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Research and Innovation Observatory Country Report 2016 Hungary

The 2016 series of the RIO Country Report analyses and assesses the development and performance of the national research and innovation system of the EU-28 Member States and related policies.

It aims at monitoring and evaluating the EU policy implementation as well as facilitating policy learning in the Member States.

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Foreword

The report offers an analysis of the R&I system in Hungary for 2016, including relevant policies and funding, with particular focus on topics of critical importance 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 January 2017. The report content is partly based on the RIO Country Report 2015 (Dóry and Slavcheva, 2016).

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HIGHLIGHTS

- In Hungary the economy grew by 2.9 in 2015 and is expected to remain relatively stable in 2016-2017.
- The budget deficit has been kept under the 3% level since 2012. Between 2013 and 2015 the budget deficit was further decreased from 2.6% of the GDP to 2.0%.
- The Hungarian industry is characterised by the dominant role of foreign controlled companies and strong export orientation. Foreign controlled enterprises accounted for 57.4% of the total production value in the Hungarian economy in 2014.
- The unemployment rate in Hungary has been constantly decreasing since its peak in 2011 of 11.2% down to 7.7% in 2014 and 6.8% in 2015. The main active policy tool to achieve this result has been the Government's public work scheme.
- Although Hungary is still a service-driven economy, during the past five years the share of industry (gross value added, % of GDP) has grown from 21.9% to 22.9% between 2010 and 2015 (without the construction sector).
- GERD has shown an upward trend with a rather strong growth rate between 2008 and 2013. At the same time R&D funding by the government has not increased proportionally. Contribution from the private sector grew faster and since 2007 the private sector has been the main contributor to GERD. The structural funds are a major source for R&D funding.

MAIN R&I POLICY CHALLENGES

- **Fostering innovation in domestic enterprises.** The level of innovation activities among the Hungarian companies is generally low, especially that of SMEs. A major reason for that is the high concentration of R&D activities in large multinational companies. It has been a high priority of the government to boost business R&D in the last decade through tax incentives and direct measures supporting business R&D.
- **Enhancing the cooperation between science, higher education and business.** Supporting cooperation between business and academia has been a high priority of the STI policy in Hungary that resulted in a number of positive developments such as the growing number of corporate research centres and R&D labs. As these partnerships usually last until they run out of public funding, sustainability of the cooperation is a real challenge.
- **Reinforcing the R&I governance and transfer mechanisms.** Frequent changes in the institutional set-up of the Hungarian R&I system have led to a situation in the financing period 2014-2020 in which R&I governance lacks experienced employees. The recently established centralisation of all major R&I resources could potentially speed up and simplify the access to RDI funding resources.
- **Supplying the R&I system with high-skilled human resources.** Currently the level of human resources of science and technology (HRST) is still lagging behind the EU average. Since 2013 the number of R&D units and the number of R&D personnel has been decreasing, although differently in the various sectors. The government tries to turn about this trend and puts a lot of emphasis on the reform of higher education, focusing on more S&E graduates, strengthening the doctoral studies, and forming long-term basis of the R&D funding of HEIs.

MAIN R&I POLICY DEVELOPMENTS IN 2016

- [Peer review of the Hungarian R&I system. H2020 Policy support Facility](#)
- [Infrastructure development of the higher education organisations](#)
- [National technology and intellectual property venture capital programme and Smart specialisation venture capital programme](#)

1. Main R&I policy developments in 2016

[Peer review of the Hungarian R&I system. H2020 Policy support Facility](#)

The peer review panel summarized the experiences in seven main policy messages: 1) Hungary has a vast science and innovation potential which can be exploited through reform and sustained increases in public funding; 2) R&I vision is needed shared across government and stakeholders; 3) A structured involvement of stakeholders is needed in overseeing the operations of NKFIH to increase transparency and responsibility; 4) Improved processes for evaluation and funding of R&I programmes and projects needed; 5) Researcher careers should be made more attractive; 6) More favourable business environment and 7) Stronger cooperation between public and private R&I actors.

[Infrastructure development of the higher education organisations](#)

In addition to GINOP calls published in 2015 focusing on strengthening research infrastructures and in line with the higher education strategy, a new call EFOP 4.2.1 was announced in November 2016 to support the infrastructure development of the higher education organisations with a budget of €93.5m from the Human Resources Operational Programme (EFOP). In order to support the smart specialisation of Hungarian HEIs, the EFOP 3.6.1. call was launched in July 2016. The programme has a budget of €64.5m and aims to improve the framework conditions of research and innovation, social innovation, to reinforce the knowledge base and transfer mechanisms at HEIs.

[National technology and intellectual property venture capital programme and Smart specialisation venture capital programme](#)

Two large financial instruments were introduced with a combined budget of €322.6m falling under the category of refundable measures. The first programme will have a total budget of €161.3M out of which €64.5m will be co-funded by the National Development Bank in addition to the GINOP resources. The primary aim of this fund will be to ensure complementary funding for those companies (including start-ups) that will be nurtured by the incubators.

1.1 Focus on national and regional smart specialisation strategies

Description and timing: After consultation with stakeholders and definition of sub-national (i.e. county) level specialisations, the National Smart Specialisation Strategy 2013-2020 was adopted by government decree 1640/2014. (XI.14.) on 14 November 2014. It outlines three national specialisations: systems science, smart production and sustainable society. The strategy lists six "national sectoral priorities" focused on specific sectors or technological areas, two "horizontal priorities" (including ICT and inclusive and sustainable society with viable environment), and a number of "smart technologies" (NIH, 2014a). The government decree also approved the Hungarian participation in the Roadmap of the European Strategy Forum on Research Infrastructures (ESFRI) as it was envisaged in the document "Research infrastructures in Hungary" (NIH 2014b).

