

# RISIS



RESEARCH INFRASTRUCTURE FOR SCIENCE  
AND INNOVATION POLICY STUDIES

## WP 9 / Task 1.2 R&D policies in the NMS EUPRO (pilot countries)

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May 2019*



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 824091

## Outline

1	Czechia.....	2
1.1	Basic characteristics of R&D expenditures.....	3
1.2	Governance of the R&D policy.....	5
1.2.1	Governing structure .....	5
1.2.2	Key research funding organisations (RFOs).....	7
1.2.3	Key research performing organisations (RPOs).....	8
1.3	R&D funding system.....	9
1.3.1	National institutional R&D funding .....	9
1.3.2	National project-based R&D funding.....	11
1.3.3	Role of the EU Structural Funds in the national R&D system.....	13
2	Estonia .....	14
2.1	Basic characteristics of R&D expenditures.....	14
2.2	Governance of the R&D policy.....	15
2.2.1	Governing structure .....	15
2.2.2	Key research funding organisations (RFOs) .....	16
2.2.2	Key research performing organisations (RPOs) .....	16
2.3	R&D funding system.....	17
2.3.1	Funding instruments .....	17
2.4	References and links .....	20
Annex 1	.....	21
Annex 2	.....	22

## 1 Introduction

EUPRO is a core facility to investigate structure, dynamics and impacts of project-based R&D collaboration to grasp and understand the development of the European Research Area. Advanced research in this direction needs constant EUPRO updates, but also extensions to other transnational and national research funding activities.

NATPRO addresses this gap

- by providing a systematic information basis on nationally funded R&D projects,
- designed and constructed in a modular way,
- focussing on specific national funding programmes and selected countries depending on data availability.

NATPRO extension will be able to respond to interesting policy questions, such as

- the relation between national and European funding, in terms of thematic complementarity and/or organisational overlapping;
- structure and dynamics of multi-level networks, featuring nodes (organisations) acting at the national level, at the European level, or at both levels ('gatekeeper');
- relationships between a set of characteristics of organisations and their ability to attract national vs. European funding.

With its original focus on Europe, EUPRO has become one of the main assets of empirical research investigating structure and dynamics of publicly funded R&D collaboration networks across the European territory. However, in a policy context we can observe a debate on the interplay between European and national funding endeavours and its impacts on observed collaboration structures at different spatial levels. Moreover, the question whether knowledge transmitted through European networks can be diffused within countries – leveraged by nationally funded collaborative R&D – is high on the research agenda.

Against this background, we have chosen to follow the demand both from policy and the scientific community to **advance EUPRO in a direction to integrate R&D projects funded by national R&D funding channels, the so-called NATPRO module**. Given that national R&D funding systems are well endowed, and in magnitude of funding usually exceed the amount of European funding, this is a very effortful exercise that can only be addressed using existing RISIS resources, e.g. in terms of name matching (with RISIS registers), geocoding or topical assignment.

As in EUPRO as a whole, the main approach of the NATPRO extension is to collect data from the publicly available data sources from the web. This requires identifying national research funding organizations (RFOs), to screen the public availability of project data, and to evaluate potential alternatives (e.g. data collection via national contact persons in RFOs or public authorities).

A specific effort will be done to cover new Member States from Eastern European countries (NMS). In this respect, this working paper analysis the R&D policies in new Member States (NMS) in terms of a characterization of the changing policy landscape of R&D policies and the identification and description of research funding structures and organizations is done. This first version of this working paper was a main input for the definition of the two pilot countries Czechia (see chapter 2) and Estonia (see chapter 3) from the NMS and the final version will also be the systematic base for the data collection in additional NMS from Q3 2020 onwards.

## 2 Czechia

### 2.1 Basic characteristics of R&D expenditures

Czechia has been experiencing steady growth of R&D expenditures over the last more than 15 years. The gross expenditures on R&D (GERD) have more than doubled in nominal terms between 2005 and 2017, and the R&D intensity has increased from 1.2% GDP in 2005 to 1.8% in 2017. The dynamic growth of R&D expenditures in Czechia was driven mainly by the business enterprise sector, nevertheless, the public sector also keeps up with the fast development. Thanks to the EU Structural Funds, the public sector (universities and institutes of the Czech Academy of Sciences) invested massively in building new R&D capacities since 2007. The drop of this type of funding between the two programming periods stands also behind the decrease of GERD in 2016. An overview of the basic characteristics of R&D expenditures and sources of funding is displayed in Annex 1.

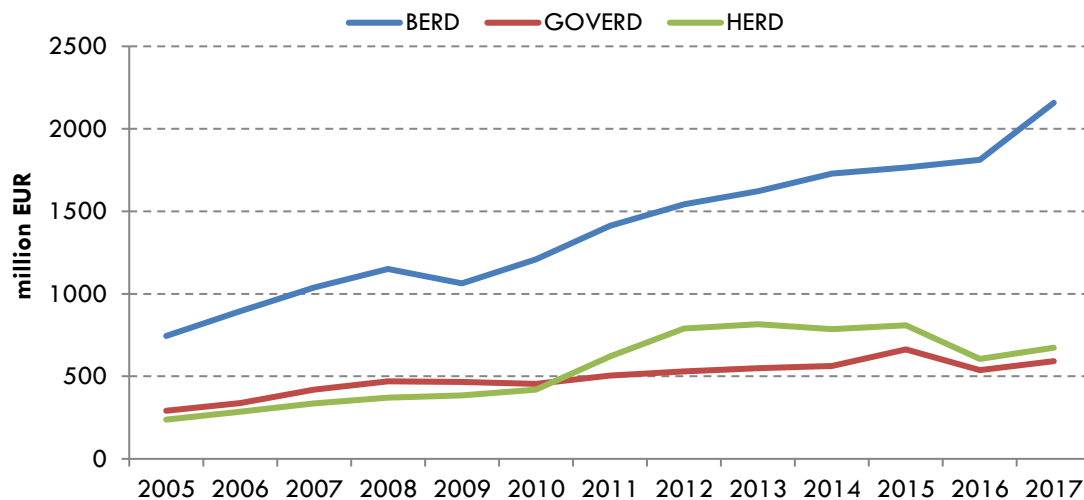
The Czech R&D system comprises three performance sectors: the Business Enterprise Sector, the Higher Education Sector, and the Government Sector.

R&D expenditures in the business enterprise sector are concentrated in affiliates of foreign companies spending around 65% of total business expenditures on R&D (BERD). It very much correlates with the structure of the knowledge-intensive industries in the Czech economy. Majority of BERD is being spent in the manufacturing sector (54%), the fast-growing pattern is clearly evident in the ICT sector (20%).

The Higher Education Sector started building R&D capacities in the mid of the 1990ies. Before that, the majority of Higher Education Institutions in Czechia (as in many Central and Eastern European Countries) were mainly teaching universities. The second wave of a dynamic R&D growth in the Higher Education Sector started with investment from the EU Structural Funds in 2007. In 2014, the Higher Education Sector for the first time became the second largest R&D performance sector in Czechia, overtaking the Government Sector.

The Government Sector of R&D performance consists mainly of institutes of the Czech Academy of Sciences (CAS), and sectoral research organisations. Whereas the Higher Education Sector gained importance in terms of R&D performance in the last decade, the Czech Academy of Sciences has been fundamentally reduced in size in the early 1990s. Since then the R&D expenditures of the CAS has stabilized, and since the beginning of the new century, they have started to grow again.

Fig 1 – Structure of gross expenditures on R&D according to the sectors of performance

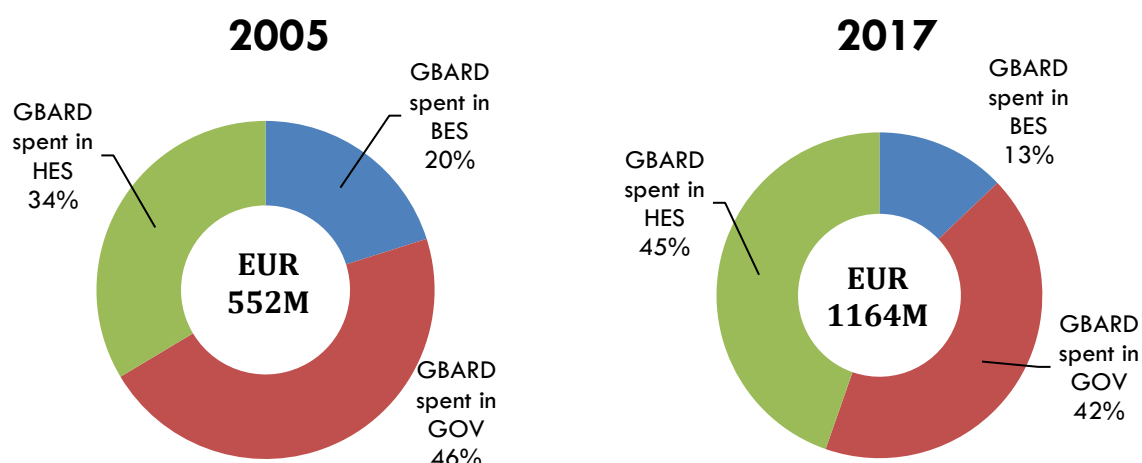


Source: Eurostat, Last update: 19.03.19, Extracted on: 02.04.19

To varying degrees, all three performance sectors are subsidized by public sources. In the Higher Education Sector 85% of R&D activities, in the Government Sector 78%, and in the Business Enterprise Sector 7% of R&D activities are financed by the national public resources. The overnment budget allocations for R&D (GBARD) has been growing steadily over the past decade with the accelerating pace in recent years. The GBARD comes up to around 0.6% of GDP and comprises nearly 1.6% of total government spending.

