INDIA*

India is a very large country and a fast-growing emerging economy. It is the global hub of offshore knowledge-intensive IT services and IT industry. However, its growth rate has slowed somewhat in recent years and poverty continues to be a major challenge. Innovation is seen as critical to India's socio-economic development. Through its national strategy, Decade of Innovations 2010-20, the government is committed to strengthening S&T capacities. The objective is to increase GERD to 2% of GDP with a doubling of the business contribution by 2020.

Hot issue 1: Innovation to address social challenges (including inclusiveness). The 12th Five-Year Plan (2012-17) seeks to address social challenges, especially poverty and exclusion, by catalysing a growth process that will promote more inclusive development. "Inclusive Innovation" initiatives that focus on innovation outcomes benefiting poor and excluded groups therefore receive particular attention. Innovation activities of the poor themselves are also important. Initiatives have been, or will be, launched to promote inclusive innovations, such as India's Inclusive Innovation Fund (IIF). The IIF is expected to mobilise USD 3.2 billion (INR 50 billion) and will support enterprises that develop innovative solutions for the "bottom 500 million" in India. About USD 320 million (INR 5 billion), or some 10% of the total, was raised by July 2012. India's National Innovation Foundation, created in 2000, supports grassroots innovators, i.e. those from poor and excluded groups, at various stages of the innovation process.

Hot issue 2: Innovation for sustainable/green growth. India faces energy security challenges, since economic growth creates more demand for energy and increases dependence on imports of coal. In response, several policies defined in the National Action Plan on Climate Change have been adopted to support renewable energy and energy conservation. The National Solar Mission aims to promote the development and use of solar energy for power generation and other uses with the ultimate objective of making solar energy competitive with fossil-based energy. The National Mission for Enhanced Energy Efficiency mandates specific decreases in energy consumption in large energy-consuming industries, with a system for companies to trade energy-savings certificates and incentives for adopting energy-efficient appliances. Finally, the national Mission for Sustainable Agriculture aims to support climate adaptation in agriculture through support for the development of climate-resilient crops. In addition, government subsidies are provided for all forms of renewable energy (whether on or off grid). Another emphasis is additive environmental technology with subsidies for cleaning up (or greening) existing manufacturing facilities.

Hot issue 3: Improving the design and implementation of STI policy. To improve the governance of STI policy making, the prime minister created the National Innovation Council (NInC) in 2010. With a mandate to formulate a roadmap for innovations for 2010-20, the NInC introduced the New Science, Technology and Innovation Policy in 2013, which focuses on inclusive growth.

