Propellants of University-Industry-Government Synergy: Comparative Study of Czech and Slovak Manufacturing Industries[1]

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Abstract

The triple helix collaboration among universities, industries and governments resulting in the efficient creation of innovation has gained lofty scholarly attention in recent times. This institutional interdependence creates win-win outcomes leading to improved firms competitiveness, human capital development and general economic development. The rapid implementation of knowledge and outcomes of academic research emanating from universities and other public research organizations are crucial for firm's competitiveness so firms are increasingly getting closer to the sources of knowledge and innovation. We examined the factors that influence firm's cooperation with universities and government research entities in the Czech Republic and Slovakia by using data from the 2010 – 2012 Community Innovation Survey and the logistic regression models. The results of our analysis have demonstrated that both Czech and Slovak firms perceive their cooperation with universities as essential and beneficial for their innovative performance. Additionally, Slovak and Czech firms are self-sufficient and can provide basic input factors and capital goods necessary for their production hence they do not cooperate in this regard.

Keywords: *Triple helix, innovation, knowledge, collaboration, competitiveness*

JEL Classification: R58, J88, I23

Introduction

The promulgation of the notion of "innovations systems" (see Lundvall, 1992; Nelson, 1993; Mowery and Nelson, 1999) lays emphasis on the interaction among different collaborators in creating competitiveness, innovation and development

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in sectors and countries (Malerba, 2005). This has become the basis of universities, industries and the public sector symbiotic relationship since time immemorial (Breznitz and Feldman, 2012; Paleari, Donina and Meoli, 2015).

Higher educational institutions such as universities and other public research organizations play pivotal roles in the national innovation systems. They are avenues of knowledge diffusion and technology transfer to industries (Thursby and Thursby, 2011; Archibugi and Filippetti, 2017). There are various ways universities collaborate with industries some of which are through spin-off formation, joint publications, joint research projects and co-patenting (Perkmann et al., 2013).

Universities are at the heart innovation; their researches produces novel knowledge that is capable of contributing to firm growth given them competitive advantage over their rivals. Academic research fuels firm's innovation, knowledge stock, technology and productivity (Tether, 2002). Academic research generates inventions that can be readily adopted by industries for development and subsequent commercialization (Belderbos et al., 2004). The foregoing discussion therefore stresses the cooperation of government, industries and academia (other public and private research institutions).

Both industries and universities engage in collaborative RandD for different reasons. Firms find themselves in intense competition so they try to collaborate with universities as their source of knowledge and innovations so they can offer improved products and services that will make them stand out among their competitors. Conversely universities also seek to cooperate with industries for long term economic benefit through research commercializing (Santoro and Bierly, 2006). Universities collaboration with industries can provide them access to technical expertise from industries (Ankrah and Omar, 2015). University faculty also offers academic consulting services which are opportunity-driven to be remunerated (Perkmann and Walsh, 2008). They earn personal incomes from consulting services to augment their meagre salaries from their academic activities.

For these aforementioned reasons universities (and other RandD organizations) need to cooperate directly with government and firms for socioeconomic development. This tripartite cooperation has become known as the triple helix of innovation (Etzkowitz, 2003). The triple helix model has become the engine of regional development that can be relied upon by underdeveloped regions to promote development because of its strong focus on the interaction among social entities such as higher educational institutions, governments, and the industrial sectors (Huggins, Jones and Upton, 2008). This collaboration has a three-dimensional flow of resources and outputs in the form of knowledge and innovation between universities, industries and governments (Leydesdorff, 2012).

The remainder of this paper is structured as follows. In the next section, we present the theoretical background on firm's innovative activities. Section 3

provides the characteristics of the dataset and the research methodology. Section 4 lists the experimental results. In Section 5, we discuss the results and conclude the paper with suggestions for future research.

