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Estonia

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ESTONIA

Estonia is a small European economy, which has experienced turbulence since 2008 from contraction of 14.1% in 2009, to growth of 9.6% in 2011, to growth of just 0.8% in 2013. Following the Knowledge-Based Estonia II Research and Development and Innovation Strategy (2007-13), the government has created two medium-term strategies: the Estonian Research and Development and Innovation Strategy (2014-20) and the Estonian Entrepreneurship Growth Strategy (2014-20).

Hot issue 1: Improving framework conditions for innovation (including competitiveness). Estonia has a conducive business environment, and an improved supply of venture capital (Panel 1^j, ^h). Through the Estonian Entrepreneurship Growth Strategy, the government aims to shift to a market-based approach to public support, with fewer direct grants and more financial instruments, including venture capital. In addition to project financing, it will put services (e.g. strategic business analysis, project planning, and capacity building for enterprises) at the heart of its support for business innovation. Over 2014-20, the government has allocated USD 155 million (EUR 85 million) for the Entrepreneurs' Development Programme and Innovation Voucher scheme, USD 87 million (EUR 48 million) for various entrepreneurship schemes, and USD 12.7 million (EUR 7 million) for innovative start-ups (Start-up Estonia).

Hot issue 2: Targeting priority areas/sectors. Investing in smart specialisation high-growth areas to increase the return on public investment in R&D is the guiding principle for targeting priority areas. The new R&D and Innovation (RDI) Strategy (2014-20) prioritises RDI investments selected and managed by the smart specialisation method to foster faster growth in the selected fields. These are: ICT, including the use of ICT in industry and other sectors, cyber-security and software development; health technologies and services, including biotechnology, e-health (IT use in the development of medical services and products); and more effective use of resources, including materials science and industry, innovative construction, i.e. "smart houses", health-promoting foods, chemical industry (more effective use of oil shale). The Estonian Entrepreneurship Growth Strategy targets the same priority areas as above, and both strategies have the same focus.

Hot issue 3: Encouraging innovation in firms and supporting entrepreneurship and SMEs. During the decade ending in 2012, BERD grew faster than in most OECD countries and has reached the OECD median (Panel 1^d). Innovation performance, however, has yet to reach OECD levels (Panel 1^e, ^f, ^g). BERD is concentrated in medium-high to low-technology manufacturing and services (Panel 2) and in a small number of firms. Productivity growth and higher employment through capital deepening and structural change to higher added value activities are central objectives of the government's economic policy. Innovation is considered essential to achieving these goals and the government is committed to stimulating business R&D and innovation through direct funding and non-financial measures with a combined budget of USD 255 million (EUR 140 million) over 2014-20. The Entrepreneurs' Development Programme was launched in 2013 to increase the international competitiveness of Estonian firms through better strategic planning, R&D and skills development. Launched in 2012, the Baltic Innovation Fund (BIF), with USD 182 million (EUR 100 million) for 2013-16, will invest in private equity and VC funds in Estonia, Latvia and Lithuania.

Hot issue 4: Improving the returns to and impact of science. Public research has improved significantly over more than a decade. Today, Estonia has a relatively strong public research system, with a high level of public R&D expenditures and strong performance in terms of international scientific publications (Panel 1^a, ^c). The system is quite well connected to global knowledge and innovation networks (Panel 1^q, ^r). However, industry-science linkages are not very strong (Panel 1^o). Efforts are being made to strengthen interactions between the scientific and business communities. For example, the University of Tartu has adopted a new governance structure that involves external partners in the university's management. The government has a programme for training doctoral students in co-operation with firms as well.

