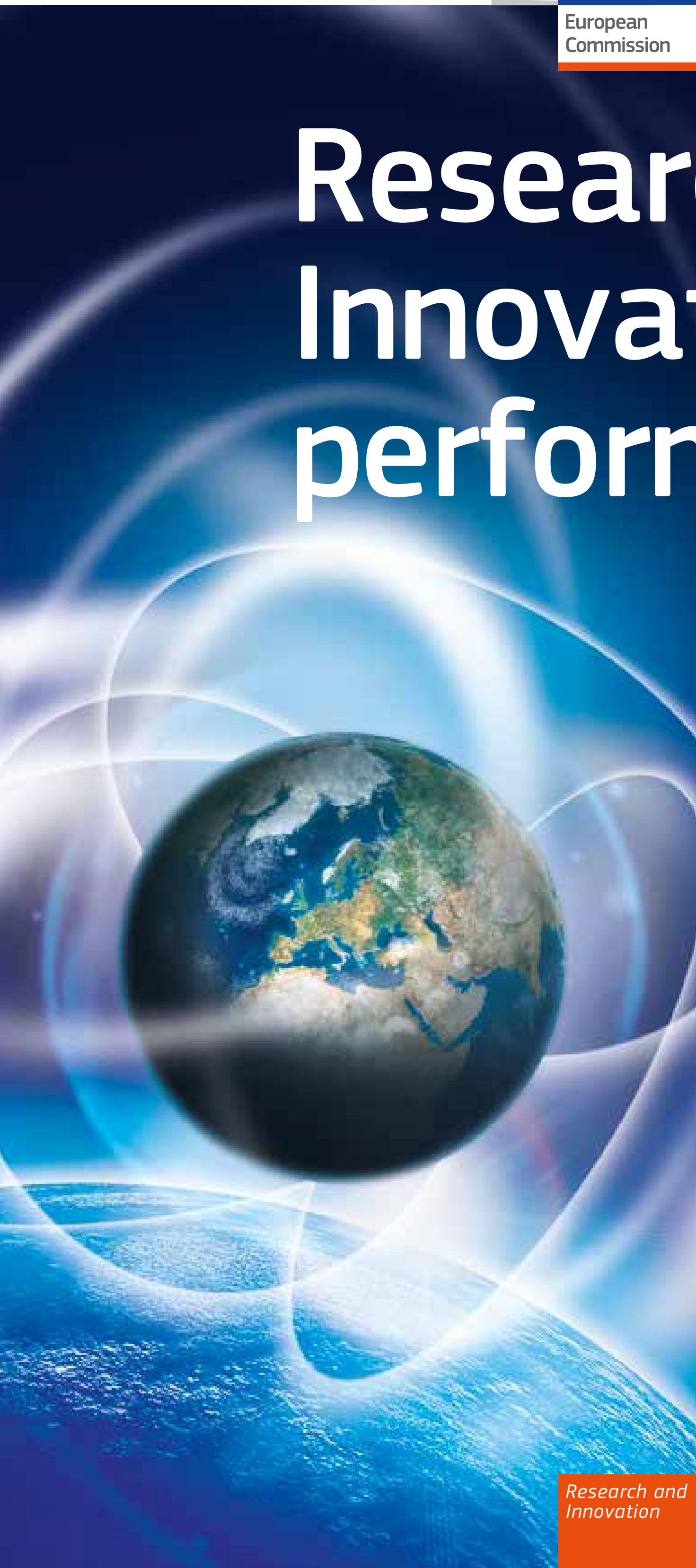
European Commission

Research and Innovation performance in

Finland

Country Profile

2014



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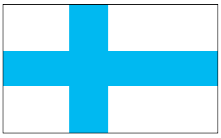


Finland

Broadening the innovation base towards new growth areas

Summary: Performance in research and innovation

The indicators in the table below present a synthesis of research and innovation (R&I) performance in Finland. They relate knowledge investment and input to performance and economic output throughout the innovation cycle. They show thematic strengths in key technologies and also the high-tech and medium-tech contribution to the trade balance. The indicator on excellence in science and technology takes into consideration the quality of scientific production as well as technological development. The Innovation Output Indicator covers technological innovation, skills in knowledge-intensive activities, the competitiveness of knowledge-intensive goods and services, and the innovativeness of fast-growing enterprises, focusing on innovation output. The indicator on the knowledge-intensity of the economy focuses on the economy's sectoral composition and specialisation and shows the evolution of the weight of knowledge-intensive sectors and products.

Key indicators of research and innovation performance	
R&D intensity 2012: **3.55 %** (EU: 2.07 %; US: 2.79 %) 2007-2012: **+0.5 %** (EU: 2.4 %; US: 1.2 %)	***Excellence in S&T***[1] 2012: **69.9** (EU: 47.8; US: 58.1) 2007-2012: **+5.1 %** (EU: +2.9 %; US: -0.2)
Innovation Output Indicator 2012: **115.7** (EU: 101.6)	***Knowledge-intensity of the economy***[2] 2012: **55.8** (EU: 51.2; US: 59.9) 2007-2012: **+0.4 %** (EU: +1.0 %; US: +0.5 %)
Areas of marked S&T specialisations: ICT, environment, materials, energy, security, food & agriculture, and health	***HT + MT contribution to the trade balance*** 2012: **1.2 %** (EU: 4.23 %; US: 1.02 %) 2007-2012: **-5.7 %** (EU: +4.8 %; US: -32.3 %)

Finland has one of the world's highest R&D intensities. The country also performs very well in terms of scientific and technological excellence, showing a strong positive evolution. The Finnish economy is knowledge-intensive and has achieved an impressive and continuous change towards a stronger high- and medium-high-tech specialisation. The country has several hot-spot clusters in key technologies on both a European and world scale, in particular in ICT, the environment, materials, energy, security, and in food and agriculture.