Highlights of the Indian STI system

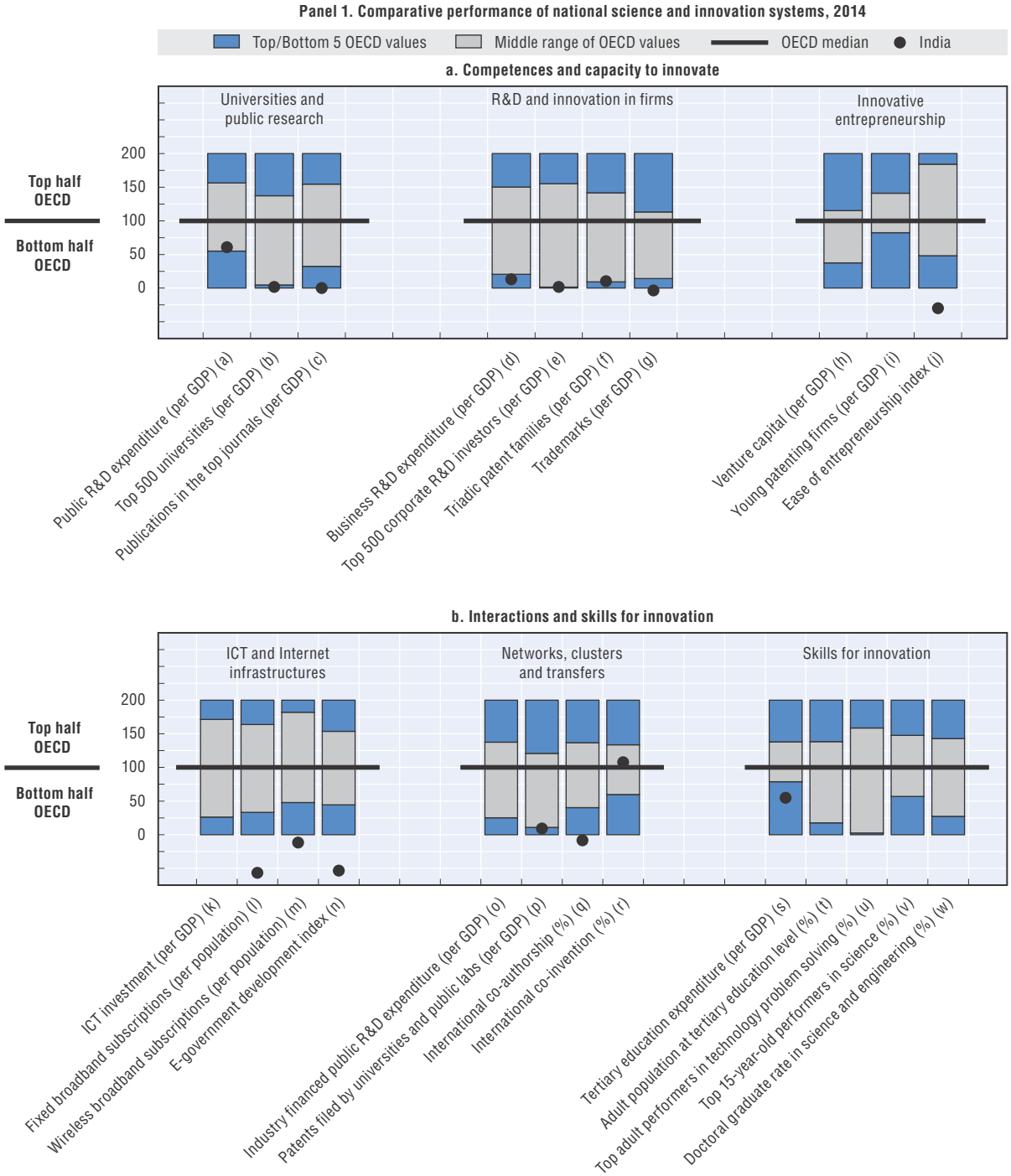
Universities and public research: As in many emerging economies, PRIs and universities dominate India's STI system. Public R&D expenditures accounted for nearly 62% of GERD in 2007 (the latest year for which data are available). At 0.50% of GDP in 2007, India is at the bottom of the OECD middle range (Panel 1[a]). Relative to GDP India has fewer world-class universities and a weaker S&T publication record in leading international academic journals (Panel 1[b, c]) than emerging economies such as Brazil, the People's Republic of China and South Africa. As PRIs are governed by the ministries in charge of sectoral research areas, there is no consolidated public research budget. India does not so far have a central research funding body. The budget for PRIs has recently declined in real terms. Evaluations are used more systematically to assess research performance in universities.

Key figures, 2013

Economic and environmental performance	IND	OECD	Gross domestic expenditure on R&D	IND	OECD
Labour productivity			**GERD**		
GDP per hour worked, USD PPP, 2013	n.a.	47.7	Million USD PPP, 2007	24 306	1 107 398
(annual growth rate, 2008-13)	n.a.	(+0.8)	As a % of total OECD, 2007	2.7	100
Green productivity			**GERD intensity and growth**		
GDP per unit of CO_2 emitted, USD, 2011	2.3	3.0	As a % of GDP, 2007	0.76	2.40
(annual growth rate, 2007-11)	(+0.9)	(+1.8)	(annual growth rate, 2007-12)	n.a.	(+2.0)
Green demand			**GERD publicly financed**		
NNI per unit of CO_2 emitted, USD, 2011	n.a.	3.0	As a % of GDP, 2012	n.a.	0.77
(annual growth rate, 2007-11)	n.a.	(+1.6)	(annual growth rate, 2007-12)	n.a.	(+2.8)

* This country profile was prepared based on India's response to the OECD Science, Technology and Industry Outlook 2014 policy questionnaire. The views expressed in the response were those of the experts who filled out the questionnaire, and do not necessarily represent the view of the Indian government.

Figure 9.20. **Science and innovation in India**



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

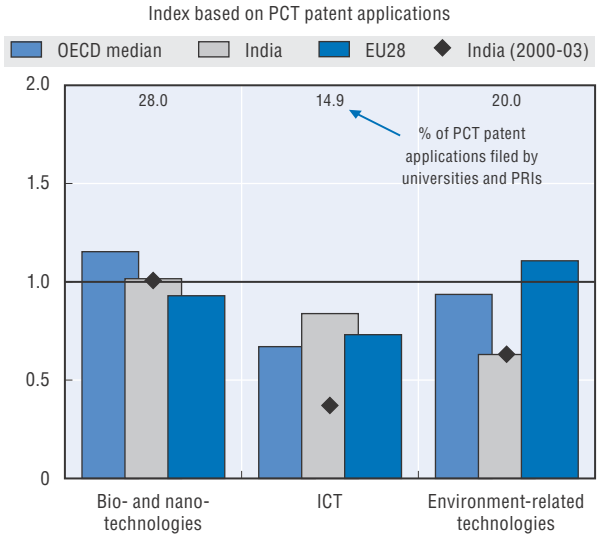
Innovative entrepreneurship: The Small Business Innovation Research Initiative (SBIRI) is a new scheme launched by the Ministry of Science and Technology to nurture and mentor innovative emerging technologies and entrepreneurs. A distinctive feature of SBIRI is that it supports high-risk pre-proof-of-concept biotechnology research as well as late-development stages in SMEs led by innovators with a science background. There is specific support for the commercialisation of technologies that meet societal needs in health care, food and nutrition, agriculture, and other sectors. Other government agencies have similar schemes.

