

# Regional Disparities of Small and Medium Enterprises in Slovakia

**Jarmila Lazíková<sup>1</sup>, Anna Bandlerová<sup>1</sup>, Oľga Roháčiková<sup>2</sup>, Pavol Schwarcz<sup>3</sup>, Ľubica Rumanovská<sup>3</sup>**

<sup>1</sup> Slovak University of Agriculture in Nitra, Department of Law, Tr. A. hlinku 2, 949 76 Nitra, Slovakia, jarmila.lazikova@uniag.sk, anna.bandlerova@uniag.sk

<sup>2</sup> Slovak University of Agriculture in Nitra, Department of Public Administration, Tr. A. hlinku 2, 949 76 Nitra, Slovakia, olga.rohacikova@uniag.sk

<sup>3</sup> Slovak University of Agriculture in Nitra, Department of EU Policies, Tr. A. hlinku 2, 949 76 Nitra, Slovakia, pavol.schwarcz@uniag.sk, lubica.rumanovska@uniag.sk

---

*Abstract: Small and medium enterprises are mostly considered as key elements of a market economy. Their share is 99% of a total number of all enterprises in Slovakia on average. The aim of the paper is to identify regional disparities of the SMEs development in Slovakia. As methods, we used chain indexes to compare the changes among numbers of small, medium and large enterprises, time series analysis, non-parametric method for investigation of the statistically significant differences and correlation analysis. According to the results we expect increasing numbers of SMEs in Slovakia in the next four years, mainly an increasing of small enterprises. The development of SMEs is very different in particular regions of Slovakia. The number of enterprises in remote rural areas grow less rapidly than the number of those in more accessible rural areas of Slovakia. The strong correlation between SMEs and large enterprises indicates suitable conditions for doing business in rural areas for SMEs as well as for large enterprises. The support policy of SMEs should be more intensive, especially in the rural areas that are not suitable for a large scale business.*

*Keywords: small and medium enterprises; regional disparities; forecasting; rural areas*

---

## 1 Introduction

Micro, small and medium enterprises are the engine of the European economy [14, 32, 48]. Small and medium enterprises (SMEs) as a part of each market – oriented economy add flexibility, competitiveness and innovation activities into the market environment and contribute to the overall regional development [37].

They are able to fulfill the gaps in the market which cannot be covered by large enterprises due to their robustness [19]. SMEs are an important element of market economy, job opportunities, added value or foreign trade [17, 41] and essential presumption for the stable progress of a country [20]. They are an essential source of jobs, create entrepreneurial spirit and innovation in the EU and are thus crucial for fostering competitiveness and employment [28, 29, 36]. SMEs are still an issue that is interesting to study because it is recognized that small enterprises have a major role in the employment and contribution to the gross domestic product [35, 45]. Therefore, the support of SMEs development is one of the political priorities of countries and supranational organisations (such as the European Union). It is, probably, the reason why many scientific papers, studies and reports are oriented on the factors that improve the success of the SMEs in the market [13, 24, 46, 47]. There are usually identified external and internal factors with the regard to the success of SMEs. As for the external factors, there are studied macroeconomic, political, legal, social, technological and demographic factors and competitive environment, as well [3, 4, 5, 10, 21, 31]. As for the internal factors, there are considered business experiences and the motivation of the owners/managers will be able to manage the organization [35], knowledge management [15], firm size and age of the business [25, 27], marketing of their products, qualification of employees in the marketing department, finance to undertake marketing research [34], lack of infrastructure [8], lack of innovativeness [18, 35, 39, 42], location and human capital [11, 25]. Storey [37] suggests that the location of a small business is a factor, which influences its performance because the bulk of sales of small enterprises are too highly localised markets. Dahlqvist, et al. [12] added that the geographic area, where a firm is located, has implications for its access to markets and resources such as: finance, skilled labour, subcontractors, infrastructure, and other facilities. Enterprises located in urban and commercial areas were more likely to survive, during a given year, than those located in rural areas [25]. However, Keeble [23] suggests that, whilst on balance rural enterprises may grow more rapidly than their urban counterparts; enterprises in remote rural areas in the United Kingdom grow less rapidly than those in more accessible rural areas.

## **2 Material and Methods**

The aim of the paper is to evaluate the impact of the location on the SMEs development in Slovakia and to confirm or refuse the above mentioned findings on location of SMEs in the Slovak environment. Slovakia is a rural country, only the Bratislava region is considered as urban area, all other regions are classified as rural or semi-rural counties. For this purpose we tried to identify the most attractive regions for SMEs. Moreover, we compare the trend development in the regions with the average trend given by the whole country as well. For this

purpose we need to identify the SMEs; unfortunately, there is no single definition and the criteria are different in various political and legal documents. So, firstly, we need to define SMEs for the purpose of this paper. Therefore, the paper is organised as follows: The first chapter introduces the various notions of SMEs and explains what is considered as a SME for our further analysis. The second chapter describes the current state and the development of SMEs during the period of 1996-2015 in Slovakia and provides a forecasting for the next four years. The third chapter identifies the most attractive regions for SMEs and regional disparities of the SME development in urban, rural and semi-rural areas using the time series and cross-sectional data as well. The last chapter provides discussion on the results of the above-mentioned issues.

The data about SMEs was received from the published data of the Statistical Office of the Slovak Republic for particular regions (NUTS III) and counties (LAU 1) for a period of 1996-2015 (the starting year is the year of the new administrative zoning of Slovakia that is used in the analysis, the last year is the year of the newest data at the time of the paper submission).

As methods, we used chain indexes to compare the changes among numbers of small, medium and large enterprises, time series analysis to provide forecasts by Statistical Analytical System (SAS), non-parametric method for investigation of the statistically significant differences and correlation analysis.

Chain index is an index number, in which, the value of any given period is related to the value of its immediately preceding period as described Pacáková [31].