In the context of the enhancement of R&D capacities in the Higher Education Sector, the structure of GBARD in terms of sectors of spending has changed accordingly over the past decade. Whereas in 2005 the major part of GBARD flew into the Government Sector, in 2017 the greatest part of GBARD was spent in the Higher Education Sector. The share of GBARD spent in the Business Enterprise Sector decreased recently too.

Fig 2 – Structure of GBARD in 2005 and 2017 according to the sector of spending



Source: Eurostat, Last update: 19.03.19, Extracted on: 02.04.19

## 2.2 Governance of the R&D policy

### 2.2.1 Governing structure

The governing structure of the Czech research, development and innovation system underwent a major transformation in the early nineties. The key changes were linked with the new measures in public spending, which resulted in the restructuring of the Czech Academy of Sciences, as well as in the privatisation of sectoral applied research institutes formerly controlled by sectoral ministries. Since then, it has been evolving slowly, without major disruption or changes until 2008 when the Reform of the System of R&D was launched. The reform has significantly changed the governance of the RDI policy and the responsibilities of the main bodies. Since the reform, two governmental bodies play the central role in the governance of the Czech R&D system – the Research, Development and Innovation Council and the Ministry of Education, Youth and Sports. On the implementation side of the R&D governing structure, the Reform led to the constitution of the innovation agency – the Technology Agency of the Czech Republic. At the same time the funding agency of the Czech Academy of Sciences was dissolved, and the project-based support of basic research was concentrated in the Czech Science Foundation.

The main body responsible for the formulation of national R&D policy is the **Research, Development and Innovation Council (RDI Council)**, an advisory body to the Government of the Czech Republic. The Council itself consists of 17 members – the chairman (a member of the Government – usually the Prime Minister) and representatives of the Czech Academy of Sciences, universities, sectoral research organisations and businesses. The RDI Council plays the main strategic and coordinating role in the research and innovation governance system. It governs the overall public R&D budget and therefore strives to strengthen complementarity between the various bodies managing R&D budgets and implementing their own R&D programmes. The role of the Council has been widened by the reform in 2008. Besides the existing competencies under Act No. 130/2002 Coll. on the Support of Research and Development from Public Funds (coordination of R&D expenditures, evaluation of R&D and its results, assessment of draft programmes, operation of the R&D Information System), the Council has also strengthened the responsibility for drafting new research, development and innovation policy, laws or other legal regulations, and for drafting and implementing R&D priorities. As a result, the Council is not just an “advisory” body, but it became an executive body with competences de facto reaching the level of a “virtual R&D ministry”.

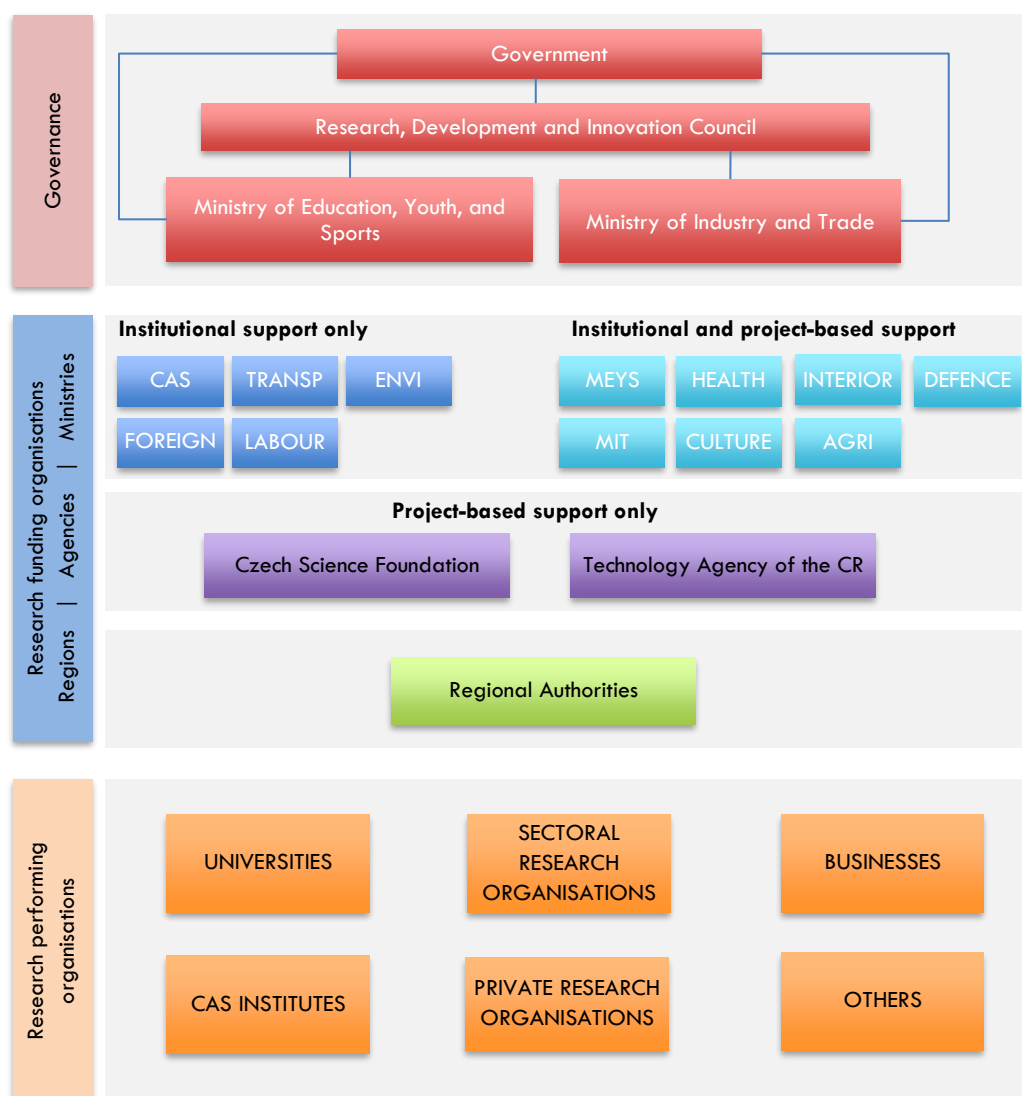
The **Ministry of Education, Youth and Sports (MEYS)** is a central administrative body responsible for research and development, although (according to the amendment of the Act No. 130/2002 approved in 2009) “with the exception of areas covered by the Research, Development and Innovation Council”). By the amendment, the MEYS has lost its position of RDI strategy maker and this role has been overtaken by the RDI Council. At present, the main competences of the ministry in the sphere of RDI remain the following:

- Providing institutional support to research in higher education institutions and other public research organisations and targeted support to specific research in higher education institutions,
- Supporting international collaboration in research and development through dedicated programmes,
- Supporting large R&D infrastructures,

- Implementing the Operational Programme Research and Development for Innovation and the Operational Programme Education for Competitiveness,
- Fulfilling administrative function of a central administrative body for research and development, e.g. maintaining registers of public research organisations, etc.

Certain competencies in R&D governance are held by several other government ministries. The **Ministry of Industry and Trade** (MIT) is responsible for applied (industrial) R&D and innovation in the business sector. Its role has been also changed with the Reform due to the foundation of the Technology Agency of the Czech Republic (TA CR) that has become the central innovation agency responsible for implementing R&D programmes for applied and pre-competitive research. MIT has implemented national R&D programmes until 2018. Next to that MIT is the managing authority for Operational programmes oriented at strengthening research and innovation capacities in businesses.

Fig 3 – Structure of R&D Governance in Czechia



There are five other ministries responsible for their own RDI concepts and programmes drafting and implementation: Ministry of Health, Ministry of Agriculture, Ministry of Culture, Ministry of Interior

and Ministry of Defence. These ministries provide RDI support from their own budgetary chapters and also establish and operate their sectoral research institutes.

