



JRC SCIENCE FOR POLICY REPORT

RIO Country Report 2017: Estonia

*Research and Innovation
Observatory country
report series*

Kattel, R., Stamenov, B.

2018



This publication is a Science for Policy report by the Joint Research Centre (JRC), the European Commission's science and knowledge service. It aims to provide evidence-based scientific support to the European policymaking process. The scientific output expressed does not imply a policy position of the European Commission. Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use that might be made of this publication.

Contact information: JRC-B7-NETWORK@ec.europa.eu

JRC Science Hub

<https://ec.europa.eu/jrc>

JRC111256

EUR 29153 EN

PDF ISBN 978-92-79-81198-2 ISSN 1831-9424 doi:10.2760/312784

Luxembourg: Publications Office of the European Union, 2018

© European Union, 2018

Reuse is authorised provided the source is acknowledged. The reuse policy of European Commission documents is regulated by Decision 2011/833/EU (OJ L 330, 14.12.2011, p. 39).

For any use or reproduction of photos or other material that is not under the EU copyright, permission must be sought directly from the copyright holders.

How to cite this report: Kattel, R, and Stamenov, B, *RIO Country Report 2017: Estonia*, EUR 29153 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-81198-2, doi:10.2760/312784, JRC111256.

All images © European Union 2018

RIO Country Report 2017

The R&I Observatory country report 2017 provides a brief analysis of the R&I system covering the economic context, main actors, funding trends & human resources, policies to address R&I challenges, and R&I in national and regional smart specialisation strategies. Data is from Eurostat, unless otherwise referenced and is correct as at January 2018. Data used from other international sources is also correct to that date. The report provides a state-of-play and analysis of the national level R&I system and its challenges, to support the European Semester.

Summary

Estonia's economic landscape in general and the R&I field specifically have remained stable in 2017. In 2016, R&D intensity decreased to 1.28% of GDP (1.50% in 2015) and business enterprise expenditure in R&D also diminished to 0.66 % (0.69% in 2015). Estonia's exports and value added are driven mostly by contract manufacturing of relatively complex products. Estonia continues to have a very favourable business environment but it is faced with a short supply of highly qualified human resources. The Estonian R&D system relies overwhelmingly on competitive project-based policy measures, both in funding public universities and in supporting private companies.

Challenges for R&I policy-making in Estonia

Addressing the asymmetry between the public and the private R&I efforts. The Estonian science system follows very different specialisation from the business sector as it finances and supports mostly curiosity-driven basic research for which there is little immediate economic demand. Perhaps the most ambitious policy measure addressing this challenge is the Support for applied research in the areas of smart specialisation (NUTIKAS) as this measure explicitly encourages and supports companies to contact and collaborate with research institutions (the main applicant has to be a company). While initially the interest in this measure was quite low from the private sector, the number of applications has increased in 2017.

Promoting private investment in R&I by addressing the low pace of technological upgrading in industry. Due to their contract manufacturing profile, most Estonian manufacturing companies are not very strong in design and development capacities, both in terms of in-house capabilities and networks they belong to, thus these companies have strong obstacles in climbing the value ladder. The Enterprise Development Programme is the main programme that aims to support well-thought-out company development, improved action planning, innovation implementation and product development. In the course of the development programme, each participating enterprise is supposed to launch new products and services that are more profitable than their predecessors.

Decrease reliance on European Structural Funds in public R&I funding. Around 50% of government spending on research comes from European structural funds. As there is no certainty about structural funds in the next EU financial perspective (from 2020 onwards), Estonia should take steps to decrease its reliance on EU's structural funding. While successive governments have been very supportive in rhetoric, actual funding increases have been quite modest. The only substantial change is the recent increase of basic funding for research institutions by 50% from 2014 to 2017.

Insufficient supply of R&I human resources. Lack of qualified labour is one of the long standing challenges for the Estonian economy due to ageing population, outward migration and low attractiveness of research careers. In response, the Alien's Act was amended in 2015 to more easily allow foreign labour force to come in the country. Moreover, with a recent Act the government created a list of 339 start-up companies that can hire foreign (non-EU) workers according to less stringent criteria.

Main R&I policy developments in 2017

- [Additional non-competitive funding](#) for public universities (increases from 9.3 million euros in 2015 to 16.9 million euros in 2017 changing the ratio between competitive and non-competitive funding to roughly 70:30).
- [Additional funding for large scale industrial investors](#) (Large Investor Support Scheme, budget of 3 million euros in 2017).
- [Additional funding for digital agenda](#): for 2018-2021, government plans to invest additional 28 million euros into four areas: furthering ICT skills, smart immigration, increasing visibility of e-Estonia, and digitalization in industry.
- [Relaxing of migration regulations](#) for start-up companies making it easier to hire foreign (non-EU) workers.
- Implementation of the [ASTRA programme](#) that supports consolidations among research and higher education institutions; it also supports their strategic goals and infrastructure investments. (Overall budget 120 million euros)

Smart Specialisation Strategy Monitoring and Implementation

The management and monitoring of smart specialization measures has been moved from the Estonian Development Fund (following its closure) to Ministry of Economic Affairs and Communications (MEAC) and the Ministry of Education and Research (MER) in 2016. Monitoring and evaluation of smart specialisation is under a special inter-ministerial commission which consists of civil servants, university and industry representatives. The key task of the commission is to monitor progress of different smart specialization measures and propose corrective actions if needed. The commission leadership rotates annually between the MEAC and MER.

There are altogether 5 special smart specialization measures implemented. In addition ca 25 measures that are partly financed from structural fund have a full or strong smart specialization focus. Implementation is on track and in line with the strategic framework. Innovative procurement and applied R&D support measures are novel policies and hence with relatively slow pick up. However, in both cases the situation has improved in 2017 as there are more applicants.

Foreword

The R&I Observatory country report 2017 provides a brief analysis of the R&I system covering the economic context, main actors, funding trends & human resources, policies to address R&I challenges, and R&I in national and regional smart specialisation strategies. Data is from Eurostat, unless otherwise referenced and is correct as at January 2018. Data used from other international sources is also correct to that date. The report provides a state-of-play and analysis of the national level R&I system and its challenges, to support the European Semester.

Acknowledgements

This report has benefited from the comments and suggestions of Ignacio Baleztena, DG Research and Innovation (RTD) and Rein Kaarli from the Estonian Ministry of Education and Research.

Authors

Rainer Kattel is professor of innovation and public governance at Institute for Innovation and Public Governance, University College London, and research professor at Ragnar Nurkse Department of Innovation and Governance, Tallinn University of Technology, Estonia.

Blagoy Stamenov is a policy analyst at Directorate-General Joint Research Centre, European Commission (Brussels, Belgium).

