The Different Drivers of Innovation Activities in European Countries: A Comparative Study of Czech, Slovak, and Hungarian Manufacturing Firms[1]

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Abstract

In the era of knowledge economy, innovations are gaining increasing importance and becoming crucial for firms (countries) to gain their competitive advantage. However, most of countries are not able to exploit the innovation potential and failing during innovation and supporting processes. In this study, we use own multiple linear regression models and data from Community Innovation Survey to compare three European countries – Czech Republic, Slovakia and Hungary, which declined in the international rankings of competitiveness and innovative activities in recent years. Results confirm our claim that there is a need to find proper drivers´ that will allow creation of synergies and spillover effects. We empirically prove, that proper targeting of innovation drivers significantly influences the growth of firms´ turnover from innovated products that may lead to increasing of firms´ (national) competitiveness.

Keywords: *innovations, cooperation, public funding, manufacturing industry, Czech Republic, Slovakia, Hungary*

JEL Classification: O11, O19, O32

Introduction

Currently, competitiveness is a topic that is frequently discussed and addressed in economic analysis. This applies not only to individual companies or sectors but also to regions by any definition. Competitiveness is an entity's ability

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to be successful in a competitive environment so that its goals are achieved to the greatest possible extent (and in the most effective way). In fact, competitiveness is considered to be one of the most significant determinants of economic development; gradually reinforcing this determinant results in fulfilling regional policy objectives and improving prosperity, quality of life, and long-term economic development (Amin, 1999; Kuvíková and Raguseo, 2010).

There are many ways to achieve maximum effectiveness. On one hand, these methods are dependent on the type of entity in question, but they are also influenced by the environment and conditions of the economic system surrounding the competing entities. Sources of competitive advantage are also continuing to develop within the current globalized system; therefore, researchers have also been trying to discover the most effective possible way to increase competitiveness for both economic entities and regions (and thus for the overall economy). Methods of communication, the internet, and information technology (IT) are important production factors that often play a key role in achieving competitiveness – thanks to globalization and technological progress (Chen, Zhu and Yuan Xie, 2004). With increasing frequency, these have been resulting in progress towards a knowledge economy, in which knowledge represents an important national, regional, or company asset that creates a source of competitive advantage (McAleer and Slottje, 2005). Each entity's economic potential is determined by its ability to create, use, and share knowledge (Malecki, 2000).

Knowledge and the ability to transform it into innovation are becoming the foundation for individual regional and national economic systems. These often try to support the creation, acquisition, and transfer of knowledge – both financially and non-financially. In this way, an economy often becomes dependent or based on knowledge. Regarding each government's limited financial possibilities, the question arises as to the effectiveness of such attempts (and their funding) to create and develop a knowledge economy. There are no standard, generally recognized methods that are able to determine the degree to which an economy is based on knowledge (Kitson, Martin and Tyler, 2004). Various studies argue about whether an economy's knowledge base is measurable or how to measure a knowledge economy's outputs, which are necessary for different types of economic analysis (Leydesdorff, Dolfsma and van der Panne, 2006). That is why it can be very difficult to evaluate the effects of each driver (determinant) in an innovation environment. The effects of soft determinants – e.g., cooperation levels – is a typical example of this. Another determinant that is difficult to evaluate is public support (Meričková and Halásková, 2014; Soukupová et al., 2016), i.e., financial resources to support collaboration as well as the transfer, acquisition, and application of knowledge in practice (funding from EU and national budgets is used primarily).

Therefore, the goal of this paper is to evaluate the influence of selected drivers – knowledge economy determinants – on the selected output, i.e., turnover from innovative production, and provide a number of practical implications for policy makers in countries beyond those selected here. The analysis is conducted using multiple linear regression models constructed by the authors.

The remainder of this paper is organized in the following way. The first two sections are focused on the problematic of the knowledge economy and the determinants of an environment that leads to innovation. The third section describes the methodology and analysis results. The last section consists of the study's conclusions and provides practical implications for policy makers.

