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R&D Subsidies as Drivers of Corporate Performance in Slovenia: The Regional Perspective

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Abstract

Investment in research and development (R&D) plays a vital role in economic growth. Therefore, the crucial role of government is to encourage companies to develop new knowledge, skills, and innovations in order to achieve greater competitiveness, employment creation, and economic development. The aim of this paper is to determine whether R&D subsidies contribute to corporate performance and ascertain whether the relationship between the amount of R&D subsidies and corporate performance is moderated by Slovenian cohesion (NUTS 2 level) and statistical (NUTS 3 level) regions. This paper ultimately tries to classify statistical regions within meaningful groups. Using an OLS regression, a unique dataset of 407 Slovenian companies is analysed for 2014. The empirical results reveal that R&D subsidies have a positive impact on corporate performance and confirm that cohesion and statistical regions can moderate the effect of R&D subsidy on corporate performance. Moreover, the paper provides for the classification of Slovenian statistical regions into four groups.

Keywords

R&D Subsidies, Corporate Performance, Regional Perspective, Slovenia

I. Introduction

The majority of countries around the world are aware that investment in R&D plays a vital role in economic growth. Constituting one of the largest economies, the European Union (EU) is striving to become a knowledge-based economy. In order to make significant progress in this area, in the so-called Lisbon Strategy the EU set an objective to raise R&D spending to 3% of GDP by 2010, where the proportion financed by the private sector should be 2/3 of that total (European Commission, 2003). However, this objective was

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not achieved. Therefore, this objective was resumed in the European strategy for smart, sustainable, and inclusive growth called Europe 2020, which set it as the main objective (European Commission, 2010).

R&D investment is not only important at the national level of a particular country, but also at the regional level and the level of companies, as the main performers of R&D activities (Aristovnik, 2012, 2014; Šipikal, 2013). Namely, in 2015 average business R&D expenditures in the EU-28 amounted to 0.98% of GDP. Slovenia even exceeds this average since its business R&D expenditures amounted to 1.85% of GDP. For comparison, in 2015 average public R&D expenditures in the EU-28 totalled 0.62% of GDP while Slovenian public R&D expenditures were 0.54%, namely below the aforementioned average (European Commission, 2016). The above-mentioned confirms that companies perform more R&D activities than other public performers.

Due to the importance of business R&D investment, governments use different tools of public support in order to encourage companies to invest their additional private funds in R&D activities and provide good conditions for better corporate performance. The most common tools of public support are direct funding through R&D subsidies and indirect funding through tax incentives. This paper focuses on R&D subsidies and their impact on corporate performance. R&D subsidies were defined in the Public Finance Act (Official Gazette of RS, No. 11/11 – official consolidated text, 14/13 – corr., 101/13, 55/15 – FISP and 96/15 – ZIPRS1617), which entered into force in 2000. They are defined as expenditure and reduced revenue of the state or the municipality, which represents a benefit for the recipients and thus provides them with an advantage over their competitors and are intended to finance and co-finance programmes in institutional units engaged in the market production of goods and services.

This paper tries to fill the gap in the literature since there is little evidence of R&D programmes affecting final company outcomes such as value added, which reflects corporate performance. Therefore, the aim of this paper is to determine whether R&D subsidies contribute to corporate performance. Moreover, another aim is to find out whether the relationship between the amount of R&D subsidies and corporate performance is moderated by Slovenian cohesion and statistical regions. Ultimately, the paper tries to classify statistical regions within meaningful groups. The remaining sections of this paper are organized as follows. In the next section, a literature review and hypotheses are presented. The following section provides a definition of R&D. The next section generally describes the most common tools of public support for R&D in Slovenia. The final section covers the empirical research where the conceptual framework, data description, variables, methodology, and empirical results are presented. The paper ends with a conclusion in which the main findings are summarized.

II. Literature review and hypotheses

In the literature, it is often emphasized that economic growth depends on the application of new knowledge in order to develop improved products and production processes. Several authors argue that R&D investment is one of the key factors for enhancing technological

progress and economic growth (Romer, 1990; Grossman and Helpman, 1991; Aghion and Howitt, 1992). In this regard, Silaghi et al. (2014) separate R&D into business and public R&D. Their analysis is based on 10 new EU member states and their results show a statistically significant impact of business R&D on economic growth, while public R&D remains not significant. However, it does not crowd out the positive effect of business R&D.

