

THE GROSS EXPENDITURES ON RESEARCH AND DEVELOPMENT BY SOURCES OF FUNDS IN POLAND AND IN THE CZECH REPUBLIC – DYNAMIC ANALYSIS

Elżbieta Sobczak, Małgorzata Karczewska

Abstract: *The goal of this article is the dynamic analysis of structure of the gross expenditures on research and development by sources of funds. In researches, into account were taken 5 sectors, which are financing the expenditures on research and development activities, distinguished in the public statistics of the European Union. Those sectors are: business enterprise sector, government sector, higher education sector, private non-profit sector and abroad sector. The time range of researches includes 1995-2011, spatial range Poland and the Czech Republic.*

Keywords: GERD indicator, sectors of funding R&D, R&D in Poland and Czech Republic

1. Introduction

In the economical literature the gross expenditures on research and development are the important subject of the analysis – especially, when researches concern the technological development or economic growth¹⁸³. Expenditures on R&D in particular countries can be financed from funds within area of the country or from foreign funds, except abroad financing. Sources of funds are as follows: government, higher education, business enterprise, private non-profit and abroad¹⁸⁴. The amount of funds which is spent on research and development activities in Poland and in the Czech Republic has an important meaning also because of being members of the European Union, which results in need of science and economy policy adaptation to the requirements of the union policy¹⁸⁵.

In the European Union dominates financing of expenditures on research and development by business enterprise sector. The high financing from government sector is typical for countries which are less developed with lower level of GDP per capita. In high developed countries the R&D activity is financed mostly by private businesses (business enterprise sector)¹⁸⁶.

The goal of this article is the dynamic analysis of the structure of the gross expenditures on research and development by sources of funds in Poland and in the Czech Republic in 1995-2011.

2. The information base of the empirical researches

In the public statistics of the European Union countries, in the area concerning the expenditures on research and development, the statistical units are grouped by economy sectors. This division allows for the identification as well as causal-descriptive analysis of differentiation of the financing structure of expenditures on R&D. There are five economy sectors, listed below, which are the elements of the mentioned structure:

- business enterprise sector (BES),
- government sector (GES),
- higher education sector (HES),
- private non-profit sector (PNP),
- abroad sector (Abroad)¹⁸⁷.

To business enterprise sector belong all companies, organizations and institutions, where the activity objective is producing of goods and services (except higher education) in order to sell them on

¹⁸³ R. Włodarczyk, *Struktura sektorowa finansowania wydatków na B&R w krajach strefy euro*, <http://www.instytut.info/Vkonf/site/40.pdf> [access: 12 June 2013].

¹⁸⁴ B. Godin, *The most cherished indicator: gross domestic expenditures on R&D (GERD)*, http://www.csiic.ca/PDF/Godin_22.pdf [access: 26 May 2013].

¹⁸⁵ A. Rozmus, K. Cyran, *Finansowanie działalności badawczo-rozwojowej w Polsce i innych krajach – diagnoza i próby oceny*, <http://www.e-finanse.com> nr 4/2009 [access: 27 April 2013].

¹⁸⁶ B. Domańska-Szaruga, K. Tomaszycycki, *Źródła finansowania projektów badawczo-rozwojowych*, [in:] *Problemy Kryminalistyki*, Nr 262, Publisher: Wydawnictwo Centralnego Laboratorium Kryminalistycznego Komendy Głównej Policji, Warszawa 2008, p. 43.

¹⁸⁷ Frascati Manual, OECD, 2002, p. 53.

the market. Also, those are the private non-profit institutions, which serve mentioned above companies, organizations and institutions¹⁸⁸.

Government sector means all departments, offices and other organs, which serve to general public (usually non-profit), and which are not connected with higher education. Those are non-commercial institutions controlled and financed mostly by government but not administrated by higher education sector¹⁸⁹.

