

# **VISEGRAD FOUR COUNTRIES: EVALUATION IN R&D SECTORS OF PERFORMANCE**

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## **Abstract**

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Competitiveness is currently being studied by many economic analyses. Generalization of the countries' competitiveness definition as a measure of understanding of the performance evaluation economies is important. Visegrad Four countries: Hungary, the Czech Republic, Slovakia and Poland were admitted to the European Union in May 2004. EU Member States must respect the common EU objectives. The European Union, as expressed in the strategy Europe 2020, is obliged to increase competitiveness, innovation, by introduction of modern technology and especially the growth R&D investment.

Limited data to evaluate R&D expenditure: inconsistencies in the R&D support, the absence of data concerning the other means of financing in the sector BERD, limitations of statistical data on the number of innovations only to firms with R&D activities.

The aim of this paper is to evaluate the development of R&D expenditures by sector of funding in the Visegrad Four countries in comparison with the values of the EU-27 and countries of Visegrad Four together.

gross domestic expenditure on R&D, Visegrad Four, increase competitiveness, financing sector R&D

## **1 INTRODUCTION**

Member States: Czech Republic, Hungary, Poland and Slovakia established a group of Central European countries in 1991 called the Visegrad Group (also known as the "Visegrad Four" or simply "V4"). Activities of mutual cooperation of the Visegrad Four freshly initiated a common interest of democratic countries to integrate into the developed Western European market economy. The aims of all member states of the Visegrad Four countries were to join the European Union. The European Union was founded as a group in order to achieve common goals. Its main objective is to ensure the well-being of all residents, economic and social development in Member States respectively. The effort to integrate into the European Economic Community Union means an agreement with the strategies adopted by the European Union. One of the objectives of the European Union is "to be the most competitive Community in the world." These words are derived from the Lisbon Strategy

and the strategy Europe 2020. Competitiveness is a word that is often mentioned in the literature. The theoretical concept has many definitions (Porter, Drucker, Jirásek). Competitiveness on the one hand, the initial condition, but on the other hand, it may ultimately affected currently considered or already implemented measures in economic policy.

One way to increase the competitiveness of Member States is to increase R&D investment. Following in the footsteps of Japan (Drucker, 1992) followed by those in the 80 years of USA Convention on the path of economic growth through increasing expenditure on R&D and European economically advanced countries. Currently, there are two ways to support R&D investments. Government direct R&D subsidies and instruments of government R&D tax incentives seems to be very important. Government direct R&D subsidies is dependent on the amount of the available amount of the state budget; support with R&D tax incentives is the stimulus for R&D investment from own

resources of companies. Indirect R&D support plays an important role in stimulating research and development as a response to high levels of risk associated with the category of investment. In the world: Japan's R&D support through R&D tax incentives, is active from 70's of the 20th century. U.S. adopted the policy tool proposed by the U.S. Congress in 1981 to support U.S. companies to cover basic technological research.

The ability of companies to invest into R&D is limited by several factors. Namely the availability of information on support, lack of capital resources, administrative complexity when processing a request for a different way of financing, lack of communication between the R&D department and strategic business management. Obstacle to R&D investment is the way competitiveness through cost savings.

The most frequent beneficiaries of direct aid are large firms. Projects in the Visegrad Four countries are not covered only from the public R&D funding, but also by the European Union, which helps new Member States to achieve higher economic growth. Majority of small and medium-sized companies are not able to self-insure against the risk of failure in research. This causes a decrease of own investments into all types of R&Ds.

Philosophy of indirect R&D subsidies for investment is dominated by the politics of economic growth in the United States, but also in the countries of the European Union, although the allegations against the past (Surrey, 1969; Bozemen *et al.*, 1984, 1985; Tassey, 1996, 2007). Contributions of Tassey (2007) and Baghana and Mohnen (2009) measure the benefits of establishing R&D tax incentive schemes for small and medium-sized enterprises in North America. Elschner *et al.* (2009) presented a simulated model of European Tax Analyzer. McKenzie (2008) uses a different method "Hall-Jorgenson-King-Fullerton (HJKF) approach to measure the user cost of capital and the related concept of effective marginal tax rate on capital is typically used for research and development, intangible capital".