1. The Innovation Environment and Its Drivers

Economic development and the gradual improvement of the living conditions in a country and its regions is a fundamental long-term strategic goal (Safiullin et al., 2012; Pachura and Hájek, 2013). Many authors emphasize that regions are key elements and political tools for economic growth and that regional competitiveness significantly shapes entrepreneurial behaviour. Moreover, they state that high-tech firms choose their location based on their assessment of regional competitiveness (using productivity and innovation) and that highly innovative firms settle in highly competitive regions (Boschma, 2004; Annoni and Kozovska, 2010). This leads to the attempt by regional governments to look for the most effective possible ways to increase their regional competitiveness, i.e., one of the main drivers of a region’s growth (Snieška and Bruneckienė, 2009; Stejskal and Hájek, 2012). A number of factors influence the success of such attempts.

One of these is knowledge, which has been an increasingly significant production factor as of the start of the 21st century (Malecki, 2000). This fact is supported by a number of studies investigating the connection between the increase in regional competitiveness and knowledge (Audretsch, Hülsbeck and Lehmann, 2012; Kwiek, 2012; Sum and Jessop, 2013; Camagni and Capello, 2013; Guerrero, Urbano and Fayolle, 2014). Knowledge undoubtedly represents a new source of economic growth; however, from the economic perspective, utilizing knowledge is not a new issue (Snieška and Bruneckienė, 2009). Around 1911 Schumpeter had already come up with the idea of using knowledge and its combinations as a foundation for innovative activities and entrepreneurship, and we can see a shift from material and capital inputs to the input of information, i.e., knowledge (Cooke and Leydesdorff, 2006; Hájek and Stejskal, 2015). A number of scholars have been analysing knowledge spillovers and their impact on company productivity, demand, and the successful implementation of product and

process innovations. Other scholars suggest it is necessary to actively support the creation and dissemination of knowledge, research and development activities, investment in appropriate infrastructure, and communication technology in order to promote economic growth. Therefore, the significance of innovation continues to be more frequently emphasized as a key engine for regional growth, standards of living, and international competitiveness (Acs, Anselin and Varga, 2002a). Analysis of the role of knowledge and its ties to innovation and economic performance is becoming more common (Shapira et al., 2006). It is clear that it is no longer possible to attain economic growth in the same ways as in the past, i.e., by hiring an ever greater number of workers as an input resource or by increasing consumer demand (Pulic, 1998; Chen, Zhu and Yuan Xie, 2004). Therefore, individual economic entities must seek new ways of keeping up with the competition and coping with a tempo of rapid change (Stejskal and Hájek, 2015). New, economically useful knowledge that leads to the creation of innovation (product or process) therefore plays a significant role in (i) achieving economic growth, (ii) international trade, and (iii) regional development (Acs, de Groot and Nijkamp, 2002b).

Efforts to conserve resources when producing innovations (product, service, process, or marketing innovations), accelerating their entry into the market, and gaining a competitive advantage in a globalized economy all result in extensive use of the innovation environment's second determinant, which is cooperation (Lee, Olson and Trimi, 2012; Fitjar and Rodríguez-Pose, 2013). A common cooperation platform is a variant of the Triple (or Quadruple) Helix (Leydesdorff, 2012). It has been proven in many studies that cooperation (in all its forms: cooperation exclusively within the enterprise or business networks; collaboration with universities and research institutions, and the broad platform of industry--university-government cooperation) contributes to creating innovations. Moreover, it accelerates all these processes and makes them less expensive (Lee, Olson and Trimi, 2012; Fitjar and Rodríguez-Pose, 2013; Schilling, 2015). However, if there is to be intensive cooperation, many preconditions for the economic environment must be fulfilled (e.g., a generally positive business atmosphere, trust, or the creation of appropriate incentives for developing cooperation at various levels). Globalization has made it possible to think about collaboration in a wider sense than merely the regional level or platform (Conrad et al., 2014). On the other hand, studies point to the fact that trust decreases with increasing distance between cooperating entities (Connell, Kriz and Thorpe, 2014).

