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Academy of Finland's State of Scientific Research in Finland Reviews

- Support Finnish universities and government research institutes in their efforts to develop their own operations
- Serve to strengthen the knowledge base for policy-making
- Produced by the Academy of Finland since late 1990s, and at two-year intervals since 2012

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State of Scientific Research in Finland Review 2018

- Content of the 2018 review
  - Research staff and research funding in universities and in government research institutes
  - Bibliometric analyses on publishing, scientific impact (citations) and co-publications
  - Special themes:
    - National goal of raising R&D investments to 4% of GDP
    - Factors related to the content of future research and the overall research conditions
- This set of slides contains selected figures and tables, and recommendations from the 2018 review
- The review as a whole is available in Finnish at www.aka.fi/tieteentila

Recommendations

Science is made by people: it is important to have attractive environments and good recruitment practices to draw in the best researchers and students.

High-quality, high-impact and attractive research and knowledge clusters are imperative for national development. These clusters will require profiling and collaboration among different actors. The building and development of the clusters will in turn require a strong funding commitment.

The opportunities offered by digitalisation and open science for the development of research and teaching provision must be seized with vigour.

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Recommendations

Science is made by people: it is important to have attractive environments and good recruitment practices to draw in the best researchers and students.

- Staff and student recruitments are the most important decisions that universities and research institutes make.
- National, international and intersectoral mobility enhances the quality, impact and renewal of science and research: mobility must be supported through career systems, recruitment practices and funding procedures.
- Multidisciplinary and phenomenon-based research is set to gain increasing importance; this must be reflected in recruitments.
- The importance of quality within individual disciplines will remain undiminished, however.
- Instead of quantitative indicators, recruitments must be based on broad assessments of scientific quality, impact and capacity for self-renewal.
- Research training must provide a strong and broad set of skills and competencies that are relevant to demanding and diverse research and advisory positions in different sectors of society.

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Recommendations

High-quality, high-impact and attractive research and knowledge clusters are imperative for national development. These clusters will require profiling and collaboration among different actors. The building and development of the clusters will in turn require a strong funding commitment.

- Successful research and knowledge clusters are nowadays often built around a phenomenon-based approach.
- These clusters are crucial to the achievement of a 4 per cent R&D intensity.
- The development of research and knowledge clusters will require strong profiling, division of labour and collaboration among research organisations.
- The building and development of these clusters should be significantly supported through a strong funding commitment.

Recommendations

The opportunities offered by digitalisation and open science for the development of research and teaching provision must be seized with vigour.

- Digitalisation is profoundly and rapidly changing both research and teaching provision.
- Open science, which includes open publishing, data and open methods, improves the quality of research and contributes to expand the use of research knowledge in society. Every support must be given to new practices.

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Research staff and funding

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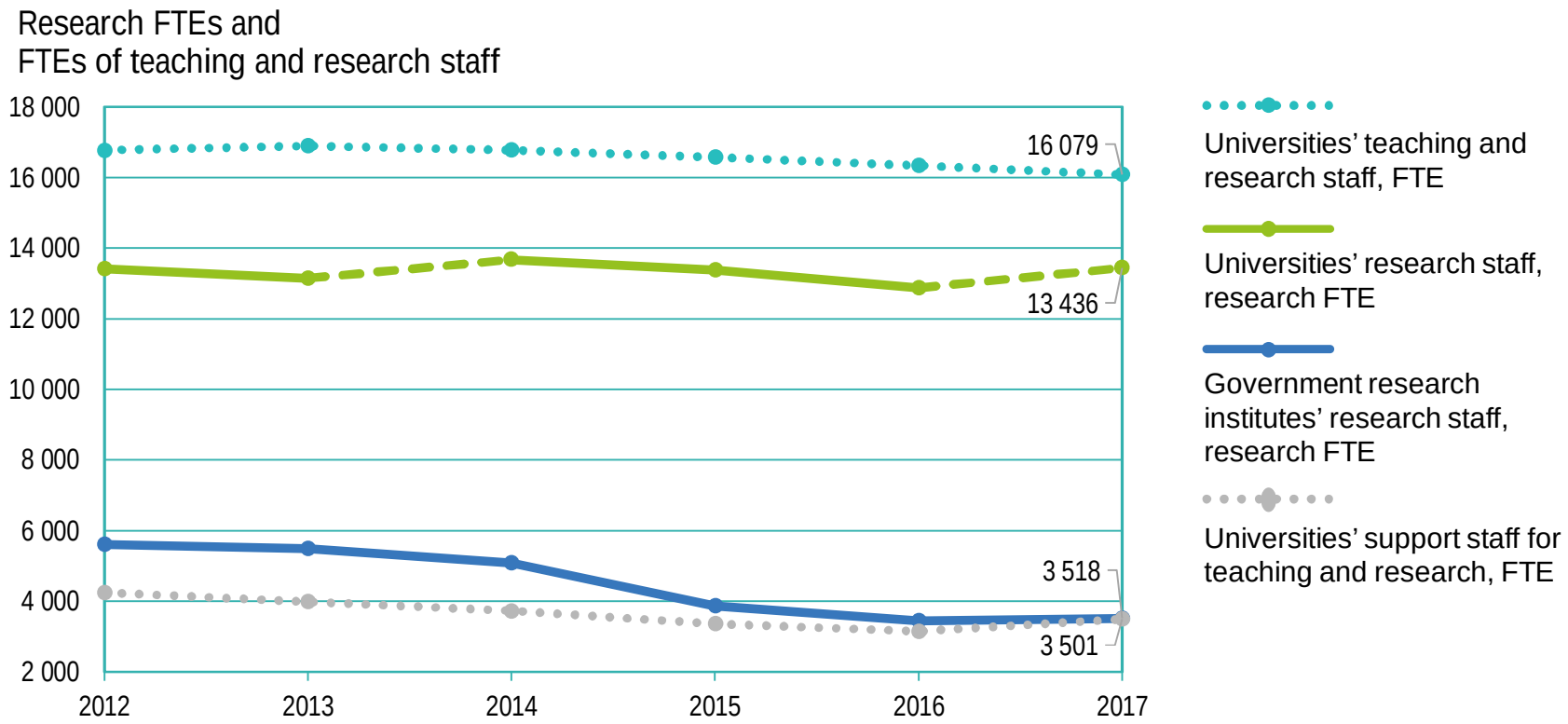
Research FTEs in universities and in government research institutes 2012–2017



Research FTE: The amount of R&D work in full-time equivalents.
FTEs of teaching and research staff: Number of teaching and research staff in full-time equivalents.
Data for government research institutes include 17 organisations in 2012 and 2013, 16 in 2014 and 12 organisations since 2015.

Sources: Statistics Finland, Research and development; Vipunen - Education Statistics Finland.

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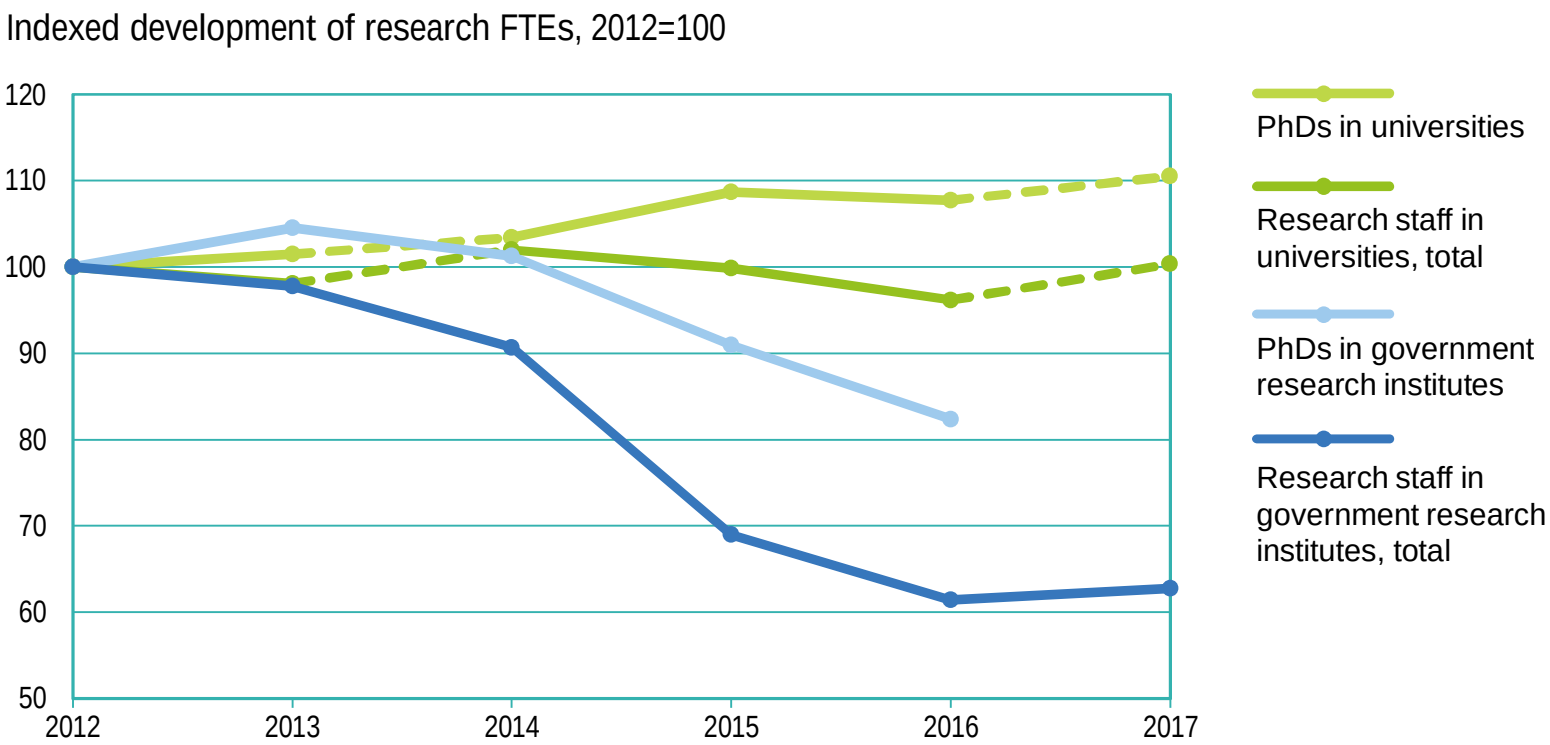
Indexed development of research FTEs in universities and in government research institutes 2012–2017



PhDs refer to all doctoral degree holders. In the university data, the method for allocating time between research and other duties has changed in 2014 and 2017 resulting a break in the time series. This is indicated with a dotted line.