Due to the importance of business R&D investment, governments use different tools of public support to encourage companies to invest their additional private funds. One of the most common of these tools is R&D subsidies. In this context, Carboni (2011) finds that R&D subsidies have additive effects on private R&D expenditure. Companies which received an R&D subsidy achieve levels of private R&D investment that are greater than had they gone without public support. This also holds for Slovenia. On a sample of 503 recipients of an R&D subsidy, Jaklič et al. (2013) confirm the complementary effect of R&D subsidies on private R&D spending and prove that R&D subsidies are an influential variable for increased private R&D expenditures. Further, in the literature it is also well established that private R&D expenditures have a positive impact on corporate performance. This is proven by studies from different countries such as the United States (Le et al., 2006), the United Kingdom (Toivanen et al., 2002), and Japan (David et al., 2008). Some evidence can also be found for European countries such as France, German, and Italy (Hall and Oriani, 2006).

To sum up the foregoing, there is evidence that R&D subsidies have a positive effect on private R&D expenditures and the latter have a positive impact on corporate performance. Accordingly, R&D subsidies can therefore have a direct positive impact on corporate performance. In this regard, Duch et al. (2007) find that recipient companies, on average, have changed business practices, improved their performance, and increased their value added as a direct result of public programmes. Generally, there is little evidence of R&D programmes affecting final company outcomes such as value added, which reflects corporate performance. Therefore, based on the above, the first hypothesis is proposed:

Hypothesis 1: The amount of R&D subsidy is positively correlated with corporate performance measured as value added.

The impact of R&D subsidies on corporate performance may vary in different regions. Some evidence is provided by Porter and Stern (2001) that certain regions around the world are better at conducting and commercializing R&D than others. They argue that companies in regions with, e.g. more generous R&D policies, more developed innovation clusters, and greater access to qualified employees are better at conducting and commercializing R&D. These findings are related to the national level of each country. Einiö (2014) provides some evidence from regional variation in government funding since he finds positive impacts on R&D investment, employment, and sales among the participants which were granted an R&D subsidy as a result of additional aggregate R&D support funding in their region. Yet there is little evidence taking account of different regions within a particular country in order to make a comparison among regions. Namely, the existing literature in

this and related fields is mostly focused on the comparison between countries (Schrott et al., 2015). Therefore, based on the above, the second and third hypotheses are proposed:

Hypothesis 2: Cohesion regions have a moderating effect on the relationship between the amount of R&D subsidy and corporate performance measured as value added.

Hypothesis 3: Statistical regions have a moderating effect on the relationship between the amount of R&D subsidy and corporate performance measured as value added.

III. Definition of R&D

According to the Frascati Manual, R&D comprises creative and systematic work undertaken in order to increase the stock of knowledge and devise new applications of available knowledge. R&D activities can be identified through a set of common features. For an activity to be an R&D activity, it must satisfy the following five core criteria. The activity must be novel, creative, uncertain, systematic, and transferable and/or reproducible (OECD, 2015). The term R&D covers three types of R&D activity: basic research, applied research and experimental development.

Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge on fundamental phenomena and observable facts without specific applications or uses. In this research, the properties, structures, and relationships are analysed in order to verify hypotheses, theories, and laws. The results of basic research are not delivered generally. They are usually published in scientific journals or sent to persons who are interested in such results (OECD, 2015).

Applied research is also exploration with the aim of acquiring new knowledge, but which is directed to a specific practical aim or objective. Applied research is carried out so as to determine the use of the results of basic research or establish new methods and ways to achieve the predefined objectives. Applied research includes the use of available knowledge and its complementarity, which is needed for solving specific problems. Moreover, applied research gives ideas a precise and practical form. The results of such research are foreseen for a limited number of products, operations, methods, or systems. Knowledge, information, or the results of applied research are often protected by patents or as a trade secret (OECD, 2015).

Experimental development is systematic work stemming from existing knowledge gained from experience in the field of research and/or practical experience, which are directed to producing new materials, products, or devices, installing new processes, systems, and services or to significantly improve the already produced or installed (OECD, 2015).

