

Research and development, 2015

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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.

Table 1

Main indicators of research and development

Year	Research and development units'			
	employed persons ^{a)}	of which: researchers	capital expenditure as a percentage of national investments	expenditure as a percentage of gross domestic product (GDP)
	as a percentage of total employment			
2010	0.84	0.57	0.79	1.15
2011	0.90	0.61	0.86	1.20
2012	0.93	0.62	1.33	1.27
2013	0.98	0.64	1.62	1.40
2014	0.91	0.64	1.16	1.37
2015	0.88	0.60	1.07 ⁺	1.39 ⁺

a) Full-time equivalents (FTE).

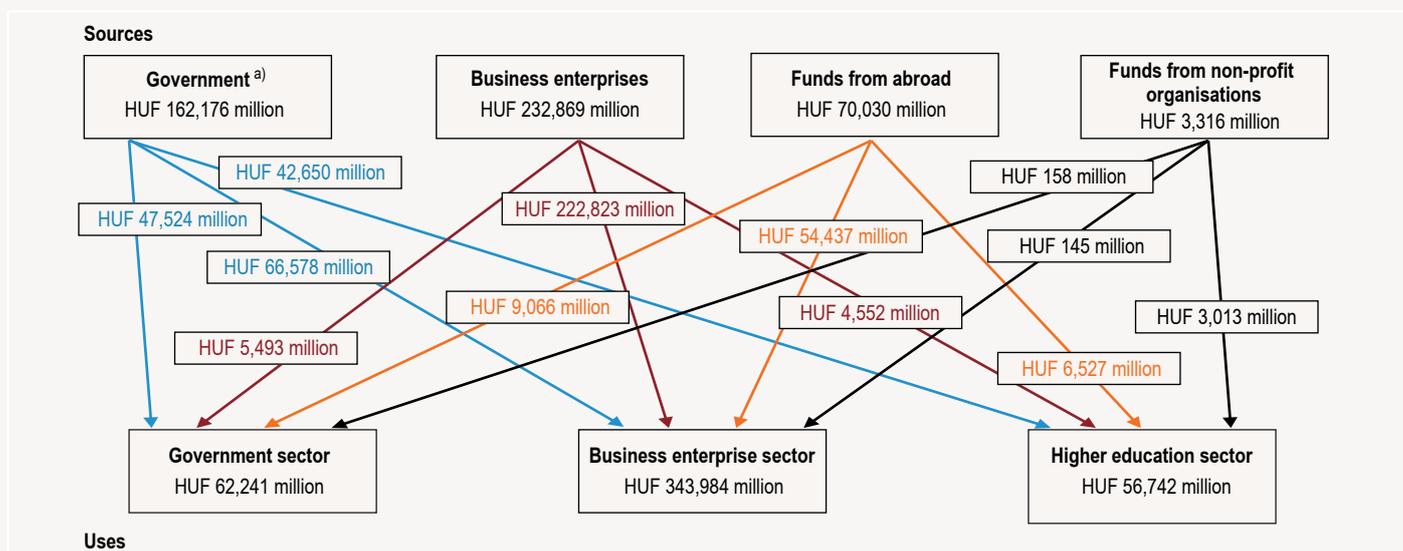
⁺ Preliminary data.

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

Figure 1

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



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.

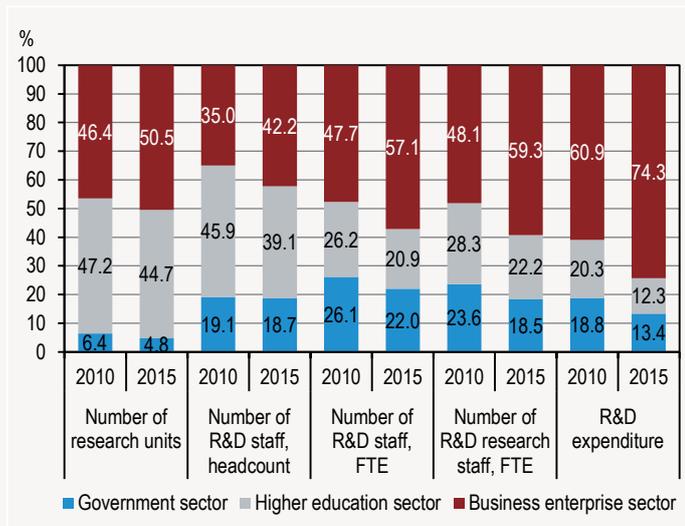
The cyclical nature of R&D capital expenditure could be perceived again, after the outstandingly high growth measured for 2013 the value of capital expenditure decreased: to HUF 59.6 billion, and its share of national investments to 1.07% in 2015. Current R&D costs rose at a lower rate in 2015 compared to the previous years, by 8.4%. The decrease of 6.5% in the higher education sector was compensated by the 12.6% 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.