Many studies highlight the fact that effective collaboration requires the creation of a favourable business environment, adequate incentives for innovation processes, and a constructive approach on the part of the public sector (Kaihua and

Mingting, 2014; Wang et al., 2016). Public support is one of the common characteristics of the drivers listed; it can help to create the above-mentioned environment and initiate cooperation at the regional level (it later spreads to other levels; De Blasio, Fantino and Pellegrini, 2015). In practice, it has been shown that providing public support to foster innovation is not very effective. Businesses often invest their own funds into company R&D activities or invest internal funds in innovative collaboration (Bronzini and Iachini, 2014). Another option is to purchase knowledge or innovations that have been realized by another economic entity on the market, again financed by internal funds. Given the EU's interest in maximizing the production of innovation and innovative products in its territory, there are many grants for various entities (including businesses, public sector organizations, knowledge-based sectors, as well as other support organizations and agencies) that focus on this area. One frequent condition for the disbursement of European funds is co-financing by national and internal funds. Evaluating the effectiveness of this public support is very problematic, as evidenced by numerous studies (Zúñiga--Vicente et al., 2014; De Blasio, Fantino and Pellegrini, 2015). There are many obstacles to detailed analysis, e.g., missing microdata, the lengthy period of time between using funds and creating innovation, missing output criteria, the difficulties inherent in measuring quality, etc. (Czarnitzki and Lopes-Bento, 2013). There are many studies that demonstrate the positive effects of public funding, though some authors are still critical and have determined the effectiveness of public subsidies to be inadequate (Antonioli, Marzucch and Montresor, 2014).

2. Data and Research Methodology

Many of the studies mentioned demonstrate that there are different circumstances in different countries. The stipulated terms of financing, bureaucratic processes, or the existence of various legal barriers often differ. Our previous research has shown that many innovation environment drivers operate independently and positively influence the outcome of the innovation process. However, the effects created by combining different drivers were detected and analysed here. There are no international comparative studies analysing the combination of drivers and subsequently comparing the situation from an international perspective. The aim of this paper is to identify which combinations of input variables (drivers) cause a significant improvement in output variables (growth of turnover from innovated products; TURNMAR). Next, the research analyses the impact of funding on the production of innovations. We have formulated our three hypotheses as follows:

H1: *Business expenditure on internal research and development affect TURNMAR more positively than business expenditure on external research and development (in all the countries analysed).*

H2: *External public funding has a positive impact on TURNMAR in all the countries analysed.*

H3: *TURNMAR is influenced to a greater degree if enterprises use EU or national funding.*

The Community Innovation Survey (CIS) for the years 2010 to 2012 was used as the data set. The data from the CIS for 2014 will not be available for all the involved countries until in the end of January 2017. The Community Innovation Survey is a harmonized questionnaire and comprises part of the EU science and technology statistics carried out every two years by EU member states and a number of ESS member countries. The CIS is designed to provide information on sector innovativeness for different types of innovation by enterprise type by using various aspects of innovation development, e.g., (i) objectives, (ii) sources of information, (iii) public funding, and (iv) innovation expenditures (Eurostat, 2016). The CIS has been used in a number of previous studies to analyse company innovation activities (e.g., Klingebiel and Rammer, 2014; Negassi and Hung, 2014; Raymond et al., 2015). For the purpose of our study, we have analysed companies in the manufacturing industry (NACE categories 10 – 33) in the selected countries (Table 1).

T a b l e 1

The Countries and Number of Enterprises Used in the Analysis

Country	Number of enterprises
Czech Republic	3 110
Hungary	2 799
Slovak Republic	870

Source: Eurostat (2016).

Regression models are commonly used for this kind of analysis (e.g., Nieto and Quevedo, 2005; Chen and Huang, 2009; Schneider and Spieth, 2013). Multiple linear regression models take the general form as follows (for more information about the method, please see, e.g., Budíková, Králová and Maroš, 2010):

$$Y_i = \beta_0 + \sum_{j=1}^{k} \beta_j x_{ij} + e_i , \quad i = 1,\ldots,n \tag{1}$$

where

x_{ij} – non-random numbers denoting the i-th value of the observation for the j-th predictor x_j; $i = 1,...,n$; $j = 0,1,...,k$;

βj – unknown (non-random) parameters; $j = 0,1,...,k$;

e_i – a random error in the i-th observation, $i = 1,...,n$.