Sources: Statistics Finland, Research and development.

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Universities' total funding, government core funding and sources of funding for research 2013–2017

	Funding, MEUR				
Source of funding	2013	2014	2015	2016	2017
Universities' total funding	**2,834**	**2,808**	**2,839**	**2,724**	**2,842**
of which government core funding (MinEdu)	1,726	1,732	1,756	1,689	1,647
(government core funding (MinEdu) including compensation for VAT)	(1,836)	(1,895)	(1,909)	(1,829)	(1,801)
Funding for research total	**1,216**	**1,276**	**1,278**	**1,278**	**1,323**
Government core funding	531	620	630	606	643
Universities' own funds	15	15	16	20	25
External funding	670	641	632	652	656
of which Academy of Finland	267	263	273	289	304
of which Tekes (Business Finland)	129	117	111	104	90
External funding as a percentage of total funding for research	55%	50%	49%	51%	50%

Sources: Statistics Finland, Research and development; Vipunen – Education Statistics Finland; Data from the up-to-date Central Government Budgets for 2015–2018 and the Budget proposal for 2019 (government core funding including compensation for VAT according to the financial statements for 2013–2017) » http://budjetti.vm.fi (in Finnish).

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Universities’ total funding, government core funding and sources of funding for research: definitions

Source of funding	Explanation
Universities’ total funding	Data source: National university data collection, information based on income statements
of which government core funding (MinEdu)	Data source: Ministry of Education / Education Statistics Finland
Funding for research total	**Universities' annual research expenditure by funding source** Data source: Statistics Finland (Official R&D Statistics of Finland)
Government core funding	**Research expenditure financed by university core funding** The data is computational and it is based e.g. on the working-time allocation statistics of research staff.
Universities’ own funds	Research expenditure financed by universities' own foundations etc.
External funding	**Research expenditure financed from external sources** (Research Council, firms, abroad...)
of which Academy of Finland	Research expenditure financed by the national Research Council, annual data (These figures do not indicate the total funding *granted* by the national research council.)
of which Tekes (Business Finland)	Research expenditure financed by the national innovation funding organisation
External funding as a percentage of total funding for research	The share of research expenditure financed from external sources

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Government research institutes' external funding for research by source of funding and share of funding source 2012–2016

	Funding, MEUR					Share of funding source, %				
Source of funding	**2012**	**2013**	**2014**	**2015**	**2016**	**2012**	**2013**	**2014**	**2015**	**2016**
Academy of Finland and Tekes	93.2	90.9	75.1	73.0	76.0	34	32	30	29	30
Other domestic funding	47.7	53.4	57.7	56.6	51.5	18	19	23	23	20
Business enterprise funding	77.5	75.8	66.6	64.6	66.6	28	27	26	26	26
Foreign funding	53.9	62.4	55.0	53.8	58.5	20	22	22	22	23
External funding total	**272.2**	**282.5**	**254.4**	**248.0**	**252.5**	**100**	**100**	**100**	**100**	**100**

Data for government research institutes include 17 organisations in 2012 and 2013, 16 in 2014 and 12 organisations since 2015.

Source: Vipunen - Education Statistics Finland.

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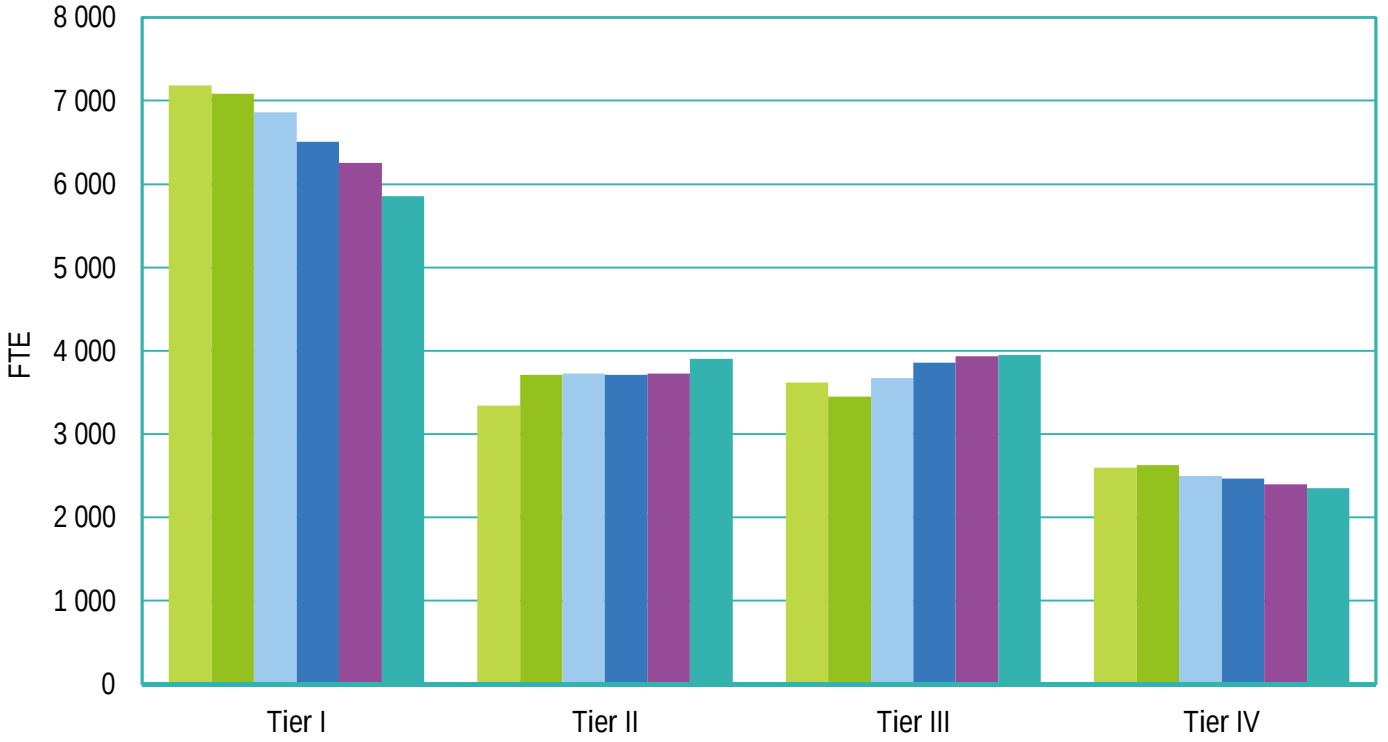
Universities' teaching and research staff in FTE by career stage 2012–2017



Examples of typical positions at different career stages in universities:

Tier I: doctoral student

Tier II: postdoctoral researcher

Tier III: university lecturer, Academy Research Fellow, associate professor

Tier IV: professor, Academy Professor, research director

Source: Vipunen - Education Statistics Finland.

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Teaching and research staff in FTE in career stages I–II and career stages III–IV by university, and the FTE ratio of fixed-term (I–II) and near-permanent (III–IV) staff in 2012 and 2017

	I–II FTE		III–IV FTE		(I–II) / (III–IV)	
University	2012	2017	2012	2017	2012	2017
Tampere University of Technology (TUT)	886	748	229	200	3.9	3.7
Lappeenranta University of Technology (LUT)	340	351	174	158	2.0	2.2
Aalto University (AALTO)	1,755	1,396	751	679	2.3	2.1
Hanken School of Economics (HANKEN)	53	68	66	66	0.8	1.0
University of Oulu (OULU)	1,031	1,065	522	479	2.0	2.2
Åbo Akademi University (ÅA)	489	383	208	180	2.4	2.1
University of Vaasa (UVA)	154	140	103	102	1.5	1.4
University of Jyväskylä (UJY)	903	867	551	577	1.6	1.5
University of Helsinki (UH)*	2,360	2,103	1,631	1,718	1.4	1.2
University of Eastern Finland (UEF)	785	744	630	689	1.2	1.1
University of Turku (UTU)	1,040	1,110	591	655	1.8	1.7
University of Tampere (UTA)	521	537	499	509	1.0	1.1
University of Lapland (ULA)	192	214	80	84	2.4	2.5
University of the Arts Helsinki (ARTS)	29	43	192	213	0.2	0.2
Universities total	**10,538**	**9,769**	**6,227**	**6,310**	**1.7**	**1.5**

* University of Helsinki (UH): As a result of a change in the statistical practices in 2017, the figures for I–II FTE and for the ratio are not fully comparable between 2012 and 2017.

Source: Vipunen - Education Statistics Finland.

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Foreign teaching and research staff in FTE and the share of foreign staff by university and by career stage in 2012 and 2017

	Foreign staff I–II FTE		Share of foreign staff in tiers I–II		Foreign staff III–IV FTE		Share of foreign staff in tiers III–IV	
University	2012	2017	2012	2017	2012	2017	2012	2017
Tampere University of Technology (TUT)	155	192	17%	26%	28	26	12%	13%
Lappeenranta University of Technology (LUT)	82	138	24%	39%	13	10	8%	6%
Aalto University (AALTO)	465	647	27%	46%	89	127	12%	19%
Hanken School of Economics (HANKEN)	13	21	25%	31%	8	13	13%	20%
University of Oulu (OULU)	200	338	19%	32%	47	52	9%	11%
Åbo Akademi University (ÅA)	127	94	26%	25%	31	21	15%	11%
University of Vaasa (UVA)	33	48	22%	34%	9	8	9%	8%
University of Jyväskylä (UJY)	126	192	14%	22%	47	51	9%	9%
University of Helsinki (UH)	592	719	25%	34%	182	220	11%	13%
University of Eastern Finland (UEF)	156	201	20%	27%	30	50	5%	7%
University of Turku (UTU)	172	212	17%	19%	48	54	8%	8%
University of Tampere (UTA)	73	84	14%	16%	28	35	6%	7%
University of Lapland (ULA)	12	19	6%	9%	2	5	2%	6%
University of the Arts Helsinki (ARTS)	2	8	6%	19%	4	21	2%	10%
Total	**2,207**	**2,913**	**21%**	**30%**	**569**	**692**	**9%**	**11%**

Data collection on foreign teaching and research staff is based on nationality.

