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RIO Country Report 2017: Hungary

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Dőry, T.
Csonka, L.
Slavcheva, M.

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

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RIO Country Report 2017

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

Summary

Key findings

The Hungarian growth rate remained on a steady level in 2016, achieving 2.2% and it is expected to achieve higher levels (3.5-3.8%) in 2017-2018 as the absorption of EU structural funds intensifies.

The general government deficit has been kept under a modest level, reaching 1.8% of the GDP in 2016 and the government debt as a % of GDP has also been decreasing since 2011 reaching 74.1% in 2016 and it is expected to continue so in the next years.

The employment situation further improved reaching an employment rate of 71.5% in 2016, slightly above the EU level. In parallel, the unemployment rate fell to 4.3% by the 2nd quarter of 2017.

After more than a decade of continuous growth, the gross expenditures on R&D declined in 2016 to 1.22% of the GDP. This fall was mainly due to the decreasing public funding.

Especially the public sources co-funded by the EU Structural Funds fell back in 2016 but the national sources of R&D also declined. Those sources are expected to be used much more intensely in 2017.

Business R&D expenditures achieved a small growth in nominal terms in 2016 mainly thanks to the activities of firms in pharmaceuticals and the vehicle industry.

Not only in general economic terms but also within the business sector's R&D activities the importance of foreign-owned companies is still extremely high.

Challenges for R&I policy-making in Hungary

Fostering innovation in domestic enterprises. Small domestic firms lack their own funding for R&D and often wait for public support in order to launch new R&I projects. Recognising this issue, a large number of measures have been put in place to support private research and innovation activities, however the statistics has not reflected these investments so far.

Enhancing the cooperation between science, higher education and business. Several programmes were launched to support the cooperation between science, higher education and business in the past decade. However, they had usually short life-span to foster the achievement of significant results. The new Higher Education and Industry Cooperation Centres (FIEKs) have been established for a span of at least four years and it is expected that they would create long-standing bridges between academia and business which requires changes in the culture and attitudes in both spheres.

Supporting the demand side of innovation. Hungary has had little experience so far in pre-commercial public procurement (PcP). In fact, the National RDI Strategy 2013-2020 identified the enlivening of the R&D demand as one of the key issues in the development of the Hungarian RDI system. Although the National Reform Plan 2016 foresaw a PcP programme, this planned call was not published in the portfolio of RDI calls in 2017 due to the lack of demand from the public sector side.

Supplying the R&I system with high-skilled human resources. 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 future. There are several initiatives to improve the situation but it will take several years to reverse the trends.

Main R&I developments in 2017

- Updating the National RDI Strategy 2013-2020 is in progress with broad participation of prominent domestic and international experts. The consultation process with the stakeholders ended in 2017 to be followed by a national consultation. It is foreseen that the renewed RDI strategy will be adopted in the course of 2018.
- Mid-term Policy Strategy of Gear Shift in Higher Education, Action Plan 2016-2020, is under implementation in higher education institutions supervised by the Ministry of Human Capacities.
- As a result of OECD-EU country review within the HEInnovate framework, the report Supporting Entrepreneurship and Innovation in Higher Education in Hungary was officially published in November 2017.

Smart specialisation

The implementation of the National Smart Specialisation Strategy (S3) 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.[1]

The S3 strategy is aligned with the National RDI Strategy 2013-2020[2] and provides a sectoral and territorial detailing of that strategy and therefore the two are – to a certain extent - intertwined. The NRDI Office launched the renewal of the RDI Strategy involving key stakeholders in May 2017 which may influence the S3 strategy, too.

The national S3 strategy put focus on the promotion of smart production. Partly from these antecedents the government started to elaborate a new strategy of Industry 4.0 in 2016 (Irinyi Plan). 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. In the context of the Irinyi Plan so called "sample factories" are planned to be established in several locations throughout Hungary that will be announced in autumn 2017[3].

The RDI calls published by NKFIH and other calls co-funded by the EU Structural Funds 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.

[1] http://nkfih.gov.hu/funding/portfolio-of-calls-to

[2] https://www.google.hu/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0ahUKEwiSgoP-m4LWAhUTSJoKHZUbD94QFggtMAE&url=http%3A%2F%2Fnkfih.gov.hu%2Fdownload.php%3FdocID%3D25559&usg=AFQjCNHGWqZ5UucVKfn4KUoHOFpeV1GPyg(Date of access: 31 August 2017)

[3] http://www.kormany.hu/hu/nemzetgazdasagi-miniszterium/belgazdasagert-felelos-allamtitkarsag/hirek/hamarosan-elindulhat-a-mintagyarak-letesitese (Date of access: 31 August 2017)

Foreword

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

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Authors

Tibor Dőry, Széchenyi István University (Győr, Hungary)

László Csonka, IKU Innovation Research Centre, Financial Research Co. (Budapest, Hungary)

Milena Slavcheva, European Commission, Directorate-General Joint Research Centre, (Brussels, Belgium)

Contents

1 Economic context for R&I

The Hungarian growth rate remained on a steady level in 2016, achieving 2.2% following the 3.1% growth in 2015. The growth rate in 2016 was slightly higher than the EU-28 average (1.9%). It seems that the absorption of EU funds – and the lack of it - is very influential on the country's economic performance. It is expected that in 2017 the rate of absorption will increase as more transfers from the EU are expected. The projected GDP growth rate for 2017 and 2018 is around 3.5% (EC ECFIN Forecast Winter 2017). In 2017 economic growth is driven by the increasing domestic demand and international trade. The trade surplus increased to over 10% of the GDP in 2016 from 8.9% in 2015 but this may not be sustainable in 2017 as the growing domestic demand will boost import. Additionally, the volume of investments went up by 34% in the first quarter of 2017 (KSH, 2017[4]) mainly driven by construction investments (up by 49% thanks to real estate activities) and machinery & equipment (up by 25%). Investments in manufacturing grew by 32% affecting almost all sub-sectors.

The general government deficit has been kept under a modest level, reaching 1.8% of the GDP in 2016, marginally above the EU-28 average (1.7%). It is expected (EC ECFIN Forecast Winter 2017) to slightly grow in 2017 depending on the effect of the corporate tax cuts and on the fulfilment of spending on investments. The government debt as a percentage of GDP has been decreasing since 2011 reaching 74.1% in 2016 and it is expected to continue to decrease in the next years. (EC ECFIN Forecast Winter 2017)

Employment rate has been growing since 2010 and in 2016 it even slightly surpassed the level of EU-28 (71.5% compared to 71.1% in age group 20-64). It is expected to grow in the next years but with a more modest rate. At the same time unemployment rate fell to 5.1% in 2016 and according to the KSH it decreased to 4.3% in the April-June period of 2017. (KSH, 2017[5]) This creates a labour market situation characterised by high demand for employees and as a consequence dynamically growing wages. The mismatch between the supply and demand of workforce will be a major problem in the next years for business organisations.[6] The employment in knowledge-intensive service sectors is below 37% (of the total employment) - slightly below the EU-average - and in high- and medium high-technology manufacturing it was below 7% in 2016, above EU-average.