Theoretical Background

Combination of factors informs firms' propensity to cooperate universities and other public research organizations (Hanel and St-Pierre, 2006; Gallego, Rubalcaba and Suárez, 2013; Laursen and Salter, 2014). The complex interaction among these social actors creates an advantageous avenue for the development of knowledge and innovation, which firms can capitalize on for new products or processes development. Firm's innovative performance is influenced significantly by an efficient and effective institutional system capable of producing and disseminating knowledge. Several factors such as research and development, marketing, design etc. contributes to new product (service) development.

Certain factors exert influence on firm's collaboration and they are dependent on the antagonistic aims of these collaborating entities. The success of university industry collaboration is measured by how best scientific research is commercialized; this involves series of stages that end with the introduction of an improved goods and services to the market. Innovation necessitates the efficient translating of ideas into beneficial outcomes. This therefore implies that innovation is influenced by knowledge acquisition, whether from internal or external sources. Internal knowledge encompasses the development or acquisition of knowledge within a firm's confinement through in-house knowledge diffusion, research and development, and internal education and training for innovative activities. On the hand external knowledge involves the introduction of innovative knowledge from sources stretching outside firms boundaries. This can be through external research and development, procurement and acquisition of machinery, equipment or other intangible technology such as softwares (Grigoriou and Rothaermel, 2017; Monteiro and Birkinshaw, 2017). An ample knowledge base is essential for the successfully utilization of acquired knowledge to innovate (Cohen and Levinthal, 1990; Garud and Nayyar, 1994; Zahra and George, 2002).

Industries especially are under compulsion to cooperate with innovation hubs to acquire valuable external knowledge and technological ideas. Firms partner with universities and other public research institutes as a means to acquire external knowledge and inputs for their RandD activities. Firms also voluntarily reveal the sources of their knowledge to potential collaboration partners such as universities or public research institutes from patenting as a sign of their innovation competencies. Firms willingly disclose their beneficial in-house knowledge

and information about their scientific and technical competences to external agents to gain reliable feedback and to enlarge their linkages to stimulate learning and knowledge (Fontana, Geuna and Matt, 2006; Dumay, 2017).

Improved product design allows firms to win the heart of customers (Czarnitzki and Thorwarth, 2012). Eye catching product design has the potential to create business uniqueness and gives product new looks. The utilization of factors of production to produce goods and services would be wasteful if the final product developed is not carefully packaged, transported and adopted by consumers. The production process ends when goods and services reach the safe hands of the consumer. This entails branding and marketing to modify the shape and appearance of goods or services to convince consumers of its importance. Firm's innovative performance can be measured by the frequency of the sale of innovative product and services to enthusiastic consumers who require less persuasion and also hard to convince product pragmatists (Nerkar and Shane, 2007; McCoy, Thabet and Badinelli, 2009). Product marketing also consists of disseminating information about a new product, its cost, functions and its advantages over competing products so as to make them easily acceptable to large product pragmatists. Expenditures devoted to design can be linked directly to firms innovative performance, hence design has become an essential component of firms competitive advantage (Marsili and Salter, 2006; Talke et al., 2009) and also contributing to new product development (Von Stamm, 2004). Shortening the time taken for innovation output to reach the market as well as perfect market information can provide firm managers the required cash to further operations. Positive feedback from customers about product quality, taste and design and packaging also helps firms to improve upon product quality in the future.

Firms can also create and stimulate innovation by offering on the job training for its employees (Børing, 2017). Studies have proven that firms' innovation performance soars when they rely on both internal knowledge and external knowledge (Cassiman and Veugelers, 2006; Lokshin, Belderbos and Carree, 2008). On the job training can sharpen and upgrade employees with current skills and new ideas needed to stay productive. Internal training for employees equips workers with precise knowledge and skills required to flourish. In-house coaching and mentoring helps employees to sharpen their skills and knowledge, because it allows employees to teach and aid others. In-house or contracted out training significantly improves salaries and wages for individual employees, and it also leads to higher employment mobility (Blundell, Griffith and van Reenen, 1999). Regular in-house training benefits both the participating employees as well as their employers (De Grip and Sauermann, 2013). Human capital development and innovation can be seen as underlying drivers of firm's innovative performance which can in addition contribute to general economic development.