Source: Vipunen - Education Statistics Finland.

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Career stage III–IV FTEs by gender and by disciplinary group in 2012 and 2017

Disciplinary group	Women 2012	Men 2012	Share of women 2012	Women 2017	Men 2017	Share of women 2017
Mathematics and statistics	23	171	12%	29	152	16%
Physics, geosciences, space science	45	299	13%	57	315	15%
Chemistry, chemical engineering	57	170	25%	62	139	31%
ICT and electrical engineering	71	418	14%	61	434	12%
Materials science, materials engineering	13	84	13%	26	97	21%
Engineering, other fields	63	278	18%	65	213	23%
Business studies and economics	143	286	33%	172	330	34%
Ecology, environmental science, plant biology	94	173	35%	123	178	41%
Agricultural and forest sciences	98	98	50%	81	84	49%
Biomedicine, biosciences	210	312	40%	250	299	45%
Clinical medicine	190	264	42%	201	229	47%
Health sciences	115	83	58%	128	85	60%
Behavioural sciences	341	228	60%	364	209	63%
Social sciences, other fields	279	402	41%	346	368	48%
Languages	266	162	62%	272	153	64%
Arts, literature studies	198	245	45%	212	219	49%
Humanities, other fields	131	202	39%	137	203	40%
Disciplines total	**2,340**	**3,887**	**38%**	**2,592**	**3,719**	**41%**

Source: Vipunen - Education Statistics Finland.

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Publication activity and scientific impact – Bibliometric approach

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Co-authored publications: fractional and whole counting

- **In fractional counting,** number of co-authored publications is fractionalised according to discipline, country and organisation.
  - One publication can belong to more than one discipline (subject category).
  - Fractional counting leads to the most proper field normalisation.
  - E.g. a Finnish-Swedish publication results in 0.5 publication points for both countries.
  - If researchers from three Finnish universities have contributed to the publication, each organisation gains 1/3 x 0.5 publication points.
- **In whole counting,** co-authored publications are counted as one publication for each discipline they belong to and for each country and organisation which has contributed to them.
  - Whole counting can be used to find out how many publications a country or an organisation has contributed to.
  - Whole counting is less useful for comparing countries or organisations.

Number of publications per capita, relative change in number of publications, and country's share in world's Web of Science publications in Finland and in countries of comparison 2002–2005 and 2012–2015

	Number of publications (whole counts) / 100 000 capita		Relative change	Number of publications (whole counts)		Share of publications (whole counts) in which the country's researchers have participated		Fractional number of publications / 100 000 capita		Relative change	Share of world's publications (fractional)	
Country	2002–2005	2012–2015	02/05–12/15	2002–2005	2012–2015	2002–2005	2012–2015	2002–2005	2012–2015	02/05–12/15	2002–2005	2012–2015
Netherlands	594	1,023	1.7	96,992	173,273	2.5%	2.4%	443	662	1.5	1.8%	1.5%
Belgium	509	868	1.7	53,322	97,545	1.4%	1.3%	360	534	1.5	1.0%	0.8%
Ireland	388	793	2.0	16,139	36,823	0.4%	0.5%	290	523	1.8	0.3%	0.3%
United Kingdom	559	787	1.4	337,886	512,729	8.6%	7.0%	443	539	1.2	6.8%	4.8%
Austria	456	798	1.8	37,496	68,849	1.0%	0.9%	328	493	1.5	0.7%	0.6%
China	18	95	5.1	241,690	1,306,108	6.1%	17.8%	16	85	5.2	5.5%	15.9%
Norway	541	1,089	2.0	25,007	56,529	0.6%	0.8 %	387	700	1.8	0.5%	0.5%
France	359	519	1.4	226,669	345,542	5.8%	4.7%	275	357	1.3	4.4%	3.2%
Sweden	776	1,176	1.5	70,051	115,281	1.8%	1.6%	567	748	1.3	1.3%	1.0%
Germany	390	602	1.5	317,584	491,369	8.1%	6.7%	302	425	1.4	6.2%	4.7%
Finland	674	1,058	1.6	35,384	57,986	0.9%	0.8%	510	694	1.4	0.7%	0.5%
Switzerland	913	1,552	1.7	68,290	128,558	1.8%	1.8%	621	918	1.5	1.2%	1.0%
Denmark	679	1,318	1.9	36,774	74,883	0.9%	1.0%	481	833	1.7	0.7%	0.6%
USA	434	562	1.3	1,285,888	1,805,182	32.7%	24.6%	381	456	1.2	28.7%	20.0%

Sources: Clarivate Analytics Web-of-Science-based data, bibliometric computing by CSC Ltd, 2018; OECD Main Science and Technology Indicators (data published on 24 July 2018), http://www.oecd.org/sti/msti.htm.

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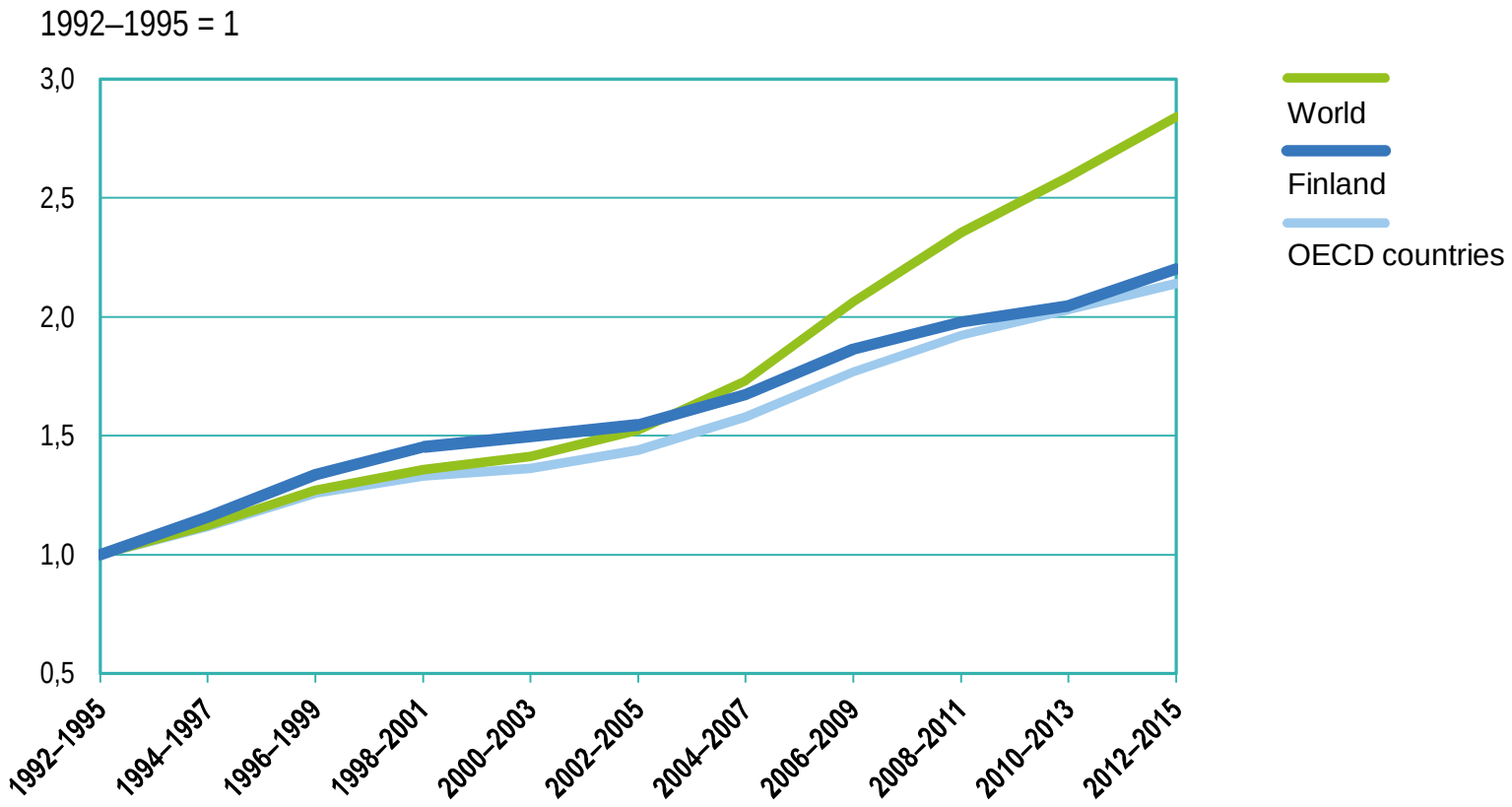
Relative change in number of Finland's publications (fractional) compared to the world and OECD countries 1992–2015



Source: Clarivate Analytics Web-of-Science-based data, bibliometric computing by CSC Ltd, 2018.

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Publication profile by disciplinary group in Finland and in countries of comparison 2012–2015

The share of publications has been highlighted when it is 0.5 percentage points higher than the world on average.

