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Introduction

Research and development are an important priority of the national economic strategy, they are a priority area in all branches. Expenditure on R&D activities increase year by year primarily due to the growing activity of business enterprises.

Over HUF 468 billion, 1.39% of GDP was spent on research and development activities at the level of the national economy in 2015. Compared to 2014, the amount at current prices was 6.2% higher. R&D expenditure was up by 9.0% at the research units of business enterprises and by 2.7% at those in the government sector, while it decreased by 4.7% at research units in higher education.

Main indicators of research and development

<table>
<thead>
<tr>
<th>Year</th>
<th>employed persons</th>
<th>of which: researchers</th>
<th>capital expenditure as a percentage of national investments</th>
<th>expenditure as a percentage of gross domestic product (GDP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>0.84</td>
<td>0.57</td>
<td>0.79</td>
<td>1.15</td>
</tr>
<tr>
<td>2011</td>
<td>0.90</td>
<td>0.61</td>
<td>0.86</td>
<td>1.20</td>
</tr>
<tr>
<td>2012</td>
<td>0.93</td>
<td>0.62</td>
<td>1.33</td>
<td>1.27</td>
</tr>
<tr>
<td>2013</td>
<td>0.98</td>
<td>0.64</td>
<td>1.62</td>
<td>1.40</td>
</tr>
<tr>
<td>2014</td>
<td>0.91</td>
<td>0.64</td>
<td>1.16</td>
<td>1.37</td>
</tr>
<tr>
<td>2015</td>
<td>0.88</td>
<td>0.60</td>
<td>1.07*</td>
<td>1.39*</td>
</tr>
</tbody>
</table>

a) Full-time equivalents (FTE).

The number of research units and the headcount of people engaged in research activities went on diminishing. 2,801 research units were operating in 2015, 6.4% less than in the previous year.

The headcount of R&D personnel was 56.2 thousand, which was a decline of 1.7% compared to a year earlier. The full-time equivalent R&D personnel lessened at a lower rate, by 1.3%. The number of people employed in this area (taking into consideration the full-time equivalent

Flow of sources and uses of R&D expenditure by sector, 2015

Sources

- Government 5b) HUF 162,176 million
- Business enterprises HUF 232,869 million
- Funds from abroad HUF 70,030 million
- Funds from non-profit organisations HUF 3,316 million
- Government sector HUF 62,241 million
- Business enterprise sector HUF 343,984 million
- Higher education sector HUF 56,742 million

Uses

- HUF 47,524 million
- HUF 66,578 million
- HUF 5,493 million
- HUF 9,096 million
- HUF 54,437 million
- HUF 4,552 million
- HUF 6,527 million
- HUF 158 million
- HUF 145 million
- HUF 3,013 million

a) Including the honoraria and salary supplements based on scientific degrees and paid by government, and the amounts of state scientific scholarships.
staff number) was lower in the past two years than the average for the national economy, thus its share of total employment decreased, it was 0.88% in 2015. The proportion of researchers in R&D personnel was practically unchanged: it made up 68.3% of the headcount and 68.7% of the full-time equivalent staff number.

The size of research units grew: the full-time equivalent number of staff per research unit from 12.5 to 13.2 and the average R&D expenditure per research unit from HUF 147 million to HUF 167 million. The ratio of technicians to researchers improved, too, 26 technicians were recorded per 100 researchers (based on full-time equivalents) in 2014 compared with 28 in 2015.

The cyclical nature of R&D capital expenditure could be perceived again, after the outstandingly high growth measured for 2013 the value of capital expenditure decreased: to HUF 59.6 billion, and its share of national investments to 1.07% in 2015. Current R&D costs rose at a lower rate in 2015 compared to the previous years, by 8.4%. The decrease of 6.5% in the higher education sector was compensated by the 12.8% development of business enterprises and the more moderate, 2.7% rise in the government sector.

The role of business enterprises in financing strengthened further in 2015. 49.7% of total R&D expenditure came from this source, and the share of government increased to 34.6%, while funds from abroad were reduced perceptibly in terms of their amount as well as their proportion.

