



From:
**OECD Science, Technology and Industry Outlook
2014**

Access the complete publication at:
http://dx.doi.org/10.1787/sti_outlook-2014-en

Poland

Please cite this chapter as:

OECD (2014), "Poland", in *OECD Science, Technology and Industry Outlook 2014*, OECD Publishing.
http://dx.doi.org/10.1787/sti_outlook-2014-69-en

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POLAND

Competitive supply helped the Polish economy outperform most EU countries during the recent economic crisis, but economic growth slowed in 2012-13. The Strategy for Innovation and Efficiency of the Economy – Dynamic Poland 2020 (2013-20), the Entrepreneurship Development Programme (EDP) and the National Research Programme (NRP) set the strategic direction for STI policy and implementation.

Hot issue 1: Innovating to contribute to structural adjustment and a new approach to growth. Although strong multi-factor productivity has boosted productivity and per capita income, Poland's labour productivity is still considerably below the OECD median. Only 60% of the working-age population are currently employed, compared to the OECD average of 65%. The 2014 OECD Economic Survey shows Poland's high potential to increase productivity by aligning product market regulations in network industries, retail distribution and professional services with the average of the three best-performing OECD countries. In addition to labour and product market reforms, Poland needs more investment in innovation to maintain growth. In line with the priorities of Horizon 2020, the NRP sets innovation for smart growth as one of the main objectives for the transition to the Polish knowledge- and innovation-based economy. Measures will therefore be taken to improve the legal and institutional environment for growth, to increase access to finance, and to promote intellectual capital investments and innovation and closer links between science and the economy.

Hot issue 2: Improving the design and implementation of STI policy. Poland has taken a new approach to innovation policy. It emphasises the importance of new forms of innovation, including new and innovative manufacturing technology, through new methods and greater interaction among innovation actors (e.g. open innovation, user-driven innovation). A holistic approach to policy design and implementation on related issues includes technological foresight, development of a low carbon economy, co-operation across regions and between businesses, government and other innovation stakeholders, and protection of industrial property rights.

Hot issue 3: Reforming and improving public research (including university research). In terms of public R&D expenditure and international publications (Panel 1^{a, c}), Poland falls at the lower end of the mid-range of OECD countries. Industry-science relations are underdeveloped and university and PRI patenting is below the OECD median (Panel 1^{o, p}). Major reforms to improve the efficiency and quality of PRIs and universities have been under way since 2010. Since 2012, additional resources are allocated on a competitive basis to promote high-quality research and teaching. PRIs and universities are encouraged to compete for the status of leading national research centre (KNOW), which gives access to additional funding for enhancing scientific and research potential, developing R&D personnel, creating attractive working conditions for research, building a strong and recognisable brand, and increasing researchers' remuneration and scholarships for PhD and undergraduate students. The centres are chosen in selected areas of knowledge through evaluations carried out by independent commissions with the participation of international experts. So far, after two rounds of competition, ten R&D units have received KNOW status.

Hot issue 4: Strengthening public R&D capacity and infrastructures. To strengthen public research, Poland increased public R&D expenditure from 0.41% of GDP in 2008 to 0.56% in 2012. Furthermore, the NRP addressed the importance of improving and modernising R&D infrastructures and made several sources of funding available for this purpose. The Polish S&T Fund and the EU Structural Funds have increased financing for investments in research infrastructure. The KNOW also receive priority when they apply for funds to upgrade infrastructure. In August 2013 the EDP introduced the obligation to prepare a draft law on corporate income tax to support R&D.

