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Abstract

The 2015 series of RIO Country Reports analyse and assess the policy and the national research and innovation system developments in relation to national policy priorities and the EU policy agenda with special focus on ERA and Innovation Union. The executive summaries of these reports put forward the main challenges of the research and innovation systems.

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Foreword

The report offers an analysis of the R&I system in Hungary for 2015, including relevant policies and funding, with particular focus on topics critical for EU policies. The report identifies the main challenges of the Hungarian research and innovation system and assesses the policy response. It was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports, websites, etc. The quantitative data are, whenever possible, comparable across all EU Member State reports. Unless specifically referenced, all data used in this report are based on Eurostat statistics available in February 2016. The report content is partly based on the RIO country report, 2014 (Dóry, 2015).

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Executive summary

The report offers an analysis of the R&I system in Hungary for 2015, including relevant policies and funding, taking into account the priorities of the European Research Area and the Innovation Union. The report was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports, websites, etc. The quantitative and qualitative data is, whenever possible, comparable across all EU Member State reports.

Context

The Hungarian R&I system is characterised by relatively low R&D intensity in both the public and private sectors. In 2013, the gross R&D expenditure (GERD) was €1,415.1m (1.41% of GDP) and the business R&D expenditure (BERD) was €982.5m (0.98% of GDP). The share of R&D funding from abroad continues to be significant (16.6% of the GERD in 2013). The share of EU funding is still only around 4% of GERD (Eurostat). However, the amount that the country received annually from the 7th Research Framework Programme (ca. €40m) is around one third (27%) of the annual budget of the two main national sources of competitive project funding (i.e., Research and Technological Innovation Fund (KTIA), and Hungarian Scientific Research Fund (OTKA), with a total annual budget of €120m and €26m respectively). This shows the key role that EU funding has in the national public R&D funding.

Concerning BERD in Hungary, the pharmaceutical industry has traditionally been the engine of R&D expenditure realizing the highest amount of R&D expenditure in 2012 (around €214.2m). The long-term, steady upward trend in R&D dynamics is related to pharmaceuticals (globally the most competitive among Hungary's highly productive industries), followed by ICT and vehicle manufacturing.

Hungary does not appear to face a risk of fiscal stress neither in the short-term nor in the medium-term perspective, conditional upon the fiscal adjustment that the country has undertaken in the post-crisis period attempting to cope with the large budget deficit and the high public debt. The fiscal consolidation had no negative effect on the R&D expenditure financed by the government, which has had an overall upward trend since 2005 with some fluctuations only during the crisis. The indirect support has become more important for R&D expenditure and compensates for the losses in the direct funding caused by budgetary constraints. Along the lines of a smart fiscal consolidation process, Hungary has not acted at the expense of the overall R&D expenditures, but has put considerable efforts in boosting them.

The research, development and innovation performance in Hungary is defined as moderate in the National Smart Specialisation Strategy and shows an increasing trend. The Innovation Union Scoreboard 2015 ranks the country the 20th in EU, including it in the group of moderate innovators.

Key developments in the R&I system in 2015 included:

- Establishment of the National Research, Development and Innovation Office (NKFIH) that, from January 2015, integrates the activities of the previous National Innovation Office and ministry departments responsible for innovation policy.
- Establishment of the National Research, Development and Innovation Fund in January 2015 that integrates the Hungarian Scientific Research Fund (OTKA) and the former Research and Technological Innovation Fund (KTIA) programmes.
- Establishment of the Innovation Body in March 2015 that consists of nine distinguished members representing both the economic and scientific spheres. The main goal of this body is to ensure the effective use of financial instruments available for research and innovation.
- Launch of new research measures funded by the Operational Programmes (i.e. GINOP, VEKOP, EFOP) co-funded by the Structural Funds.

The identified challenges for Hungary's R&I system are:

- (1) Stabilising the R&I governance
- (2) Fostering innovation in domestic enterprises
- (3) Enhancing the cooperation between science, higher education and business
- (4) Sustaining the supply of human resources for the R&I system

R&I Challenges

Challenge 1: Stabilising the R&I governance

Description

The system of governance of research, development and innovation (RDI) in Hungary has been subjected to constant structural changes since the beginning of the 1990s, which have led to lack of political commitment, instability of the RDI system, shortfalls in the policy implementation, and slow, insufficiently informed policy learning processes. (CR 2015) The latest significant governance restructuring entered into force on 1 January 2015 when the new National Research, Development and Innovation Office (NKFIH) was established. It is the legal successor of the National Innovation Office (NIH) and now incorporates also the National Research, Development and Innovation Fund (NKFIA). This fund integrates the previous Hungarian Scientific Research Fund (OTKA) and the Research and Technological Innovation Fund (KTIA). The NKFIH coordinates the RDI strategy-making, including the Operational Programmes supported by the Structural funds and elaborates the RDI funding instruments of the Hungarian government in collaboration with the respective ministries and the Hungarian Academy of Sciences (MTA).

In the past few years, a number of Science, Technology and Innovation (STI) policy advisory bodies have been established, among which the most recent one is the National Science Policy and Innovation Board (NTIT), whose task is to provide advice to the management of the NKFIH, to evaluate and recommend strategic issues of the development of the research and innovation system. However, the activity of those advisory bodies is very small.

A study carried out within the Stairway to Excellence (Hegyí, 2015) project shows that there are substantial flaws in the management and control of the European Structural and Investment Funds (ESIF), as well as in the Framework Programmes (FP). During the 2007-2013 programming period the unpredictability of publication and closure of calls hindered the implementation of the RDI ESF funds. In April 2015, the European Commission suspended the Economic Development Operational Programme affecting the payment of around €500m. The audits revealed severe deficiencies related to the evaluation of calls for proposals and the Commission asked the authorities to strengthen the project selection system, and to create synergies between the objectives of the operational programme and the conditions of the specific calls for proposals. It was necessary to ensure transparency, equal treatment and efficient financial management, as well as to improve the fraud detection mechanisms. (Hegyí, 2015)

Policy response

The rationale behind the establishment of the new NKFIH is to ensure the government level coordination of the research and innovation policies, and to provide stable institutional background of predictable financing as well as efficient and transparent RDI funding. In addition, the NKFIH office and the NKFIA fund support financially the entire innovation chain from basic research to applied and experimental research. The new office also runs the database of RDI projects that are financed by public resources.

Concerning the unpredictability of the governance system, the government offered a solution by publishing a yearly funding plan indicating the timing and eligibility criteria of calls for proposals. (Hegyí, 2015)

Hungary was one of the first Member States (the other one is Bulgaria) that volunteered to undergo a peer-review of its research and innovation system within the framework of the Horizon 2020 Policy Support Facility¹. So far a pre-Peer Review was carried out by a panel of three independent experts agreed upon by the European Commission and the Hungarian authorities. The pre-Peer Review panel identified four focus areas to be examined in-depth during the subsequent Peer Review process: 1) R&I governance and policy making; 2) availability of human resources for R&I; 3) university-industry cooperation, technology transfer and entrepreneurship; 4) framework conditions for innovation in the business sector (EC, 2015c)².

Assessment

The governance of the research and innovation system in Hungary is characterised by constant structural and personnel changes that have often delayed the implementation of policies and have slowed down the system performance. The management and control flaws in the operational and framework programmes have caused delays throughout the whole funding cycle, more specifically in the decision making regarding the funding, payments, signature of contracts, approval of modifications, and communication.

Challenge 2: Fostering innovation in domestic enterprises

Description

In the context of the governmental policy of fostering the business R&I expenditure and of raising the significance of the business R&I performance, the level of innovation activities is low, especially that of SMEs. Only about one-fifth of the enterprises introduce product or process innovations in Hungary, with no major change in the last decade. This ratio is even lower for SMEs and the share of SMEs innovating in-house is only 10.6% - only one-third of the EU-28 average (28.7%). According to the Innovation Union Scoreboard 2015, only 12.8% of Hungarian SMEs introduced product or process innovations, that is, 42% of the EU-28 average (30.6%). This is explained with the fact that R&D activities are highly concentrated in large companies and a mere 8% of all Hungarian research units are responsible for half of the business expenditures on R&D (KSH, 2014). The small domestic firms lack their own funding for research and innovation and often wait for public support in order to launch new research and innovation projects, therefore they try to avoid taking risk and rarely invest in RDI activities from their own pocket.

A complex analysis of Hungary's participation in FP7, carried out within the Stairway to Excellence (S2E) project, shows that the policy of funding RDI from the European Structural and Investment Funds does not favour innovation. Calls for proposals in the field of innovation are risk avoiding in a way that they strongly limit the innovativeness of projects or exclude innovative business concepts completely. This is evidenced by the fact that RDI calls evaluate only the previous performance of the applicant but do not evaluate at all the business potential of the proposed idea itself or the innovativeness of the new product, service or process. In addition, the implementation period of the EU funded projects is limited to 24 months, which hinders the innovation processes. Many large and small-and-medium-sized enterprises report that this time period does not allow them to carry out substantial research, because in the second part of the projects they should focus entirely on the delivery of the promised results. Hence less risky projects are implemented in order to deliver "results". In addition there is a lot of administrative work that companies should comply with. (Hegyí, 2015)

¹ The Directorate-General for Research & Innovation of the European Commission set up a 'Policy Support Facility' (PSF) under the European Framework Programme for Research & Innovation 'Horizon 2020' to support Member States in reforming their national science, technology and innovation systems.

² The report is available at the joint Research and Innovation Observatory – Horizon 2020 Policy Support Facility website: <https://rio.jrc.ec.europa.eu/en/library/horizon-2020-policy-support-facility-pre-peer-review-hungarian-research-and-innovation>

Policy response

The RDI strategy 2013-2020 foresees measures that are dedicated explicitly to innovative SMEs and favours innovative SMEs in certain restricted areas of pre-commercial procurement (PcP). More specifically, the RDI strategy would increase the public demand for innovation through PcP actions. The National Smart Specialisation Strategy foresees a PcP pilot action in order to examine whether the domestic application of PcP will require amendments to the existing regulations or the introduction of new legislation. The pilot action aims to investigate what financial incentives are needed for the domestic expansion of the PcP programme. However, these actions are late, they were already supposed to be introduced in 2015.

According to the National Reform Programme 2015 of Hungary, in 2015-2016, innovation related measures are expected to be launched using EU and domestic resources. Supporting RDI activities carried out individually or in cooperation in the framework of both revolving funds (loans, guarantees and venture capital) and grant type support are envisaged. The aim is that innovative enterprises (including the suppliers) will further develop their existing marketable products, and introduce improved products to the market. (NRP, 2015)

From 2015 innovation support is available from the new National Research, Development and Innovation Fund and the Operational Programmes (mainly the Economic Development and Innovation Operational Programme (GINOP) and Competitive Central Hungary Operational Programme (VEKOP)) co-funded by the Structural Funds.

Assessment

The risk avoiding attitude both of the governmental bodies and the SMEs (especially of the domestically owned ones), as well as the unfavourable framework conditions, are obstacles to accelerate the progress of innovation. In addition, the lack of innovation experience, the insufficient knowledge base and human resources capacity hamper the development of the innovation process. The most recent policy documents propose some measures that could offer solutions for a faster and more effective development of the Hungarian innovation system, but it depends a lot on the quality of the implementation of those measures in order to achieve the expected outcomes. What is more, a systemic development of the entire national innovation system is necessary so that to strengthen and synchronize all the components of the innovation driving mechanisms.

Challenge 3: Enhancing the cooperation between science, higher education and business

Description

Scopus data show that between 2003 and 2013 the percentage of academia-industry co-publications in Hungary has almost not changed, in 2013 being 1.4%, well below the EU-28 average of 2.2%. Moreover, in 2013 Hungary had only 12.8 public-private co-publications per million of population compared to 29 for the EU-28 (17.5 for the Czech Republic, 9.8 for Poland and 6.8 for the Slovak Republic). The domains with the highest percentage of academia-industry co-publications (excluding the multidisciplinary publications) are energy, immunology and microbiology, the health related professions, pharmacology, toxicology and pharmaceuticals.

The exploitation of public research results, including knowledge transfer and spin-off creation, is not yet a well explored area, even if Technology Transfer Offices (TTOs) have been established in all major Higher Education Institutions (HEIs). These intermediary organisations are not yet ready to efficiently mediate between academia and industry and to transfer research results to companies. Apart from the above mentioned Technology Transfer Offices, there are a relatively large number of intermediary organisations (e.g. regional innovation agencies, foundations for enterprise promotion) in the Hungarian national innovation system, but they have no critical mass in size or in responsibilities.

According to Deloitte, even though the government aims to facilitate joint R&D projects through grants and incentives, three quarters of the respondent companies in a survey prefer to carry out R&D activities on their own – that is, they do not wish to involve third parties in R&D projects. Companies that plan to carry out their R&D projects in consortium arrangements mostly say they select universities and academies as partners. Despite that, co-operation with universities and research institutions is less than common as a feature of corporate R&D spending, both in 2013 and 2014. (Deloitte, 2014)

Policy response

Several new measures within the Economic Development and Innovation Operational Programme (GINOP) and the Competitive Central Hungary Operational Programme (VEKOP) address the issue of collaboration between science and business, e.g., the measure GINOP 2.2.1 has one of the largest budgets for 2015 – around €166.67m are planned to be spent on "Competitiveness and excellence cooperation" between the private and public sector.

The National Smart Specialisation Strategy mentions two specific pilot measures addressing this challenge. The first one is "Open laboratories" aiming to facilitate networking among public research centres, technology centres, large companies and SMEs, and to provide support, research capacities and equipment to those actors of the system that still lack them. (It should be noted that probably this measure will be implemented within the second measure mentioned here, that is, the "Higher Education and Industrial Cooperation Centres".) The second measure is "Higher Education and Industrial Cooperation Centres" (FIEK) aiming to develop sectorial training and RDI activities better aligned with industry needs. In the new programming period 2014-2020, measure GINOP 2.3.4 will allocate €83.3m to the development of a small number of FIEKs in 2015.

Several measures have been launched in the last five years to support R&I cooperation and knowledge transfer (KT) between the public and the private sector: "Start-up_13" aiming to support the development of young technology start-ups with high growth potential; "Support to market-oriented R&D activities" scheme targeted at R&D projects expected to develop prototypes of marketable products, services or processes with high added value through stimulating business demand for R&D activities and fostering the public-private technology transfer; "Strengthening Co-operative Research Centres (KKK) and Regional Knowledge Centres at Universities (RET)" scheme.

Assessment

Although there are programmes launched to support the cooperation between science, higher education and business, they can foster the achievement of good results if they exist for longer periods of time. The programmes are constantly new and the key players have difficulties in perceiving them and adopting them in their own business plans. It would be better if this type of measures are organised in two phases, for example, 3+3 years, so that the key players are given the possibility to really work together and achieve results.

Challenge 4: Sustaining the supply of human resources for the R&I system

Description

Both the share of science and engineering (S&E) graduates and the rate of participation in life-long learning are rather low in international comparison and a significant gap might be opening between the supply and demand for qualified S&E personnel in the near future. The "stock" of S&E graduates is 5% in Hungary, which is lower than in the Czech Republic (5.5%), Poland (6.3%) or the EU average (6.4%). Likewise in the case of new doctorate graduates (i.e. potential supply to the RDI system) the numbers are as follows: Hungary 0.9 doctorate graduates per 1,000 people, compared to the Czech Republic (1.7), Slovakia (2.4), Poland (0.6) and the EU average (1.8).

It is a positive trend, however, that the share of the population aged 30-34 having completed tertiary education increased slightly to 31.9% (IUS 2015) closing the gap with the EU average (36.9%). The share of persons with tertiary education in Hungary in the total active population shows an increasing decennial trend: from 16% in 2000 it grew to 24.8% in 2013, still lower than the EU average (30.3%). The share of persons with tertiary education employed in science and technology shows a similar trend, moreover, by 2013 Hungary has practically caught up with the EU (17.9% vs. 19.1% - EU average). The share of persons with tertiary education employed in high and medium high-tech manufacturing in the total employment reached 6.4% in 2014 outpacing the EU average (5.3%), but it is only the second best after the Czech Republic (7.1%). The situation is similar for the knowledge-intensive high-tech services: Hungary (6.1%), Czech Republic (7.7%), Slovakia (7.2%), and EU average (5.7%). Brain-drain primarily affects the highly qualified young people, especially those with S&E degrees that are overrepresented within the group of Hungarians working abroad. The main barrier for pursuing a career in research is the low salaries, especially in the early years of researchers, even within the national context.

According to the National Smart Specialisation Strategy, the quality of the human resources needs development and should be aligned with the needs of the market.

Policy response

The higher education strategy ("Changing gear in higher education", 2014) foresees major changes in the way the HEIs are financed. Performance based financing will be introduced in Hungarian HEIs from 2016 that will be based on various performance indicators. The strategy also foresees the introduction of fixed-term post-doctorate positions that are currently lacking from the higher education system. These positions aim to allow early career researchers to find job opportunities at HEIs so as to prevent "brain-drain" from Hungary and to ensure the supply of researchers at the same time. The higher education strategy seeks to develop career paths for researchers. The strategy also created the basis of the dual education system, which was launched in February 2015.

The strategic R&D workshop excellence programme, with a budget of €141.9m (HUF44b), aims to establish and renew higher education research groups by taking the burden of lectures off the researchers with outstanding performance and by supporting young talents.

In 2014, the government took a decision to allocate €38.7m (HUF12b) from the Research, Technology and Innovation Fund (KTIA) to support the National Programme in Brain Sciences. The strategic objective of the "A" sub-programme managing €20.6m (HUF6.4b) is to strengthen the research centres and institutes belonging to the international front line by introducing new topics and technologies. The objective of the "B" sub-programme with a total budget of €18.1 (HUF5.6b) is to turn back brain-drain by inviting and employing researchers working abroad.

The "Momentum" programme of the Hungarian Academy of Sciences (MTA) aims at the renewal of its research teams and those of collaborating universities via attracting outstanding young researchers back to Hungary by paying them competitive salaries. Every year 8-12 new research groups are supported with a competitive grant for maximum five years. Since 2009 more than 100 groups have been supported and several of them became part of the research network of MTA after termination of the grant period.

It should also be mentioned that the RDI strategy 2013-2020 addressed the issue of sustainable supply of researchers and intends to double the number of researchers from 38,000 to 50,000.

Assessment

Some programmes have been launched aiming to increase the attractiveness of the research career and to improve the higher education quality, but the efforts are fragmented and do not really impact the sustaining of the human resources in the R&I system. The Momentum programme of the Hungarian Academy of Sciences could be seen as a good practice, however its scale is rather limited in comparison to the objectives of the RDI strategy 2013-2020.

There is insufficient supply of researchers, which is due to the very low salaries and the more attractive career opportunities in the business sector and abroad. Meeting the challenge of increasing shortage of qualified human resources goes together with strengthening the entire R&I and higher education system.

1. Overview of the R&I system

1.1 Introduction

Hungary is a medium-sized European Union member state since 2004, with a territory of 93,036 km². Hungary had 9,877,365 inhabitants on 1 January 2014 (about 2% of the EU-28 total) according to the Eurostat database. This means a slight decrease of 1.5% in the past 5 years, i.e. compared to the 2009 figure of 10,030,975. Hungary has a medium-sized, structurally, politically, and institutionally open economy. The Hungarian GDP per capita at current prices was €10,000 in 2012 and €10,600 in 2014. This means a 6.0% increase between 2012 and 2014. Compared to the EU-28 average, the Hungarian GDP per capita at current prices was only 38.7% of the EU-28 average, but if we look at the GDP in terms of PPS (purchase power standard) then the picture is much better 68% of the EU-28 average in 2014. Between 2012 and 2014, the Hungarian real GDP growth rate compared to the previous year was -1.5%, 1.9% and 3.7% respectively. This latter figure in 2014 was almost three times higher than the average growth rate of the EU-28 countries. The Hungarian GDP is still below its 2008 level by about 1%, while Poland's and Slovakia's GDP far exceeds the pre-crisis levels. (see Table 1 below)

According to the Hungarian Central Statistical Office (KSH), the growth of the GDP continued in the first and second quarter of 2015 by 2.7% and 3.1% respectively. The growth was mainly due to the increasing production of the vehicle industry while agriculture held in growth because of unfavourable weather conditions. (KSH, 2015a) In addition, the absorption of the Structural Funds in the growth of the GDP should be mentioned. According to the European Commission's 2015 winter forecast, economic growth is projected to stand at 2.4 % and 1.9 % in 2015 and 2016, respectively, reflecting the fading of the above mentioned time-bound stimulus measures. (EC, 2015)

The general government deficit has been kept under control after exit from the Excessive Deficit Procedure in 2013. The government deficit was 2.4% of the GDP in 2012 that stayed almost stable with 2.5% in 2013 and 2.5% in 2014. At the same time the average government deficit of the EU-28 countries reached 3.0%. The government forecasts a deficit of 2.4% of the GDP for 2015, while the European Commission projects a deficit of 2.5% of GDP in 2016 and foresees that the structural balance will improve moderately, but will remain well above the country's medium-term objective (i.e. -1.7% of GDP). The government tries to decrease the debt-to-GDP ratio but it reduced only slightly from 78.3% in 2012 to 76.2% in 2014. The debt reduction is expected to be rather contained in 2015 and relatively faster in 2016 according to the forecast of the European Commission. (EC, 2015)

The yearly unemployment rate was 7.7% in 2014 that is well below the EU-28 average of 10.2% in the same year. After the peak in 2010 (11.2%) the unemployment rate has been reduced mainly due to the expansion of public works.

Agriculture produced 4.4% of the Hungarian GDP in 2014 after 50% lower contribution in 2013 (2.2%). Agriculture employs 4.6% of the work force and it is responsible for 6.1% of investments. Agriculture contributed with 0.5% to the GDP growth in 2014. In 2014, the industry had 26% contribution to the GDP which is the fourth biggest value in the European Union after Czech Republic, Romania and Slovenia. The Hungarian industry is characterised by strong export orientation and it is dominated by multinational companies. The consequence of this structure is that the industrial production is strongly influenced by European demand and prosperity. It fell back significantly in both 2009 and 2012 because of global and European recession.

In 2014 the production volume of the manufacturing sector representing more than nine-tenths of the industrial output rose by 8.6% following a 1.4% increase in the previous year, in which foreign sales continued to play a dominant role.

Output expanded in each of the subsections in 2014, among them vehicle production was the primary engine of growth: the production of the subsection giving more than a quarter of the manufacturing output increased by 21%. Machinery dominates the industrial production with 51%, followed by the chemical industry (21%), food industry (11%), textiles (5%) and other industries (12%). The export orientation of the Hungarian industrial production increased further in the past decade from 50% of total industrial output to 58% in 2013 up to 61% in 2014. (KSH, 2015b)

In terms of the employment, the industrial sectors employ 24% of the active population, while the service sector employs 65% of the total (i.e. more than 2.6 million persons). In the service sector, public services employ the majority of employees that increased even further in the past few years after expansion of the public works schemes. (KSH, 2015b)

Employment in high- and medium-high-technology manufacturing sectors as share of total employment reached 8.9% in 2014 which is more than 50% higher than the EU-28 average (5.7%). On the other hand employment in knowledge-intensive service sectors as share of total employment is slowly increasing. In 2014 it was 36.1%, slightly below the EU-28 average (39.4%). The value added of manufacturing as share of total value added seems to be stable with a ratio of 38.5% in 2013, the last year this data is available for. The value added of high tech manufacturing as share of total value added slightly decreased to 5.7% in 2013 from 6.4% in the previous year but it is still one of the highest ratios among the EU-28 member states. (see Table 1)

The Hungarian GERD increased every year even in and after the years of the economic crisis. While GERD was €1,257.3m in 2012 and it grew by 13.6% to €1,428,85m in 2014. The GERD reached its highest value in the last two decades with a value of 1.41% of the GDP in 2013 then slightly decreased to 1.38% in 2014 according to Eurostat data. Nevertheless, the GERD at current prices increased by 4.6% compared to 2013. At the same time the number of researchers grew by 4.5% and reached a total of 26,200 FTE in 2014. (KSH, 2015c)

Innovation activities are more characteristic to large firms. According to KSH (2015b) every third company with more than 10 employees introduced some kind of innovation between 2010 and 2012. This ratio is 67% in the case of companies with more than 250 employees. If we look at the Eurostat data on the turnover from innovation, it presents a decreasing trend, 16.4% in 2008, 13.7% in 2010 and 9.7% in 2012. This latest value is almost 20% lower than the EU-28 average of 11.9%.

Table 1: Main R&I indicators 2012-2014

Indicator	2012	2013	2014	EU average (2014)
GDP per capita (current prices)	10,000	10,200	10,600	27,400
GDP growth rate	-1.7	1.7	3.9	1.4
Budget deficit as % of public budget	78.5	77.3	76.9	86.8
Government debt as % of GDP	-2.3	-2.5	-2.5	-3,0
Unemployment rate as percentage of the labour force	11.0	10.2	7.7	10.2
GERD in €m	1,257.3	1,415.1	1,428.85	283,009.4
GERD as % of the GDP	1.27	1.41	1.38	2.03
GERD (EUR per capita)	126.6	142.8	144.7	558.4
Employment in high- and medium-high-technology manufacturing sectors as share of total employment	8.3	8.5	8.9	5.7
Employment in knowledge-intensive service sectors as share of total employment	35.1	36.1	35.7	39.8
Turnover from innovation as % of total turnover	16.4*	13.7**	9.7***	11.9***
Value added of manufacturing as share of total value added	38.8	38.5	n.a.	n.a.
Value added of high tech manufacturing as share of total value added	6.4	5.7	n.a.	n.a.

Notes:

* - data for 2008

** - data for 2010

*** - data for 2012

The Hungarian R&D investment target was set by the National Research-Development and Innovation Strategy (2013-2020) (entitled "Investment into the future") that was approved in July 2013. According to this RDI strategy Hungary will increase its research and development expenditures to 1.8% of the GDP by 2020 and 3% by 2030. The strategy also set that the BERD/GDP ratio should reach 1.2% by 2020.

Hungary put lot of efforts to increase the R&D expenditures even during the years of the economic crises. After the general elections in April 2014, the re-elected central-right government changed its rhetoric and would like to develop Hungary into the "innovation centre of Central and Eastern Europe". Beforehand, Hungary as a main "production centre of Central and Eastern Europe" was highlighted by the prime minister and other senior government officers. Even if the public sector spends less and less every year on research and development, the business sector was able to increase its R&D expenditure that is highly visible in statistical figures. According to the argumentation of the government, the centralisation of all RDI related funding into the new government agency called National Research, Development and Innovation Office (NKFIH)³ should serve more efficient and effective resource allocation for RDI as well as achieving of the national R&D target. Based on the assessment of the latest government initiatives and the development of the figures on the R&D expenditures, the achievement of the national R&D target seems to be realistic, assuming no major change happens in policymaking and in the global environment.

1.2 Structure of the national research and innovation system and its governance

1.2.1 Main features of the R&I system

Hungary is a unitary state with a centralised decision-making system with regard to major policy domains, including science, technology and innovation policies. Hungarian regions have neither democratically elected leaderships, nor any power to raise revenues, e.g. regional tax. In effect from 1 January 2013, new territorial administrative units, districts (NUTS3 level) were created within the 19 counties with no significant role regarding STI policy-making.

The business sector finances the biggest share of the total R&D funding and stayed almost at the same level between 2010 and 2014 (47.3% and 48.8% respectively). The ratio of public funding within the financing sources for R&D decreased significantly from 39.3% in 2010 to 33.8% in 2014, as its growth could not keep up with the considerable aggregate growth rate of GERD. This decrease is even more remarkable if we consider a longer period as the government sector funded half (49.6%) of the total R&D expenditures in 2005. However, it should be noted that the overall public R&D funding increased from 0.45% to 0.51% of the GDP between 2010 and 2013, then fell back to 0.46% in 2014, while the public expenditures on R&D of GDP have decreased from 0.44% in 2010 to 0.38% in 2014. Research and development funding from abroad has a quite high and increasing share of the GERD, i.e. 17.5 % in 2014, the growth was 41.1% compared to 2010 (12.4%).

Compared to the business sector, universities and public research organisations play a minor role in research with 13.5% and 13.7% of GERD performed in 2014. Concerning PROs, the network of the Hungarian Academy of Sciences (MTA) is the most significant actor and represents 71.2% of the R&D expenditures of the PRO sector (KSH, 2014).

³ See at <http://nkfi.gov.hu/>

While research centres and institutes of MTA are engaged mainly in basic or discovery research, research units at higher education organisations are smaller and they focus more on applied research.

According to the survey data of the national statistical office (KSH), 32.5% of the companies reported some kind of innovation between 2010 and 2012. Hungarian small- and medium-sized companies originate 16.7% of their income from new or improved products. This ratio is 24% at large companies. (KSH, 2014).

1.2.2 Governance

Hungary has a stable centre-right government that maintained its power after the general elections held in April 2014. The government has almost two-thirds majority in the Parliament. The focus of the Hungarian economic policy is to support the economic growth and increasing of employment. The reorganisation of the RDI governance and funding system in January 2015 had the main objective to coordinate RDI policies and provide stable background as well as predictable financing. The justification of the law on "Scientific Research, Development and Innovation" – that was approved in November 2014 – also stresses that the new government office, the National Research, Development and Innovation Office should implement efficient and transparent RDI funding.