New developments: The implementation of the National Smart Specialisation Strategy has begun under the supervision of the National Research, Development and Innovation

Office (NKFIH). The defined specialisations of the S3 strategy are embedded in the calls of the NKFIH that were published for the new programming period 2014-2020. The Office aims to ensure the implementation of the S3 strategy through a wide portfolio of competitive RDI calls. The budget of various calls is defined by the Annual Development Framework that serves as an "implementation plan" of the S3 strategy. The operative portfolio of RDI calls is available on the NKFIH website¹.

Until the end of September 2016, the NKFIH published RDI calls with a total of €1.68bn (HUF521bn) framework budget out of which €443.5m (HUF137.5bn) was allocated to RDI projects.

Outstanding issues: Competitive RDI calls in the period 2015-2016 focus on three main priorities: i) support of RDI activities of companies, ii) development of RDI infrastructure and capacities, and iii) support of collaboration between academia and business. These new RDI calls consider the S3 priorities in the following ways: the RDI calls contain explicitly S3 priorities within the stated objectives of the calls, and the evaluation process favours those project proposals that are in line with S3 priorities. Consequently, the strategic objectives of S3 are realised at the level of the entire RDI portfolio.

2. Economic context

In Hungary the economy grew by 3.1% in 2015 following the 4% growth in 2014. That is a sign of a solid recovery that started in 2013 with a sustained rate of growth between 2-4% - slightly higher than that of the EU average (0.2-2%) in the same period. According to the Hungarian Central Statistical Office (KSH) the GDP growth continued also in 2016. According to ECFIN (2016) the Hungarian GDP growth is forecast to remain relatively stable in 2016-2017. It is set to decrease to 2.1% in 2016 as EU funds disbursement temporarily dips due to a transition between programming periods and the slack in the economy diminishes. The Hungarian industry is characterised by the dominant role of foreign controlled companies and strong export orientation. Foreign controlled enterprises account for 57.4% of the total production value in the Hungarian economy (in 2014). Their share is highest in manufacturing (71.2%), information and communication (65.2%) and electricity (58.7%) industries. The Hungarian government considers the reduction of the debt rate as one of its main priorities. As a result the budget deficit has been kept under the 3% level since 2012. Between 2013 and 2015 the budget deficit has been further decreased from 2.6% of the GDP to 2.0%, thus Hungary has performed better than the EU-28 average. Similarly, the public debt-to-GDP ratio has been declining (since its peak at 81% in 2011) on a modest rate to 75% in 2015. It is still relatively high compared to other Central and Eastern European countries but it can further decrease in the next years according to the European Commission forecast (EC 2016). The unemployment rate in Hungary has been constantly decreasing since its peak in 2011 of 11.2% down to 7.7% in 2014 and 6.8% in 2015. In parallel, the activity rate has increased and now it clearly exceeds the pre-financial crisis level (but is still lagging behind the EU average). The main active policy tool to achieve this result was the Government's public work scheme. An important recent trend is the growing number of people working abroad. According to the KSH their share in the total employed workforce is 2.7% after growing by 8.1% since the previous year. (KSH, 2016)

Productivity growth seems to be very limited in the past few years. While the EU-28 average labour productivity continuously improved since 2010 by 4.5% until 2015, unfortunately the Hungarian case shows almost stagnation – with only 1.6% growth by 2015 - and thus falling behind most EU member countries. Besides labour productivity, the total factor productivity remains also on a very low level although showing some improvement from 2014 to 2015 (from -1.0% to 0.2%). (OECD 2016b) Looking into the

¹<http://nkfih.gov.hu/palyazatok/hazai-kfi-palyazatok>

details of labour productivity, OECD (2016a) offers more insights. Labour productivity measured as a % of GDP per hour worked seems to grow by 2.45% between 2009 and 2014 but during the same period grew only 0.18% of GDP per person employed. This is in relation with the governmental efforts to employ more low-skilled workforce through e.g. the public work schemes. Thus labour productivity contribution to the growth of GDP per capita has decreased significantly compared to the period 2001-2007. The smaller a firm is, the bigger its gap to the OECD productivity average. Manufacturing is the main contributor to business sector productivity growth and to a lesser extent business services (mainly trade, hotels and transport).

2.1 Structure of the economy

Although Hungary is still a service-driven economy, during the past five years the share of industry (gross value added, % of GDP) has grown from 21.9% to 22.9% between 2010 and 2015 (without the construction sector). This share is the 7th highest among the EU member states, only after Ireland, some other Central and Eastern European Countries and Germany. The growing share of the industry was mainly fuelled by new vehicle manufacturing capacities, which continue to largely determine the country's industrial performance in 2016 (as well as in the next years). Manufacturing has an 89% share in industry and while industry has grown by 15.9% between 2010 and 2015 this rate was 22.9% for manufacturing. Simultaneously the services sector also has a higher growth contribution based on increase in tourism, retail trade and strengthening the domestic demand. Yet, the share of knowledge intensive services (% of total value added) is above 34% (but shrinking) while the share of high- and medium-high manufacturing is above 13% (growing since 2010). According to the central Statistical office, besides the vehicle industry, the pharmaceuticals and machinery are spending the highest amount on R&D²