The function $\beta_0 + \sum_{j=1}^{k} \beta_j x_{ij}$ is the conditional mean of the dependent variables Y at the fixed values of the predictors x_j, and $j = 1,...,k$.

Verifying whether the data from the CIS were correlated was conducted using Spearman's test. Spearman's coefficient (r_s) measures the strength of the linear relationship between each pair of variables when the values of each variable are rank-ordered from 1 to N, where N represents the number of pairs of values (the N cases of each variable are assigned integer values from 1 to N inclusive, and no two cases share the same value). The difference between the ranks for each case is represented by d_i. The formula for Spearman's rank correlation coefficient takes the general form as follows (Weinberg and Abramowitz, 2002; Borradaile, 2013):

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

T a b l e 2

The Variables Used in the Models

Dependent	Independent (Categorical/Continuous)					
	Cooperation (CO)	**Innovation (IN)**	**Financing (FU)**	**Expenditures (EX)**	**Enterprise (EN)**	**Other (OT)**
TURNMAR	CO CO_GP CO_SUP CO_CUS CO_COMP CO_UNI CO_GOV CO_CONS	INN_G INN_S INN_P	FUNLOC FUNGMT FUNEU	RRDIN RRDEX RMAC ROEK ROTR	ENMRG ENOUT ENWEUR ENNWOTH	LARMAR GP

Legend: TURNMAR – the % of turnover in new or improved products introduced during 2010 – 2012 that were new to the market; CO – cooperation arrangements on innovation activities; CO_GP – cooperation partner: other enterprises within an enterprise group; CO_SUP – cooperation partner: suppliers of equipment, materials, components, or software; CO_CUS – cooperation partner: clients or customers from the private or public sector; CO_COMP – cooperation partner: competitors or other enterprises in the sector; CO_UNI – cooperation partner: universities or other higher education institutions; CO_GOV – cooperation partner: government or public research institutes; CO_CONS – cooperation partner: consultants and commercial labs; INN_G – introduced a new or significantly improved good into the market; INN_S – introduced a new or significantly improved service into the market; INN_P – introduced a new or significantly improved pro cess into the market (method of production; logistic, delivery, or distribution system; supporting activities); FUNLOC – public funding from local or regional authorities; FUNGMT – public funding from the central government; FUNEU – public financial support from the EU; RRDIN – expenditures in intramural R&D in 2012 (% of total turnover); RRDEX – expenditures in extramural R&D in 2012 (% of total turnover); RMAC – expenditures for acquisition of machinery in 2012 (% of total turnover); ROEK – expenditures for acquisition of external knowledge in 2012 (% of total turnover); ROTR – expenditures for all other activities in 2012 (% of total turnover); ENMRG – merge with or take over another enterprise; ENOUT – sell, close, or outsource some of the company's tasks or functions; ENNWEUR – establish new subsidiaries in [home country] or in other European countries; ENNWOTH – establish new subsidiaries outside Europe; LARMAR – the largest market in terms of turnover between 2010 – 2012 (1 – local or national, 0 – other); GP – part of the group of enterprises.

Source: Authors' own research.

All calculations were made using the statistical software STATISTICA (StatSoft Inc., 2011). The values of Spearman's test led to the rejection of the hypothesis that the data are correlated at the level of significance $p < 0.05$. The analysis itself was conducted after fulfilling the first prerequisite (uncorrelated data) and demonstrating that there was no multicollinearity in the model.