Every new R&D programme of any research funding organisation must be submitted to the Government for approval. Before the submission, the RDI Council must be consulted in order to get a statement on compliance with the national R&D strategy.

## 2.2.2 Key research funding organisations (RFOs)

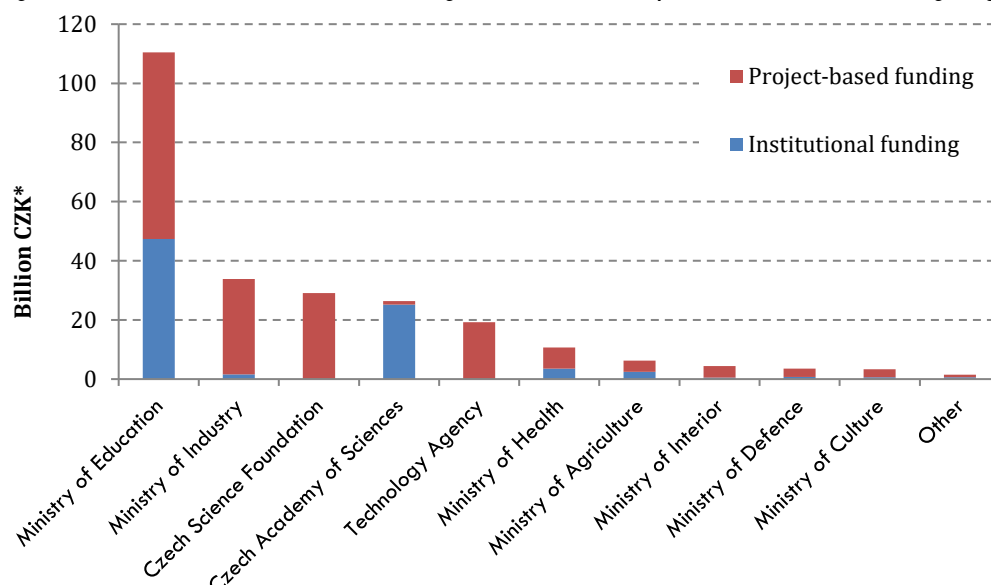
The system of RDI policy implementation and financing has been significantly changed by the Reform in 2008. The former number of budgetary chapters supporting R&D activities Czechia has decreased from 22 to 15 including the newly established Technology Agency of the CR.

There are basically two R&D funding streams – institutional (base) funding and project-based (competitive) funding (see below). Institutional support is provided to research organisations by the Ministry of Education, Youth and Sports, the Czech Academy of Sciences and other 9 ministries. The majority of project-based funding is allocated by two agencies:

- The **Czech Science Foundation (GACR)**, established in 1992, allocates funding for projects of basic research. It funds basic research predominantly in public universities and institutes of the Czech Academy of Sciences.
- The **Technology Agency of the Czech Republic (TACR)**, established in 2009, allocates funding for projects of applied research, development, and innovation. TACR was established in order to simplify and defragment the system of R&D funding in Czechia. TACR implements funding programmes for applied R&D on behalf of the RDI Council, ministries and other central authorities.

The rest of project-based (competitive) support is distributed through sectoral and cross-sectional R&D programmes of the Ministry of Interior, Ministry of Culture, Ministry of Defence, Ministry of Agriculture and Ministry of Health, and through programmes of the MEYS supporting international R&D collaboration, large research infrastructures, and specific university research.

Fig. 4 Total allocation of research funding in 2010 – 2018 by the main Research Funding Organisations





Note: The CZK/EUR exchange rate is approx. 25 CZK/EUR; Source: National Research Information System (IS VaVal)

Regional authorities do not have any responsibilities in R&D policy and their main role has been in catalysing the EU Structural Funds. Yet the law does not prevent regional authorities from launching their own RDI policy initiatives. Several have done so in recent years, for example, by launching innovation voucher programmes. Coordination between the national and regional level innovation strategies has traditionally been weak, although it has begun to improve recently due to the implementation of the national RIS3 strategy.

### 2.2.3 Key research performing organisations (RPOs)

The largest R&D performer in the Czech Republic is the business sector spending 63% of GERD and its share has been growing steadily over the last years. The higher education sector comes second with nearly 20%, followed by the government sector with 17%. The role of the private non-profit sector in R&D is negligible.

From the historical perspective, the transformation of the Czech R&D in the early 1990s resulted in the reduction of the number of the former sectoral applied research institutes (they were either privatised or shut down). At the same time the business sector - which was constituted of public enterprises - underwent large-scale privatisation and, during this process, lost much of their R&D capacity in a rather short-sighted effort to quickly reduce costs. The consequences of these processes are still being felt at present, especially in the context of the absence of RTOs to act as partners for the business sector.

More recently, the public R&D system has been experiencing significant structural change since 2009. Until then the government sector played a pivotal role with the strong position of the Czech Academy of Sciences and its institutes. The massive inflow of investment from EU Structural Funds in R&D at universities since 2009 resulted in the strengthened role of higher education sector in the Czech R&D landscape, and since 2011 the higher education sector has been taking over the government sector in terms of expenditures on R&D, as well as in the number of R&D personnel.

#### RPOs in the public sector

The public research is characterised by a split between institutes of the Czech Academy of Sciences and public universities, though these increasingly collaborate. Private universities and other research institutes play a minor role in terms of expenditures on R&D.

The **Czech Academy of Sciences (CAS)** consists of 54 formally independent public research institutes. The CAS institutes employ about 5,500 FTE researchers and spend CZK 11.7 billion (the year 2017) on R&D. More than 75% of the total R&D expenditures are financed from the national state budget (CZK 8.8 billion).

The **higher education sector** consists of 26 public, 2 state and 44 private higher education institutions (HEIs). Previously, the universities focused on education but during the decade they have rapidly built their research activities. Currently, the HEIs employ about 10,900 FTE researchers, of which 93% in public universities. The public universities spend CZK 16.4 billion on R&D, of which CZK 14.0 billion (85%) is funded from the national state budget.

Next to the CAS institutes and higher education institutions, there are 28 **sectoral research institutes** founded by responsible ministries. Most of the sectoral research institutes were established by the Ministry of Agriculture, Ministry of Interior and Ministry of Environment. The sectoral research institutes employ about 1,300 FTE researchers and spend nearly CZK 2.0 billion on R&D. The dominant part of the R&D expenditures are financed from the national state budget (CZK1.6 billion, i.e. 84%).

## RPOs in the private sector

The **business research sector** consists of about 2,600 actors, of which 24% are foreign affiliates and 80% small and medium-sized enterprises. The business sector employs about 20,200 FTE researchers and spends nearly CZK 57.0 billion on R&D. The foreign affiliates play a dominant role in the Czech business R&D sector with the share of 56% in terms of researchers and nearly 65% in terms of R&D expenditures. About 7% of the business R&D expenditures are financed from the national state budget. More than 63% of the public funding on business R&D goes to the domestic private companies and about 23% spend the domestic public companies. The foreign-owned companies spend about 13% of the public support to the business R&D.

**RTOs** constitute part of the domestic business R&D sector. The RTO sector largely comprises privatised state institutes. There are currently around 60 such institutes – about a half as many as there were before 1990. These organisations basically work for the business sector but some also participate actively in public research programmes. Twelve of them even get institutional funding from the Ministry of Industry and Trade.

## 2.3 R&D funding system

### 2.3.1 National institutional R&D funding

Public R&D funding has been traditionally dominated by institutional funding. However, this changed through the Reform of the RDI System, during which the share of institutional funding decreased from 56% in 2009 to 49% in 2014. This change has been caused by mainly political, and partly economic factors (austerity policy after the economic downturn of 2009 – 2010). The crucial political factor is anchored in the Reform of the RDI system from 2009, which states the aim to achieve a ratio of project-based and institutional funding at 60:40 by 2015. Since 2015 however, the policy approach has changed again in favour of the need for stability in the R&D system, and a consequent higher share of institutional funding compared to the competitive one. Since 2016, the ration of project-based and institutional funding has been kept about 50:50.

The institutional funding comprises six different funding streams (according to the Act Nr. 130/2002 Coll. on the support of R&D from public resources):

- the long-term conceptual development of research organisations
- the international cooperation of the Czech Republic in R&D performed on the basis of international treaties
- operational programmes in R&D
- ensuring public tenders in R&D, including costs for the project and programme evaluation and monitoring
- material or financial rewards for excellent R&D results or for the promotion or popularisation of R&D

- expenditure related to the activities of the Research, Development and Innovation Council, the Czech Science Foundation, the Technology Agency of the Czech Republic, and the Czech Academy of Sciences.

Only the first funding stream, namely the long-term conceptual development of research organisations, is the institutional funding allocated directly to research organisations based on evaluation of their previous results (base funding). We call this part of institutional funding hereafter “institutional support”.