However, Finland's competitive position is facing challenges and its large export businesses have suffered. Considering its high level of R&D intensity, high-tech and medium-high-tech goods make a relatively low contribution to the country's trade balance. Since the start of the economic crisis in 2008, the major decline of the important electronics (telecommunications) sector, in particular, has led to a large-scale structural change of manufacturing industries in Finland. The decline of this sector is further reflected in a decrease in business R&D expenses that were previously dominated by Nokia. Consequently, as part of the Europe 2020 strategy, the Council recommended in 2014 that Finland boosted its capacity to deliver innovative products, services and high-growth companies in a rapidly changing environment. The extent to which both the business and public sector will be capable of absorbing new innovations from the ICT sector – and, more concretely, the available highly skilled human resources – is seen as a determinant for new growth.

To address these challenges, the Finnish government has intensified the reform of the national R&I system. In addition to general efforts to enhance the efficiency and improve the internationalisation of the system, current and planned policy reforms are targeted, in particular, at increasing the number of high-growth innovative firms as the major source of future employment

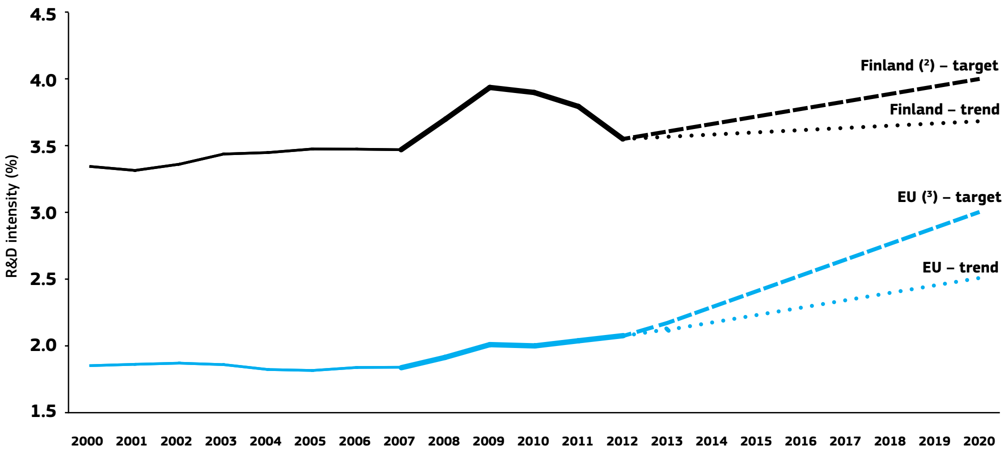
[1] Composite indicator that includes PCT per population, ERC grants per public R&D, top universities and research institutes per GERD and highly cited publications per total publications.

[2] Composite indicator that includes R&D, skills, sectoral specialization, international specialization and internationalization sub-indicators.

and growth. The R&D tax incentive targets both limited companies and cooperatives and is applicable only to the fiscal years 2013-2014. The tax incentive for private investors into start-ups was introduced in 2013 to increase the volume of domestic venture capital market. These actions are expected to support in particular knowledge- and innovation-based young growth enterprises. The government has also recently fostered innovation and the country's transfer to a digital service economy by opening the non-sensitive databases it administers for public use.

Investing in knowledge

Finland – R&D intensity projections: 2000–2020 (1)



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: DG Research and Innovation, Eurostat, Member State
Notes: (1) The R&D intensity projections based on trends are derived from the average annual growth in R&D intensity for 2007–2012.
(2) FI: The projection is based on a tentative R&D intensity target of 4.0 % for 2020.
(3) EU: The projection is based on the R&D intensity target of 3.0 % for 2020.

In 2012, R&D intensity fell in Finland to 3.55 % of GDP (3.80 % of GDP in 2011). While this remains the highest value in the EU, the decreasing trend since 2009 means that Finland is not on track to reach its R&D intensity target for 2020 of 4 %. This trend is due to a fall in business R&D intensity. As to public R&D expenses, they remained around EUR 2 billion in 2012. Due to the government's budget deficit, the volume of public R&D funding is not expected to increase in the coming years.

Finland is the top performer in the EU in terms of business R&D spending, although in 2012 its share decreased to 2.44 % of GDP (2.68 % of GDP in 2011) reflecting the major restructuring of the R&D intensive electronics sector. Although many other manufacturing and services sectors have increased their R&D intensities in Finland, in 2012 business R&D investments were still highly concentrated in Nokia and a few other large firms. This has made the country's economic position more vulnerable than it may appear. In 2012, the percentage share of venture capital of GDP amounted to 0.24 % (0.20 % of GDP in 2011).

The European Structural and Investment (ESI) Funds are an important source of funding for R&I activities. Of the EUR 1.6 billion of Structural Funds allocated to Finland over the 2007-2013 programming period, EUR 468 million (29.3 % of the total) related to RTDI[3]. In general, the share of the ESI Funds allocated to R&I has increased in Finland throughout the programming periods.