In addition, the government resolution 272/2014. (XI. 5.) states that the main provisions of the annual development framework should be published two months before the end of each year in the period 2014-2020. The exemption is the year 2015 when the new financial period starts and all programmes should be defined and approved by the European Commission. In March 2015, the government resolution 1173/2015. (III. 24.) was published that revealed the main directions of 133 different calls. This development framework indicated that 64 calls with an indicative budget of (~€2.45b (HUF746b) of the largest operational programme entitled "Economic Development and Innovation Operational Programme" (GINOP) would be published by the end of 2015. In fact, altogether 119 calls of 8 Operational Programmes were published by the end of 2015 that opened up €7.27b (HUF2,253b) funding to applicants. These calls represent about 40% of all funding available in the period 2014-2020 and their publication clearly reflects the motivation of the government to publish all calls by summer 2017.

Along with the RDI strategy, the Smart Specialisation Strategy and major programmes were consulted in the past years with relevant stakeholders of industry, local authorities and NGOs, therefore it could be concluded that RDI policies in place are backed by stakeholders. In fact, the stakeholders urge the government to significantly increase the funding for economic development and RDI purposes. Because of the immense changes within the institutional system and high turnover of experienced staff, there are concerns within the research and innovation community how the tenders will be evaluated and what kind of administration as well as paper work will be required for successful implementation of the RDI projects.

Hungary has all the major elements of a potentially successful national innovation system (NIS). The main policy making bodies are the Parliament and its committees. Policies are formed and approved by the government. The National Development Cabinet (NFK) headed by the prime minister co-ordinates all major governmental development actions including STI policy decisions. NFK was established in June 2012 in order to speed up and prepare well government decisions in the field of development policy and to ensure efficient implementation of major development programmes. Apart from the prime minister, the ministers of the Prime Minister's Office, the Ministry of National Economy and Ministry of National Development participate in this high-level decision making body. If needed, other ministers are invited to the meetings of the NFK. In addition, the Ministry of Human Capacities, the Ministry of Justice and the Ministry of Agriculture have responsibilities in research and development.

The state-owned higher education organisations belong to the Ministry of Human Capacities. The Hungarian Intellectual Property Office⁴ works under the Ministry of Justice. Also, the Ministry of Agriculture has responsibilities in research-development and innovation as well as dedicated funding for agriculture and food related research activities.

At operational level, the National Research, Development, and Innovation Office (NKFIH) is the governmental body responsible for research, development and technological innovation as of 1 January 2015⁵. The new office was established by Law LXXVI on "Scientific Research, Development, and Innovation" (of 25 November 2014) in order to integrate strategy-making and governance of research-development and innovation as well as to coordinate the RDI funding. The NKFIH is the legal successor of the National Innovation Office (NIH) that was established in 2010 and its tasks included strategy-making and programme planning as well as international RDI collaboration. The NKFIH is responsible for the National Research, Development and Innovation Fund. This fund integrates the Hungarian Scientific Research Fund (OTKA) and the Research and Technological Innovation Fund (KTIA) programmes. This integrated fund has a budget of about €247m (HUF74.1b) for 2015. In addition, the president of the NKFIH has the role to coordinate the RDI strategy-making, including the Operational Programmes supported by the Structural funds and elaborate the RDI funding instruments of the Hungarian government in collaboration with respective ministers and the president of the Hungarian Academy of Sciences (MTA).

In the past few years there were a number of STI policy advisory bodies established. The most recent one is the National Science Policy and Innovation Board (NTIT) that was established by government decree 116/2013 (IX.25.)⁶. The president of the NTIT is the prime minister, and the co-chairman is the president of the Hungarian Academy of Sciences (MTA). The mandate of the board is to provide advice, evaluate and make recommendations on strategic issues of scientific, research and development and innovation programmes, the sustainable finance of these programmes and the evaluation methodology to be carried out at scientific institutions. Nevertheless, there is no public information available about the meetings of NTIT.

In March 2015, a new decision making "Innovation Body"⁷ was established within the National Research, Development and Innovation Office. This Innovation Body consists of nine distinguished members representing both the economic and scientific spheres. The body is headed by the ex-president of the Hungarian Innovation Association. The main goal of this body is to ensure the effective use of financial instruments available for research and innovation. Especially, it has a role to elaborate such investment programmes that contribute to the development of the Hungarian economy and to the well-fare in the country. In addition, the body will contribute to the elaboration of science and innovation policy guidelines, forming the RDI strategy, as well as a selection of the members of the evaluation committees of RDI funds.

An International Scientific Advisory Board started its work to provide the president of the NKFIH with strategic advice. The five members of this board are prominent foreign scientists experienced in science policy and R&D funding. The first meeting of the board was held in December 2015 in order to overview and evaluate the operation of the reorganised RDI funding system as well as to make proposals for improvements.

STI policy monitoring and evaluation culture is weak in Hungary. This situation has changed with the establishment of the Science and Technology Observatory (called Kaleidoscope information service) within the National Innovation Office in 2012.

⁴ See at <http://www.sztnh.gov.hu/en>

⁵ See at <http://nkfih.gov.hu/>

⁶ The new law LXXVI (of 25 November 2014) on scientific research, development and innovation does not mention this advisory body and no public information is available about its meetings since its establishment.

⁷ See at <http://nkfih.gov.hu/hivatal/donteshozo-testuletek/innovacios-testulet>

After several years of planning, this service provided stakeholders of the innovation system with reliable data and reports until the end of 2014. The new National Research, Development and Innovation Office has not implemented such service so far that monitors and reviews the Hungarian innovation system and potentially could provide accurate and comparable information about the quality and efficiency of funding through R&I programmes.

Apart from the necessary ex-post evaluation of calls of the Operational Programmes co-funded by the Structural Funds, national research and innovation funding schemes are not subjects of evaluation. A most recent exception was the international evaluation of OTKA that was carried out by foreign experts based on an agreement with the European Science Foundation⁸. Beforehand, an assessment of the operation of the Research and Technology Innovation Fund (KTIA) between 2004 and 2009 was produced by a consortium of Ernst&Young and GKI Economic Research Co in 2010. (EY, 2010)

Hungary was one of the first Member States, together with Bulgaria, who requested the peer review of their national innovation systems within the framework of the Horizon 2020 Policy Support Facility⁹. The pre-peer review report of the expert group was published in mid-October 2015. The report analyses the Hungarian R&I system in detail and identified the following four focus areas for peer review in order to come with appropriate solutions: i) R&I governance, funding and policy-making; ii) availability of human resources for R&I; iii) university-industry cooperation, technology transfer and entrepreneurship; iv) framework conditions for innovation in the business sector. (EC, 2015c)¹⁰

The Ministry for National Economy used to publish its economic forecasts two times a year: once in spring in relation to the Convergence Programme, and once in autumn in relation to the annual budget preparation. Until 2014, the QUEST III model (including R&D indicators) was mainly used. Then the unit responsible for macroeconomic forecasting within the Ministry for National Economy started to use its own new model called DINAMO. According to a publication about the DINAMO model, it provides forecasts for the following six main fields: household consumption, public consumption, investments, foreign trade, payment balance and government budget. The input indicators of the model do not include research-development indicators.

1.2.3 Research performers

According to the Hungarian Central Statistical Office, there were 2,994 research units in Hungary in 2014, which is 5.2% less than in 2013. (KSH, 2015d) Companies operated 54.2% of all research units while higher education organisations hosted 41.7% of them. The main public research performers are the 16 institutes of the Hungarian Academy of Sciences that are responsible for 71.2% of all public research-development expenditures and employ 60.1% of all public research personnel (FTE). Among private research performers, multinational and large companies have a clear dominance. More than half (56.6%) of the research-development expenditures are spent by foreign or foreign-dominated companies, and they employ 52.5% of all research personnel (FTE) in the private sector. (KSH, 2014a)

Hungarian research performers are relatively small at international level, only the pharmaceutical company Richter Gedeon appears in the 2015 EU Industrial R&D Investment Scoreboard ranked 178th with €138.8m invested in research and development in fiscal year 2014.

⁸ The evaluation report is available at http://www.esf.org/fileadmin/Public_documents/Publications/otka_evaluation_01.pdf (Date of access: 23 February 2015)

⁹ See more details at: <http://ec.europa.eu/research/index.cfm?pg=newsalert&year=2015&na=na-030315>

¹⁰ <https://rio.jrc.ec.europa.eu/en/library/horizon-2020-policy-support-facility-pre-peer-review-hungarian-research-and-innovation>

Since 2004 all sectors have increased the size of their research units. They employed 9 researchers (FTE) per research unit in 2004 and 12.1 researchers (FTE) per research unit in 2013. While public research units employ 60 researchers (FTE) on average, the research units of the higher education organisations are much smaller, they have only 6 FTE researchers per unit. The differences are more balanced when looking at the R&D expenditures per researcher, this value is about €24,660 (HUF7.4m) and about €27,000 (HUF8.1m) respectively. The business sector employed 57.2% of all researchers (FTE), higher education organisation 23.7% and the PROs 19.1% in 2013. The corresponding figures ten years ago were: 28.9%, 39.6% and 31.5% respectively. The change happened because the business sector increased more than three times the employment of researchers from 6,704 to 22,244 researchers (FTE) between 2004 and 2013.

Researchers both in the business sector and PROs dedicate more than 80% of their working time to research and development activities, while this ratio is only 35% in the higher education organisations where staff members are mainly involved in teaching. In 2013, more than 80% of total research-development expenditures (GERD) were spent in the fields of engineering sciences (54%) and natural sciences (26%). Pharmaceutical companies have the most intensive research-development activities (19% of BERD) followed by ICT, machinery and transport sectors. (KSH, 2014a)

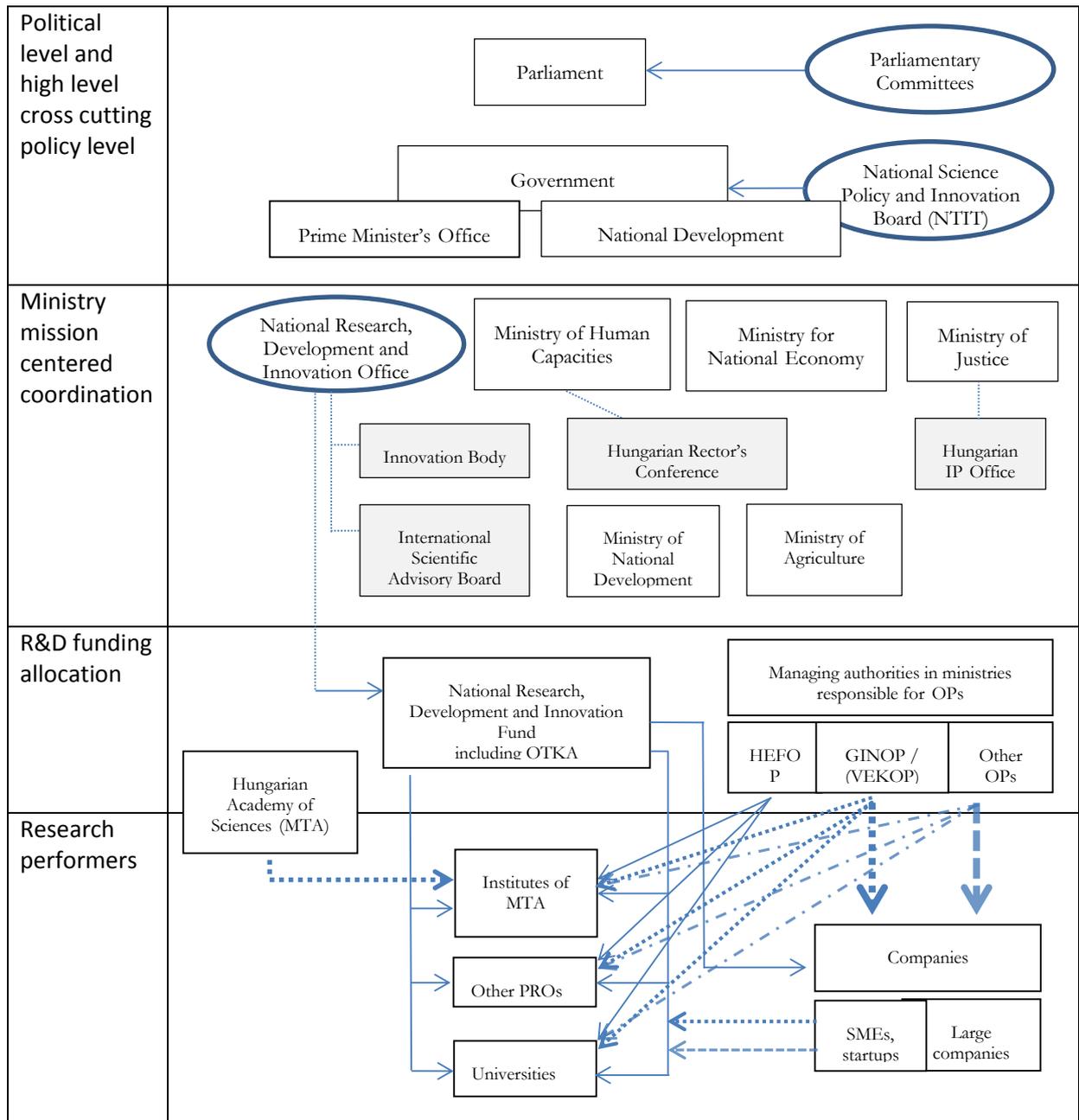


Figure 1 Policy governance subsystem of the Hungarian research and innovation system Source: author's own compilation

2. Recent Developments in Research and Innovation Policy and systems

2.1 National R&I strategy

The National Research-Development and Innovation Strategy (2013-2020), entitled "Investment into the Future" was approved by government decree 1414/2013. (VII.4.) after public consultation that started in November 2012. The strategy aims to raise the RDI investments, and as a result, to mobilise the Hungarian economy and to strengthen its competitiveness. The strategy set the target to raise the amount of R&D expenditures to 1.8% of GDP and the BERD/GDP ratio to 1.2%, as well as to increase the number of researchers from 37,000 in 2012 to 56,000 by 2020.

Various benchmarking methods, including a SWOT analysis, have been used in the situation analysis part of the RDI strategy. The strategy clearly addresses the priorities of the EU and the Horizon 2020 programme as well as the importance of the "smart specialisation" and market developments.

The RDI strategy intends to support the creation of an environment in which public institutions, companies and innovative enterprises could develop and grow. The strategy focuses on three main areas of intervention: the knowledge creation, knowledge transfer and knowledge utilisation. The RDI strategy employs direct and indirect measures, such as tax reliefs, adjustments of capital market conditions, public procurement systems (also PCP) and innovation services to promote specialisation built naturally on the characteristics of local actors as well as market-driven and society-driven innovation processes. The strategy foresees a purposeful system building according to three priority axes: i) internationally competitive knowledge bases, ii) support of efficient knowledge and technology transfer collaborations and iii) companies that exploit intensively the results of modern S&T. The expected results of the above specific targets are: the stimulation of RTDI demand, establishment of an efficient support and funding system as well as the completion of the start-up ecosystem.

According to government decree 1414/2013, the RDI strategy should be used as a guiding document for planning the budget allocations for research, development and innovation for the next programming period 2014-2020. The vision, objectives and instruments of the RDI strategy are also taken into account in the elaboration of sectoral strategies and smart specialisation strategies (RIS3/S3). The National Reform Programme 2014 and the National Reform Programme 2015 make explicit reference to the RDI strategy. (NRP, 2014 and NRP, 2015)

While the RDI strategy reflects the EU priorities and acknowledges the leverage effects of the EU instruments, it does not mention explicitly opportunities for joint programming and cross-border cooperation that could be exploited. However, the strategy aims to support the development of research centres to become part of the "global elite". This process requires the flow and exchange of domestic and foreign researchers, therefore the foreseen measures supporting the knowledge base have a strong international dimension, e.g. joining large international research networks (in particular ESFRI infrastructures) and supporting the mobility of researchers, including the reintegration of researchers. The RDI strategy foresaw that the measures will be designed in collaboration with an advisory body, while the implementation of the strategy will be reviewed by an inter-ministerial coordination body and the key performance indicators will be monitored by the RDI observatory within the National Innovation Office (from 1 January 2015 National Research, Development and Innovation Office).

Actually, no public information is available on the assessment of the RDI strategy since its approval. Nevertheless, the new Law on "Scientific Research, Development, and Innovation" defines that NKFIH is responsible for the elaboration of methodologies, background analyses, reports required for the planning of RDI programmes, concepts and strategies, as well as for the evaluation and monitoring of the funding programmes.

In conclusion, a large number of new RDI programmes has been launched already in 2015 and will be launched within the new programming period 2014-2020 that are in line with the objectives of the RDI strategy. The publication of the National Smart Specialisation (S3) Strategy Action Plan is still pending even if the NRP 2015 promised it for May 2015. According to the annex of the NRP 2015, this action plan would

- set the objectives of the implementation of S3 objectives,
- present the instruments to be launched in 2015-16,
- introduce pilot projects and list of measures, the management and sustainable cooperation, operating EDP process, the frameworks of the participating organisations, tasks, implementation;
- define the indicator system and monitoring processes.

2.2 R&I policy initiatives

Laws, regulations

The Hungarian Parliament passed a new Law LXXVI (of 25 November 2014) on "Scientific Research, Development, and Innovation". Based on this law, the National Innovation Office (NIH) has been integrated into a new government office called National Research, Development and Innovation Office (NKFIH). From 1 January 2015 this new office is responsible for RDI strategy making and the distribution of national public research and innovation funding.

As stated in the National Reform Programme 2015¹¹, this law changed significantly the Hungarian institutional system of RDI in 2015. Not only a new office was created by merging the National Innovation Office, the Hungarian Scientific Research Fund (OTKA) and the department of the Research and Technology Innovation Fund (KTIA), managed by the Prime Minister's Office into the National Research, Development and Innovation Office, but also a new centralised RDI fund, the National Research, Development and Innovation Fund has been established as the legal successor of the previous KTIA and OTKA. "Thereby, the previously fragmented RDI policy and funding has been placed under a single management" (NRP, 2015, p. 40). According to the justification of the merger of the above mentioned funds and the creation of the new office, the most important advantage of these changes is that the new structure could manage RDI funding in a standardised way by diminished parallel funding.

In addition, the new office (i.e. NKFIH) has the task to ensure the government level coordination of research and innovation policies, and provides stable institutional background of predictable financing as well as efficient and transparent implementation of RDI funding. Other reasons behind the establishment of the NKFIH office and the NKFI fund were to support the funding of the entire innovation chain starting from basic research through applied and experimental research. Also, the new office operates the database of RDI projects that are financed by public resources. Hungarian RDI projects can be queried from the Hungarian Current Research Information System (HunCris), which contains projects financed by domestic or EU funds¹².

Strategies, plans

In addition to the National Smart Specialisation Strategy and the National Research-Development and Innovation Strategy 2013-2020, which have a generic character, there are two thematic R&I strategies in place:

- the National Environmental Technology Innovation Strategy that aims to create programmes and tenders based on the budget of the Operational Programmes of 2014-2020;

¹¹ See section IV.2. Facilitating Research and Development in the NRP (2015, pp. 40-43).

¹² See at <http://nkfi.gov.hu/funding/otka/programme-informations/rdi-projects> (Date of access: 25 September 2015)

- in connection to the National Energy Strategy 2030, an Energy Industry Development and R+D+I Action Plan was drafted in 2013 in the field of energy research-development and innovation in order to support the companies that build intelligent systems facilitating the regulation of electricity networks, which contributes to domestic employment and the encouragement of producing exportable products and services (nuclear supply, nuclear training, designing, implementing and operating intelligent systems).

In addition, it should be mentioned that the government approved the Action Plan of the Jedlik Ányos Plan (JÁT) with the government resolution 1487/2015. (VII. 21.) in order to promote electro-mobility that is in line with the European Union objectives. Within the framework of the JÁT, the primary aim is to support the RDI activity linked to the dissemination of electro-mobility in order to enhance the domestic production. In addition, it is foreseen to train professionals and technicians who may mean added value in carrying out research-development tasks also at an international level. As part of the plan, the role of public transport in e-mobility and its possible applications will be examined in order to enhance its financing and its involvement in the operation of international and EU organisations (e.g. European Green Vehicles Initiatives). Further directions of the plan are to enlarge the electronic mobility infrastructure bearing significant industry development potential, to enhance project financing and to define the pilot projects and enhance their financing.

Research programmes

The support of research and fostering of innovation can be considered as key areas of policy intervention. As stated in the RDI strategy, the government would like to provide stable and foreseeable funding for fundamental research and to support the public research network, in particular the higher education and the research centres of the Hungarian Academy of Sciences.

From January 2015, there are two main funding sources for research and innovation in Hungary:

- the National Research, Development and Innovation Fund (NKFIA)¹³ that integrates the Hungarian Scientific Research Fund (OTKA)¹⁴, and
- various Operational Programmes (in particular GINOP and VEKOP) of the Structural Funds co-funded by the central budget.

According to the Partnership Agreement signed by the European Commission and Hungary, the following Operational Programmes and particularly their competitive measures will support research and innovation in the new programming period 2014-2020:

¹³ See at <http://nkfia.kormany.hu/palyazatok> (Date of access: 25 September 2015)

¹⁴ See at <http://www.otka.hu/en> (Date of access: 25 September 2015)

Programme	Objective	Total budget (2014-2020)¹⁵
Economic Development and Innovation OP (GINOP) Priority 2	Reinforcement of research, technological development and innovation	€1,687.9m
Economic Development and Innovation OP (GINOP) Priority 8	Financial instruments to top up R&I support by 10%	€2,553.2m
Competitive Central Hungary OP (VEKOP) Priority 1	Improvement of the competitiveness of companies and development of the knowledge economy	€202.2m
Competitive Central Hungary OP (VEKOP) Priority 2	Financial instruments and development of services	€44.1m
Human Resources Development OP (EFOP) Priority 3	Increase research, innovation and smart specialisation in the field of human resources, improvement of the quality of education, etc.	€898.3m
Rural Development Programme (VP) Priority 1	Knowledge transfer and innovation measures	€25.3m

Source: NIH (2014a)

According to the planning documents, Hungary will allocate 60% of the total EU funding available in the period 2014-2020 for economic development purposes and about €2b for the development of the knowledge economy (i.e. support of company R&D and research programmes). According to the Open Data Platform of the European Commission, the Hungarian government will invest a significant part (8.9%) of the Structural Funds in R&I which would be €2.232b (about HUF720b) in the new financing period 2014-2020. This is a similar amount and ratio of the total compared to the previous financial period 2007-2013. The above mentioned new research and innovation programmes clearly focus on specific priorities and address the priorities of the Horizon 2020 programme, namely reinforcement of "scientific excellence" and the leading role of industry. In line with the priorities defined by the European Union, Hungary focuses on strengthening the development of R&D infrastructure and capacity, especially in favour of the support of the competence centres of European interest. The main objective is to get involved in the international cooperation of excellence to the greatest possible extent through creating research-development capacities of high standard. (NRP, 2014) Also, one of the foci of the RDI strategy is to respond to global societal challenges. Nevertheless, the societal challenges are explicitly addressed only in the priorities of the new Human Resources Development OP.

The government resolution 1262/2015 (IV.30.) defined the framework of R&I measures to be launched in 2015. This document provided details of the priorities and calls to be published from the National Research, Development and Innovation Fund as well as from the new Operational Programmes in 2015. The government resolution also specified the total amount available for the given measure. In line with this decision, the NRP 2015 document¹⁶ set out the following R&I programmes that were already announced in 2014:

- National Brain Programme (NAP)¹⁷ was launched in February 2013 to dedicate about €40m (HUF12b) to the support of research groups and the establishment of new research infrastructures in the next four years.

¹⁵ It should be noted that not all the budget of the enlisted Operational Programmes will be devoted to research and innovation, e.g. financial instruments.

¹⁶ See NRP (2015) pp. 41-42 and Annex 1 of the NRP 2015, in particular measures 51-66.

¹⁷ See at <http://nkfia.kormany.hu/ktia-nap-13> (Date of access: 25 September 2015)

- R+D Competitiveness and Excellence Cooperation programme (VKSZ)¹⁸ to support research-development activities of strategic importance – it was announced at the end of 2014 and allocates about €24m (HUF7.2b).

The National Research, Development and Innovation Office provides details on its website¹⁹ about already opened calls as well as about measures that will be published soon. The following table provides a summary about all RDI measures by thematic fields, including the total budget of the funding available for 2015.

Table 2: Overview of the Hungarian research, development and innovation measures

Thematic objective	Name of the measure	Total amount available in million Euros*	Funding sources in 2015
Business RDI [€286.5m HUF88,8 billion]	Supporting R&D&I activities carried out individually [The call is open from August 2015]	161.3 16.1	GINOP [€830.6m HUF257.5 billion] EU development resource open to all Hungarian regions of Hungary, excluding the Central-Hungary region
	IPR support [The call is open from August 2015]	3.2 0.9	
	Innovation Vouchers [The call is open from March 2016]	9.7 3.2	
	Innovation Ecosystem [The call is open from December 2015]	16.1 4.8	
	Prototype, product, technology and service development [The call is open from December 2015]	64.5 6.4	
	Transfer [€284.2m HUF88,1 billion]	R&D Competitiveness and Excellence Cooperation National R&D&I programmes [The call is open from September 2015]	
	Higher Education and Industrial Cooperation Centres [The call is open from December 2015]	80.6 12.9	

¹⁸ See at <http://nkfia.kormany.hu/vksz-14> (Date of access: 25 September 2015)

¹⁹ See at <http://nkfi.gov.hu/palyazatok/hazai-kfi-palyazatok> (Date of access: 25 September 2015)

Infrastructure [€341.9m HUF106 billion]	Strategic R&D workshop excellence [The call is open from September 2015]	129.0	VEKOP [€41.9m HUF13b] EU development resources dedicated to Budapest and Central-Hungary region
		12.9	
	Strengthening the R&D infrastructure, internationalisation and networking [The call is open from August 2015]	64.5	
		6.4	
	Phase 2 of ELI laser research centre (ELI-ALPS)	129.0	
Thematic research calls	Thematic research calls [To be open soon]	19.3	NKFI Fund [€87.5m HUF 27.13b] based on the innovation levy paid by Hungarian firms
	Post-doctorate calls [To be open soon]	5.0	
International RDI	Development of international R&D relationships Support Hungarian applicant in ERC calls Support the participation in EU initiatives [The call is open from November 2015]	11.3	
		11.8	

Source: <http://nkfi.gov.hu/palyazatok/hazai-kfi-palyazatok> (Date of access: 15 January 2016)

Notes:

Colour codes mean different funding sources: blue: GINOP, orange: VEKOP, green: NKFI Fund.

* The exchange rate is calculated at €1=HUF310.

When assessing public actions and funding allocation on RDI, it should be highlighted that the president of the National Research, Development and Innovation Office is the former president of the Hungarian Academy of Sciences, who stresses in all his interventions that the EU funds should be used as investment into the future in the period 2014-2020. Actually, the RDI strategy 2013-2020 is also entitled "Investment into the future". The President of the NKFI Office often emphasises the importance to invest in renewing the research infrastructure that could offer comparable conditions and can attract back researchers working abroad. Here it should also be mentioned that the Hungarian Academy of Sciences continues its "Momentum" programme that aims at the renewal of the research teams of the MTA and participating universities via attracting outstanding young researchers back to Hungary by paying them competitive salaries. These measures specifically aim at strengthening the fundamental research base or, as the president of the NKFI Office often calls it, the "discovery research".

According to the information of the NKFI Office (see Table 2), a total funding of close to €1b (HUF297.63b) was announced through open calls to RDI in 2015. Out of this amount €669.3m (HUF207.5b) or 91.3% of the total fund to RDI will be spent from the Operational Programmes (i.e. GINOP and VEKOP) funded by the European Union.

The distribution of this amount seems to be fairly balanced. About one-third (35.6%) of all funding to RDI through calls will be allocated to RDI infrastructure, 29.6% to transfer (i.e. supporting of RDI cooperation between PROs, HEIs and companies) and again 29.8% will be devoted to support business RDI.

Certainly, these are the plans and the benefits of RDI will have an impact on the development of the Hungarian RDI system as well as the national economy only in few years time.

From an analytical point of view the direction seems promising because it reinforced the efforts of the previous years that resulted in increasing GERD and BERD. In terms of the development of the evaluation culture, the president of the National Research, Development and Innovation Office stressed in his public interventions and interviews that he initiated an impact assessment of the RDI funding programmes of the previous funding period 2007-2013 which is not yet published. Concerning business RDI support, a major difference will be that in the current financial period it is expected from companies to introduce some new products and services to the market by the end of the funding project. On the one hand, this would definitively increase the innovation productivity of the Hungarian firms that are traditionally lagging behind the EU-28 average. On the other hand, time will decide what proportion of the companies, especially SMEs, would undertake such conditions in order to get public funding for their RDI efforts.

2.2.1 Evaluations, consultations, foresight exercises

STI policy monitoring and evaluation culture is weak in Hungary as it was mentioned before in Section 1.2.2. Nevertheless, the president of the new National Research, Development and Innovation Office established in January 2015 stresses in his public interventions that the new office will carry out an assessment of the programmes and projects funded in the previous funding period 2007-2013 in order to learn about the impact of funded projects.

As for the nationally funded support schemes, one of the basic principles of the Law on Research and Technological Innovation (Act CXXXIV of 2004) was that publicly financed STI policy measures shall regularly be evaluated by independent experts. Based on the Law, Government Decree no. 198/2005 specifies the precise range of measures to be evaluated ex-post. As a general rule, one-off schemes above €3.3m (HUF1b) are to be evaluated within three years following the closure of the scheme, whereas continuous programmes (with a cumulated funding over HUF1b) within two years of the closure of the given programme cycle. For continuous programmes, irrespective of the volume, ex-post evaluation is compulsory within four years of the launch of its first call. Several on-going evaluations are under way that address financial support mechanisms and indicators related to the cohesion policy.

