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Switzerland

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SWITZERLAND

Switzerland is a small open economy, with overall good performance and outstanding strengths in science, technology and innovation. Maintaining its leading position in global research and innovation is an overarching objective. The federal government's strategy document, Promotion of Education, Research and Innovation (ERI Dispatch) 2013-16, therefore aims to reinforce the high level of competition based public R&D investment, to increase the provision of well-qualified human resources and to ensure framework conditions that are conducive to innovation and help maintain Switzerland's position in international competition. The government's Financial Plan stipulates that the ERI budget should grow at an above-average rate of 3.7% a year during 2013-16, with a total planned federal expenditure of around USD 35.6 billion (CHF 26 billion). The Swiss Parliament approved 11 relevant budget lines totalling USD 32.9 billion (CHF 24 billion).

Hot issue 1: Improving public research. The Swiss science system is very productive: R&D expenditures of universities and public research institutes were 0.9% of GDP in 2012 (Panel 1^a), and performance in scientific publications tops the OECD ranks (Panel 1^c). Patenting by universities and PRIs is above the OECD median (Panel 1^p).

The ERI Dispatch gives priority to strengthening Switzerland's international reputation as a competitive location for research and economic activities by increasing the amount of grant funding awarded on a competitive basis for research and innovation. The Swiss National Science Foundation (SNSF)'s Council initiated an evaluation of SNSF with a view to assessing and improving the SNSF's evaluation procedures in terms of their fairness and transparency and the extent to which they promote research excellence, increase the competitiveness of Swiss research and of researchers in Switzerland, and promote young researchers. The largely positive evaluation recommended a reform of the processes and procedures for external evaluations of funding applications, greater transparency through better documentation and information provision, and regular, systematic reviews and possible revisions of funding schemes.

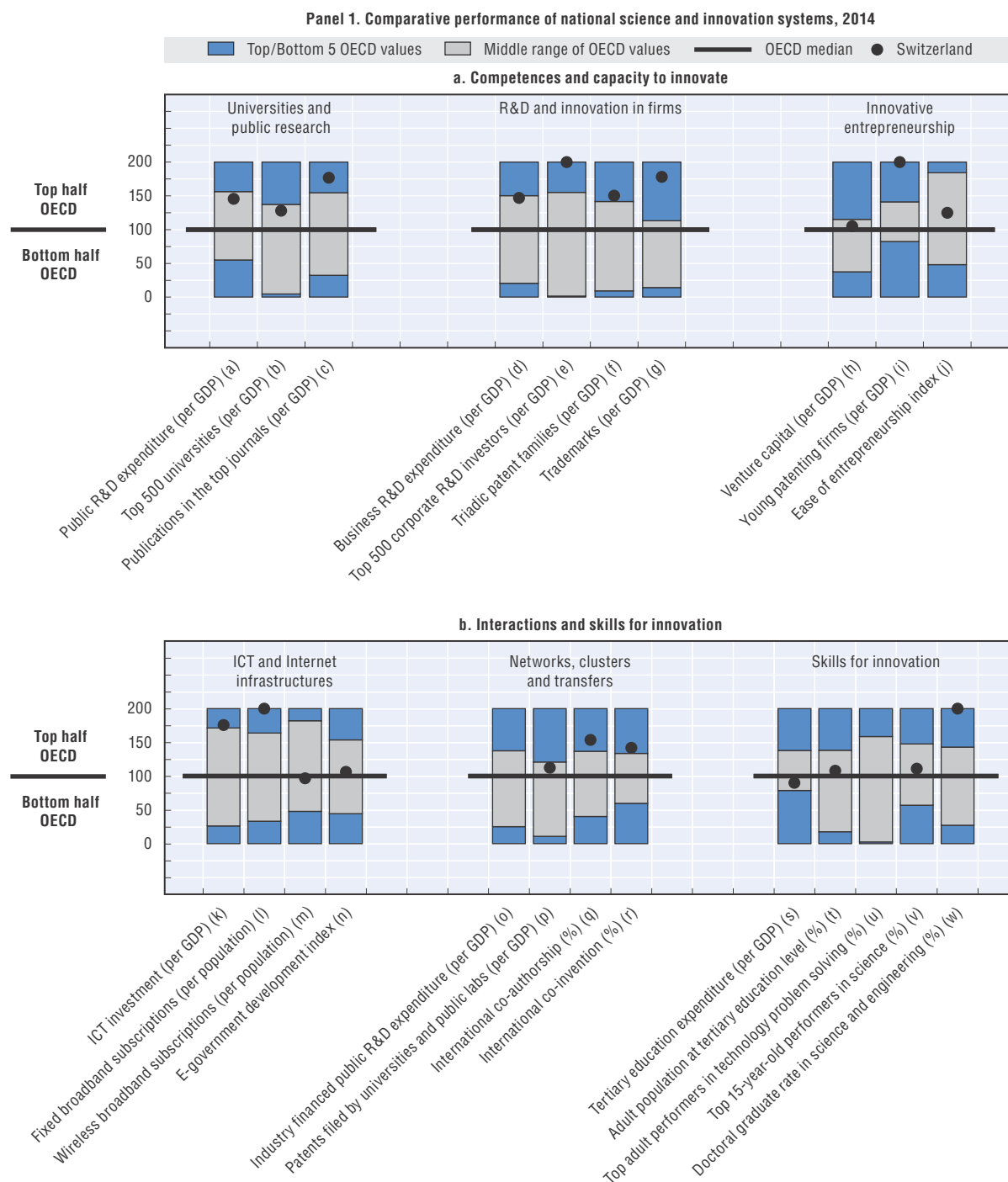
Hot issue 2: Ensuring a supply of high-end HRST, including researchers. The country's tertiary-qualified adult population and the performance of 15-year-olds in science are slightly above the OECD median (Panel 1^{t, v}). Doctoral graduates in S&E top the OECD ranks (Panel 1^w). A lack of specialists is however perceived as an increasingly acute problem owing to demographic developments. It may be exacerbated by restrictions on immigration. In response, the September 2011 Specialists Initiative of the Federal Department of Economic Affairs (FDEA) was launched to meet the demand for specialists to a greater extent with Swiss human resources by 2020. The Law on Support and Co-ordination of Higher Education Institutes (LEHE) makes the federal and canton governments jointly responsible for the co-ordination and quality assurance of HEIs and constitutes a major reform of the Swiss higher education system. LEHE was adopted by the Federal Parliament in autumn 2011 but will not come into effect before 2015.