The Czech system of institutional support has undergone significant changes during the last 25 years. The first institutional support model, which had been used up to 1999, was based on the index method, i.e. funding based on the level of expenditures in previous years with some minor changes. In 1998, this model was replaced by the system of “research plans” (i.e. wide, general, research projects designed for the 5 and later 7 years’ period). Research organisations had considerable freedom to design research plans. The Reform of 2009 has introduced a performance-based research funding model. This model used a metrics-based quantitative evaluation of research results. The institutional support has been allocated solely according to the quantity (and partly quality) of research results achieved by a respective research organisation in the previous 5 years. For the strict metric-based approach the allocation of institutional support was called “coffee grinder”. Since 2013, this model has been replaced by sort of index-based model, where significant part (80%) of the institutional support is allocated in the same amount as the previous year, and the rest is allocated according to the achieved results.

Institutional support is mainly allocated to universities by the Ministry of Education, Youth and Sports, and to the institutes of the Czech Academy of Sciences from the own budget chapter of the CAS. Other 9 ministries, namely Ministry of Agriculture, Ministry of Interior, Ministry of Environment, Ministry of Industry and Trade, Ministry of Foreign Affairs, Ministry of Labour and Social Affairs, Ministry of Transport, Ministry of Defence, and Ministry of Culture allocate institutional support to the sectoral research organisations that come under their responsibility.

Institutional support allocated by respective RFOs displays the following overview.

Tab. 1 - Institutional support (from 2010 to 2013 including research plans) allocated by major RFOs (in million CZK)

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Ministry of Education	4 093	3 276	3 584	3 694	3 846	3 907	4 333	4 387	5 033
Czech Academy of Sciences	2 972	2 900	2 732	3 274	3 002	3 170	3 402	3 552	3 950
Ministry of Health	200	362	376	384	405	406	467	597	597
Ministry of Agriculture	411	404	317	378	390	390	391	447	453
Ministry of Industry	0	173	139	146	150	150	215	242	348
Ministry of Defence	84	74	74	69	80	84	98	88	91
Ministry of Culture	72	68	64	72	72	88	97	102	97
Ministry of Interior	33	54	47	43	64	55	56	54	89
Ministry of Environment	186	222	0	0	0	0	0	153	248
Ministry of Transport	21	0	0	0	0	0	0	15	50
Ministry of Foreign Affairs	14	13	0	0	0	0	0	10	25
Ministry of Labour and Social Affairs	36	0	0	0	0	0	0	10	14
Other	44	40	5	5	5	5	6	6	6

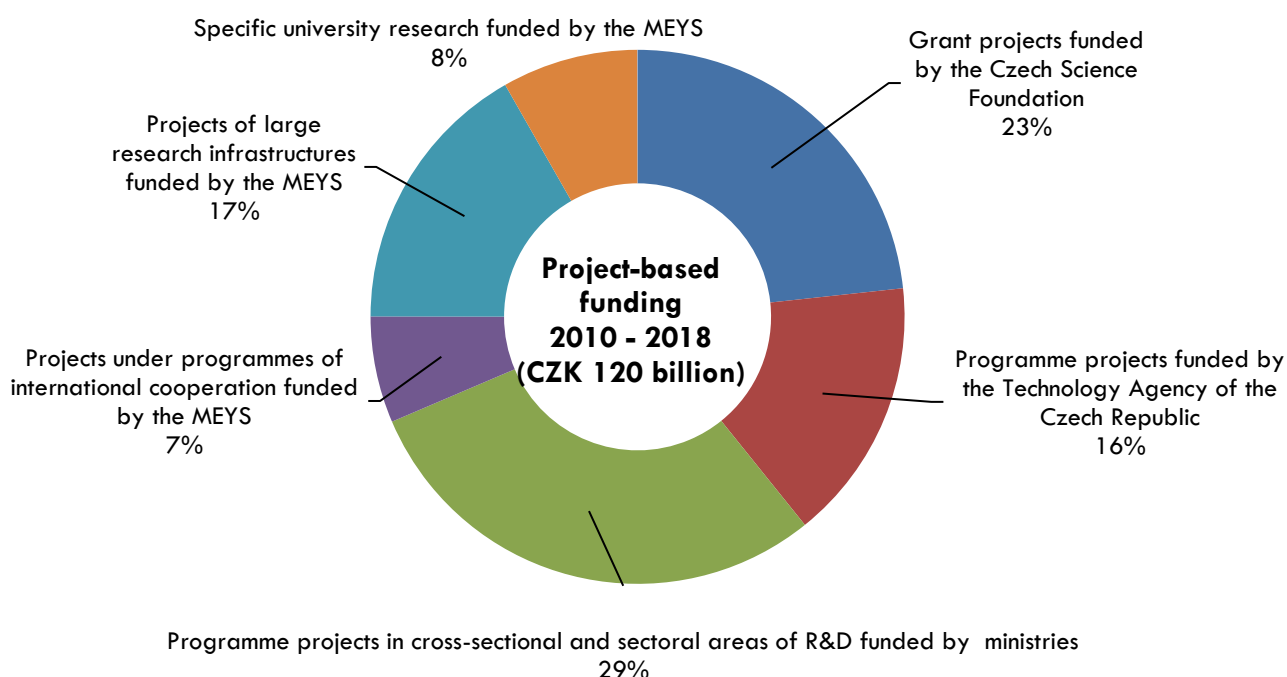
Source: National Research Information System (IS VaVal)

### 2.3.2 National project-based R&D funding

As in the case of institutional funding, types of project-based funding are defined by the Act on R&D support (nr. 130/2002 Coll.). According to this Act, project-based funding can be allocated in the form of support for:

- grant projects funded by the Czech Science Foundation
- programme projects funded by the Technology Agency of the Czech Republic
- programme projects in cross-sectional and sectoral areas of R&D funded by responsible ministries
- projects under programmes of international cooperation funded by the MEYS
- projects of large research infrastructures funded by the MEYS
- specific university research funded by the MEYS
- projects under programmes of regional authorities

Fig. 5 – Structure of project-based funding in 2010 – 2018 according to different types of support



Source: National Research Information System (IS VaVal)

As mentioned above, there are two major agencies allocating the project-based funding in Czechia, namely Czech Science Foundation and Technology Agency of the Czech Republic. Before establishing the Technology Agency in 2009, MIT played the role of the key RFO for industrial research. Since 2009 the funding of industrial R&D has been gradually transferred to the TACR. Since 2017, the project-based funding allocated by MIT has been growing again due to the launch of a new research programme of MIT supporting industrial research. Significant increase of the project-based support allocated by MEYS since 2014 is connected with two new programmes supporting the sustainable development of research centres newly built from the EU Structural Funds in the period 2007 – 2013, and one programme supporting large research infrastructures. The four major RFOs

(GACR, MEYS, TACR, and MIT) are responsible for allocating more than 80% of the total project-based funding in Czechia. An overview of the main R&D programmes implemented over the last 10 years is presented in Annex 2.

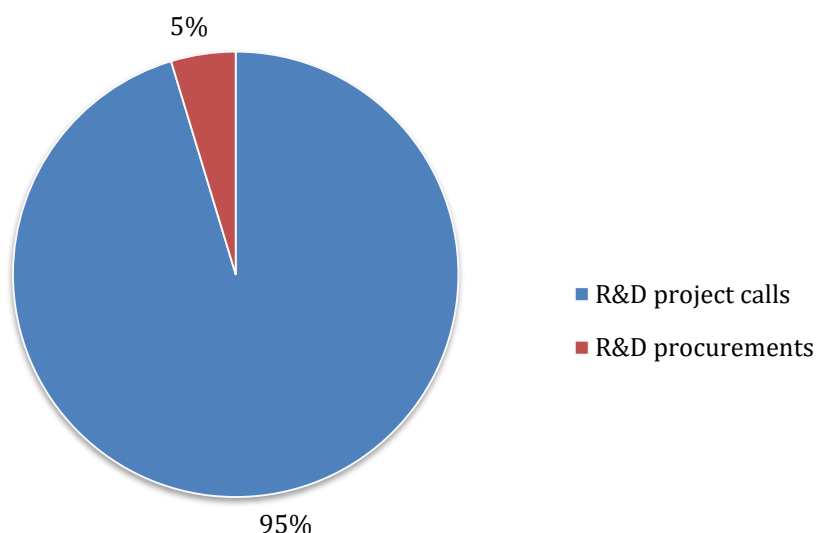
Tab. 2 – Project-based funding allocated by major RFOs (in million CZK)

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Czech Science Foundation	1 937	2 357	2 872	3 130	3 339	3 605	3 842	4 037	2 954
Ministry of Education	3 081	3 012	1 582	1 644	2 467	3 006	4 637	4 501	3 849
Technology Agency	0	775	1 848	2 514	2 781	3 056	2 750	2 795	2 676
Ministry of Industry	3 236	3 189	2 976	2 026	1 042	360	298	826	1 174
Ministry of Health	612	683	557	811	805	886	696	971	883
Ministry of Interior	101	380	475	533	553	375	314	599	532
Ministry of Agriculture	417	400	398	388	377	423	464	425	156
Ministry of Defence	384	311	270	284	281	301	265	344	279
Ministry of Culture	23	141	309	396	402	368	275	279	493
Other	1 041	582	162	48	3	2	2	0	0

Source: National Research Information System (IS VaVal)

Generally, there are two possible types of allocation of R&D funding to programme projects funded either by the TACR or by responsible ministries. First, the allocation is based on project calls and the selection of most appropriate R&D projects. Results of these projects belong to the research entities. The second type is the R&D procurements, where RFOs purchase R&D services from research entities together with the rights to use the research results. The R&D procurements make only a minor part of the total R&D funding to programme projects.