Higher education sector covers all universities, technical colleges and other institutions offering higher education, independent from their sources of funds and legal status. In this sector included are all research institutions, experimental stations and clinics working under direct control of higher education institution and administrated or created by them¹⁹⁰.

To private non-profit sector belong all non-market, non-profit private institutions working for households (this means general public) as well as private persons and households¹⁹¹.

Abroad sector covers all institutions and private persons located outside political boundaries of particular country. Those are also all international institutions and organizations (besides companies) as well as their activities on the area of a given country¹⁹².

In this article the subject of analysis is the structure of expenditures on research and development in Poland and Czech Republic. The time range of the researches covers years 1995-2011. Used statistical information are taken from internet database of Eurostat.

3. Analysis of changes in financing the expenditures on R&D from particular sectors in Poland and in the Czech Republic

In the table 1 presented is participation of sectors: business enterprise, government, higher education, private non-profit and abroad in financing of the expenditures on research and development in Poland and in the Czech Republic within 1995-2011.

Table 1. The structure of expenditures on research and development by sources of funds in Poland and in the Czech Republic in 1995-2011

Years	Business Enterprise Sector (%)		Government Sector (%)		Higher Education Sector (%)		Private Non-Profit Sector (%)		Abroad (%)	
	CZ	PL	CZ	PL	CZ	PL	CZ	PL	CZ	PL
1995	63,1	36,0	32,3	60,2	1,0	1,7	0,3	0,4	3,3	1,7
1996	59,6	38,9	34,7	57,8	3,5	1,6	0,2	0,3	1,9	1,4
1997	59,8	35,1	30,8	61,7	7,2	1,3	0,2	0,3	1,9	1,6
1998	60,2	37,8	36,8	59,0	0,3	1,3	0,1	0,3	2,6	1,5
1999	52,6	38,1	42,6	58,5	0,7	1,4	0,1	0,3	4,0	1,7
2000	51,2	29,5	44,5	66,5	0,5	1,7	0,7	0,4	3,1	1,8
2001	52,5	30,8	43,6	64,8	0,7	1,6	1,0	0,4	2,2	2,4
2002	53,7	30,1	42,1	61,9	0,5	2,9	1,0	0,3	2,7	4,8
2003	51,4	30,3	41,8	62,7	1,2	2,1	1,0	0,3	4,6	4,6
2004	52,8	30,5	41,9	61,7	1,5	2,4	0,1	0,3	3,7	5,2
2005	53,2	33,4	40,9	57,7	1,1	2,9	0,0	0,3	4,9	5,7
2006	56,4	33,1	39,0	57,5	1,0	2,2	0,0	0,3	3,6	7,0
2007	52,5	34,3	41,2	58,6	0,8	0,2	0,0	0,2	5,5	6,7
2008	51,1	30,5	41,3	59,8	1,2	4,1	0,0	0,2	6,5	5,4
2009	44,6	27,1	43,9	60,4	1,1	6,7	0,0	0,3	10,4	5,5

¹⁸⁸ Ibidem p. 54.

¹⁸⁹ Ibidem, p. 62.

¹⁹⁰ Ibidem, p. 68.

¹⁹¹ Ibidem, p. 64.

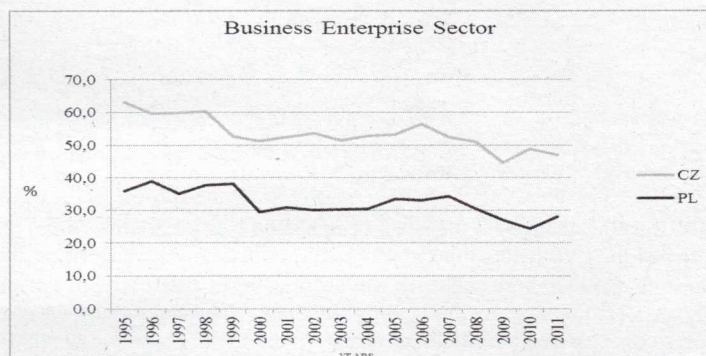
¹⁹² Ibidem, p.72.

