

Chapter 1

Overview of the Hungarian higher education system

This chapter provides an overview of the Hungarian higher education system and highlights key challenges and development opportunities resulting from recent policy developments. The chapter also describes the multiple roles of the higher education institutions (HEIs) in the country's research, development and innovation (RDI) and the emerging importance of the third mission in HEIs. Since 2000, there has been a notable shift in the orientation of academic staff towards increased application of research results and greater societal relevance. Changes in national funding and grant schemes, as well as the support for transdisciplinary research on global challenges in EU funding schemes have triggered this change in attitude. Effective HEI-internal responses are, however, often lagging behind. Supporting students and graduates in considering venture creation as a viable career path has gained ground but so far, the focus has been more on skills development and less on start-up support.

Introduction

Over the last three years, Hungary's economy has demonstrated a solid growth performance. Inward foreign direct investment and European Union (EU) funds have been the main investment drivers and Hungary is one of the few countries for which the 2012 Community Innovation Survey noted an increase in firm-level innovation activities, although growth occurred largely outside the domestic small and medium-sized enterprise sector. Only 10.6% of firms with less than 50 employees in the country reported carrying out innovation activities in contrast to 28.7% for the EU-28 average. The country is performing well in terms of value added in high-tech and in medium-high-tech manufacturing. The share of persons with tertiary education employed in high-tech and medium-high-tech manufacturing reached 6.4% of total employment in 2014, outpacing the EU average (5.3%). The situation is similar for the knowledge-intensive high-tech services: Hungary (6.1%), Czech Republic (7.7%), Slovakia (7.2%), and EU average (5.7%) (Döry and Slavcheva, 2015). The European Innovation Scoreboard (2016) noted growth in R&D expenditures in the business sector (10%) and community trademarks (8.1%).

All this has raised the demand for high skilled workers (OECD, 2016). Sustaining the development path of Hungary's economy will require structural reforms in higher education and the research, development and innovation (RDI) system, as well as effective mechanisms to build synergies between the two.

The fall in unemployment to 6.4% (Q3/2015) was the result of a rapid expansion of the public works scheme, cross-border mobility of job seekers and job creation in the private sector, which picked up in 2013 (EU, 2016). At the same time, labour market exclusion of disadvantaged groups remains a major challenge for inclusive development (EU, 2016). Developing an effective lifelong learning system for the working age population,¹ which addresses the needs of different age groups, also in terms of re-entry into formal education, is a key policy priority. In 2014, the government adopted a new lifelong learning strategy to the year 2020 and a new law on adult training. Both are expected to raise the take-up, quality and portfolio of training courses, and to bring greater visibility and acknowledgement of results for learners.

As part of the Europe 2020 indicators, Hungary reached its target of 34.1% tertiary attainment in the age group 30-34 years in 2014 (from 26.1% in 2010).² Enrolment in tertiary education has nearly quadrupled since 1991 and boosted enrolment rates in the age group 20-29 years to 26%. This has, however, not resulted in higher tertiary graduation rates. Less than half of all students are graduating within the required time, and the completion rate is one of the lowest in the OECD. Salient factors are insufficient academic preparation prior to enrolment and slow study progression (OECD, 2016).

The prevailing approach to teaching in higher education is content-centred and leaves little space for experiential pedagogy, knowledge application and problem solving. Employers' main critique of graduates is that they are not sufficiently prepared for today's jobs, which require the solving of non-routine problems and the effective handling of

unfamiliar situations. The foundations for this are actually missing in earlier levels of education. The average performance of Hungarian 15-year-old students in basic skills in the Programme for International Student Assessment (PISA) 2012 was below the EU average and the proportion of low-achievers has increased. Large performance gaps are already visible at 6th grade (12-year-olds) and become prominent at 10th grade (16-year-olds). The influence of socio-economic background and school location (urban vs. rural) on educational performance is one of the highest in the EU. Most low achievers live in the north-east of the country, which is hit strongest by poverty and has the highest early school leaving rate (OECD, 2016).

Employment outcomes for higher education graduates are mixed. On the one hand, their unemployment rate is half the national average and employers highly reward education credentials. For example, a 25-34 year-old degree holder can expect to earn on average 78% more than an employee from the same age cohort with only secondary education. On the other hand, graduation rates increase mainly in study areas with low or decreasing employment growth rates. This has led to a mismatch between offer and demand. In particular, the undersupply of highly-skilled professionals for jobs in engineering and science has become a major issue. In 2013, the percentage of new graduates in science and engineering at levels 5 and 6 of the International Standard Classification of Education (ISCED) per thousand population aged 25-34 in Hungary was 9.6%, well below the EU average of 16.3% (OECD, 2016). However, the over-representation of science and engineering graduates among Hungarian expatriates also points to an inability in the national economy to absorb these graduates, and low and insufficient degrees of job quality (Dóry and Slavcheva, 2015). In social sciences, humanities and agriculture the oversupply of graduates pushes many young job seekers to accept jobs that are not related to their educational background.

Supporting students and graduates to consider starting up a business as a viable career path thus gains ground as an objective in many higher education institutions (HEIs) across the country. So far, this has been mainly associated with skills development and less with the provision of tailored start-up support. The 2012 Higher Education Act explicitly states that the “the provision of financial and business skills linked to the knowledge-based economy” shall be organised in line with core activities. Several attempts have been undertaken to integrate the development of these skills into all study programmes (Kovacs, 2016).

Introducing curricula changes in higher education to enhance the development of creativity, problem solving, teamwork, intercultural and communication skills in all programmes, will take some time to become effective. The 2014 Higher Education Strategy points out key areas for policy action around teacher training, closer interaction with the local labour market and community, and new forms of vertical and horizontal partnerships in HEIs to build and nurture synergies between education, research and third mission activities (Hungarian Government, 2014).

Higher education in Hungary

Higher education providers

Approximately 2.3 million Hungarians belong to the age group 18-34 years (2011 census³). Across the country there are 53 accredited HEIs, of which 28 are universities (21 state-owned), 7 universities of applied sciences (5 state-owned), and 18 colleges of

education (3 state-owned). This includes several foreign HEIs, which offer degree programmes in the country (Oktatas, 2017).

The Higher Education Act of 2012 regulates the establishment and operation of all HEIs. The state-owned HEIs are accountable to, and receive funding from the Ministry of Human Capacities, whereas non-state HEIs can be founded by churches, business organisations and foundations. All universities are authorised to offer Bachelor and Master programmes, as well as doctoral programmes in at least two fields of study. They are required to have at least three faculties, at least half of their teaching and research staff⁴ must have a doctoral degree, and they must have the capacity, in some programmes, to offer courses in foreign languages. Universities of applied sciences can only offer Bachelor and Master programmes, vocational training, as well as post-graduate specialist training, which does not lead to a higher education degree. The required share of doctoral degree holders among teaching and research staff is, at one-third, significantly lower than in universities (Kovacs, 2016).

