

## **PLACE OF RESEARCH AND DEVELOPMENT ACTIVITY IN THE DEVELOPMENT POLICY OF ENTERPRISES**



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### Summary

In this article the author verifies the thesis that the commonness of investing in research and development activity (R&D) in enterprises operating in the Member States of the European Union is variable and diverse. The basis of such verification is a statistical-comparative analysis of the results of the empirical researches on innovative trends in EU companies. The study was conducted in February 2015 by TNS Political & Social in 28 Member States of the European Union, Switzerland and the United States. Analysis of the commonness of investing in R&D in enterprises is carried out in the following 3 dimensions: 1) the commonness of investing in R&D according to the country, 2) the commonness of investing in R&D according to the category of enterprises, 3) the turnover invested in R&D according to the country. The results of the studies confirmed the research thesis.

**Keywords: research and development activity, innovation, investment, manager, knowledge, management**

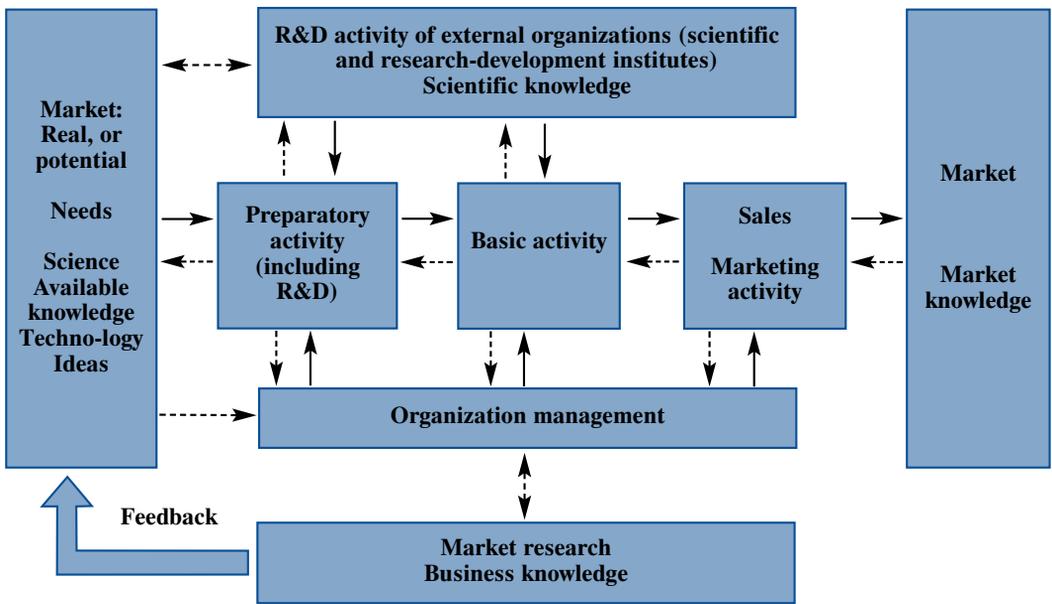


## Introduction

The activity of each organization can be divided into three spheres (see picture 1):

- 1) preparatory,
- 2) basic,
- 3) marketing and sales.

Picture 1. Model of functioning of an organization



Source: Own materials.

One of the elements of preparatory actions is research-development activity (R&D), which includes primary research, applied research and development works<sup>1</sup>. The goal of R&D is conducting regular creative works resulting in raising the possessed knowledge, including knowledge about

the human, about culture and society, as well as finding new applications for this knowledge<sup>2</sup>. Primary research involves theoretical and experimental works started mainly in order to gain, or expand knowledge concerning the causes of phenomena and facts. In general, they are not aimed at generating new practical applications. Primary research can be divided into:

- pure research, which leads to the progress of knowledge, without aiming at the achievement of long-term economic, or social benefits, without efforts aimed at applying research results to solve problems of practical nature, or at transferring these results to entities that could take care of applying them in practice,
- targeted research, conducted in order to establish a broad body of knowledge, which will be suitable to serve as a basis for solving already identified problems, or problems expected in the future.