Figure 2

Distribution of main characteristics of R&D activities by sector



Data on business enterprises' research units

The substantial growth of the research and development activities of business enterprises, as observed for the previous years, continued in spite of the number of research units lessening by 10% to 1,413 by 2015 and the proportion of business enterprises employing fewer than 50 people being 75.4% among these. Out of the total of business enterprises' research and development units the largest proportion (75.1%) was represented by mostly domestic-owned business enterprises and the lowest by mostly local-government-owned (0.4%) and mostly state-owned ones (1.4%).

The headcount of staff performing R&D activities was 23,706, 6.5% less than in 2014. The number of researchers became 3.1% and that of technicians 12.9% lower.

The full-time equivalent number of staff was 21,030 in 2015, 5.2% less than a year earlier. While the full-time equivalent number of researchers grew at a rate exceeding 8.0% in 2013–2014 compared to the previous

year, it diminished by 3.5% by 2015. The number of technicians fell even more markedly than earlier on, by 12.3%.

The form of ownership and the size of business enterprises are both strongly concentrated. The share of foreign- or partly foreign-owned research units was 66.8% of all researchers and 66.2% of total expenditure. From the point of view of the research units of business enterprises employing at least 250 people, these proportions were 58.5% and 54.4% respectively.

Table 2

Distribution of major data of business enterprises' R&D units, 2015

Denomination	Number of R&D staff, headcount	Number of R&D staff		R&D expenditure
		Of which: number of researchers	full-time equivalents	
By proprietor				
Hungarian- and mostly Hungarian-owned	41.8	38.0	30.0	25.8
Foreign- and mostly foreign-owned	54.9	58.7	66.8	66.2
By employment size category				
0– 9	10.4	10.8	9.1	11.3
10– 49	20.9	20.2	16.8	19.0
50–249	19.5	18.3	15.4	15.2
250 staff or more	49.0	50.5	58.5	54.4

The R&D expenditure of business enterprises rose by 9.0% to HUF 344 billion over a year, which made up 73% of R&D expenditure at the level of the national economy. Within R&D expenditure, the proportion of capital expenditure changed from 16.1% to 13.4%. More than 77% of total R&D capital expenditure was realized at business enterprises, its amount exceeding HUF 45.9 billion.

The increase of expenditure of the business enterprise sector compared to the previous year was the highest (30.6%) in the case of small business enterprises (employing 10–49 persons), considerably exceeding the average rise of 9.0%.

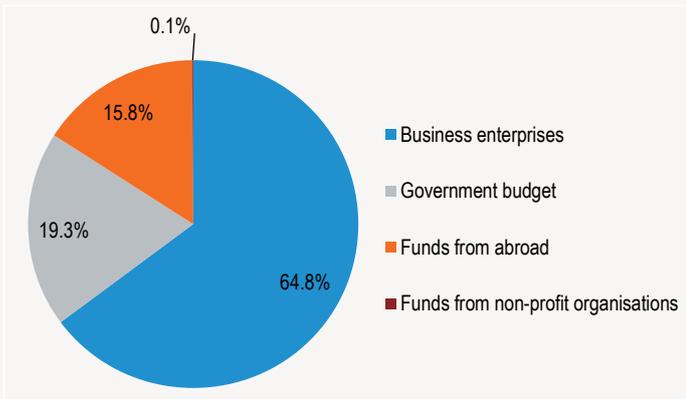
The proportions of R&D expenditure by form of ownership were unchanged compared to the previous years, it was foreign-owned business enterprises that spent the most on research and development (47.1%) in 2015 too. While 41.8% of the R&D staff were working at the research units of Hungarian-owned business 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.