The new Law LXXVI (of 25 November 2014) on "Scientific Research, Development, and Innovation" specifically mentions the importance of evaluation. The guiding principles of this law foresee regular monitoring and independent evaluation of RDI support measures following the principles of the Europe 2020 – Innovation Union document. According to this law, the president of the National Research, Development and Innovation Office has the task to launch evaluations and monitor the impact of research and innovation funding programmes. In order to fulfil these tasks, the NKFI Office created an Innovation Body in March 2015 that has the responsibility to contribute to the elaboration of science and innovation policy guidelines, forming of the RDI strategy as well as select the members of the evaluation committees of RDI funds. According to the initiative of the minister of the Prime Minister's Office, a new transparent and accountable evaluation system will be elaborated in April 2016. The new system would rely on civil servants who will carry out the evaluation work besides their daily tasks. Each proposals will be evaluated by two experts employed and paid by the state.

These are still plans because there is no publicly available service currently that provides accurate and comparable information about the quality and efficiency of funding through R&I programmes.

The last comprehensive evaluation of the Hungarian STI policy was carried out in 2008 (see OECD, 2008). Participatory policy preparation tools (e.g. foresight) for designing RTDI concepts and sectoral strategies are rarely used. Nevertheless, the S3 White Book foresaw the application of modern innovation policy decision making tools, such as evaluation, foresight, technology assessment and Delphi-surveys. Apart from the six RDI Sectoral White Books²⁰ (i.e. agriculture and food processing; health industry; energy; ICT; environment protection; mobility, vehicle industry and logistics) related to the Smart Specialisation Strategy, no comprehensive study of strategic intelligence was published in recent years.

In the last few years, two comprehensive assessment studies were carried out. In 2010, an assessment of the operation of the Research and Technology Innovation Fund (KTIA) between 2004 and 2009 was produced by a consortium of Ernst&Young and GKI Economic Research Co. (EY, 2010) Most recently, the evaluation of OTKA – the national fund that supported basic research in the past two and a half decades before its merger into the new National Research, Development and Innovation Fund in January 2015 – was carried out in 2014 based on an agreement with the European Science Foundation (ESF)²¹. The evaluation had the overall goal of identifying strengths and recommendations for further improvement related to OTKA governance and management structures. OTKA's international evaluation has been preceded by a long process of development. In order to effectively carry out a constant task of more than 25 years (supporting internationally competitive basic research projects in an open call system), OTKA introduced English as the language of proposals and strict rules on conflicts of interest in the peer review process. The number of foreign referees has gradually increased; international review panels, consisting of foreign experts, have been established. The OTKA Board decided to order the evaluation in 2012. Published in November 2014, the conclusions from the Evaluation Committee review and the survey were overwhelmingly positive in terms of OTKA's governance, administrative procedures, and potential for an expanded role in the Hungarian research system. According to the recommendations made by the ESF, OTKA should:

- be more centrally involved in developing basic research strategy at national level;
- be more independent and should define its own strategy in keeping with national research priorities;
- negotiate a continuous but substantial (in the order of at least 10% per year) increase in its budget;
- raise its public profile and ensure that relevant policy makers are aware of its grant management expertise;
- continue to offer a limited number of well-defined schemes;
- retain its focus on funding basic research;
- use additional funding to increase the size of grants;
- raise its role in supporting inward and outward mobility;
- continue the process of increasing the involvement of international reviewers;
- monitor both academic and socio-economic impact of funded research by performing an assessment of wider and longer-term impacts of its activities through periodic surveys of grant beneficiaries.

In addition to the consultation of the National Research-Development and Innovation Strategy as well as the Smart Specialisation Strategy, the government launched consultations on the following strategic documents during 2013-2015:

²⁰ Short summary of the sectoral strategies can be found at <http://nkfih.gov.hu/szakpolitika-strategia/archivum/kfi-agazati-strategiai-150203-2> (Date of access: 30 September 2015)

²¹ The evaluation report is available at http://www.esf.org/fileadmin/Public_documents/Publications/otka_evaluation_01.pdf (Date of access: 30 September 2015)

- National Development 2020. National and Territorial Development Concept; (Government, 2014a)
- Draft Science Policy Strategy 2014-2020; (Government, 2013)
- County level development concepts;
- New operational programmes for the planning period 2014-2020, more specifically the Economic Development and Innovation Operational Programme (GINOP), Competitive Central-Hungary Operational Programme (VEKOP) as well as the Human Resources Development Operational Programme (EFOP).

2.3 European Semester 2014 and 2015

Both the National Reform Programme 2014 and NRP 2015 reported that Hungary made significant progress in the past few years towards the quantitative R&D target set by the government. The aim set by the RDI Strategy 2013-2020 is to increase the level of research and development expenditures to 1.8% of the gross domestic product (GDP) by 2020. The R&D expenditures increased further in 2013 and reached 1.41% of the GDP but the GERD decreased to 1.38% in 2014. After a 15.5% nominal increase in 2013 compared to 2012, the decrease was 2.1% in 2014. The structure of GERD seems to be advantageous to reaching the R&D target as companies increased their research and development expenditures by 19.1% in 2013 compared to the previous year and again by 4.0% in 2014.

The European Commission Staff Working Document highlighted different aspects of this progress. The Country Report Hungary 2015 pointed out that the “public R&D intensity in Hungary has decreased over recent years from 0.46% of GDP in 2007 to 0.41% in 2013; this level is not only well below EU average (0.72%), but also lower than in most of the Central and Eastern European Countries”. (EC, 2015 p. 56)

In preparing for future challenges of the national research and innovation system, the following three strategies were mentioned in the NRP 2014 and NRP 2015 documents:

- The National Research-Development and Innovation Strategy 2013-2020 entitled “Investment into the future” was approved by government decree 1414/2013. (VII.4.) on 4 July 2013. The RDI strategy plans to solve the problems identified in the assessment with the following means: encouraging smart specialisation, creating a sustainable support system that ensures equal opportunities, providing stable financing conditions, raising public awareness and strengthening the acknowledgment of knowledge and technology, and creating a stable, innovation-friendly economic and regulatory environment. (NRP 2014)
- The National Smart Specialisation Strategy (S3) was approved by the government on 14 November 2014²². Besides, the document “Research infrastructures in Hungary” was prepared that set out the Hungarian participation in the large European research infrastructure projects that are, where appropriate, included in the Roadmap of the European Strategy Forum on Research Infrastructures and the development of the national research infrastructures²³.

²² See NIH (2014a) and Section 2.4 for further details of the status of the National Smart Specialisation (RIS3) strategy.

²³ The strategy on research infrastructures is available at: http://www.s3magyarorszag.hu/documents/224092/253257/research_infrastructures_en.pdf (NIH, 2014b) (Date of access: 30 September 2015)

- The Science Policy Strategy (2014-2020) was mentioned both in NRP 2013 and 2014 as being under elaboration. A working group was set up for the preparation of the Science Policy Strategy, in which the Hungarian Academy of Sciences was actively involved. As a result, the draft strategy was published for public administration consultation in September 2013. (Government, 2013) After the integration of stakeholders' comments, the strategy was ready to be submitted at the secretary of state meeting after the formation of the new Government in June 2014. While the NRP 2014 stated (see page 35 and measure #55 of its Annex) that the Science Policy Strategy 2014-2020 is under elaboration, the NRP 2015 doesn't mention this strategy any longer.

Both NRP 2014 and NRP 2015 set out the most relevant measures that were already launched or will be launched by the end of 2015. These measures are:

- R+D Competitiveness and Excellence Cooperation programme;
- National Brain Programme (NAP);
- Supporting R&D&I activities carried out individually or in cooperation;
- Innovation start-up and spin-off ecosystem building programme;
- Innovation vouchers;
- Strengthening the R&D infrastructure, including internationalisation and networking;
- Strategic R&D workshop excellence programme;
- Higher Education and Industrial Cooperation Centres;
- Supporting the implementation of the Phase 2 of ELI laser research centre (ELI-ALPS).

The above cited European Commission Staff Working Document also highlighted that the Smart Specialisation Strategy and the new 'Higher education concept' could help to bring about a more effective public funding system in Hungary. However, the working document also warns that the successful implementation of these strategies will depend on "reversing of the decreasing trend in public R&D intensity and institutional funding". (EC, 2015 p. 57)

In reply to this recommendation, the NRP 2015 document stresses that the government will pay greater emphasis on the support of the scientific, non-profit sector besides the corporate sector compared to the approach in the previous period. A further goal is to increasingly encourage the networking of SMEs and their cooperation with companies. (NRP, 2015 p. 40)

Nevertheless, simply putting more funding into the public research sector would not necessary increase the efficiency of the Hungarian research and innovation system because its problems seem to be more complex. In fact, several factors play an important role in the development of an attractive public research sector, i.e. competitive salaries both of researchers and R&D staff members, up-to-date research infrastructure, supporting excellence, transfer mechanisms and exploitation of research results as well as internationalisation of research units both in the public research sector and in the higher education organisations.

Another important challenge recognised by the EC (2015a) document is that the Hungarian innovation system could not improve the innovation capacity of SMEs in the past couple of years even if several support schemes have been implemented with that focus. Also, the dynamic increase of business R&D investment has been driven by foreign direct investment and multinational companies' presence in Hungary is insufficiently used and the emergence of a national research and innovation ecosystem with innovative SMEs could be fostered. (EC, 2015a)

Nevertheless, the government made important steps addressing these challenges in the last year:

- Establishment of the National Research, Development and Innovation Office (NKFIH) as of 1 January 2015 that places under a single management the previously fragmented RDI policy and funding by the merging the National Innovation Office (NIH), the Hungarian Scientific Research Fund (OTKA), the Research and Technology Innovation Fund (KTIA). Perhaps the most important advantage of the government office is that it harmonises the RDI calls and funding procedures.
- Shaping the focus of the RDI funding programmes, including the Operational Programmes of the Structural Funds, in particular GINOP, VEKOP and EFOP towards supporting excellence of research, business RDI, in particular innovation activities of SMEs, RDI collaborations and exploitation of research results by the business sector.
- The new higher education concept was published after first reading of the government in December 2014 that foresees major changes in the way the HEIs are financed. Performance based financing will be introduced in Hungarian HEIs from 2016 that will be based on various performance indicators. The higher education concept also seeks to develop career paths of researchers, in particular in medical, health sciences and pedagogic education. (Government, 2014b) In addition, the concept created the basis of the dual education system that was launched in February 2015 and rise of salaries of university staff by 15% from January 2016.

No country specific recommendation relevant to the research and innovation policy in Hungary has been adopted by the council of the European Union neither in 2014 nor in 2015.

2.4 National and Regional R&I Innovation Strategies on Smart Specialisation

Status of the RIS3. All the seven Hungarian regions elaborated their Smart Specialisation Strategies (S3) by the end of May 2013 according to the guidelines provided by the European Commission. In summer 2013, the S3 strategy was further developed using a process-based approach. In September 2013 the longer term development scenarios for Hungary were taken into account for the planning of the S3. An important milestone of the S3 planning was the elaboration of the draft White Book entitled "S3 White Book. Smart Specialisation Directions of Hungary" that was published for public consultation by the Ministry for National Economy in November 2013. (NGM, 2013)

Country-wide events took place in autumn 2013 to make the methodology and the so-called entrepreneurial discovery process (EDP) widely-known so as to assist the preparation of the S3 process. In the first part of 2014, a scientific supervisory board was established to elaborate the methodology and to monitor it constantly. After the new government was formed in June 2014, a government commissioner was appointed by the prime minister who became responsible for setting up the National Research, Development and Innovation Office, as well as the finalisation of the S3 strategy which is a pre-condition to get access to the Operational Programmes dedicated to research and innovation in the EU financial planning period 2014-2020. By October 2014 county level workshops took place in all the 19 counties in order to define the specialisations of these territorial units. As a result a draft S3 strategy was published for public consultation on 3 October 2014 and the National Smart Specialisation Strategy was approved by the government decree 1640/2014. (XI. 14.) on 14 November 2014.

Also a self-standing website²⁴ was created for the consultation of the S3 strategy that contains all relevant background information of the S3; county level consultation surveys; and news regarding public consultations. The approved strategy is available on the website of the National Research, Development and Innovation Office²⁵.

Main features of the S3. A multi-level governance structure was established for the elaboration of the S3. A dedicated *government commissioner* and his working group in the Prime Minister's Office was responsible for the elaboration of the strategy. All coordination is carried out within the *National Management Body* that consisted of experts and representatives of stakeholder groups. The *Central S3 Working Group* was responsible for the operational activities, quality assurance and preparatory work for decision making. An *Inter-ministerial Working Group* was set up in order to ensure the follow-up of the elaboration of the S3, to provide feedback and coordinate the planning of the S3 and relevant Operational Programmes. Finally, *county level Working Groups* supported by the government bureaus are responsible for the involvement of local and regional stakeholders.

Based on the RIS3 Guide provided by the EC, the draft S3 strategy classified the Hungarian counties into three groups and defined their vision and strategic objectives according to their level of development. Significant part of the draft S3 strategy dealt with the development of research infrastructures that could have the highest impact on the development of the Hungarian economy. In addition a national survey was launched to collect development ideas from those who could not attend the above mentioned workshops.

Three national smart specialisations were formulated in the course of the strategy building in accordance with the types of regions outlined in the S3 strategy. These are: i) systems science, ii) smart production and iii) sustainable society. Determined by means of the two round EDP process, 6+2 (six sectoral and two horizontal) national research priorities and a limited number of local specialisation sectors/technologies were created in order to achieve the vision and objectives to be implemented along the smart specialisation. As a result, the following national priorities were defined with local, county level specialisations included:

- healthy society and well-being;
- advanced technologies in the vehicle and other machinery industry;
- clean and renewable energies;
- sustainable environment;
- healthy and local food;
- agricultural innovation.

Besides the national S3 priorities, a few horizontal priorities have been set up: i) ICT and related services; ii) inclusive and sustainable society and liveable environment. In the county level specialisations technologies closely linked to the national priorities such as bionics, photonics, laser technology, creative industry or logistics are represented.

Consideration of financial requirements. The National Smart Specialisation Strategy clearly discusses its consistency with key planning documents, namely the National Reform Programme, the National Research-Development and Innovation Strategy 2013-2020, the Operational Programmes and the Horizon 2020 programme.

²⁴ See at: <http://www.s3magyarorszag.hu/> (Date of access: 30 September 2015)

²⁵ See at: <http://nkfih.gov.hu/szakpolitika-strategia/nemzeti-strategiak/nemzeti-intelligens-150203-4> (Date of access: 30 September 2015)

According to the financing principles of the S3, it will mainly employ direct instruments, but soft instruments for innovation financing will be tested in order to strengthen the collaboration between industry and academia. No new indirect instruments and tax credits are specified. With regard to the resources, the majority of funding would come from the European Regional Development Fund (ERDF), in addition to the major national R&I funding instruments, i.e. National Research, Technology and Innovation Fund that integrates the previous KTIA and OTKA funds.

Also, the S3 strategy clarifies the measures to stimulate private investment. The intervention matrix of the S3 strategy specifies the thematic objectives, investment priority of the measure, specific targets and type of funding source. The thematic priority "strengthening of research, technology and innovation" specifically addresses the stimulation of business sector RDI activities. This measure foresees the promotion of R&I investments of companies and the creation of links and synergies between research and development centres and the higher education sector, particularly with regard to product and service development, technology transfer, social innovation, eco-innovation and public service applications, demand stimulation, networking, clusters and investments into open innovation through smart specialisation; and the support of technological and applied research, experimental programmes, early product verification measures, modern production capacities and pilot lines of enabling technologies, and dissemination of general-purpose technologies. (NIH, 2014 p. 72)

Foreseen monitoring and evaluation mechanisms. The S3 strategy clearly specifies the reasons for an effective monitoring and evaluation mechanisms. Three kinds of evaluation methods are foreseen: interim evaluation, on-going evaluation and ex-post evaluation. The provisions of the S3 foresee that the implemented evaluation will be both normative and summative according to pre-defined indicators.

R&I infrastructures. The thematic priority "infrastructural investments" of the S3 strategy specifically addresses how the conditions of frontier researches will be improved by implementing the strategy. This measure is foreseen to support the strengthening of links between education research-innovation (knowledge triangle) and (public) services and higher education institutions, basic research related to key technologies and key sectors, the expansion of the new research generation and the alignment of university-academy and business capacities in line with smart specialisation. Purchase of instruments and devices related to smart specialisation and supporting the interventions ensuring a new research generation in higher education is also included in this measure.

In addition to the S3 strategy, a supplementary document – entitled "Research infrastructures in Hungary" – was prepared that set out the Hungarian participation in the large European research infrastructure projects that are, where appropriate, included in the Roadmap of the European Strategy Forum on Research Infrastructures and the development of the national research infrastructures²⁶.

Status of implementation. As long as the president of the National Research, Development and Innovation Office was responsible for the finalisation of the S3 strategy, the new research programmes and calls reflect well the provisions defined in the S3 strategy even if they evolve and change slightly in the programming phase.

²⁶ The strategy on research infrastructures is available at: http://www.s3magyarorszag.hu/documents/224092/253257/research_infrastructures_en.pdf (NIH, 2014b) (Date of access: 15 January 2016)

2.5 Main policy changes in the last five years

Main Changes in 2011

- The National Innovation Office (NIH) started its operation as a new governmental body responsible for research, development and technological innovation. NIH is the successor the of the National Office for Research and Technology (NKTH) established in 2004

Main changes in 2012

- Reorganisation of the research network of the largest PRO, the Hungarian Academy of Sciences (MTA)
- Set up of the National Development Cabinet (NFK) that co-ordinates all major governmental development actions including STI policy decisions and dissolution of the National Research, Innovation and Science Policy Council (NKITT)

Main changes in 2013

- Set up of a new advisory body - the National Science Policy and Innovation Board (NTIT)
- National Development Agency works within the prime minister's central office and is supervised by a government commissioner

Main Changes in 2014

- Approval of the new Law LXXVI (of 25 November 2014) on "Scientific Research, Development, and Innovation"
- The Prime Minister's Office overtakes the role and responsibilities of the National Development Agency (NFÜ) responsible body for distribution of the Structural Funds
 - o Dedicated ministries became successors of intermediary institutions and the managing authorities previously working under NFÜ

Main Changes in 2015

- Establishment of the National Research, Development and Innovation Office (NKFIH) that , integrates the activities of the previous National Innovation Office and ministry departments responsible for innovation policy from January 2015
- Establishment of the National Research, Development and Innovation Fund in January 2015 that integrates the Hungarian Scientific Research Fund (OTKA) and the former Research and Technological Innovation Fund (KTIA) programmes
- Establishment of the Innovation Body in March 2015 that consists of nine distinguished members representing both the economic and scientific spheres. The main goal of this body to ensure the effective use financial instruments available for research and innovation
- Launch of new research measures funded by the Operational Programmes (i.e. GINOP, VEKOP, EFOP) co-funded by the Structural Funds

3. Public and private funding of R&I and expenditure

3.1 Introduction

The Hungarian GERD was fluctuating between 0.8-1.15% of the GDP between 2000 and 2010. The economic crisis had severe impact on the Hungarian economy. According to the forecast of European Commission, the Hungarian GDP in nominal terms was 1% below its 2008 value in 2014. (EC, 2015) Even in this situation the government maintained its R&D target and did not cut salaries, neither laid off civil servants in public research institutions. The government would increase the number of researchers by 50% up to 56,000 (from 37,000 in 2012) in order to achieve the 1.8% GERD/GDP target by 2020 set by the RDI strategy.

According to Eurostat data, the R&D expenditures increased every year from 2010 to 2014 and reached the peak with 1.41% of the GDP in 2013, which achievement was brought by BERD. In 2014 the GERD decreased slightly to 1.38% of the GDP. The GERD per capita increased by 19.9% in the period 2011-2014, still it reached only one-quarter of that of the EU-28 average (25.9%). Nevertheless, it is a positive development that companies located in Hungary invest steadily increasing amounts on research and development. The R&D funded by the business enterprise sector grew from 0.57% of the GDP in 2011 to 0.67% in 2014 which is 59% of the EU-28 average. The government sector funding also increased from 0.46% of the GDP in 2011 to 0.51% in 2013 then decreased to 0.46% in 2014. R&D funding provided by private non-profit organisations is rather limited, it only reached 0.01% of the GDP in the investigated period.

The patterns of R&D performance by sectors became similar to the EU-28 average in the period 2011 and 2014. The business enterprise sector increased its share from 62.4% to 71.5% in this period (63.8% in EU-28). The higher education organisations underperformed the EU-28 average (23.2%), because their share decreased significantly in the past four years from 20.2% in 2011 to 13.5% 2014. In the same period, the research performance of the government sector was shrinking from 15.7% to 13.7% which is close to the EU-28 average (12.2%). It should be highlighted that R&D performance of both companies and public research organisations is rather concentrated. More than half of the total business expenditures on R&D were spent by 8% of the total business R&D units. In the case of public research organisations, the 16 research institutes of MTA are responsible for 71.2% of all government sector research expenditures. (KSH, 2014)

The Structural Funds play a prominent role in the total national R&D funding, nevertheless no annual statistical data is available on the R&D funded by the Structural Funds. According to the Cohesion Policy Database of the European Commission²⁷, Hungary received a total of €2,125.6m from the Structural Funds to R&D and innovation between 2007 and 2013. The annual amount could be estimated around €300m that makes about one-quarter of the GERD in 2013. Certainly, this is a strong simplification, because this share also includes innovation expenditures, but nevertheless it highlights the significance of the Structural Funds in GERD.

The Hungarian Central Statistical Office publishes the amount of EU grants in funds from abroad in the total R&D expenditure. This share reached 19.9% of the R&D funding coming from abroad in 2014, which makes 3.5% of the GERD.

According to the eCORDA database (status 1 July 2014), altogether 1,582 Hungarian projects received a total of €280.26m funding from the 7th Framework Programme between 2007 and 2013. This amount is more than double the amount received in FP6 and 22% of the GERD in 2013 and two-thirds of the combined GOVERD and HERD in 2013. Dividing by seven the total amount of the R&D funded by the FP, still about 10% of the total public R&D was financed by the FP, although it is just about 3% of the GERD.

²⁷ See at <https://cohesiondata.ec.europa.eu/country?country=Hungary>

Table 3: Basic indicators for R&D investments

Indicator	2011	2012	2013	2014	2015	EU average (2014)
GERD (as % of GDP)	1.2	1.27	1.41	1.38	n.a.	2.03
GERD (Euro per capita)	120.6	126.6	142.8	144.7	n.a.	558.4
GBAORD (€m)	296.2	337.5	662.7	455.6	n.a.	92,828.1
R&D funded by BES (% of GDP)	0.57	0.6	0.66	0.67	n.a.	1.12*
R&D funded by GOV (% of GDP)	0.46	0.47	0.51	0.46	n.a.	0.66*
R&D funded by PNP (% of GDP)	0.01	0.01	0.01	0.01	n.a.	0.03*
R&D funded from abroad (% of GDP)	0.16	0.2	0.23	0.24	n.a.	0.2*
R&D performed by HEIs (% of GDP)	0.24	0.23	0.2	0.19	n.a.	0.47
R&D performed by government sector (% of GDP)	0.19	0.18	0.21	0.19	n.a.	0.25
R&D performed by business sector (% of GDP)	0.75	0.84	0.98	0.99	n.a.	1.3

Notes:

* - data for 2013

3.2 Smart fiscal consolidation

3.2.1 Economic context²⁸ and public R&D indicators

The direct impact of the crisis upon the Hungarian **GDP** was a moderate one with a 6.6% decrease only in one year (2009). However protracted low growth alternating with a further decrease in 2012 (-1.7%) followed due to weak external and domestic demand. 2014 is the first year with a more solid growth (3.7%), but supported by stimulus factors of temporary nature, such as the increased absorption of EU funds, subsidised loan schemes as well as regulated utility price cuts. In 2015 it is estimated that real GDP growth was 2.7% driven by private consumption and net exports (due to improvements in competitiveness). For 2016 and 2017 the Commission forecasts a GDP growth of 2.1% (a slowdown caused by the temporary halt in the EU funds disbursements) and 2.5% respectively (the relative acceleration is due to accelerating rate of implementation of EU-funded projects).

In the pre-crisis period Hungarian public finances were characterized by high and persistent government deficits, which contributed massively to a significant increase of public debt. Since 2012 Hungary's general government deficit has been kept under control at levels of ca. 2.5% in 2013-14, falling to 2.1% in 2015 and expected to further fall to 1.9% by 2017. The high level of public debt remains a source of fragility for the Hungarian economy. Although government debt has been declining, its pace is still very low (Figure 2). It was 75.8% of GDP in 2015 and it is projected by the Commission to reach 74.3% in 2016 and 72.4% in 2017 as a result of low deficits and improving economic growth.

²⁸ Sources: DG ECFIN, http://ec.europa.eu/europe2020/pdf/csr2016/cr2016_hungary_en.pdf

Hungary does not appear to face a risk of fiscal stress on short and medium term perspective, provided full implementation of the planned ambitious fiscal consolidation resulting in a permanent improvement of 0.5% of GDP in the structural primary balance in order to close the fiscal gap²⁹.

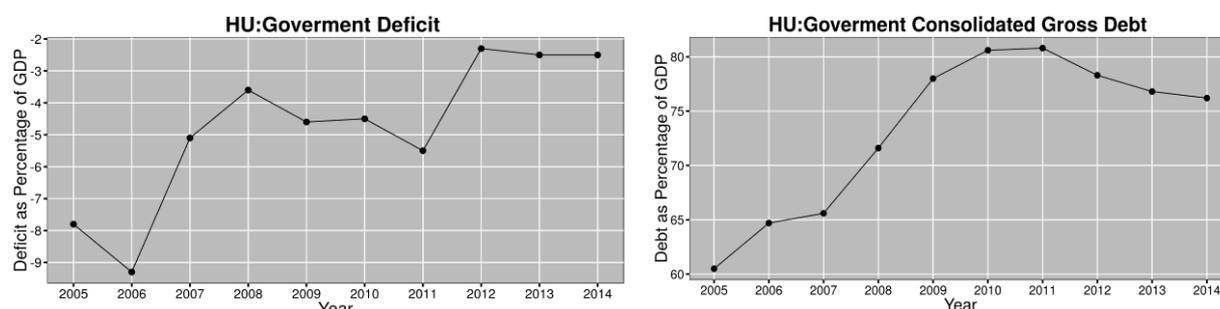


Figure 2 Government deficit and public debt
Data source: Eurostat

Total GERD in Hungary was €1,415m in 2013. There are three main sources of R&D funding in Hungary: the business sector (€662m), the government sector (€508m), and the foreign funding (€235m³⁰). Direct funding from the government goes to business enterprises (€187m), the government (€161m) and the higher education sector (€142m).

Table 4: Key Hungarian Public R&D Indicators

	2007	2009	2013
GBAORD, % of gov. exp.	0.75	0.89	1.30
GERD, % of GDP	0.97	1.14	1.41
out of which GERD to public, % of GDP	0.46	0.47	0.41
Funding from GOV to, % of GDP			
Business	0.05	0.10	0.19
Public (GOV+HES)	0.36	0.36	0.30
Total	0.43	0.48	0.51
EU funding, % of GDP *	n.a.	0.04	0.06

Source: Eurostat

²⁹ This effort is well below the average improvement required for the EU as a whole (2.6%), mainly reflecting the country's better position concerning costs of ageing and, to a smaller extent, the initial budgetary position. Source: DG ECFIN

³⁰ EU funding in 2012 was €51.1m. Data for 2013 is not yet available. Total foreign funding for 2012 was €193.6m.

3.2.2 Direct funding of R&D activities

The sources of R&D funding according to the Frascati manual are: Government sector (GOV), Higher education sector (HES), Private non-profit sector (PNP) and Abroad (including EC). In this analysis the public sector as source of funds is given by the GOV part of the total intramural R&D expenditure (GERD), whereas the public sector as a sector of performance is the aggregation of GOV and HES. Figure 3 shows the historical evolution of GERD financing in current prices in Hungary.

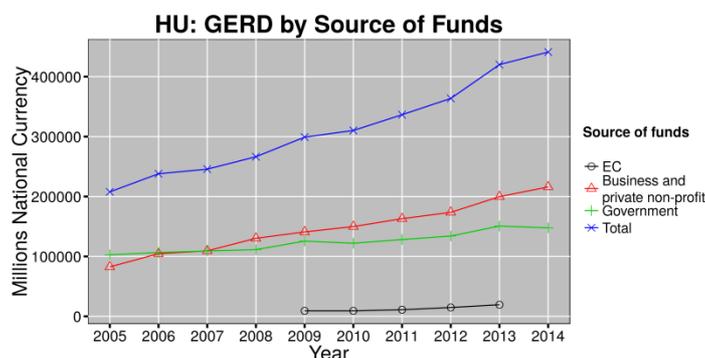


Figure 3 Funding of the total GERD
Data source: Eurostat

During the last 10-13 years GERD showed an upward trend with a rather strong growth rate.³¹ At the same time R&D funding by the government has not increased proportionally³². Contribution from the private sector grew faster³³ and since 2007 the private sector has been the main contributor to GERD. It is important to notice also that at a first glance funding from the EU appears to be less important even though structural funds are a major source for R&D funding. This might be due to the accounting system of Hungary that includes structural funds for R&D into GERD funded by government.

Direct public funding from the government

Direct public funding is usually the main source of the total governmental support to R&D. Figure 4 below shows the time evolution of the total R&D appropriations (GBAORD) and the GERD directly funded by the government.

