to low share of Non-R&D innovation expenditures. All the Modest and Moderate innovators perform below the EU average, with the Modest innovators being at the bottom of the performance scale.

Performance differences between Member States within each of these groups are relatively small, in particular for the Innovation leaders (with all 4 countries among the 6 best performing countries) and the Modest innovators (with all 3 countries showing the lowest performance levels).

Figure 8: Member States' performance in Firm investments

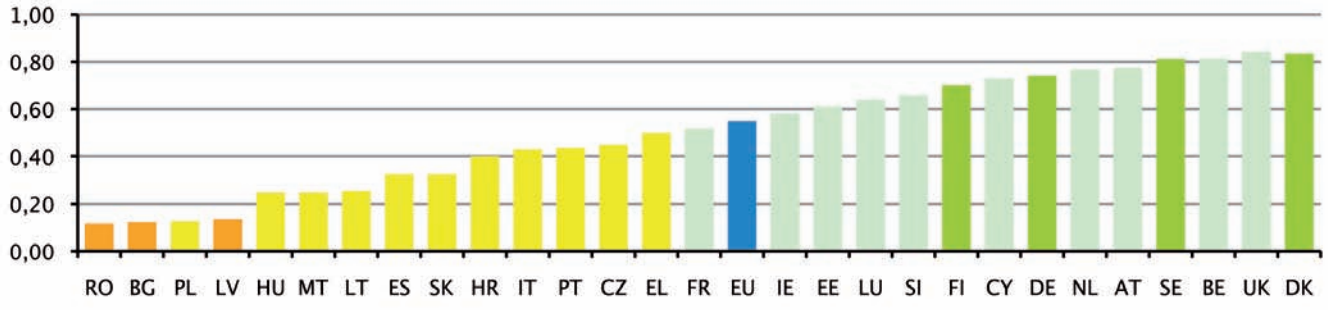


Linkages & entrepreneurship (Firm Activities)

In the dimension Linkages & entrepreneurship the Innovation leaders and followers are performing the best (Figure 9). Belgium, Denmark, Sweden and the UK are the overall leaders. SMEs in these countries have more deeply rooted innovation capabilities as they combine in-house innovation activities with joint innovation activities with other companies or public sector organisations. The research systems in these countries are also geared towards meeting the demand from companies as highlighted by high co-publication activities. France is the only innovation follower performing below the EU average. All the Modest and Moderate innovators perform below the EU average and Poland is performing relatively weak compared to the other Moderate innovators.

Performance differences between all Member States are quite high for this dimension. Within the different performance groups these differences are small among the Innovation leaders and Moderate innovators. Performance differences are higher for both the Innovation followers and the Moderate innovators. Within the Moderate innovators the best performing country (Greece) performs almost four times as high as the least performing country (Poland).

Figure 9: Member States' performance in Linkages & entrepreneurship

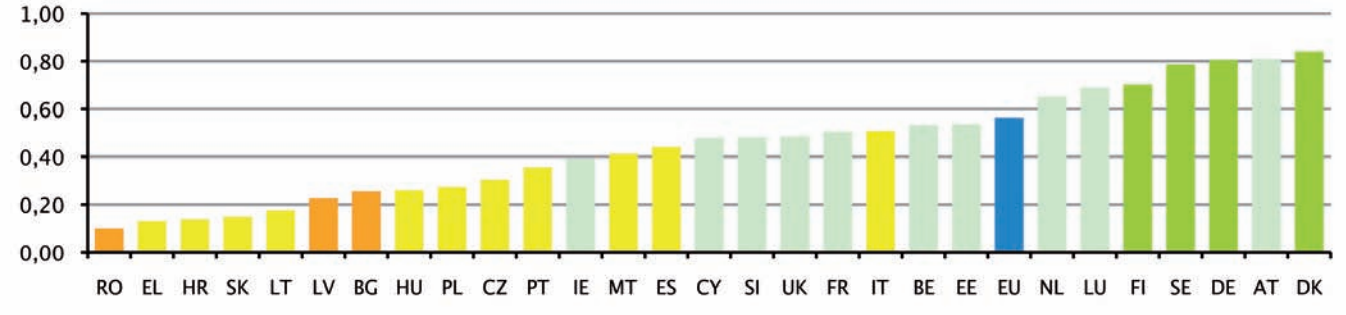


Intellectual assets (Firm Activities)

In the dimension Intellectual assets the Innovation leaders are performing the best (Figure 10). Austria, Denmark, Germany and Sweden are the overall leaders. These countries manage very well protecting their new ideas and innovations, whether by using patents to protect new technologies or by using trademarks or designs which protect new goods and services. The majority of the Innovation followers perform below average, as do all the Modest and Moderate. The average EU performance is higher than that of most Member States due to the very good performance of the before-mentioned countries. Italy is performing relatively strong compared to the other Moderate innovators.

Differences in performance are small for the Innovation leaders with all countries being among the best performers. Differences in performance are higher for both the Innovation followers and modest innovators. In particular for the Moderate innovators there are high differences in performance with the best performing country (Italy) performing almost four times as high as the least performing country (Greece).

Figure 10: Member States' performance in Intellectual assets

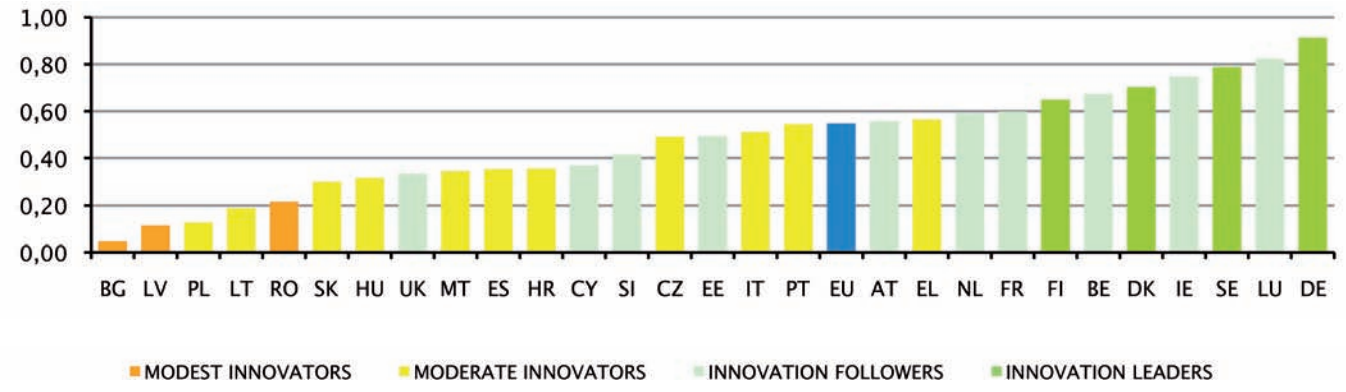


Innovators (Outputs)

In the dimension Innovators the Innovation leaders are performing the best (Figure 11). Germany is the overall leader followed by Luxembourg and Sweden. Innovation systems in these countries are characterised by high rates of firms involved in innovation activities: innovation seems a natural strategy for firms to meet their customers' demands and to face competitive pressures. This also results in faster employment growth linked to innovation activities. Cyprus, Slovenia and the UK are the weakest performing Innovation followers whereas Greece and Portugal are the strongest performing Moderate innovators. The performance of the Modest innovators is weak, with Romania being the strongest performing Modest innovator.

Performance differences between Member States are high for the Innovation followers and Moderate innovators. Within the Innovation followers the best performing country (Luxembourg) is performing 2.5 times as high as the least performing country (UK). Within the Moderate innovators the best performing country (Greece) is performing 4.5 times as high as the least performing country (Poland). The Innovation leaders and the Modest innovators perform more equally.

Figure 11: Member States' performance in Innovators

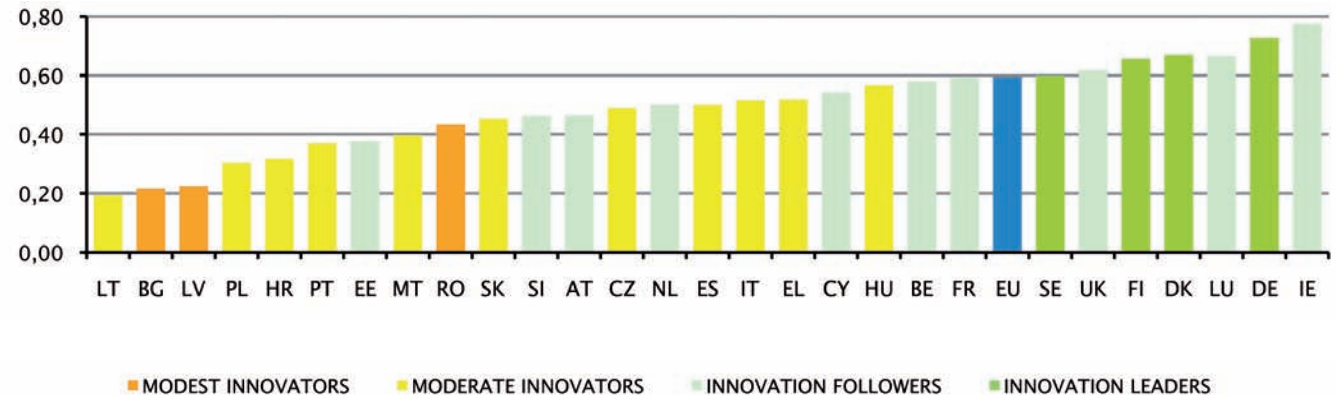


Economic effects (Outputs)

In the dimension Economic effects the Innovation leaders and several Innovation followers are performing the best (Figure 12). Ireland, an innovation follower, is the overall leader in this dimension followed by Denmark, Finland, Germany and Luxembourg. All the Modest and Moderate innovators perform below the EU average, with Hungary showing the best performance and Bulgaria, Latvia and Lithuania the worst performance.

Performance differences are small between the Innovation leaders and relatively modest for the Innovation followers and Moderate innovators. The spread in performance is relatively high for the Modest innovators with Romania performing twice as high as both Bulgaria and Latvia.

Figure 12: Member States' performance in Economic effects



3. Changes over time in Member States' innovation performance

3.1 Performance changes over time

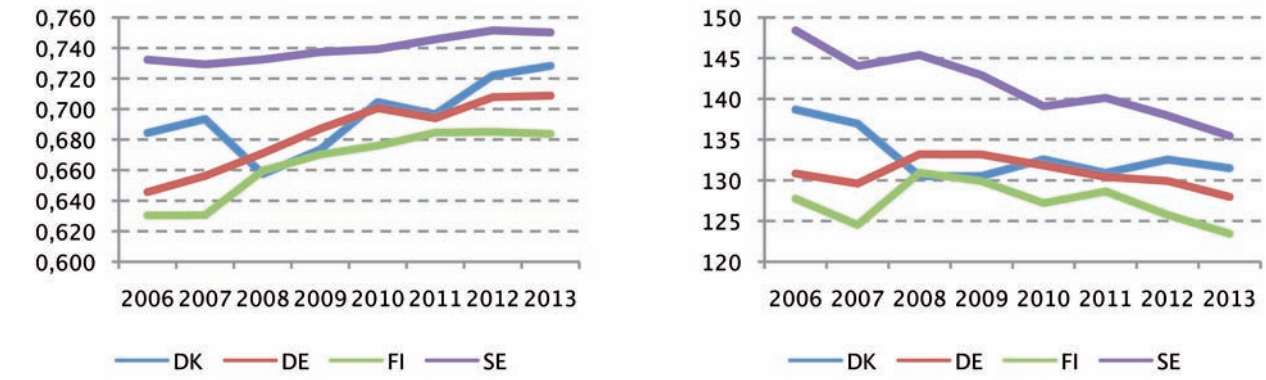
Where the IUS 2013 analysed innovation performance over a five-year period, for the IUS 2014 the analysis has been extended to an eight-year period. This longer time frame will allow comparing performance changes before and during the crisis. The eight-year period corresponds with data availability from the Community Innovation Survey starting with the CIS 2004.[6] Performance changes over time will be discussed separately for each of the innovation performance groups.

Innovation leaders

Over the analysed period of eight years, innovation performance has been improving for all Innovation leaders (Figure 13, left-hand side). Sweden has been the most innovative Member State over the whole 2006-2013 period, followed by Denmark, Germany and Finland. A closer look at the graph shows that Germany replaced Denmark as the 2nd most innovative Member State in 2008 and 2009 but performance differences between both countries are quite small over time.

Performance has improved strongest for Germany. The German innovation index has grown at an average annual rate of 1.3% (also cf. Figure 17), followed by Finland (1.2%), Denmark (0.9%) and Sweden (0.3%). But none of the Innovation leaders has been able to match the performance increase of the EU (1.7%) resulting in declining performance leads over the EU average (Figure 13, right-hand side). For Sweden e.g. the performance lead over the EU has declined from almost 50% in 2006 to 35% in 2013. The fact that the less innovative countries have been growing at a higher rate than the innovation leaders, thus catching up, contributes to the convergence of innovation performance in the EU (cf. Section 3.3).

Figure 13: Innovation leaders



Innovation index

Relative to EU (EU=100)

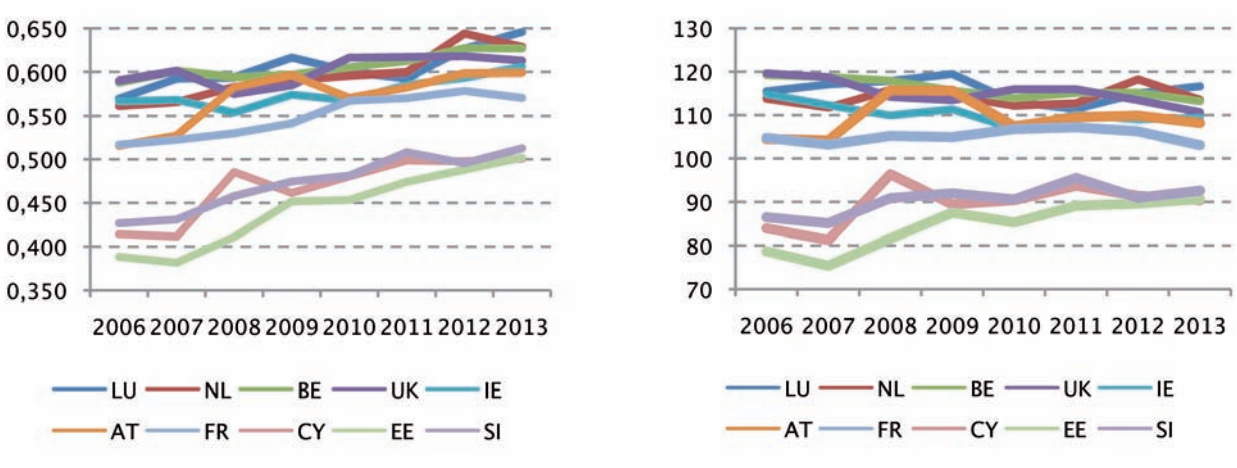
[6] *Previous versions of the CIS are not very compatible with the structure and questions asked in the CIS 2004, 2006, 2008 and 2010.*

Innovation followers

Innovation performance has been improving for all Innovation followers (Figure 14, left-hand side). Within the group of Innovation followers there have been continuous changes in rank performance, in particular among the most innovative Followers. E.g. several countries have been the leading Follower with the UK holding first position in 2006, Belgium holding first position in 2007 and 2008, Luxembourg in 2009, the UK in 2010 and 2011, the Netherlands in 2012 and finally Luxembourg again in 2013. Among the less innovative Followers group dynamics have been more modest with in particular Cyprus and Slovenia changing leading ranks several times.

Performance has improved strongest for Estonia at an average annual rate of 3.7%, followed by Cyprus (2.7%), Slovenia (2.7%), Austria (2.2%) and Luxembourg (1.8%). These were the only countries growing at a higher rate than the EU and for these countries the relative performance to the EU has improved (Figure 14, right-hand side). Growth performance of the Netherlands (1.6%) and France (1.4%) is close to that of the EU and the relative performance of these countries has only slightly decreased. Growth performance of Ireland (1.0%), Belgium (0.9%) and the UK (0.5%) is well below that of the EU and their relative performance has worsened over time.

Figure 14: Innovation followers

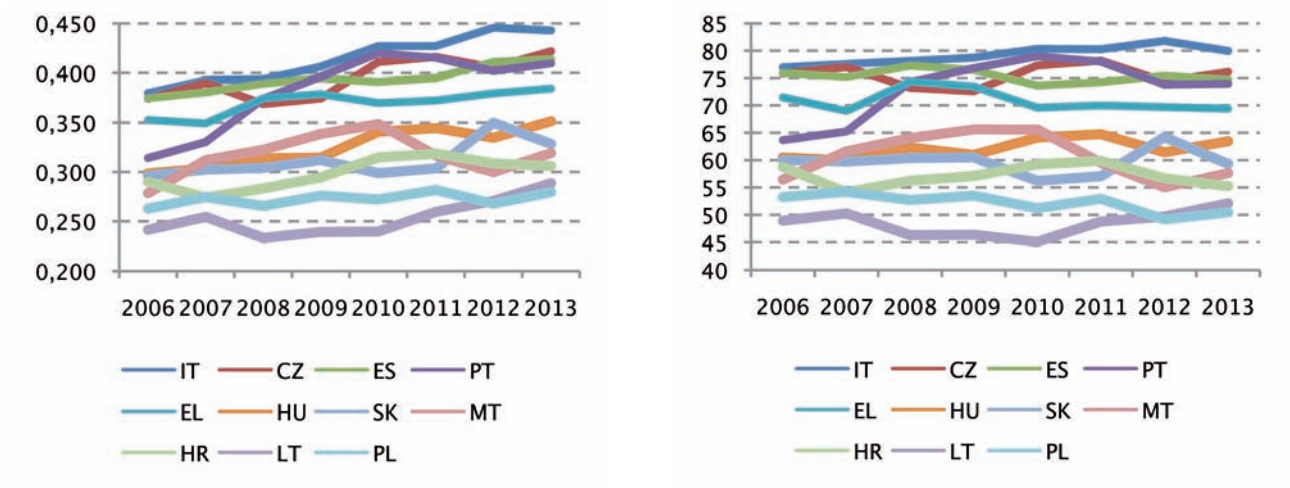


Innovation index *Relative to EU (EU=100)*

Moderate innovators

Innovation performance has been improving for all Moderate innovators (Figure 15, left-hand side). Italy has consistently been the best performing country within this group. Both Portugal and Malta experienced rapid increases between 2006 and 2010. Lithuania was the weakest performing Moderate innovator but the gap to the other countries has been decreasing and in 2012 it swapped last place with Poland.

Figure 15: Moderate innovators



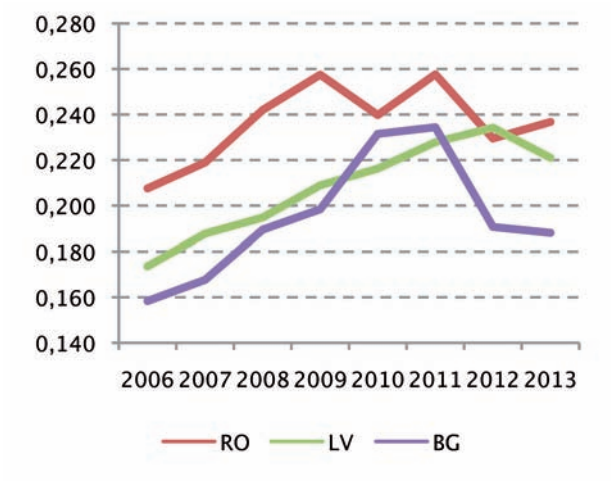
Innovation index *Relative to EU (EU=100)*

Performance has improved strongest for Portugal at an average annual rate of 3.9%, followed by Lithuania (2.6%), Hungary (2.4%), Italy (2.2%) and Malta (2.0%). These five Moderate innovators were growing at a higher rate than the EU and their relative performance to the EU has improved (Figure 15, right-hand side). Growth performance of the Czech Republic (1.7%) and Slovakia (1.5%) is close to that of the EU. Growth performance of Spain (1.4%), Greece (1.2%), Poland (0.9%) and Croatia (0.8%) is below that of the EU and for these countries the performance gap to the EU has increased.

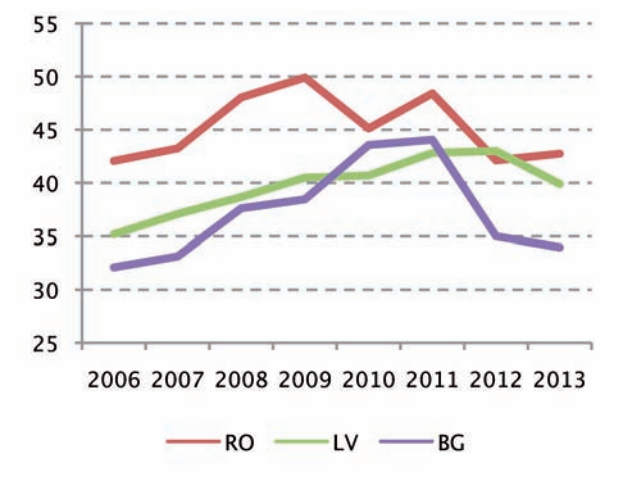
Modest innovators

Innovation performance has been improving for all three Modest innovators (Figure 16). Latvia (3.5%) and Bulgaria (2.5%) have seen a higher improvement in their innovation performance compared to the EU, but where Latvia managed to almost consistently grow until 2012, Bulgaria experienced a strong decline in its performance after 2011. Growth performance for Romania (1.9%) is also above that of the EU and Romania remains the most innovative country in its performance group.

Figure 16: Modest innovators



Innovation index



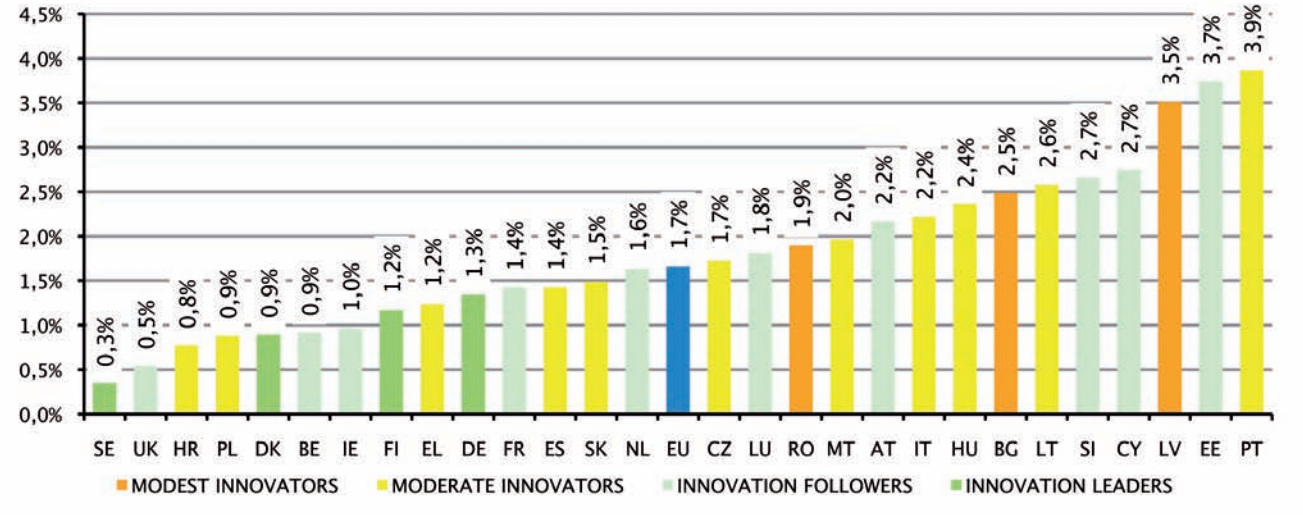
Relative to EU (EU=100)

Growth performance and growth leaders

Within the four country groups growth performance is very different. Some countries are growing relatively rapidly and others more slowly (Figure 17). Within the Innovation leaders, Germany is the growth leader. Cyprus, Estonia and Slovenia are the growth leaders of the Innovation followers, Portugal is the growth leader of the Moderate innovators and Latvia is the growth leader of the Modest innovators. Overall innovation performance has improved strongest in Portugal followed closely by Estonia and Latvia. Growth performance of these countries is driven by strong growth in particular indicators. High growth in International scientific co-publications has benefited all countries. High growth in Non-EU doctorate students, R&D expenditures in the business sector, PCT patent applications in general and in societal challenges have been important drivers of the growth performance of both Estonia and Portugal but not in Latvia, for several of these indicators Latvia is showing only a mediocre growth performance. For Latvia high growth in New doctorate graduate students, Population with completed tertiary education aged 30-34, Most cited publications, SMEs introducing marketing or organizational innovations, Employment in knowledge-intensive activities and the Contribution of medium and high-tech product exports to the trade balance have been the main drivers of the country's strong growth performance.

The graph also shows that innovation performance for all Modest innovators and about half of the Moderate innovators has been growing faster than the EU's innovation performance. On the other hand the performance of all Innovation leaders and half of the Innovation followers has been growing slower than the EU's innovation performance. The above average growth of the less innovative and below average growth of the more innovative Member States results in a gradual process of convergence in innovation performance among the Member States (see section 3.3 for a more detailed discussion).

Figure 17: EU Member States' growth performance



Average annual growth rates of the innovation index have been calculated over an eight-year period (2006-2013) (cf. section 6.2).

3.2 EU growth performance

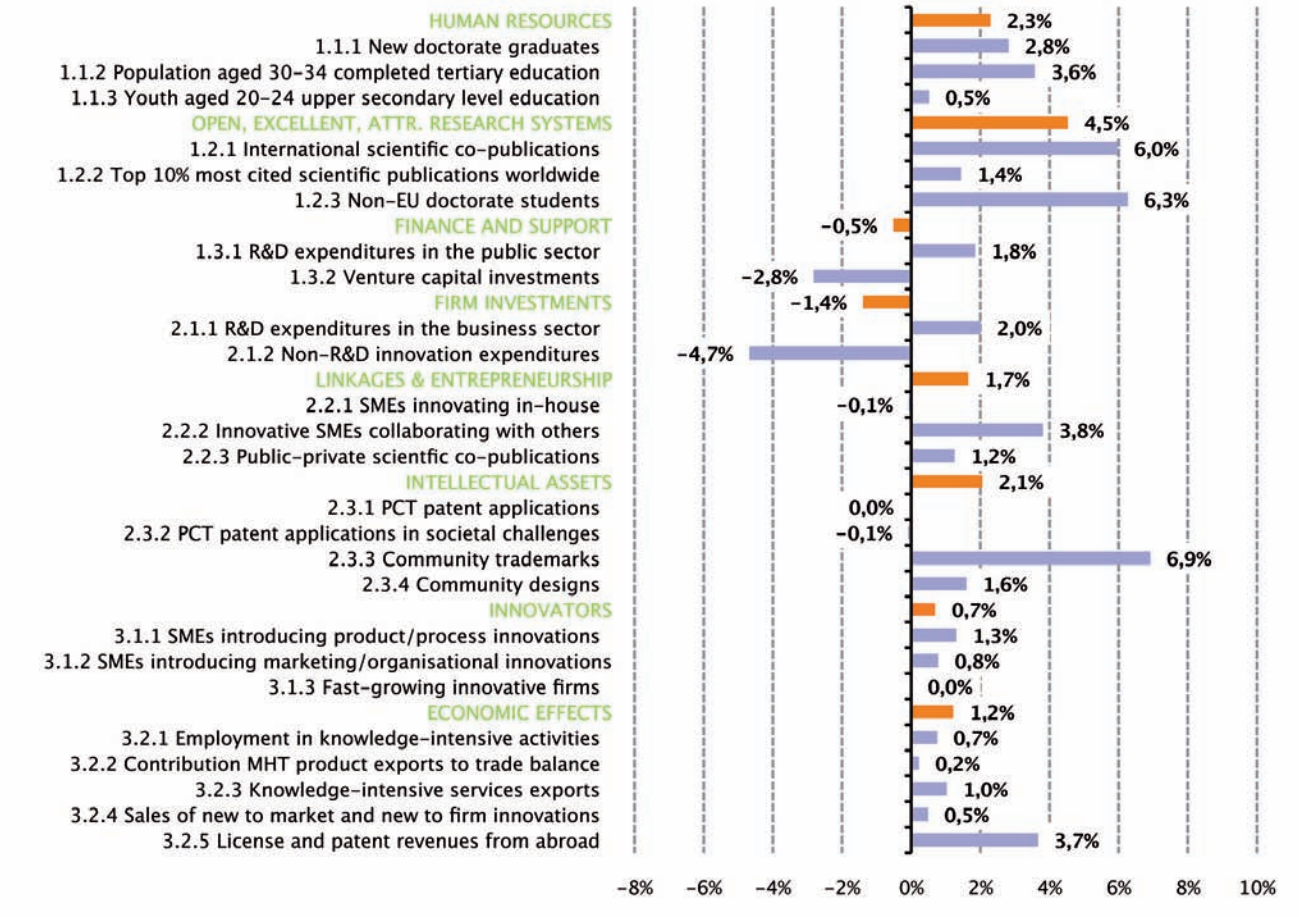
For the EU innovation performance has been increasing at an average annual rate of 1.7% between 2006 and 2013. But growth has not been equally strong across all dimensions and indicators (Figure 18). In particular in **Open, excellent and attractive research systems** (4.5%) growth has been very strong. Growth in this dimension has been driven by both high *growth in International scientific co-publications* (6.0%) and *Non-EU doctorate students* (6.3%). The EU innovation system is becoming more networked both between the Member States and at the global scale.

Also in **Human resources** (2.3%) and **Intellectual assets** (2.1%) growth has been relatively strong. In Human resources performance has increased most for *New doctorate graduates* (2.8%) and *Population aged 30-34 with completed tertiary education* (3.6%). Growth in Intellectual assets is mostly driven by a strong performance increase in *Community trademarks* (6.9%) while patent application activity has been stagnant. The EU is improving its educational knowledge base showing that Europe is turning into a more knowledge-based economy. At the same time the EU is also increasingly protecting new ideas and innovations generated by European companies and research.

Growth in **Linkages & entrepreneurship** (1.7%), **Economic effects** (1.2%) and **Innovators** (0.7%) has been positive but below average. Strong performance increases are observed for *Innovative SMEs collaborating with others* (3.8%) and *License and patent revenues from abroad* (3.7%). In these dimensions the EU is also improving its performance where more and more EU companies have in-house capabilities to innovate and to collaborate with public or private partners. More and more firms are innovating and innovation is having positive effects on exports and employment.

For **Finance and support** (-0.5%) and **Firm investments** (-1.4%) growth has even been negative, in particular due to a strong decline in *Venture capital investments* (-2.8%) and *Non-R&D innovation expenditures* (-4.7%).

Figure 18: Annualised EU growth performance over 2006-2013

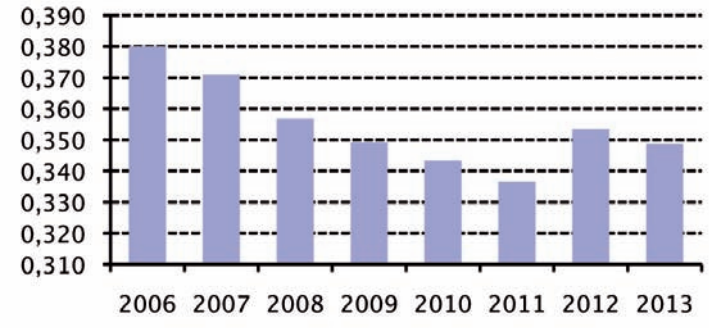


3.3 Convergence in innovation performance

Innovation performance differs between Member States and these differences can become smaller *(convergence)* or larger *(divergence)* over time.[7] Up until 2011 differences in innovation performance have become smaller with a steady rate of convergence (Figure 19). But in 2012 the process of convergence reversed and differences in countries' innovation performance increased to a level between that observed in 2008 and 2009. The results for this year again show that **innovation performance among Member States is converging** although the level of convergence went back to the level of 2009. Differences in innovation performance between Member states in 2013 are thus more pronounced than those observed for the years up until 2008.

Differences in innovation performance are becoming smaller between the different Member States. At the same time membership of the innovation performance groups is stable with hardly any country managing to move between groups. Does convergence also take place within each of these groups? If it does, it becomes unlikely that countries in the near future will manage to move from one performance group to the other. For this to happen divergence is needed in at least one performance group such that either the best performing country in that group manages to pass the upper performance threshold level or the worst performing country falling below the lower performance threshold of that group.

Figure 19: Convergence in Member States innovation performance



The bars show the degree of sigma-convergence. Lower (higher) degrees of sigma-convergence reveal higher (lower) convergence.

Differences with the four performance groups

Among the Innovation leaders performance has been converging over the 2006-2013 period but convergence was only the dominant process until 2011 after which differences in performance marginally increased (Figure 20).

Among the Innovation followers there is a rotating year-to-year pattern of convergence and divergence but over the entire 2006-2013 period performance differences have become smaller with the less innovative Followers, closing their performance gap with the more innovative Followers (Figure 21).

[7] *The change in performance difference over time can be measured by sigma-convergence. Sigma-convergence occurs when the spread in innovation performance across a group of economies falls over time. This spread in convergence is measured by the ratio of the standard deviation and the average performance of all EU Member States. Figures 20 to 22 show an additional indicator for measuring changes in performance differences using the performance gap ratio between the best and worst performing country in each performance group.*

Figure 20: Innovation leaders

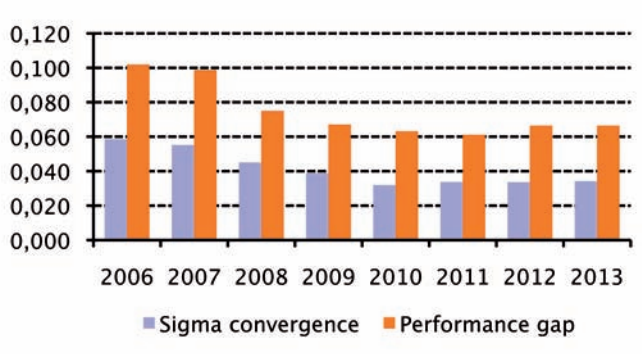
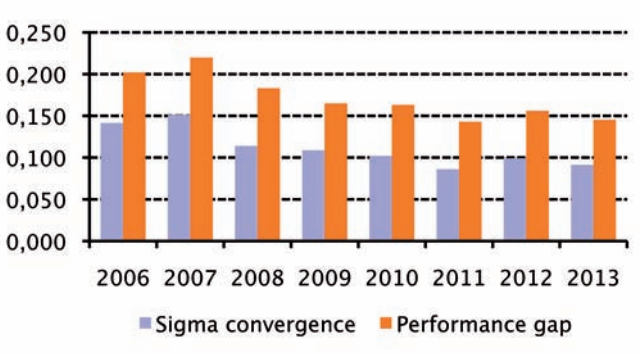


Figure 21: Innovation followers



Among the Moderate innovators performance differences have been increasing over time in particular in the years up until 2010 (Figure 22). Since 2011 performance differences are becoming smaller but differences in 2013 are higher than those in 2006.

For the Modest innovators we see a mixed pattern for the years before 2010, 2010 itself and the years after 2010. Before 2010 there was neither convergence nor divergence but in 2010, due to a strong performance improvement for Bulgaria, the innovation performance differences within this group strongly declined (Figure 23). Starting in 2011 there is strong process of divergence caused by significant declines in performance for Bulgaria compared to more moderate declines in performance for Latvia and Romania.

These results for the different performance groups show that what is observed for all Member States - a process of convergence with decreasing differences in innovation performance – is also observed within the Innovation leaders, Innovation followers and to a certain extent the Modest innovators (but for the latter there is a difference between the years before and after 2010). However this is not the case for the Moderate innovators where differences between countries have rather increased over time. With increasing differences between the Moderate innovators it is becoming more likely to see a country moving up to the Innovation followers or down to the Modest innovators in the near future. In particular countries like Croatia and Poland which have a performance slightly above 50% of the EU average and low growth rates risk falling below the 50% threshold level and thus to the category of the Modest innovators.

Figure 22: Moderate innovators

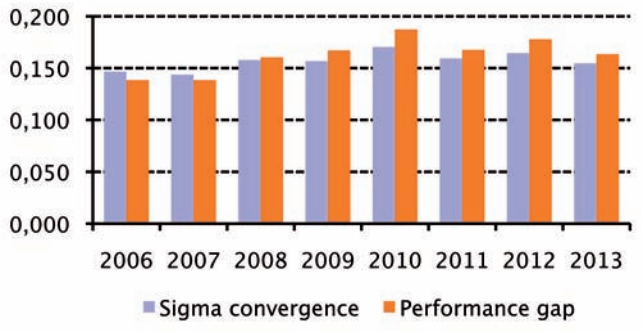
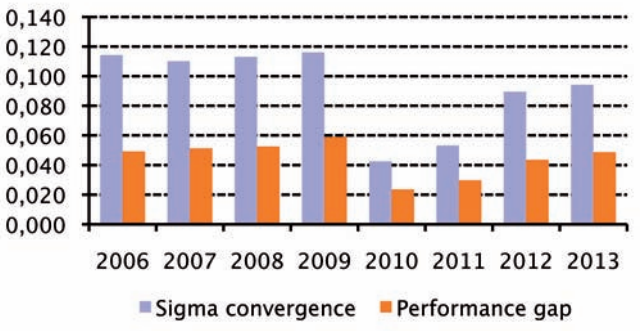


Figure 23: Modest innovators



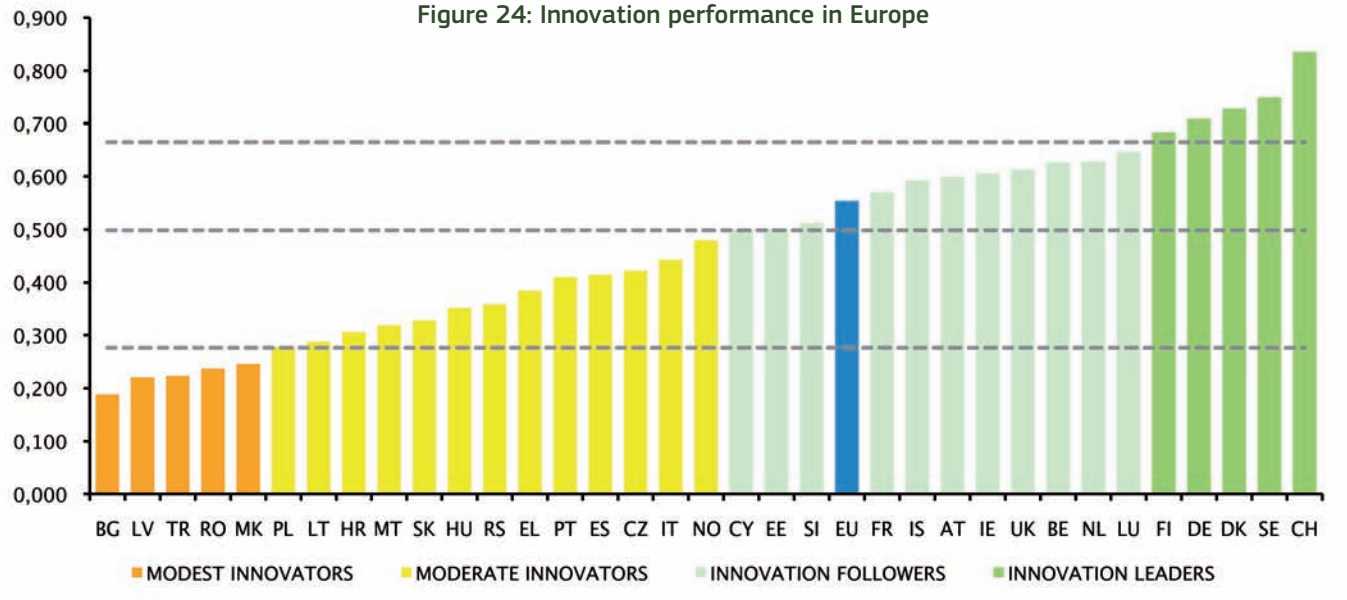
4. Benchmarking innovation performance with non-EU countries

4.1 Benchmarking with other European countries

When looking at a wider European comparison, Switzerland is the overall innovation leader in Europe, outperforming all EU Member States (Figure 24). Switzerland's strong performance is linked to being the best performer in 9 indicators, in particular in Open, excellent and attractive research systems where it has the best performance in all three indicators and Economic effects where it has best performance in two indicators (Employment in knowledge-intensive activities and License and patent revenues from abroad). Switzerland's relative weakness is in having below EU average shares in SMEs collaborating with others (9.4% compared to 11.7% for the EU) and Exports of knowledge-intensive services (25.1% as compared to 45.3% for the EU).

