

Finland

Finland is a small knowledge-intensive economy with an industry that has not recovered yet from the economic crisis and other external shocks. The manufacturing sector has been downsizing reflecting both an industrial restructuring (particularly in electronics due to changes in Nokia's business) and losses in competitiveness. The economy is dominated by high and medium-high technology and still has a strong specialisation in ICT, wood and paper industries, metal-machinery and basic metals.

Although the Finnish STI system performs rather well by OECD standards (high investment in human capital and education), socio-economic indicators such as inequality, unemployment and productivity stagnate or reflect a downtrend. Labour productivity is below the OECD average and has stagnated since 2013. Exports remain weak due to eroded competitiveness, and the slowdown of the Russian economy. High-tech goods as a share of total exports dropped from 23% in 2005 to 6% in early 2016.

The government is currently implementing an austerity agenda, intending to level off the GDP-to-debt ratio, and budget cuts also affect expenditure on R&D and innovation. The Strategic Government Programme of the Prime Minister has been launched in 2015 based on five strategic priorities: i) Employment and Competitiveness; ii) knowledge and education; iii) wellbeing and healthcare; iv) bioeconomy and clean technologies; and v) digitalisation, experimentation and deregulation.

Hot Issues: Improving transfers, returns and impact of science

While Finland has a strong public research sector, as illustrated by its performance in terms of scientific publications, universities and PRIs perform less well than those of other leading countries in filing for patents. Major challenges to overcome are the lagging mobility of researchers, the translation of research outcomes into technological performance, and the high fragmentation of research within the higher education system. One of the government's strategic objectives is therefore to increase the economic and social impact of research and development through enhanced co-operation between HEIs and businesses and further commercialisation. A key tool for improving R&D impact is to encourage the profiling and division of work between HEIs and state-funded research institutes. Government objective is to encourage municipalities to utilise their significant future investments as platforms for developing innovations in cooperation with businesses. Incentives for commercialisation of research results and knowledge transfer will be strengthened. For innovation policies this means targeted actions to foster commercialisation of research and knowledge: USD 32 million PPP (EUR 30 million) have been allocated to the Academy of Finland to foster exploitation and commercialisation of research results of young researchers. Government has also allocated USD 15.2 million PPP (EUR 14 million) for Innovation Funding Agency Tekes to speed up commercialisation of research results by strengthening cooperation between HEI's, state-funded research institutes and companies.

Fostering sustainable/green growth

Problems related to climate change, the overexploitation of natural resources and the pollution of environments present Finland with opportunities. Environmental performance has increased sharply since 2010 but declined recently below the OECD median. The VTT Technical Research Centre of Finland, the Finnish Environment institute (SYKE), and The Finnish Partnership for Research on Natural Resources and the Environment (LYNET) increased their research and support activities on bioeconomy, resource efficient industries, smart energy and clean water. Supported by the Government Strategic projects on Bioeconomy and Clean Solutions, the four main strategies on green growth and sustainable development are closely linked to each other: the Forest Strategy, the Bioeconomy Strategy, the Energy and Climate Policy Strategy and the National Biodiversity Strategy. More than 60% of Finland is covered by forest. A sustainable and competitive environment for forest-

based businesses and activities is crucial to meet ecological targets and to contribute to growing welfare. Finland's National Forest Strategy, adopted in 2015, specifies the main objectives for timber industries, including the development of a diverse knowledge base. The size of forest holdings will be increased, with entrepreneurial forestry and good forest management as the targets. The goal of the strategies and Government strategic projects on cleantech, the circular economy and the bioeconomy is to accelerate growth, create new products and businesses (renewable fuels, liquefied natural gas, innovative bioproducts) and renew traditional industries through innovation to keep Finland a pioneer in these sectors. The Academy of Finland also launched a new research programme on energy-sector solutions for managing the energy transition focussing on three key themes: i) Consumers' energy choices; ii) adaptation of energy production and consumption; and iii) integrated energy solutions.