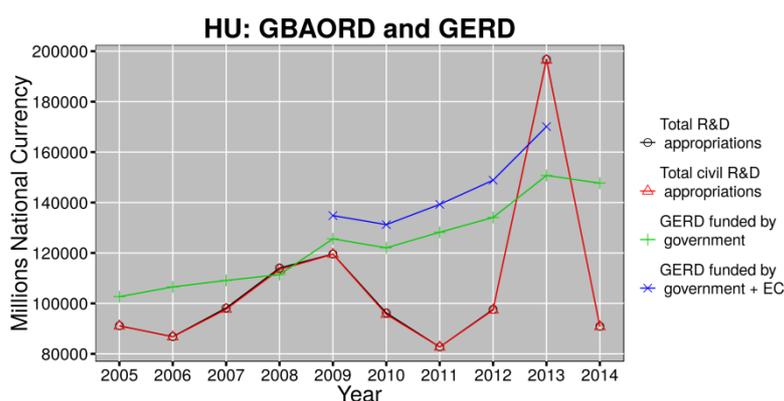


Figure 4 R&D appropriations and government funded GERD in millions of national currency
Data source: Eurostat

³¹ From 2007 to 2013 only, it increased by ca. 71%

³² The compounded annual growth rate (CAGR) of the publicly funded GERD for the period 2007-2013 is 4.7% whereas for the total GERD is 8%.

³³ With a CAGR of 9%

GERD funded by the government shows an overall upward trend (in current prices) throughout the analysed period³⁴, except for the fall in 2014. Contrary to the majority of the EU MSs, in Hungary it usually exceeds the R&D budget appropriations (GBAORD) due to the specific accounting of the structural funds, which play a very important role in the funding of R&D as it will be shown later.

The Hungarian GBAORD faced a considerable decrease in 2010 and 2011 (**Figure 4**) mainly due to the extremely difficult situation of the Hungarian state budget at the outburst of the crisis³⁵. In 2012-2013 there seems to be a reverse trend. Year 2013 stands out as a peak of the total R&D allocations, which is due to the fact that 2013 GBAORD data include funds/payments on multi-annual R&D projects, not allocated to the year in which they were budgeted³⁶. The value has been flagged by Eurostat and it must be interpreted with caution. In 2014 there is a considerable decrease of GBAORD, which can be explained with the end of the 2007-2013 EU programming period and the beginning of the new programming period.

Direct public funding from abroad

Similarly to a number of MS, also in the case of Hungary, the EU is the most important external public source of R&D funding. External public funding from other governments and higher education entities as well as from international organizations was marginal, as shown in Table 5 below:

Table 5: External public sources used for financing total Hungarian R&D

Source from abroad	2009	2010	2011	2012	2013	2014
Total	32619.7	38321.7	45266.8	56002.8	69606.9	77371.2
BES	21733.2	26662	32281	39080.4	47414.7	
EC	9218.5	9206.2	11051.7	14779.7	19381.7	
GOV	61.8	51	99.9	165.4	415.9	
HES	56.9	54	56.6	57	240.9	
International Organizations	344.8	666.2	753.4	683.1	989.6	
Total as % GERD	10.9	12.35	13.45	15.4	16.57	17.54
EC as % GOVERD	7.34	7.54	8.62	11.02	12.86	

Data source: Eurostat

Table 5 clearly shows that the share of EC funding is becoming more and more important, being at around 11% of GOV in 2012. Funding of R&D by the EC is provided through FP6/FP7 and the Structural Funds (SF). In the case of Hungary one part of the SF for R&D are reported as expenditure funded by the government. This diminishes however the quality of the data included in the category "Abroad-EC", which becomes thus a mixture of SF and FP related funding³⁷.

Assuming that Hungary absorbed all the allocated funds, the average annual amount of SF allocated to R&D activities over 2007-2013 was €213.04m, i.e., 46%-49% of GERD funded by the government annually (over 50% of GBAORD)³⁸.

³⁴ The differences in the pattern when measured as a share of GDP are due to the fluctuations of GDP (see annex 4).

³⁵ This is even more obvious when the allocations are measured as percentage of GDP or of government expenditure.

³⁶ Source: Eurostat

³⁷ The EC financial contribution from FP7 was around €300m in seven years, double compared to FP6.

³⁸ The above amounts are not comparable to the figures reported to Eurostat as funding from Abroad-EC (Table 5), because they refer to the allocation of funds and not to the actual payments.

This shows the important role of the EU in the funding. Based on data from DG REGIO, around €1.5b (6.0% of total SF for Hungary) was dedicated to 'Core' R&D activities³⁹.

Distribution of public funding

Figure 5 below shows how the distribution of public funding to sectors of performance evolved over time.

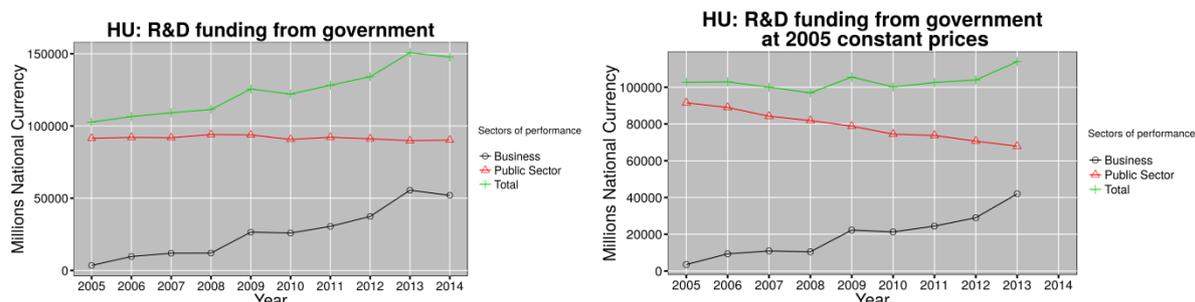


Figure 5 Government intramural expenditure by sectors of performance
Data source: Eurostat

Unsurprisingly, the public sector is the main recipient of government funded GERD, although, due to its nominal stagnation, its importance in total financing is decreasing. Since 2005 the business sector has been getting more and more public financing both in nominal and in real terms, becoming the driver of the increase of public support to R&D. Concerning indirect funding through tax incentives, in Hungary tax support for R&D in 2012 was more than 256 million USD PPPs, whereas the total government support for business R&D (both direct and indirect) was 0.25% of GDP (OECD), which positions Hungary fourth among EU MS above Austria and below Belgium.

3.2.3 Indirect funding – tax incentives and foregone tax revenues

The Hungarian annual budget does not make explicit reference to foregone tax revenues. Concrete figures for R&D tax incentives are not systematically reported. The country offers a limited range of R&D tax incentives and they are often combined with other incentives at regional level (e.g. subsidized land prices)⁴⁰. Generally the emphasis is more on attracting foreign direct investors using regionally differentiated schemes and incentives. The country also adopts a case-by-case approach to negotiating in particular with individual and larger investors. There is little differentiation and no special schemes offered to SMEs.

In an attempt to estimate the relative importance of the indirect public support to R&D we used the data provided by OECD for 3 years, 2006, 2011 and 2012. Figure 6 below shows the total public support distinguishing between direct and indirect funding.

³⁹ The definition of 'Core' R&D activities is provided in the study "Cohesion policy and regional research and innovation potential

⁴⁰ <http://www.doingbusinessinhungary.com/taxation#corporate-tax-rate-150324123447>

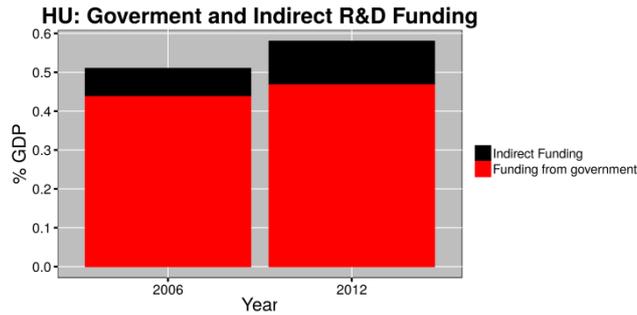


Figure 6 Indirect funding to R&D
Data source: OECD, Eurostat

It can be seen that indirect support becomes more important for R&D expenditure and compensates for the losses in the direct funding caused by budgetary constraints.

3.2.4 Fiscal consolidation and R&D

Figure 7 below shows the scatterplot of the structural balance and a relevant measure of the R&D (GBAORD as % GDP, first panel and government financed GERD as % GDP, second panel)⁴¹:

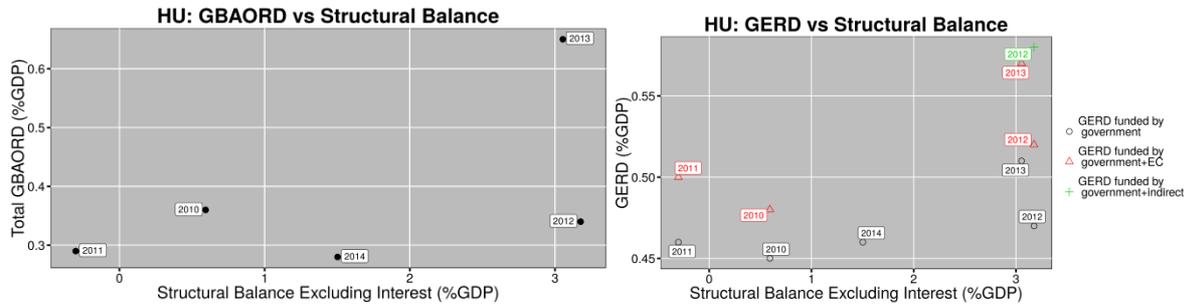


Figure 7 Fiscal consolidation and R&D
Data source: AMECO, Eurostat

The key observation based on Figure 7 is that post-crisis fiscal consolidation⁴² had a very small initial negative impact (0.06% of the GDP) on the GBAORD in 2011, leaving it practically unchanged throughout the consolidation period with the exception of 2013 when GBAORD increased by almost 0.3% of GDP only to drop again the following year. Nevertheless, despite the fluctuation of GBAORD, the structural balance has always been positive. Fiscal consolidation had no negative effect on government financed R&D, which even increased slightly during the post-crisis budgetary consolidation period. This is even more obvious if we consider the external public (Abroad – EC) as well as indirect (tax incentives) financing of the GERD. Again 2014 is an exception with a noticeable decrease in the direct public support to R&D. This may be related to some extent to the previously mentioned specific accounting of the structural funds and their life cycle (lower absorbance at the beginning of a new programming period).

⁴¹ Structural balance data come from the AMECO database, the other indicators were taken from Eurostat. The 2013 value of GBAORD (solely) may not be fully comparable with the rest of the series due to the previously mentioned data issues.

⁴² Fiscal consolidation is a policy aimed at reducing government deficits and debt accumulation. Smart fiscal consolidation is understood as fiscal consolidation which spares or increases public expenditures in R&I.

The Hungarian post-crisis fiscal consolidation process has not come at the expense of the overall R&D expenditures. Although the government did not increase direct funding to government and higher education institutions, it increased the support to R&D through indirect measures. Therefore, it can be concluded that in the post-crisis period Hungary has put considerable efforts to boost R&D expenditures along the lines of a smart fiscal consolidation.

3.3 Funding flows

3.3.1 Research funders

As mentioned in Section 1.2.2. the National Research, Development, and Innovation Office is the governmental body responsible for research, development and technological innovation and for the management of the National Research, Development and Innovation Fund (NKFIA)⁴³. This structure was established by Law LXXVI on "Scientific Research, Development, and Innovation" (of 25 November 2014). The NKFIA integrates the Hungarian Scientific Research Fund (OTKA) and the Research and Technological Innovation Fund (KTIA) programmes. This integrated fund has a budget of about €247m (HUF74.1b) for 2015. In addition, the president of the NKFIA has the role to coordinate the RDI strategy-making, including the Operational Programmes supported by the Structural funds and elaborate the RDI funding instruments of the Hungarian government in collaboration with respective ministers and the president of the Hungarian Academy of Sciences (MTA).

There are two main competitive funding sources for research and innovation in Hungary from January 2015:

- the National Research, Development and Innovation Fund (NKFIA) that integrates
- the Hungarian Scientific Research Fund (OTKA)⁴⁴,
- various Operational Programmes of the Structural Funds co-funded by the central budget, in particular the Economic Development and Innovation Operational Programmes (GINOP).

The main source of NKFIA is the innovation levy that is collected from medium-size and large companies based on their income before taxation. Companies pay every year about €160m (~HUF50b) out of which multiannual projects and new calls are financed. The strategic objectives of KTIA, the predecessor of NKFIA, were to support technology transfer and the open, pre-competitive and social innovations as set in the RDI strategy. The main territorial focus of NKFIA is Central Hungary, the region of the capital Budapest, which has limited access to Structural Funds. In 2014 only one call, "R&D competitiveness and excellence contracts" (VKSZ), was announced by KTIA with a total support of about €24m (HUF7.2b) () to be allocated to 3-12 consortia.

As Table 2 in Section 2.2. provides a comprehensive overview of all Hungarian RDI programmes that were launched in 2015, at this point only the programmes funded by the KTIA are highlighted:

- IPR support (total budget for 2015: about €0.9m (HUF0.3b),
- Development of international R&D relationships, support the participation in EU initiatives (i.e. AAL, ECSEL, Eurostars) (total budget for 2015: about €4.45m (HUF1.38b).

In addition, 222 thematic research projects, 101 post-doctorate grants and 16 international research projects as well as 16 publication projects were funded from KTIA with a total amount of €25m (HUF7.5b) () in 2015.

⁴³ See at <http://nkfia.kormany.hu/index> (Date of access: 5 October 2015)

⁴⁴ See at <http://www.otka.hu/> (Date of access: 5 October 2015)

These calls were launched from the predecessor of the KTIA, i.e. Hungarian Scientific Research Fund (OTKA)⁴⁵ that used to be an independent scheme until the end of 2014.

OTKA aimed at the improvement of the public research base and facilitation of international transfer of knowledge by providing independent support to scientific research and research infrastructures, financial assistance for young researchers and promotion of the achievement of scientific results that meet international standards. OTKA is under the new National Research, Development and Innovation Fund (NKFI), through which the funding will be allocated instead of the central budget previously. According to the plans OTKA will continue to provide financial support through competitive calls to scientific research projects, post-doctorate research activities, and the publication of results that are expected to lead to the recognition of new scientific laws, the generation of new scientific knowledge, and the elaboration of new methods and techniques. The annual budget of OTKA used to be around €20m between 2008 and 2011. It increased to €26.5m (HUF7.7b) both in 2013 and remained the same in 2014 as well as in 2015 (HUF7.5b).

Funding of the higher education sector. The total annual budget of the 29 Hungarian public higher education organisations is about €656.6m (HUF197b) out of which about €520m (HUF156b) is spent on the operation of these organisations and about €133.3m (HUF40b) is devoted to financing of PPP investments and excellence programmes as well as R&D activities of the sector. The operation costs of the HE organisations cover the salaries of the staff and the maintenance of the education and research infrastructure. It can be assumed that about 30-35% of the salaries of the staff is dedicated to research or related activities. In the years to come, the researchers of the higher education organisations could apply to the National excellence programme (foreseen budget is about €30.66m or HUF9.2b) for support.

Funding of PROs. According to report of secretary general of the Hungarian Academy of Sciences, MTA received €83.3m (HUF24.99b) from the Hungarian central budget in 2014. 74.8% of this budget served directly academic research objectives. In addition, the MTA funded 89 "Momentum research groups"⁴⁶ in the research centres and institutes of MTA and 40 research groups located in various higher education organisations with a total amount of about €11.86m (HUF3.56b). (MTA, 2015)

Private not-for-profit funding and charities do not play a significant role in Hungary.

3.3.2 Funding sources and funding flows

The Structural Funds play a prominent role in the total national R&D funding, nevertheless no annual statistical data is available on the R&D funded by the Structural Funds. According to the Cohesion Policy Database of the European Commission⁴⁷, Hungary received a total of €2,125.9m from the Structural Funds to R&D and innovation between 2007 and 2013. The annual amount could be estimated around €300m that makes about one-quarter of the GERD in 2013. Certainly, this is a strong simplification, because this share also includes innovation expenditures, but nevertheless it highlights the significance of the Structural Funds in GERD.

⁴⁵ The Hungarian Parliament passed Law LXXVI on "Scientific Research, Development, and Innovation" on November 25, 2014, terminating the OTKA Office with legal successor and overruling the previous OTKA law as of December 31, 2014.

⁴⁶ See the list of Momentum research groups at: <http://mta.hu/cikk/az-mta-lendulet-kutatocsoport-halozata-131393> (Date of access: 5 October 2015)

⁴⁷ See at <https://cohesiondata.ec.europa.eu/country?country=Hungary> (Date of access: 5 October 2015)

Concerning the new programming period 2014-2020, a total amount of €2,148.86m is committed to research and innovation projects according to the Cohesion Policy Database of the European Commission. If we look at again the foreseen budget of RDI programmes in 2015 (see Table 2), which makes a total of about 901.67m (HUF270.5b) to be financed from GINOP and VEKOP and about €90.4m (HUF27.13b) from KTIA, then we can conclude that 90% of total RDI project support is financed from the Operational Programmes of the Structural Funds. Certainly, these are or will be new RDI projects as long as KTIA is already committed about 2/3 of its resources to fund multiannual projects approved in the previous years.

According the information of NKFIH⁴⁸ a bit more than one-third (35.6%) of all funding to RDI in 2015 will be allocated to RDI infrastructure, 29.6% on knowledge transfer (i.e. supporting of RDI cooperation between PROs, HEIs and companies) and 29.8% will be devoted to support business RDI. Concerning measures and calls financed from the Structural Funds in 2015, these are the following:

- R&D competitiveness and excellence cooperations (GINOP 2.2.1-15)⁴⁹ – The foreseen budget for 2015 is about €161.3m (HUF50b). The measure aims at the initiation of collaboration between domestic companies, research units and the higher education organisations in order to achieve scientific results to be able to exploited and commercialised by the business sector.
- Strategic R&D workshop excellence (GINOP 2.3.2-15)⁵⁰ – The foreseen budget for 2015 is about €146.67m (HUF44b)). The measure aims at strengthening the R&D capacities of research units of strategic importance. It is expected that the reinforced research units will be able to achieve world-class research results alone or in collaboration with their partners.
- Strengthening the research infrastructure, internationalisation and networking (GINOP 2.3.3-15)⁵¹. The foreseen budget for 2015 is about €73.3m (HUF22b). The measure aims at the development of knowledge centres that are competitive at international level. Also, the measure supports the participation of Hungarian researchers in international research networks and cooperation, in particular increasing the participation in Horizon 2020 projects.
- IP protection (GINOP 2.1.3-15)⁵². The foreseen budget for 2015 is about €3.33m (HUF1b). The measure aims to support of IP protection at national and international level, including patent search, fees of patenting, evaluation and audit of IP.
- Support of RDI activities of companies (GINOP 2.1.1-15)⁵³. The foreseen budget for 2015 is €183m (HUF55b). The measure aims to support the development of prototypes, new products and services. At least prototypes and demonstration phases of product development should be achieved, in certain cases the market entry also is expected.

⁴⁸ See Table 2 and <http://nkfi.gov.hu/palyazatok/hazai-kfi-palyazatok> (Date of access: 15 January 2016)

⁴⁹ See at

https://www.palyazat.gov.hu/megjelent_a_k_f_versenykepessegi_es_kivalosagi_egyuttmukodeseket_tamogato_felhivas (Date of access: 15 January 2016)

⁵⁰ See at https://www.palyazat.gov.hu/megjelent_a_strategiai_k_f_muhelyek_kivalosaga_cimu_felhivas (Date of access: 15 January 2016)

⁵¹ See at https://www.palyazat.gov.hu/megjelent_a_kutatasi_infrastruktura_megerositeset_tamogato_felhivas (Date of access: 15 January 2016)

⁵² See at https://www.palyazat.gov.hu/megjelent_az_iparjog_cimu_felhivas (Date of access: 15 January 2016)

⁵³ See at https://www.palyazat.gov.hu/megjelent_a_vallalatok_k_f_i_tevekenyseget_tamogato_felhivas (Date of access: 15 January 2016)

- Innovation ecosystem (GINOP-2.1.5-15)⁵⁴. The foreseen budget is about €16.13m (HUF5b) that will be allocated to 8-10 applicants. The measure aims to support the operation of business incubators for which only 20% of the support could be used while min. 80% of the support should be provided to incubate companies. It is foreseen that the measures help start-ups in developing products and services as well as their teams.
- Higher Education and Industry Cooperation Centre (FIEK) – Development of research infrastructure (GINOP-2.3.4-15)⁵⁵. The foreseen budget is about €80.6m (HUF25b) that will be allocated to 3-6 applicants. The measure aims at the establishment of such organisations that could provide RDI capacities and services to industrial partners, develop competitive products and services as well as development of production of competitive products.
- Development of prototypes, products, technology and services (GINOP-2.1.7-15)⁵⁶. The foreseen budget is about €64.5m (HUF20b) that will be allocated to 150-2000 applicants. The measure supports the development of prototypes, testing and commercialisation activities. Applicants should carry out experimental research (40% of costs) and the development should result in a Minimum Viable Product (MVP), demonstration phase or market entry.
- Innovation vouchers (GINOP-2.1.4-15)⁵⁷. The foreseen budget is about €10m (HUF3b) that will be available for 150-1000 start-ups and SMEs to collaborate with consultants and knowledge centres. These vouchers could be used for temporary innovation consulting services and innovation support services.

A large number of other calls of GINOP, the Economic Development and Innovation Operational Programme were launched from summer 2015, and the preliminary results show that domestic companies, in particular manufacturing SMEs seek for support to increase their capacities. Even the framework budget of GINOP 1.2.1. and GINOP 1.3.1. calls were increased from the initial €28.3m and €113.3m (HUF8.5b to HUF34b respectively). Applicant companies should comply with the following criteria that are positively taken into account in the evaluation of the proposals:

- growth potential of the SME;
- expert-orientation of the SME;
- collaboration and networking with other partners;
- go a step higher in the production value chain;
- the investment is related to the manufacturing of renewable energy products and
- young or female entrepreneur.

As illustrated above, the new calls are rather demanding and expect results almost ready to be commercialised. This criterion will surely reduce the number of potential applicants, but the authorities promise that they will only revisit these criteria after the experiences of the first round of calls.

The first GINOP proposals are under review until early 2016 because the Intermediary Bodies received too many proposals and they cannot employ new staff as flexibly as before the reorganisation of the EU fund management institutions in 2014. The Hungarian authorities promise to evaluate the proposals in a transparent way in order to avoid intervention of auditing organisations.

⁵⁴ See at <https://www.palyazat.gov.hu/node/57223> (Date of access: 15 January 2016)

⁵⁵ See at <https://www.palyazat.gov.hu/node/57139> (Date of access: 15 January 2016)

⁵⁶ See at <http://palyazat.gov.hu/doc/4539> (Date of access: 15 January 2016)

⁵⁷ See at <https://www.palyazat.gov.hu/node/57247> (Date of access: 15 January 2016)

3.4 Public funding for public R&I

3.4.1 Project vs. institutional allocation of public funding⁵⁸

From 1 January 2014, all managing authorities that used to be controlled by the National Development Agency (NFÜ) in the period 2007-2013 work under the Prime Minister's Office and four ministries that are responsible for the implementation of various Operational Programmes co-financed by the European Union in 2014-2020. In addition, all the other intermediary bodies responsible for managing Structural Funds have been integrated into dedicated ministries by 15 April 2014. Responsible ministries for allocation of Operational Programmes co-financed by the European Union in 2014-2020 are the following:

- Ministry for National Economy: Economic Development and Innovation OP (GINOP), Competitive Central-Hungary OP (VEKOP), Territorial and Settlement Development OP (TOP)
- Ministry of Human Capacities: Human Resource Development OP (EFOP);
- Ministry of National Development: Integrated Transport Development OP (IKOP), Environmental and Energy Efficiency OP (KEHOP);
- Ministry of Agriculture: Rural Development and Hungarian Fishery OP, and
- Prime Minister's Office: Public Administration and Public Service OP.

Out of the above OPs, only the GINOP, VEKOP and EFOP will allocate project based funding for research and innovation. In addition, some funding (HUF32b which is about €103.2m) for European Innovation Partnership (EIP_AGRI) will be available from the Rural Development OP to new agricultural products development in the second part of 2016.

The institutional public funding for research and development decreased significantly in the past few years. The Hungarian government's central budget spends every year less on R&D, but institutional funding is vital for the operation of research units at higher education organisations and PROs. There used to be two principal channels for providing such funding: block funding for R&D activities conducted at HEIs, and support to the largest PRO, the Hungarian Academy of Sciences⁵⁹. However, higher education organisations have not received block funding from the Ministry of Human Capacities since 2011 when the Convergence Programme cut almost by half the funding of HEIs.

Concerning state higher education organisations, several concepts were elaborated and discussed in the past five years by the Hungarian Rector's Conference and other stakeholders to reform the higher education system and its financing. In mid-October 2014, the state secretariat of the Ministry of Human Capacities responsible for higher education published the draft higher education concept entitled "*Gear shift in higher education. Directions of performance based development of higher education*". After consultation with stakeholders, the government approved the higher education concept in December 2014 that foresees major changes in the way the HEIs are financed.

⁵⁸ "Institutional funding is defined as the total of national budgets in a given country, attributed to an institution, with no direct selection of R&D project or programmes and for which money the organisation has more or less freedom to define the research activities to be performed." Institutional funding can be in the form of non-competitively allocated Block funding. Institutional funding may also be allocated in a variable/competitive manner tied to institutional assessments. "project funding is defined as the total of national budgets in a given country, attributed to a group or an individual to perform an R&D activity limited in scope, budget and time, normally on the basis of the submission of a project proposal describing the research activities to be done".

⁵⁹ Unfortunately, no statistical data are available neither on institutional funding nor on block funding provided for state-owned higher education organisations.

The foreseen performance indicators of HEIs are: i) cost of teaching by specialisations, ii) cumulated number of credits, iii) increase of the competence level of students, iv) number of diplomas, v) drop-out rates and vi) scientific measures (i.e. number of publications in foreign languages, technology transfer projects, patent applications, PhDs awarded, scientific prizes). In particular, the strategy expects that HEIs will be able to rise the funding through research grants from industry. In addition, the government will support the entrepreneurial and "third mission" activities of universities through technology transfer and spin-off activity that is regulated by intellectual property rights. (Government, 2014b)

The austerity measures had a major impact on the institutional funding of the higher education organisations that decreased by one-third between 2009 and 2013. The total sector got an institutional funding of €424m (HUF123b) in 2013 which corresponds to the budget of a bigger Western-European university. In 2014 the institutional funding of HEIs remained at the same level as they received a total of €469m (HUF136b). In 2015 the central budget will provide only HUF7b (a mere €23m) more compared to 2014 (a total of HUF143b). In addition to this, they are foreseen to collect of about €943.3m (HUF283b) income⁶⁰. This own income comes mainly from projects funded by the Structural Funds, the KTIA, OTKA resources, international projects, different fees as well as from their services. Higher education organisations earn relatively small proportion of their budget from contract research or collaborative R&D projects with the business sector. This type of income makes only 1.5% of their total income which is estimated for about €1,666.6m (HUF500b) according to the information of the state secretary for higher education⁶¹.

It should be noted that the decrease of institutional budgets was quite uneven among the HEIs, as the shrinking of their budget depended on the evolution of the number of students and the specialisation of the respective HEIs. The priority was given to natural science and engineering specialisations, while the social science faculties suffered the most. At the same time, the HEIs got access to substantial funding from different Operational Programmes of the Structural Funds 2007-2014. This funding was distributed through competitive measures (i.e. TIOP and TÁMOP) through which HEIs were able to establish new research centres, renew their research infrastructure and launch new research programmes, including the implementation of some basic research projects. No analysis or assessment is available on this topic, however the size of the project-based funding could be estimated similar to the institutional funding of HEIs. This view is supported by the state-secretary for higher education who estimates that HEIs could have access to funding from OPs in the order of about €666m (HUF200b) per year in the years to come. The draft higher education concept published in October 2014 describes the average pattern of the budget of HEIs in the following way: about 50% institutional funding, 24% competitive public funding (e.g. operational programmes), 22% own incomes (i.e. tuition fees, services), 2-4% direct R&D funding from third parties, and less than 1% donations. The foreseen modification of the higher education law would increase the income from the business sector up to 10% by 2020.

In conclusion, institutional funding makes only about one-third of the total budget of the higher education organisations. Certainly, there are major differences across different universities and colleges in this regard.

According to the data of KSH, the largest PRO network, i.e. research centres and institutes of the Hungarian Academy of Sciences (MTA) received about €123.5m (HUF37.04b) from the Hungarian central budget in 2013.

⁶⁰ See at http://eduline.hu/felsooktatas/2014/10/30/2015_koltsegvetes_egvetemek_foiskolak_R99MJ3 (Date of access: 5 October 2015)

⁶¹ See at <http://www.kormany.hu/hu/emberi-eroforrasok-miniszteriuma/felsooktatasert-felelos-allamtitkarsag/hirek/a-felsooktatasi-torveny-ujabb-modositasa-kerulhet-osszel-a-parlament-ele> (Date of access: 5 October 2015)

In addition to the institutional support MTA earned about €10.67m (HUF3.2b) from companies and about €14.3m (HUF4.3b) from abroad, presumably mainly from FP7 projects. (KSH, 2014)

More recently in May 2015, the secretary general of MTA reported to the general assembly of MTA €83.3m (HUF24.99b) institutional support from the Hungarian central budget in 2014. According to this report, 74.8% of the institutional support served directly academic research objectives. In addition, the MTA received about €11.86m (HUF3.56b) in order to fund 89 "Momentum research groups" in the research centres and institutes of MTA and 40 research groups located in various higher education organisations. (MTA, 2015)

Based on this information, it can be concluded that MTA is mainly (83%) funded from institutional funding provided by the central budget. Even if no statistical data are publicly available on project funding, in particular on the R&D allocation of the Structural Funds, it could be estimated that the share of institutional funding decreased in the budget of HEIs drastically in the past few years. This trend is likely to be continued because the government would allocate more funding from the Structural Funds to research and innovation, while HEIs can access them only through project applications.