The aim of this paper is to evaluate the development of R&D expenditures by sector of R&D financing in the countries of the Visegrad Group in comparison with the values of the EU-27 and the other from the statistical processing of data to assess the impact of laws on the change in the financing sector-specific R&D. In conclusion, the author evaluated the expected path of the GBOARD: BERD, which is defined as the strategy Europe 2020 target of R&D.

## 2 MATERIALS AND METHODS

The subject of my research was to analyse sector R&D funding in Visegrad Four countries in the proportions recommended by the European Commission. To quantify the contribution to the objectives it was necessary to establish the issues which will be analysed. Used input data come from

the secondary assembly. Data used in the research were from the Ministry of Industry and Trade of the Czech Republic, Deloitte, publicly available databases and statistical database Eurostat and national statistical offices Visegrad Four countries. To measure differences in the use of methods of R&D support was accessed based on statistical methods of time series analysis. To analyse the evolution of the percentage of funding R&D sectors in relation to GDP was based on simple rate dynamics of time series. Data sets from the years 2006–2011 were used. Statistical analysis of R&D expenditure was carried out "ceteris paribus". Real R&D expenditures were assessed by the sector R&D financing. Change in the structure of sectors R&D financing were compared with regard to legislative changes supporting business financing from own resources.

Absolute increments shaped

$$\Delta t = y_t - y_{t-1} \quad t = 2, 3, \dots, n \quad (1)$$

Relative increments are equal

$$\delta_t = \frac{y_t - y_{t-1}}{y_{t-1}} \quad t = 2, 3, \dots, n \quad (2)$$

The mean absolute increase

$$\bar{\Delta} = \frac{y_n - y_1}{n - 1} \quad (3)$$

The average growth rate time series

$$\bar{k} = \sqrt[n-1]{\frac{y_n}{y_1}} \quad (4)$$

### 2.1 Definition of variables

Tab. I. presents the relative shares of the different sources of R&D funds'. More specifically the indicators are given as percentages of GERD (Gross Domestic Expenditure on R&D) financed respectively by industry, government, the higher education and the private non-profit sector. The fifth source of funds' shown is an international finance. There are R&D activity where are significant transfers of resources among different units, Organisations, Sectors and Countries. The Importance of the Source of Funding has been recognized in one of the Barcelona targets of the Lisbon agenda where it is said: The split the R&D funds is one third financed by public government funds' and two thirds by private ones. Gross Domestic Expenditure of R&D (GERD) is consequently composed of: Business Enterprise Expenditure on R&D (BERD), Higher Education Expenditure on R&D (HERD), Government Expenditure on R&D (GOVERD) Abroad (AB) and Private Non-profit Expenditure on R&D (PNPRD). Government direct R&D funding includes grants, loans and procurement. Government indirect R&D funding includes tax incentives such as

R&D tax credits, R&D allowances, reductions in R&D workers' wage taxes and social security contributions, and accelerated depreciation of R&D capital.

SARIO (Slovak Investment and Trade Development Agency) gives R&D support information. R&D expenditure in the business sector (BERD) includes R&D expenditures for on its territory in a given period, regardless of the source of funds.

Businesses R&D support can apply for regional investment aid, aid work, helping to build a technology centres or on its extension. Slovakia has, since 2009, R&D tax incentives. According to Act No. 185/2009 may apply for grants from the state budget to support basic research, applied research or experimental development, the temporary placement of highly qualified R&D personnel. Relief for tax incentives are provided for three consecutive tax periods (SARIO, 2010).