2010	48,9	24,4	39,9	60,9	0,8	2,5	0,0	0,3	10,4	11,8
2011	46,9	28,1	37,0	55,8	0,8	2,4	0,0	0,2	15,2	13,4

Source: own elaboration on the basis of Eurostat database.

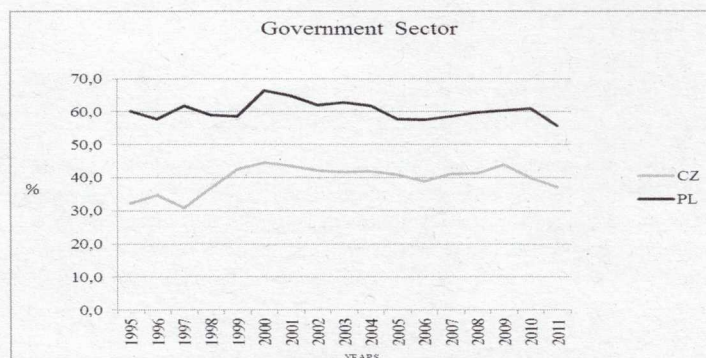
Drawing 1 presents the changes of expenditures on R&D financed by business enterprise sector in Poland and in the Czech Republic in 1995-2011. In both analyzed countries the gross expenditures on R&D showed the descending tendency. In 2011 in relation to 1995 in the Czech Republic occurred decrease of expenditures in business enterprise sector in financing of expenditures on R&D by 25,7% and in Poland by 21,9%. In the whole analyzed period in the Czech Republic - business enterprise sector had higher input in financing expenditures on R&D than in Poland. In 1995 business enterprise sector financed in the Czech Republic 63,1% expenditures on R&D, in Poland only 36% (the difference was more than 27 percentage point), in 2011 in the Czech Republic it was 46,9%, while in Poland 23,1% (almost 19 percentage point of difference).

Drawing 2 presents gross expenditures on research and development financed from government sector in Poland and in the Czech Republic in 1995-2011. The changes tendency of the analyzed structure indicator in both countries, in the whole researched period was congenial. In 1995-2000 is observed the ascending tendency, and in the next years it was descending. In each of researched years financing of expenditures on R&D from government sector was higher in Poland than in the Czech Republic. The highest share of government sector in financing of expenditures on R&D in both countries was in 2000, in Poland it was equal to 66,5% and in the Czech Republic 44,5% (difference of 22 percentage points).



Drawing 1. The gross expenditures on R&D financed from business enterprise sector in Poland and in the Czech Republic in 1995-2011

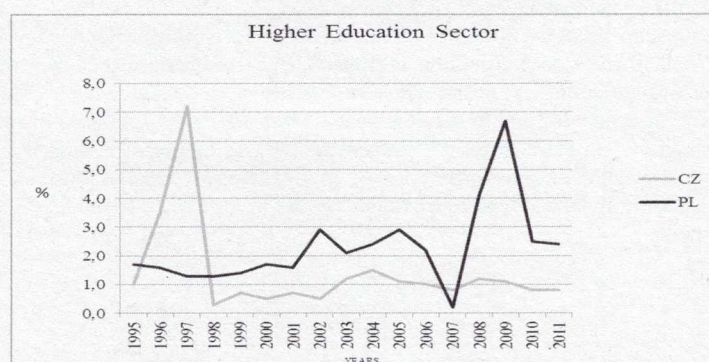
Source: own elaboration on the basis of data from table 1.



Drawing 2. The gross expenditures on R&D financed from government sector in Poland and in the Czech Republic in 1995-2011

Source: own elaboration on the basis of data from table 1.