3.4.2 Institutional funding

Institutional assessment is not playing yet a key role in institutional funding allocations of HEIs. Nevertheless, the higher education concept approved in December 2014 and the foreseen modification of the higher education law would change drastically the funding of the state higher educator sector. In 2015 the state secretariat responsible for higher education produced several funding models that are tested and the changes in funding allocations will be introduced probably in 2017. The major change would be that no block funding would be provided to HEIs. They would be funded on cost basis differentiated by type of education. For instance, clinical and art education could count on the highest cost. In addition the educational outcome (i.e. number and quality of degrees) would be taken into account in calculation of the institutional budget.

The largest PRO, the Hungarian Academy of Sciences (MTA), receives its funding from the central budget that is allocated to its research centres increasingly through criteria of scientific excellence. According to the report of the secretary general of MTA, 74.8%% of the budget directly supported scientific activities in 2014, the share for 2013 was 71.5% and 65.7% in 2012. Close to one third of this amount is allocated through internal tenders, e.g. for renewal of scientific infrastructure. Apart from this, no public information about the evaluation mechanisms of allocating institutional funding could be identified.

3.4.3 Project funding

Until the end of 2014, the largest domestic research and innovation funds used to be the Research and Technological Innovation Fund (KTIA), and various Operational Programmes of the Structural Funds, while the bottom-up funding was provided by a smaller fund, called Hungarian Scientific Research Fund (OTKA). As presented in Section 1.2.2, the National Research, Development and Innovation Fund integrates both KTIA and OTKA funding programmes from January 2015. The largest STI policy support schemes are co-financed by the EU Structural Funds, and given the cuts in domestic public funding in the post-crisis period, the balance has shifted significantly towards EU funds. Actual funding figures are not publicly available, and using that metric might lead to a somewhat different picture, but probably still with a larger share of EU funds.

The Research and Technological Innovation Fund allocated funding through several calls that clearly specified the activities to be carried out, the expected results indicators, as well as the conditions to be fulfilled by the applicants. Similar mechanism has been in place for the calls for the Operational Programmes. The proposals used to be evaluated by the experts requested by the bodies responsible for the management of the Operational Programmes.

In the new programming period 2014-2020 a new approach was introduced in the evaluation process of the research and innovation proposals financed from the reorganised National Research, Development and Innovation Fund as well as from the Economic Development and Innovation Operational Programme (GINOP). The National Research, Development and Innovation Office takes part in the elaboration of calls and provides a professional opinion of the research and innovation content of the proposals to the Managing Authority that is part of the Ministry for National Economy. In this opinion the experts of the NKFIH present the grade of novelty of the scientific and innovation content of the project proposals. The objective is to avoid financing such projects that seek for an outcome already developed elsewhere. A Steering Committee will have a final say about the professional opinion that will be sent to the applicants. Only those projects would be supported that have a positive opinion from the NKFIH.

Companies could apply for a preliminary opinion of the NKFIH before they submit their proposals for the published GINOP calls. In order to facilitate this process, the NKFIH set up a dedicated website⁶² in autumn 2015 through which applicants could submit their proposals for preliminary opinion. Applicant should provide the following information:

- research, development plan;
- planned budget;
- CV of the project leader and
- CV of the professional leader of the project in case of consortia.

Until the end of 2014, the domestic research fund OTKA has provided bottom-up funding for fundamental research projects of researchers or small research teams that are based at a Hungarian research organisation. The annual budget of OTKA for 2015 is €25m (HUF7.5b), slightly lower than in 2014 (€25.6m or HUF7.7b), and the same as in 2013. The average size of a funded research project has been a few million HUF. A successful applicant researcher could get a maximum amount of about €10,000 (HUF3m) per year and the maximum duration of a project has been three years. The funding was allocated on a competitive basis and appraised through a peer review system. The proposals were evaluated on the basis of the following criteria: originality of the fundamental research, scientific relevance, novelty, expected results, scientific and societal benefits, scientific background, institutional conditions and guarantees, justification and reality of funding requested, planned working hours, scientific results, publications so far, results of previous OTKA experiences. The peer-review had been carried out by Hungarian scientists on a voluntary basis requested by the OTKA secretariat. OTKA continuously tried to involve a greater number of foreign experts in remote peer review, which has been facilitated by the fact that all proposals (with the exception of "Hungaricum" proposals) have been submitted in English since 2009. According to the OTKA self-evaluation report the percentage of foreign reviewers has continuously grown since 2009, i.e., from 9.51% in 2009 to 28.9% in 2014.

The OTKA supports about four-times more thematic research grants than post doctorate grants if we take into account the budget available for these two types of support. In 2015, 222 thematic research projects, 101 post-doctorate grants were supported with about €19.9m (HUF5.98b) and about €5.23m (HUF1.57b), respectively.

Apart from OTKA, international peer review of research proposals is not yet typical, although the MTA applies more and more frequently this type of evaluation in its funding programmes, e.g. the Momentum Programme. This programme aims at the renewal of the research teams of the MTA and participating universities via attracting outstanding young researchers back to Hungary. The impact and success of this application model is highly acclaimed and recognised even by the international scientific community whose members participate in the selection board.

⁶² See at <http://kfivелеmeny.nkfi.gov.hu/>

3.4.4 Other allocation mechanisms

No other funding allocations could have been identified.

3.5 Public funding for private R&I

3.5.1 Direct funding for private R&I

The Hungarian research and innovation funding system has changed drastically in 2015 when the National Research, Development and Innovation Office (NKFIH) was created. This governmental office, headed by the former president of the Hungarian Academy of Sciences, is responsible for the design of all national and EU-funded research and innovation programmes. The official reasoning behind the concentration of all RDI funding programmes under NKFIH is to manage all RDI related national calls in a standardised and transparent way in order to achieve highest possible impact and excellence. Also, the office is involved in the evaluation of project proposals and runs a professional network of reviewers. Nevertheless, the final say of the funding decisions remains in the Managing Authority of the Ministry for National Economy.

The new funding programmes focus mainly on the main challenges of the Hungarian innovation system, i.e. low innovation activity of firms, particularly SMEs, low collaboration between actors and low or outdated research and innovation capacities of both private and public research units. The key funding priority is to have high impact on competitiveness of the individual innovation actor as well as on the local, regional and national economy in a sustainable way. In order to achieve this goal, RDI programmes will be less fragmented than in the previous funding period 2007-2014 and the evaluation of proposals will focus more on excellence and impact. Several measures explicitly demand new products and services to be developed as an outcome of the support. The strict evaluation process, the preliminary opinion of the research and innovation content of the project proposals could be seen as a kind of guarantee to deliver the expected outcomes of the new funding programmes.

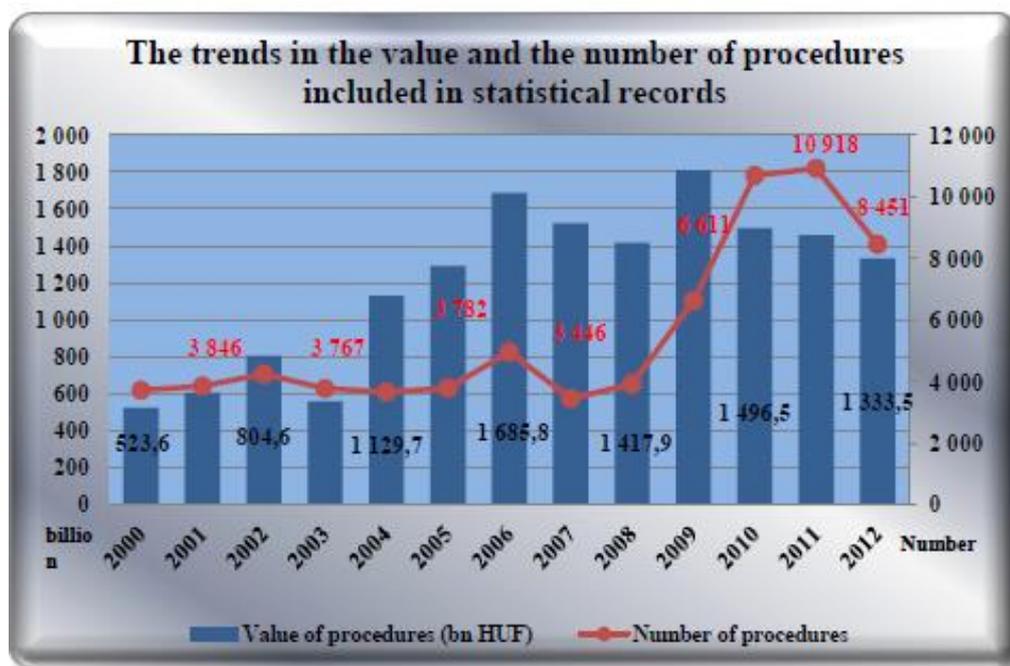
There are a large number of measures in place that cover the entire research and innovation process. A wide range of programmes provide support to RDI projects such small as HUF500,000 (~€1,666) that goes up to HUF8b (~€26.26m). Even innovation ideas could be supported in a new three stages scheme aiming at the building of the Hungarian start-up ecosystem. In larger scale programmes it is expected that the business sector take a lead and involve other actors, including public research units and higher education organisations in the implementation of the RDI project.

As stated in the National Research-Development and Innovation Strategy 2013-2020, Hungary aims to increase its research and development expenditures to 1.8% of the GDP by 2020 and 3% by 2030. A complementary target of the strategy is that BERD will reach 1.3% by 2020. The public measures clearly reflect this objective as several measures aim at leveraging greater private sector investments, e.g. support to market-oriented R&D activities, development and strengthening of research and development centres. The most recent indication of the success of this effort is that the companies increased their research and development expenditures by 22.2% according to the Central Statistical Office. (KSH, 2014) According to Eurostat data, the business sector increased further their RDI expenditures by 4.0% in 2014 compared to the previous year.

3.5.2 Pre-commercial procurement (PcP) and public procurement for innovation (PPI)

Background

The diagram below depicts the trends in the number and the value of procurement procedures from the year of 2000. The sharp rise in the number of procedures in 2009 is due to technical reasons: following the Public Procurement Act amendment entering into force on 1 April 2009, the scope of public procurements available for statistical purposes has been increased (simple procedures). The large-scale increase continued the following year; then there was stagnation and significant decline in 2012. In terms of the value of contracts, after a drop in 2003, the value of contract award procedures conducted by the contracting authorities peaked in 2009. A continuous, but small decrease over the following 3 years can be observed.



Source: Public Procurement Authority of Hungary⁶³

Legal Public Procurement Framework

Hungary was one of the eight member states that complied with the deadline and were the first to transpose the two EC public procurement directives of March 2004, namely, Directive 2004/17/EC and Directive 2004/18/EC.⁶⁴ The Hungarian lawmakers are in the process of transposing the new directives on public procurement – Directive 2014/23/EU and Directive 2014/25/EU.

The new Hungarian Act CXLI on public procurement entered into force on 1st November 2015. The new Act implements and harmonises the national public procurement rules with EU public procurement directives.

⁶³ Közbeszerzési hivatal (Public Procurement Authority)

http://kozbeszerzes.hu/data/documents/2014/02/04/Information_about_the_Authority_20140101.pdf

⁶⁴ http://www.europarl.europa.eu/RegData/etudes/note/join/2006/373599/IPOL-IMCO_NT%282006%29373599_EN.pdf

The Hungarian Parliament adopted a long awaited Amendment⁶⁵ of the new Public Procurement Act ("PPA") on 15 December 2015. The two main reasons behind the amendment were the relaxation of public procurement obligations for subsidised procurements and more flexible contract modification rules for contracts awarded under the old PPA.

Subsidised procurements

The PPA entered into force on 1 November 2015 and originally prescribed that public procurement proceedings are required in situations where entities' procurement is subsidised by contracting authorities with least HUF25m (approx. €80,000). This public procurement threshold appeared to be unreasonably low in light of the new EU Procurement Directives and entailed significant uncertainty and unease as private companies, who are otherwise outside the scope of the PPA, were obliged to conduct lengthy and burdensome public procurement proceedings to spend their subsidies – a task for which they are obviously not prepared. The amendment relaxes this rule by making the following subsidies exempt from the "HUF25m rule":

- investment subsidies granted in individual government decisions;
- individual subsidies for job creation;
- subsidies for training, workshop creation and development;
- subsidies for R + D projects and innovation;
- subsidies for reindustrialisation investments of large enterprises; and
- any subsidy from the EU or Hungarian budgetary resources requested before 1 November 2015.

Modification and examination of contracts

The Amendment prescribes that the rules of the PPA regarding contract modification apply retroactively to contracts awarded under the old public procurement rules, i.e. tenders launched and contracts awarded before 1 November 2015. This means that parties may be able to amend their public contracts more freely as the new PPA enables more flexible contract modification. However it is still not possible to amend contracts in a way that exempts the bidder from its obligations arising from a breach of the contract or for the contracting authority to take over unjustifiable risks and additional costs from the bidder. Based on the PPA, the contracting authority and the Public Procurement Authority shall monitor the modification and performance of the "old" contracts more closely and if an examination reveals serious breach of public procurement rules, proceedings before the Public Procurement Dispute Board or court may result.

The new Hungarian Act CXLIII on public procurement (1 November 2015) introduced very strict rules on automatic disqualification for competition infringements. Companies doing a significant part of their business through tenders are required to revisit their compliance strategy, making competition compliance - also for the field of non-hardcore infringements - a top priority. It is very important that compliance efforts should focus not only on avoiding future infringements, but also on uncovering internally potential past violations. This is so, because although debarment can be healed by the new self-cleaning procedure, in case of serious competition infringements such as hard-core cartels, the cost of self-healing may be overwhelming due to the 10% damages presumption existing in Hungary.⁶⁶

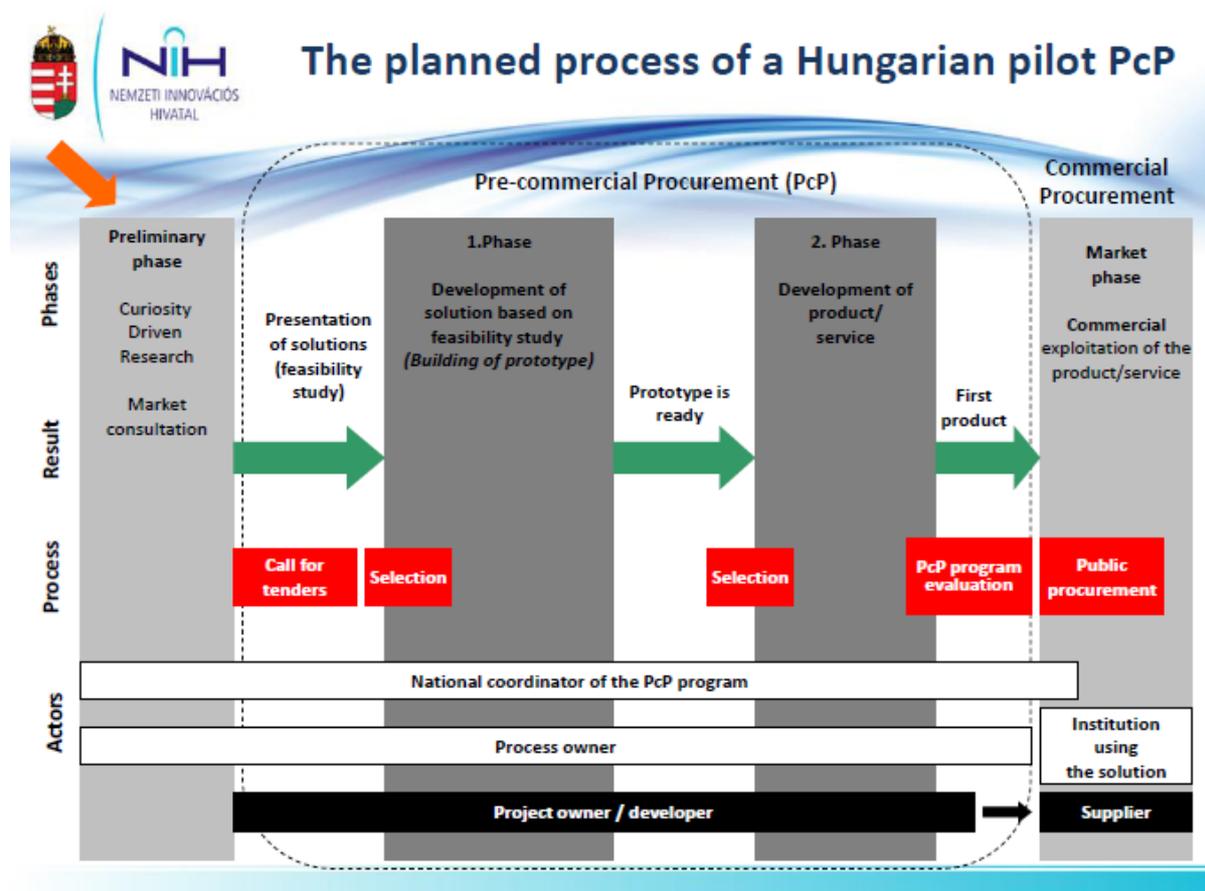
⁶⁵ <http://www.cms-lawnow.com/ealerts/2015/12/hungarian-ppa-amendment--relief-for-subsidised-procurements>

⁶⁶ Márton Horányi. The Hungarian Parliament adopts the new Public Procurement Act (Act CXLIII), <http://www.kluwercompetitionlaw.com/CommonUI/document.aspx?id=kli-kcl-ecom-201576846>

The PCP/PPI landscape in Hungary

Pre-commercial procurement was first explored through a pilot programme carried out by the National Innovation Office in 2012. This support instrument is taken up in the RDI strategy 2013-2020, which provides for measures that are dedicated explicitly to innovative SMEs and positively discriminate in favour of innovative SMEs in certain restricted areas of pre-commercial procurement (PcP). More specifically, the RDI strategy would increase the public demand for innovation through PcP actions. New tools for intensifying the dynamics of innovation in the public sector through PcP are foreseen in the fields of health care, environment protection, energy, education and transport. Also, the National Smart Specialisation Strategy includes an option to launch an experimental programme in order to examine how much the Hungarian application of foreign best practices requires the amendment of regulations in force and the introduction of new legislation.⁶⁷

The diagram below shows how a Hungarian PcP procedure is realised. First those public procurers are identified that have mid- to long-term needs for new technological developments and an interest in purchasing those via PcP. The next stage consists of finding solutions for the gaps between the procurers' needs and the state-of-the art, and of building a prototype. In the last stage, the real product is developed.



Source: András Hlács. Innovation in public procurement, 13 October 2013, Hungarian National Innovation Office⁶⁸

⁶⁷ RIO Country Report Hungary 2015, Draft.

⁶⁸ András Hlács. Innovation in public procurement, 13 October 2013 (presentation at the International Conference "The new EU public procurement directives and other actualities", 10-11 October 2013, Budapest, Hungary, http://kozbeszerzes.hu/data/documents/2013/10/21/HI%C3%A1cs_Andr%C3%A1s_EN.pdf)

PCP/PPI initiatives in Hungary

Hungary was the first EU-10 country that piloted the usage of Structural Funds to setup pre-commercial procurement projects⁶⁹. During the EU funded RAPIDE project, the Hungarian Észak-Alföld Regional Innovation Agency (INNOVA)⁷⁰ investigated the feasibility of incorporating PcP practices into their regional operational programme for the structural funds. They presented the case for starting up a PcP pilot to the Észak-Alföld Regional Development Agency (the intermediate body for structural funds in the region) and the National Development Agency (the managing authority for the structural funds in Hungary). The engagement of the managing authorities is essential for ensuring that the PcP action plan of the region is taken up in the mainstream structural funds and innovation programmes.

The Hungarian Észak-Alföld Regional Innovation Agency (INNOVA) participated as a PcP expert in the IMAILE⁷¹ project - Innovative Methods for Award procedures ICT Learning Europe (1 February 2014 - 1 March 2015, €4.6m). The IMAILE project arose from a perceived demand for personalized learning, especially in STEM subjects. New technology and innovative solutions are needed to meet this demand, and IMAILE uses a pre-commercial procurement (PcP) method to stimulate research and innovation. IMAILE was coordinated by the city of Halmstad, Sweden, and was funded by the Seventh Framework Programme (FP7) in cooperation with partners from Sweden, Spain, Germany, Finland, Hungary, and Portugal.

Hungary participated in the PROGR-EAST project, which encouraged the use of Pre-commercial Procurement (PcP) in five targeted European Countries (Poland, Czech Republic, Slovakia, Hungary and and Slovenia), taking into consideration the specific needs and constraints for public procurement and in particular for the procurement of R&D existing in Eastern Europe. The aim was to introduce innovative PcP strategies to public authorities, universities and industrial stakeholders, and transfer successful experiences implemented in other European and external regions to implement innovative public services.

Hungary participated in the EFFECT⁷² project - Upgrading of Energy Efficient Public procurement for a balanced economic growth of the area of South-East Europe (SEE). The EFFECT project arose from the need to innovate the SEE countries public procurement procedures and stimulate their integration with energy efficiency criteria to meet EU Public Procurement requirements and to contribute to achieve EU energy strategy objectives. EFFECT general objective was to stimulate the adoption and adaption of EU renewable energy policies in SEE area, upgrading public authorities and energy local key actors, acting on the leverage of energy efficient public procurement (EPPP) as key instrument to improve competitiveness and promote balanced and sustainable economic growth in the countries involved, able to face the growing energy demand.

The Észak-Alföld Regional Innovation Agency participates in the P4ITS network⁷³ that gathers together contracting authorities experienced or planning to shortly embark on deploying Cooperative Intelligent Transport Systems and Services (C-ITS), and willing to improve the market roll-out of innovative transport systems and services through Public Procurement of Innovation (PPI).

⁶⁹ <http://cordis.europa.eu/fp7/ict/pcp/hungary-case.pdf>

⁷⁰ INNOVA – Észak-Alföld Regionális Innovációs Ügynökség (Hungarian Észak-Alföld Regional Innovation Agency) <http://innova.eszak-alfold.hu/en/mainpage.html>

⁷¹ <http://openeducationeuropa.eu/en/project/imaile>

⁷² <http://www.effectproject.eu/index.php>

⁷³ <http://p4its.eu/#tab1>

The network will enable exploring common issues and themes with counterparts from different countries, with a view to developing a more concerted approach for deploying C-ITS in Europe. P4ITS is a Thematic Network of the ICT Policy Support Programme (ICT PSP), Competitiveness and Innovation Framework Programme (CIP). It stands for Public procurement of innovation for cooperative ITS. The project duration is December 2013 until May 2016. It is a contract with the European Commission, DG CONNECT.⁷⁴

Hungarian procurers (Semmelweis University Health Services Management Training Centre) participate in the EU funded PPI project ECOQUIP⁷⁵ on medical equipment.⁷⁶

3.5.3 Indirect financial support for private R&I

Indirect funding through tax incentives plays an increasing role in the total public support. As long as the Hungarian annual budget does not provide data on foregone tax revenues, the OECD data is used to see the importance of this measure. According to the STI Outlook, tax incentives for R&D are the second most important measure in Hungary after direct funding through competitive grants. Also the relative share of tax incentives for R&D is comparable to that of competitive grants. (OECD, 2014)

Concerning indirect tax incentives, the measure 200% of R&D expenditures deductible has been in place since 1996. The objective of the scheme is to promote R&D activities of companies, and thus they can deduct 200% of their R&D expenditures from their taxable income. A 300% RTD tax allowance is applicable from 2004 if a company lab is located at the site of a university or a public research institute.

An indirect measure was introduced in January 2013 that made the employment of researchers with a PhD title (up to salaries of ~ €1,800 (HUF300,000)/month) cheaper as they are exempt from paying social security and other contributions (altogether 27% less). This incentive cost the government about €3.5m according to estimates of the Ministry for National Economy and was applied for about 1,300 researchers employed in companies.

Apart from the latter measure, no significant change could be observed in the balance between subsidies and tax incentives. The National S3 strategy also states that the resources of the Structural Funds provided in the framework of the EU Cohesion Policy account for the most significant sources of public support for the RDI sector in both the last and the next seven-year EU financial periods.

3.6 Business R&D

3.6.1 The development in business R&D intensity

R&D performed by the business sector more than doubled from 0.4% to 0.99% of GDP in the period 2004 to 2014. The increase in particular took place after 2008 and the economic and financial crisis does not seem to have had a negative impact on overall business intensity as the total amount of private R&D investments increased significantly in the 2009 to 2014 period (Figure 8).

The biggest funder of business R&D is business itself, but government funding and funding from abroad have since 2010 both doubled their share of funding of business R&D from 0.1% to 0.2% of GDP. Government funding and funding from abroad, therefore, now account for about 40% of the funding of business R&D (Figure 9)⁷⁷.

⁷⁴ http://3mciz7425dl33nqj32irbgu.wpengine.netdna-cdn.com/wp-content/uploads/sites/6/2015/03/P4ITS_DEL_D3.2-DiscussionPaper-ExtCons_v1.1.pdf

⁷⁵ <http://www.ecoquip.eu/>

⁷⁶ <http://ec.europa.eu/digital-agenda/en/news/innovation-procurement-initiatives-around-europe>

⁷⁷ This figure does not include the foregone tax revenue from fiscal measures. As fiscal measures are important in Hungary, the share of government funding would be higher, if they were included as government funding of private R&D.

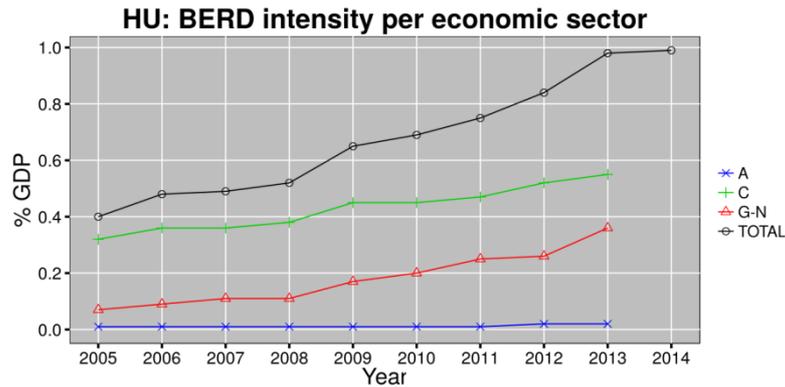


Figure 8 BERD intensity broken down by most important macro sectors (A= agriculture, C= manufacture, G_N=services).

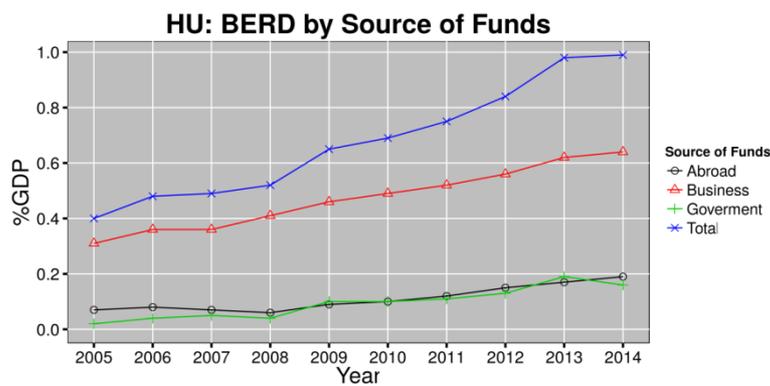


Figure 9 BERD by source of funds

3.6.2 The development in business R&D intensity by sector

Manufacturing has increased its R&D intensity from about 0.32% to 0.55% of GDP between 2005 and 2013, and it performed a bit more than half of Hungarian business R&D in 2013, but services have since 2008 increased their R&D intensity from about 0.1% to 0.36% of GDP and therefore now perform about one third of business R&D.

Within manufacturing pharmaceuticals is the most important research performer accounting for some 60% of total manufacturing R&D. Gedeon Richter is the only Hungarian company that was included in the 2011, 2012 2013 and 2014 EU Industrial R&D Investment Scoreboard.⁷⁸ The company spent HUF 38.8b (approx. €130m) on research and development in 2012, which amounts to 11.9% of its consolidated sales revenue⁷⁹ and about 15% of total Hungarian business R&D intensity. Apart from a small drop in 2011 and 2013 pharmaceuticals has seen a steady increase in business R&D since 2005 (Figure 10).

The computer, electronics and optical equipment sector as well as motor vehicles are the two other main performers of R&D in manufacturing, each accounting for about 20% of manufacturing R&D. They have both managed to almost double their R&D intensity since 2005 despite the crisis. Motor vehicles have the highest share of high growth companies with as share of 9-11% depending on the year⁸⁰.

⁷⁸ <http://iri.jrc.ec.europa.eu/scoreboard14.html>

⁷⁹ <https://www.richter.hu/en-US/research-development/Pages/Research-activity.aspx>

⁸⁰ If we exclude small companies with less than 10 employees, the shares increase significantly but the pattern remains the same.

An analysis of the size distribution of companies by manufacturing sector, also shows pharmaceuticals and motor vehicles are the sectors with the largest share of big companies. In particular about 30% of the companies in these two sectors employ more than 50 people. This is in line with the observation that big companies are often the biggest performers of R&D.