In the Czech Republic it was established in 2005 deductible item. Czech income tax law allows companies to reduce R&D spending 100 per cent of their annual tax base, the tax credit for research and development. Tax incentives are available to all businesses regardless of size. Activities eligible for R&D tax support must meet the OECD Frascati Manual. Deducting the cost of research and development cannot be used for services, royalties and research and development acquired from other persons (Parlament České republiky, 2009). In 2008, the procedure was modified as a result of changes before the commencement of the R&D work of entrepreneurs to seek the advice from the tax office as to whether the project qualifies for the available tax incentives (PriceWaterhouseCoopers, 2008).

Hungarian law contains a number of tax measures aimed at supporting research and development activities. Main tax incentives, meant to be aimed at supporting research and development in the field of corporate income tax and special taxes, where the cost of research and development are deductible from pre-tax profits of the company, and as such double deduction can be achieved. Other direct tax relief are available for corporation tax; however, these tax incentives are linked to several criteria and administrative requirements. Legislation in the field of innovation contribution tax credit also provides an opportunity for companies involved in research and development. In particular, the Hungarian law contains essentially two types of R&D tax incentives: deductions from corporate income tax base and tax credits that can be used to reduce tax liability (Deloitte Touche Tohmatsu Limited, 2012). Changes to the definitions of R&D apply in Hungarian law for beginning in the 2012.

In Poland, the main two measures aimed at supporting R&D activities and innovation activities include provisions on the status of R&D centre position, which provides for special tax exemptions and depreciation, namely monthly expenditure on innovation fund and aid for the purchase of new technology. Conditions for obtaining this status are as follows: net income from the sale of goods, products and financial operations for the year preceding the year of application for the grant, research and development centre status must be at least 800 000 EUR, net revenues from the sale of the results of the research and development activities must at least 50 per cent of total sales, and must not have any outstanding tax and national insurance. After undertaking acquires the status of research and development, may benefit from an exemption from property tax, as well as rural and forest exemptions (EU OFFICE Česká Spořitelna, a. s., 2012).

Support for R & D of EU funds:

Hungary – EU provides funding under the Operational Programme “Economic Development”.<sup>1</sup> Priority Axis: “Investment in research and development and competitiveness” draws 34% of the budget funds. It is 998.2 million EUR.

Slovakia promotes R&D by OP Research and Development (Ministry of Education by 2012 1 422.9 million EUR). Subsidies can draw on the infrastructure support R&D; R&D; R&D infrastructure in the Bratislava region, promoting R&D in the Bratislava region, higher education infrastructure.

Poland promotes R&D by OP Innovative economy (Ministry of Regional Development; 2012 was budget 9 711.6 million EUR. Subsidies can draw on new R&D technologies, investment in innovative enterprise; diffusion of innovation, expansion into international markets; Information Society.

The Ministry of Industry and Trade of the Czech Republic launched programmes of the support of SMEs „DEVELOPMENT“ and „Innovation – Patent“.

Programmes are part of the Operational Programme Enterprise and Innovation. It is focused on the support of competitiveness of SMEs particularly by purchasing new technologies in areas with the concentrated support of the state. Planned allocation for the calls in 2012 is about 29.4 million EUR.

### 3 RESULTS

Europe has a long-standing tradition of excellence in research and innovation, and European teams continue to lead progress in many fields of science and technology. Centres of excellence are scattered across the continent in 27 Member States. The

<sup>1</sup> The entrepreneur is the most interesting programs OP Economic Development, whose governing body is also National Development Agency. OP aim is to intensify R&D of the corporate sector and the business environment and simplification of investment for SMEs.

European Research Area (ERA) AIMS to bring national and European Union endeavours together through networking and co-operation and to build a research and innovation equivalent of the “common market” for goods and services (European Commission).

