

## Are There Differences in the Financial Performance of Czech and Slovak Cluster Organizations?<sup>1</sup>

Natalie PELLONEOVÁ\*

---

### Abstract

*This paper assesses differences in the financial performances of member businesses of selected cluster organizations in the Czech and Slovak Republics. The first research sample was comprised of member businesses of five cluster organizations operating in the Czech Republic. The second research sample was made up of member businesses of four cluster organizations operating in Slovakia. The aim of the research was to find out whether the financial performance of member businesses in Czech cluster organizations differed from the performance of member businesses in Slovak cluster organizations. The financial performance was assessed using selected financial indicators. The research results showed that member businesses of selected Slovak cluster organizations did not achieve any different financial performance. Finally, the possible causes of this situation are discussed.*

**Keywords:** *industry cluster, cluster organization, performance, financial performance*

**JEL Classification:** L14, L25, O38

**DOI:** <https://doi.org/10.31577/ekoncas.2021.09.02>

---

### Introduction

The establishment and development of clusters is one of the current trends in economic and regional innovation policy. As a general concept, a cluster can be understood as the interconnection of businesses and other institutions in a certain geographical area that benefits those involved and results in a competitive

---

\* Natalie PELLONEOVÁ, Technical University of Liberec, Faculty of Economics, Department of Business Administration and Management, Studentská 2, 461 17 Liberec, Czech Republic; e-mail: natalie.pelloneova@tul.cz

<sup>1</sup> Supported by Czech Science Foundation grant No. GA18-01144S *An Empirical Study of the Existence of Clusters and Their Effect on the Performance of Member Enterprises.*

advantage (Estélyiová and Koráb, 2010; Sölvell, 2009). Clusters in the Czech and Slovak Republics can be described as a relatively new form of business groupings. In both countries, clusters are institutionalized and managed and can therefore be referred to as cluster organizations (a voluntary grouping of entities within one organization that has its own company identification number).

The present research focuses on the comparison of the financial performances of member businesses of cluster organizations operating in the Czech Republic, the establishment of which was in most cases supported with considerable funds from public sources, with member businesses of cluster organizations operating in Slovakia. In the Czech Republic, the establishment and development of cluster organizations has been actively supported since 2004, when clusters began to be supported under EU operational programmes. That year was also a national milestone that marked the start of a trend in establishing cluster organizations. Prior to 2004, there were only two cluster organizations in the Czech Republic. The first such programme was the Operational Program Industry and Enterprise, which supported the establishment and development of clusters through the Clusters sub-programme. In 2007, the Clusters programme was followed by the aid sub-programme entitled Cooperation – Clusters within the Operational Program Enterprise and Innovation. Since 2014, clusters have been supported through the Operational Program Enterprise and Innovation for Competitiveness, which lasted until 2020 (CzechInvest, 2019).

Compared to the Czech Republic, Slovakia lags significantly behind in terms of public support for the establishment and development of clusters. In the past, however, several cluster organizations were established in Slovakia even without high-level support. The earliest cluster organizations in Slovakia were established in 2004, and Slovakia started its first one-off support activity (it should be noted that it was only provided to technology clusters) in 2012. Despite this, 24 cluster organizations had been established in Slovakia by 2012. While there has been support for cluster organizations in Slovakia since 2012, its scope is not comparable to that in the Czech Republic.

The Ministry of Education of the Slovak Republic and the Ministry of Economy of the Slovak Republic can be considered the main institutions focused on the support of clusters in Slovakia. The instrument of the Ministry of Economy is the Slovak Innovation and Energy Agency, which is dedicated to supporting cluster initiatives. The first one-off support activity of cluster organizations was implemented in 2012 by the Ministry of Education, which announced a call for support for scientific and technical services. Five of the seven best projects of technology cluster organizations were supported (CVTISR, 2021). In 2013, the initiative was taken over by the Ministry of Economy. The Ministry of the

Economy of the Slovak Republic is thus another institution that supports the development of legal associations that fulfill the functions of cluster organizations in the field of industry within the Scheme for the Support of Industrial Cluster Organizations (2013, 2014, 2015, 2016 and 2017 – 2020) (MFSR, 2017). The need to support the development of clusters is also stated in the national strategy document RIS 3 – Findings for Prosperity – Research and Innovation Strategy for Intelligent Specialization of the Slovak Republic (MVSR, 2019). The main implementation tool of RIS 3 and the most important program to support innovation and cooperation in Slovakia is the Operational Program Research and Innovation.

The level of financial support is different in the two countries and, in comparison with the Czech Republic, support for clusters in Slovakia can be described as unsystematic and irregular. Funds are provided in insufficient volume and for a too short period. Significant players in the formation of clusters in Slovakia were also higher territorial units, which significantly supported the establishment and became donors of their initial start-up. The resulting clusters proved their viability under real market conditions and gradually began to start their activities (Littvová, 2014). Unlike in the Czech Republic, it can be concluded that Slovak cluster organizations were established mainly on the initiative of companies within their own sector, and not because of the possibility of obtaining government or other public support. Therefore, the aim of the research is to verify the assumption that member businesses of cluster organizations that have been established mainly on the initiative of companies achieve different financial performances than member businesses of cluster organizations that have been established only on the basis of public intervention. Based on the above, it can also be assumed that members of Slovak cluster organizations might achieve better financial performance than members of Czech cluster organizations.

Only a few studies examine the difference between the performance of clusters formed with different intensities of public support. In their study, Jungwirth and Müller (2014) compare the performance of clusters based on whether their creation was initiated by public authorities or private companies. They completed a study comparing approaches to cluster formation in a German-speaking area. In their research, they concluded that there were no significant differences between clusters. Some experts, e.g. Bresnahan, Gambardella and Saxenian (2001) believe that publicly initiated clusters lack dynamism and are thus skeptical about the effectiveness of public sector-supported cluster initiatives. Enright (2003) also highlights the lack of sustainability of top-down cluster initiatives. The professional public generally seems to consider the mechanism of clustering with the help of public administration inferior to the mechanism of support from

private entities. One reason for this skepticism may be the potential inferiority of public policy agendas. Examples are studies on the effectiveness of public subsidies for research and development or cluster policy programs, which point to several benefits of public support, but also reveal some weaknesses. E.g. Nishimura and Okamuro (2011) found that direct support for research and development has only a small impact on companies' innovation performance. Taking into account the above aspects, it can be assumed that the way clusters are formed can also influence the overall performance of clusters.

