

Expenditures on research and development in the Czech Republic – today and 10 years ago

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Abstract- Ten years ago, the government of the Czech Republic was criticized by the opposition, the scientific community, universities and financial institutions, including the EU, for insufficient financial support for research and development in the Czech Republic. They argued that the low level of scientific outputs is mainly due to the lack of R&D resources. It is true that in comparison with other EU countries, the share of R&D expenditures was significantly lower. Since then, the situation in the Czech Republic has changed. More money was spent on R&D every year than ever before. The article deals with how the annual increase in funds was reflected in the scientific output in the Czech Republic. Using various statistical variables, the article shows not only data about the Czech Republic in relation to R&D, but also other European Union states so that the difference in (in)efficiency of research is better visible.

Keywords –Research, Development, Innovation.

I. RESEARCH AND DEVELOPMENT IN „NUMBERS“

According to OECD data, not only the Czech Republic but also the EU states have invested too little share of GDP in research, development and innovation compared to other countries such as Japan, the USA, Israel and Korea. The total expenditures on research and development per capita in 2008 in the Czech Republic were only 344 USD and the EU invested less than 600 USD (Tab.1). These values lagged significantly behind not only in comparison with the already mentioned countries, which are traditionally considered to be superpowers in research and innovation, but also in comparison with the Scandinavian and West-European countries like Sweden, Finland, Luxembourg and other, which invested over 1000 USD on R&D per capita. [1]

Table -1 Total expenditures on research and development (GERD) per capita (USD) [1]

Country /Year	2008	2015	2016	2017	2018
Austria	1 061,59	1 523,49	1 641,17	1 666,27	1 786,16
Belgium	733,74	1 122,15	1 226,22	1 349,94	1 399,47
Czech Republic	343,60	650,18	602,84	689,59	779,84
Denmark	1 144,97	1 499,11	1 607,09	1 678,97	1 735,28
Estonia	285,18	429,04	389,17	433,48	511,72
Finland	1 417,75	1 220,63	1 224,08	1 297,90	1 360,38
France	723,53	925,87	952,33	984,82	1 017,48
Germany	1 005,06	1 397,14	1 487,08	1 626,36	1 704,34

Greece	204,21	258,59	276,55	329,02	358,13
Hungary	202,57	359,09	329,65	393,31	484,22
Iceland	1 070,82	1 073,60	1 128,35	1 169,34	1 178,79
Ireland	613,62	817,85	841,65	967,42	843,54
Italy	409,08	494,03	545,52	572,51	610,22
Latvia	112,96	154,74	116,28	146,68	196,47
Lithuania	163,55	300,94	260,49	303,18	337,47
Luxembourg	1 405,33	1 351,53	1 430,89	1 429,64	1 412,60
Netherlands	753,24	998,43	1 044,03	1 097,61	1 245,54
Norway	959,42	1 168,30	1 204,62	1 321,23	1 394,16
Poland	109,75	266,15	269,44	308,28	380,65
Portugal	384,88	368,87	404,77	436,50	465,44
Slovak Republic	108,93	347,99	234,48	273,92	273,03
Slovenia	481,43	694,71	681,38	684,22	756,75
Spain	440,46	427,07	444,17	479,65	504,03
Sweden	1 462,90	1 581,07	1 637,48	1 773,50	1 784,96
European Union	580,77	757,19	795,53	855,08	905,16

As can be seen in Tab. 1, the expenditures on R&D in the Czech Republic have been growing continuously since 2008. In 2018, 780 USD per capita was invested in research and development in the Czech Republic, 905 USD per capita in the EU. At the other end of the ranking, far below the average, there are currently member states of the European community with expenditures of <\$ 400 per capita. These are Slovakia, Poland, Lithuania, Latvia and Greece. In this indicator, the Czech Republic is slightly below the European average, ie. 780 USD per capita. [1] This shows that there is sufficient funding of the Czech science compared to other European countries.