Hot issue 3: Improving framework conditions for innovation, including competitiveness. The Swiss government is committed to providing good framework conditions for innovation through a high-quality education system, a flexible legal framework, a reliable IPR system, the removal of regulatory constraints and good infrastructures. In 2013 the Commission for Technology and Innovation (CTI) introduced CTI KTT SUPPORT to foster knowledge and technology transfer (KTT) between research centres and firms. CTI also introduced national thematic networks (NTNs) aimed at boosting innovation capacity, especially through improved access for SMEs to scientific research findings. NTNs act as a bridge between industry and academia and provide industry with access to research-related facilities. Since 1 January 2013, eight have been accredited by CTI and are up and running. Innovation Mentors is a support measure to help create contacts and identify and implement ways of encouraging innovation. In 2013, nine innovation mentors were recruited to work at the CTI. The KTT Platforms bring together representatives from the world's business and science communities and provide a physical, interactive interface between innovation mentors and NTNs.

Key figures, 2013

Economic and environmental performance	CHE	OECD	Gross domestic expenditure on R&D	CHE	OECD
Labour productivity			GERD		
GDP per hour worked, USD PPP, 2013	57.4	47.7	Million USD PPP, 2008	10 525	1 107 398
(annual growth rate, 2008-13)	(+0.4)	(+0.8)	As a % of total OECD, 2008	1.1	100
Green productivity			GERD intensity and growth		
GDP per unit of CO ₂ emitted, USD, 2011	7.7	3.0	As a % of GDP, 2008	2.87	2.40
(annual growth rate, 2007-11)	(+4.2)	(+1.8)	(annual growth rate, 2008-12)	n.a.	(+2.0)
Green demand			GERD publicly financed		
NNI per unit of CO ₂ emitted, USD, 2011	8.2	3.0	As a % of GDP, 2008	0.72	0.77
(annual growth rate, 2007-11)	(+2.2)	(+1.6)	(annual growth rate, 2008-12)	n.a.	(+2.8)

Figure 9.43. Science and innovation in Switzerland



Selected Highlights of the Swiss STI system

STI policy governance: Swiss governance features a reliance on bottom-up processes and federalism, with the Confederation and cantons sharing responsibility for research and higher education policy. Since 1 January 2013, the Federal Department of Economic Affairs (FDEA) has become the Federal Department of Economic Affairs, Education and Research (EAER), reflecting the integration of training, research and innovation as an economic policy issue. The State Secretariat for Education, Research and Innovation (SERI) at the EAER serves as the federal government's specialised agency for national and international matters concerning education, research and innovation policy.

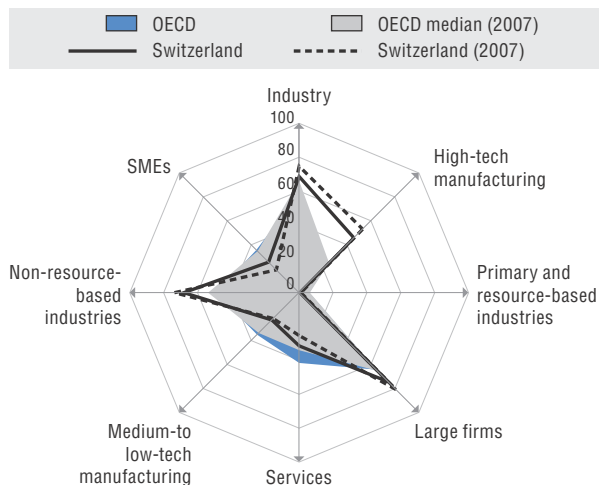
New challenges: The Federal Council has drawn up measures to secure the country's future energy supply. As part of its new Energy Strategy 2050, it emphasises increased energy savings (energy efficiency), the expansion of new renewable energies, and fossil fuel-based electricity production (cogeneration facilities, gas-fired combined-cycle power plants) and imports if necessary. Research on green energy is to play a strategic role in this context and will receive an additional USD 277 million (CHF 202 million) to support young scientists in energy-related research and to promote the "Energy" Programme and the inter-university Swiss Competence Centres for Energy Research.