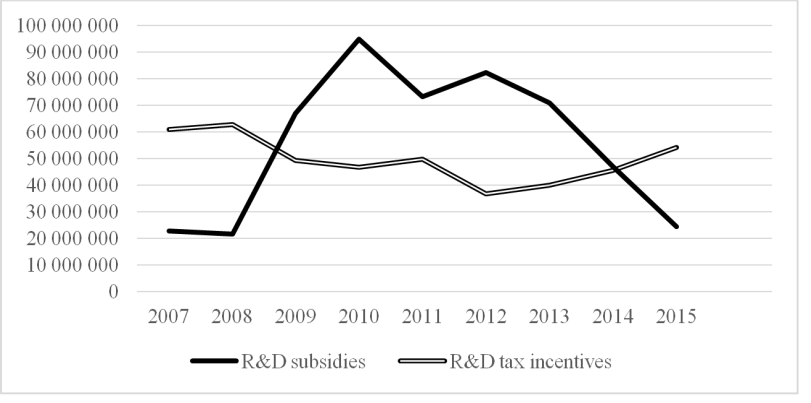
Basic and applied research is primarily carried out by the academic sector and mostly financed from public resources. By contrast, experimental development is largely funded by the business sector and represents a way for companies to maintain competitiveness and ensure long-term financial growth (Deloitte, 2016a).

IV. Public support for R&D in Slovenia

Governments use different tools of public support to encourage companies to invest their additional private funds in R&D activities and provide good conditions for better corporate performance. The most common tools of public support are direct funding through R&D subsidies and indirect funding through tax incentives. Both of these tools of public support are also available in Slovenia. Namely, Slovenian companies emphasize that the availability of several types of benefits such as R&D subsidies and tax incentives is one of the key factors impacting an increase in R&D spending, which can lead to better corporate performance (Deloitte, 2016a).

A comparison of both tools of public support for R&D in Slovenia over time reveals that they behave as substitutes. Before comparing public support for R&D, tax incentives should be normalized since tax incentives were subject to change over time. The relevant data are presented in Figure 1, which shows that when R&D subsidies are increasing tax incentives are falling, and vice versa. Such behaviour of R&D subsidies and tax incentives can be explained by Article 55 of the Corporate Income Tax Act (Official Gazette of RS, nos. 117/06, 56/08, 76/08, 5/09, 96/09, 110/09 – ZDavP-2B, 43/10, 59/11, 24/12, 30/12, 94/12, 81/13, 50/14, 23/15, 82/15 and 68/16). Namely, when these assets are granted, a taxpayer cannot claim tax relief for R&D investments in the part where the assets for the investment are financed from the budgets of local authorities, the Budget of the Republic of Slovenia, or the EU budget.

Figure 1: R&D subsidies and R&D tax incentives for the period 2007–2015 (in EUR)



Sources: Ministry of Finance, 2016; Financial Administration of the Republic of Slovenia 2016; own calculations

A comparison of R&D subsidies and tax incentives reveals that the total amount of R&D subsidies received was steeply decreasing after 2012, while tax incentives were increasing. One reason for that is that most support schemes expired and new ones have not yet been announced, which is associated with current presence of public financial pressures (Ministry of Finance, 2015; Ravšelj and Aristovnik, 2016). The second reason is the lack of companies' familiarity with R&D subsidies. Deloitte (2016b) observes

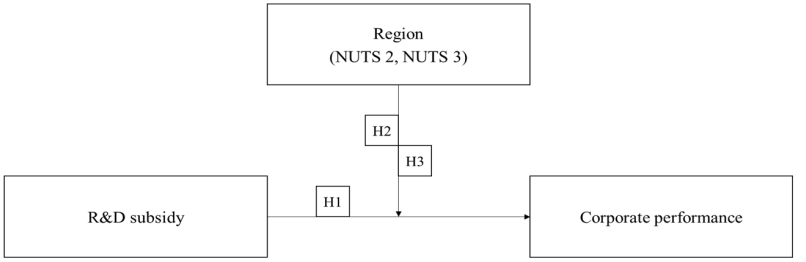
that most companies are fully familiar with R&D tax incentives and make use them. By contrast, the use of R&D subsidies is less common than R&D tax incentives. The aforementioned suggests there is still room for improvement in terms of making companies aware of the R&D subsidies available. It is also important that companies are aware of the potential beneficial effects of R&D subsidies, which may bring positive effects to corporate performance.