Contents

- 1 Economic context for R&I..... 4**
 - 1.1 Structure of the economy.....4
 - 1.2 Business environment.....5
- 2 Main R&I actors..... 5**
- 3 R&I policies, funding trends and human resources..... 7**
 - 3.1 Public allocation of R&D and R&D expenditure8
 - 3.2 Private R&D expenditure9
 - 3.3 Supply of R&I human resources 10
- 4 Policies to address innovation challenges..... 12**
 - Challenge 1: Address the asymmetry between the public and the private R&I efforts12
 - Description 12
 - Policy response 12
 - Policy Assessment 12
 - Challenge 2: Promote private investment in R&I by addressing the low pace of technological upgrading in industry 13
 - Description 13
 - Policy response 13
 - Policy Assessment 14
 - Challenge 3: Decrease reliance on European Structural Funds in public R&I funding. 14
 - Description 14
 - Policy response 15
 - Policy Assessment 15
 - Challenge 4: Insufficient supply of R&I human resources 15
 - Description 15
 - Policy response 15
 - Policy Assessment 16
- 5 Focus on R&I in National and Regional Smart Specialisation Strategies 17**
- References 19**
- Abbreviations 20**
- Factsheet..... 21**
- List of figures 22**
- List of tables..... 22**

1 Economic context for R&I

In 2016, Estonian GDP grew by 1.6% due to a drop off in investment linked to the EU's investment funding cycle and low global energy prices. However, in the first two quarters of 2017, the economic growth sped up to 4.4% and to 5.7% respectively, due to increased industrial production, increased construction activity and internal consumption (Statistics Estonia, 2017). According to the European Commission Autumn 2017 Economic Forecast, overall growth is expected to be around 4.4% in 2017 and 3.2% in 2018.¹ The employment rate is currently at its historical peak and is projected to increase further, even though the working age population is shrinking due to ageing. Unemployment is also expected to increase from 7% in 2017 to 7.7% in 2018 as reforms bring partly disabled people back to the labour market.

The 2017 budget of the new centre left coalition government, formed in November 2016, is in deficit (0.3%) due to increased investment. Overall public debt remains, however, very low (9.5%). Global food and energy prices and a significant increase in excise duties are expected to increase inflation to 4% in 2017.

For 2018, the coalition government plans for a further investment programme that will increase public deficit to 0.4% of GDP. This includes additional 16.1 million euros for R&D funding. The government also plans for a multitude of new expenditure programmes in healthcare, education, social funding and in financing local governments.

Estonia's productivity lags behind the EU average – in 2016 labour productivity per hour worked was 71.8% of the EU28 average. This puts Estonia in the 6th lowest position within the EU28. Since the crisis of 2007-2008, Estonia has registered a substantial loss in total factor productivity (-13%), one of the highest in the EU. Furthermore, according to the European Semester 2017 country report², there are indications that Estonia's export structure in manufactured goods is shifting towards the lower quality ranks and the total productivity of the manufacturing sector (on the basis of value added) has constantly declined over the years.

While various changes to taxes (e.g., increased excise taxes on alcohol, introduction of elements of progressive tax to individual income tax from 2018) have dominated public debates, overall economic policy and R&I policies in particular have experienced only incremental changes in 2017. According to the European Innovation Scoreboard 2017, during the period of 2010-2016 Estonia's performance has slightly declined (by 3.6%) relative to that of the EU.

1.1 Structure of the economy

The structure of the Estonian economy has remained remarkably stable during the post financial crisis period (2010-2016) with the share of manufacturing in total value added staying around 15-16% and in total employment around 18-19%. Other sectors, including knowledge intensive services, show similar stability both in valued added and in employment (knowledge intensive services made up 35.5% of total employment in 2016).

Exports and value added are driven by manufacturing; in exports, mineral oils, electronics, wood and wooden products dominate since mid-2000s (Karo et al 2014). In 2017, the Estonian construction sector experienced rapid growth as well.³ Manufacturing exports are by 2016 mostly based on contract manufacturing of relatively complex technology intensive products. However, at the same time many such products tend to be niche products and thus without significant potential for economies of scale. Perhaps

¹ https://ec.europa.eu/info/sites/info/files/economy-finance/ecfin_forecast_autumn_091117_ee_en.pdf

² <https://ec.europa.eu/info/sites/info/files/2017-european-semester-country-report-estonia-en.pdf>

³ <http://www.stat.ee/news-release-2017-093>.

most importantly, electronics and other similar manufacturers of machinery import almost all of their inputs which shows weak domestic value chains (Karo et al 2014). The latter is also reflected in relatively weak industry organizations with low engagement in policy making. However, there are important exceptions as well - for instance, ABB has brought one of its six global development centres to Estonia, cooperates with ca 100 companies and employs through its value chains ca 10,000 people in Estonia (Kattel and Varblane 2017).

The Estonian economy has high levels of openness (exports of goods and services amounted to 80% of GDP in 2016 according to the World Bank Development Indicators) and integration with Western and particularly Nordic neighbours as evidenced by the high levels of foreign direct investments (both stocks and flows). One of the key and relatively unique structural features of the Estonian economy is the high share of foreign ownership in the banking sector: more than 90% of banking assets are foreign owned (Kattel 2010 & 2015). As throughout the 2000s, the leading sectors for foreign investments in 2017 are the financial and real estate sectors (Bank of Estonia, 2017).

In terms of firm organisation, more than 90% of enterprises in Estonia are micro enterprises with less than 10 employees (Statistics Estonia, 2017). SMEs dominate the 'non-financial business economy'. They provide 75% of value added and roughly 78% of employment.⁴ This is 18 percentage points higher than the EU average for value added, and 11 percentage points higher than the EU average in terms of employment.

1.2 Business environment

Estonia has a high ranking (rank 12 out of 189 economies) in the World Bank Ease of Doing Business 2018 index⁵ which places it 1st among Central and Eastern European EU member states. In general, the rules for starting up and running a business are simple (rank 14) and the legal framework is transparent and up-to-date. The Tax Foundation ranks Estonia as number 1 globally in tax competitiveness in 2016 and 2017 (Tax Foundation 2017). The Global Innovation Index ranks Estonia at 25th position in 2017.⁶

In addition, Estonia's Small Business Act (SBA) profile is generally strong⁷. Estonia performs above the EU average in five SBA principles — it scores particularly well in responsive administration, access to finance, single market and internationalisation. Its scores for 'second chance' are below the EU average. The only issue for Estonia, therefore, is to work on faster insolvency procedures for a second chance for entrepreneurs who may have failed the first time around.

2 Main R&I actors

Government

The Organisation of Research and Development Act provides the framework for the structure of the Estonian research and innovation system. According to this law, the Government of the Republic prepares national R&D development plans, submits them to the Riigikogu (Parliament), approves national R&D programmes, ensures the cooperation between the ministries and enacts legislation.

⁴ European Commission, SBA Factsheet 2016 Estonia.

⁵ <http://www.doingbusiness.org/rankings>

⁶ Global Innovation Index 2017, <https://www.globalinnovationindex.org/gii-2017-report>.