3. Results

In the first stage, we analysed the relationship between each of the independent variables from our groups and the target variable, the growth of turnover from innovated products, see Eq. (3).

$$\text{TURNMAR} = \beta_0 + \beta_1 \text{CO} + \beta_2 \text{IN} + \beta_3 \text{FU} + \beta_4 \text{EX} + \beta_5 \text{EN} + \beta_6 \text{OT} + \varepsilon \qquad (3)$$

The results in Table 3 show that there are different determinants inside the countries influencing the dependent variable, the percentage of turnover in new or improved products (new to the market). Paradoxically, the strongest model was created for companies in Hungary's manufacturing industry. This means that companies in the Hungarian manufacturing industry that focused on the knowledge economy determinants were able to significantly influence innovation activities and the growth of turnover from innovated products independently (without further combinations of these determinants). On the other hand, it is necessary to have proper combinations of the selected determinants in the Czech Republic and Slovakia. Properly targeted combinations of knowledge economy determinants can lead to the emergence of more significant results affecting the growth of company turnover from innovated products. This is evident because innovations do not occur in isolation (Tödtling, Asheim and Boschma, 2013; Borrás and Edquist, 2013; Prokop and Stejskal, 2015), and the relationship between different internal and external factors, organizational creativity and learning, and innovation are bidirectional, synergistic, and lead to the creation of spillover effects (Huber, 1998; Stejskal and Hájek, 2015; Hájek and Stejskal, 2015; Stejskal, Meričková and Prokop, 2016).

Using the above results, we investigated further combinations of determinants that would allow for the creation of spillover effects. In the Czech Republic's manufacturing industry, regression models showed significant links and the emergence of advanced combinations of factors. The largest market in terms of turnover (LARMAR) in combination with other variables was proved to be an important determinant that influenced the dependent variable. For example, public financial support from the EU was shown to be insignificant in the Czech Republic's manufacturing industry (Table 3 – FUNEU: 0.532).

T a b l e 3

The Differing Influence of Innovation Determinants

Variables	Czech Republic	Hungary	Slovakia
	R = 0.502; R^2 = 0.252; P = 3.1 E – 05	R = 0.985; R^2 = 0.970 P = 0.008	R = 0.470; R^2 = 0.221 P = 0.021
	p-value (Sd)	p-value (Sd)	p-value (Sd)
RMAC	0.530 (0.058)	0.005 (0.008)***	–
RRDIN	0.000 (0.157)***	0.001 (0.001)***	0.681 (1.450)
RRDEX	0.644 (0.211)	0.001 (0.044)***	0.910 (6.173)
ROEK	0.992 (0.592)	0.002 (0.219)***	0.719 (3.989)
ROTR	–	–	–
ENOUT	–	–	0.010 (0.518)**
ENMRG	0.752 (0.082)	–	0.394 (0.384)
ENNWOTH	–	–	0.644 (0.389)
ENWEUR	–	–	
CO_CUS	–	0.319 (0.070)	–
LARMAR	0.017 (0.088)**	0.002 (3.197)***	–
INN_P	0.437 (0.085)	–	–
INN_S	0.017 (0.077)**	0.119 (0.732)	–
INN_G	–	0.002 (0.569)***	0.208 (0.452)
FUNGMT	0.901 (0.086)	0.003 (1.053)***	–
FUNEU	0.532 (0.105)	0.002 (1.742)***	–
CO	0.667 (0.104)	–	–
CO_UNI	0.105 (0.114)	0.008 (0.491)***	–
CO_GOV	–	–	–
CO_SUP	–	0.002 (4.076)***	0.038 (0.511)**
CO_GP	–	0.001 (0.724)***	–
CO_COMP	–	–	0.834 (0.530)
GP	0.187 (0.051)	–	0.000 (0.579)***

Legend: ** significant at P < 0.05; *** significant at P < 0.01; Sd = standard deviation.

Source: Authors' own research.

On the other hand, we found significant impact on percentage of turnover from innovated products in combination with LARMAR and with the introduction of process innovation (INN_P; Table 4 – FUNEU*LARMAR*INN_P: 0.029***). This is an important finding, because it is clear that the provision of public financial support (both from national and European funds) emerges as inefficient. For example, the common combination of national and European funds does not lead to creating significant effects (Table 4 – FUNEU*FUNGMT*INN_P: 0.987; FUNEU*FUNGMT*CO: 0.282). To achieve stronger results, it is necessary to involve cooperation (Table 4 – ENMRG*INN_S*CO: 0.004***; LARMAR*ENMRG*CO: 0.003***).