2.2 Business environment

Hungary ranks 41st out of 190 economies in the "Doing business 2017" report produced by the World Bank³, which is one position higher compared to 2016⁴. Globally, Hungary ranks first (!) according to "trading across borders" indicator and has prominent 20th position for "getting credit" among 190 countries involved in the report. Apart from "getting electricity" (121st) the second worst position is reflected by the indicator protecting minority investors which ranks 81st. (World Bank, 2016a) Hungary stands at 75 in the ranking of 190 economies on the ease of starting a business, which is a better position than its neighbouring countries' ranking, i.e. Austria 111th, Czech Republic 67th, Poland 107th. In 2015 Hungary made starting a business more difficult by increasing the paid-in minimum capital requirement. In the last few years, another major change in starting a business was the increase of the registration fees for limited liability companies, and the addition of new tax registration at the time of incorporation, as well as and enforcing a requirement for mandatory registration with the Hungarian Chamber of Commerce and Industry in 2013. (World Bank, 2016b)

2.3 Supply of human resources

According to EIS (2016), the annual growth rate of new doctorate graduates in Hungary is above the EU-average (3.6% vs. 2%). The proportion of doctorate students in science

² <http://statinfo.ksh.hu/Stainfo/haViewer.jsp>

³ The rankings are benchmarked to June 2016 and based on the average of each economy's distance to frontier (DTF) scores for the 11 topics included in aggregate ranking.

⁴ Doing business 2016 ranking shown is not last year's published ranking but a comparable ranking for DB2016 that captures the effects of such factors as data corrections and the changes in methodology.

and technology fields is stagnating at only 0.2% of the population aged 20-29 years (EU-28 average: 0.5%, 2014). Yet, the share of new STEM graduates (as % of 1000 population) has increased since 2010 from 1.1% to 1.4% by 2014 but remains well below the EU-28 average of 2.3% (2014). More positive is the picture of the tertiary education attainment (as a % of the population aged 30-34) which has grown from 26.1% in 2010 to 34.3% in 2015. Furthermore, Hungary is ranked at the 7th place in the Digital Economy and Society Index (DESI) 2016 in the share of ICT specialists among employed individuals. (DESI, 2016)

3. Main R&I actors

The central governmental actor in the Hungarian RDI system is the National Research, Development and Innovation Office (NKFIH), which is responsible for the realisation of the governmental policies and the management of the RDI funds (both national and EU sources). The NKFIH also incorporates the National Research, Development and Innovation (NKFI) Fund - the main domestic financial source for RDI. The aim of the high centralisation of the managing and financing bodies is the better coordination of the governmental programmes and the financial mechanisms supporting basic research, experimental development and innovation.

The Ministry of National Economy and the Ministry of National Development act as managing authorities in running the Operational Programmes. In addition, the Ministry of Human Capacities and the Ministry of Agriculture have responsibilities in research and development overseeing sectoral activities.

A relatively new actor in the Hungarian RDI system from the broader governmental sphere is a foundation of the Hungarian Central Bank (Magyar Nemzeti Bank, MNB). In 2014 the MNB established six foundations under the strong criticism of the parliamentary opposition and generated active public debates. The establishment and the operation of the foundations are challenged due to their limited transparency.

The academic sector in Hungary consists of two main groups of actors: a) the Hungarian Academy of Sciences (MTA) and its research institutions and b) higher education research units. The MTA is the single most significant public research actor representing 71.2% of the R&D expenditures of the public research sector (KSH, 2014). In total the public research sector spending is comparable to that of the higher education sector's research expenditures (HUF 60.6bn and HUF 59.5bn in 2014). The MTA and its network of research institutes are engaged mainly in basic or discovery research. Research units of higher education institutions are focused more on applied research largely due to their collaboration with the business sphere.

In the past few years the business sector has become the main research performer in Hungary registering a remarkable growth both in R&D expenditures and in the number of R&D personnel. The share of R&D funded by the business has reached 0.66% of GDP by 2015. The business R&D expenditure (BERD) has been growing significantly since 2010 (from 0.69 to 1.01% of GDP) but it is still only three-quarters of the level of EU-28 average in 2015. The business sector R&D activities are concentrated at and dominated by few large, mainly multinational corporations so the largest share of BERD is generated by large companies. Enterprises with more than 250 employees account for 51% of BERD spent in 2014 while enterprises with 50-249 employees account for 20%, and enterprises with 10-49 employees account for 17%. It can be seen as a positive trend that since 2010 the share of the largest companies has slightly declined and that of the medium and small-sized enterprises (SMEs) has slightly increased. There are specific support programmes (from national and EU sources, and through the JEREMIE programme) for start-up companies but their number and performance is still limited at national level.

4. R&I trends

Total GERD in Hungary was €1,492.33m in 2015. There are three main sources of R&D funding in Hungary: the business sector (€751.19m), the government sector (€523.15m), and the foreign funding (€225.90m). GERD showed an upward trend with a rather strong growth rate between 2008 and 2013. At the same time R&D funding by the government has not increased proportionally⁵. Contribution from the private sector grew faster 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.