## **1. Literature Review**

Technical publications dealing with regional development or network economics use a variety of terms to describe agglomerations of economic entities. The first mention of agglomerations is attributed to Alfred Marshall (1920), who observed that certain industries tend to concentrate locally around companies with similar or complementary profiles. The development of the term "cluster" did not begin until the early 1990s, when Michael Eugene Porter's groundbreaking book entitled "The Competitive Advantage of Nations" was published (Porter, 1998a). In his book, Porter introduced and popularized the term cluster and expanded upon the idea of agglomeration economies originally presented by Marshall. In his book, he outlined his own conceptual framework for clusters and, for the first time, he used the concept of a cluster as a new tool to improve the performance of individual participating companies and a new way to support the competitiveness of companies, innovation, and industrial and economic development (Hájek, 2011; Albekov et al., 2017).

In this book, Porter formulated the first definition, which brought clusters to the attention of more than just the scientific community. The book is additionally considered to be one of the most influential interpretations of the ways clusters work. Porter (1998b) defined a cluster as a geographically proximate group of interconnected companies, suppliers and associated institutions within a particular field or as a group of companies in related fields that compete and also co-operate with each other. Over the past few decades, a number of cluster definitions have been formulated that develop or complement Porter's original understanding of a cluster. For example, Simmie and Sennett (1999) define a cluster as a large number of interconnected industrial and/or service companies having a high degree of collaboration and operating under the same market conditions. Schmiedeberg (2010) sees clusters as a group of proximate companies interlinked by input/output, knowledge and other flows that may result in agglomeration advantages. Kuah (2002) defines a cluster as a geographical agglomeration

of competing and related industries. According to another definition by Swann, Prevezer and Stout (1998), clusters are large groups of firms in related industries and operating in a particular location.

After more than twenty years, clusters are still an important topic for economists and economic policy makers. Clusters are no longer viewed as the mere spontaneous grouping of companies, but rather as a solid, organised structure whose basic economic effect lies in its impact on the competitiveness of businesses, regions and states (Hučka, Kislíngrová and Malý, 2011). According to Kincaid (2005), clusters offer all participants a wide range of benefits, which mainly translate into improved efficiency, productivity, innovation activities and, in turn, help increase performance and competitiveness. The very existence of a cluster drives competition through increasing productivity, provides an impetus for innovation and, in turn, supports future productivity growth. Although, in theory, the potential benefits of clustering are widely acknowledged, they are far from always confirmed in practice on real data. Indeed, some research has shown that the expected positive impact of clustering companies is not the rule (Martin and Sunley, 2003; Vaan, Boschma and Frenken, 2013).

Despite numerous studies on clusters, their benefits and development policies, studies focusing on making a comprehensive assessment of cluster performance are still lacking in the existing technical literature. This may be due to the fact that cluster development is a relatively new topic and there are only a very limited number of analyses dealing with cluster results and performance (Gürellier, 2010).

Rothgang and Lageman (2016) state that measuring the performance of clusters is important for the so-called comprehensive evaluation (i.e. evaluating the results resulting from the existence of a cluster initiative in order to legitimize its existence and funding). Economic policy makers want to receive feedback on whether clusters are successful and whether they are achieving their goals. Feedback will help economic policy makers determine whether incentives, promotion and funding are beneficial to the cluster and whether these factors are being used properly. In addition, identifying cluster weaknesses is important for further improvement interventions. Cluster performance evaluations conducted in Japan and France show that cluster evaluations can also be used as an effective tool for cluster self-regulation (Meier zu Köcker and Rosted, 2010). Cluster performance can be measured mainly by quantitative indicators, but the fact that cluster performance also depends on qualitative indicators such as the level of cooperation and social capital (Gürellier, 2010) cannot be overlooked. Meier zu Köcker and Rosted (2010) also emphasize that different industries need different sets of indicators and measurement approaches. The literature presents several methods and

models for measuring cluster performance (Delgado, Porter and Stern, 2014; 2016). For example, Pavelková et al. (2009) describes a multicriteria model for evaluating clusters and cluster initiatives. In their study, Sölvell, Lindqvist and Ketels (2003) present a performance model for cluster initiatives. There are also institutional approaches, such as the Canadian National Research Council's evaluation of clusters (Cassidy et al., 2005), the UK approach to cluster evaluation (DTI, 2002), the Scottish Enterprise Development Agency's cluster evaluation or the Cluster Benchmarking Model developed by the Norwegian Innovation Center (Andersen, Bjerre and Hansson, 2006). In the Czech Republic, Marešová, Jašíková and Bureš (2014) deal with the issue of cluster performance evaluation, using their own multicriteria model. As many of the benefits of involving companies in clusters are also non-financial, some authors (Carpinetti, Galdamez and Gerolamo, 2008) are inclined to measure the performance of clusters using BSC. However, none of these approaches has yet been identified as the most appropriate. Experts' views on the use of cluster management concepts and performance measurement are mixed. The above methods of cluster performance evaluation make it relatively difficult to obtain information. Thus, for this reason there has been an effort to find a method of evaluating the performance of clusters, which would not burden the members of the examined cluster and at the same time would have the best possible informative value.

## **2. Methodology**

Given the availability of financial statements, the research focused on the 2013 – 2017 period. Business data for earlier years were not available for Slovak cluster organizations. Business data for 2018 and later are not yet available for a significant portion of the businesses in both countries. The research as a whole can be divided into the following 6 steps:

1. *Selecting cluster organizations* – during the present research, databases of cluster organizations operating in the Czech Republic and Slovakia were created. These databases were created by combining the Commercial Register and the results of cluster mapping by CzechInvest and the Slovak Innovation and Energy Agency. Several cluster organizations that met the three conditions set by the research were selected from these databases. Only active cluster organizations were included in the research. This category includes cluster organizations with projects and latest news being posted on the cluster's official website. For these cluster organizations, financial statements can also be found in the public register and the collection of documents. Also, over the long term, these organizations have reported non-zero sales in their financial statements. Only cluster organizations

in the maturity phase (i.e. organizations established before or in 2012) were included in the research. The last condition was that the list of member entities for the cluster organization had to be available.

