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## Ireland

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## IRELAND

Following a prolonged economic recession preceded by a severe financial crisis, the Irish economy has started to recover through a process of structural reforms and fiscal consolidation. The Strategy for Science, Technology and Innovation (SSTI) 2006-13 set Ireland's goals and objectives for R&D and innovation policy and the framework for implementation. The National Recovery Plan (NRP) 2011-14 also made R&D an investment priority, as does the National Strategy for Higher Education to 2030.

**Hot issue 1: Addressing STI globalisation and increasing international co-operation.** The Irish innovation system is well integrated in the international science and innovation landscape. In 2012, 52% of S&T publications and 36% of PCT patent applications involved international collaboration (Panel 1<sup>a, 1</sup>), and funding from abroad accounted for 20.4% of GERD. Ireland engages in international co-operation on STI with a wide range of countries in Europe and beyond, including the United States and China. To promote further international co-operation in research and innovation, Science Foundation Ireland (SFI) recently introduced two programmes: the Research Centres Programme which aims to develop world-leading, large-scale, theme-based research centres by establishing and improving linkages between foreign MNEs and Irish SMEs, and the International Strategic Cooperation Award (ISCA) programme which supports new and existing research-based collaborations between Ireland's HEIs and partner organisations in four designated countries so far: Brazil, the People's Republic of China, India and Japan. ISCA will provide the funding to co-ordinate and carry out a range of activities designed to initiate and/or strengthen academic and associated linkages between one or more of SFI's eligible research bodies and one or more organisations in one of the four partner countries.

**Hot issue 2: Strengthening public R&D capacity and infra-structures.** While public R&D expenditures are below the OECD median (Panel 1<sup>a</sup>), Ireland is home to three of the world's top 500 universities (Panel 1<sup>b</sup>) and performs well in terms of international S&T publications (Panel 1<sup>c</sup>). In comparison with large EU member states, Ireland has relatively few PRIs, which mostly work on R&D related to natural resources (food, agriculture, forestry and marine), and societal issues (health, energy, the environment). A major

objective of the National Strategy for Higher Education is to maximise the excellence and impact of the Irish public research system. To deliver on this objective, the Higher Education Authority has established a comprehensive strategic dialogue with each HEI to monitor and drive its performance. The strategy also fosters regional clusters, and in some cases mergers, of institutions to build critical mass and to ensure efficiency across the system.

