ANALYSIS OF TRADE EFFICIENCY IN SERBIA BASED ON THE MABAC METHOD

АНАЛИЗА ЕФИКАСНОСТИ ТРГОВИНЕ У СРБИЈИ НА БАЗИ МАВАС МЕТОДЕ

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Abstract: *In recent times, as it is well known, various methods of multi-criteria analysis are increasingly used in order to evaluate the efficiency of companies more accurately. One of them is the MABAC method. With this in mind, this paper analyzes trade efficiency in Serbia on the basis of this method. Trade in Serbia was the most efficient in the observed period (2013 - 2020) in 2020. The general conclusion is that recently, under the positive influence of numerous macro and micro factors, trade efficiency in Serbia has increased. The impact of Covid-19 on trade efficiency in Serbia is negligible. It has been largely compensated by increased electronic sales.*
Key words: *efficiency, determinants, Serbian trade, MABAC method.*

Сажетак: *У новије време, као што је познато, све се више у циљу што тачније евалуације ефикасности предузећа користе различити методе вишекритеријумске анализе. Једна од њих је и MABAC метода. Имајући то у виду, у овом раду се анализира ефикасност трговине у Србији на бази ове методе. Трговина у Србији била је у посматраном временском периоду (2013 – 2020) најефикаснија у 2020. Генерални закључака је да се у последње време под позитивним утицајем бројних макро и микро фактора повећавала ефикасност трговине у Србији. Занемарљив је утицај Covid-19 на ефикасност трговине у Србији. Он је у великој мери конпензиран са повећаном електронском продајом.*
Кључне речи: *ефикасност, детерминанте, трговина Србије, MABAC метода*

INTRODUCTION

Recently, various (new) methods of multicriteria analysis have been developed (Mathew, 2018; Timiryanova, 2020; Okwu, 2020; Singh, 2020; Pachar, 2021; Brezović, 2021; Tsai, 2021) in order to more realistically evaluate the efficiency (and other performance measures) of companies. One of these methods is the MABAC (*Multi-Attributive Border Approximation area Comparison*) method (Pamučar, 2015; Božanić, 2016; Boyanic, 2019, 2020; Işik, 2020; Nedeljković, 2021). In this paper, as a subject of research, the analysis of trade efficiency in Serbia is performed on the basis of the MABAC method. The goal and purpose of this research is to determine the most realistic situation as a

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basis and precondition for taking appropriate measures in the function of improving trade efficiency in Serbia in the future.

The world is increasingly rich in literature dedicated to the analysis of trade efficiency based on various methods of multi-criteria analysis (Ersoy, 2017). This is also the case with the literature in Serbia (Lukic, 2011a, b, 2018, 2019, b, 2020a, b, c, d, 2021a,b,c,d,e,f). However, in the literature of Serbia, there is, as far as we know, no complete work dedicated to the evaluation of trade efficiency using the MABAC method. This paper fills that gap to some extent. This, among other things, reflects its scientific and professional contribution.

1. MATERIALS AND METHODS

For the purposes of researching the problem treated in this paper, empirical data were obtained from the Agency for Business Registers of the Republic of Serbia in accordance with relevant international standards. There are no restrictions on comparability at all levels.

The research methodology is based on the use of the MABAC method. To a certain extent, statistical analysis was used as a whole for the treatment of the issue.

MABAC (*Multi-Attributive Border Approximation area Comparison*) is a newer method of multi-criteria decision making developed by Pamučar and Ćirović (2015). The main feature of this method is in defining the distance of the criterion function of each observed alternative from the limit approximate value. The mathematical formulation of the MABAC method consists of the following steps (Pamučar, 2015):

Step 1: Forming the initial decision matrix (X).

In this phase, m alternatives are evaluated according to n criteria. Alternatives are represented by vectors $A_i = (x_{i1}, x_{i2}, ..., x_{in})$, where x_{ij} value of the i -th alternative according to the j -th criterion (i = 1, 2, ..., m; j = 1, 2, ..., n).

$$= \begin{matrix} A_1 \\ A_2 \\ \dots \\ A_m \end{matrix} \begin{matrix} \begin{matrix} C_1 & C_2 & \dots & C_n \end{matrix} \\ \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \dots & \dots & \dots & \dots \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix} \end{matrix} \quad (1)$$

where m is the total number of alternatives, n is the total number of criteria.

Step 2: Normalize the elements of the initial matrix (X).

$$N = \begin{matrix} \\ A_1 \\ A_2 \\ \cdots \\ A_m \end{matrix} \begin{matrix} \begin{matrix} C_1 & C_2 & \cdots & C_n \end{matrix} \\ \begin{bmatrix} n_{11} & n_{12} & \cdots & n_{1n} \\ n_{21} & n_{22} & \cdots & n_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ n_{m1} & n_{m2} & \cdots & n_{mn} \end{bmatrix} \end{matrix} \quad (2)$$

The elements of the normalized matrix (*N*) are obtained using the following equations:

a) For beneficial (income) types of criteria (high value of criteria is preferred)

$$n_{ij} = \frac{x_{ij} - x_i^-}{x_i^+ - x_i^-} \qquad (3)$$

b) For cost types of criteria (lower value of criteria is preferred)

$$n_{ij} = \frac{x_{ij} - x_i^+}{x_i^- - x_i^+} \qquad (4)$$

where x_{ij}, x_i^+ and x_i^-, and the elements of the initial decision matrix (X), where they are x_i^+ and x_i^- defined as:

$x_i^+ = max(x_{1,} x_2, \ldots, x_m)$ and represent the maximum values of the observed criterion by alternatives.