Tab. I shows the development R&D expenditure by sectors of funding in the 2006–2011. For years, the government is to create an economic environment suitable for technology-intensive economic activities. This is especially the case in developed countries where labour costs are relatively high and the economy is necessary to focus on activities that provide higher value products or customer. As part of the development of various European countries decided to use:

- R&D tax incentives
- R&D tax subsidies
- To stimulate the most developed region in the world.

Lisbon Strategy and strategy Europe 2020 plan to become the most developed region in the world. Objective competitiveness sets investment in the each country on research and development to reach per cent of their GDP. Allocation of invested assets was regarded as 1per cent of this amount as an investment should the state and private companies should be 2per cent of the investment. Sweden, Finland and Denmark achieved more than 3 per cent R&D expenditure of GDP by 2011. Among the countries of the Visegrad Group is closest to the defined objectives the Czech Republic, which achieved GERD 1.84 per cent in 2011.

Gross Domestic Expenditure on R&D (GERD) is consequently composed of: Business Enterprise Expenditure on R&D (BERD), Higher Education Expenditure on R&D (HERD), Government

Expenditure on R&D (GOVERD) and Private Non-profit Expenditure on R&D (PNPRD). However, the question remains whether the research and development, R&D indirect support R&D tax incentives and government direct support for R&D spending is actually stimulating private firms to increase their R&D investment.

Resources spending on R&D from businesses reach two thirds of total R&D expenditure in accordance to the European traditions and experience. From the comparison, of the time series (see Tab. I), EU-27 and the countries of the Visegrad Group countries it follows that the EU-27, since 2006, the ratio of R&D expenditures in the business sector is still declining.

Average annual decrease is 0.3 per cent to 53.9 per cent in 2010. In the Czech Republic, which in 2006 had the highest R&D expenditure of the monitored countries occurred despite demonstrably best stimulating indirect support (Elschner *et al.*, 2011) to an average annual decline of 1.9 per cent. A study, which I conducted in 2012, showed that the number of businesses enterprises using indirect support in the Czech Republic is increasing. At the same time increases the amount of funds R&D invests companies. This suggests that the decline in BERD figures (see Tab. II) occurs because firms in the Czech Republic do not increase their spending on R&D in parallel with the growth of value added generated. Slovakia and Poland, as well as the Czech Republic recorded a decrease in the period indicators BERD annually by 0.22 per cent, or 1per sent. Since 2006 among of the Visegrad Four countries only Hungary increases, the share of business R&D expenditure was about 0.84 per cent per year. In 2011 and even surpassed the Czech Republic, which in 2006 was close to achieving set objectives.

I: Gross domestic expenditure on R&D by source of funds – % of total GERD

	Gross domestic expenditure on R&D (GERD) by source of funds (%)														
	2006					2007					2008				
	BERD	GOVERD	HERD	PNPRD	AB	BERD	GOVERD	HERD	PNPRD	AB	BERD	GOVERD	HERD	PNPRD	AB
EU - 27	55.1	33.5	0.9	1.7	8.8	55	33.2	0.9	1.7	9.2	54.9	33.7	1	1.6	8.8
Czech Republic	56.4	39	1	0	3.6	52.5	41.2	0.8	0	5.5	51.1	41.3	1.2	0	6.5
Hungary	43.3	44.8	0	0.6	11.3	43.9	44.4	0	0.6	11.1	48.3	41.8	0	0.6	9.3
Slovakia	35	55.6	0.3	0.1	9.1	35.6	53.9	0.2	0.1	10.2	34.7	52.3	0.3	0.4	12.3
Poland	33.1	57.5	2.2	0.3	7	34.3	58.6	0.2	0.2	6.7	30.5	59.8	4.1	0.2	5.4
	Gross domestic expenditure on R&D (GERD) by source of funds (%)														
	2009					2010					2011				
	BERD	GOVERD	HERD	PNPRD	AB	BERD	GOVERD	HERD	PNPRD	AB	BERD	GOVERD	HERD	PNPRD	AB
EU - 27	54.1	34.8	1	1.6	8.5	53.9	34.6	0.9	1.6	8.9					
Czech Republic	44.6	43.9	1.1	0	10.4	48.9	39.9	0.8	0	10.4	46.9	37	0.8	0	15.2
Hungary	46.4	42	0	0.7	10.9	47.4	39.3	0	0.9	12.4	47.5	38.1	0	1	13.5
Slovakia	35.1	50.6	0.6	1	12.8	35.1	49.6	0.4	0.3	14.7	33.9	49.8	1.8	0.4	14.2
Poland	27.1	60.4	6.7	0.3	5.5	24.4	60.9	2.5	0.3	11.8	28.1	55.8	2.4	0.2	13.4