2. *Defining the research samples and compiling a list of companies to be evaluated* – the list of the cluster organizations' members was obtained from the cluster organizations' websites or by asking the cluster organization manager. Since the present research focused on evaluating financial performance, only business entities were included. All non-business entities were intentionally excluded from the analysis. All individuals were also excluded from the research because it was not possible to obtain their financial statements. In order to create a homogeneous core, an analysis of the line of business according to the CZ/SK-NACE statistical classification was performed for each member business entity. For each cluster organization, business entities in the same or a similar industry (according to the CZ/SK-NACE classification) as the entire cluster organization were identified as the homogeneous core. The research is based on a comparison of two research samples. The first research sample comprises the homogeneous cores of 5 active cluster organizations that are in the maturity phase and that operate in the Czech Republic. The second research sample comprises the homogeneous cores of 4 active cluster organizations that are in the maturity phase and that operate in Slovakia.

3. *Gathering financial statements and extracting data from the financial statements* – for both research samples, the necessary data for the years 2013 – 2017 were obtained from financial statements. In the Czech Republic, the MagnusWeb commercial database was used as the main source of accounting data. When this database did not contain the required financial statements, the collection of documents in the Commercial Register was used as the second source. In Slovakia, the Finstat database and the Register of Financial Statements were used as the data sources. Furthermore, given the relatively short period of time, companies that were missing a financial statement for more than one year were excluded from the research samples. In the case of the first research sample, 21 companies were excluded. In the case of the second research sample, the success rate of obtaining financial statements was 100%. Where financial statements were missing for only one year, the missing values were replaced with values calculated according to a suitable functional trend.

4. *Calculating economic value added* – for each of the business entities, the economic value added indicator (hereinafter EVA) was calculated. EVA was calculated using the EVA equity method (see formula 1). This is an equity-based approach (MIT, 2017) where EVA is defined as the product of equity  $E$  and spread (i.e. return on equity ROE minus the alternative cost of equity  $r_e$ ).

$$EVA = spread \cdot E = (ROE - r_e) \cdot E \quad (1)$$

The CAPM model was used to estimate the cost of equity  $r_e$  (see formula 2). Where  $r_f$  is the risk-free interest rate,  $\beta$  is the coefficient expressing the degree of specific market risk through measurement of the sensitivity of the stock to changes in the market portfolio,  $r_m$  is the expected (average) return of the capital market as a whole,  $r_m - r_f$  is the market risk premium.

$$r_e = r_f + \beta(r_m - r_f) \quad (2)$$

The risk-free rate ( $r_f$ ), which was determined using the ten-year government bond yield rate was used, which was published in the Czech Republic by the Ministry of Industry and Trade (MIT, 2017) and in Slovakia by the Debt and Liquidity Management Agency (ARDAL, 2019). The  $\beta$  coefficient was calculated using values from the Damodaran website (2019). The market risk premium ( $r_m - r_f$ ) was determined based on the ratings of both countries.

The EVA indicator can accept both positive and negative values. A positive EVA means that the company generates value for its owners. If EVA is negative, the value of the company decreases. The EVA indicator according to the chosen methodology can only be determined for companies with positive equity. Therefore, companies with zero or negative equity had to be excluded from both research samples.

5. *Calculating other financial indicators* – furthermore, the following indicators were compared between the research samples: return on assets (ROA), return on sales (ROS), EVA per employee and EVA per sales.

6. *Comparing selected characteristics* – as the last step of the research, the medians for cluster organizations in both countries were compared using the non-parametric Wilcoxon W-test. Since the Shapiro-Wilk significance test showed that none of the indicators was normally distributed, the Wilcoxon test was used to verify differences in financial performance. The Wilcoxon test was performed at a significance level of 10%. All statistical testing was carried out using the STATGRAPHICS Centurion XVIII software.

### 3. Research Results

The main objective of the present research was to find out whether there were differences in the financial performance of member business entities of the selected cluster organizations (further CO) in the Czech Republic and Slovakia. As part of the research, five pairs of COs operating in four different industrial areas were compared with each other. Each pair consisted of one Czech and one Slovak



CO. The research aimed to verify the hypothesis that businesses that are members of a Slovak CO report different values of selected indicators than businesses that are members of a Czech CO. The null-hypothesis always assumed that there was no statistically significant difference between the medians of the two research samples.

### *Automotive Industry*

The first pair to be compared were COs from the automotive industry. The first evaluated CO was the Czech Moravian-Silesian Automotive Cluster, which was established in 2006. The second evaluated CO was the Slovak Automotive Cluster – Western Slovakia, which was established in 2007.

Table 1

#### **Medians of ROA, ROE and ROS Financial Performance Indicators for Automotive Industry**

Year	ROA		ROE		ROS	
	SK	CZ	SK	CZ	SK	CZ
2013	0.0166	0.0462	0.0418	0.1087	0.0149	0.0344
2014	0.0454	0.0664	0.0948	0.1588	0.0288	0.0502
2015	0.0399	0.0696	0.1344	0.1419	0.0324	0.0492
2016	0.0496	0.0541	0.1439	0.0993	0.0313	0.0358
2017	0.0268	0.0589	0.0964	0.1098	0.0198	0.0346

Source: Prepared by the author.

Table 2

#### **Medians of EVA Financial Performance Indicators for Automotive Industry**

Year	EVA		EVA/employees		EVA/sales	
	SK	CZ	SK	CZ	SK	CZ
2013	-4,939.35	-1,049.82	-58.60	-21.25	-0.0401	-0.0151
2014	-349.17	172.08	-20.19	7.07	-0.0182	0.0032
2015	-407.59	29.90	-19.11	0.73	-0.0120	0.0004
2016	-327.25	-1,512.54	-19.88	-19.26	-0.0126	-0.0151
2017	-2,045.76	-1,810.48	-43.52	-18.09	-0.0230	-0.0086

Source: Prepared by the author.

Table 1 shows that, according to ROE, both Czech and Slovak businesses achieved accounting profitability in the years under review. By contrast, the EVA indicator (which, unlike accounting profit, also includes the implicit cost of equity) was negative for the Automotive Cluster – Western Slovakia throughout the period under review. This means that its member businesses in the aggregate did not create any value for their owners, but rather they were consuming the capital invested. Productivity expressed as EVA/employees and return on sales expressed as EVA/sales were also negative. In the case of the Moravian-Silesian

Automotive Cluster, profitability – expressed by the EVA indicator – was also negative, with the exception of 2014 and 2015. Furthermore, Tables 1 and 2 show that the Czech CO had slightly better values for all indicators in almost all years.