The labour productivity has practically stagnated since 2010. The highest growths were registered in 2013 and 2015 with 2.8% but there was a fall to only 1.8% in 2016 (compared to 2010). At the same time the EU-28 achieved a continuous growth in the labour productivity, the index reaching 5.8% in 2016 (compared to 2010). The low level of Hungarian labour productivity is partly influenced by the government's public work scheme which typically targets the low-skilled less trained employees. In the pre-crisis period (2004-2008) economic growth was supported by 1.6% average yearly growth of total factor productivity in Hungary but this element practically disappeared after 2008 and stagnated on a 0.0-0.3% level between 2009 and 2015. This is clearly related to the low investment levels registered in Hungary in the past few years. Particularly important is the productivity differential between larger and typically foreign owned firms and domestic-owned SMEs in favour of the former. (EC, 2017)

1.1 Structure of the economy

After many years of growth, the contribution of industry to the gross value added (henceforth: GVA) in Hungary stopped growing in 2016, yet it is still one of the highest among the EU member states. The contribution of manufacturing to GVA was 23.9% of

[4] http://www.ksh.hu/gyorstajekoztatok/#/en/document/ber1703
[5] http://www.ksh.hu/gyorstajekoztatok/#/en/document/mun1706
[6] Matheika, Palócz 2017 http://www.vosz.hu/hirek/99-a-magyarorszagi-munkaero-helyzet-attekintese-2017-elejen (Date of access: 15 August 2017)

the total value added in 2016 (0.7% lower than the previous year) and the contribution of the total industry decreased to 27% (0.8% lower). Both values are significantly higher than the shares of the EU-28 average.[7] Still the service sector is the main contributor to the GVA with a level over 64% in 2016. In the service sectors knowledge intensive services (henceforth: KIS) are responsible for more than 53% of the value added, which means that these sectors are producing above 34% of the total value added generated in Hungary.

According to KSH[8], the industrial output rose by 5.4% between September 2016 and 2017 and the manufacturing production by 5.7% over the same period. Within manufacturing, the pharmaceuticals and the computer, electronic and optical products sectors grew most dynamically (16-27%), while the manufacture of food products and of the largest sub-sector, the transport equipment, has dropped (-1 and -1.8% respectively). The main driving force of growth in the manufacturing sectors was export which rose overall by 5.9% in this period.

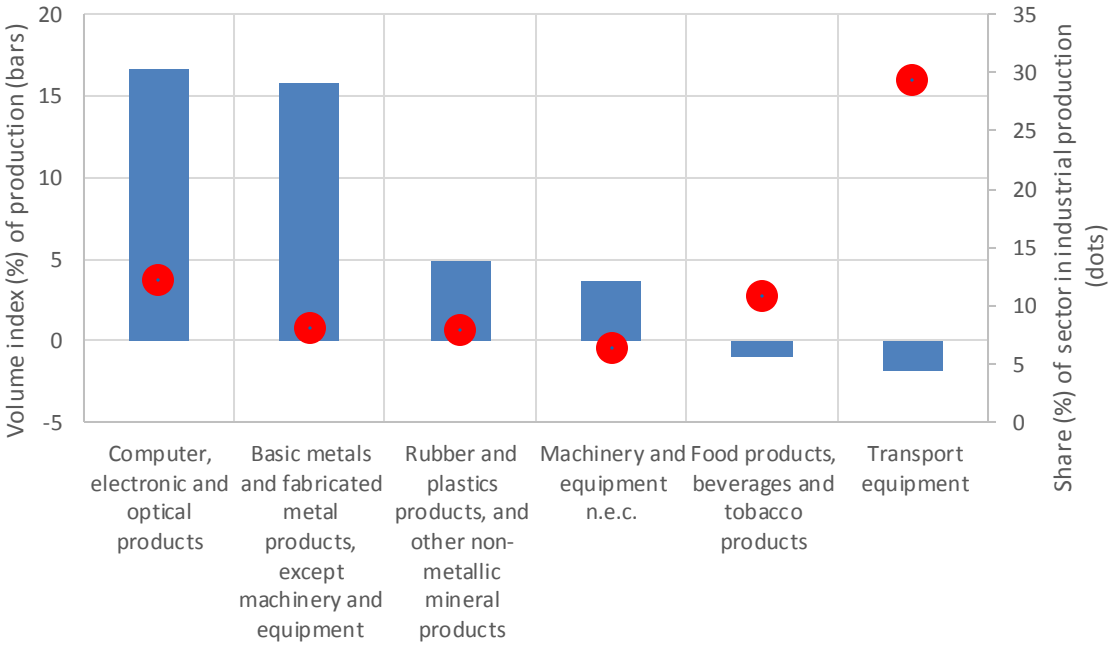

Figure 1. Growth of manufacturing production in selected sectors, June 2016/2017

Data source: KSH, November 2017

In the population of business organisations SMEs are having the overwhelming majority measured by their numbers. However the importance of large, typically foreign owned companies is much higher than their number would suggest. The share of the largest enterprises (250+ employees) in the Hungarian economy is at 0.16% and that of the medium enterprises is 0.79% in 2014, both have slightly increased in the past few years. The share of foreign controlled enterprises in the total number of enterprises is three times higher than the EU-28 average in 2014 (3.55% compared to 1.14%) and even higher in manufacturing (4.7%) or wholesale and repair of vehicles (4.4%). Foreign controlled enterprises account for 57.1% of the total production value in the Hungarian economy (in 2013) but their share is highest in manufacturing (69.9%), information and communication (68.7%) and in the electricity (62.8%) industries. The share of these companies in the total employment is 26.4% and highest in the above mentioned three subsectors (48.3%, 39.3% and 52.7% respectively).The Hungarian economy still suffers

[7] Eurostat: Gross value added and income by A*10 industry breakdowns (nama_10_a10)

[8] http://www.ksh.hu/gyorstajekoztatok/#/en/document/ipa1709

from the duality of its economic structure where in general, the few large, foreign-owned enterprises perform technology-intensive, export-oriented activities and the large number of smaller domestic owned enterprises struggle with inadequate capital, lack of technologies and low level of networking. Hungary has one of the highest shares of foreign value added in gross exports among the OECD member states. The participation in global value chains seems to somewhat positively influence productivity growth in the country between 1995 and 2011 which is also enhanced by the relatively high start-up rates (OECD, 2016a).

1.2 Business environment

Hungary ranks 48th out of 190 economies in the "Doing business 2018" report produced by the World Bank, which is seven positions lower compared to 2016[9]. Globally, Hungary ranks first (!) according to the "trading across borders" indicator and has the prominent 13th position for "enforcing contracts" among 190 countries involved in the report. However, Hungary ranks low according to the "getting electricity" (110th) and the "protecting minority investors" (108th) indicators (World Bank, 2017).