[3] RTDI includes the following sectors: (01) RTD activities in research centres, (02) RTD infrastructures and centres of competence, (03) Technology transfer and improvement of cooperation of networks, (04) Assistance to RTD, particularly in SMEs (and RTD services in research centres), (06) Assistance to SMEs for the promotion of environmentally friendly products and processes, (07) Investment in firms directly linked to research and innovation, (09) Other methods to stimulate research and innovation and entrepreneurship in SMEs, and (74) Developing human potential in the field of research and innovation.

In the current period 2014-2020, Finland will receive almost EUR 1.3 billion from the European Structural and Investment Funds. R&D as well as improving the competitiveness of SMEs feature among the most important thematic objectives together with a cross-cutting theme that is seeking new solutions for development towards the low-carbon economy. The plan is for all three themes together to absorb more than EUR 822 million of the funding received from the European Regional Development Fund. Furthermore, it is proposed to allocate more than EUR 99 million from the ERDF to R&I-related activities supporting bio-economy developments in Finland.

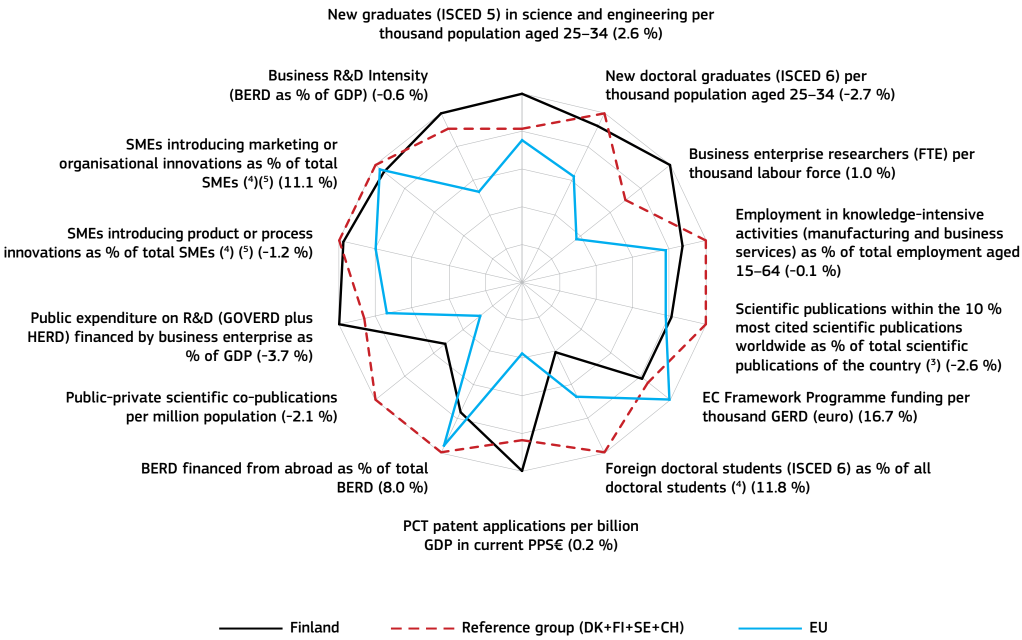
In the past, Finland has also sought to increase its participation in the Seventh Framework Programme for Research and Technological Development. By 31 March 2014, almost 2600 Finnish entities had participated in a FP7 project, with a total EU financial contribution of EUR 848 million and a success rate of 21.2 % (slightly over the EU average of 20.5 %).

An effective research and innovation system building on the European Research Area

The spider graph below illustrates the strengths and weaknesses in the Finnish R&I system. Reading clockwise, the graph provides information on human resources, scientific production, technology valorisation and innovation. The average annual growth rates from 2000 to the latest available year are given in brackets under each indicator.

Finland, 2012 (1)

In brackets: average annual growth for Finland, 2007–2012 (2)



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: DG Research and Innovation, Eurostat, OECD, Science-Metrix/Scopus (Elsevier), Innovation Union Scoreboard.
Notes: (1) The values refer to 2012 or to the latest available year.
(2) Growth rates which do not refer to 2007–2012 refer to growth between the earliest available year and the latest available year for which comparable data are available over the period 2007–2012.
(3) Fractional counting method.
(4) EU does not include EL.
(5) CH is not included in the reference group.

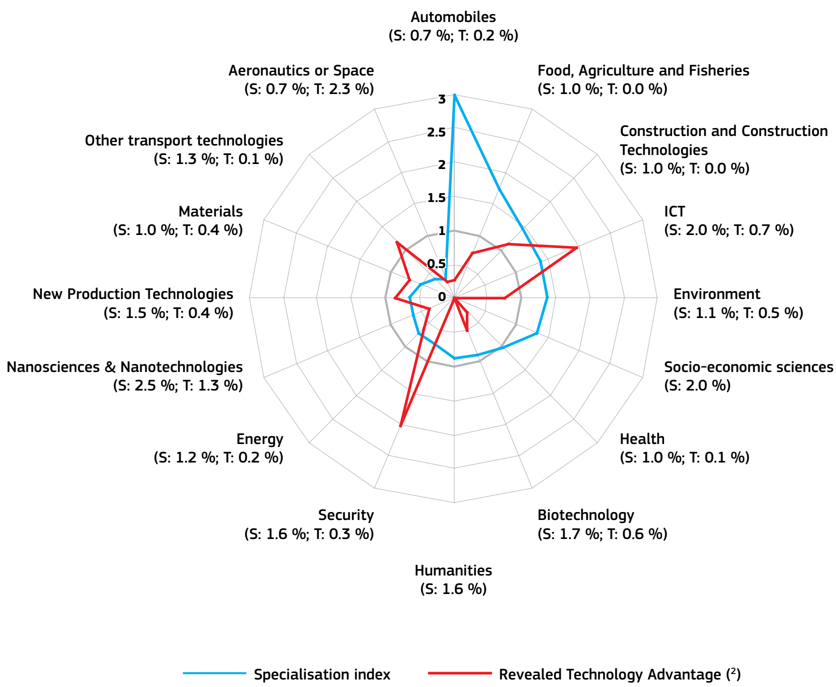
Overall, Finland has a strong innovation performance and outperforms its reference group in terms of highly skilled human resources (new graduates in science and engineering as well as business enterprise researchers), public and business investment in R&D and patent applications. However, in 2012 the share of new doctoral graduates was lower in Finland than in the reference group. The main weakness in the Finnish innovation system lies in its low level of internationalisation, affecting both the public and private sectors. It performs below the EU average on inward BERD, share of foreign doctoral students and funding from EU excellence-driven programmes.