**Hot issue 3: Innovation in firms, entrepreneurship and SMEs.**

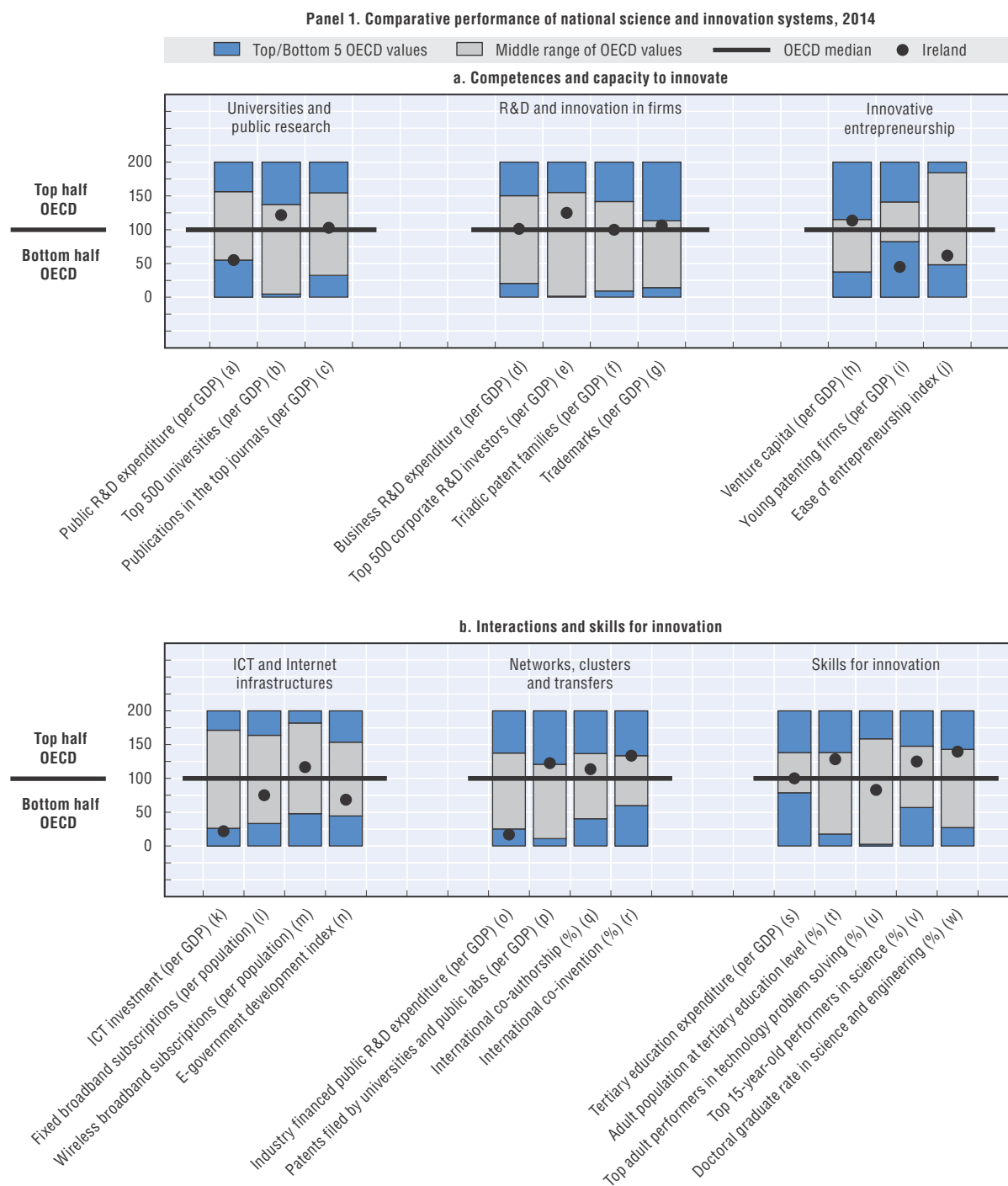
Ireland has a large number of top corporate R&D investors (Panel 1<sup>e</sup>), thanks to the strong presence of high-technology MNEs. The bulk of Ireland's BERD (71%) is performed by foreign affiliates, owing to Ireland's supportive environment for FDI. However, the Ease of Entrepreneurship Index (Panel 1<sup>f</sup>) indicates the need for improvement, owing in particular to a difficult licencing and permit system and complex regulatory procedures. Entrepreneurship has been given a strong policy focus. The government has committed to produce the first National Entrepreneurship Policy Statement within the context of the Action Plan for Jobs 2014. The statement will contain a set of cross-governmental actions to drive improvements in the overall environment for entrepreneurship and is due to be published in Q2 2014. The Entrepreneurship Policy Statement will build on work undertaken in 2013, which included the establishment of an Entrepreneurship Forum in May 2013 to examine the current environment and policy framework and to make further recommendations to support entrepreneurship and business start-ups. A public consultation was also undertaken in May 2013 inviting views from stakeholders.

The performance of young patenting firms also requires improvement (Panel 1<sup>g</sup>). In 2014 a new central technology transfer office was launched to improve companies' access to and use of results from publicly funded research to develop innovative products and services and ultimately to generate jobs and exports. New programmes – the Credit Guarantee Scheme, the Microenterprise Loan Fund, the National Intellectual Property Protocol, the second phase of the Technology Transfer Strengthening Programme (TTSI2), the SFI Industry Fellowships Programme, and the SFI Investigators Programme – have been introduced to support innovation in all categories of firms.

