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Denmark

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DENMARK

Denmark is a highly developed European economy with strong business innovation and the world's leading renewable energy technology. The Innovation Strategy: Denmark A Nation of Solutions (2012-20), launched in December 2012, represents a shift to a demand-driven innovation policy approach, with enhanced knowledge flows and stronger innovation capabilities in the educational sector.

Hot issue 1: Improving the framework conditions for innovation (including competitiveness). Except for availability of venture capital, which is on par with the OECD median, Denmark ranks near the top among OECD countries on the Ease of Entrepreneurship Index (Panel 1^l), and the entrepreneurship environment has improved regularly over the last decade. Since November 2013, the Danish Growth Fund (*Vækstfonden*) can support Danish entrepreneurs with subordinated loans. Other new initiatives to facilitate entrepreneurship include the Green Entrepreneurship House and the Entrepreneurial Company Registration (IVS). The tax on capital gains from unlisted portfolio shares, also known as the entrepreneurship tax, was abolished as part of the 2012 tax reform; as part of the growth plan adopted in April 2013, the government has increased efforts to diffuse knowledge on IPRs to companies and entrepreneurs, particularly to designers and creative industries, as well as to students. Since July 2013, initiatives have been launched to enhance enforcement of IPR rules by the police and public prosecutors. Standard contracts for commercialisation aim to make it easier for large and small businesses in creative industries to collaborate on the commercialisation of designs and ideas.

Hot issue 2: Innovation to contribute to structural adjustment and new approaches to growth. Denmark is a leader among OECD countries in terms of its RTA in bio- and nano-technologies and environmental technologies (Panel 3). The Danish government has commissioned eight growth teams with members from industry in areas in which Danish businesses are or can be internationally competitive. Based on their recommendations the government has published specific growth plans for each of the following seven areas: the Blue Denmark; Creative Industries and Design; Water, Bio and Environmental Solutions; Health and Care Solutions;

Energy and Climate; Food Sector; and Tourism and Experience Economy. A growth plan for ICT and Digital Growth remains to be published. The plans address specific barriers to investment and focus on areas in which new markets can be developed. For example, government regulations mandating efficiency improvements in the wastewater sector could help to develop more cost-effective technology, through which savings can be achieved in the cost of wastewater treatment for large businesses that currently pay higher costs to treat their wastewater. In terms of corporate development activities, the creation of a single, transparent and efficient means of access to Danish health data could attract medical research to Denmark.

Hot issue 3: Improving overall human resources, skills and capacity. Overall, Danish STI skills lie in the mid-range of OECD countries (Panel 1^{l, u, v, w}), although expenditure on higher education and the rate of PhD graduates in science and engineering are at the top of the mid-range of OECD countries (Panel 1^{s, w}). Denmark's national innovation strategy includes a range of initiatives to strengthen innovation capacity through education. The government anticipates that at least 25% of a youth cohort will complete a master's degree by 2020, and that the uptake of PhD students will remain at the 2010 level of 2 400 a year. The Danish government established (end of 2013) the Quality Committee (*kvalitetsudvalget*) to look into how to improve the quality and relevance of higher education.