The ongoing restructuring of the ICT sector is both a challenge and an opportunity for Finnish SMEs, as much of future innovation and growth depend on them. The graph does not take this fully into account. It is expected to affect, in particular, the number of business sector researchers and business R&D intensity. In addition, the effect that the expected loss of R&D jobs in the business sector and the subsequent capacity to attract foreign researchers will have on linkages in the R&I system remains to be seen.

Finland's scientific and technological strengths

The graph below illustrates the areas, based on the Framework Programme thematic priorities, where Finland shows scientific and technological specialisations. Both the specialisation index (based on the number of publications) and the revealed technological advantage (based on the number of patents) measure the country's scientific (SI) and technological (RTA) capacity compared to that at the world level. For each specialisation field, it provides information on the growth rate in the number of publications and patents.

Finland – S&T National Specialisation ([1]) in thematic priorities, 2000–2010
in brackets: growth rate in number of publications ([3]) (S) and in number of patents ([4]) (T)



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Science-Metrix Canada; Bocconi University, Italy
Notes: ([1]) Values over 1 show specialisation; values under 1 show a lack of specialisation.
([2]) The Revealed Technology Advantage (RTA) is calculated based on the data corresponding to the WIPO-PCT number of patent applications by country of inventors. For the thematic priorities with fewer than 5 patent applications over 2000–2010, the RTA is not taken into account. Patent applications in 'Aeronautics or Space' refer only to 'Aeronautics' data.
([3]) The growth rate index of the publications (S) refers to the periods 2000–2004 and 2005–2009.
([4]) The growth rate in number of patents (T) refers to the periods 2000–2002 and 2003–2006.

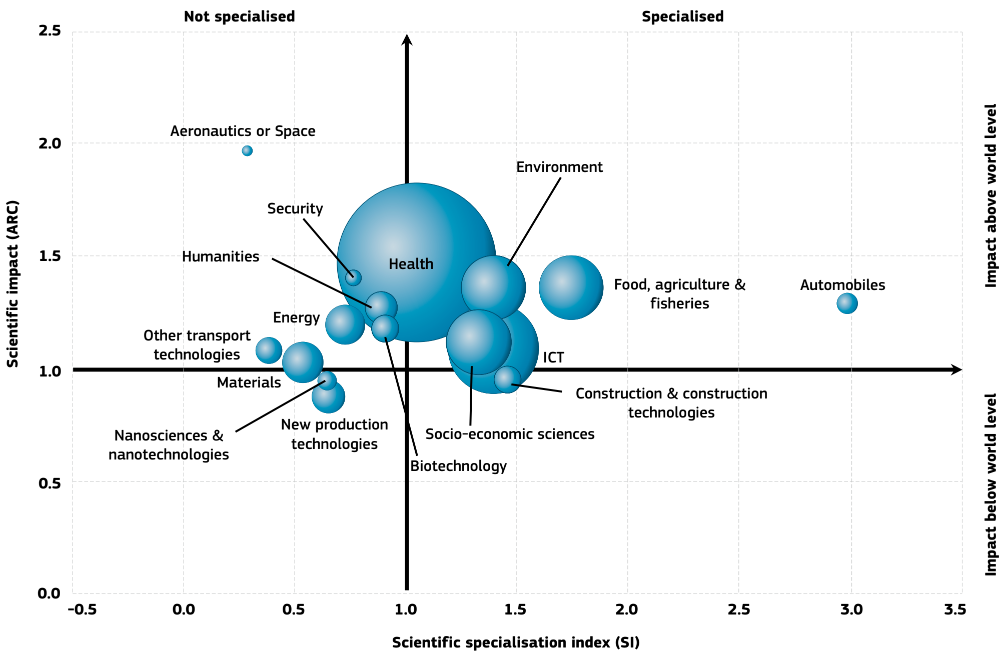
A comparison of the scientific and technological specialisations in the FP7 thematic priorities shows a mixed situation. Technology production is specialised in security, ICT, and other transport technologies.

Finland's scientific specialisation indexes show a specialisation in the scientific fields related to the FP7 thematic priorities of automobiles, food, agriculture and fisheries, construction and construction technologies, ICT, the environment and socio-economic sciences. The ICT thematic priority is where scientific and technological specialisations are best matched.