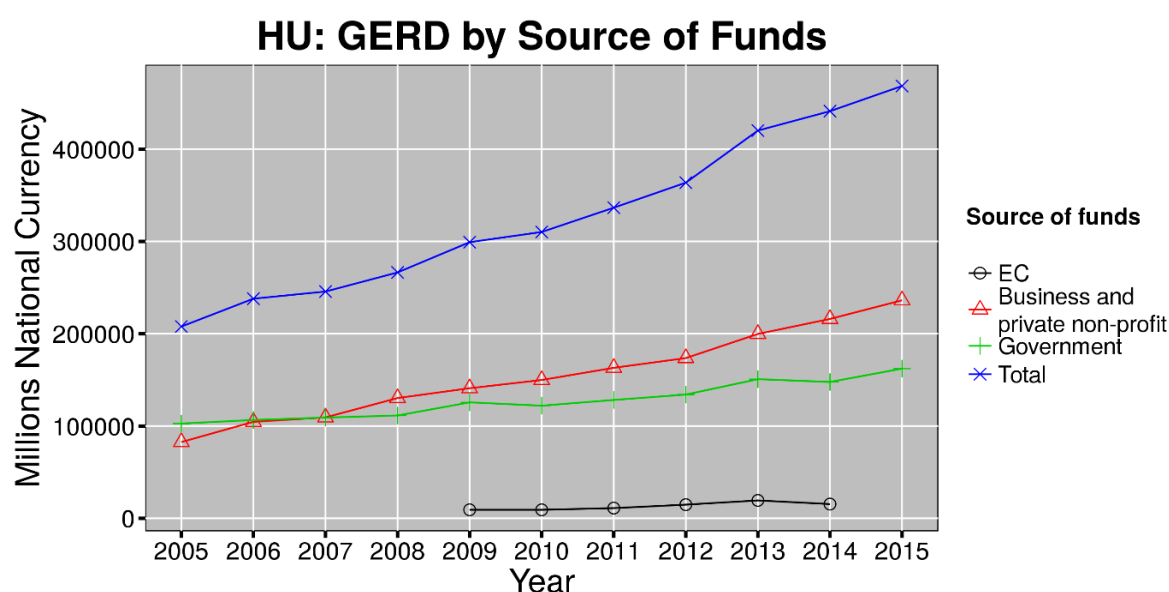


Figure 1. Government funding of the total GERD

Data source: Eurostat, November 2016

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

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. The R&D tax incentives are still playing an important element of the domestic support policy. The direct costs of the R&D carried out in their own scope of activities have long been deductible from the tax base of the corporate tax, sole proprietor's income tax, local business tax and innovation contribution. For example, those paying corporate tax accounted for HUF288b (€933m) R&D tax allowance in 2014. (NRP, 2016, p.21)

Reported by the NRP (2016), there will be a new and potentially significant allowance introduced in 2016, i.e., local governments may decide at their discretion that enterprises can reduce the sum of their local business tax by 10% of the direct costs of R&D. More and more corporations are using the tax relief which was extended to

⁵ 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%.

researchers participating in doctoral programmes in 2014; the estimated number of doctoral students employed in industry exceeded 850 in 2015. (NRP, 2016)

4.2 Private R&D expenditure

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.

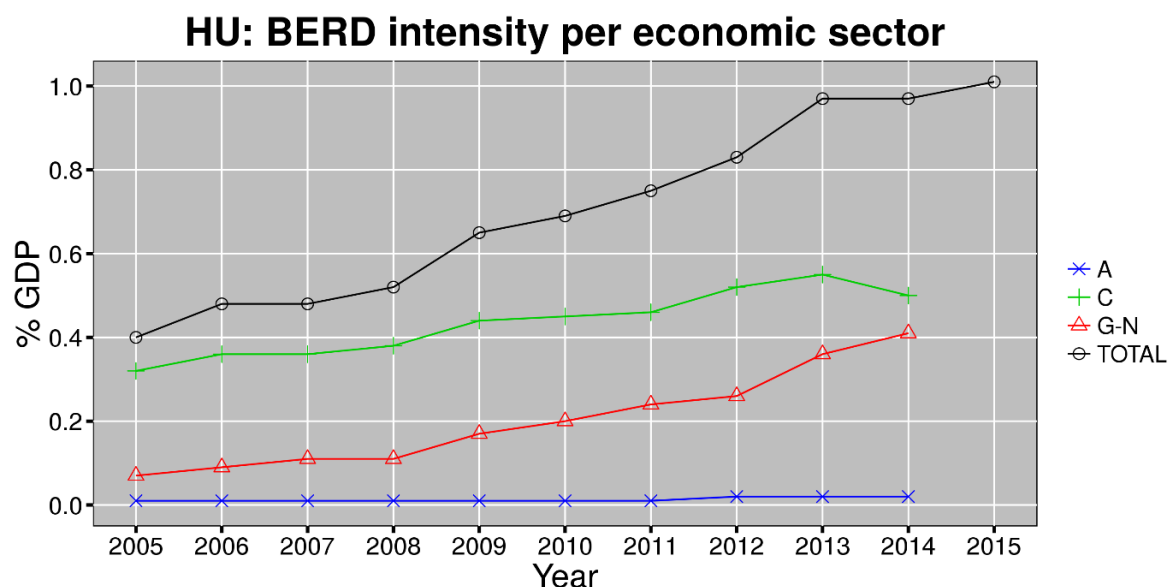


Figure 2. BERD intensity broken down by most important macro sectors (A= agriculture, C= manufacture, G_N=services).

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 in 2015. Government funding and funding from abroad, therefore, account for about 40% of the funding of business R&D.

Manufacturing has increased its R&D intensity from about 0.4% to 1.01% of GDP between 2005 and 2015, and it performed a bit more than half of Hungarian business R&D in 2014, but services have since 2008 increased their R&D intensity from about 0.1% to 0.41% of GDP in 2014 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 Scoreboard⁶. The pharmaceutical company spent HUF 38.8b (approx. €130m) on research and development in 2012, which amounts to 11.9% of its consolidated sales revenue⁷ and about 15% of total Hungarian business R&D intensity. Apart from a small drop in 2007, 2011 and 2013 pharmaceuticals has seen a steady increase in business R&D since 2005.

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

⁶<http://iri.jrc.ec.europa.eu/scoreboard14.html>

⁷<https://www.richter.hu/en-US/research-development/Pages/Research-activity.aspx>

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 a share of 9-11% depending on the year⁸.