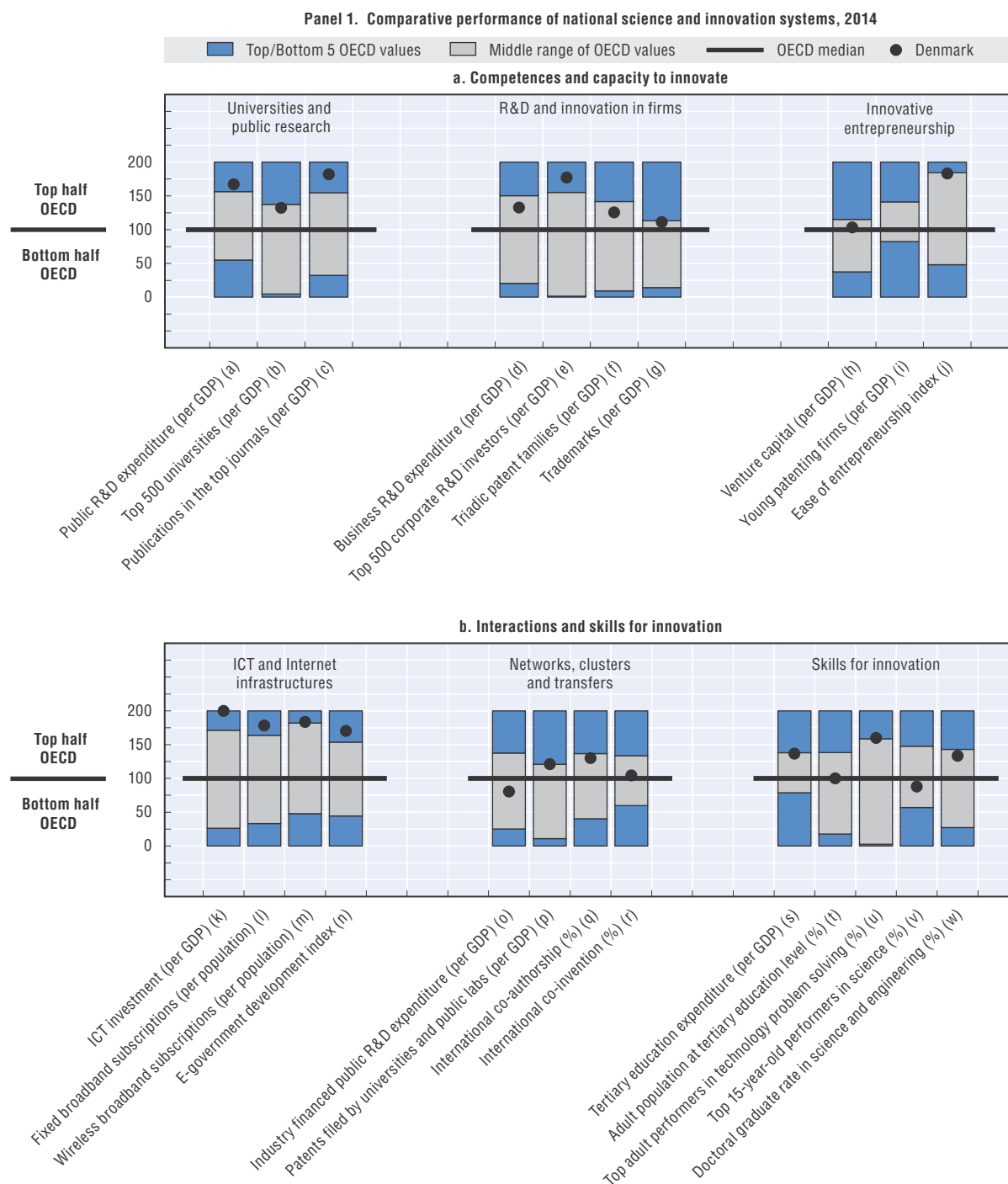
Highlights of the Danish STI system

STI policy governance: One of the initiatives of the Danish innovation strategy is to create a coherent and cross-cutting research and innovation council. As a result, the Danish National Advanced Technology Foundation, the Danish Council for Technology and Innovation, and the Danish Council for Strategic Research have been merged into a new foundation (*InnovationsFonden – Denmark*). In 2013, the Ministry of Higher Education and Science (MHES) called on a broad variety of stakeholders to prepare the so-called INNO+ catalogue containing promising focus areas for strategic investments in innovation. In November 2013, five focus areas were selected and are to be carried out as part-