In 2010, five universities were awarded the title “research-intensive university” by the Ministry of Human Capacities. These are the Budapest University of Technology and Economics, Eötvös Loránd University, Semmelweis University, the University of Debrecen, and the University of Szeged. The award was linked to additional funding. Furthermore, the following seven universities were formally acknowledged as excellent universities: Corvinus University of Budapest, Szent István University, University of Miskolc, University of Pannonia and University of Pécs. The excellence award takes into consideration achievements in education and research, outstanding scientific results in more than one discipline, presence and upward mobility in international rankings and notable participation in international student mobility programmes (Deloitte, 2014).

In terms of geographic spread and attractiveness, the HEIs located in Budapest appear to be the preferred choice of students (Hegedős, 2015). They absorb almost half of the newly enrolled students, including an over-representation of students from elite high schools. HEIs elsewhere in the country have regional catchment areas which are based on geographical location and specialisation of study programmes.

The 2014 Higher Education Strategy brought forward the restructuring of the country’s higher education system with mergers and separations of faculties, as well as a transformation of the former colleges into universities of applied sciences (Hungarian Government, 2014). Examples relevant to the case study HEIs of this review are the Eszterházy Károly College (EKF) in Eger which became a University of Applied Sciences in 2016 after having incorporated the Károly Robert college (in Gyöngyös), and the Pedagogical Faculty (in Jászberény) of the Szent István University as new faculties. The Veterinary faculty of the Szent István University became an independent University, and two faculties of Corvinus University in Budapest were incorporated into the Szent István University.

Students

Between 2005/06 and 2011/12, the total number of students in Hungary fell by 13% (European Commission, 2015a). In order to sustain the country’s upward development in the tertiary education attainment rate, admission rates need to stabilise on an upward trend, and the high drop-out rates in some fields call for effective counter measures. Improvement is also needed in study orientation and career counselling (OECD, 2016). A competency test was recently introduced for newly admitted students. Results will guide the development of catch-up courses and mentor programmes (Kovacs, 2016). The new admission measures,

however, bear the risk of narrowing access to higher education (EU, 2016). Admission measures need to be complemented with effective support measures to raise the progression and completion rates of students. Application rates to higher education from students in upper secondary vocational education are going down, and pupils from disadvantaged backgrounds could tend to apply to programmes and institutions with lower admission requirements to raise their chances of admission. For example, it is relatively easy to get into engineering and IT programmes as admission points are relatively low compared to other programmes, but drop-out rates are very high (Megyeri and Berlinger, 2015).

The 2015 Active Youth in Hungary representative student survey found that family background, in particular the parents' level of education and the students' place of residence, largely determine the educational attainment of students (Szabo, 2015). The survey also provides information about the financial situation of students. Two-thirds of full-time students receive financial support from their parents, and 41% have a paid job besides their studies. A study of the motivation of students to work found that 54% stated "to gain experience in the labour market" as a motivation; 39% had a job which was closely or very closely related to their field of study (Orr, 2016). Hence, experiential learning undertaken by students on their own and outside lecture halls seems to be well established as a phenomenon, but not integrated or formally recognised by the higher education system. The recent introduction of dual education programmes (see below) is thus an important step to provide students with formal opportunities to gain contemporaneously practice-based know-how, work experience and academic knowledge.

A commendable pilot initiative to widen participation in higher education for students from disadvantaged groups is Bridge into Higher Education, a small-scale programme piloted in 2013/14 by researchers from Corvinus University (Megyeri and Berlinger, 2015). Key aims were to "demystify" higher education, raise students' aspirations, and improve their performance in Mathematics and English language. Beneficiaries were secondary school students in their final year, from very-low income families, with a strong ambition to enter higher education, as well as tertiary students who wanted to improve their performance. Findings suggest that face-to-face consultations, work in groups and regular feedback are the most effective teaching methods. University mentors were found to play an important role in lowering mental barriers.

Efforts to raise graduate employability

More efforts are needed to provide prospective students with information on employability and market returns of their educational choices. In 2012, the Higher Education Information System (FIR) was restructured and expanded into a holistic management information system, fed into by every HEI. FIR connects the data from HEIs with the student loan centre, the national tax office, the labour office and other relevant databases. The Educational Authority report the official statistics to the Ministry of Human Capacities, who, in turn, provide the national Statistical Office with the necessary input to produce further statistics on the Hungarian higher education sector. Some of the reported data are publicly accessible in a highly aggregated form, however access to the main database is not granted for external users.

In Bachelor programmes student workload and contact hours are high. In full-time study programmes, there are at least 300 classes per semester, with obligatory attendance from Monday to Friday. Students are expected to cover between 10-15 courses per semester of which many have only 1-3 ECTS points assigned. This results in a high number of contact

hours. Consequently, teaching is often organised in the form of traditional lectures and frontal teaching, which leaves little room for experiential learning and the application of classroom knowledge to real life cases (Kovacs, 2016).

Dual education programmes at Bachelor level were recently launched. Currently, 19 HEIs offer a total of 79 BSc programmes in engineering, natural sciences, ICT, economics and agriculture (Kovacs, 2016). Each programme includes 20-24 weeks work-based learning in a company per academic year. Students have a higher workload compared to their peers, who follow a standard programme in the same field. After an initial 13-week period the dual students start their practical experience in the companies and prepare for the first round of exams. There are up to eight weeks of practice in the autumn-winter semester, and 16 weeks in the spring-summer semester. Students apply for a dual BSc through the central entrance exam or based on their final exam points in secondary school. They also have to apply with one of the programme partner companies, who generally use a variety of recruitment channels, such as road shows, exhibitions, secondary school visits, etc. The companies select students according to their own requirements based on a personal interview. Successful applicants are informed by the end of July and start the programme in September.

Doctoral schools are widely present in Hungarian universities. Currently, approximately 173 thematic doctoral schools are organised within 28 universities (Kovacs, 2016). Doctoral schools are accredited by the Senate of the HEI and the Hungarian Accreditation Committee. Several policy measures have been put in place to strengthen the doctoral school (e.g. Research University Programme, Hungarian Talent Programme), and in 2012 a ranking of doctoral schools was introduced (Dóry and Slavcheva, 2015).⁵ All doctoral students require certified competencies in foreign languages, which are tested by the doctoral school when entering the programme and upon completion.