4.3 Public sector innovation and civil society engagement

Public-sector innovation is defined as a new or significantly improved service, communication method, process or organisational method. The European Public Sector Innovation Scoreboard 2013 report concludes that Hungary belongs to the EU countries with 12 below-average scores out of the 22 total indicators observed. Hungary lags behind especially in government effectiveness, regulatory quality, increased efficiency of government services due to the use of ICT, online availability of public services, share of service and process innovators that innovate in-house as well as the government procurement as a driver of business innovation and importance of innovation in procurement. Collaboration in the public sector is a major issue: Hungary ranks the last in terms of the amount of group work to develop innovation (6%)⁹.

In 2016, Hungary ranks 46th out of 193 countries in the E-Government Development Index of the United Nations¹⁰. This is 7 positions worse than in 2014. In comparison, Austria ranks 16th, Slovenia 21st, Croatia 37th, the Czech Republic 50th, and Slovakia 67th. The E-participation rank (91st out of 193) worsened compared to 2014 (75th position out of 193), the corresponding Hungarian score is only half of the United Kingdom's.

Citizen science initiatives are premature in Hungary, as research agendas are generally set by scientists or the management of research institutes that focus more on achievement of scientific excellence than addressing societal grand challenges and knowledge exploitation.

5. Innovation challenges

5.1 Challenge 1: Fostering innovation in domestic enterprises

Description

The Innovation Union Scoreboard 2016 classifies Hungary as a "moderate innovator". The level of innovation activities among the Hungarian companies is generally low, especially that of SMEs. Although the total turnover of the business sector stemming from innovation (9.7%) is close to the EU-28 average (11.9%), only about one-tenth (10.6%) of the Hungarian SMEs could be considered as innovative companies (EU-28 average is 28.7%). Based on IUS 2016 data, only 12.8% of the SMEs introduce some kind of product or process innovations in Hungary, a slight decrease compared to 2012 (14.1%), that is less than half of the EU-28 average (30.6%). These processes could be explained by the high concentration of R&D activities in large companies: 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 R&D and often wait for public support in order to launch new R&I projects. However, such funding very often does not reach the SMEs as they lack the level of tender and administration capacities required by national and EU funds. In general, SMEs try to avoid taking risk and rarely invest in RDI activities from their own pocket.

⁸ If we exclude small companies with less than 10 employees, the shares increase significantly but the pattern remains the same.

⁹the highest is that of Sweden's public administration. (EPSIS, 2013)

¹⁰See Hungarian E-government data at: <https://publicadministration.un.org/egovkb/en-us/Data/Country-Information/id/75-Hungary> (Date of access: 15 August 2016)

Policy response

It has been a high priority of the government to boost business R&D in the last decade through tax incentives and direct measures supporting business R&D. During the planning of the 2014-2020 financial period, the government has decided to allocate 60% of total available funding from the Structural Funds for economic development purposes, including non-refundable and refundable resources¹¹. In 2016, research infrastructures will receive fewer funds than in 2015, which is mainly due to the fade out support of the ELI laser research laboratory¹². Research projects receive less than 2% of the funds slightly more than the international RDI activities. Ongoing programmes such as the "IPR support", "Innovation voucher", "Innovation ecosystem", "Smart specialisation venture capital programme" and "Prototype, product, technology and service development" clearly focus on supporting research and innovation activities of SMEs and start-ups.

The largest part of domestic funding (37%) from NKFIA is allocated to the National Competitiveness and Excellence Program for enhancing technology transfer and for Supporting Business RDI activities.

Policy assessment

There are several measures in place that build on each other and form a fully-fledged business RDI support mix. Still 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. In addition, it depends a lot on the quality of the implementation of RDI 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 synchronise all the components of the innovation driving mechanisms.

5.2 Challenge 2: Enhancing the cooperation between science, higher education and business

Description

Supporting cooperation between business and academia has been a high priority of STI policy in Hungary that resulted in a number of positive developments such as the growing number of corporate research centres and R&D labs (predominantly run by multinationals) that work closely with academic partners. Several RDI measures supported the creation of this type of partnerships that usually last until they run out of public funding. Therefore, sustainability of these partnerships is a real challenge as they are not necessarily based on mutual interest of participating parties and lack longer-term vision or commitment that could be financed with own resources later on. The life-cycle of business-academia partnerships is usually relatively short (1-2 years) and mainly

¹¹ The Economic Development and Innovation Operational Programme (GINOP) and the Competitive Central Hungary Operational Programme (VEKOP) are of particular importance for STI policy that focus on five major objectives: 1) business RDI activities, 2) (technology and knowledge) transfer, 3) (research) infrastructure, 4) research projects and 5) international RDI. According to the Annual Development Framework Programme, clearly the business RDI activities will receive most of the funds in 2016 (71%) among the main objectives of the GINOP sources. This objective received the highest growth of available funds compared to 2015 (four times more).

¹² In this way the transfer activities became the 2nd largest target with 15% of all funds (but the emphasis is put on the NKFIA sources in 2016 compared to GINOP in the previous year)

focused on one-off development or problem-solving. An issue related to this is the lacking growth and internationalisation ambitions of Hungarian firms.

Hungary became one of the manufacturing centres of the European vehicle industry with prominent international players as well as their suppliers that attract most talented people but they haven't got a strong demand for domestic RDI services to be delivered by Hungarian SMEs and public institutions.

Interchange of personnel between companies and academic institutions is not yet a widely discovered practice, because of low salaries in public research and lack of longer-term funding for such initiatives.

Policy response

There has been a series of measures that supported science-industry collaborations and technology transfer activities in the past few years. Currently, there are several RDI programmes in place that support collaborative research and innovation activities between different sectors. These are: i) R&D Competitiveness and Excellence Partnerships, ii) Supporting innovation in international cooperation and iii) the so-called Higher Education-Industrial Cooperation Centres (FIEK). Its main objective is the development of the R&D&I background at universities that can provide innovation capacity for the Hungarian economy. In 2016, five FIEK projects were selected backing with dominant local industrial players outside of Central-Hungary region. Three FIEKs will be established in Central-Hungary from the domestic NKFI Fund. Furthermore, the Ministry for Human Capacities and the Hungarian Academy of Sciences signed an agreement in June 2016 to deepen the cooperation between HAS and universities, including through the establishment of joint research groups and shared access to research infrastructures.