Numerous studies have underscored the significant role of human capital development for firm's performance (Galor and Tsiddon, 1997; Hashi and Stojčić, 2013). On-the-job and work-related training is evidenced to have a positive influence on firm's productivity (Almeida and Carneiro, 2009; Sepúlveda, 2010), there is also a confirmation that firms offering training for its employees have higher innovation in terms of new product development (Leonard-Barton, 1992). Bauernschuster, Falck and Heblich (2008) also supported the claim that constant training for employees has a positive effect on a firm's innovations.

The multitude of literature reviewed showed little evidence of university, industry and government interactions among Central European countries. Studies in the Czech Republic (Vitásková, 2005; Odehnalová and Pirožek, 2013; Ministr and Pitner, 2015) and Slovakia (Bušíková, 2011) have all demonstrated that these collaborations are non-existent or subnormal. The end of communism and the subsequent split between the Czech Republic and Slovakia has led to lots of reforms in the higher educational institutions and research system. It has also opened up these economies for businesses. We therefore intend to examine the extent and factors influencing university-industry-government collaboration in these countries. Our paper intends to contribute to the literature on the triple helix collaboration in Eastern Europe.

Data and Methodology

In agreement with previous related studies (e.g. see Archer and Lemeshow, 2006; Coad and Rao, 2008; Schneider and Spieth, 2013), our empirical analyses were performed by using the logistic regression models. The logistic regression model is specified as follows (Neupane, Sharma and Thapa, 2002):

$$\ln\left[P_i / (1-P_i)\right] = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots + \beta_k X_{ki} \quad (1)$$

where subscript *i* denotes the *i*-th observation in the sample, *P* is the probability of the outcome (cooperation with enterprises/universities/government and RandD institutions).

These analyses were performed within manufacturing industries (NACE 10-33) in the Czech Republic and Slovak Republic. As a data source, we collected and pre-processed data from the Community Innovation Survey 2010 – 2012 (CIS). CIS uses harmonized questionnaire created for all EU Member States by Eurostat and combines stratified random sampling with exhaustive surveys. CIS 2012 uses the NACE Rev. 2 classification of economic activities. We analysed 3 980 (47%) enterprises (total number of initial sample, conducted by Eurostat, providing information about 8 346 Czech and Slovak enterprises). CIS questionnaire's

minimum mandatory coverage consists of all enterprises with 10 or more employees, therefore our analyses covered only enterprises with more than 10 employees, with a response rate greater than 60% – same criteria had to be followed in this research. There were 1 486 (37%) active enterprises in the corporate group sample. CIS data does not provide information on whether enterprises are from the same corporate groups. Note that not all firms in the sample answered all questions. Therefore, missing data had to be treated. We used a common procedure for this task, replacing the missing values with median values of the respective country and industry.

To analyse whether data from Community Innovation Survey are not correlated, Spearman's test was used. Spearman's coefficient (r_s) measures the strength of the linear relationship between each two variables. The values of each variable are rank-ordered from 1 to N (N = the number of pairs of values[2]). The difference between ranks for each case is represented by d_i. Spearman's rank correlation coefficient formula is generally expressed as (Weinberg and Abramowitz, 2002; Borradaile 2013):

$$r_s = 1 - \frac{6\sum d_i^2}{N^3 - N} \tag{2}$$

We rejected the hypothesis that the data are correlated with a level of significance at $p < 0.05$. Subsequently, we tested the collinearity among the independent variables by Variance Inflation Factor (VIF) for each regression model. Multicollinearity was rejected in the models (VIF < 5). All calculations were made by using the statistical software SPSS. Following the previous section, we selected 8 explanatory variables (RandD determinants) and distinguished them into three groups (Research, Acquisition and Market support), to analyse their influence on enterprises' cooperation at the university-industry-government level. For the purpose of this research, we created our own research model (see Figure 1) and defined three research questions (RQ) as follows:

Which of the RandD determinants have the greatest effects on enterprises' willingness to cooperate:

RQ1: within the groups of companies;

RQ2: with universities;

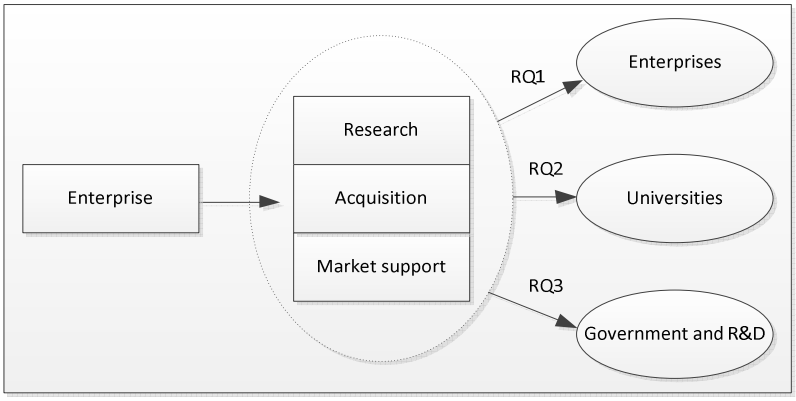
RQ3: with government and public/private research institutes; in the Czech Republic and in the Slovak Republic?

These results consequently allow us to create the comparative analysis between selected countries.

[2] N cases of each variable are assigned integer values from 1 to N inclusive, and no two cases share the same value.

F i g u r e 1

Proposal of Own Research Model



Source: Own processing.

T a b l e 1

Description of Explanatory Variables Used in the Models

Abrev.	Variable	Detail description
Research	In-house RandD RRDIN (X_1)	Research and development activities undertaken by enterprise to create new knowledge or to solve scientific or technical problems (including in-house software development that meets this requirement)
	External RandD RRDEX (X_2)	RandD that enterprise has contracted out to other enterprises (including other enterprises in enterprise group) or to public or private research organisations
Acquisition	Acquisition of machinery, equipment, software and buildings RMAC (X_3)	Acquisition of advanced machinery, equipment, software and buildings to be used for new or significantly improved products or processes
	Acquisition of existing knowledge from other enterprises or organisations ROEK (X_4)	Acquisition of existing know-how, copyrighted works, patented and non-patented inventions, etc. from other enterprises or organisations for the development of new or significantly improved products and processes
	Training for innovative activities RTR (X_5)	In-house or contracted out training for personnel specifically for the development and/or introduction of new or significantly improved products and processes
Market support	Market introduction of innovations RMAR (X_6)	In-house or contracted out activities for the market introduction of new or significantly improved goods or services, including market research and launch advertising
	Design RDSG (X_7)	In-house or contracted out activities to design or alter the shape or appearance of goods or services
	Pre-implement activities RPRE (X_8)	Other in-house or contracted out activities to implement new or significantly improved products and processes such as feasibility studies, testing, tooling up, industrial engineering, etc.
Other (control variables)	Enterprise size SIZE (X_9)	Size of the company. (1-small and medium company/0-large company)
	Market MARKET (X_{10})	Geographic markets enterprise sell their goods and/or services during the three years 2010 to 2012. (1-domestic/0-foreign)
	Public funding FUND (X_{11})	Public financial support for innovation activities. (1-received/0-not received)

Source: Own processing.

The explanatory variables $X_1 – X_8$ were binary and are subsequently listed and described in Table 1. As other (control) variables, we (inspired by Fontana, Geuna and Matt, 2006 work) used enterprise size (X_9), market (X_{10}) and public funding (X_{11}). The Dependent variables were also binary (1-cooperation/0-non--cooperation).