Technology transfer and commercialisation: The CTI seeks to foster the development of innovative products and services by encouraging HEIs and companies to work together on joint R&D projects. A new initiative, CTI INNOVATION CHEQUE, gives firms an incentive to carry out R&D activities and facilitates their initial co-operation on innovation with public research facilities. Since the launch of the first batch of innovation cheques in September 2012, CTI has received a total of 272 applications, of which 38 were approved for funding in the Innovation Cheque budget for 2013.

Globalisation: Swiss research and innovation has strong international links (Panel 1^a 1), and framework conditions for attracting FDI and human resources both in businesses and universities are generally favourable. A federal strategy for the internationalisation of education, research and innovation was adopted in 2010. On 13 September 2013, Parliament adopted the Federal decree on Swiss involvement in Horizon 2020 (2014-20) with USD 6 billion (CHF 4.4 billion) over a seven-year period. The federal government also earmarked some USD 31.9 million (CHF 23.3 million) for Swiss participation in the EU Co-operation in Science and Technology (COST) programme for 2013-16. For bilateral co-operation, the ERI Dispatch (2013-16) identified the BRICS countries, Japan and Korea as high priorities.

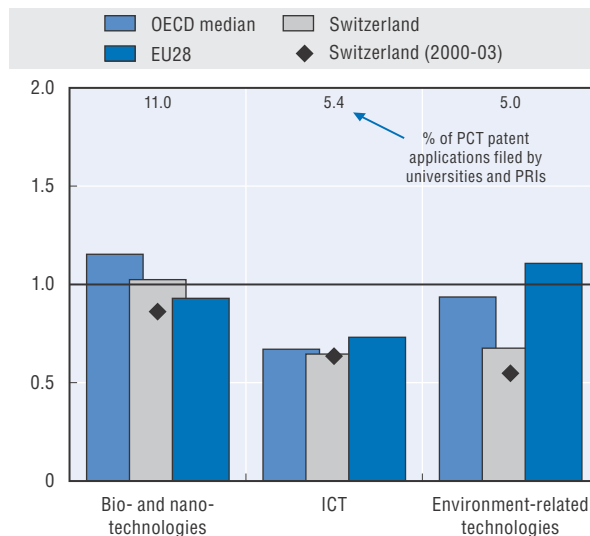
Panel 2. Structural composition of BERD, 2011

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

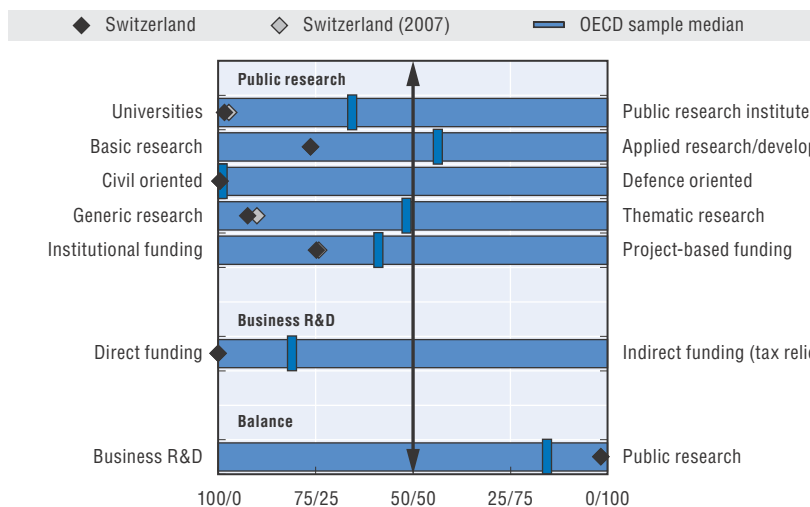


Panel 3. Revealed technology advantage in selected fields, 2009-11

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. Switzerland's responses are available in the OECD STI Outlook Policy Database, edition 2014 at <http://qdd.oecd.org/Table.aspx?Query=C9BF6FC2-39A7-41DF-9EE9-D02491588642>.

Source: See reader's guide and methodological annex.

StatLink <http://dx.doi.org/10.1787/888933152434>

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 (△) 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	△	△	○	○	○	○	○			
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	▲	▲	★	▲	△	▲	△	▲	▲	

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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