Internationalisation plays an important role for several HEIs, particularly those with faculties in human medicine, dentistry or veterinary medicine. Recently, the internationalisation experience of twelve HEIs was reviewed in institutional audits supported by the Tempus Public Foundation (Kovacs, 2016). Key findings suggest that international mobility offers great potential to learn from international good practices and that individual contacts should be employed more strategically to strengthen institutional relationships (e.g. Erasmus Mundus), or to commence new research projects. For students, experiences gained during international mobility or from taking classes together with foreign students were found to contribute to proficiency in a foreign language and employability. Special attention should be on international students, who have studied in Hungary and are thus familiar with the language and culture. These students should be allowed to look for a job after graduation and automatically provided with a work permit if they find a job (OECD, 2016).

Resources in higher education

Investment in educational institutions across all levels is, with 4.1% of GDP, one of the lowest among OECD countries (the OECD average is 5.3%). During 2005-12, public expenditure in education decreased by 25%, whereas the OECD average increased by 18%. Between 2008 and 2012, the public expenditure per student in higher education decreased by 15%, whilst the number of students also decreased by 7%. In 2012, USD 7 405 were spent per student at tertiary level compared to the OECD average of USD 10 309 (OECD, 2016).⁶

In 2015, the total government funding for all public HEIs was EUR 492 million.⁷ Latest data on the expected income for all state-owned HEIs is approximately EUR 943 million,

which includes, in order of magnitude, EU structural funds, competitive research funding and other co-funded calls, national research funding, and revenues from commercialisation and consulting activities.

The Higher Education Strategy foresees several modifications in the institutional funding of state-owned HEIs. The new funding formula takes into account the type of education, its associated costs, as well as the educational output, that is, number and level of degrees. First changes are expected for 2017. The future budget of an HEI will draw on the following sources: 50% institutional funding, 24% competitive funding, 22% own incomes (i.e. tuition fees, services), 2-4% direct R&D funding from third parties, and less than 1% from donations (Dóry and Slavcheva, 2015). This new approach to institutional funding expects a significantly increased capacity of HEIs to raise income from industry collaborations and third mission activities.

HEIs independently manage their income from commercialisation, consulting and other R&D activities with a separate account and these funds can be used for the development of educational, research and cultural activities (Kovacs, 2016). On average, this accounts for around 1.5% of an HEI's total income (Dóry and Slavcheva, 2015).

Research units in public HEIs receive formula-based funding from the HEI's budget (Dóry and Slavcheva, 2015). This funding has decreased significantly in recent years as a result of severe cuts in the institutional funding for HEIs and a reduced share of national project-based funding. Since 2015, the latter comes from the National Research, Development and Innovation Fund (NKFI), which combines the two previously separated funding sources for basic research (OTKA) and for applied research (KTIA). For 2015, the total NKFI budget was EUR 247 million (Kovacs, 2016).

It is estimated that half of the funding for HEIs and public research organisations is covered by competitive project-based funding. Given the importance of EU funding, a key objective is the improvement of the absorption capacity. Efforts are underway to remove management and administrative barriers and improve the capacity to prepare and evaluate

Table 1.1. Summary overview of key facts on the Hungarian higher education system

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|---|-----------|
| Population (1 Jan 2017) | 9 799 000 |
| GDP in EUR per capita (2015) | 11 000 |
| Tertiary attainment in population aged 25-64 (2015) | 24.2 % |
| Of which | |
| Short cycle tertiary education | 1.3% |
| Bachelor | 13.2% |
| Master | 9.0 % |
| Doctorate | 0.8 % |
| Expenditure on tertiary education institutions as a percentage of GDP (2013) | 0.9 % |
| Expenditure (from public and private sources) on R&D (2015) | 1.39 % |
| Direct government budget for R&D as a percentage of GDP (2015) | 0.48 % |
| Number of students in publicly funded higher education institutions (2015/16) | 220 058 |
| Of which: | |
| Universities | 196 949 |
| Universities of Applied Sciences | 17 586 |
| Other higher education institutions | |
| Tertiary degrees conferred (2016) | 68 110 |
| Of which: | |
| Degrees by universities (BA, MA, first degree, second degree) | 54 309 |
| Degrees by UAS (Bachelor, Master, Associate) | 9 078 |

Source: Ministry of Human Capacities (2017).

funding applications, and to enhance synergy with national funding sources (EC, 2015b). During 2007-14, the HEIs had access to substantial funding from several Operational Programmes, which should have increased their collaborative capacity with industry; however, no analysis or assessment is available (Dóry and Slavcheva, 2015).

Table 1.1 provides a summary overview of key facts on the Hungarian higher education system.

Higher education policy framework

Key actors

In the following, the main government organisations and other national stakeholders with responsibilities in higher education and the country's research, development and innovation system are briefly presented as relevant to this study.

At the national level, the Ministry of Human Capacities is responsible for the country's education system from pre-school to tertiary education, except for vocational education and training. Within the Ministry of Human Capacities, the State Secretariat for Higher Education covers the higher education agenda. The Ministry's portfolio also includes youth, sports, healthcare and welfare, and the protection of cultural heritage. The Ministry for National Economy has a wide range of responsibilities for financial and economic governance areas, as well as for vocational education and training. It is responsible for the research and innovation policy and oversees three relevant Operational Programmes: Economic Development and Innovation (GINOP), Competitive Central-Hungary (VEKOP), and the Territorial Operational Programme (TOP).

The Hungarian Accreditation Committee (HAC) was established in 1993 together with the country's first higher education law (Kovacs, 2016). The HAC conducts ex-ante and ex-post quality assurance of programmes and institutions. Its main task is to ensure the quality of higher education programmes. The HAC also evaluates foreign HEIs operating in Hungary. Ex-ante quality assurance of programmes includes the national-level educational and outcome requirements, which are framework requirements for all degree programmes in Hungary. The ex-post quality assurance is conducted in five-year cycles. Based on the 2012 Higher Education Act, the HAC has 18 full members, of which eight are appointed by the Ministry for Human Capacities, three by the Hungarian Rectors' Conference, two by the Hungarian Academy of Sciences, two by the Churches, one by the Hungarian Academy of Arts, and one by the National Union of Doctoral Students. The president is nominated by these members and appointed by the Minister in agreement with the president of the Hungarian Academy of Sciences. The president and members receive their letters of appointment from the Prime Minister for a six-year term, renewable once.