V. Empirical research

Conceptual framework

The conceptual framework, which summarizes the hypotheses of this paper, is presented in Figure 2. The government subsidizes companies in order to stimulate them to spend more private funds on R&D and this would then have an impact on corporate performance measured as value added. In other words, companies in receipt of an R&D subsidy should be more motivated to engage in R&D activities and have more final outcomes that result in higher value added. In order to capture the size effects, which might affect value added, company size is added to the model as a control variable.

Figure 2: The conceptual framework



Source: Own

Data description

The paper focuses on evaluating the impact of R&D subsidies on corporate performance, taking the regional perspective into account. Therefore, a unique dataset was created by merging data from two different main sources. Data about the amount of R&D subsidies received were provided by the Ministry of Finance for 2014, while other relevant data (value added, net sales, and region) were collected from the Agency of the Republic of Slovenia for Public Legal Records and Related Services for 2014 and 2015. Value added and net sales were collected for both of the aforementioned years in order to detect those companies that ceased to operate, even though they received an R&D subsidy. Such collected and merged data allow the impact of R&D subsidies on corporate performance to be examined.

In Slovenia, 436 companies received an R&D subsidy in 2014. Companies engaged in banking activity and which were no longer operating in 2015 are excluded from the sample. Moreover, companies with missing values were also excluded. The final sample for the

analysis consists of 411 companies. In order to reduce the effect of possibly spurious outliers and exclude companies which no longer operated in 2015, the data were trimmed. Therefore, 0.5% of companies with the lowest value of the dependent variable in 2015 were excluded from the analysis. In order to balance the sample, 0.5% of companies with the highest value of the dependent variable in 2015 were also excluded from the analysis. Since the symmetric trimming was based on the dependent variable in 2015, it is expected this will not impact the results of the analysis, which is conducted for 2014. The final sample for the analysis consists of 407 companies. In other words, the analysis covers 93.35% of all companies that received an R&D subsidy in 2014. Detailed information and the sample's distribution across the two cohesion and twelve cohesion regions is presented in Table 1.

Table 1: The number and percentage of companies included in the analysis and their distribution by cohesion and statistical regions in Slovenia

Cohesion region	Statistical region	Region code	Number of companies	Share of companies (in %)
East Slovenia	Mura	SI011	10	2.46
	Drava	SI012	46	11.30
	Carinthia	SI013	7	1.72
	Savinja	SI014	49	12.04
	Central Sava	SI015	5	1.23
	Lower Sava	SI016	9	2.21
	Southeast Slovenia	SI017	22	5.41
	Littoral-Inner Carniola	SI018	9	2.21
East Slovenia Total		**SI01**	**157**	**38.57**
West Slovenia	Central Slovenia	SI021	177	43.49
	Upper Carniola	SI022	35	8.60
	Gorizia	SI023	27	6.63
	Coastal-Karst	SI024	11	2.70
West Slovenia Total		**SI02**	**250**	**61.43**
Total			**407**	**100.00**

Source: Own calculations

Variables

The aim of this paper is to investigate the effects of R&D subsidies on corporate performance by taking the moderation effects of cohesion and statistical regions into account. As the hypotheses also stated, the amount of R&D subsidy will affect corporate performance in a positive way. In this case, the dependent variable is corporate performance measured as value added, the independent variable is the amount of R&D subsidy while moderator variables are cohesion and statistical regions. In addition, company size is included in the regression as a control variable in order to check whether corporate performance is caused by this variable.

The dependent variable represents a variable which is caused by other, independent variables. The dependent variable in this paper is corporate performance. Corporate performance is a very broad term and can be calculated in many different ways. In this paper, corporate performance is measured as value added (VA) in €. Value added is calculated by subtracting changes in the value of inventories of products and work-in-process, the cost of goods, material, and services and other operating expenses from gross operating yield. Value added represents the underlying economic indicator and a fundamental measure of economic activity and success. Substantively, it represents newly created value created by the company in one year. Negative value added is called loss of substance. A higher value of this indicator, while achieving profit, also means a higher quality of products and services (AJPES, 2006).

The independent variable represents the variable which causes something. This variable has some effects on others. Since this paper investigates the relationship between R&D subsidy and corporate performance, the independent variable is the amount of R&D subsidy received (SUB) (measured in €).