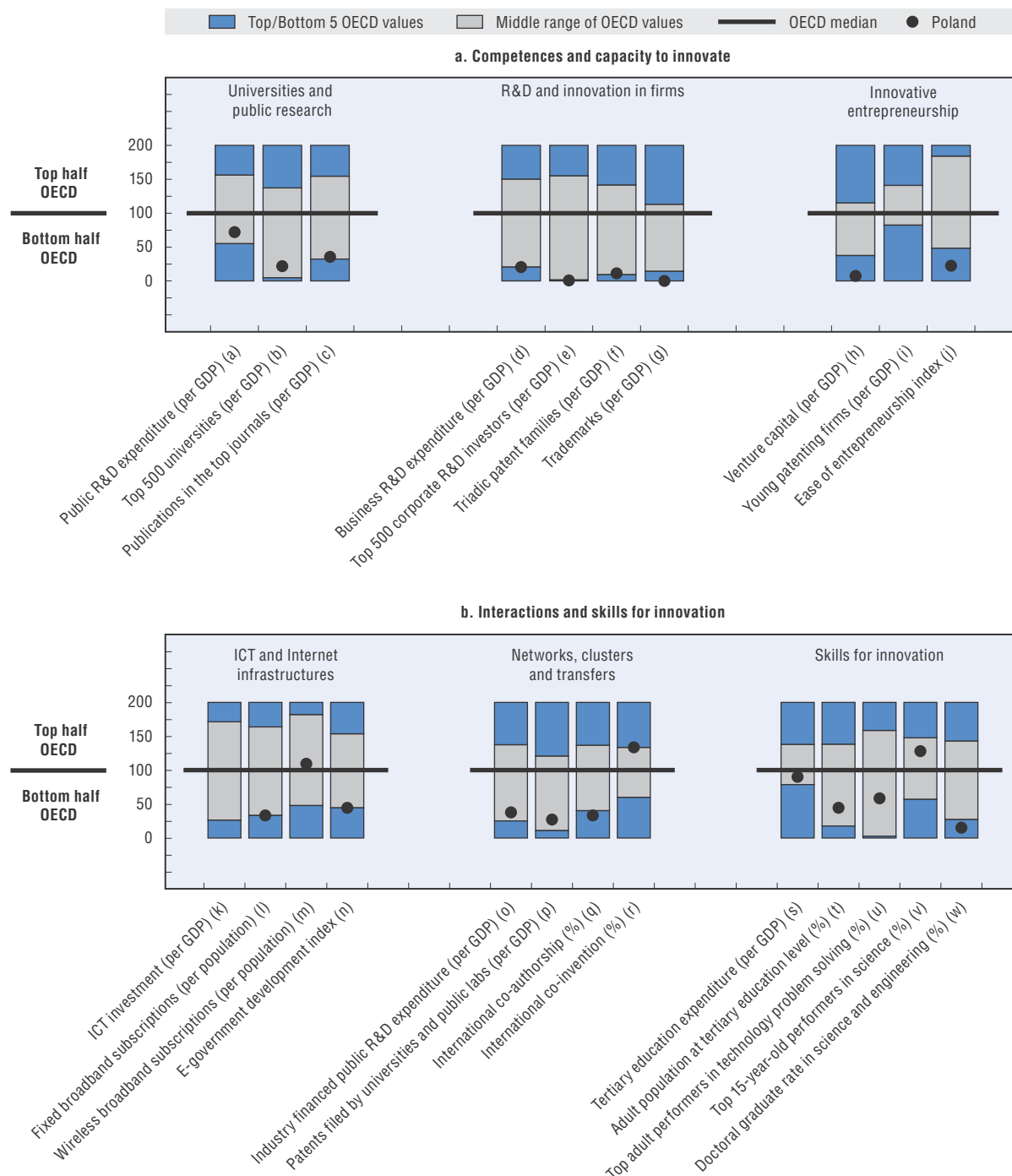
Hot issue 5: Business innovation, entrepreneurship and SMEs. Polish enterprises, especially SMEs, show relatively little interest in R&D and innovation owing to the perceived technological and business risks and lack of recognition of the critical role of innovation for competitiveness. As a result, BERD was only 0.33% of GDP in 2012 (Panel 1^d) and innovation output, as measured by the number of patents and