The Hungarian Rectors' Conference (HRC) was established in 1988 and represents all HEIs in the country. Its primary task is to represent the higher education institutions and to protect their interests in any issue relevant to higher education at national and international levels. In this respect HRC manages the elaboration of proposals on legislative provisions, and co-ordinates the discussion process to form common positions of the Hungarian higher educational sector on significant HE issues. As a result of these activities HRC is a determinant actor in shaping relevant national public policy. By means of full membership in the European University Association (EUA) and the International Association of Universities (IAU) HRC plays an active role in the realisation and improvement of the internationalisation strategies of the Hungarian HEIs. In the framework of the professional

working groups of the EUA, HRC is also forming perspectives of research and innovation activities in the European Higher Education Area. Researchers and experts delegated by HRC to these working groups are involved in the newest developments of current HE issues, and provide useful inputs to national HE principles. By participating in EU-funded projects with different kinds of scopes HRC contributes to the development of crucial fields of EHEA, such as the enhancement of teaching quality in higher education, and addressing the present challenges of professional higher education. HRC pursues constant dialogue with international partners, as a result of which mutually fruitful international collaborations are undertaken. A good example of successful co-operation is the Brazilian scholarship programme, Science Without Borders, in which more than 2 000 Brazilian students visited Hungary under the umbrella of HRC's co-ordinating and organising activity.

The National Research, Development and Innovation Office (NKFIH), established in January 2014, is responsible for research, development and innovation. It brings together several government bodies and the two public research funding programmes KTIA and OTKA. NKFIH hosts an independent panel of external experts, which follows the smart specialisation agenda; they play a crucial role in the Horizon 2020 applications and run bilateral science and technology co-operations. The NKFIH also plays a key role in the preparation and implementation of the Operational Programmes (see below), and pre-reviews the eligibility of project proposals. The Office has, for the last decade, been involved in the panels selecting science funding proposals. Firms applying for projects can also ask the NKFIH to check the project plan, budget, and the composition of the project team prior to proposal submission.

The National Science Policy and Innovation Board was created as a policy advisory body in 2013. It is co-chaired by the Prime Minister and the president of the Hungarian Academy of Sciences. The mandate of the board is to provide advice, evaluate and make recommendations on strategic issues of scientific, research and development and innovation programmes, the sustainable finance of these programmes and the evaluation methodology to be carried out by public research organisations and HEIs (Dóry, 2014). This body was expanded in 2015 with nine distinguished members from the fields of economy and science to monitor the effective use of financial instruments available for research and innovation (Dóry and Slavcheva, 2015).

The national umbrella for the technology transfer offices in HEIs is the Hungarian Intellectual Property Office (HIPO), a government agency under the supervision of the Minister for Justice. The president is appointed by the Prime Minister and the two vice-presidents are appointed by the Minister of Justice. The HIPO collaborates with the technology transfer offices in HEIs and the Chambers of Commerce and it supports the operation of territorial centres that offer IP consultancy services and training for scientists and local firms.

The Tempus Public Foundation (TPF) is a non-profit organisation established in 1996 by the Hungarian government, with the task of managing international co-operation programmes and special projects in the field of education, training and EU-related issues. TPF is also a member of the network of Erasmus+ national agencies and information offices. TPF also operates a knowledge centre which provides structured information on education and training policies, implements projects in education policies, participates in initiatives for improving mobility and other internationalisation measures, organises thematic conferences, compiles professional publications, and implements joint actions with partner

organisations. It also offers a wide range of its training courses, and operates a best practice database on innovative educational tools and digital methodology in education.

As an implementing agency for European, multilateral and bilateral educational programmes, the main goals of the Foundation are: supporting initiatives aiming at the modernisation and quality improvement of education, training and human resources development; encouraging international co-operation and mobility; and strengthening the European dimension in these fields. Activities include management of scholarships for incoming and outgoing students and staff, support for co-operation programmes, and capacity building activities for HEIs. TPF provides assistance and consultancy services; organises training courses, info days, conferences and joint actions with partner organisations; and publishes research studies, dissemination materials, and best practice publications.

Recent policies

The national higher education strategy “A Change of Pace in Higher Education”

The 2014 national higher education strategy “A Change of Pace in Higher Education. Guidelines for Performance Oriented Higher Education Development”, sets the agenda up to 2030 (Hungarian Government, 2014). The key objectives are to establish a performance-based higher education system, boost the research element of higher education and introduce a career system for researchers; and to strengthen links between HEIs and businesses. The strategy foresees several major changes in the internal governance structures of HEIs, content and structure of study programmes, and access to higher education (Hungarian Government, 2014). The following performance indicators were set in the new strategy: i) cost of teaching by specialisations, ii) cumulated number of credits, iii) increase of the competency level of students, iv) number of diplomas, v) drop-out rates, and vi) research achievements in terms of number of publications in foreign languages, technology transfer projects, patent applications, doctoral degrees awarded, scientific prizes (Dóry and Slavcheva, 2015).

Two major changes to the HEI internal governance structures have been introduced: i) the position of the chancellor, who is in charge of the non-academic management of an HEI, and ii) a consistory, which involves three external stakeholders (besides the rector and the chancellor), appointed by the Ministry of Human Capacities, in strategic decision making processes, including adopting the medium-term institutional development plan and the RDI related strategy, the annual budget and report, as well as asset management plans and the establishment of a business entity (Kovacs, 2016).

The rationale for the introduction of the chancellor was to enhance the HEI’s professional management capacity. As stated in the Higher Education Act of 2012, the chancellor is responsible for “the economic, financial, controlling, accounting, employment, legal, management and IT activities of the higher education institution, the asset management of the institution, including the matters of technology, institution utilisation, operation, logistics, services, procurement and public procurement”; and responsible for the employment of all non-academic staff. The chancellor is appointed by the Prime Minister, following a job description drafted by the Ministry of Human Capacities, to which he/she is also accountable. According to Kováts (2015) there is as yet no functioning mechanism in place to “resolve conflicts between the chancellor and the academic leadership (rector), [...] the chancellor’s external and internal legitimacy is [sic] uncertain, not to mention the strong tendencies inherent in the system to erode his internal legitimacy”. In a system where

limited and decreasing funding (see below) has introduced a certain degree of tension, conflicts over the allocation of resources and the identification of strategic development areas are likely to emerge.

By 2020 the number of study programmes in higher education will be cut by 15% (Hungarian Government, 2014). At the same time, launching new programmes will become easier, however, implying stricter monitoring and evaluation of quality and outcomes. This includes the above-mentioned dual education bachelor programmes for which a Dual Training Council with representatives of government, HEIs, chambers and companies was established to co-ordinate the dual education programmes. Companies that offer placements can deduct the cost of trainees from their vocational training tax contribution, and receive financial resources for training equipment (EU, 2015). This practice has been in place for some time.