Policy 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 amended 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 were 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.

5.3 Challenge 3: Reinforcing the R&I governance and transfer mechanisms

Description

Frequent changes in the institutional set-up of the Hungarian R&I system in the past two decades led to a situation in the financing period 2014-2020 in which R&I governance lacks of experienced employees who can implement strategies quickly and run an efficient and effective R&I funding system. High level strategies such as the RDI Strategy 2013-2020 set ambitious goals but have not defined an appropriate feedback and evaluation mechanism that could contribute to the fine-tuning and improvement of the funding system. The centralisation of all major R&I resources under the newly established NKFIH (in January 2015) could potentially speed up and simplify the access to RDI funding resources, however companies, especially SME's complain in public fora that the review of the proposals is slow and the administrative burden / red tape is not lowered in contracting as it was promised.. It should be noted that in the case of GINOP and VEKOP programmes the Managing Authority (Ministry for National Economy) is the

organisation responsible for the preparation of the funding decisions and contracting. Most of the applications – especially those supporting business RDI activities – are evaluated by the state project evaluation system coordinated by the Prime Minister's Office. In some cases the applicants have to obtain a supporting policy judgement based on the NKFIH peer review before applying at the Managing Authority. It takes time for this new system to work with full capacity.

Apart from strong focus on reinforcing research excellence, the government lacks a holistic strategy concerning the development of an innovation ecosystem with dedicated and well-funded institutions, including support and transfer mechanisms that could contribute to the exploitation of research results and to facilitate business-academia collaboration, more prominently with SMEs.

Policy response

The National Research, Technology and Innovation Office (NKFIH) was established in January 2015 in order to ensure government level coordination of research and innovation policies, and to provide stable institutional background of predictable financing as well as efficient and transparent RDI funding. The programme portfolio of the Office covers the entire innovation chain from basic research through applied and experimental research to the commercialization of innovative products and services. The distribution of sources is based on three pillars: supporting business RDI activities, supporting the collaboration of enterprises and research institutes, higher education, technology transfer activities, and strengthening the research infrastructure. A number of RDI programmes have been launched under coordination of the NKFIH since 2015. The new office also runs the database of RDI projects that are financed by public resources.

In the past few years, a number of 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 R&I system. However, the activity of these bodies is very limited and has minor influence on budget decisions.

More recently, the Irinyi-Plan, i.e., Industrial Development Strategy for 2016-2020 was announced in March 2016. The aim of the Irinyi-plan is to further increase the share of manufacturing in the Hungarian GDP with the support of seven key industries: vehicle and special machine production, green economy, ICT hardware production, health and food industries and the defence industry. The aims are supported by the governmental programmes for strengthening business RDI capacities, for start-up and high-tech innovation ecosystems both from national and EU sources. (NGM, 2016)

Policy assessment

Although innovation intermediaries such as regional innovation agencies and technology transfer offices were established in universities in the past decade, they couldn't facilitate a necessary cultural change of old attitudes. They were unable to reach a critical mass in size and specialisation, and they could not prove their usefulness in policy making. The consequence is that these intermediaries have been ailing for years because of lack of sufficient funding and loss of experienced staff.

5.4 Challenge 4: Supplying the R&I system with high-skilled human resources

Description

Both the total number of research units and number of researchers (FTE) decreased in 2014-2015 (by 11.3% and 3.4% respectively). The decrease in the number of researchers took place mainly in the public sector. This trend has a strong implication on the implementation of the RDI Strategy 2013-2020 that foresaw to increase the number of the researchers to 56,000 by 2020. This means that the number of researchers would have to be increased by around 50% between 2015 and 2020. In more recent communications the achievement of this target is pushed to be achieved by 2023. Notwithstanding, it is a real challenge for the public research units to keep and motivate researchers while they have to fulfil their teaching obligations, raise funding and collaborate with the business sector. There is only a limited number of dedicated researcher positions at higher education organisations and the majority of faculty members can dedicate only a fraction of their time to research activities. Since the publication of the higher education concept entitled "*Gear shift in higher education*" in late 2014, there has been no more recent strategy or implementation plan released that would support the development of career path of faculty members and supporting excellence in higher education that was foreseen by the draft strategy. An update of the higher education strategy was published in December 2016 that contains specific mid-term objectives in order to improve the performance of the Hungarian HEI system.

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 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).

Policy response

Both the RDI strategy 2013-2020 and the higher education strategy emphasised the importance of strengthening of the research infrastructure and supporting excellence in academia. In a response, new GINOP programmes support "Excellence of strategic R&D centres" and "Strengthening research infrastructures, internationalisation and networking" with the aim to provide better research conditions and higher salaries for researchers. From the domestic NKFI Fund a new post-doctoral research programme was implemented in 2016 and in addition to, this programme will be continuing in 2017 and MTA established 11 new Momentum research groups. Also, the National Programme in Brain Sciences aims to strengthen research centres and institutes belonging to the international front line with €20.6m and turn back brain-drain by inviting and employing researchers working abroad with a total budget of €18.1.

Policy assessment

The Momentum programme of MTA could be seen as a successful example but it is only accessible to relatively low number of excellent researchers. Even if salaries were raised by 15% in the higher education in 2016 still there is insufficient supply of researchers, especially in STEM fields. This is mainly 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. However, currently the impact of the latest reforms in the higher education system is still to be seen but the overall decreasing

funding of education, and the decreasing HERD do not forecast a quick change in the situation of HRST in the public and higher education sectors.

