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## Chile

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## CHILE

Over 2008-13, Chile's productivity growth exceeded that of most OECD economies. While Chile's STI system lags in many respects, it is catching up in some areas.

**Hot issue 1: Improving the framework conditions for innovation (including competitiveness).** While BERD as a share of GDP lags the OECD median (Panel 1<sup>d</sup>), it grew by 10% in 2009-12; 7.8% of BERD is publicly financed in 2012, down from 18.3% in 2009, and close to the OECD average (7.6%). In March 2012, to encourage further private investment in R&D, the government modified its R&D tax credit framework: the eligibility requirements for collaboration with external research centres and the requirement to invest at least 15% of the company's gross annual revenue were abolished.

**Hot issue 2: Increasing returns and impact of science.** Chile's public research system has a small budget; few of its universities are among the world's leading institutions and there are few international publications relative to GDP by OECD standards (Panel 1<sup>a, b, c</sup>). However, the 35.3% of Chilean GERD performed by HEIs in 2012 was well above the OECD average (18.1%), owing to the importance of HEIs in the innovation system. To capitalise on the returns from a rather limited science base, several initiatives to encourage and step up the commercialisation of public research were introduced during 2012-14 (see below).

**Hot issue 3: Encouraging innovation in firms and supporting entrepreneurship and SMEs.** Chile's business innovation performance is well below the OECD medians (Panel 1<sup>d, f, g</sup>), particularly among SMEs. To address this challenge, the government supports entrepreneurship through several funding schemes, including seed, angel and venture capital programmes that also provide financial, legal and managerial advice. Triadic patent applications as a share of GDP (Panel 1<sup>f</sup>) indicate that Chile currently has a weak international technological presence. In 2012 the Ministry of Foreign Affairs created CONTACTChile to support the internationalisation of Chilean businesses. CONTACTChile

targets technology-intensive companies (primarily SMEs) with a strong export potential. Each beneficiary is supported with up to USD 20 000. It focuses on ICT, environment and biotechnology sectors and on firms that address social challenges.

**Hot issue 4: Improving the governance of innovation.** In January 2013, the government created an S&T advisory committee (STAC) to improve the governance of the innovation system. In its report, "Institutional Modernisation for STI", the committee identified several obstacles that are hard to address under the current governance framework. A key objective is to optimise the use of the public budget for innovation. Public R&D expenditure is managed by different agencies; they respond to different ministries and do not necessarily adhere to an integrated, common, long-term vision for STI policy. The STAC suggested creating an institutional body to co-ordinate the agencies involved. Also, to strengthen collaboration of HEIs with the business sector, the STAC proposed creating a ministry in charge of formulating co-ordinated policies for STI and higher education.