For non-parametric testing, the Kruskal-Wallis test was used characterised as follows:

$$H = \left( \frac{12}{N(N+1)} \sum_{j=1}^k \frac{R_j^2}{n_j} \right) - 3(N+1) \quad (1)$$

H – Kruskal – Wallis test characteristics

N – total number of counties (all regions combined)

R<sub>j</sub> – rank total for each region

n<sub>j</sub> – number of counties in each above mentioned region

k – number of regions

For time series analysis, we used the linear trend with auto-regressive errors for forecasting of SMEs, the combination of 4 models (log linear trend with auto-regressive errors, Winters method additive and multiplicative, and linear (Holt) exponential smoothing) for forecasting of small enterprises; and combination of two models (linear trend with auto-regressive errors and log linear trend with auto-regressive errors) for forecasting of medium enterprises. The models are described in various publications [2, 9, 37].

Linear trend with auto-regressive errors calculated as follows:

$$y_t = b_0 + b_1 t + \varepsilon_t \quad (2)$$

$$\varepsilon_t = \delta \cdot x_{t-1} + u_t \quad (3)$$

where  $b = (b_0, b_1)$  is a vector parameter and  $\{\varepsilon_t\}$  represents the auto-regressive errors.

Log – linear trend with auto-regressive errors, in which the dependent variable changes at an exponential rate over time or constant growth at a particular rate calculated as follows:

$$\ln(y_t) = b_0 + b_1 t + \varepsilon_t \quad (4)$$

$$\varepsilon_t = \delta \cdot x_{t-1} + u_t \quad (5)$$

where  $b = (b_0, b_1)$  is a vector parameter and  $\{\varepsilon_t\}$  represents the auto-regressive errors.

Linear (Holt) exponential smoothing calculated as follows:

$$\hat{y}_{t+1} = u_t + v_t \quad (6)$$

$$u_t = \alpha \cdot y_t + (1 - \alpha)(u_{t-1} + v_{t-1}) \quad (7)$$

$$v_t = \beta \cdot (u_t - u_{t-1}) + (1 - \beta)v_{t-1} \quad (8)$$

$$u_1 = y_1 \quad (9)$$

$$v_1 = 0 \quad (10)$$

$$0 < \alpha \leq 1 \quad (11)$$

$$0 \leq \beta \leq 1 \quad (12)$$

Winters method additive calculated as follows:

$$y_t = (\beta_0 + \beta_1 t) + s_t + \varepsilon_t \quad (13)$$

Winters method multiplicative calculated as follows:

$$y_t = (\beta_0 + \beta_1 t) \times s_t \times \varepsilon_t \quad (14)$$

where  $s_t$  is seasonal pattern and  $\varepsilon_t$  is irregular component.

To quantify the association between the small, medium and large enterprises, we used the correlation analysis. We used the Pearson correlation coefficient calculated as follows:

$$r_{xy} = \frac{\text{COV}(x, y)}{\sqrt{s_x^2 s_y^2}} \quad (15)$$

where  $\text{cov}(x, y)$  is covariance of two variables in a data set and  $s_x^2$ ,  $s_y^2$  are variances of  $x$  and  $y$  as described Pacáková [31].

## 3 Results

### 3.1 Notion of SMEs

There is still no universally accepted definition what small and medium enterprises are. In scientific papers, international legal binding or non-binding documents or political documents, many definitions of SMEs are included, but they differ from one another. We can find the definitions of SMEs based on two approaches; qualitative and quantitative ones. Bolton report [7] defines three qualitative criteria of SMEs: management of firm by its owner(s) in a personalized manner, relatively small share of the market in economic terms, independence in the sense that it does not form a part of a larger enterprise is relatively free from outside control in its principal decisions. Marwede [27] regards legal form, the role of the firm owner, the firm's position on the market, organizational structure and economic and legal autonomy. Loecher [26] deals with the qualitative measures such as personal principle, unity of leadership and capital. Despite the volume of SME definitions, there is a tendency to accept quantitative criteria, first and foremost the headcount or employee number criterion as the main determinant in categorizing SMEs [6]. Ardic, Mylenko and Saltane [1] confirm in their cross-country analysis that the most common definitions used by regulators are based on the number of employees, sales and/or loan size. The most common among the three is the number-of-employees criterion. Within the World Bank Group, IFC and MIGA have official definitions but also define SMEs in other ways. IFC and MIGA formally define SMEs as fulfilling two of three criteria: (1) having more than 10 and fewer than 300 employees; (2) having between 100 000 and 15 million dollars in sales; (3) having between 100 000 and 15 million dollars in assets [40]. The enterprises under the above-mentioned minimum level are considered as micro enterprises. The SME definition has been developing also in the legal acts of the European Union. The first definition was incorporated in the article 11 of Fourth Council Directive 78/660/EEC on the annual accounts of certain types of companies.<sup>1</sup> It permits some exemptions from the detailed annual accounts for companies, which on their balance sheet dates do not exceed the limits of two of the three following criteria: (1) balance sheet total; (2) net

---

<sup>1</sup> Fourth Council Directive 78/660/EEC of 25 July 1978 based on Article 54 (3) (g) of the Treaty on the annual accounts of certain types of companies (OJ L 222, 14.8.1978, pp. 11-31)

turnover; (3) average number of employees during the financial year. The first two criteria were changed five times but the number of employees is stable over the time. The overview is presented in the Table 1.