On the other hand, fewer additional combinations of determinants were found in Slovakia's manufacturing industry. Unlike for other countries, determinants from the "Enterprise" group (Table 2) were generally involved in the regression models for Slovakia. The determinant of sell, close, or outsource some of the company's tasks or functions (ENOUT, Table 3) independently influenced innovative activities in the manufacturing industry; conversely, the establishment of new

subsidiaries outside Europe (ENNWOTH, Table 4) significantly influenced the dependent variable in combinations with other determinants (e.g., CO_SUP* ENNWOTH: 0.000***). We also confirmed our previous claim that innovation does not occur in isolation – in Slovakia, the involvement of innovation did not influence the dependent variable separately (Table 3 – INN_G: 0.208). On the other hand, properly targeted combinations did (Table 4 – CO_GP*INN_G: 0.009***; ENMRG*INN_G: 0.027**). We have assumed that the weak results for Slovak manufacturing firms are due to the smaller sample of companies.

T a b l e 4

Advanced Combinations of Variables in the Czech Republic and Slovakia

	Czech Republic				**Slovakia**	
Variables	INN_P	INN_S	CO	**Variables**	INN_G	ENNWOTH
FUNEU*LARMAR	0.029 (0.068)**	0.024 (0.090)**	0.009 (0.066)***	GP	0.009 (0.324)***	0.004 (0.529)***
FUNEU*FUNGMT	0.987 (0.082)	0.411 (0.060)	0.282 (0.080)	CO_SUP	0.933 (0.231)	0.000 (0.306)***
LARMAR*FUNGMT	0.027 (0.037)**	0.025 (0.051)**	0.543 (0.047)	ENOUT	0.452 (0.322)	0.000 (0.355)***
LARMAR*INN_S	0.040 (0.080)**	–	0.653 (0.033)	ENMRG	0.027 (0.249)**	–
FUNGMT*ENMRG	0.837 (0.036)	0.033 (0.035)**	0.110 (0.044)	ENWOTH	0.000 (0.304)***	–
FUNEU*INN_S	0.587 (0.063)	–	0.028 (0.053)**	INN_G	–	0.000 (0.304)***
LARMAR*ENMRG	0.152 (0.060)	0.0757 (0.062)*	0.003 (0.056)***	GP*ENMRG	0.008 (0.227)***	–
ENMRG*INN_S	0.264 (0.084)	–	0.004 (0.049)***			
ENMRG*CO_UNI	0.173 (0.047)	0.011 (0.024)**	–			

Legend: * significant at P < 0.1; ** significant at P < 0.05; *** significant at P < 0.01; the table shows p-values; the values of Sd are shown in parentheses.

Source: Authors' own research.

As was mentioned and empirically proved above, it emerged that there was inefficiency in providing public financial support in the Czech Republic from national and European funds. Therefore, we performed additional analyses for Hungary's manufacturing industry (Table 5) to analyse the provision of public subsidies and, additionally, the effects of implementing innovation on the growth of company turnover from innovated products. The results show that, just as in the Czech Republic (Table 4; LARMAR), proper market orientation results in creating strong links that influence the dependent variable (in all cases). This is the same for service innovation, most strongly in cooperation within groups of companies. On the other hand, innovation of goods is significant only if it is well-targeted to the proper market (0.004***) or supported by national funds (0.004***). As we can

see in Table 5, providing public subsidies (national and/or European) can be effective, but it is necessary to find the proper combination of factors. However, the combination of national and European funds is not strong or significant (0.132). This seems to be a problem, because most collaborations (industry – industry, university – industry, and university – government – industry) are supported by both national and European funds (in most cases, this combination is required).