The role and the intensity of change of R&D activities differed essentially by sectors. The research units operating within business enterprises are of a growing significance, while the higher education and the government sectors are slowly but more or less continuously forced back.

The weight of business enterprises in financing business enterprises’ research units increased in 2015 too. While 41.8% of the R&D staff were working at the research units of Hungarian-owned business enterprises, merely 25.8% of R&D expenditure was spent here.

The manufacture of basic pharmaceutical products and pharmaceutical preparations invariably played an important role (HUF 53.9 billion) in the R&D expenditure of sections and divisions, however, other research and experimental development on natural sciences and engineering – with their expenditure of HUF 83.6 billion – overtook it in 2015.

The weight of business enterprises in financing business enterprises’ expenditure on research and development activities did not change essentially, it increased slightly, from 64.3% to 64.8% compared to last year. The financial sources of business enterprises’ research units received from the government budget went up substantially, by 28%, and funds from abroad were reduced by 10% compared to the previous period. The proportion of funds from non-profit organisations was invariably very low. Significant parts of government budget sources went to micro- and small-sized business enterprises (26% and 54% respectively). Medium-sized enterprises’ share of this source was only 8.5% this year, compared with 16.7% in 2014.
Statistical reflections

The publication activity of business enterprises’ research units was similar to that in the past years. As the primary aim of their scientific activities is not publication but the strengthening of their market position, they issued 169 scientific works and 965 articles in total, considerably fewer compared to the research units in the higher education and government sectors.

**Data on higher education sector**

There is a continuous decrease in R&D activities of the higher education sector, which can be observed when analysing research units, data on the number of staff as well as R&D expenditure.

A total 1,253 research units were operating in 66 higher education institutions in 2015, 35 fewer (3% less) than in the previous year, their proportion of all research units not reaching 45%.

21,988 people were engaged in research and development activities, which was a 2% decrease compared to 2014, slightly higher than the average. The number of researchers became 1.8% and that of technicians 4.2% less. The composition of the headcount of R&D staff by type of occupation hardly changed compared to the previous year: the proportion of researchers was more than two-thirds (71%), that of technicians 14% and the proportion of other support staff 15%. 40% of the total headcount of R&D staff, within which more than 40% of researchers and other support staff and less than 30% of technicians were employed in this sector in 2015.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of R&amp;D staff, headcount</th>
<th>Of which: researchers</th>
<th>Number of R&amp;D staff, FTE</th>
<th>Of which: researchers</th>
<th>R&amp;D expenditure, million HUF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher education sector</td>
<td>18</td>
<td>12</td>
<td>6</td>
<td>4</td>
<td>45</td>
</tr>
<tr>
<td>Total R&amp;D units</td>
<td>20</td>
<td>14</td>
<td>13</td>
<td>9</td>
<td>167</td>
</tr>
</tbody>
</table>

The total full-time equivalent (FTE) number of people engaged in R&D activities was 7,706, almost 3% less than in 2014. The higher decrease of the FTE number of R&D staff compared to the headcount of the staff shows that less time was spent on research and experimental development on average in 2015 than a year earlier. The lowest proportion of working time (35%) spent on research and experimental development – due to other tasks – was invariably in the higher education sector, while this proportion was 65.5% at national level.

Within the total full-time equivalent number of R&D staff, the FTE number of researchers lessened by 4.3% and that of technicians by 5.6%, while the FTE number of other support staff rose by 9.7%.

The decrease in the R&D expenditure of the sector continued, universities and colleges spent 4.7% less on R&D activities in 2015 compared to the previous year, HUF 56.7 billion in total, nearly 12% of the expenditure at the level of the national economy.

The amount of expenditure per research unit was invariably the lowest in this sector: HUF 45 million, 27% of the national average of HUF 167 million.

The current R&D costs of the higher education sector amounted to HUF 51.5 billion and its R&D capital expenditure to HUF 5.3 billion. While current R&D costs went down (6.5%) as opposed to the national average, capital expenditure rose (16.9%). As a result, the weight of R&D capital expenditure became larger within the expenditure of the sector, but it did not reach 10% even thus.