Key figures, 2013

Economic and environmental performance	POL	OECD	Gross domestic expenditure on R&D	POL	OECD
Labour productivity			GERD		
GDP per hour worked, USD PPP, 2013	28.7	47.7	Million USD PPP, 2012	7 899	1 107 398
(annual growth rate, 2008-13)	(+3.4)	(+0.8)	As a % of total OECD, 2012	0.7	100
Green productivity			GERD intensity and growth		
GDP per unit of CO ₂ emitted, USD, 2011	2.3	3.0	As a % of GDP, 2012	0.90	2.40
(annual growth rate, 2007-11)	(+4.7)	(+1.8)	(annual growth rate, 2007-12)	(+13.4)	(+2.0)
Green demand			GERD publicly financed		
NNI per unit of CO ₂ emitted, USD, 2011	2.4	3.0	As a % of GDP, 2012	0.49	0.77
(annual growth rate, 2007-11)	(+5.0)	(+1.6)	(annual growth rate, 2007-12)	(+11.5)	(+2.8)

Figure 9.35. Science and innovation in Poland

Panel 1. Comparative performance of national science and innovation systems, 2014



Note: Normalised index of performance relative to the median values in the OECD area (Index median = 100).

trademarks registered (panel 1^{f, g}), is weak. To boost business innovation and to support entrepreneurship and SMEs, new instruments have been introduced and existing ones revised. The Development Projects (2012-15) under the Operational Programme Innovative Economy promote industrial research and development. In July 2013, the Loan Fund was launched to provide low-interest loans for private investments in innovative start-ups.

Highlights of the Polish STI system

New challenges: To address challenges such as health and environment, the government has introduced strategic R&D programmes such as: STRATEGMED (2013-18) for health and BIOSTRATEG (2014-19) for natural environment, agriculture and forestry. Polish industry relies heavily on coal as a source of energy, and the government supports research on renewables and the low emission economy through Blue Gas – Polish Shale Gas Programme (2012-17), and the GEKON programme (2013-16) on energy production technologies. The GREEN-EVO Programme also promotes Polish environmental technologies. New business-driven initiatives, such as the INNOLOT programme (2013-18) are supported by the government.

Technology transfer and commercialisation: To improve the commercialisation of research results, participants in the Development Projects (2012-15) initiative must sign the consortium agreement between research organisations and enterprises. The BRIDGE VC (2013-17) programme supports commercialisation of public R&D results. Since 2013, the pilot Innovation Voucher projects support experienced entrepreneurs who collaborate with the research sector. OCEAN, a new research data centre, is funded by the National Centre for Research and Development (NCBiR). To be operational by the fourth quarter 2015, it will provide the e-infrastructure for storage of open data and facilities and expertise for big data analysis. A budget of about USD 36 million (EUR 20 million) has been allocated for 2014-15.

Clusters and smart specialisation: Poland has developed national and regional smart specialisation strategies through consultation with stakeholders and an entrepreneurial discovery process. The results of foresight exercises have also been used in these processes. While the government adopted the National Smart Specialisation document on 8 April 2014, areas of specialisations are still being identified in co-operation with stakeholders' working groups and with the Observatory of Economy. Entrepreneurial discovery is supported by the World Bank in order to improve the engagement of entrepreneurs in the formation of innovation policy and the identification of emerging specialisations.

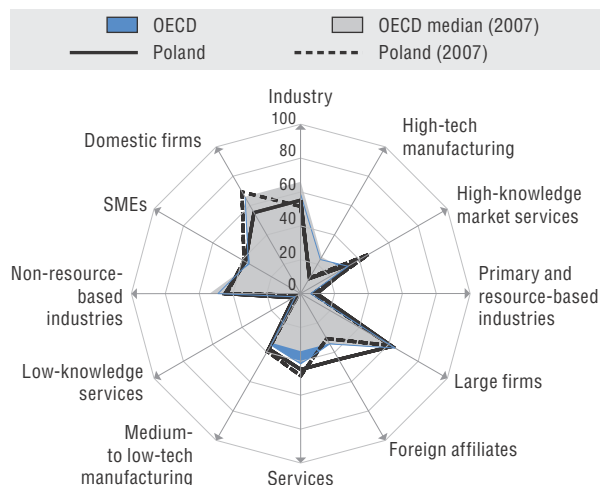
Globalisation: Polish innovators are well integrated in international innovation networks (Panel 1^f), unlike their academia counterparts (Panel 1^g). The MOBILITY PLUS initiative supports academic researchers who work abroad for periods of 6 to 36 months. 57 researchers benefited from the initiative in 2013. Greater openness to FDI on the business side would also increase knowledge spillovers.