In order to capture the direct impact of cohesion and statistical regions on corporate performance, dummy variables for each region are also included in the model as independent variables. The dummy variable for cohesion regions (ESI) is defined as a binary variable coded 1 if a company was founded and operates in East Slovenia, and 0 otherwise. Dummy variables for statistical regions (for the purposes of labelling the statistical region code is used) are defined as a binary variable coded 1 if a company was founded and operates in the considered region, and 0 otherwise.

To check the moderating effect of cohesion and statistical regions, 13 interactions are included in the regression model for each region separately. Interactions are calculated as a product of the independent variable (SUB) and dummy variables, which define a particular cohesion or statistical region.

So as to capture the size effects, which might affect the dependent variable (value added), company size is added to the model ($SIZE$) as *a control variable*. In the literature, there are different measures for company size such as the number of employees, total assets, net sales, etc. In this paper, company size is measured as net sales.

Methodology

Based on the proposed hypotheses, this paper uses regression analysis. Regression analysis is a statistical tool for investigating the relationships between variables to ascertain the causal effect of one variable upon another (Sykes, 1993: 1). For testing the proposed hypotheses in this paper, an ordinary least squares (OLS) multivariate regression analysis is applied.

The data for the analysis are obtained for every company at the same time, which in our case is the end of 2014. The aim of this data is to examine the relationship between the amount of R&D subsidy and corporate performance measured as value added by taking the moderation effects of cohesion and statistical regions into account. Therefore, this type of research is cross-sectional.

VI. Empirical results

R&D subsidy and corporate performance

The first hypothesis is that the amount of R&D subsidy is positively correlated with corporate performance measured as value added. At this point, two regression models are set and presented in Table 2. In this part, the empirical model is specified as follows (Equation 1):

$$VA_i = \beta_0 + \beta_1 \, SIZE_i + \beta_2 \, SUB_i + \varepsilon_i \tag{1}$$

where VA is the value added of a company as a measure of corporate performance, $SIZE$ is a company's size measured as net sales, and SUB is the amount of R&D subsidy. Model 1 only includes the control variable ($SIZE$). In model 2, the independent variable (SUB) is added. The coefficient of variable SUB is positive and significant ($\beta = 0.093$, $p < 0.05$). Moreover, the inclusion of the variable SUB in model 2 increases the R^2 and adjusted R^2. This suggests that the amount of R&D subsidy can significantly improve corporate performance. Therefore, hypothesis 1 is supported.

Table 2: Regression results for the relationship between R&D subsidy and corporate performance

	Model 1	Model 2
$SIZE$	0.627***	0.624***
SUB		0.093*
F value	263.020***	136.045***
R^2	0.394	0.402
Adjusted R^2	0.392	0.399

Note: $*p < 0.05$; $**p < 0.01$; $***p < 0.001$
Source: Own calculations

Moderating effect of cohesion regions on the relationship between R&D subsidy and corporate performance

The second hypothesis is that the cohesion regions have a moderating effect on the relationship between the amount of R&D subsidy and corporate performance measured as value added. Compared with model 2 in the previous subsection, two more variables are added to model 3. A dummy variable for cohesion region is added so as to capture the direct impact of cohesion region on corporate performance. Further, the interaction between the amount of R&D subsidy and cohesion region is added in order to check the moderating impact of cohesion region on the relationship between R&D subsidy and corporate performance. The empirical model is specified as follows (Equation 2):

$$VA_i = \beta_0 + \beta_1 \, SIZE_i + \beta_2 \, SUB_i + \beta_3 \, ESI_i + \beta_4 \, SUB * ESI_i + \varepsilon \tag{2}$$

where VA is the value added of a company as a measure of corporate performance, $SIZE$ is a company's size measured as net sales, SUB is the amount of R&D subsidy,

ESI represents a dummy variable for cohesion region, and $SUB * ESI$ represents the interaction between the amount of R&D subsidy and the cohesion region. Regression results are presented in Table 3.