Results and Discussion

As has been mentioned above, economic entities exist in dynamic and innovative environment and hence they interact in different ways. The subject of our research was to analyse the selected determinants that help firms, but also other economic entities, to increase their productivity (through production of innovations).

The variables were examined in three groups. The results for the Czech Republic are presented in Table 2.

T a b l e 2

Influence of RandD Determinants on Enterprises' Willingness to Cooperate with Different Partners in the Czech Republic

	Other enterprises within enterprise group		**Universities or other higher education institutions**		**Government. public or private research institutes**	
	Sig.	B (expB)	Sig.	B (expB)	Sig.	B (expB)
Research						
RRDIN	.286	.179(1.196)	.000***	1.509(4.523)	.166	.443(1.558)
RRDEX	.000***	.650(1.915)	.000***	1.207(3.343)	.000***	1.356(3.880)
Acquisition						
RMAC	.729	.059(1.061)	.534	–.119(.888)	.984	.006(1.006)
ROEK	.672	–.079(.924)	.178	–.278(.757)	.971	–.009(.991)
RTR	.113	.264(1.302)	.196	.242(1.274)	.565	.157(1.170)
Market support						
RMAR	.025**	–.380(.684)	.797	–.047(.954)	.010**	.677(1.968)
RDSG	.816	.039(1.040)	.644	–.083(.920)	.419	–.196(.822)
RPRE	.001	.548(1.730)	.000***	.694(2.001)	.100	.478(1.613)
Others						
SIZE	.000***	–1.264(.282)	.217	–.203(.817)	.801	–.057(.945)
MARKET	.000***	–.560(.571)	.086*	–.283(.753)	.605	–.118(.888)
FUND	.244	.171(1.186)	.000***	1.786(5.964)	.000***	1.159(3.188)

Notes: * statistically significant at p = .10, ** at p = .05 and *** at p = .01.

Source: Own processing.

Results of the Slovak republic data are presented in Table 3. To begin with answering our research questions outlined above, we found out that in the Czech Republic, manufacturing firm's cooperation with other enterprises (RQ1) is mostly influenced by the external research activities and by pre-implemented activities such as the introduction of innovation to the market (RMAR). Similarly, cooperation with universities (RQ2) as well as government and public/private

research institutes (RQ3) is mostly influenced by enterprises' research activities (mostly external cooperation with universities and also firms own internal research). Moreover, other in-house or contracted out activities (RPRE) to implement new or significantly improved products and processes such as feasibility studies, testing, tooling up, industrial engineering, etc. represented other significant determinant of cooperation with universities. In-house or contracted out activities for the market introduction of new or significantly improved goods or services (RMAR), including market research and launch advertising represent different determinant influencing cooperation with government and other public/ private research institutes positively. However, the acquisition of existing knowledge from other enterprises or organisations (ROEK) as well as acquisition of machinery, equipment, software and buildings did not influence collaboration as can be seen from the insignificant results.

T a b l e 3

Influence of RandD Determinants on Enterprises' Willingness to Cooperate with Different Partners in Slovak Republic

	Other enterprises within enterprise group		**Universities or other higher education institutions**		**Government. public or private research institutes**	
	Sig.	B (expB)	Sig.	B (expB)	Sig.	B (expB)
Research						
RRDIN	.049**	.723(2.061)	.000***	2.361(10.605)	.016**	2.628(13.850)
RRDEX	.001***	1.251(3.495)	.028**	1.023(2.781)	.004***	1.923(6.843)
Acquisition						
RMAC	.828	.088(1.092)	.041**	–1.010(.364)	.134	–1.024(.359)
ROEK	.587	.226(1.253)	.355	.494(1.639)	.719	.247(1.280)
RTR	.703	.148(1.160)	.924	–.048(.953)	.977	–.022(.979)
Market support						
RMAR	.803	.096(1.100)	.022**	1.065(2.902)	.043**	1.429(4.175)
RDSG	.678	–.162(.851)	.269	–.528(.590)	.600	–.354(.702)
RPRE	.019**	.843(2.323)	.018**	1.075(2.929)	.348	.609(1.838)
Others						
SIZE	.514	–.227(.797)	.109	–.707(.493)	.663	.270(1.310)
MARKET	.185	–.469(.626)	.688	.177(1.193)	.252	.660(1.934)
FUND	.210	.523(1.688)	.001***	1.661(5.267)	.006***	1.651(5.211)