Fig. 6 – Types of allocation of R&D funding to programme projects – distribution based on the amount of allocated funding in 2010 – 2018



Source: National Research Information System (IS VaVal)

### 2.3.3 Role of the EU Structural Funds in the national R&D system

The EU Structural Funds has been playing a significant role in strengthening the R&D capacities in public as well as private sectors since 2007. They served as the largest source of funding for building and initial development of R&D centres and R&D infrastructures.

R&D support from EU Structural Funds has been managed by the Ministry of Education, Youth, and Sports, Ministry of Industry and Trade and by the City of Prague. MEYS supported R&D capacities in the public sector (Operational programme Research, Development for Innovation 2007 – 2013, and Operational Programme Research, Development and Education 2014 – 2020), MIT developed R&D capacities in private sector (Operational Programme Enterprise and Innovation 2007 – 2013, and Operational Programme Enterprise and Innovations for Competitiveness 2014 – 2020). The City of Prague has been implementing its own support schemes since the capital city is the only more developed region in Czechia (OP Prague - Competitiveness 2007 – 2013, and Operational Programme Prague - Growth Pole of the Czech Republic 2014 – 2020).

The following table provides an overview of financial resources allocated to research organisations and businesses for R&D related activities (building new and modernising existing R&D capacities and funding initial research projects of the new R&D facilities).

Tab. 3 – Support from EU Structural Funds and corresponding national/regional public co-funding on R&D activities in period 2007 – 2013 and 2014 – 2020

		Support from EU SF and national/regional budget (in mil. CZK)
<b>Programming period 2007 - 2013</b>		
<b>OP RDI</b>	European Centres of Excellence	20 175
	Regional R&D Centres	20 374
<b>OP EI</b>	Business R&D Capacities	7 744
<b>OP PC</b>	Research Centres in Prague	1 396
<b>Programming period 2014 – 2020 (plan)</b>		
<b>OP RDE</b>	Strengthening capacity for high-quality research	26 200
<b>OP EIC</b>	Corporate R&D centres and industrial R&D	22 300
<b>OP PGP</b>	R&D capacities in businesses	2 600

Source: Programme documents and statistics of MEYS, MIT, and City of Prague

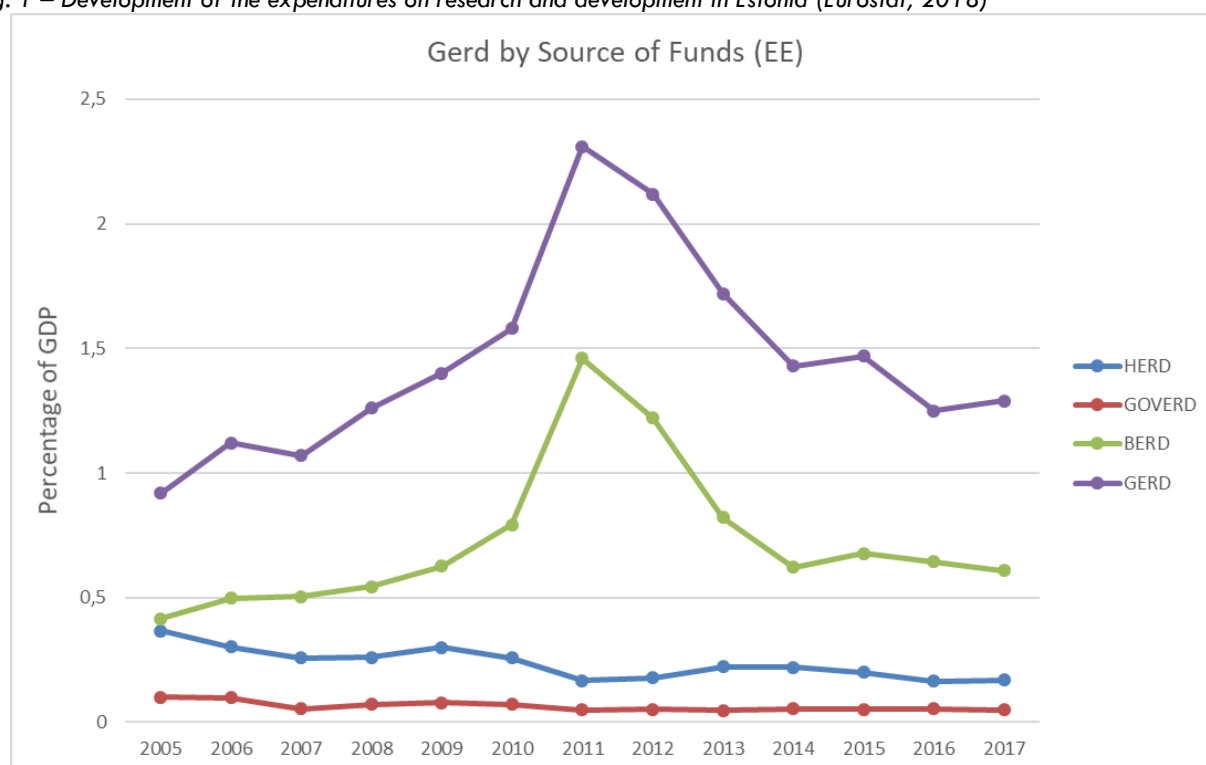
## 3 Estonia

### 3.1 Basic characteristics of R&D expenditures

Research and development in Estonia is guided by the Organisation of Research and Development Act (Riigi Teataja, 2019). This Act defines properties of the R&D institutions, structure and content of the national R&D information system, legal status of the Estonian Academy of Sciences, and duties of research library and archives. It also describes competencies of the Estonian Research Council, which is the main body responsible for supervising R&D in Estonia. Policy of R&D is conducted by two main ministries. Ministry of Education and Research (MER) is responsible for the national research and education issues. Ministry of Economic Affairs and Communications (MEAC) is in charge of development, technology, and innovation policy. Currently, the research and development and innovation strategy Knowledge-based Estonia 2014-2020 is implemented. The top 3 fields of science in Estonia (based on WOS citation analysis) are clinical medicine, molecular biology and genetics, and physics.

Total R&D expenditures were 304 million EUR in 2017, which constituted about 1.3% of GDP. From a longitudinal perspective (Figure 1), a peak is apparent between the years 2011 and 2013. The maximum was reached in 2011, where GERD was 384 million EUR (about 2.3% of GDP). This increase was associated with the increase of BERD between 2011 and 2013. The main reason of this elevation was the investment in oil shale refinery by Eesti Energia (Kattel & Stamenov, 2018). Other funding sources are stable over time compared to the BERD and GERD.

Fig. 1 – Development of the expenditures on research and development in Estonia (Eurostat, 2018)