More pathways into higher education will be created for secondary school and mature learners (Hungarian Government, 2014). For the latter, work experience and prior non-formal learning will be recognised in the higher education entry requirements. Furthermore, higher education centres for community based studies will be opened in remote areas. For secondary school graduates an intermediate level of foreign language command will be required for all HEI programmes by 2020, with the exception of short cycle vocational programmes. These pathways into higher education have already been partially introduced with the new higher vocational education and training system. From the 2013/14 school year onwards only HEIs can launch these programmes after secondary school, which is reflected in the change of the name of the programme (from advanced to third-level vocational education and training). Graduates can transfer up to 75% of all the credits gained (between 30-90 credits) to a Bachelor programme in the same field.

The “Investing in the Future 2020” strategy

The Investing in the Future 2020 strategy follows the Science, Technology and Innovation Strategy (2007-13). In a seven-year time period it seeks to address key persistent challenges in the innovation system, which result from shortcomings in technology transfer and knowledge exchange, internal weaknesses in knowledge production in HEIs and public research organisations, and the low knowledge absorption capacity in the domestic business sector. The overall target is to raise the research and development (R&D) intensity rate from 1.4% in 2015 to 1.8% of GDP by 2020.⁹

Several specific measures, such as the National Talent Programme, have the following set of objectives: i) strengthen higher education attainment rates in sciences and engineering, ii) facilitate temporary mobility of researchers into industry, iii) offer continuous professional development in innovation management, project management and intellectual property rights, (iv) strengthen the entrepreneurial culture of researchers and students, iv) improve the accessibility of scientific databases, and v) enhance international co-operation and participation in scientific networks (Dóry and Slavcheva, 2015).

The role of higher education in the country’s research, innovation and development system

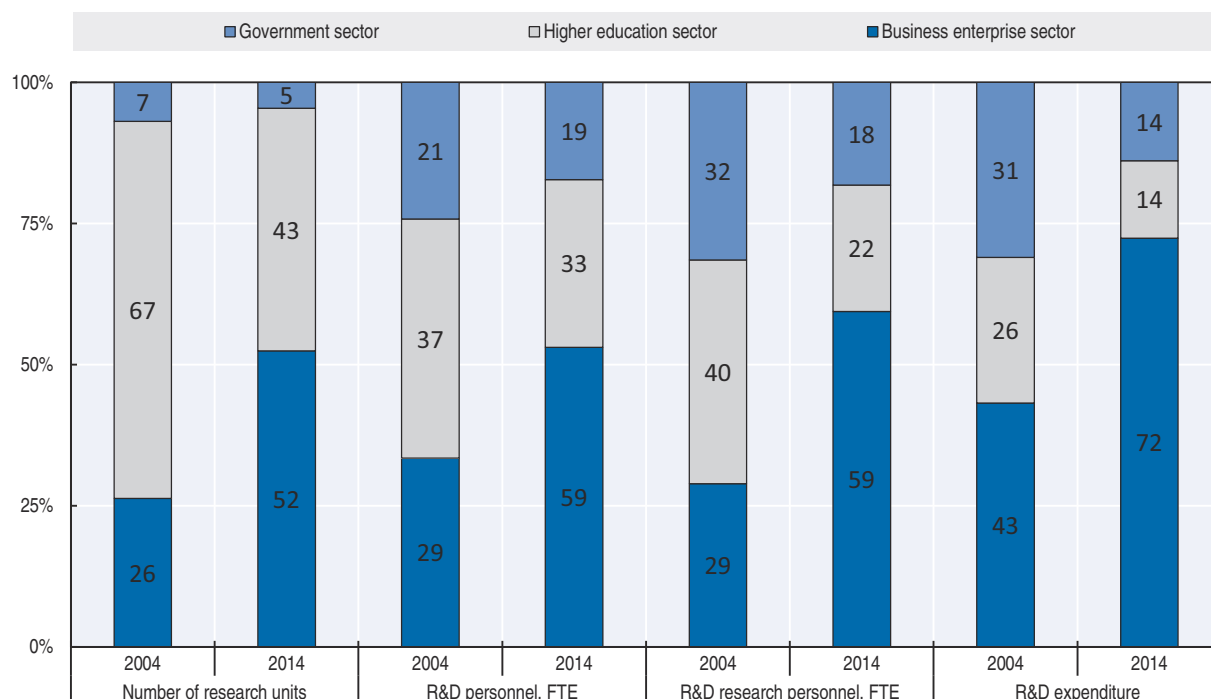
Key challenges in the country’s RDI system are the low rate of innovation activity in domestic firms, gaps in the supply of human resources, and a lack of functioning interfaces for enhanced co-operation between HEIs, PROs and businesses (Dóry and Slavcheva, 2015).

Regarding the role of HEIs in the RDI system, an underlying issue, however, of salient importance is the dominant perception of linearity of research and innovation and “a stronghold of ‘basic research’, where ‘applied research’ is regarded with scepticism and mistrust” (European Commission, 2015b). This also manifests in the isolation of research units due to their narrow disciplinary research orientation and a lack of opportunities to participate in transdisciplinary research initiatives. This could be partly explained by the long existence of two distinct funding streams for basic and applied research and the dominance of the traditionally grounded Hungarian Academy of Sciences in non-HEI research (*ibid.*).

Two important initiatives to strengthen the role of HEIs in the RDI system are the “Momentum” and “Visiting Scholar” programmes (Dóry, 2014). The aim is to raise the efficiency and effectiveness of scientific research through greater exchange with international networks and leading scholars, a start-up ecosystem around HEIs, and measures to raise the absorptive capacity of incumbent firms. More could be done to attract young and mid-career professionals from companies into HEIs and public research organisations – (lower salaries are an obvious barrier) – and to strengthen professional research management support and skills.

According to latest available data, in 2013 the business sector employed more than half of all full-time equivalent (FTE) researchers (57.2%); 23.7% worked in HEIs and 19.1% in public research organisations (Dóry and Slavcheva, 2015). The largest research units were located in public research organisations with on average 60 scientists, whereas research units in private firms have twice as many researchers per team than HEIs (Figure 1.1).

Figure 1.1. **Distribution of key research and development resources in Hungary (2004, 2014)**



Source: Kovacs (2016) based on National Statistical Office.

Businesses, especially large enterprises and multinational corporations located in the Central Hungarian region, employ approximately 60% of all researchers. Other regions lag behind but still show a substantive increase. During 2004-10 the number of researchers in all sectors increased by a factor of 2.8 in Eastern Hungary and 2.6 in Western Hungary (European Commission, 2015b). Looking into company size, the greatest increase in the number of R&D personnel can be noted for micro- and large enterprises, which almost doubled their average number of researchers in the period 2001-10, while medium-sized companies showed no increase (National Innovation Office, 2012 cf. Kovacs, 2016).