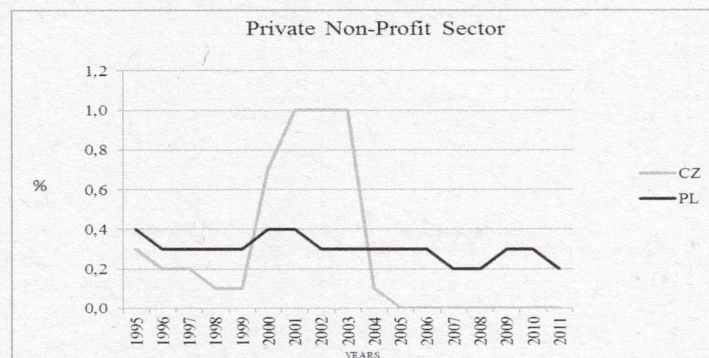
On the drawing 3 presented are the gross expenditures on R&D financed by higher education sector in Poland and in the Czech Republic in 1995-2011. In both countries changes of analyzed indicator were shaping differently but both had an irregular character. In the Czech Republic in 1995-1998 there were sudden changes, characterized with very high fluctuation amplitude. In 1995 the share of higher education sector in financing of expenditures on R&D activities was 1%, in 1996 increased to 3,5%, in 1997 to 7,2% - in the next year it decreased to 0,3%. In the next years of analyzed period the financing of expenditures on R&D from this sector was shaping in the borders from 0,5% to 1,2%. In Poland high fluctuations and irregular changes of higher education share in financing of R&D activities appeared in 2007-2010. In 2007 occurred a rapid decrease from 2,2% to 0,2%, and in the next two years increase from 4,1% to 6,7%, in 2010 decreased again to 2,5%. In the rest of the period financing of expenditures on R&D from higher education sector was shaping from 1,3% to 2,5% and was higher than in the Czech Republic.



Drawing 3. The gross expenditures on R&D financed from higher education sector in Poland and in the Czech Republic in 1995-2011

Source: own elaboration on the basis of data from table 1.

Drawing 4 reflects the changes in the share of financing R&D activities from private non-profit sector in Poland and in the Czech Republic in 1995-2011. The analysis of drawing 4 shows that the share of expenditures on R&D in both countries was shaping quite differently. In Poland, in the whole researched period, was occurring slightly descending tendency. Analyzed indicator had values of range from 0,2% to 0,4% so the changes were not significant. In the Czech Republic in 2000-2003 occurred sudden increase of private non-profit sector significance in financing research and development activities (to 1%), afterwards the rapid decrease took place, in years 2005-2011 this sector stopped financing of expenditures on R&D.

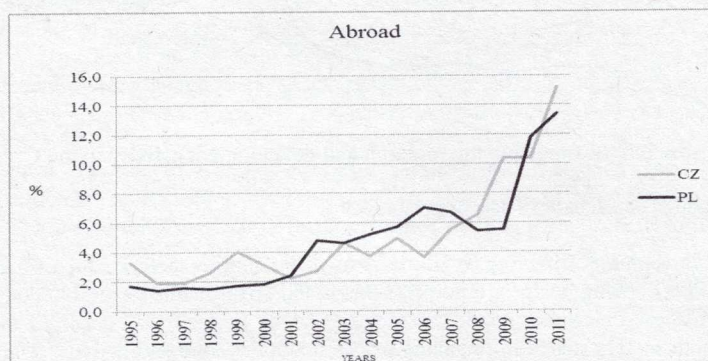


Drawing 4. The gross expenditures on R&D financed from private non-profit sector in Poland and in the Czech Republic in 1995-2011

Source: own elaboration on the basis of data from table 1.

As shown on the drawing 5, changes of expenditures on R&D share financed by abroad sector in Poland and in the Czech Republic in 1995-2011 demonstrated congenial, dynamically growing tendency of changes.