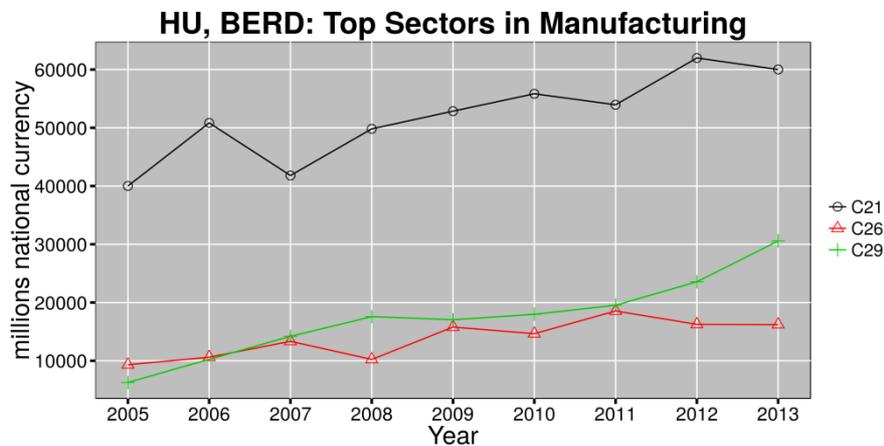


Figure 10 Top sectors in manufacturing (C21: basic pharmaceutical products and pharmaceutical preparations; C26: computer, electronic and optical products; C29: motor vehicles, trailers and semi-trailers)

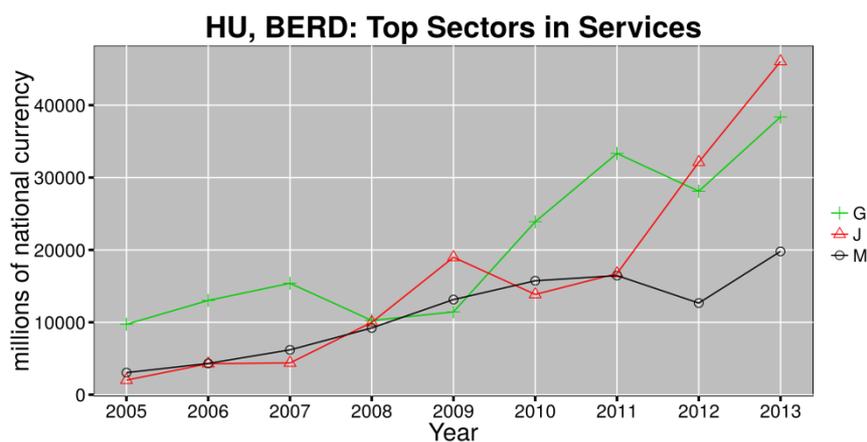


Figure 11 Top service sectors (J=information and communication, G=wholesale and retail trade, repair of motor vehicles and motorcycles, M=professional, scientific and technical activities)

Within services a strong decade-long increase of R&D expenditures can be observed in the three most important service sectors: wholesale and retail, information and communication, and professional, scientific and technical activities. It is also seen that the economic crisis hit R&D activities performed by the wholesale and retail trade as well as the information and communication sector very hard. This may be due to a relatively high share of domestically owned smaller companies, which may have been financially less robust. However, the performance of R&D by these sectors has since the economic and financial crisis recovered (Figure 11).

3.6.3 The development in business R&D intensity and value added

Manufacturing is the biggest contributor to Gross Value Added (GVA) in Hungary accounting for 23% in 2012, which is above the EU average (Figure 12). The share has been stable during the last years showing that Hungary has managed to maintain its manufacturing base.

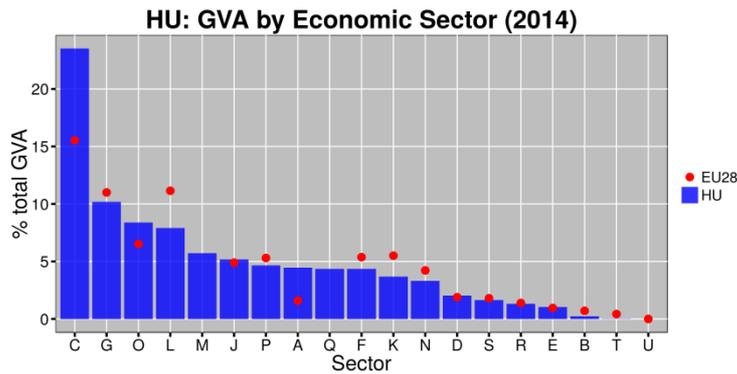


Figure 12 Economic sectors as percentage of the total GVA. Top 6 sectors in decreasing order: 1) Manufacturing 2) Wholesale and retail trade; repair of motor vehicles and motorcycles, 3) Public administration and defence; compulsory social security, 4) Real estate activities, 5) Professional, scientific and technical activities, 6) Information and communication

Within manufacturing the biggest sector in terms of GVA is motor vehicles followed by machinery and equipment, food, computers, electronics and optical equipment, and pharmaceuticals (Figure 13). Within services, the low knowledge intensive services accounted for more than 75% of GVA, whereas the knowledge intensive business services remained at a relatively low, but stable level in the VA at factor cost (Figure 14).

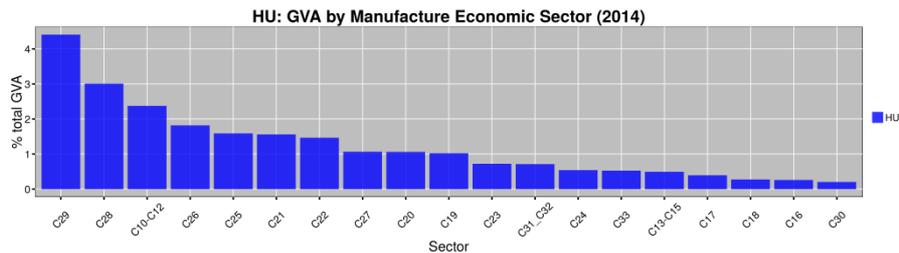


Figure 13 GVA in manufacturing. Top 6 manufacturing sectors: 1) motor vehicles, trailers and semi-trailers, 2) machinery and equipment, 3) food products; beverages and tobacco products, 4) computer, electronic and optical products, 5) fabricated metal products, except machinery and equipment, 6) basic pharmaceutical products and pharmaceutical preparations,

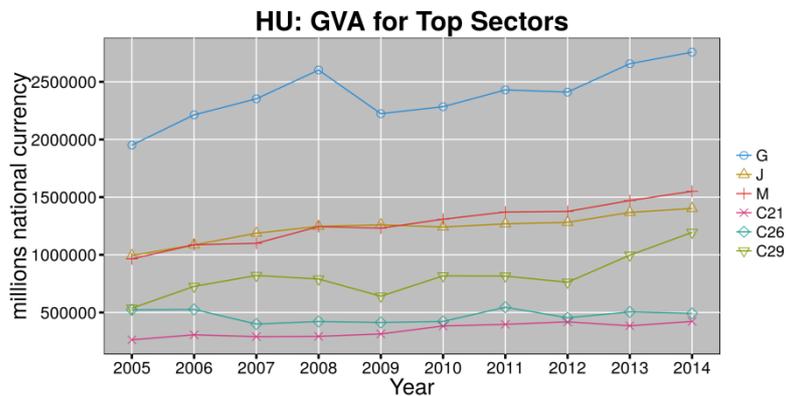


Figure 14 Value added for the leading sectors

Foreign controlled enterprises have a decisive role in the Hungarian economy. The key motor vehicles sector is for example controlled almost entirely by the large European automotive groups. The large inflow of foreign direct investment has been very positive for the Hungarian economy, but the fact that many research performing Hungarian companies are part of larger groups means that business R&D performing outside Hungary can have a decisive influence on value added and employment in Hungary (and vice versa), and that technology and knowledge is to a large extent embedded in machinery, equipment and software purchased by Hungarian firms rather than developed in Hungary. As a result, there is no simple relationship between sectorial GVA, employment and business R&D.

Consistent with this observation, data on overall innovation expenditures shows that knowledge is to a large extent acquired by Hungarian firms. The acquisition of machinery, equipment and software thus accounted for 38.2% of total innovation expenditures in Hungary in 2010 according to the Community Innovation Survey. Furthermore, acquisition of external knowledge accounted for 2.6% and of external R&D for 32.5%, whereas in-house R&D by only accounted for 26.7%.

In a small open economy such as Hungary, which cannot be at the technology frontier in all sectors, one would expect that technology and know-how is to a large extent acquired either as embedded in machinery, equipment and software purchased by Hungarian firms or from external sources. However, this also means that GDP growth and employment is only to some extent for some sectors driven by business R&D performed in Hungary.

Still, within manufacturing it is clear that the three largest R&D performers: pharmaceuticals, motor vehicles, and computers, electronics, and optical equipment have increased their R&D intensity and at the same time recovered from the economic and financial crisis measured on GVA and employment. In services wholesale and retail trade are still below their pre-crisis level weaker, but information and communication as well as professional, scientific and technical services have recovered. The employment trends for are consistent with this conclusion. Notably the number of scientists and engineers employed by industry as well as by professional, scientific and technical services and by the information and communication service sectors, have been on a strong upward trend. While the level is still low, this would seem to indicate that Hungary has even gained competitiveness as a location for performing R&D following the economic and financial crisis and has succeeded in a certain up-skilling of the labour force. The fiscal measures introduced may have an important role in explaining this development.

3.7 Assessment

The balance between the project funding and institutional funding could be seen as appropriate in Hungary. While public financing of the largest PRO, the MTA remained stable, the institutional R&D funding is significantly decreased in the higher education sector. This decrease could not be balanced by Operational Programmes of the Structural Funds. Competitive project based funding is already relatively high especially in smaller HEIs while in large, traditional state universities the institutional block funding still prevails. In most cases there are several research groups at HEIs that can attract and manage very efficiently project based funding while others – that are usually outside of the priority areas of the RDI strategy – should rely on institutional research funding, if any. The other issue that hinders the increase of project based funding is the governance structure of universities that does not favour the operation of research groups/teams that are mainly financed through R&I projects. Furthermore, the administration and research support is not always prepared for managing large scale research and innovation projects due to the lack of capacities and experience. Also, the generally low basic salaries of researchers make academic and research jobs not attractive for young graduates.

The changes introduced in the Hungarian RDI funding system in 2015 aim to overcome the previous fragmentation of different funding channels. Announced principles of the RDI funding are: reinforcing scientific excellence, increase impact and sustainability of the funding system beyond the funding period 2014-2020. In order to achieve these goals, the expectation is very high in certain funding instruments as successful applicants should deliver tangible results in form of new products or services. It is promised that evaluation and impact assessment will be carried out in order to influence the design of the RDI programmes and calls.

4. Quality of science base and priorities of the European Research Area

4.1 Quality of the science base

Hungarian researchers produced 0.92 publications per thousand inhabitants in 2013 that is about one-third less than the EU-28 average (1.43). They are also internationally orientated with 47.1% of publications internationally co-published. In 2013, Hungary had 0.43 international scientific co-publications per thousand population that is 82% of the EU-28 average (0.52). In the period 2000-2013, 7.8% of the Hungarian scientific publications were in the top 10% most cited publications worldwide in comparison with 11.3% of top scientific publications produced in the EU-28 (Science Metrix, 2014)⁸¹. The share of public-private co-publications in Hungary is 1.3% in the period 2011-2013 against 1.8% for the EU-28. According to the Innovation Union Scoreboard, Hungary produces 31.2 public-private co-publications per million population, while the EU-28 average is 60% more (52.8).

Table 6: Selected bibliometric indicators

Indicator	Value and year	EU average
Number of publications per thousand of population	0.92 (2013)	1.43 (2013)
Share of international co-publications	47.1% (2013)	36.4% (2013)
Number of international publications per thousand of population	0.43 (2013)	0.52 (2013)
Percentage of publications in the top 10% most cited publications	7.83% (2000-2013)	11.29% (2000-2013)
Share of public-private co-publications	1.3% (2011-2013)	1.8% (2011-2013)
Public-private co-publications per million population	31.2 (2014)	52.8 (2014)

Source: Data is provided by DG JRC IPTS based on Web of Science, Scival and IUS data

Looking at national data for scientific output, the number of publications by Hungarian researchers slightly decreased in 2013 compared to the previous year. Hungarian researchers produced 7,356 books and book chapters as well as 27,250 articles out of which 15,215 were published in foreign language. While the number of articles published in Hungarian language decreased, the number of publications in a foreign language grew by 2.8%. (KSH, 2014)

Based on the above data, we can conclude that the quality of the scientific outcome of Hungarian researchers corresponds 60-80% of respective bibliometric indicators of the EU-28 average. This has to do with below EU-28 average public research funding, low number of dedicated researchers in the higher education organisations where staff members mainly focus on education activities. The picture is far more positive if taking into account the performance of the largest PRO network, i.e. MTA, where the aggregated impact factor of the researchers of MTA grew by 24% in 2014.

⁸¹ Source: JRC IPTS RIO elaboration on Scopus data collected by Sciencematrix in a study for the European Commission DG RTD (Campbell, 2013). The share of public-private co-publications is derived from the Scival platform and is also based on Scopus data (September 2015). SciVal[®] is a registered trademark of Elsevier Properties S.A., used under license. The data on public-private co-publications is not fully compatible with the data included in the IUS, due to differences in the methodology and the publication database adopted.

The average impact factor is per publication in the field of life sciences 4.85, in the field of mathematics and natural sciences 2.81 and in the field of social sciences 2.35. (MTA, 2015)

4.2 Optimal transnational co-operation and competition

4.2.1 Joint programming, research agendas and calls

Although the design of national STI strategies takes into account what is being done in other EU countries, no initiative or experience could have been identified that specifically addresses supporting of joint activities such as sharing information, joint research agendas, joint calls and joint programming.

Hungary operates a "Science and technology attaché network". The international scientific relations of Hungary are also managed and developed by delegated Science and Technology attachés. They support the international and European integration of the Hungarian S&T community by acquiring and disseminating information and by building connections between institutions. According to the information of the NKFIH in December 2015, there are S&T attachés at the Hungarian Embassies in 9 cities: Beijing, Berlin, Brussels (for the S&T relations with the EU Commission), London, Moscow, New York, Paris, Tel Aviv and Tokyo. This attaché network is jointly operated by the NKFIH and the Ministry of Foreign Affairs and Trade. The main tasks of the S&T attachés are:

- to monitor and to analyse the science and technology policy and the international relations of the host country, thereby contributing to the formulation of the Hungarian R&D policy; to prepare reports on significant S&T policies and developments in host country;
- to give information in the host country about the Hungarian R&D policy, its implementation and opportunities for cooperation; to identify scientific and technological areas of mutual interest to both countries which are suitable for bilateral collaboration; to explore new areas for S&T cooperation and exchanges;
- to assist Hungarian R&D institutions and organisations in establishing contacts;
- to represent Hungary at scientific and technological meetings and similar activities; to serve as coordinator for significant S&T visits and missions.

Both the National Research, Development and Innovation Fund and the Economic Development and Innovation Operational Programme (GINOP) supports the development of international research and development partnerships. For this purpose HUF3.5b (~€11.67m) and HUF3.68b (~€12.26m) is available from the before mentioned funds in 2015.

4.2.2 RI roadmaps and ESFRI

In 2008, the Hungarian Government launched the National Research Infrastructure Survey and Roadmap (NEKIFUT) project as a part of its 2007–2013 mid-term science, technology and innovation (STI) strategy. The NEKIFUT project had two objectives: i) the assessment of the Hungarian research infrastructure: the preparation, publication and operation of the National Research Infrastructure Register of national research infrastructures, in order to optimise their use; ii) and the formulation of a national report and programme for the development of research infrastructures. The National Research Infrastructure Register used to be a searchable database providing information on major research infrastructures (RIs) in Hungary in all fields of science. RIs included research facilities, resources, related services and their networks like instruments, gene banks, data bases, etc. that are used by the scientific community to conduct top-level research in their respective fields. The National Research Infrastructure Register contained only RIs of strategic importance in Hungary, i.e. those having the highest scientific and socioeconomic impact (strategic research infrastructure, SRI).

The RDI strategy 2013-2020 foresaw the utilisation of the Register to measure the implementation of some quantitative targets of the strategy, namely the growth of the number research centres joining the global elite (i.e. 30 new centres by 2020) ⁸².

In addition to the National Smart Specialisation Strategy 2013-2020, the document "Research infrastructures in Hungary" was prepared that set out the Hungarian participation in the large European research infrastructure projects that are, where appropriate, included in the Roadmap of the European Strategy Forum on Research Infrastructures (ESFRI) and the development of the national research infrastructures⁸³. This document defined the sources for the participation in foreign research infrastructures and infrastructural developments of research institutes. The planned amount for the „development of the infrastructure of research organisations" is about €187.86m (HUF56.36b) and the „support for the participation in international research infrastructures" is between about €68.33m (HUF20.5b) 2015 and 2020.

So far Hungary has chosen to participate in two research infrastructures (RI) listed on the ESFRI roadmap. The European XFEL is a research facility currently under construction in the Hamburg area, Germany. From 2017 on, XFEL will generate extremely intense X-ray flashes to be used by researchers from all over the world. Hungary contributes about 1% of XFEL total budget, around €1.0-1.5m.

ELI-ALPS (Extreme Light Infrastructure Attosecond Light Pulse Source) will be established in South-East Hungary, in Szeged. In April 2013, the Government qualified the implementation of ELI-ALPS as a high priority project. The government committed about €127.5m (HUF36.99b) to the first phase of ELI that is in 85% co-financed by the Structural Funds. The first phase of ELI-ALPS started in April 2015 and it is under implementation. In addition to the ELI-ALPS facility a science park will be built in collaboration with the University of Szeged, one of the largest universities in Hungary. The second phase of ELI-ALPS will be financed from the GINOP 2.3.6. programme in the next programming period 2014-2020. In this programme about €129m (HUF40b) was allocated to this high priority project.

In addition to these large scale infrastructure development projects, several Hungarian research units have expressed their interest to participate in over a dozen ESFRI projects, in which cases RIs are (or would be) located in other EU countries. Hungary has joined several inter-governmental agreements, organisations and large RIs, nevertheless relatively little funding was allocated for those collaborations compared to the above mentioned high priority project.

Furthermore, GINOP 2.3.3. programme specifically addresses the development and strengthening of the Hungarian research infrastructure. For this purposes €66.67m (HUF20b) is allocated from GINOP and an additional €6.67m (HUF2b) from VEKOP that exclusively focuses on the renewal of the research infrastructure in Central Hungary where about two-thirds of all national research capacities are located.

In addition, the Human Development Operational Programme (EFOP) foresees investments into upgrading research facilities and fostering the collaboration between the higher education organisations and the business sector. These measures will be launched in 2016.

⁸² Unfortunately the service is not available after the reorganisation of the National Innovation Office.

⁸³ The strategy on research infrastructures is available at: http://www.s3magyarorszag.hu/documents/224092/253257/research_infrastructures_en.pdf (NIH, 2014b) (Date of access: 9 October 2015)

4.3 International cooperation with third countries

The role of research and innovation in addressing societal challenges, and social innovation are generally perceived as not important issues in Hungary yet. Nevertheless, a horizontal priority of the "National Research, Development and Innovation Strategy 2013-2020" explicitly addresses the global social challenges and the importance of excellent research infrastructure. According to the quantitative objectives of the RDI strategy, thirty major research and technology centres are expected to find their way to the global elite. The priority fields of the strategy are related to research of water resources, agro-food production, energy research, brain research, integration of roma population and network research (mathematics).

The Hungarian Government announced the policy of Global Opening. As part of that the Stipendium Hungaricum Scholarship Programme was launched in 2013 for foreign students. The aim of the programme is to promote cultural understanding, economic and political relations between Hungary and other countries. Among others, ASEAN (Association of Southeast Asian Nations) member states, China, Japan and several other Central Asian countries have been invited to participate in the scheme⁸⁴.

The largest PRO, the Hungarian Academy of Sciences introduced a number of programmes in the past few years to facilitate access to its research infrastructure and mobility of researchers, e.g. visiting scholars, Invitation 13, Teaming for excellence and the Momentum programme.

To conclude, some positive developments could be reported on the conditions of trans-national scientific co-operation, although the scale of the programmes is rather limited and should be further expanding to achieve a critical mass of initiatives.

4.4 An open labour market for researchers.

4.4.1 Introduction

The Hungarian higher education and public research sector could be seen as a centrally regulated system, although individual institutions enjoy high level of autonomy within the regulatory framework. Generally, research positions at public research institutes are open to non-nationals.

According to the Hungarian Central Statistical Office, there were 3,159 research units operated in Hungary in 2013. (KSH, 2014) The total number of research personnel was 58,237 persons, out of which 25,038 persons worked as full time (FTE) researchers. The number of FTE researchers increased by almost one-quarter (24.8%) compared to 2009. Based on Eurostat data, the total R&D personnel and researchers as % of total labour force and total employment reached 0.87% of the total labour force in 2013 which is 22.5% higher than it was in 2009 (0.71%), although still lagging behind the EU-28 average (1.12% in 2013). The crisis had not much impact on the catch up of the Hungarian research personnel figure as the number of researchers, particularly in the business sector, grew every year in the past five years.

4.4.2 Open, transparent and merit-based recruitment of researchers

Higher education organisations as well as the research centres and institutes of the largest PRO, the Hungarian Academy of Sciences (MTA) have no special employment requirements towards foreign researchers other than the requirements of merit-based scientific qualification. Research positions at higher education organisations and public research institutes are open to non-nationals.

⁸⁴ More information about the programme available at: <http://www.tka.hu/international-programmes/2966/stipendium-hungaricum> (Date of access: 10 October 2015)

As long as most of the courses at HEIs are delivered in Hungarian and the share of foreign students is generally low, in most of the cases command of the Hungarian language is among the prerequisites of positions. This condition basically prevents foreign nationals from applying for these positions (except the ethnic Hungarians coming from neighbouring countries). The situation is far more advantageous in the institutes of the Hungarian Academy of Sciences (MTA) where all researchers speak at least one foreign language, therefore foreign national researchers can be easily integrated.

Act CCIV of 2011 on the national higher education set the employment rules of different teachers and researchers positions at HEIs. The main employability criteria are defined by law, i.e. the qualification and sufficient number of years of education and research experience. According to the stipulations of this act, all positions before publication should be signed by the rector and published on the government recruitment portal. All applications are reviewed by the department, then the faculty council and finally they are approved by the Senate of the respective higher education organisation.

In case of permanent researcher positions at the largest PRO, the Hungarian Academy of Sciences, positions are announced based on Act XXXIII of 1992 on the status of civil servants. According to this law, permanent contracts could only be awarded to Hungarian citizens or with persons who permanently settled in Hungary. The act also specifies that in certain cases the candidate could be exempt from the criteria of Hungarian citizenship and the knowledge of the Hungarian language which could ease the employability of foreign researchers. Remuneration of academic and research positions is set by Act XXXIII of 1992 that regulates salary classes of all types of teachers and researchers jobs in both HEIs and the institutes of MTA.

According to the higher education concept "*Gear shift in higher education*", published in December 2014, the situation is likely to be changed after the introduction of the performance based and competitive remuneration of employees of HEIs⁸⁵. Performance based financing will be introduced in Hungarian HEIs from 2016 that will be based on various performance indicators. The strategy also foresees the introduction of fixed-term post-doctorate positions that are currently lacking from the higher education system. These positions aim to help early career researchers to find job opportunities at HEIs and prevent "brain-drain" from Hungary, and ensure the supply of researchers at the same time. The higher education concept also seeks to develop career paths of researchers, in particular in medical, health sciences and pedagogic education. In addition, the concept created the basis of the dual education system that was already launched in February 2015. (Government, 2014b)

Publicly funded researcher jobs are published online on both the institutions' websites and private job sites. Since January 2008, it is legally obligatory to recruit openly researchers who will have an employment status of a civil servant. The institutions are obliged to publish all public research jobs on the central government recruitment portal at run by the Office of Public Administration and Justice⁸⁶. This portal provides all relevant information on the selection process and criteria for the applicants. Also the minimum time period between the vacancy publication and the deadline for submission of the application is defined. The common recruitment practice of Hungarian higher education organisations and the MTA is the following:

⁸⁵ The higher education concept foresees among its objectives, without further specification, the elaboration of performance based promotion system, measurement of the performance of academic and research staff and the conditions for competitive remuneration.

⁸⁶ See at <https://kozigallas.gov.hu>

- the vacancy is published on the web-site of the organisation and the portal of public sector administration;
- the announcement includes the job profile, skills and competencies required and eligibility criteria;
- information on the selection process and criteria is generally available for the candidates;
- the time period between the vacancy publication and the deadline for application is usually between 15 and 30 days;
- applicants have the right to receive feedback on the results of the recruitment;
- applicants have the right to appeal against decisions;
- in general, there are no provisions in place for setting up selection panels neither on the rules for the composition of selection panels;
- the composition of selection panel is usually not published;
- selection panels are usually composed of internal staff members of the respective organisation.

No public information or evaluation report is available on the law that regulates hiring of researchers.

In terms of inward and outward flow of researchers, the number of foreign researchers slightly increased compared to 2009, there were 667 foreign researchers (many ethnic Hungarians from the neighbouring countries) working in Hungarian institutions in 2013, out of which 456 came from other EU Member States. This means 1.8% of the total FTE researchers. In addition, 329 foreign citizens hold a research grant, out of which 184 from other EU Member States. The number of Hungarian researchers who spent more than six months abroad was oscillating between 373 and 454 in the period from 2009 to 2013, the lowest value was in 2013. These figures indicate that out-going mobility is smaller than the incoming mobility of researchers, although it can happen that the official statistics does not register all those Hungarian researchers who work abroad. (KSH, 2014)

The Hungarian Academy of Sciences (MTA) had a few initiatives to attract prominent foreign scientists to its research centres and institutes in recent years. The "Visiting scholars" programme aimed to attract the most outstanding experts, i.e. ones who can inspire the Hungarian research environment. In addition several internationally acclaimed scientists took part in the Hungarian Academy of Science's workshops as part of the "Invitation 13" competition.

The recognition of the level of the qualification and the professional qualification testified by it belongs to the Hungarian Equivalence and Information Centre (Hungarian ENIC) within the Educational Authority, while the recognition of scientific degrees is done by the Hungarian higher education institutions. The recognition of scientific degrees issued by a foreign higher education institution falls within the authority of those Hungarian higher education institutions which are entitled to offer PhD training and award scientific degrees in the field of study testified by the foreign degree. During this procedure the higher education institution examines whether the degree issued abroad is equivalent to a PhD or Doctor of Liberal Arts (DLA) degree obtainable in Hungary. The recognition is done by the university chosen by the applicant. Also, it is possible to request the recognition of the level testified by the foreign scientific degree from the Hungarian Equivalence and Information Centre (HEIC) that fulfils the task of the European Network of Information Centres (ENIC) office in Hungary.

The Hungarian scientific labour market is dominated by permanent contracts. However, temporary contracts are typical for early stage researchers. The HEIs and the institutes of the MTA try to attract young researchers because ageing is a serious issue in the public research sector, especially in engineering and natural science fields. Unfortunately, the low salaries and the long take-off of scientific career drive back the younger generations.

They often leave the sector because of higher remuneration and faster career opportunities in the private sector, or they simply go abroad. This issue is well recognised and the RDI strategy 2013-2020 aims to improve the situation by allocating more funding to the sector and increasing the number of researchers by 50% up to 56,000 (from 37,000 in 2012).

According to the preliminary data of the Hungarian Central Statistical Office, the number of researchers grew by 3.7% in 2014 compared to the previous year. However, the calculated total number of researcher staff decreased by 2.2% to 37,300 in 2014 while the number of researchers (FTE) grew by 4.7% up to 26,200.

The government did not cut the salaries neither laid off researchers in the post crisis period. However salaries in the sector haven't increased since 2008. The government argued that salaries would increase when the performance of the Hungarian economy could allow paying higher wages to researchers and other civil servants. In order to increase the attractiveness of positions in universities, in particular the young staff, the government will increase the salaries of professors' assistants and assistant professors by 15% from January 2016. Also the stipend of doctorate students will be increased by 50 to 100% in 2016 and they will have the opportunity to complete their studies within four years from the current time limit of three years.

4.4.3 Access to and portability of grants

The national legislation does not address specifically the issue of access to and portability of national grants by foreign citizens or companies. Nevertheless, the government resolution 380/2014 (XII. 31.) about operational and management rules of the National Research, Development and Innovation Fund (NKFIA) states that support could be only provided to those legal entities, entrepreneurs and individuals who has a headquarters / seat in Hungary or having a headquarters in one of the member states of the European Economic Area and a branch office in Hungary.

The Hungarian Scientific Research Fund (OTKA) – that became part of the National Research, Development and Innovation Fund as of 1 January 2015 – provides financial support for basic research, international cooperation, development of the research infrastructure and fellowships for young scientists. Even if OTKA supports international cooperation in research projects, only Hungarian researchers could get funding from OTKA while foreign researchers should apply for grants by one of their domestic research funds. Also, it is a prerequisite of OTKA grants that Hungarian researchers should be affiliated to a Hungarian research unit. This type of applications could only be approved if both OTKA and the foreign research fund support the research project. The guidelines and sample contracts of OTKA clearly set that grants (i.e. salaries) are not portable if the successful applicant moves to another country. In case the temporary research stay abroad exceeds 6 months, the beneficiary researcher should suspend his/her OTKA grant, however his/her team could continue the research activities as defined in the contract.

Before the establishment of NKFIA in January 2015, the other main RDI funding source, the Research and Technological Innovation Fund (KTIA) had also strict rules for applicants. As long as the main source of the KTIA – similarly to NKFIA – used to be the "innovation levy" paid by companies operating in Hungary, the beneficiaries of the fund could only be domestic firms registered in Hungary or research units located in Hungary.