Iceland is an Innovation follower and has the highest performance of all countries in International scientific co-publications and Public-private co-publications but at the same time the lowest performance in Youth education (together with Turkey) and the Contribution of medium-high-tech product exports to the trade balance. Iceland is also the only country where performance has not improved over the 2006-2013 period.

Figure 24: Innovation performance in Europe



Non-EU countries include Switzerland (CH), Iceland (IS), Norway (NO), RS (Serbia), MK (Former Yugoslav Republic of Macedonia) and Turkey (TR).

Norway and Serbia are Moderate innovators with Norway's innovation performance coming close to that of the Innovation followers in particular due to its strong performance in Tertiary education, International scientific co-publications and Non-domestic doctorate students. Norway's growth performance (1.4%) however is below that of the EU (1.7%). Serbia performs very well in Youth education, and Employment in knowledge-intensive activities and innovation performance has been improving rapidly at an average annual growth rate of 5.5%.

The Former Yugoslav Republic of Macedonia and Turkey are Modest innovators. Macedonia is performing well above average in Youth education and the Contribution of medium-high-tech product exports to the trade balance (where it is taking 4th place overall) and its growth performance (3.7%) has been almost double that of the EU. Turkey is performing strongly in the Contribution of medium-high-tech product exports to the trade balance and Sales due to new innovative products. Turkey's growth rate at 3.2% is also above that of the EU.

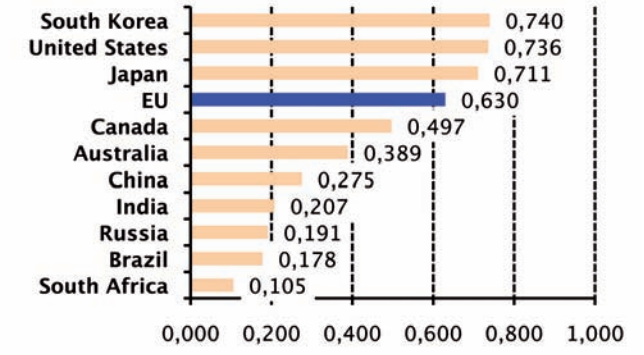
4.2 Benchmarking with global competitors

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

South Korea, the US and Japan have a performance lead over the EU (Figure 25). The performance lead has been increasing for South Korea as its growth over 2006-2013 has been more than double that of the EU (Figure 26). Innovation performance for the EU has been improving at a higher rate than that for the US and Japan. As a consequence, the EU has been able to close almost half of its performance gap with the US and Japan since 2008. These three global top innovators are particularly dominating the EU in indicators capturing business activity as measured by R&D expenditures in the business sector, Public-private co-publications and PCT patents but also in educational attainment as measured by the Share of population having completed tertiary education. It means that enterprises in these countries invest more in research and innovation and collaborative knowledge-creation between public and private sectors is better developed. Further, the skilled workforce in these countries is relatively larger than in the EU.

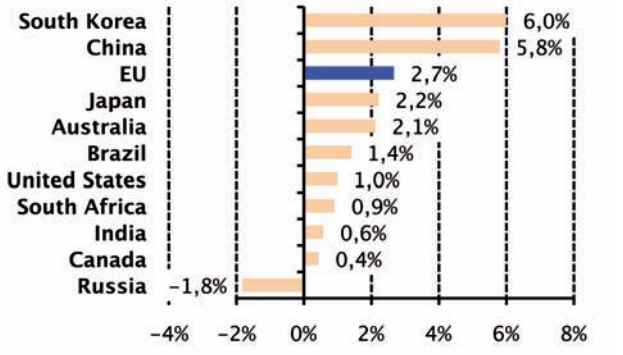
The EU continues to have a performance lead over Australia, Canada and all BRICS countries (Brazil, Russia, India, China and South Africa). Of these countries only China has managed to grow at a higher rate than the EU, albeit from a relatively low level.

Figure 25: Global innovation performance



Note: Average performance is measured using a composite indicator building on data for 12 indicators ranging from a lowest possible performance of 0 to a maximum possible performance of 1. Average performance reflects performance in 2010/2011 due to a lag in data availability.

Figure 26: Global innovation growth rates



Note: Average annual growth rates of the innovation index have been calculated over an eight-year period (2006-2013). Due to a smaller set of indicators used as compared to the benchmarking for the Member States and the EU the growth rate for the EU in this figure is not comparable to the one discussed before.

Methodology

For all countries data availability is more limited than for the European countries (e.g. comparable innovation survey data are not available for many of these countries). Furthermore, the economic and/or population size of these countries outweighs those of many of the individual Member States and innovation performance is therefore compared with the aggregate of the Member States or the EU.

For the international comparison of the EU with its global competitors a more restricted set of 12 indicators (Table 3, next-page) is used of which most are nearly identical to those used the measurement framework for the EU Member States (cf. Table 1).[8] Most of these indicators focus on performance related to R&D activities (R&D expenditures, publications, patents) and there are no indicators using innovation survey data as such data are not available for most of the global competitors or are not directly comparable with the European Community Innovation Survey (CIS) data. The indicator measuring the Share of the population aged 30 to 34 having completed tertiary education has been replaced by the same indicator but for a larger age group, namely 25 to 64 as data for the age group 30 to 34 is not available for most countries.

For each of the international competitors the following pages discuss their relative performance to the EU and relative strengths and weaknesses for the different indicators. Indicator values, performance leads and changes in performance leads are shown in Annex G.

[8] *The methodology for calculating average innovation performance is explained in Section 6.4.*

Table 3: Indicators used in the international comparison

Main type / innovation dimension / indicator	Data source: Numerator	Data source: Denominator	Most recent year	Date not available for
ENABLERS				
Human resources				
1.1.1 New doctorate graduates (ISCED 6) per 1000 population aged 25-34	OECD, Eurostat	OECD, Eurostat	2011	India
1.1.2 Percentage population aged 25-64 having completed tertiary education	OECD, World Bank, Eurostat	OECD, World Bank, Eurostat	2011	
Open, excellent and attractive research systems				
1.2.1 International scientific co-publications per million population	Science-Metrix (Scopus)	World Bank, Eurostat	2012	Australia, Canada, South Africa
1.2.2 Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	Science-Metrix (Scopus)	Science-Metrix (Scopus)	2009	Australia, Canada, South Africa
Finance and support				
1.3.1 R&D expenditure in the public sector as % of GDP	OECD, Eurostat	OECD, Eurostat	2011	
FIRM ACTIVITIES				
Firm investments				
2.1.1 R&D expenditure in the business sector as % of GDP	OECD, Eurostat	OECD, Eurostat	2011	
Linkages & entrepreneurship				
2.2.3 Public-private co-publications per million population	CWTS (Thomson Reuters)	World Bank, Eurostat	2008	
Intellectual assets				
2.3.1 PCT patents applications per billion GDP (in PPS€)	OECD	OECD, Eurostat	2010	
2.3.2 PCT patents applications in societal challenges per billion GDP (in PPS€) (environment-related technologies; health)	OECD	OECD, Eurostat	2010	
OUTPUTS				
Economic effects				
3.2.2 Contribution of medium and high-tech product exports to the trade balance	United Nations	United Nations	2012	
3.2.3 Knowledge-intensive services exports as % total service exports	United Nations, Eurostat	United Nations, Eurostat	2011	South Africa
3.2.5 License and patent revenues from abroad as % of GDP	World Bank, Eurostat	World Bank, Eurostat	2012	

South Africa

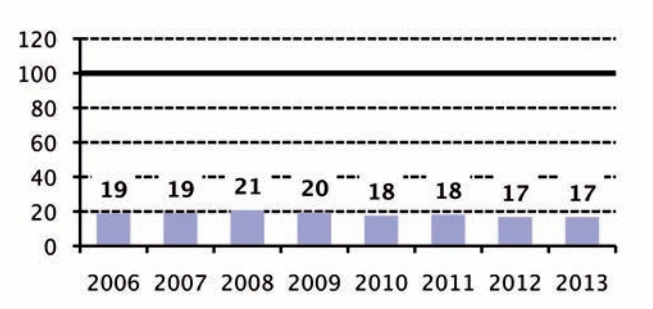
The innovation performance of South Africa is lagging behind that of the EU and is slowly declining. Relative performance was about 20% for 2006-2009 of the EU level and then declined to 17% in 2013.

South Africa is performing worse than the EU for all indicators, particularly on License and patent revenues from abroad, Doctorate graduates, Public-private co-publications and Patent applications.

Looking at the relative growth performance reveals that for almost all indicators South Africa's growth performance is below that of the EU explaining the divergence process in innovation performance relative to the EU. Growth is only above that of the EU for the Population with completed tertiary education.

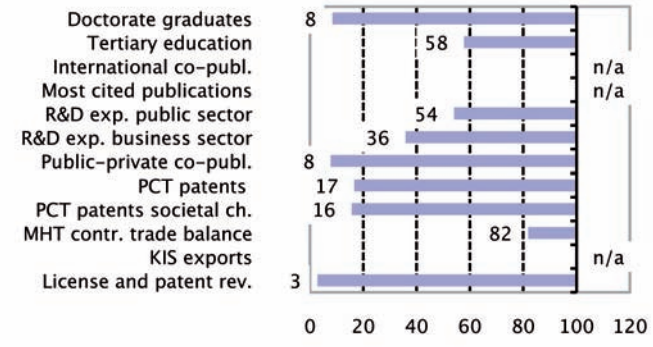
The performance gap therefore has worsened for almost all indicators especially for License and patent revenues from abroad and Patent applications. The performance gap has only decreased for the Population with completed tertiary education.

Innovation performance: South Africa



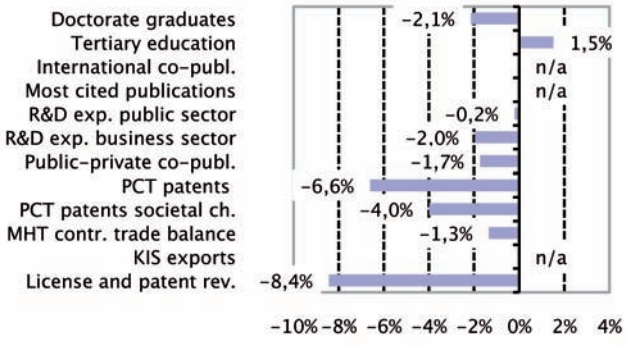
The performance scores are calculated by dividing the South African innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

Performance lead: South Africa



The scores are calculated by dividing the South African indicator value by that of the EU and multiplying by 100.

Change in performance lead: South Africa



The scores are calculated by subtracting the EU growth rate from that of South Africa.

For indicators International scientific co-publications, Most-cited publications and Exports of knowledge-intensive services data are not available.

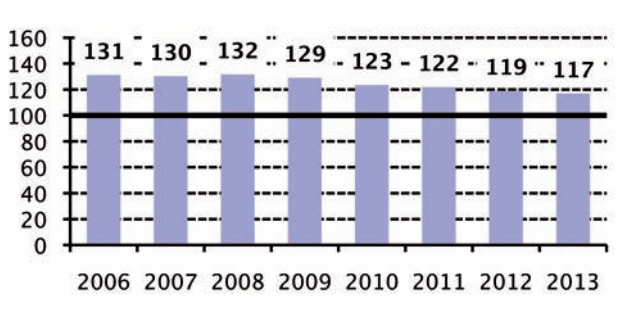
United States

The United States has been consistently more innovative than the EU but the performance lead is continuously decreasing. Between 2006 and 2009 the US innovation index was about 30% higher than that of the EU, but since 2009 the US lead has been steadily declining to 17% in 2013. Between 2008, when the lead was at its peak, and 2013 the US performance lead has thus reduced by half from 32% to 17%.

A closer look at the individual indicators reveals that the US is performing better on 9 indicators. A much higher share of the US population has completed tertiary education, 42% in the US compared to 28.5% in the EU in absolute terms (cf. Annex G) creating a performance lead of the US over the EU of almost 50%. The number of International co-publications and the quality of US scientific publications are also much higher and the Scientific collaboration between the private and public sector is almost double that in the EU. US businesses spend about 40% more on R&D (1.82% of GDP in 2011 compared to 1.29% in the EU). The US is also more successful in commercializing new technologies with 17% more License and patent revenues compared to the EU. The US has relative weaknesses in PCT patent application and the Contribution of medium-high-tech product exports to the trade balance.

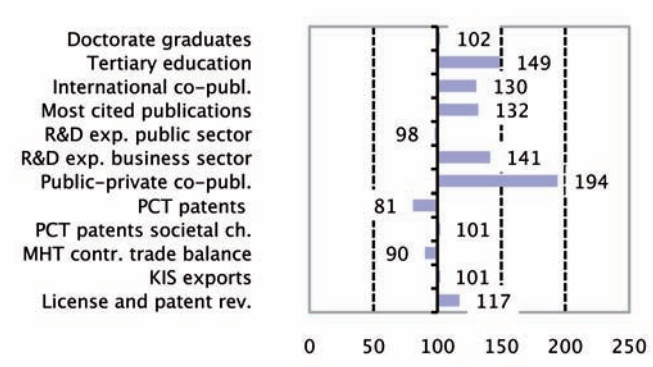
For most indicators however the relative growth performance of the US has worsened. Only for Doctorate graduates and Knowledge-intensive services exports the US has managed to improve its performance lead. For all other indicators either the performance lead has declined or the performance gap to the EU has increased. The strongest relative declines are observed for License and patent revenues from abroad, Patent applications in societal challenges and International scientific co-publications. In particular for those indicators where the gap is increasing – R&D expenditures in the public sector, PCT patent applications and the Contribution of medium-high-tech product exports to the trade balance – the US is, compared to the EU, not performing well.

Innovation performance: United States



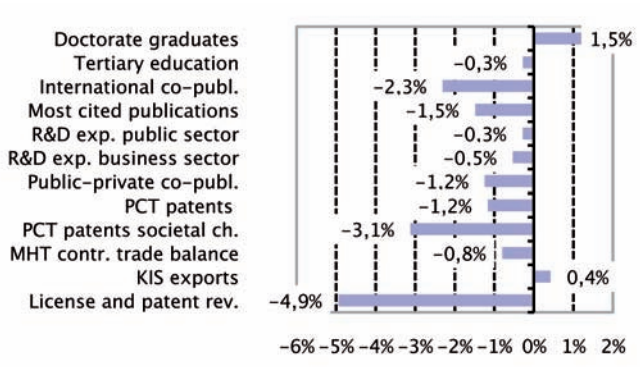
The performance scores are calculated by dividing the US innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

Performance lead: United States



The scores are calculated by dividing the US indicator value by that of the EU and multiplying by 100.

Change in performance lead: United States



The scores are calculated by subtracting the EU growth rate from that of the US.

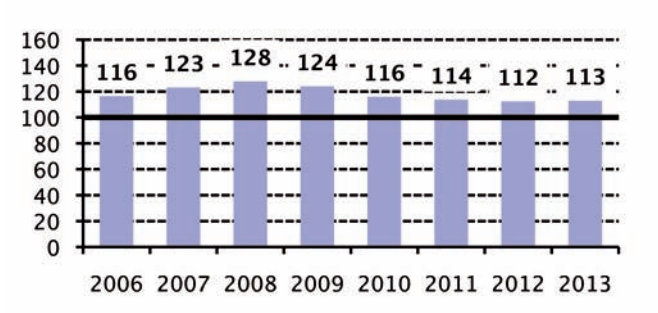
Japan

Japan has been consistently more innovative than the EU; however its performance lead decreases. The Japanese innovation index reached a peak in 2008 with the value being 28% higher than that of the EU. The performance lead started to decline after 2008 and in 2011 it was only half that of 2008. From 2011 to 2013 the performance lead remained relatively stable at about 13%.

A closer look at the individual indicators reveals that Japan is performing better on 6 indicators. A 63% higher share of population has completed tertiary education (46.4% in Japan compared to 28.5% in the EU). Japanese businesses spend twice as much on R&D and Japan is also more successful in applying for Patents and Medium-high-tech products exports make a larger contribution to the country's trade balance. Japan has weaknesses in Doctorate graduates, International co-publications, Most-cited publications, Exports of knowledge-intensive services and License and patent revenues from abroad.

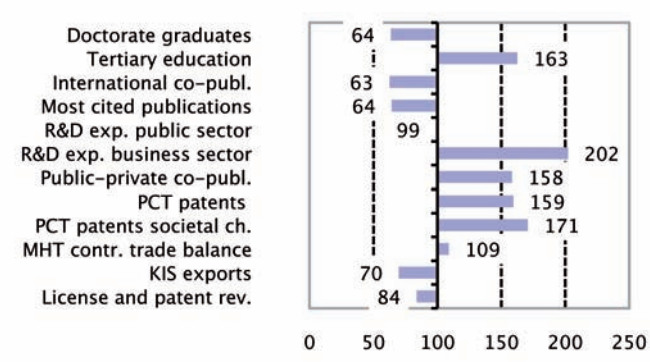
In 7 indicators however the relative growth performance of Japan has worsened and in 5 indicators it has improved. The Japanese lead has been improving in 4 indicators, in particular in patent indicators, Tertiary education and the Contribution of medium-high-tech product exports to the trade balance. The gap towards the EU has worsened in 5 indicators, in particular for International scientific co-publications, Most cited publications, R&D expenditures in the public sector, Exports of knowledge-intensive services and License and patent revenues from abroad.

Innovation performance: Japan



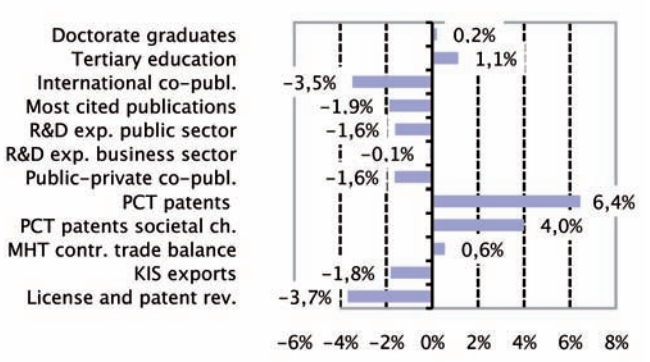
The performance scores are calculated by dividing the Japanese innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

Performance lead: Japan



The scores are calculated by dividing the Japanese indicator value by that of the EU and multiplying by 100.

Change in performance lead: Japan



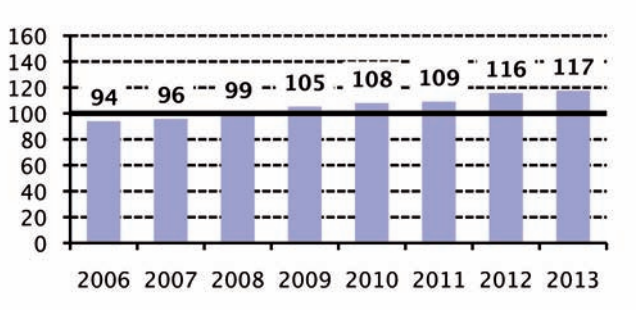
The scores are calculated by subtracting the EU growth rate from that of Japan.

South Korea

South Korea is relatively more innovative than the EU and the innovation lead is further increasing. The innovation performance of South Korea was below that of the EU up until 2008. From 2009 onwards the performance gap has been reversed into a performance lead which has steadily improved to 17% in 2013. South Korea has also been catching-up with the US and its performance equalled that of the US in 2013. A closer look at the individual indicators reveals that South Korea is performing better on 8 indicators. A 42% higher share of population has completed tertiary education. South Korea is more successful in applying for patents and in particular the country spends more than twice as much on business R&D (2.74% of its GDP in 2011 as compared to 1.29% in the EU I absolute terms). South Korea has weaknesses in Doctorate graduates, License and patent revenues from abroad and in its knowledge base with weaker performance compared to the EU in both International co-publications and Most-cited publications.

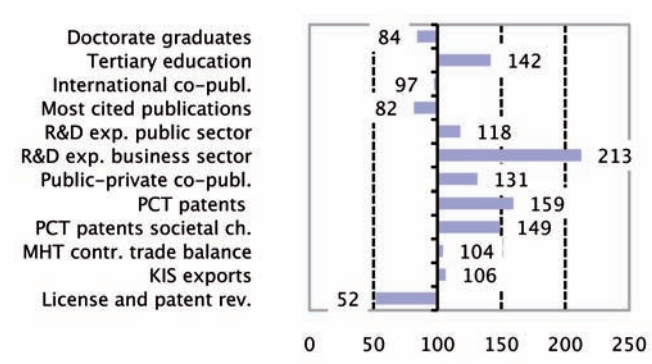
The relative growth performance of South Korea has improved for 10 indicators. This has led to performance gap increases for 8 indicators, particularly in Patent applications, Public-private co-publications, R&D expenditures in the business and public sector and the Population that completed tertiary education. Furthermore South Korea is decreasing the performance gap with positive growth performances in Doctorate graduates, International co-publications and Most cited publication. On the other hand South Korea still has a performance lead in Knowledge-intensive services exports but the performance lead for this indicator is decreasing in favour of the EU. Only in License and patent revenues from abroad South Korea's performance gap has worsened.

Innovation performance: South Korea



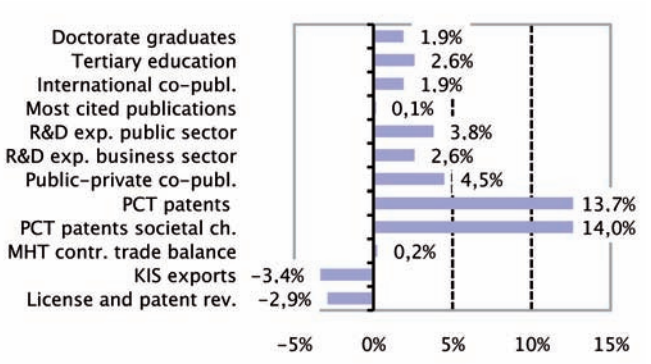
The performance scores are calculated by dividing the South Korean innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

Performance lead: South Korea



The scores are calculated by dividing the South Korean indicator value by that of the EU and multiplying by 100.

Change in performance lead: South Korea



The scores are calculated by subtracting the EU growth rate from that of South Korea.

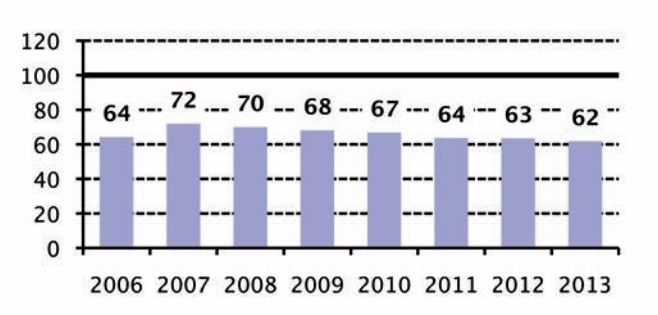
Australia

Australia's innovation performance is lagging behind that of the EU and the innovation gap slowly widens. The performance gap was at its smallest in 2007 when the country's relative performance was 72% of that of the EU and has since steadily decreased to 62% in 2013.

Australia is performing worse than the EU in 7 indicators, particularly on License and patent revenues from abroad, Exports of knowledge-intensive services, Patent applications and Public-private co-publications. Australia is performing better than the EU on 3 indicators related to the public sector: Doctorate degrees, Population having completed tertiary education, where Australia is performing 34% better than the EU, and R&D expenditures in the public sector.

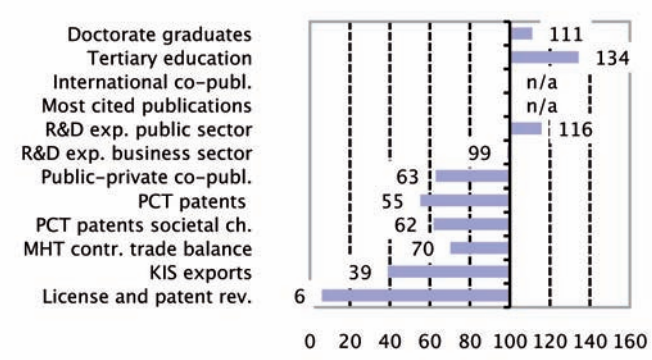
Australia shows a mixed growth performance in its individual indicators with performance in 5 indicators growing faster and in 5 indicators growing slower compared to the EU. Australia has improved its performance lead in Tertiary education and R&D expenditures in the public sector. However Australia's performance gap in Patent applications, the Contribution of medium-high-tech product exports to the trade balance and License and patent revenues from abroad has worsened. The performance gap on Exports of knowledge-intensive services is decreasing in favour of Australia. Australia seems to do much better in its enabling conditions but worse in both firm activities and innovation outputs.

Innovation performance: Australia



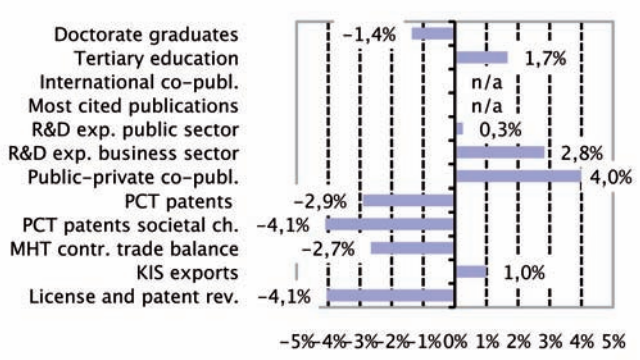
The performance scores are calculated by dividing the Australian innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

Performance lead: Australia



The scores are calculated by dividing the Australian indicator value by that of the EU2and multiplying by 100.

Change in performance lead: Australia



The scores are calculated by subtracting the EU growth rate from that of Australia.

For international scientific co-publications and most-cited publications data are not available.

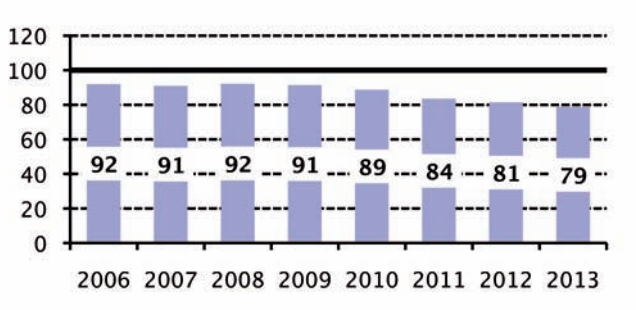
Canada

Canada's innovation performance is lagging behind that of the EU and the innovation gap is further decreasing. Relative performance was at its highest in the period 2006 - 2009 at more than 90% of that of the EU after which it started to decrease. In 2013 Canada's innovation performance has declined to 79% of that of the EU.

Canada is performing worse than the EU on 7 indicators, in particular on License and patent revenues from abroad, Patent applications and R&D expenditures in the business sector. Canada is performing better than the EU for 3 indicators: Population with completed tertiary education, where the country is performing 80% better than the EU, R&D expenditures in the public sector and Public-private co-publications.

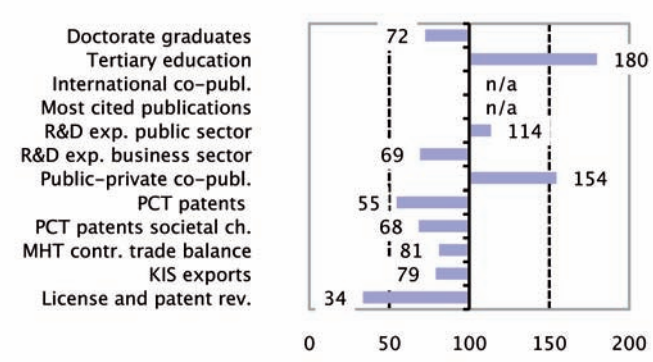
Canada shows a mixed growth performance in its individual indicators with growth performance for 7 indicators below that of the EU and for 3 indicators above. Canada has only been able to improve its performance lead in Tertiary education. Furthermore it has decreased the performance gap for Doctorate graduates and Knowledge-intensive service exports. The performance leads Canada has on R&D expenditures in the public sector and Public-private co-publications are decreasing. In addition the performance gap in R&D expenditures in the business sector, Patent applications, the Contribution of medium-high-tech product exports to the trade balance and License and patent revenues from abroad have worsened.

Innovation performance: Canada



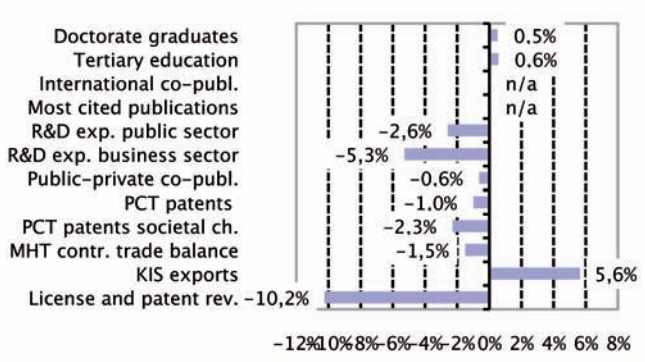
The performance scores are calculated by dividing the Canadian innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

Performance lead: Canada



The scores are calculated by dividing the Canadian indicator value by that of the EU and multiplying by 100.

Change in performance lead: Canada



The scores are calculated by subtracting the EU growth rate from that of Canada.

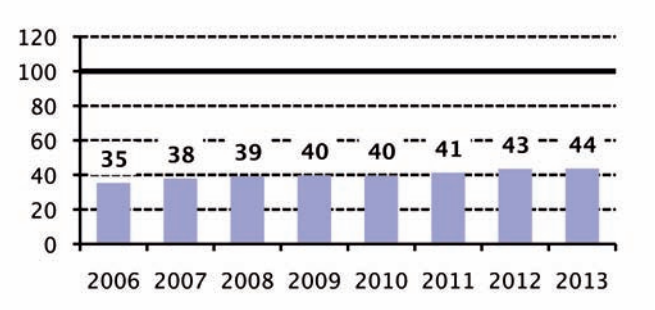
For two indicators International scientific co-publications and Most-cited publications data are not available.

China

China's innovation performance is lagging behind that of the EU but its relative performance has been increasing from 35% in 2006 to 44% in 2013. China is performing worse than the EU in 10 out of 12 indicators, in particular on License and patent revenues from abroad, Public-private co-publications, International co-publications, Patent applications and Tertiary education. China is outperforming the EU only on two indicators: Doctorate graduates (where the country is performing 31% better as a result of having 2.2 new doctorate graduates per 1,000 population aged 25-34 as compared to 1.7 in the EU) and R&D expenditures in the business sector (1.82% of GDP in China compared to 1.29% in the EU) .

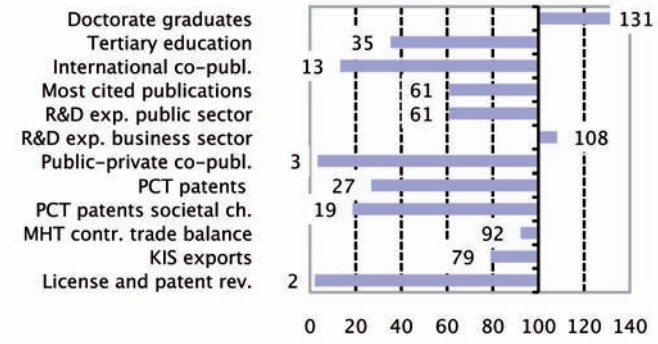
However, China's growth performance has been much stronger with growth in 9 indicators being above that of the EU, which indicates a continuous catching-up process. Growth was below that of the EU in Doctorate graduates and only marginally in R&D expenditures in the public sector and the Contribution of medium-high-tech product exports to the trade balance. China's performance lead in R&D expenditures in the business sector has improved and its performance gap has become smaller in 7 indicators, in particular in Patent applications, Public-private co-publications, International co-publications, Tertiary education and Exports of knowledge-intensive services. China's performance lead in Doctorate graduates has decreased and its gap in R&D expenditures in the public sector and the Contribution of medium-high-tech product exports to the trade balance has worsened slightly.

Innovation performance: China



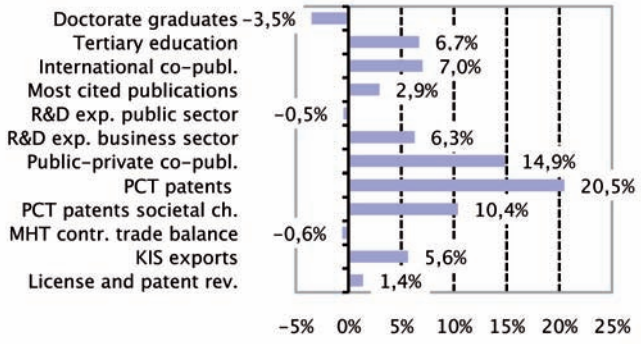
The performance scores are calculated by dividing the Chinese innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

Performance lead: China



The scores are calculated by dividing the Chinese indicator value by that of the EU and multiplying by 100.

Change in performance lead: China



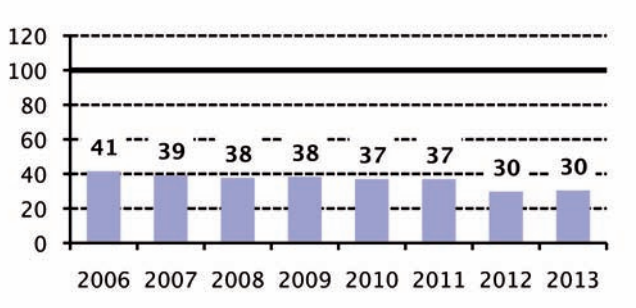
The scores are calculated by subtracting the EU growth rate from that of China.

Russia

Russia's innovation performance is lagging well behind that of the EU27 and the innovation gap continues to widen. Relative innovation performance was close to 40% up until 2011 and has decreased to 30% in 2012 and 2013. The strong decline in 2012 is due to a sharp decline in New doctorate graduates from 1.4 to 0.4 per 1,000 population aged 25-34.

A closer look at the individual indicators reveals that Russia is performing worse than the EU on 10 indicators, in particular on Public-private co-publications, License and patent revenues from abroad, Patent applications, International co-publications and Most-cited publication and Doctorate graduates. A 87% higher share of Russia's population has completed tertiary education.

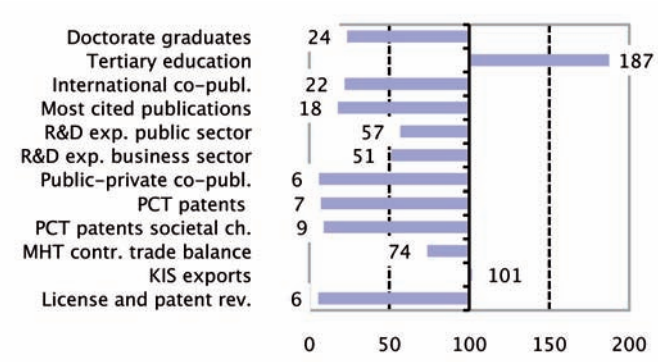
Innovation performance: Russia



The performance scores are calculated by dividing the Russian innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

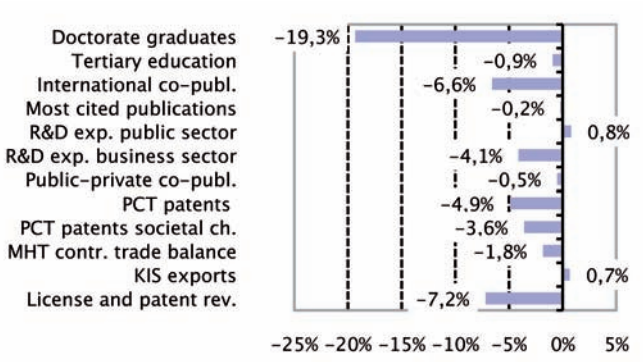
Russia's growth performance is worse than that of the EU with growth in 10 indicators being below that of the EU, especially for Doctorate graduates, International co-publications, R&D expenditures in the business sector, Patent applications and License and patent revenues from abroad. Growth was above that of the EU in R&D expenditures in the public sector and Exports of knowledge-intensive services. The performance gap with the EU has increased for 9 indicators, particularly for Doctorate graduates, License and patent revenues from abroad, International co-publications and Patent applications. The performance gap of Russia with the EU has slightly decreased for R&D expenditures in the business sector, and Knowledge-intensive service exports.

Performance lead: Russia



The scores are calculated by dividing the Russian indicator value by that of the EU and multiplying by 100.

Change in performance lead: Russia



The scores are calculated by subtracting the EU growth rate from that of Russia.

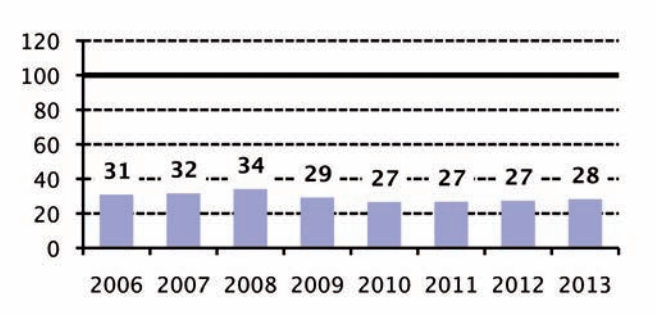
Brazil

Brazil's innovation performance is lagging behind that of the EU and is stagnating. Relative performance was at its highest in 2008 at 34% and then declined to 27% in the period 2010-2012. In 2013 performance has slightly improved to 28%.

Taking a closer look at the individual indicators shows that Brazil is performing worse than the EU on 11 indicators, in particular on License and patent revenues from abroad, Patent applications, Public-private co-publications, International co-publications and Doctorate graduates. Brazil is only performing better than the EU on Exports of knowledge-intensive services.[9]

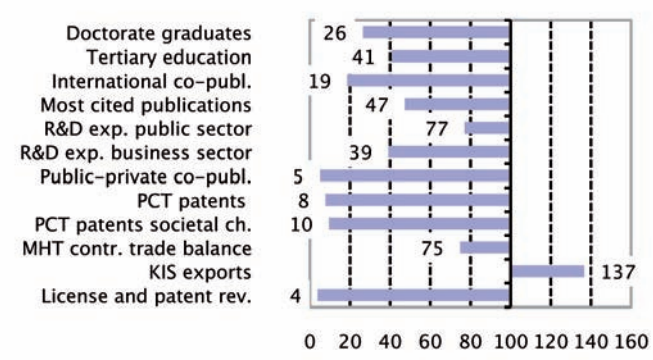
For most indicators however the relative growth performance of Brazil exceeds the growth performance of the EU. Growth performance is better than that of the EU for 10 indicators, in particular in Public-private co-publications, Patent applications and Exports of knowledge-intensive services. Brazil has managed to reduce its performance gap in 9 indicators and improve its performance lead in Exports of knowledge-intensive services. The performance gap on Doctorate graduates and the Contribution of medium-high-tech product exports to the trade balance has worsened.

Innovation performance: Brazil



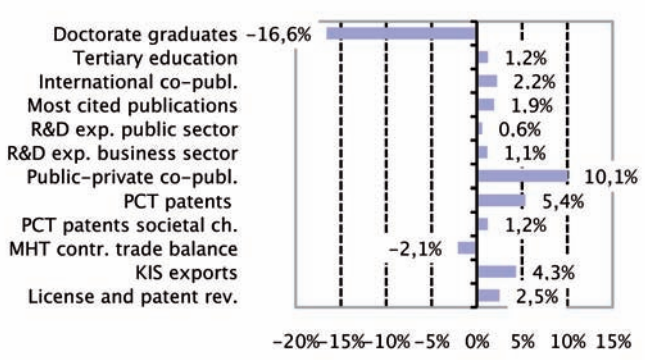
The performance scores are calculated by dividing the Brazilian innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

Performance lead: Brazil



The scores are calculated by dividing the Brazilian indicator value by that of the EU and multiplying by 100.