$x_i^- = \min(x_1, x_2, \ldots, x_m)$ and represents the minimum values of the observed criterion by alternatives.

Step 3: Calculation of weight matrix elements (*V*).

The elements of the weight matrix (*V*) are calculated as follows:

$$V_{ij} = w_i g(n_{ij} + 1) \qquad (5)$$

where the n_{ij} elements of the normalized matrix (*N*) are the w_i weighting coefficients of the criteria.

Based on the previous equation, the following weight matrix V is obtained

$$V = \begin{bmatrix} v_{11} & v_{12} & \cdots & v_{1n} \\ v_{21} & v_{22} & \cdots & v_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ v_{m1} & v_{m2} & \dots & v_{mn} \end{bmatrix} = \begin{bmatrix} w_1 g(n_{11}+1) & w_2 g(n_{12}+1) & \dots & w_n g(n_{1n}+1) \\ w_1 g(n_{21}+1) & w_2 g(n_{22}+1) & \dots & w_n g(n_{2n}+1) \\ \cdots & \cdots & \cdots & \cdots \\ w_1 g(n_{m1}+1) & w_2 g(n_{m2}+1) & \dots & w_n g(n_{mn}+1) \end{bmatrix} \quad (6)$$

where n is the total number of criteria, m is the total number of alternatives.

Step 4: Determining the matrix of boundary approximate areas (*G*).
The cut-off approximate range (BAA) for each criterion is determined according to the following expression:

$$g_i = \left(\prod_{j=1}^{m} v_{ij}\right)^{1/m} \quad (7)$$

where are the v_{ij} elements of the weight matrix (*V*), m the total number of alternatives.

After calculating the value of g_i for each criterion, a matrix of boundary approximate areas (G) of the format n +1 is formed (n represents the total number of criteria according to which the offered alternatives are selected):

$$G = \begin{matrix} C_1 & C_2 & \dots & C_n \\ [g_1 & g_2 & \cdots & g_n] \end{matrix} \quad (8)$$

Step 5: Calculation of the elements of the alternative distance matrix from the boundary approximate domain (Q).

$$Q = \begin{bmatrix} q_{11} & q_{12} & \cdots & q_{1n} \\ q_{21} & q_{22} & \cdots & q_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ q_{m1} & q_{m2} & \dots & q_{mn} \end{bmatrix} \quad (9)$$

The distance of the alternatives from the boundary approximate domain (q_{ij}) is determined as the difference between the elements of the weight matrix (V) and the values of the boundary approximate domains (G).

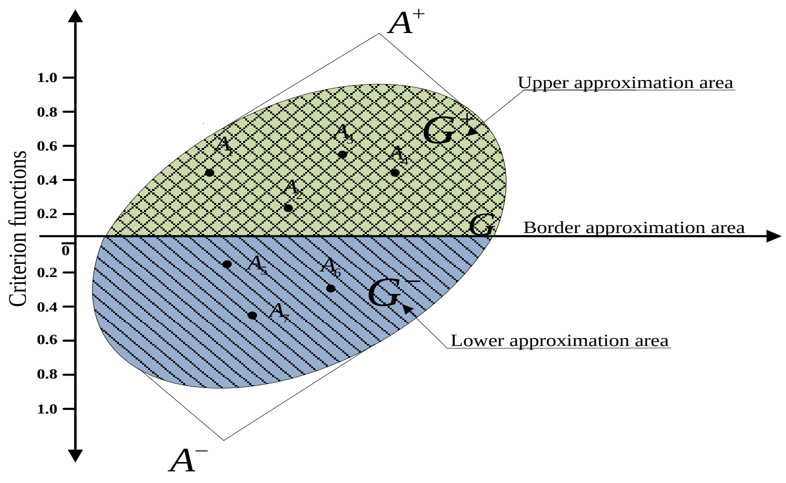
$$Q = V - G = \begin{bmatrix} v_{11} & v_{12} & \cdots & v_{1n} \\ v_{21} & v_{22} & \cdots & v_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ v_{m1} & v_{m2} & \ldots & v_{mn} \end{bmatrix} - \begin{bmatrix} q_1 & q_2 & \cdots & q_n \\ q_1 & q_2 & \cdots & q_n \\ \cdots & \cdots & \cdots & \cdots \\ q_1 & q_2 & \ldots & q_n \end{bmatrix} \quad (10)$$