Table 3: Regression results for the moderating effect of cohesion regions

	Model 3
$SIZE$	0.618***
SUB	0.088*
ESI	0.059
$SUB * ESI$	0.078*
F value	70.397***
R^2	0.412
Adjusted R^2	0.406

Note: $*p < 0.05$; $**p < 0.01$; $***p < 0.001$
Source: Own calculations

Moderating effect of statistical regions on the relationship between R&D subsidy and corporate performance

The third hypothesis is that the statistical regions have a moderating effect on the relationship between the amount of R&D subsidy and corporate performance measured as value added. The regression results for the moderating effect of statistical regions are presented in Table 4 for statistical regions of East Slovenia and in Table 5 for statistical regions of West Slovenia separately. In each model (models 4 to 15), two additional variables are added into the model in comparison with model 3. A dummy variable for each statistical region (labelled by statistical region code) is added to capture the direct impact of statistical region on corporate performance. In addition, the interaction between the amount of R&D subsidy and statistical region is added in order to check the moderating impact of cohesion region on the relationship between R&D subsidy and corporate performance. In this part, the empirical model is specified as follows (Equation 3):

$$VA_i = \beta_0 + \beta_1\, SIZE_i + \beta_2\, SUB_i + \beta_3\, SI0XY + \beta_4\, SUB * SI0XY + \varepsilon \qquad (3)$$

where VA is the value added of a company as a measure of corporate performance, $SIZE$ is a company's size measured as net sales, SUB is the amount of R&D subsidy, $SI0XY$ represents a dummy variable for each statistical region, and $SUB * SI0XY$ represents the interaction between the amount of R&D subsidy and statistical region.
East Slovenia includes eight statistical regions: Mura ($SI011$), Drava ($SI012$), Carinthia ($SI013$), Savinja ($SI014$), Central Sava ($SI015$), Lower Sava ($SI016$), Southeast Slovenia ($SI017$), and Littoral Inner Carniola ($SI018$). Therefore, eight regression models are set and presented in Table 4.

Table 4: Regression results for the moderating effect of statistical regions of East Slovenia

	Model 4	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**	**Model 10**	**Model 11**
$SIZE$	0.624***	0.625***	0.621***	0.601***	0.624***	0.619***	0.621***	0.624***
SUB	0.093*	0.101**	0.105**	0.126**	0.091*	0.099*	0.096*	0.095**
$SI011$	−0.030							
$SI012$		−0.071						
$SI013$			0.034					
$SI014$				0.134***				
$SI015$					0.047			
$SI016$						0.033		
$SI017$							0.008	
$SI018$								0.015
$SUB * SI011$	0.000							
$SUB * SI012$		−0.068						
$SUB * SI013$			0.104**					
$SUB * SI014$				0.200**				
$SUB * SI015$					−0.039			
$SUB * SI016$						−0.039		
$SUB * SI017$							0.062	
$SUB * SI018$								−0.012
F value	67.933***	70.354***	71.110***	84.453***	68.280***	68.309***	68.782***	67.772***
R^2	0.403	0.412	0.414	0.457	0.405	0.405	0.406	0.403
Adjusted R^2	0.397	0.406	0.409	0.451	0.399	0.400	0.400	0.397

Note: $*p < 0.05$*;* $**p < 0.01$*;* $***p < 0.001$
Source: Own calculations

Table 4 shows that control variable ($SIZE$) and independent variable (SUB) remain significant after two new variables for each statistical region are included in the model. Compared with model 2, all of the presented models have a higher value of R^2 after the inclusion of the two new variables in the model. However, the value of adjusted R^2 is higher only in five models (model 5, model 6, model 7, model 9, model 10). Regression results reveal that in models 6 and 7 the interaction terms are positive and significant. This suggests that statistical regions moderate the causal effect of the amount of R&D subsidy on corporate performance. Namely, in model 6 the interaction between the amount of R&D subsidy and the statistical region Carinthia ($SUB * SI013$) is positive and significant ($\beta = 0.104, p < 0.01$). In other words, companies from the statistical region of Carinthia achieve a greater effect of R&D subsidies on corporate performance compared with companies from the other Slovenian statistical regions. In addition, in model 7 the interaction between the amount of R&D subsidy and the statistical region Savinja ($SUB * SI014$) is positive and significant ($\beta = 0.200, p < 0.01$). In other words, companies from the Savinja statistical region achieve a greater effect of R&D subsidies on corporate performance compared with companies from the other Slovenian statistical regions. In model 7, the coefficient of the dummy variable ($SI014$) is also positive and significant ($\beta = 0.134, p < 0.001$). This suggests that companies from the statistical region of Savinja generate greater value added compared with companies from the other Slovenian statistical regions.