Table 1  
Overview of the changes in the financial criteria of SME definition in EU directives

	Directive 78/660/EC	Directive 94/8/EC <sup>2</sup>	Directive 1999/60/EC <sup>3</sup>	Directive 2003/38/EC <sup>4</sup>	Directive 2006/46/EC <sup>5</sup> and Directive 2012/6/EU <sup>6</sup>	Directive 2013/34/EC <sup>7</sup>
<b>Micro-enterprises</b>						
Balance sheet total EUR	-	-	-	-	350 000	350 000
Net turnover EUR	-	-	-	-	700 000	700 000
Average number of employees per year	-	-	-	-	10	10

<sup>2</sup> Council Directive 94/8/EC of 21 March 1994 amending Directive 78/660/EEC as regards the revision of amounts expressed in ecus (OJ L 82, 25.3.1994, pp. 33-34)

<sup>3</sup> Council Directive 1999/60/EC of 17 June 1999 amending Directive 78/660/EEC as regards to amounts expressed in ecus (OJ L 162, 26.6.1999, pp. 65-66)

<sup>4</sup> Council Directive 2003/38/EC of 13 May 2003 amending Directive 78/660/EEC on the annual accounts of certain types of companies as regards to amounts expressed in euro (OJ L 120, 15.5.2003, pp. 22-23)

<sup>5</sup> Directive 2006/46/EC of the European Parliament and of the Council of 14 June 2006 amending Council Directives 78/660/EEC on the annual accounts of certain types of companies, 83/349/EEC on consolidated accounts, 86/635/EEC on the annual accounts and consolidated accounts of banks and other financial institutions and 91/674/EEC on the annual accounts and consolidated accounts of insurance enterprises (Text with EEA relevance) (OJ L 224, 16.8.2006, pp. 1-7)

<sup>6</sup> Directive 2012/6/EU of the European Parliament and of the Council of 14 March 2012 amending Council Directive 78/660/EEC on the annual accounts of certain types of companies as regards micro-entities (OJ L 81, 21.3.2012, pp. 3-6)

<sup>7</sup> Directive 2013/34/EU of the European Parliament and of the Council of 26 June 2013 on the annual financial statements, consolidated financial statements and related reports of certain types of enterprises, amending Directive 2006/43/EC of the European Parliament and of the Council and repealing Council Directives 78/660/EEC and 83/349/EEC Text with EEA relevance (OJ L 182, 29.6.2013, pp. 19-76)

<b>Small enterprises</b>						
Balance sheet total EUR (EUA, <sup>8</sup> ECU <sup>9</sup> )	1 000 000	2 500 000	3 125 000	3 650 000	4 400 000	4 000 000
Net turnover EUR (EUA, ECU)	2 000 000	5 000 000	6 250 000	7 300 000	8 800 000	8 000 000
Average number of employees per year	50	50	50	50	50	50
<b>Medium enterprises</b>						
Balance sheet total EUR (EUA, ECU)	4 000 000	10 000 000	12 500 000	14 600 000	17 500 000	20 000 000
Net turnover EUR (EUA, ECU)	8 000 000	20 000 000	25 000 000	29 200 000	35 000 000	40 000 000
Average number of employees per year	250	250	250	250	250	250

This definition is used only for the purpose of this directive on the annual accounts of certain types of companies and its amendments. Regardless of this limited use, the changes were very often. Moreover, the European Commission adopted two recommendations that define SMEs. The indicators are the same as in the above-mentioned directives but the highest levels were changed again. In 1996, the recommendation of EC<sup>10</sup> established the first common SME definition mainly for the purposes of the implementation of various Community policies. The definition could be used in general for various purposes, but a recommendation compared to a directive is not a legally binding act. It is binding

<sup>8</sup> according to the Fourth Council Directive 78/660/EEC of 25 July 1978 based on Article 54 (3) (g) of the Treaty on the annual accounts of certain types of companies (OJ L 222, 14.8.1978, pp. 11-31)

<sup>9</sup> according to the Council Directive 94/8/EC of 21 March 1994 amending Directive 78/660/EEC as regards to the revision of amounts expressed in ecus (OJ L 82, 25.3.1994, pp. 33-34)

<sup>10</sup> Commission Recommendation 96/280/EC of 3 April 1996 concerning the definition of small and medium enterprises (Text with EEA relevance) (Official Journal L 107, pp. 4-9)

for the European institutions, but it is only voluntary for individual Member States. According to the recommendation a small enterprise has fewer than 50 employees and has either, an annual turnover not exceeding ECU 7 million, or an annual balance-sheet total not exceeding ECU 5 million. A medium enterprise has fewer than 250 employees, and either, an annual turnover not exceeding ECU 40 million, or an annual balance-sheet total not exceeding ECU 27 million. In 2003, the European Commission adopted a new recommendation<sup>11</sup> because of the need to adapt it to economic developments. It entered into force on January 1, 2005 and applies to all EU policies, programmes and measures for SMEs. Article 2 of the Annex of this recommendation defines a microenterprise as an enterprise which employs fewer than 10 people and an annual turnover and/or annual balance sheet total of which does not exceed EUR 2 million; a small enterprise as an enterprise which employs fewer than 50 people and an annual turnover and/or annual balance sheet total of which does not exceed EUR 10 million; a medium enterprise is made up of enterprises which employ fewer than 250 people with an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million. According to the overview of the above-mentioned changes only within the EU legal acts we can state that the number of employees is the most stable criterion. However, Curran and Blackburn [11] point out that the definition of SMEs by number of employees has become difficult due to part-time work, casual work or temporary work becoming more widely used by employers. Gibson and Vaart [16] consider the criterion of turnover as the most consistent of the three quantitative criteria. On the other hand, the financial criteria are changed relatively often and then, it is impossible to use permanently changing statistical data for a mathematical-statistical analysis mainly for the time series analysis. Precisely, product of these definitions is the definition of SMEs legitimized by the European Union and, which is used by most of the researchers [6]. Therefore, we regard in further analysis the SMEs by number of employees as provided by the Statistical Office of Slovakia. Small enterprises are considered as enterprises with the number of employees within the range 0 to 49; medium enterprises within the range of employees 50 to 250 and large enterprises have 250 employees or more.