⁷ <https://ec.europa.eu/docsroom/documents/26562>

Policy design and evaluation is carried out mainly by the **Ministry of Education and Research (MER)** which is in charge of national research and education policy and the **Ministry of Economic Affairs and Communications (MEAC)** which oversees technological development and innovation policy. **Other ministries** are also responsible for organising and financing R&D activities, drafting and implementing R&D programmes in their area of responsibility.

A permanent advisory body - the **Research Policy Committee** - provides advice to the Ministry of Education and Research and the **Innovation Policy Committee** advises the Ministry of Economic Affairs and Communications. The **Research and Development Council** is an expert consultative body that advises the Government on R&D and innovation matters – all policy documents have to pass the R&D Council prior to being submitted to the Government for approval.

At the operational level, both MEAC and MER have implementing agencies and intermediaries. The main implementing body under the Ministry of Economic Affairs and Communication is the **Enterprise Estonia** Foundation, which is responsible for managing business support, innovation and technology programmes. Foundation **KredEx**'s mission is to facilitate the increase of the competitive strength of Estonian companies by improving the availability of financing and managing credit risks, and the improvement of the energy efficiency in the housing sector.

From the research policy perspective, the Ministry of Education and Research has three main agencies that among their other activities deliver funding and support: the **Archimedes** Foundation is implementing agency for structural support in the field of R&D and administers schemes for improving mobility and marketing Estonian higher education and research abroad. The **Estonian Research Council** was established in March 2012 to concentrate the funding of R&D and achieve better functioning of the financing systems. This body is the main funding organization of R&D, consolidating different grants and types of funding and giving research more visibility in the society. The **INNOVE** Foundation manages a range of programmes and support measures in the fields of lifelong learning and active labour market policies.

Academia

The main players of the Estonian research system are the six public universities (one private university is focused mostly on education, not research); out of these universities, Tartu University and Tallinn University of Technology dominate in terms of student and staff numbers, research output and public funding received. In 2016, the R&D expenditure in non-profit institutional sectors (higher education, government and non-profit private sectors) was €131m (this is €32m less than in 2015 which is explained by the hiatus between two EU structural funding periods), of which 73% was performed by universities (Statistics Estonia 2017). From 22 positively evaluated R&D institutions 7 are universities (1 private and 6 public), 4 are private R&D institutions (3 in health services, 1 in ICT field) and 11 are relatively small public research organisations.⁸

An important aspect of the Estonian R&D system is its overwhelming reliance on competitive project-based policy measures, both in funding public universities and private companies (Raudla et al 2015). This is particularly glaring in research where ca 70% of all funding is competitive (Ministry of Finance, Explanatory Statement on State Budget Act 2017⁹). However, in 2016 and 2017 basic funding of universities has been increased to 16.9 million euros per year.

⁸ The latest evaluation took place in 2017, the results are available at the homepage of the Estonian Research Council, <http://www.etaq.ee/tegevused/evalveerimine/korraline-evalveerimine/>.

⁹ The Estonian version is available here: <https://www.rahandusministeerium.ee/system/files/force/document/files/riigieelarve-seaduse-seletuskiri-2018.pdf?download=1>

Business

According to the National Audit Office (2014; see also Varblane and Kattel 2017), the structure of the Estonian economy is dominated by small and medium-sized low-tech companies whose need for research and development is limited and therefore only a few of them are cooperating with universities. Private sector R&D is performed mostly in larger companies: around half of the private R&D investments are done by companies with more than 250 employees (Mürk and Kalvet 2014). Around 40% of private R&D expenditure is done by about 100 manufacturing companies (Mürk and Kalvet 2014). Overall, in 2015 there were 225 companies reporting R&D expenditure and this number has been quite stable over the past years (Statistics Estonia 2017).

Estonian manufacturing is characterized by contract manufacturing as a prevalent business model (Kaarna et al 2015). Contract manufacturing means that there are relatively low levels of in-house competences for design and development. According to CIS data, contract manufacturing companies also have low access to external networks of competences (Kaarna et al 2015).

Multinational R&D organisations do not operate in Estonia.

Organizations aimed at creating and solidifying networks and linkages between various R&D system actors are rather poorly developed in Estonia. Most such networks have been created in late 2000s and early 2010s with the help of European structural funds via cluster, competence centre and similar programmes. Estonia has 22 technology clusters¹⁰, 6 competence centres¹¹, 3 Science and Technology Parks (Tallinn Science Park Tehnopol, Tartu Science Park, Technopolis Ülemiste)¹².

In addition, the Estonian Intellectual Property and Technology Transfer Centre (EIPTTC) was founded by the Estonian Chamber of Commerce and the Ministry of Economic Affairs and Communication in 2013. EIPTTC offers a wide variety of intellectual property and technology transfer support services, training and education.

3 R&I policies, funding trends and human resources

Main R&I policy developments in 2017

<i>Document title, hyperlink and date of publication/announcement</i>	<i>Short description</i>
Implementation of ASTRA programme. State Budget Act 2017. https://www.hm.ee/sites/default/files/programmes_for_research_and_development.pdf	The ASTRA programme supports consolidations among research and higher education institutions; it also supports their strategic goals and infrastructure investments. Proposals in smart specialization areas will get additional points during evaluation. Budget: 120 million euros.
Increasing basic funding of research institutions. State Budget Act 2017.	Basic funding of universities is increased to 16.9 million euros per year. This brings that the relationship between competitive and non-competitive funding to 70:30 in 2017.

¹⁰ <http://www.estonianclusters.ee/?lang=en>

¹¹ <http://researchinestonia.eu/science-scene/competence-centers/>

¹² <http://www.workinestonia.com/living-in-estonia/science-technology/#articleblock-Scienceparks>

<p>Large Investor Support Scheme. Enterprise Estonia, https://www.eas.ee/service/large-investor-support-scheme/?lang=en</p>	<p>New grant scheme from 2017 supports technology investments by domestic and foreign investors. Budget: 3 million euros in 2017.</p>
<p>Relaxing of migration regulations for start-up companies. Government act: https://www.riigiteataja.ee/akt/118012017002.</p>	<p>With the act government created a list of 339 start-up companies that can hire foreign (non-EU) workers according to less stringent criteria.</p>

R&I funding trends

The overall level of R&D investments as a percentage of GDP (GERD) almost doubled in 2009-2011 (from 1.4% to 2.31%), but dropped below the EU28 average in 2013 (EU28: 2.03%; EE: 1.71%) as the effect of the R&D investments in an oil shale refinery by Eesti Energia ended. In 2015 GERD as a percentage of GDP was 1.5% (similar to pre-peak levels) and in 2016 it dropped to 1.28% (Figure 1).

