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## SMALL AND MEDIUM ENTERPRISES IN REGIONS - EMPIRICAL AND QUANTITATIVE APPROACH\*

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**Abstract.** The problem of identifying and quantifying the efficiency of accommodation units is currently a discussed issue. Recognition and identification of the most important aspects that increase the financial efficiency of a rapidly changing business environment, especially in a difficult period of economic and tourism bounce back is a key issue. Only the companies that adequately address the issue of their measurement and evaluation and are able to choose the right approach in this regard will win the competition. Our work focuses on the identification of key factors influencing the management of business entities. We carried out a detailed analysis of accommodation units in selected accommodation facilities at the regional level. We wanted to point out the differences within the individual regions of Slovakia. By applying the DEA method, we used individual models focused on inputs and outputs in order to determine the inefficient units in our research, and revealed its shortcomings and pointed out the way to improve the economic results of these research subjects.

**Keywords:** small and medium enterprises; regions; DEA; models; correlation

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## 1. Introduction

The focus of this research is to identify the relationship between the key economic factors and the efficiency of businesses (Belas et al., 2020; Baša et al., 2019), which we examine through interrelated financial indicators. The concept of performance is compared to the productive capacity of the company in terms of achieving performance in individual research areas (Duygulu et al., 2016). In today's global environment, it is the best to define business performance as market success (Teles, Schachtebeck, 2019; Wach, 2020), the ability to succeed in competition, and find opportunities for further growth in a changing unstable environment (Thames et al. 2016; Cepel et al., 2018; Stacho et al., 2021). Tumpach (2008) considers efficiency to be one of the main criteria for evaluating the company's results and defines it as a measure of achieving the set goals and creating conditions for their fulfillment in the future (Herman et al., 2018). Business performance has been examined from different perspectives, but flexible reaction to the changing environment is important (Aisyah et al., 2017; Aisyah et al., 2017). According to Sahid et al. (2018), efficiency is achieved if the company is able to increase the resulting volume of outputs while maintaining an identical amount of inputs. However, efficiency can also be increased while maintaining the required final output and limiting the resources expended to achieve it. The most important factor is the efficiency criterion, which expresses the ratio between the outputs of economic activity and the given inputs. A large number of modern efficiency measurement models have emerged due to the development of statistical methods, information technology, as well as growing interest from banks, rating agencies and businesses (Kozubikova, Kotaskova, 2019; Obeidat et al. 2016; Curado et al. 2018; Morrison.2011). The overall efficiency of a company can be assessed in the context of the company's strategy. Waal (2013), Borocki et al. (2019) define the strategic performance as the company's ability to achieve the determined strategic goals. Dad. et al. (2012) point out, however, the company is evaluated by different market players from different perspectives (Kokocinska, Puziak, 2018; Krizanova et al., 2018), the concept of efficiency acquires a relative and at the same time very complex character. One recent study by Shih (2018) states that the efficiency of a business entity is most affected by its ability to innovate radically and achieve a competitive advantage through an established brand and products offered. Another new study showed that a company's performance is directly positively affected only by its strategic orientation and indirectly by its organizational structure and different production capabilities (Chatzoglou et al., 2018). A large number of studies examine for example Udriyah, 2019; Tien et al., 2018, but also setting business goals in the SME segment (Virglerova et al., 2020; Csabay, Stehlikova, 2020; Chong et al. 2019; Lazikova et al., 2018; Binh, 2010; in a family business environment (Ballini et al., 2019; Dagnino et al., 2017; Zahra, 2017; Ślusarczyk, Ul Haque, 2019). The influence of institutional factors on ensuring the innovative performance of SMEs deserves attention. SMEs have become an important area of research in the last years of our century (European Commission, 2016; Cibik, 2018; Podhorska et al., 2019). The aim of this research is to reveal the influence of orientation on the interaction of individual inputs and the effective operation of companies in the field of services (European Commission, 2017). Factors with a direct impact on the level of business affect the results in the field of finance, quality of production, increase in revenues, reduction of costs, increase in profits, influence of liquidity of companies, stock levels (Muhammand Khan, 2020; Tamulevičienė, Androniceanu, 2020).