Source: (European Commission, 2012)

## II: Additions to expenditure in the sector BERD (%)

		EU - 27	Czech Republic	Hungary	Slovakia	Poland
2007	$\Delta t$	-0.1	<b>-3.9</b>	0.6	0.6	1.2
	$\delta t$	-0.002	<b>-0.069</b>	0.014	0.017	0.036
2008	$\Delta t$	-0.1	<b>-1.4</b>	4.4	-0.9	-3.8
	$\delta t$	-0.002	<b>-0.027</b>	0.1	-0.025	-0.111
2009	$\Delta t$	-0.8	<b>-6.5</b>	-1.9	0.4	-3.4
	$\delta t$	-0.015	<b>-0.127</b>	-0.039	0.012	-0.111
2010	$\Delta t$	-0.2	<b>4.3</b>	1	0	-2.7
	$\delta t$	-0.004	<b>0.096</b>	0.022	0	-0.1
	$\Delta$	0.99		1.05		
	k	-0.3		0.84		
2011	$\Delta t$		<b>-2.0</b>	0.1	-1.2	3.7
	$\delta t$		<b>-0.041</b>	0.002	-0.034	0.152
	$\Delta$		<b>0.91</b>	1.05	0.98	0.92
	k		<b>-1.9</b>	0.84	-0.22	-1

Source: own computations

## III: Additions to expenditure in the sector GOVERD (%)

		EU - 27	Czech Republic	Hungary	Slovakia	Poland
2007	$\Delta t$	-0.3	2.2	-0.4	-1.7	1.1
	$\delta t$	-0.009	0.056	-0.009	-0.031	0.019
2008	$\Delta t$	0.5	0.1	-2.6	-1.6	1.2
	$\delta t$	0.015	0.002	-0.059	-0.030	0.020
2009	$\Delta t$	1.1	2.6	0.2	-1.7	0.6
	$\delta t$	0.033	0.063	0.005	-0.033	0.010
2010	$\Delta t$	-0.2	-4	-2.7	-1	0.5
	$\delta t$	-0.006	-0.091	-0.064	-0.02	0.008
	$\Delta$	1.02				
	k	0.275				
2011	$\Delta t$		-2.9	-1.2	0.2	-5.1
	$\delta t$		-0.073	-0.031	0.004	-0.084
	$\Delta$		0.97	0.92	0.95	0.99
	k		-0.4	-1.34	-1.16	-0.34

Source: own computations

## IV: Additions to expenditure in the sector ABROAD (%)

		EU - 27	Czech Republic	Hungary	Slovakia	Poland
2007	$\Delta t$	0.4	1.9	-0.2	1.1	-0.3
	$\delta t$	0.045	0.528	-0.018	0.121	-0.043
2008	$\Delta t$	-0.4	1	-1.8	2.1	-1.3
	$\delta t$	-0.043	0.182	-0.162	0.206	-0.194
2009	$\Delta t$	-0.3	3.9	1.6	0.5	0.1
	$\delta t$	-0.034	0.6	0.172	0.041	0.019
2010	$\Delta t$	0.4	0	1.5	1.9	6.3
	$\delta t$	0.047	0	0.138	0.148	1.145
	$\Delta$	1.01				
	k	0.025				
2011	$\Delta t$		4.8	1.1	-0.5	1.6
	$\delta t$		0.462	0.089	-0.034	0.136
	$\Delta$		2.05	1.09	1.25	1.38
	k		2.32	0.44	1.02	1.28