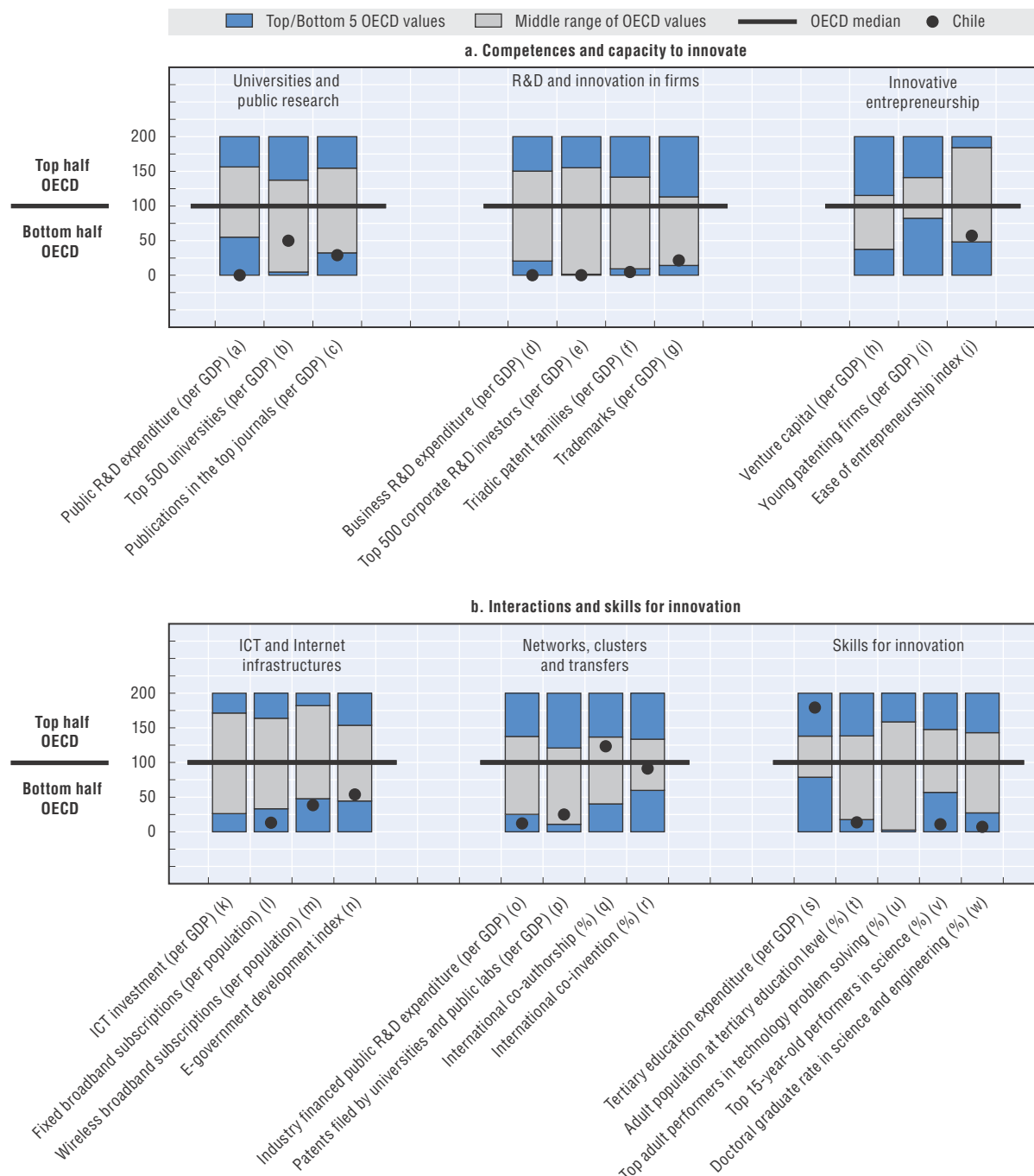
**Hot issue 5: Enhancing high-end HRST and the supply of researchers.** Chile spends 2.61% of GDP on higher education (Panel 1<sup>s</sup>), just behind Canada and the United States, and 29% of the Chilean population has tertiary education (Panel 1<sup>t</sup>), a share comparable to that of the EU28 (27%). Yet in 2012, Chile had only one researcher per thousand employees, compared to the EU28 average of seven. Also, quality indicators only place Chile at the OECD bottom (Panel 1<sup>v</sup>). To improve the supply of high-end HRST, the government is expanding its *Becas Chile* scholarship programme. Its budget of USD 151 million (CLP 52 588 million) for 2013 provides full financial support for international postgraduate studies on condition that students return to Chile upon completion of their studies. In addition, a national scholarship programme, with USD 113 million (CLP 39 238 million) in 2013, funds postgraduate studies in Chilean universities.

### Key figures, 2013

Economic and environmental performance	CHL	OECD	Gross domestic expenditure on R&D	CHL	OECD
<b>Labour productivity</b>			<b>GERD</b>		
GDP per hour worked, USD PPP, 2013	26.7	47.7	Million USD PPP, 2012	1 312	1 107 398
(annual growth rate, 2008-13)	(+2.4)	(+0.8)	As a % of total OECD, 2012	0.1	100
<b>Green productivity</b>			<b>GERD intensity and growth</b>		
GDP per unit of CO <sub>2</sub> emitted, USD, 2011	3.4	3.0	As a % of GDP, 2012	0.35	2.40
(annual growth rate, 2007-11)	(-1.4)	(+1.8)	(annual growth rate, 2007-12)	(+6.4)	(+2.0)
<b>Green demand</b>			<b>GERD publicly financed</b>		
NNI per unit of CO <sub>2</sub> emitted, USD, 2011	4.4	3.0	As a % of GDP, 2011	0.16	0.77
(annual growth rate, 2007-11)	(+0.2)	(+1.6)	(annual growth rate, 2007-10)	(+8.4)	(+2.8)

Figure 9.7. Science and innovation in Chile

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).

### Highlights of the Chilean STI system

**New sources of growth:** The National Innovation Council reviewed Chile's innovation strategy in August 2013 at the end of the President Piñera government. The review identified energy, biology and education as strategic business sectors. As part of its new STI strategy, Chile will also carry out a decadal survey on astronomy in 2014. The government expects to host more than two-thirds of the world's terrestrial observations in the next decade. In addition to providing policy guidelines, the review aims to create a public network of actors to co-ordinate scientific, technological and entrepreneurial efforts. Recently, the new government of President Bachelet launched the Growth, Innovation and Productive Agenda, which includes priority sectors for social and economic development.

**Innovative entrepreneurship:** Overall, Chile's Ease of Doing Business Index is below the OECD median (Panel 1j). The Chilean authorities have continued their efforts in this regard: a new law, introduced in May 2013, eases requirements for business registration and reduces the time required for registering a firm to one day.