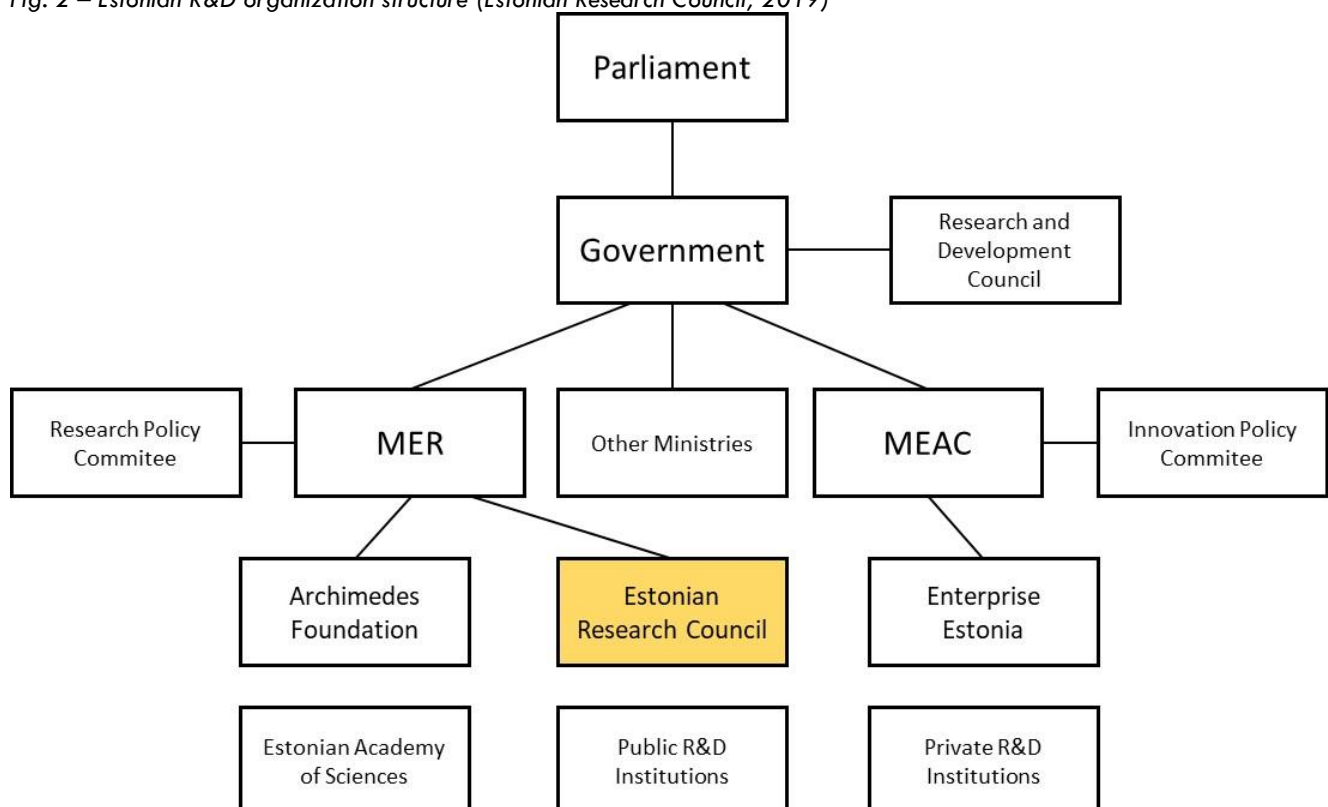


## 3.2 Governance of the R&D policy

### 3.2.1 Governing structure

On the top of hierarchy is parliament and government in Estonia. Estonian Research and Development Council is a government foundation and constitutes the main funding and strategy-making body for whole R&D in Estonia. It works with different grants and funding types. Budget on R&D proposed by the government and approved by the parliament is subsequently distributed among MER, MEAC and other ministries. Two independent committees, the Research Policy Committee and Innovation Policy Committee serves as advisor bodies to MER and MEAC, respectively. Part of the budget of both ministries is dedicated to R&D through agencies. Besides Estonian Research Council, the Archimedes Foundation is another notable independent organisation founded by the government and supported by MER. Its main purpose is to implement several mobility schemes including national and international scholarships. In addition, the Enterprise Estonia (supported by MEAC) is situated at the same level. This organization with 266 employees and annual budget about 81 million EUR implements part of Structural Funds and provides financial assistance and training for entrepreneurs as well as for the non-profit sector. Three main types of research performers are distinguished in Estonia including Estonian Academy of Sciences, Public R&D institutions and Universities, and Private R&D institutions. The whole system can be depicted as a diagram in Figure 2.

Fig. 2 – Estonian R&D organization structure (Estonian Research Council, 2019)





### 3.2.2 Key research funding organisations (RFOs)

**Estonian Research Council** – provides research funding, mobility funding, partnership and infrastructure funding, and funding of applied research. The main category of interest is the research funding. Research grants are divided here into three components: personal research funding, institutional research funding, and proof-of-concept grants. Council also administers research information system (ETIS), which incorporates information about projects funded from a variety of sources including at least one Estonian participant. Another important activity of the council is organizing regular evaluation of research organizations.

**Archimedes Foundation** – independent body established by the government. The main purpose is to implement and coordinate different national and international programs and projects. Three domains are taken into account here: education, research, and youth work. In the case of education, it implements the Erasmus+ Programme and international scholarship schemes. Structural Funds Agency is a body within the Archimedes Foundation umbrella which implements the EU programming period of 2014-2020 and funds projects in the area of higher education and R&D. The total volume of support from FP7 was about 413 million EUR and from H2020 is about 339 million EUR meantime (Archimedes Foundation, 2019).

**Enterprise Estonia** – largest institution in Estonia within the national support system for entrepreneurship. It provides financial assistance, counselling, cooperation opportunities and training for entrepreneurs, research institutions, the public and non-profit sectors. Among other activities belong also tourism, export, foreign investments, and digitalization of industry. A special attention is paid also to the foreign recruitment grants and large investor support schemes.

### 3.2.3 Key research performing organisations (RPOs)

**Estonian Academy of Sciences (EAS)** – founded in 1938. The mission of the EAS is to assist in building a knowledge-based Estonia, fostering adaptation of new knowledge for economic growth and improvement of the quality of life in Estonia, enhancing public appreciation of science and scientific methods of thought (Estonian Academy of Sciences, 2019). Unlike to other EU-13 countries, EAS isn't strong RPO player. Although several RPO institutions are registered within EAS umbrella, they are consisted mainly of libraries and museums.

**University** – most of the research is performed by six largest public universities: University of Tartu, TarTech University, Tallinn University, Estonian University of Life Sciences, Estonian Academy of Arts, and Estonian Academy of Music and Theatre. In addition, Estonian Business School is the largest private University performing research.

**Other Public R&D Institutions** – except for above mentioned universities, 4 public research institutes, 5 competency centres, 2 museums, and 2 private companies were positively evaluated by external judges. The National Institute of Chemical Physics and Biophysics, the Institute of the Estonian Language, the National Institute for Health Development, the Estonian Crop Research Institute, and the Estonian Literary Museum are the most significant public R&D institutions in Estonia.

**Private R&D Institutions** – about 360 private R&D are listed in national information system (ETIS). Two of them were positively evaluated as the RPOs: Cybernetica and Protobios. Cybernetica is ICT company that develops software solutions, light signalling and telematics products, maritime

surveillance and radio communications systems. Protobios develops new diagnostic tests in the field of immunoprofiling analysis and precision biomarker development.

### 3.3 R&D funding system

#### 3.3.1 Funding instruments

A total of 7 funding instruments are applied in Estonia: baseline funding, personal funding, national R&D programs, applied research funding, financing of centres of excellence and doctoral schools, funding of R&D infrastructures, and mobility programs. Moreover, 2 important instruments for incoming researchers are the Mobilitas plus program and Dora plus program, both supported by EU Regional Development Fund. Financing flows within and between sectors in 2017 are given in Table 1.

Tab. 1 – Flows of funding between sectors in Estonia in 2017

From	To	
Public sector 125.3 mln EUR	Public sector 117.3 mln EUR	Private sector 8.0 mln EUR
Private sector 133.4 mln EUR	Public sector 8.1 mln EUR	Private sector 125.3 mln EUR
Funds from abroad 45.6 mln EUR	Public sector 31.2 mln EUR	Private sector 14.4 mln EUR

**Baseline funding** – provided to R&D institutions that have received a regular positive evaluation. It can be used for co-financing national and foreign research projects, strategic development, and/or investing in the infrastructure. Institutions receive the baseline funding from the state budget via the budget of MER. The structure of the research budget of MER is depicted in Figure 3.

Baseline funding accounted for 18% from the total MER budget (about 151 million EUR) in 2018. From a longitudinal perspective, the proportion between baseline funding and national research grants noticed a significant change in recent years. This proportion is portrayed in Figure 4.

**Personal research funding** – type of competitive funding. This type of funding is supposed to be an analogue to the excellent ERC grants. Funding is allocated for a high-quality R&D bottom-up projects carried out by a person or a research group working at Estonian R&D institution. Personal funding is divided into start-up grants, post-doctoral grants, and team grants with fixed funding per year and per type of research within category.

**National R&D programs** – under this category is covered research in the field of Estonian language and culture. These research activities have been supported by the government programs since 1999. The most recent is the program Estonian language and cultural memory II (2014–2018). MER dedicates around 492 000 EUR each year to this program and grants are awarded annually through open calls.

**Applied research funding** – two main funding instruments are recognized here: NUTIKAS and RITA. NUTIKAS supports research in smart specialization growth areas. The funding range is 20 000 – 2 million EUR. It aims mainly on companies registered in Estonian commercial register operating at ICT,

health technologies and services, and more effective use of resources. RITA supports sectoral R&D in Estonia according to the needs of ministries. It aims to strengthen the capabilities of the Ministries in commissioning applied research needed by the state and strengthen the collaboration between state and research performing organizations.