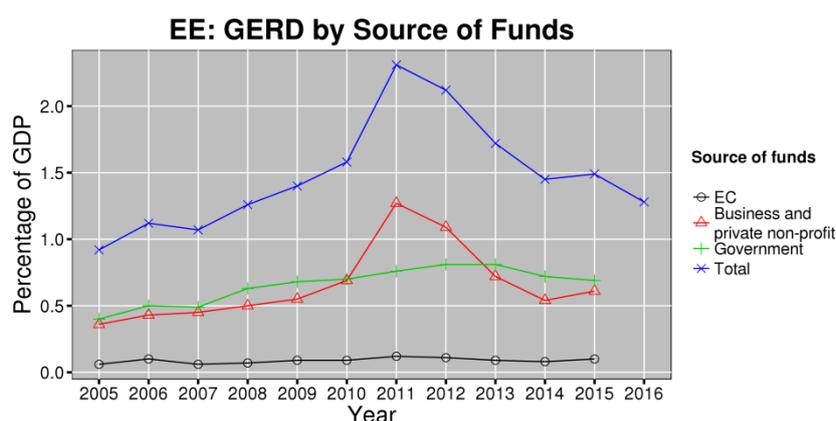


Figure 1 Development of government funding of the total GERD (Eurostat, 2017)

3.1 Public allocation of R&D and R&D expenditure

The share of government sector investments (GBAORD) as a percentage of GDP has been growing steadily in 2009-2013 (from 0.68% to 0.81%), but has declined since 2014 to 0.69% in 2016. This trend was caused by the remarkable growth of the share of EU Structural funds in government R&D budget from 2009 to 2011 and later by the decrease of payments from structural funds at the time of substitution of funding periods.¹³ Still, GBAORD is above the EU average (0.64% in 2016) and as a share of general government expenditure it was 1.75% in 2015 (EU28: 1.36%). The higher education sector performed 36% of GERD in 2016 which is also above the EU average (EU28: 23%).

During the period 2008-2015, external funding for the Estonian R&D activities accounts for 9-12% of the total GERD (which includes participation in the Framework Programmes but doesn't include Structural funds like in some other countries). In 2015, 12% of Estonian total GERD was funded from abroad (ca 50% of which is FP funding). Overall,

¹³ In Estonia EU Structural funds are included in the composition of State budget and treated accordingly in statistics as part of government funding, not funding from abroad.

Estonian R&I funding is quite dependent on EU funds if EU Structural funds are considered.

In the 2014-2020 period €665.8m (15.2% of total structural funds allocation) is allocated to thematic objective 1. Strengthening research, technological development and innovation (EC 2014). A significant amount of public RD&I funding is planned to be channelled into smart specialisation areas. The budget for Smart Specialisation in 2014-2020 (including structural funds and state budget co-financing) is planned to be about €208m. (RDI Strategy 2014-2020).

Unsurprisingly, the public sector is the main recipient of government funded GERD. Government support to private sector R&D has mainly been in the form of direct funding via competitive grants. However, a gradual shift towards increased use of financial instruments is being planned. Through the Estonian Entrepreneurship Growth Strategy, the government aims to shift to a more market-based approach to public support, with fewer direct grants and more financial instruments, including loans, loan guarantees and venture capital. As far as indirect public support to business R&D is concerned, Estonia has no special tax incentives for R&D and innovation investments as its tax policy traditionally follows the rule of taxing everything similarly and allowing as few exemptions as possible.

3.2 Private R&D expenditure

The business sector is the main funder of the Estonian business sector investment and it has been the main driver of its changes. Business Expenditures on Research and Development (BERD) tripled between 2008 and 2011, and in 2011 it was 1.46% of GDP. The significant growth in BERD occurred mostly due to big one-off R&D investments in the oil shale refining industry by a single company (an Eesti Energia subsidiary). This effect faded and BERD declined to 0.63% in 2014, which is close to the pre-peak levels of 2009, and has been stable since then. In 2015 a small increase of private R&D spending is observable (0.69%) but in 2016 the level slightly dropped to 0.66%. Importantly, public funding of BERD in Estonia (ca 10 % in 2014) has been higher than EU28 average (ca 6 % in 2014).

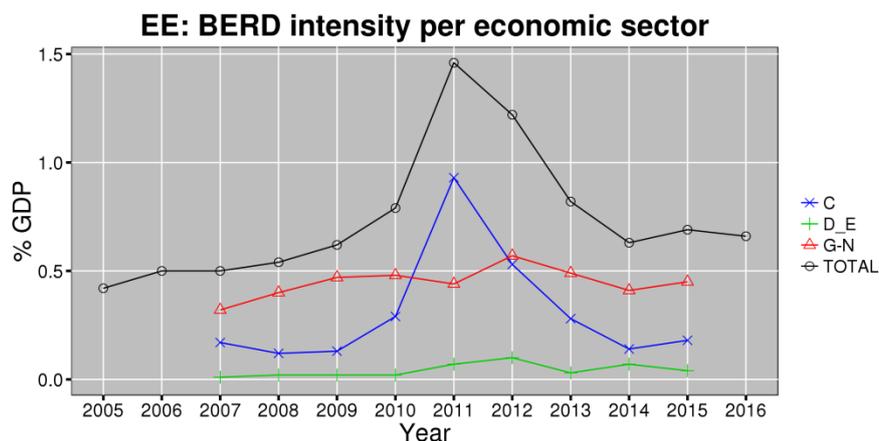


Figure 2 Development of BERD intensity per economic sector¹⁴ (Eurostat, 2017)

In 2015, the highest BERD spenders are the ICT, manufacturing and energy sectors. In manufacturing the leading R&D expenditure product categories are computer, electronic and optical products and refined petroleum products. The electronics sector is very internationally oriented with a handful of widely recognized multinational companies

¹⁴ C: Manufacturing, D_E: Energy and utilities, G-N: Services

(such as ABB and Ericsson) and some smaller companies specialised in high quality contract manufacturing of niche products (see also section 1.1). The nature of the contract manufacturing business model implies that very few of those companies would use public support since the products they are producing change quite frequently and at best they would be interested in state support for acquiring machinery and improving infrastructure but not for longer-term R&D projects. As regards refined petroleum products, the oil shale industry in Estonia is one of the most developed in the world and several large-scale enterprises of the refining industry are located in the industrial area of the North-Eastern Estonia.

In the business services sector ICT, professional, scientific and technical activities and the financial services sectors are the top R&D spenders. ICT is one of the fields that has had the fastest growth in the last 10-15 years in Estonia. The ICT sector witnesses the highest number of high growth innovative enterprises and the second highest number of employees among the most innovative sectors in the recent years. The number of ICT enterprises is quite big in Estonia (ca 3,800 in 2015), but most of them have less than 10 employees. In 2015, ICT enterprises comprised 13.5% of the manufacturing sector and 6.7% of the overall business sector (measured by sales revenue) (Statistics Estonia 2017).

3.3 Supply of R&I human resources

Supply of R&I human resources is a somewhat paradoxical area in Estonia: on one hand, Estonian students score very well in PISA tests – the country scored in 2012 and in 2015 well above the OECD average in all three categories (mathematics, reading, science) (PISA 2012 Results in Focus; PISA 2015 Results in Focus), indicating a well-functioning education system; on the other hand, career in R&I, and especially pursuing a PhD, is not very popular. In addition, ageing population and outward migration have made the supply of human resources a persisting bottleneck for Estonia's R&I system (ERAC, 2012; European Commission DG EAC, 2015).