In this respect, there is room for improvement in the scientific impact related to some FP7 thematic priorities ranking high on the science specialisation index, i.e. construction and construction technologies. It is also interesting to note the above-world-level scientific impact of Finnish scientific publications related to aeronautics and space as well as to security and energy, while the specialisation indexes related to those thematic priorities are rather low.

The graph below illustrates the positional analysis of Finnish publications showing the country's situation in terms of scientific specialisation and scientific impact over the period 2000-2010. The scientific production of the country is reflected by the size of bubbles, which corresponds to the share of scientific publications from a science field in the country's total publications.

Finland – Positional analysis of publications in Scopus (specialisation versus impact), 2000–2010



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Science-Metrix Canada, based on Scopus
Note: Scientific specialisation includes 2000–2010 data; the impact is calculated for publications of 2000–2006, citation window 2007–2009.

Policies and reforms for research and innovation

The Finnish R&I policy documents are prepared at the strategic level by the Research and Innovation Council which is led by the prime minister. The current 'Research and Innovation Policy Guidelines' cover the period of 2011-2015, and the government has tasked the Council to prepare new guidelines for 2014-2020. At the end of 2012, the government also published a document 'Growth through expertise, Action plan for research and innovation policy' which seeks to enhance the quality, impact and internationalisation of the Finnish R&I system. The action plan emphasises the need to increase the number of high-growth innovative firms, and anticipates that the digital service economy will provide Finland with opportunities for growth.

One of the fundamental reforms launched in Finland in 2013 concerns the reform of research institutes and research funding. It marks a major restructuring of the Finnish R&I landscape with a view to strengthening multi-disciplinary and high-level research of societal significance. National sectorial research institutes will gradually be combined into larger entities. A Strategic Research Council will be established to finance research-seeking solutions to the challenges facing Finnish society and to promote the renewal of the country's economic base and competitiveness. The funding will be assembled in stages from state research institutes' appropriation, as well as from the funding for the Academy of Finland and Tekes, with a view to making EUR 70 million available for strategic research in 2017.

As the key government objective is to fortify the growth of the Finnish economy, more public funding is now being channelled into innovation activities. The activities target, in particular, growth-oriented companies as well as new and young innovative enterprises, and include measures that help knowledge-based companies to enter international markets. For example, the government budget for 2013 included two tax incentives aimed at growth-seeking businesses. The R&D tax incentive for limited companies and cooperatives is a novelty for Finland. It allows for a deduction from corporate income taxes tied to the wage costs of R&D personnel. The tax incentive for private investors targets business angels investing equity in small and medium-sized enterprises (SMEs) providing the possibility to postpone paying capital gains taxes as long as those gains are reinvested in qualifying businesses. However, the R&D tax incentive is only applicable to fiscal years 2013-2014 and the tax incentive for private investors to 2013-2015, due to the lowering of corporate income tax rate from 24.5 % to 20 %.

As to the availability of venture capital, together with pension funds the Finnish Industry Investment will launch a new growth fund for growth-stage businesses as part of the government's long-term risk finance programme. The experiences gained from the Vigo accelerator programme have been positive and it has attracted direct foreign investment in Finnish start-ups. The government has also made non-sensitive data gathered by public authorities freely available with the aim of promoting the emergence of innovative start-ups. In the area of internationalisation, the establishment of Team Finland has streamlined services for companies, and the FiDiPro programme – the Finland Distinguished Professor Programme – continues to enhance the international dimension of the universities and research institutes.

Among the most significant structural changes in Finland in recent years has been the university reform that took effect in 2010. This made universities autonomous legal entities and developed them towards more flexibility with the aim of promoting high-level research, internationalisation and the focusing of resources. As part of the reform process, a new university funding model entered into force in 2013 that seeks to build a more efficient university system with a greater emphasis on quality and impact as well as better profiling and internationalisation. In parallel, the polytechnics reform is ongoing, and a new polytechnics funding model came into force at the beginning of 2014. In the second stage of the reform, the responsibility for polytechnics funding will be transferred from municipalities to the government, and polytechnics will be made independent legal entities. These changes will come into force from the beginning of 2015. The objective is to reinforce the role of polytechnics as increasingly independent educational institutions contributing to a renewal of the working life and competitiveness of the regions. The government is currently reviewing the funding models of both universities and polytechnics with a view to reinforcing, inter alia, the utilisation aspect of research. Furthermore, a national road map of research infrastructures was published recently.

In Finland, R&I policies have emphasised the importance of both academic entrepreneurship through start-ups and university-industry collaboration. In that respect, the main funding instruments are the Tekes programmes and the Strategic Centres for Science, Technology and innovation (SHOKs)[5]. In the last five years, SHOKs have become one of the main mechanisms of Finnish innovation policy and one of its 'flagship programmes'. These are industry-driven public-private partnerships of research actors and the private sector which aim to speed up innovations and renew industrial clusters. The government is currently introducing several improvements to the SHOK concept with the view to sharpening the focus and increasing competition for funding, renewing governance and steering, and increasing international cooperation.