### Key figures, 2013

Economic and environmental performance	IRL	OECD	Gross domestic expenditure on R&D	IRL	OECD
<b>Labour productivity</b>			<b>GERD</b>		
GDP per hour worked, USD PPP, 2013	59.6	47.7	Million USD PPP, 2012	3 340	1 107 398
(annual growth rate, 2008-13)	(+1.7)	(+0.8)	As a % of total OECD, 2012	0.3	100
<b>Green productivity</b>			<b>GERD intensity and growth</b>		
GDP per unit of CO <sub>2</sub> emitted, USD, 2011	4.8	3.0	As a % of GDP, 2012	1.66	2.40
(annual growth rate, 2007-11)	(+5.2)	(+1.8)	(annual growth rate, 2007-12)	(+3.7)	(+2.0)
<b>Green demand</b>			<b>GERD publicly financed</b>		
NNI per unit of CO <sub>2</sub> emitted, USD, 2011	3.9	3.0	As a % of GDP, 2012	0.46	0.77
(annual growth rate, 2007-11)	(+2.9)	(+1.6)	(annual growth rate, 2007-12)	(+2.2)	(+2.8)

Figure 9.22. Science and innovation in Ireland



**Hot issue 4: Targeting priority areas/sectors.** The report of the Research Prioritisation Steering Group recommended 14 areas of opportunity as well as underpinning technologies, which should receive the majority of competitive public investment in STI over a five-year period. The areas were identified on the basis of existing strengths of the public research system and the enterprise base, opportunities in terms of the global marketplace and those that are most likely to deliver economic and social impact and benefits, including, most notably, jobs. These areas include: data analytics management, security and privacy; manufacturing competitiveness; smart grids and smart cities. The Centre for Applied Data Analytics Research (CeADAR), established in November 2012, aims to accelerate the development, deployment and adoption of Data Analytics technology and related innovations. In July 2013, the Insight Centre (INSIGHT) was established by SFI with funding of USD 94 million (EUR 75 million) from both public and industry sources to bring together leading Irish and international academics from five of Ireland's research centres to consolidate a national research platform and build critical mass in big data analytics.

### Highlights of the Irish STI system

**STI policy governance:** In 2014, the policy research functions of Forfás, Ireland's policy advisory board for enterprise, trade, science, technology and innovation, will be integrated into the Department of Jobs, Enterprise and Innovation (DJEI) to strengthen the Department's capacity for job-creation policy and for evaluation. The current membership of the Advisory Council for Science, Technology and Innovation (ACSTI) stood down with effect from September 2013, pending the results of the Forfás integration process and overall policy on public service reform. This does not rule out the option of establishing an Advisory Council of a similar nature on an alternate footing, if this is deemed appropriate in the future. Following publication of the Research Prioritisation Steering Group report in March 2012, the Prioritisation Action Group (PAG), involving

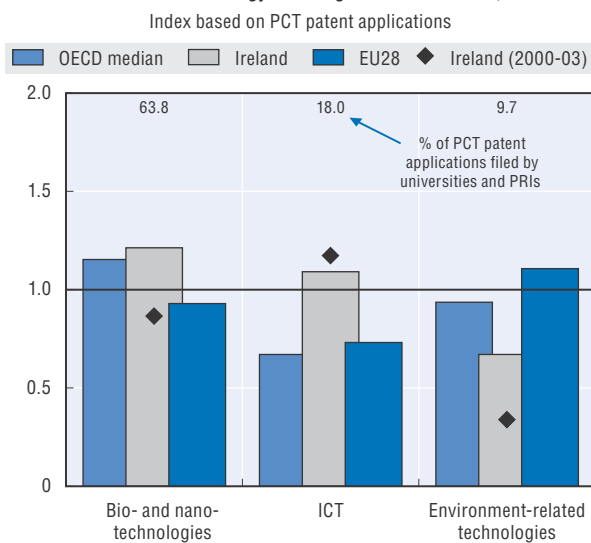
all relevant departments and funding agencies, was established to drive implementation of research prioritisation. Action plans for each of the priority areas, as well as a Framework of Metrics and Targets, were drawn up and approved by government in summer 2013. The Action plans represent the detailed blueprint for actions to be taken to re-align the majority of competitive public research funding around the priority areas over the following five years and include a vision, key objectives and specific actions, along with timelines and responsibilities for leading and supporting delivery of the action.