West Slovenia includes four statistical regions: Central Slovenia (*SI021*), Upper Carniola (*SI022*), Gorizia (*SI023*), and Coastal-Karst (*SI024*). Therefore, four regression models are set and presented in Table 5.

Table 5: Regression results for the moderating effect of statistical regions of West Slovenia

	Model 12	**Model 13**	**Model 14**	**Model 15**
SIZE	0.621***	0.625***	0.625***	0.624***
SUB	0.082*	0.093*	0.088*	0.094*
SI021	−0.098*			
SI022		0.034		
SI023			0.055	
SI024				−0.005
SUB ∗ *SI021*	−0.054			
SUB ∗ *SI022*		0.005		
SUB ∗ *SI023*			−0.050	
SUB ∗ *SI024*				−0.030
F value	71.193***	68.024***	68.911***	67.951***
R^2	0.415	0.404	0.407	0.403
Adjusted R^2	0.409	0.399	0.401	0.397

Note: $*p < 0.05$*;* $**p < 0.01$*;* $***p < 0.001$
Source: Own calculations

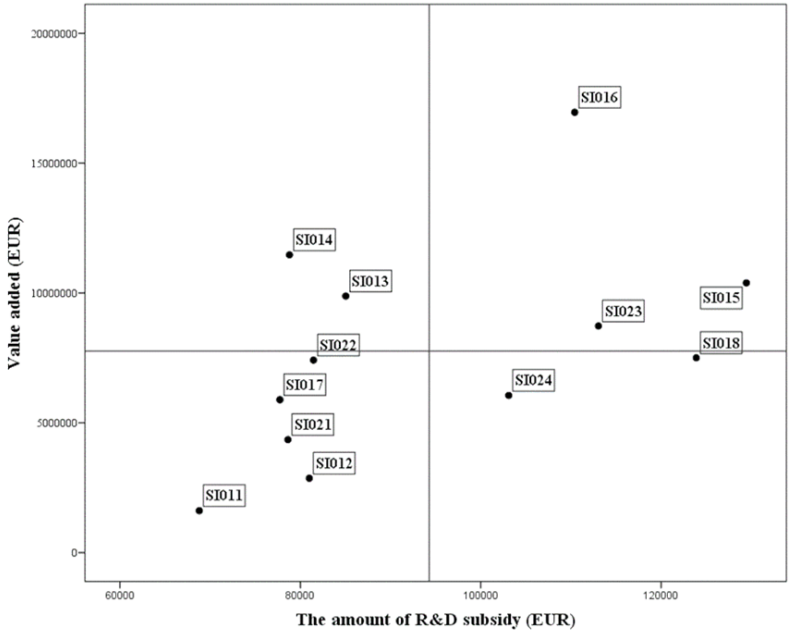
Table 5 presents regression results for statistical regions of West Slovenia. The control variable (*SIZE*) and independent variable (*SUB*) remain significant after the inclusion of the two new variables for each statistical region in the model as well as for statistical regions of East Slovenia. In comparison with model 2, the inclusion of the two new variables in the model improves the value of R^2 of all presented models. However, the value of adjusted R^2 is higher only in models 12 and 14. The presented results reveal that only one coefficient of the variable which is associated with regions is significant. In model 12, the coefficient of the dummy variable (*SI021*) is negative and significant ($\beta = -0.098$, $p < 0.05$). This suggests that companies from the statistical region Central Slovenia generate greater value added compared with companies from the other Slovenian statistical regions. For statistical regions of West Slovenia, all interactions between the amount of R&D subsidy and the statistical region are not significant.

Briefly, there are two statistical regions where companies generate significantly greater or lower value added compared with other statistical regions. These are Savinja and Central Slovenia. Although this is not the main aim of this paper, the results suggest there are differences among statistical regions concerning generated value added. In this part, the paper focuses on the moderation effect of statistical regions. In this regard, the results reveal that there are two statistical regions where companies achieve a greater effect of

R&D subsidies on corporate performance. These are the Carinthia and Savinja statistical regions, which represent part of East Slovenia. Based on the aforementioned, hypothesis 3 is supported.