Hungary maintained relatively stable ranking since 2014, but it went back from the 33rd (2016) to the 39th position out of 127 countries enlisted in The Global Innovation Index 2017 ranking. The relative strengths of Hungary are in the Knowledge and technology outputs, in particular its high share of high and medium-high-tech manufacturing (3rd), creative goods exports as percentage of total trade (8th). The main weaknesses, compared to other countries, are in university-business collaboration (99th), e-participation (89th) and the share of firms providing formal training to their employees (85th). (GII 2017)

Hungary improved its competitiveness performance according to the World Economic Forum's Global Competitiveness Report, 2017-2018. The general ranking of Hungary is 60th position (same as in 2014-2015) out of 138 countries, which is 9 positions better than in the previous year. This rise is to a large extent due to an improved technological readiness (i.e. an increase in technology take-up by firms from a low level) – from 135th to 109th on firm-level technology absorption and increase in the Internet take-up by individuals. The innovation pillar improved also significantly (from 80th to 62nd position). This pillar includes university-industry collaboration (from 109th to 68th position), most likely because of the establishment of new university-industry collaboration centres (so-called FIEKs) and the continued R&D investment by companies. (WEF, 2017)

According to the Executive Opinion Survey data published in the Global Competitiveness Report 2017-2018, the three most important difficulties for doing business in Hungary are inadequately educated workforce, corruption and tax rates.

The Hungarian SME sector dropped by around 10% in terms of number of businesses, employment and value added after the 2008 financial crisis. In the past few years there has been a recovery only in terms of value added which rose by 12% between 2009 and 2014, while employment fell by 2% in the same period. (EC, 2015a) According to the Small Business Act Factsheet[10], SMEs in 2015-2016 grew, with both their value added and employment rising close to 2%. However employment growth is significantly lower than in large companies and the employment level at SMEs is still below the pre-crisis level. While there are no big changes expected in employment for the coming years, the value added of SMEs is expected to grow further by 10.1% between 2016 and 2018.

[9] 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.

[10] see at http://ec.europa.eu/growth/smes/business-friendly-environment/performance-review/#sba-fact-sheets (Date of access: 15 August 2017 & 26 January 2018)

Regarding the implementation of the Small Business Act for Europe (SBA), Hungary's profile indicates a number of weaknesses. In five of the SBA principle areas[11] — Entrepreneurship, 'Second chance', 'Responsive administration', Skills & innovation and Environment — the country trails the EU average. State aid & public procurement, Access to finance, Single market and Internationalisation are the areas where Hungary is on a par with the EU in general. Compared to 2016, the changes have been limited. Since 2008, the most significant catch-up vis-à-vis the EU as a whole has been achieved in the 'Responsive administration', Access to finance, State aid & public procurement and Environment. In 2015, major policy developments were observed in the field of Entrepreneurship, Access to finance and Skills & innovation.

2 Main R&I actors

The R&D and innovation (RDI) system has undergone a number of structural changes in the past ten years although one and the same stable government has been in power since 2010. A major feature of the latest reorganisations was centralisation. In Hungary the NUTS2 regions without funding sources have not been able to support local interests and even their consultative role has almost vanished since 2010. Other, lower level territorial units neither have any significant role in science, technology and innovation (STI) policy making.

Government

The central governmental actor in the Hungarian RDI system is the National Research, Development and Innovation Office (its Hungarian abbreviation is NKFIH), which is responsible for the realisation of the governmental RDI policy, setting the national RDI strategy and managing the RDI funds. The NKFIH was established as the successor of the National Innovation Office with extended responsibilities to ensure the government level of coordination of research and innovation policies. The Office provides stable institutional background of predictable financing as well as efficient and transparent implementation of RDI funding. Also, the NKFIH operates a comprehensive "RDI data store"[12] that provides searchable information about RDI projects financed by public resources, research infrastructures and innovative enterprises in Hungary.

The Development Policy Coordination Committee – composed of representatives of the Managing Authorities and the Prime Minister's Office – is focused on coordinating relevant development policy initiatives funded from the EU Structural and Cohesion Funds. The Ministry for National Economy and the Ministry of National Development play a major role in running the Operational Programmes. In addition, the Ministry of Human Capacities, the Ministry of Justice and the Ministry of Agriculture have responsibilities in research and development.The highest-level forum of policy consultation and coordination has also been re-organised a few times during the past 5-10 years. It has been re-structured under various names and with changing membership and responsibilities even under the current government (since 2010). However, the changes have not helped in giving weight to the role and decisions of the responsible committees. The latest version was established in 2015, when the President of the NKFIH founded an *Innovation Board*[13] to help the Office in improving the exploitation of research funds and in the design of investment programmes supporting economic growth. Based on Act LXXVI of 2014 on Scientific Research, Development and Innovation, the Innovation Board approves the programme strategy of the NRDI Fund as well as the evaluation and decision-making procedures of the programmes. The minutes of their meetings are not publicly available. In the evaluation of research and development projects an extended system of scientific

[11] The SBA principle areas are: entrepreneurship, second chance, responsive administration, skills & innovation and environment.
[12] see at: http://kfiadattar.nkfih.gov.hu/ (Date of access: 15 August 2017)
[13] http://nkfih.gov.hu/the-office/innovation-board/innovation-board (Date of access: 15 August 2017)

review panels are used which finalise the ranking of the proposals based on the opinions of the external experts and forward the list of proposals recommended for funding to the President of the NRDI Office[14]. Pursuant to Act LXXVI of 2014 on scientific research, development and innovation, a dedicated committee, the National Research Infrastructure Committee was established which assists the National Research, Development and Innovation Office in the fulfilment of its public functions aimed at the sustainable development of the domestic RDI infrastructure.[15]
With the aim of supporting the process of the renewal of the national RDI strategy a specialized advisory board was set up composed of representatives of major RDI stakeholders.[16] Also, an International Scientific Advisory Board[17] was set up in 2015 to provide the President of NKFIH with strategic advice. It consists of five internationally acknowledged experts of science policy and R&D funding. After one meeting in December 2015, no meeting was held until December 2017.

Academia

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. Both groups include a lot of actors making the public research system fragmented, although MTA is the single most significant public research actor representing more than two-thirds of the R&D expenditures of the PRO sector and consisting of a number of varying research institutions and centres. The MTA and its network of research institutes are engaged mainly in basic or discovery research. Research units of higher education institutions are focusing more on applied research largely due to their collaboration with the business sphere. It is expected that eight industry-university consortia – the so called Centres for Higher Education and Industrial Cooperation[18] (FIEK in Hungarian abbreviation) established in 2017 – will be able to adapt university research programmes in applied science and innovation to the industrial needs in the years to come.

Business sector

Several multinational companies (e.g. Knorr Bremse, Robert Bosch and Siemens) and large domestic firms (e.g. Richter Gedeon) established research and development centres and increased their operation in Hungary in the past few years. They triggered a remarkable growth both in expenditure and in the number of R&D personnel but the performance of the Hungarian business sector still lags behind the EU-27 average. The business R&D expenditure (BERD) has been growing significantly since 2010. This trend continued in 2016 because more and more funds are earmarked for R&D activities by businesses reaching 56% of all R&D expenditure according to the data of the Central Statistical Office. Ten years ago, in 2006 the sector's share was less than 43% of GERD. However, business sector R&D activities are concentrated at and dominated by large, mainly multinational corporations, so the largest share of the BERD is generated by large companies in Hungary.