The number of new graduates in science, maths, computing, engineering, manufacturing, construction per 1000 population has slightly increased but remains below the EU average (2.11 per 1000 in 2015 vs 2.32 per 1000 for EU-28). While Estonia does well in terms of higher education rates among 25-34 year olds (40% which is around the OECD average) in terms of PhD graduates and researchers Estonia is one of the laggards in Europe and the OECD (Tammaru 2016). Over the past decade the number of PhD graduates has significantly increased, from 124 in 2005 to 208 in 2015 (Statistics Estonia 2017). Yet, in comparison, Estonia has 4 PhD graduates per 1000 working age people, which is below the OECD average. Less than 10% of people with PhDs work in the private sector (Statistics Estonia). The key reason for this can be found in the low amount of the scholarships offered to PhD students: for a decade, monthly public funding for a PhD student was 385 euros (since 2005), while net average salary in Estonia is more than double this, 882 euros (in 2016). In 2016, the PhD funding was increased to 442 euros which is still less than 50% of the net average salary (since 2015, however, the state covers social and health tax contributions for PhD students making them eligible for health care and other similar services). Tallinn University of Technology has mandated that since 2016, all new PhD students have to be paid Estonian average salary.

In 2015 Estonia had 5.46 researchers per 1000 population which is slightly lower than the EU28 average (5.61). In 2015, a researcher salary was roughly 1.5 times higher than Estonia's average wage¹⁵. The share of female researchers is strongly above the EU28 average: in 2015 (latest comparable data), there were 44% of female researchers in Estonia, and 33% in EU28.

¹⁵ See Council of Rectors, <http://www.ern.ee/et/leht/uelikoolide-personaliandmed>

The competition for research positions in Estonia is generally low. For highly qualified foreign researchers to settle in Estonia, the drawback is not only the salary level, which is not internationally competitive but also the fact that Estonia's research institutions are not sufficiently broadly known and the immigration rules for third country nationals are quite strict, making it difficult for local companies to attract qualified labour from outside Europe.

Nevertheless, Estonia has been active in addressing the human resources issue and some results are already visible: the number of foreign researchers has grown from 58 in 2004 to 393 in 2013 (Statistics Estonia, 2017). The Alien's Act was amended in 2015 to more easily allow foreign labour force to come in the country. Moreover, with a recent Act the government created a list of 339 start-up companies that can hire foreign (non-EU) workers according to less stringent criteria.

4 Policies to address innovation challenges

Challenge 1: Address the asymmetry between the public and the private R&I efforts

Description

The need to address the weak cooperation between science and business is an "old" issue, identified as a major challenge of the Estonian R&I system in nearly all the Council Country Specific Recommendations (CSRs) between 2012 and 2017. There seems to be a structural mismatch between the needs of the business sector and the provision of knowledge from the public sector. According to the Community Innovation Survey 2012 only 10.8% of the total sample of innovative companies cooperated with universities and HEIs (compared to almost 26% in neighbouring Finland). Moreover, only 3.8% of public R&D is contracted by private enterprises (Kaarna et al 2015).

Such asymmetries are, on the one hand, to be expected after the tumultuous structural changes that took place in the 1990s and the subsequent industry specialisation into contract manufacturing for European production networks. However, as the asymmetries are persistent since early 2000s, it appears that the problems of mismatching specialisations in public and private R&D profiles are ingrained in respective governance structures as well. Estonia has a particularly strong decentralisation culture between ministries (making coordination rather difficult) and also between ministries and their respective agencies. Thus, Estonia has a quite strongly disjointed RD&I policy governance structure (Suurna and Kattel 2010; Karo and Kattel 2015). For instance, in evaluating research proposals at the Estonian Research Council there is no input from Enterprise Estonia, or from other outside agencies or industry associations. Such problems are endemic across the policy landscape. Also important is the general weakness of mediating or networking organisations, as well as civil society's role in R&D and innovation policy. This is particularly important for the business sector whose policy positions are more scattered, with diverse interests and much less involvement in policy making.

Policy response

As regards specific programmes promoting science-business cooperation and smart specialisation, the 2014-2020 Technology development centres (formerly known as Competence centres in the 2007-2013 period) programme and the Innovation voucher grants for SMEs which are cooperating with a higher education institution, test laboratory or intellectual property experts (maximum amount of the grant €4,000) are ongoing. In addition, the Ministry of Education and Research launched the new activity Support for applied research in the areas of smart specialisation (NUTIKAS) in August 2015. One aim is to support enterprises tendering applied research or product development from Estonian public R&D institutions and about 1/3 of financing should come from enterprises.

One of the ways the government is attempting to deal with the governance side of the challenge is to support the creation of R&D officer positions in line ministries. This governance change was introduced quite recently, in 2016.

Policy Assessment

From the policy measures listed above, perhaps the most ambitious one is the Support for applied research in the areas of smart specialisation (NUTIKAS) as this measure explicitly encourages and supports companies to contact and collaborate with research institutions (the main applicant has to be a company). While initially the interest in this measure was quite low by the private sector, the number of applications has increased in 2017 (altogether there have been 50 applications from January 2016 till August 2017). However, in terms of funding, this as well as other measures supporting alignment of

private and public research profiles remain quite low (NUTIKAS funding is roughly similar to the increase in public universities basic funding in 2017). Thus, it remains to be seen whether these measures will have a significant impact in alleviating the asymmetry in public and private research profiles.

Some positive developments in the indicators can be observed - in 2016 the share of public R&D contracted by the business sector increased to 6.3% (Statistics Estonia).

Challenge 2: Promote private investment in R&I by addressing the low pace of technological upgrading in industry

Description

Private investment in R&D has been decreasing in the last couple of years and after the oil shale sector related boom in 2011-12 it has returned to the pre-boom level. In 2016 and 2017 Estonia received a CSR to promote private investment in research, development and innovation.¹⁶

While manufacturing is Estonia's leading economic activity in terms of value added, employment and exports, the country still lags behind European average productivity. CIS surveys show that low technology and less research-intensive innovations dominate in the Estonian manufacturing sector (Kaarna et al 2015). As already pointed out, most manufacturing companies engage in contract manufacturing for European and global value chains. Overall, process innovations dominate over science driven technology upgrading (Kaarna et al 2015). Results from CIS 2014 show that key obstacles for non-innovators are their low demand for innovations and lack of good ideas (Statistics Estonia 2016).

Estonian manufacturing companies are not very strong in design and development capacities, both in terms of in-house capabilities¹⁷ and networks they belong to or are able to leverage for their own business and production processes. This makes most manufacturers relatively weak at interpreting new or emerging market trends and signals, thus these companies have strong obstacles in climbing the value ladder towards activities with higher value added and profit margins.