The regression results suggest there are differences among statistical regions regarding value added and the amount of R&D subsidy. The regression results reveal that companies from the Carinthia and Savinja statistical regions use R&D subsidies in a more effective way than other statistical regions in Slovenia. A possible reason for that may be the lack of other sources for financing R&D activities and therefore these companies strive to optimize the use of R&D subsidies, which consequently leads to greater value added. Although the regression results for other statistical regions are not significant, this paper also tries to classify other statistical regions in order to obtain more information about how efficiently companies use R&D subsidies in these statistical regions (Figure 3).

Figure 3: Classification of Slovenian statistical regions according to value added and the amount of R&D subsidy in 2014



Source: Own calculations

In order to classify statistical regions, for each statistical region the averages of value added and the amount of R&D subsidy are calculated. Moreover, total averages for value added and the amount of R&D subsidy of statistical regions are calculated to identify which statistical regions are above and which below these averages. By considering the above-mentioned, the matrix is created and graphically presented in Figure 3, which reveals substantial differences among statistical regions regarding value added and the amount of R&D subsidy. By using this matrix, statistical regions can be classified in four groups.

Statistical regions in the upper-left quadrant (Carinthia and Savinja) are statistical regions where companies on average achieve greater value added by having on average a lower amount of R&D subsidies. In the upper-right quadrant are those statistical regions (Central Sava, Lower Sava, Gorizia) where companies on average achieve greater value added by having on average a higher amount of R&D subsidies. Statistical regions found in the lower-left quadrant (Mura, Drava, Southeast Slovenia, Central Slovenia) represent regions where companies on average achieve lower value added by having on average a lower amount of R&D subsidies. In the lower-right quadrant are those statistical regions (Littoral-Inner Carniola, Coastal-Karst) where companies on average achieve lower value added by having on average a higher amount of R&D subsidies. Based on this, companies from statistical regions presented in the upper-left quadrant are the most effective, companies from statistical regions presented in the lower-left and upper-right quadrants are medium-effective, while companies from statistical regions presented in the lower-right quadrant are the least effective in terms of their use of R&D subsidies.

VII. Conclusion

Investment in R&D is very important for economic growth. Accordingly, governments in many countries try to encourage companies to invest their additional private funds in R&D activities by using different tools of public support for R&D. The most common of these tools are direct funding through R&D subsidies and indirect funding through tax incentives. Both of these tools are also available in Slovenia. This paper is focused on R&D subsidies and their impact on corporate performance, taking the regional perspective into account.

In this paper, all of the proposed hypotheses are confirmed. This means the empirical results of this paper reveal that R&D subsidies can significantly improve corporate performance and confirm that cohesion and statistical regions can moderate the effect of R&D subsidies on corporate performance. On the one hand, for cohesion regions it holds that companies from East Slovenia achieve a greater effect from R&D subsidies on corporate performance than companies from West Slovenia. On the other hand, for statistical regions it holds that companies from Carinthia and Savinja achieve a greater effect from R&D subsidies on corporate performance compared with companies from the other Slovenian statistical regions. Therefore, Carinthia and Savinja are those statistical regions in which companies are the most effective in terms of their use of R&D subsidies. Companies from Mura, Drava, Central Sava, Lower Sava, Southeast Slovenia, Central Slovenia, Upper Carniola, and Gorizia are medium-effective and companies from Littoral-Inner Carniola and Coastal-Karst are the least effective in terms of their use of R&D subsidies.

This paper has some limitations. The analysis only includes data for R&D subsidies, which represent merely part of the funds spent by companies on R&D activities. This represents a potential limitation of the analysis presented here. Namely, companies also invest their private funds in R&D activities in order to enhance their corporate performance. One suggestion for further research is as follows. It would be interesting to upgrade this research by including private funds for R&D activities in the analysis. Another potential limitation of this paper is that only cross-sectional data for 2014 are used. Namely, it

would be interesting to extend the data by including additional years in the analysis and examining differences among cohesion and statistical regions.

This paper provides insight into the area of public support for R&D in Slovenia, especially into R&D subsidies. Although the results show a beneficial effect of R&D subsidies on corporate performance, many companies today are still not familiar with R&D subsidies. Therefore, there is still room for improvement in terms of making companies aware of the R&D subsidies that are available. This will help companies utilize these resources and can thus lead to better corporate performance. Moreover, the findings of this paper could help the government in designing R&D subsidy policy in the future.

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