	Number of publications (fractional)	Share of country's publications, %														
Disciplinary group	Finland	Finland	NL	BE	IE	GB	AT	CN	NO	FR	SE	CH	DE	DK	US	World
Mathematics and statistics	**836**	2.2	1.3	2.4	1.8	1.9	3.6	3.2	2.2	4.5	1.7	2.7	2.1	1.3	2.1	2.7
Physics, geosciences, space science	**4,859**	12.8	9.9	12.6	10.0	11.8	13.8	14.9	11.4	18.0	11.3	17.3	16.5	10.6	11.5	13.7
Chemistry, chemical engineering	**2,490**	6.5	4.5	6.6	6.4	5.1	6.3	13.8	4.4	8.1	5.9	8.8	7.4	5.2	5.1	8.8
ICT and electrical engineering	**5,575**	14.7	7.6	10.1	11.8	8.2	13.5	16.2	9.1	12.8	10.8	10.4	9.7	8.5	8.6	12.2
Materials science, materials engineering	**1,119**	2.9	2.3	3.4	4.1	2.6	3.3	9.5	2.1	4.1	3.2	4.1	3.4	2.3	3.0	4.9
Engineering, other fields	**1,922**	5.1	3.9	4.5	4.4	4.5	5.3	11.7	8.6	4.8	6.0	5.0	4.1	5.4	4.5	6.6
Business studies and economics	**1,317**	3.5	3.0	2.3	2.3	3.0	2.4	1.7	3.2	1.9	2.4	2.1	2.1	2.4	2.2	2.1
Ecology, environmental science, plant biology	**3,120**	8.2	5.9	7.5	5.8	5.5	6.9	5.0	7.9	6.4	6.8	5.8	6.6	7.6	6.4	6.5
Agricultural and forest sciences	**1,282**	3.4	2.2	3.9	5.3	1.9	2.8	1.7	3.7	2.0	2.1	2.2	2.6	3.6	2.1	2.9
Biomedicine, biosciences	**3,373**	8.9	12.0	11.7	10.5	11.0	10.9	8.7	8.6	10.3	11.1	11.5	12.8	12.9	13.6	10.7
Clinical medicine	**5,683**	14.9	26.1	18.0	18.9	20.5	19.7	7.6	16.2	17.5	19.5	18.5	19.5	23.7	20.6	15.8
Health sciences	**1,732**	4.6	5.7	3.2	5.2	5.1	2.1	0.6	7.3	1.9	6.4	2.0	3.1	5.3	5.4	3.2
Behavioural sciences	**1,356**	3.6	4.8	3.8	3.9	4.1	2.0	1.0	3.7	1.3	2.6	2.6	2.3	1.8	4.4	2.6
Social sciences, other fields	**1,413**	3.7	4.6	3.6	4.2	6.2	2.5	1.7	5.7	1.3	4.1	2.0	2.5	3.8	4.1	2.8
Humanities	**906**	2.4	2.5	3.9	3.1	5.3	2.1	0.4	2.8	2.4	2.2	2.0	1.8	2.1	2.9	1.9
General scientific journals	**1,034**	2.7	3.7	2.7	2.2	3.4	2.9	2.6	2.9	2.7	3.9	3.0	3.8	3.5	3.4	2.7
Disciplines total	**38,019**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Country codes: NL Netherlands; BE Belgium; IE Ireland; GB United Kingdom; AT Austria; CN China; NO Norway; FR France; SE Sweden; CH Switzerland; DE Germany; DK Denmark; US United States

Source: Clarivate Analytics Web-of-Science-based data, bibliometric computing by CSC Ltd, 2018.

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Scientific impact of publications: Top 10 index as a citation indicator

- Research with the greatest scientific impact can be analysed by examining the most highly cited publications.
- **The top 10 index** describes a country's/organisation's relative share of the 10% most cited publications in the world.
- The citation indicator is scaled so that the **world average in each discipline is always one**.
- Top 10 index > 1: The share of a country's publications that belong to the most highly cited 10% of publications in their field is greater than in the world on average.
  - World = publications covered in the citation database and included in the analysis.
- **The number of citations** gained by publications is **normalised**.
  - Publications are compared to the international level within the same discipline and the same publication year.
  - Self-citations are excluded from the analysis.
  - The number of citations to co-publications are fractionalised according to discipline, country and organisation.

Development of scientific impact in OECD countries and in China according to Top 10 index 1992–2015

OECD countries are listed according to Top 10 index 2012-2015.

	Top 10 index				Number of publ. (fractional)
Country	1992–1995	2002–2005	2007–2010	2012–2015	2012–2015
Switzerland	1.25	1.1	1.50	1.51	76,006
USA	1.43	1.39	1.46	1.43	1,463,187
Netherlands	1.23	1.33	1.44	1.43	112,151
United Kingdom	1.03	1.19	1.31	1.40	351,223
Denmark	1.16	1.34	1.38	1.36	47,324
Luxemburg	0.32	0.82	1.18	1.32	2,699
Australia	0.96	1.05	1.18	1.28	182,852
Belgium	0.95	1.08	1.21	1.26	59,993
Canada	1.09	1.15	1.23	1.24	214,929
Sweden	1.16	1.11	1.18	1.23	73,337
Ireland	0.75	0.95	1.13	1.22	24,273
Finland	1.03	1.01	1.02	1.12	38,019
Germany	0.82	0.97	1.03	1.08	346,824
Norway	0.94	1.10	1.14	1.07	36,131
Austria	0.75	0.94	1.02	1.05	42,541
Israel	0.91	1.01	1.05	1.05	43,920
New Zealand	0.93	0.90	1.02	1.05	27,585
France	0.82	0.94	1.00	1.03	237,506
Iceland	1.08	1.09	1.12	1.03	2,358
Italy	0.70	0.82	0.89	0.96	228,244
Spain	0.59	0.81	0.88	0.96	192,086
Greece	0.50	0.75	0.87	0.91	39,210
South Korea	0.59	0.73	0.76	0.84	209,006
Portugal	0.60	0.80	0.84	0.83	48,419
Slovenia	0.58	0.60	0.66	0.78	12,566
Estonia	0.49	0.52	0.58	0.70	5,552
Chile	0.41	0.58	0.62	0.63	19,870
Japan	0.70	0.65	0.64	0.60	331,239
Hungary	0.45	0.60	0.57	0.58	21,117
Turkey	0.37	0.52	0.59	0.50	114,241
Poland	0.32	0.38	0.36	0.46	97,463
Mexico	0.48	0.45	0.44	0.45	44,198
Czech Republic	0.37	0.46	0.40	0.41	53,872
Slovakia	0.19	0.28	0.30	0.34	17,370
OECD countries	**1.10**	**1.09**	**1.13**	**1.14**	**4,817,491**
China	0.39	0.71	0.73	0.90	1,167,300

Source: Clarivate Analytics Web-of-Science-based data, bibliometric computing by CSC Ltd, 2018.

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Number of ERC grants per researcher FTEs in higher education and government sectors, and scientific impact (Top 10 index)

The figure includes countries with a minimum of 20 ERC grants 2008–2016 apart from Israel.

Country codes

AT	Austria
BE	Belgium
CH	Switzerland
CZ	Czech Republic
DE	Germany
DK	Denmark
ES	Spain
FI	Finland
FR	France
GB	United Kingdom
GR	Greece
HU	Hungary
IE	Ireland
IT	Italy
NL	Netherlands
NO	Norway
PL	Poland
PT	Portugal
SE	Sweden

Sources: ERC website https://erc.europa.eu/projects-figures/erc-funded-projects; OECD Main Science and Technology Indicators (data published in February 2018), http://www.oecd.org/sti/msti.htm; Clarivate Analytics Web-of-Science-based data, bibliometric computing by CSC Ltd, 2018.

ACADEMY OF FINLAND

Scientific impact in Finland and in countries of comparison by disciplinary group 2012–2015

	Number of publ. (fract.)	Top 10 index													
Disciplinary group	Finland	Finland	NL	BE	IE	GB	AT	CN	NO	FR	SE	DE	CH	DK	US
Mathematics and statistics	**836**	1.21	1.10	1.27	0.89	1.27	1.25	1.03	1.37	1.17	1.11	1.15	1.48	1.15	1.37
Physics, geosciences, space science	**4,859**	1.03	1.50	1.15	1.12	1.44	1.14	0.92	1.09	1.10	1.17	1.22	1.62	1.47	1.47
Chemistry, chemical engineering	**2,490**	0.89	1.49	1.23	1.43	1.32	0.70	1.24	0.70	0.95	1.11	1.08	1.38	1.08	1.56
ICT and electrical engineering	**5,575**	1.23	1.19	1.29	1.13	1.39	0.92	0.92	1.05	0.98	1.30	0.88	1.65	1.44	1.48
Materials science, materials engineering	**1,119**	1.03	1.40	1.32	1.41	1.31	0.87	1.00	0.72	0.86	1.17	1.02	1.66	1.35	1.56
Engineering, other fields	**1,922**	1.20	1.46	1.50	1.40	1.51	0.89	0.81	0.89	1.27	1.25	0.93	1.49	1.49	1.12
Business studies and economics	**1,317**	1.35	1.53	1.29	1.05	1.45	1.14	0.51	1.06	1.05	1.28	1.17	1.47	1.47	1.70
Ecology, environmental science, plant biology	**3,120**	1.09	1.68	1.40	1.20	1.74	1.35	0.85	1.24	1.24	1.53	1.37	1.79	1.51	1.46
Agricultural and forest sciences	**1,282**	1.29	1.78	1.48	1.72	1.55	1.20	1.33	1.38	1.51	1.41	1.07	1.29	1.73	1.33
Biomedicine, biosciences	**3,373**	1.05	1.40	1.30	1.45	1.53	1.20	0.68	0.97	1.07	1.14	1.17	1.61	1.22	1.48
Clinical medicine	**5,683**	1.16	1.42	1.33	1.13	1.32	1.07	0.71	1.20	0.97	1.34	0.99	1.36	1.37	1.42
Health sciences	**1,732**	1.02	1.30	1.25	1.35	1.32	0.92	0.96	1.08	0.84	1.01	0.88	1.33	1.14	1.22
Behavioural sciences	**1,356**	1.10	1.59	1.16	0.96	1.34	0.83	0.32	1.19	0.58	1.18	0.96	1.09	1.18	1.39
Social sciences, other fields	**1,413**	1.00	1.59	1.13	0.84	1.27	1.07	0.38	1.16	0.78	1.24	1.12	1.42	1.51	1.39
Humanities	**906**	1.31	1.37	0.78	0.91	1.37	0.81	0.64	1.08	0.52	1.16	0.88	0.89	1.52	1.28
General scientific journals	**1,034**	1.07	1.01	0.88	1.06	1.20	1.11	0.70	0.68	1.04	0.92	1.13	1.67	1.09	1.61
All disciplines	**38,019**	**1.12**	**1.43**	**1.26**	**1.22**	**1.40**	**1.05**	**0.90**	**1.07**	**1.03**	**1.23**	**1.08**	**1.51**	**1.36**	**1.43**

Country codes: NL Netherlands; BE Belgium; IE Ireland; GB United Kingdom; AT Austria; CN China; NO Norway; FR France; SE Sweden; CH Switzerland; DE Germany; DK Denmark; US United States

Source: Clarivate Analytics Web-of-Science-based data, bibliometric computing by CSC Ltd, 2018.