[14] More information on the review panels at: http://nkfih.gov.hu/funding/panels/thematic-research-proposals (Date of access: 26 January 2018)
[15] More information on this committee is available at: http://nkfih.gov.hu/the-office/decision-making-bodies/national-research-infrastructure-committee (Date of access: 10 September 2017)
[16] Details of the board and the whole process are available at: http://nkfih.gov.hu/policy-and-strategy/rdi-scenario-analysis (Date of access: 26 January 2018)
[17] http://nkfih.gov.hu/hivatal/szervezet/nemzetkozi-tanacsado-testulet/testuleti-tagok(Date of access: 15 August 2017)
[18] see at: http://nkfih.gov.hu/funding/calls-of-the-national/research-infrastructure (Date of access: 10 September 2017)

3 R&I policies, funding trends and human resources

Main R&I policy developments in 2017

Relevant document	Short description
Updating the national RDI strategy 2013-2020	In May 2017 the NKFIH launched a consultative process for the renewal of the RDI strategy involving key stakeholders. The objectives of the process are: i) evaluation of the implementation of the strategy in the past four years, ii) update and re-focus of the strategy objectives, iii) assessment of related programmes and policy instruments, and iv) ensuring the synergy of the strategy with other policy objectives. The consultation process with the stakeholders ended in 2017 to be followed by a national consultation. It is foreseen that the renewed RDI strategy will be adopted in the course of 2018.
Mid-term Policy Strategy of Gear Shift in Higher Education. Action Plan 2016-2020	In the context of the update of the higher education strategy approved by government resolution 1785/2016 (XII. 16), the action plan – published in June 2017 - provides concrete initiatives, tasks, resources and appoints responsibles with deadlines for the next three years. Apart from initiatives in the fields of education and research, the action plan foresees important changes in the third mission activities of the HEIs and puts more emphasis on the socio-economic role of HEIs, the social innovation, as well as the knowledge dissemination activities of universities. In particular, the action plan stresses the importance of supporting the social mobility of underprivileged groups, diminishing the dropout rates, supporting the supply of researchers, the internationalisation of institutions and the mobility of students. In the area of research it is expected that HEIs will play significant role in developing innovation competencies of SMEs, building research and innovation networks between HEIs, embedding Hungarian HEIs in international networks and developing world class institutions, as well as renewing the research infrastructure.
Supporting Entrepreneurship and Innovation in Higher Education in Hungary	The report summarises the results of the HEInnovate country review of Hungary, which presents evidence-based analysis of the progress and challenges of the process of changes in the organisational culture of HEIs and a new approach to education and research for students and staff. The report offers practical recommendations on how to enhance and sustain outcomes both for public policy actions and management of higher education institutions. The analysis is structured according to the HEInnovate framework. It proposes a holistic approach to the support

	of entrepreneurship and innovation, including strategy, governance and resources, practices in organising education, research and engagement with business and society, and measuring impact. It is based on a study visit to five institutions and the results of a system-wide HEI Leader. The recommendations of the report address both public policy makers and senior management members of HEIs.

R&I funding trends

The gross domestic expenditures on research and development (GERD) were growing modestly since 2008 but this trend was interrupted in 2016. By 2015 GERD grew to 1.38% of GDP from a sub-1% level before 2008, however in 2016 it dropped back to 1.22% (KSH 2017b[19]) or €1,38b (HUF427b). This means an 8.8% decrease in the expenditures compared to 2015.

It should be noted that past growth in R&D expenditures was mainly fuelled by increase in the spending of the private sector (Fig. 2). While the business R&D intensity grew from approx. 0.5% to around 1.0% of the GDP between 2008 and 2015, it decreased in the public sector from approx. 0.5% to below 0.4% of the GDP. This latter indicator now has one of the lowest values among the EU member states and signals the weakening of the local knowledge base. The share of the business sector in the sources of R&D expenditures reached 56% or €777m (HUF241b), of the government sector 26% or €361m (HUF112b), while the foreign sources achieved 16% or €229m (HUF71b) in 2016. The share of the domestic non-profit sector is negligible (0.7%).

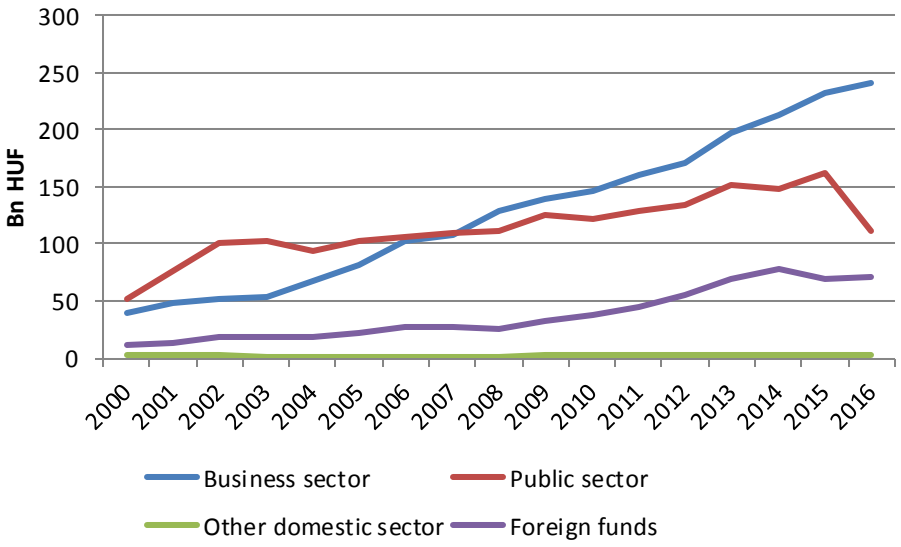

Figure 2. Source of funding of the total GERD

Data source: KSH, October 2017

The decrease (which started in 2013) in the number of R&D units and in the total number of R&D personnel continued in 2016 as well. There were 2.6% less R&D units in Hungary in 2016 and 2.8% less total R&D personnel (headcount) – although the number of

[19]KSH Statisztikai Tükör, Kutatás-fejlesztés 2016 (előzetes adatok), 2017. július 13. és KSH Statisztikai Tükör, Kutatás-fejlesztés 2016, 2017. október 11. (http://www.ksh.hu/docs/hun/xftp/idoszaki/tudkut/tudkut16.pdf)

researchers grew by 1.3% compared to the previous year. (KSH 2017c) Hungary could not significantly improve the performance of its innovation system. Measured by the Summary Innovation Index, Hungary's performance remained around 67% of the EU-28 performance which means that the country dropped in the ranking from the 21st position in 2015 to the 23rd in 2016. (EC, 2017)

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

The share of the public sector as a source of R&D expenditures significantly decreased in 2016 compared to the previous year. Public sources decreased by 31% partly due to the slow utilization of funds from governmental programmes co-funded by the EU Structural Funds. Although the contracted amount of public funding (from the NRDI Fund and from the EU Structural Funds) started to grow significantly already in 2016 and even more intensely in 2017, these projects will be realised in the coming years so they will impact the following years' statistics.