Academic staff in HEIs can be deployed for up to one-third of their time for research activities. In order to raise the R&D capacity in HEIs, young researchers on assistant and associate professor posts received a 15% salary increase in 2016. Doctoral students now receive higher scholarships plus an additional year to complete their studies (within a total period of four years) (Dóry and Slavcheva, 2015).

The recently started R&D Workshop Excellence programme, with a budget of EUR 141.9 million, seeks to strengthen research units in HEIs by releasing researchers from their teaching duties and creating new positions for young researchers (Dóry and Slavcheva, 2015). This also includes the introduction of fixed-term post-doctorate positions, which hitherto did not exist. It is expected that these positions will allow early-career researchers to find a position in Hungary and keep them from moving abroad (Dóry and Slavcheva, 2015).

Except for bibliometrics, there is little quantitative information on the performance of intersectoral R&D collaboration. Scopus data shows that in the period 2003-13 there was almost no change in the percentage of academia-industry co-publications; which in 2013 were, with 1.4%, below the EU-28 average of 2.2% (Dóry and Slavcheva, 2015). Co-publications mainly cover research in areas of energy, immunology and microbiology, health related professions, pharmacology, toxicology and pharmaceuticals. Since Hungary's accession to the European Patent Office in 2003, the number of national patent applications has decreased from 4 810 (2003) to 619 (2014). The regional distribution of patent activity is largely concentrated around Budapest and the Central Hungarian region (Kovacs, 2016).

Education related collaboration with businesses and industry

Across the country, several multinational corporations have established long-term relationships with HEIs (Deloitte 2014). Five examples are briefly presented below:

- 20 years ago, Ericsson Telecommunications Hungary started collaborations with several departments of Budapest University of Technology and Economics (BME) and ELTE University, two large universities located in Budapest. Students, mainly in MSc and doctoral programmes work together with their research supervisors and company R&D staff on jointly identified research questions in software and hardware development and microwave networks. Temporary employment contracts are offered for PhD students to collaborate in research projects.
- In 2005, the Robert Bosch Group established the Department of Mechatronics at the University of Miskolc. The choice was motivated by the University's educational profile in mechanical, electrical and computer engineering, and economics, and its proximity to four Bosch Group factories, two of which are located in Miskolc. The collaboration is based on experiential education and joint research activities in the field of mechatronics. Outstanding students can apply for the Faculty Memorial Medal and the Bosch Award.

- A similar collaboration developed between the Széchenyi István University in Győr and Audi Hungary Ltd. in 2007 with the establishment of the Department for Internal Combustion Engines. Engineering students are trained in the tribology of internal combustion engines. The collaboration, which is supported by the Municipality of Győr, was formally recognised as a role model for the FIEK policy initiative (see below).
- In February 2009, Dunaújváros University of Applied Sciences and Hankook Tire Hungary Ltd. started a joint Rubber Technology Engineer programme, which provides engineers with theoretical and practical knowledge of tyre manufacturing. Training sessions are organised on campus and in the factory. Hankook engineers are educators in the programme.
- In 2011, Kecskemét University of Applied Sciences signed an agreement with Mercedes-Benz Manufacturing Hungary and Knorr-Bremse to establish a dual vocational training programme in mechanical engineering following the German model. The Kecskemét City Council and the Chamber of Industry and Commerce are also involved. The initiative became a blue print for the recently started and above-mentioned dual education programmes at Bachelor level.

Industry collaboration at the level of individual HEIs has been taken to the next level with the following two policy initiatives: The Higher Education and Industry Collaboration Centres (FIEK) and Open Laboratories. The FIEK Centres are expected to play a major role in establishing a broader territorial co-operation between HEIs and local industry and businesses. FIEK partners shall play a crucial role in the development of programme and course curricula. This is linked with the dual education initiative. The aim of the Open Laboratories initiative is to open up public research laboratories, as well as corporate labs, for companies, in particular small and medium-sized enterprises (SMEs). It is expected that, as a result of their involvement in an open laboratory, non-innovator firms will commence an innovation activity. FIEK has its roots in the Co-operative Research Centres and Regional Knowledge Centres at Universities (RET), which aimed at strengthening pathways for the commercialisation of research results. All five HEIs that were visited as part of this review benefitted from this (Table 1.2).

Table 1.2. **Examples of Co-operative Research Centres and Regional Knowledge Centres in the case study HEIs**

| HEI | Year | Research/industry areas | Funding (million HUF) |
|--|------|--|-----------------------|
| University of Debrecen | 2004 | Genomic, nanotechnological and biotechnological applications | 1 700 |
| Semmelweis University | 2004 | Molecular and info-bionic research in medical sciences | 1 600 |
| Széchenyi István University | 2005 | Automotive industry | 1 100 |
| Szent István University | 2005 | Natural resources, environmental protection | 500 |
| Eszterházy Károly University of Applied Sciences | 2005 | Consumer focusing complex traceability systems, new food safety parameters and devices with new info-communication systems | 800 |

Source: Kovacs (2016).

Policy initiatives that seek to enhance HEI-industry collaboration and to raise the absorptive capacity of SMEs need long-term implementation commitment to be effective, as they require the establishment of organisational structures and procedures. Critical voices pointed out that policy initiatives have kept changing content, direction and actors, which resulted in discontinuity of successful measures and introduced overlap (Deloitte, 2014). A multi-phase approach that includes selection, evaluation and replication or continuing of effective measures could help here. Such an approach guides the Operational

Programmes for the period 2014-20. Table 1.3 provides an overview of the most relevant measures and calls in the Operational Programmes for economic development (GINOP) and competitiveness for Central Hungary (VEKOP).

Table 1.3. **Overview of RDI relevant measures and calls in the Operational Programmes 2014-20**

| Measure | Main objective | Foreseen budget (2014-20) (in million EUR) |
|--|--|---|
| Support for RDI activities of companies | Support the development of prototypes, new products and services. | 183.00 |
| R&D competitiveness and excellence co-operations | Collaboration between domestic companies, research units and HEIs to enhance exploitation and commercialisation of scientific research results. | 161.30 |
| Strategic R&D workshop excellence | Strengthening the R&D capacities of strategically important research units to achieve world-class research results. | 146.67 |
| Higher Education and Industry Co-operation Centre (FIEK) | Establishment of a collaboration infrastructure to strengthen Hungary's RDI system and in particular the role of HEIs. | 80.60 |
| Development of prototypes, products, technology and services | Applicants should carry out experimental research (40% of costs) and the development should result in a new product or service either in demonstration phase or market entry. | 64.50 |
| Strengthening the research infrastructure, internationalisation and networking | Development of internationally competitive knowledge centres, participation of Hungarian researchers in international research networks (particularly in Horizon 2020 projects). | 73.30 |
| Innovation ecosystem | Support the operation of business incubators and enhance the performance of tenant companies. | 16.13 |
| Innovation vouchers | Vouchers for start-ups and SMEs to be used for temporary innovation consulting services and innovation support services, also to enhance collaboration with knowledge centres. | 10.00 |
| IP protection | Support of intellectual property rights protection at national and international levels, including patent search and fees. | 3.33 |

Source: RIO (2015).