However, the number of studies evaluating effectiveness at regional level is relatively low compared to the number of studies evaluating individual countries. We focused on and a reviewed the efficiency of accommodation facilities in the regions of the Slovak Republic. Tourism, as an important sector of the Slovak economy was significantly affected by the pandemic. It is necessary to kick start the economic recovery, also by increasing the performance of business entities in the field of accommodation services. It is necessary to realize that in the time of the ongoing recession of the world economy, tourism, as a cross-cutting sector of the national economy, is one of the ways to increase state budget revenues and improve the economic situation and employment not only in regions with potential for its development (Smerek, Vetráková, 2020; Machyniak, 2018;

Imrovic, Kovacik, 2019). Domestic tourism is an important source of value creation – GDP (Matijová et al, 2019), foreign exchange incomes, job creation and has the potential to play a significant role in revitalizing the economically weaker regions, respectively to become an accelerator of regional development with the assumption of balancing regional disparities (Maris, 2015; Štefko et al., 2017; Melichová et al., 2017; Vekic et al., 2020). Domestic tourism represents a significant source of revenue to the state budget in Slovakia. In addition to economic, it also fulfills social, health and cultural functions (Bačík et al., 2019), helps to become aware of cultural and natural heritage, social integration, national harmony of residents and motivates the optimal use of free time.

## 2. Current situation

In 2018, 4,007 accommodation facilities were registered in the regions of Slovakia. Most of these facilities were located in the Žilina region, up to 27% of the total number and in the Prešov region 18%. The overall growing trend in a positive sense was recorded by the Trnava region with a growth value of up to 39% (Fig. 1).

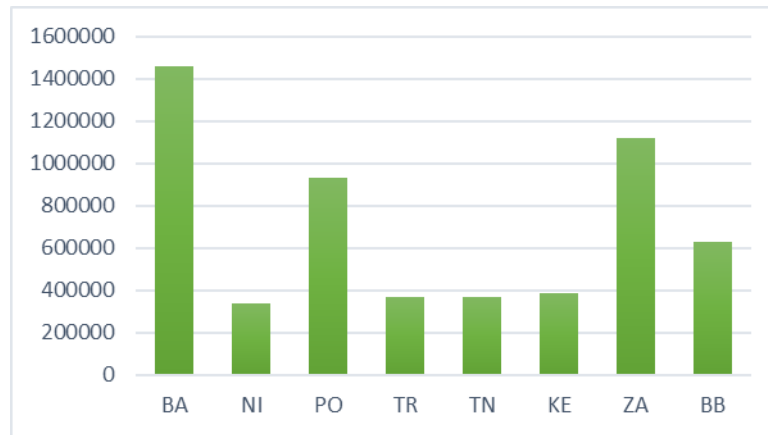


Figure 1. Visitors by regions in SR 2018

Source: own processing

Bratislava region is in leading position with the number of accommodated guests up to 1,460,000, which represents up to 25% of the total revenue from the segment with a volume of 429,000,000 euros (Fig. 2).

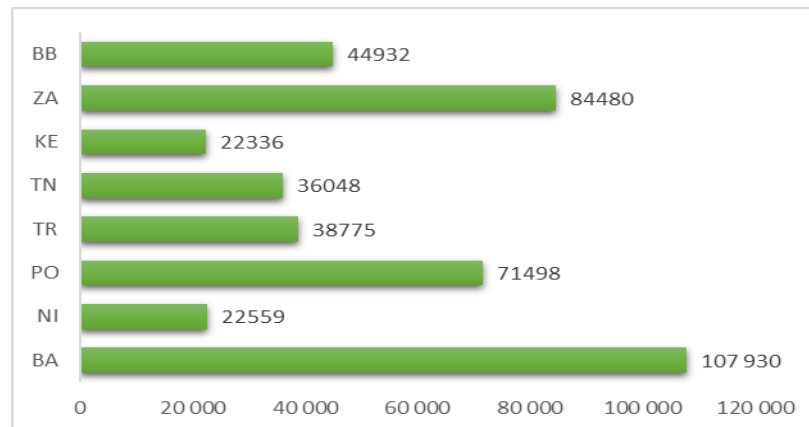


Figure 2. Revenues of accommodation facilities by region in SR 2018

*Source: own processing*

We would like to evaluate the development of efficiency of accommodation facilities in individual regions in connection with the development of tourism in Slovakia. In 2019 we recorded an increase in this segment by 22.1% compared to 2018. This means that up to 48,042 people used the services of these facilities. While comparing the ratio of foreign and domestic visitors, we can assume an increasing trend of domestic visitors to 27.6%. In the monitored period, about 158,790 foreigners visited the regions of Slovakia and used the services of accommodation units. The number of accommodation establishments in the observed period from 2018 to 2019 increased annually by an average of 11.7% (Table 1).