The second indicator considering investment in R&D is the expression of the share in GDP in Tab.2.

Table -2 Science and research investments (% GERD as percentage of GDP) [2]

Country/ Year	2008	2015	2016	2017	2018
Austria	2,57	3,05	3,12	3,05	3,17
Belgium	1,94	2,43	2,52	2,66	2,76
Czech Republic	1,24	1,93	1,68	1,79	1,93
Denmark	2,77	3,05	3,09	3,05	3,03
Estonia	1,25	1,46	1,25	1,28	1,40
Finland	3,54	2,87	2,72	2,73	2,75
France	2,06	2,27	2,22	2,21	2,20
Germany	2,62	2,93	2,94	3,07	3,13
Greece	0,66	0,96	0,99	1,13	1,18
Hungary	0,98	1,35	1,19	1,33	1,53
Iceland	2,49	2,20	2,13	2,10	2,03
Ireland	1,39	1,18	1,17	-	1,15

Italy	1,16	1,34	1,37	1,37	1,39
Latvia	0,58	0,62	0,44	0,51	0,64
Lithuania	0,79	1,04	0,84	0,90	0,88
Luxembourg	1,62	1,27	1,26	1,27	1,21
Netherlands	1,62	1,98	2,00	1,98	2,16
Norway	1,55	1,94	2,04	2,10	2,07
Poland	0,60	1,00	0,96	1,03	1,21
Portugal	1,44	1,24	1,28	1,32	1,35
Slovak Republic	0,46	1,16	0,79	0,89	0,84
Slovenia	1,63	2,20	2,01	1,87	1,95
Spain	1,32	1,22	1,19	1,21	1,24
Sweden	3,47	3,23	3,25	3,37	3,31
European Union	1,76	1,95	1,94	1,98	2,03

In this indicator, the Czech Republic is again slightly below the European average of 1.93% of GDP. When comparing the outputs of R&D (new technologies, patents, licenses...), the Czech Republic has worse results than some states with lower expenditures.

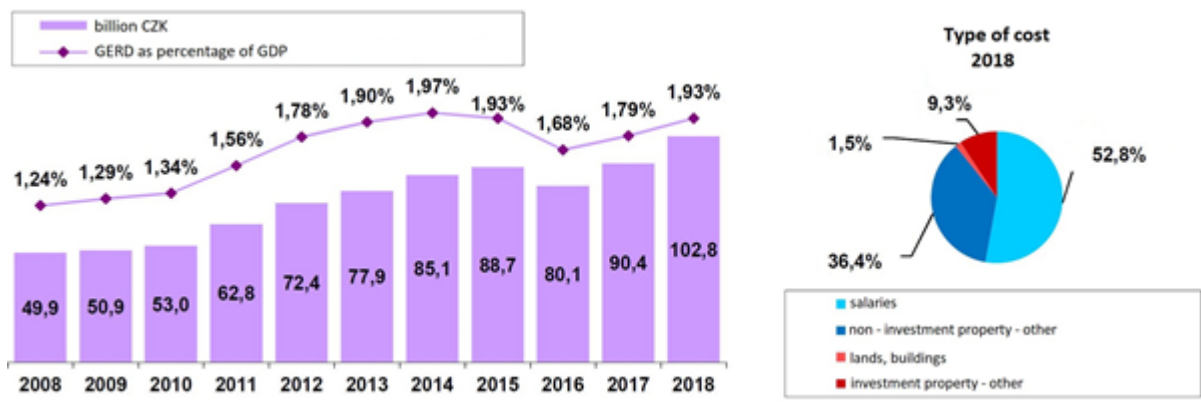


Figure 1. Science and technology in the Czech Republic [3]

As can be seen in Fig. 1, since 2008 expenditures on R&D has been growing continuously. The EU structural funds contributed significantly to the annual increase in total R&D expenditures, which reached 88.7 billion CZK in 2015. 2015 was the last year of the use of funds from the 2007-2013 operational programs. The slow use of funds from the EU intended for the next programming period 2014-2020 has caused a sharp almost 10% decrease of year-on-year expenditures on R&D in 2016. Nevertheless, in terms of financing, the following years were again successful. In 2017 the expenditures were 90.4 billion CZK, in 2018 the expenditures even reached a record 103 billion CZK (Fig. 1).