Fig. 3 – Research budget of MER in 2018 (Estonian Research Council, 2019)

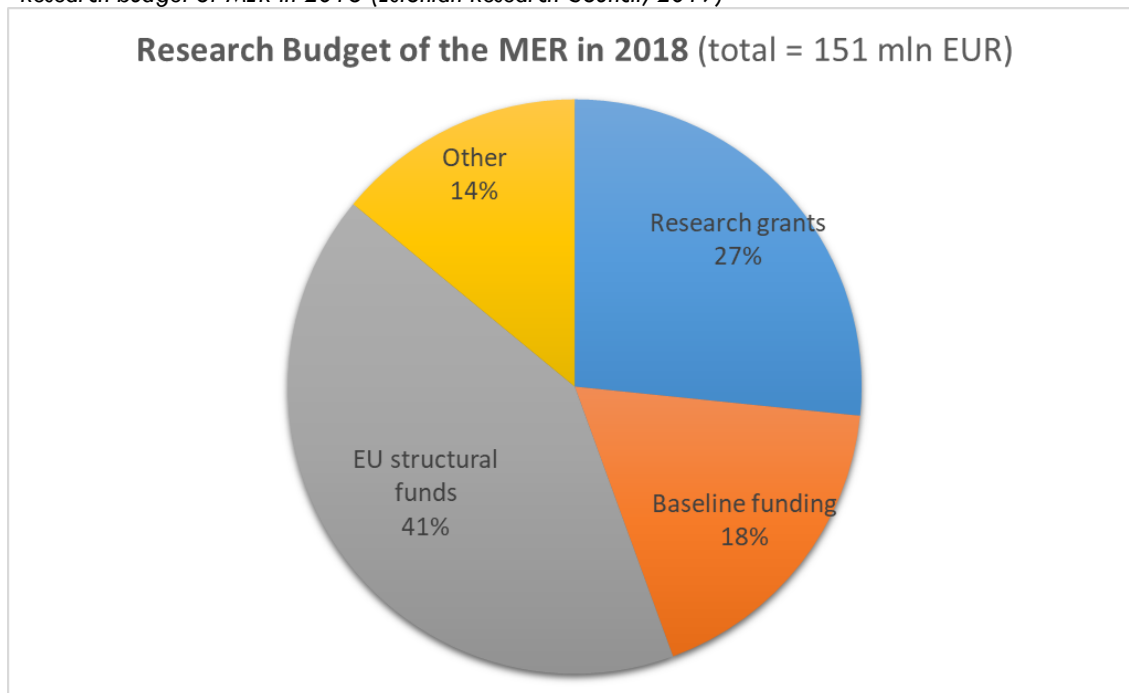
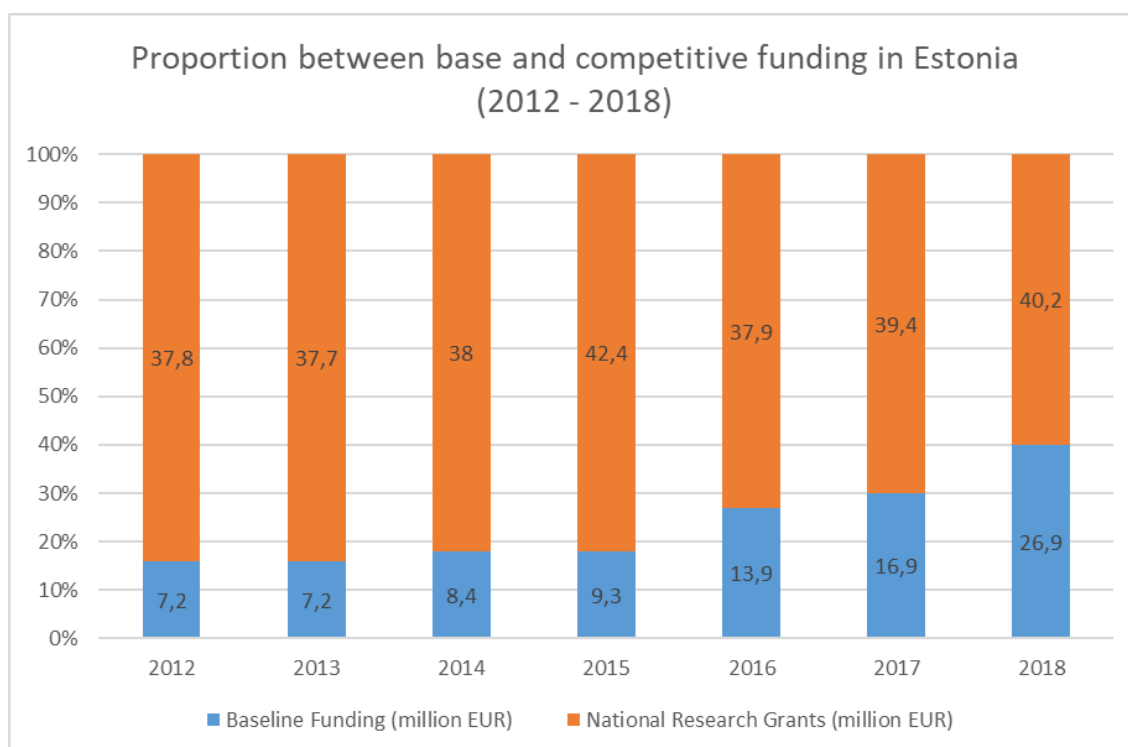


Fig. 4 – Development of proportion between baseline funding and national research grants in Estonia (Estonian Research Council, 2019)



**Financing of centres of excellence and doctoral schools** – like in other EU-13 countries, centres of excellence and doctoral schools have been supported by the European Regional Development Fund. A total amount of 41.2 million EUR was taken from H2020 program (2014–2020). To date, 21 centres of excellence were established in Estonia. Seven centres of excellence were established within 2008–2015 period, five centres between 2011 and 2015, and nine centres between 2014 and 2020. A total of 13 doctoral schools were led by the Estonian universities between 2014 and 2020.

**Funding of R&D infrastructures** – Estonia is running 17 R&D infrastructures and participates in 14 international R&D infrastructures. Estonian Research Council has prepared plan for Research Infrastructures of National Importance. Total planned investment is about 31 million EUR and up to 85% is supported by EU Structural Funds (2014–2020). All infrastructures are included on the list of a roadmap. Each item was approved by the government and can be found in a supplement to the Knowledge-based Estonia 2014–2020 innovation strategy.

**Mobility programs** - between the years 2008-2015, Mobilitas was the main program with the budget about 20.3 million EUR for foreign top-level post-docs (127 supported) and senior researchers (18 supported). At this time, Mobilitas Pluss program is running as a support for foreign researchers. It includes four main funding schemes: post-doc grants (with Ph.D. from abroad), top researcher program (for high-level foreigner researchers), returning researcher grant (for national researchers coming from post-doc stay abroad), and support for study visits and training abroad (short stages, visiting scholars). Finally, Dora Plus is an Estonian government program that is implemented from 2015 to 2023. The main purpose of this program is to the number of international students at Estonian universities through supporting mobility and organizing summer/winter schools. The budget is 22.5 million EUR (up to 87% supported by EU).



## 3.4 References and links

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		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
R&D expenditures (total)	GERD (in million EUR)	1281	1527	1801	1999	1924	2095	2552	2877	2997	3091	3250	2963	3433
	GERD (as % GDP)	1.17	1.23	1.3	1.24	1.29	1.34	1.56	1.78	1.9	1.97	1.93	1.68	1.79
	GERD (growth rate, basic prices)		12.7	11.7	-2.3	-0.6	5.6	18.4	13.6	6.1	6.7	3.0	-10.8	11.2
R&D expenditures (structure)	BERD (as % of GERD)	58.2	58.6	57.7	57.6	55.3	57.7	55.3	53.6	54.1	56.0	54.3	61.1	62.9
	GOVERD (as % of GERD)	22.8	22.2	23.3	23.5	24.2	21.7	19.8	18.4	18.3	18.2	20.4	18.2	17.2
	HERD (as % of GERD)	18.6	18.7	18.6	18.5	20.0	20.0	24.4	27.5	27.2	25.4	24.9	20.4	19.6
Financial sources of R&D funding (structure)	GERD funded by BES (as % of GERD)	48.2	49.1	47.2	45.0	39.8	40.8	37.7	36.4	37.6	35.9	34.5	39.5	39.3
	GERD funded by national public resources (as % of GERD)	45.2	44.9	44.7	44.8	47.8	44.4	41.7	36.8	34.7	32.9	32.2	35.6	34.6
	GERD funded by abroad (as % of GERD)	5.4	4.8	7.3	8.9	11.3	13.9	19.7	25.9	27.2	30.5	32.5	24.0	25.0
Public funding of R&D (total)	GBARD (in million EUR)	552	646	737	821	870	894	1051	1040	1028	991	1020	1035	1164
	GBARD (as % of GDP)	0.50	0.52	0.53	0.51	0.59	0.57	0.64	0.64	0.65	0.63	0.61	0.59	0.61
	GBARD (as % of total general government expenditures)	1.19	1.26	1.32	1.25	1.32	1.31	1.49	1.45	1.53	1.49	1.45	1.49	1.56
Public funding of R&D (structure of flows)	BERD funded by national public resources (as % of BERD)	16	15	14	14	16	15	16	14	12	10	8	6	7
	HERD funded by national public resources (as % of HERD)	92	91	92	91	91	87	72	59	59	62	62	87	84
	GOVERD funded by national public resources (as % of GOVERD)	82	84	82	83	85	82	78	71	66	63	61	77	78
Private funding of R&D (structure of flows)	BERD funded by BES (as % of BERD)	79	80	79	75	69	68	66	66	67	62	60	62	60
	HERD funded by BES (as % of HERD)	1	1	1	1	1	1	1	1	2	2	4	5	5
	GOVERD funded by BES (as % of GOVERD)	9	8	7	7	5	5	3	4	3	3	3	4	4
Funding of R&D from abroad (structure of flows)	BERD funded by abroad (as % of BERD)	5	4	7	11	15	16	18	20	21	28	32	32	33
	HERD funded by abroad (as % of HERD)	3	4	4	4	4	8	24	37	37	34	32	6	6
	GOVERD funded by abroad (as % of GOVERD)	7	6	10	8	9	13	19	25	30	33	36	18	18