**Table 1.** Capacity of tourism accommodation establishments 2019

Regions of SR		Number of accommodation establishments	Occupancy rates of bedrooms(%)	Number of bedrooms(total)
<b>Bratislava region</b>	BA	385	45,4	24238
<b>Trnava region</b>	TR	315	41,2	16493
<b>Trenčín region</b>	TN	323	39,2	15153
<b>Nitra region</b>	NI	399	26,5	15341
<b>Žilina region</b>	ZA	1171	29,1	42374
<b>Banská Bystrica region</b>	BB	642	38,2	22914
<b>Prešov region</b>	PO	853	32,6	33977
<b>Košice region</b>	KE	385	26,4	14905
<b>Total</b>	SR	4473	35,1	185395

*Source: own processing*

These statistics prove that tourism in Slovakia has recorded a rapid increase in recent years, but a new situation has occurred the accommodation units have to deal with. In the last decade, the Slovak Republic (SR) has gained popularity as an international and domestic destination. It ranked on the 43rd position based on the number of foreign tourists arrival. The perspectives for international and domestic tourism for the country as a whole are therefore clear. According to the data of the United Nations World Tourism Organization (UNWTO), the income from tourism in Slovakia increased from 6.2 million to 9.1 million EUR. These statistics prove that tourism in Slovakia has seen a rapid increase in recent years, but the impact of COVID-19 created new circumstances that the accommodation units have to deal with.

Nowadays, tourism is one of the sectors most affected by the measures taken against the spread of COVID-19. The development of tourist accommodation statistics was therefore very specific in April 2020. The almost

complete closure of tourism services and radical restrictions on travel at national and international level has led to a drop in number of visitors. Tourism businesses are facing existential problems and need to increase their efficiency in order to survive this difficult period. Even if they manage to survive, their financial health and stability will be marked by high to chronic indebtedness. However, many regions are already losing sources of funding today because they have lost income from accommodation tax due to the widespread closure of facilities. Accommodation tax is paid by the visitor when staying in the facility, usually up to one euro per person / overnight stay. In 2018, the revenues of communities from this tax amounted to more than 15 mil. €. The estimated loss of income of communities from this tax for the last months as a result of tourism slowdown is more than 4.5 mil. €. The figures since the beginning of 2020 are very unfavorable (Fig. 3). While in April 2020, only 417 foreigners were accommodated in these facilities, at the same time in 2019 it was 171,000 visitors. 1.1 million visitors have been accommodated in tourism facilities since January 2020, which represents an annual decrease of 35.8%. In detailed figures, 705,857 (64.8%) were domestic visitors and 383,435 foreigners (percentage data). The number of domestic visitors decreased annually by 34.3% and the number of foreigners by 38.3%. The number of overnight stays also decreased by about a third (3.1 million nights).