Applied research involves preparatory works taken up in order to gain new knowledge which can be used in particular practical applications. It involves searching for:

- possible practical applications for the results of primary research,
- new solutions allowing to achieve practical goals assumed in advance.

The effects of applied research are trial models of products, processes, or methods.

Development works include construction work, technological-design work, as well as experimental work, which involves applying already existing knowledge obtained as a result of research works, or as a result of practical experience in order to work out new, or substantial improvement of existing materials, devices, products, processes, systems, or services, along with preparation of experimental prototypes, or trial installations<sup>3</sup>.

R&D activity treated as a source of knowledge for innovative processes, as well as knowledge necessary to solve all kinds of problems in an organization, can be conducted by the organization itself, if technical, economic and personnel background allow this, or can take advantage of

the results of R&D activity conducted by external organizations<sup>4</sup>. The third solution is conducting joint works constituting R&D within networking structures together with scientific and research organizations. This strategy allows an organization to gain access to complementary resources held by other organizations. It is necessary to remember that external knowledge is more useful, when an organization gets engaged in own R&D activity, regardless of activity conducted together with other institutions, or when a company has an earlier body of own knowledge at its disposal. Organizations conducting own R&D works are more inclined to cooperate in order to boost their competitive advantage<sup>5</sup>.

R&D activity, in order to play its assigned roles, should constitute an important element of development policy of every organization, that's why it is important to cover it with systemic management. The assumptions of such a policy constitute the basis for working out a strategy suitable for internal and external circumstances. These strategies depend on the attractiveness of the market where an organization operates and on its competitive position<sup>6</sup>.

High position of R&D activity as a source of knowledge used to solve emerging problems, to carry out innovative processes, requires the active involvement of the management in its systemic development. The degree of this involvement can be assessed by means of defined measures such as:

- 1) popularity of investing in R&D,
- 2) volume of turnovers invested in R&D.

For the identification of the level of these measures empirical research conducted on chosen respondents — employees of companies functioning in Member States of the European Union — has been used. The survey was conducted by TNS Political & Social in 28 Member States of the European Union, Switzerland and the United States from February 2 to February 20, 2015. The questionnaire survey covered 13117 companies from the European Union. Including United States and Switzerland — 14118 companies participated in the survey<sup>7</sup>.

Thus, the goal of this publication is to conduct a statistical-comparative analysis of the results of this survey and verify the thesis that the

popularity of investing in R&D in companies functioning in EU Member States is variable and diversified. R&D activity isn't a priority in the development strategies of companies.

### The popularity of investing in R&D depending on country

The position of R&D activity in the development strategies of all kinds of organizations can be measured with the percentage of generated turnover invested in this type of activity. The basis for the analysis are the respondents' answers to the question concerning the percentage of total revenues that the respondents' companies had invested since January 2012 in the following activities (see table 1):

- 1) training,
- 2) software development ,
- 3) reputation of company and brand, including Internet website design,
- 4) research and development,
- 5) designing products and services,
- 6) organization, or improvement of business processes,
- 7) purchasing machines, equipment, software, or a license.

It turns out that on average in the European Union, compared to other forms of activity, R&D was financed by the smallest number of companies. Slightly more than every third surveyed company financed R&D activity. At the same time in 2011 the share of such companies was 4 percentage points higher. From 2012 the most common activity in the surveyed companies was investing in machines, equipment, software and licenses. This activity was pursued by 7 out of 10 companies, that is, 1 percentage point more than in 2011.

Among Member States the share of companies investing R&D was highest among:

- 1) Irish (47%), Dutch (45%) and Italian (44%) companies — among old Member States,
- 2) Slovenian (46%), Croatian (44%) and Cypriot (40%) companies — among new Member States.

Table 1. The percentage of companies which since January 2012 had invested a part of their revenues in particular actions — according to EU Member States.