Table 3

**Wilcoxon's W-test and P-values for Automotive Industry**

Year	ROA		ROE		ROS	
	W	P-value	W	P-value	W	P-value
2013	367	0.4941	349	0.7158	392	0.2594
2014	420	0.1042	377	0.3891	427	0.0802*
2015	363	0.5401	299	0.6128	358	0.6003
2016	319	0.8800	304	0.6764	371	0.4504
2017	410	0.1478	378	0.3794	408	0.1580

Note: P-value < 0.1\*.

Source: Prepared by the author.

Table 4

**Wilcoxon's W-test and P-values for Automotive Industry**

Year	EVA		EVA/employees		EVA/sales	
	W	P-value	W	P-value	W	P-value
2013	365	0.5168	400	0.2042	379	0.3698
2014	361	0.5638	381	0.3511	359	0.5881
2015	326	0.9787	329	0.9929	326	0.9787
2016	315	0.8243	332	0.9504	337	0.8800
2017	369	0.4720	408	0.1580	413	0.1334

Source: Prepared by the author.

Tables 3 and 4 show that while there were some differences between the financial performance of member businesses of the two COs in the automotive industry, these were generally not statistically significant. The analysis showed that the largest differences in financial performance were reported in 2014. The only significant exception at the 10% level, was when the Moravian-Silesian Automotive Cluster achieved a higher return on sales. At the same time, however, it was not possible to prove that the financial performance of the Czech CO was significantly better than that of the Slovak CO in any of the other years under review.

**Plastics Industry**

The second pair to be compared were COs from the plastics industry. Established in 2006, the Plastics Cluster was selected to represent the conditions present in the Czech Republic. Established in 2009, the Slovak Plastics Cluster was selected to represent the conditions existing in Slovakia.

Table 5 shows that both Czech and Slovak businesses achieved positive medians of accounting profitability in the years under review. In the case of the Slovak Plastics Cluster throughout, the EVA indicator was also positive over the period under review, except in 2013. It can thus be concluded that the owners' wealth mostly grew, because businesses increased the value of their capital more than the level of their capital costs. By contrast, in the case of the Czech CO, profitability – expressed by the EVA indicator – was negative, with the exception of 2014. It can thus be concluded that the owners' wealth mostly declined, because businesses increased the value of their capital less than what their capital costs were. Tables 5 and 6 show that the Slovak CO had slightly better values for all financial performance indicators throughout the whole time period.

Table 5

**Medians of ROA, ROE and ROS Financial Performance Indicators for Plastics Industry**

Year	ROA		ROE		ROS	
	SK	CZ	SK	CZ	SK	CZ
2013	0.0494	0.0368	0.0999	0.0636	0.0431	0.0311
2014	0.0723	0.0784	0.1066	0.1518	0.0457	0.0533
2015	0.0603	0.0580	0.1196	0.1015	0.0376	0.0451
2016	0.0735	0.0465	0.1384	0.0990	0.0440	0.0423
2017	0.0502	0.0591	0.1031	0.0487	0.0447	0.0371

Source: Prepared by the author.

Table 6

**Medians of EVA Financial Performance Indicators for Plastics Industry**

Year	EVA		EVA/employees		EVA/sales	
	SK	CZ	SK	CZ	SK	CZ
2013	-45.01	-3,674.85	-6.43	-62.95	-0.0029	-0.0351
2014	371.71	421.52	24.78	4.53	0.0045	-0.0008
2015	910.80	-1,010.66	14.17	-14.87	0.0024	-0.0080
2016	719.19	-1,512.26	22.09	-25.93	0.0144	-0.0209
2017	23.45	-1,693.65	1.86	-55.05	0.0005	-0.0182

Source: Prepared by the author.

Table 7

**Wilcoxon's W-test and P-values for Plastics Industry**

Year	ROA		ROE		ROS	
	W	P-value	W	P-value	W	P-value
2013	200	0.3673	196	0.3208	211	0.5154
2014	233	0.8821	246	0.9001	233	0.8821
2015	217	0.6076	207	0.4583	247	0.8821
2016	192	0.2783	191	0.2684	205	0.4311
2017	246	0.9001	135	0.0167**	209	0.4864

Note: P-value < 0.05\*\*.

Source: Prepared by the author.

Table 8  
**Wilcoxon's W-test and P-values for Plastics Industry**

Year	EVA		EVA/employees		EVA/sales	
	W	P-value	W	P-value	W	P-value
2013	183	0.1972	172	0.1234	184	0.2053
2014	229	0.8106	225	0.7407	210	0.5008
2015	233	0.8821	188	0.2399	184	0.2053
2016	203	0.4048	175	0.1410	160	0.0696*

Note: P-value < 0.1\*.

Source: Prepared by the author.

Tables 7 and 8 show that while there were some differences between the financial performance of the member businesses of the two plastics COs, these were mostly not statistically significant at a 10% level. The only significant difference was identified in the ROE indicator in 2017; in this case, the P-value was even below 5%. It can be concluded that in 2017, Slovak member businesses achieved significantly better equity appreciation than Czech ones. Other exceptions were found for the return on sales in 2016 and 2017, when the Slovak CO reported better ROS values. At the same time, however, it could not be proven that the financial performance of the Czech CO in the plastics industry was significantly better than that of the Slovak CO in any of the other years under review.

### ***Industrial Automation and Robotics***

The third pair of COs to be compared within the research were COs in the area of industrial automation, robotics and mechatronics. The research included the Czech Klastř Mechatronika, which was established in 2011, and the Slovak AT+R Cluster, which was established in 2010.

Table 9 shows that, according to the ROE indicator, both Czech and Slovak businesses achieved accounting profitability in the years under review. In the case of Klastř Mechatronika, the median of the EVA indicator was also positive throughout the period under review. It can thus be concluded that the owners' wealth grew, because businesses increased the value of their capital more than the level of their costs. By contrast, in the case of the AT+R Cluster, economic profitability – expressed by the EVA indicator – was negative, with the exception of 2014 – 2015.