The R&D expenditures of the (public) R&D institutions declined by 8% mainly due to the diminishing funding from the business sector (-37%) and from foreign sources (-27%), while the government funding practically remained on the same level as in 2015. In higher education R&D expenditures declined even more, by 16% mainly due to the diminishing governmental funding (-23%), while the business funding remained practically on the same level (+0.7%), and foreign funding even increased (+8.8%).

In the funding of (public) R&D institutions the share of government funds is the highest (82%), while the business sector provides 6%, and the foreign sources 11% of the R&D expenditures of these organisations. In higher education institutions the share of government funding is 69%, foreign sources provide 15% of the funding, and the business sector adds 10%.

It seems that the government's preference for the support of STEM fields (and graduates) did not have immediate effect on the activities of public higher education (HE) research institutions. Within the public sector the combined share of natural sciences and engineering practically stagnated between 2011 and 2016, while in the higher education sector the social sciences and humanities could even raise significantly their share within the R&D expenditures.

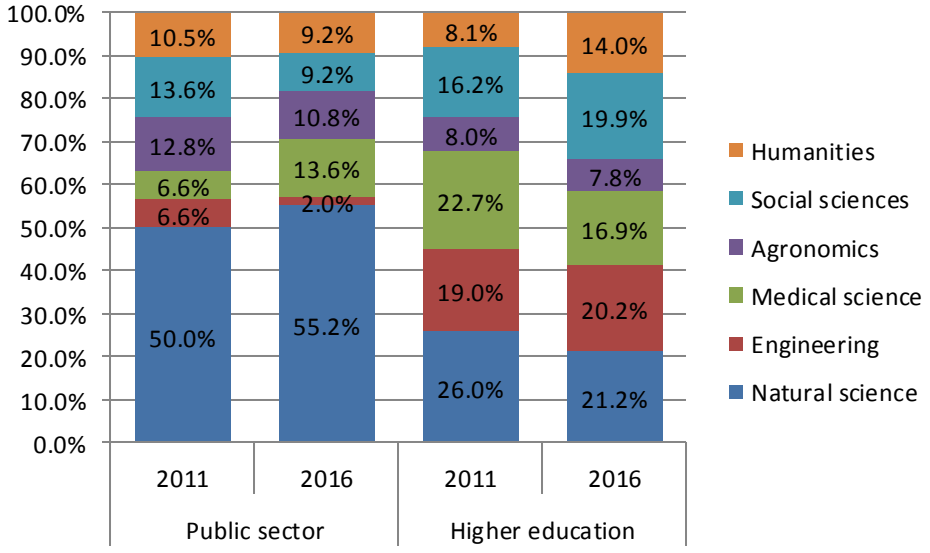

Figure 3. Proportion of R&D expenditures by scientific fields in public and HE research institutions

Data source: KSH, October 2017

Since 2005 the business sector has been getting more and more public financing both in nominal and in real terms, and currently the share of public funding of private R&D expenditures is one of the highest in Hungary among the OECD countries. In 2016 more than 8% of the R&D expenditures were financed by the government. Furthermore, the R&D tax incentives continue to be an important element of the domestic support policy. The direct costs of the R&D carried out in the firms' 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.

The government funding is provided through three main channels which cover 40% of the total government spending in 2016 (compared to 60% in 2015). The NRDIF provides 18%, while the co-funds of the EU Structural Funds represent almost 17% of all government funds in 2016. The share of these sources were much higher in 2015, 19% and 37% respectively. The third channel is the previously called OTKA funds – now part of the NRDIF – which represent 6% of the public spending (compared to 4.4% in 2015).

3.2 Private R&D expenditure

The business sector could maintain the growth of its R&D expenditures in nominal terms but, due to the decreasing governmental funding sources, the total R&D expenditures of the sector's R&D units decreased in 2016 compared to the previous year. The share of the business sector in the funding of R&D expenditures grew by 4.6% in the private sector and by 3.5% in total between 2015 and 2016. Even so the BERD (as a % of GDP) declined slightly in 2016 to settle at 0.89%. Apart from the business sector's own funding, the foreign sources play an important role (18%) in the sector's R&D expenditures. These foreign sources are typically foreign companies (most probably headquarters of the local subsidiaries) and the EU's research calls. (KSH 2017c)

In 2016 manufacturing was responsible for 53% of all business R&D expenditures, while the service sector's share was slightly above 44%. This means that after the peak year for the services sector in 2015, the manufacturing sector became again the main sector of business R&D expenditures. Within manufacturing the pharmaceuticals (35.8%) and the vehicle industry (28.5%) are spending the most on R&D followed by the computers and electronics and the chemicals sectors. (KSH 2017c)

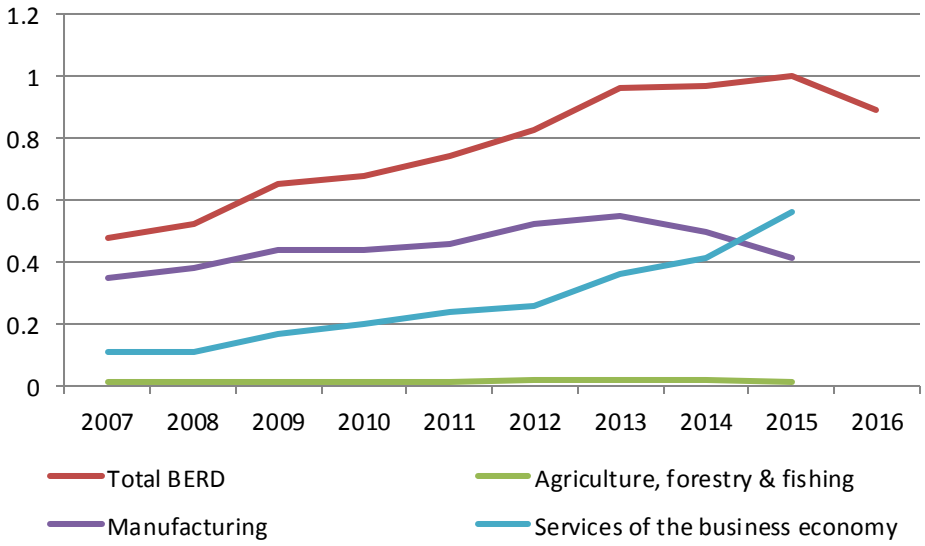

Figure 4. BERD by most important macro sectors as a % of the GDP
Data source: Eurostat, [rd_e_berdindr2]

More than three quarters of the business R&D expenditures are realized in engineering, and the natural sciences are the other field which has a notable share of the spending (17%).

Within the business sector's R&D activities the importance of foreign-owned companies is still extremely high. According to the KSH (2017c) the foreign-owned and majority foreign-owned companies' share in the sector's R&D expenditures is almost 78% and their share in the number of R&D employees is almost 60%.