Countries	Number of respondents	Formy działania						
		Buying machines, equipment, software, or licenses	Training	Company and brand reputation, including website design	Organization, or improvement of business processes	Product and service design	Software development	Research and development
		Percentage of the surveyed companies						
European Union EU-28Old Member States	13117	70	64	59	53	44	43	31
EU-15:								
Austria	503	78	69	61	57	51	37	24
Belgium	502	74	69	70	64	51	55	41
Denmark	501	73	61	63	48	52	45	37
Finland	501	80	66	58	45	53	42	38
France	501	63	65	68	54	44	33	29
Greece	500	61	44	63	55	49	49	39
Spain	500	68	73	62	64	43	47	22
Holland	504	61	61	66	51	49	38	45
Ireland	500	72	67	69	57	51	42	47
Luxembourg	200	75	70	72	63	54	49	33
Germany	500	78	70	63	53	41	43	26
Portugal	500	71	66	41	61	47	44	27
Sweden	501	78	62	53	42	43	32	23
Great Britain	500	69	62	65	46	44	36	38
Italy	500	68	64	44	55	46	56	44
New Member States								
EU-13:								
Bulgaria	502	54	47	45	44	35	28	20
Croatia	501	73	73	62	59	45	63	44
Cyprus	200	63	64	55	55	37	39	40
Czech Republic	500	71	61	67	53	50	31	21
Estonia	500	66	60	36	30	21	34	11
Lithuania	500	54	54	39	41	28	26	9
Latvia	500	66	56	50	59	43	26	29
Malta	200	61	59	51	55	42	41	32
Poland	<b>500</b>	<b>72</b>	<b>57</b>	<b>58</b>	<b>48</b>	<b>36</b>	<b>48</b>	<b>30</b>
Romania	500	55	57	41	51	43	28	27
Slovakia	501	70	66	65	49	43	32	21
Slovenia	500	77	67	57	59	46	56	46
Hungary	500	69	44	53	43	33	44	19
USA	500	60	52	53	49	41	28	33

Source: prepared on the basis of: Innobarometer 2015 — The innovation trends at EU enterprises. Report, Flash Eurobarometer 415 — TNS Political & Social, European Commission, September 2015, p. 31.

At the other end of the spectrum there are:

- 1) Spanish (22%), Swedish (23%) and Austrian (24%) companies — among old Member States,
- 2) Lithuanian (9%), Estonian (11%) and Hungarian (19%) companies — among new Member States.

The maximum difference in popularity of investing in R&D, amounting to 38 percentage points was found between Ireland and Lithuania.

The general remark is that in a vast majority of Member States investing in R&D was the least popular activity among companies. Holland, Ireland, Great Britain and Latvia are an exception, as in these countries investing in R&D is second from the bottom in terms of popularity. In Italy and Slovenia the percentage of companies investing in R&D was equal to the percentage of organizations investing in company and brand reputation, including website design, as well as product and service design.

In comparison to 2011, from 2012 only in 10 Member States the percentage of companies investing in R&D increased. The strongest growth took place on Malta (by 16 percentage points) and in Ireland (by 10 percentage points). The smallest growth was recorded in Germany and Luxembourg (1 percentage point each). The biggest declines of the percentage of companies investing in R&D were recorded in: Hungary (by 17 percentage points), Finland (by 16 percentage points), Poland (by 15 percentage points) and Portugal (by 12 percentage points). In four countries such as: Italy, Lithuania, Romania and Slovenia, the percentage of companies investing in R&D remained at the same level after 2012 as in 2011.

In Poland after 2012 only 3 out of 10 companies invested in R&D. The result is 1.1 percentage point lower than the average for the European Union. This percentage puts Poland on the 14th position among EU Member States. In comparison to 2011 the percentage of such companies decreased by 15 percentage points<sup>8</sup>. Similarly as in most EU Member States, most Polish companies (72%) invested in machines, equipment, software, or licenses. This result exceeds the EU average by 2 percentage points.

In USA only every third company invested in R&D. In the structure of discussed activities subject to investing, this result is higher only than the popularity of investing in software development. In comparison to the EU

average, the popularity of investing in R&D by companies from the USA was 2 percentage points higher. The biggest percentage of American companies (60%) invested in purchasing machines, equipment, software, or licenses. On average in the European Union the percentage of such companies was 10 percentage points higher. Generally, the average rates of popularity of investing in the discussed forms of activity were higher in the EU, except for R&D activity.