ACADEMY OF FINLAND

Domestic publications and international co-publications

- **Domestic publications**: all authors are affiliated with one or more organisations in one country

- **International co-publications**: authors are affiliated with organisations in at least two countries

Share of international co-publications and domestic publications in total number of publications in Finland and in countries of comparison 2002–2005 and 2012–2015

Countries are listed according to share of international co-publications 2012–2015.

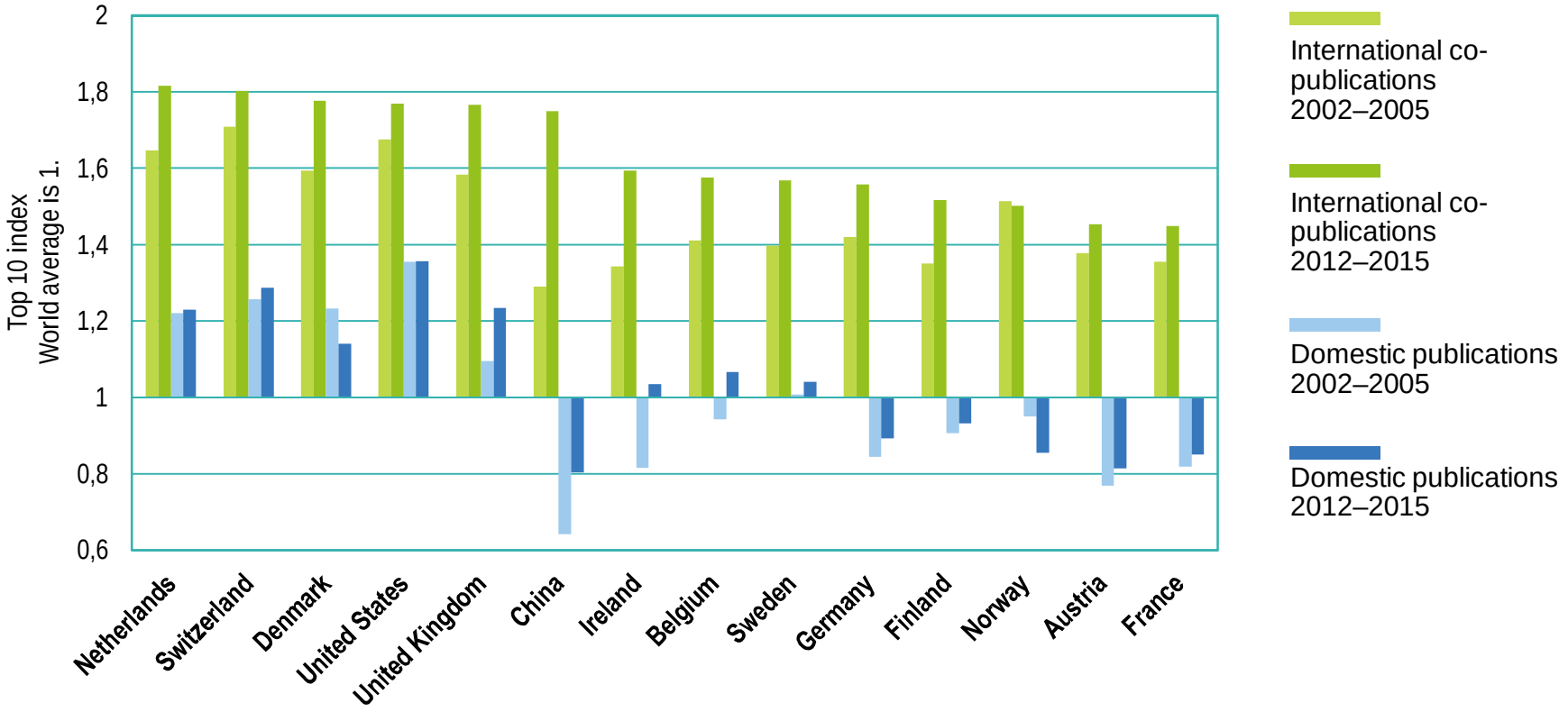
	2002–2005			2012–2015		
Country	Share of international co-publications, %	Share of domestic publications, %	Total number of publ. (fractional)	Share of international co-publications, %	Share of domestic publications, %	Total number of publ. (fractional)
Switzerland	33	67	46,489	43	57	76,006
Belgium	29	71	37,711	38	62	59,993
Austria	27	73	27,013	37	63	42,541
Sweden	26	74	51,236	35	65	73,337
Denmark	28	72	26,068	35	65	47,324
Norway	27	73	17,873	34	66	36,313
Netherlands	24	76	72,290	34	66	112,151
Ireland	25	75	12,070	33	67	24,273
Finland	22	78	26,745	32	68	38,019
United Kingdom	20	80	267,606	31	69	351,223
France	23	77	173,724	30	70	237,506
Germany	22	78	245,516	28	72	346,824
USA	12	88	1,127,372	18	82	1,463,187
China	11	89	214,447	10	90	1,167,300

Source: Clarivate Analytics Web-of-Science-based data, bibliometric computing by CSC Ltd, 2018.

ACADEMY OF FINLAND

Scientific impact of publications in Finland and in countries of comparison by type of publishing 2002–2005 and 2012–2015

Countries are listed according to Top 10 index of international co-publications 2012-2015.



Source: Clarivate Analytics Web-of-Science-based data, bibliometric computing by CSC Ltd, 2018.

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Number of publications and scientific impact of organisational groups in Finland 2012–2015

Organisational group	Number of publications (fractional)	Top 10 index
Universities	26,456	1.15
Government research institutes	4,250	1.11
University hospitals	3,107	1.11
Business enterprises	1,526	1.02
Universities of applied sciences	383	0.44
Other organisations	2,338	0.91
Organisational groups total	**38,060**	**1.12**

Source: Clarivate Analytics Web-of-Science-based data, bibliometric computing by CSC Ltd, 2018.

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Special theme: Towards 4% R&D intensity

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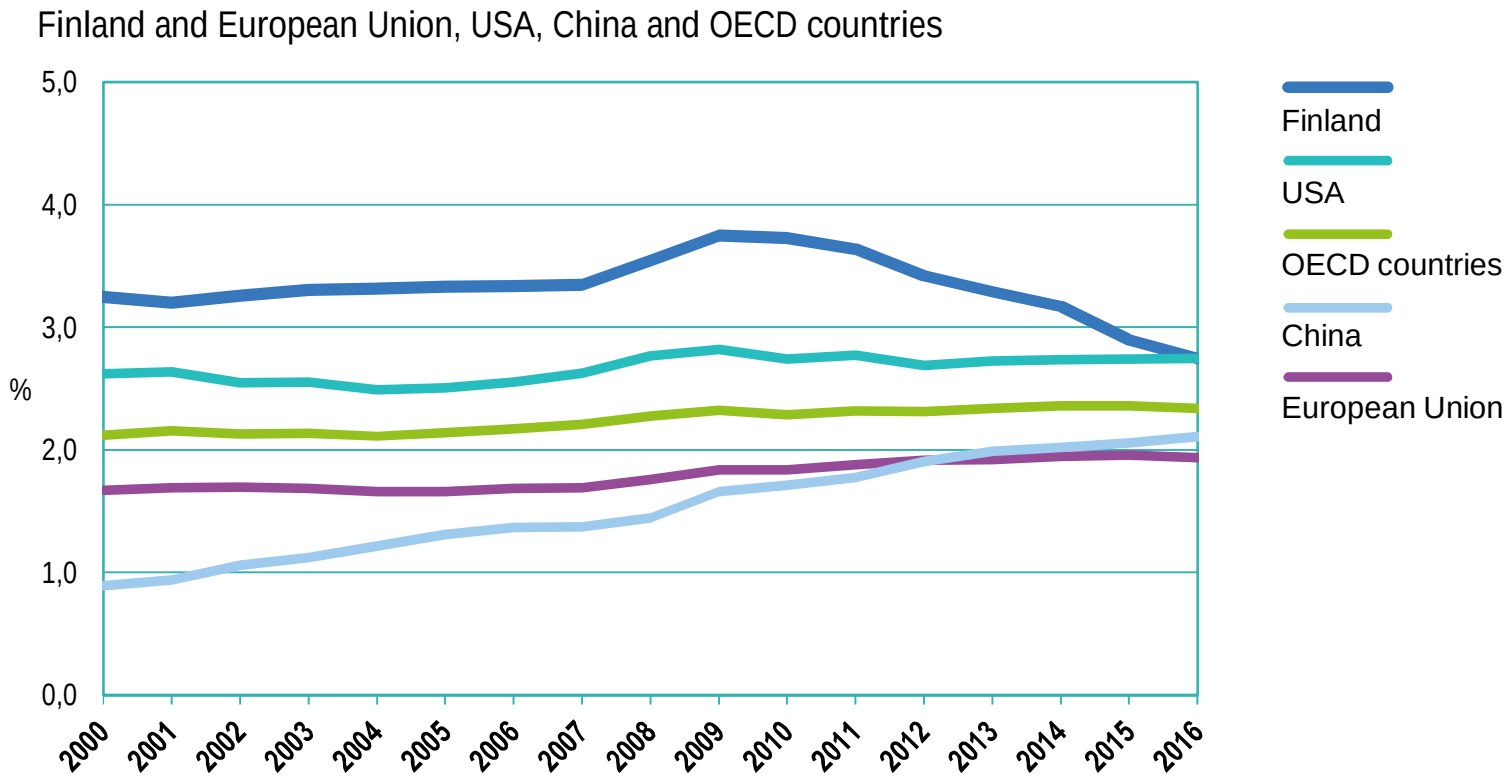
R&D intensity in Finland in international comparison 2000–2016

The vertical axis shows the R&D expenditure as percentage of GDP.