Key figures, 2013

Economic and environmental performance	DNK	OECD	Gross domestic expenditure on R&D	DNK	OECD
Labour productivity			GERD		
GDP per hour worked, USD PPP, 2013	61.6	47.7	Million USD PPP, 2012	7 138	1 107 398
(annual growth rate, 2008-13)	(+0.7)	(+0.8)	As a % of total OECD, 2012	0.6	100
Green productivity			GERD intensity and growth		
GDP per unit of CO ₂ emitted, USD, 2011	4.3	3.0	As a % of GDP, 2012	2.98	2.40
(annual growth rate, 2007-11)	(+5.5)	(+1.8)	(annual growth rate, 2007-12)	(+2.0)	(+2.0)
Green demand			GERD publicly financed		
NNI per unit of CO ₂ emitted, USD, 2011	4.7	3.0	As a % of GDP,	n.a.	0.77
(annual growth rate, 2007-11)	(+5.6)	(+1.6)	(annual growth rate, 2007-12)	(+4.4)	(+2.8)

Figure 9.12. Science and innovation in Denmark



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

nerships addressing social challenges. The five areas selected for 2014 are: blue jobs via green solutions; intelligent, sustainable and efficient plant production; Denmark as a preferred country for early clinical testing of new medicines; water-efficient industrial production; and building renovation of world-class standard. The mandate of the Danish Council for Research Policy was widened as of spring 2014 to include technological development and innovation. The development of quantitative impact assessments is continuing, and the Central Innovation Manual on Excellent Econometric Impact Analyses of Innovation Policy (CIM) has been updated and is now called CIM 2.0.

New sources of growth: To encourage the business sector's contribution to growth and job creation, new societal innovation partnerships to start next year will focus on accelerating innovation efforts in areas in which Denmark has a solid knowledge base and a strong business-sector advantage. The five areas selected from the INNO+ catalogue as priorities so far will receive funding from the *InnovationsFonden – Denmark*.

New challenges: The Fund for Green Business Development was established in 2013 and will be extended through 2016. It provides grants to Danish companies to help address increasing resource scarcity, raise business competitiveness and growth and make environmental improvements. The fund runs a programme to promote green industrial symbiosis between companies so that waste or reserves of a given resource, e.g. water or materials, of one company become a resource for another company.

Universities and public research: Denmark has a strong science base, which has been increasingly dominated by universities over the past five years (Panel 4). Public expenditures on R&D were among the top five OECD countries (Panel 1^a). Danish scientists perform well in terms of S&T publications in top international journals and patent applications (Panel 1^{c, p}). The University Act was amended to give universities more autonomy for arranging their management structures. As part of the government's

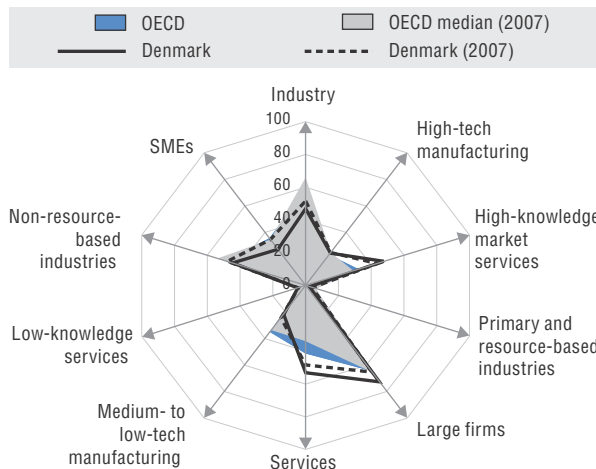
effort to increase the internationalisation of higher education, a two-part action plan has been launched. The first part, Enhanced insight through global outlook, focuses on sending more Danish students to study abroad, creating stronger international learning environments, and improving Danish students' foreign language skills. The second part, Denmark – an attractive study destination, focuses on attracting the most capable international students and retaining international graduates in Denmark. Danish universities are also in the process of implementing open access policies regarding research data.