Notes: * statistically significant at p = .10, ** at p = .05 and *** at p = .01.

Source: Own processing.

In the Slovak Republic, the results are similar. Cooperation with other enterprises (RQ1), universities (RQ2), government, and public/private research institutes (RQ3) are mostly influenced by the enterprises' internal and external research activities. These results confirm previous findings that enterprises can and should use both internal and external research and ideas as they look to advance their technology (West and Bogers, 2014), innovation (Chesbrough, 2006), and cooperation at different levels (Gallego, Rubalcaba and Suárez, 2013; Ramos--Vielba, Sánchez-Barrioluengo and Woolley, 2016). Conversely firm's acquisition

of existing knowledge from other enterprises or organisations (ROEK) as well as their acquisition of machinery, equipment, software and buildings (RMAC) didn't also influence collaboration. RMAC significantly influenced only firm's cooperation with universities but in the negative way.

The first group of explanatory variables is research and development activities – aiming to create new knowledge or to solve scientific or technical problems by in-house or contracted research. The results show that in both countries the cooperative activities of businesses, universities (and other RandD organizations) and governmental organizations are key stimulus for innovation activities. Both Czech and Slovak firms perceive cooperation with universities as essential and beneficial (evidenced by the strongest links). The results of our analysis on Czech and Slovak manufacturing firms reveal that firms are interested in cooperating with universities or with governmental or private RandD organizations. The results can most probably be explained by the stimulus effects of public subsidies (FUND), as well as the implementation of strategic development plans for individual states or regions.

According to the second group of explanatory variables, firms business environment are also influenced by both the tangible and intangible assets it possesses. These are the subject of acquisitions; firms need to provide either advanced technology, equipment, software and buildings or proprietary assets (proprietary know-how, copyrighted works, patents and non-patented inventions). Intangible assets also include in-house or contracted out training activities for employees specifically for development, i.e. soft developmental skills. The results show that these assets do not represent a significant stimulus for the development of multifaceted cooperation. Surprisingly, in the case of Czech and Slovak firms, no significance has been proven even in any of the acquisition areas (only one negative influence in Slovak Republic, described above). The results can be interpreted in such a way that both Slovak and Czech firms are able to independently provide basic input factors and capital goods that are necessary for their production and do not require any degree of cooperation in this respect. The Czech and Slovak economies are to a large extent export economies, where the vast majority of industrial enterprises are connected to concerns within international value chains (global or supranational production chains).

Leading (often foreign) firms (due to comparable quality everywhere in the supra-region) often invest in the technical and knowledge facilities of their subcontractors (or the subcontractors are forced by the terms of a business contract to realize these fundamental technological improvements and investments). Efforts of Czech and Slovak economies to build economic development on territorial assets are still underway, and are reliant on exogenous knowledge transfers

and foreign capital to stimulate growth. Domestic firms (with some exceptions) are less competitive because of their lower innovative potential. Firms are trying to overcome this gap with towering levels of cooperation with universities and RandD organizations.