4.4.4 Doctoral training

Doctoral training is carried out at 28 higher education organisations, including religious organisations, at 173 thematically organised “doctoral schools” in Hungary⁸⁷. The number of doctoral school grew by 8 newly accredited schools. Hungarian universities are autonomous to develop and promote their own doctoral programmes. In academic year 2015-2016, the state finances 1,270 PhD scholarships, out of which 850 scholarships in “hard sciences” and 420 in “soft sciences”. Altogether 30 PhD scholarships are separated for Hungarian students living in neighbouring countries.

In case a higher education institution plans to introduce a new PhD curriculum, it requires the approval of the Hungarian Accreditation Committee as stipulated by Act CCIV of 2011 on national higher education. The Hungarian Accreditation Committee (HAC) is a national body of experts facilitating the control, assurance and evaluation of the scientific quality of education, scientific research and artistic activity at higher education institutions. The HAC conducts ex-ante and ex-post evaluation of both doctoral programmes and institutions. The Hungarian Accreditation Committee assures a dedicated quality system for doctoral training, distinct from the quality system for Master studies. Without the accreditation of HAC no doctoral training could take place at universities. The accreditation process involves among others: the evaluation criteria for doctoral schools, the description of the procedure for establishing new doctoral schools.

The doctoral and habilitation process is organised according to government decree 387/2012. (XII. 19.). The organisation of doctoral studies, the assessment of PhD students and the tutoring and conferring of a doctoral degree are overseen by the doctoral council of the individual HEI. The duration of doctoral education is 36 months (i.e. six semesters) and the workload of the students is at least 180 credits. Obtaining a doctoral degree is a separate procedure and it takes generally 2 more years on average in addition to the doctoral studies that is based mainly on lectures.

As a legal requirement for delivering the doctoral training, the HEI must provide master training in the given branch of science or art in order to be granted the right to operate a doctoral school. The doctoral school should undergo an accreditation procedure carried out by the Hungarian Accreditation Committee. The schools should fulfil the criteria set by HAC that are transparent, merit-based and specific to scientific fields.

Within universities, the doctoral training is organised in a given discipline, or cooperating disciplines (i.e. interdisciplinary doctoral school). In a single discipline a doctoral school should have four core members, while in the case of interdisciplinary doctoral schools - minimum seven core members. Launching a doctoral school requires a coherent training and research programme, a definition of research topics for the students, and approval (accreditation) by HAC and the Senate of the higher education organisation.

In October 2013, HAC published recommendations on the quality assurance of the doctoral process⁸⁸. The document specifies among others how doctoral themes should be announced, how to monitor and evaluate the progress of doctoral students, as well as the requirements to obtain a PhD degree. In addition, HAC regularly carries out an evaluation of the doctoral schools. The most recent evaluation of the doctoral schools was carried out in the second half of 2014 and HAC decided about the accreditation of 149 doctoral schools. The term Innovative Doctoral Training is not mentioned explicitly in the evaluation criteria of the doctoral schools, although the principles of IDT are taken into account in most doctoral training programmes.

⁸⁷ Information about the doctoral schools could be accessed through the portal of the Hungarian Doctoral Council at: <http://www.doktori.hu/> (Date of access: 10 October 2015)

⁸⁸ See at http://www.doktori.hu/cikk_file/minosegbiztositas_2013.doc - only available in Hungarian language. (Date of access: 10 October 2015)

4.4.5 Gender equality and gender mainstreaming in research

The proportion of women in academic positions in Hungary increased in the past decade. According to the report produced by the National Innovation Office about women in RDI in 2013, the share of female research in public research organisations is 41.1% while in the higher education organisations 36.7%. In the business sector the share of female researchers is much lower only reach 21.1% of all researchers in companies. The representation of women in higher academic positions is very small, only 4.4% of the full members of the Hungarian Academy of Sciences are women, nevertheless the share is higher (15.2%) among corresponding members of MTA and 16.6% of all researchers having the title "doctor of sciences". The share of female researchers increased slightly, only grew by 5% between 2005 and 2013. (NIH, 2013)

According to the "She figures" produced by the European Commission, Hungary belongs to those countries where women represent less than 40% of the members of scientific and administrative boards at national level. Nevertheless the trend is positive with regard to proportion of women heads of institutions increased from 9% in 2010 to 17% in 2014. The development is slower if we consider the proportion of women researchers which is only 31% of all researchers and only grew by 1.5% between 2005 and 2011 which only about one-third of the growth of the EU-28 average. (EC, 2015b)

There are no specific provisions for female researchers in Hungary. Nevertheless, the restoration of the same position after maternity leave is no longer safeguarded by the general provisions of the Labour Code changed in July 2012. The employer can quit the employee in case the previous position terminated or the employer cannot offer similar position to the person coming back from maternity leave and the person rejects the offered new position. At the same time, the employer is not obliged to extend the employment period of a fixed-term contract.

Gender quotas have been discussed in various areas in order to reduce the gap between the representation of men and women in various professions and bodies. Recognised the low share of women in academic positions, the MTA introduced a framework programme for equal opportunities that allow for female researchers with children under 10 years old to apply for grants over two years of age limit compared to male researchers. Also, the impact of EU policies and expectations towards balanced gender representation could be identified in the various operational programmes of the Structural Funds that contain specific provisions in the calls. This means that at least one third (30%) of the management positions and project participants should be given to under-represented sex.

There is a dedicated association, i.e. Women in Science⁸⁹ that promotes and supports career development of female scientists through awareness raising events as various services.

4.5 Optimal circulation and Open Access to scientific knowledge

4.5.1 E-Infrastructures and researchers electronic identity

The National Information Infrastructure Development (NIIF)⁹⁰ Programme serves as a framework for the development and operation of the research network in Hungary. The Programme covers the entire Hungarian academic, research and public collection community by providing them with

- an integrated computer networking infrastructure,
- a wide range of communication, information, and co-operation services,
- cutting-edge environment for networking applications, and
- advanced framework for content generation and provision.

⁸⁹ See at: <http://nokatud.hu/> (Date of access: 10 October 2015)

⁹⁰ See at <http://www.niif.hu/en> (Date of access: 10 October 2015)

The Programme is dated back to the late 1980s and it is based on funding provided by the central state budget. The development and operation of the network as well as the services are executed by the NIIF Institute (NIIFI). The Programme is closely co-operating with Hungarnet, the association of the user community.

Launched in June 2010, the Videotorium⁹¹ is a video/audio sharing portal created for the higher-education and research institutions in Hungary. The Videotorium, also called "Science online" provides professional presentation of video content recorded at higher-education organisations, research institutions and public collections. Videotorium, together with the Hungarian research and education computer network infrastructure, has been maintained by the National Information Infrastructure Development Institute (NIIFI). The portal is the successor of the former "Video on Demand" repository aiming at providing professional accommodation for the growing collection of recordings and content upload and sharing by institutions.

Hungarian researchers of the MTA and HEIs are requested to use and update regularly their publications in the scientific bibliography database⁹² (i.e. List of Hungarian Scientific Works, MTMT in Hungarian) of the Hungarian Academy of Sciences' Library. Also the Act CXXXI of 21 July 2015 that modified the higher education act CXXXI of 1992 has provisions about MTMT. According to the modified higher education act, scientific output of staff members should be published in MTMT. This database has the main purpose "to keep an inventory of Hungarian academic achievements and to make these valuable contributions known to the world in a high quality format". The database became a central part of the Hungarian research-development information system, because all Ph.D. dissertations and bibliometric data of PhD students should be published in MTMT.

Eduroam offers Internet connectivity to the roaming users of all member institutions operated and coordinated by NIIFI in Hungary. Most Hungarian universities and public research centres joined Eduroam⁹³.

Hungary is member of eduGAIN through eduId.hu that is a service intended to enable trustworthy exchange of information related to identity, authentication and authorisation between the GEANT (GN3plus) partner federations. eduID is available to all academic organisations in Hungary and it is operated by NIIF Institute⁹⁴.

4.5.2 Open Access to publications and data

The Hungarian Academy of Sciences (MTA), the largest PRO network, introduced several actions with regard to open circulation and access to and transfer of scientific knowledge. The president of the Hungarian Academy of Sciences (MTA) issued an Open Access Mandate decree in 2012. According to this decree, the researchers and employees of MTA – including researchers of the subsidised research units and the Momentum research groups – should make their scientific publications Open Access. Open Access could be achieved by i) self-archiving in institutional or discipline-based repositories, ii) publishing in Open Access journals or in hybrid journals offering paid Open Access.

The Hungarian Scientific Research Fund (OTKA) that provides financial support for basic research signed the Berlin Declaration in 2008 and committed to Open Access. As a member of international associations, OTKA supports the recommendations on Open Access and participates in elaborating the relevant documents in the Science Europe Working Group on Open Access to Scientific Publications.

⁹¹ See at <http://videotorium.hu/en> (Date of access: 10 October 2015)

⁹² See at <https://www.mtmt.hu/> (Date of access: 10 October 2015)

⁹³ See participating organisations at http://www.niif.hu/szolgalatasok/middleware/eduroam_intezmenyek (Date of access: 10 October 2015)

⁹⁴ Partners organisations of eduID.hu are available at: <http://www.eduid.hu/hu/resztvevok/> (Date of access: 10 October 2015)

According to the general rules of OTKA, it is the task of the project leader researcher to make public – at least for reading – the results of their research without payment or upload the resulting publications in an open access repository (e.g. REAL of MTA). In addition, OTKA publishes research reports on its own website.

Operated by the Library of the Hungarian Academy of Sciences, REAL is an electronic library service containing full-text documents. REAL runs EPrints software and supports the OAI-PMH protocol (Open Archives Initiative Protocol for Metadata Harvesting). The collection contains research output (journal articles and conference publications) of projects supported by grants from OTKA, mandated for open access by the same organisation and uploaded by the authors themselves, as well as research reports deposited centrally by OTKA. Research reports are in Hungarian, with English titles and abstracts. REAL welcomes and encourages the depositing of articles in other languages, if available. REAL-d database contains theses of the doctors of the MTA. The collection contains dissertations submitted in partial fulfilment of the requirements for the degrees of Candidate of Sciences (C.Sc.) and Doctor of Sciences (D.Sc.) of the Hungarian Academy of Sciences.

Apart from running REAL, the Library of the Hungarian Academy of Sciences offers to its registered users (SMEs could potentially also be included) access to more than 10,000 e-journals in full text. Access to e-journals is regulated by license agreements that the Library signed with the individual e-service providers.

With regard to share of Open Access publications, the Hungarian figure is 61%, a six-year non-weighted sampling in the period 2008-2013, according to the estimates of the study made by Science-Metrics⁹⁵. Out of this figure, about 7.8% could be perceived as "Gold access" while 10% as "Green access".

Nevertheless, the main obstacle for the implementation of open access is the lack of national Open Access strategy, the general lack of awareness about relevant copyright and digital issues and the resistance by researchers to allocate time and effort to the depositing process. Advocacy programmes (attached to a network of institutional repositories) by higher education libraries could provide an effective way of increasing national research visibility and impact.

⁹⁵ See at http://science-metrix.com/files/science-metrix/publications/d_1.8_sm_ec_dq-rtd_proportion_oa_1996-2013_v11p.pdf (Date of access: 10 October 2015)

5. Framework conditions for R&I and Science-Business cooperation

5.1 General policy environment for business

Globally, Hungary ranks 54th on the “Doing business 2015” report produced by the World Bank⁹⁶. This is 4 ranks higher than it was in the previous year. The most significant changes happened to topics starting business (33 positions lower) and getting to credit (38 positions higher). (World Bank, 2014a)

Hungary stands at 57 in the ranking of 189 economies on the ease of starting a business. In 2015 Hungary made starting a business more difficult by increasing the paid-in minimum capital requirement. In the last few years, other major changes in starting a business were the increasing of the registration fees for limited liability companies and adding a new tax registration at the time of incorporation in 2013 and implementing online registration, with registration confirmed 1 hour after application in 2010. Hungary stands at 17 in the ranking of 189 economies on the ease of getting credit. In 2015 Hungary improved access to credit by adopting a new legal regime on secured transactions. Concerning the ease of paying taxes Hungary stands at 88 in the ranking of 189 economies. In 2013 Hungary made paying taxes easier for companies by abolishing the community tax. At the same time, Hungary increased health insurance contributions paid by the employer. Then Hungary made paying taxes easier and less costly in 2015 by abolishing the special tax for companies that had been temporarily introduced in 2010 and by reducing the vehicle tax rate. (World Bank, 2014b)

According to data collected by Doing Business 2015, **resolving insolvency** takes 2 years on average and costs 14.5% of the debtor’s estate, with the most likely outcome being that the company will be sold as piecemeal sale. The average recovery rate is 40.2 cents on the dollar. With this result Hungary stands at 64 in the ranking of 189 economies on the ease of resolving insolvency. The last reform was in 2011 since when amendments to Hungary’s bankruptcy law encourage insolvent companies to consider reaching agreements with creditors out of court so as to avoid bankruptcy. (World Bank, 2014b)

Based on Global Competitiveness Report 2015-2016 produced by the World Economic Forum, Hungary stands at 63th place out of 140. This is 3 positions lower than in the year before. According to this report, the main reasons of relatively low competitiveness are the instability of economic policy, corruption, red tape, low governmental transparency and the distribution of state support. The education is lagging behind the global elite and the tax burden is also high in international comparison. There are major differences in salaries and Hungary has problems to keep the highly educated labour force. The domestic companies generally produce low value added goods and the country participates in labour-intensive global production value chains. (WEF, 2015)

5.2 Young innovative companies and start-ups

Several support schemes were implemented in the past few years that specifically aimed at the facilitation of knowledge transfer and the creation of university spin-offs. After Hungary joined the EU in 2004, regional knowledge centres were created at major universities that resulted in some dozens of university spin-offs. In addition to the knowledge centres, Technology Transfer Offices (TTOs) were established at HEIs. These university organisations face the challenge to sustain their operation after termination of project funding.

⁹⁶ The rankings are benchmarked to June 2014 and based on the average of each economy’s distance to frontier (DTF) scores for the 10 topics included in this year’s aggregate ranking.

Although there are a number of innovation and technology centres operating across the country, these centres have no critical mass activity especially in cases when they are not attached to the local HEI. Unfortunately, no business incubators are working at universities. The situation seemed to be improved with the introduction of a two-stage scheme, called "Start-up_13" that was launched in June 2013 in order to support the development of the Hungarian start-up ecosystem and more specifically the development of technology start-up companies. The programme was supported by about €7.2m (HUF2.1b) from the Research and Technological Innovation Fund. The first stage of the programme aimed at the accreditation of technology incubators, accelerators that would work together with technology start-ups on their business plan and prepare them for fundraising to finance their growth. After long negotiation process contracts were signed with two selected technology incubators with the reorganised the government office responsible for research and innovation, i.e. NKFIH in summer 2015.

The NKFIH elaborated a new unified three-stage system that aims to support business ideas and start-ups. In the first phase, innovators could get a maximum of €10.000 (HUF3m) in very short time to elaborate their business ideas if the expert committee find the idea prosperous. In the second phase innovators could be higher support to elaborate further their ideas. A maximum support of €200,000 (HUF60m) could be used for technology and business development. In this phase start-ups should collaborate with the technology incubators and accelerators funded in the Start-up_2013 programme. A call with a total amount of €20.9m (HUF6.5b) was published for these two phases of the programme in December 2015. Out of this amount €16.1m (HUF5b) will be financed from GINOP 2.1.5 entitled "Development of the innovation ecosystem and the additional €4.8m (HUF1.5b) from the National research, Development and Innovation Fund. In addition, a third measure (i.e. GINOP 2.1.7.) supports the development of prototypes and commercialisation of new products. A total amount of €66.67m (HUF20b) is dedicated to this measure in 2015 and the expected size of the supported projects will be between €33,333 and €433,333 (HUF10m and HUF130m).

Furthermore, in the new programming period 2014-2020, the Priority #1 of GINOP foresees to support the improvement of the competitiveness of SMEs by providing support for capacity development, establishment and further development of business incubators, marketing and commercialisation activities of micro enterprises and SMEs, support the services of professional cluster management organisations as well as the development of supplier companies.

Also, innovation vouchers will be available for start-ups and SMEs to support collaboration with consultants and knowledge centres in the elaboration of their innovative products and services. The first call of the measure GINOP 2.1.4. was announced in March 2016 that allocates €10m (HUF3b) for this purpose.

5.3 Entrepreneurship skills and STEM policy

According to the IUS 2015, the number of doctoral graduates in the 25-34-year age group is 0.9 (per 1,000 people), which is only half of the EU-28 average (1.8) and it is at the same level as it was five years before. It is a positive trend, however, that the share of the population aged 30-34 having completed tertiary education increased slightly to 31.9% according to the IUS 2015 figures and reached 86% of the EU average (36.9%). The government has the objective to increase this figure to 35% by 2020 which seems to be achievable taking into account the trends in the past few years. (IUS, 2015)

The insurance of sufficient supply of (post)graduates in science, technology, engineering and mathematics (STEM) is clearly a priority of the STI policy in Hungary. In this respect the government stimulates the orientation of the younger generations towards STEM studies and limits the support for other specialisations at state HEIs.

In addition, two-thirds of the doctoral scholarships support doctoral studies in the “hard sciences”. In academic year 2015-2016, the share of those students who attend STEM specialisations reached 40% of the total. According to the state secretary responsible for higher education⁹⁷, the share of students attended STEP specialisations grew by 12% compared to 2010, which seems to be a significant progress of this policy. In order to increase the employability of fresh graduates the government has introduced the “dual education” that is based on practical training and apprenticeship at companies, but the share of this type of training is rather low for the time being.

More and more emphasis is given to learning of transversal competences such as critical thinking, problem solving, creativity, teamwork, and intercultural and communication skills. However, the education and training curricula are rather rigid and not easy to be changed, therefore it will take a while until this type of training will be embedded in standard curricula. Entrepreneurship education and training appears mainly as an elective course. The government expressed its support for further development of the Hungarian start-up ecosystem in the document entitled “Budapest Runway 2.0.2.0. – A Start-up Credo”⁹⁸ published in November 2013. The document has several concrete proposals for strengthening a competitive start-up and innovation ecosystem that is based on the following four components and the interactions between them: i) education and training, ii) access to funds, iii) taxation and regulation, and iv) enabling environment.

Priority #5 of GINOP foresees to support young entrepreneurs, staff training in young SMEs and promotion of social enterprises. In March 2016, a new call of innovation vouchers was announced that will be available for start-ups and SMEs to collaborate with consultants and knowledge centres. The first call of the measure GINOP 2.1.4. allocates €10m (HUF3b) for this purpose.

5.4 Access to finance

The first eight venture capital funds (Jeremie I) were set up within the frame of the New Széchenyi Venture Capital Programmes in the first half of 2010. The Jeremie II programme, launched in 2012, allocated €140.3m (HUF40.7b) venture capital to be invested by the end of 2015 in three different investment categories: seed funding, growth I and growth II, which reflects the focus of the funds with regard to stage of the company life cycle. With the Jeremie III and IV programmes altogether 28 Jeremie Funds were created by the end of 2014, out of which four funds focus specifically on the early stage investments. Nevertheless, there is still a scarcity of funding available in the “valley of death” stage. The situation could be improved by support of proof-of-concept phase of innovation.

According to the report published by the Hungarian National Bank in January 2015, 70% of venture capital invested in Hungary was connected to one of the Jeremie Funds in the period of January 2010 and end of June 2014. In this period, there were 50 exits but only a minority of them has connection to the Jeremie funds, while 62% of them were “trade sales”. (MNB, 2015)

Growth in venture capital investments has been the highest of all Member States in 2012 (0.069% of the GDP) when most of the Jeremie funds were launched, but then this figure fell back to 0.018% of the GDP in 2013. According to the report of the European Venture Capital Association, Hungary has the fourth strongest venture capital market in Central-Eastern-Europe. In Hungary 73 companies got a VC investment in 2014, 32 companies more than in 2013.

⁹⁷ See the interview at: <http://www.autopro.hu/oktatas/Palkovics-Laszlo-nem-alom-az-iparbarat-felsooktatas/16245/> (Date of access 10 October 2015)

⁹⁸ See the document at: <http://nkfih.gov.hu/policy-and-strategy/budapest-2-0-2-0-runway> (Date of access: 10 October 2015)

The total value of VC investments was €32m which is 92% higher than the year before. The share of VC investments reached 0.164% of the GDP in 2014. (EVCA, 2015)

Business angels and angel networks are new phenomena in Hungary. The first events of the Business Angel Club were organised by INNOSTART National Innovation Centre between 2007 and 2010. After INNOSTART stopped its activities, the series of events, a kind of business get-together happenings, were re-launched by the Startup Underground in October 2012. The objective of the club is to establish such an environment, where business angels could meet and learn about potential investment opportunities or start-ups could seek for early stage investment.

So far there is no specific taxation regime available for business angel investments.

Hungary had one of the most beneficiaries of financial engineering instruments such as loans, guarantees and venture capital in the Economic Development Operational Programme (GOP) in the programming period 2007-2013. Concerning the new financial period 2014-2020 the GINOP foresees to support the competitiveness of SMEs with revolving instruments such as microcredits, loans and combined financial instruments. For this type of measures the priority 8 of GINOP foresees €146.67m (HUF44b) and €100m (HUF30b) respectively for 2015, while Priority 1 of VEKOP foresees €11.8m (HUF3.67b) for 2016 but these instruments were not published by the end 2015.

5.5 R&D related FDI

The Hungarian Investment Promotion Agency (HIPA)⁹⁹ supports FDI investments with a one-stop-shop service. As part of the support package HIPA offers its assistance for potential investors by mapping the available subsidies and preparing tailor-made incentive packages for them by selecting the optimal combination of subsidies for the planned project.

A wide range of tax allowances is available for new investments and R&D. Hungary provides tax exemption on holding structures, capital gains on shares and intellectual property under certain conditions are tax free, and a 50% tax allowance is applicable on royalty incomes. There is no withholding tax on dividends, interest and royalty paid by a Hungarian company to a foreign company.

Each development tax allowance may be claimed for a 10-year period (beginning once the development is completed) in Corporate Income Tax ("CIT") returns within a maximum period of 14 years from the original application for the incentive. In any given tax year, the tax incentive is available for up to 80% of the tax payable, but in total up to the state aid intensity ceiling. Applications for tax incentives must be submitted to the Ministry for National Economy, and the Hungarian Government has the right to grant permission if the aggregate eligible costs of the investment exceed €100m. If the investment is below this threshold, taxpayers need only notify the Ministry for National Economy before starting the investment.

Set by the RDI strategy 2013-2020, Hungary would like to develop 30 global research centres in collaboration with the business sector by 2020. There are several multinational companies e.g. Ericson, IBM, Robert Bosch, Siemens, Nokia Siemens Network that already employ more than one thousand researchers in Hungary. Also such innovative forms of collaborations are explored such the establishment and financing university departments, for instance Robert Bosch at University Miskolc. AUDI even supports an entire faculty of automotive engineering at Széchenyi István University in Győr.

⁹⁹ See at: <http://hipa.hu/en/> (Date of access 10 October 2015)

In addition the strategic collaboration agreements should be mentioned that are made between the government and large multinational companies as well as domestic companies. These agreements aim at increasing investments, export activity and broadening the collaboration with Hungarian companies, higher education organisations and research centres. Until September 2015 the government signed 74 strategic collaboration agreements¹⁰⁰.

5.6 Knowledge markets

The Hungarian Intellectual Property Office (HIPO)¹⁰¹, the government office responsible for the protection of intellectual property, promotes awareness of intellectual property protection by providing several training options, and ensures the operation of the industrial property education system. In addition, HIPO develops, supports and operates the graduate and the post-graduate system of intellectual property education. In addition, it cooperates in the organisation of special trainings tailored to individual needs from basic to proficiency levels. HIPO also maintains and supports the operation of PATLIB centres in collaboration with Chambers of Commerce in almost all counties and university Technology Transfer Offices (TTOs). These local PATLIB centres offer basic IP consultancy services and IP trainings for researchers and local SMEs.

HIPO has extended its function from February 2012 to cover qualification of R&D activity. This service includes, on the one hand, preliminary qualifications that could be initiated optionally and on a voluntary basis by companies. On the other hand, HIPO qualifies the R&D activity of firms in response to requests received from the National Tax and Customs Administration (NAV).

The Hungarian Intellectual Property Agency (Hipavilon)¹⁰² is a government-owned non-profit company that supports the creation of knowledge based products and services and assists their commercialisation on Hungarian and foreign markets. The founder's rights are exercised by the Hungarian Intellectual Property Office as the government office responsible for the execution of intellectual property policy in Hungary. In collaboration with national partner organisations dedicated to innovation, Hipavilon provides services that cover every step of the innovation process and are tailored to the market needs to support Hungarian economic development efforts. Hipavilon has a network of both national and international contacts, highly qualified staff and access to specialised international databases that guarantee the quality of their services.

Specific policies and instruments for the development of knowledge markets for patenting and licensing could not be identified. However, a related initiative of the National Innovation Office is worth mentioning since it aims at the establishment of an "innovation marketplace". This is an interactive portal that was launched in October 2014, where innovative project owners can upload and share their projects seeking for investments¹⁰³.

¹⁰⁰ See at: <http://www.kormany.hu/hu/kulgazdasagi-es-kulugyminiszterium/strategiai-partnersegi-megallapodasok> (Date of access: 15 January 2016)

¹⁰¹ See at: <http://www.sztnh.gov.hu/en> (Date of access: 10 October)

¹⁰² See at: <http://hipavilon.hu/en> (Date of access: 10 October 2015)

¹⁰³ See at: <http://nkfih.gov.hu/innovacios-piacter-pontinno> (Date of access: 10 October 2015)

5.7 Public-private cooperation and knowledge transfer

5.7.1 Indicators

Funding: BES-funded publicly-performed R&D

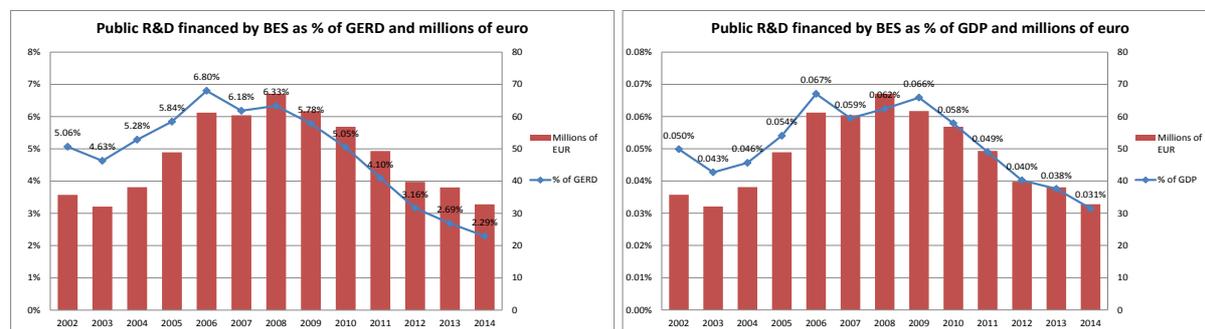


Figure 15 BES-funded public R&D in HUNGARY as % of GERD (in €MLN) and % of GDP

In Hungary, the business enterprise sector (BES)-funded public R&D expenditure as a percentage of GERD has been constantly decreasing since 2008 falling down to 2.29% in 2014, which is almost three times less than the value of 6.33% in 2008.

The indicator expressed as a percentage of GDP also shows a constantly descending trend since 2009 reaching the rather low value of 0.031% of GDP in 2014, which is less than half the value of 0.066% in 2009.

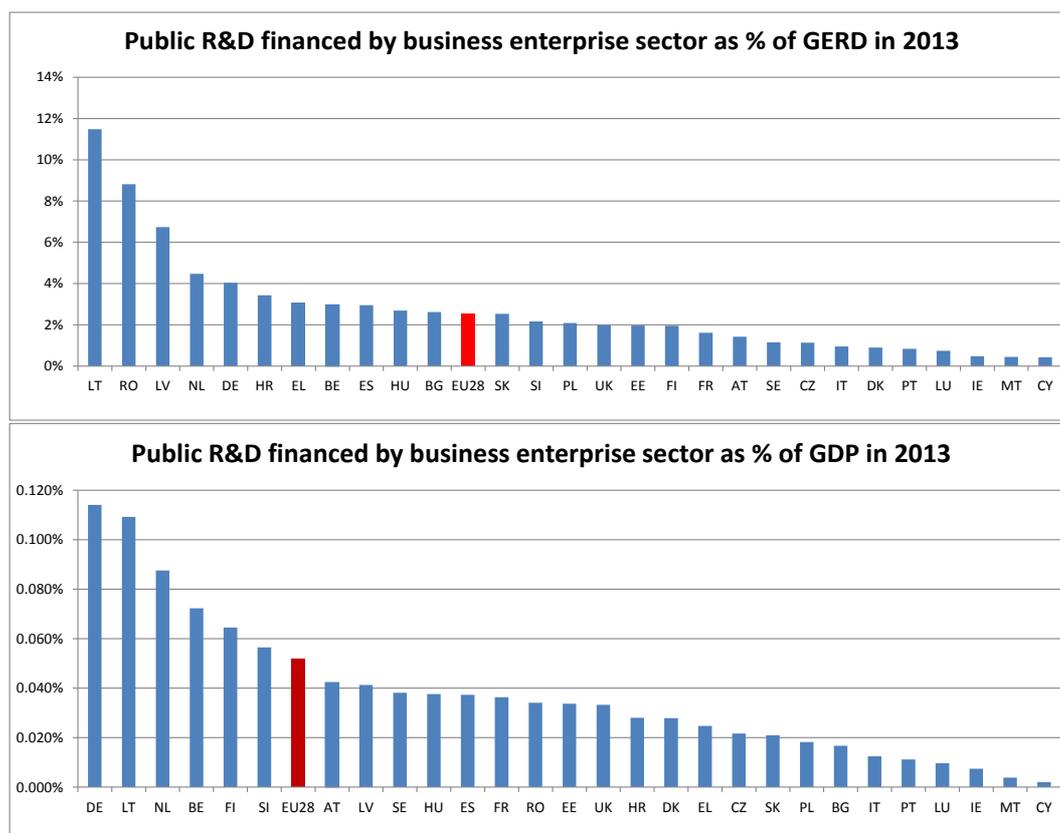


Figure 16 BES-funded public R&D as % of GERD and as % of GDP in 2013 in Member States¹⁰⁴

¹⁰⁴ 2011 was chosen as the latest data series providing a full comparison within EU-28.