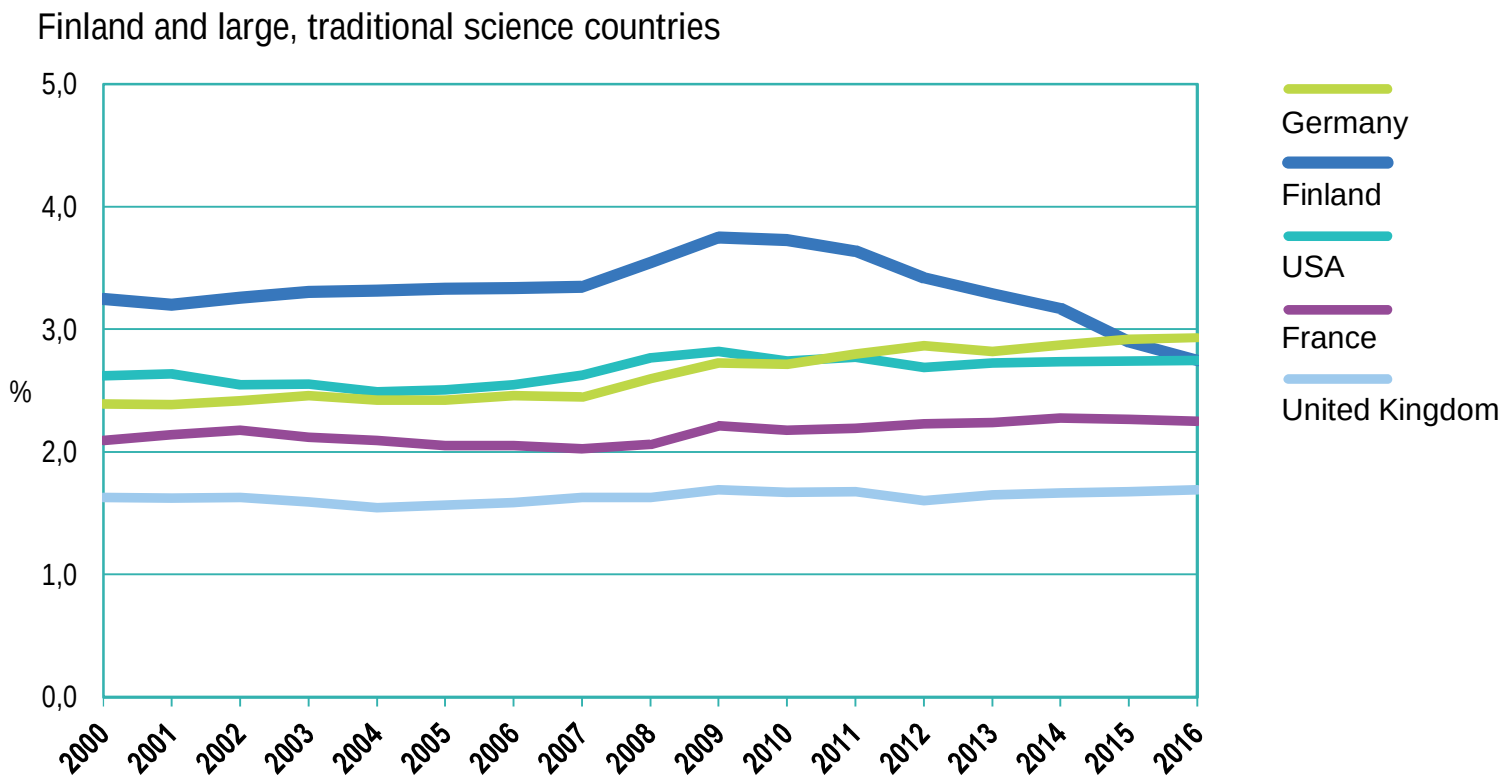


Source: OECD Main Science and Technology Indicators (data published on 24 July 2018), http://www.oecd.org/sti/msti.htm

ACADEMY OF FINLAND

R&D intensity in Finland in international comparison 2000–2016

The vertical axis shows the R&D expenditure as percentage of GDP.



Source: OECD Main Science and Technology Indicators (data published on 24 July 2018), http://www.oecd.org/sti/msti.htm

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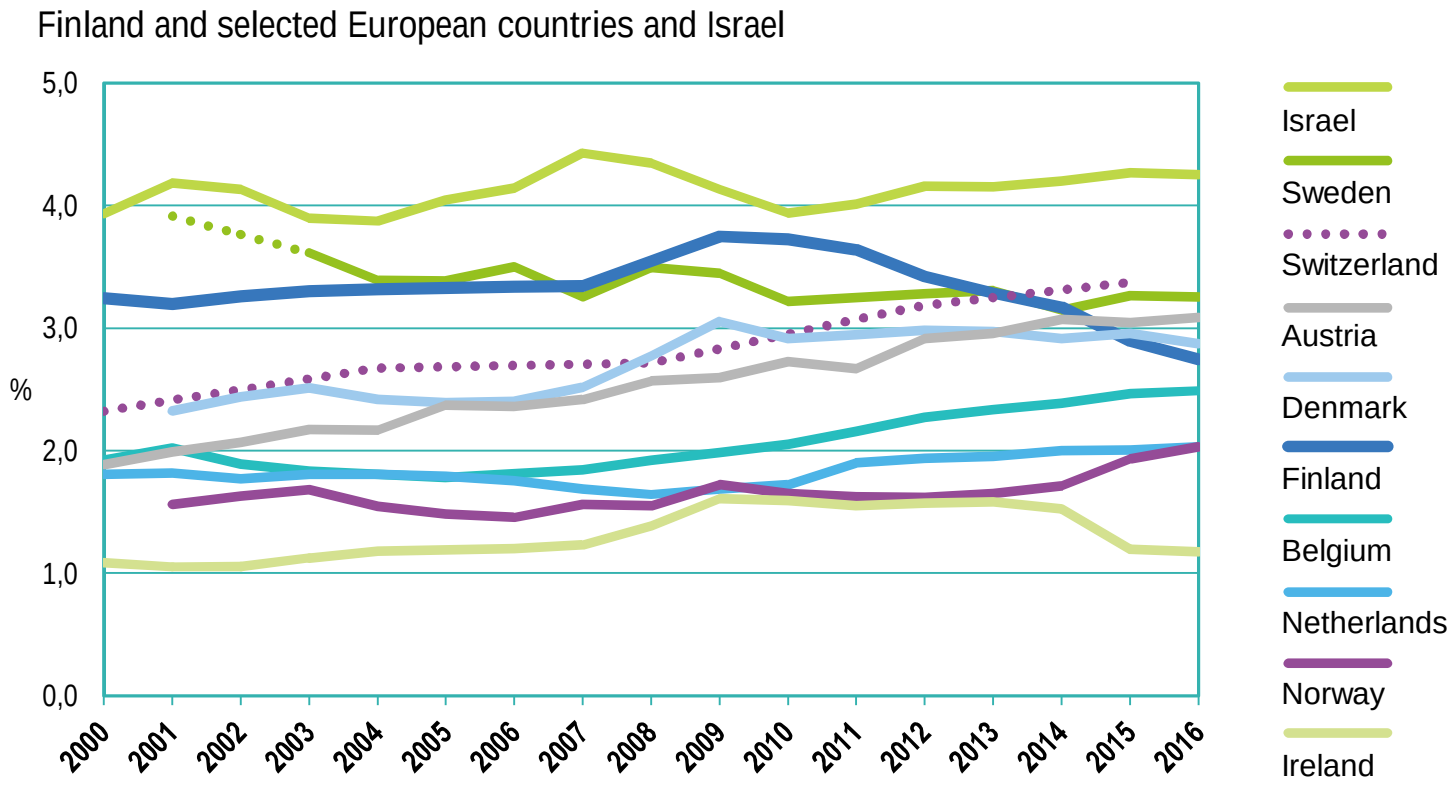