### **Popularity of investing in R&D, depending on the category of companies**

An interesting image of the interest of managers in R&D activity emerges when we take into consideration the categories of surveyed companies. As table 2 shows, the popularity of investing in R&D grew along with growth of companies measured with the number of employees. The smallest percentage of companies (29%) investing a part of their revenues in R&D was recorded in the group of micro businesses. This percentage grew along with size of companies to 67% in the group of big companies.

The phenomenon of growing popularity of investing in R&D along with growth of size of companies is a logical phenomenon resulting from the fact that bigger companies have organizational units dealing with the subject of R&D. It is necessary to emphasize that investing in R&D in micro, small and medium companies was the least popular among all considered forms of activity, in which companies invested. In the smallest and small companies the most popular form of activity was investing in purchases of machines, equipment, software, or licenses. At the same time in medium and big companies the most popular activity is investing in employee training.

Looking into the sectoral classification of the surveyed companies, it is possible to conclude that investing in R&D was most popular among manufacturing companies. After January 2012 almost every second company did that. This kind of activity was least popular among companies from the retail trade sector — only every fourth company from the sector invested in R&D. In the industrial sector there were only 1 percentage point more of such companies. Looking at a sectoral cross-section, investing in R&D was the least common phenomenon, except for the manufacturing sector in which investing in software development was least common. In all sector the most popular activity was investing in machines, equipment, software, or licenses.

Table 2. The percentage of companies, which after January 2012 invested a part of their revenues in particular activities — depending on the category of companies

Categories	Forms of activity						
	Buying machines, equipment, software, or licenses	Training	RCompany and brand reputation, including website design	Organization, or improvement of business processes	PDesigning products and services	Software development	Research and development
Percentage of surveyed companies							
European Union EU-28	70	64	59	53	44	43	31
Companies according to size:							
- micro businesses 1-9 employees	68	61	57	51	42	41	29
- small 10-49 employees	77	75	65	65	52	49	39
- medium 50-249 employees	81	83	72	75	64	60	56
- big 250, or more employees	78	83	69	55	56	57	67
Companies according to sectoral affiliation:							
- manufacturing	74	62	59	55	57	43	46
- retail trade	64	58	56	54	40	42	25
- services	72	67	63	53	47	47	36
- industrial	74	72	54	51	38	36	26
Companies according to age:							
- established before 2009.	69	65	58	53	45	44	31
- established in 2009-2014	72	63	65	52	43	39	32
- established after 2014.	77	55	63	52	44	44	31
Companies forming part of a group:							
- yes	69	72	63	63	51	50	41
- no	69	63	58	52	43	42	30
Companies according to turnover in 2014:							
- up to EUR100,000	61	51	48	42	36	35	26
- EUR 100,000 to EUR 500,000	72	66	63	51	46	41	28
- EUR 500,000 to EUR 2,000,000	75	72	64	61	48	48	38
- Over EUR 2,000,000	76	75	64	67	52	56	42
Since 2012 a company's turnover increased:							
- by 5%, or more	79	70	69	62	53	51	40
- remained the same	70	64	57	49	42	40	29
- dropped by 5%, or more	61	61	51	52	40	40	27

Source: prepared on the basis of: *Innobarometer 2015 — The innovation trends at EU enterprises*. Report, Flash Eurobarometer 415 — TNS Political & Social, European Commission, September 2015, p. 33.

Investing in R&D was least popular in companies viewed from the perspective of age. Regardless of age, slightly more than 3 out of 10 companies concluded that they spent a part of their revenues on R&D. The activity was slightly more popular among companies established in 2009-2014. The difference was 1 percentage point. In all groups of companies arranged according to age the most popular form of investing was buying machines, equipment, software, or licenses.

Companies can also be divided into those functioning independently and companies functioning within bigger groups. It turns out that companies forming a part of a group invested in R&D more often than companies functioning independently. The difference in the popularity of investing in R&D amounted to 11 percentage points. In companies being a part of a group the most common activity was investing in training, at the same time in case of independent companies the most popular activity was investing in buying machines, equipment, software, or licenses.

