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France

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FRANCE

The French economy is the second largest in the euro zone and has grown modestly in recent years. A marked deindustrialisation has implications for the competitiveness of the French export industry. In view of this, mobilising STI to promote innovation-based growth is at the top of the policy agenda.

Hot issue 1: Contributing to structural adjustment and the new approach to growth. France puts innovation at the heart of its policy for growth, which focuses on new industrial policy, particularly on “managing” the energy transition and on information technology. Policies to promote business R&D and the development of young firms have been strengthened and a number of specific plans have been announced. The New Face of Industry in France, of September 2013, selected 34 industrial activities that will benefit from co-ordinated state support and business efforts to commercialise new technologies (e.g. fuel efficient car, digital hospital, e-education tools), by 2020. A complementary plan, the New Deal for Innovation (November 2013), includes 40 measures to evaluate public policies, to foster an entrepreneurial culture, to facilitate technology transfer and to encourage the growth of innovative firms (by facilitating their access to markets, finance, intellectual property, etc.).

Hot issue 2: Addressing social challenges (including inclusiveness). France aims to improve the contribution of public research to meeting major societal challenges (the environment, ageing). This will be a major component of the National Strategy for Research French (SNR) being elaborated in the first half of 2014 through broad consultation with stakeholders, notably PRIs. The implementation plan will identify the needed resources. It will be linked with the Investments for the Future (PIA), with a budget of USD 23.8 billion (EUR 20 billion) for research and innovation over 2010-20.

Hot issue 3: Reforming the public research system. The French public research system continues to evolve. Measures have been implemented to strengthen the links between PRIs, universities, and social and economic stakeholders. Better integration of universities, engineering and business schools (*grandes écoles*) and PRIs is also a priority. This

includes a programme funding excellent teams that are affiliated both to PRIs and to universities through the PIA. A new evaluation agency for universities and PRIs established in 2014 (the HCFERES) has a status that guarantees its independence from the evaluated parties.

Hot issue 4: Increasing returns to and impact of science. To strengthen the competitiveness of businesses and address societal challenges through the commercialisation of public research and the reduction of the time to market of business R&D is a main goal of French policy and is linked to the EU Horizon 2020 agenda. A plan with this goal was established in 2012-13, and the New Deal for Innovation also includes some specific measures. Entrepreneurship courses are now given in all universities. Technology Transfer Acceleration Companies (SATT), are being set up as part of the PIA with a specific business plan and professional staff. Joint PRI-SME labs are being supported. The PIA also funds several dedicated joint research facilities of businesses and PRIs or universities, including some for developing technologies relating to the energy transition.

Highlights of the French STI system

Universities and public research: Public R&D expenditure as a share of GDP is above the OECD median (Panel 1^a). The reforms started in the mid-2000s have continued. In July 2013, a law on the missions and organisation of the higher education and research system was passed, which encourages them to associate or merge so as to reach critical mass in research and teaching.

Innovation in firms: With business R&D at 1.48% of GDP in 2012, France is just above the OECD median (Panel 1^d), but below Germany and countries in northern Europe. To boost R&D and innovation, the government has maintained the R&D tax credit, which is among the most generous in the world, with a total claim of around USD 6 billion a year (EUR 5 billion). It has also taken a number of measures to strengthen direct support, such as the 34 key industries mentioned above.