Source: own computations

Public funding has GOVERD reached one third of total R&D expenditure (see Tab. III). The decline in the GOVERD all Visegrad Four countries suggests that governments of all the countries reduce indirect government R&D expenditure in order to comply with strategy Europe 2020. The Czech

Republic with 37 per cent is as close as possible to the recommended proportion of R&D expenditure. If there was a decrease in the expenditure-to-GDP ratio in the sector GOVERD same pace, reached the CR recommended ratio in 2021.



V: Additions to expenditure in the sector HERD and PNPRD

		EU - 27	Czech Republic	Hungary	Slovakia	Poland
2007	$\Delta t$	0	-0.2	0	-0.1	1.2
	$\delta t$	0	-0.2	0	-0.25	0.036
2008	$\Delta t$	0	0.4	0	0.4	-3.8
	$\delta t$	0	0.5	0	1.333	-0.111
2009	$\Delta t$	0	-0.1	0.1	0.9	-3.4
	$\delta t$	0	-0.083	0.167	1.286	-0.111
2010	$\Delta t$	-0.1	-0.3	0.2	-0.9	-2.7
	$\delta t$	-0.038	-0.273	0.286	-0.563	-0.1
	$\Delta$	0.98				
	k	-0.025				
2011	$\Delta t$		0	0.1	1.5	3.7
	$\delta t$		0	0.111	2.143	0.152
	$\Delta$		0.89	1.29	2.35	0.92
	k		-0.04	0.08	0.36	-1

Source: own computations

Tab. IV shows the increase in R&D expenditure of abroad funds. Abroad R&D expenditures of the Czech Republic are increasing rapidly. Investors come at least in the Hungarian economy. R&D abroad investment of the Visegrad Group countries' economies increase more than average EU-27. Visegrad Four countries are attractive to foreign investors of highly qualified, but compared with developed EU countries with cheap labour.

According Tab. V Poland R&D expenditure in HERD sector and PNPRD greatly exceeds the average EU-27. HERD percentage increase is 0.92 per cent. Polish R&D expenditure in HERD sector was during the period under essentially the same. R&D expenditure in the Czech Republic HERD sector and growth is comparable with the EU-27. R&D expenditures increased significantly in Slovakia in the period 2010–2011 in the sector HERD. Intensity of growth is the second highest among the Visegrad Group countries.

## DISCUSSION

The effectiveness of R&D tax incentives is published in the international literature for more than 2 decades (Baghana *et al.*, 2009), (Tassey, 2007), (Baghana *et al.*, 2009). Empirically validated findings showed a clearly positive effect on increasing R&D expenditure in BERD sector. This article is focused on the comparison of R&D expenditure of Visegrad Four countries to meet the strategy Europe 2020 target of R&D expenditure. Staníčková and Melecký (2011), assessed the Czech Republic and Slovakia as countries using their competitive advantages and the countries with the greatest development potential. Hungary and Poland were rated as a country highly effective. The results of the processed statistical data with regard to legislative conditions for R&D aid in the Visegrad Four countries are Hungary and Slovakia, the country with the highest percentage increase in R&D expenditure to GDP in the period 2006–2011. Lowest increase being in the Czech Republic, according to a simulation model of

European Tax Analyzer (Elschner *et al.*, 2011) has the best legislative conditions for enterprises using the R&D tax incentives. The results clearly show that the effects of the lending business research can vary dramatically. Slovakia, Hungary and Poland, more targeted uses of public resources in the form of direct grants or support from the OP it are more challenging. Further alarm slow growth of R&D spending is focused on the possibility of financing the public sector development activity, which did not in the absence of motivation. Tax incentives clearly encourage enterprises to increase R&D spending.