The lowest popularity of investing in R&D was typical also of companies analysed according to sales. The popularity increased along with the growth of generated sales — from 26% of companies generating sales up to EUR 100,000 to 42% of companies generating more than EUR 2 million in sales. In this classification of surveyed companies investing in the purchase of machines, equipment, software, or licenses was the most popular activity. It increased along with the growth of generated sales — from 61% of companies with sales up to EUR 100,000 to 76% of companies generating higher sales.

Dynamics of sales can be growing, stable, or decreasing. It turns out that 40% of companies with sales growing since 2012 invested in R&D. In companies with a stable level of sales, the share of companies investing in R&D was 11 percentage points lower. At the same time, in the group of companies recording contraction of sales, only 27% of surveyed companies decided to invest in R&D. Also in this cross-section of the analysis, investing in R&D was the least popular activity and the most popular activity was investing in purchases of machines, equipment, software, or licenses. This was more popular in companies recording growth of sales and least common in companies recording contraction of sales.

## Share of revenues invested in R&D

Another category in the analysis of popularity of investing in R&D is the share of turnover allocated to R&D — according to Member States. As table 3 shows, on average in the European Union 65% of the surveyed companies didn't allocate any part of their turnover to R&D. The same percentage of companies not investing in R&D was recorded in 2011. Most companies (14%) invested in R&D from 1% to 5% of their turnovers (in 2011 the share was 2 percentage points lower), 9% of the surveyed companies allocated over 5% of their turnovers to the purpose (in 2011 the share was 3 percentage points higher) and 8% of the surveyed declared that their companies allocated less than 1% of their turnovers (the same as in 2011) to this purpose<sup>9</sup>.

Among EU Member States the biggest percentage of companies, according to the respondents, didn't invest any share of revenues in R&D. The biggest groups of such companies were found in:

- 1) Spain (77%), Sweden (75%) and Austria (71%) — old Member States,
- 2) Lithuania (89%), Estonia (86%) and Hungary (78%) — new Member States.

The smallest groups of companies not investing in R&D were found in:

- 1) Ireland (50%), Holland, Great Britain and Italy (53% each) — old Member States,
- 2) Croatia and Slovenia (52% each) and Cyprus (58%) — new Member States.

The maximum difference in the popularity of this phenomenon, amounting to 39 percentage points, was found between Lithuania and Ireland. It is necessary to remark here that the situation is more beneficial in countries, where the percentage of companies declaring they allocate 0% of their revenues to R&D was lower.

The group of companies allocating less than 1% of their revenues to R&D was dominated by companies functioning in:

Table 3. The percentage of companies investing their revenues in research-development activity from January 2012 — according to country

Country	Number of surveyed companies	Ranges of the percentage of revenues invested in R&D				
		0%	Less than 1%	1-5%	Over 5%	No answer/ I don't know
		Percentage of surveyed companies				
European Union EU-28Old	<b>13117</b>	<b>65</b>	<b>8</b>	<b>14</b>	<b>9</b>	<b>4</b>
Member States EU-15:						
Austria	503	71	8	7	9	5
Belgium	502	56	12	22	7	3
Denmark	501	55	10	14	14	7
Finland	501	61	11	17	10	1
France	501	69	8	14	7	2
Greece	500	58	6	21	13	2
Spain	500	77	5	13	4	1
Holland	504	53	11	18	16	2
Ireland	500	50	15	21	11	3
Luxembourg	200	62	8	16	9	5
Germany	500	55	10	14	14	7
Portugal	500	68	7	12	8	5
Sweden	501	75	7	9	7	2
Great Britain	500	53	11	15	11	10
Italy	500	53	12	21	11	3
New Member States EU-13:						
Bulgaria	502	75	6	7	7	5
Croatia	501	52	13	20	11	4
Cyprus	200	58	7	24	8	3
Czech Republic	500	75	5	12	3	5
Estonia	500	86	4	3	4	3
Lithuania	500	89	4	3	2	2
Latvia	500	70	9	15	5	1
Malta	200	64	10	15	7	4
Poland	<b>500</b>	<b>66</b>	<b>8</b>	<b>13</b>	<b>9</b>	<b>4</b>
Romania	500	69	8	12	7	4
Slovakia	501	75	4	8	9	4
Slovenia	500	52	24	17	5	2
Hungary	500	78	7	9	3	3
USA	500	65	11	13	9	2

Source: Prepared on the basis of: *Innobarometer 2015 — The innovation trends at EU enterprises*. Report, Flash Eurobarometer 415 — TNS Political & Social, European Commission, September 2015, p. T29.