Policy response

The Enterprise Development Programme is the main programme (€73m) that aims to support well-thought-out company development, improved action planning, innovation implementation and product development. In the course of the development programme, each participating enterprise is supposed to launch new products and services that are more profitable than their predecessors. It targets industrial enterprises and companies active in smart specialisation fields, operating for at least 3 years, with minimum 8 employees and already having some experience in exporting or having increased their sales each year by 10% on average. The programme does not only provide funding, it also aims to give to its "clients" business development guidance.

Furthermore, additional funding for large scale industrial investments (from 2017) and for digitalization in industry (from 2018) are also policy measures related to this challenge.

Moreover, in the State Budget for 2018, 3 million euros are allocated as special support to R&D in the ICT sector.¹⁸

¹⁶ https://ec.europa.eu/info/sites/info/files/2017-european-semester-country-specific-recommendations-commission-recommendations_-_estonia.pdf.

¹⁷ According to CIS2012, 20% of Estonian enterprises are engaged continuously in in-house R&D activities compared to 41% in Finland and 29% in Sweden.

¹⁸ <https://www.riigikogu.ee/download/3e60a835-5c3b-4d9b-9034-c486271b6a0d>

Last but not least, to support growth entrepreneurship, Estonia has also launched a number of new financial instruments such as the EstFund fund-of-funds and the COSME counter-guarantees. EstFund is a €60m risk capital fund-of-funds, complementary to the Baltic Innovation Fund (BIF), oriented at early-stage investment in business ideas and supported by Structural funds and the European Fund for Strategic Investments (EFSI). The COSME counter-guarantee agreement between KredEx and the EIF (also benefiting from EFSI support) will allow KredEx to support €200m of loans and leases. Approximately 1,000 SMEs are estimated to receive financing for their business ideas. Most of these SMEs are active in high-tech and knowledge intensive service sectors.

Policy Assessment

Estonia has started to shift the way industry support works towards increased use of financial instruments. It is therefore a key challenge for this period to change organizational culture in the main funding agencies towards a new way of policy thinking and implementation (more bank-like and less bureaucratic) and to change the mindset on the level of both policy makers and final beneficiaries (the target group). In any case, it might be highly useful to experiment with such new ways of implementing industry support as there are persistent doubts whether grant support measures deployed in the 2000s have had any meaningful impact on industrial upgrading (National Audit Office 2014)¹⁹. Indeed, given the fact that Estonian banking sector is overwhelmingly in the hands of foreign owners, it is worth considering transforming innovation and economic policy agencies (such as KredEx, Enterprise Estonia) into a development bank-like institution that takes positions in companies it supports either via loans or equity. Furthermore, as large parts of the RD&I budget are based on structural funds that will likely diminish after 2020, such investment vehicles would provide a sensible exit strategy from reliance on EU funding. Also, such investment vehicles could provide options for Estonian pension funds to diversify their local portfolios by participating in the capitalization of such a "bank" structure. While there were some proposals along these lines made during 2016 by at that time Minister of Economic Affairs and Communications Liisa Oviir, after the government change in November 2016, such ideas for a public development bank have also been shelved. There are, however, other investment vehicles such as the BIF and EstFund that signal a shift towards using more financial instruments than direct support. Altogether, Kredex has €145.5 million during the current structural funding period to support lending and exports via various financial instruments.

Challenge 3: Decrease reliance on European Structural Funds in public R&I funding

Description

During 2011-2015, EU's structural funds made up more than half of the entire research budget of the Ministry of Education and Research. (Koppel 2016) The situation is not unique to research funding (Varblane 2014) and while in 2016 the share of structural funds decreased (to 48%), the decrease was not substantial. It is quite likely that Estonia will receive less structural funds under the post-2020 European Union financial perspective, therefore such high dependence on structural funds carries huge risks. The problem is compounded by the fact that EU structural funding has been crucial in upgrading and building new research infrastructure which, however, has also increased the costs of amortisation that were partially covered by structural funds as well.

¹⁹ The National Audit office has found that the economic impact of the €166 million of support paid out from 2007-2013 to further companies' innovativeness and capacity for growth has been limited and random. Only half of the six main measures aimed at supporting innovation helped the supported companies to achieve better results in terms of increasing exports or added value than companies that received no support.

Policy response

Estonia has recognized this issue already in its current RDI strategy 'Knowledge based Estonia' 2014-2020 (adopted in 2014). The strategy states that by 2018, implementation plans should also include exit plans from EU structural funds. The only clear-cut solution to decrease the reliance on structural funds is to increase Estonia's own public funding. And while successive governments have been very supportive in rhetoric, actual funding increases have been quite modest. The only substantial change is the recent increase of basic funding for research institutions by 50% (up to 16.9 million euros) in 2017. In 2018 the figure will increase further to 26.9 million euros.²⁰

Policy Assessment

This challenge could potentially pose significant problems to Estonia's R&I system in the future; in this context, Estonia's policy response so far can be deemed to be inadequate. However, there is increasing awareness among policy makers that this issue needs more attention. It would be advisable to make an 'exit strategy' from EU structural funds one of the key priorities for R&I policy in 2018. This is all the more significant as key R&I public agencies (e.g., Enterprise Estonia, Archimedes) have set up their internal administrative and external policy processes in accordance with European regulatory requirements. Exiting structural funds could offer a window of opportunity to rethink and reform some of these processes to increase public sector capacities to deal with other challenges listed in this report.

Challenge 4: Insufficient supply of R&I human resources

Description

Lack of qualified labour is one of the long standing challenges for the Estonian economy due to ageing population, outward migration and low attractiveness of research careers. Specifically, the number of new graduates in science, maths, computing, engineering, manufacturing, construction per 1000 population has slightly increased but remains below the EU average (2.11 per 1000 in 2015 vs 2.32 per 1000 for EU-28). While Estonia does well in terms of higher education rates among 25-34 year olds (40% which is around the OECD average) in terms of PhD graduates and researchers Estonia is one of the laggards in Europe and the OECD. Over the past decade the number of PhD graduates has significantly increased, from 124 in 2005 to 208 in 2015 (with national target being 300 PhD graduates by 2020). Yet, in comparison, Estonia has 4 PhD graduates per 1,000 working age people, which is below the OECD average. Less than 10% of people with PhDs work in the private sector.

Policy response

Estonia has been active in addressing the human resources issue and some results are already visible. In the recent years a significant proportion of EU structural funds have been directed to the development of human capital, entrepreneurship and vocational education. The number of foreign researchers has grown from 58 in 2004 to 393 in 2013 (Statistics Estonia, 2015). The Alien's Act was amended in 2015 to more easily allow foreign labour force to come in the country. Moreover, with a recent Act the government created a list of 339 start-up companies that can hire foreign (non-EU) workers according to less stringent criteria. Last but not least, public universities are actively seeking to make academic careers more attractive, for instance through tenure systems (introduced in Tallinn University of Technology in 2017).