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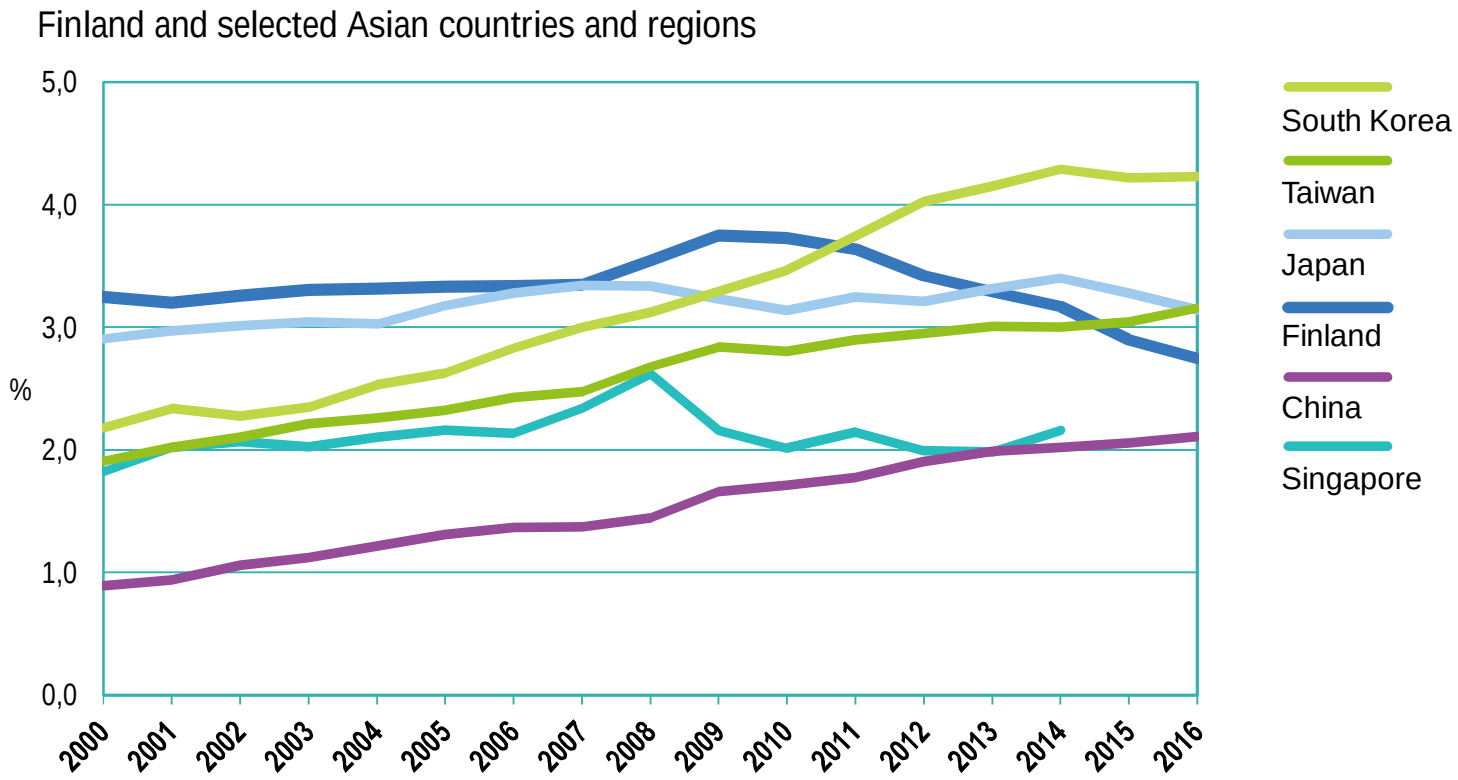
ACADEMY OF FINLAND

R&D intensity in Finland in international comparison 2000–2016

The vertical axis shows the R&D expenditure as percentage of GDP.



Source: OECD Main Science and Technology Indicators (data published on 24 July 2018), http://www.oecd.org/sti/msti.htm

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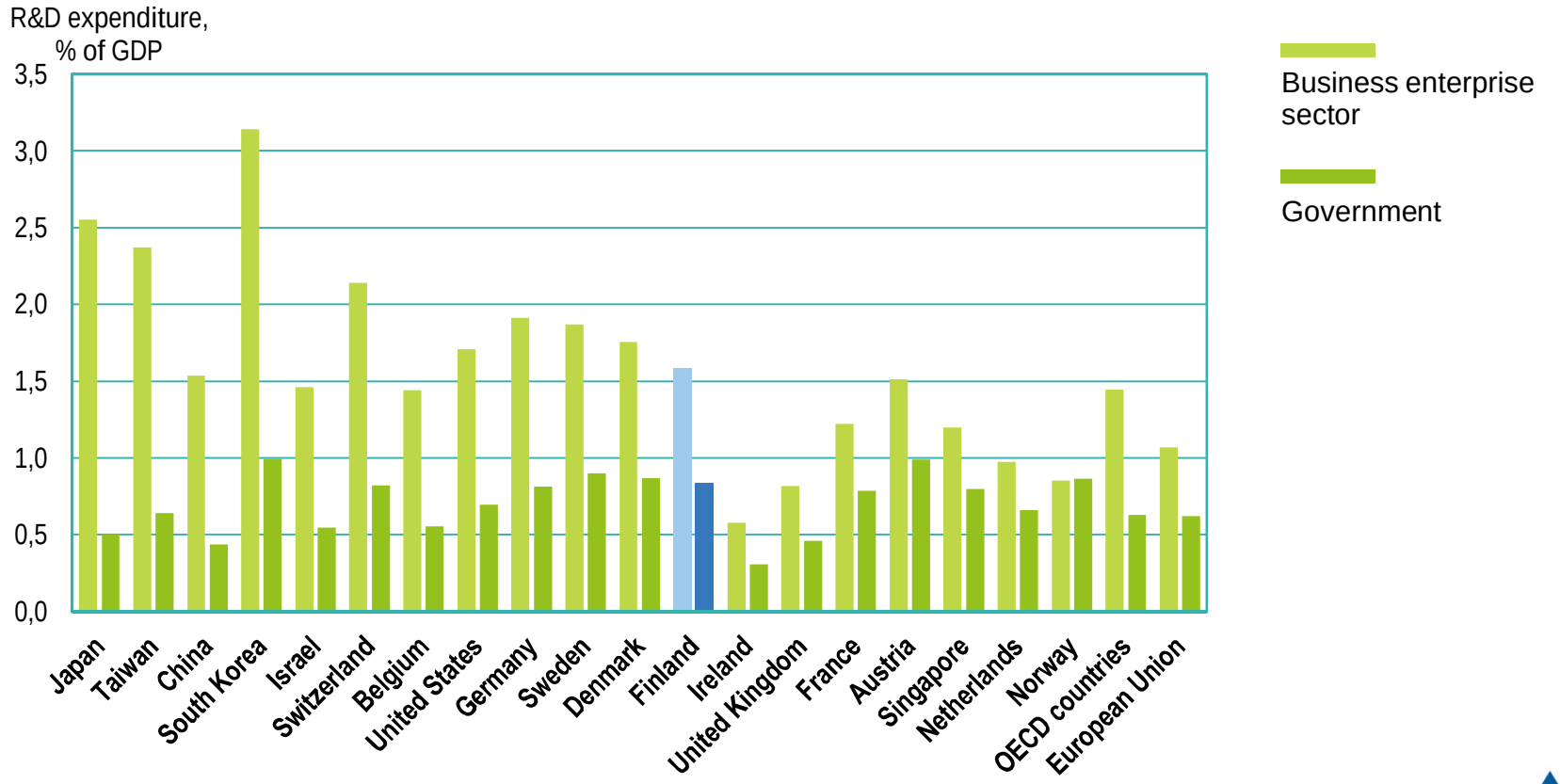
Business-financed and government-financed R&D expenditure as percentage of GDP in different countries and regions in 2015

The figure does not show the part of R&D intensity financed by other national sources or the rest of the world. The information is organised according to the descending ratio of the R&D intensity financed by the business enterprise sector with the exception of the OECD countries and European Union.



Source: OECD Main Science and Technology Indicators (data published on 24 July 2018), http://www.oecd.org/sti/msti.htm

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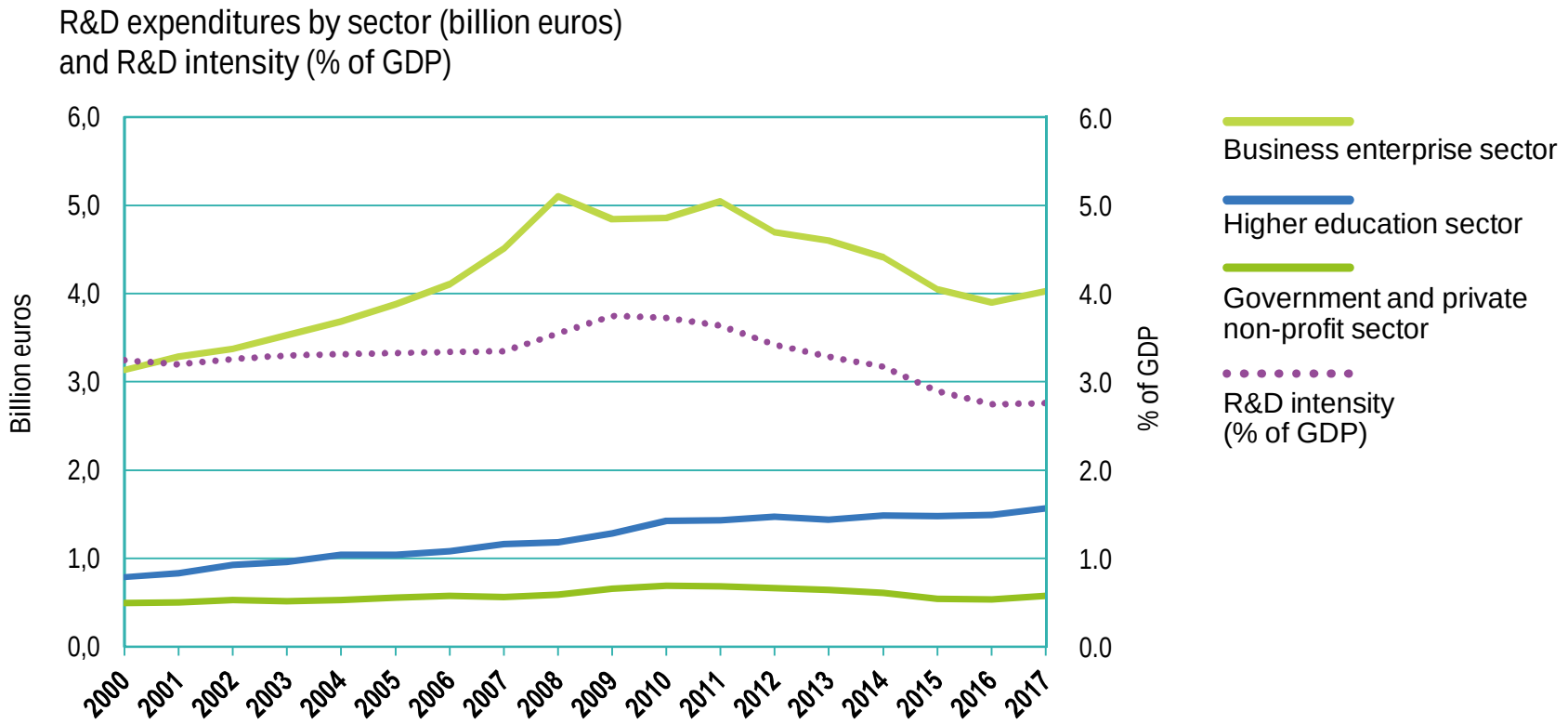
R&D expenditure and R&D intensity in Finland by the sector of performance 2000–2017

The sectors are the ones used in the research and development statistics of Statistics Finland.