The expenditures on R&D have been gradually increasing in recent years (apart from 2016), yet the expected multiplier effect of investment has not arisen. Although, new economic entities engaged in research and development were created and the number of researchers and scientists, doctoral students and pedagogical staff was increased,

these have not effected the scientific outputs. Another interesting comparison of the registered results of research and development between 2017-2019 and 2007 can be seen in tab. 4 these have not effected the scientific outputs. Another interesting comparison of the registered results of research and development between 2017-2019 and 2007 can be seen in tab. 3.

Table -3 Number of registered science and research results according to type of outcome and year of use [4]

Type of outcome	Year of use		
	2003	2005	2007
Articles in periodicals	23 018	25 551	29 599
Expert book	1 786	1 889	2 150
Chapter in a book	3 068	3 712	5 648
Article in a yearbook (summary)	24 189	27 413	29 083
Patents	86	164	174
Prototype, used methodology, fiction sample, authorized SW, utility design	186	336	2 436
Pilot plant, certified technology, variety, breed	263	572	316
Other outcomes	2 895	6 165	3 476
Total	55 491	65 802	72 909

Although, R&D expenditures in the Czech Republic have boosted by more than 100% between 2007 and 2019, the numbers of recorded R&D results in 2018 and 2019 have not increased, but showed a decrease when compared to the 2007 results. The only exception is the number of registered patents, which has doubled (an increase from 174 patents in 2007 to 352 patents in 2019).

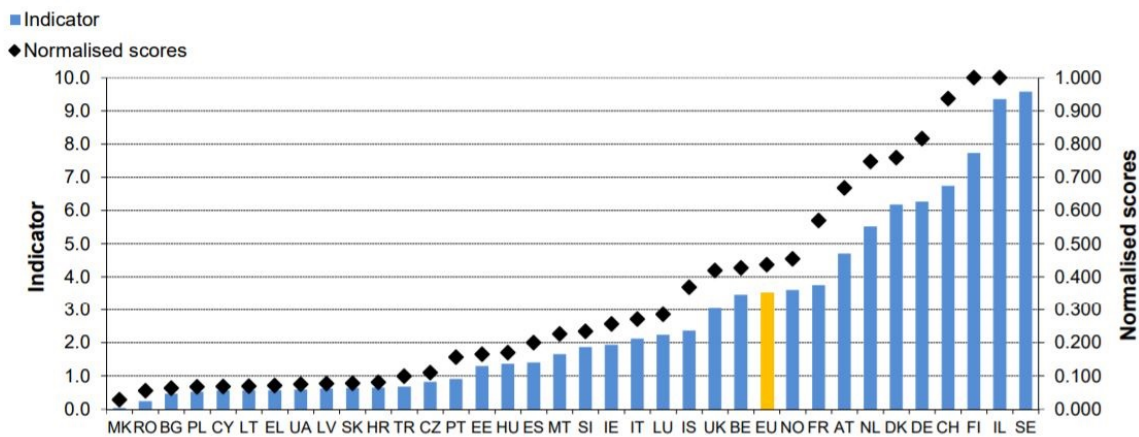


Figure 2. PCT patent applications per billion GDP [5]

In comparison with other countries the Czech Republic falls behind especially in number of applied research results: certified technologies and patents or prototypes. The biggest shortage (according to the indicators of the European Innovation Scoreboard) is in patent activity, where the Czech Republic has one of the lowest values of PCT patent applications indicator in the EU (see Fig. 2).