The primary financial source of R&D activities of universities and colleges is the government budget. HUF 42.7 billion, over three-quarters of total R&D expenditure was financed from this, thus the decrease was 3.3%, while a rise of 9.8% was measured at the level of the national economy. It was solely the amount of funds from non-profit organisations that fell in the sector, by 9.0%, but as its weight was small (5.3%) within the R&D sources of higher education, too, it could not compensate the decline of the other sources. Funds from business enterprises and from abroad were cut more markedly than the average, by 15.5% and 10.4%, respectively, so their proportion became smaller (by 8.0% and 11.5%, respectively) in financing the scientific activities of higher education. From business enterprises HUF 4.6 billion and from funds from abroad HUF 6.5 billion were used for R&D purposes in 2015.
in the number of technicians, their proportion of the sector as a whole became some 7–8 percentage points higher in the case of both the actual and the FTE number of staff. Similarly to the previous year, the number of women participating in research activities increased only in the government sector (by 11%), and it went on diminishing in the other two sectors.

The expenditure of the government sector’s research units was over HUF 62 billion, 2.7% higher than in the previous year. Similar rises were observed for current R&D costs (2.7%) and R&D capital expenditure (2.4%). R&D expenditure and current R&D costs accounted for 13% each, while R&D capital expenditure for 14% of the national total. The share of the capital expenditure of the government sector was higher than that of the higher education sector (8.9%) but was significantly lower than the business enterprise sector’s (77.1%).

At national level most of the expenditure was incurred on engineering and technology researches, at the same time, in the government sector natural sciences have the most important role out of the major fields of science: nearly 50% of the expenditure was devoted to this purpose in 2015.

The activity of publication activities in research institutes, belonging to the government sector, decreased compared with 2014: they published 1,691 Hungarian-language and 747 foreign-language books in 2015, 17% and 12% less, respectively, than in 2014. The number of Hungarian-language articles was 2,833 and that of foreign-language ones 4,447, nearly 50% of the expenditure was devoted to this purpose in 2015.

Based on the size of organisations the dispersion is invariably high, among those employing 250 people or more the share of innovative enterprises was 55.1% and in the case of those with fewer than 50 employed persons 21.7%.

The disparities are significant not only according to the size of enterprises but also in respect of the area of the national economy, the section, division or group in which they operate. The share of organisations introducing novelties was outstandingly high in pharmaceutical industry (66.7%) and in the manufacture of coke and refined petroleum products (50%).

### Innovation, 2012–2014

The introduction of new or significantly improved products or services, the application of new and modern technologies, changes implemented in the organisation or in organisational methods and new solutions applied in the area of marketing all promote a more successful operation, thus they contribute to improving competitiveness and increasing efficiency.

HCSO – in compliance with the requirements¹ of the European Union – surveys every two years the innovation data of enterprises employing at least 10 people. The results of the survey are comparable at EU level as well, but only to a limited extent with the period before 2010, since the coverage of the data collection – in line with the recommendations – changed.²

### Innovative enterprises

25.6% of the enterprises covered by the survey implemented some type of innovation between 2012 and 2014. This proportion was lower than it was in the period of the previous survey (32.5%) despite the proportion of product or process innovative enterprises rising in the examined period. The reason for the decrease is that the surveyed enterprises reported fewer organisation or marketing innovation activities, since the majority of them acted in the spirit of the Act on R&D&I³, applied for the calculation of the innovation contribution allowance, also when filling in the questionnaire, so in many cases only product or process innovation but not organisation or marketing innovation was considered as innovation.
Examining solely technological innovation, i.e. the innovation of products and processes, it can be stated as well that along with the size of enterprises the group of changed areas increased, too. Besides a growth observed for small-sized enterprises, it still holds true that the largest part of firms with fewer than 50 employed persons developed exclusively their products.

Out of non-technological innovative enterprises 30.6% marked that they had performed only organisation innovation, 41.1% only marketing innovation and 27.9% both. For small enterprises mainly marketing innovation (45.7%) and for large enterprises mostly organisation innovation (47.6%) was typical. There is no such a difference in the proportion of enterprises performing both types of innovation in parallel: 26.8% of small enterprises and 32.5% of large enterprises declared so.