Skills for innovation: Expenditure on higher education as a share of GDP is just below the OECD median (Panel 1^h) and Polish 15-year-olds perform above the OECD median in science (Panel 1^v). However, adults with tertiary qualifications, adults' technical problem-solving skills, and the share of PhD graduates in science and engineering are all far below the OECD median (Panel 1^{t, u, w}). Programmes supporting skills development include the TOP 500 Innovators (2013-15) and the LIDER programme (2009-17), and entrepreneurship education has been made compulsory in Polish universities.

Recent developments in STI expenditures: In 2012, Poland's GERD stood at 0.9% of GDP, having grown by a robust 13.4% a year over 2007-12. The government seek to reach GERD of 1.7% of GDP by 2020. In 2012, industry funded a comparatively low 32.3% of GERD, up from 24.4% in 2010, and the government a high 51.3%, down from 60.9% in 2010. The share of GERD financed from abroad reached 13.3%, up from 5.4% in 2008, during the economic crisis.

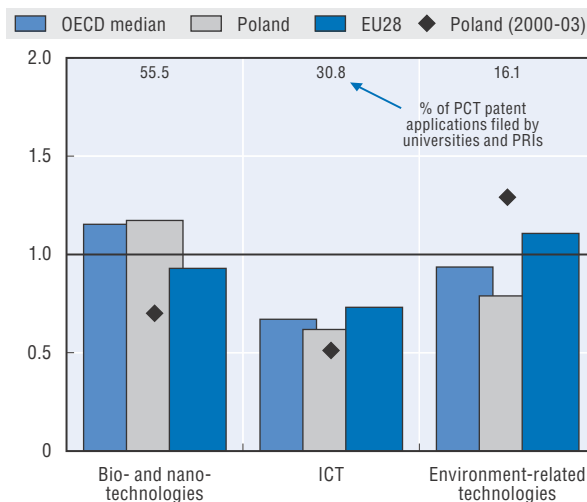
Panel 2. Structural composition of BERD, 2011

As a % of total BERD or sub-parts of BERD

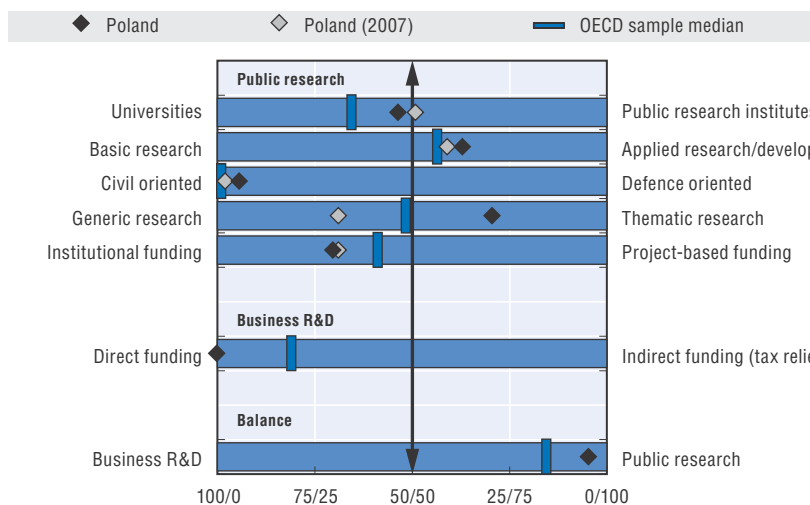


Panel 3. Revealed technology advantage in selected fields, 2009-11

Index based on PCT patent applications



Panel 4. Allocation of public funds to R&D, by sector, type and mode of funding, 2012



Note: Policy information comes from country responses to the OECD STI Outlook policy questionnaires 2014 and 2012 as well as the OECD Economic Survey of Poland 2014. Poland's responses are available in the OECD STI Outlook Policy Database, edition 2014 at <http://qdd.oecd.org/Table.aspx?Query=498B27DF-83F5-40D3-9E4E-B6CA4EEC64D6>.

Source: See reader's guide and methodological annex.

StatLink <http://dx.doi.org/10.1787/888933152355>

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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