**New challenges:** Of the 14 priorities identified in the Research Prioritisation Exercise, several address societal challenges: sustainable food production and processing, connected health and independent living, and medical devices and therapeutics. These areas are priorities for competitive R&D funding.

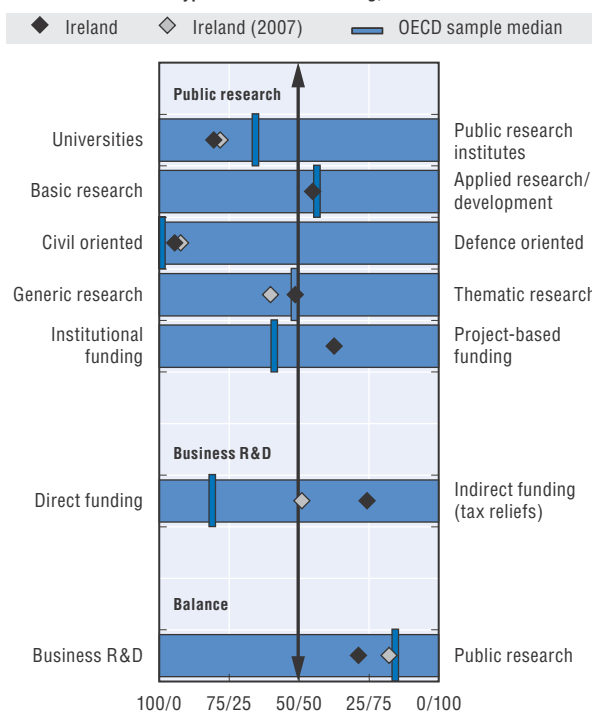
**Skills for innovation:** Ireland has a relatively strong skills base for innovation: the share of the tertiary-qualified adult population (Panel 1<sup>t</sup>), the performance of 15-year-olds in science (Panel 1<sup>v</sup>) and doctoral graduates in science and engineering (Panel 1<sup>w</sup>) are all above the OECD median. Going forward, Ireland has initiatives – a new Junior Cycle, new science curricula at post-primary level, a review of mathematics curriculum at primary level and ongoing implementation of revised mathematics specifications at post-primary as well as bonus points for mathematics – for strengthening science education in primary and post-primary schools in order to improve education outcomes and increase throughputs to higher education.

**Recent developments in STI expenditures:** GERD increased from 1.28% GDP in 2007 to 1.66% in 2012, mainly thanks to the rise in BERD from 0.85% to 1.2% of GDP during the years of financial crisis and economic recession. Owing to the impact of the recent crisis, however, public support for R&D and innovation is likely to remain under pressure in the years ahead.

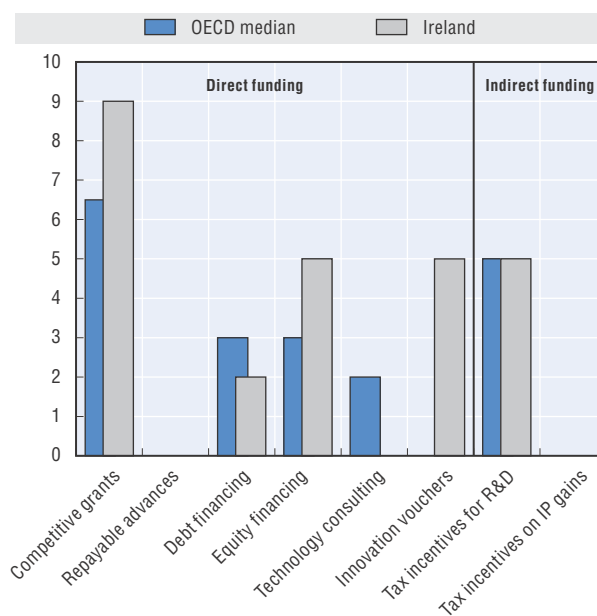
**Panel 2. Revealed technology advantage in selected fields, 2009-11**