$$Q \begin{bmatrix} v_{11} - g_1 & v_{12} - g_2 & \cdots & v_{1n} - g_n \\ v_{21} - g_1 & v_{22} - g_2 & \cdots & v_{2n} - g_n \\ \cdots & \cdots & \cdots & \cdots \\ v_{m1} - g_1 & v_{m2} - g_2 & \ldots & v_{mn} - g_n \end{bmatrix} - \begin{bmatrix} q_{11} & q_{12} & \cdots & q_{1n} \\ q_{21} & q_{22} & \cdots & q_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ q_{m1} & q_{m2} & \ldots & q_{mn} \end{bmatrix} \quad (11)$$

where g_i the boundary approximate area for criterion C_i, v_{ij} the elements of the weight matrix (V), n is the number of criteria, m is the number of alternatives.

Alternative A_i may belong to the boundary approximate region (G), the upper approximate region (G^+) or the lower approximate region (G^-), i.e. $A_i \in \{G \vee G^+ \vee G^-\}$. The upper approximate region (G^+) is the region in which the ideal alternative (A^+) is located and the lower approximate region is the region in which the anti-ideal alternative (A^-) is located (Figure 1).

Figure 1.: Representation of the upper (G^+), lower (G^-) and approximate areas



Source: Pamučar, 2015

The affiliation of alternative A_i approximate domain (G , G^+ or G^-) is determined on the basis of the following equation:

$$A_i \in \begin{cases} G^+ & if \quad q_{ij} > 0 \\ G & if \quad q_{ij} = 0 \\ G^- & if \quad q_{ij} < 0 \end{cases} \qquad (12)$$

In order for alternative A_i to be chosen as the best from the set, it is necessary that it belongs to the upper approximate area (G^+) according to as many criteria as possible. If, for example, alternatives A_i as per 5 criteria (out of the 6 criteria) is from above the approximate area, and one criterion as belonging to the approximate area of (G^-), it indicates, in other words that after the 5 criteria alternative close to or equal to an ideal alternative to, while by one criterion it is close to or equal to the anti-ideal alternative. If the value of $q_{ij} > 0$, i.e. $q_{ij} \in G^+$, then alternative A_i is close to or equal to the ideal alternative. However, if q_{ij} <0, i.e. $q_{ij} \in G^-$, then alternative A_i is close to or equal to the anti-ideal alternative (Pamučar, 2015).

Step 6: Ranking the alternatives.

The calculation of the values of the criterion functions by alternatives (13) was obtained as the sum of the distances of the alternatives from the boundary approximate areas (q). By summing the elements of the matrix Q by rows, the final values of the criterion functions of the alternatives are obtained:

$$S_i = \sum_{j=1}^{n} q_{ij} \quad j = 1, 2, \ldots, n \quad i = 1, 2, \ldots, m \quad (13)$$

where n is the number of criteria, m is the number of alternatives.

In this paper, for the purposes of applying the MABAC method in the evaluation of the efficiency of agricultural enterprises in Serbia, the weighting coefficients are determined on the basis of the **AHP** (Analytical Hierarchical Process) method. With this in mind, we will briefly review the theoretical characteristics of the AHP method. The Analytical Hierarchical Process (AHP) method includes the following steps (Saaty, 2008):

Step 1: Forming a pair-wise comparison matrix

$$A = [a_{ij}] = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ 1/a_{12} & 1 & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ 1/a_{1n} & 1/a_{2n} & \cdots & 1 \end{bmatrix} \quad (14)$$

Step2: Normalizing the pair-wise comparison matrix

$$a_{ij}^* = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}, i, j = 1, \dots, n \quad (15)$$

Step 3: Determining the relative importance, i.e. the weight vector

$$w_i = \frac{\sum_{i=1}^{n} a_{ij}^*}{n}, i, j = 1, \dots, n \quad (16)$$

Consistency index - CI (consistency index) is a measure of deviation *n* from λ_{max} and can be represented by the following formula:

$$CI = \frac{\lambda_{max} - n}{n} \quad (17)$$

If CI <0.1, the estimated values of the coefficients a_{ij} are consistent, and the deviation λ_{max} from *n* is negligible. This means, in other words, that the AHP method accepts an inconsistency of less than 10%.
Using the consistency index, the consistency ratio CR = CI / RI can be calculated, where RI is a random index.

2. RESULTS AND DISCUSSION

During the analysis of trade efficiency in Serbia on the basis of the MABAC method, the following criteria were used: C1 - number of employees, C2 - employees' earnings, C3 - assets, C4 - capital, C5 - sales and C6 - net profit. Alternatives were observed in the years: A1 - 2013, A2 - 2014, A3 - 2015, A4 - 2016, A5 - 2017, A6 - 2018, A7 - 2019 and A8 - 2020. The calculation was performed using the software program MABAC Software-Excel, and obtained the results are shown in the tables below, as well as graphically.

Table 1 shows the initial data for the evaluation of trade efficiency in Serbia based on the MABAC method.