Tables 9 and 10 show that, with the exception of ROE, the Czech CO had slightly better values for financial performance indicators throughout the whole time period.

Table 9

**Medians of ROA, ROE and ROS Financial Performance Indicators for Industrial Automation and Robotics**

Year	ROA		ROE		ROS	
	SK	CZ	SK	CZ	SK	CZ
2013	0.0355	0.0347	0.0956	0.1246	0.0318	0.0281
2014	0.0669	0.1379	0.1487	0.2347	0.0527	0.1159
2015	0.0736	0.0270	0.2579	0.1216	0.0654	0.0712
2016	0.0180	0.0516	0.1482	0.1378	0.0102	0.0590
2017	0.0307	0.0445	0.1128	0.1099	0.0155	0.0493

Source: Prepared by the author.

Table 10

**Medians of EVA Financial Performance Indicators for Industrial Automation and Robotics**

Year	EVA		EVA/employees		EVA/sales	
	SK	CZ	SK	CZ	SK	CZ
2013	-369.17	929.06	-20.07	13.87	-0.0180	0.0058
2014	673.84	8,626.95	25.37	99.06	0.0139	0.0519
2015	803.11	56.11	10.98	11.22	0.0048	0.0083
2016	-2,298.76	355.14	-62.57	5.46	-0.0481	0.0099
2017	-1,472.99	196.81	-26.30	2.85	-0.0134	0.0055

Source: Prepared by the author.

Table 11

**Wilcoxon's W-test and P-values for Industrial Automation and Robotics**

Year	ROA		ROE		ROS	
	W	P-value	W	P-value	W	P-value
2013	31	1.0000	29	0.8323	24	0.4587
2014	41	0.3408	39	0.4587	48	0.0903*
2015	24	0.4587	31	1.0000	33	0.9157
2016	40	0.3971	34	0.8323	41	0.3408
2017	36	0.6720	33	0.9157	34	0.8323

Note: P-value < 0.1\*.

Source: Prepared by the author.

Table 12

**Wilcoxon's W-test and P-values for Industrial Automation and Robotics**

Year	EVA		EVA/employees		EVA/sales	
	W	P-value	W	P-value	W	P-value
2013	42	0.2898	37	0.5966	30	0.9157
2014	49	0.0719*	45	0.1688	42	0.2898
2015	32	1.0000	34	0.8323	35	0.7508
2016	47	0.1123	43	0.2443	43	0.2443
2017	51	0.0443**	50	0.0567*	46	0.1384

Note: P-value < 0.05\*\*, P-value < 0.1\*.

Source: Prepared by the author.

Tables 11 and 12 show that while there were some differences between the financial performances of the member businesses of the two COs, these were not statistically significant, with three isolated exceptions in 2014 and 2017. In terms of economic value added, the greatest difference in financial performance (in 2017, the P-value was even lower than 5%) was confirmed in 2014 and 2017, when owners' wealth in the Klastř Mechatronika cluster grew. Also, the productivity indicator showed more favourable values for the Czech CO in 2017. At the same time, however, it could not be proven that the financial performance of the Czech CO in the area of industrial automation, robotics and mechatronics was significantly better than that of the Slovak CO in any of the other years under review.

### **Information Technology**

The last pair of COs to be examined were clusters in the IT industry. Established in 2007, the Košice IT Valley cluster was selected to represent the conditions existing in Slovakia. As of 1 April 2020, there were two COs operating in this industry in the Czech Republic (the IT Cluster, which was established in 2006, and the Czech IT Cluster, which was established in 2010). Both Czech COs were included in the research.

The first pair of COs to be compared were Košice IT Valley and IT Cluster. Table 13 shows that, according to ROE, both Czech and Slovak businesses achieved accounting profitability in the years under review. In terms of profitability – expressed by the EVA indicator – the Košice IT Valley cluster performed better, as it was also positive throughout the period under review, except for 2017. By contrast, in the case of the IT Cluster (CZ), profitability – expressed by the EVA indicator – was negative, except at the beginning of the period under review.

Tables 13 and 14 show that the Slovak Košice IT Valley cluster achieved slightly better values for all financial performance indicators in most years.

Table 13

#### **Medians of ROA, ROE and ROS Financial Performance Indicators for IT**

Year	ROA		ROE		ROS	
	SK	CZ	SK	CZ	SK	CZ
2013	0.0789	0.0927	0.1643	0.1991	0.0396	0.0741
2014	0.0806	0.0576	0.2303	0.1957	0.0525	0.0438
2015	0.0925	0.0544	0.2021	0.1540	0.0588	0.0397
2016	0.0968	0.0368	0.2755	0.1103	0.0520	0.0311
2017	0.0597	0.0425	0.1598	0.1748	0.0321	0.0431

Source: Prepared by the author.

Table 14

**Medians of EVA Financial Performance Indicators for IT**

Year	EVA		EVA/employees		EVA/sales	
	SK	CZ	SK	CZ	SK	CZ
2013	22.28	553.89	1.49	26.99	0.0015	0.0238
2014	602.90	639.16	23.36	18.51	0.0062	-0.0069
2015	1,289.39	-1,731.86	33.36	-27.25	0.0232	-0.0092
2016	100.39	-900.87	4.56	-19.87	0.0013	-0.0099
2017	-676.71	-510.39	-27.23	-15.77	-0.0053	-0.0085

Source: Prepared by the author.

Table 15

**Wilcoxon's W-test and P-values for IT**

Year	ROA		ROE		ROS	
	W	P-value	W	P-value	W	P-value
2013	104	0.3530	103	0.3796	118	0.1027
2014	75	0.6334	84	0.9800	87	0.9400
2015	73	0.5637	76	0.6695	76	0.6695
2016	63	0.2804	63	0.2804	66	0.3530
2017	85	0.9800	95	0.6334	91	0.7824

Source: Prepared by the author.

Table 16

**Wilcoxon's W-test and P-values for IT**

Indicator	EVA		EVA/employees		EVA/sales	
	W	P-value	W	P-value	W	P-value
2013	108	0.2586	107	0.2804	116	0.1257
2014	76	0.6695	86	0.9800	74	0.5981
2015	58	0.1833	63	0.2804	64	0.3033
2016	72	0.5303	74	0.5981	70	0.4666
2017	96	0.5981	103	0.3796	97	0.5637

Source: Prepared by the author.