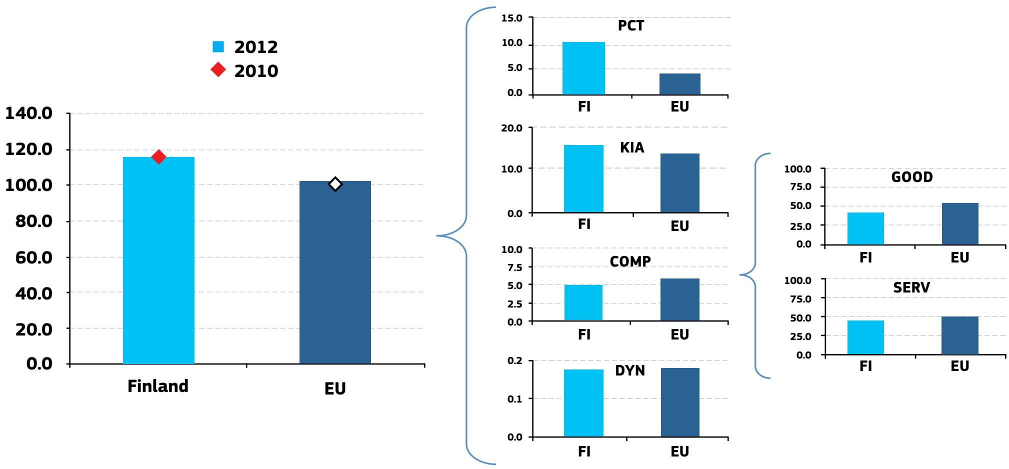
The ICT 2015 advisory board has been set up in the restructuring field of electronics with the mandate to coordinate the implementation of the ICT 2015 actions[5] aiming to re-establish Finland's technological lead in ICT. These actions include the rapid development of a common architecture for all public services; establishment of a 10-year programme on ICT-related R&I; and the launch of a funding programme for high-growth enterprises. In addition, the government's four other strategic growth targeted programmes – in the fields of clean-tech, bio-economy, health, and intangible value creation – build heavily on the increased role of ICT which is expected to be the main driver of the country's productivity growth. If successful in boosting growth in other sectors, ICT is expected to have the potential to diversify the Finnish economy.

The government has launched the 'Innovative Cities' programme that will be implemented from 2014-2017 and represents a novel innovation policy instrument for Finland. The programme embeds the ideas and approaches of a 'smart specialisation strategy for research and innovation'. In so doing, it supports urban regions in identifying and focusing on their strengths, encouraging them to select new types of specialisation areas, and intensifying cooperation between the public and private sectors. The programme seeks to create internationally attractive urban innovation hubs and platforms in Finland. In 2013, the government announced five thematic priorities for each lead city: health and well-being in the future (Oulu); bio-economy (Joensuu); sustainable energy solutions (Vaasa); smart cities and restructuring industries (Tampere) and cyber safety (Jyväskylä). The programme is managed by Tekes and the funding will be channelled from the government's budget, the cities' budgets and the European Structural and Investment Funds. The programme will also help to align the content of the Finnish national research and innovation strategy and related regional strategies.

Innovation Output Indicator

The Innovation Output Indicator, launched by the European Commission in 2013, was developed at the request of the European Council to benchmark national innovation policies and to monitor the EU's performance against its main trading partners. It measures the extent to which ideas stemming from innovative sectors are capable of reaching the market, providing better jobs and making Europe more competitive. The indicator focuses on four policy axes: growth via technology – (patents); jobs (knowledge-intensive employment); long-term global competitiveness (trade in mid/high-tech commodities); and future business opportunities (jobs in innovative fast-growing firms). The graph below enables a comprehensive comparison of Finland's position regarding the indicator's different components.

Finland – Innovation Output Indicator



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Eurostat, OECD, Innovation Union Scoreboard 2014, DG JRC
Notes: All data refer to 2012 except PCT data, which refer to 2010.
PCT = Number of PCT patent applications per billion GDP, PPS.
KIA = Employment in knowledge-intensive activities in business industries as % of total employment.
DYN = Innovativeness of high-growth enterprises (employment-weighted average).
COMP = Combination of sub-components GOOD and SERV, using equal weights.
GOOD = High-tech and medium-high-tech products exports as % total exports. EU value refers to EU-28 average (extra-EU = 59.7 %).
SERV = Knowledge-intensive services exports as % of total service exports. EU value refers to EU-28 average (extra-EU = 56 %).

4 Six SHOKs are in operation: Cleen Ltd (environment and energy), FIMECC Ltd (metals industry), SalWe Oy (health and well-being), Digile Oy (ICT and digital services), RYM Ltd (built environment) and Bio-economy Cluster FIBIC.

5 The actions outlined in the report of the 'ICT 2015 working group' set up by the government.

Finland is a very good performer in the European innovation indicator. It ranks fifth in the EU after Germany, Sweden, Ireland and Luxembourg. This is the result of a good or very good performance as regards all the components of the indicator, with the exception of the export of goods and services. The country's performance stagnated between 2010 and 2012.

Finland performs particularly well in patents (data refers to 2010), where it is the EU's top performer as a result of strong patenting in the ICT sector. The relatively low performance in the share of medium-/high-tech goods in total goods exports is explained by the importance of wood and paper exports, not sufficiently compensated for by strong exports of medium-/high-tech products.