### **3.2 Development of SMEs in Slovakia**

SMEs represent 99% of all enterprises in the European Union [14]. It is also the case of Slovakia, where the share of SMEs is on average 99.85% during the period of 1996-2015. Out of it, the share of small enterprises is on average 99.31% of a total number of SMEs and the share of medium enterprises in Slovakia is quite negligible (only 0.69% on average). The development of SMEs was more

---

<sup>11</sup>Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium enterprises (Text with EEA relevance) (notified under document number C(2003) 1422) (Ú. v. EÚ L 124, 20.5.2003, s. 36-41)



intensive after the accession of Slovakia in the European Union in 2004. The number of SMEs was increasing when the economic crisis broke out. Since 2008, the number of SMEs is quite stable without important changes until today (Figure 1).

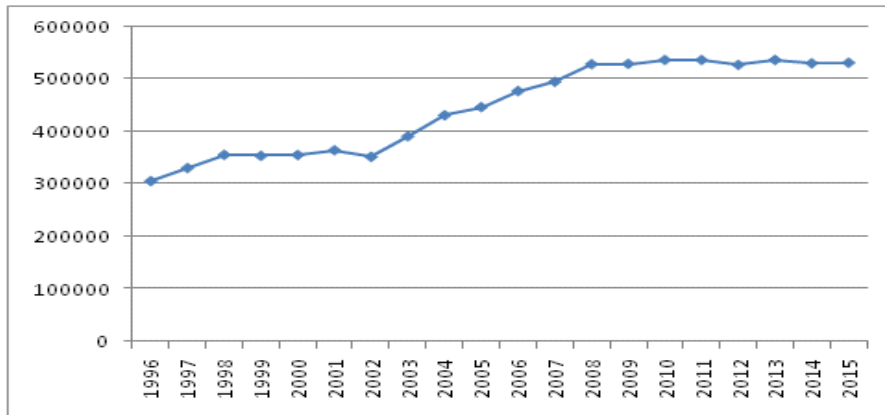


Figure 1

Development of SMEs 1996–2015 in Slovakia

The comparison of the development of small, medium-sized and large enterprises is only possible according to the chain indexes. The absolute numbers of enterprises are not comparable because of a high share (99%) of small enterprises. The chain indexes are documented in Figure 2. The impact of the economic crisis was reflected in 2009 and 2010 when the highest decreasing was recorded in the number of large enterprises. Small enterprises were the first to recover from the economic crisis. In 2010, they were increasing in number, but medium and large enterprises were still decreasing. The number of these categories of enterprises increased one year later. During the period of 1996–2015, the development of medium and large enterprises was very similar and the fluctuation was higher in numbers than in the number of small numbers. Small enterprises are more able to help in the stabilisation process during the economic recession.

A similar development of medium and large enterprises indicated long-term relation between them. However, no co-integration relations were confirmed (neither between the numbers of large and medium enterprises nor between the numbers of medium and small enterprises). There are no long-term balanced relations among the numbers of all three groups of enterprises. Based on the above mentioned results we can state that the macroeconomic, legal and political changes are able to influence the state and the development of the numbers of these three groups of enterprises in a very different way. The number of large enterprises is more sensitive to these changes than the number of SMEs, mainly the number of small enterprises.

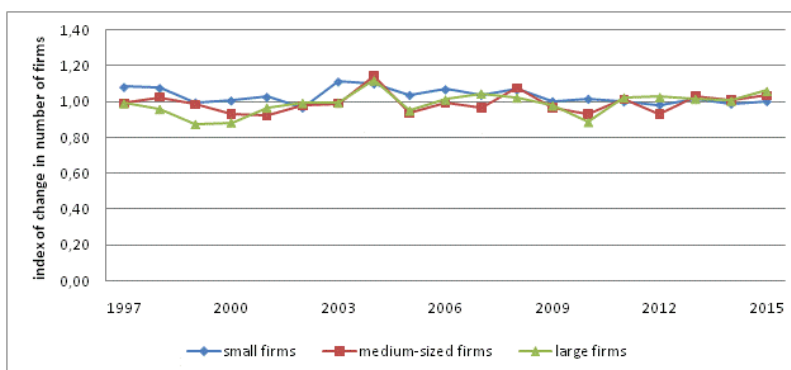


Figure 2

Chain indexes of change in number of enterprises according to their size

After the economic crisis the numbers of SMEs fluctuates around 530,000. The probability of a further trend is proved by the models of time series analysis that enable us to predict the development of the number of SMEs in the next four years. The forecast models were developed by the statistical analytical system (SAS) and the SAS Time Series Forecasting System was used to predict the development of SMEs in Slovakia, given the historical data of the absolute data of the number of SMEs in the period of 1996-2015. We chose three models that predict (1) development of number of SMEs together by the linear trend with auto-regressive errors; (2) development of small enterprises by the combination of 4 models (log linear trend with auto-regressive errors, winters method additive and multiplicative, and linear (Holt) exponential smoothing; (3) development of medium enterprises by the combination of two models (linear trend with auto-regressive errors and log linear trend with auto-regressive errors). The forecasting results are documented in Table 2.

Table 2

Forecast of development of the SMEs in Slovakia based on the historical data

	Year	2016	2017	2018	2019
1 <sup>st</sup> model	Predicted value	549377	573229	602475	631023
	Upper 95% confidence	580357	615491	653968	686162
	Lower 95% confidence	518396	530968	550983	575884
2 <sup>nd</sup> model	Predicted value	543790	560475	577394	594301
	Upper 95% confidence	562181	587218	610093	631652
	Lower 95% confidence	525400	533732	544695	556951
3 <sup>rd</sup> model	Predicted value	2684	2606	2515	2486
	Upper 95% confidence	2870	2799	2707	2686
	Lower 95% confidence	2498	2412	2324	2285

All three models were compared by Mean Absolute Percent Error (MAPE), R-Square, Akaike Information Criterion and Schwarz–Bayssian Information Criterion [9, 2, 37] and the best values of indicators were considered to choose particular model for forecasting of SMEs together and individually. The results are presented in Table 3.