**Panel 3. Allocation of public funds to R&D, by sector, type and mode of funding, 2012**



**Panel 4. Most relevant instruments of public funding of business R&D, 2014**



Note: Policy information comes from country responses to the OECD STI Outlook policy questionnaires 2014 and 2012. Ireland's responses are available in the OECD STI Outlook Policy Database, edition 2014 at <http://qdd.oecd.org/Table.aspx?Query=3A5C5564-995F-482A-BC8A-BD6D0C427B8C>.  
 Source: See reader's guide and methodological annex.

StatLink <http://dx.doi.org/10.1787/888933152225>

## STI country profiles reader's guide

The country profiles (CPs) in the 2014 *OECD STI Outlook* (STIO) are designed to provide a concise overview of science, technology and innovation (STI) policy and performance in OECD members and selected non-OECD economies. Each country profile is based on information gathered from the country's response to the OECD STIO policy questionnaires 2012 and 2014, as well as various additional OECD and non-OECD sources.

Headings in the country profiles are linked to the STIO policy profiles, which examine the main global STI policy trends across countries. Issues featuring in both the policy and country profiles are: i) innovation policy governance; ii) new sources of growth; iii) new challenges; iv) universities and public research; v) innovation in firms; vi) innovative entrepreneurship; vii) technology transfer and commercialisation; viii) clusters and smart specialisation; ix) globalisation; and x) skills for innovation.

The table of key figures presents indicators on the country's economic performance (labour productivity), environmental performance (green productivity and demand), the size of its R&D system as measured by gross domestic expenditure on R&D (GERD), the degree of public commitment to S&T as measured by the share of GERD that is publicly financed, and the changes in these indicators over the past five years. In the text, all amounts are given both in USD in purchasing power parities (PPP) of the relevant year (if available) and in national currencies.

Panel 1 contains a double figure that sheds light on the strengths and weaknesses of the country's STI performance. It uses indicators on the country's national innovation system and performance with respect to: universities and public research, business R&D and innovation, innovative entrepreneurship, information and communication technology (ICT) and Internet infrastructure, networks, clusters and transfers, and skills for innovation. The dot for each indicator positions the country relative to the OECD median and to the top and bottom five OECD countries. Non-OECD countries are also compared to the OECD benchmarks, and may fall out of the range indicated in the figure (e.g. below the lowest OECD country). All indicators are normalised (by GDP and population cohorts) to take account of the size of the economy and the relevant population cohorts, and are presented as indices (OECD median = 100) for benchmarking purposes.

Panel 2 shows the structural composition of business expenditure on R&D (BERD) in terms of performance of the main industry sectors, firm size and firms' national affiliation. It reflects the country's industry structure and its business innovation efforts. Panel 3 presents the country's revealed technological advantage (RTA), as measured by international patent applications filed under the Patent Cooperation Treaty (PCT) in three key technology fields (bio- and nano-technology, ICTs, and environment-related technologies). It also shows the number of patents filed by universities and public research institutions in these fields.

Panel 4 gives an overview of the country's policy mix for public R&D, i.e. the orientation and funding modes of public research. It also illustrates changes in the policy mix for R&D over the past five years. Finally, Panel 5, a new feature in STIO 2014, reflects the balance and relative importance of various government measures to support business R&D and innovation. It is based on the country's self-assessment in its reply to the OECD STIO 2014 policy questionnaire.