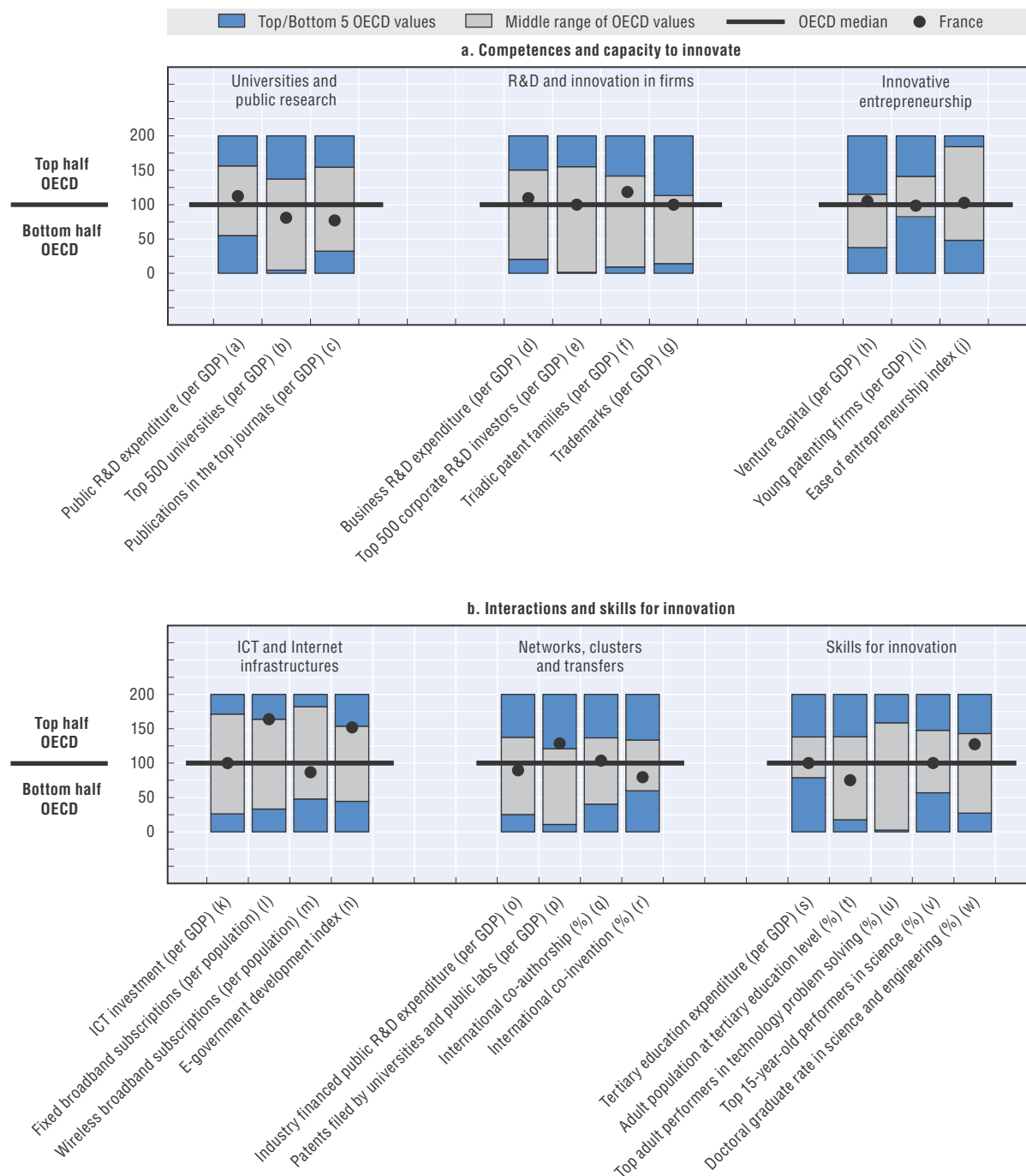
Innovative entrepreneurship: Boosting the creation and growth of innovative start-ups is a prominent goal of French policy. Recent measures include the creation of the