Technology transfer and commercialisation: India has no legislation on technology transfer and commercialisation. Various programmes provide access to knowledge developed in PRIs and HEIs. The creation and preservation of knowledge systems, the dissemination of knowledge, and better knowledge services are core concerns of the National Knowledge Commission. Created in 2005, it guides policy on these topics and directs reforms concerning education, science and technology, agriculture, industry, and e-governance. SBIRI also aims to strengthen the commercialisation of public research.

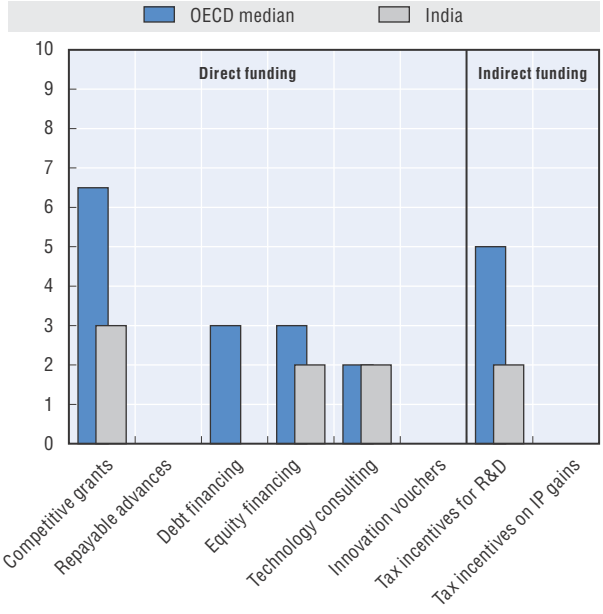
Globalisation: The presence of R&D centres of MNEs has accelerated India's integration in global R&D and innovation systems. While India hosts several top corporate R&D investors in automotive, industrial machinery and IT industries, it lags China, Brazil and Russia in this regard (Panel 1^{e}). However, India is at the OECD median, and well ahead of Brazil, China and South Africa in international co-patenting (Panel 1^{r}), although its share of internationally co-authored S&T publications is very low, not only by OECD standards, but also compared to South Africa, Brazil and the Russian Federation. In recent years Indian universities have progressively opened up internationally, much more than PRIs. Various government departments have programmes that facilitate international mobility of human resources.

Skills for innovation: India has a large, young and growing labour force. However, low school attainment rates and the poor quality of the education system hamper the development of human resources for S&T and innovation. The National Skills Development Agency (NSDA) has been charged with co-ordinating and harmonising the skill development efforts of the government and the private sector with a view to achieving the skilling targets of the 12th Five-Year Plan. Related initiatives include the Confederation of Indian Industry (CII)'s Skills Centre at Chhindwara (in Madhya Pradesh), which teaches industrial techniques, and the joint CII-HPCL (Hindustan Petroleum Cooperation Limited) Swavalamban Project, which trains youth at the local level. The Ministry of Human Resources and the Ministry of Minority Affairs also have initiatives to reduce the gender and minority gap in S&T education, such as the Scheme for Providing Quality Education in Madrasas (SPQEM) and Sarva Shiksha Abhiyan (SSA).

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



Panel 3. Most relevant instruments of public funding of business R&D, 2014.



Note: Policy information comes from country responses to the OECD STI Outlook policy questionnaire 2014. India's response is available in the *OECD STI Outlook Policy Database*, edition 2014 at *http://qdd.oecd.org/Table.aspx?Query=76708487-C497-4C59-AF7A-E2BCAF2458FA*.
Source: See reader's guide and methodological annex.