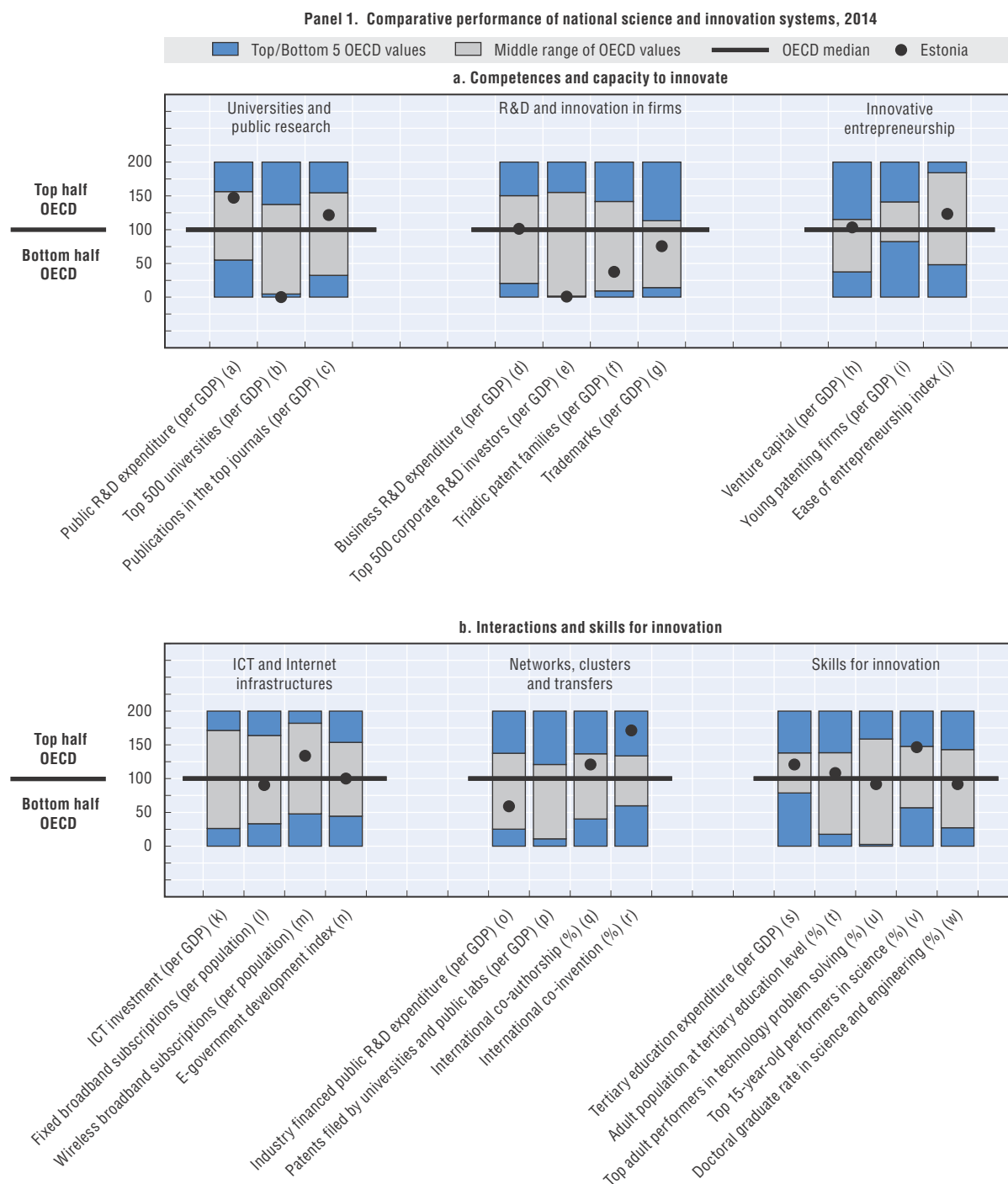
Highlights of the Estonian STI system

STI policy governance: The two new medium-term strategies mentioned above were prepared together in a co-ordinated