Even in terms of number of proposals for newly implemented projects and their access, the Czech Republic is not doing very well. Many small countries, such as Slovenia, Malta, Estonia and Luxembourg are much more active and successful in this area. In the Czech Republic, there are about 111 projects per 1 million inhabitants, which is the fourth lowest number of all EU-27 countries.

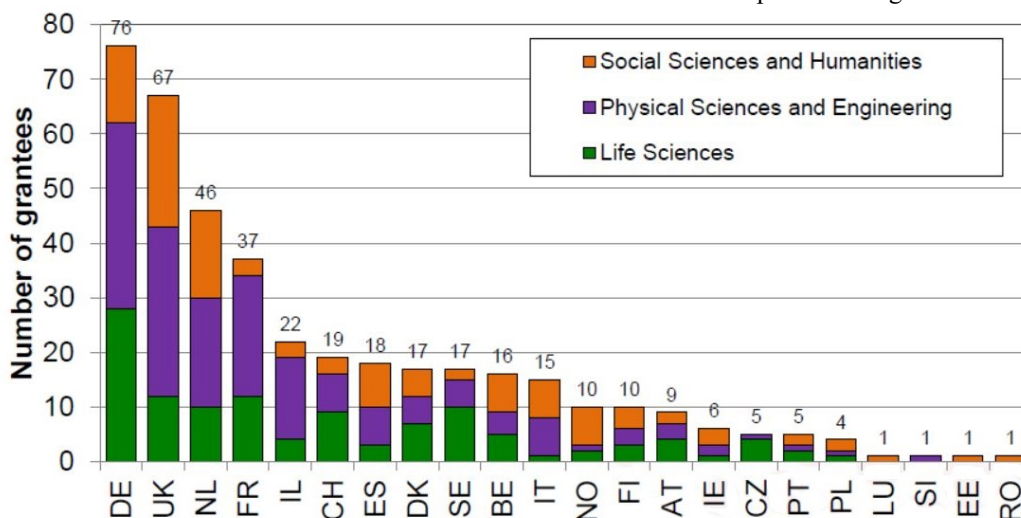


Figure 3. The efficiency of EU teams in Horizont 2020 [6]

Fig.3. illustrates the rank of individual states according to the projects efficiency. The rating of the Czech teams with 5 grantees ranks the Czech Republic 16th among the EU – 22 states. Fig. 3 shows that the medium - sized countries, i.e Netherlands, Denmark, Sweden, Belgium, Norway, Finland, Austria, Ireland, often compared to Czech Republic, have a higher number of projects per 1 million inhabitants than the Czech Republic. As stated in the Report of the Technology Center of the ASCR, as a reset, the Czech Republic will participate in the solution of a much smaller number of projects than comparably large countries.

II. CONCLUSION

1. When relativizing total expenditures on research and development by population, 780 USD per capita was invested in R&D in the Czech Republic in 2018. In 2008, R&D expenditures accounted for less than half. Comparing the current values with the amounts spent on R&D 10 years ago, we can see a significant increase. It is a positive change in opinion of the importance of knowledge as a key factor for the society.

2. Although, the Czech Republic invested 780 USD per capita in research and development in 2018, compared to countries such as the West-European and Scandinavian countries, whose expenditures for R&D exceed 1000 USD per capita, the Czech Republic is still lagging behind.

3. Although, the expenditures on R&D in the Czech Republic have increased by more than 100% from 2008 to 2018, this growth has not affect the number of registered R&D results. The numbers of recorded results of research and development in 2018 show a decrease, compared to the results from 2008. The only exception is the number of registered patents, which has doubled.

4. It is clear from these conclusions that the criticism from the opposition was not entirely justified. The lack of funds for research and development was not the main cause of weak scientific research activity in the Czech Republic. According to statistics, the Czech Republic is in the lower half of fulfilling the key indicators focused on specific results (patents, technologies, etc.). However, funding for R&D is slightly below the EU average. Providers of funding should more closely tie recipients with indicators that focus on the number of patents and the development of new technologies.

III. REFERENCE

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