Change in performance lead: Brazil



The scores are calculated by subtracting the EU growth rate from that of Brazilian.

[9] *Brazil is in particular exporting relatively much more in EBOPS 280 (Architectural, engineering, and other technical services) and EBOPS 284 (Other business services).*

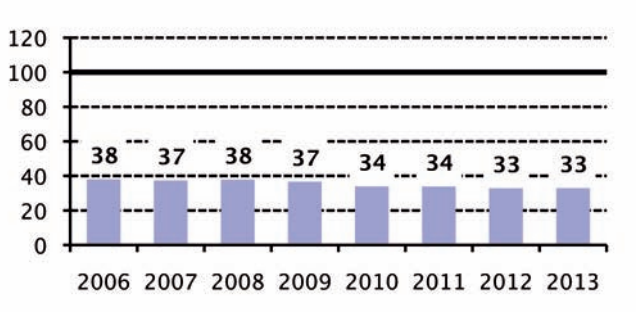
India

India's innovation performance is lagging behind that of the EU and slowly continues to decline. Relative performance was at its highest in 2006 and 2008 with 38% and then started to decrease until it reached 33% in 2012 and 2013.

Looking at the individual indicators reveals that India is performing worse than the EU on 10 indicators, in particular on License and patent revenues from abroad, International co-publications, Public-private co-publications and Patent applications. India is only performing better than the EU in Exports of knowledge-intensive services where its share of exports is 60% higher than that of the EU.

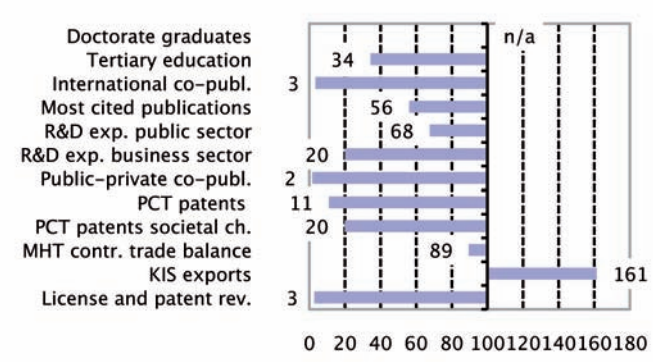
India's growth performance is mixed with growth in 4 indicators being above the EU, in particular for Most-cited publications and Public-private co-publications. Growth for 7 indicators however has been below that of the EU, with a large growth difference in License and patent revenues from abroad and to a lesser extent in R&D expenditures in the public sector and Patent applications in societal challenges. India has managed to reduce its performance gap in 4 indicators: in R&D expenditures in the business sector and the 3 indicators measuring the performance of its science system; International co-publications, Most-cited publications and Public-private publications. The performance gap has worsened for 6 indicators, in particular on License and patent revenues from abroad, R&D expenditures in the public sector and Patent applications in societal challenges. The performance lead India has on Knowledge-intensive service exports is also decreasing.

Innovation performance: India



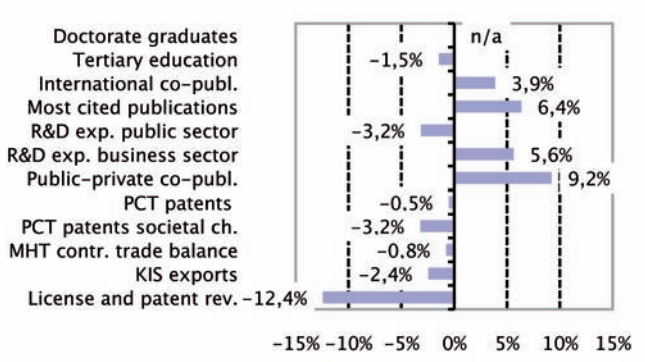
The performance scores are calculated by dividing the Indian innovation index by that of the EU and multiplying by 100. The bold line shows average EU performance at 100 (EU=100).

Performance lead: India



The scores are calculated by dividing the Indian indicator value by that of the EU and multiplying by 100.

Change in performance lead: India



The scores are calculated by subtracting the EU growth rate from that of India.

For the indicator New doctorate graduates data are not available.

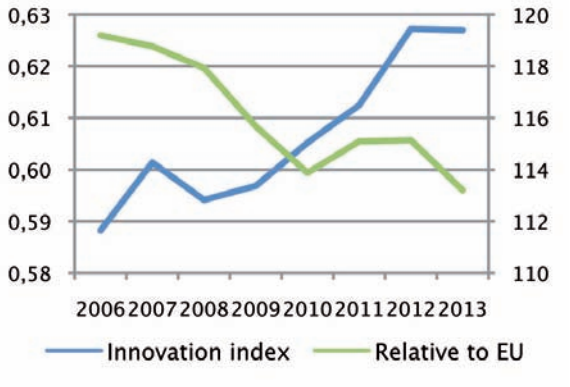
5. Country profiles

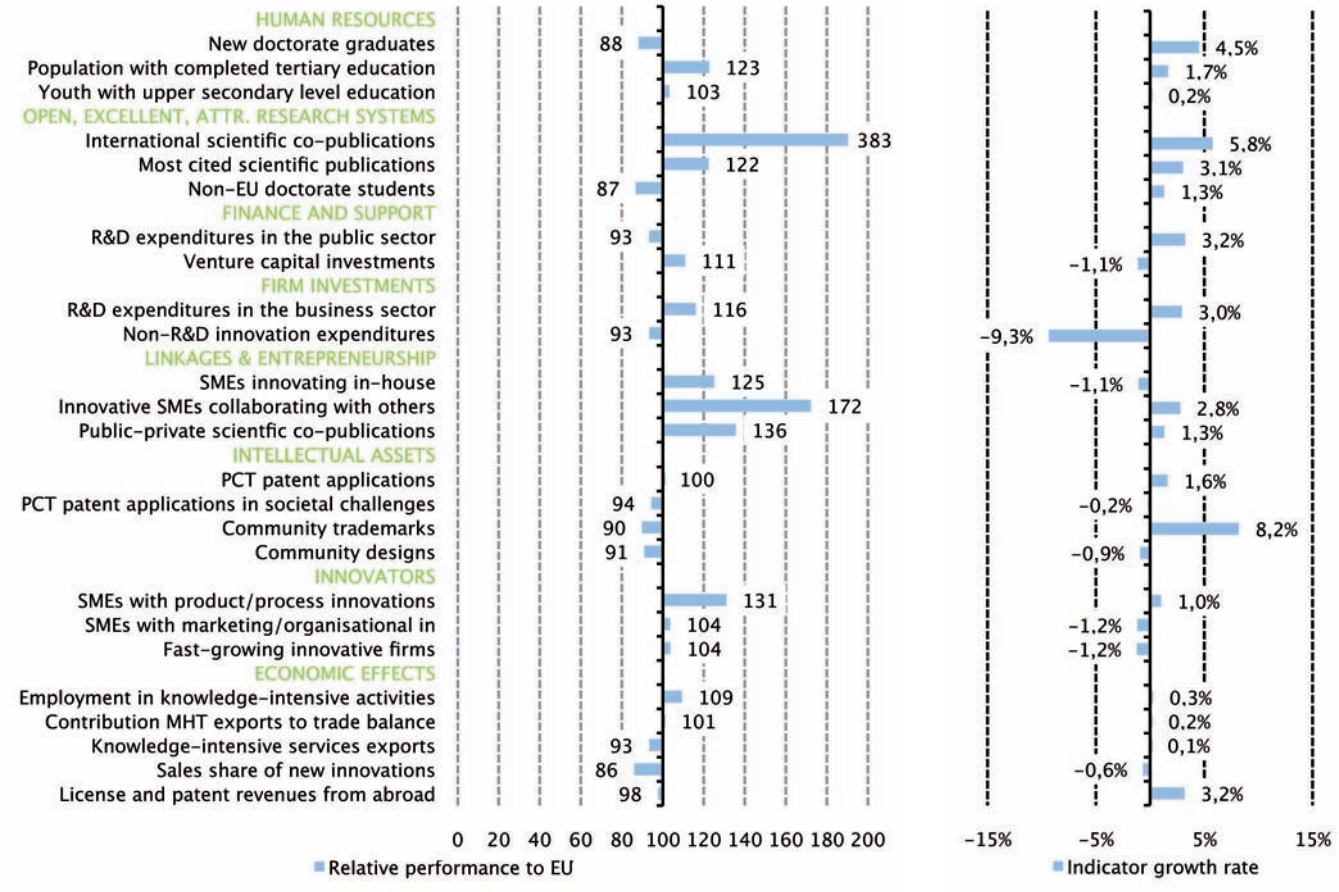
This section provides more detailed individual profiles for all European countries. Each profile includes 3 graphs. The first graph shows the development of the country's innovation index over time and its development relative to the EU average. The second graph provides a comparison by indicator with that of the EU highlighting relatively strong and weak indicators, i.e. it shows if a country is under- or outperforming the EU average on an individual indicator. The third graph shows the growth performance for each indicator highlighting which indicators have been driving a country's innovation performance change over time.

Belgium is an Innovation follower. Innovation performance has been steadily increasing over time until 2012 after which it remained steady in 2013. But the increase in the country's performance has been below that of the EU which resulted in Belgian's relative performance declining from almost 20% above average in 2006 to 14% above average in 2013.

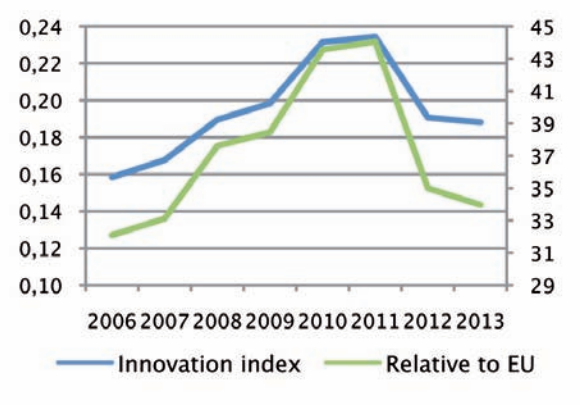
Strong indicators where Belgium is performing well above the average EU performance include International scientific co-publications, Innovative SMEs collaborating with others and Public-private co-publications. Relatively weak indicators include Sales share of new innovations, Non-EU doctorate students and New doctorate graduates.

Performance has improved most in Community trademarks and International scientific co-publications. Performance has worsened in Non-R&D innovation expenditures and to a lesser extent also in Venture capital investments, SMEs with marketing and/or organisational innovations and Fast-growing innovative firms.





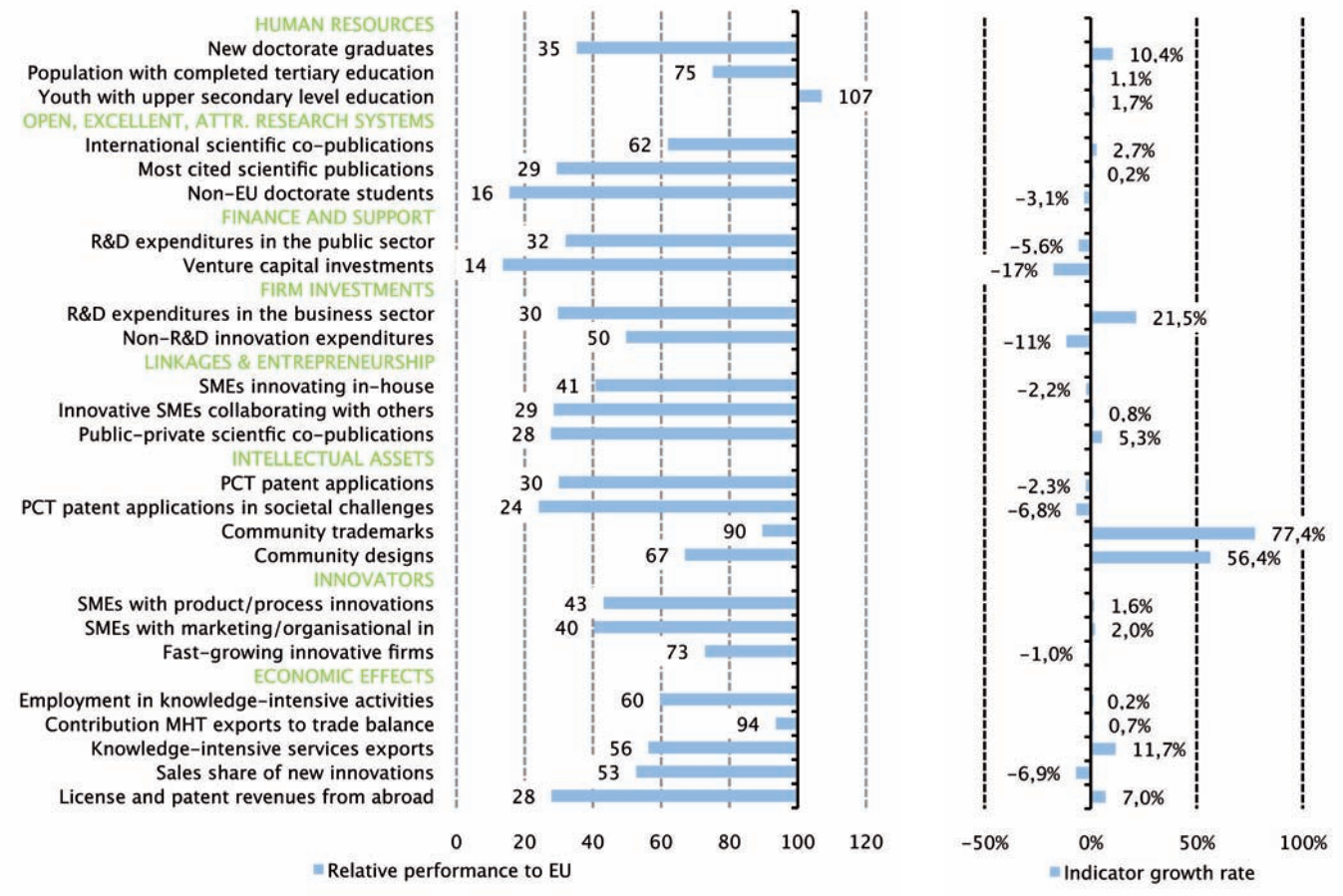
Note: Performance relative to the EU where the EU = 100.



Bulgaria is a Modest innovator. Innovation performance has been steadily increasing over time until 2010, but started declining in 2011. As a consequence, the performance relative to the EU has declined from 44% in 2011 to 33% in 2013 as well.

For all indicators, except for Youth with upper secondary level education, Bulgaria has performed below the average of the EU. The weakest indicators are Venture capital investments and Non-EU doctorate students.

However, for some indicators growth has been positive, most notably for Community trademarks and Community designs where the growth rates where respectively 77.4% and 56.4%. These high growth rates were realised because of the very low base from which these indicators started to grow. Other important high growth increases were R&D expenditures in the business sector, Knowledge-intensive service exports and New doctorate graduates. Strong declines in growth performance are observed in Venture capital investment and Non-R&D innovation expenditures.

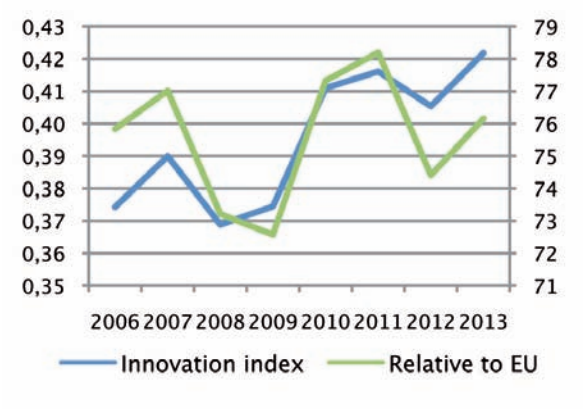


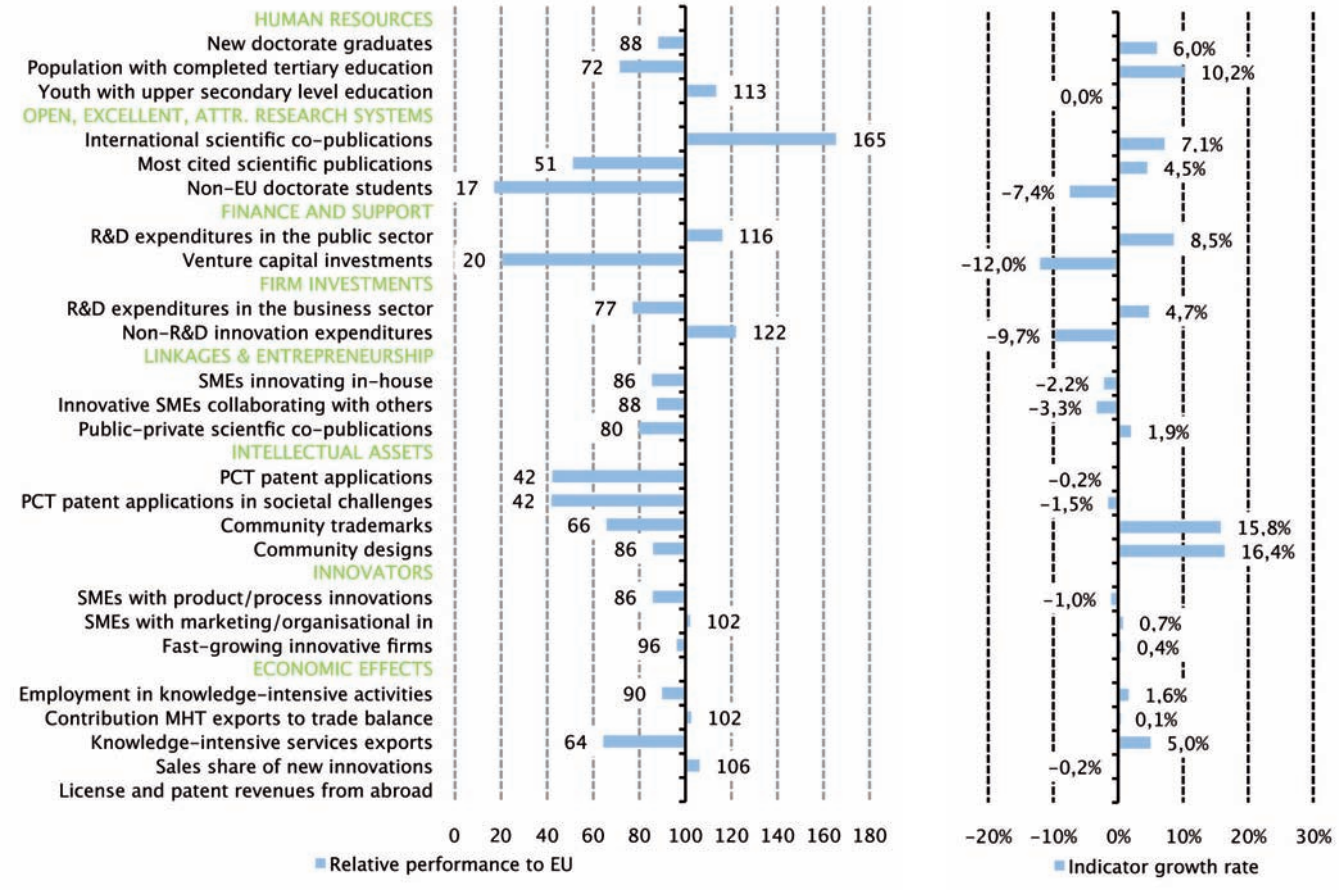
Note: Performance relative to the EU where the EU = 100.

The **Czech Republic** is a Moderate innovator. Innovation performance has been quite volatile over the past 8 years but over the whole period the innovation index has improved. The performance relative to that of the EU follows the same volatile pattern. The performance was at its highest in 2011 at 78% and after a decline in 2012 it reached 76% of the EU average in 2013.

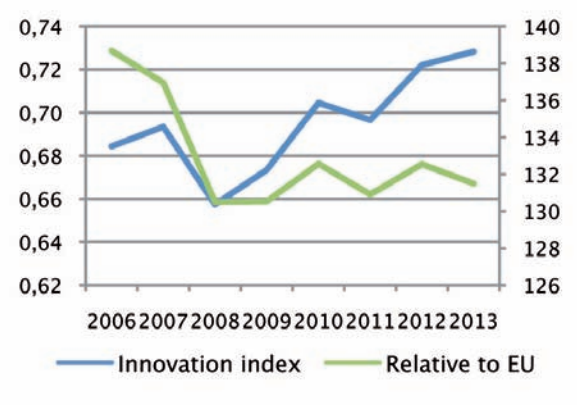
Relative strengths compared to the EU average are in International scientific co-publications, Non-R&D innovation expenditures and R&D expenditures in the public sector. Relative weaknesses are in Non-EU doctorate students and in Venture capital investments.

High growth is observed for Community trademarks, Community designs and Population with tertiary education. A strong decline is observed in Venture capital investment and Non-R&D innovation expenditures.





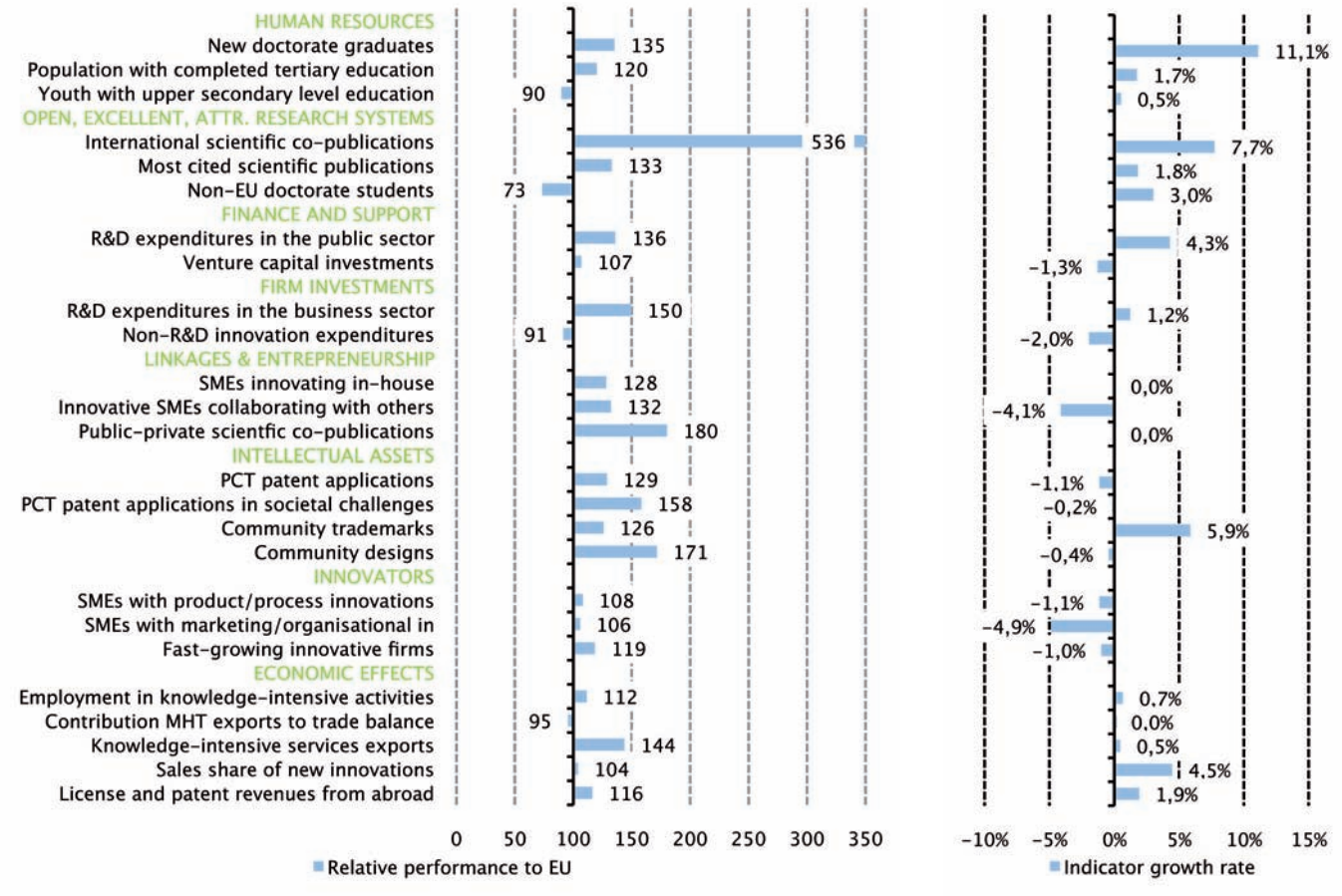
Note: Performance relative to the EU where the EU = 100.



Denmark is an Innovation leader. Innovation performance declined significantly in 2008 (in particular due to lower shares of product and/or process innovators, marketing and/or organizational innovators, innovative SMEs collaborating with others and sales due to new innovative products) but has been increasing since then. The performance drop in 2008 and a slower rate of improvement as that of the EU caused a decline in the performance lead to the EU from 40% above average in 2008 to 32% in 2013.

Relative strengths compared to the EU average are in International scientific co-publications, Public-private scientific co-publications, Community designs and R&D expenditures in the business sector. Denmark performs below the EU average for Non-EU doctorate graduates, Youth with secondary level education, Non-R&D innovation expenditures and for the Contribution of Medium and High Tech exports to the trade balance.

High growth is observed for New doctorate graduates and International scientific co-publications. Growth has declined most notably for SMEs with Marketing and/or Organisational innovations and for Innovative SMEs collaborating with others.

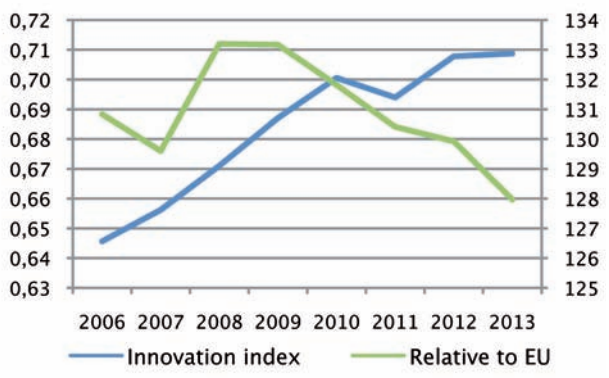


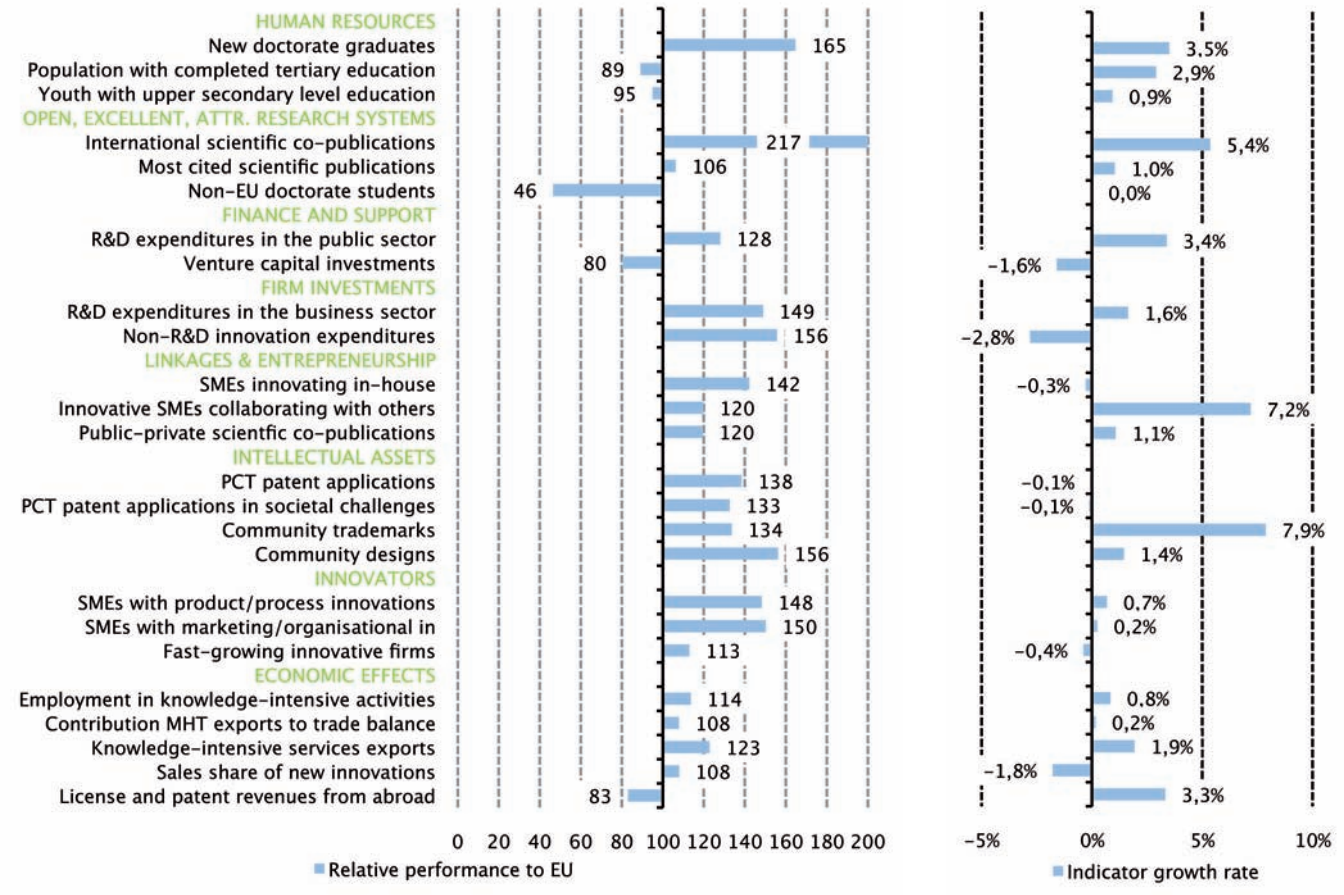
Note: Performance relative to the EU where the EU = 100.

Germany is an Innovation leader. Innovation performance has been increasing over the 2006-2013 period with only a temporary decline in 2011. The performance relative to the EU has declined from being 33% above average in 2008 and 2009 to 28% in 2013.

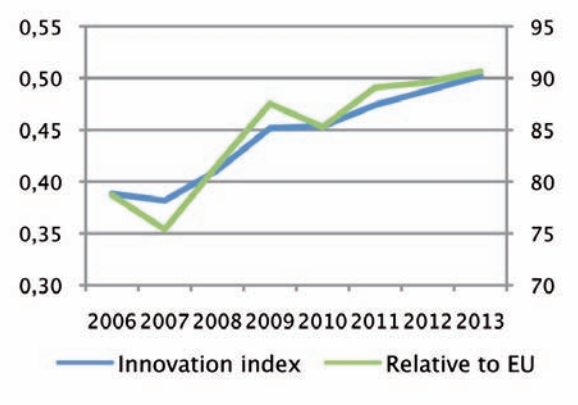
Germany is performing well above the EU average, especially for International scientific co-publications, New doctorate graduates, Non-R&D innovation expenditures and Community designs. Relative weaknesses are in Non-EU doctorates students, Venture capital investments and License and patent revenues from abroad.

Strong increases in growth are observed in Innovative SMEs collaborating with others and Community trademarks. Most notable growth declines are observed in Non-R&D innovation expenditures, Venture capital investments and Sales share of new innovations.





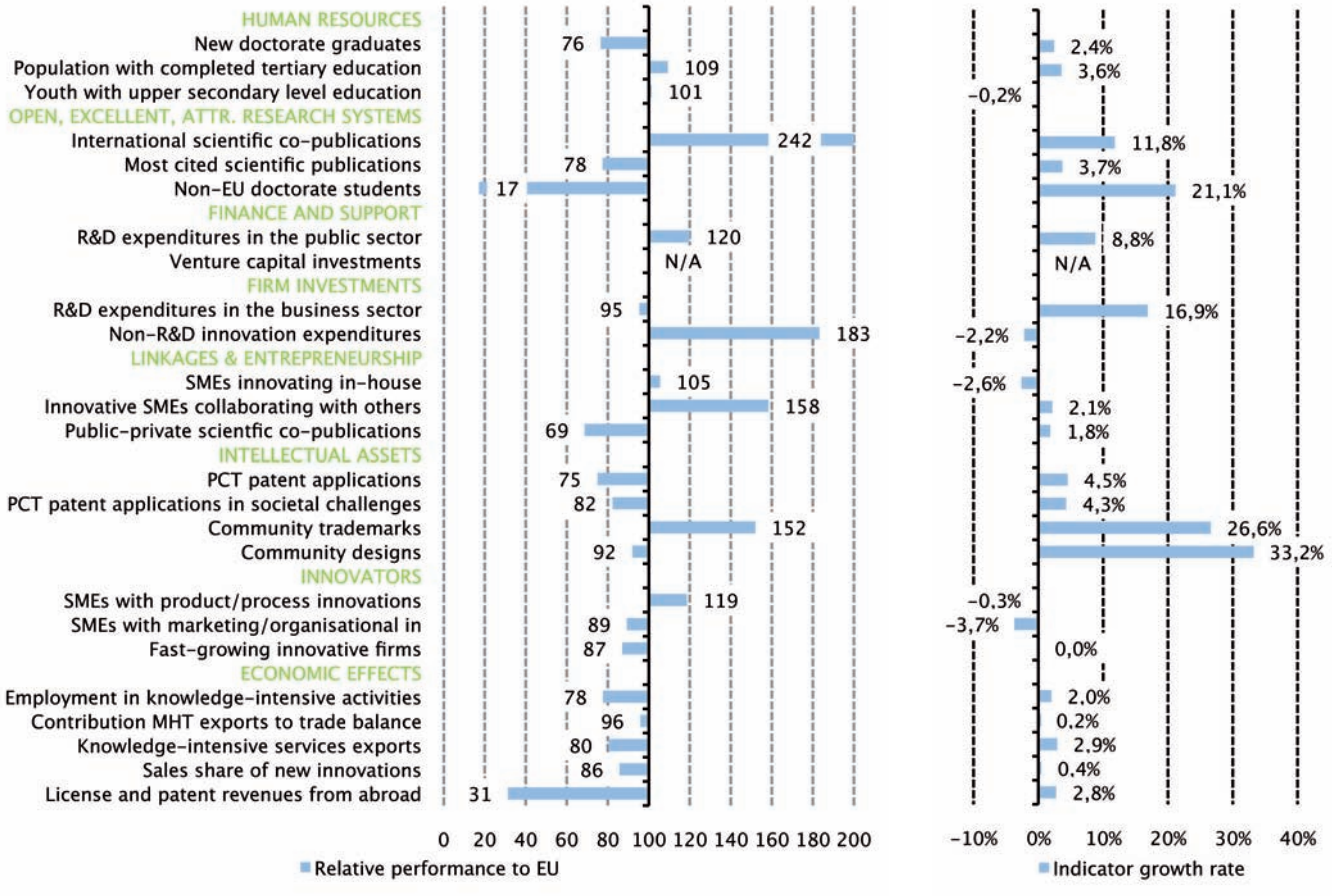
Note: Performance relative to the EU where the EU = 100.



Estonia is an Innovation follower. Innovation performance has been increasing at a steady rate since 2007 although the growth rate has slowed down since 2009. Estonia's performance relative to that of the EU has also been improving passing 90% in 2013, which is just above the threshold between the Innovation followers and Moderate innovators.

Estonia's performance is above the EU average for International scientific co-publications, Non-R&D innovation expenditures, Innovative SMEs collaborating with others and Community trademarks. Performance is well below the EU average for Non-EU doctorate students and License and patent revenues from abroad.

Estonia has experienced growth for most indicators included in the IUS 2014. Highest growth rates are observed for Community designs, Community trademarks and Non-EU doctorate students. Largest growth declines are observed for SMEs with Marketing and/or Organisational innovations, SMEs innovating in-house and Non-R&D innovation expenditures.

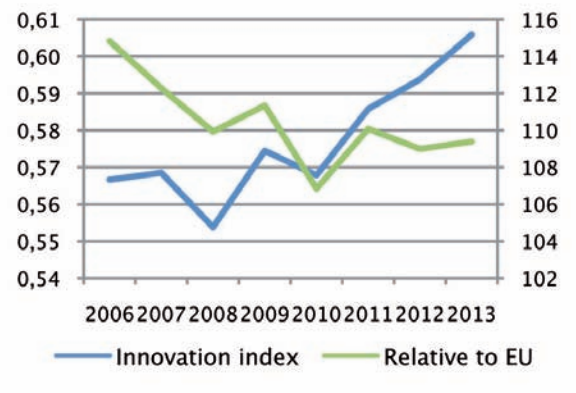


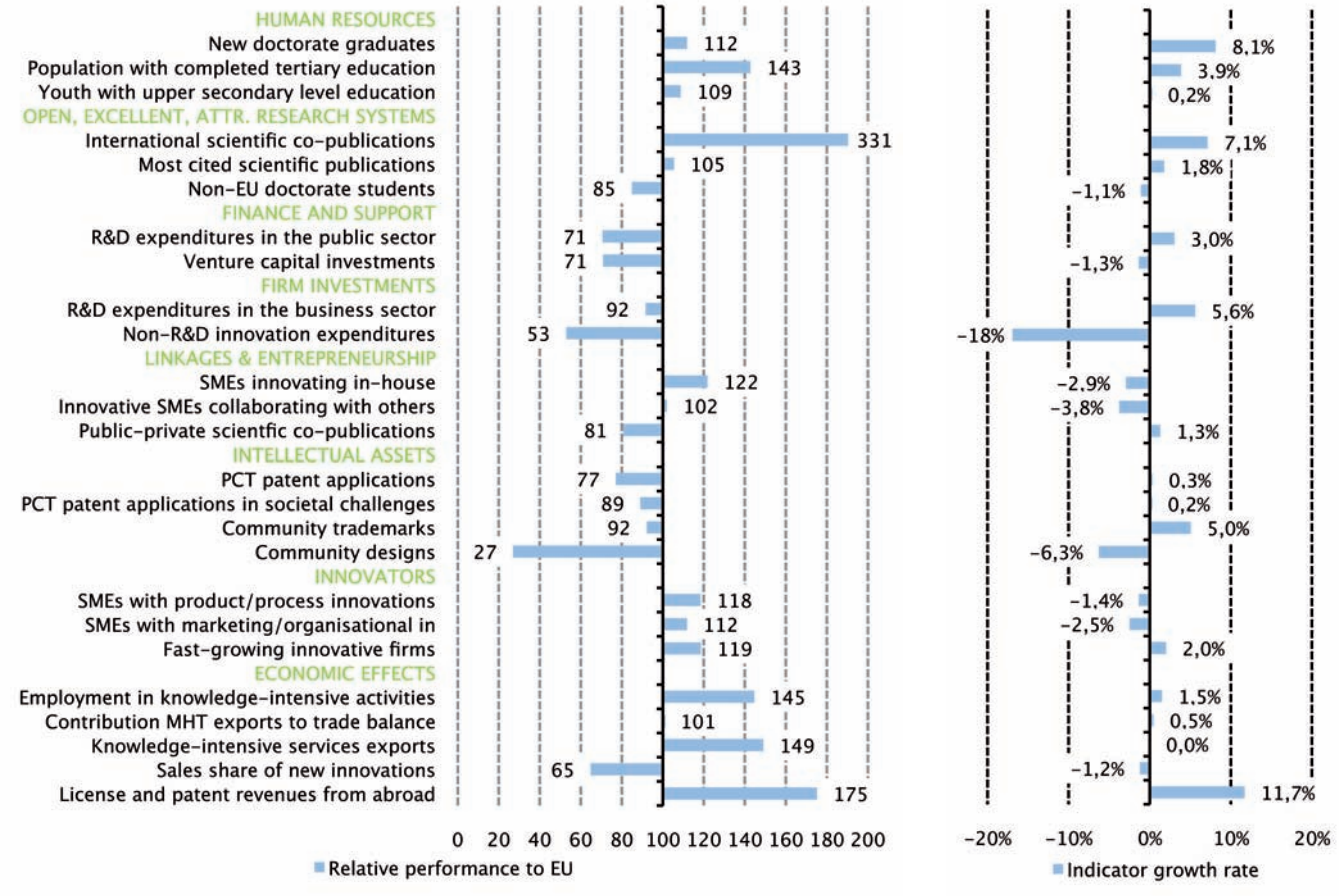
Note: Performance relative to the EU where the EU = 100. No data for Venture capital investments.