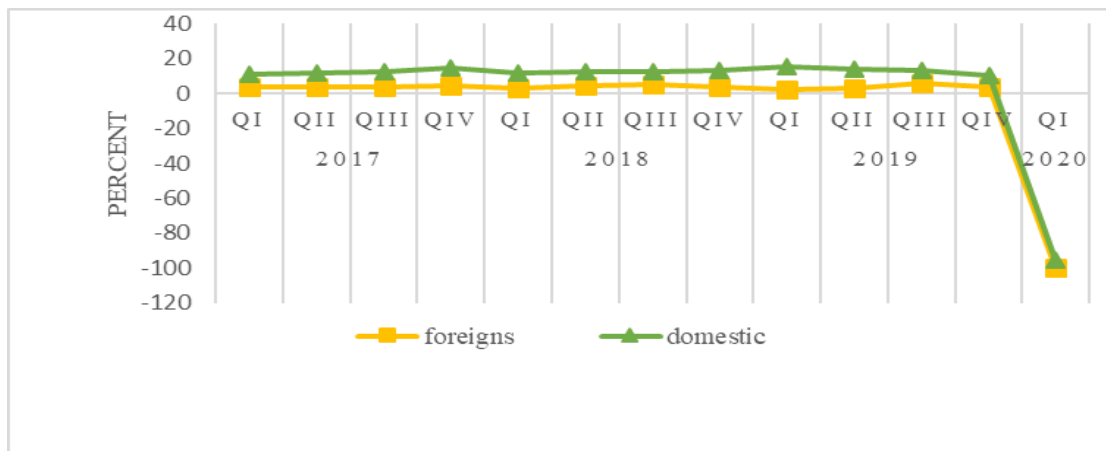


Figure 3. Development of number visitors (2017-2018)

Source: own processing

### 3. Methods, methodology and research data

Based on a review of the literature, we identified that the Data envelopment analysis (DEA) is a widely used method for evaluating efficiency in health care but also in the environment. Its theoretical foundations were laid by (Farrell, 1957; Charnes, A, 1984) and subsequently developed in many other studies. Cooper et al. (2007) made significant theoretical development. They proposed models that assume either constant returns to scale, the so-called CCR DEA models, and models that assume variable returns to scale, the so-called BCC DEA models. In this paper, we will use exclusively input-oriented DEA models, as in terms of the models used, the influence of inputs and not outputs can be assumed. Moreover, in terms of efficiency results, this is irrelevant, as output efficiency is only the inverse of input efficiency.

Relative efficiency  $DMU_j$ ,  $j = 1, \dots, n$  are defined as a function of the determined factors as follows:

$$E_j(u, v) = \frac{y_j^T u}{x_j^T v} \quad (1)$$

Assuming that we have  $m$  input items and  $s$  output items, we have determined individual  $DMU_j$  from a set of  $n$  units we will record input data  $(x_{1j}, \dots, x_{mj})$  in the matrix  $X$  and output data  $(y_{1j}, \dots, y_{sj})$  in the matrix  $Y$ . Then it has matrix  $X$  size  $(m \times n)$  and matrix  $Y$  size  $(s \times n)$ , (Mardani et al., 2017):

$$\text{Purpose function:} \quad \max_{v, u} \theta = \frac{u_1 y_{10} + \dots + u_s y_{s0}}{v_1 x_{10} + \dots + v_m x_{m0}} \quad (2)$$

$$\text{Restrictive conditions:} \quad \frac{u_1 y_{10} + \dots + u_s y_{s0}}{v_1 x_{10} + \dots + v_m x_{m0}} \leq 1 \quad j = 1, 2, \dots, n \quad (3)$$

$$\text{Non-negative condition} \quad v_1, \dots, v_m \geq 0; u_1, \dots, u_s \geq 0 \quad (4)$$

CCR DEA model - input-oriented CCR model based on standardization of the value of  $x_j^T v = 1$

assesses the efficiency of units. The  $DMU_j$  for which it applies is considered effective

$E_j(\hat{u}_j, \hat{v}_j) = 1$  and  $u > 0, v > 0$ .

$$\begin{aligned} \max_{u \in R_+^s, v \in R_+^m} \quad & Y_j^T u - X_j^T v \\ & Y_j^T u - X_j^T v \leq 0 \\ & u \geq 1, v \geq 1 \end{aligned} \quad (5)$$

The BCC DEA input model also focuses on a detailed analysis of inputs with both positive and negative trends. This model is calculated as the follows: (McDonald, 2009; Shi et al., 2010):

$$\begin{aligned} \min_{\theta, \lambda, s, e} \quad & \theta - \epsilon(1^T s + 1^T e) \\ & Y\lambda - s = Y_j \\ & -X\lambda + \theta X_j - e = 0 \\ & 1^T \lambda = 1 \\ & \lambda \geq 0, e \geq 1, s \geq 0 \end{aligned} \quad (6)$$