Sources: Statistics Finland, Research and development; vuosien 2000–2008 t&k-intensiteetin osalta Source: OECD Main Science and Technology Indicators (data published on 24 July 2018), http://www.oecd.org/sti/msti.htm

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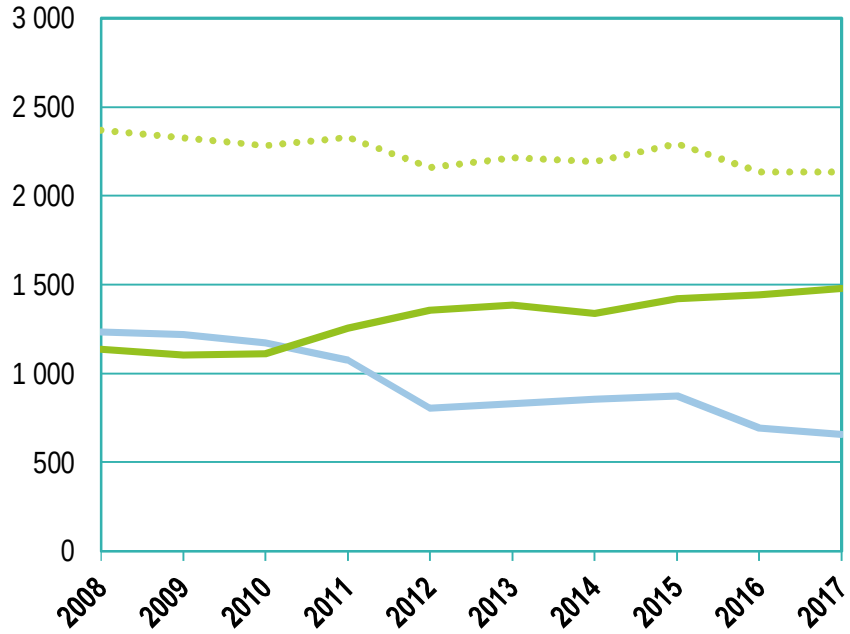
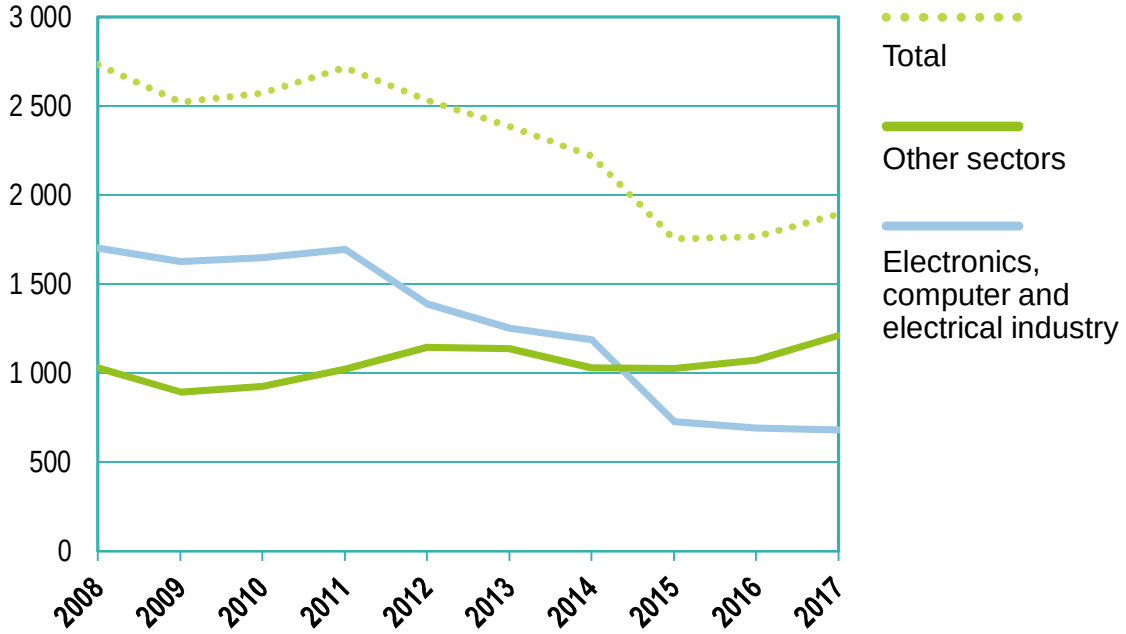
Labour and other costs of R&D activities in Finnish business enterprises 2008–2017

Electronics, computer and electrical industry sector as defined by Statistics Finland and other sectors.

Labour costs of R&D activities of business enterprises (billion euros)



Other costs of R&D activities of business enterprises (billion euros)



Source: Statistics Finland, Research and development.

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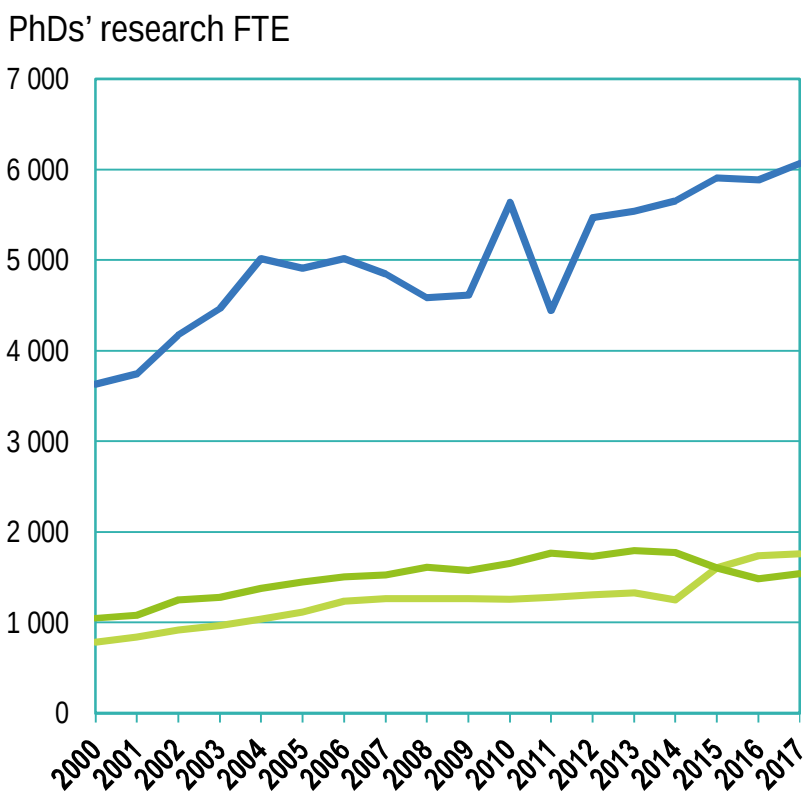
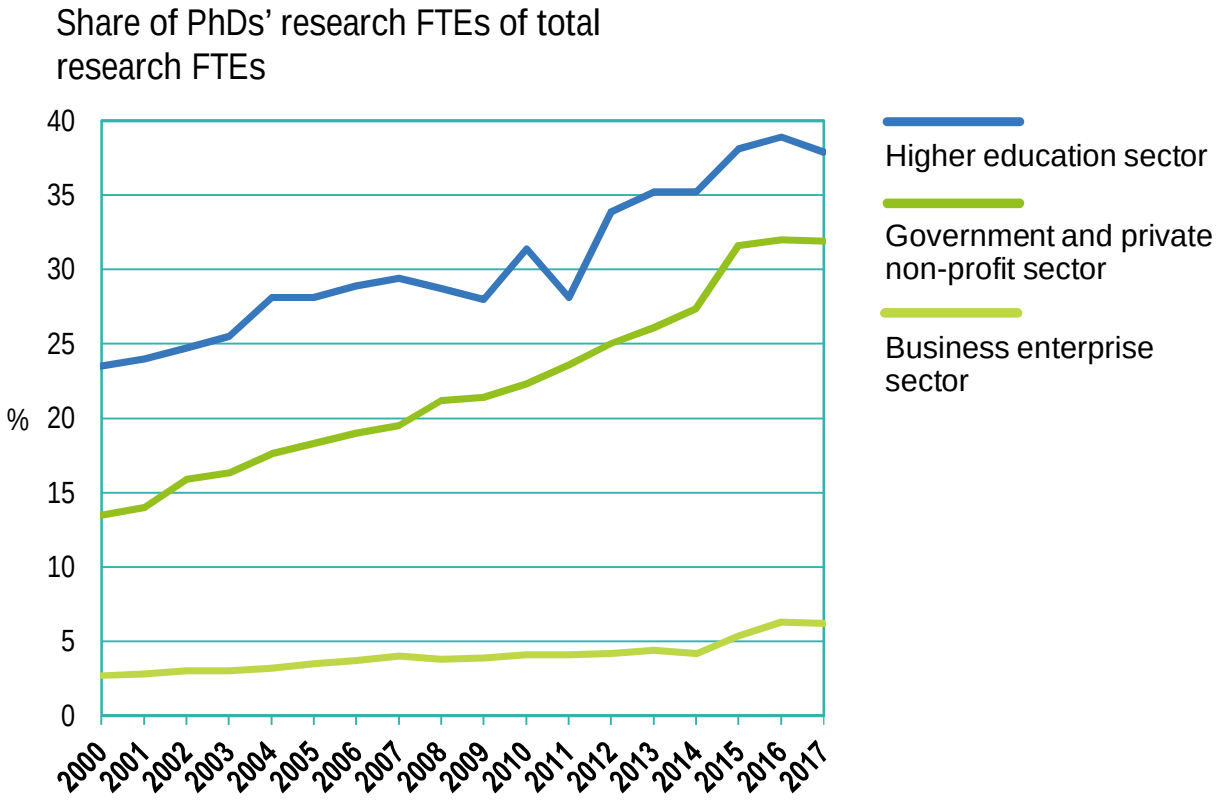
PhDs' research FTEs and their share in total research FTEs by the sector of performance 2000–2017

Data describes the amount of R&D work in full-time equivalents.





Source: Statistics Finland, Research and development.

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