Table 1.: Initial data

	Number of employees	Employees' earnings	Assets	Capital	Sales	Net profit
2013	193210	151978	2160474	746992	2891518	89730
2014	191621	154833	2157564	761305	2594602	86955
2015	159621	164718	2197931	805009	2731999	95265
2016	206092	180367	2324843	859749	3009651	105238
2017	208020	194924	2375290	920992	3172393	122727
2018	219373	218410	2524897	1007972	3361094	121816
2019	222049	238022	2682931	1073056	3608329	139409
2020	227618	262322	2837599	1183026	3664505	171010

Note: Data is shown in millions if dinar. Number of employees is shown as a whole number.

Source: The Serbian Business Registers Agency (SBRA)

Table 2 shows the statistics of the initial data.

Table 2.: Statistics

Statistics							
		1 Number of employees	2 Employees' earnings	3 Assets	4 Capital	5 Sales	6 Net profit
N	Valid	8	8	8	8	8	8
	Missing	0	0	0	0	0	0
Mean		203450.5000	195696.7500	2407691.1250	919762.6250	3129261.3750	116518.7500
Std. Error of Mean		7765.75139	14344.42335	89632.96460	55471.58315	139264.95990	10115.84043
Median		207056.0000	187645.5000	2350066.5000	890370.5000	3091022.0000	113527.0000
Std. Deviation		21964.86187	40572.15608	253520.30840	156897.33040	393900.79000	28611.91747
Skewness		-1.119	.565	.717	.576	.141	.960
Std. Error of Skewness		.752	.752	.752	.752	.752	.752
Kurtosis		1.355	-1.028	-.773	-.869	-1.373	.519
Std. Error of Kurtosis		1.481	1.481	1.481	1.481	1.481	1.481
Minimum		159621.00	151978.00	2157564.00	746992.00	2594602.00	86955.00
Maximum		227618.00	262322.00	2837599.00	1183026.00	3664505.00	171010.00

NPar Tests

Friedman Test

Test Statistics[a]	
N	8
Chi-Square	38.929
Df	5
Asymp. Sig.	.000
a. Friedman Test	

Note: Author's calculation using the SPSS software program

Trade performance in Serbia in 2020 was better than the statistical average. The impact of the Chovid-19 corona virus pandemic has been neutralized by increased electronic sales. The null hypothesis is rejected. There is a significant statistical difference between the observed variables (Asymp. Sig. .000 < .05).

Table 3 shows the correlation matrix of the initial data.

Table 3.: Correlations

Correlations		1	2	3	4	5	6
1 Number of employees	Pearson Correlation	1	.802*	.813*	.793*	.852**	.769*
	Sig. (2-tailed)		.017	.014	.019	.007	.026
	N	8	8	8	8	8	8
2 Employees' earnings	Pearson Correlation	.802*	1	.997**	.999**	.961**	.975**
	Sig. (2-tailed)	.017		.000	.000	.000	.000
	N	8	8	8	8	8	8
3 Assets	Pearson Correlation	.813*	.997**	1	.995**	.963**	.976**
	Sig. (2-tailed)	.014	.000		.000	.000	.000
	N	8	8	8	8	8	8
4 Capital	Pearson Correlation	.793*	.999**	.995**	1	.956**	.979**
	Sig. (2-tailed)	.019	.000	.000		.000	.000
	N	8	8	8	8	8	8
5 Sales	Pearson Correlation	.852**	.961**	.963**	.956**	1	.933**
	Sig. (2-tailed)	.007	.000	.000	.000		.001
	N	8	8	8	8	8	8
6 Net profit	Pearson Correlation	.769*	.975**	.976**	.979**	.933**	1
	Sig. (2-tailed)	.026	.000	.000	.000	.001	
	N	8	8	8	8	8	8
*. Correlation is significant at the 0.05 level (2-tailed).							
**. Correlation is significant at the 0.01 level (2-tailed).							

Note: Author's calculation using the SPSS software program

Thus, there is a strong correlation between the observed variables at the level of statistical significance (Sig. (2-tailed < .05).