Tables 15 and 16 show that while there were some differences between the financial performance of the member businesses of the Košice IT Valley cluster (SK) and the IT Cluster (CZ), these were not statistically significant at a 10% significance level. At the same time, however, it was not possible to prove that the financial performance of the Czech CO was significantly better than that of the Slovak CO in any of the years under review.

The second pair of COs to be compared were the Košice IT Valley and the Czech IT Cluster. Table 17 shows that, according to ROE, both Czech and Slovak businesses achieved accounting profitability in the years under review. In terms of profitability – expressed by the EVA indicator – the Košice IT Valley cluster performed better yet again, as it was also positive throughout the period under review, except for 2017. By contrast, in the case of the Czech IT Cluster

(CZ), profitability – expressed by the EVA indicator – was negative throughout the period under review.

Table 17

**Medians of ROA, ROE and ROS Financial Performance Indicators for IT**

Year	ROA		ROE		ROS	
	SK	CZ	SK	CZ	SK	CZ
2013	0.0789	0.0302	0.1643	0.0863	0.0396	0.0256
2014	0.0806	0.0209	0.2303	0.0808	0.0525	0.0234
2015	0.0925	0.0137	0.2021	0.0351	0.0588	0.0064
2016	0.0968	0.0194	0.2755	0.0484	0.0520	0.0214
2017	0.0597	0.0442	0.1598	0.1102	0.0321	0.0686

Source: Prepared by the author.

Table 18

**Medians of EVA Financial Performance Indicators for IT**

Year	EVA		EVA/employees		EVA/sales	
	SK	CZ	SK	CZ	SK	CZ
2013	22.28	-698.62	1.49	-60.60	0.0015	-0.0086
2014	602.90	-303.75	23.36	-70.56	0.0062	-0.0145
2015	1,289.39	-837.44	33.36	-111.32	0.0232	-0.0242
2016	100.39	-618.97	4.56	-47.93	0.0013	-0.0188
2017	-676.71	-272.23	-27.23	-25.41	-0.0053	-0.0064

Source: Prepared by the author.

Table 19

**Wilcoxon's W-test and P-values for IT**

Year	ROA		ROE		ROS	
	W	P-value	W	P-value	W	P-value
2013	71	0.1026	60	0.0364**	98	0.6155
2014	73	0.1215	54	0.0191**	101	0.7064
2015	54	0.0191**	44	0.0057**	82	0.2413
2016	71	0.1026	56	0.0238**	97	0.5864
2017	107	0.9001	95	0.5301	126	0.5301

Note: P-value < 0.05\*\*.

Source: Prepared by the author.

Table 20

**Wilcoxon's W-test and P-values for IT**

Year	EVA		EVA/employees		EVA/sales	
	W	P-value	W	P-value	W	P-value
2013	100	0.6756	79	0.1945	77	0.1672
2014	85	0.2954	87	0.3358	80	0.2093
2015	54	0.0191**	43	0.0050**	44	0.0057**
2016	97	0.5864	83	0.2585	75	0.1430
2017	115	0.8670	110	1.0000	98	0.6155

Note: P-value < 0.05\*\*.

Source: Prepared by the author.



Tables 17 and 18 show that the Slovak Košice IT Valley cluster achieved slightly better values for all financial performance indicators throughout nearly the entire period of time.

Tables 19 and 20 show that there were some differences between the financial performances of the member businesses of the Košice IT Valley cluster and the Czech IT Cluster, especially in the ROE indicator from 2013 to 2016. It can be concluded that, in those years, Slovak member business achieved significantly better equity appreciation than Czech ones. Another exception was 2015, when 5 out of 6 financial performance indicators showed statistical significance. In all these five indicators, the Slovak Košice IT Valley cluster achieved significantly better values. It is also important to note that, in all cases, the P-value was even lower than 5%. At the same time, it was not possible to prove that the financial performance of the Czech CO in IT was significantly better than that of the Slovak CO in any of the other years under review.

#### **4. Discussion**

The research that was conducted in the four selected industries showed that the trends in the financial performance indicators used were similar in both countries in the 2013 – 2017 period. COs reported the lowest values of financial performance indicators mostly in 2013, the highest in 2014 – 2015, with a slight decline in 2017. The time series includes the 2013 – 2014 period, when the Czech economy was recovering from the recession. In 2013, Czech GDP shrank by 0.5% year on year, and in 2014, the Czech economy grew by 2.7% (CZSO, 2020). To some extent, this fact might have affected the economic results of member companies of Czech COs. In contrast, Slovakia only experienced a slowdown in GDP growth in 2013 (1.5% growth). In 2014, the GDP growth rate in Slovakia was 0.1% higher than growth in the Czech Republic (MIT, 2017). By contrast, in 2015 and 2017, the growth rate in the Czech Republic was about 1% higher than in Slovakia. However, the dependence of GDP on various trends in selected financial performance indicators cannot be reliably statistically verified with such a short period of time. The indicative average value of the Spearman correlation coefficient for all CO pairs was 0.635 (indicating a moderate positive correlation), and the lowest P-value of all was 0.0845.

Within the existing support system in the Czech Republic, the establishment and development of COs is financially subsidized mainly from public sources and EU structural funds, but in Slovakia there is no similar comparable high-level support. While in the Czech Republic there is a hypothetical possibility of establishing COs for the purpose of obtaining public support, and some previous

research (Žižka and Pelloneová, 2019) suggested that this is indeed the case, this reason is currently not relevant in Slovakia. However, COs do exist in Slovakia and their members expect positive benefits from their cluster membership. It can thus be assumed that the main motive for the establishment of COs in Slovakia was the actual initiative of business entities in the given economic sector, and it can also be assumed that there is greater motivation for CO activities. In contrast, it can be assumed that the establishment of Czech COs is motivated more by obtaining financial resources and less by cooperating and pursuing CO activities. Despite these significant differences in the level and type of support and the methods of financing, the research shows that while there were some differences between the financial performance of member businesses of the five pairs of selected Czech and Slovak COs, these were generally not statistically significant. It can thus be assumed that these four Slovak Cos – because of their higher motivation for activities – were able to at least catch up with similar Czech COs operating in the same industries, despite inadequate support for clusters at the regional and national levels.