Further details on the methodology, data sources and descriptions of indicators used in the country profile are provided in Annex 9.A. Data, metadata as well as the original sources and databases of the indicators used in the STIO 2014 are accessible at the statistical portal IPP.Stat (cut-off date: 8 July 2014).

### Abbreviations used in the country profiles

BERD:	Business expenditure on research and development
EU:	European Union
FDI:	Foreign direct investment
GDP:	Gross domestic product
GERD:	Gross expenditure on research and development
HEIs:	Higher education institutions
IPRs:	Intellectual property rights
MNEs:	Multinational enterprises
PRIs:	Public research institutes
R&D:	Research and development
S&E:	Science and engineering
SSS:	Smart specialisation strategy (also known as 3S)
STI:	Science, technology and innovation
S&T:	Science and technology
3S:	See SSS
STEM:	Science, technology, engineering and mathematics
USD:	United States dollars (converted using the purchasing power parities of the relevant year)
VC:	Venture capital



**Synthetic table**
**Table 9.1. Comparative performance of national science and innovation systems, 2014**

Country relative position: in the top 5 OECD or above (★), in the middle range on par or above OECD median (▲), in the middle range below OECD median (Δ) and in the bottom 5 OECD or below (○)

		Competences and capacity to innovate									
		Universities and public research			R&D and innovation in firms				Innovative entrepreneurship		
		Public R&D expenditure (per GDP)	Top 500 universities (per GDP)	Publications in the top-quartile journals (per GDP)	Business R&D expenditure (per GDP)	Top 500 corporate R&D investors (per GDP)	Triadic patent families (per GDP)	Trademarks (per GDP)	Venture capital (per GDP)	Young patenting firms (per GDP)	Ease of entrepreneurship index