Ireland is an Innovation follower. The Irish innovation performance has experienced some declines in the time period considered but the general trend has been upward. The performance relative to that of the EU has declined over time, from 115% in 2006 to 110% in 2013. Although Ireland experienced an increase in its innovation performance, the growth rate of that performance was below that of the EU.

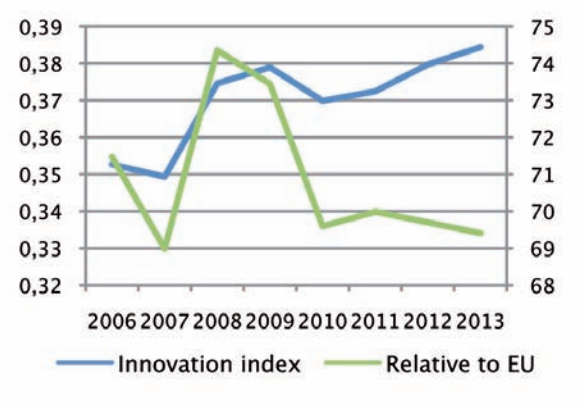
Ireland performs well above the EU average on International scientific co-publications and License and patent revenues from abroad. Other strong performing indicators are Population with tertiary education, Employment in knowledge intensive-services and Knowledge-intensive services exports. Relative weaknesses are in Community designs and Non-R&D innovation expenditures.

Growth has increased considerably in License and patent revenues from abroad, New doctorate graduates and International scientific co-publications. Most notable growth declines are observed in Non-R&D innovation expenditures, Community designs and Innovative SMEs collaborating with others.





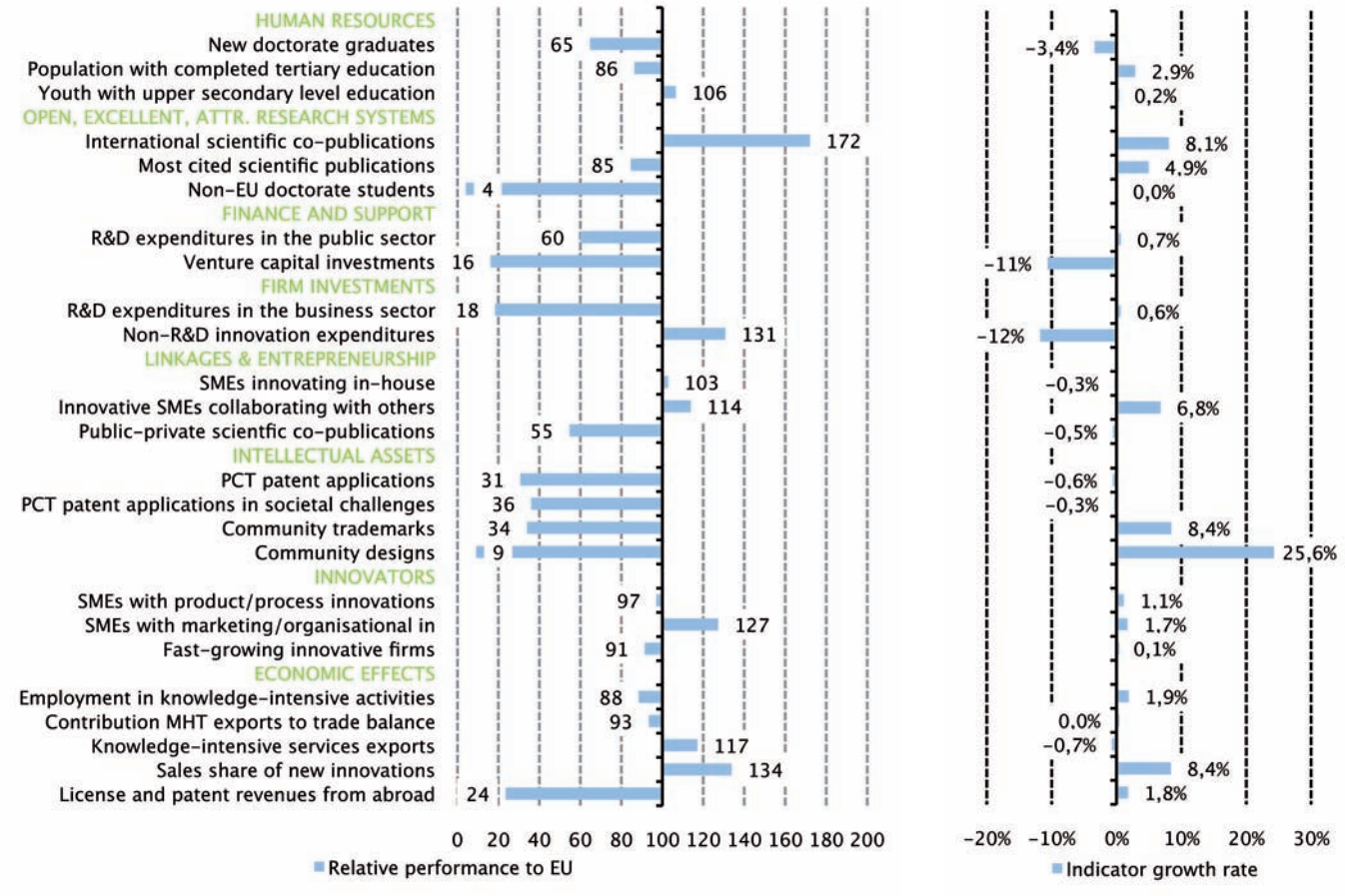
Note: Performance relative to the EU where the EU = 100.



Greece is a Moderate innovator. Over time its innovation performance has been improving. The country did experience a slowdown in 2010 but the innovation performance has since been increasing again and in 2013 the innovation index reached a new peak level. Growth however is below that of the EU. The relative performance to the EU has dropped from 74% in 2008 to almost 69% in 2013.

For most indicators, Greece performs below that of the EU average, particularly for Non-EU doctorate students, Community designs, Venture capital investments and R&D expenditures in the business sector. Greece performs above the EU average on International scientific co-publications, Sales share of new innovations and SMEs with Marketing and/or Organisational innovations.

Growth on the other hand has been improving for most indicators in Greece. Highest growth indicators are observed for Community designs, Community trademarks, Sales share of new innovations and International scientific co-publications. Growth has declined in Non-R&D innovation expenditures and Venture capital investments.

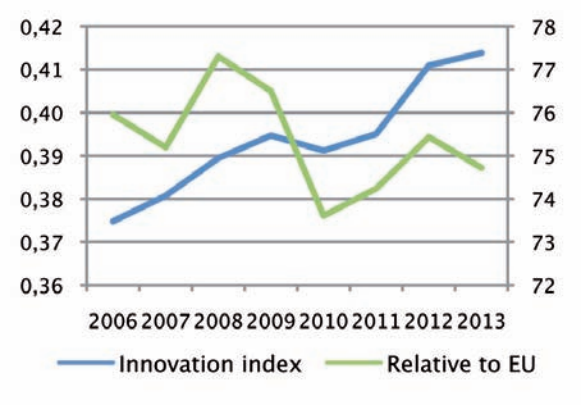


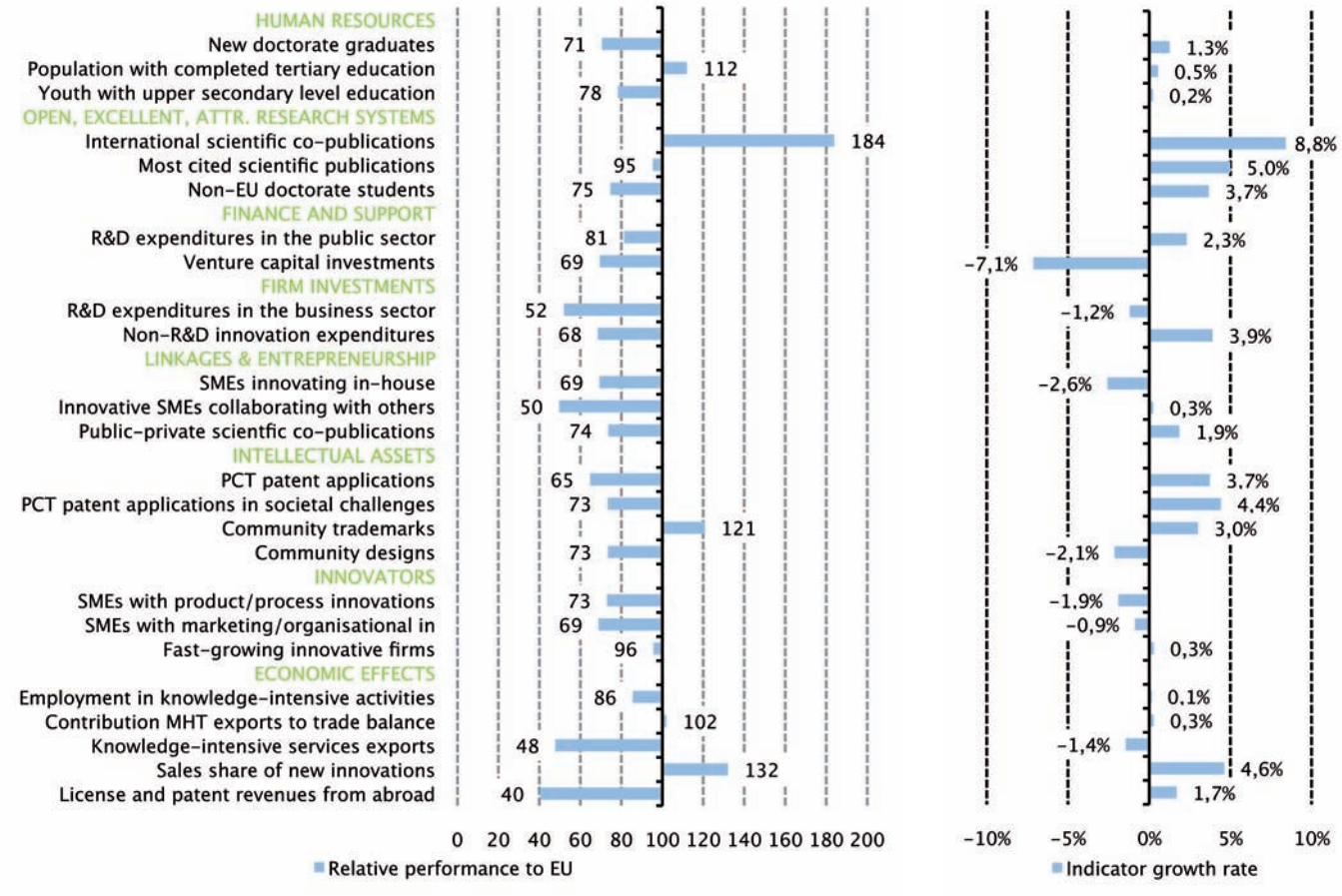
Note: Performance relative to the EU where the EU = 100.

Spain is a Moderate innovator. Innovation performance has improved between 2006 and 2013. However, the country's performance gap to the EU has increased. In 2008 the relative performance level was 77% whereas in 2013 it has decreased to 75%.

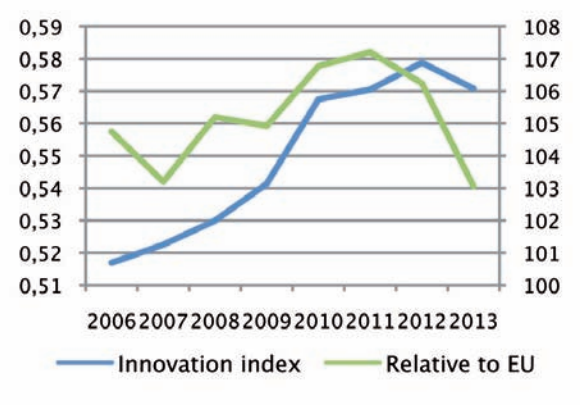
Spain is performing for most indicators below the average of the EU. Relative weaknesses are in License and patent revenues from abroad and Knowledge-intensive services exports. Relative strengths are in International scientific co- publications, Sales share of new innovations and Community trademarks.

High growth in Spain is observed for International scientific co-publications, Sales share of new innovations and PCT patent application in societal challenges. The largest growth decline is observed for Venture capital investment. Other notable declines are in SMEs innovating in-house and in Community designs.





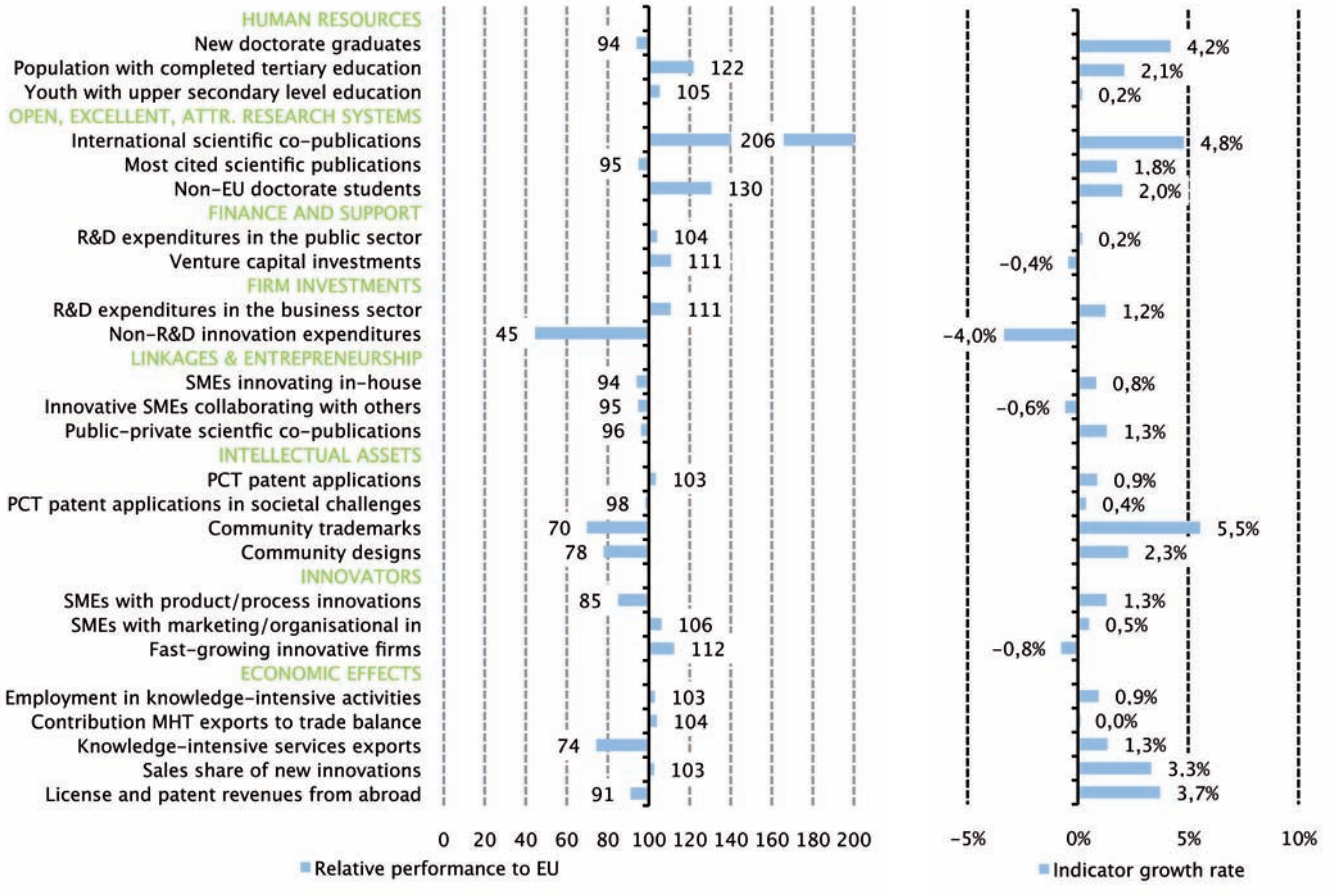
Note: Performance relative to the EU where the EU = 100.



France is an Innovation follower. Innovation performance has been increasing strongly until 2010 after which growth started to slow down until its performance level declined in 2013 (in particular due to a smaller share of fast-growing firms in innovative sectors). The performance level relative to the EU reached a peak of 107% in 2011 but has dropped to just 103% in 2013.

France is performing for most indicators around the EU average. Relative strengths are in International scientific co-publications, Non-EU doctorate students and Population with tertiary education. Relative weaknesses are in Non-R&D innovation expenditures, Community trademarks and in Knowledge-intensive service exports.

France has experienced growth for most indicators, particularly in Community trademarks, International scientific co-publications and New doctorate graduates. The largest growth decline is observed for Non-R&D innovation expenditures.

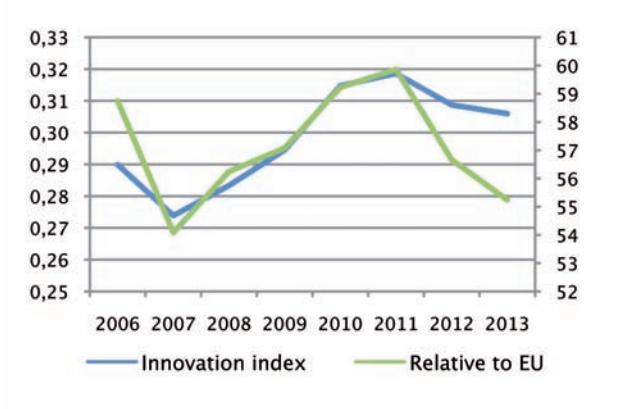


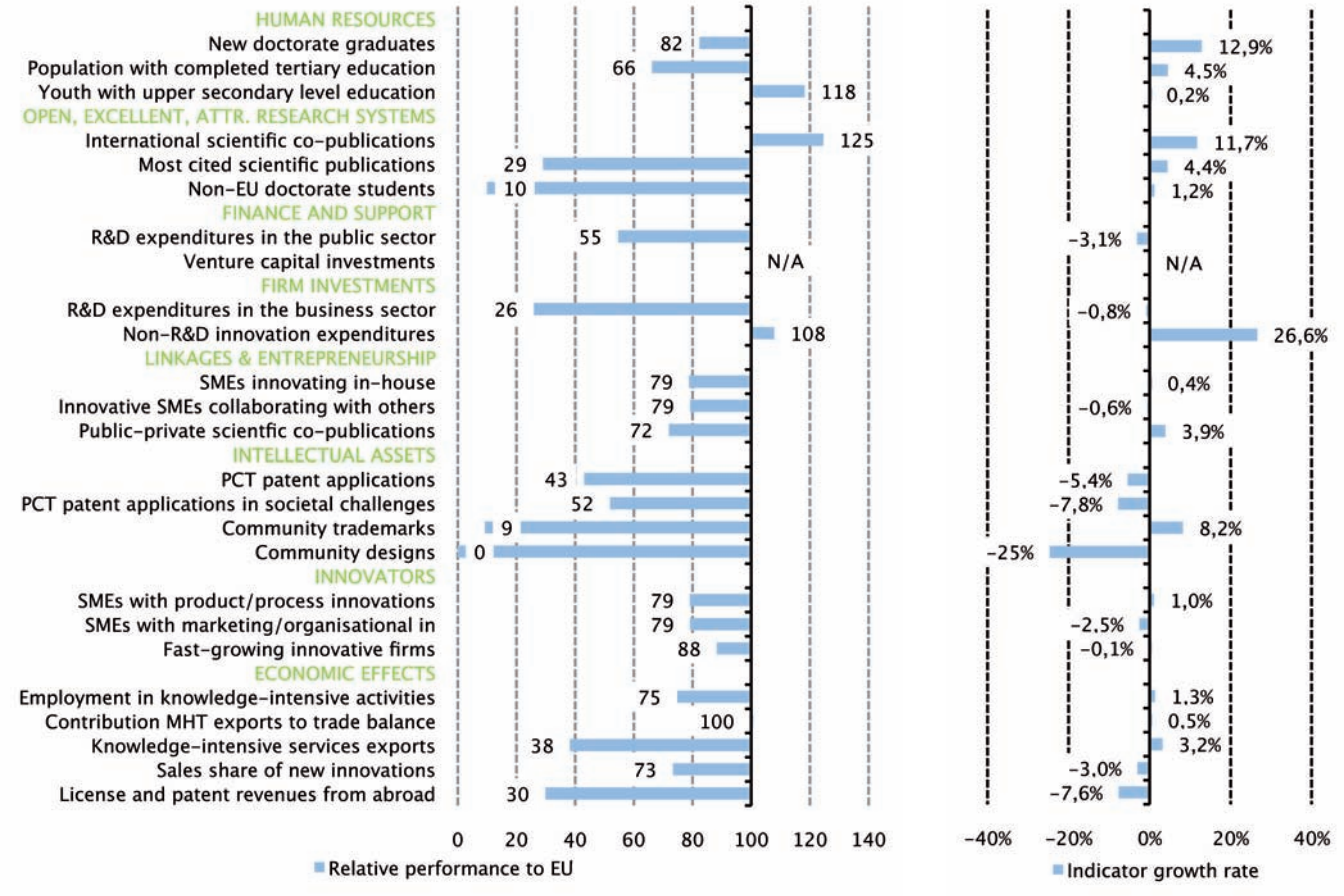
Note: Performance relative to the EU where the EU = 100.

Croatia is a Moderate innovator. After an initial decline in 2007, the Croatian innovation performance improved at about the same rate as that of the EU until 2011. Innovation performance started to decline in 2012 (in particular due to a declining sales share of new innovative products) leading to a decrease in the performance relative to the EU from 60% in 2011 to 55% in 2013.

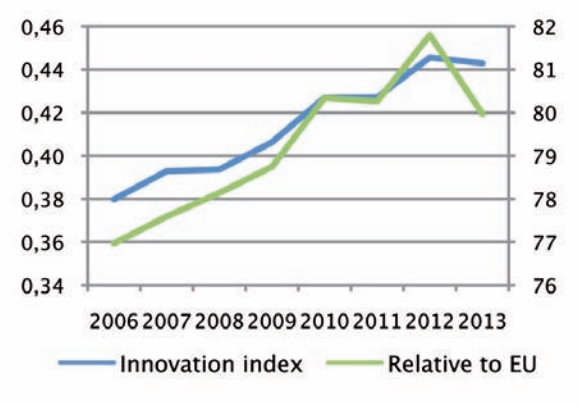
Croatia is performing well below the average of the EU for most indicators, most notably for Community designs, Community trademarks and Non-EU doctorate students. Relative strengths compared to the EU are in International scientific co-publications, Youth with upper secondary level education and Non-R&D innovation expenditures.

High growth is observed for Non-R&D innovation expenditures, New doctorate graduates and International scientific co-publications. Large declines in growth are observed in Community designs, PCT patent applications in societal challenges and in License and patent revenues from abroad.





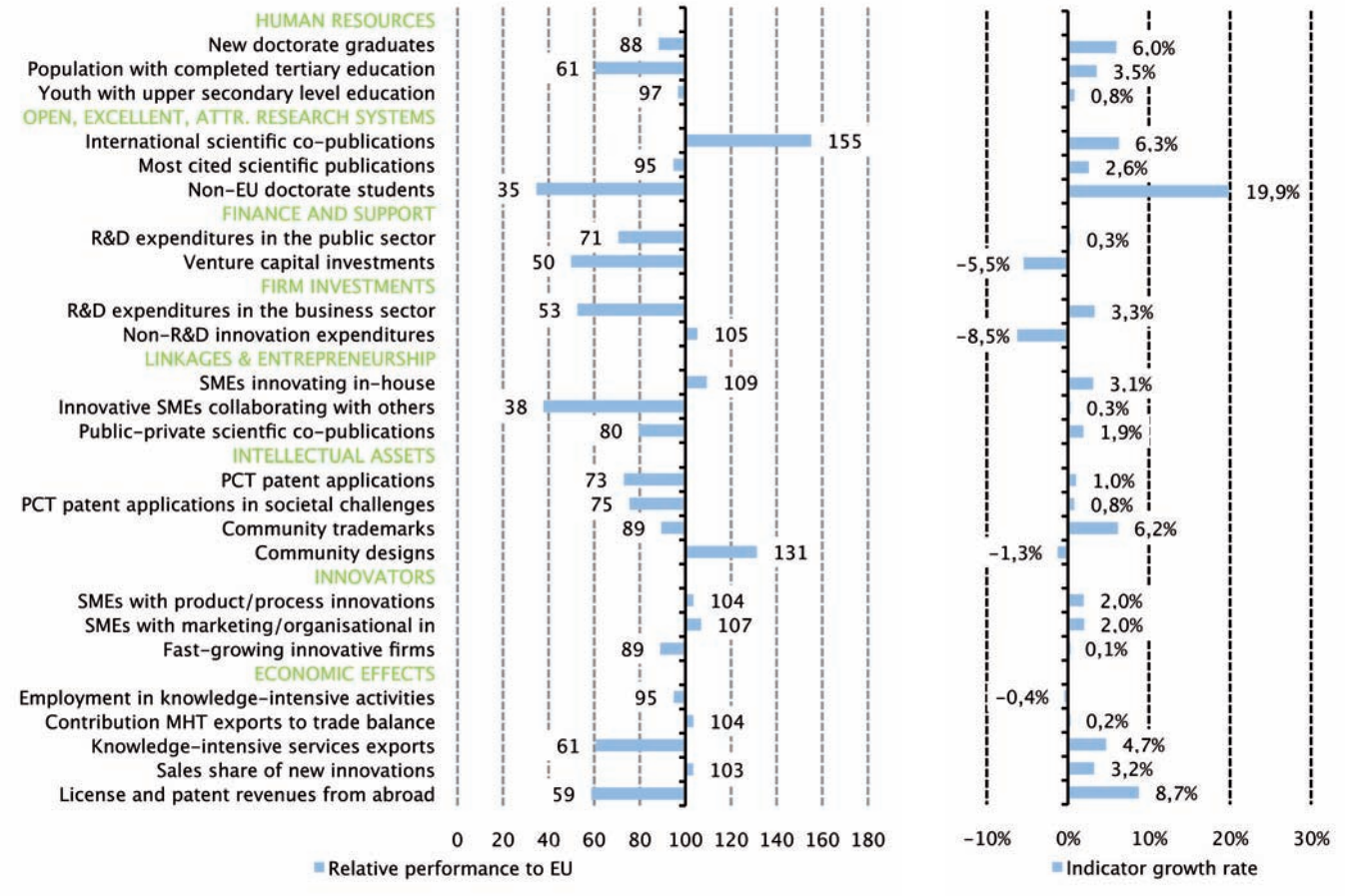
Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.



Italy is a Moderate innovator. Its innovation performance has been increasing steadily until 2012 and experienced a small decline in 2013. Italy has been increasing its innovation performance relative to the EU which reached 80% in 2013.

Italy performs below the average of the EU for most indicators. Relative weaknesses are in Non-EU doctorate students and Innovative SMEs collaborating with others. Relative strengths are in International scientific co-publications and Community designs.

Italy has experienced growth for most indicators. High growth is observed for Non-EU doctorate students, License and patent revenues from abroad, International scientific co-publications and community trademarks. Growth declines are observed in Venture capital investments, Non-R&D innovation expenditures, Community designs and Employment in knowledge-intensive activities.

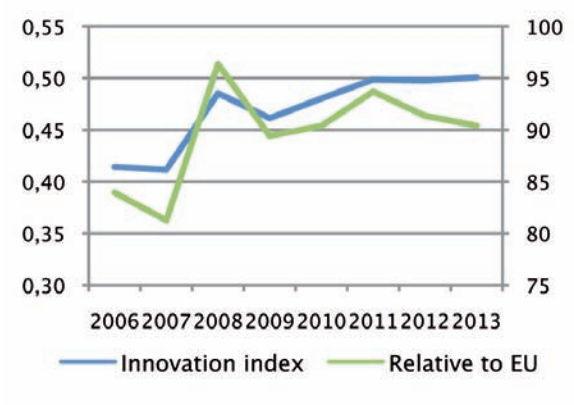


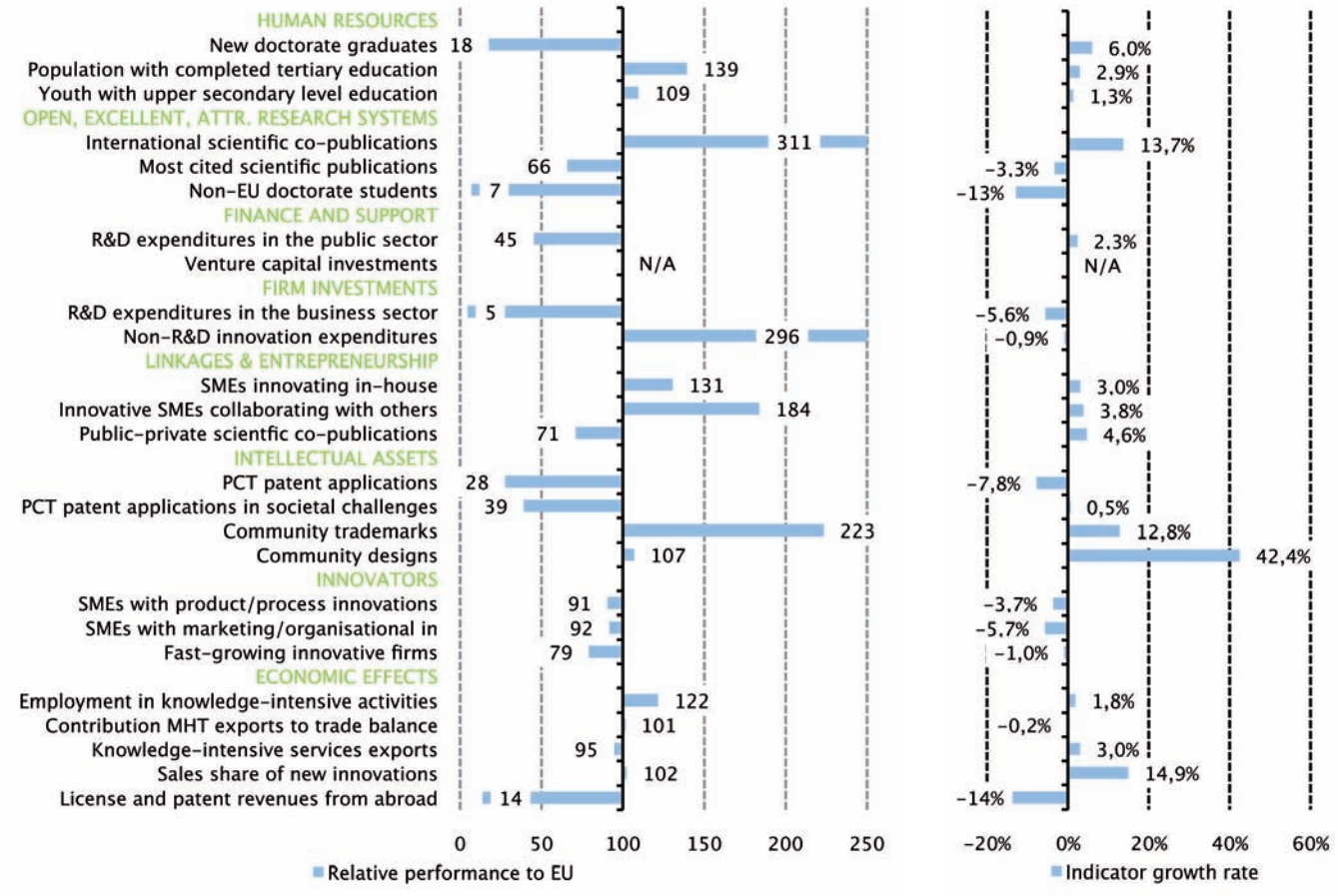
Note: Performance relative to the EU where the EU = 100.

Cyprus is an Innovation follower. Innovation performance increased strongly until 2008 after which it has remained relatively stable except for the small set back in 2009. Innovation performance has been increasing at a more moderate rate since 2010. The performance relative to the EU has been improving over time from 81% in 2007 to just above 90% in 2013. Cyprus also moved from being a Moderate innovator in 2006 and 2007 to being an Innovation follower from 2008 onwards.

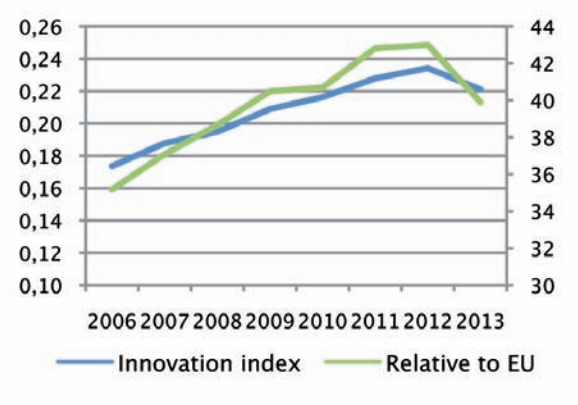
Cyprus performs well above the EU average for International scientific co-publications, Non-R&D innovation expenditures, Community trademarks and Innovative SMEs collaborating with others. Performance well below the average is observed in Non-EU doctorate students, License and patent revenues from abroad and New doctorate graduates.

High growth is observed for Community designs, Sales share of new innovations, International scientific co-publications and community trademarks. Large declines in growth are observed in License and patent revenues from abroad, Non-EU doctorate students and PCT patent applications.





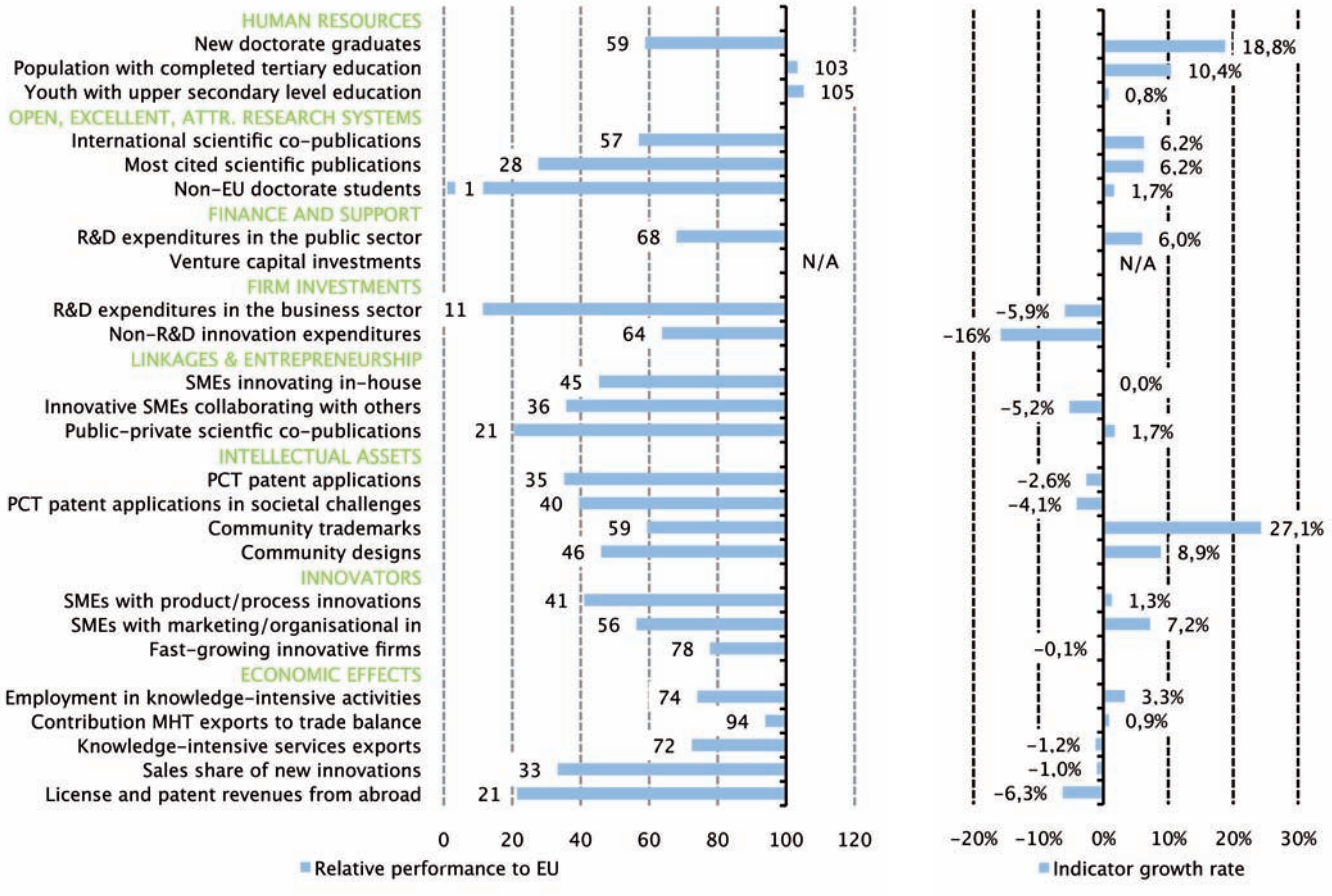
Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.



Latvia is a Modest innovator. Innovation performance has been increasing at a steady rate until 2012 but dropped in 2013, in particular due to a worsened performance in patent applications. Latvia has been improving its relative performance to the EU from 35% in 2006 to 40% in 2013.

Latvia performs below the average of the EU for most indicators, most particularly for Non-EU doctorate students, R&D expenditures in the business sector, Public-private scientific co-publications. Relative strengths are in Youth with upper secondary level education and in Population with completed tertiary education.

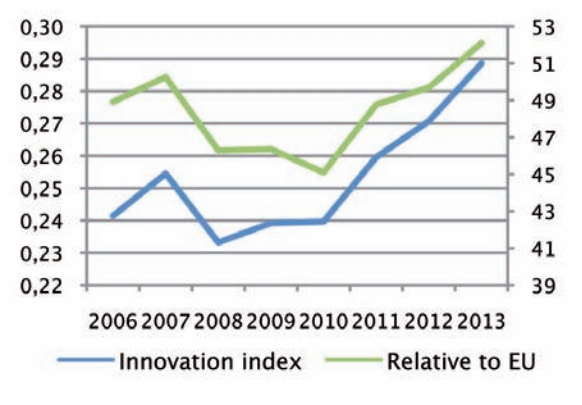
Despite the fact that Latvia performs below the average of the EU for almost all indicators, growth is increasing for a number of indicators. High growth is observed for Community trademarks, New doctorate graduates, Population with completed tertiary education and Community designs. A large decline in growth is observed for Non-R&D innovation expenditures. Other strong declines are in R&D expenditures in the business sector, Innovative SMEs collaborating with others and License and patent revenues from abroad.