Key figures, 2013

Economic and environmental performance	EST	OECD	Gross domestic expenditure on R&D	EST	OECD
Labour productivity			GERD		
GDP per hour worked, USD PPP, 2013	29.3	47.7	Million USD PPP, 2012	710	1 107 398
(annual growth rate, 2008-13)	(+2.2)	(+0.8)	As a % of total OECD, 2012	0.1	100
Green productivity			GERD intensity and growth		
GDP per unit of CO ₂ emitted, USD, 2011	1.3	3.0	As a % of GDP, 2012	2.19	2.40
(annual growth rate, 2007-11)	(-4.4)	(+1.8)	(annual growth rate, 2007-12)	(+14.2)	(+2.0)
Green demand			GERD publicly financed		
NNI per unit of CO ₂ emitted, USD, 2011	1.3	3.0	As a % of GDP, 2012	0.84	0.77
(annual growth rate, 2007-11)	(-4.4)	(+1.6)	(annual growth rate, 2007-12)	(+10.1)	(+2.8)

Figure 9.13. Science and innovation in Estonia



process. Based on the 2011 amendments of the Organisation of Research and Development Act (ORDA), several changes in governance have been made since 2012. The Estonian Research Council was established in March 2012 and combines the functions of several previous bodies (the Estonian Science Foundation, the Research Competence Council, and the Department of International Co-operation of the Archimedes Foundation). A strategic aim of the Estonian R&D and Innovation Strategy (2014-20) is to strengthen the role of branch ministries in supporting R&D in socioeconomically important areas. Representatives of these ministries are being invited to the advisory bodies of the Ministry of Research and the Ministry of Economic Affairs and Communication (MEAC) and are involved in preparations to join international research networks (such as joint programming initiatives).

New challenges: Energy, sustainable development and environmental issues are increasingly important government priorities. In 2008-15 the Estonian government has six national programmes in support of R&D in energy technology, ICT, biotechnology, health, environment technology and material technology. The Estonian Energy Technology Programme is a co-operative programme involving research, business and the state to develop oil shale technologies and new, mainly renewable, energies. The centres of excellence and competence centres also target ICTs, the environment, new materials, health care and medicine.

Universities and public research: In 2010, the government adopted a Research Infrastructures Roadmap for upgrading existing research infrastructures and creating new ones. It lists 20 research infrastructures of national importance to guide public investments in R&D infrastructures over the next 10-20 years. Over 2007-13, investments in R&D infrastructures – USD 322 million (EUR 177 million) – were largely funded by EU Structural Funds. In continuing to modernise R&D infrastructures, the government's priorities

are to achieve sustainable funding and maintenance of R&D infrastructures and to support the effective use and sharing of these infrastructures, including with the business sector. The Research Infrastructures Roadmap will be renewed in 2014.

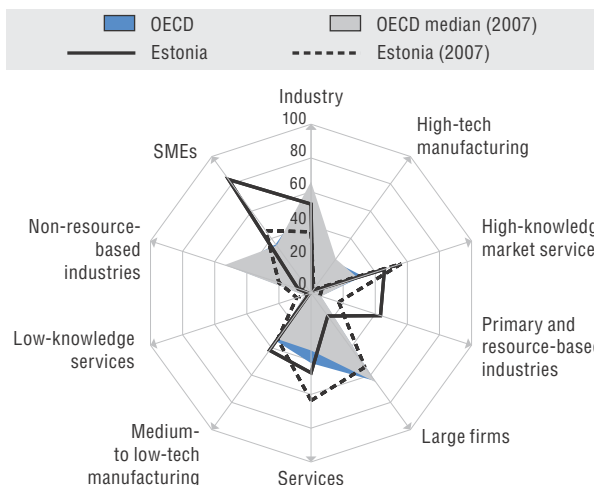
Clusters and smart specialisation: A smart specialisation strategy serves as the overall theme of several government policies. The government aims to harmonise the priorities of R&D, higher education and enterprise policies through such a strategy. Instruments to support smart specialisation include co-operation schemes (such as competence centres and clusters), demand-side measures, and the Start-up Estonia programme.