T a b l e 5

Advanced Combinations of Variables in Hungary

	Market orientation	**European subsidies**	**National subsidies**	**Cooperation within groups of companies**	**Cooperation with suppliers**	**Innovation of goods**	**Cooperation with universities**
European subsidies	0.003 (1.270)***	–	0.132 (0.084)	0.007 (0.181)***	0.005 (0.729)	–	0.219 (0.130)
National subsidies	0.005 (0.265)***	0.132 (0.084)	–	0.198 (0.079)	0.002 (0.476)***	0.004 (1.605)***	0.009 (0.506)***
Innovation of services	0.002 (2.413)***	0.002 (2.180)***	0.004 (0.176)***	0.001 (1.129)***	0.002 (4.540)***	0.003 (2.376)***	–
Innovation of goods	0.004 (0.220)***	–	0.004 (1.605)***	–	–	–	–

Legend: * significant at P < 0.1; ** significant at P < 0.05; *** significant at P < 0.01; the table shows p-values; the values of Sd are shown in parentheses.

Source: Authors' own research.

4. Conclusion and Discussion

In recent years, there has been more frequent documentation of the role played by knowledge in the innovation creation process and in increasing the competitiveness of individual companies and regions. Its significance has been stressed by a number of authors (Connell and Ranjit, 2013; Huggins, Izushi and Thompson, 2013; Holsapple, Jones and Leonard, 2015). The goal of this paper was to analyse and evaluate the influence of selected drivers – knowledge economy determinants – on the selected output, i.e., turnover from innovative production in a selected industry in select countries. We outlined three hypotheses.

The results show (see Table 3) that business expenditure on internal research and development affect TURNMAR in the Czech Republic and Hungary (but not in Slovakia). On the other hand, business expenditure on external research and development affect TURNMAR only in Hungary. Therefore, we can confirm Hypothesis H1, but with some limitations, because business expenditures on research and development (internal/external) did not have a significant effect on influencing TURNMAR in Slovakia. Subsequently, we analysed whether external public funding has a positive impact on TURNMAR in all the countries

analysed (H2). We can see in Table 3 that public funding has a positive impact on TURNMAR only in Hungary; therefore, we reject hypothesis H2. In light of the previous hypothesis, we can conclude that when EU and national funding are properly targeted, they positively impact TURNMAR in the Czech Republic (see Table 4) as well as in Hungary (see Table 5). Therefore, we can confirm Hypothesis H3 for the Czech Republic and Hungary, though again with some limitations: these external public funds (FUNEU, FUNGMT) must be properly targeted and cannot be combined.

Using the results of this research, we have provided some practical implications for policy makers (including those outside the Czech Republic). Our research has proven that the innovation environments analysed for these three countries are not at the same level. The firms do not have the same conditions for innovation. The results showed that individual drivers (acting alone) are able to affect companies' innovation performance. Slovakia and the Czech Republic did not show separate effects for each selected determinant. We recommend that countries should focus on reforming the innovation environment. They should discover which elements are missing in their innovation environment and which do not work properly. Subsequently, the situation should be rectified. Changes should be in accordance with the principles of the knowledge economy; they should promote the use of knowledge, knowledge spillovers, and knowledge transfer, and they should operate on the basis of the Triple Helix. It is advisable to focus mainly on the regional level – by supporting the creation of regional innovation systems, for example.

Public support should be allocated wisely and only for select areas of industry. Individual projects must be clearly defined and innovation outputs should be measurable. Therefore, policy makers should carefully decide which projects and centres to support (using national or European funds) and which not to support. Extensive unmonitored funding should be replaced with selective funding focused on achieving the greatest possible efficiency. A declaration of interest in maximum efficiency should be incorporated into various strategies from the national to the regional level. Public institutions and decision makers must use monitoring tools and methods that employ an ex ante effectiveness evaluation.

Finally, it should be noted that this study's conclusions evaluate the effect of selected variables in the selected countries. Therefore, the results' explanatory power is limited. Future research should examine other factors affecting the innovation environment within national economies. These factors include education levels, the quality of business and legislative environments, or individual sources of competitive advantage, such as the acquisition and utilization of new knowledge, knowledge transfer, and knowledge spillover effects – in addition to the ability to cooperate.

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