Figure 3

Financial composition of business enterprises' R&D expenditure by source, 2015



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 3

Indicators of research and experimental development activities, 2015

Year	Number of R&D staff, headcount	Of which: researchers	Number of R&D staff, FTE	Of which: researchers	R&D expenditure, million HUF
Higher education sector	18	12	6	4	45
Total R&D units	20	14	13	9	167

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 by 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.

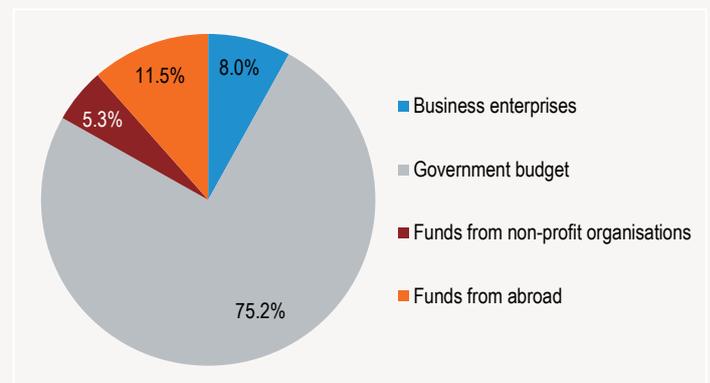
The amount of expenditure per research unit was invariably the lowest in this sector: HUF 45 million, 27% of the national average of HUF 167 million.

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 rose 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.

Figure 4

Composition of R&D expenditure of higher education sector by financial source, 2015



7,891 books and chapters and 17,564 articles were published in 2015 as a result of scientific work, which were decreases of 1.7% and 6.9%, respectively, compared to 2014. Out of the three sectors, publication activity was even so the most intensive in higher education: 75% of all books and chapters and 68% of articles came from here. The intensity of the publication activity of universities and colleges can be described by the fact that there were 141 books and chapters and 313 articles per hundred researchers in this sector, while these indicators were 41 and 102, respectively, when considering all research units.

Data on government sector

135 research and development institutes and other government research units were operating in Hungary in 2015, 1 fewer than in 2014.

The actual and FTE number of people working at research units both increased by 12% compared to the previous year. 10,531 people, 18.7% of total research staff were employed in these institutes in 2015 (their share was 2.3 percentage points higher than in the previous year). The FTE number of staff grew from 7,215 to 8,111 compared to 2014 due to a rise

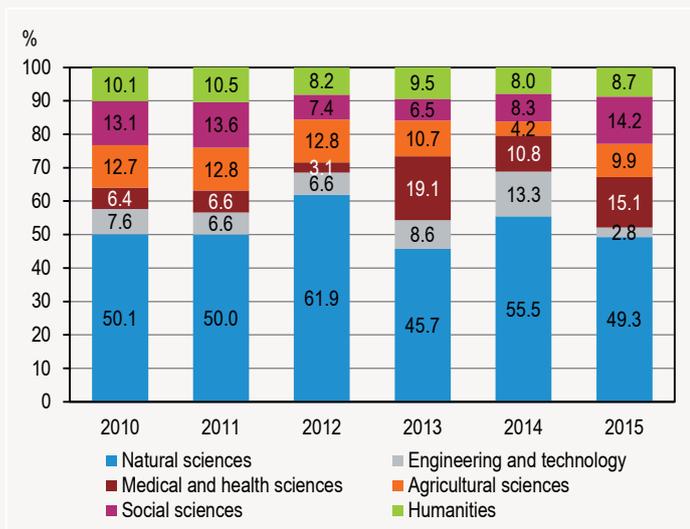
in the number of technicians, their proportion of the sector as a whole became some 7–8 percentage points higher in the case of both the actual and the FTE number of staff. Similarly to the previous year, the number of women participating in research activities increased only in the government sector (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. Medical and health sciences and social sciences had significant (more than 10%) shares in the research and development activities of the sector, expenditure in these areas grew at rates above the average in the past year.