3.3 Supply of R&I human resources

In Hungary the available stock of R&I human resources and their new supplies are facing challenges both in terms of quality and of quantity. The share of persons with tertiary education and/or employed in science and technology (% of active population) has been growing since 2010 although there was a minor decline in 2016 when this share was 35.2%. The share of persons employed in science and technology (% of active population) was growing between 2010 and 2013 but it has stagnated since then on a 28.1% level. Both values remain clearly under the EU-28 averages and even lag behind the levels in many CEE countries. The share of scientists and engineers (% of active population) has also stagnated since 2011 around 5% (2016: 5.4%). The same share is 7.4% for the EU as a whole as a result of a growing trend since 2011.

The total number of scientists and engineers grew between 2010 and 2014 on a modest level (yearly growth ranged between 0.2 and 3.6%) but declined in 2015 (-2%) just to grow again in 2016 by 1.3% compared to the previous year. Growth mainly took place among male scientists and engineers whose number grew by 12.4% (2010-2014), while the number of female researchers grew only by 4.2% during the same period. The EU-28 average number of researchers grew by 11.4% between 2010 and 2014.

From 2014 to 2015 the number of researchers declined in the field of natural sciences and engineering, while it grew in medical sciences and agriculture.[20] Although, in communication, the government is committed to strengthen STEM fields in research and education (e.g. in the latest higher education development plan), there are no short term results yet. In 2016 the share of researchers working in natural sciences and engineering was 51%. (KSH 2017c)

Among researchers men are typically over-represented. In higher education 60% of the researchers were men in the 2016/2017 school year. Looking at the younger age generation, the situation does not change significantly. Among the researchers women under 34 represent only 29% of all female researchers, which is a lower share than among males. (KSH 2017c) Looking at the broader picture, the gender ratio is only slightly better. In the total number of researchers women were 31% in 2016 and 38% within the number of R&D employees. Their share is 48-49% in public R&D institutions and higher education institutions, while it is only 24% in the case of business R&D organisations.

The available amount of human resources in science and technology remains under the level of the EU 28 member states' average. Most importantly, it seems that new doctorates – measured by their numbers – will not be able to close this gap. In 2015 the share of new doctorates was 0.7% (per thousand population of the corresponding age group 25-34) among men and 0.6% among women which is also clearly below the EU average of around 1.1-1.0%. The number of new doctorate graduates in STEM fields was also clearly below the EU average (1.53 in Hungary compared to 2.32 EU28) in 2015. The government launched a new higher education strategy in 2016 which addresses among others the improvement of the quality of doctorate education in STEM fields.

[20] http://statinfo.ksh.hu/Statinfo/haViewer.jsp?lang=en, Technicalidentifier: HA3A03

4 Policies to address innovation challenges

4.1 Challenge 1: Fostering innovation in domestic enterprises

Description

The European Innovation Scoreboard (EIS) 2017 report classifies Hungary as a "moderate innovator". The level of innovation activities among the Hungarian companies is generally low, especially that of SMEs. Actually, only about one-tenth (11.7%) of the Hungarian SMEs could be considered as innovative companies (EU-28 average is 28.8%). Based on EIS 2017 data, only 15.1% of SMEs introduce some kind of product or process innovations in Hungary. If we look at the trends, this is a 2.3% increase from the previous year and a slight decrease compared to 2010 (16.8%). Nevertheless, the main issue is that this value is only half of the EU-28 average (30.9%). One explanation behind these processes could be 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). According to the data of KSH, the number of researchers at large companies has increased by about 40% since 2013, while this figure has remained stable or has slightly decreased at other categories of companies. 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. In general, SMEs try to avoid taking risk and rarely invest in RDI activities from their own pocket.

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 the total available funding from the Structural Funds to economic development purposes, including non-refundable and refundable resources.[21] According to the Annual Development Framework Programme, business RDI activities were supported with the majority of the funds in 2016 (71%) being among the main objectives of the GINOP programme. This objective received the highest growth of available funds compared to 2015 (four times more). There is an abundance of ongoing programmes because the portfolio of calls promoting businesses' innovation activities has a total budget (including both non-refundable and refundable resources) more than €1.3b (about HUF400b), half of which already awarded between 2015 and the first half of 2017, and the rest is to be utilised in the next four years. The portfolio of programmes that support corporate and business RDI activities consists of a large number (thirteen (!)) of measures.[22] In particular, four measures clearly focus on supporting research and innovation activities of SMEs and start-ups. The high number of calls is the result of having so called "mirror calls" of ESIF calls financed from the NKFI Fund targeting the Central Hungarian region.

[21] 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.

[22] "Support of business RDI activities" (calls such as GINOP-2.1.1-15; VEKOP-2.1.1-15; KFI_16), Business RDI, loan (GINOP-8.1.1-16), Business RDI, combined with loan (GINOP-2.1.2, GINOP-8.1.4-16), National technology and intellectual property, venture capital programme (GINOP-8.1.3/A-16), Smart specialisation, venture capital programme (GINOP-8.1.3/B-17; VEKOP 2.1.2-17), National Capital Fund (GINOP 8.6.3/A-17), Intellectual property rights (GINOP-2.1.3-15; IPARJOG_15), Innovation voucher GINOP-2.1.4-15, Innovation ecosystem (start-up and spin-off) GINOP-2.1.5-15; ÖKO_16, Exportable innovative product development (GINOP-2.1.6-16), Support for export oriented R&D activities of domestic businesses (Export_17), Prototype, product, technology and service development (GINOP-2.1.7-15; VEKOP-2.1.7-15) and Enhancing the competitiveness of SMEs through adaptive technological innovation GINOP-2.1.8-17.

Assessment

There are several measures in place that build on each other and form a fully-fledged business RDI support mix. EU and national resources are clearly geared to support business research and innovation activities. Nevertheless, it is early to evaluate the impact of the new measures, because it will depend a lot on the quality of the implementation of RDI measures in order to achieve the expected outcomes.

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

Description

The support of the cooperation between business and academia has been a high priority of the STI policy in Hungary, which 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, the sustainability of such partnerships is a real challenge as they are not necessarily based on the mutual interest of the 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 focused on one-off developments or problem-solving. An issue related to this challenge is the lacking growth and internationalisation ambitions of Hungarian firms.

Interchange of personnel between companies and academic institutions is not yet a widely accepted practice because of the low salaries in the public research and the 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. In the current portfolio of calls for proposals to foster research, development and innovation managed by NKFIH, there are three main programmes that support collaborative research and innovation activities among different sectors. These are: i) R&D competitiveness and excellence cooperation programmes calls GINOP-2.2.1-15; NVKP_16; VEKOP-2.2.1-16, ii) Competitiveness and excellence cooperation programmes (call VKE_17), and iii) Research infrastructure development of Higher Education and Industry Cooperation Centres (GINOP-2.3.4-15; FIEK_16).

In fact, the FIEK programme is implemented within the framework of S3. After preparatory work in 2015 and 2016, in 2017 five Centres for Higher Education and Industrial Cooperation (FIEK) were established in Győr, Kaposvár, Miskolc, Kecskemét and Debrecen. In addition to the FIEKs in university cities outside of Budapest and the Central Hungarian region, three other consortia in the Central Hungarian region received funding of €26.5m (about HUF8b) provided by the NRDI Fund in 2017. The three consortia operate at the Budapest University of Technology and Economics (BME), Eötvös Loránd University (ELTE), and Szent István University (SZIE). The main objective of these centres is to adapt university research programmes in applied sciences and innovation to the industrial needs and to formulate a long-term, business-based cooperation between the university and industrial partners. Furthermore, the FIEK centres aim to open up opportunities for SMEs otherwise unable to engage in costly research and development activities according to the expectations of NKFIH.