6. Focus on creating and stimulating markets

It is a protracted challenge of the Hungarian RDI system to boost the business sphere's demand for R&D results and its competences to engage in innovation and create lead markets for enhancing economic development. The government has a broad programme portfolio of enhancing business RDI capabilities, increase innovation demand and improve enterprises' international expansion. These are complemented by such indirect tools as the procurement purchases or the tax system instruments.

The National RDI strategy (2013-2020) already identified the enlivening of the R&D demand as one of the key issues in the development of the Hungarian RDI system. It has forecasted the enhancement of public sector demand and the use of pre-competitive tools (such as pre-commercial procurement, innovative procurement purchases and so on). Among the instruments of the national S3 strategy, procurements are listed again as one of the important market instruments supporting the demand-side interventions.

In Hungary, the total number of procurements has increased significantly between 2012 and 2014 and stagnated in the last year. In the volume of the procedures there is a huge, almost 80% increase in 2012-2013 which is thanks to a few unique cases and since 2013 the volume is gradually decreasing, by almost 10% in 2015. Within the procedures the number and volume of EU co-funded procurements has significantly decreased. While the number of procurements co-funded by the EU gets up to 50% of the total in 2014, it decreased to 46% in 2015. The decrease in volume was even bigger, from 49% to 38%.

There is no separate statistics available on the number and volume of RDI-related procurements, pre-commercial procurements or public procurements for innovation but in some major cases the government intention is observable to align the procurement commissions with the RDI policy objectives (such as the procurement of the Centre for Budapest Transport for an electronic ticket system or some elements of the investment of the underground line 4). Although various pilot and research projects are run with Hungarian participation under the funding of the EU (e.g. RAPIDE, EMAILE, SMART@FIRE projects) and a Hungarian PCP procedure has been adopted as early as 2013 (see RIO country report, 2015) it is still not a common practice. According to the annual report of the Public Procurement Authority of 2015 the committed advocacy of innovative procurements (along with sustainable and socially important procurements) are among the future aims.

The public procurement act (Act CXLIII of 2015) provides some exemptions from certain rules in the case of subsidised procurements among others for R&D and innovation, for job creation, for training. In these cases the publishers are exempt from the obligation to launch a public procurement procedure already at a threshold of €80k (HUF25m).

However the procurement procedures are suffering from some major weaknesses that question the efficiency of this tool. According to a recent report by the Corruption Research Centre Budapest (CRCB, 2016) the Hungarian public procurements are still lacking competition and transparency and thus highly exposed for corruption. In the investigated period of 2009-2015 transparency has decreased, risk of corruption increased and the EU-funded projects face a higher level of corruption than the national-funded ones.

More direct intervention from the government is the re-launch of the Innovation Voucher program to boost the demand for RDI services and results from the business sphere. The government has already had an innovation voucher program (called INNOCSEKK, 2005-2009) which was assessed as a highly successful program in terms of the number of participating firms and of the funds employed. A notable recommendation from an

international evaluating panel was to broaden the involved firms beyond the innovative, R&D active SMEs. (PRO INNO, 2009) In 2015 the government launched a new innovation voucher initiative (based on the EU Structural Funds) in line with the priorities of the national S3 strategy. The innovation voucher program aims to involve SMEs into the innovation chain and intensify RDI activities of SMEs. A strong feature of the program is the supporting of university-industry collaborations. Furthermore, the FIEK programme also targets the strengthening of the business sector demand for RDI. Recently the government has announced that it will elaborate a new bus production strategy for the benefit of Hungarian bus producing companies and to preserve the long-standing heritage in this specific field of the vehicle industry. Such strategy may contribute not only to the preservation of production facilities but to the revival and strengthening of RDI capacities at various companies.

A third tool of the Hungarian government to indirectly support business demand for R&D and innovation is tax exemption. For long (but repeatedly modified) there is an R&D tax allowance opportunity for R&D carried out in the enterprises' own scope of activities. In 2014 this tax allowance amounted to ~€935m (HUF288b). (NRP, 2016) A new feature of the tax system in 2016 is the opportunity for local governments to allow a reduction of local tax by 10% of the R&D direct costs. It may also broaden the RDI capacity of firms that they can now employ researchers with reduced labour tax. In November 2016, the minister of Ministry for National Economy announced a new tax exemption in the modification of the tax system in 2017. According to the new regulation, investors in early stages of start-up companies could deduct 25% of their investment.

STI policy and programme evaluation is not an integral part of the Hungarian RDI system. Monitoring of project development is a common practice but it is often soft and the selection of indicators is often left for the choice of beneficiaries. Programme evaluation – that is an independent, external evaluation – is much more incidental. In the case of programmes funded by the EU Structural Funds evaluations are compulsory and most of them publicly available. However, in the case of programmes funded by the NKFI, evaluations are ordered only in some cases. Decisions about the termination and launch of programmes – even if they are supporting basically the same aims – are made based on the availability of funds and rarely on results and impacts.

Nevertheless, the president of the new National Research, Development and Innovation Office stresses in his public interventions that the new office will carry out an assessment of the programmes and projects in order to learn about the impact of funded projects. This process has started in the NKFI Office, but no reports of this assessment have been published. The new Act on Innovation (LXXVI of 2014) contains among the basic principles the realisation of independent evaluations but no detailed implementation regulations are attached to this principle yet. New regulations have been introduced in 2016 as the framework of the state project evaluation system (Act XXXIII of 2016 and Governmental Decree 1216/2016 (IV. 29.)). This system relies on civil servants who will carry out the evaluation work besides their daily tasks. Each proposal will be evaluated by two experts employed and paid by the state.