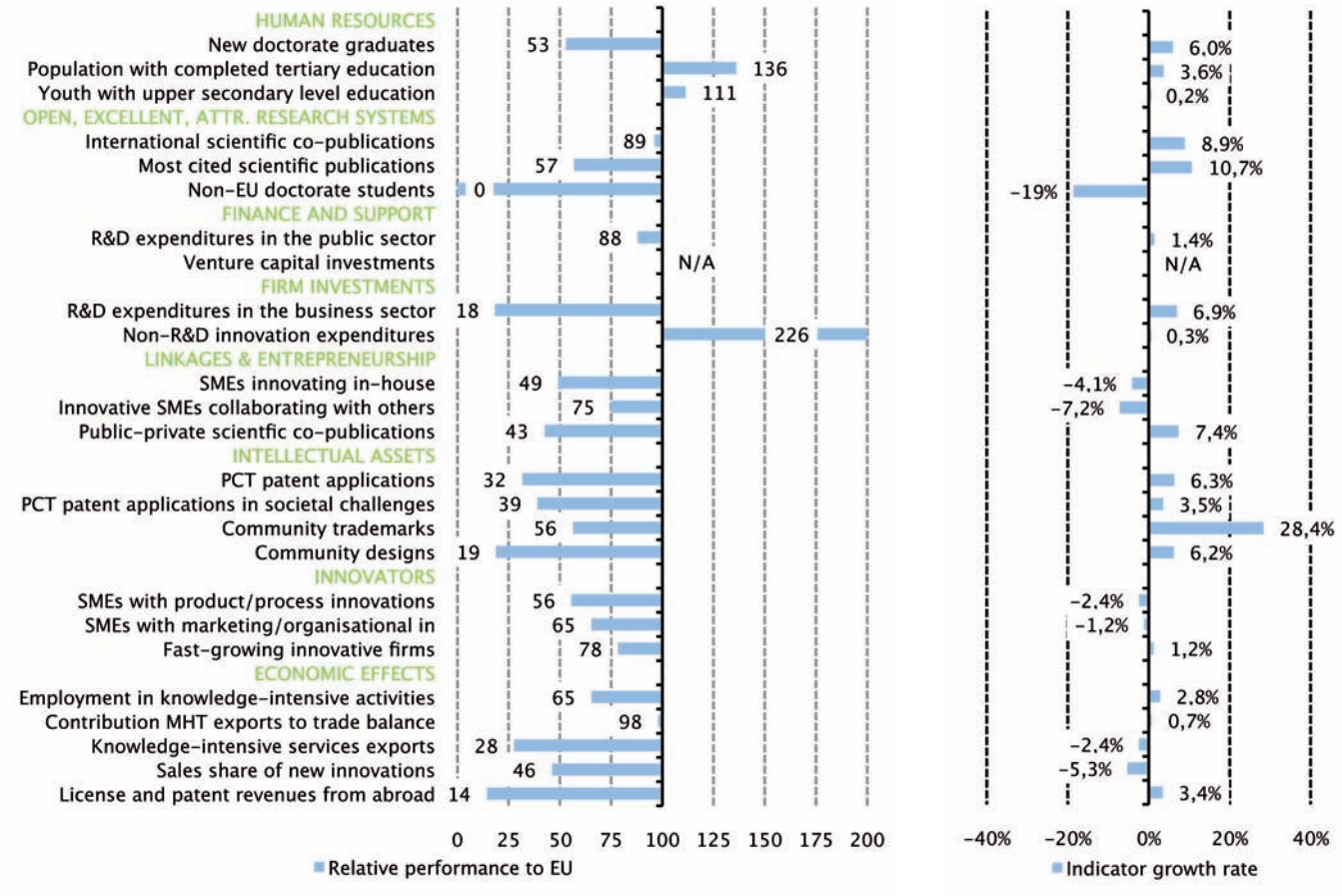


Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.

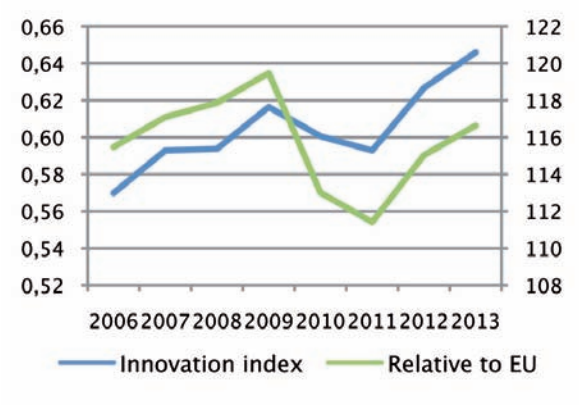
Lithuania is an Innovation follower. Despite some fluctuations the overall innovation performance has been improving between 2006 and 2013. The performance relative to the EU has been improving in the last few years, which moved the country to the group of Moderate innovators. Due to rapid rates of improvement from 2011 to 2013 Lithuania is currently performing at 52% of the average for the EU.

Lithuania performs below the average of the EU for most indicators, in particular for Non-EU doctorate students, R&D expenditures in the business sector, License and patent revenues from abroad and Community designs. Performance above average is observed for Non-R&D innovation expenditures, Population with completed tertiary education and Youth with upper secondary level education. High growth is observed for Community trademarks, Most cited scientific publications and International scientific co-publications. The largest growth decline is in Non-EU doctorate students. Other large declines are observed for Innovative SMEs collaborating with others and Sales share of new innovations.





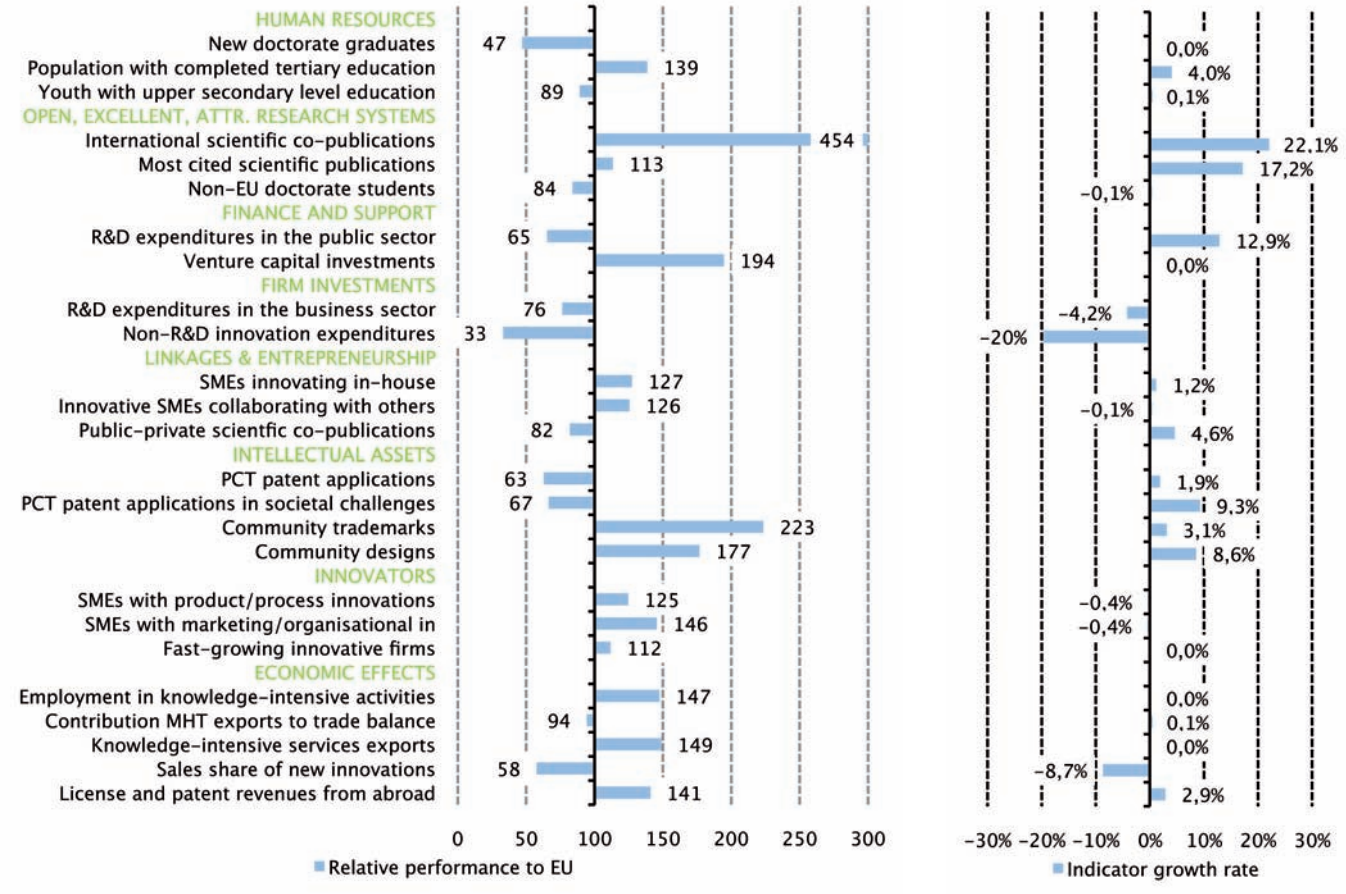
Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.



Luxembourg is an Innovation follower. Performance declined strongly in 2010 and 2011 (due to a much worse performance in non-R&D innovation expenditures) and fully recovered in 2012. The performance relative to the EU has declined from almost 120% in 2009 to 117%% in 2013.

Relative strengths are in International scientific co-publications, community trademarks, Venture capital investments and in Community designs. Luxembourg performs well below the average for Non-R&D innovation expenditures and New doctorate graduates.

High growth is observed for International scientific co-publications, Most cited scientific publications and R&D expenditures in the public sector. Strong declines are observed in Non-R&D innovation expenditures, Sales share of new innovations and R&D expenditures in the business sector.

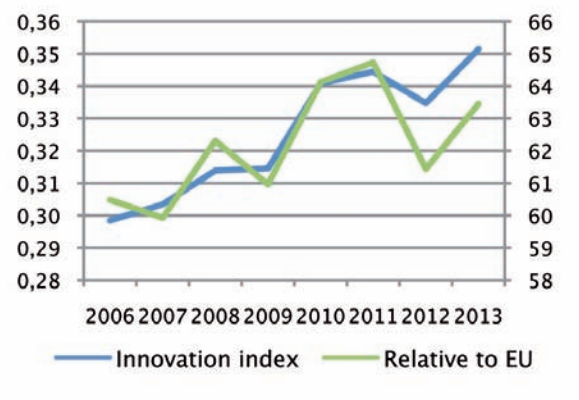


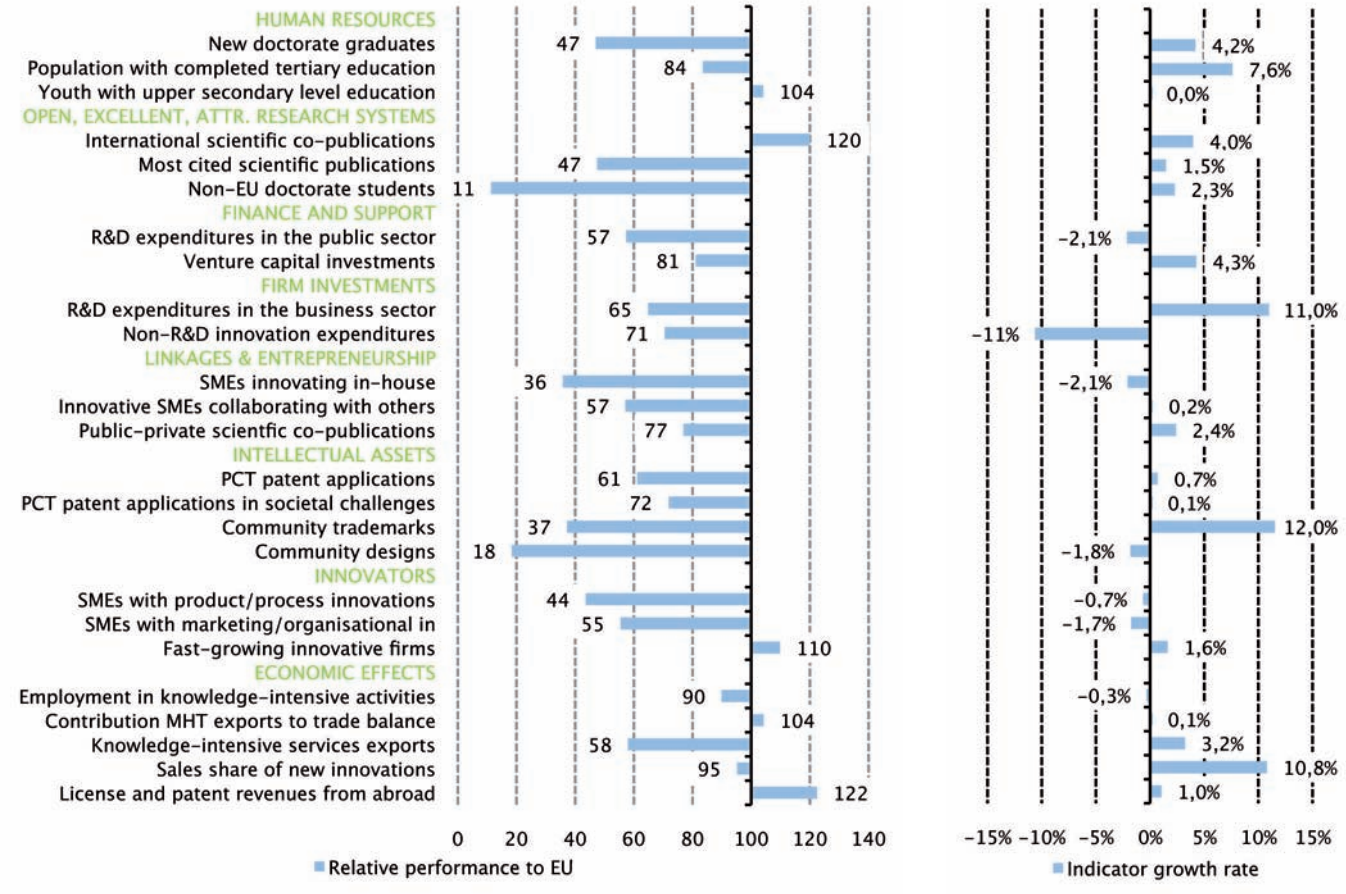
Notes: Performance relative to the EU where the EU = 100.

Hungary is a Moderate innovator. The country's innovation performance, despite some fluctuations, improved between 2006 and 2013. The performance relative to the EU increased to 63% in 2013 from around 60% in 2006.

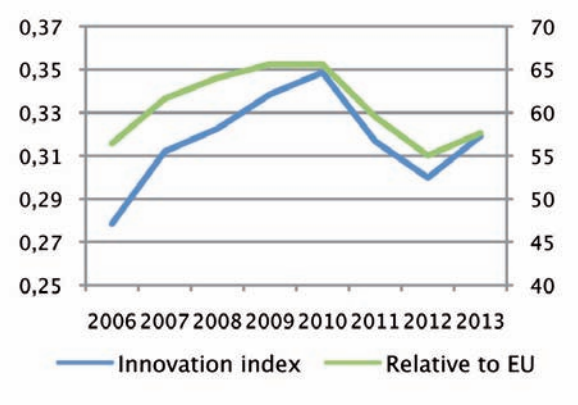
Hungary performs below the EU average for most indicators, especially for Non-EU doctorate students and Community designs. Relative strengths are observed in License and patent revenues from abroad, International scientific co-publications and Fast-growing innovative firms.

High growth is observed for Community trademarks, R&D expenditures in the business sector and Sales share of new innovations. A large decline in growth is observed for Non-R&D innovation expenditures. Other notable declines are in R&D expenditures in the public sector, SMEs innovating in-house and Community designs.





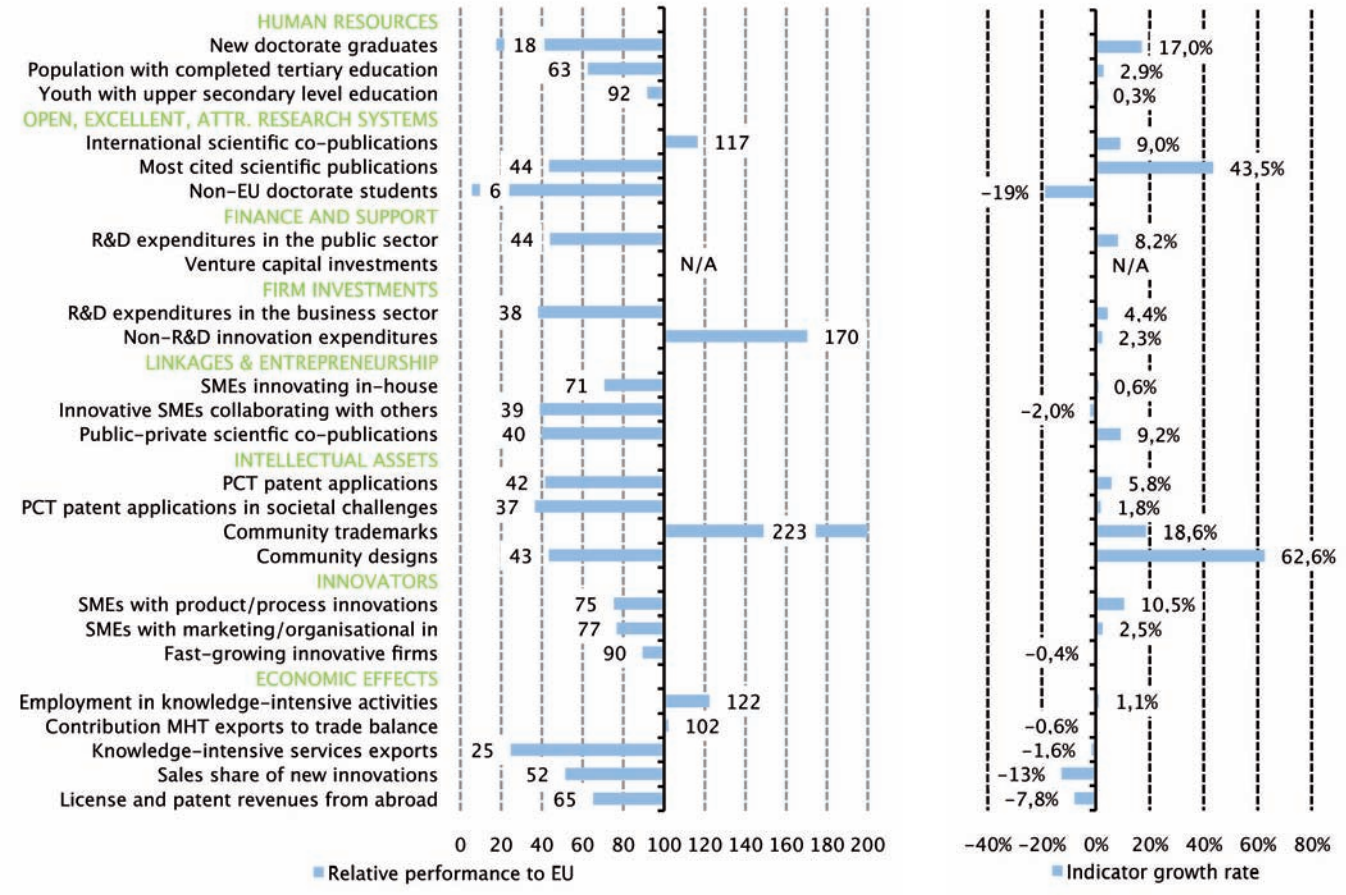
Notes: Performance relative to the EU where the EU = 100.



Malta is a Moderate innovator. Innovation performance improved until 2010 after which it strongly declined. Innovation performance improved in 2013 to a level comparable with that in 2008. The performance relative to the EU first increased to 66% in 2010 but after relative declines in 2011 and 2012 it reached 58% in 2013.

Malta is performing below the average of the EU for most indicators. Relative strong weaknesses are in Non-EU doctorate students and New doctorate graduates. Relative strengths are in Community trademarks, Non-R&D innovation expenditures and in Employment in knowledge-intensive activities.

Very high growth is observed for Community designs and Most cited scientific publications. Large declines in growth are observed for Non-EU doctorate students, Sales share of new innovations and License and patent revenues from abroad.

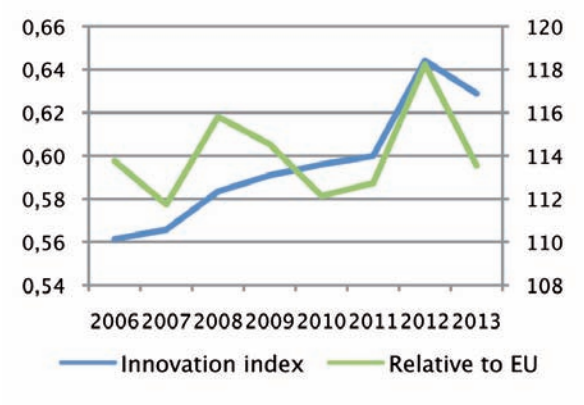


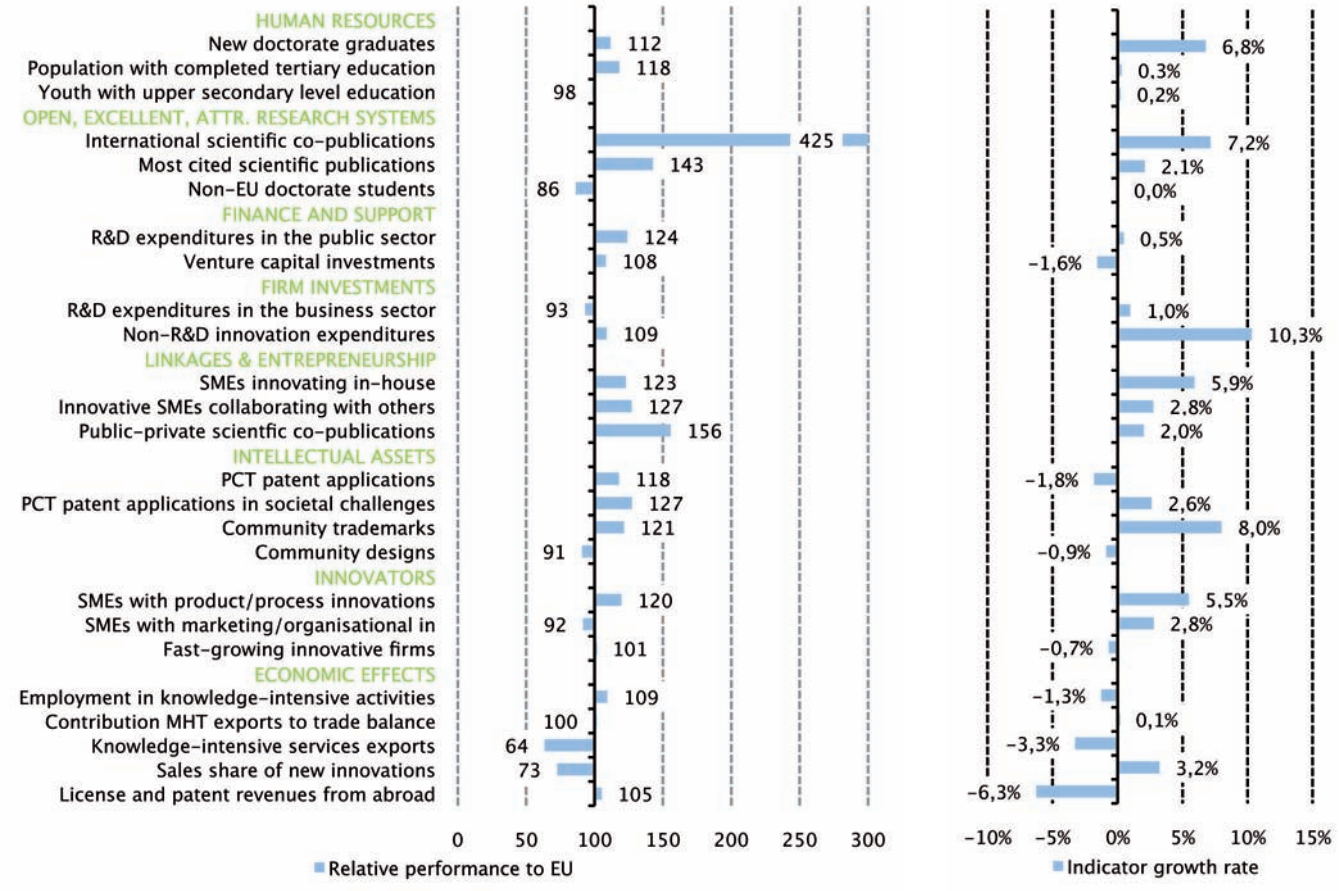
Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.

The **Netherlands** is an Innovation follower. Performance has been improving steadily up until 2011 and then increased strongly in 2012 (among others due to a much high share of product and/or process innovators) and declined in 2013 (among others due to reduced license and patent revenues from abroad). The performance relative to the EU has been more volatile, reaching a peak of 118% in 2012 before falling to 114% in 2013.

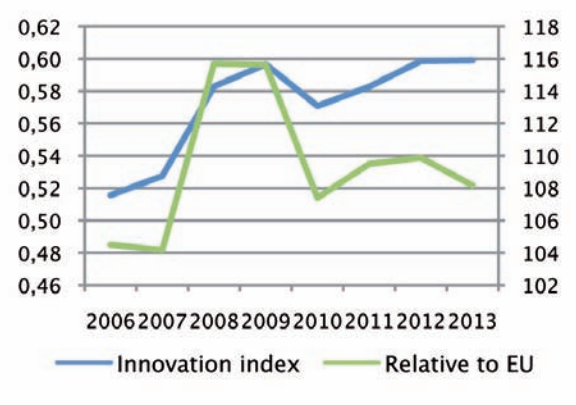
The Netherlands are performing above the EU average for most indicators, most notably for International scientific co-publications, Public-private scientific co-publications and Most cited scientific publications. Relative weaknesses are in Knowledge-intensive services exports and in the Sales share of new innovations.

High growth is observed for Non-R&D innovation expenditures, Community trademarks, International scientific co-publications and New doctorate graduates. Strong declines in growth are observed for License and patent revenues from abroad and Knowledge-intensive services exports.





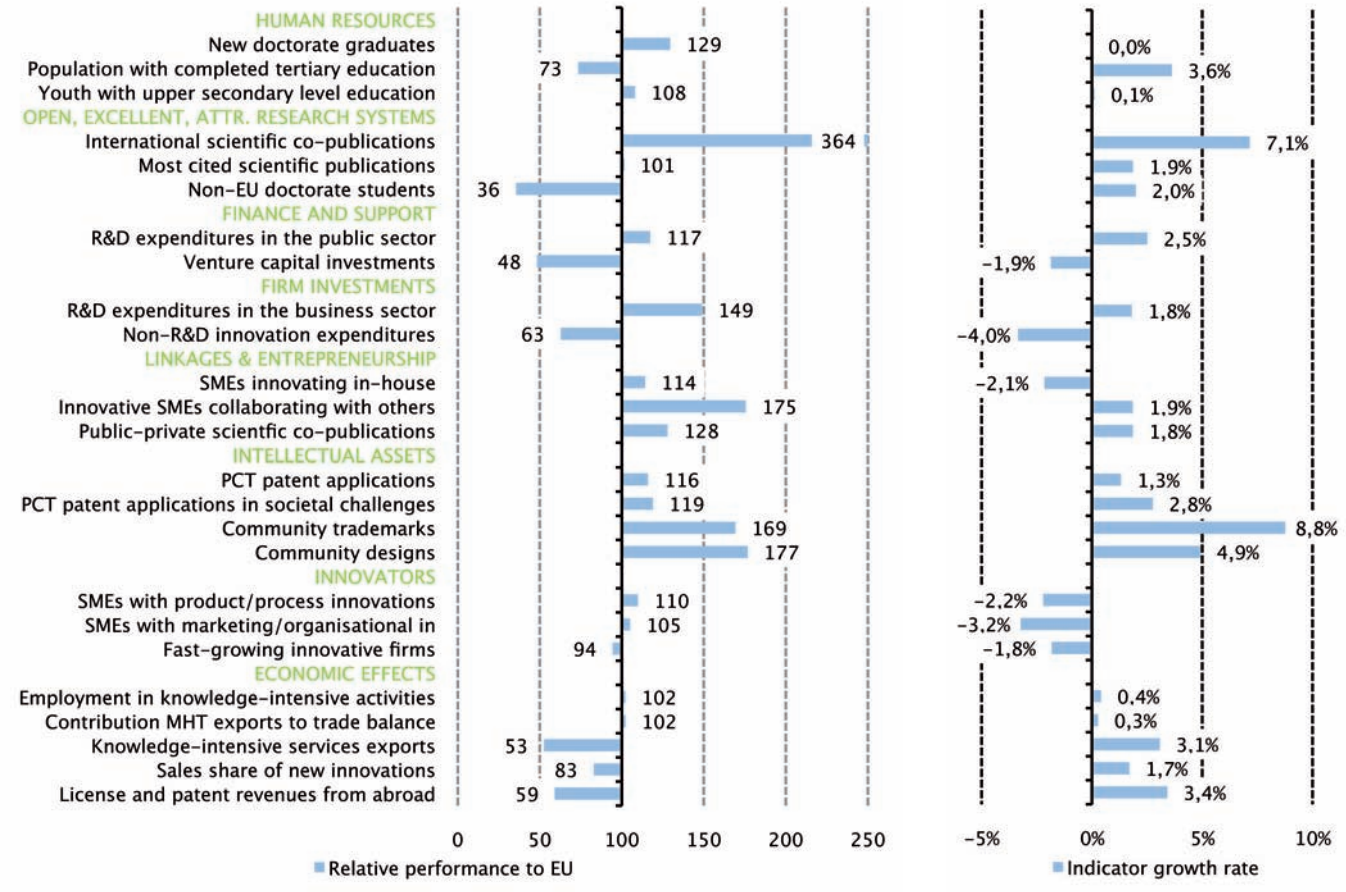
Notes: Performance relative to the EU where the EU = 100.



Austria is an Innovation follower. Innovation performance has been increasing until 2009, declined in 2010, due to lower shares of product or process innovators, marketing or organizational innovators, SMEs innovating in-house and SMEs collaborating with others. The innovation performance has fully recovered since 2012. The performance relative to the EU peaked at 116% in 2008 and 2009 and has since declined to 108% in 2013.

Relative strengths in performance are in International scientific co-publications, Community designs and Innovative SMEs collaborating with others. Relative weaknesses are in Non-EU doctorate students and Venture capital investments.

Strong increases in growth are observed for Community trademarks, International scientific co-publications and Community designs. Strong declines in growth are observed in Non-R&D innovation expenditures and SMEs with Marketing and/or Organisational innovations.

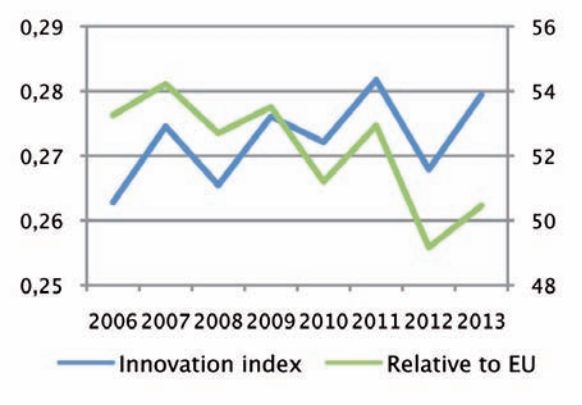


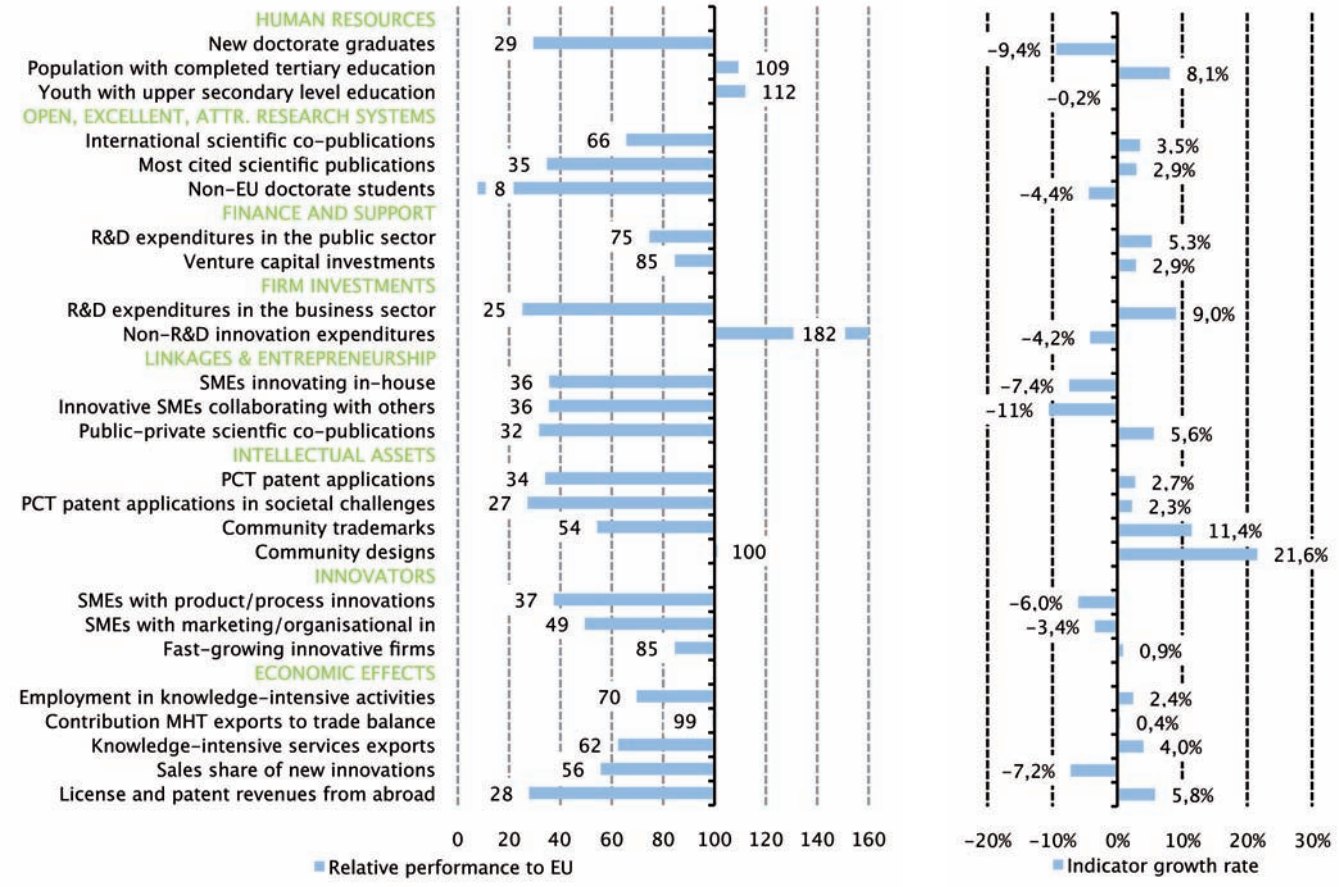
Notes: Performance relative to the EU where the EU = 100.

Poland is a Moderate innovator. Innovation performance has been quite volatile within a relatively narrow range. The innovation performance has only marginally improved between 2006 and 2013 and due to a more rapidly increasing performance for the EU the relative performance to the EU has been declining from 54% in 2007 to about 50% in 2013. This has resulted in Poland virtually dropped from being a Moderate innovator up until 2011 to being a Modest innovator in 2012.

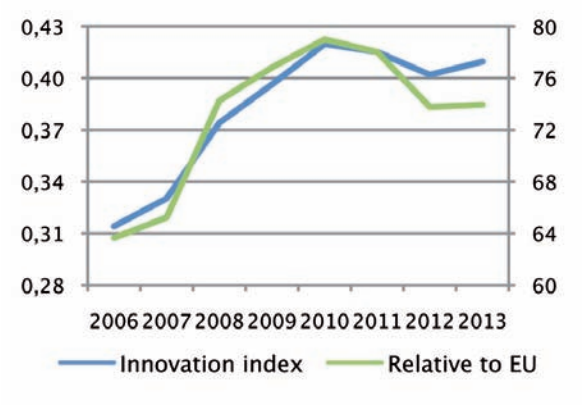
Poland is performing below the average of the EU for most indicators. Relative weaknesses are in Non-EU doctorate students, PCT patent applications in societal challenges and License and patent revenues from abroad. Relative strengths are in Non-R&D innovation expenditures and Youth with upper secondary level education.

High growth is observed for Community designs, Community trademarks and R&D expenditures in the business sector. Strong declines in growth are observed in Innovative SMEs collaborating with others, New doctorate graduates, SMEs innovating in-house and Sales share of new innovations.





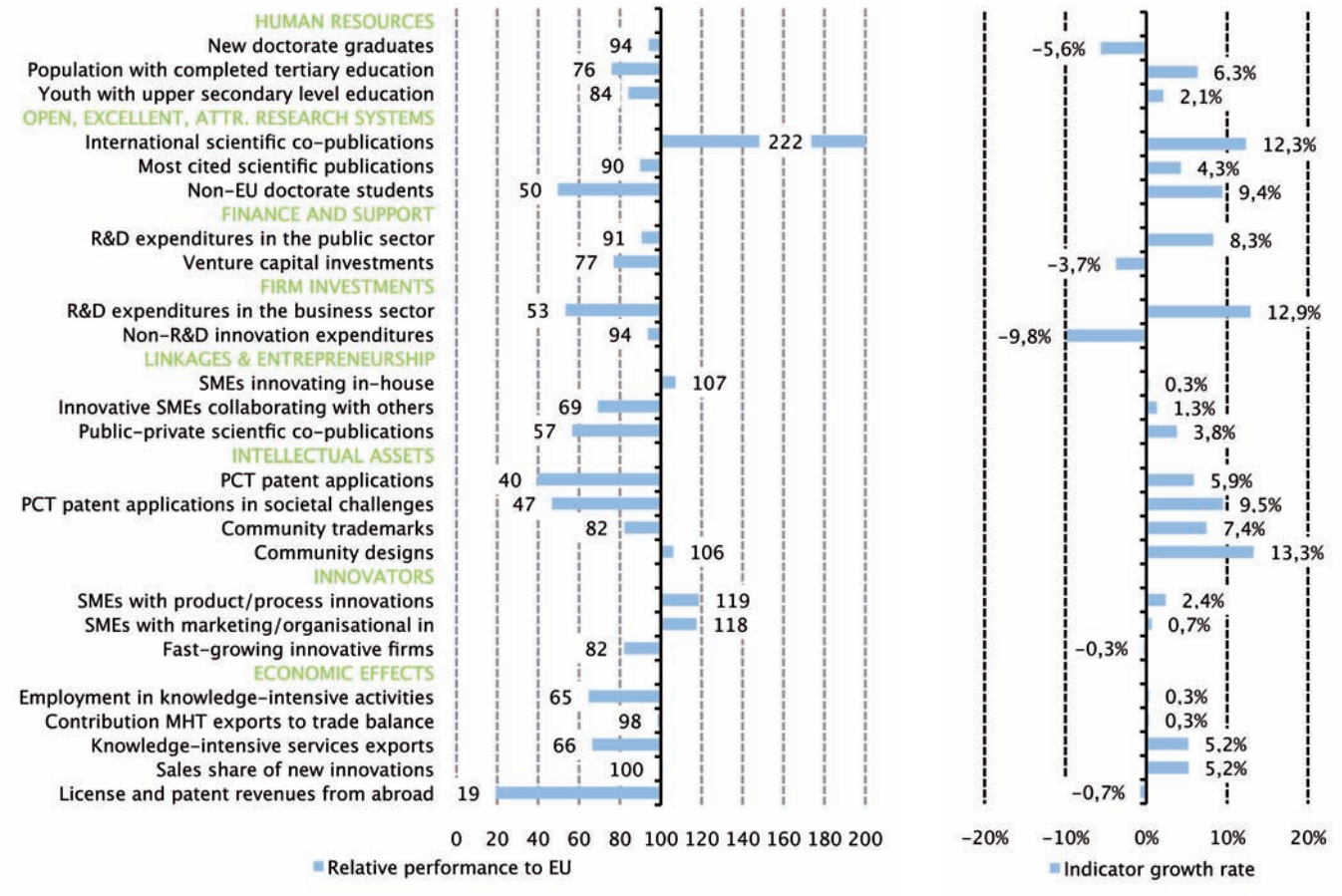
Notes: Performance relative to the EU where the EU = 100.



Portugal is a Moderate innovator. Innovation performance has been increasing until 2010 after which it has remained relatively steady. Portugal managed to improve its performance relative to the EU from 64% in 2006 to 79% in 2010 before falling to 74% in 2013.