Key figures, 2013

Economic and environmental performance	FRA	OECD	Gross domestic expenditure on R&D	FRA	OECD
Labour productivity			GERD		
GDP per hour worked, USD PPP, 2013	61.6	47.7	Million USD PPP, 2012	55 352	1 107 398
(annual growth rate, 2008-13)	(+0.5)	(+0.8)	As a % of total OECD, 2012	5.0	100
Green productivity			GERD intensity and growth		
GDP per unit of CO ₂ emitted, USD, 2011	5.9	3.0	As a % of GDP, 2012	2.29	2.40
(annual growth rate, 2007-11)	(+3.3)	(+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	6.2	3.0	As a % of GDP, 2011	0.82	0.77
(annual growth rate, 2007-11)	(+3.2)	(+1.6)	(annual growth rate, 2007-11)	(+0.1)	(+2.8)

Figure 9.15. Science and innovation in France

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).

new *Banque Publique d'Investissement* (Bpifrance), which supports innovation by start-ups and SMEs, the broadening of the Young Innovation Firms (JEL), an instrument that supports young innovative companies, and the creation of an Innovation Tax Credit (CII) aimed at increasing innovation investments by independent SMEs. In 2011 a fund of funds (FNA), with USD 714 million (EUR 600 million), was established for seed capital. It had made 15 investments as of 30 November 2013 in digital technologies (45%), life sciences (40%) and clean technology (10%).

Technology transfer and commercialisation: PRIs file many patents (Panel 1^P). To improve the return to public research, the aforementioned law of July 2013 established technology transfer as one of the missions of PRIs. As part of the PIA, the SATT aim to achieve critical mass and the professionalism needed for technology transfer.

Clusters and smart specialisation: Since 2004, France's Competitiveness Clusters (*pôles de compétitivité*) have funded public entities' R&D projects on specific themes (e.g. nanotechnology, aerospace). Following an evaluation

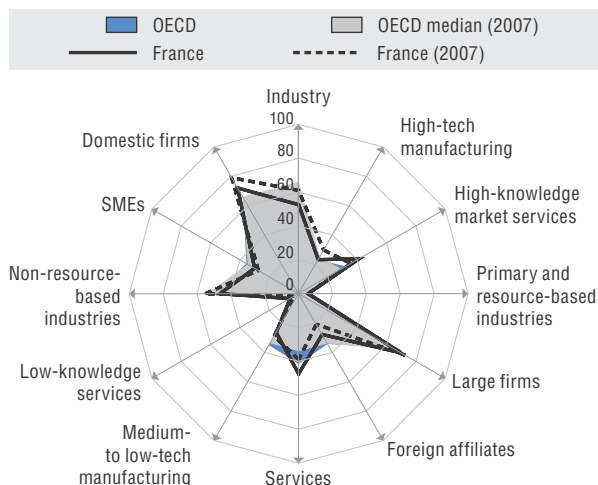
in 2012, the third phase of this policy places more emphasis on the downstream stage (i.e. prototyping and commercialisation of innovations).

Globalisation: Increasing the exposure of French researchers to foreign colleagues is an important policy goal. Several programmes help French researchers get temporary positions abroad and attract leading foreign researchers to France. For instance, the Chairs of Excellence give up to USD 2.4 million (EUR 2 million) to selected foreign researchers for a period of 18-48 months in France. In light of the modest French participation in the 7th Framework Programme, the government is actively preparing actors to participate in Horizon 2020.

Skills for innovation: The law of July 2013 expands the autonomy of HEIs, giving them greater freedom to design their curricula. France has a relatively high rate of doctoral students in S&E (Panel 1^W). Doctoral students have a new statute (the Doctoral Contract), which includes a higher salary and the possibility of teaching, consulting, etc. Student entrepreneurship is also encouraged: e.g. dedicated classes, counselling by experienced entrepreneurs, facilitated access to funding, etc.