		PUB_XGDP	UNI500_GDP	PUB25_GDP	BE_XGDP	CORPRD500_GDP	PTRIAD_GDP	TRDMRK_GDP	VC_XGDP	PTYG_GDP	EASE_I
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Argentina	ARG	Δ	Δ	○	○	○	○	○			
Australia	AUS	▲	▲	▲	▲	Δ	Δ	▲	Δ		▲
Austria	AUT	▲	★	▲	▲	▲	▲	Δ	Δ	★	▲
Belgium	BEL	Δ	▲	▲	▲	Δ	▲	Δ	▲	Δ	Δ
Brazil	BRA		Δ	○		Δ	○	○			Δ
Canada	CAN	▲	▲	▲	Δ	Δ	▲	★	★	○	▲
Chile	CHL	○	Δ	○	○	○	○	Δ			Δ
China	CHN	Δ	Δ	○	▲	Δ	Δ	○			○
Colombia	COL	○	○	○	○						
Costa Rica	CRI	○	○	○	○	○					
Czech Republic	CZE	▲	Δ	Δ	Δ	Δ	Δ	Δ	○		Δ
Denmark	DNK	★	▲	★	▲	★	▲	▲	▲		▲
Estonia	EST	▲		▲	▲	○	Δ	Δ	▲		▲
Finland	FIN	★	★	▲	★	★	★	▲	★	★	▲
France	FRA	▲	Δ	Δ	▲	▲	▲	▲	▲	Δ	▲
Germany	DEU	★	▲	Δ	▲	▲	★	▲	▲	★	▲
Greece	GRC	○	Δ	Δ	○	Δ	○	○	○		Δ
Hungary	HUN	○	Δ	Δ	Δ	Δ	Δ	○	Δ		Δ
Iceland	ISL	★	○	★	▲	▲	Δ	★			Δ
India	IND	Δ	○	○	○	○	Δ	○			○
Indonesia	IDN		○	○	○		○	○			Δ
Ireland	IRL	Δ	▲	▲	Δ	▲	▲	▲	★	○	Δ
Israel	ISR	Δ	★	▲	★	▲	▲	▲	★		○
Italy	ITA	Δ	Δ	Δ	Δ	Δ	Δ	Δ	○	▲	★
Japan	JPN	▲	Δ	○	★	▲	★	Δ	Δ	○	▲
Korea	KOR	▲	Δ	Δ	★	▲	▲	▲	▲		Δ
Latvia	LVA	Δ	○	○	○		Δ				
Lithuania	LTU	Δ	○	○	○		Δ				
Luxembourg	LUX	○	○	Δ	Δ	★	▲	★	Δ		Δ
Malaysia	MYS	Δ	Δ	○	Δ	Δ					
Mexico	MEX	○	○	○	○	○	○	Δ			○
Netherlands	NLD	▲	▲	★	▲	▲	▲	▲	▲	▲	★
New Zealand	NZL	Δ	★	▲	Δ	Δ	Δ	★	Δ		★
Norway	NOR	▲	▲	Δ	Δ	▲	Δ	Δ	Δ	▲	Δ
Poland	POL	Δ	Δ	Δ	○	○	Δ	○	○		○
Portugal	PRT	Δ	▲	▲	Δ	Δ	Δ	Δ	Δ		▲
Russian Federation	RUS	Δ	○	○	Δ	Δ	○	○	Δ		Δ
Slovak Republic	SVK	Δ	○	○	○	○	○	○			★
Slovenia	SVN	Δ	▲	▲	▲	Δ	Δ	Δ	Δ		Δ
South Africa	ZAF	○	Δ	○	Δ	Δ	Δ	Δ	Δ		○
Spain	ESP	Δ	Δ	Δ	Δ	Δ	Δ	Δ	○	○	○
Sweden	SWE	★	★	★	★	★	★	▲	▲	★	Δ
Switzerland	CHE	▲	▲	★	▲	★	★	★	▲	★	▲
Turkey	TUR	Δ	○	○	Δ	Δ	○	○			○
United Kingdom	GBR	Δ	▲	▲	Δ	▲	▲	▲	▲	Δ	▲
United States	USA	▲	Δ	Δ	▲	▲	▲	▲	★	○	★
EU28	EU28	▲	▲	★	▲	Δ	▲	Δ	▲	▲	