21

## Annex 2

Following table provides an overview of the main R&D programmes implemented over the last 10 years.

Programme name	RFO	Focus	Time span	Total budget (mil. CZK)
<b>TIP</b>	Ministry of Industry	New materials and products. New advanced technologies. New information and controlling systems.	2009 - 2017	12 543
<b>Large RDI infrastructures projects</b>	Ministry of Education	Provide funding for excellent research base and thus increase the competitiveness of Czech R & D	2010 - 2022	10 561
<b>ALFA</b>	Technology Agency	The main goal of the programme is the increase of quantity and quality of new knowledge in applied research and experimental development in progressive technologies, materials and systems, energy sources, environment protection and creation and sustainable development of transport that will be applicable in innovation. This knowledge will subsequently reinforce the performance of institutions and enterprises, increase of competitiveness of Czech economy and society.	2011 - 2019	9 188
<b>National Programme for Sustainability I</b>	Ministry of Education	The aim of the Programme is a permanent development of the research infrastructure built in the Czech Republic in the years 2007-2013/15 under co-financing of the European Regional Development Fund, to support the social and economic development of regions where the centres operate, steadily form and implement high-quality R & D results, retain or increase the number of jobs created in this centres, especially jobs for the researchers.	2013 - 2020	7 141
<b>Competence Centres</b>	Technology Agency	Main objective of the programme: to increase the competitiveness of the CR in advanced fields with a high potential for the application of R&D results in innovation. The partial objectives of the programme: strengthening long-term collaboration between research organizations and enterprises in R&DI, through strategic partnerships between the research and corporate spheres, formed to achieved advancement in R&D and for the implementation of its results in practice; strengthening the interdisciplinarity of R&D; creation of conditions for the development of human resources in R&D, with particular emphasis on the involvement of early-stage researchers under the age of 35, incl. students involved in the project; creation of conditions for the horizontal mobility of researchers; fulfilment of the national priorities; sustainability of the strategic research agenda of the centres for at least 5 years after completion of the project.	2012 - 2019	6 152
<b>EPSILON</b>	Technology Agency	The main goal of the programme is the support of projects of applied research and experimental development, whose results have a high potential for a quick application in new products, production processes and services. This will help to sustain and develop the position of the Czech Republic in technologies, research, development and innovations in the world, which is important for the competitiveness in many current and also emerging industry and other branches. The instrument to reach this goal is the fulfilling of National Priorities of orientated research, development and innovations.	2015 - 2025	4 871
<b>Medical applied research</b>	Ministry of Health	The principle and primary objective of the Programme is to ensure an internationally comparable level of medical research and the use of its results to improve the health of the Czech population and to secure the current needs of the health service in the Czech Republic. The Programme has three primary areas: Incidence and development of diseases; New diagnostic and therapeutic methods; and Epidemiology and prevention of the most serious diseases, which are further broken down into 21 subareas and 43 component objectives.	2015 - 2022	4 739





<b>programme „KUS“</b>		local food in sufficient quantities for healthy nutrition of the population; To introduce new methods, technological processes and systems as a way to increase competitiveness of Czech agriculture within the framework of the EU and to support sustainable development of the agricultural sector, rural areas and regions of the Czech republic; To support sustainable use of natural resources with minimum negative impact on the environment by implementing new findings and to introduce management systems inductive to limiting negative impact of climate change on ecosystem function in agriculture and forests and water systems; To increase the potential of other functions of agriculture, forests and water systems.		
<b>Junior Grants</b>	Czech Science Foundation	The purpose of the junior grants is to support outstanding young researchers.	2015 - 2022	1 999
<b>Security Research for the Needs of the State</b>	Ministry of Interior	The Programme was proposed with the aim to increase the security of the state and its citizens with the use of applied research, experimental development and innovations in the area of identification, prevention and protection against unlawful actions towards citizens of Czech Republic, its organizations and structures, possessions and infrastructure as well as against natural or industrial disasters. New methods, tools and technologies will be developed as a result of the Programme.	2010 - 2015	1 855
<b>Security Research Programme of the Czech Republic</b>	Ministry of Interior	The main objective of the Programme is to increase the security of the state and citizens using new technologies, knowledge and other results of applied research, experimental development and innovation in the field of identification, prevention and protection against acts of unlawful interference, natural or industrial disasters, to the detriment of Czech citizens, organizations or structures goods and infrastructure.	2015 - 2022	1 810
<b>INTER-EXCELLENCE</b>	Ministry of Education	Development of the Czech research & development via international cooperation, reaching of synergies in realized activities in combination with other support mechanisms and lever effect in financing of these activities. The Programme is the tool of strategic support focusing on the international cooperation. It is aimed at the initiation of support and further development of the international cooperation in research & development and integration processes turning the Czech Republic into the European and worldwide research structures. It contributes to the creation of linkages between Czech research teams and research teams abroad cooperating together in European projects as well as in non-European projects. It forms favourable conditions and thus helps the Czech research teams to get the access towards international results, knowledge and skills and to take a part in their creation and utilization. Via its focus on international cooperation, it contributes to the improvement of research & development results and to the creation and strengthening of the linkage between Czech research & development activities in prioritized areas and the international activities. The system of research & development in the Czech Republic stays, irrespective of all taken measures, rather isolated. Low participation of the Czech workplaces in the framework European programmes, low number of top, internationally recognized results in research & development, high portion of publications not involving foreign authors as well as for instance insufficient contribution of the Czech research community to the creation of the European research area is the evidence of insufficient international cooperation of the Czech research entities both on the European and the worldwide level. The Programme while aimed at research & development activities that are close to the market also	2016 - 2024	1 743

		contributes to the creation of the strong base of applied research in the Czech Republic. Via mutually complementary and interactive sub-programmes that represent homogeneous units and can be administrated effectively as those separated units (including organization of R&D&I tenders)		
<b>Applied research and development of national and cultural identity</b>	Ministry of Culture	The core objective of the proposed Programme is to contribute to public funds invested into applied research and development in the area of national and cultural identity bringing specific economic or other benefit from the execution thereof. The core objective of the Programme is pursued by means of performance-oriented individual objectives linked to the main thematic priorities, thematic priorities subordinated thereto and the definition of applied research and development of the national and cultural identity in the Conceptual Plan.	2011 - 2017	1 723
<b>Defence applied research, experimental development and innovation</b>	Ministry of Defence	The aim of the programme is a systematic development of defence R&D&I and obtaining new knowledge, its utilization in practice and the achievement of such a knowledge level that enables to gain, master, maintain and develop specific capabilities needed for the defensive capability and the national security. The programme will be pointed at accomplishment of operational capabilities that the Czech Armed Forces need to fulfil tasks resulting from national and international standards, obligations and politico-military ambitions of the Czech republic by the year 2020.	2011 - 2017	1 422
<b>Development of Armed Forces of Czech republic</b>	Ministry of Defence	The aim of the program is the development of the Armed Forces of the Czech Republic which are necessary to ensure the defence of the country and to achieve the declared political-military ambitions of the Czech Republic and fulfilment of roles and functions of the Armed Forces of the Czech Republic.	2015 - 2022	1 346
<b>Information - the basis of the research</b>	Ministry of Education	Development of information infrastructure and infrastructure services for the research - Information as a fundamental building block, which is impossible to build up without", i.e. it is impossible to produce new R&D results."	2013 - 2017	1 017

Source: National Research Information System (IS VaVal)