Higher education engagement with the wider world

Since 2000, there has been a notable shift in the orientation of academic staff in Hungarian HEIs towards increased application of their research and greater societal relevance (Novotny, 2010). Changes in national funding and grant schemes, as well as the support for transdisciplinary research on global challenges in EU-funding schemes (e.g. Horizon 2020), have triggered this change in attitude. Effective HEI-internal responses are, however, often lagging behind. Efforts are needed to raise awareness of students and staff and provide horizontal support services, for example in research grant management.

The 2014 Higher Education Strategy assigns third mission activities in HEIs a central role and raises stakeholders' awareness of the impact of knowledge exchange for economic and social development. However, no clear definition is given of what third mission activities entail. The study visits to five HEIs confirmed that a narrow definition, with a focus on commercialisation of research results through existing companies and newly created firms (mainly spin-offs by HEI staff) prevails, particularly among HEI leadership, faculty heads and staff involved in research. Third mission activities, however, cover much broader dimensions of development. For example, as environmental problems become increasingly difficult to tackle without scientific advice, demands for involvement of HEIs are also articulated in political arenas and through not-for-profit organisations, social movements or foundations that are increasingly linked to universities (OECD, 2011).

Third mission activities are considered as literally a "third" set of activities on top of education and research, and staff perceives it as difficult to make space for these activities on top of their daily workload. Respondents in a representative survey of more than 1 500

academic staff in engineering, natural sciences, medicine and health sciences, and agriculture departments from 14 HEIs found it very hard to deliver equally well on both education and research, particularly as the latter is the basis of their performance evaluation. This conflict is particularly evident for those who aim to meet the expectations of students and their academic peers (Novotny, 2010).

Looking into the framework conditions for third mission activities in Hungarian HEIs, the pre-peer review report (European Commission, 2015b) pointed out a number of barriers, which can be grouped into i) the wider ecosystem, ii) HEI culture, and iii) HEI support structure.

- *Wider ecosystem:*
 - ❖ Few/weak connections between RDI actors
 - ❖ Lack of support for technology transfer and entrepreneurship
 - ❖ Ineffective Regional Innovation Agencies
 - ❖ Weak private sector demand for technology transfer
 - ❖ Low internationalisation of domestic firms
- *HEI culture:*
 - ❖ Narrow understanding of the third mission as a third set of activities apart from education and research
 - ❖ Little/no space for entrepreneurship as a key competence in curricula
 - ❖ Difficulty in changing mindsets, persistence of old patterns
 - ❖ Deep lack of trust
 - ❖ Few multidisciplinary projects; lack of co-operation between departments or different HEIs
- *HEI support structure:*
 - ❖ Virtually no entrepreneurship education
 - ❖ Innovation in a broader sense, including responses on teaching and learning, and organisational challenges, is not high on the agenda
 - ❖ Lack of support services for technology transfer and entrepreneurship
 - ❖ No clearly defined or broadly accepted organisational structures and procedures by academic and non-academic staff
 - ❖ No critical mass in technology transfer and entrepreneurship

Technology transfer offices

Several HEIs have created technology transfer offices (TTOs) to facilitate the commercialisation of research results. Funding was available in the Operational Programme for Social Renewal for the period 2007-14), ranging from HUF 209 million to HUF 461 million. HEIs had 24 months to establish technology transfer structures (Kovacs, 2016). The programme evaluation found that the HEIs were largely not prepared to implement their ambitious plans within the time available, and instead of using the funds for pilot projects to define innovation pipelines or the introduction of a proof-of concept funding, state-of-the art reports and other studies were produced (ibid.).

Also, several intermediary organisations, such as Regional Innovation Agencies, technology incubators, foundations for enterprise promotion, etc., were established. Their contribution to raising the effectiveness of the RDI system remains low, not least because they are largely detached from the HEIs (Dóry and Slavcheva, 2015). There is agreement that

the current commercialisation support infrastructure in and around HEIs is not yet prepared to identify and act upon invention and innovation opportunities (Dóry, 2014; Dóry and Slavcheva, 2015; European Commission, 2015b).

All HEIs have their own manuals on intellectual property rights to deal with disclosure of inventions and some TTOs (e.g. University of Pécs, University of Debrecen and Semmelweis University) have established full in-house invention evaluation systems covering technological, marketing and legal aspects. Several HEIs have relied on competitive funding (often EU co-funded) to attract qualified staff. This, however, has proved to be only a short-term solution potentially risking a high turnover in staff.

The evaluation of the Operational Programme for Social Renewal found that the funded TTOs had achieved only a weak position within their HEIs (Kovacs, 2016). Several studies found that at the level of individual academics there was thus only little willingness to openly share information and that one of the most critical challenges for TTOs was to create trust-based relations (Nowotny, 2008, 2010). Certain fields of science, such as engineering, ICT and biotechnology, have a higher commercialisation potential for research results. However, the high level of autonomy of faculties and the absence of a functioning reward and funding redistribution system are likely to distort initiatives and resources for technology transfer and entrepreneurship into certain niche areas instead of enhancing their spread across the entire HEI (Nowotny, 2010; Szabó, 2010).

Studies on the motivation of researchers to engage in commercialisation activities show mixed results for how important the extra income from these activities is. Whereas Novotny (2014) reported that extra income is a primary motivation for the majority of scientists in his sample, Huszar et al. (2016), proposed from their survey a combination of several motivational factors. These are, in order of importance: i) obtain financial resources for further research; ii) access to an environment that is more flexible than the university for the invention's further development; iii) increase of personal income; iv) collect industrial feedback on the applicability of the invention; v) benefits for society; vi) direct control over the commercialisation process; vii) secure jobs for young researchers in the spin-off company; viii) secure a job for oneself if university position is terminated; ix) increase social reputation; x) increase scientific reputation; xi) demonstrate the practical relevance of research to family/friends. The study by Huszar et al. (2016) also pointed to another interesting aspect, which could be followed up by specific policy measures. The majority of scientists who were successful in research commercialisation had gained some kind of managerial experience in the private sector. Temporary mobility programmes for academic staff into industry could stimulate this.