Portugal performs below the EU average for most indicators, most notably for License and patent revenues from abroad, PCT patent applications and PCT patent applications from societal challenges. Relative strengths are in International scientific co-publications, SMEs with Product and/or Process innovations and SMEs with Marketing and/or Organisational innovations.

Most indicators are growing positively in Portugal, in particular Community designs, R&D expenditures in the business sector and International scientific co-publications. Large declines in growth are observed in Non-R&D innovation expenditures, New doctorate graduates and Venture capital investments.

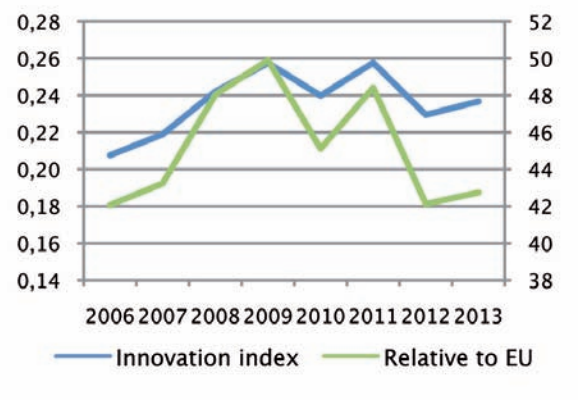


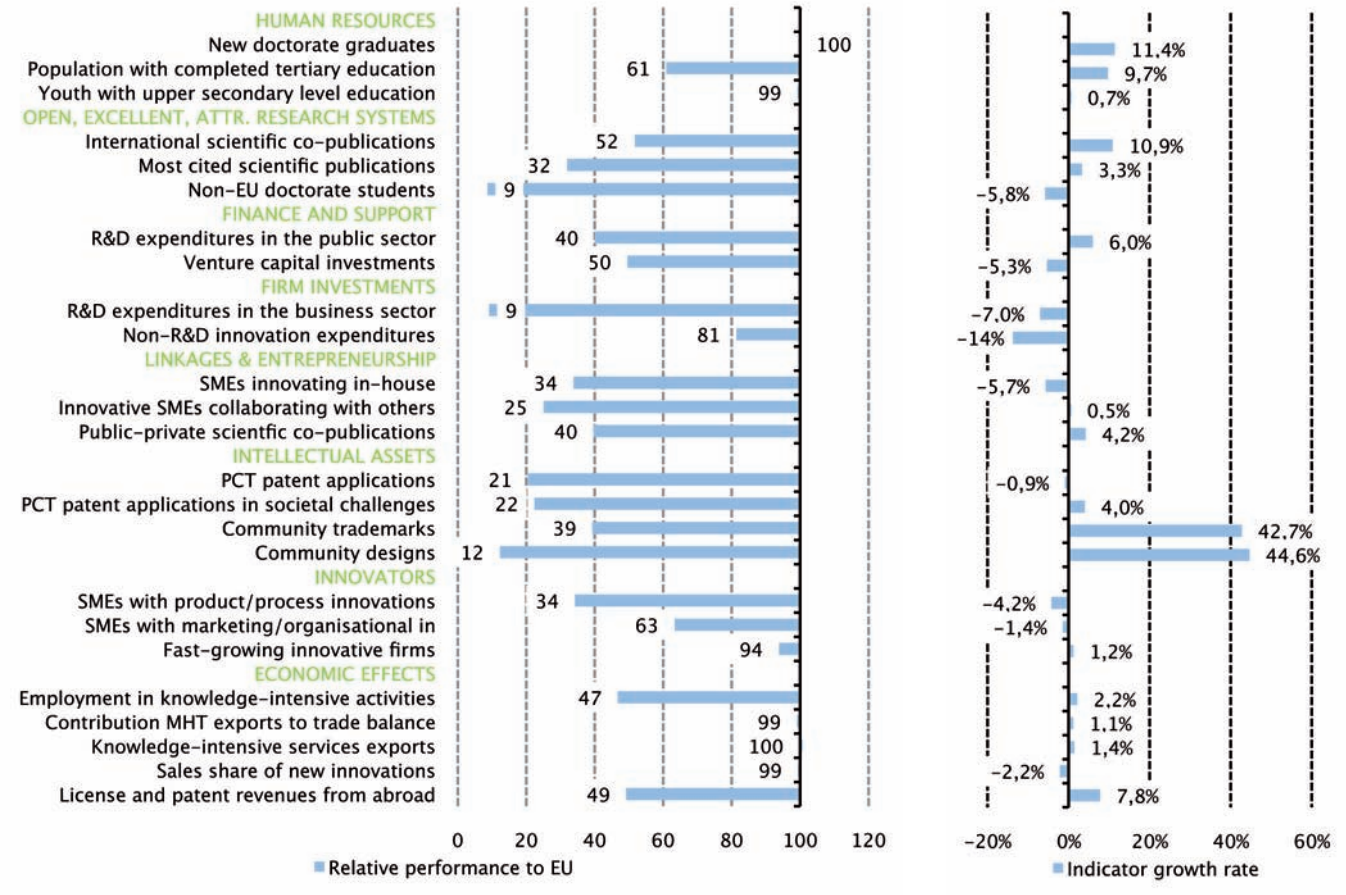
Notes: Performance relative to the EU where the EU = 100.

Romania is a Moderate innovator. Innovation performance increased up until 2009 after which it has fluctuated ever since. Relative performance to the EU has worsened from being close to 50% in 2009 to 43% in 2013.

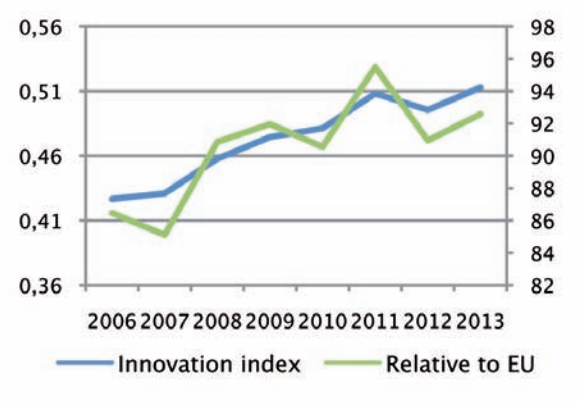
Romania is performing well below the average of the EU for almost all indicators. Very weak performance is observed for Non-EU doctorate students and R&D expenditures in the business sector. Romania performs similar to the EU for New doctorate graduates and Knowledge-intensive services exports.

High growth in Romania is observed for Community designs, Community trademarks, New doctorate graduates and International scientific co-publications. Strong declines are observed Non-R&D innovation expenditures, R&D expenditures in the business sector, Non-EU doctorate students and Venture capital investments.





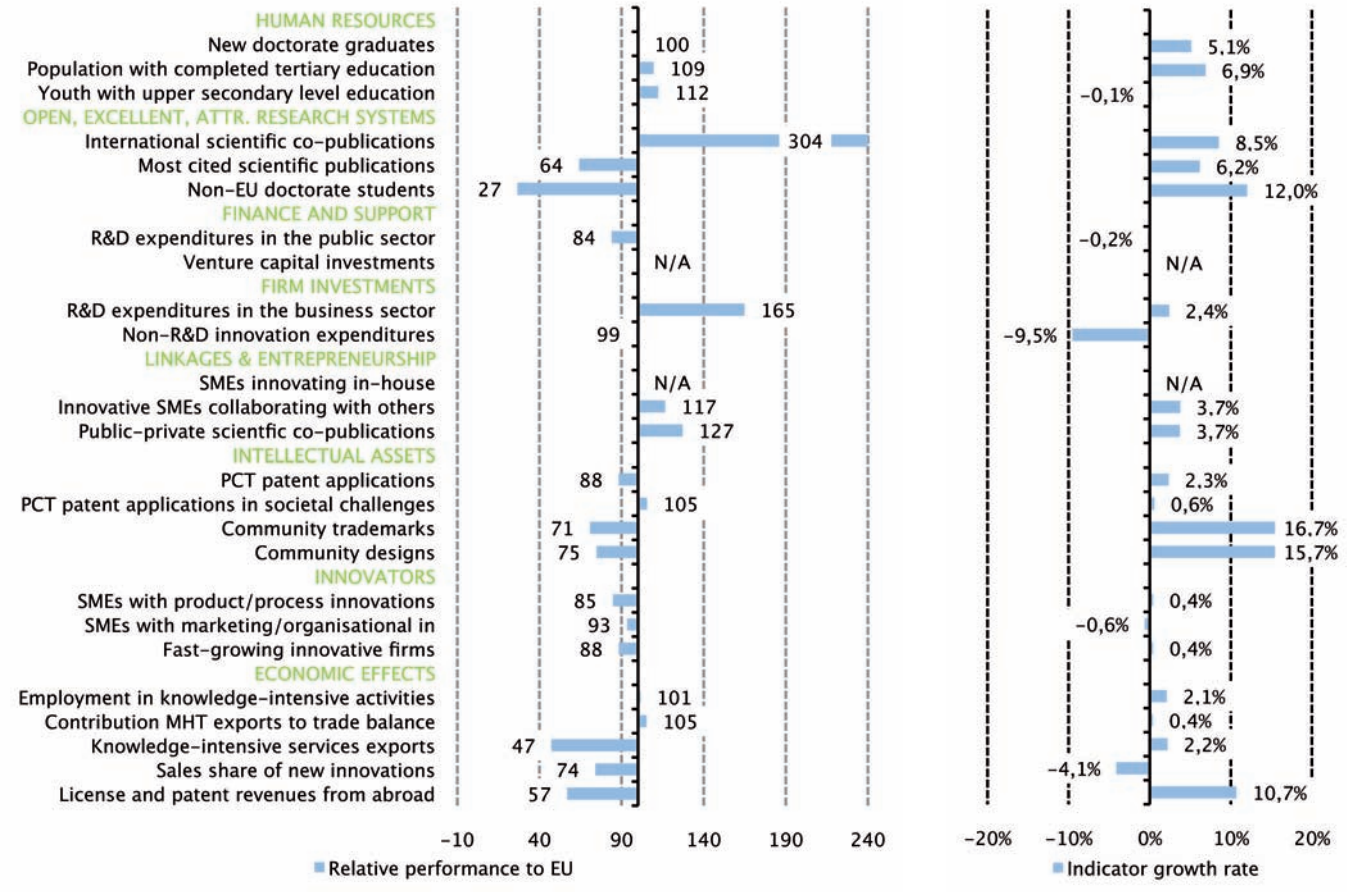
Notes: Performance relative to the EU where the EU = 100.



Slovenia is an Innovation follower. Innovation performance has been steadily increasing with a minor downfall in 2012. Slovenia's relative performance to the EU has improved from 85% in 2007 to 93% in 2013. The increase in relative performance has moved the country from the Moderate innovators in 2006 and 2007 to the Innovation followers from 2008 onwards.

Relative strengths are in International scientific co-publications, R&D expenditures in the business sector and Public-private scientific co-publications. Relative weaknesses are observed in Non-EU doctorate students and Knowledge-intensive services exports.

Most indicators are growing in Slovenia. High growth is observed for Community trademarks, Community designs, Non-EU doctorate students and License and patent revenues from abroad. Strong declines in growth are observed in Non-R&D innovation expenditures and Sales share of new innovations.

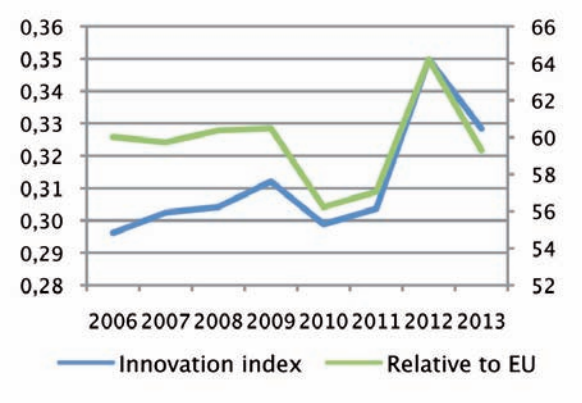


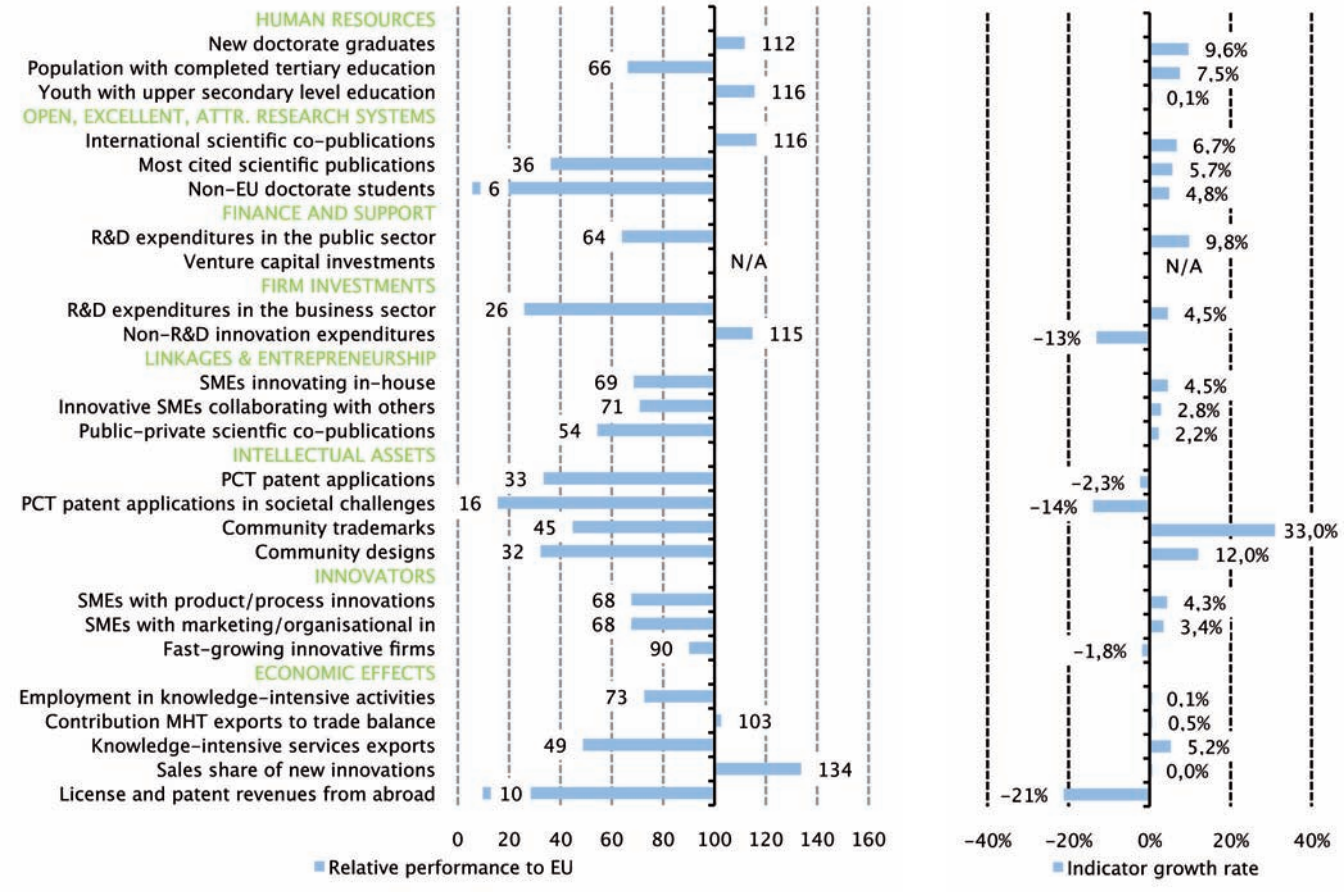
Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.

Slovakia is a Moderate innovator. Innovation performance has increased between 2006 and 2013 but declined in 2010 followed by a steep increase in 2012, in particular due to improvements in new doctorate degrees and product or process innovators. This is followed by a sharp decline in 2013, due to a decline in new doctorate degrees. The performance relative to the EU reached a peak in 2012 at 64% but fell to 59% in 2013.

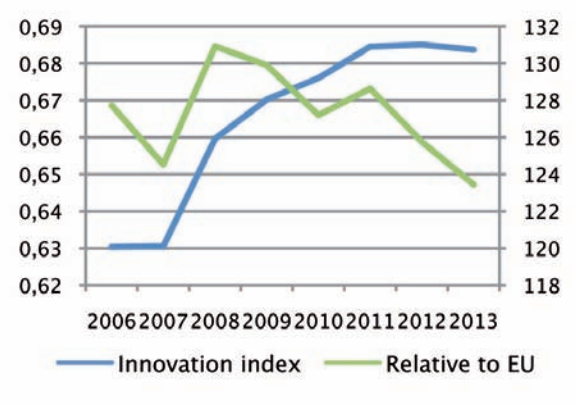
Slovakia performs below the EU average for most indicators. Relative strengths are in Sales share of new innovations, Youth with upper secondary level education and International scientific co-publications. Relative large weaknesses are in Non-EU doctorate students, License and patent revenues from abroad and PCT patent applications in societal challenges.

Most indicators are growing in Slovakia. High growth is observed for Community trademarks and Community designs. Large declines in growth are observed in License and patent revenues from abroad, PCT patent applications in societal challenges and Non-R&D innovation expenditures.





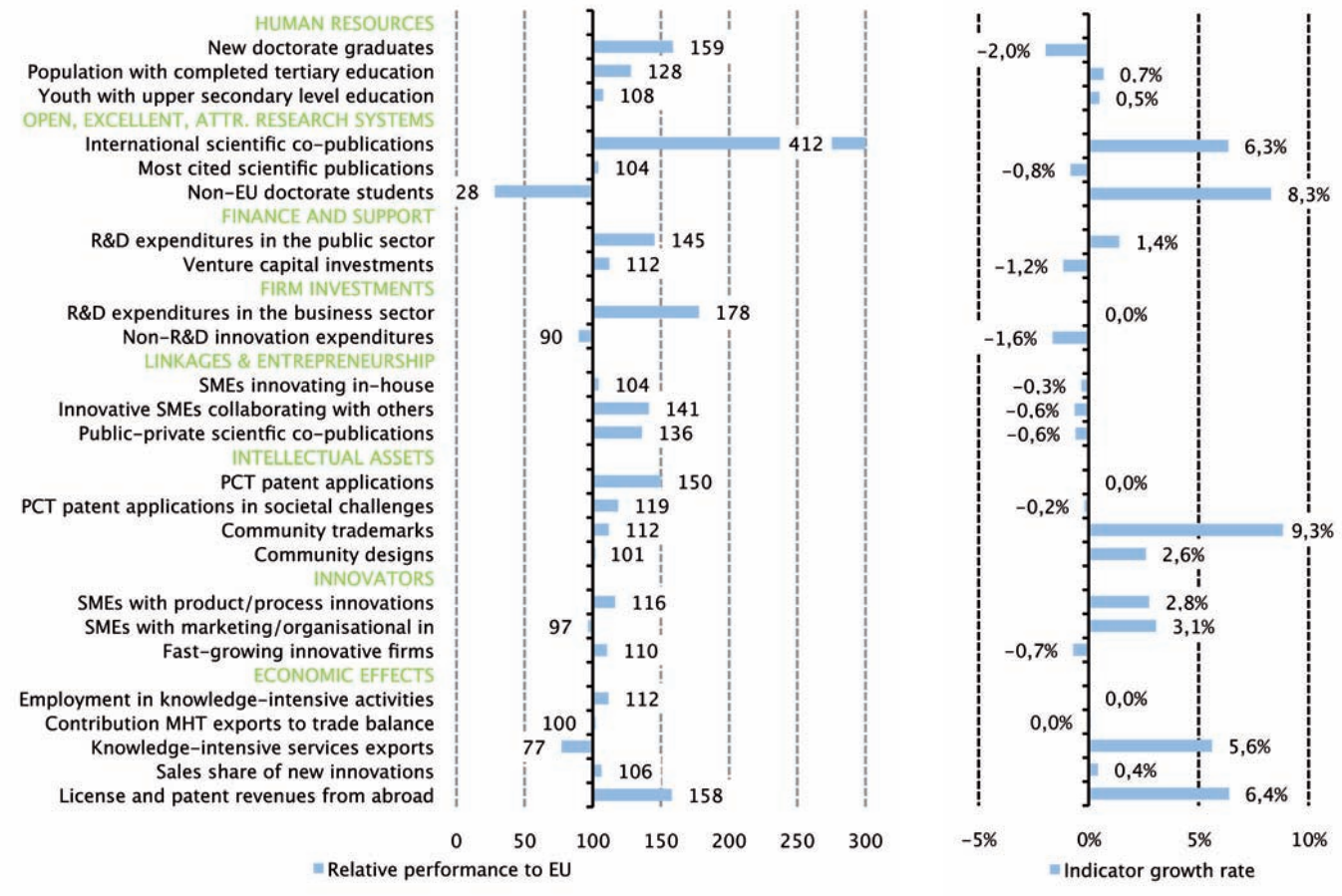
Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.



Finland is an Innovation leader and innovation performance has been increasing until 2011 and remained stable in 2012 and 2013. The performance relative to the EU has been declining from its peak of 131% in 2008 to 123% in 2013.

Finland is performing above the average of the EU for most indicators. Relative strengths are in International scientific co-publications, R&D expenditures in the business sector, New doctorate graduates and License and patent revenues from abroad. Relative weaknesses are in Non-EU doctorate students and Knowledge-intensive services exports.

High growth is observed for Community trademarks and Non-EU doctorate students. Notable declines in growth are observed for New doctorate graduates and Non-R&D innovation expenditures.

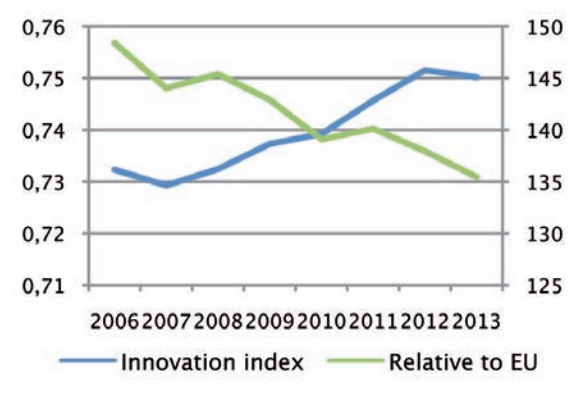


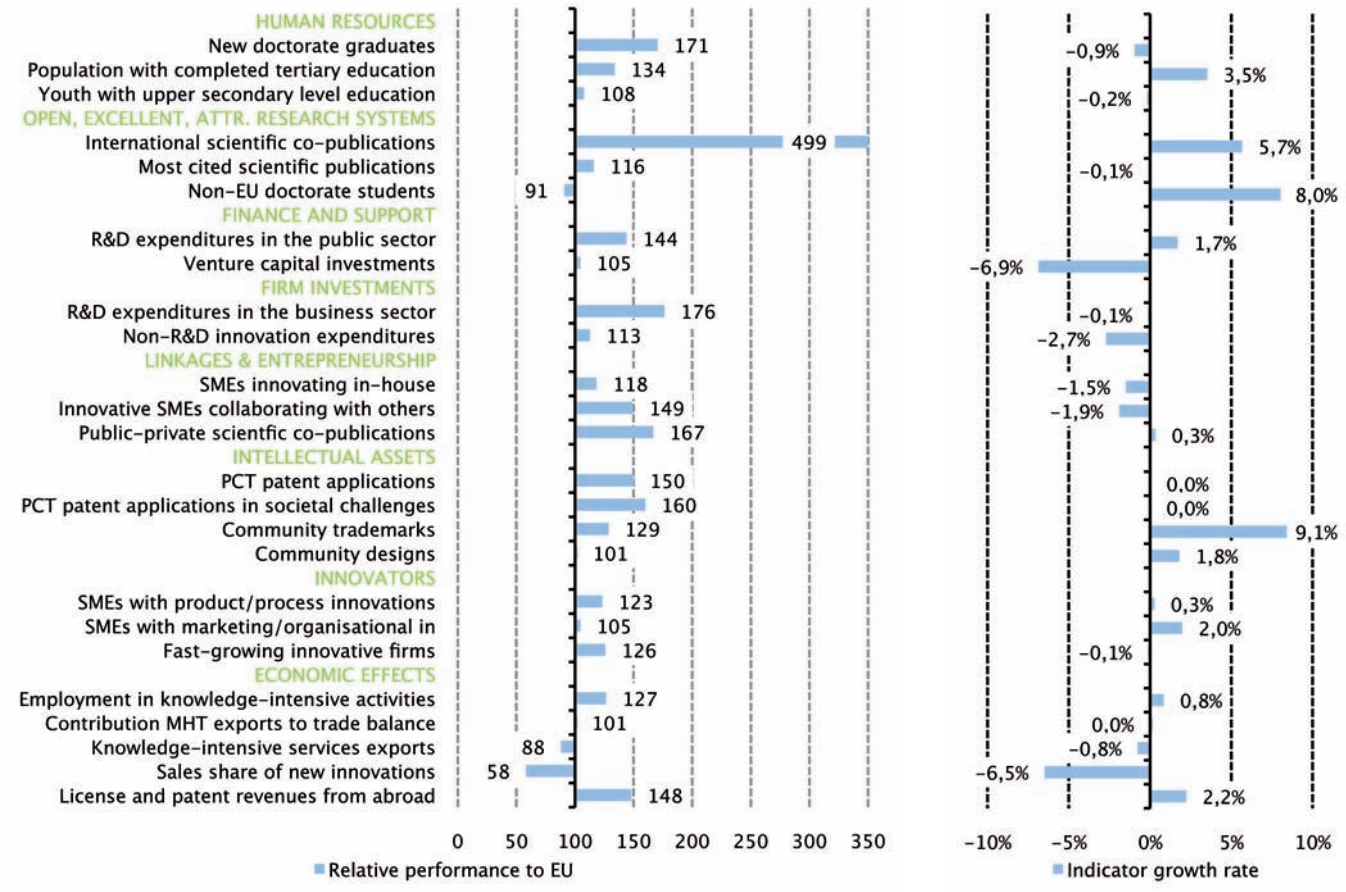
Notes: Performance relative to the EU where the EU = 100.

Sweden is an Innovation leader. Innovation performance has been increasing until 2012 but slightly declined in 2013, in particular due to declining venture capital investments. The performance relative to the EU has been declining over the whole period from 148% in 2006 to 135% in 2013.

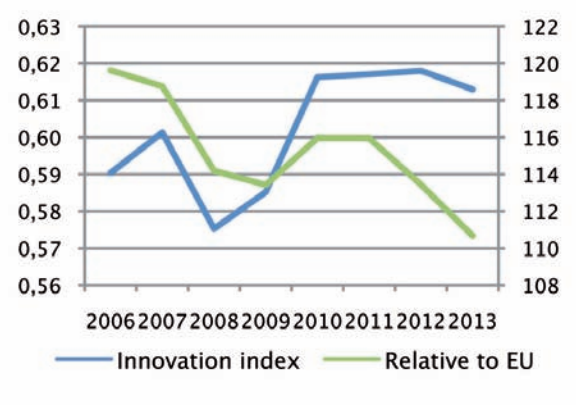
Sweden is performing above the average of the EU for most indicators especially for International scientific co-publications, R&D expenditures in the business sector, Public-private scientific co-publications and PCT patent applications in societal challenges. Relative weaknesses are in Sales share of new innovations and Knowledge-intensive services exports.

High growth in Sweden is observed for Community trademarks and Non-EU doctorate students. Strong declines in growth are observed for Venture capital investments and Sales share of new innovations.





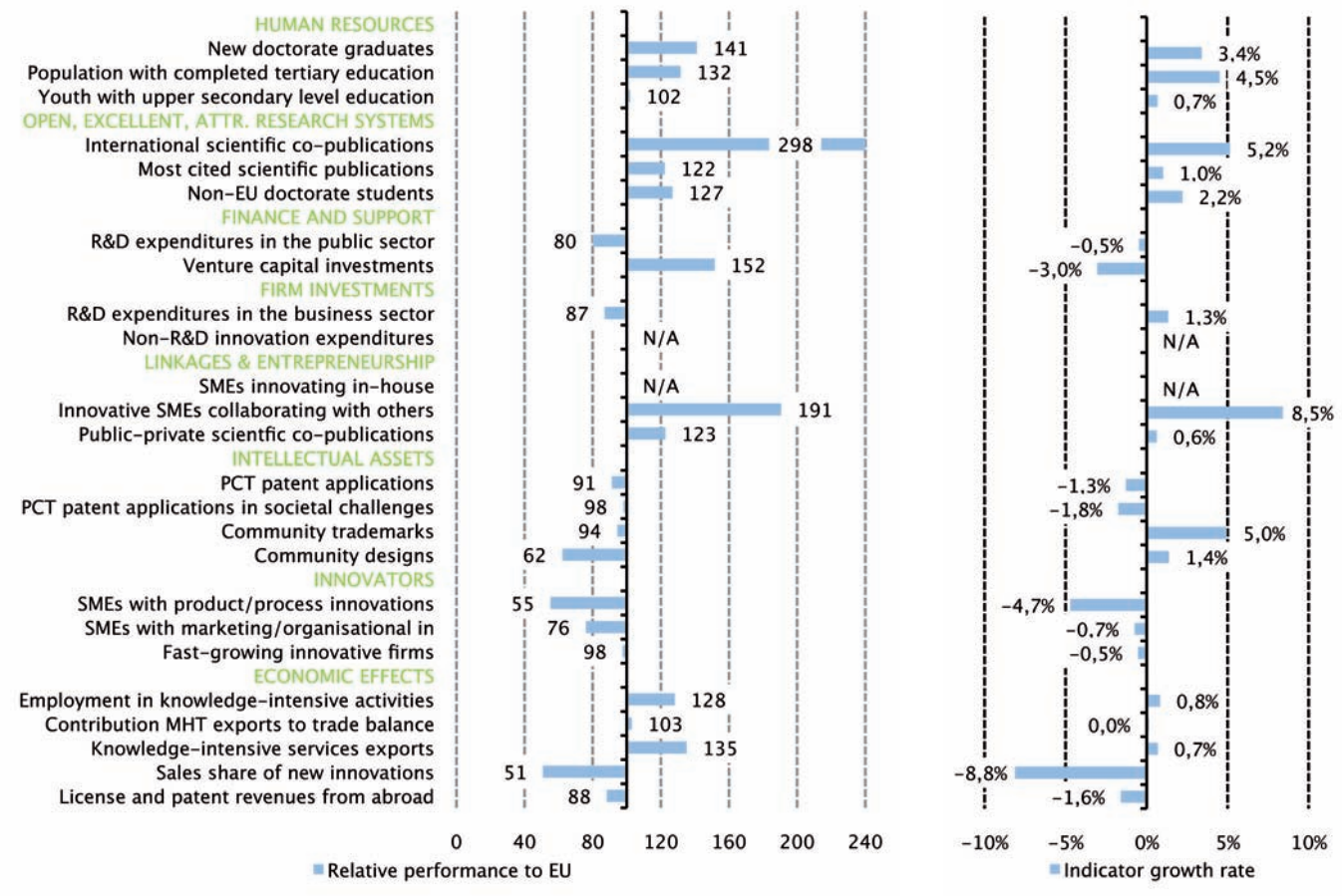
Notes: Performance relative to the EU where the EU = 100.



The **United Kingdom** is an Innovation follower. After a decline in 2008 performance improved strongly in 2009 and in 2010, in particular due to increases in Innovative SMEs collaborating with others. Since 2010 performance has been stable with a small decline in 2013. The performance relative to the EU has declined from almost 120% in 2006 to 111% in 2013.

Relative strengths for the United Kingdom are in International scientific co-publications, Innovative SMEs collaborating with others and New doctorate graduates. Relative weaknesses are in Sales share of new innovations and SMEs with Product and/or Process innovations.

Performance in terms of growth has improved most for Innovative SMEs collaborating with others and International scientific co-publications. Strong declines in growth are observed in Sales share of new innovations and SMEs with Product and/or Process innovations.

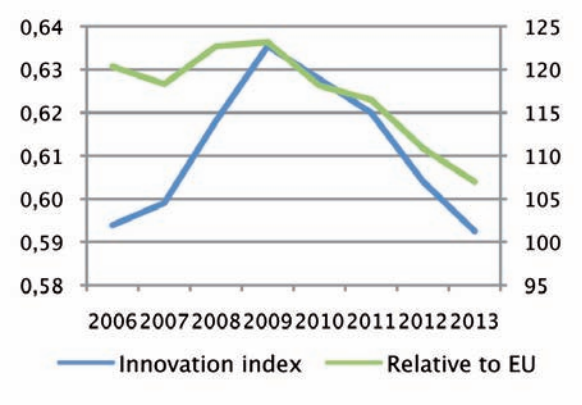


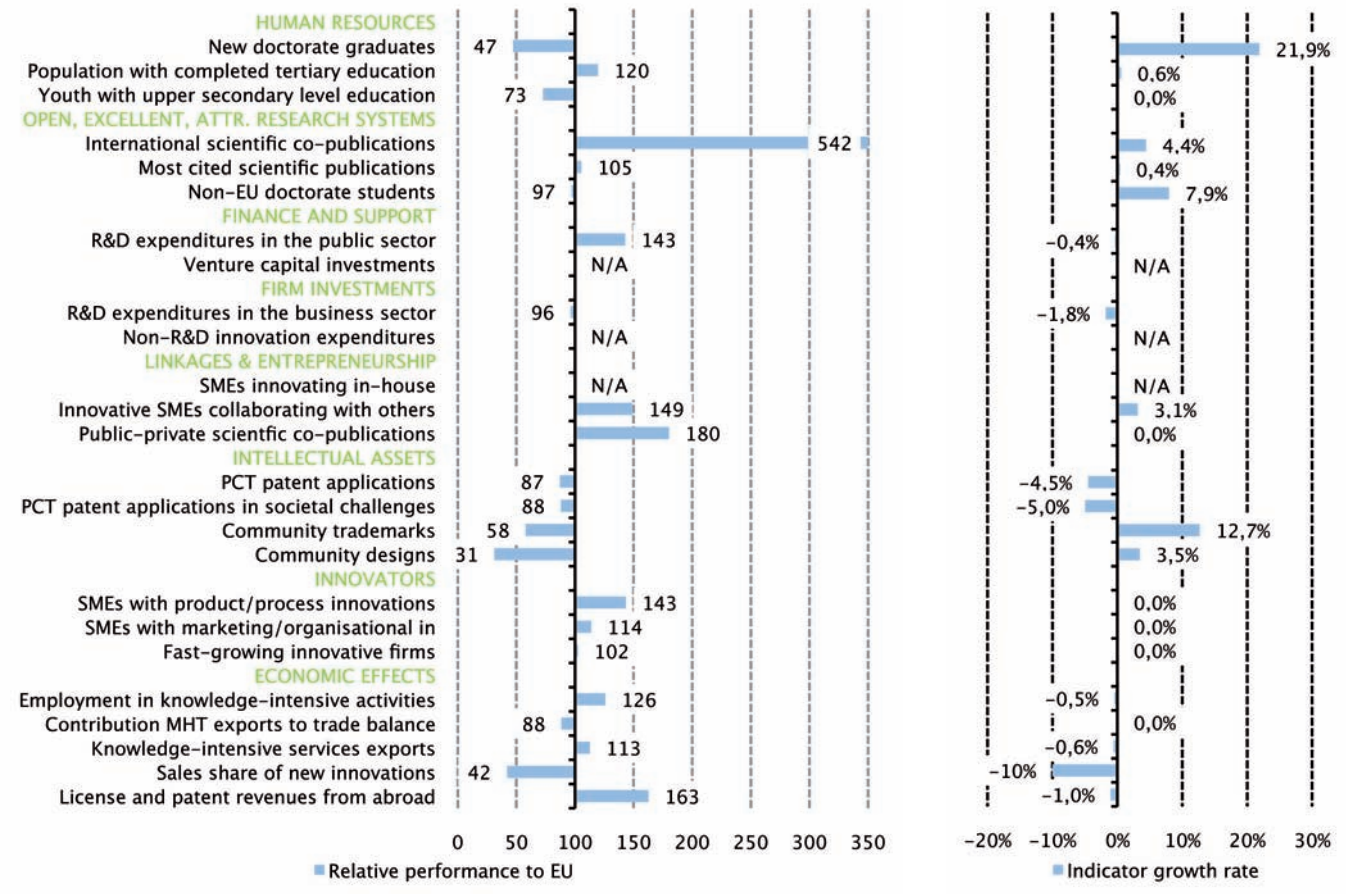
Notes: Performance relative to the EU where the EU = 100. No data for Non-R&D innovation expenditures and SMEs innovating in-house.

Iceland is an Innovation follower. Performance has been improving strongly until 2009 after which it started to decline, mainly due to drops in Patent applications and Community trademarks[10]. In 2013 innovation performance has dropped to its level in 2006: Iceland is the only country for which innovation has not improved over the 2006-2013 period. The performance relative to the EU has declined from being 23% above the EU in 2008 and 2009 to 7% above average in 2013.

Relative strengths for Iceland are in International scientific co-publications, Public-private scientific co-publications and License and patent revenues from abroad. Relative weaknesses are in Community designs and Sales share of new innovations.

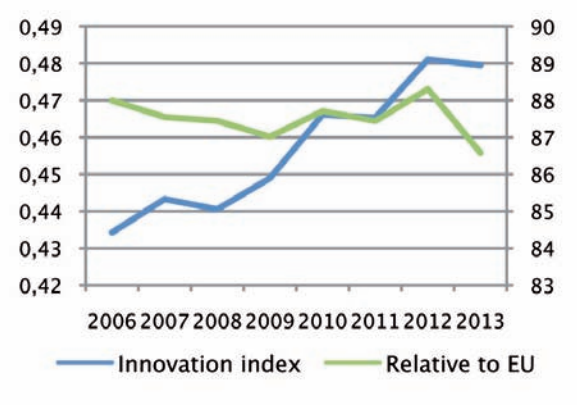
High growth is observed in New doctorate graduates and Community trademarks. Large declines in growth are observed in Sales share of new innovations and PCT patent applications in societal challenges.





Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments, Non-R&D innovation expenditures and SMEs innovating in-house.