Table 3  
Selected indicators for evaluation of model's quality

Models	MAPE	R-Square	Akaike Criterion	Schwarz Bayssian Criterion
1 <sup>st</sup> model	2,661	0,975	391,912	397,886
2 <sup>nd</sup> model	3,066	0,966	393,594	397,576
3 <sup>rd</sup> model	3,495	0,730	195,191	197,182

MAPE criterion measures the size of the error in percentage terms. The model is acceptable if the MAPE criterion is less than 10. We chose the models with the smallest value of MAPE and all three models have MAPE of about 2-3%, which is acceptable for forecasting. The values of Akaike criterion and Schwarz–Bayssian criterion are useful when comparing more models. In this case, we chose the models with the lowest values for each forecasting. The first and second models have similar values because the small enterprises prevail in the number of SMEs. The R-square characteristic is more than 90% in the case of forecasting of number of SMEs together and forecasting of number of small enterprises. We prefer models according to the highest R-square and the smallest MAPE.

Based on the results of the first model (SMEs together) we can expect an increasing trend of numbers of SMEs in Slovakia. According to this model, the number of SMEs will increase by approx. 100,000 enterprises during the next four years. This model was selected as the best according to the above – mentioned criteria. We assume that it is very optimistic forecasting because of a relatively stable number of SMEs from 2008 until nowadays. Therefore, we separated the number of SMEs enterprises between the small and medium enterprises and did the forecasting again. The second model for small enterprises indicates an increasing trend of the number of small enterprises by approx. 60,000 enterprises. We assume that it is more realistic forecasting than the forecasting in the first model mainly when expecting a decreasing number of medium enterprises. The third model of forecasting of medium-sized enterprises will indicate a decrease by about 300 enterprises. Small enterprises are more adaptive when markets fail while the medium enterprises are more sensitive to political and economic changes, such as the actual migration crisis, preparation of the negotiation process between the EU and the Great Britain on the secession from the EU and the negotiation process between the EU and the USA on the trade agreement. We conclude that the number of SMEs together will indicate an increasing; however, this increasing will be probably a little bit smaller than the forecasting according to the first model.

### 3.3 Development of SMEs in Slovak Regions

The Slovak Republic has eight regions (NUTS III) with various levels of development and living standard. Therefore, we are interested in allocation of SMEs in particular regions of Slovakia. The most developed region of Slovakia is the Bratislava region. The number of SMEs is much higher in this region than in all other regions of Slovakia during the whole selected period of 2000-2015 (on average 47 SMEs per 1 km<sup>2</sup>, minimum 33 per 1 km<sup>2</sup> in 2002 and maximum 60 per 1 km<sup>2</sup> in 2014). All other regions are more comparable considering the number of SMEs per 1 km<sup>2</sup>. The view is provided by Figure 3.

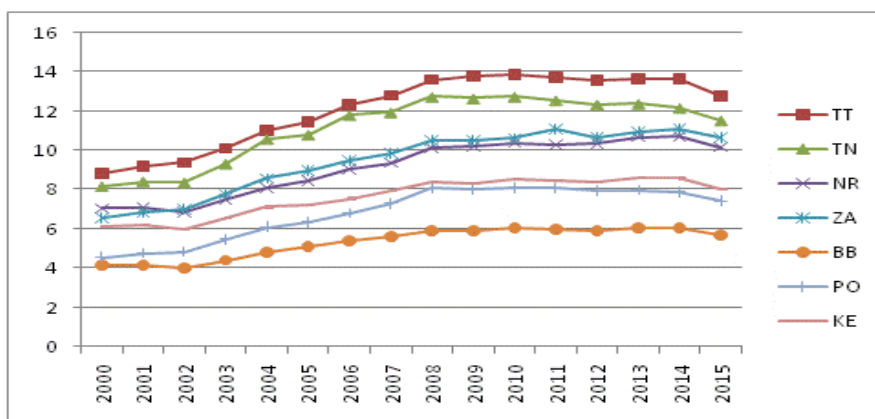


Figure 3

Number of SMEs per 1 km<sup>2</sup> during 2000-2015 in some regions of Slovakia<sup>12</sup>

The development of number of SMEs per 1 km<sup>2</sup> in particular regions has copied the development of number of SMEs in the whole country. The order of the regions has been retained during the period of 2000-2015. We can state that the SME enterprises prefer more developed regions when they decide on the location of their business. There are significant differences between the Bratislava region and all other regions. According to the Programme of rural development for the programming period of 2014-2020, only the Bratislava region is considered as urban region. Other regions of Slovakia are considered as rural (Nitra region, Banská Bystrica region, Prešov region and Trnava region) or semi-rural regions (Trenčín region, Žilina region, Košice region). It confirms the results of Liedholm (2002) that enterprises located in urban and commercial areas are more likely to survive during a given year than those located in rural areas or those being

<sup>12</sup> \* TT – Trnava region, TN – Trenčín region, NR – Nitra region, ZA – Žilina region, BB – Banská Bystrica region, PO – Prešov region, KE – Košice region; BA – Bratislava region needs a separate figure due to data considered as outliers – its data are between 30-60 SMEs per 1 km<sup>2</sup>