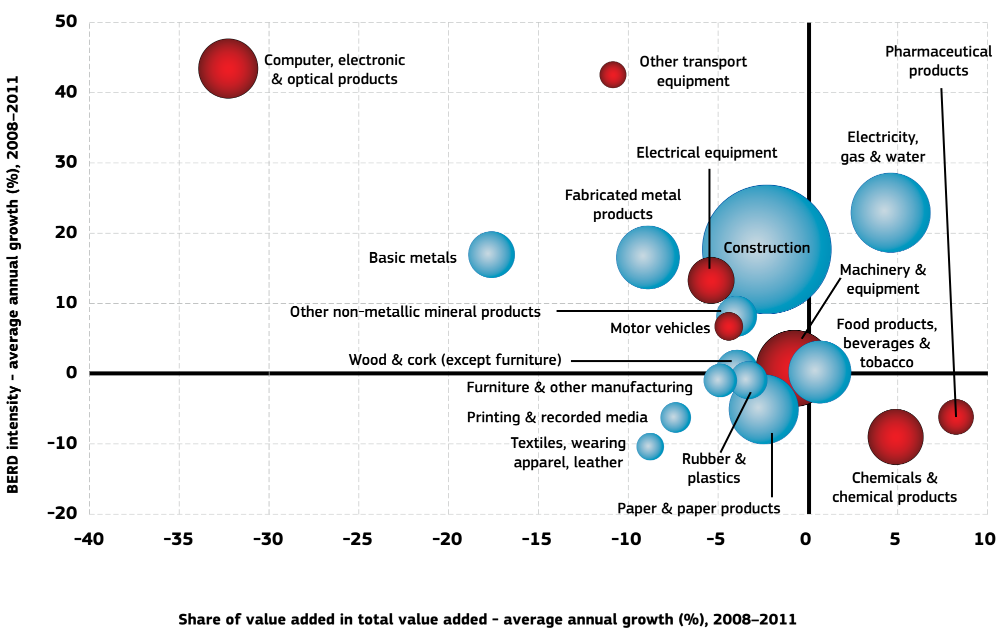
As a freight-transport transit country to and from Russia, Finland has a relatively important non-knowledge-intensive transport and merchant-related services (rail freight transport, pipeline) sector, leading to a below EU average share of knowledge-intensive services exports, despite relatively high computer services exports.

The country's performance is average in employment in fast-growing innovative firms as a % of total employment in fast-growing firms. In addition, there is a high share of computer programming, architectural and engineering companies among the fast-growing enterprises.

Upgrading the manufacturing sector through research and technologies

The graph below illustrates the upgrading of knowledge in different manufacturing industries. The position on the horizontal axis illustrates the changing weight of each industry sector in value added over the period 2008-2011. The general trend to the left-hand side reflects a decrease in manufacturing in the overall economy. The sectors above the x-axis are those where research intensity has increased over time. The size of the bubble represents the sector share (in value added) in manufacturing (for all sectors presented on the graph). The red sectors are high-tech or medium-high-tech sectors.

Finland – Share of value added versus BERD intensity: average annual growth, 2008–2011



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Eurostat
Note: (1) High-tech and medium-high-tech sectors (NACE Rev. 2 – two-digit level) are shown in red.

The Finnish manufacturing sector has achieved a clear upgrading of its knowledge intensity since the 1990s. Finland has evolved from having a primarily pulp and paper and machinery-driven manufacturing sector to being a producer of electronics as well as software and services. Simultaneously, the services sector, including business services, has grown significantly. However, since the start of the economic crisis in 2008, the Finnish manufacturing industries which are highly dependent on export markets have faced major difficulties. In the past five years, the country has undergone a period of major economic restructuring, and the electronics industry, in particular, has lost significant market share and employment. In effect, the 2008-2009 economic slowdown has had a more severe effect on the Finnish economy than in many other competing countries, because the recession coincided with the decline in the electronics industry.

In the period 2008-2011, the R&D intensive manufacturing sectors (red bubbles) which had contributed most to the growth of value added in the Finnish economy were pharmaceutical products and chemicals and chemical products, although business R&D intensity decreased in both sectors. The recent reorganisation of the electronics industry has resulted in a major reduction in its share of the value added to the economy, but in the period under review, the sector was still able to increase its BERD intensity substantially. Machinery and equipment continues to be an important R&D-intensive manufacturing sector in Finland. In 2008-2011, its R&D investment increased marginally while, at the same time, its share of value added fell slightly. Although the sectors of other transport equipment and electrical equipment did not make a positive contribution to the economy's added value during that period, the two sectors increased their BERD intensity, the former, in particular. Similarly, the motor vehicle sector experienced an increase in R&D investment.

As regards traditionally less R&D-intensive industries (the other bubbles), in the period of 2008-2011, the paper and paper products sector experienced reductions in both its R&D intensity and its share of value added to the economy. A renewal in R&D investment is observed in the basic metals sector – an industrial sector that is leading the mining boom mainly in the north-eastern and northern parts of Finland. The fabricated metal products sector also shows a positive upward trend in its R&D intensity. Moreover, the electricity, gas and water sector increased its R&D intensity in the same period. Finally, the country's important construction sector has also increased its R&D intensity. In that regard, it is worth emphasising that since 2007 the government has supported the renewal of traditional manufacturing sectors with a specific instrument 'Strategic Centres for Science, Technology and Innovation' that bridges innovative companies and world-class research aimed at producing globally significant breakthrough innovations.