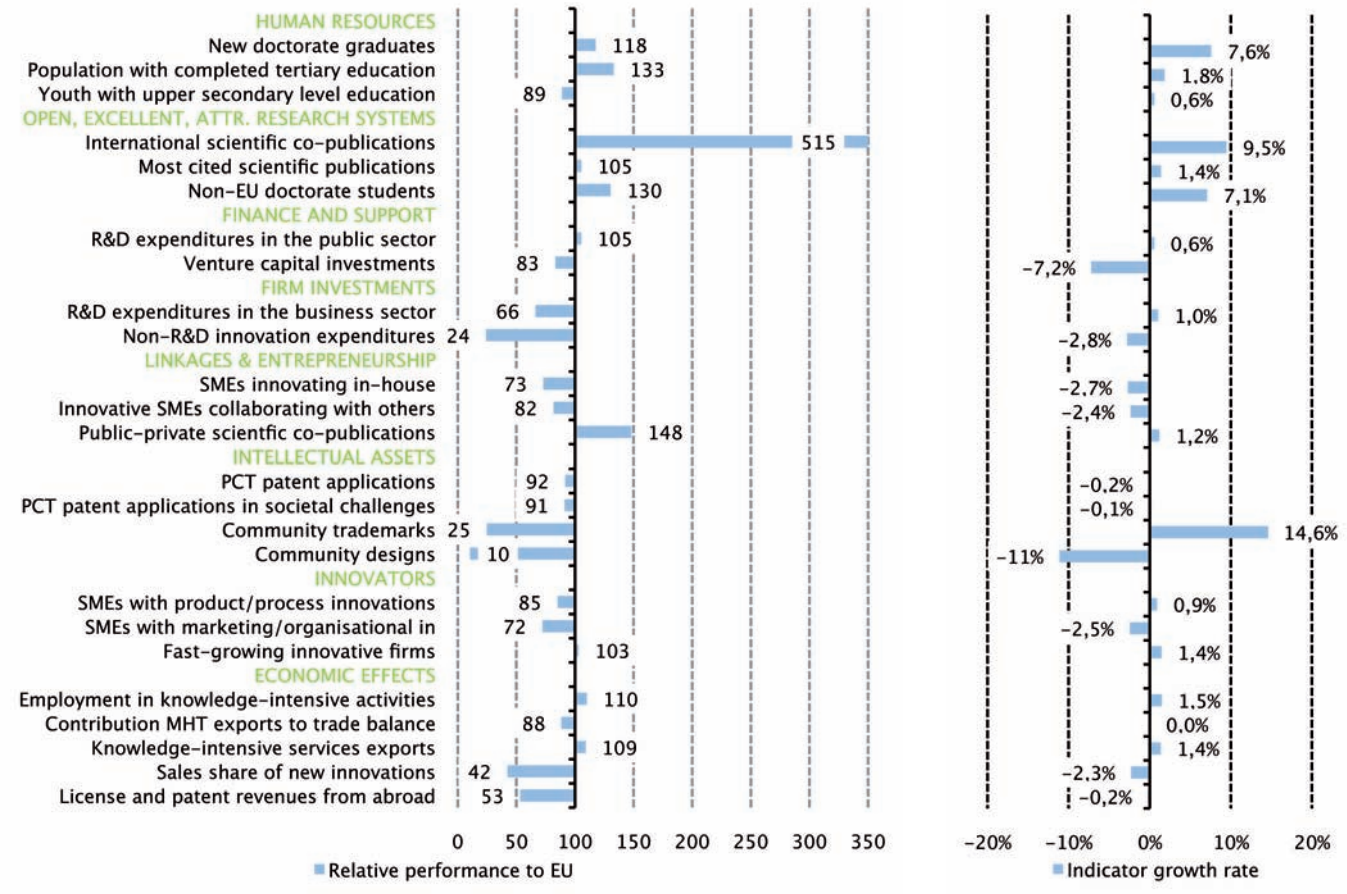
[10] *Over the whole 2006-2013 period Community trademarks grew strongly as shown in the graph showing the growth rates per indicator. But there is a strong difference between 2006-2009 when trademark applications increased eightfold and 2009-2013 when trademark applications dropped almost fourfold.*



Norway is a Moderate innovator. Norwegian innovation performance has been increasing since 2007 with only small declines in 2008 and 2011. But the growth rate has been just below that of the EU and the relative performance to the EU has declined from 88% in 2006 to 87% in 2013.

Norway is performing below the EU average for most indicators, particularly for Community designs, Non-R&D innovation expenditures and Community trademarks. Relative strengths are in International scientific co-publications and Public-private scientific co-publications.

High growth in Norway is observed for Community trademarks and International scientific co-publications. Large growth declines are observed in Community designs and Venture capital investments.



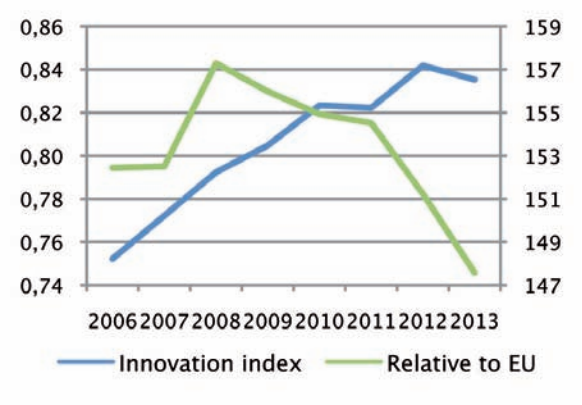
Notes: Performance relative to the EU where the EU = 100.

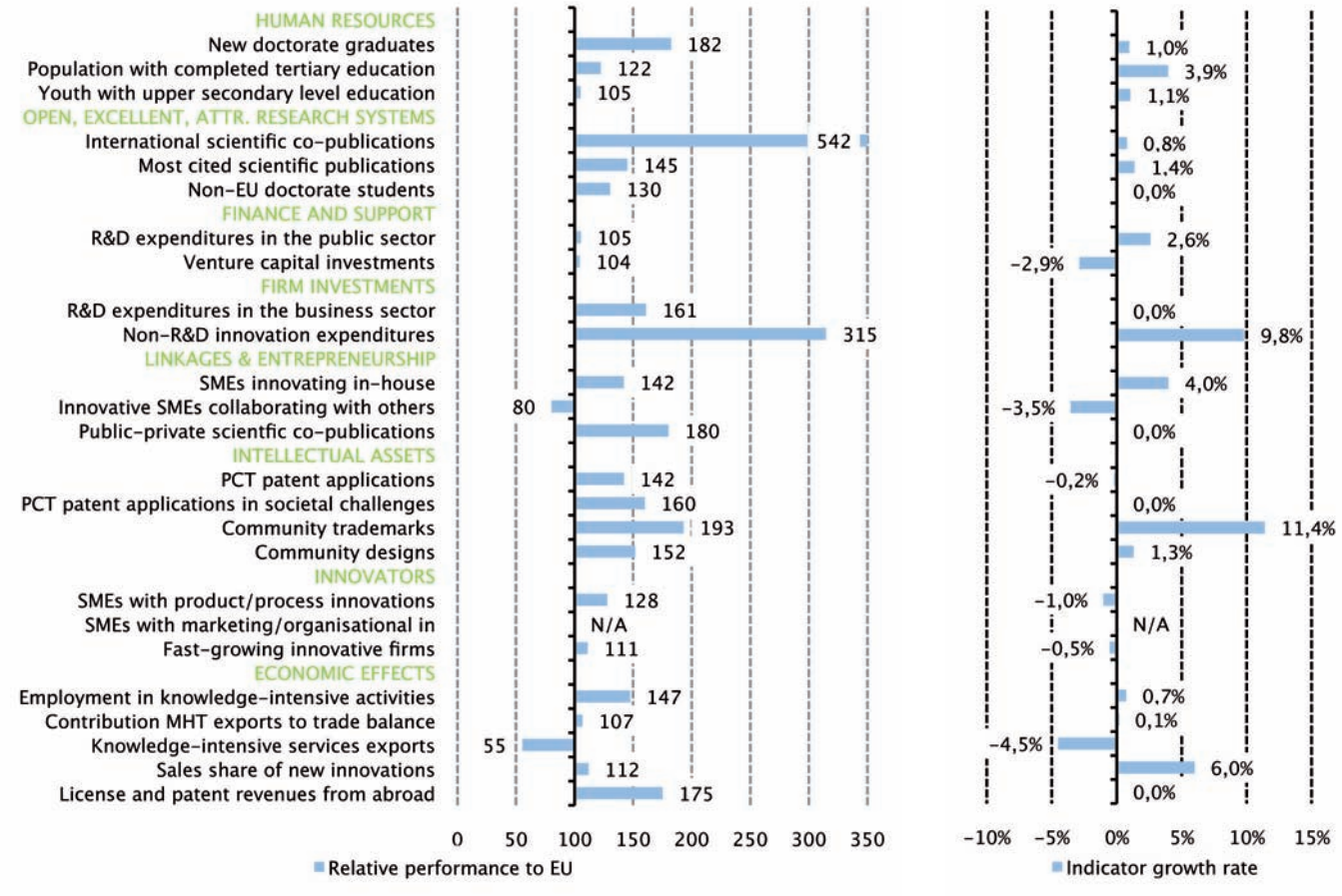
Switzerland is an Innovation leader and the most innovative country in Europe. Innovation performance has been increasing until 2012 after which it marginally declined.

The performance lead over the EU has been declining. The Swiss innovation index was 57% higher than that of the EU in 2008, but in 2013 this has reduced to 51%.

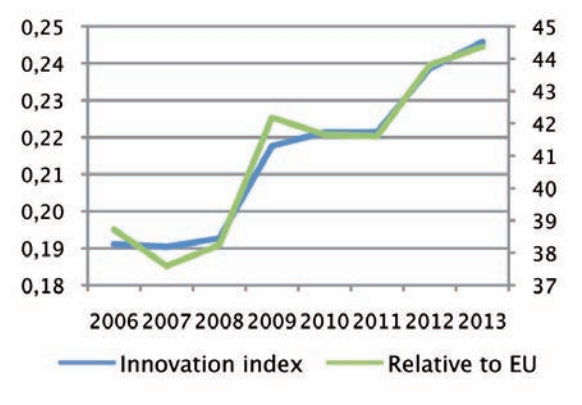
Switzerland is performing well above the EU average for most indicators, above all for International scientific co-publications, Non-R&D innovation expenditures, Community trademarks and New doctorate graduates. Relative weaknesses are in Knowledge-intensive services exports and Innovative SMEs collaborating with others.

Performance in terms of growth has improved particularly for Community trademarks Non-R&D innovation expenditures and Sales share of new innovations. Strong declines in growth are observed in Knowledge-intensive services exports and Innovative SMEs collaborating with others.





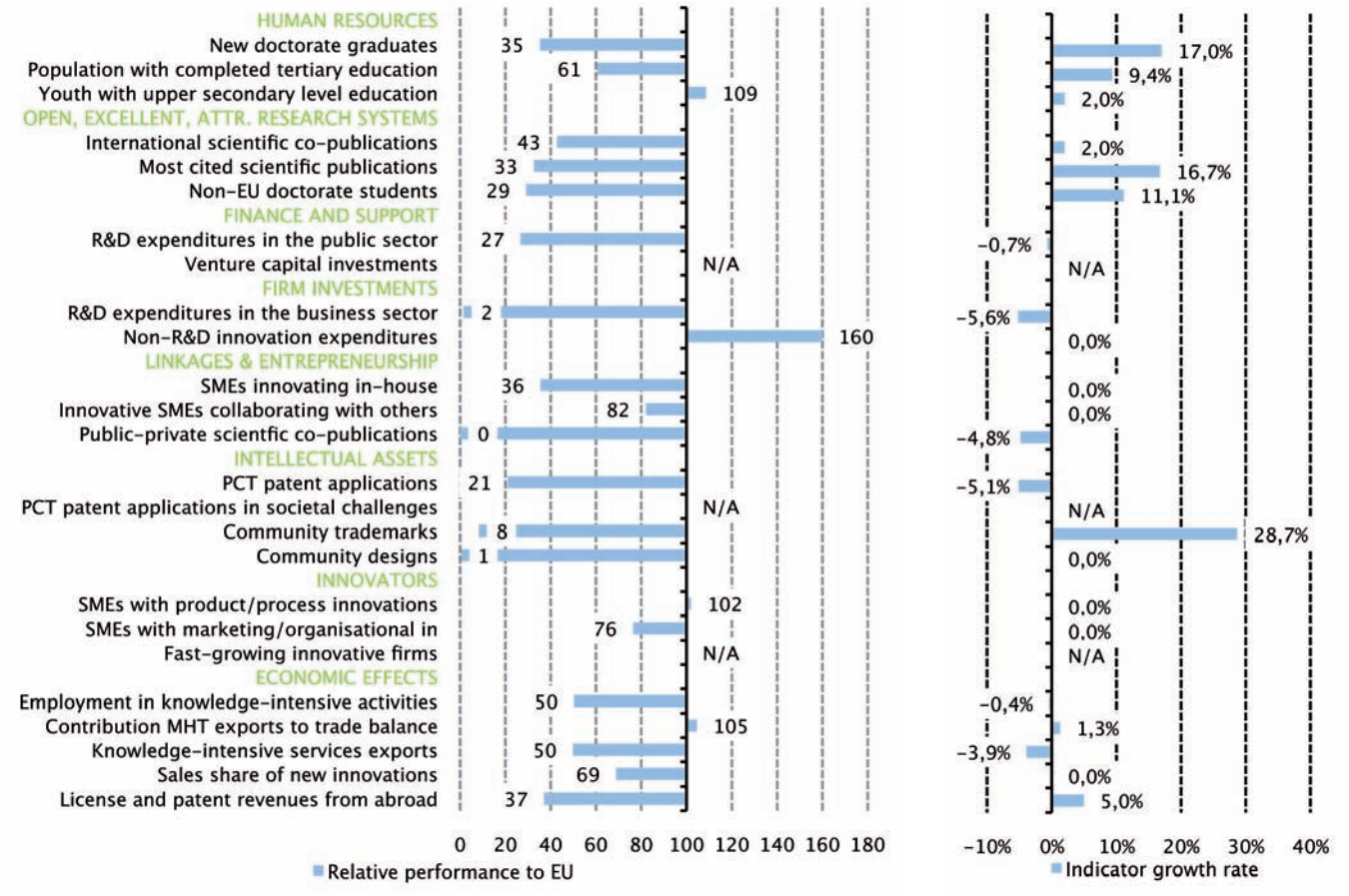
Notes: Performance relative to the EU where the EU = 100. No data for SMEs with marketing or organisational innovations.



The F**ormer Yugoslav Republic of Macedonia** is a Moderate innovator. Innovation performance has been increasing between 2006 and 2013. The country has been catching up to the performance level of the EU: its relative performance improved from 38% in 2008 to 44% in 2013.

The Former Yugoslav Republic of Macedonia is performing well below the EU average. Relative strong weaknesses are in Public-private scientific co-publications, Community designs and R&D expenditures in the business sector and Community trademarks. Relative strengths are in Non-R&D innovation expenditures and Youth with upper secondary level education.

Performance in terms of growth has increased significantly for Community trademarks, New doctorate graduates and Most cited scientific publications. Other high growing indicators are Non-EU doctorate students and Population with completed tertiary education. Strong declines in growth are observed in R&D expenditures in the business sector, PCT patent applications and Public-private scientific co-publications.

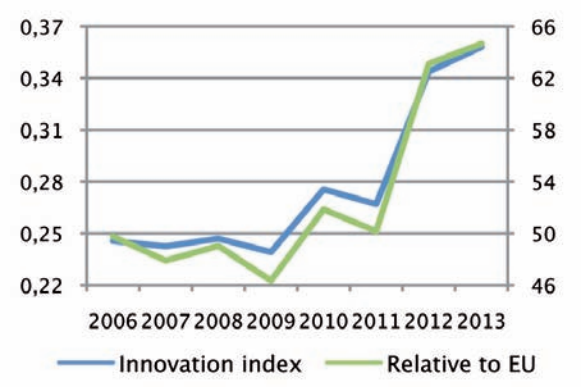


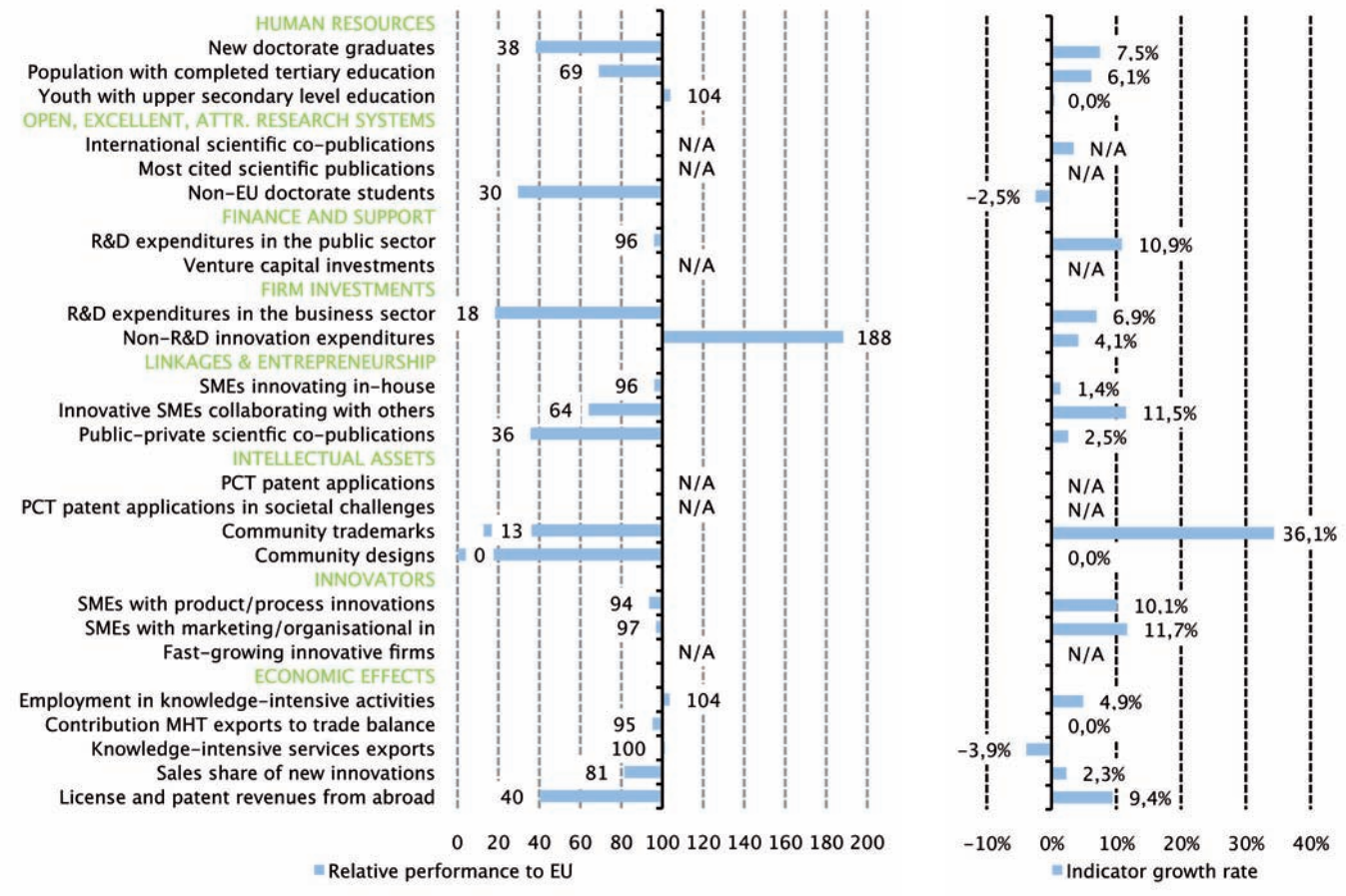
Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments, PCT patent applications in societal challenges and Employment in fast-growing firms of innovative sectors.

Serbia is a Moderate innovator. Innovation performance has increased over the whole period due to increases in Innovative SMEs collaborating with others, Product and/or process innovators and Marketing and/or organisational innovators. The country relative performance to the EU has improved from 48% in 2007 to 65% in 2013.

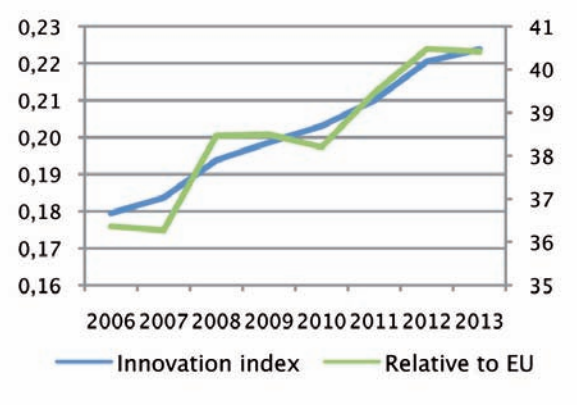
Serbia is performing well below the EU average. Relative strengths are in Non-R&D innovation expenditures, Employment in knowledge-intensive activities and Youth with upper secondary level education. Relative strong weaknesses are in Community designs, Community trademarks and R&D expenditures in the business sector.

Performance in terms of growth has been positive in Serbia for most indicators. High growth is observed for Community trademarks, SMEs with Marketing and/or Organisation innovations, Innovative SMEs collaborating with others and R&D expenditures in the public sector. Declines in growth are only observed for Knowledge-intensive services exports and Non-EU doctorate students.





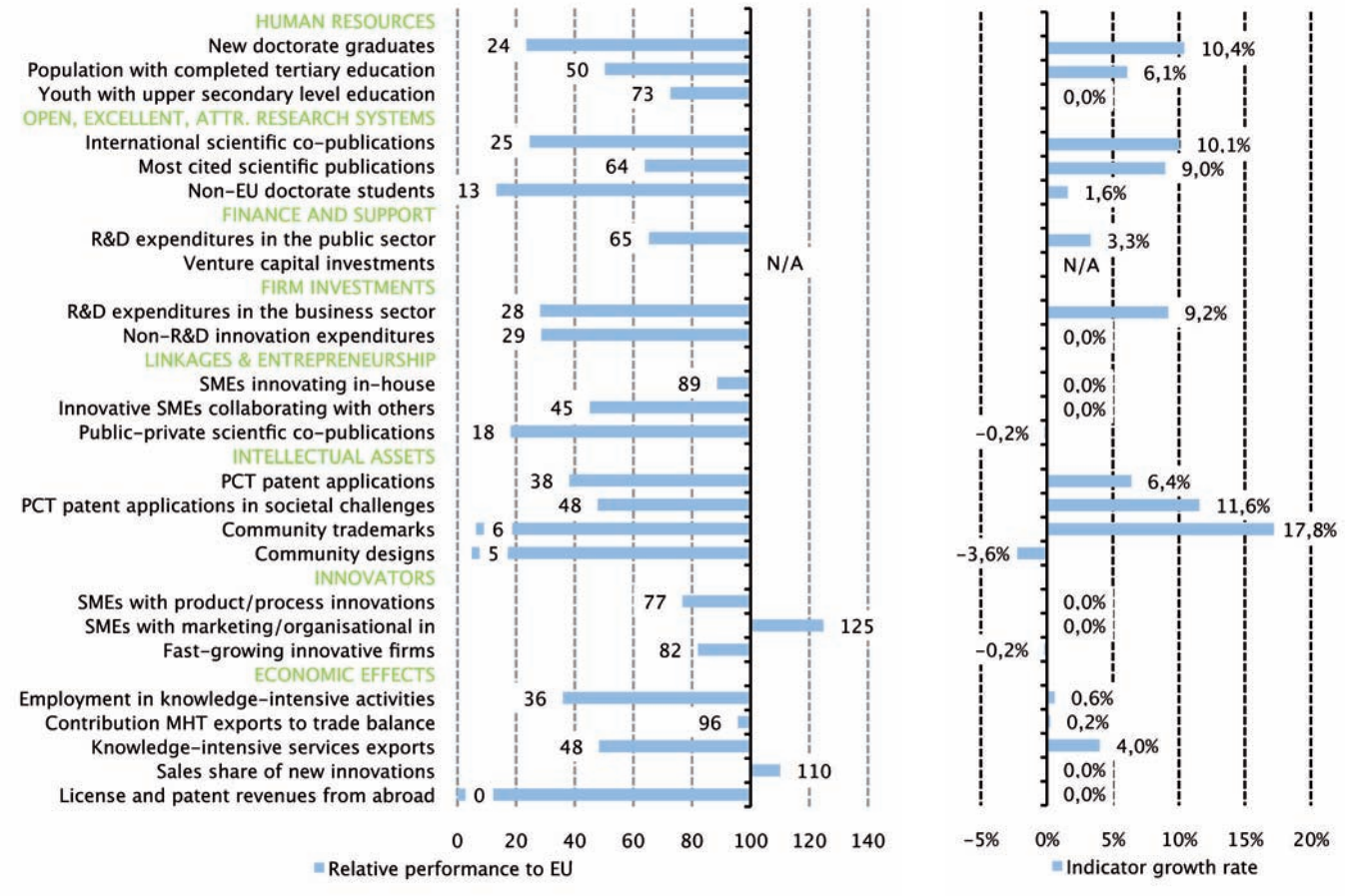
Notes: Performance relative to the EU where the EU = 100. No data for International scientific co-publications, Most cited scientific publications, Venture capital investments, PCT patent applications, PCT patent applications in societal challenges and Employment in fast-growing firms of innovative sectors.



Turkey is a Modest innovator. Turkish innovation performance has been improving at a steady rate between 2006 and 2013. The country is catching up to the EU: its relative performance has improved from 36% in 2006 to 40% in 2013.

Turkey is performing well below the average of the EU for almost all indicators except for SMEs with Marketing and/or Organisational innovations and Sales share of new innovations. Relative strong weaknesses are in License and patent revenues from abroad, Community designs, Community trademarks, Non-EU doctorate students and Public-private scientific co-publications.

Most indicators are positively growing in Turkey. High growth is observed for Community trademarks, PCT patent applications in societal challenges and New doctorates graduates. The few declines in growth are minor, with the largest one in community designs.



Notes: Performance relative to the EU where the EU = 100. No data for Venture capital investments.

6. Innovation Union Scoreboard methodology

6.1 How to calculate composite indicators

The overall innovation performance of each country has been summarized in a composite indicator (the Summary Innovation Index). The methodology used for calculating this composite innovation indicator will now be explained in detail.

Step 1: Identifying and replacing outliers

Positive outliers are identified as those relative scores which are higher than the mean across all countries plus 2 times the standard deviation. Negative outliers are identified as those relative scores which are smaller than the mean across all countries minus 2 times 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 1 or 2 years behind the year to which the IUS refers. Thus for the IUS 2014 the reference year will be 2011 or 2012 for most indicators (cf. Table 1).

Step 3: Imputing for missing values

Reference year data are then used for "2013", etc. If data for a year-in-between is not available we substitute with the value for the previous year. If data are not available at the beginning of the time series, we replace missing values with the latest 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 be left empty).

EXAMPLE 1 (LATEST YEAR MISSING)	"2013"	"2012"	"2011"	"2010"	"2009"
Available relative to EU score	N/A	150	120	110	105
Use most recent year	**150**	150	120	110	105

EXAMPLE 2 (YEAR-IN-BETWEEN MISSING)	"2013"	"2012"	"2011"	"2010"	"2009"
Available relative to EU score	150	N/A	120	110	105
Substitute with previous year	150	**120**	120	110	105

EXAMPLE 3 (BEGINNING-OF-PERIOD MISSING)	"2013"	"2012"	"2011"	"2010"	"2009"
Available relative to EU score	150	130	120	N/A	N/A
Substitute with latest available year	150	130	120	**120**	**120**

Step 4: Determining Maximum and Minimum scores
The Maximum score is the highest relative score found for the whole time period within all countries excluding positive outliers. Similarly, the Minimum score is the lowest relative 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 the following indicators skewness is above 1 and data have been transformed using a square root transformation: Venture capital investments, Public-private co-publications, PCT patent applications, PCT patent applications in societal challenges and License and patent revenues from abroad. A square root transformation simply means taking using the square root of the indicator value instead of the original value.

Step 6: Calculating re-scaled scores
Re-scaled scores of the relative scores 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 and small countries where the value of the relative score is above the Maximum score or below the Minimum score, the re-scaled score is thus set equal to 1 respectively 0.

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.

6.2 How to calculate growth rates

For the calculation of the average annual growth rates of the indicators and the Summary Innovation Index in innovation performance we use geometric means[11 12]:

Step 1: For each indicator i (and also the SII) we calculate for each country c the ratios between the indicator values (the SII values), as obtained after transforming the indicator values (cf. Step 5 in Section 6.1), between all pairs in consecutive years:

$$y_{ic}^{t} / y_{ic}^{t-1},\ y_{ic}^{t-1} / y_{ic}^{t-2},\ y_{ic}^{t-2} / y_{ic}^{t-3},\ y_{ic}^{t-3} / y_{ic}^{t-4},\ y_{ic}^{t-4} / y_{ic}^{t-5},\ y_{ic}^{t-5} / y_{ic}^{t-6} \text{ and } y_{ic}^{t-6} / y_{ic}^{t-7}$$

Step 2: We calculate for each indicator i (and the SII) the average annual growth rate as the geometric average of all ratios calculated in Step 1:

$$\sqrt[7]{\left(\frac{y_{ic}^{t}}{y_{ic}^{t-1}}\right) * \left(\frac{y_{ic}^{t-1}}{y_{ic}^{t-2}}\right) * \left(\frac{y_{ic}^{t-2}}{y_{ic}^{t-3}}\right) * \left(\frac{y_{ic}^{t-3}}{y_{ic}^{t-4}}\right) * \left(\frac{y_{ic}^{t-4}}{y_{ic}^{t-5}}\right) * \left(\frac{y_{ic}^{t-5}}{y_{ic}^{t-6}}\right) * \left(\frac{y_{ic}^{t-6}}{y_{ic}^{t-7}}\right)}$$

6.3 Performance change compared to IUS 2013

Compared to last year countries' rank performance has changed. A direct comparison between the ranks in this year's report and the IUS 2013 is however not possible for the following reasons.

First, the IUS 2013 captured only 24 indicators as compared to 25 indicators in the current edition. The IUS 2014 for the first time included an indicator on Employment in fast-growing firms in innovative sectors. Second, for two countries, Germany and the Netherlands, data for Non-EU doctorate students have become available increasing the number of indicators for these two countries used for calculating the innovation index as compared to last year.

The table on the right provides a breakdown of the change in performance rank due to 1) data updates, 2) improved data availability for Germany and the Netherlands and 3) adding the new indicator on Fast-growing firms in innovative sectors.

The table shows that data updates are the main driver of rank changes causing a rank change for 12 countries. Having additional data for Germany and the Netherlands has no effect on the ranking of countries. Adding the indicator on Employment in fast-growing firms in innovative sectors has an effect on 6 countries.

RANK CHANGE IUS 2014 vs. IUS 2013 Due to				
	Data updates	More data DE, NL	New indicator	Total
EU27	--	--	--	--
BE	0	0	0	0
BG	0	0	0	0
CZ	2	0	0	2
DK	1	0	0	1
DE	-1	0	0	-1
EE	0	0	1	1
IE	0	0	1	1
EL	0	0	0	0
ES	-2	0	1	-1
FR	0	0	0	0
HR	-1	0	0	-1
IT	0	0	0	0
CY	0	0	-1	-1
LV	-1	0	0	-1
LT	0	0	0	0
LU	1	0	0	1
HU	1	0	0	1
MT	1	0	0	1
NL	-1	0	0	-1
AT	0	0	-1	-1
PL	0	0	0	0
PT	0	0	-1	-1
RO	1	0	0	1
SI	0	0	0	0
SK	-1	0	0	-1
FI	0	0	0	0
SE	0	0	0	0
UK	0	0	0	0

E.g. for Spain the drop in 1 rank compared to the IUS 2013 can be explained by a combination of a positive effect adding the indicator on Employment in fast-growing firms in innovative sectors and a negative effect of using more recent data.

[11] *A geometric mean is an average of a set of data that is different from the arithmetic average. The geometric mean is of two data points X and Y is the square root of (X*Y), the geometric mean of X, Y and Z is the cube root of (X*Y*Z), and so on.*

[12] *Cf. Tarantola, S., (2008), "European Innovation Scoreboard: strategies to measure country progress over time", Joint Research Centre. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/921/1/report%231.pdf*

6.4 International benchmarking

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:

1. Calculate normalised scores for all indicators as follows: Yi = ((Xi - smallest X for all countries) / (largest X for all countries – smallest X for all countries) such that all normalised scores are between 0 and 1

2. Calculate the arithmetic average over these index scores (CIi)
3. Calculate performance relative to that of the EU27: CIi* = 100*CIi/CIEU

Note that the results for country i depend on the data from the other countries as the smallest and largest scores used in the normalisation procedure are calculated over all countries.

Annex A: Current performance

	EU27	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU
ENABLERS																		
Human resources																		
1.1.1 New doctorate graduates	1,7	1,5	0,6	1,5	2,3	2,8	1,3	1,9	1,1	1,2	1,6	1,4	1,5	0,3	1,0	0,9	0,8	0,8
1.1.2 Population completed tertiary education	35,8	43,9	26,9	25,6	43,0	31,9	39,1	51,1	30,9	40,1	43,6	23,7	21,7	49,9	37,0	48,7	49,6	29,9
1.1.3 Youth with upper secondary level education	80,2	82,8	85,8	90,9	72,0	76,2	81,3	87,2	85,4	62,8	84,4	94,8	77,6	87,8	84,3	89,3	71,5	83,5
Open, excellent and attractive research systems																		
1.2.1 International scientific co-publications	343	1313	213	568	1840	746	831	1138	590	631	707	428	532	1066	196	304	1559	412
1.2.2 Scientific publications among top 10% most cited	11,0	13,4	3,2	5,6	14,5	11,6	8,5	11,5	9,3	10,4	10,4	3,2	10,4	7,2	3,0	6,2	12,4	5,2
1.2.3 Non-EU doctorate students	24,2	21,0	3,8	4,1	17,7	11,2	4,2	20,5	1,0	18,0	31,5	2,4	8,4	1,7	0,2	0,0	20,3	2,7
Finance and support																		
1.3.1 R&D expenditure in the public sector	0,75	0,70	0,24	0,87	1,02	0,96	0,90	0,53	0,45	0,61	0,78	0,41	0,53	0,34	0,51	0,66	0,49	0,43
1.3.2 Venture capital investments	0,277	0,307	0,038	0,056	0,296	0,223		0,196	0,045	0,192	0,307		0,138				0,538	0,224
FIRM ACTIVITIES																		
Firm investments																		
2.1.1 R&D expenditure in the business sector	1,31	1,52	0,39	1,01	1,96	1,95	1,25	1,20	0,24	0,68	1,45	0,34	0,69	0,06	0,15	0,24	1,00	0,85
2.1.2 Non-R&D innovation expenditure	0,56	0,53	0,28	0,69	0,51	0,88	1,03	0,30	0,74	0,39	0,25	0,61	0,59	1,66	0,36	1,27	0,19	0,40
Linkages & entrepreneurship																		
2.2.1 SMEs innovating in-house	31,8	39,8	13,0	27,2	40,8	45,2	33,6	38,8	32,7	22,1	29,9	25,1	34,8	41,6	14,4	15,7	40,5	11,4
2.2.2 Innovative SMEs collaborating with others	11,7	20,1	3,3	10,3	15,5	14,0	18,5	11,9	13,3	5,8	11,1	9,3	4,4	21,5	4,2	8,8	14,7	6,7
2.2.3 Public-private co-publications	7,3	9,9	2,0	5,8	13,1	8,7	5,0	5,9	4,0	5,4	7,0	5,2	5,8	5,2	1,5	3,1	6,0	5,6
Intellectual Assets																		
2.3.1 PCT patent applications	1,98	1,98	0,59	0,84	2,55	2,74	1,48	1,53	0,61	1,28	2,05	0,85	1,45	0,55	0,70	0,63	1,25	1,21
2.3.2 PCT patent applications in societal challenges	0,92	0,87	0,22	0,38	1,45	1,22	0,76	0,82	0,33	0,68	0,90	0,48	0,69	0,36	0,36	0,36	0,61	0,66
2.3.3 Community trademarks	5,91	5,32	5,30	3,89	7,45	7,90	8,99	5,46	2,01	7,14	4,13	0,55	5,29	13,21	3,51	3,33	13,21	2,20
2.3.4 Community designs	4,75	4,32	3,18	4,08	8,14	7,42	4,37	1,28	0,44	3,49	3,70	0,00	6,23	5,07	2,18	0,89	8,39	0,87
OUTPUTS																		
Innovators																		
3.1.1 SMEs introducing product or process innovations	38,4	50,3	16,6	33,0	41,6	57,0	45,6	45,5	37,3	28,1	32,7	30,4	39,8	34,8	15,8	21,4	47,9	16,8
3.1.2 SMEs introducing marketing/organisational innovations	40,3	41,7	16,3	41,1	42,6	60,5	36,0	45,0	51,3	27,7	42,8	31,9	43,0	37,0	22,7	26,4	58,7	22,4
3.1.3 Fast-growing innovative firms	16,2	16,8	11,8	15,6	19,2	18,3	14,1	19,2	14,8	15,5	18,2	14,3	14,4	12,8	12,6	12,7	18,1	17,8
Economic effects																		
3.2.1 Employment in knowledge-intensive activities	13,9	15,2	8,3	12,5	15,5	15,8	10,8	20,1	12,3	11,9	14,3	10,4	13,2	16,9	10,3	9,1	20,5	12,5
3.2.2 Contribution MHT product exports to trade balance	1,27	2,27	-5,23	3,79	-3,34	9,24	-2,94	1,99	-5,41	3,31	5,23	1,03	4,82	2,39	-4,89	-0,85	-4,43	5,56
3.2.3 Knowledge-intensive services exports	45,3	42,3	25,5	29,2	65,1	55,6	36,4	67,4	53,0	21,6	33,7	17,3	27,5	42,9	32,8	12,5	67,4	26,3
3.2.4 Sales of new to market and new to firm innovations	14,4	12,4	7,6	15,3	15,0	15,5	12,3	9,3	19,2	19,0	14,7	10,5	14,9	14,7	4,8	6,6	8,3	13,7
3.2.5 License and patent revenues from abroad	0,77	0,75	0,21	0,32	0,89	0,64	0,24	1,34	0,18	0,31	0,70	0,23	0,45	0,11	0,16	0,11	1,08	0,94

	EU27	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK	TR	IS	NO	CH	RS	MK
ENABLERS																		
Human resources																		
1.1.1 New doctorate graduates	1,7	0,3	1,9	2,2	0,5	1,6	1,7	1,7	1,9	2,7	2,9	2,4	0,4	0,8	2,0	3,1	0,7	0,6
1.1.2 Population completed tertiary education	35,8	22,4	42,3	26,3	39,1	27,2	21,8	39,2	23,7	45,8	47,9	47,1	18,0	42,8	47,6	43,8	24,7	21,7
1.1.3 Youth with upper secondary level education	80,2	73,6	78,9	86,6	89,8	67,5	79,6	90,1	92,7	86,3	86,4	81,8	58,3	58,3	71,3	84,3	83,4	87,1
Open, excellent and attractive research systems																		
1.2.1 International scientific co-publications	343	400	1457	1248	226	761	177	1042	399	1415	1712	1021	85	1862	1767	1862	45	147
1.2.2 Scientific publications among top 10% most cited	11,0	4,8	15,6	11,1	3,8	9,9	3,5	7,0	4,0	11,4	12,7	13,4	7,0	11,5	11,5	15,9		3,6
1.2.3 Non-EU doctorate students	24,2	1,4	20,9	8,6	1,9	12,0	2,1	6,4	1,4	6,8	21,9	30,6	3,2	23,4	31,5	31,5	7,1	7,0
Finance and support																		
1.3.1 R&D expenditure in the public sector	0,75	0,33	0,93	0,88	0,56	0,68	0,30	0,63	0,48	1,09	1,08	0,60	0,49	1,07	0,79	0,79	0,72	0,20
1.3.2 Venture capital investments	0,277		0,300	0,134	0,234	0,213	0,137			0,310	0,289	0,419			0,231	0,289		
FIRM ACTIVITIES																		
Firm investments																		
2.1.1 R&D expenditure in the business sector	1,31	0,50	1,22	1,95	0,33	0,70	0,12	2,16	0,34	2,33	2,31	1,14	0,37	1,26	0,87	2,11	0,24	0,02
2.1.2 Non-R&D innovation expenditure	0,56	0,96	0,61	0,35	1,02	0,53	0,46	0,56	0,65	0,51	0,64		0,16		0,14	1,77	1,06	0,90
Linkages & entrepreneurship																		
2.2.1 SMEs innovating in-house	31,8	22,5	39,1	36,3	11,3	34,1	10,8		21,8	33,2	37,7		28,2		23,2	45,2	30,6	11,3
2.2.2 Innovative SMEs collaborating with others	11,7	4,6	14,9	20,5	4,2	8,1	2,9	13,6	8,3	16,5	17,5	22,3	5,3	17,4	9,6	9,4	7,5	9,6
2.2.3 Public-private co-publications	7,3	2,9	11,3	9,3	2,3	4,1	2,9	9,2	4,0	9,9	12,1	8,9	1,3	13,1	10,8	13,1	2,6	0,0
Intellectual Assets																		
2.3.1 PCT patent applications	1,98	0,82	2,33	2,30	0,67	0,79	0,41	1,75	0,66	2,97	2,97	1,81	0,76	1,73	1,82	2,81		0,42
2.3.2 PCT patent applications in societal challenges	0,92	0,34	1,17	1,09	0,25	0,43	0,21	0,97	0,14	1,09	1,47	0,90	0,44	0,81	0,84	1,47		
2.3.3 Community trademarks	5,91	13,21	7,19	10,01	3,21	4,86	2,33	4,18	2,65	6,61	7,61	5,59	0,38	3,42	1,47	11,41	0,76	0,49
2.3.4 Community designs	4,75	2,06	4,31	8,39	4,76	5,04	0,59	3,55	1,53	4,78	4,82	2,95	0,23	1,48	0,50	7,20	0,01	0,03
OUTPUTS																		
Innovators																		
3.1.1 SMEs introducing product or process innovations	38,4	29,0	46,0	42,2	14,4	45,6	13,2	32,6	26,0	44,8	47,4	21,3	29,5	55,1	32,8	49,2	36,0	39,2
3.1.2 SMEs introducing marketing/organisational innovations	40,3	31,0	36,9	42,3	19,9	47,4	25,5	37,7	27,3	38,9	42,1	30,6	50,3	45,9	29,1		39,1	30,8
3.1.3 Fast-growing innovative firms	16,2	14,5	16,4	15,3	13,7	13,3	15,2	14,3	14,6	17,9	20,4	15,8	13,3	16,6	16,7	18,0		
Economic effects																		
3.2.1 Employment in knowledge-intensive activities	13,9	17,0	15,2	14,2	9,7	9,0	6,5	14,1	10,1	15,5	17,6	17,8	5,0	17,5	15,3	20,5	14,4	7,0
3.2.2 Contribution MHT product exports to trade balance	1,27	3,42	0,88	3,55	0,58	-0,28	0,38	6,54	3,88	1,24	1,80	4,25	-3,13	-10,47	-10,47	8,08	-3,50	5,92
3.2.3 Knowledge-intensive services exports	45,3	11,2	28,8	23,8	28,3	30,1	45,2	21,4	22,1	34,9	39,8	61,2	21,9	51,0	49,4	25,1	45,2	22,5
3.2.4 Sales of new to market and new to firm innovations	14,4	7,4	10,4	11,9	8,0	14,3	14,3	10,6	19,2	15,3	8,4	7,3	15,8	6,1	6,1	16,1	11,7	9,9
3.2.5 License and patent revenues from abroad	0,77	0,50	0,81	0,45	0,21	0,15	0,38	0,44	0,08	1,21	1,13	0,68	0,00	1,25	0,41	1,34	0,31	0,28