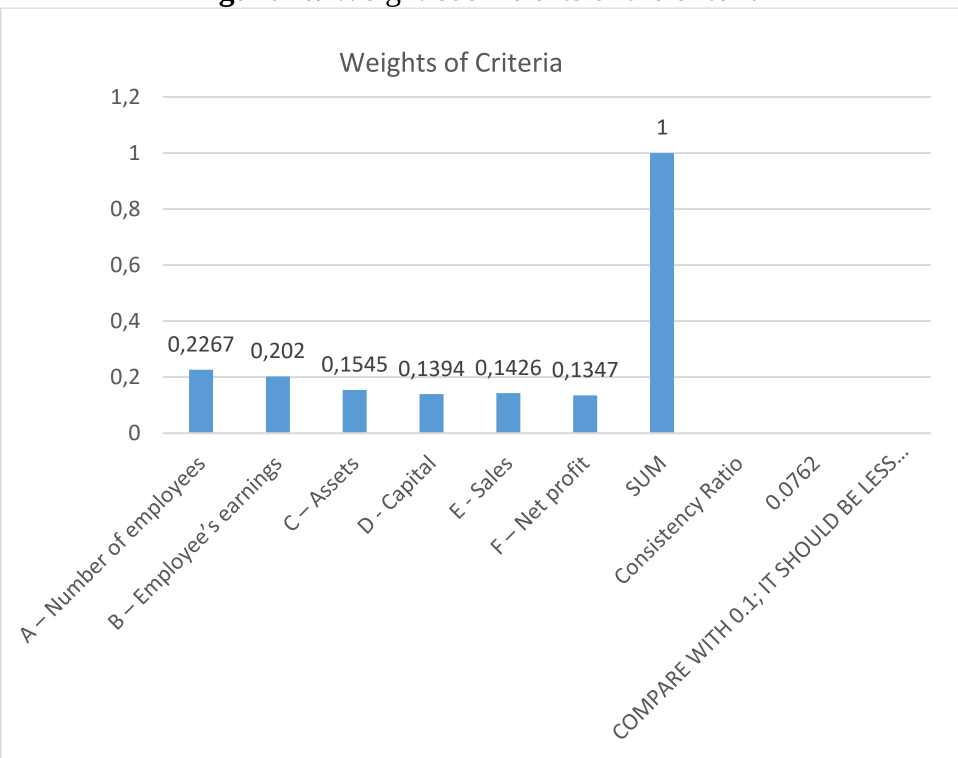
The weight coefficients of the criteria were determined using the AHP (Analytical Hierarchical Process) method (Saaty, 2008). They are shown in Table 4 and Figure 2.

Table 4.: Weight coefficients of the criteria

	Weights of Criteria
A – Number of employees	0.2267
B – Employee's earnings	0.2020
C – Assets	0.1545
D – Capital	0.1394
E – Sales	0.1426
F – Net profit	0.1347
SUM	**1**
Consistency Ratio **0.0762** **COMPARE WITH 0.1; IT SHOULD BE LESS THAN 0.1.**	

Note: Author's calculation

Figure 2.: Weight coefficients of the criteria



Source: Author's picture

Of all the observed criteria, the most significant are the number of employees and the salaries of employees. In order to improve trade efficiency in Serbia in the future, it is necessary to manage human capital as efficiently as possible (training, reward system, flexible employment) (Berman, 2018; Levy, 2019).

Tables 5, 6, 7, 8, 9 and 10 as well as Figure 3 show the obtained results of research on trade efficiency in Serbia using the MABAC method. The calculation was performed using the software program MABAC Software.

Table 5.: Initial matrix

Initial Matrix							
weights of criteria	0.2267	0.202	0.1545	0.1394	0.1426	0.1347	0.9999
kind of criteria	-1	-1	1	1	1	1	
A1	193210	151978	2160474	746992	2891518	89730	
A2	191621	154833	2157564	761305	2594602	86955	
A3	159621	164718	2197931	805009	2731999	95265	
A4	206092	180367	2324843	859749	3009651	105238	
A5	208020	194924	2375290	920992	3172393	122727	
A6	219373	218410	2524897	1007972	3361094	121816	
A7	222049	238022	2682931	1073056	3608329	139409	
A8	227618	262322	2837599	1183026	3664505	171010	

MAX	227618	262322	2837599	1183026	3664505	171010
MIN	159621	151978	2157564	746992	2594602	86955

Note: Author's calculation

Table 6.: Normalized matrix

Normalized Matrix						
weights of criteria	0.2267	0.202	0.1545	0.1394	0.1426	0.1347
kind of criteria	-1	-1	1	1	1	1
	C1	**C2**	**C3**	**C4**	**C5**	**C6**
A1	0.5060	1.0000	0.0043	0.0000	0.2775	0.0330
A2	0.5294	0.9741	0.0000	0.0328	0.0000	0.0000
A3	1.0000	0.8845	0.0594	0.1331	0.1284	0.0989
A4	0.3166	0.7427	0.2460	0.2586	0.3879	0.2175
A5	0.2882	0.6108	0.3202	0.3991	0.5400	0.4256
A6	0.1213	0.3980	0.5402	0.5985	0.7164	0.4147
A7	0.0819	0.2202	0.7726	0.7478	0.9475	0.6240

Note: Author's calculation

Table 7.: Normalized Weighted Matrix

NormalizedWeighted Matrix (V)						
	C1	**C2**	**C3**	**C4**	**C5**	**C6**
A1	0.3414	0.4040	0.1552	0.1394	0.1822	0.1391
A2	0.3467	0.3988	0.1545	0.1440	0.1426	0.1347
A3	0.4534	0.3807	0.1637	0.1579	0.1609	0.1480
A4	0.2985	0.3520	0.1925	0.1754	0.1979	0.1640
A5	0.2920	0.3254	0.2040	0.1950	0.2196	0.1920
A6	0.2542	0.2824	0.2380	0.2228	0.2448	0.1906
A7	0.2453	0.2465	0.2739	0.2436	0.2777	0.2188
A8	0.2267	0.2020	0.3090	0.2788	0.2852	0.2694