Supporting R&D and innovation in firms

Finland's BERD intensity is well above the OECD median despite contractions and ongoing industrial re-structuring. BERD is primarily performed by the high-technology manufacturing sector and largely concentrated in large firms. SMEs account for less than a quarter of BERD (21.8% in 2013). Nokia's restructuring and R&D cuts have been important but still represent a large share in business R&D: while the company accounted for 50% of BERD in 2009, this value decreased to 20% in 2015. Overall patent applications and patenting by young firms rank at the top of the OECD mid-range. Current dynamics show a revival of the shipbuilding industry and promising signs in the chemical industry and cleantech. Nevertheless, declining competitiveness and falling risk-taking capacity retard investment and narrow the production structure. Reforms have been implemented since 2015 to promote employment, entrepreneurship and economic growth. Structural reforms and government measures aim at reducing regulation and red tape to improve operating conditions for businesses. According to the government decision, Finnvera Plc will in the future concentrate on granting loans and guarantees for Finnish SMEs and exports. Finnvera will therefore withdraw from venture capital activities and government will no longer make direct venture capital investments in early stage companies. Tekes Venture Capital Ltd. was founded in 2014 to catalyse private venture capital funds for early stage investments. Tekes Venture Capital Ltd. makes only investments in funds and thus acts as a fund-of-fund. In 2015, a third of Tekes' funding for businesses went to young small firms (USD million PPP (EUR 140 million) of which USD 29 million PPP (EUR 27 million)) were for young innovative firms. The Funding Scheme for Young Innovative Companies provides support to young SMEs with high growth potential to develop their business and/or internationalise their activities. The government's tax policy aims to boost growth, entrepreneurship, work and employment. The total tax rate is set not to rise during the government term and labour taxes will be eased. Adoption of low-emission energy sources will also be encouraged through taxation.

Improving the governance of innovation system and policy

A new public procurement legislation will be adopted in 2016 to better consider innovation and environment aspects in public procurement agendas. This revision is based on the EU Public Procurement Directives. Furthermore, the government intends to increase its activities on Open Science and the availability of information. The Open Science and Research Roadmap was launched in 2014 based on the Open Science and Research Initiative (ATT). Dialogue in science and research will be promoted via four sub-objectives, namely: i) reinforcing the intrinsic nature of science and research; ii) strengthening openness-related expertise; iii) ensuring a stable foundation for the research process, and iv) increasing the societal impact of research. In September 2013, the Finnish government adopted a Resolution on Comprehensive Reform of State Research Institutes and Research Funding, which focuses on building up multidisciplinary, high-level research of significant societal relevance and research in support of government decision making. The resolution covers reorganisation of PRIs, reallocation of some public research funding to competitive research funding, and creation of a new, strategic research funding instrument within the Academy of Finland to support long term research on challenges facing Finnish society.

Promoting structural adjustment and new approaches to growth

Foresight exercises are commissioned by the Committee for the Future under the aegis of the Finnish Parliament and are published every four years. The latest exercise from 2014 '100

Opportunities for Finland and the World: Radical Technology Inquirer (RTI) for anticipation/evaluation of technological breakthroughs' spans to the year 2030. It discussed 100 emerging technologies in the context of 20 different value-producing networks, defined as clusters of demand and areas of change that have been created by global megatrends. The next exercise will be expanded into a joint forum of developers of foresight at all levels. The Research and Innovation Council was recently re-established. The former Council launched its latest Research and Innovation Policy Review in 2015. The Government's strategic projects and new growth sectors include digitalisation, the bioeconomy, clean solutions, and health sector. The health and healthcare industry and research are of strategic relevance for Finland. Therefore, the Health Sector Growth Strategy for Research and Innovation will develop the operating environment and ecosystem to create a competitive advantage for Finland as a health sector research and innovation partner and a target country for investment. The Team Finland network brings together all state-funded actors across different agencies and facilitates the interaction of services they offer. The overall objective is to promote the internationalisation of Finnish companies, to attract foreign investments and to promote the country's brand.