Despite the increasing R&D spending, the growth rate of R&D in the Visegrad Group countries is not sufficient for States to meet the strategy Europe 2020 target of R&D investment, which is one of the conditions of competitiveness of the European Union.

## CONCLUSIONS

The concept of competitiveness of regions and countries is linked to the strategic documents of developed economies. The Visegrad Group countries must follow their strategy Europe 2020. Measuring competitiveness is currently inconsistent (World Forum, Kadeřábková, Blažek, and Staníčková Melecký). The aim of this paper was to evaluate the development of R&D expenditures by sector of funding in the Visegrad Four countries of comparison with the values of the EU-27 and other. The reference period was 2006–2011, i.e. the years in which all the countries of the Visegrad Four countries have acceded to legislative changes in the area of indirect support R&D Expenditure in the sector BERD. The Czech Republic and Slovakia and its BERD ratio deteriorated GOVERD, Hungary and Poland improved. The development of growth / decrease by sector GOVERD that domestic business sector, except Hungary, is not sufficiently stimulated to increase R&D expenditure. Reduction of the GOVERD: BERD in all countries due to increasing

R&D in the sector ABROAD (subsidies from EU funds).

Statistical analysis of developments in the structure of sector R&D funding can become the basis for further research in the area of R&D investment. Ratio analysis GOVERD: BERD recommended the strategy Europe 2020 is just one

of the ways to evaluate the intensity of R&D. Future research should consider the effects of standard and optional support for R&D to GDP growth of individual Member States the Visegrad Group. Similarly, it is necessary to further study the impact of individual forms of support to businesses in various industries and the selected time period.

## SUMMARY

The aim of this paper was to use a simple time series dynamics assess growths / decrease in R&D expenditure by sector in the Visegrad Four countries. It was monitored by time series 2006–2011 Visegrad Four countries compared to the EU-27. In order to evaluate the required parameters the stimulus factors were used. One of the factors is influencing the competitiveness of the European Union as well as the amount of R&D investment. According to the strategy Europe 2020, Member States should spend on R&D expenditure of 3 per cent of GDP in the composition of one third from public sources, two thirds of the business resources. Currently no country of Visegrad Four has under achieved the objective. The best is the spending of Czech Republic. In 2011, GERD amounted to 1.84 per cent. Second on the list is Hungary with 1.21 per cent, followed by Poland with 0.77 per cent. Slovakia is last with a value of 0.68 per cent GERD. The analysis carried out in this paper shows that neither the Visegrad countries does meet the recommended ratio of R&D expenditure. The Czech Republic is closest to the objective. Slovakia and Poland have R&D expenditure in the sector GOVERD 50 per cent.

The Czech Republic enterprises have just little use of the best stimulus measures from the Visegrad Group countries – R&D tax incentives. Even globally recognized R&D tax incentives are not sufficiently stimulating factor to increase R&D investment in the business sector. The tendency to reduce the share GOVERD R&D expenditure as a structure of R&D expenditures and their development in the years 2006–2011 indicates that if they want the Visegrad countries can achieve the aim set strategy Europe 2020. The ranking among competitive countries of the European Union must take more action to motivate the business sector to increase R&D spending. The situation is critical, especially in Poland and the Slovak Republic, where the ratio of BERD and GOVERD opposite than recommended.