Figure 5

Distribution of R&D expenditure of research and development institutes and other research units of government sector by field of science



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, both considerably fewer than a year earlier.

Most of the Hungarian-language books and articles came from humanities, followed by social scientific publications. As for foreign-language articles, the priority of articles on natural sciences was clear, 63% of all articles were prepared in such theme, and medical and health sciences were the second in the ranking (21%).

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.

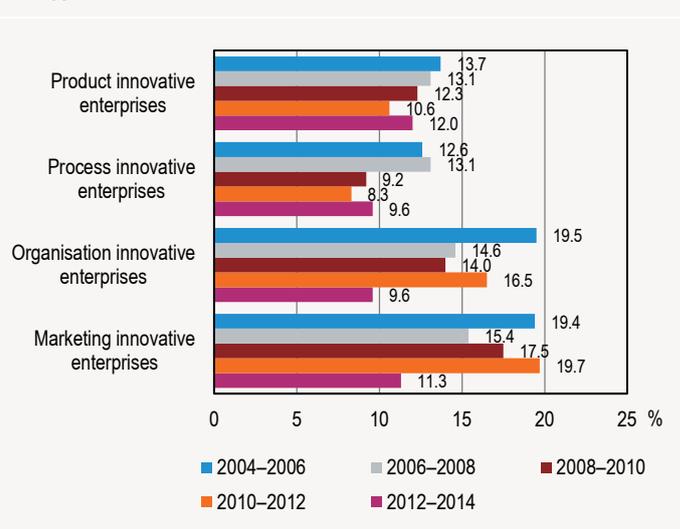
HCSO – in compliance with the requirements¹ of the European Union – surveys every two years the innovation data of enterprises employing at least 10 people. The results of the survey are comparable at EU level as well, but only to a limited extent with the period before 2010, since the coverage of the 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&D³, 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.

Figure 6

Innovative enterprises as a percentage of total enterprises by type of innovation



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%).

Types of innovation

It is true for all types of innovation that they were introduced in a higher proportion of larger enterprises: the disparity in favour of large enterprises was 3.3-fold in the case of product innovation and 4.3-fold in the case of process innovation.

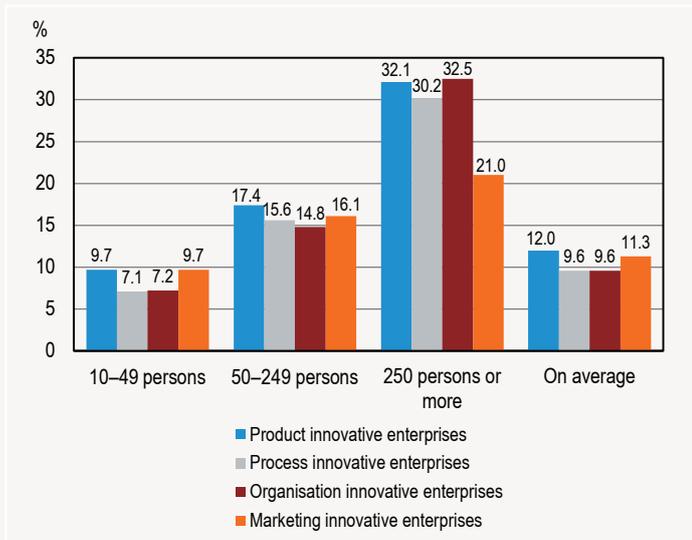
¹ Commission Regulation (EC) No 1450/2004 of 13 August 2004 implementing Decision No 1608/2003/EC concerning the production and development of statistics on innovation.

² In 2010 the observed divisions were extended with: motion picture, video and television programme production, sound recording and music publishing activities; programming and broadcasting activities; scientific research and development; advertising and market research.

³ Act LXXVI of 2014 on Scientific Research, Development and Innovation.