- 1) Spain (77%), Sweden (75%) and Austria (71%) — old Member States,
- 2) Lithuania (89%), Estonia (86%) and Hungary (78%) — new Member States.

The smallest groups of companies not investing in R&D were found in:

- 1) Ireland (50%), Holland, Great Britain and Italy (53% each) — old Member States,
- 2) Croatia and Slovenia (52% each) and Cyprus (58%) — new Member States.

The maximum difference in the popularity of this phenomenon, amounting to 39 percentage points, was found between Lithuania and Ireland. It is necessary to remark here that the situation is more beneficial in countries, where the percentage of companies declaring they allocate 0% of their revenues to R&D was lower.

The group of companies allocating less than 1% of their revenues to R&D was dominated by companies functioning in:

- 1) Ireland (15%), Belgium and Italy (12% each) — among old Member States,
- 2) Slovenia (24%), Croatia (13%) and Malta (10%) — among new Member States,

It was the least common among companies from:

- 1) Spain (5%), Greece (6%), Portugal and Sweden (7% each) — among old Member States,
- 2) Estonia, Lithuania and Slovakia (4% each) and Czech Republic (5%) — among new Member States.

The maximum difference in popularity of this phenomenon amounting to 20 percentage points appeared between Slovenia and Estonia, Lithuania.

Some of the surveyed companies invested between 1% and 5% of their revenues in R&D after January 2012. Most often they were companies functioning in:

- 1) Belgium (22%), Greece, Ireland and Italy (21% each) — among old Member States,
- 2) Cyprus (24%), Croatia (20%) and Slovenia (17%) — among new Member States.

It was the least common among companies from:

- 1) Austria (7%), Sweden (9%) and Portugal (12%) — among old Member States,
- 2) Estonia and Lithuania (3% each) Bulgaria (7%) and Slovakia (8%) — among new Member States.

The biggest difference in popularity of such investments amounting to 21 percentage points was found between Lithuania and Cyprus, Estonia.

A small, but diversified percentage of companies allocated more than 5% of their revenues to R&D. This was most popular among companies from:

- 1) Holland (16%), Denmark and Germany (14% each) and Greece (13%) — among old Member States,
- 2) Croatia (11%), Poland and Slovakia (9% each) and Cyprus (8%) — among new Member States.

At the other end of the spectrum there were companies from:

- 1) Spain (4%), Belgium, France and Sweden (7% each) — among old Member States,
- 2) Lithuania (2%), Czech Republic and Hungary (3% each) and Estonia (4%) — among new Member States.

The maximum difference in the popularity of this phenomenon amounting to 14 percentage points was found between Holland and Lithuania.

The popularity of investing or not investing in R&D a particular percentage of revenues by Polish companies was close to the average results in the European Union. In Poland 66% of companies didn't allocate any part of their revenues to R&D. This result is 1 percentage point higher than the average for the European Union and puts Poland on the 14th position among Member States. 8% of Polish companies invested in R&D less than 1% of their turnovers. This result is equal to the average for the European Union and puts Poland on the 13th position among Member States, along with Austria, France, Luxembourg and Romania.

Slightly more Polish companies (13%) allocated to R&D between 1% and 5% of their revenues. This result is 1 percentage point lower than the average for the European Union and puts Poland on 17th position among

Member States, along with Spain. Finally, 9% of Polish companies (the same as the EU average) invested in R&D over 5% of turnovers generated after January 2012. This result puts Poland on the 10th position among Member States, along with Austria, Luxembourg and Slovakia.