The result of solving  $n$  problems, but not necessarily  $n$  different levels, because the level that belongs to the effective  $DMU_j$  may be the closest level for any with inefficient  $DMU_j$  (Ramanathan, 2011; Fernandes et al., 2018). The input CCR and BCC models assume the total independence of the inputs (or outputs) so the input (or output) of any given  $DMU$  does not affect the input (or output) of other units. However, this independence does not always exist, for example in a competitive market or in the case of constant demand for production - then it is appropriate to use the ZSG-DEA model. The monitored  $DMU$  reaches the effective limit just by changing the limit itself. The basic approach of this model is a proportional reduction of inputs. In particular, an inefficient  $DMU$  must lose a certain number of inputs (or receive a certain number of outputs).  $DMU$  is looking for an effective boundary, assuming that the sum of the inputs is constant. The mathematical entry is the following:

Purpose function:  $\min h_{R0}$

$$h_{R0} x_0 \geq \sum_k \lambda_k x_k \left[ 1 + \frac{x_0(1-h_{R0})}{\sum_{k \neq 0} x_k} \right]; \quad (7)$$

Restrictive conditions:  $\sum_k \lambda_k y_k \geq y_0$

Non-negative condition:  $\lambda_k \geq 0; \forall k$

#### 4. Results

During the assessment of the efficiency of the given segment within the regions, we chose suitable DMU units from each region. It was a sample of 40 accommodation units as a random selection from all regions of Slovakia. We selected five accommodation facilities from each region of Slovakia that were comparable to each other and had the same parameters. This step was necessary to maintain the homogeneity of the individual DMUs. The next step in the implementation was the identification and quantification of the determined factors within the use of DEA methodology. The trend in our segment is to increase outputs while maintaining the same inputs, or increasing outputs when decreasing inputs.

We have chosen the following parameters for the input parameters: employees, receivables, external sources, total assets, inventories. The output variables we determined as the follows: total sales, equity, net profit. For clarity, we named the individual DMUs by region and serial number. Using correlations, we verified the relationships between the individual parameters of the model. In our case, in the table of the correlation matrix we present the relationship between the units such as inventories, receivables for this reason (Table 2.).