Interest in entrepreneurship and start-up support in HEIs

Interest in entrepreneurship among students and young scientists in Hungary is growing quickly. For several years, Bridge Budapest (2016) has been surveying the entrepreneurial intentions of students, young scientists and other groups of society. The 2016 edition of a representative survey of young people showed that six out of ten young people in the age group 20-35 years have concrete plans for their own business, and almost 60% of the respondents with a higher education degree stated that they know a company which was founded by a Hungarian young person and has achieved global visibility (e.g. Start-up.hu, 2017).⁸ Reasons for not starting a business have changed over time. Whereas financial safety and risk avoidance have fallen to 18%, from 36% in 2015, insufficient business knowledge has remained a major start-up barrier.

The regularly survey activity of the Hungarian team of the Global Entrepreneurship Monitor also points out a growing interest in entrepreneurship. According to latest data, 16% of the surveyed population intends to start a business within the next three years. Main start-up barriers are the “unsupportive education system and negative media attention” (GEM Hungary, 2016). The study concluded that in the long run, the challenge will be to make the education system more supportive of entrepreneurship.

Only a few HEIs have on campus business incubator facilities (Dóry and Slavcheva, 2015). A major initiative to strengthen the Hungarian start-up ecosystem is the “Start-up_13” programme, launched in June 2013 with EUR 7.2 million funding. The aim is to support (high) technology start-ups and spin-offs to finally grow into dynamic international firms. It operates in multiple phases. In 2015, contracts were signed with four incubators and a number of selected projects (National Research, Development and Innovation Fund, 2016). In the first phase, innovators could get a maximum of EUR 10 000 to elaborate their business ideas if the expert committee finds the idea prosperous. In the second phase, innovators could get higher support to further elaborate their ideas, up to a maximum support of EUR 200 000 for technology and business development. In this phase, start-ups should collaborate with the technology incubators and accelerators (Dóry and Slavcheva, 2015). A new initiative was recently launched with the “Innovation Ecosystem” programme (Box 1.1).

Box 1.1. “Innovation Ecosystem” programme

The “Innovation Ecosystem” programme (EDIOP-2.1.5) launched in 2016 seeks to strengthen incubation facilities for start-ups and spin-offs. The state will share the high risks associated with investing in innovation-based start-ups, with the owners of incubators specialising in the development of start-ups.

Total funding per incubator is HUF 600 million (approx. EUR 1.9 million) for a three-year period and covers costs related to the recruitment of start-ups/spin-offs, mentoring, technology and business development, financing of innovative start-ups/spin-offs to market entry, as well as the organisation of events. Incubators are expected to incubate at least five start-ups/spin-offs with at least three prototype/tested products or services, and at least five public start-up events organised per year.

Incubators define their own selection criteria for start-ups/spin-offs. Only unlisted micro enterprises up to five years following their registration, which have no distributed profits and are not the result of a merger can apply as start-ups/spin-offs. They are entitled to use up to 20% of the grant to cover operating costs, and remaining funds should be transferred to beneficiaries, up to HUF 60 million (approx. EUR 193 500) for each project.

Only public/private limited companies or limited liability companies with at least HUF 5 million nominal capital are eligible as incubators. These companies are required to invest at least 20% of the allocated grant in the start-ups/spin-offs. During incubation, the incubator is therefore, because of the investment of its own funds, a shareholder, owning up to 24% of the company.

Evaluation criteria for incubator applicants include: professional experience of the management and owners of the incubator; business plan; proportion of for-profit organisations in the ownership structure; amount of nominal capital available; expected impact of the incubator on the development of the local/regional innovation ecosystem; oral presentation and assessment.

Source: National Research, Development and Innovation Office (2017).

The Budapest Runway 2.0. – A Start-up Credo, published in 2013 by the Ministry for National Economy and the National Research, Development and Innovation Office put forward several concrete proposals to strengthen support for academic entrepreneurship. Education and training, access to funding, taxation and regulation, and an enabling environment were identified as four pillars of an effective start-up ecosystem. The strategy, however, lacks a more detailed understanding of the wider role of higher education in promoting start-up creation, which clearly goes beyond offering services and facilities by putting an emphasis on the development of entrepreneurship as a key competence, that is, the ability of individuals to identify, create and act upon opportunities to create value. Instead, the strategy focuses on the start-up process, and proposes the establishment of start-up business academies for young people with short, targeted trainings and mentoring, financed mainly by private investor funds and complementary national funding. The role of HEIs in creating initiative and raising awareness is clearly missing in this.

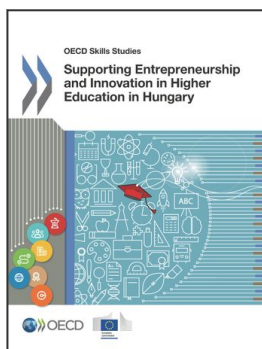
Notes

1. Population ageing has brought the share of 55-64 year olds in the population to 21%, which is one of the highest among OECD countries.
2. The EU-28 average in 2013 was 37.7%, the 2020 target is 40%. Hungary's new Higher Education Strategy (2014) sets 35% tertiary attainment as the target for 2023.
3. The total population of Hungary is 9 937 628, according to the 2011 census.
4. This concerns all teaching and research staff members who are employed directly or on a public service employment basis.
5. In the academic year 2015-16 the Hungarian state awarded 1 270 PhD scholarships, of which 850 were in the areas of engineering, natural sciences and ICT. About 30 scholarships were reserved for (ethnic) Hungarian students living in neighbouring countries (Dóry and Slavcheva, 2015)
6. Converted from HUF into USD using 2012 purchasing power parity.
7. In comparison, the annual budget of the University of Amsterdam is approximately EUR 600 million.
8. Key performance indicators include 30 research and technological laboratories to receive global recognition, the establishment of 30 new globally embedded R&D centres, and 300 fast-growing SMEs that enter international markets.
9. Two of the most well-known examples of Hungarian start-ups are Indextools, sold in 2008 to Yahoo, and Prezi, a cloud-based presentation software founded in 2009.

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From:
**Supporting Entrepreneurship and Innovation in
Higher Education in Hungary**

Access the complete publication at:
<https://doi.org/10.1787/9789264273344-en>

Please cite this chapter as:

OECD/European Union (2017), "Overview of the Hungarian higher education system", in *Supporting Entrepreneurship and Innovation in Higher Education in Hungary*, OECD Publishing, Paris/European Union, Brussels.

DOI: <https://doi.org/10.1787/9789264273344-6-en>

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