Note: Author's calculation

Table 8.: Border Approximation Area Matrix

Border Approximation Area Matrix (G)	0.3003	0.3157	0.2049	0.1892	0.2081	0.1774

Note: Author's calculation

Table 9. Distance of Alternatives from Border Approximation Areas matrix Matrix (Q)

Distance of Alternatives from BAA matrix (Q)						
	C1	**C2**	**C3**	**C4**	**C5**	**C6**
A1	0.0411	0.0883	-0.0497	-0.0498	-0.0260	-0.0383
A2	0.0464	0.0830	-0.0504	-0.0452	-0.0655	-0.0427
A3	0.1531	0.0649	-0.0412	-0.0313	-0.0472	-0.0294
A4	-0.0018	0.0363	-0.0124	-0.0138	-0.0102	-0.0134
A5	-0.0083	0.0096	-0.0009	0.0058	0.0115	0.0146
A6	-0.0461	-0.0334	0.0331	0.0336	0.0366	0.0132
A7	-0.0550	-0.0693	0.0690	0.0544	0.0696	0.0414
A8	-0.0736	-0.1137	0.1041	0.0896	0.0771	0.0920

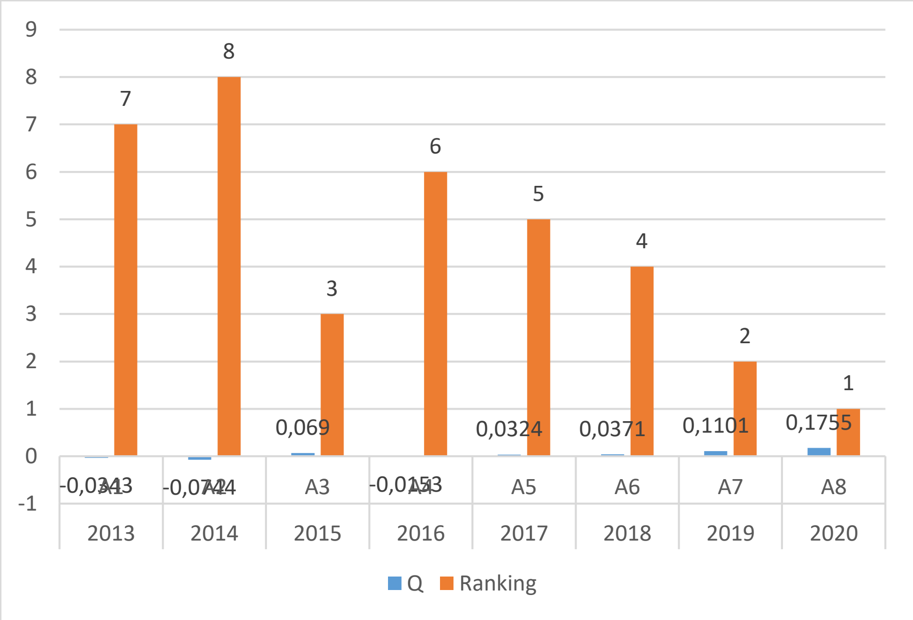
Note: Author's calculation

Table 10.: Ranking of alternatives

	Alternatives	**Q**	**Q**	**Ranking**
2013	**A1**	-0.0343	-0.0343	**7**
2014	**A2**	-0.0744	-0.0744	**8**
2015	**A3**	0.0690	0.0690	**3**
2016	**A4**	-0.0153	-0.0153	**6**
2017	**A5**	0.0324	0.0324	**5**
2018	**A6**	0.0371	0.0371	**4**
2019	**A7**	0.1101	0.1101	**2**
2020	**A8**	0.1755	0.1755	**1**

Note: Author's calculation

Figure 3.: Ranking of alternatives



Source: Author's picture

Trade in Serbia was most efficient in 2020, followed by 2019, 2015, 2018, 2017, 2016, 2013 and 2014. Recently, altogether, the efficiency of trade in Serbia has been improving. This was positively influenced by a number of macro and micro factors, such as: improved general economic conditions, low inflation, low bank interest rate, reduced unemployment rate, increased living standards, inflow of foreign direct investment (global retailers with new business models: private label, sales of organic products, multichannel sales - store and electronic sales), application of modern concepts of cost, sales and profit management, application of product category management concepts, application of sustainable development concepts (economic, social and environmental dimension), application of circular economy concepts (waste recycling) and digitalization of the entire business. The impact of Covid-19 on trade efficiency in Serbia is negligible. It is largely compensated by increased electronic sales, which is the case almost all over the world.

CONCLUSION

According to the obtained results of the research on trade efficiency in Serbia using the MABAC method, the following can be concluded:

Of all the observed criteria (number of employees, employees 'salaries, assets, capital, sales and net profit), the most significant are the number of employees and employees' earnings. Therefore, in order to improve the efficiency of trade in Serbia in the future, it is necessary to manage human capital as efficiently as possible (training, reward systems, flexible employment).