The average results in the European Union are not far from the results achieved by companies from the USA. 65% of them didn't allocate any part of their revenues to R&D. this result is equal to the average result in the European Union. 11% of American companies (3 percentage points more than the European Union average) invested less than 1% of their revenues in R&D. 13% (1 percentage point less) allocated to this purpose between 1% and 5% of their turnover, at the same time 9% (the same as the average for the European Union) spent over 5% of generated turnover on R&D.

Comparing the percentage of companies which after January 2012 didn't invest any share of their revenues in R&D to 2011, in 16 Member States of the European Union the percentage dropped, which is a positive phenomenon. Estonia, Spain, France, Cyprus, Hungary, Holland, Austria, Poland, Portugal, Slovakia, Finland and Great Britain are an exception. In these countries the percentage of companies not investing in R&D increased, compared to 2011, which is a negative phenomenon. The biggest declines were recorded in Malta, Greece, Ireland and the biggest growth was recorded in Hungary and Finland.

Both growth and decline was observed in case of the percentage of companies which in the considered periods invested less than 1% of turnover in R&D. The growth of the percentage of companies was recorded in 15 countries, this concerns in particular Slovenia and Ireland. At the same time, in 9 countries the percentage decreased. In the range of 1% to 5% of revenues invested in R&D, the growth of the percentage of companies was observed in 16 countries — the biggest growth was observed in Greece. In the remaining 12 countries the percentage of companies investing the highlighted percentage of their revenues in R&D decreased. This concerned Finland in particular.

Also in the last range of spending on R&D (exceeding 5% of turnover) both increasing and decreasing popularity of spending on R&D was recorded. Growth of the percentage of companies investing after January 2012 more than 5% of their revenues was observed in 9 countries and this concerned Malta in particular. At the same time, in the remaining 19 countries the percentages of companies engaged in such activities decreased. This conclusion refers in particular to Slovenia and Latvia<sup>10</sup>.

## Conclusions

The goal of this publication was to carry out a statistical-comparative analysis of an empirical study concerning the popularity of investing a part of money from generated sales in R&D among companies and to verify the thesis that the popularity of investing in R&D in companies functioning in EU Member States is variable and diversified and that R&D activity isn't a priority in companies' development policy.

The results of this analysis suggest that less than every third surveyed company in the European Union invested a part of its revenues in R&D. It also turns out that other forms of investing enjoyed much greater popularity, this concerns in particular purchasing machines, equipment, software, or licenses. Investing in R&D was least popular among Lithuanian companies and most popular in Irish companies. However, even in this country less than half of companies invested in R&D.

The surveyed companies most often invested 1% to 5% of generated sales in R&D. On average in the EU there were just 14% such companies. At the same time 65% of the surveyed companies didn't invest anything. The popularity of not investing in R&D any part of turnover ranged from 89% in Lithuania to 50% in Ireland. Major differences in the popularity of investing a part of revenues in R&D were found in all percentage ranges. For example, almost every fourth company in Cyprus and just 3 out of 100 companies in Estonia and Lithuania invested between 1% and 5% of turnover.

Only 29% micro businesses and 67% of big companies, 46% of manufacturing companies and 25% of trading companies, 26% of companies generating the lowest sales and 42% of companies generating the highest turnover, 27% of companies recording contraction of sales and 40% of companies recording growth of sales.

The results presented as an example confirm the assumed research thesis. This is not an encouraging image, as it suggests there is little interest in acquiring knowledge and putting them into innovations providing clients with the value they expect. For many companies R&D activity doesn't constitute an important element in their development policy, which includes innovation policy. It is necessary to emphasize here that running such a policy requires technical, technological, management,

organizational, economic, marketing and social competences. Acquiring them is determined by an organization's willingness to learn<sup>11</sup>.

Running R&D activity in a systemic manner, treating it as an important source of knowledge necessary in the processes of creating innovations requires changing the mentality of managers, abandoning the way of thinking from the perspective of the past and present in exchange for thinking about an organization's future and shaping this future together with the employees<sup>12</sup>, as well as individual and institutional clients, especially those who form the so-called research-development sphere. This refers to scientific and research-development institutions, as not all companies have the capacity to run own R&D activity. For this reason development policy should be aimed at systemic cooperation with such entities, which is very important in the context of generating so-called "open innovations".