The Act on Legislation (CXXX of 2010) made it compulsory to do an ex ante and ex post impact assessment of all new laws and pieces of government legislation. Among the aspects for assessments the burden of bureaucracy, the environmental and health consequences have to be considered as the priorities, but no particular mention is made to R&D and/or innovation related impacts. It is not part of the Hungarian policy-making practice and procedure to prepare evaluations or analysis on the impact of legislation and it is clearly not a practice in the STI policy. The NKIFH takes efforts to change this situation. The first step on this way was that the Government approved and published the Government Decree No. 433/2016 about the rules of the evaluation of R&I programmes and projects financed by the National Research, Development and Innovation Fund. In 2011 the government launched a trade opening towards the East trying to boost export to the post-soviet states and Asia. However, currently (2015) 81% of the Hungarian export is oriented to the EU member states and this share has even

increased from 78% in 2010. The main tool for facilitating the Hungarian export activity is the Hungarian National Trade House that aims to support enterprises that are capable of exporting and finding adequate business partners in the international markets. The trading house provides state guarantee to their partners in order to facilitate smooth trade activities and it has a commercial presence in almost 40 countries of four continents. Furthermore, it has a dedicated start-up programme entitled Innotrade that provides exhibition opportunities and participations in international start-up events for the enterprises that seek international market entry. The exports to the EU-28 have grown by 28% to €72.4m between 2010 and 2015 while during the same time the extra-EU exports have increased by 6% (although in the middle of the time period it was much higher).

In this context, 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 end of November 2016, the government signed 72 strategic collaboration agreements¹³.

Other forms of support for the internationalisation of domestic enterprises are launched under the GINOP and VEKOP programmes (continuous since 2015). The supported activities by these programmes include the participation in trade fairs, business meetings, international networking and related job creation.

More specifically in the field of RDI, SMEs may apply for funding available for the participation in the Horizon2020 SME development tool, for the participation in international project consortium development, for the participation in the EUREKA or ERA-NET initiatives.

Inward FDI are also treated as a priority by the Hungarian government. Large subsidies are available on an individual basis for multinational companies who are establishing now – or developing existing – production facilities. The main agency to support inward investments is the Hungarian Investment Promotion Agency (HIPA).

¹³See at: <http://www.kormany.hu/hu/kulgazdasagi-es-kulugyminiszterium/strategiai-partnersegi-megallapodasok> (Date of access: 22 November 2016)

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Abbreviations

BERD	Business Expenditures for Research and Development
EFOP	Emberi-Erőforrás Fejlesztési Operatív Program (Human Resource Development Operational Programme)
EIS	European Innovation Scoreboard
EMMI	Emberi Erőforrások Minisztériuma (Ministry of Human Capacities)
ERA	European Research Area
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
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
HERD	Higher Education Expenditure on R&D
HES	Higher Education Sector
HUF	Hungarian Forint
IP	Intellectual Property
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
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 Szerződéses (Competitiveness and Excellence Cooperation Programme)
WEF	World Economic Forum

Factsheet

	2009	2010	2011	2012	2013	2014	2015	2016
GDP per capita (euro per capita)	9300	9800	10100	10000	10200	10600	11100	
Value added of services as share of the total value added (% of total)	66.85	66.39	65.35	65.22	65.46	64.5	63.97	
Value added of manufacturing as share of the total value added (%)	20.26	21.63	22.03	22.32	22.49	23.32	24.59	
Employment in manufacturing as share of total employment (%)	20.42	20.04	20.56	19.88	18.75	18.4	18	
Employment in services as share of total employment (%)	62.95	63.62	63.57	64.11	65.8	66.48	67.49	
Share of Foreign controlled enterprises in the total nb of enterprises (%)	3.31	3.3	3.38	3.42	3.54			
Labour productivity (Index, 2010=100)	88.9	100	102.1	101.4	102.8	101.6	102.8	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	0.47	0.52	0.48	0.52	0.5	0.6	0.61	
Summary Innovation Index (rank)	26	25	25	25	26	26	26	
Innovative enterprises as a share of total number of enterprises (CIS data) (%)				32.5		25.6		
Innovation output indicator (Rank, Intra-EU Comparison)			13	12	13	13		
Turnover from innovation as % of total turnover (Eurostat)		13.7		9.7				
Country position in Doing Business (Ease of doing business index WB)(1=most business-friendly regulations)						40	42	41
Ease of getting credit (WB GII) (Rank)						16	18	
Venture capital investment as % of GDP (seed, start-up and later stage)	0.001	0.018	0.03	0.068	0.017	0.029	0.022	
EC Digital Economy & Society Index (DESI) (Rank)						21	21	20
E-Government Development Index Rank		27				39		46
Online availability of public services - Percentage of individuals having interactions with public authorities via Internet (last 12 months)	30	34	38	42	37	49	42	48
GERD (as % of GDP)	1.14	1.15	1.19	1.27	1.39	1.36	1.38	
GBAORD (as % of GDP)	0.46	0.36	0.29	0.34	0.65	0.28	0.31	
R&D funded by GOV (% of GDP)	0.48	0.45	0.46	0.47	0.5	0.46	0.48	
BERD (% of GDP)	0.65	0.69	0.75	0.83	0.97	0.97	1.01	
Research excellence composite indicator (Rank)				13				
Percentage of scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country		7.55	7.39	7.6	6.46			
Public-private co-publications per million population	23.03	26.76	23.73	20.74	21.7	23.18		
World Share of PCT applications	0.14	0.15	0.14	0.14	0.12	0.1		

List of Figures

Figure 1. Government funding of the total GERD

Figure 2. BERD intensity broken down by most important macro sectors (A= agriculture, C= manufacture, G_N=services).

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