Innovation in firms: While the ratio of BERD and triadic patents to GDP are at the top of the mid-range of OECD countries (Panel 1^{d, f}), Denmark has a large share of leading global corporate R&D investors for the size of its economy. The Market Development Fund (2013-15), a new type of initiative, supports the development process just before commercialisation, when a functioning prototype must be customised to fit the demands of the market. The fund co-finances facilitation of end-consumer testing and adaptation of the new product or service, thereby shortening the developer's time to market and strengthening the potential for growth and employment. In 2013 the Danish Growth Fund introduced subordinated loans to facilitate the access of SMEs to debt financing. In 2012 a tax credit scheme was introduced to provide the opportunity for firms with a negative balance sheet to obtain a credit for the tax value of their R&D expenditures. The scheme has greater impact on young small innovative companies owing to a built-in maximum of R&D expenditure to be granted a tax credit. The maximum is increased fivefold from 2012.

Technology transfer and commercialisation: Danish universities and PRIs are active in patenting (Panel 1^p) although the share of public R&D expenditures financed by industry is slightly below the OECD median (Panel 1^o). The new innovation strategy: Denmark A Nation of Solutions (2012-20) focuses on better knowledge exchange between companies and knowledge institutions, between public and private sectors, as well as across national borders.

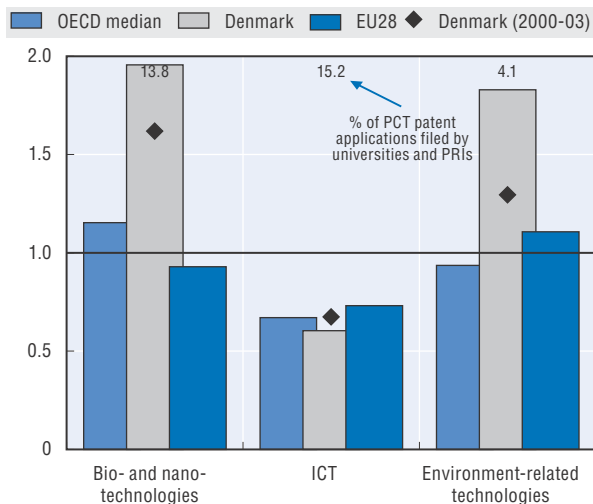
Panel 2. Structural composition of BERD, 2011

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

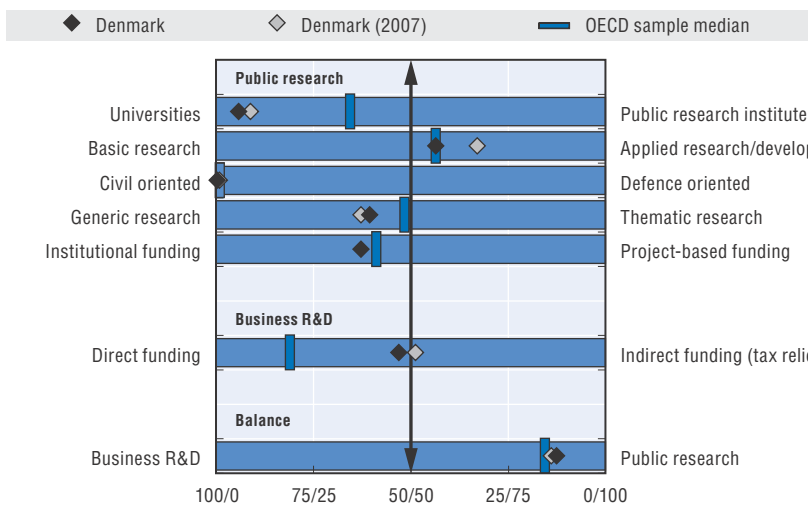


Panel 3. Revealed technology advantage in selected fields, 2009-11

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. Denmark's responses are available in the OECD STI Outlook Policy Database, edition 2014 at <http://qdd.oecd.org/Table.aspx?Query=1033BA05-5BA0-4FC9-9990-F4A19F2AF649>.

Source: See reader's guide and methodological annex.

StatLink <http://dx.doi.org/10.1787/888933152128>

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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