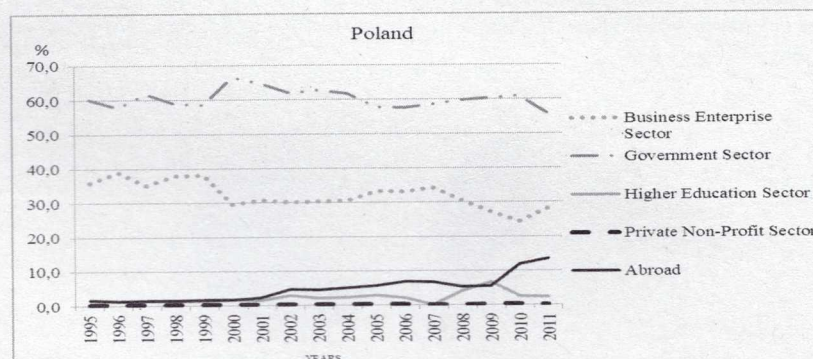
In 2011 in the relation to 1995 in the Czech Republic occurred increase of the share of abroad sector in financing R&D activities from 3,3% to 15,2% (by 11,9 percentage point), and in Poland from 1,7% to 13,4% (by 11,7 percentage point). The meaning of this sector, in both researched countries, significantly increased.



Drawing 5. The gross expenditures on R&D financed from abroad sector in Poland and in the Czech Republic in 1995-2011

Source: own elaboration on the basis of data from table 1.

On the drawings 6 and 7 presented is the structure of financing of expenditures on research and development in Poland and in the Czech Republic in 1995-2011.

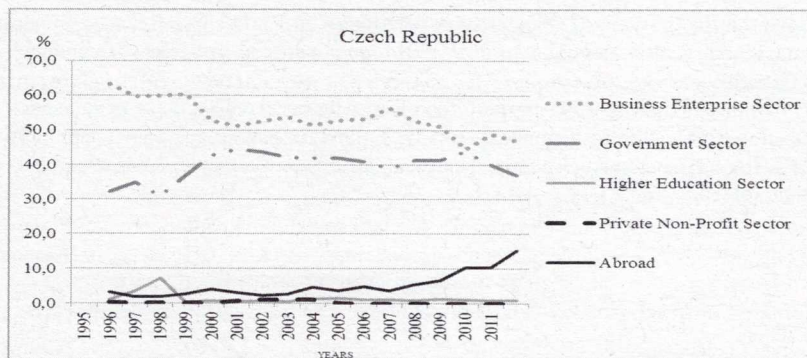


Drawing 6. The structure of financing the research and development activity in Poland in 1995-2011

Source: own elaboration on the basis of data from table 1.

In Poland in the whole researched period dominates financing of R&D activities from government sector, the share of this sector oscillates around 60%.

The next important sector, which significance unfortunately decreased from 40% to below 30% was the business enterprise sector. A much smaller role in financing of expenditures on research and development played the rest of sectors, however, it is worth to note the growing share of the financing from abroad sector.



Drawing 7. The structure of financing the research and development activity in the Czech Republic in 1995-2011

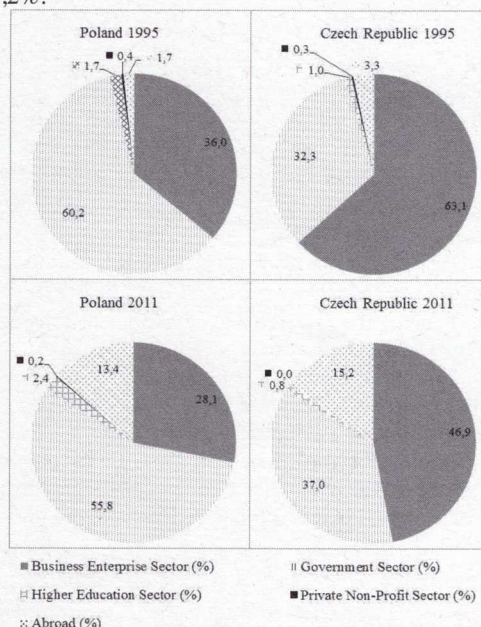
Source: own elaboration on the basis of data from table 1.