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## REFERENCES

- BAGHANA, R. and MOHNEN, P., 2009: Effectiveness of R&D tax incentives in small and large. *Small Business Economics*, 33, 1: 91–107. ISSN 0921-898X.
- Deloitte Touche Tohmatsu Limited, 2012: Taxation and Investment in Hungary 2012. *www.deloitte.com*. [Online] 28 05 2012. [cit. 2012-12-23]. Available from: [http://www.deloitte.com/assets/Dcom-Global/Local%20Assets/Documents/Tax/Taxation%20and%20Investment%20Guides/2012/dttl\\_tax\\_guide\\_2012\\_Hungary.pdf](http://www.deloitte.com/assets/Dcom-Global/Local%20Assets/Documents/Tax/Taxation%20and%20Investment%20Guides/2012/dttl_tax_guide_2012_Hungary.pdf).
- DRUCKER, P. F., 1992: *Management: budoucnost začíná dnes*. Praha: Management Press, 126 s. ISBN 80-85603-00-4.
- ELSCHNER, CH. et al., 2011: What the design of an R&D tax incentive tells about its effectiveness: a simulation of R&D tax incentives in the European Union. *The Journal of technology transfer*, 36, 3: 233–256. ISSN 0892-9912.
- EU OFFICE Česká Spořitelna, a. s., 2012: Country Report Polsko. Praha: EU OFFICE Česká Spořitelna, a. s., [Online] 28 01 2012. [cit. 2012-06-01]. Available from: [http://www.csas.cz/static\\_internet/cs/Evropska\\_unie/EU\\_programy/EU\\_programy/Prilohy/cs\\_polsko\\_final.pdf](http://www.csas.cz/static_internet/cs/Evropska_unie/EU_programy/EU_programy/Prilohy/cs_polsko_final.pdf).
- European Commission. European R&D Policies. EURAXESS. [Online] [cit. 2012-12-20]. Available from: [http://ec.europa.eu/euraxess/links/policies\\_en.htm](http://ec.europa.eu/euraxess/links/policies_en.htm).
- European Commission. Eurostat Data – Statistics. Eurostat. [Online] 03. 06 2012. [cit. 2012-02-12]. Available from: [http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search\\_database](http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database).
- PAFF, L., 2005: State-level R&D tax credits: A firm-level analysis. *Topics in Economic Analysis and Policy*, 5, 1: 17. ISSN 1935-1682.
- Parlament České republiky, 2009: Sbírka zákonů a Sbírka mezinárodních smluv. *Ministerstvo vnitra České republiky*. [Online] 27. 4 2009. [cit. 2012-12-20]. Available from: [http://aplikace.mvcr.cz/sbirka-zakonu/SearchResult.aspx?q=110/2009&typeLaw=zakon&what=Cislo\\_zakona\\_smlouvy](http://aplikace.mvcr.cz/sbirka-zakonu/SearchResult.aspx?q=110/2009&typeLaw=zakon&what=Cislo_zakona_smlouvy).

- PriceWaterhouseCoopers, Česká Republika, 2008: *www.pwc.com*. [Online] 2008. [cit: 2012-06-20]. Available from: <https://www.pwc.com/cz/en/studie-analyzy/impact-of-r-and-d-tax-incentives-on-investments-of-private-companies-into-r-and-d.pdf>.
- SARIO, 2010: R&D in Slovakia – Discover the Potencital. *www.sario.sk*. [Online] 2010. [cit: 2012-12-28]. Available from: [http://www.sario.sk/userfiles/file/sario/pzi/rad/handout\\_rad\\_v1.pdf](http://www.sario.sk/userfiles/file/sario/pzi/rad/handout_rad_v1.pdf).
- STANIČKOVÁ, M. and MELECKÝ, L. 2011: Competitiveness evaluation of Visegrad Four countries by CCR input oriented model of data envelopment analysis. *Scientific papers of the University of Pardubice Series D*, 16, 22: 176–188. ISSN 1804-8048.
- SURREY, S., 1969: Tax incentives: Conceptual criteria for identification and comparison with direct government expenditures. *Tax Incentives: Symposium Conducted by the Tx Institute of America*, Nov. 20–21., 1969. Washington D. C.: Health Lexington: [s.n.], 1971. OCLC Number 86402111. 20–21.
- TASSEY, G., 2007: Tax incentives for innovation: time to restructure the R&E tax credit. *The Journal of Technology Transfer*, 32, 6: 605–615. ISSN 0892-9912.

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