When looking at activities of enterprises it can be stated that in addition to the manufacturing divisions already mentioned – where the proportion of organisation or marketing innovative enterprises was 48.7% in pharmaceutical industry and 50% in the manufacture of coke and refined petroleum products – outstanding was such an activity of the financial and insurance area (32.3%). The average for the service sector was 17.5%, somewhat higher than that for manufacturing (15.5%).

The innovative capacity of enterprises is reflected in the composition of sales revenues, too. The share of revenues from the sales of new or significantly improved products increased in all employment size categories between 2012 and 2014, mostly so in the case of small enterprises: to 25.2%, some one and a half times higher than in the previous period. This proportion remained the highest for large companies (30.2%). The share of sales revenues of the products that offered something new compared to the already existing ones not only for the enterprise but also for the market was nearly the same for small and large enterprises (13.7% and 13.2% respectively).

Activities related to product or process innovation

Most enterprises introduced new products or processes invariably by purchasing machinery, equipment and software – irrespective of their size – in all employment size categories. The proportion of using the results of own research and development activities was significant among smaller as well as larger enterprises. At the same time, a more than twice higher proportion of the enterprises employing at least 250 people purchased R&D activities than those with fewer than 50 employed persons. Training for innovative activities and design were also more often applied in the case of larger firms.
Environmental innovation
35.6% of innovative enterprises, 57.7% of large enterprises and 32.6% of small enterprises introduced innovation that had some environmental benefit. The positive impact was mainly apparent in energy use, from the aspects of both the enterprise and the end user.

Table 5
Proportion of enterprises introducing innovation with environmental benefits within innovative enterprises, 2012–2014 (%)

<table>
<thead>
<tr>
<th>Denomination</th>
<th>Employment size category</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10–49 50–249 250 or more</td>
</tr>
<tr>
<td></td>
<td>persons</td>
</tr>
<tr>
<td>Environmental benefits for the enterprise:</td>
<td></td>
</tr>
<tr>
<td>decrease in material or water consumption per unit</td>
<td>28.1 32.7 54.2 31.5</td>
</tr>
<tr>
<td>decrease in energy use or carbon dioxide &quot;footprint&quot; (CO₂ emissions)</td>
<td>11.0 18.5 33.0 14.8</td>
</tr>
<tr>
<td>decrease in soil, water or air pollution levels and in noise</td>
<td>12.3 18.1 35.7 15.8</td>
</tr>
<tr>
<td>use of less polluting or dangerous materials</td>
<td>11.0 15.3 29.5 13.7</td>
</tr>
<tr>
<td>replacement of fossil energy with renewable energy sources</td>
<td>14.5 16.5 27.7 16.2</td>
</tr>
<tr>
<td>use or sales of recycled waste, water or materials</td>
<td>4.6 5.5 10.7 5.3</td>
</tr>
<tr>
<td>Environmental benefits for the end user when using the goods or services:</td>
<td></td>
</tr>
<tr>
<td>decrease in energy use or carbon dioxide &quot;footprint&quot;</td>
<td>21.5 23.5 34.8 23.2</td>
</tr>
<tr>
<td>decrease in soil, water or air pollution levels and in noise</td>
<td>11.2 12.5 25.3 12.8</td>
</tr>
<tr>
<td>promotion of recycling of the product</td>
<td>9.6 11.7 17.6 10.8</td>
</tr>
<tr>
<td>extending product life by producing more durable products</td>
<td>7.2 10.6 14.9 8.7</td>
</tr>
<tr>
<td></td>
<td>10.4 11.0 17.6 11.2</td>
</tr>
</tbody>
</table>

A fifth (21%) of enterprises had procedures in place to regularly measure and reduce the enterprise’s negative environmental impacts. This proportion was 28% for innovative enterprises, compared with 18% for non-innovative ones.

Non-innovative enterprises
To the question – put to non-innovative enterprises – saying what was the reason for the enterprise not performing innovation in the examined period 91% marked that they had not needed innovation and 8.9% that innovation had occurred but had failed owing to different obstacles. Large enterprises marked the latter reason in 15% of the cases.