Table 9.1. **Comparative performance of national science and innovation systems, 2014** (cont.)

Country relative position: in the top 5 OECD or above (★), in the middle range on par or above OECD median (▲), in the middle range below OECD median (△) and in the bottom 5 OECD or below (○)

		Interactions and skills for innovation												
		ICT and Internet infrastructures				Networks, clusters and transfers				Skills for innovation				
		ICT investment (per GDP)	Fixed broadband subscribers (per population)	Wireless broadband subscribers (per population)	E-government readiness index	Industry financed public R&D expenditure (per GDP)	Patents filed by universities and public labs (per GDP)	International co-authorship (%)	International co-invention (%)	Tertiary education expenditure (per GDP)	Adult population at tertiary education level (%)	Top adult performers in technology problem solving (%)	Top 15 year-old performers in science (%)	Doctoral graduate rate in science and engineering (%)
		ICTINV_XGDP	FBBAND_HAB	WBBAND_HAB	EGOV_I	PUB_BEF_XGDP	PATPRI_XGDP	INTCOA_XSA	COPAT_XPCT	TER_XGDP	ADTERPOP_XT	TOPAD_PST_XAD	TOP15_SCI_XT	PHDR_SCIENG_XCOH
		(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)	(s)	(t)	(u)	(v)	(w)
Argentina	ARG	○	○	○	○	○		△	★	▲	○		○	○
Australia	AUS	▲	△	★	▲	▲	▲	△	△	▲	▲	▲	★	▲
Austria	AUT	▲	△	▲	△	▲	△	★	▲	△	△	△	△	▲
Belgium	BEL	▲	▲	△	△	▲	▲	★	★	△	▲		▲	▲
Brazil	BRA		○	△	○		△	○	△	○	○		○	○
Canada	CAN	△	▲	△	▲	▲	▲	△	▲	★	★	▲	▲	▲
Chile	CHL		○	○	△	○	△	▲	△	★	○		○	○
China	CHN		○	○	○	▲	△	○	○		○			○
Colombia	COL		○	○	△			▲	△	★	△		○	
Costa Rica	CRI		○	○	○			★	★		△		○	
Czech Republic	CZE	△	△	△	○	△	△	△	▲	△	△	△	△	△
Denmark	DNK	★	★	★	★	△	★	▲	▲	▲	△	★	△	▲
Estonia	EST		△	▲	△	△		▲	★	▲	▲	○	★	△
Finland	FIN	△	▲	★	▲	★	▲	▲	△	★	▲	★	★	★
France	FRA	△	★	△	▲	△	★	▲	△	▲	△		▲	▲
Germany	DEU	△	▲	△	▲	★	▲	△	△	△	△	▲	▲	★
Greece	GRC	○	△	△	△	△	○	△	▲	▲	△		○	△
Hungary	HUN		△	○	△	▲	○	▲	▲	○	△		△	○
Iceland	ISL		▲	▲	△	★		★	▲	○	▲		△	△
India	IND		○	○	○		△	○	▲	○				
Indonesia	IDN		○	○	○			▲	★	○	○		○	○
Ireland	IRL	○	△	▲	△	○	★	▲	▲	▲	▲	○	▲	▲
Israel	ISR		△	△	▲	▲	★	△	△	▲	★		△	▲
Italy	ITA	△	△	△	△	○	△	△	○	○	○		△	△
Japan	JPN	★	▲	▲	▲	△	▲	○	○	▲	★	▲	★	△
Korea	KOR	▲	★	★	★	▲	★	○	○	★	★	○	▲	△
Latvia	LVA		△	△	△	▲		△	★	▲	△		○	△
Lithuania	LTU		△	○	△	★		△	△		▲		△	
Luxembourg	LUX	○	▲	▲	▲	△	△	★	★	○	▲		▲	
Malaysia	MYS		○	○	△			△	△	★	○		○	
Mexico	MEX	○	○	○	○	○	○	△	▲	△	○		○	○
Netherlands	NLD	▲	★	▲	★	★	▲	▲	△	▲	△	★	▲	△
New Zealand	NZL	★	▲	▲	▲	★	△	▲	△	▲	▲		★	▲
Norway	NOR		▲	▲	▲	▲	△	▲	△	▲	▲	★	△	▲
Poland	POL		○	▲	○	△	△	○	★	△	△	○	▲	○
Portugal	PRT	▲	△	○	△	○	○	△	▲	△	○		○	△
Russian Federation	RUS		○	△	△	★	○	○	△	△	★		○	○
Slovak Republic	SVK	○	○	△	○	△		△	▲	○	△	○	△	▲
Slovenia	SVN	△	△	△	△	▲	△	△	△	△	△		▲	▲
South Africa	ZAF		○	○	○	△	△	△	△	○	○			○
Spain	ESP	△	△	△	△	▲	▲	△	△	△	△		△	△
Sweden	SWE	★	▲	★	▲	▲	○	▲	△	▲	▲	★	△	★
Switzerland	CHE	★	★	△	▲	▲	▲	★	★	△	▲		▲	★
Turkey	TUR		○	○	○	▲	○	○	○	△	○		○	○
United Kingdom	GBR	▲	▲	▲	★	△	▲	△	▲	△	▲		▲	★
United States	USA	▲	▲	▲	★	△	▲	○	○	★	★	△	△	△
EU28	EU28	△	▲	▲		△	▲	▲	▲		△		△	▲

Note: Non-OECD countries are also compared to OECD countries and may therefore be out of range (e.g. lower than the lowest OECD country). They appear in this table with top five and bottom five OECD values

Israel: "The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law."

Source: See references and methodological annex of the OECD STI Outlook 2014 country profiles.

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