In such a situation research-development cooperation, strengthened by organizational culture, should be treated as a special kind of mutual influences favouring the generation of knowledge necessary for creating innovation and its bilateral flow<sup>13</sup>.

Despite growing significance of R&D cooperation, especially in the aspect of creating open innovations, the growing complexity of such cooperation and the character of basic resources, including knowledge remains an open issue. What may be a negative effect of badly organized cooperation are stresses resulting from the necessity to both share knowledge and protect the technological competences of cooperating companies. Thus, what remains an open question, which should be considered by every manager is: How can organization balance sharing knowledge and protecting knowledge in R&D cooperation?<sup>14</sup>.

## References

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- <sup>2</sup> R&D activity can be treated as a process consisting of three stages: development of technology, development of concept and product design. J. Baruk, *Zarządzanie rozwojem nowego produktu*, „Marketing i Rynek” 2008, No. 6, p. 17.
- <sup>3</sup> Nauka i technika w 2014 r., GUS, Warszawa 2015, p. 14.
- <sup>4</sup> J. Baruk, *Zarządzanie wiedzą i innowacjami*, Wydawnictwo Adam Marszałek w Toruniu, Toruń 2006, ps. 58.
- <sup>5</sup> A.M. Serrano-Bedia, M.C. López-Fernandez, G. Garcia-Piqueres, *Decision of institutional cooperation on R&D*, „European Journal of Innovation” 2010, Vol. 13 No. 4, p. 443.

<sup>6</sup> Available strategies of R&D activity are described in: J. Baruk, *Zarządzanie wiedzą i innowacjami*, Wydawnictwo Adam Marszałek w Toruniu, Toruń 2006, p. 66–67.

<sup>7</sup> *Innobarometer 2015 — The innovation trends at EU enterprises*. Report, Flash Eurobarometer 415 — TNS Political & Social, European Commission, September 2015, p. 2.

<sup>8</sup> *Innobarometer 2015 — The innovation trends at EU enterprises*. Report, Flash Eurobarometer 415 — TNS Political & Social, European Commission, September 2015, p. 31.

<sup>9</sup> *Innobarometer 2015 — The innovation trends at EU enterprises*. Report, Flash Eurobarometer 415 — TNS Political & Social, European Commission, September 2015, p. T29.

<sup>10</sup> *Innobarometer 2015 — The innovation trends at EU enterprises*. Report, Flash Eurobarometer 415 — TNS Political & Social, European Commission, September 2015, p. T29.

<sup>11</sup> E. Stawarz, Polityka innowacyjna wobec MSP, [in:] *Polityka innowacyjna państwa wobec sektora małych i średnich przedsiębiorstw w Polsce — analiza uwarunkowań i ocena realizacji*, eds. P. Niedzielskiego, R. Stanisławskiego, E. Stawasza, Uniwersytet Szczeciński, Wydział Zarządzania i Ekonomiki Usług, Zeszyty Naukowe No. 654, Szczecin 2011, p. 39.

<sup>12</sup> Employees can contribute to improving business results by using their skills to generate ideas and used them as building blocks for new and better products, services and work processes J.P.J. de Jong, D.N. Den Hartog, *How leaders influence employees' innovative behaviour*, „European Journal of Innovation Management” 2007, Vol 10 No. 1, p. 41.

<sup>13</sup> Innovations require organizational culture, which boosts employees' creativity and innovative behaviour, R. Sanz-Valle, J.C. Naranjo-Valencia, D. Jiménez, L. Perez-Caballero, *Linking organizational learning with technical innovation and organizational culture*, „Journal of Knowledge Management” 2011, Vol. 15 No. 6, p. 1002.

<sup>14</sup> M. Bogers, *The open innovation paradox: knowledge sharing and protection in R+D collaborations*, „European Journal of Innovation Management” 2011, Vol. 14 No. 1, p. 94.

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