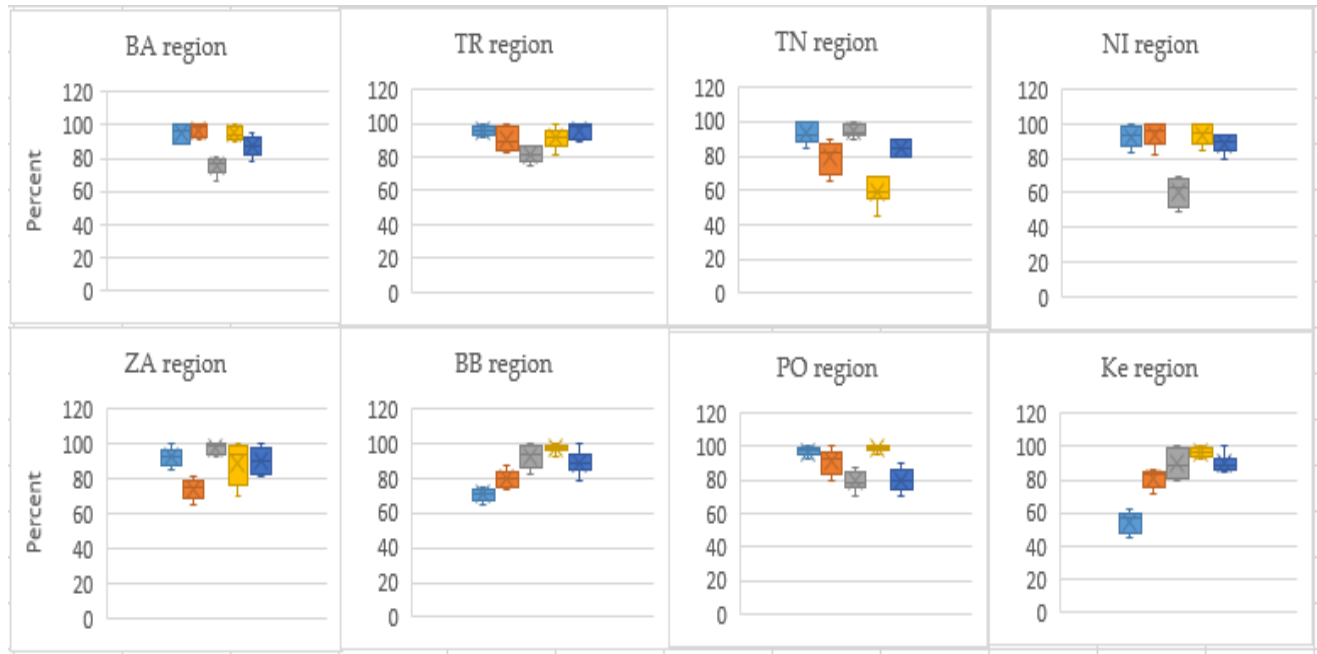
**Table 2.** Input correlations

	Resources	Receivables	Liabilities	Employees	Assets
Resources	1				
Receivables	0,15766	1			
Liabilities	0,10011	0,19871	1		
Employees	0,13131	0,15002	0,21421	1	
Assets	0,24581	0,384982	0,15926	0,25451	1

Source: own processing

### Model CCR-input

As it is important to monitor and examine the development of efficiency for the subjects examined individually, we will graphically display the results for all subjects during the research period 2013-2018. Figure 4. shows the development and quantitative expression of measured values in individual subjects, given the range of data. The horizontal axis does not include all years in the form of a legend, but the individual vertical columns present the trend of efficiency development by region.



**Figure 4.** Result values of input oriented CCR-I model

*Source: own processing*

In 2018, we accurately evaluated the inputs that need to be reduced for individual entities and for DMUs that were inefficient. In the efficiency mode, there are 25 units, whose purpose function is on level 1. These units are declared as CCR-inputs efficient. We consider other units to be inefficient. Since we need to evaluate their status, we have quantified the unit for all units formed by the weighted sum of peer units. Due to the large scope of research, we present only the resulting  $\lambda$  for individual companies (Table 3.).



**Table 3.** Sum of peer units for inefficient –DMUs

DMU	Suma $\lambda$
BA 5	0,164
NI 20	0,061
PO 35	0,045
TN 15	0,111
PO 33	0,035
TR8	0,245
TN 12	0,221
KE37	0,312
BB 27	0,041
ZA 22	0,054
BA 3	0,123
BB26	0,237
TN 14	0,201
NI 18	0,118
KE36	0,025

*Source: own processing*

An example is the analysis of the BA5 unit (Table 4.). As a result of accurate analysis, we concluded that the subject BA5, which is ineffective, has a total of four peer units. The inputs of this unit are listed in the table.

**Table 4.** Peer unit for the selected subject

DMU	Peer	$\lambda$	Peer	$\lambda$	Peer	$\lambda$	Peer	$\lambda$	SUM $\lambda$
BA5	BA2	0,033	TN11	0,019	TR9	0,027	ZA24	0,085	0,164

*Source: own processing*

The BA5 unit has a total of 4 peer units. For this DMU, the sum of the values of  $\lambda$  is equal to 0,164. The inputs of this unit should be 20.12% identical to the inputs of the BA2 unit, 11.59% identical to the inputs of the TN11 unit, 16.45% identical to the inputs of the TR9 unit and 51.82% identical to the inputs of the ZA24 unit.

According to the analysis, we can precisely determine the changes in inputs for individual entities. As a conclusion of the CCR-input model analysis, we state that in all units it is necessary to rapidly reduce inputs in order to get these units to a level that we consider effective. It is essential to regulate the entry of stocks and reduce them by up to 58%, then it is necessary to address the issue of human resources and overemployment. It is

also important to eliminate overemployment in inefficient units by up to 49%, and the last very important item of change is the reduction of total assets by more than 51%.

#### *Model BCC –input*

This model is also focusing on input evaluation. In the variable-scale /variable yield assessment mode, 36 units reached the value of purpose function 1. It means 100%, so these units lie at the limit of production possibilities and are considered BCC-I effective. Figure 5. shows the development and amount of measured values in individual entities (2013-2018).