In addition, it should be noted that joint research groups and shared access to research infrastructures support the deepening of the cooperation between the institutes of the

Hungarian Academy of Sciences (MTA) and universities based on the agreement signed between the Ministry for Human Capacities and MTA in June 2016.

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. This could be the case of the FIEK programmes that are established for four years and will potentially continue after this funding period. Nonetheless, the take-off and operation of the five plus three FIEKs will be challenging because they should create long-standing bridges between academia and business, and that requires changes in the culture and attitudes in both sectors. The positive effect of the R&D competitiveness and excellence cooperation programmes (VKE) and the FIEKs might be that companies could access the knowledge base of universities in a more regulated and professional way.

4.3 Challenge 3: Supporting the demand side of innovation

Description

Boosting the business demand for R&D results and developing the business competences to engage in innovation for creating lead markets has been a long-standing challenge of the Hungarian RDI system. The government has had a broad programme portfolio for enhancing the business RDI capabilities, for increasing the innovation demand and for fostering the enterprises' international expansion. Nevertheless, the measures have a rather narrow technology focus and do not support workplace innovation, public sector innovation, social innovation and design-driven innovation. Mainly the linear view of innovation prevails, while knowledge and technology transfer based on academic research results is limited. The "Europe 2020 Flagship Initiative Innovation Union" communication and related action plans defined important policy priorities in addition to traditional RDI support programmes that are only partially addressed by current Hungarian RDI measures such as training of excellent researchers, enhancing access to finance for innovative companies, developing world class research infrastructure.

Policy response

There is no dedicated 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 obviously intends 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). Apart from these intentions and initiatives, Hungary has had little experience so far with pre-commercial public procurements. In fact, the National RDI strategy 2013-2020 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 were listed again as one of the important market instruments supporting the demand-side interventions. In addition, the National Reform Plan (NRP) 2016 foresaw – based on the Annual Development Framework of GINOP – a PcP programme to be launched with an indicative budget of €3.2m (HUF1b) in 2016. Following the NRP document, the portfolio of calls for proposals to foster research, development and innovation indicated a PcP programme on the website of the National Research, Development and Innovation Office early in 2016, but this planned call was not published in the portfolio of RDI calls in 2017 as no real demand from the public sector has been formulated.

Assessment

Certainly, definition and forecasting of research and innovation needs of the public sector requires strategic planning capacities on the side of public institutions and laborious consultation with stakeholder groups as well as significant amount of trust among these groups to launch pre-commercial procurement programmes or procurements with relevant innovation content. However the procurement procedures are suffering from some major weaknesses that question the efficiency of this tool.

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

Description

Since 2013 both the number of R&D units and the total number of researchers has been declining. The decline does not involve all sectors, all positions or all fields univocally but yet the global trend clashes with the government's aim to improve the quality and quantity of researchers in Hungary. The RDI Strategy for 2013-2020 or more lately the higher education development plan (EMMI, 2017) emphasizes this issue where governmental actions should be taken.

There has been very little change in this area since last year when the RIO Country Report stated that the RDI Strategy 2013-2020 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. Considering the low number of RDI-intensive companies in Hungary it cannot be expected that the number of business R&D personnel will grow in the future to compensate the loss of jobs in the public sector observable in the past few years.

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 open between the supply and demand for qualified S&E personnel in the near future.

Policy response

Both the RDI strategy 2013-2020 and the higher education strategy emphasised the importance of strengthening the research infrastructure and supporting excellence in academia. As a response, new GINOP programmes have been launched, namely, "Excellence of strategic R&D centres" and "Strengthening research infrastructures, internationalisation and networking". The programmes aim to provide better research conditions and to strengthen the RDI capacities of the centres. The domestic NKFI Fund started a new post-doctoral research programme in 2016, which continued in 2017. It has two branches: for post-doctoral researchers (the budget is €4.8m or HUF1.5b) and for young researchers (the budget is €9.7m or HUF3b). The MTA continues its Momentum programme to provide support for outstanding young researchers to establish their own research groups. (The 2017 call results have not been published yet.) Also, the National Programme in Brain Research aims to strengthen research centres and institutes belonging to the international front line with €20.6m, as well as to turn back the brain-drain by inviting and employing researchers working abroad providing a total budget of €18.1m. Furthermore, it is worth mentioning the new research funding programme (HUF1b or €3.3m) of NKFIH that supports researchers achieving results of high international impact while working in Hungary and accumulating a scientific citation record within the top 5% in their discipline in two years of publication. Another new

funding programme of NKFIH is the "Frontline" Research Excellence Programme (total budget of HUF3b or €10m) that supports 12 research group leaders with grants of HUF150m to HUF300m (nearly €0.5m to €1m) each, to be spent in the coming five years on creating or expanding their research group and implementing a promising discovery research project.

The higher education development plan (2016) foresees three actions to improve the situation of the human resources is science and technology (HRST) in the long-run: a) transformation of the system of doctoral education; b) modifying R&D funding principles; and c) creating an incentive system for business people to take part in doctoral education.

Assessment

In 2017, in higher education, there was still 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 higher education expenditure on R&D (HERD) do not forecast a quick change in the situation of HRST in the public and higher education sectors.

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

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.[23] Additionally the NKFIH considered smart specialisation as a major aspect and selecting criterion also in the relevant calls of the National Research, Development and Innovation Fund (i.e. GINOP and VEKOP calls) that have been launched since 2015. The national S3 strategy states that "by smart specialization, Hungary aims to increase the performance of all actors of the domestic scientific, technological and innovation (STI) system through direct and indirect effects." Therefore, 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 website[24].

New policy developments

The S3 strategy is aligned with the National RDI Strategy 2013-2020[25] and provides a sectoral and territorial detailing of that strategy and therefore the two are – to a certain extent - intertwined. In May 2017 the NRDI Office launched the renewal of the RDI Strategy involving key stakeholders, which may influence the S3 strategy, too.

The national S3 strategy focuses on the promotion of smart production. Partly from these antecedents the government started to elaborate a new strategy of Industry 4.0 in 2016 (Irinyi Plan). The aim of the Irinyi Plan is to further increase the share of manufacturing

[23] http://nkfih.gov.hu/funding/portfolio-of-calls-to

[24] http://nkfih.gov.hu/palyazatok/hazai-kfi-palyazatok(Date of access: 31 August 2017)

[25] https://www.google.hu/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0ahUKEwiSgoP-m4LWAhUTSJoKHZUbD94QFggtMAE&url=http%3A%2F%2Fnkfih.gov.hu%2Fdownload.php%3FdocID%3D25559&usg=AFQjCNHGWqZ5UucVKfn4KUoHOFpeV1GPyg(Date of access: 31 August 2017)

in the Hungarian GDP with the support of seven key industries. In the context of the Irinyi Plan so called "sample factories" are planned to be established in few locations throughout Hungary that were expected to be announced in autumn 2017[26]. The main objective behind the establishment of these highly specialised and automated factories is that SMEs can visit them and study the latest high-end digital and ICT technologies which could be later implemented in their companies and could increase the value-added of their products. A new measure is under elaboration with a planned budget of about €8.1m (HUF2.5b) which will support companies to adapt Industry 4.0 technologies.