Annex B: Growth performance

	EU27	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU
ENABLERS																		
Human resources																		
1.1.1 New doctorate graduates	2,8%	4,5%	10,4%	6,0%	11,1%	3,5%	2,4%	8,1%	-3,4%	1,3%	4,2%	12,9%	6,0%	6,0%	18,8%	6,0%	0,0%	4,2%
1.1.2 Population completed tertiary education	3,6%	1,7%	1,1%	10,2%	1,7%	2,9%	3,6%	3,9%	2,9%	0,5%	2,1%	4,5%	3,5%	2,9%	10,4%	3,6%	4,0%	7,6%
1.1.3 Youth with upper secondary level education	0,5%	0,2%	1,7%	0,0%	0,5%	0,9%	-0,2%	0,2%	0,2%	0,2%	0,2%	0,2%	0,8%	1,3%	0,8%	0,2%	0,1%	0,0%
Open, excellent and attractive research systems																		
1.2.1 International scientific co-publications	6,0%	5,8%	2,7%	7,1%	7,7%	5,4%	11,8%	7,1%	8,1%	8,8%	4,8%	11,7%	6,3%	13,7%	6,2%	8,9%	22,1%	4,0%
1.2.2 Scientific publications among top 10% most cited	1,4%	3,1%	0,2%	4,5%	1,8%	1,0%	3,7%	1,8%	4,9%	5,0%	1,8%	4,4%	2,6%	-3,3%	6,2%	10,7%	17,2%	1,5%
1.2.3 Non-EU doctorate students	6,3%	1,3%	-3,1%	-7,4%	3,0%	0,0%	21,1%	-1,1%	0,0%	3,7%	2,0%	1,2%	19,9%	-12,9%	1,7%	-18,6%	-0,1%	2,3%
Finance and support																		
1.3.1 R&D expenditure in the public sector	1,8%	3,2%	-5,6%	8,5%	4,3%	3,4%	8,8%	3,0%	0,7%	2,3%	0,2%	-3,1%	0,3%	2,3%	6,0%	1,4%	12,9%	-2,1%
1.3.2 Venture capital investments	-2,8%	-1,1%	-17,5%	-12,0%	-1,3%	-1,6%		-1,3%	-10,6%	-7,1%	-0,4%		-5,5%				0,0%	4,3%
FIRM ACTIVITIES																		
Firm investments																		
2.1.1 R&D expenditure in the business sector	2,0%	3,0%	21,5%	4,7%	1,2%	1,6%	16,9%	5,6%	0,6%	-1,2%	1,2%	-0,8%	3,3%	-5,6%	-5,9%	6,9%	-4,2%	11,0%
2.1.2 Non-R&D innovation expenditure	-4,7%	-9,3%	-11,4%	-9,7%	-2,0%	-2,8%	-2,2%	-18,2%	-11,8%	3,9%	-4,0%	26,6%	-8,5%	-0,9%	-15,8%	0,3%	-19,8%	-10,6%
Linkages & entrepreneurship																		
2.2.1 SMEs innovating in-house	-0,1%	-1,1%	-2,2%	-2,2%	0,0%	-0,3%	-2,6%	-2,9%	-0,3%	-2,6%	0,8%	0,4%	3,1%	3,0%	0,0%	-4,1%	1,2%	-2,1%
2.2.2 Innovative SMEs collaborating with others	3,8%	2,8%	0,8%	-3,3%	-4,1%	7,2%	2,1%	-3,8%	6,8%	0,3%	-0,6%	-0,6%	0,3%	3,8%	-5,2%	-7,2%	-0,1%	0,2%
2.2.3 Public-private co-publications	1,2%	1,3%	5,3%	1,9%	0,0%	1,1%	1,8%	1,3%	-0,5%	1,9%	1,3%	3,9%	1,9%	4,6%	1,7%	7,4%	4,6%	2,4%
Intellectual Assets																		
2.3.1 PCT patent applications	0,0%	1,6%	-2,3%	-0,2%	-1,1%	-0,1%	4,5%	0,3%	-0,6%	3,7%	0,9%	-5,4%	1,0%	-7,8%	-2,6%	6,3%	1,9%	0,7%
2.3.2 PCT patent applications in societal challenges	-0,1%	-0,2%	-6,8%	-1,5%	-0,2%	-0,1%	4,3%	0,2%	-0,3%	4,4%	0,4%	-7,8%	0,8%	0,5%	-4,1%	3,5%	9,3%	0,1%
2.3.3 Community trademarks	6,9%	8,2%	77,4%	15,8%	5,9%	7,9%	26,6%	5,0%	8,4%	3,0%	5,5%	8,2%	6,2%	12,8%	27,1%	28,4%	3,1%	12,0%
2.3.4 Community designs	1,6%	-0,9%	56,4%	16,4%	-0,4%	1,4%	33,2%	-6,3%	25,6%	-2,1%	2,3%	-24,6%	-1,3%	42,4%	8,9%	6,2%	8,6%	-1,8%
OUTPUTS																		
Innovators																		
3.1.1 SMEs introducing product or process innovations	1,3%	1,0%	1,6%	-1,0%	-1,1%	0,7%	-0,3%	-1,4%	1,1%	-1,9%	1,3%	1,0%	2,0%	-3,7%	1,3%	-2,4%	-0,4%	-0,7%
3.1.2 SMEs introducing marketing/organisational innovations	0,8%	-1,2%	2,0%	0,7%	-4,9%	0,2%	-3,7%	-2,5%	1,7%	-0,9%	0,5%	-2,5%	2,0%	-5,7%	7,2%	-1,2%	-0,4%	-1,7%
3.1.3 Fast-growing innovative firms	0,0%	-1,2%	-1,0%	0,4%	-1,0%	-0,4%	0,0%	2,0%	0,1%	0,3%	-0,8%	-0,1%	0,1%	-1,0%	-0,1%	1,2%	0,0%	1,6%
Economic effects																		
3.2.1 Employment in knowledge-intensive activities	0,7%	0,3%	0,2%	1,6%	0,7%	0,8%	2,0%	1,5%	1,9%	0,1%	0,9%	1,3%	-0,4%	1,8%	3,3%	2,8%	0,0%	-0,3%
3.2.2 Contribution MHT product exports to trade balance	0,2%	0,2%	0,7%	0,1%	0,0%	0,2%	0,2%	0,5%	0,0%	0,3%	0,0%	0,5%	0,2%	-0,2%	0,9%	0,7%	0,1%	0,1%
3.2.3 Knowledge-intensive services exports	1,0%	0,1%	11,7%	5,0%	0,5%	1,9%	2,9%	0,0%	-0,7%	-1,4%	1,3%	3,2%	4,7%	3,0%	-1,2%	-2,4%	0,0%	3,2%
3.2.4 Sales of new to market and new to firm innovations	0,5%	-0,6%	-6,9%	-0,2%	4,5%	-1,8%	0,4%	-1,2%	8,4%	4,6%	3,3%	-3,0%	3,2%	14,9%	-1,0%	-5,3%	-8,7%	10,8%
3.2.5 License and patent revenues from abroad	3,7%	3,2%	7,0%	8,9%	1,9%	3,3%	2,8%	11,7%	1,8%	1,7%	3,7%	-7,6%	8,7%	-13,7%	-6,3%	3,4%	2,9%	1,0%

	EU27	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK	TR	IS	NO	CH	RS	MK
ENABLERS																		
Human resources																		
1.1.1 New doctorate graduates	2,8%	17,0%	6,8%	0,0%	-9,4%	-5,6%	11,4%	5,1%	9,6%	-2,0%	-0,9%	3,4%	10,4%	21,9%	7,6%	1,0%	7,5%	17,0%
1.1.2 Population completed tertiary education	3,6%	2,9%	0,3%	3,6%	8,1%	6,3%	9,7%	6,9%	7,5%	0,7%	3,5%	4,5%	6,1%	0,6%	1,8%	3,9%	6,1%	9,4%
1.1.3 Youth with upper secondary level education	0,5%	0,3%	0,2%	0,1%	-0,2%	2,1%	0,7%	-0,1%	0,1%	0,5%	-0,2%	0,7%	0,0%	0,0%	0,6%	1,1%	0,0%	2,0%
Open, excellent and attractive research systems																		
1.2.1 International scientific co-publications	6,0%	9,0%	7,2%	7,1%	3,5%	12,3%	10,9%	8,5%	6,7%	6,3%	5,7%	5,2%	10,1%	4,4%	9,5%	0,8%	3,4%	2,0%
1.2.2 Scientific publications among top 10% most cited	1,4%	43,5%	2,1%	1,9%	2,9%	4,3%	3,3%	6,2%	5,7%	-0,8%	-0,1%	1,0%	9,0%	0,4%	1,4%	1,4%		16,7%
1.2.3 Non-EU doctorate students	6,3%	-18,8%	0,0%	2,0%	-4,4%	9,4%	-5,8%	12,0%	4,8%	8,3%	8,0%	2,2%	1,6%	7,9%	7,1%	0,0%	-2,5%	11,1%
Finance and support																		
1.3.1 R&D expenditure in the public sector	1,8%	8,2%	0,5%	2,5%	5,3%	8,3%	6,0%	-0,2%	9,8%	1,4%	1,7%	-0,5%	3,3%	-0,4%	0,6%	2,6%	10,9%	-0,7%
1.3.2 Venture capital investments	-2,8%		-1,6%	-1,9%	2,9%	-3,7%	-5,3%			-1,2%	-6,9%	-3,0%			-7,2%	-2,9%		
FIRM ACTIVITIES																		
Firm investments																		
2.1.1 R&D expenditure in the business sector	2,0%	4,4%	1,0%	1,8%	9,0%	12,9%	-7,0%	2,4%	4,5%	0,0%	-0,1%	1,3%	9,2%	-1,8%	1,0%	0,0%	6,9%	-5,6%
2.1.2 Non-R&D innovation expenditure	-4,7%	2,3%	10,3%	-4,0%	-4,2%	-9,8%	-13,7%	-9,5%	-13,1%	-1,6%	-2,7%		0,0%		-2,8%	9,8%	4,1%	0,0%
Linkages & entrepreneurship																		
2.2.1 SMEs innovating in-house	-0,1%	0,6%	5,9%	-2,1%	-7,4%	0,3%	-5,7%		4,5%	-0,3%	-1,5%		0,0%		-2,7%	4,0%	1,4%	0,0%
2.2.2 Innovative SMEs collaborating with others	3,8%	-2,0%	2,8%	1,9%	-10,5%	1,3%	0,5%	3,7%	2,8%	-0,6%	-1,9%	8,5%	0,0%	3,1%	-2,4%	-3,5%	11,5%	0,0%
2.2.3 Public-private co-publications	1,2%	9,2%	2,0%	1,8%	5,6%	3,8%	4,2%	3,7%	2,2%	-0,6%	0,3%	0,6%	-0,2%	0,0%	1,2%	0,0%	2,5%	-4,8%
Intellectual Assets																		
2.3.1 PCT patent applications	0,0%	5,8%	-1,8%	1,3%	2,7%	5,9%	-0,9%	2,3%	-2,3%	0,0%	0,0%	-1,3%	6,4%	-4,5%	-0,2%	-0,2%		-5,1%
2.3.2 PCT patent applications in societal challenges	-0,1%	1,8%	2,6%	2,8%	2,3%	9,5%	4,0%	0,6%	-13,9%	-0,2%	0,0%	-1,8%	11,6%	-5,0%	-0,1%	0,0%		
2.3.3 Community trademarks	6,9%	18,6%	8,0%	8,8%	11,4%	7,4%	42,7%	16,7%	33,0%	9,3%	9,1%	5,0%	17,8%	12,7%	14,6%	11,4%	36,1%	28,7%
2.3.4 Community designs	1,6%	62,6%	-0,9%	4,9%	21,6%	13,3%	44,6%	15,7%	12,0%	2,6%	1,8%	1,4%	-3,6%	3,5%	-11,1%	1,3%	0,0%	0,0%
OUTPUTS																		
Innovators																		
3.1.1 SMEs introducing product or process innovations	1,3%	10,5%	5,5%	-2,2%	-6,0%	2,4%	-4,2%	0,4%	4,3%	2,8%	0,3%	-4,7%	0,0%	0,0%	0,9%	-1,0%	10,1%	0,0%
3.1.2 SMEs introducing marketing/organisational innovations	0,8%	2,5%	2,8%	-3,2%	-3,4%	0,7%	-1,4%	-0,6%	3,4%	3,1%	2,0%	-0,7%	0,0%	0,0%	-2,5%		11,7%	0,0%
3.1.3 Fast-growing innovative firms	0,0%	-0,4%	-0,7%	-1,8%	0,9%	-0,3%	1,2%	0,4%	-1,8%	-0,7%	-0,1%	-0,5%	-0,2%	0,0%	1,4%	-0,5%		
Economic effects																		
3.2.1 Employment in knowledge-intensive activities	0,7%	1,1%	-1,3%	0,4%	2,4%	0,3%	2,2%	2,1%	0,1%	0,0%	0,8%	0,8%	0,6%	-0,5%	1,5%	0,7%	4,9%	-0,4%
3.2.2 Contribution MHT product exports to trade balance	0,2%	-0,6%	0,1%	0,3%	0,4%	0,3%	1,1%	0,4%	0,5%	0,0%	0,0%	0,0%	0,2%	0,0%	0,0%	0,1%	0,0%	1,3%
3.2.3 Knowledge-intensive services exports	1,0%	-1,6%	-3,3%	3,1%	4,0%	5,2%	1,4%	2,2%	5,2%	5,6%	-0,8%	0,7%	4,0%	-0,6%	1,4%	-4,5%	-3,9%	-3,9%
3.2.4 Sales of new to market and new to firm innovations	0,5%	-12,7%	3,2%	1,7%	-7,2%	5,2%	-2,2%	-4,1%	0,0%	0,4%	-6,5%	-8,8%	0,0%	-10,0%	-2,3%	6,0%	2,3%	0,0%
3.2.5 License and patent revenues from abroad	3,7%	-7,8%	-6,3%	3,4%	5,8%	-0,7%	7,8%	10,7%	-21,2%	6,4%	2,2%	-1,6%	0,0%	-1,0%	-0,2%	0,0%	9,4%	5,0%

Annex C: Definitions of indicators

INDICATOR	DEFINITION NUMERATOR	DEFINITION DENOMINATOR	INTERPRETATION
	Source	Source	
1.1.1 New doctorate graduates (ISCED 6) per 1000 population aged 25-34	Number doctorate graduates (ISCED 6)	Population between 25 and 34 years	The indicator is a measure of the supply of new second-stage tertiary graduates in all fields of training. For most countries ISCED 6 captures PhD graduates only, with the exception of Finland, Portugal and Sweden where also non-PhD degrees leading to an award of an advanced research qualification are included.
	Eurostat	Eurostat	
1.1.2 Percentage population aged 30-34 having completed tertiary education	Number of persons in age class with some form of post-secondary education (ISCED 5 and 6)	Population between 30 and 34 years	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. International comparisons of educational levels however are difficult due to large discrepancies in educational systems, access, and the level of attainment that is required to receive a tertiary degree. The indicator focuses on a narrow share of the population aged 30 to 34 and it will more easily and quickly reflect changes in educational policies leading to more tertiary graduates.
	Eurostat	Eurostat	
1.1.3 Percentage youth aged 20-24 having attained at least upper secondary education	Number of young people aged 20-24 years having attained at least upper secondary education attainment level, i.e. with an education level ISCED 3a, 3b or 3c long minimum	Population between 20 and 24 years	The indicator measures the qualification level of the population aged 20-24 years in terms of formal educational degrees. It provides a measure for the "supply" of human capital of that age group and for the output of education systems in terms of graduates. Completed upper secondary education is generally considered to be the minimum level required for successful participation in a knowledge-based society and is positively linked with economic growth.
	Eurostat	Eurostat	
1.2.1 International scientific co-publications per million population	Number of scientific publications with at least one co-author based abroad (where abroad is non-EU for the EU27)	Total population	International scientific co-publications are a proxy for the quality of scientific research as collaboration increases scientific productivity.
	Science-Metrix (Scopus)	Eurostat	
1.2.2 Scientific publications among the top-10% most cited publications worldwide as % of total scientific publications of the country	Number of scientific publications among the top-10% most cited publications worldwide	Total number of scientific publications	The indicator is a proxy 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. Countries like France and Germany, where researchers publish relatively more in their own language, are more likely to underperform on this indicator as compared to their real academic excellence.
	Science-Metrix (Scopus)	Science-Metrix (Scopus)	
1.2.3 Non-EU doctorate students as a % of all doctorate holders	For EU Member States: number of doctorate students from non-EU countries (for non-EU countries: number of non-national doctorate students)	Total number of doctorate students	The share of non-EU doctorate students reflects the mobility of students as an effective way of diffusing knowledge. Attracting high-skilled foreign doctorate students will add to creating a net brain gain and will secure a continuous supply of researchers.
	Eurostat	Eurostat	

INDICATOR	DEFINITION NUMERATOR	DEFINITION DENOMINATOR	INTERPRETATION
	Source	Source	
1.3.1 R&D expenditure in the public sector (% of GDP)	All R&D expenditures in the government sector (GOVERD) and the higher education sector (HERD)	Gross Domestic Product	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.
	Eurostat	Eurostat	
1.3.2 Venture capital (% of GDP)	Venture capital investment is defined as private equity being raised for investment in companies. Management buyouts, management buyins, and venture purchase of quoted shares are excluded. Venture capital includes early stage (seed + start-up) and expansion and replacement capital	Gross Domestic Product	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.
	Eurostat	Eurostat	Comment: Two-year averages have been used
2.1.1 R&D expenditure in the business sector (% of GDP)	All R&D expenditures in the business sector (BERD)	Gross Domestic Product	The indicator captures the formal creation of new knowledge within firms. It is particularly important in the science-based sector (pharmaceuticals, chemicals and some areas of electronics) where most new knowledge is created in or near R&D laboratories.
	Eurostat	Eurostat	
2.1.2 Non-R&D innovation expenditures (% of turnover)	Sum of total innovation expenditure for enterprises, in thousand Euros and current prices excluding intramural and extramural R&D expenditures	Total turnover for all enterprises	This indicator measures non-R&D innovation expenditure as 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.
	Eurostat (CIS)	Eurostat (CIS)	
2.2.1 SMEs innovating in-house (% of SMEs) [13]	Sum of SMEs with in-house innovation activities. Innovative firms are defined as those firms which have introduced new products or processes either 1) in-house or 2) in combination with other firms	Total number of SMEs	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.
	Eurostat (CIS)	Eurostat (CIS)	
2.2.2 Innovative SMEs collaborating with others (% of SMEs)	Sum 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	Total number of SMEs	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 on 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.
	Eurostat (CIS)	Eurostat (CIS)	

[13] *This indicator is not directly available from Eurostat. The 2010 Methodology report provides detailed instructions how to calculate this indicator (http://www.proinno-europe.eu/sites/default/files/page/11/12/IUS_2010_Methodology_report.pdf).*

Annex C: Definitions of indicators

INDICATOR	DEFINITION NUMERATOR	DEFINITION DENOMINATOR	INTERPRETATION
	Source	Source	
2.2.3 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	Total population	This indicator captures public-private research linkages and active collaboration activities between business sector researchers and public sector researchers resulting in academic publications.
	CWTS (Thomson Reuters)	Eurostat	
2.3.1 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	Gross Domestic Product in Purchasing Power Standards	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.
	OECD	Eurostat	
2.3.2 PCT patent applications in societal challenges per billion GDP (in PPS€)	Number of PCT patent applications in Environment-related technologies and Health. Patents in Environment-related technologies include those in General Environmental Management (air, water, waste), Energy generation from renewable and non-fossil sources, Combustion technologies with mitigation potential (e.g. using fossil fuels, biomass, waste, etc.), Technologies specific to climate change mitigation, Technologies with potential or indirect contribution to emissions mitigation, Emissions abatement and fuel efficiency in transportation and Energy efficiency in buildings and lighting. Patents in health-related technologies include those in Medical technology (IPC codes (8th edition) A61[B, C, D, F, G, H, J, L, M, N], H05G) and Pharmaceuticals (IPC codes A61K excluding A61K8)	Gross Domestic Product in Purchasing Power Standards	This indicator measures PCT applications in health technology and environment-related technologies and is relevant as increased numbers of patent applications in health technology and environment-related technologies will be necessary to meet the societal needs of an ageing European society and sustainable growth.
	OECD	Eurostat	
2.3.3 Community trademarks per billion GDP (in PPS€)	Number of new community trademarks applications	Gross Domestic Product in Purchasing Power Standards	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 is a form of communication, a basis for publicity and advertising.
	Office for Harmonization in the Internal Market	Eurostat	Comment: two-year averages have been used

INDICATOR	DEFINITION NUMERATOR	DEFINITION DENOMINATOR	INTERPRETATION
	Source	Source	
2.3.4 Community designs per billion GDP (in PPS€)	Number of new community designs applications	Gross Domestic Product in Purchasing Power Standards	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 programs. 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.
	Office for Harmonization in the Internal Market	Eurostat	Comment: two-year averages have been used
3.1.1 SMEs introducing product or process innovations (% of SMEs)	Number of SMEs who introduced a new product or a new process to one of their markets	Total number of SMEs	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.
	Eurostat (CIS)	Eurostat (CIS)	
3.1.2 SMEs introducing marketing or organisational innovations (% of SMEs)	Number of SMEs who introduced a new marketing innovation or organisational innovation to one of their markets	Total number of SMEs	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 tries to capture the extent that SMEs innovate through non-technological innovation.
	Eurostat (CIS)	Eurostat (CIS)	
3.1.3 Employment in fast-growing enterprises in innovative sectors (% of total employment)	The sum of sectoral results for the employment in fast-growing enterprises by economic sector multiplied by the innovation coefficients of these sectors. Fast-growing enterprises are defined as firms with average annualised growth in employees of more than 10 % a year, over a three-year period, and with 10 or more employees at the beginning of the observation period.	Total employment in fast-growing enterprises in the business economy (without financial sector)	The indicator shows the degree of innovativeness of successful entrepreneurial activities. It captures the capacity of a country to transform its economy rapidly to take advantage of emerging demand.
	Eurostat	Eurostat	
3.2.1 Employment in knowledge-intensive activities (% 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 (ISCED5 or ISCED6)	Total employment	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.
	Eurostat	Eurostat	

Annex C: Definitions of indicators

INDICATOR	DEFINITION NUMERATOR	DEFINITION DENOMINATOR	INTERPRETATION
	Source	Source	
3.2.2 Contribution of medium and high-tech products exports to the trade balance	The contribution to the trade balance is calculated as follows: (XMHT-MMHT) - (X-M)*[(XMHT+MMHT) / (X+M)], where (XMHT-MMHT) is the observed trade balance for medium and high-tech products and (X-M)*[(XMHT +MMHT) / (X+M)] is the theoretical trade balance (where X denotes exports and M denotes imports of resp. MHT products and all products). MHT exports include 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	Value of total exports	The manufacturing trade balance reveals an economy's structural strengths and weaknesses in terms of technological intensity. It indicates whether an industry performs relatively better (or worse) than total manufacturing and can be interpreted as an indicator of revealed comparative advantage that is based on countries' trade specialisation. A positive value indicates a structural surplus, while a negative value indicates a structural deficit. The indicator is expressed as a percentage of total trade in order to eliminate business cycle variations.
	UN Comtrade	UN Comtrade	
3.2.3 Knowledge-intensive services exports as % of total services exports	Exports of knowledge-intensive services are measured by the sum of credits in EBOPS (Extended Balance of Payments Services Classification) 207, 208, 211, 212, 218, 228, 229, 245, 253, 260, 263, 272, 274, 278, 279, 280 and 284	Total services exports as measured by credits in EBOPS 200	The indicator measures the competitiveness of the knowledge-intensive services sector. Knowledge-intensive services are defined as NACE classes 61-62 and 64-72. These can be related to the above-mentioned EBOPS classes using the correspondence table between NACE, ISIC and EBOPS as provided in the UN Manual on Statistics of International Trade in Services (UN, 2002).
	Eurostat	Eurostat	
3.2.4 Sales of new-to-market and new-to-firm innovations as % 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	Total turnover for all enterprises	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).
	Eurostat (CIS)	Eurostat (CIS)	
3.2.5 License and patent revenues from abroad as % of GDP	Export part of the international transactions in royalties and license fees	Gross Domestic Product	Trade in technology comprises four main categories: Transfer of techniques (through patents and licences, disclosure of know-how); Transfer (sale, licensing, franchising) of designs, trademarks and patterns; Services with a technical content, including technical and engineering studies, as well as technical assistance; and Industrial R&D. TBP receipts capture disembodied technology exports.
	Eurostat	Eurostat	

Annex D: 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
IN	India	UK	United Kingdom
IS	Iceland	US	United States

Annex E: Summary Innovation Index (SII) time series

	2006	2007	2008	2009	2010	2011	2012	2013	GROWTH RATE
EU	0,493	0,506	0,504	0,516	0,531	0,532	0,545	0,554	1,66%
BE	0,588	0,601	0,594	0,597	0,605	0,612	0,627	0,627	0,92%
BG	0,158	0,168	0,189	0,198	0,232	0,234	0,191	0,188	2,49%
CZ	0,374	0,390	0,369	0,374	0,411	0,416	0,405	0,422	1,72%
DK	0,684	0,693	0,657	0,673	0,705	0,697	0,722	0,728	0,89%
DE	0,646	0,656	0,671	0,687	0,701	0,694	0,708	0,709	1,34%
EE	0,388	0,382	0,411	0,452	0,453	0,474	0,488	0,502	3,74%
IE	0,567	0,569	0,554	0,574	0,568	0,586	0,594	0,606	0,96%
EL	0,353	0,349	0,375	0,379	0,370	0,372	0,380	0,384	1,24%
ES	0,375	0,381	0,389	0,395	0,391	0,395	0,411	0,414	1,43%
FR	0,517	0,523	0,530	0,541	0,567	0,570	0,579	0,571	1,43%
HR	0,290	0,274	0,283	0,295	0,315	0,319	0,309	0,306	0,77%
IT	0,380	0,393	0,394	0,406	0,427	0,427	0,446	0,443	2,22%
CY	0,414	0,411	0,485	0,461	0,480	0,499	0,498	0,501	2,74%
LV	0,174	0,188	0,195	0,209	0,216	0,228	0,234	0,221	3,51%
LT	0,241	0,254	0,233	0,239	0,240	0,260	0,271	0,289	2,58%
LU	0,570	0,593	0,594	0,616	0,601	0,593	0,627	0,646	1,81%
HU	0,298	0,303	0,314	0,315	0,341	0,344	0,335	0,351	2,36%
MT	0,278	0,312	0,323	0,338	0,349	0,317	0,300	0,319	1,97%
NL	0,561	0,566	0,583	0,591	0,596	0,600	0,644	0,629	1,64%
AT	0,516	0,527	0,583	0,597	0,571	0,583	0,599	0,599	2,17%
PL	0,263	0,275	0,265	0,276	0,272	0,282	0,268	0,279	0,88%
PT	0,314	0,330	0,374	0,396	0,420	0,415	0,402	0,410	3,86%
RO	0,208	0,219	0,242	0,257	0,240	0,258	0,229	0,237	1,90%
SI	0,427	0,431	0,458	0,474	0,481	0,508	0,495	0,513	2,66%
SK	0,296	0,302	0,304	0,312	0,299	0,304	0,350	0,328	1,49%
FI	0,630	0,631	0,660	0,670	0,676	0,685	0,685	0,684	1,17%
SE	0,732	0,729	0,732	0,737	0,739	0,746	0,752	0,750	0,35%
UK	0,590	0,601	0,575	0,585	0,616	0,617	0,618	0,613	0,54%
TR	0,179	0,184	0,194	0,199	0,203	0,210	0,221	0,224	3,21%
IS	0,594	0,599	0,618	0,635	0,628	0,620	0,604	0,593	-0,03%
NO	0,434	0,443	0,441	0,449	0,466	0,465	0,481	0,480	1,43%
CH	0,752	0,772	0,792	0,805	0,823	0,822	0,842	0,835	1,51%
MK	0,191	0,190	0,193	0,218	0,221	0,221	0,239	0,246	3,66%
RS	0,246	0,243	0,247	0,239	0,276	0,267	0,344	0,358	5,54%

Annex F: Performance scores per dimension

	HUMAN RESOURCES	RESEARCH SYSTEMS	FINANCE AND SUPPORT	FIRM INVESTMENTS	LINKAGES & ENTRE-PRENEURSHIP	INTELLECTUAL ASSETS	INNOVATORS	ECONOMIC EFFECTS
EU	0,583	0,539	0,558	0,417	0,550	0,564	0,549	0,595
BE	0,653	0,735	0,563	0,451	0,814	0,531	0,672	0,580
BG	0,440	0,133	0,057	0,133	0,121	0,255	0,047	0,216
CZ	0,571	0,253	0,400	0,389	0,450	0,306	0,491	0,490
DK	0,635	0,822	0,717	0,543	0,836	0,840	0,702	0,669
DE	0,633	0,491	0,613	0,650	0,742	0,805	0,914	0,728
EE	0,577	0,364	0,794	0,545	0,610	0,536	0,494	0,378
IE	0,795	0,658	0,364	0,314	0,580	0,391	0,749	0,775
EL	0,524	0,303	0,172	0,237	0,498	0,130	0,567	0,520
ES	0,410	0,516	0,402	0,227	0,325	0,442	0,354	0,501
FR	0,675	0,672	0,604	0,354	0,517	0,503	0,598	0,591
HR	0,579	0,157	0,289	0,220	0,401	0,137	0,357	0,316
IT	0,420	0,394	0,306	0,292	0,430	0,507	0,512	0,516
CY	0,618	0,353	0,216	0,477	0,730	0,481	0,370	0,542
LV	0,554	0,089	0,392	0,105	0,134	0,225	0,116	0,225
LT	0,686	0,175	0,546	0,398	0,254	0,176	0,189	0,193
LU	0,524	0,751	0,686	0,237	0,640	0,689	0,824	0,666
HU	0,466	0,201	0,341	0,268	0,248	0,260	0,316	0,567
MT	0,261	0,175	0,206	0,360	0,248	0,413	0,347	0,397
NL	0,647	0,808	0,674	0,413	0,766	0,652	0,590	0,501
AT	0,614	0,542	0,482	0,493	0,774	0,810	0,559	0,464
PL	0,567	0,128	0,418	0,343	0,126	0,274	0,127	0,305
PT	0,387	0,463	0,458	0,274	0,436	0,355	0,545	0,372
RO	0,460	0,115	0,187	0,128	0,117	0,100	0,214	0,434
SI	0,700	0,395	0,515	0,599	0,659	0,482	0,415	0,462
SK	0,614	0,158	0,361	0,232	0,325	0,148	0,301	0,454
FI	0,829	0,561	0,767	0,621	0,701	0,702	0,651	0,657
SE	0,869	0,803	0,741	0,655	0,813	0,787	0,788	0,600
UK	0,767	0,784	0,623	0,485	0,840	0,485	0,334	0,618
TR	0,098	0,185	0,371	0,093	0,270	0,126	0,444	0,264
IS	0,350	0,821	0,969	0,537	0,891	0,376	0,731	0,507
NO	0,635	0,889	0,533	0,194	0,529	0,323	0,445	0,349
CH	0,837	1,000	0,591	0,952	0,785	0,915	0,765	0,781
RS	0,405	0,116	0,608	0,334	0,357	0,026	0,530	0,451
MK	0,408	0,163	0,072	0,239	0,149	0,019	0,478	0,337

Annex G: International data

INDICATOR ABSOLUTE VALUES	EU	AU	BR	CA	CN	IN	JP	KR	RU	SA	US
1.1.1 New doctorate graduates	1.7	1.9	0.4	1.2	2.2	n/a	1.1	1.4	0.4	0.1	1.7
1.1.2 Population completed tertiary education	28.5	38.3	11.6	51.3	10.1	9.8	46.4	40.4	53.5	16.5	42.4
1.2.1 International scientific co-publications	343.2	n/a	64.0	n/a	45.5	11.7	214.8	334.4	75.7	n/a	447.6
1.2.2 Most cited scientific publications	11.0	n/a	5.2	n/a	6.7	6.1	7.0	9.0	2.0	n/a	14.5
1.3.1 R&D expenditure in the public sector	0.74	0.86	0.57	0.84	0.45	0.50	0.73	0.87	0.42	0.40	0.73
2.1.1 R&D expenditure in the business sector	1.29	1.27	0.50	0.89	1.40	0.26	2.61	2.74	0.66	0.46	1.82
2.2.3 Public-private co-publications	35.6	22.41	1.83	55.02	1.18	0.56	56.39	46.77	2.16	2.77	69.07
2.3.1 PCT patent applications	3.75	2.07	0.29	2.05	1.00	0.41	5.98	5.98	0.27	0.62	3.03
2.3.2 PCT patent applications in societal challenges	0.82	0.51	0.08	0.56	0.15	0.16	1.40	1.22	0.07	0.13	0.83
3.2.2 Contribution MHT product exports to trade balance	11.90	-21.38	-16.19	-9.29	3.18	0.13	21.77	16.65	-17.43	-8.35	1.02
3.2.3 Knowledge-intensive services exports	45.3	17.61	61.85	35.78	35.78	73.05	31.57	48.19	45.75	n/a	45.64
3.2.5 License and patent revenues	0.59	0.03	0.02	0.20	0.01	0.02	0.49	0.30	0.03	0.02	0.69

RELATIVE PERFORMANCE (EU = 100)	AU	BR	CA	CN	IN	JP	KR	RU	SA	US
1.1.1 New doctorate graduates	111.1	26.4	72.5	131.3	n/a	63.7	84.2	23.7	8.4	102.1
1.1.2 Population completed tertiary education	134.4	40.7	179.9	35.2	34.3	162.6	141.6	187.4	57.8	148.8
1.2.1 International scientific co-publications	n/a	18.6	n/a	13.2	3.4	62.6	97.4	22.1	n/a	130.4
1.2.2 Most cited scientific publications	n/a	47.3	n/a	61.0	56.1	64.2	81.7	17.8	n/a	132.0
1.3.1 R&D expenditure in the public sector	115.9	77.1	113.5	61.0	67.6	98.9	117.8	56.9	54.1	98.0
2.1.1 R&D expenditure in the business sector	98.7	39.1	69.2	108.2	19.9	202.1	212.5	51.4	35.9	141.2
2.2.3 Public-private co-publications	62.9	5.1	154.4	3.3	1.6	158.3	131.3	6.1	7.8	193.9
2.3.1 PCT patent applications	55.3	7.7	54.6	26.8	11.0	159.4	159.4	7.2	16.6	80.9
2.3.2 PCT patent applications in societal challenges	61.9	9.6	68.5	18.7	19.8	170.7	149.1	9.0	15.7	101.2
3.2.2 Contribution MHT product exports to trade balance	70.3	74.9	81.1	92.2	89.5	108.8	104.2	73.8	81.9	90.3
3.2.3 Knowledge-intensive services exports	38.9	136.6	79.0	79.0	161.4	69.7	106.5	101.1	n/a	100.8
3.2.5 License and patent revenues	5.9	3.9	33.5	2.2	2.7	83.8	51.9	5.6	2.8	117.2

CHANGE IN RELATIVE PERFORMANCE	AU	BR	CA	CN	IN	JP	KR	RU	SA	US
1.1.1 New doctorate graduates	-1.4%	-16.6%	0.5%	-3.5%	n/a	0.2%	1.9%	-19.3%	-2.1%	1.5%
1.1.2 Population completed tertiary education	1.7%	1.2%	0.6%	6.7%	-1.5%	1.1%	2.6%	-0.9%	1.5%	-0.3%
1.2.1 International scientific co-publications	n/a	2.2%	n/a	7.0%	3.9%	-3.5%	1.9%	-6.6%	n/a	-2.3%
1.2.2 Most cited scientific publications	n/a	1.9%	n/a	2.9%	6.4%	-1.9%	0.1%	-0.2%	n/a	-1.5%
1.3.1 R&D expenditure in the public sector	0.3%	0.6%	-2.6%	-0.5%	-3.2%	-1.6%	3.8%	0.8%	-0.2%	-0.3%
2.1.1 R&D expenditure in the business sector	2.8%	1.1%	-5.3%	6.3%	5.6%	-0.1%	2.6%	-4.1%	-2.0%	-0.5%
2.2.3 Public-private co-publications	4.0%	10.1%	-0.6%	14.9%	9.2%	-1.6%	4.5%	-0.5%	-1.7%	-1.2%
2.3.1 PCT patent applications	-2.9%	5.4%	-1.0%	20.5%	-0.5%	6.4%	13.7%	-4.9%	-6.6%	-1.2%
2.3.2 PCT patent applications in societal challenges	-4.1%	1.2%	-2.3%	10.4%	-3.2%	4.0%	14.0%	-3.6%	-4.0%	-3.1%
3.2.2 Contribution MHT product exports to trade balance	-2.7%	-2.1%	-1.5%	-0.6%	-0.8%	0.6%	0.2%	-1.8%	-1.3%	-0.8%
3.2.3 Knowledge-intensive services exports	1.0%	4.3%	5.6%	5.6%	-2.4%	-1.8%	-3.4%	0.7%	n/a	0.4%
3.2.5 License and patent revenues	-4.1%	2.5%	-10.2%	1.4%	-12.4%	-3.7%	-2.9%	-7.2%	-8.4%	-4.9%

European Commission

Innovation Union Scoreboard 2014

2014 – 94 pp – 210 x 297 mm

ISSN 1977-8244
ISBN 978-92-79-34662-0
doi: 10.2769/88936

Enterprise & Industry Magazine

The Enterprise & Industry online magazine (http://ec.europa.eu/enterprise/magazine) covers issues related to SMEs, innovation, entrepreneurship, the single market for goods, competitiveness and environmental protection, industrial policies across a wide range of sectors, and more.

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Innovation **Union** Scoreboard 2014

NB-AY-14-001-EN-C

ISSN 1977-8244
ISBN 978-92-79-34662-0
doi: 10.2769/88936

Publications Office