In the Czech Republic (drawing 7) similarly as in Poland, to sectors which finance mostly the expenditures on R&D belong business enterprise sector and government sector, but contrary to Poland dominates the business enterprise sector. Moreover, can be noticed that occurred the tendency of approaching of both sectors shares in financing research and development activity. The importance of other sectors, as in Poland, is much lower, by significant increase of abroad sector.

On the drawing 8, on a pie charts presented is the structure of financing of expenditures on R&D in Poland and in the Czech Republic in the first and the last year of the research. As can be noticed, over the researched years the dominating sectors have changed, but decreased their meaning.

In case of Poland it was the government sector, which share in financing of expenditures on R&D decreased from 62% in 1995 to 55,8% in 2011. In the Czech Republic dominated the business enterprise sector, in which financing decreased form 63,9% to 46,9%.

Characteristic for both countries is also the similar increase of abroad sector in financing research and development activities. In Poland from 1,7% in 1995 to 13,4% in 2011, and in the Czech Republic from 3,3% to 15,2%.



Drawing 8. The structure of financing the research and development activity in Poland and in the Czech Republic in 1995 and 2011

Source: own elaboration on the basis of data from table 1.

4. Conclusions

Conducted analysis allowed to formulate conclusions concerning the changes of importance of particular sources of funds on expenditures on research and development in Poland and in the Czech Republic in 1995-2011. The most important of them are mentioned below:

- Research and development activity in Poland, in researched period, is characterized by the domination of financing from government sector, while in the Czech Republic bigger importance had business enterprise sector.
- In 2011, in comparison to 1995, in both researched countries decreased the share of business enterprise sector in financing of expenditures on R&D, in Poland from 36% to 28,1% and in the Czech Republic from 63,1% to 46,9%.
- The financing from government sector decreased in 2011 in comparison to 1995 both in Poland and in the Czech Republic (respectively from 60,2% to 55,8% and from 32,3% to 37%).
- The biggest importance of higher education sector in financing of expenditures on research and development took place in 2009 in Poland (6,7%), in the Czech Republic in 1997 (7,2%).
- In the Czech Republic from 2005 R&D activities were not financed from private non-profit sector.
- In 2011, in comparison to 1995, in both researched countries the importance of abroad sector as the source of R&D activities financing increased distinctly (in Poland from 1,7% to 13,4%, in the Czech Republic from 3,3% to 15,2%).

Analysis, presented in this article can be the basis for further researches concerning the sources of funds of expenditures on research and development activity in Poland and in the Czech Republic, as well as in other member states of the European Union.

Bibliografia

- [1] DOMAŃSKA-SZARUGA B., TOMASZYCKI K., *Źródła finansowania projektów badawczo - rozwojowych*, [in:] Problemy Kryminalistyki, Nr 262, Publisher: Wydawnictwo Centralnego Laboratorium Kryminalistycznego Komendy Głównej Policji, Warszawa 2008.
- [2] *Frascati Manual*, OECD, 2002
- [3] *GERD by source of funds*, <http://epp.eurostat.ec.europa.eu>, [access: 2 June 2013].
- [4] GODIN B., *The most cherished indicator: gross domestic expenditures on R&D (GERD)*, http://www.csiic.ca/PDF/Godin_22.pdf [access: 26 May 2013].
- [5] ROZMUS A., CYRAN K., *Finansowanie działalności badawczo-rozwojowej w Polsce i innych krajach – diagnoza i próby oceny*, <http://www.e-finanse.com> nr 4/2009 [access: 27 April 2013].
- [6] WŁODARCZYK R., *Struktura sektorowa finansowania wydatków na B&R w krajach strefy euro*, <http://www.institut.info/Vkonf/site/40.pdf> [access: 12 June 2013].

Elżbieta Sobczak, Małgorzata Karczewska
Wrocław University of Economics, Poland