Trade in Serbia was the most efficient in 2020, followed by 2019, 2015, 2018, 2017, 2016, 2013 and 2014. Recently, the efficiency of trade in Serbia has been improving. This was positively influenced by a number of macro and micro factors, such as improved general economic conditions, low inflation, low bank interest rate, reduced unemployment rate, increased living standards, inflow of foreign direct investment (global retailers with new business models: private label, sales of organic products, multichannel sales - store and electronic sales), application of modern concepts of cost management, sales and profit, application of product category management concepts, application of sustainable development concepts, application of circular economy concepts and digitalization of the entire business. The impact of Covid-19 on trade efficiency in Serbia is negligible. It has been largely compensated by increased electronic sales. This is the case almost all over the world.

The application of the MABAC method in the evaluation of trade efficiency is very simple, as illustrated by the example of Serbia. It provides realistic results of the efficiency evaluation and therewith indicates what appropriate measures should be taken in order to improve the efficiency of trade in the future. A much greater effect is achieved in combination with other methods of multi-criteria decision-making (TOPSIS, AHP, ARAS, VASPAS and others). Also in combination with ratio analysis.

REFERENCES

1. Berman, B. R., Evans, J. R., Chatterjee, P. M. (2018). *Retail Management: A Strategic Approach*. 13th Edition, Pearson.
2. Božanić, D. I., Pamučar, D. S., & Karović, S. M. (2016). Primene metode MABAC u podršci odlučivanju upotrebe snaga u odbrambenoj operaciji. *Tehnika*, 71(1), 129-136.
3. Bozanic, D., Tešić, D., & Kočić, J. (2019). Multi-criteria FUCOM – Fuzzy MABAC model for the selection of location for construction of single-span Bailey bridge. *Decision Making: Applications in Management and Engineering*, *2*(1), 132-146. https://doi.org/10.31181/dmame1901132b
4. Bozanic, D., Tešić, D., & Milić, A. (2020). Multicriteria decision making model with Z-numbers based on FUCOM and MABAC model. *Decision Making: Applications in Management and Engineering*, *3*(2), 19-36. https://doi.org/10.31181/dmame2003019d
5. Brezović, K., Stanković, R., Šafran, M., Kolarić, G. (2021). Applying Multi Criteria Analysis in Evaluation of Distribution Channels. In: Petrović M., Novačko L. (eds) Transformation of Transportation. EcoProduction (Environmental Issues in Logistics and Manufacturing). Springer, Cham. https://doi.org/10.1007/978-3-030-66464-0_8
6. Ersoy, N. (2017). Performance measurement in retail ındustry by using a multi-criteria decision making methods. *Ege Academic Review*, 17(4), 539–551. https://doi.org/10.21121/eab.2017431302
7. Işik, Ö., Aydin Y., Koşaroğlu Ş. (2020). The assessment of the logistics performance index of CEE countries with the new combination of SV and MABAC methods. *LogForum* 16 (4), 549-559. http://doi.org/10.17270/J.LOG.2020.504
8. Levy, M., Weitz, B., Grewal, D. (2019). *Retailing Management*. 10th Edition, Mc Graw Hill.
9. Lukić, R. (2011a). *Evaluacija poslovnih performansi u maloprodaji*. Beograd: Ekonomski fakultet.
10. Lukic, R. (2011b). Estimates of economic performance of organic food retail trade. *Economic research*, 24(3), 157-169. https://doi.org/10.1080/1331677X.2011.11517474
11. Lukic, R., Lalic, S., Suceska, A., Hanic, A., Bugarcic, M. (2018). Carbon dioxide Emissions in retail food. *Economics of Agriculture*, 65(2), 859-874. DOI: https://doi.org/10.5937/ekoPolj1802859L