**Figure 5.** Result values of input oriented BCC-I model

*Source: own processing*

In 2018, we accurately evaluated the inputs that need to be reduced for individual entities and for DMUs that were inefficient. Thanks to the dual model, it is possible to read from the results not only the current efficiency level of individual DMUs, but also the extent to which individual inputs must be reduced, so that the unit reaches the efficiency limit. Specifically, it is about reducing the inputs of inefficient units, which are - TN14, NI18, BB26, KE36. We proceeded analogously as in the analysis of the CCR-input model, by calculating peer units for the inefficient subjects. In the table we present the changes of individual inputs of inefficient units in percentage. These inputs with the stated value must be reduced. It can be said that all inputs must be reduced in the case of inefficient units, so that the individual DMUs reach the effective limit. It is necessary to reduce inventories by 55.95%, foreign sources by 53.21%, the number of employees by 35.61%, receivables by up to 67.18% and the least desirable is to reduce total assets (Table 6).

**Table 6.** Reduction of items in ineffective units (%)

DMU	Total Assets	Resources	Receivables	Liabilities	Employees
<b>TN14</b>	26,31	55,12	15,12	45,56	<b>29,35</b>
<b>NI18</b>	18,23	61,23	14,23	56,23	<b>33,25</b>
<b>BB26</b>	31,42	49,24	18,31	61,21	<b>38,29</b>
<b>KE36</b>	17,21	58,23	19,52	49,85	<b>41,56</b>
<b>Average</b>	<b>23,29</b>	<b>55,95</b>	<b>67,18</b>	<b>53,21</b>	<b>35,61</b>

*Own processing.*

In this extensive analysis, we also used the ZSG-DEA model to verify the achieved results. The value of the purpose function 1, and thus reached 26 units out of the examined 40 units, which makes up 63% of the examined sample. 14 units are inefficient. Most of them can be found in the Trenčín and Prešov regions.

### Conclusions

The research focuses on the evaluation of the impact of determinants on the effectiveness of individual entities. In this case, the dependent variable is the input CCR and BCC efficiencies adjusted by the double bootstrap method. Subsequently, we used the truncated regression based on their recommendations. The predictive power of the model is higher in the case of the BCC model based on the Log likelihood and R-squared indicators, while this model describes 74.43% of the variability of the basic set. The CCR model describes 71.57% of the variability of the base set. For this reason, we have given the exact values of the change of individual inputs for inefficient DMUs in the BCC models. For the purposes of this analysis, we have provided specific rules for practice. Exact implementation of methodology DEA for individual regions of the Slovak Republic with input models CCR and BCC, ZSG-DEA models, units such as TN14, NI18, BB26 and KE36 are identified as ineffective in three models to determine efficiency. In this model, we determined the necessary change in the level of inventories, the number of employees and total assets. BCC-input model - draw attention to monitoring the level of receivables, inventories and liabilities. The most effective units were identified by the ZSG-DEA model, where we identified, from a regular aspect, a region where it is necessary to change the approach to the development of this segment. In the case of reducing total assets, it is appropriate to focus on reducing the amount of surplus tangible movable and immovable property such as land, buildings, machinery or cars. Another possibility is the rationalization of already used premises and their further lease to external entities. Smaller but regular deliveries are preferred to achieve the optimum level of stocks, and at the same time the maximum freshness of the raw materials used. When reducing the number of employees or the number of jobs, it is necessary to follow the defined legislative rules. Possible solutions include changing the duties of the current and new employees.

Income from tourism is an important contribution to GDP, foreign exchange incomes, as well as provides job opportunities and has the potential to play a significant role in the revitalization of the economically weaker regions. Tourism might become an accelerator of the regional development and according to Horvath, Mikus, (2016) is associated with the assumption of balancing regional disparities. Direct income is generated via consumption of visitors in the tourist destinations, as well as indirect revenue is generated by taxes (Rajić,

Milošević, 2016; Zsigmond et al., 2020), levies and various fees introduced in individual regions. Entrepreneurship in tourism helps to develop all regions of Slovakia in long term. In our work we wanted to identify the individual factors that affect the efficiency of the examined accommodation facilities in terms of all regions of Slovakia.

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