Skills for innovation: Estonia already has a good skills base, and its 15-year-olds perform very well in science (Panel 1^{s, t, v}). With regard to skills development, the government's priorities are to continue to develop human resources with a focus on engineers, to turn brain drain into balanced brain circulation, and to increase the attractiveness of careers in research. The R&D and Innovation Strategy aim for 300 PhD graduates a year by 2020. The Estonian Euraxess Services Network provides information services and customised assistance for increasing the inward and outward mobility of foreign and Estonian highly skilled people. To address the relatively low rate of doctoral graduates in S&E (Panel 1^w), several public initiatives aim to raise young people's interest in S&T careers. For 2014-20 specific measures are being planned to support the development of human resources and to raise the quality of teaching.

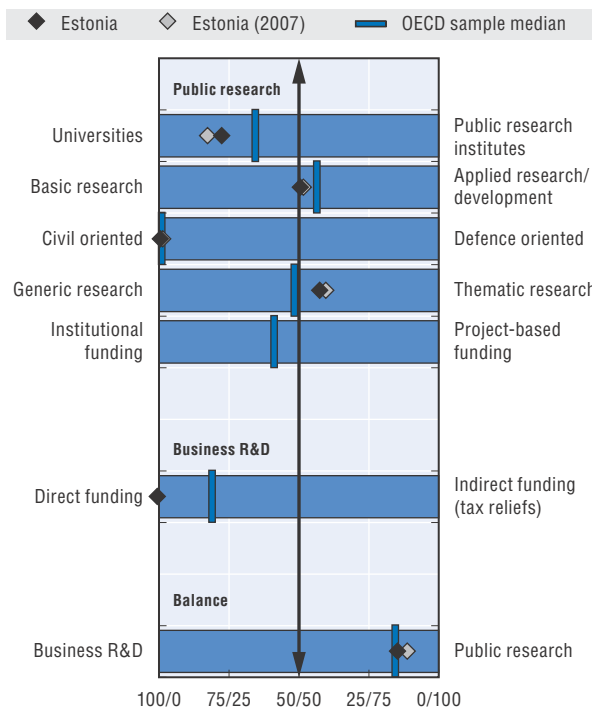
Recent developments in STI expenditures: Estonia has had one of the fastest increases in GERD in the OECD area, averaging 14.2% a year over 2007-12. In spite of the recent economic crisis, GERD rose from 1.28% of GDP in 2008 to 2.19% of GDP in 2012. The Strategy for R&D and Innovation targets GERD at 3% of GDP and BERD at 2% of GDP by 2020.

Panel 2. Structural composition of BERD, 2011

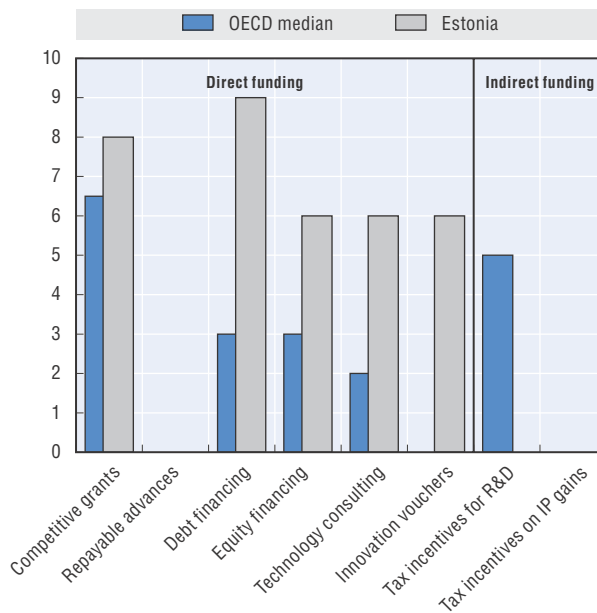
As a % of total BERD or sub-parts of BERD



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. Estonia's responses are available in the OECD STI Outlook Policy Database, edition 2014 at <http://qdd.oecd.org/Table.aspx?Query=FCDF672A-33EF-4A60-A1B8-36DA2DA48EAD>.

Source: See reader's guide and methodological annex.

StatLink <http://dx.doi.org/10.1787/888933152132>

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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