Key indicators for Finland

FINLAND	2000	2005	2006	2007	2008	2009	2010	2011	2012	Average annual growth 2007-2012 (1) (%)	EU average (2)	Rank within EU
ENABLERS												
Investment in knowledge												
New doctoral graduates (ISCED 6) per thousand population aged 25–34	2.71	3.07	2.96	3.07	2.96	2.89	2.56	2.71	2.67	-2.7	*1.81*	3
Performance in mathematics of 15-year-old students – mean score (PISA study)	:	:	548	:	:	541	:	:	519	-29.6 (3)	495 (4)	3 (4)
Business enterprise expenditure on R&D (BERD) as % of GDP	2.37	2.46	2.48	2.51	2.75	2.81	2.72	2.67	2.44	-0.6	1.31	1
Public expenditure on R&D (GOVERD + HERD) as % of GDP	0.95	0.99	0.98	0.94	0.93	1.10	1.16	1.09	1.09	2.9	*0.74*	2
Venture capital as % of GDP	0.29	0.15	0.16	0.21	0.25	0.20	0.23	0.20	0.24	2.4	0.29 (5)	6 (5)
S&T excellence and cooperation												
Composite indicator on research excellence	:	:	:	54.6	:	:	:	:	69.9	5.1	47.8	4
Scientific publications within the 10% most cited scientific publications worldwide as % of total scientific publications of the country	:	11.6	11.4	12.0	11.5	11.4	:	:	:	-2.6	11.0	9
International scientific co-publications per million population	:	920	995	1101	1139	1204	1286	1356	1415	5.1	343	5
Public–private scientific co-publications per million population	:	:	:	107	107	106	102	98	:	-2.1	53	4
FIRM ACTIVITIES AND IMPACT												
Innovation contributing to international competitiveness												
PCT patent applications per billion GDP in current PPS (EUR)	12.1	10.9	11.6	10.3	9.5	10.5	10.4	:	:	0.2	3.9	1
License and patent revenues from abroad as % of GDP	0.72	0.62	0.51	0.52	0.54	0.73	0.98	1.23	1.34	21.0	0.59	3
Community trademark (CTM) applications per million population	100	104	120	139	143	148	181	187	196	7.1	152	9
Community design (CD) applications per million population	:	37	35	36	38	43	46	44	52	7.9	29	6
Sales of new-to-market and new-to-firm innovations as % of turnover	:	:	15.7	:	15.6	:	15.3	:	:	-1.0	14.4	5
Knowledge-intensive services exports as % total service exports	:	:	:	23.8	39.7	37.7	36.4	34.9	:	10.0	45.3	12
Contribution of high-tech and medium-tech products to the trade balance as % of total exports plus imports of products	-0.58	1.44	1.39	1.66	3.56	2.41	2.01	1.69	1.24	-	4.23 (6)	16
Growth of total factor productivity (total economy): 2007 = 100	88	95	97	100	98	91	93	95	93	-7 (7)	97	20
Factors for structural change and addressing societal challenges												
Composite indicator on structural change	:	:	:	54.8	:	:	:	:	55.8	0.4	51.2	9
Employment in knowledge-intensive activities (manufacturing and business services) as % of total employment aged 15–64	:	:	:	:	15.5	15.2	15.1	15.3	15.5	-0.1	13.9	9
SMEs introducing product or process innovations as % of SMEs	:	:	44.7	:	41.8	:	40.9	:	:	-1.2	33.8	8
Environment-related technologies: patent applications to the EPO per billion GDP in current PPS (EUR)	0.46	0.52	0.53	0.46	0.51	0.75	:	:	:	27.3	0.44	4
Health-related technologies: patent applications to the EPO per billion GDP in current PPS (EUR)	0.75	0.65	0.65	0.56	0.57	0.52	:	:	:	-3.2	0.53	10
EUROPE 2020 OBJECTIVES FOR GROWTH, JOBS AND SOCIETAL CHALLENGES												
Employment rate of the population aged 20–64 (%)	71.6	73.0	73.9	74.8	75.8	73.5	73.0	73.8	74.0	-0.2	68.4	7
R&D intensity (GERD as % of GDP)	3.35	3.48	3.48	3.47	3.70	3.94	3.90	3.80	3.55	*0.5*	*2.07*	1
Greenhouse gas emissions: 1990 = 100	99	98	114	112	101	95	107	97	:	-16 (8)	83	19 (9)
Share of renewable energy in gross final energy consumption (%)	:	28.6	29.8	29.4	30.7	30.4	31.4	31.8	:	2.0	13.0	3
Share of population aged 30–34 who have successfully completed tertiary education (%)	40.3	43.7	46.2	47.3	45.7	45.9	45.7	46.0	45.8	-0.6	35.7	7
Share of population aged 18–24 with at most lower secondary education and not in further education or training (%)	9.0	10.3	9.7	9.1	9.8	9.9	10.3	9.8	8.9	-0.4	12.7	11 (9)
Share of population at risk of poverty or social exclusion (%)	:	17.2	17.1	17.4	17.4	16.9	16.9	17.9	17.2	-0.2	24.8	3 (9)

Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Eurostat, DG JRC – Ispra, DG ECFIN, OECD, Science Metrix / Scopus (Elsevier), Innovation Union Scoreboard
Notes: (1) Average annual growth refers to growth between the earliest available year and the latest available year for which compatible data are available over the period 2007–2012.
(2) EU average for the latest available year.
(3) The value is the difference between 2012 and 2006.
(4) PISA (Programme for Internatonal Student Assessment) score for EU does not include CY and MT. These Member States were not included in the EU ranking.
(5) Venture capital: EU does not include EE, HR, CY, LV, LT, MT, SI and SK. These Member States were not included in the EU ranking.
(6) EU is the weighted average of the values for the Member States.
(7) The value is the difference between 2012 and 2007.
(8) The value is the difference between 2011 and 2007. A negative value means lower emissions.
(9) The values for this indicator were ranked from lowest to highest.
(10) Values in italics are estimated or provisional.

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