operated out of home; urban and commercial location is also associated with faster growth, as measured by the number of employees hired in a given year. However, statistical differences among all other regions are not distinct. Therefore, we use the Kruskal-Wallis test to identify statistically significant differences among the Slovak regions. We used the data on the number of SMEs per 1 km<sup>2</sup> in particular counties (LAU1) of each region in 2015. The total number of observations is the number of counties (79) that are organized in 8 regions (NUTS 3). Due to small number of observations a non-parametric test (Kruskal-Wallis test) was used. Statistically significant differences were defined by the multiple range tests in Statgraphic. If we regard all 79 counties, the Kruskal-Wallis test confirms the statistical significance only between the Bratislava region and the rest of Slovakia; it is not possible to follow the potential statistical differences among other regions. Therefore, we left out the Bratislava region from the observation; the Kruskal-Wallis test confirms the statistical significance only between the Košice region and the rest of Slovakia. In spite of the fact that the Košice region was among the last three regions when comparing their development in the period of 2000-2015 (Figure 3), it was considered as the second best by the Kruskal-Wallis test. In the first case (development in 2000-2015), the number of SMEs per 1 km<sup>2</sup> was distributed on the whole area of the region and the best counties such as Košice I, Košice II, Košice III and Košice IV with the highest number of SMEs were down by the worst counties such as Rožňava and Sobrance with the smallest number of SMEs. In the second case, the number of SMEs per 1 km<sup>2</sup> was considered only for a particular county, so the best counties in the Košice region can use their impact on the results. If we want to consider the potential statistical significance in the regions of Slovakia, we need to leave out the outliers caused by the best counties from the Bratislava region (i.e. Bratislava I-V counties) and the Košice region (i.e. Košice I-IV counties). The number of observations was reduced to 70 counties.

Table 4  
Differences of number of SMEs among regions of Slovakia

Region	Mean	Variance	p-value	K-W test statistic
Bratislava	17,00	68,65	0,00013	29,32
Trnava	12,79	12,19		
Trenčín	11,23	13,37		
Nitra	10,72	19,66		
Žilina	10,77	34,01		
Banská Bystrica	5,89	15,71		
Prešov	6,86	12,27		

Slovak regions; p-value is smaller than 0.05. In addition, according to the multiple range tests, there are statistically significant differences:

- between the Bratislava region and every other region (except the Trnava region and the Trenčín region);

- between the Trnava region and the Prešov, Košice and the Banská Bystrica regions;
- between the Trenčín region and the Prešov, Košice and the Banská Bystrica regions;
- between the Nitra region and the BanskáBystrica and the Košice regions;
- between the Žilina region and the Prešov, Košice and the Banská Bystrica regions.

Table 5  
Multiple Range test results

Region	Count	Homogenous groups			
Košice	7	X			
Banská Bystrica	13	X			
Prešov	13	X	X		
Nitra	7		X	X	
Žilina	11			X	
Trenčín	9			X	X
Trnava	7			X	X

According to the above mentioned classification of rural, semi-rural and urban regions, we can state that there is no significant difference among semi-rural and rural regions regarding the number of SMEs. The counties of the Bratislava region which remain after excluding the most developed counties Bratislava I to V are not considered as urban area any more, only together with Bratislava I to V the data rank these counties as urban ones. We can state that the location is an important factor for SMEs development and urban areas are more appropriate for SMEs enterprises than rural and semi-rural regions. Finally, we regarded the numbers of small, medium and large enterprises in each of the 79 counties of Slovakia and found very strong correlation between the pairs of all three groups of enterprises (Table 6).

Table 6  
Correlation matrix between particular group of enterprises

	Small enterprises	Medium enterprises	Large enterprises
Small enterprises	1		
Medium enterprises	0,895971011	1	
Large enterprises	0,834352581	0,949558998	1

If there are many small enterprises in a particular county, there is also higher number of medium or large enterprises. There is an extremely strong correlation between medium and large enterprises (0.95). We can suppose that the conditions for doing business in a county are suitable for SMEs as well as for large enterprises. The support policy of SMEs should be more intensive especially in the counties that are not very attractive for doing business either.

## 4 Discussion

There is still no universally accepted definition what small and medium enterprises are. The most usual criteria are the financial criteria of turnover, sales or assets and a number of employees. While the limits of the financial criteria are still being changed because of its adaptation to economic development, the number of employees is more stable during the period of time and so more suitable for statistical analysis of the SME development. Therefore, we were able to analyse the development of SMEs in Slovakia from 1996 to 2015. The share of SMEs is on average 99.85% during the period of 1996-2015. Out of it, the share of small enterprises is on average 99.31% of a total number of SMEs and the share of medium enterprises in Slovakia is quite negligible (only 0.69% on average). The development of SMEs during the economic crisis confirms the fact about a higher flexibility of small enterprises which increased in number in 2010 while the number of medium and large enterprises was still decreasing. During the period of 1996-2015, the situation of medium and large enterprises was developed in a very similar way, but it was different from the development of small enterprises. We assume that small enterprises are able to help the stabilisation process during the economic recession more than medium enterprises. It is a question if the support policy of SMEs should not be oriented only on the support of small enterprises because medium enterprises are more similar to large enterprises than to small ones. We had not found any long-term balanced relations among the numbers of all three groups of enterprises. Therefore, we suppose that the macroeconomic, legal and political changes are able to influence the state and development of the quantity of these three groups of enterprises in a very different way. The amount of large enterprises is more sensitive to these changes than the amount of SMEs, mainly the amount of small enterprises. In the future, we expect an increasing of numbers of SMEs in Slovakia (an increasing of small enterprises by app. 60 000 and a decreasing of medium enterprises by app. 300). The medium enterprises are more sensitive to the political and economic changes than the small ones.

The development of SMEs is very different in particular regions (NUTS III) of Slovakia. The most developed region of Slovakia is the Bratislava region. The number of SMEs is much higher in this region than in all other regions of Slovakia. We can state that the SMEs prefer more developed regions when deciding on the location of their business. There are significant differences between the Bratislava region (urban region) and all other regions (semi-rural and rural regions) of Slovakia. The result of Kruskal-Wallis test confirms statistically significant differences among the Slovak regions after excluding the urban areas. We expected the confirmation of the statistically significant differences between rural and semi-rural regions. However, it was not confirmed and the statistically significant differences were measured between the Nitra region (rural region) and the Banská Bystrica region (rural region) as well as between the Nitra region (rural region) and the Košice region (semi-rural region). We conclude that the best

conditions for the SMEs development are indicated in the counties of Bratislava I-V and Košice I-IV. After excluding these counties from the analysis, the best region is still the Bratislava region. The second best are the Trnava region and the Trenčín region. The third place is occupied by the Žilina region and the Nitra region. The Prešov region rank on the fourth place. The least attractive regions for SMEs are the Banská Bystrica region and the Košice region (excluding the counties of Košice I-IV). We can conclude that the number of enterprises in remote rural areas grows less rapidly than the number of those in more accessible rural areas.