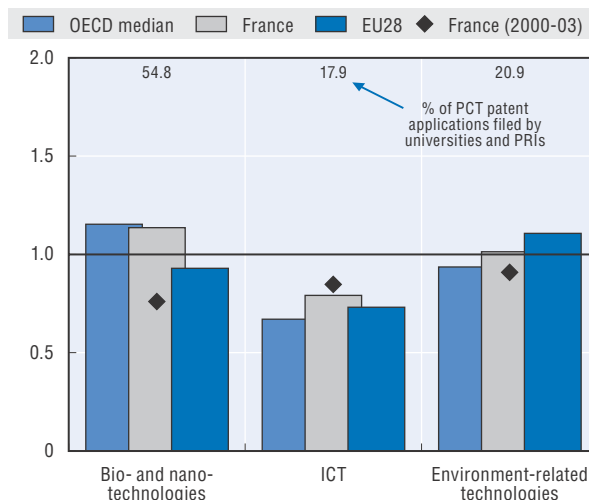
Panel 2. Structural composition of BERD, 2011

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

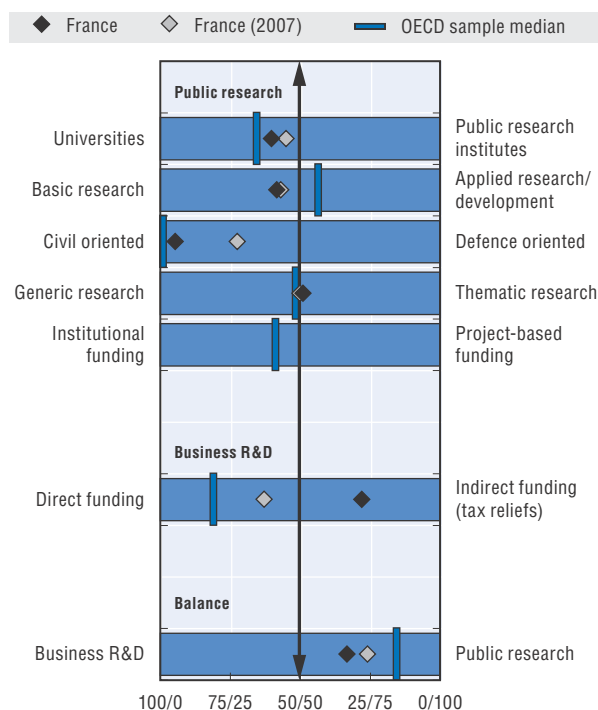


Panel 3. Revealed technology advantage in selected fields, 2009-11

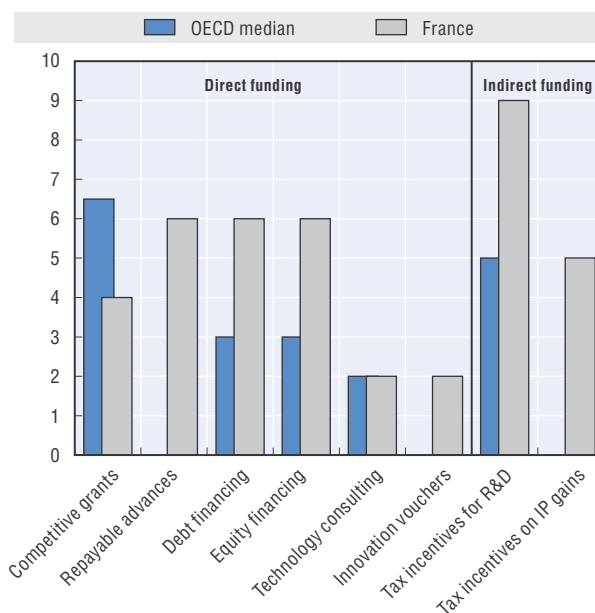
Index based on PCT patent applications



Panel 4. Allocation of public funds to R&D, by sector, type and mode of funding, 2012



Panel 5. 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. France's responses are available in the OECD STI Outlook Policy Database, edition 2014 at <http://qdd.oecd.org/Table.aspx?Query=E1A91286-E3E7-4E83-9DA9-2FE5689B1090>.

Source: See reader's guide and methodological annex.

StatLink <http://dx.doi.org/10.1787/888933152159>

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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