12. Lukić, R. (2019a). *Upravljanje troškovima u poljoprivrednom preduzeću*. Beograd: Ekonomski fakultet.
13. Lukic, R. and Hadrovic Zekic, B. (2019b). Evaluation of efficiency of trade companies in Serbia using the DEA approach. Proceedings of the 19 th International Scientific Conference BUSINESS LOGISTICS IN MODERN MANAGEMENT October 10-11, Osijek, Croatia, Josip Juraj Strossmayer University of Osijek, Faculty of Economics in Osijek, 145-165.
14. Lukic, R, Hadrovic Zekic, B. and Crnjac Milic, D. (2020a). Financial performance evaluation of trading companies in Serbia using the integrated Fuzzy AHP - TOPSIS Approach. 9th INTERNATIONAL SCIENTIFIC SYMPOSIUM REGION, ENTREPRENEURSHIP, DEVELOPMENT, Under the auspices of: REPUBLIC OF CROATIA MINISTRY OF SCIENCE AND EDUCATION, Osijek, June, 690-703.
15. Lukic, R. (2020b), ANALYSIS OF THE EFFICIENCY OF TRADE IN OIL DERIVATIVES IN SERBIA BY APPLYING THE FUZZY AHP-TOPSIS METHOD. *Business Excellence and Management*, 10 (3), 80-98. DOI: 10.24818/beman/2020.10.3-06
16. Lukic, R., Vojteski Kljenak, D. and Anđelić, S. (2020c). Analyzing financial performances and efficiency of the retail food in Serbia by using the AHP-TOPSIS method. *Economics of Agriculture*, 67(1), 55-68. DOI: https://doi.org/10.5937/ekoPolj2001055L
17. Lukić, R. (2020d). *Računovodstvo trgovinskih preduzeća*. Beograd: Ekonomski fakultet.
18. Lukic, R., Vojteski Kljenak, D., Anđelic, S. and Gavilovic, M. (2021a). Application WASPAS method in the evaluation of efficiency of agriccultural enterprises in Serbia. *Economics of Agriculture*, Year 68, No. 2, (pp. 375-388), Belgrade. DOI: https://doi.org/10.5937/ekoPolj2102375L
19. Lukic. R. (2021b). ANALYSIS OF THE EFFICIENCY OF INSURANCE COMPANIES BY LINES OF INSURANCE IN SERBIA USING THE COCOSO METHOD. *Insurance Trends*, 2, 24-38. DOI: 10.5937/TokOsig2102009L
20. Lukic, R. (2021c). Application of MABAC Method in Evaluation of Sector Efficiency in Serbia. *Review of International Comparative Management*, 22(3), 400-417. DOI: 10.24818/RMCI.2021.3.400
21. Lukić, R. (2021d). Analiza efikasnosti finansijskih institucija na bazi OCRA metode. *Tehnika*, 76(1), 103-111. DOI: 10.5937/tehnika2101103L

22. Lukic, R. (2021e). APPLICATION OF THE EDAS METHOD IN THE EVALUATION OF BANK EFFICIENCY IN SERBIA. *Bankarstvo*, 50(2), 13-24. *doi:* 10.5937/bankarstvo2102064L
23. Lukić. R. (2021f). ANALYSIS OF THE EFFICIENCY OF TRADE COMPANIES IN SERBIA BASED ON THE SAW METHOD. *ECONOMIC OUTLOOK*, 23 (1), 1-16. (In Serbian: Лукић. R. (2021f). АНАЛИЗА ЕФИКАСНОСТИ ТРГОВИНСКИХ ПРЕДУЗЕЋА У СРБИЈИ НА БАЗИ SAW МЕТОДЕ. *Економски погледи*, 23(1),1-16.)
24. Mathew, M., & Sahu, S. (2018). Comparison of new multi-criteria decision making methods for material handling equipment selection. *Management Science Letters*, 8(3), 139-150. DOI: 10.5267/j.msl.2018.1.004
25. Nedeljković, M., Puška, A., Doljanica, S., Virijević Jovanović, S., Brzaković, P., Stević. Ž., et al. (2021). Evaluation of rapeseed varieties using novel integrated fuzzy PIPRECIA – Fuzzy MABAC model. PLoS ONE 16(2): e0246857. https://doi.org/10.1371/journal.pone.0246857
26. Okwu, M. O., Tartibu, L. K. (2020). Sustainable supplier selection in the retail industry: A TOPSIS- and ANFIS-based evaluating methodology. *International Journal of Engineering Business Management*, 12, 1-14. doi:10.1177/1847979019899542
27. Pachar, N., Darbari, J.D., Govindan, K. et al. (2021). Sustainable performance measurement of Indian retail chain using two-stage network DEA. *Ann Oper Res*. https://doi.org/10.1007/s10479-021-04088-y
28. Pamučar, D. i Ćirović, G. (2015). The selection of transport and handling resources in logistics centers using Multi-Attributive Border Approximation area Com- parison (MABAC). *Expert Systems with Applications*, 42(6), 3016-3028. https://doi.org/10.1016/j.eswa.2014.11.057
29. Saaty, T. L. (2008). Decision Making With The Analytic Hierarchy Process. *Int J Serv Sci*, 1(1), 83-98. https://doi.org/10.1504/IJSSCI.2008.017590
30. Singh, J., Tyagi, P., Kumar, G. and Agrawal, S. (2020). Convenience store locations prioritization: a fuzzy TOPSIS-GRA hybrid approach. *Modern Supply Chain Research and Applications*, 2(4) 281-302. https://doi.org/10.1108/MSCRA-01-2020-0001
31. Tsai, Chi-Mao; Lee, Hsuan-Shih; and Gan, Guo-Ya (2021). A New Fuzzy DEA Model for Solving the MCDM Problems in

Supplier Selection. *Journal of Marine Science and Technology*: 29(1), Article 7. DOI: 10.51400/2709-6998.1006

32. Timiryanova, V. (2020). Analyzing the production-distribution-consumption cycle using hierarchical modeling methods. *Accounting*, 6(7), 1313-1322.

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