## **Conclusions**

The present research focused on comparing the financial performance of selected COs in the Czech Republic and Slovakia. Thanks to their shared history, the two countries have very similar political, economic and social conditions. On the other hand, the two countries have differing public support for clusters. In the Czech Republic, COs have been able to receive financial support from operational programmes since 2004. Unlike Czech COs, Slovak COs were established mainly on the initiative of the business entities and universities themselves, and not due to the possibility of obtaining state support funds. The trends of financial support for COs are different in the Czech Republic and Slovakia. In addition, the approaches taken to support the establishment and development of COs are also different. It was therefore assumed that the financial performance of member businesses would also be different in the two countries, i.e. that Slovak COs, which were created mainly due to the needs of the members themselves, would achieve better financial performance as a result of their higher motivation. Despite the very close historical ties between the two countries, no similar comparison has been made to date.

Even though the present research did not confirm any major differences in the financial performance for these five pairs of technological COs, this does not necessarily mean that statistically significant differences would not be identified for other pairs of Czech and Slovak COs. Due to the lack of data on COs in

Slovakia, only four Slovak technological COs were included in the research, and these can be classified as elite. Based on these four COs, it is not possible to make generalisations any differences in financial performance between the Czech Republic and Slovakia. The reason is that, to a large extent, these four selected Slovak COs are a positive exception to the way COs work in Slovakia. These four Slovak COs represent Slovakia's very best, and rather than being a benchmark of the success of Slovak clusters, they are an exception to the current level of clusters in Slovakia. Therefore, future research should be focused on comparing other Slovak COs from other industries. A comparison of the financial performance of a larger sample of companies within Slovak COs with companies within Czech COs might identify statistically significant differences when making a financial performance assessment in favour of Czech COs.

The main limitation to the present research was the lack of financial statements by companies in COs in Slovakia. For this reason, the originally high number of Slovak COs dropped to a much lower number. Also, another limitation of the research was the lack of financial statements by Slovak companies in some years; due to the unavailability of financial statements of Slovak companies before 2013, the relatively short period of 2013 – 2017 had to be chosen. It would therefore be useful to extend future research to include the subsequent years 2018 and 2019. However, this would depend on the availability of published financial statements.

## References

- ALBEKOV, A. U. – ANDREEVA, E. U. – VANUSHKINA, V. V. – PILIVANOVA, E. K. (2017): The Regional Cluster Initiatives. *European Research Studies Journal*, 0, No. 1, pp. 234 – 245. DOI: 10.35808/ersj/613.
- ANDERSEN, T. – BJERRE, M. – HANSSON, E. W. (2006): The Cluster Benchmarking Project. [Project Report.] Oslo: Nordic Innovation Centre, 56 pp.
- ARDAL (2019): Vysledky aukcii podľa jednotlivých rokov. [Cit. 13. 02. 2019.] Available at: <<https://www.ardal.sk/sk/statne-cenne-papiere/statne-dlhopisy/vysledky-aukcii-sd/vysledky-aukcii-podla-jednotli>>.
- BRESNAHAN, T. – GAMBARDELLA, A. – SAXENIAN, A. (2001): “Old Economy” Inputs for “New Economy” Outcomes: Cluster Formation in the New Silicon Valleys. *Industrial and Corporate Change*, 10, No. 4, pp. 835 – 860. DOI: 10.1093/icc/10.4.835.
- CASSIDY, E. – DAVIS, CH. – ARTHURS, D. – WOLFE, D. (2005): Measuring Technology Clusters: the National Research Council's Approach. *Journal of New Business Ideas and Trends*, 3, No. 2, pp. 30 – 39.
- CZECHINVEST (2019): Operační program Podnikání a inovace pro konkurenceschopnost. [Cit. 24. 05. 2019.] Available at: <<https://www.czechinvest.org/cz/Sluzby-pro-male-a-stredni-podnikatele/Chcete-dotace/OP-PIK>>.
- CARPINETTI, L. C. R. – GALDAMEZ, E. V. C. – GEROLAMO, M. C. (2008): A Measurement System for Managing Performance of Industrial Clusters. *International Journal of Productivity and Performance Management*, 57, No. 5, pp. 405 – 419. DOI: 10.1108/17410400810881854.