²⁰ <https://www.riiqikoqu.ee/download/3e60a835-5c3b-4d9b-9034-c486271b6a0d>

Policy Assessment

While significant funds have been directed towards attracting international talent to Estonia – and internationalisation of universities in terms of international student and staff numbers are increasing – there is still a persistent lack of qualified labour. Thus, for instance, the ICT sector – one of Estonia’s key economic sectors – is still arguably lacking a significant number of engineers. Furthermore, with the migration crisis engulfing European countries, inward migration of significant number of even highly qualified engineers faces a considerable political backlash. One of the key challenges in going forward is to refocus development of R&I human resources towards ‘softer’ measures from family support (ensuring international school and kindergarten options) to cultural issues of tolerance and diversity.

5 Focus on R&I in National and Regional Smart Specialisation Strategies²¹

Estonia does not have a separate national or regional R&I strategy on smart specialisation. Instead, the country's smart specialisation framework comprises of the Entrepreneurship Growth Strategy (adopted by the government in October 2013) and the Research, Development and Innovation Strategy (adopted by the Parliament in January 2014). The joint strategy focuses on shared priorities while further specialising in the thematic areas. There are three smart specialisation growth areas: ICT supporting other sectors (use of ICT in industry incl. automation and robotics, cyber security, software development); health technologies and services (biotechnology, e-health); resource efficiency (material science and industry, knowledge-based construction, health-promoting food industry, chemical industry).

The process of selecting these areas was relatively top-down, driven by both key ministries in the R&D arena (MER, MEAC). The analytical part of the process was implemented by the Estonian Development Fund. The management and monitoring of smart specialization measures has been moved from the Estonian Development Fund (following its closure) to MEAC and MER in 2016. In MEAC, the smart specialization management is in one team with the economic analysis division and smart specialization measure design and monitoring. MEAC and MER staff meet regularly to align day-to-day activities.

Monitoring and evaluation of smart specialisation is under a special inter-ministerial commission.²² The commission is based on a quadruple helix model and consists of civil servants (Ministry of Economic Affairs and Communication, Ministry of Education and Research, Ministry of Finance), Government Office, university and industry representatives. The key task of the commission is to monitor progress of different smart specialization measures and propose corrective actions if needed. The commission leadership rotates annually between the Ministry of Economic Affairs and Communications and the Ministry of Education and Research. The budget for smart specialisation in 2014-2020 (including structural funds and state budget co-financing) is planned to be about €208m (RDI Strategy 2014-2020).

There are altogether 5 special smart specialization measures implemented; in addition ca 25 measures that are partly financed from structural fund have a full or strong smart specialization focus. The key measures are listed in Table 1 below.

Table 1 Key smart specialisation measures

Measure	Funding ²³	Targets	Current level
Support for applied research and product development in cooperation between research institutions and businesses in smart specialisation areas	35.5 million euros	200 companies involved by 2023	17 (as of mid-2017)
Support for more flexible opportunities for businesses to participate in technology	50 million euros	300 companies involved by 2023	12 clusters and 6 technology development centers have received funding; by the end of

²¹ This section benefited from input by Ministry of Economic Affairs and Communication (Laura Arengu) and Ministry of Education and Research (Ene Kadastik).

²² The documentation is available in Estonian only, see here: https://www.mkm.ee/sites/default/files/kaskkiri_16-0132.pdf.

²³ Government of Estonia, Structural funds, https://www.strukturifondid.ee/sites/default/files/meetmete_nimekiri.xlsx

development centres and clusters			2016, 251 have been involved in technology development centers and 154 in clusters
Support for public procurements that foster innovation	20 million euros	2 companies engaged in innovative procurements by 2016, 20 by 2023	3 procurements have been done by the end of 2016
Boosting start-up entrepreneurship	7 million euros	Start-ups supported: 240 in 2016, 1000 in 2023	2016 target was achieved by the end of 2016
Student scholarships in smart specialisation areas	21.5 million euros	2800 scholarships by 2016; 14 000 by 2023	By mid 2016, 1980 scholarships have been awarded

Implementation is on track and in line with the strategic framework. Innovative procurement and applied R&D support measures are novel policies and hence with relatively slow pick up. However, in both cases the situation has improved in 2017 as there are more applicants.

References

- Bank of Estonia (2017). Statistics database, <http://www.eestipank.ee/en/statistics>.
- ERAC (2012). Peer-Review of the Estonian Research and Innovation System: Steady Progress Towards Knowledge Society. http://www.mkm.ee/public/ERAC_EE_Peer-Review_Report_2012.pdf
- European Innovation Scoreboard (2017). Available: http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en.
- European Commission, DG EAC (2015). Education and Training Monitor 2015: Estonia European Semester Country Report 2016, Estonia. (2016). Available: http://ec.europa.eu/europe2020/pdf/csr2016/cr2016_estonia_en.pdf.
- Government Office (2016): Action plan for open government, <https://riigikantselei.ee/en/news/government-approved-new-action-plan-open-government-partnership>
- Holm, Jacob R. and Edward Lorenz (2015). "Has Discretionary Learning' declined during the Lisbon Agenda? A cross-sectional and longitudinal study of work organization in European nations." Industrial and Corporate Change, Volume 24, Number 6, pp. 1179–1214.
- Kaarna, K., K. Ojamäe, K. Lember, E. Welch, and B. Fisher (2015). Eesti ettevõtete uuendusmeelsus ja innovatsiooni toetamise võimalused. Estonian Ministry of Economic Affairs and Communications https://www.mkm.ee/sites/default/files/inno_24.pdf
- Karo, E., R. Kattel (2015). Economic Development and Evolving State Capacities in Central and Eastern Europe: can 'smart specialization' make a difference? Journal of Economic Policy Reform, 18 (2), 172–187, [10.1080/17487870.2015.1009068](https://doi.org/10.1080/17487870.2015.1009068).
- Karo, E., H. Kanep, K. Urkainski, R. Kattel, V. Lember and U. Varblane (2014). Nutikas spetsialiseerumine: kas Eesti teadus-, arendus- ja innovatsioonipoliitika kuldvõtmeke aastail 2014–2020, Riigikogu Toimetised, <http://rito.riigikogu.ee/eelmised-numbrid/nr-29/nutikas-spetsialiseerumine-kas-eesti-teadus-arendus-ja-innovatsioonipoliitika-kuldvotmeke-aastail-2014-2020/>.
- Kattel, Rainer (2010). Financial and Economic Crisis in Eastern Europe. Journal of Post Keynesian Economics, 33 (1), 41–60, [10.2753/PKE0160-3477330103](https://doi.org/10.2753/PKE0160-3477330103).
- Kattel, Rainer (2015). Economic consequences of location: European integration and crisis recovery reconsidered. Real-World Economics Review, 72, 135–146.
- Kattel, Rainer and Urmas Varblane (2017). The Production and Innovation Networks of Estonian Companies. In: T.Tammaru, R.Eamets, K.Kallas (Ed.). Estonian Human Development Report 2016/2017 Estonia at the Age of Migration. Tallinn: Foundation Estonian Cooperation Assembly, 91–97.
- Koppel, Andreas (2016). Kulutused teadus- ja arendustegevusele: investering tulevikku. In: Jüri Allik, Urmas Varblane, Tiit Tammaru (eds.), Eesti Teadus 2016, Eesti Teadusagentuur.
- Mürk, Imre and Tarmo Kalvet (2014). Teaduspõhiste ettevõtete roll Eesti T&A- ja innovatsioonisüsteemis. Science and Innovation Policy Monitoring Programme, <http://www.tips.ut.ee/index.php?module=32&op=1&id=3686>.
- National Audit Office (2014). [The state's innovation support must be significantly increased to accelerate economic development.](https://www.nao.gov.uk/wp-content/uploads/2014/06/The-state-s-innovation-support-must-be-significantly-increased-to-accelerate-economic-development.pdf)
- PISA 2012 Results in Focus (2012). Available: <https://www.oecd.org/pisa/keyfindings/pisa-2012-results-overview.pdf>.