StatLink http://dx.doi.org/10.1787/888933152202

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 entrepreneur-ship 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 (Δ) 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		○	○	○	○		Δ	★	▲	○		○	○
Australia	AUS	▲	Δ	★	▲	▲	▲	Δ	Δ	▲	▲	▲	★	▲
Austria	AUT	▲	Δ	▲	Δ	▲	Δ	★	▲	Δ	Δ	Δ	Δ	▲
Belgium	BEL	▲	▲	Δ	Δ	▲	▲	★	★	Δ	▲		▲	▲
Brazil	BRA		○	Δ	○		Δ	○	Δ	○	○		○	○
Canada	CAN	Δ	▲	Δ	▲	▲	▲	Δ	▲	★	★	▲	▲	▲
Chile	CHL		○	○	Δ	○	Δ	▲	Δ	★	○		○	○
China	CHN		○	○	○	▲	Δ	○	○		○			○
Colombia	COL		○	○	Δ			▲	Δ	★	Δ		○	
Costa Rica	CRI		○	○	○			★	★		Δ		○	
Czech Republic	CZE	Δ	Δ	Δ	○	Δ	Δ	Δ	▲	Δ	Δ	Δ	Δ	Δ
Denmark	DNK	★	★	★	★	Δ	★	▲	▲	▲	Δ	★	Δ	▲
Estonia	EST		Δ	▲	Δ	Δ		▲	★	▲	▲	○	★	Δ
Finland	FIN	Δ	▲	★	▲	★	▲	▲	Δ	★	▲	★	★	★
France	FRA	Δ	★	Δ	▲	Δ	★	▲	Δ	▲	Δ		▲	▲
Germany	DEU	Δ	▲	Δ	▲	★	▲	Δ	Δ	Δ	Δ	▲	▲	★
Greece	GRC	○	Δ	Δ	Δ	Δ	○	Δ	▲	▲	Δ		○	Δ
Hungary	HUN		Δ	○	Δ	▲	○	▲	▲	○	Δ		Δ	○
Iceland	ISL		▲	▲	Δ	★		★	▲	○	▲		Δ	Δ
India	IND		○	○	○		Δ	○	▲	○				
Indonesia	IDN		○	○	○			▲	★	○	○		○	○
Ireland	IRL	○	Δ	▲	Δ	○	★	▲	▲	▲	▲	○	▲	▲
Israel	ISR		Δ	Δ	▲	▲	★	Δ	Δ	▲	★		Δ	▲
Italy	ITA	Δ	Δ	Δ	Δ	○	Δ	Δ	○	○	○		Δ	Δ
Japan	JPN	★	▲	▲	▲	Δ	▲	○	○	▲	★	▲	★	Δ
Korea	KOR	▲	★	★	★	▲	★	○	○	★	★	○	▲	Δ
Latvia	LVA		Δ	Δ	Δ	▲		Δ	★	▲	Δ		○	Δ
Lithuania	LTU		Δ	○	Δ	★		Δ	Δ		▲		Δ	
Luxembourg	LUX	○	▲	▲	▲	Δ	Δ	★	★	○	▲		▲	
Malaysia	MYS		○	○	Δ			Δ	Δ	★	○		○	
Mexico	MEX	○	○	○	○	○	○	Δ	▲	Δ	○		○	○
Netherlands	NLD	▲	★	▲	★	★	▲	▲	Δ	▲	Δ	★	▲	Δ
New Zealand	NZL	★	▲	▲	▲	★	Δ	▲	Δ	▲	▲		★	▲
Norway	NOR		▲	▲	▲	▲	Δ	▲	Δ	▲	▲	★	Δ	▲
Poland	POL		○	▲	○	Δ	Δ	○	★	Δ	Δ	○	▲	○
Portugal	PRT	▲	Δ	○	Δ	○	Δ	▲	▲	Δ	○		○	Δ
Russian Federation	RUS		○	Δ	Δ	★	○	○	Δ	Δ	★		○	○
Slovak Republic	SVK	○	○	Δ	○	Δ		Δ	▲	○	Δ	○	Δ	▲
Slovenia	SVN	Δ	Δ	Δ	Δ	▲	Δ	Δ	Δ	Δ	Δ		▲	▲
South Africa	ZAF		○	○	○	Δ	Δ	Δ	Δ	○	○			○
Spain	ESP	Δ	Δ	Δ	Δ	▲	▲	Δ	Δ	Δ	Δ		Δ	Δ
Sweden	SWE	★	▲	★	▲	▲	○	▲	Δ	▲	▲	★	Δ	★
Switzerland	CHE	★	★	Δ	▲		▲	★	★	Δ	▲		▲	★
Turkey	TUR		○	○	○	▲	○	○	○	Δ	○		○	○
United Kingdom	GBR	▲	▲	▲	★	Δ	▲	Δ	▲	Δ	▲		▲	★
United States	USA	▲	▲	▲	★	Δ	▲	○	○	★	★	Δ	Δ	Δ
EU28	EU28	Δ	▲	▲		Δ	▲	▲	▲		Δ		Δ	▲

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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