The two charts in Figure 16 show the values of BES-funded public R&D in all EU-28 as percentages of GERD and GDP respectively.

As percentage of GERD, Hungary's level of BES-funded public R&D is slightly above the EU-28 average, but as percentage of GDP it is somewhat lower compared to the EU-28 average. On this indicator, Hungary holds the 10th place among EU 28 member states.

The tendencies of BES-funded public R&D depicted in Figures 15 and 16 can be related to the fact that the majority of the private companies prefer to carry out R&D activities on their own – i.e., they do not wish to involve third parties in R&D projects¹⁰⁵, Companies that plan to carry out their R&D projects in consortium arrangements mostly say they select universities and academies as partners. Despite this, co-operation with universities and research institutions is less than common as a feature of corporate R&D spending, both in 2013 and 2014.

The three external factors that predominantly define corporate R&D spending are the financing of R&D activities, the management of the R&D portfolio (setting priorities and allocating resources between R&D projects), and an HR policy that aims to retain the most valuable members of the workforce. In one interesting change from previous years (i.e., before 2014), when R&D spending was mostly influenced by the stability of the legal environment, this factor is less important this time (i.e., in 2014). This implies that recent legislative changes are not affecting R&D spending according to the companies involved in the survey. This is definitely a very positive development compared to the previous year, as a transparent and predictable regulatory background is the key to R&D activities and increases in R&D expenditure. Furthermore, based on the answers it may be concluded that the availability of various funding options (such as cash grants and tax incentives) and well qualified researchers would tempt companies to increase their R&D spending in the years to come.

¹⁰⁵ Hungary Corporate R&D Report 2014, Deloitte
http://www2.deloitte.com/content/dam/Deloitte/global/Documents/About-Deloitte/CE_RD_Hungary_2014.pdf

Funding: structural funds devoted to knowledge transfer

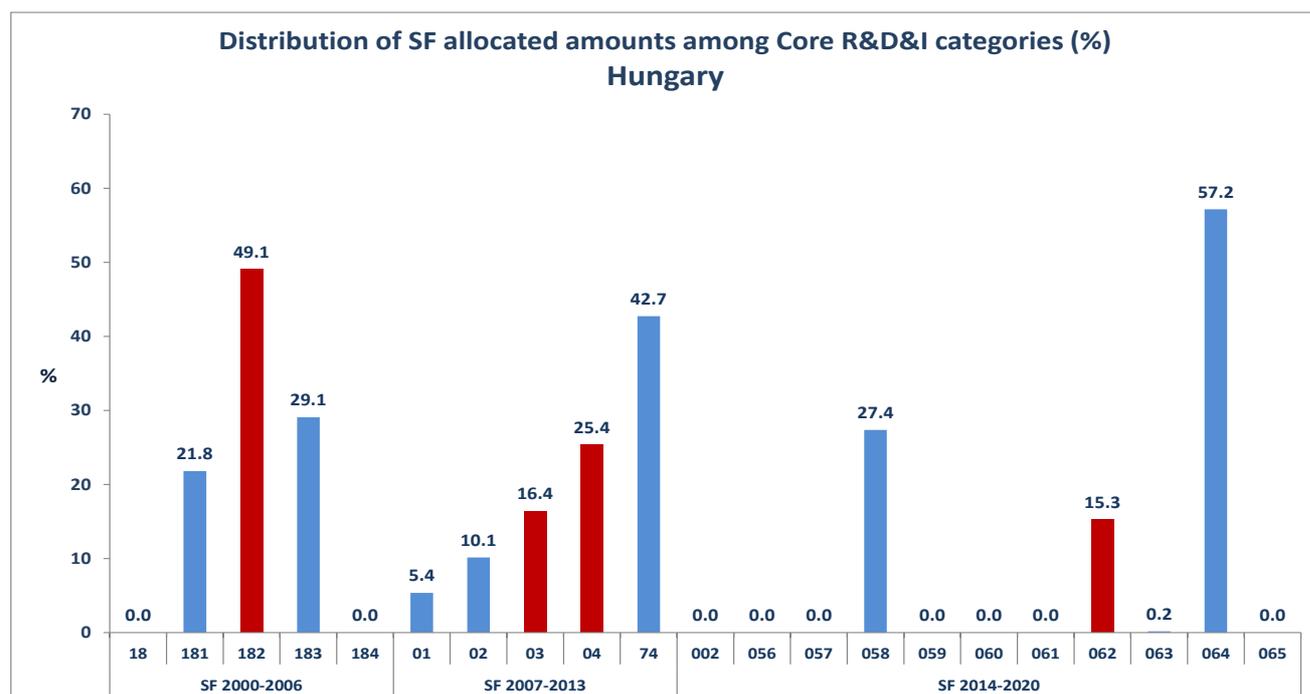


Figure 17 Structural Funds for core R&D activities 2000-2006, 2007-2013 and 2014-2020¹⁰⁶. We use the categories: 182 (2000-2006), 03 and 04 (2007-2013) and 062 (2014-2020) as proxies for KT activities.

For the current programming period Hungary has allocated 15.3% of its structural funds for core R&D activities to "Technology transfer and university-enterprise cooperation primarily benefiting SMEs" (compared to 49.1% for 2000-2006 and 41.8% in the 2007-2013 programming period). It almost equals the EU average of 15.7% (the EU average was 26.1% for 2000-2006 and 30.1% for 2007-2013).

¹⁰⁶ Figure 17 provides the Structural Funds allocated to Hungary for each of the above R&D categories. The red bars show the categories used as proxies for KT. Please note that the figures refer to EU funds and they do not include the part co-funded by the Member State. The categories for 2000-2006 include: 18. Research, technological development and innovation (RTDI); 181. Research projects based in universities and research institutes; 182. Innovation and technology transfers, establishment of networks and partnerships between business and/or research institutes; 183. RTDI infrastructures; 184. Training for researchers.

The categories for 2007-2013 include: 01. R&TD activities in research centres; 02. R&TD infrastructure and centres of competence in specific technology; 03. Technology transfer and improvement of cooperation networks; 04. Assistance to R&TD particular in SMEs; 74. Developing human potential in the field of research and innovation.

The categories for 2007-2013 include: 01. R&TD activities in research centres; 02. R&TD infrastructure and centres of competence in specific technology; 03. Technology transfer and improvement of cooperation networks; 04. Assistance to R&TD particular in SMEs; 74. Developing human potential in the field of research and innovation.

The categories for 2014-2020 include: 002. Research and Innovation processes in large enterprises; 056. Investment in infrastructure, capacities and equipment in SMEs directly linked to Research and Innovation activities; 057. Investment in infrastructure, capacities and equipment in large companies directly linked to Research and Innovation activities; 058. Research and Innovation infrastructure (public); 059. Research and Innovation infrastructure (private, including science parks); 060. Research and Innovation activities in public research centres and centres of competence including networking; 061. Research and Innovation activities in private research centres including networking; 062. Technology transfer and university-enterprise cooperation primarily benefiting SMEs; 063. Cluster support and business networks primarily benefiting SMEs; 064. Research and Innovation processes in SMEs (including voucher schemes, process, design, service and social innovation); 065. Research and Innovation infrastructure, processes, technology transfer and cooperation of enterprises focusing on the low carbon economy and on resilience to climate change.

Cooperation: share of innovative companies cooperating with academia

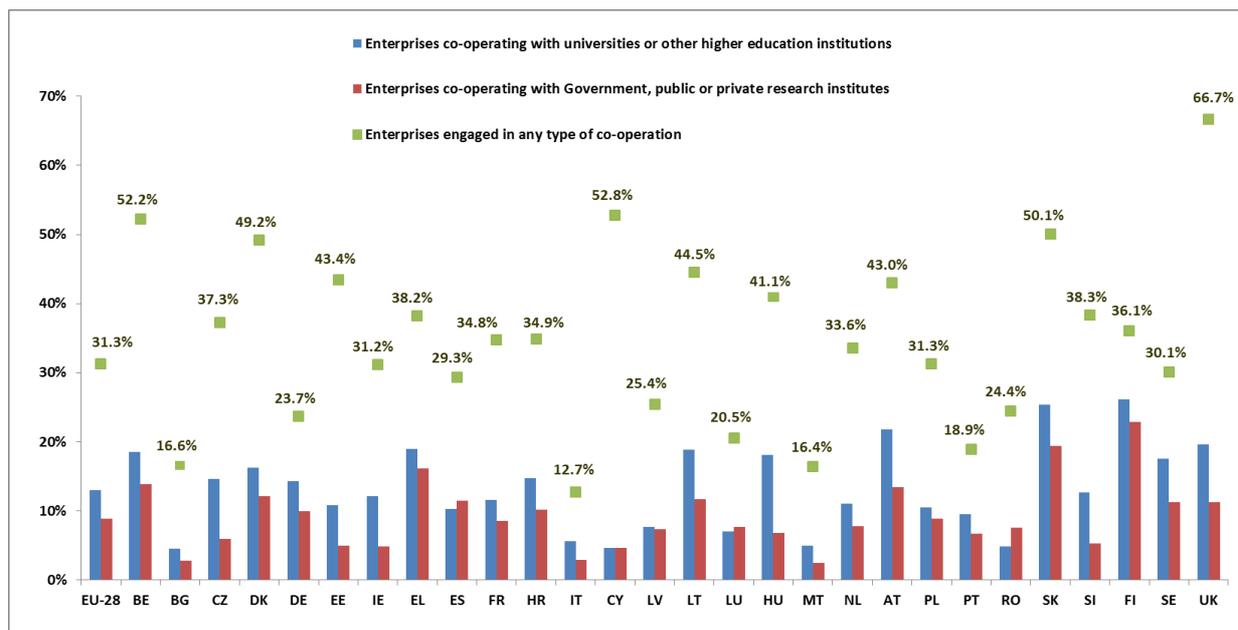


Figure 18 CIS survey 2012 – share of enterprises cooperating with academia

As shown in Figure 18, in Hungary, 41.1% of the innovative companies engage in any type of cooperation, which is above the EU average. Less than half of them (i.e., 18.1% of the total sample of innovative companies) cooperate with universities or other higher education institutions compared to 10.5% in Poland and 14.6% in the Czech Republic. Even less – 6.8% of the innovative companies cooperate with government, public or private research institutes (compared to 8.9% in Poland and 5.9% in the Czech Republic).

Cooperation: share of public-private co-publications

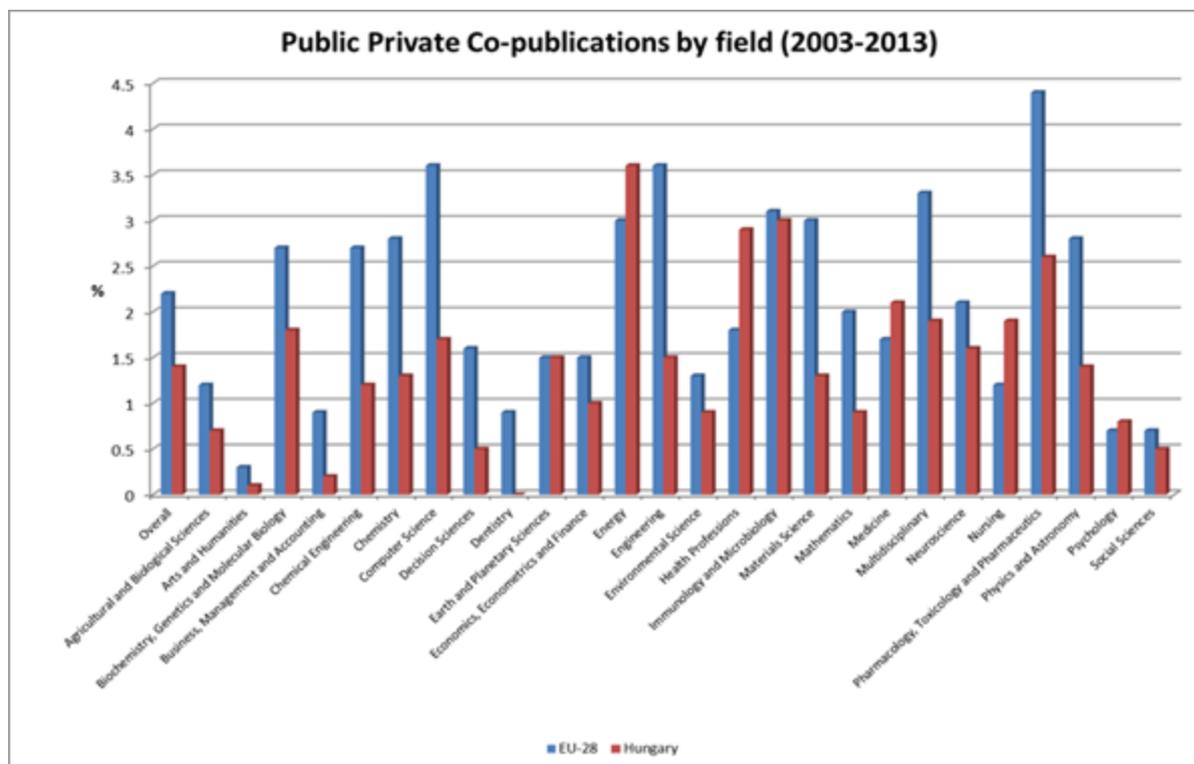


Figure 19 Co-publications by field 2003-2013 in Hungary, Scopus database

Figure 19 shows the 2003-2013 average percentages of academia-industry co-publications by field in Hungary compared to the European average. Scopus data indicate also that the percentage of co-publications has almost not changed in the last ten years (2003-2013), in 2013 being 1.4%. In 2013 Hungary had only 12.9 public-private co-publications per million of population compared to 29 for the EU-28 (and 9.8 for Poland, and 17.6 for the Czech Republic).¹⁰⁷ The domains with the highest percentage of academia-industry co-publications (excluding the multidisciplinary publications) are energy, immunology and microbiology, the health related professions, pharmacology, toxicology and pharmaceuticals.

5.7.2 Policy measures

The National Smart Specialisation Strategy, published in November 2014, mentions two specific pilot measures that address the interaction and strategic partnering between industry and academia. These pilot measures would be implemented along with the national priorities formulated in the smart specialisation strategy (see NIH, 2014a, pp. 78-79):

- “Open laboratories” means opening up public research laboratories and corporate labs for the public, in particular for other companies and SMEs. These open laboratories would be in charge of networking between public research centres, technology centres, large companies and SMEs and would support the innovation activities of those actors of the R&I system that have no research capacities and equipment. The benefit expected from the measure is that currently non-innovating companies could engage in some innovation activity with the help of open laboratories. Also, the open laboratories could play a “living lab” role.
- “Higher Education and Industry Collaboration Centres” (FIEK). In the framework of FIEK, a broad cooperation between industry and the higher education sector will be established. The aim of the FIEK is to develop sectoral training and R&D&I activities in a co-ordinated way, which is aligned with economic interests. The participants in FIEK aim to jointly develop the curricula and education methods on subjects that meet the technological needs of the industry, to harmonise their accreditation activities, to develop the common structure and content of the practice-oriented (so-called dual) education.

In the new programming period 2014-2020, the measure GINOP 2.3.4¹⁰⁸ will allocate €83.3m (HUF25b) to the development of a small number of FIEKs, while measure GINOP 2.2.1¹⁰⁹ foresees €166.67m (HUF50b) to be spent on “Competitiveness and excellence cooperations” between the private and public sector.

In the last five years, the following measures were launched to support research and innovation cooperation and knowledge transfer (KT) between public and private sector, in particular those related to KT performance and outcome:

- “Start-up_13” – development of the Hungarian start-up ecosystem;
- Development and strengthening of research and development centres, a scheme aimed at the strengthening of the business enterprises established as R&D centres, which were originally set up as so-called Co-operative Research Centres (KKK) and Regional Knowledge Centres at Universities (RET);

¹⁰⁷ Source: JRC IPTS RIO elaboration on Scopus data collected by Sciencematrix in a study for the European Commission DG RTD (Campbell, 2013). The share of public-private co-publications is derived from the Scival platform and is also based on Scopus data (September 2015). SciVal[®] is a registered trademark of Elsevier Properties S.A., used under license. The data on public-private co-publications is not fully compatible with the data included in the IUS, due to differences in the methodology and the publication database adopted.

¹⁰⁸ The call for proposals was published in December 2015 that is available at: <https://www.palyazat.gov.hu/node/57139> (Date of access: 15 January 2016)

¹⁰⁹ The call for proposals was published in December 2015 that is available at: https://www.palyazat.gov.hu/meqjelent_a_k_f_versenykepessegi_es_kivalosagi_egyuttmukodeseket_tamogato_felhivas (Date of access: 15 January 2016)

- Support to market-oriented R&D activities, a scheme aimed to support R&D projects that build on research results and are expected to develop prototypes of marketable products, services or processes representing high added value.

In the new programming period 2014-2020, Priority 1 of the "Economic Development and Innovation" Operational Programme (GINOP) foresees to support the improvement of the competitiveness of SMEs by developing industry parks and logistical service centres. Also, priority 2 of GINOP aims at the development of the Hungarian start-up ecosystem, among other measures, through establishment and funding of technology incubators.

5.8 Regulation and innovation

As presented earlier in this report the evaluation culture is traditionally weak in Hungary. However an impact assessment of the RDI funding programmes of the previous funding period 2007-2013 is in process as announced by the president of the National Research, Development and Innovation Office. Apart from that no public information is available on the impact of regulation on innovation.

5.9 Assessment of the framework conditions for business R&I

A wide range of direct RDI measures and tax incentives support business investment in research and innovation. The government has a clear priority to increase private research and innovation efforts and as a result BERD increased continuously in the past five years. However the highly open and export-oriented Hungarian economy has a dual character that inhibits quick progress. On the one hand it is dominated by large multinational companies embedded in global value chains that carry out gradually more and more RDI activities especially in pharmaceuticals, ICT and vehicle industry. These companies opened several R&D centres in Hungary that offer attractive working environment and international career opportunities to talented researchers and innovators. On the other hand domestic companies, especially SMEs rarely innovate and collaborate with knowledge providers as reflected in the innovation performance figures (see IUS, 2015). Recognised this dual character of the business sector RDI policy interventions cannot change the situation on the short term. Even if there are some start-up success stories and promising high-growth firms backed by Jeremie funds, slow progress could be foreseen in the years to come. The situation might change and private RDI expenditures could accelerate if stated RDI funding principles (i.e. focus on excellence, transparency and sustainability) could be implemented successfully in the new programming period 2014-2020.

6. Conclusions

From a systemic perspective the following *main weaknesses* of the Hungarian RDI system could be identified by using the Innovation Union self-assessment tool¹¹⁰:

- unstable, frequently changing STI governance structure even within government cycles that affects highly qualified personnel and generally low interest of stakeholders to be actively involved in the design of STI policy and related measures;
- weak supply of researchers especially in the public sector where age structure of researchers in many scientific disciplines, in particular in natural science and engineering, is unfavourable;
- weak technology transfer capacities and capabilities in public research centres and low motivation and empowerment of staff to exploit their research results;
- despite the large number of measures implemented in the years, the business-academy partnership and interoperability is still weak;
- innovative financing solutions such as private-public partnerships are not yet explored and pre-commercial procurement (PcP) projects are postponed to 2016;
- public funding of research focusing mainly on tackling and improving the competitiveness of the economy and not really oriented towards addressing major societal challenges, such as ageing and climate change as reflected in GBAORD figures;
- weak programme evaluation culture apart from the necessary ex-ante/ex-post evaluation of the Structural Fund programmes and low use of modern STI policy making tools such as foresight and technology assessment;
- education and training curricula mainly focus on factual learning while critical thinking, team and project work is not frequently used neither in secondary nor in higher education. Entrepreneurship education and training is rarely available in the curricula apart from these specialisations at dedicated faculties;
- low share of women in senior researchers and management positions in research and higher education organisations;
- weak entrepreneurial culture and framework conditions (e.g. frequently changing regulation) do not favour innovative entrepreneurship, specific support is not widely available to young innovative companies to help them commercialise their ideas rapidly and to promote internationalisation partly because university technology transfer offices set up in the past decade could not become stronger.

Opportunities of the Hungarian RDI system could be summarised in the following:

- high-quality higher education with established knowledge centres;
- increasing focus on natural science and engineering education, expansion of practice-oriented training (dual training) and reinforced innovation management education and entrepreneurship training;
- increasing economic role of networking, cooperation and innovation clusters as well as spreading of incubator services;
- closer cooperation between academia and the business sector;
- strengthening excellence in public research and education as well as development of centres of excellence that take part in world-class research projects;
- integrated research and innovation funding system that supports smart
- specialisation and avoids double financing.

¹¹⁰ See EC (2010) Annex 1.

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Abbreviations

BERD	Business Expenditures for Research and Development
BME	Budapesti Műszaki és Gazdaságtudományi Egyetem (Budapest University of Technology and Economics)
CERN	European Organisation for Nuclear Research
CIS	Community Innovation Survey
COST	European Cooperation in Science and Technology
CSR	Country Specific Recommendation
EFOP	Emberi-Erőforrás Fejlesztési Operatív Program (Human Resource Development Operational Programme)
EIS	European Innovation Scoreboard
ELTE	Eötvös Lóránd Egyetem (Eötvös Lóránd University)
EMMI	Emberi Erőforrások Minisztériuma (Ministry of Human Capacities)
ERA	European Research Area
ERA-NET	European Research Area Network
ESF	European Science Foundation
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EU-28	European Union including 28 Member States
FDI	Foreign Direct Investments
FP	European Framework Programme for Research and Technology Development
FP7	7 th Framework Programme
FIEK	Felsőoktatási és Ipari Együttműködési Központ (Higher Education and Industrial Cooperation Centre)
FTE	Full-time equivalent
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GINOP	Gazdaságfejlesztési és Innovációs Operatív Program (Economic Development and Innovation Operational Programme)
GOP	Gazdaságfejlesztési Operatív Program (Economic Development Operational Programme)
GOVERD	Government Intramural Expenditure on R&D
GUF	General University Funds
HERD	Higher Education Expenditure on R&D
HES	Higher Education Sector
HIPO	Szellemi Tulajdon Nemzeti Hivatal (Hungarian Intellectual Property Office)
HUF	Hungarian Forint
IP	Intellectual Property
IKOP	Integrált Közlekedésfejlesztési Operatív Program (Intelligent Transport Development Operational Programme)
IU SAT	Innovation Union Self-Assessment Tool
JÁT	Jedlik Ányos Terv (Jedlik Ányos Plan)
JTI	Joint Technology Initiative
KEHOP	Környezeti és Energiahatékonysági Operatív Program (Environmental and Energy Efficiency Operational Programme)
KSH	Központi Statisztikai Hivatal (Hungarian Central Statistical Office)
KTIA	Kutatási és Technológiai Innovációs Alap (Research and Technological Innovation Fund)
MISZ	Magyar Innovációs Szövetség (Hungarian Association of Innovation)

MTA	Magyar Tudományos Akadémia (Hungarian Academy of Sciences)
NAV	Nemzeti Adó- és Vámhivatal (National Tax and Customs Administration)
NFM	Nemzeti Fejlesztési Minisztérium (Ministry of National Resources)
NEKIFUT	Nemzeti Kutatási Infrastruktúra Felmérés és Útiterv (National Research Infrastructure Survey and Roadmap)
NFK	Nemzeti fejlesztési Kormánybizottság (National Development Cabinet)
NFM	Nemzeti Fejlesztési Minisztérium (Ministry of National Development)
NGM	Nemzetgazdasági Minisztérium (Ministry for National Economy)
NKFIH	Nemzeti Kutatási, Fejlesztési és Innovációs Hivatal (National Research, Development and Innovation Office)
NKFIA	Nemzeti Kutatási, Fejlesztési és Innovációs Alap (National Research, Development and Innovation Fund)
NIH	Nemzeti Innovációs Hivatal (National Innovation Office)
NIS	National Innovation System
NKITT	Nemzeti Kutatási, Innovációs és Tudománypolitikai Tanács (National Research, Innovation and Science Policy Council)
NKTH	Nemzeti Kutatási és Technológiai Hivatal (National Office for Research and Technology)
NRP	National Reform Programme
NTIT	Nemzeti Tudománypolitikai és Innovációs Testület (National Science Policy and Innovation Board)
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
OP	Operational Programme
OTKA	Országos Tudományos Kutatási Alapprogramok (National Scientific Research Fund)
PcP	Pre-commercial Procurement
PCT	Patent Cooperation Treaty
PPS	Purchasing Power Standard
PRO	Public Research Organisation
R&D	Research and Development
R&D&I	Research and Development and Innovation
RI	Research Infrastructure
RIÜ	Regionális Innovációs Ügynökség (Regional Innovation Agency)
ROP	Regionális Operatív Program (Regional Operational Programme)
RTDI	Research Technological Development and Innovation
S&E	Science and Engineering
S3	Nemzeti Intelligens Szakosodási Stratégia (National Smart Specialisation Strategy)
S&T	Science and Technology
SF	Structural Funds
SME	Small and Medium Sized Enterprise
SZTE	Szegedi Tudományegyetem (University of Szeged)
SZTNH	Szellemi Tulajdon Nemzeti Hivatala (Hungarian Intellectual Property Office)
STI	Science, Technology and Innovation
TÁMOP	Társadalmi Megújulás Operatív Program (Social Renewal Operational Programme)
TOP	Terület- és Településfejlesztési Operatív Program (Territorial and Settlement Development Operational Programme)
TTO	Technológiatranszfer Iroda (Technology Transfer Office)
TTPK	Tudomány- és Technológiapolitikai Kollégium (Science and

	Technology Policy Council)
VC	Venture Capital
VEKOP	Versenyképes Közép-Magyarország Operatív Program (Competitive Central-Hungary Operational Programme)
VKE	Versenyképességi és Kiválósági Együttműködések (Competitiveness and Excellence Cooperation)
VKSZ	Versenyképességi és Kiválósági Szerződések (Competitiveness and Excellence Cooperation Programme)

Annex 1 – List of the main funding programmes

Name of the funding programme	Timeline	Budget (HUF)	Target group
National Brain Programme	2013-2017	12b	research groups, scientists
NKFIA – Thematic research calls	2015	5.98b	scientists at PROs and HEIs
NKFIA – Post-doctorate grants	2015	1.57b	post-docs
NKFIA – Development of international R&D relationships	2015	3.68b	scientists at PROs and HEIs
NKFIA – Higher Education and Industry Cooperation Centres	2015	4b	small number of HEIs and large companies in Central Hungary
NKFIA - R&D Competitiveness and Excellence Cooperations and national R&D&I programmes	2015	9.1b	Public research centres, companies and HEIs
NKFIA – Innovation ecosystem	2015	1.5b	would-be entrepreneurs, start-ups and technology incubators
NKFIA – Innovation voucher	2016	1b	micro-companies, SMEs, start-ups
NKFIA IPARJOG_15- IP support	2015	0.3b	companies, PROs and HEIs in Central-Hungary and Hungarian individuals
NKFIA NEMZ_15 – Support of participation in joint EU projects (i.e. AAL, ECSEL and EUROSTARS)	2015	1.38b	companies, PROs and HEIs
NKFIA ERC_HU_15 – Support to unsuccessful ERC grantholders	2015-2016	0.45b	unsuccessful ERC grantholders with category A, B evaluation to implement their research at their home institution
GINOP 2.1.1 – Support of R&D&I activities of companies	2015	50b	companies with a seat outside of Central-Hungary
GINOP 2.1.3. – IP support	2015	1b	companies, PROs and HEIs
GINOP 2.1.4. – Innovation voucher	2016	3b	micro-companies, SMEs, start-ups
GINOP 2.1.5. – Innovation ecosystem	2015	5b	would-be entrepreneurs, start-ups and technology incubators
GINOP 2.1.7. – Development of prototypes, products, technologies and services	2015	20b	no specification is available yet
GINOP 2.2.1. – R&D Competitiveness and Excellence Cooperations	2015	50b	Public research centres, companies and HEIs
GINOP 2.3.1. – Development of international R&D relationships	2015	3.5b	scientists at PROs and HEIs
GINOP 2.3.2. – Strategic R&D workshops excellence	2015	40b	Public research centres, HEIs and NGOs
GINOP 2.3.3. – Strengthening of research infrastructures, internationalisation and networking	2015	20b	PROs and HEIs
GINOP 2.3.4. – Higher Education and Industry Cooperation Centres	2015	25	small number of HEIs and large companies outside of Central Hungary
GINOP 2.3.6. – Implementation of 2 nd phase of ELI-ALPS research centre	2015	40	ELI-ALPS

VEKOP – Support of R&D&I activities of companies	2016	5	companies with a seat in Central-Hungary
VEKOP – Development of prototypes, products, technologies and services	2016	2	no specification is available yet
VEKOP – Strategic R&D workshops excellence	2016	4	Public research centres, HEIs and NGOs
VEKOP – Strengthening of research infrastructures, internationalisation and networking	2016	2	PROS and HEIs

Source: NKFIH <http://nkfi.gov.hu/palyzatok/hazai-kfi-palyzatok> (Date of access: 15 January 2016)

Annex 2 – Evaluations, consultations, foresight exercises

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