The third group of explanatory variables are conditions of favourable business environment (market support instruments). The impact of activities affecting the introduction of new or significantly improved goods or services to the market has also been analysed. We analysed also the design or alteration of the shape or appearance of goods and services and other developmental market activities. The results show that Czech firms cooperate especially in marketing their innovations, mainly with industries in the group of companies or with specialized agencies. However, marketing based cooperation within the enterprise groups was negative. Universities, due to their teaching and research activities, cooperate with enterprises only in the framework of feasibility or testing and industrial engineering studies. Here, however, they equally compete with firms that are willing to cooperate and to deliver the same results. Slovak firms are slightly different from Czech ones. Collaboration with universities (or RandD organizations) helps to introduce some new products to market. Interestingly, Czech and Slovak firms did not cooperate in any way on the basis of design creation. This is probably due to the fact that they are provided on commercial basis.

To answer research questions (RQ1), in the Czech Republic, cooperation with enterprises is mostly influenced by the research activities (in-house). Similarly, cooperation with universities (RQ2) as well as with government and public/private research institutes (RQ3) is mostly influenced by enterprises' research activities. Moreover, other in-house or contracted out activities (RPRE) to implement new or significantly improved products and processes such as feasibility studies, testing, tooling up, industrial engineering, etc. represent other significant determinant of cooperation with universities. In-house or contracted out activities for the market introduction of new or significantly improved goods or services (RMAR), including market research and launched advertisement are different determinant influencing cooperation with government and public/private research institutes – however, in different ways.

In the Slovak Republic case, the results are similar. Cooperation with other enterprises (RQ1), universities (RQ2), government, and public/private research institutes (RQ3) are mostly influenced by enterprises' internal and external research activities. These results confirm previous findings that enterprises can and should use both internal and external research and ideas as they look to advance their technology (West and Bogers, 2014), innovation (Chesbrough, 2006), and cooperation at different levels (Gallego, Rubalcaba and Suárez, 2013; Ramos-Vielba, Sánchez-Barrioluengo and Woolley, 2016).

Conclusions

Universities have undergone numerous academic revolutions. The first revolution added the mission of generating knowledge through research to the traditional mission of preserving and transmitting knowledge with which universities were established. The second and third academic revolutions made economic and social development a third mission of universities in addition to teaching and research. This means that besides conserving and transmitting knowledge, universities also need to create knowledge and put it to use. Governments support and provide incentives for university that want to cooperate with industries, with the rationale that these synergetic outcomes can have can spill over effects on economy. Public subsidy or in its simplest form financial contributions from government has become a major source of financing RandD collaborations in many parts of the world. The rationale for public subsidies or governmental support for RandD collaboration activities is rooted in the classic market failures.

And it is precisely on the basis of the prevention of market failure and its solutions that governmental organizations are have developed various activities. Currently, both countries have strategies (regional development strategies or strategies to support investment, innovation or RandD support), and follow-up supporting systems that help to create innovation (typical kind of public/government interventions). These strategies and government statements assume that individual economic entities will cooperate spontaneously and perceive this cooperation as an important source of input factors. Therefore, both the Czech Republic and in the Slovak Republic rather support the emergence of innovation, not the way to get to new innovation (this could include effective motivation to cooperate on knowledge, cooperative or scientific base). However, foreign experience shows that attention should be shifted from results to process-based innovation activities. It has a capacitive effect, which produces spill-over and various synergistic effects for both the public and private sector. On the other hand, it is necessary to admit the threats of very low efficiency of such public interventions.

The research results show that firms emphasize the importance of active cooperation (by concluding cooperation agreements) especially in the field of research. It is gratifying that in both countries the assumptions have been confirmed that the most important co-operative partners of enterprises are universities. Results proved that public funding supports this cooperation with research institutions (universities and government, RandD institutes) in both countries. On the other hand, it is alarming that the results in both countries do not confirm the cooperation with other enterprises in the group, significantly.

Certain limitations of this study must be admitted. The results were found only from a limited range of enterprises from both compared countries. This therefore

calls for subsequent research to examine the impact of both private and public entities of universities and RandD organizations. This can bring to bear the different factors influencing firm's willingness to cooperate.

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