In line with the Irinyi Plan and the smart specialisation priorities defined by the national S3 strategy, a new test track for dynamic tests of self-driving cars and electrical vehicles will be implemented in South-West Hungary with a budget of about €12.4m (HUF40b). The foundation stone of this test track was laid down in May 2017[27].

Progress on implementation

The RDI calls published by NKFIH and other calls co-funded by the EU Structural Funds 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.

The government is keen to publish all calls (co-funded by the EU Structural Funds) well before the end of the financial planning period which means that the overwhelming part of the available budget has been already opened up for applicants by 2017.

Monitoring mechanisms and the feedback loop

The S3 strategy contains a dedicated section on the monitoring and evaluation practices to be applied during the implementation phase. Although the strategy envisages interim, ongoing and ex-post assessments, and highlights the essential need for a monitoring system with well-defined indicators, these remain in general terms only. This is a generic issue in the Hungarian R&I system, which is also underlined by the review of the SAO, stating that the controlling system of the RDI funds co-funded by the EU Structural Funds has been established according to the legal requirements but its operation was not smooth enough and the evaluation and monitoring system was inefficient.

The general monitoring of the EU Structural Funds takes place (for all competitive calls without any specific measures for the S3 strategy) but the focus is mainly on financial aspects. All calls of the second priority of GINOP and VEKOP programmes as well as relevant calls of the NRDI Fund have S3 aspects as selecting criteria. So only proposals in line with S3 can be subsidized from those funds. Since the programmes were processed very slowly at the beginning, we are only now in the position to examine the indicators promised in the proposals according to S3 aspects.

Evidence of impact

There are not any ex-ante or interim evaluations or monitoring reports related to the realization of the S3 strategy. According to the interviews with officers of NKFIH, the first review of the impact of RIS3 strategies is planned to be carried out in 2018 after the renewal of the RDI strategy.

[26] http://www.kormany.hu/hu/nemzetgazdasagi-miniszterium/belgazdasagert-felelos-allamtitkarsag/hirek/hamarosan-elindulhat-a-mintagyarak-letesitese (Date of access: 31 August 2017)

[27] http://www.hirado.hu/2017/05/19/orban-viktor-egyedulallo-lesz-a-zalaegerszegi-tesztpalya/ (Date of access: 31 August 2017)

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Abbreviations

BERD	Business Expenditures for Research and Development
CIS	Community Innovation Survey
CSR	Country Specific Recommendation
EFOP	Emberi-Erőforrás Fejlesztési Operatív Program (Human Resource Development Operational Programme)
EIS	European Innovation Scoreboard
EMMI	Emberi Erőforrások Minisztériuma (Ministry of Human Capacities)
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EU-28	European Union including 28 Member States
FDI	Foreign Direct Investments
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)
GOVERD	Government Intramural Expenditure on R&D
GUF	General University Funds
HE	Higher Education
HERD	Higher Education Expenditure on R&D
HUF	Hungarian Forint
IP	Intellectual Property
JÁT	Jedlik Ányos Terv (Jedlik Ányos Plan)
KSH	Központi Statisztikai Hivatal (Hungarian Central Statistical Office)
KTIA	Kutatási és Technológiai Innovációs Alap (Research and Technological Innovation Fund)
MTA	Magyar Tudományos Akadémia (Hungarian Academy of Sciences)
NFM	Nemzeti Fejlesztési Minisztérium (Ministry of National Resources)
NFK	Nemzeti Fejlesztési Kormánybizottság (National Development Cabinet)
NGM	Nemzetgazdasági Minisztérium (Ministry for National Economy)
NKFIA	Nemzeti Kutatási, Fejlesztési és Innovációs Alap (National Research, Development and Innovation Fund)
NKFIH	Nemzeti Kutatási, Fejlesztési és Innovációs Hivatal (National Research, Development and Innovation Office)
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
PPS	Purchasing Power Standard
PRO	Public Research Organisation
R&D	Research and Development
R&D&I	Research and Development and Innovation
R&I	Research and Innovation
RI	Research Infrastructure
RIÜ	Regionális Innovációs Ügynökség (Regional Innovation Agency)
RTDI	Research Technological Development and Innovation
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
TOP	Terület- és Településfejlesztési Operatív Program (Territorial and Settlement Development Operational Programme)
TTO	Technológiatranszfer Iroda (Technology Transfer Office)
VC	Venture Capital
VEKOP	Versenyképes Közép-Magyarország Operatív Program (Competitive Central-Hungary Operational Programme)
VKE	Versenyképességi és Kiválósági Együttműködések (Competitiveness and Excellence Cooperation)
WEF	World Economic Forum

Factsheet

	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
GDP per capita (euro per capita)	9400	9900	10200	10000	10300	10700	11300	11600		
Value added of services as share of the total value added (% of total)	67.01	66.57	65.52	65.37	65.59	64.71	63.87	65.1		
Value added of manufacturing as share of the total value added (%)	20.17	21.52	21.92	22.23	22.4	23.14	24.44	23.54		
Employment in manufacturing as share of total employment (%)	20.42	20.04	20.02	19.89	18.76	18.41	17.89	17.77		
Employment in services as share of total employment (%)	62.95	63.63	64.18	64.16	65.84	66.54	67.63	68.1		
Share of Foreign controlled enterprises in the total nb of enterprises (%)	3.31	3.3	3.38	3.42	3.54	3.55	3.2			
Labour productivity (Index, 2010=100)	88.9	100	102.1	101.4	102.7	101.7	102.8	101.7		
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	0.62		
Summary Innovation Index (rank)	20	19	19	21	22	20	21	23		
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	41	48
Ease of getting credit (WB GII) (Rank)						16	18	19		
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	20	20	21	
E-Government Development Index Rank		27		31		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	47	
GERD (as % of GDP)	1.13	1.14	1.19	1.26	1.39	1.35	1.36	1.21		
GBAORD (as % of GDP)	0.45	0.35	0.29	0.34	0.65	0.28	0.28	0.4		
R&D funded by GOV (% of GDP)	0.48	0.45	0.45	0.47	0.5	0.45	0.47			
BERD (% of GDP)	0.65	0.68	0.74	0.83	0.96	0.97	1	0.89		
Research excellence composite indicator (Rank)	13	14	16	15	14	16				
Percentage of scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country		6.9	6.98	6.97	6.03	5.72				
Public-private co-publications per million population	23.43	27.16	24.43	22.05	26.54	30.27	23.24			
World Share of PCT applications	0.14	0.15	0.14	0.14	0.12	0.12	0.11			
Global Innovation Index				31	35	35	33	39		

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

List of figures

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