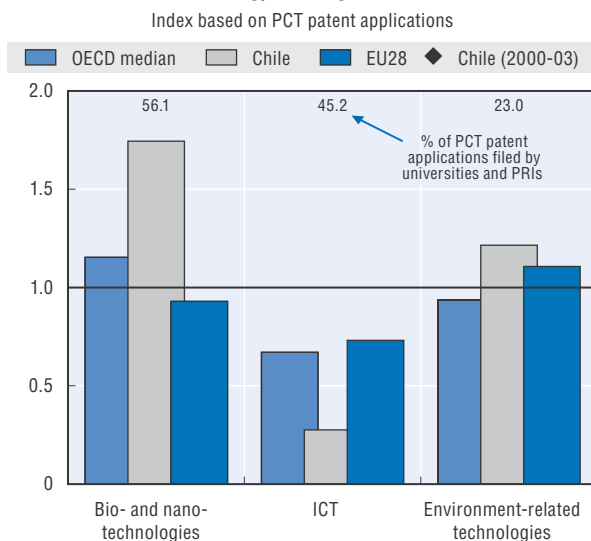
**ICT and Internet infrastructures:** Connectivity and use of the Internet continue to be a challenge for Chile. The country

lags the OECD in fixed and wireless broadband subscribers per capita (Panel 1<sup>l, m</sup>). Its e-government development index has improved since 2012 but is still below the OECD median (Panel 1<sup>n</sup>).

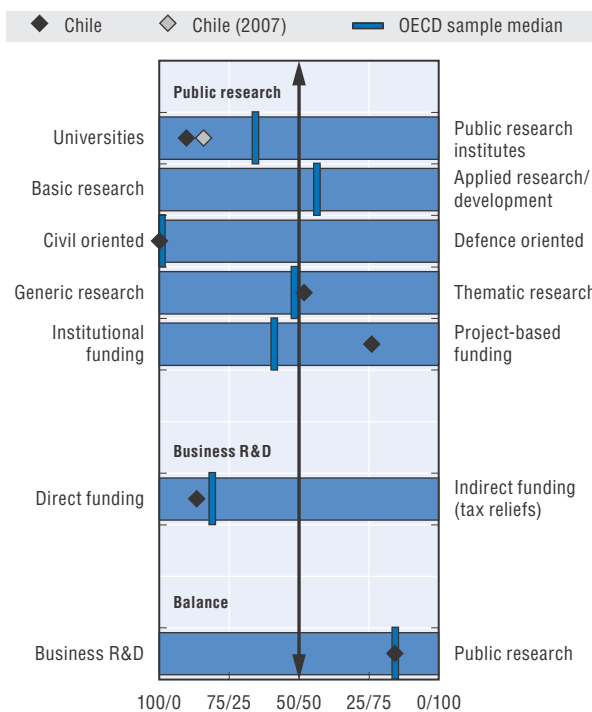
**Technology transfer and commercialisation:** In order to strengthen the commercialisation of public research, the Transfer and Licensing Offices Programme (from the Chilean Economic Development Agency, CORFO) seeks to build competences for managing technology transfer and commercialising R&D. It also funds the training (in Chile and abroad) of professionals and technical staff in universities and research institutes. It also seeks to strengthen its IPR framework by improving procedures, protection and enforcement of IPR. The National Commission for Scientific and Technological Research (CONICYT) continues its efforts to facilitate access to research data generated by public funds.

**Globalisation:** Over the past three years, Start-Up Chile, a seed capital programme, has supported more than 750 start-ups, whose founders come from over 70 countries. The programme seeks to attract overseas entrepreneurs by offering USD 40 000 in equity-free seed capital and a working visa to develop projects in Chile.

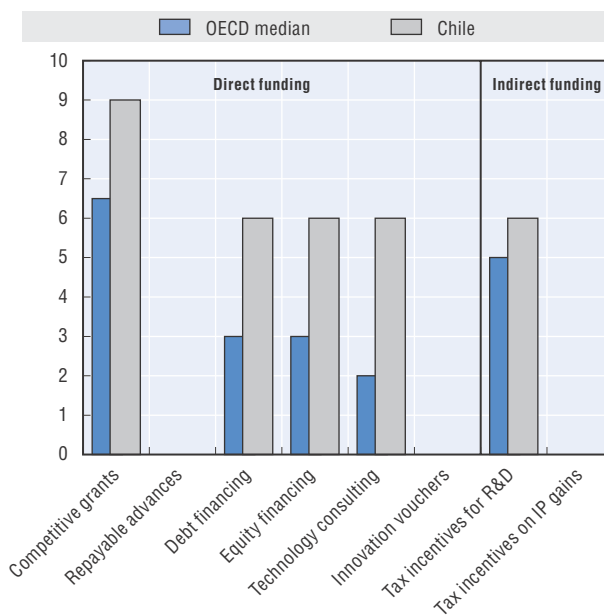
**Panel 2. Revealed technology advantage in selected fields, 2009-11**



**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. Chile's responses are available in the OECD STI Outlook Policy Database, edition 2014 at <http://qdd.oecd.org/Table.aspx?Query=F0FDDB-9EE4-46BB-B88D-03B3CF196AED>.

Source: See reader's guide and methodological annex.

StatLink <http://dx.doi.org/10.1787/888933152070>

## 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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