Selected Highlights: Universities and public research

Finland has a strong science base, high public expenditure on R&D, highly ranked universities and a high rate of scientific publications relative to GDP. Investments in higher education and research in 2016: Ministry of Education and Culture USD 3.7 billion PPP (EUR 3,4 billion) and Ministry of Employment and the Economy USD 188 billion PPP (EUR 171 billion). Additional resources are allocated through Government's key strategic projects in strengthening competences in the branches of these Ministries. Furthermore, as a response to the 2010 university reform, competitive funding was increased to strengthen universities' diversity and specific research profiles. The Government Programme (2015-19) provides new learning environments and digital materials to comprehensive schools and HEIs. A Polytechnics Act took force from the beginning of 2014 to help polytechnics (universities of applied sciences) to meet changes and challenges in Finnish workplaces and society by shifting responsibility for their basic funding to the state and by granting them the status of independent legal persons.

ICT and Internet infrastructures

With comparatively low ICT investment per GDP, Finland has managed to establish well-developed Internet infrastructures with exceptional wireless broadband subscription rates. In 2014, Tekes introduced three complementing programmes to further boost the Finnish position as a significant producer and user of new ICT and digitalisation solutions in various sectors, namely the i) 'Bits of Health'; ii) the Industrial Internet; and iii) the 5G programmes.

Clusters and regional policies

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Skills for innovation

All human capital indicators for Finland are above the OECD medians. Adults' ability to solve technical problems and 15-year-olds' performance in science are outstanding, and the high rate of doctoral graduates in science and engineering indicates a secure supply of the highly skilled for STI. A national working group of the Science Education Programme reviewed overall science education in 2014 and developed guidelines and propositions with a view to stimulating the interest in science and research among children and adolescents. Based on the findings, the government intends to reform basic education with the aid of digital learning environments.

Globalisation

Centres of excellence and internationally networked competence centres will play a central role for Finland in attracting skilled workforce, researchers, knowledge-intensive companies and investments. Moreover, the Academy of Finland promotes the international mobility of researchers by providing grants for research stays and joint projects abroad. Bilateral or multilateral agreements exist with China (Cas Fellowship), Japan (JSPS Fellowship), Estonia, India, and Russia as well as Brazil and Chile. Publicly funded grants or fellowships by the Academy of Finland are also portable to EU countries. However, many interested researchers are discouraged by the administrative burden of application processes. Simplification thus remains major target. With international co-publications above and international co-patenting below the OECD median, Finland's position in international co-operation on science and innovation is mixed. To exceed the EU average in the stock of FDI as a share of GDP (41% in 2014) by 2020 from its current level (34% in 2014), the government adopted in December 2012 a decision-in-principle, Team Finland – Strategy for Promoting Foreign Investment. Rather than creating a new initiative or adding a new layer of bureaucracy, this strategy seeks to improve the efficiency of existing FDI promotion efforts by bringing them under a single umbrella. By doing so, the government wishes to create a clear, flexible and customer-oriented model so that key actors at home and abroad work towards a coherent strategic goal. In addition, international companies conducting R&D activities in Finland can apply for Tekes' funding if they are registered in Finland.

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[6] https://www.innovationpolicyplatform.org/system/files/STIO%20Key%20messages_0.pdf

[7] http://www.oecd-ilibrary.org/science-and-technology/oecd-science-technology-and-innovation-outlook-2016/finland_sti_in_outlook-2016-59-en

[8] http://www.oecd-ilibrary.org/science-and-technology/oecd-science-technology-and-innovation-outlook-2016/sti-country-profiles-reader-s-guide_sti_in_outlook-2016-44-en

[9] http://www.oecd-ilibrary.org/science-and-technology/oecd-science-technology-and-innovation-outlook-2016/methodological-annex-to-the-2016-oecd-sti-outlook-country-profiles_sti_in_outlook-2016-95-en

[10] <https://innovationpolicyplatform.org/system/files/sti-outlook-2014-finland.pdf>

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