Figure 7

Innovative enterprises as a percentage of total enterprises by type of innovation and employment size category, 2014



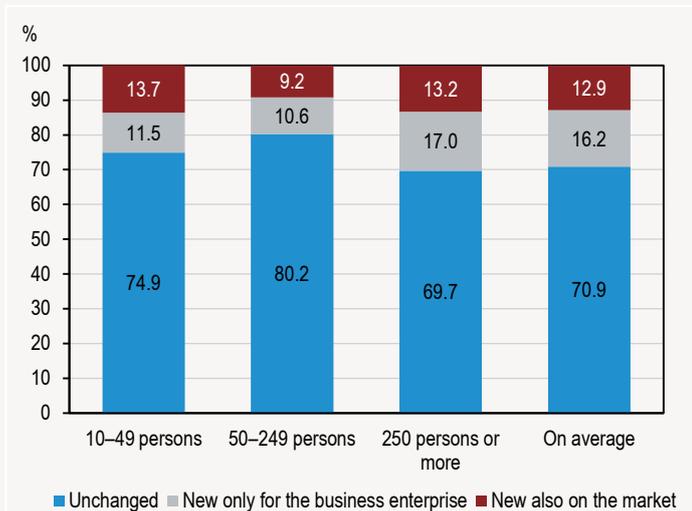
Examining solely technological innovation, i.e. the innovation of products and processes, it can be stated as well that along with the size of enterprises the group of changed areas increased, too. Besides a growth observed for small-sized enterprises, it still holds true that the largest part of firms 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%).

Figure 8

Distribution of sales revenues of product innovation enterprises by degree of novelty of product, 2014



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.

Table 4

Rate of product and/or process innovation related activities among innovative enterprises, 2012–2014

Innovation activities	Employment size category (%)			On average
	10–49	50–249	250 or more	
	persons			
In-house R&D activities	47.8	46.9	60.1	48.8
External R&D activities	12.1	12.6	27.3	13.8
Purchase of machinery, equipment and software	72.0	75.0	73.1	72.9
Purchase of other external knowledge	13.4	14.3	19.2	14.2
Training for innovative activities	34.2	41.3	49.8	37.6
Market introduction of innovations	30.1	28.2	32.5	29.9
Design	25.7	26.3	32.8	26.6
Other innovation activities	31.5	36.2	52.0	34.8

Some 43% of product and/or process innovative enterprises, 46% of small enterprises and 38% of large enterprises received some state subsidy for their innovation activities.

38.5% of enterprises performing product and process innovation activities co-operated with other enterprises or organisations during these activities of theirs. The proportion of co-operation was 59% in the group of large enterprises and 34% for small enterprises. Nearly two-thirds of co-operating enterprises marked – irrespective of employment size category – the suppliers of equipment, materials, spare parts and software as partners, though it was mainly small enterprises that considered this co-operation as the most useful from the point of view of the innovation activities of the enterprise. Co-operation within the enterprise group also had an important role in the case of large enterprises (but the reason for this is that innovative large enterprises are more often members of enterprise groups). Suppliers were followed by clients or buyers from the private sector (37%), specialists and accredited laboratories (35%), universities and other higher education institutions (32%) and then enterprises within the own enterprise group (32%) as co-operating partners the most often marked. Large enterprises reported on more partnerships in general, too.

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

(%)

Denomination	Employment size category			On average
	10–49	50–249	250 or more	
	persons			
Environmental benefits for the enterprise:				
decrease in material or water consumption per unit	28.1	32.7	54.2	31.5
decrease in energy use or carbon dioxide 'footprint' (CO ₂ emissions)	11.0	18.5	33.0	14.8
decrease in soil, water or air pollution levels and in noise	12.3	18.1	35.7	15.8
use of less polluting or dangerous materials	11.0	15.3	29.5	13.7
replacement of fossil energy with renewable energy sources	14.5	16.5	27.7	16.2
use or sales of recycled waste, water or materials	4.6	5.5	10.7	5.3
Environmental benefits for the end user when using the goods or services:				
decrease in energy use or carbon dioxide 'footprint'	10.3	14.6	29.5	13.1
decrease in soil, water or air pollution levels and in noise	21.5	23.5	34.8	23.2
promotion of recycling of the product	11.2	12.5	25.3	12.8
extending product life by producing more durable products	9.6	11.7	17.6	10.8
	7.2	10.6	14.9	8.7
	10.4	11.0	17.6	11.2

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.

Further information, data (links):

[Tables](#)

[Methodology](#)

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