Finally, we found a very strong relation between the pairs of the numbers of small, medium and large enterprises in each of 79 counties of Slovakia. We suppose that the conditions for doing business in a county are suitable for SMEs as well as for large enterprises. The support policy of SMEs should be more intensive especially in the counties that are not very attractive for large enterprises either. In spite of the effort to eliminate the divergences among the regions of the EU, there are still rather considerable differences among the regions of a given country, not to mention the differences in the whole EU.

## 5 Conclusions

The share of SMEs was 99.85% during the period of 1996-2015 on average. Out of it, the share of small enterprises was on average 99.31% of a total number of SMEs and the share of medium enterprises in Slovakia was quite negligible. In the future, we expect an increasing trend of numbers of SMEs in Slovakia, mainly an increasing of small enterprises. Medium enterprises are more sensitive to political and economic changes. The development of SMEs is very different in particular regions of Slovakia. The most developed region of Slovakia is the Bratislava region. The number of enterprises in remote rural areas grow less rapidly than the number of those in more accessible rural areas of Slovakia. The conditions for doing business in a county are suitable for SMEs as well as for large enterprises. The support policy of SMEs should be more intensive especially in the counties that are not very attractive for large enterprises. In spite of the efforts to eliminate the divergences among the regions of the EU, there are still rather considerable differences among the regions of Slovakia.

### Acknowledgement

The paper is an output of project P7-INCO-2013-9 Reinforcing cooperation with European Neighbourhood Policy countries on bridging the gap between research and innovation (R2I-ENP), KEGA 001UCM-4/2016 Creating Innovative Study Materials for the newly accredited Programme Management in Public Administration and GA 7/2017 Impact of the supporting mechanisms of CAP on the agricultural land market in Slovakia.



## References

- [1] Ardic, O. P., Mylenko, N., Saltane, V. Small and Medium Enterprises. A cross – Country Analysis with a New Data Set. Policy Research Working Paper. The World Bank, 2011, 32 p.
- [2] Arlt, J., Arltová, M. Economic time series. Praha: Professional Publishing, 2009, 290 p.
- [3] Attahir, Y. Critical success factors for small business: Perceptions of South Pacific entrepreneurs. In: Journal of Small Business Management, 1995, Vol. 33, No. 2, pp. 68-73
- [4] Beck, T. et al. The influence of financial and legal institutions on firm size. Journal of Banking & Finance, 2006, Vol. 30, No. 11, pp. 2995-3015
- [5] Benzing, C. et al. Entrepreneurs in Turkey: A Factor Analysis of Motivations, Success Factors, and Problems. Journal of Small Business Management, 2009, Vol. 47, No. 1, pp. 58-91
- [6] Berisha, G., Pula, J. S. Defining Small and Medium Enterprises: a critical review. Academic Journal of Business, Administration, Law and Social Sciences, 2015, Vol. 1, No. 1, pp. 17-28
- [7] Bolton, J. E. and Committee of Inquiry on Small Enterprises. Small enterprises: report of the Committee of Inquiry on Small Enterprises. London: Her Majesty's Stationary Office, 1971, 435 p.
- [8] Chowdhury, M. S., Alam, Z., Arif, I. Success Factors of Entrepreneurs of Small and Medium Sized Enterprises: Evidence from Bangladesh. Business and Economic Research, 2013, Vol. 3, No. 2, pp. 38-52
- [9] Cipra, T. Analysis of time series. Praha: SNTL, 1986. 248 p.
- [10] Clover, T. A., Darroch, M. A. G. Owners' perceptions of factors that constrain the survival and growth of small, medium and micro agribusiness in Kwazulu-Natal, South Africa. Agrekon, 2005, Vol. 44, No. 2, pp. 238-263
- [11] Cseh Papp, I., Varga, E., Schwarczová L., Hajós, L. Public work in an international and Hungarian context. Central European Journal of Labour Law and Personnel Management, 2018, Vol. 1, No. 1, pp. 6-15
- [12] Curran, J. Blackburn, R. A. Researching the Small Enterprise. London: SAGE, 2001, 216 p.
- [13] Dahlqvist, J., Davidsson, P., Wiklund, J. Initial conditions as predictors of new venture performance: A replication and extension of the Cooper et al. study. In: Enterprise and Innovation Management Studies, 2000, Vol. 1, No. 1, pp. 1-17