PISA 2015 Results in Focus (2016). Available: <https://www.oecd.org/pisa/pisa-2015-results-in-focus.pdf>.

Raudla, Ringa; Karo, Erkki; Valdmaa, Kaija; Kattel, Rainer (2015). Implications of project-based funding of research on budgeting and financial management in public universities. *Higher Education*, 70 (6), 957–971, [10.1007/s10734-015-9875-9](https://doi.org/10.1007/s10734-015-9875-9).

Statistics Estonia (2017). Statistics database, <http://www.stat.ee>.

Suurna, M.; Kattel, R. (2010). Europeanization of innovation policy in Central and Eastern Europe. *Science and Public Policy*, 37 (9), 646–664, [10.3152/030234210X12778118264459](https://doi.org/10.3152/030234210X12778118264459).

Tammaru, Tiit (2016). Doktorikraad ja teadustöötajad tööturul: Eesti Euroopa riikide võrdluspeeglis. In: Jüri Allik, Urmas Varblane, Tiit Tammaru (eds.), *Eesti Teadus 2016*, Eesti Teadusagentuur.

Tax Foundation (2017). International Tax Competitiveness Index, <http://taxfoundation.org/article/2015-international-tax-competitiveness-index>.

Varblane, Urmas (2014). Euroopa raha võlu ja valu. *Riigikogu Toimetised*, 29, 25–39.

Abbreviations

BERD	Business Enterprise Research and Development Expenditure
BIF	Baltic Innovation Fund
COSME	EU programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises
CSR	Country Specific Recommendation
EIF	European Investment Fund
EIPTTC	Estonian Intellectual Property and Technology Transfer Centre
EU	European Union
FDI	Foreign Direct Investment
FP	Framework Programme
GBAORD	Government Budget Appropriations or Outlays on Research and Development
GDP	Gross Domestic Product
GERD	Gross domestic expenditure on Research and Development
ICT	Information and Communications Technology
MEAC	Ministry of Economic Affairs and Communications
MER	Ministry of Education and Research
PRO	Public Research Organisation
RD&I	Research, Development and Innovation
SBA	Small Business Act

Factsheet

	2009	2010	2011	2012	2013	2014	2015	2016	2017
GDP per capita (euro per capita)	10600	11000	12500	13500	14300	15000	15500	16000	
Value added of services as share of the total value added (% of total)	70.62	68.84	66.93	67.6	67.85	67.85	69.11	70.51	
Value added of manufacturing as share of the total value added (%)	14.13	15.69	16.57	15.91	15.55	16.16	15.98	15.75	
Employment in manufacturing as share of total employment (%)	19.16	19.03	20.1	18.97	18.97	18.4	18.93	19	
Employment in services as share of total employment (%)	65.5	66.9	64.62	65.75	66.6	67.43	66.66	67.81	
Share of Foreign controlled enterprises in the total nb of enterprises (%)	1.58	1.4	1.33	1.27	1.22	1.21	1.15		
Labour productivity (Index, 2010=100)	95.1	100	98.7	103	104.8	107.4	106.6	108.3	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	0.56	0.57	0.82	0.66	0.8	0.7	0.64		
Summary Innovation Index (rank)	14	16	15	13	13	13	13	15	
Innovative enterprises as a share of total number of enterprises (CIS data) (%)				47.6		26.5			
Innovation output indicator (Rank, Intra-EU Comparison)			20	19	20	21			
Turnover from innovation as % of total turnover (Eurostat)		12.3		7.8					
Country position in Doing Business (Ease of doing business index WB)(1=most business-friendly regulations)						16	16	12	12
Ease of getting credit (WB GII) (Rank)						22	27	29	
EC Digital Economy & Society Index (DESI) (Rank)						12	11	9	9
E-Government Development Index Rank		20		20		15		13	
Online availability of public services – Percentage of individuals having interactions with public authorities via Internet (last 12 months)	46	50	53	54	48	51	81	77	78
GERD (as % of GDP)	1.4	1.58	2.31	2.12	1.72	1.45	1.49	1.28	
GBAORD (as % of GDP)	0.68	0.7	0.76	0.81	0.81	0.72	0.69	0.69	
R&D funded by GOV (% of GDP)	0.68	0.7	0.76	0.81	0.81	0.72	0.69		
BERD (% of GDP)	0.62	0.79	1.46	1.22	0.82	0.63	0.69	0.66	
Research excellence composite indicator (Rank)	19	12	15	16	15	14			
Percentage of scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country		7.57	7.17	7.8	7	7.77			
Public-private co-publications per million population	23.96	25.5	19.55	13.58	12.88	6.84	1.52		
World Share of PCT applications	0.03	0.03	0.03	0.02	0.01	0.02	0.02		
Global Innovation Index				25	24	23	24	25	

Data sources: various, including Eurostat, European Commission and International scoreboard data.

List of figures

Figure 1 Development of government funding of the total GERD (Eurostat, 2017) 8
Figure 2 Development of BERD intensity per economic sector (Eurostat, 2017) 9

List of tables

Table 1 Key smart specialisation measures17

GETTING IN TOUCH WITH THE EU

In person

All over the European Union there are hundreds of Europe Direct information centres. You can find the address of the centre nearest you at: <http://europa.eu/contact>

On the phone or by email

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

- by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),
- at the following standard number: +32 22999696, or
- by electronic mail via: <http://europa.eu/contact>

FINDING INFORMATION ABOUT THE EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website at: <http://europa.eu>

EU publications

You can download or order free and priced EU publications from EU Bookshop at: <http://bookshop.europa.eu>. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see <http://europa.eu/contact>).

JRC Mission

As the science and knowledge service of the European Commission, the Joint Research Centre's mission is to support EU policies with independent evidence throughout the whole policy cycle.



EU Science Hub
ec.europa.eu/jrc



@EU_ScienceHub



EU Science Hub - Joint Research Centre



Joint Research Centre



EU Science Hub