- CZSO (2020): HDP, národní účty. [Cit. 11. 01. 2019.] Available at:  
<[https://www.czso.cz/csu/czso/hdp\\_narodni\\_ucty](https://www.czso.cz/csu/czso/hdp_narodni_ucty)>.
- CVTISR (2021): Dotácie na vedecko-technické služby. [Cit. 22. 04. 2019]. Available at:  
<<https://www.vedatechnika.sk/SK/dotacieVTsluzby/Stranky/default.aspx>>.
- DAMODARAN, A. (2019): Archived Data – Levered and Unlevered Betas by Industry. [Cit. 11. 01. 2019.] Available at:  
<[http://pages.stern.nyu.edu/~adamodar/New\\_Home\\_Page/dataarchived.html](http://pages.stern.nyu.edu/~adamodar/New_Home_Page/dataarchived.html)>.
- DELGADO, M. – PORTER, M. E. – STERN, S. (2014): Clusters, Convergence, and Economic Performance. *Research Policy*, 43, No. 10, pp. 1785 – 1799.  
DOI: 10.1016/j.respol.2014.05.007.
- DELGADO, M. – PORTER, M. E. – STERN, S. (2016): Defining Clusters of Related Industries. *Journal of Economic Geography*, 16, No. 1, pp. 1 – 38. DOI: 10.1093/jeg/lbv017.
- DTI (2002): A Practical Guide to Cluster Development. A Report to the Department of Trade and Industry and the English RDAs. [Report.] Birmingham: Ecotec Research & Consulting, 79 pp.
- ENRIGHT, M. J. (2003): Regional Clusters: What We Know and What We Should Know. In: BRÖCKER, J., DOHSE, D. and SOLTWEDEL, R. (eds): *Innovation Clusters and Interregional Competition*. Berlin: Springer, pp. 99 – 129.
- ESTÉLYIOVÁ, K. – KORÁB, V. (2010): Síťová spolupráce malých a středních firem v Jihomoravském kraji. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 58, No. 3, pp. 41 – 54. DOI: 10.11118/actaun201058030041.
- GÜRELLIER, Ö. (2010): Design of a Performance Measurement Model for Industrial Clusters in Turkey. [MSc Theses.] Çankaya: Graduate School of Natural and Applied Sciences of Middle East Technical University, Industrial Engineering Department, 169 pp.
- HÁJEK, O. et al.: (2011): Inovace a region: klastry a regionální inovační systém zlínského kraje. *E+M Ekonomie a Management*, 2011, No. 2, pp. 31 – 44.
- HUČKA, M. – KISLINGEROVÁ, E. – MALÝ, M. (2011): Vývojové tendence velkých podniků: podniky v 21. století. Praha: C.H. Beck. ISBN 978-80-7400-198-7.
- JUNGWIRTH, C. – MÜLLER, E. F. (2014): Comparing Top-down and Bottom-Up Cluster Initiatives from a Principal-agent Perspective: What We Can Learn for Designing Governance Regimes. *Schmalenbach Business Review*, 66, No. 3, pp. 357 – 381. DOI: 10.1007/BF03396911.
- KINCAID, B. L. (2005): Competitive Advantage of Clusters within Lesser Developed Countries of the South Pacific: An Empirical Case Study Extending the Porter Diamond Model. [Dissertation.] Ann Arbor: Capella University, 246 pp. ISBN 9780542045240.
- KÖCKER, G. M. – ROSTED, J. (2010): Promoting Cluster Excellence, Measuring and Benchmarking the Quality of Cluster Organisations and Performance of Clusters. [Discussion Papers.] Berlin: VDI/VDE Innovation + Technik GmbH, FORA Danish Enterprise and Construction Authority, 101 pp.
- KUAH, A. T. H. (2002): Cluster Theory and Practice: Advantages for the Small Business Locating in a Vibrant Cluster. *Journal of Research in Marketing and Entrepreneurship*, 4, No. 3, pp. 206 – 228. DOI: 10.1108/14715200280001472.
- LITTOVÁ, V. (2014): Klastrová iniciatíva ako nástroj zvyšovania efektivity a prosperity podnikov regiónu Liptov. In: *Management Challenges in the 21<sup>st</sup> Century*. [Proceedings.] Bratislava: School of Management, pp. 129 – 138.
- MAREŠOVÁ, P. – JAŠÍKOVÁ, V. – BUREŠ, V. (2014): Multi-criteria Model for Evaluation of Cluster Initiatives: the Comparative Case Study. *Procedia – Social and Behavioral Sciences*, 2014, No. 109, pp. 1242 – 1246.
- MARSHALL, A. (1920): *Principles of Economics*. London: Macmillan. ISBN 1-57392-140-8.
- MARTIN, R. – SUNLEY, P. (2003): Deconstructing Clusters: Chaotic Concept or Policy Panacea? *Journal of Economic Geography*, 3, No. 1, pp. 5 – 35. DOI: 10.1093/jeg/3.1.5.
- MFSR (2017): Štátna pomoc. [Cit. 13. 02. 2019.] Available at:  
<<http://www.statnapomoc.sk/?p=666>>.

- MIT (2017): Finanční analýza podnikové sféry za rok 2017. [Cit. 17. 12. 2017.] Available at: <<https://www.mpo.cz/cz/rozcestnik/analyticke-materialy-a-statistiky/analyticke-materialy/financni-analyza-podnikove-sfery-za-rok-2017--237570/>>.
- MVSR (2019): Operačný program Výskum a inovácie 2014 – 2020. [Cit. 13. 05. 2019.] Available at: <<https://www.minv.sk/?operacny-program-vyskum-a-inovacie>>.
- NISHIMURA, J. – OKAMURO, H. (2011): Subsidy and Networking: The Effects of Direct and Indirect Support Programs of the Cluster Policy. *Research Policy*, 40, No. 5, pp. 714 – 727. DOI: 10.1016/j.respol.2011.01.011.
- PAVELKOVÁ, D. et al. (2009): *Klustry a jejich vliv na výkonnost firem*. Praha: Grada Publishing. ISBN 978-80-247-2689-2.
- PORTER, M. E. (1998a): *The Competitive Advantage of Nations: With a New Introduction*. New York: Free Press. ISBN 06-848-4147-9.
- PORTER, M. E. (1998b): Clusters and the New Economics of Competition. *Harvard Business Review*, 76, No. 6, pp. 77 – 90.
- ROTHGANG, M. – LAGEMAN, B. (2016): Evaluating Cluster Initiatives: Agency, Organisation, Functionality, Performance. *Fteval Journal for Science and Technology Policy Evaluation*, 2016, No. 41, pp 25 – 34.
- SCHMIEDEBERG, C. (2010): Evaluation of Cluster Policy: A Methodological Overview. *Evaluation*, 16, No. 4, pp. 389 – 412. DOI: 10.1177/1356389010381184.
- SIMMIE, J. – SENNET, J. (1999): *Innovation in the London Metropolitan Region. Innovative Clusters and Competitive Cities in the UK and Europe*. [Working Paper, No. 182.] Oxford: Brookes School of Planning.
- SÖLVELL, Ö. – LINDQVIST, G. – KETELS, CH. H. M. (2003): *The Cluster Initiative Greenbook*. Sweden: Ivory Tower. ISBN 91-974-7831-8.
- SÖLVELL, Ö. (2009): *Cluster: Balancing Evolutionary and Constructive Forces*. Stockholm: Ivory Tower Publishers. ISBN 9197478334.
- SWANN, G. M. P. – PREVEZER, M. – STOUT, D. (1998): *The Dynamics of Industrial Clustering: International Comparisons in Computing and Biotechnology*. Oxford: Oxford University Press. ISBN 0198289596.
- VAAN, M. D. – BOSCHAMA, R. – FRENKEN, K. (2013): Clustering and Firm Performance in Project-based Industries: The Case of the Global Video Game Industry, 1972 – 2007. *Journal of Economic Geography*, 13, No. 6, pp. 965 – 991. DOI: 10.1093/jeg/lbs038.
- ŽIŽKA, M. – PELLONEOVÁ, N. (2019): Do Clusters with Public Support Perform Better? Case Study of Czech Cluster Organizations. *Administratie si Management Public*, 17, No. 33, pp. 20 – 33. DOI: 10.24818/amp/2019.33-02.