- [14] De Alwis, C. Owner family and business succession in family owned companies. *Acta Oeconomica Universitatis Selye*, 2016, Vol. 5, No. 1, pp. 40-54
- [15] European Commission. The new SME definition. User guide and model declaration. Brusel: EC, 2005, 52 p.
- [16] Gholami, M. H. et al. Investigating the influence of knowledge management practices on Organizational performance: An empirical study. *Acta Polytechnica Hungarica*, 2013, Vol. 10, No. 2, pp. 205-216
- [17] Gibson, T., van der Vaart H. J. Defining SMEs: A Less Imperfect Way of Defining Small and Medium Enterprises in Developing Countries. *Brookings Global Economy and Development*, 2008, 29 p. <<http://seaf.com/wp-content/uploads/2014/10/Defining-SMEs-September-20081.pdf>>
- [18] Gogolová, M. The doorstep sales and the selling events in Slovakia. *Acta Oeconomica Universitatis Selye*, 2014, Vol. 3, No. 2, pp. 33-39
- [19] Grancay, M., et al. Gravity model of trade of the Czech and Slovak Republics 1995-2012: How have determinants of trade changed. *Politická Ekonomie*, 2015, Vol. 63, No. 6, pp. 759-777
- [20] Harabi, N. Determinants of Firm Growth: An Empirical Analysis from Morocco. MPRA Paper, Switzerland: University of Applied Sciences, 2005, 33 p. <[https://mpra.ub.uni-muenchen.de/4394/1/MPRA\\_paper\\_4394.pdf](https://mpra.ub.uni-muenchen.de/4394/1/MPRA_paper_4394.pdf)>
- [21] Hitka, M., et al. Load-carrying Capacity and the Size of Chair Joints Determined for Users with a Higher Body Weight. *Bioresources* 2018, Vol. 13, No. 3, pp. 6428-6443
- [22] Holešová, H. Small and medium business. Bratislava: Úrad vlády SR, 2003, 19 p.
- [23] Horvátová, L. et al. Aspects of effective support of small and medium sized enterprises. *Economics, Management, Innovation*, 2012, Vol. 4, No. 2, pp. 49-59
- [24] Ivanova, S., Latyshov, A. Sustainable entrepreneurship: agrarian policy in South Korea. *Entrepreneurship and Sustainability Issues*, 2018, Vol. 5, No. 4, pp. 748-760
- [25] Jasra, J. M. et al. Determinants of Business Success of Small and Medium Enterprises. *International Journal of Business and Social Science*, 2011, Vol. 2, No. 20, pp. 274-280
- [26] Jeck, T. Small and medium enterprises in Slovakia and in the European Union: Barriers, Financing and Innovations. Bratislava: Ekonomický ústav SAV, 2014, 26 p.

- [27] Keeble, D. Small firm creation, innovation and growth and the urban-rural shift. In: J. Curran and D. Storey (Eds) *Small Enterprises in Urban and Rural Locations*, London: Routledge, 1993, pp. 54-78
- [28] Korcsmáros, E. Factor affecting the development of SMEs (example from Slovakia based on primary research in Nitra region). *Acta Oeconomica Universitatis Selye*, 2018, Vol. 7, No. 1, pp. 70-78
- [29] Liedholm, A. Small Firm Dynamics: Evidence from Africa and Latin America. *Small Business Economics*, 2002, Vol. 18, No. 1, pp. 225-240
- [30] Loecher, U. Small and medium sized enterprises: delimitation and the European definition in the areas of industrial business. *European Business Review*, 2000, Vol. 12, No. 5, pp. 261-264
- [31] Marwede, E. Die Abgrenzungproblematik mittelständischer Unternehmen - Eine Literaturanalyse (in German). Augsburg: Institute for Economics of University of Augsburg, 1983, 119 p.
- [32] Mura, L. Current situation in family businesses. Managerial trends in the development of enterprises in globalization era, *Conference Proceedings*, 2017, pp. 178-185
- [33] Mura, L. et al. Economic freedom – classification of its level and impact on the economic security. *AD ALTA-Journal of Interdisciplinary Research*, 2017, Vol. 7, No. 2, pp. 154-157
- [34] Nucci, A., Bates, T.. An Analysis of small business size and rate of discontinuance. *Journal of Small Business Management*, 1989, Vol. 27, No. 1, pp. 1-7
- [35] Orlova, L., Gagarinskaya, G., Gorbunova, Y., Kalmykova, O. Start-ups in the field of social and economic development of the region: a cognitive model. *Entrepreneurship and Sustainability Issues*, 2018, Vol. 5, No. 4, pp. 795-811
- [36] Pacáková, V. et al. *Statistics for Economicists*. Bratislava: Ekonómia, 2003, 358 p.
- [37] Rajić, T., Milošević, I. An empirical analysis of the determinants of SME's customer loyalty: evidence from Serbia. *Acta Oeconomica Universitatis Selye*, 2016, Vol. 5, No. 1, pp. 128-138
- [38] Ranjith, J. G. S., Banda, O. G. D. Determinants of Success of Small Business: A Survey-Based Study in Kuliyaipitiya Divisional Secretariat of Sri Lanka. *International Journal of Business and Social Research*, 2014, Vol. 4, No. 6, pp. 38-50
- [39] Rogerson, C. In Search of the African Miracle: Debates on Successful Small Enterprise Development in Africa. In: *Habitat International*, 2001, Vol. 25, No. 1, pp. 115-142

- [40] Sarwoko, E. Frisdiantara, Ch. Growth Determinants of Small Medium Enterprises (SMEs) *Universal Journal of Management*, 2016, Vol. 4, No. 1, pp. 36-41
- [41] Simo, D., Mura, L., Buleca, J. Assessment of milk production competitiveness of the Slovak Republic within the EU-27 countries. *Agricultural Economics-Zemedelska Ekonomika*, 2016, Vol. 62, No. 10, pp. 482-492
- [42] Spyros, G. et al. *Forecasting methods for management*. Michigan: Wiley, 1989, 470 p.
- [43] Storey, D. J. *Understanding the Small Business Sector*. London: Routledge, 2016, 280 p.
- [44] Szabo, K. Z, Herman E. Productive Entrepreneurship in the EU and Its Barriers in Transition Economies: A cluster Analysis. *Acta Polytechnica Hungarica*, 2014, Vol. 11, No. 6, pp. 73-94
- [45] Takáč, I. Competitiveness of small and medium enterprises in Slovakia. Competitiveness and innovations on agricultural land in SR. Nitra: Slovak University of Agriculture, 2011, pp. 61-66
- [46] Takáč, I. EU Policy to promote entrepreneurship of small and medium-sized enterprises in rural areas. *Entrepreneurship in rural areas. EU Business Law I*. Nitra: Slovak University of Agriculture, 2011, pp. 257-265
- [47] Takáč, I. Support of SME business in the EU. Lazíková *et al.* (2013): *EU Business Law*, Nitra: Slovak University of Agriculture, 2013, pp. 160-177
- [48] World Bank. *The big business of small enterprises*. Washington: World Bank, 2014, 262 p.