APPLICATION OF ELECTRE METHOD IN PERFORMANCE ANALYSIS OF FOOD RETAILERS IN SERBIA

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Abstract
Various methods of multicriteria optimization have been developed and have recently been widely applied in trade. With this in mind, this paper investigates the performance of food retailers in Serbia based on the ELECTRE method. The goal and purpose of researching the efficiency problems of leading food retailers using the ELECTRE method is to see as realistically as possible their position on the food market in Serbia in order to improve in the future by more efficient control of critical factors and implementation of relevant measures. In addition to the challenges, topicality, significance and complexity, the reasons for researching the given problem in this paper are reflected in that. In addition, by applying the ELECTRE method, more realistic results are obtained in relation to the ratio analysis, especially in combination with other methods of multicriteria analysis (TOPSIS, AHP, ARAS and others). The results of the research show that Delhaize Serbia is the best company in terms of performance. This is the result of Delhaize Serbia's good position in the retail market in Serbia. It applies new business models (private label, sales of organic products, multi-channel sales - stores and electronic). It applies modern concepts of cost management, sales, assets, capital, customers, product categories and profit. In addition to all that, the digitalization of the entire business is at a high level. These and other factors have positively influenced its good positioning on the retail food market in Serbia.
Keywords: efficiency, ELECTRE method, factors, retail food, Serbia.

1. INTRODUCTION

The issue of measuring the efficiency of food retailers is continuously topical, complex and very important (Berman, 2018; Levy, 2019). For these reasons, it is permanently researched on a global level, by individual countries and by individual food retail companies. At the same time, different, individually or integrated, methods of mathematical programming (multicriteria optimization) are increasingly used (Adriyendi, 2015; Gaur, 2020; Churchman, 1954; Ersoy, 2017; Jain, 2013; Khatrouch, 2017; Memariani, 2009; Milani, 2006; Vural, 2020; Velasquez, 2013; Triantaphyllou, 1998; Wu, 2019; Yeh, 2001). This includes the ELECTRE method. Starting from that, the subject of research in this paper is the assessment of the efficiency of food retailers in Serbia on the basis of the ELECTRE method. The purpose and goal of this is to review the current situation and propose adequate measures to improve the efficiency of food

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retailers in Serbia in the future. This, among other things, reflects the scientific and professional contribution of this paper.

Recently, an increasingly rich literature has been devoted to the analysis of the efficiency of enterprises, including trade, using the ELECTRE method (Burinskiene, 2014; Wu,, 2019) . In this paper, as far as we know, for the first time in the literature in Serbia and analyzes the efficiency (performance measures) of food retailers in Serbia using the ELECTRE method, which is not the case with other methods (Lukic, 2011, 2019, 2020a, b, c, d, 2021a, b, c, d, e).

The basic hypothesis of the research is that continuous monitoring of the dynamics of efficiency of food retailers in all countries, which means in Serbia, is a prerequisite for its improvement in the future. This provides a basis for timely action in that direction by taking appropriate measures.

The research methodology of the given hypothesis is based on the application of the ELECTRE method. This method can play a significant role in improving the efficiency of retail companies that sell food in Serbia. It makes it easier to see as fully as possible which are the most favourable alternatives (i.e. in our case which are the best food retailers in Serbia in terms of performance) under the given criteria in specific circumstances and limitations.

Empirical data for the needs of research on the issues treated in this paper were obtained from the Business Registers Agency of the Republic of Serbia. In methodological terms, they are “produced” in accordance with relevant international standards and, given that, there are no restrictions on the international comparability of initial data and results.

2. ELECTRE METHOD

The main purpose of the ELECTRE (ELimination and Choice Expressing the REality) method is to enable the comparison of alternatives in pairs for each criterion. As part of the successive comparison of the relationship of preferential superiority of alternatives, the agreement index is defined as the amount of evidence supporting the result that "alternative *Aj* is superior to alternative *Ak* " or "more important", while the index of disagreement is opposite to the compatibility index. The ELECTRE method is particularly suitable for solving decision-making problems involving several criteria, with many alternatives being superior (Triantaphyllou, 2018; Khatrouch, 2017; Vural, 2020; Velasquez, 2013). The ELECTRE method takes place through the following steps (Vural, 2020):

Step 1. Creating a decision matrix (A).

The decision matrix (A), in which the criteria (for evaluation) are presented in columns and alternatives in rows, is formulated as follows:

$$A_{ij} = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a2n \\ \vdots & \vdots & \vdots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{bmatrix}$$

Step 2. Creating a standard decision matrix (X).

Decision matrix A is transformed by normalization into a standard structure of the decision matrix. Different normalization formulas are used for the criteria of benefits (utility) and costs.

Normalization for benefit criteria is:

$$x_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^{n} a_{ij}^2}} \quad i = 1, \dots, m \; j = 1, \dots, n. \qquad (1)$$

Normalization for cost criteria is:

$$x_{ij} = \frac{\frac{1}{a_{ij}}}{\sqrt{\left(\frac{1}{a_{ij}}\right)^2}} \quad i = 1, \dots, m \;\; j = 1, \dots, n. \qquad (2)$$

The standard decision matrix (*X*) generated with the given formulas is:

$$x_{ij} = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix}$$

Step 3. Creating a weighted (weight) normalized decision matrix (Y).

The standardized matrix is multiplied by the values of W_j to obtain a weighted (weight) normalized decision matrix (*Y*):

$$y_{ij} = \begin{bmatrix} W_1 x_{11} & W_2 x_{12} & \cdots & W_n x_{1n} \\ W_1 x_{21} & W_2 x_{22} & \cdots & W_n x_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ W_1 x_{m1} & W_2 x_{m2} & \cdots & W_n x_{mn} \end{bmatrix} Y_{ij} = W_j x_{ij} \; i = 1, \dots, m \;\; j = 1, \dots, n.$$

$$\left(\sum_{i=1}^{n} W_j = 1\right). \qquad (3)$$

where *Wj* weight j^{th} criterion (Triantaphyllou, 1998).

Step 4 . Determining the set of agreement and disagreement.

The criteria for each pairwise comparison was divided into two separate groups. In the case when alternatives that represent a future solution to the problem are not "the best" according to all criteria, they are then asked to be "better" according to most criteria, and comparisons are made in pairs (Milani, 2006). The characteristics of the ELECTRE method are that each set of consents (C_{kl}) corresponds to a set of disagreements (D_{kl}), ie that there are as many sets of disagreements as there are sets of consents. The set of elements of disagreement consists of j values that do not belong to the corresponding set of consents. The agreement set C_{kl} of two alternatives A_k and A_l where $k \geq 1$ and $l \geq 1$, is defined as the set of all criteria so that A_k preferred over A_l It is displayed as follows:

$$C_{kl} = \{j, |y_{kj} \geq y_{lj}\}, j = 1,2,3, \dots, N. \qquad (4)$$

A complementary set is called a set of disagreements. He is described as (Triantaphyllou, 1998):

$$D_{kl} = \{j, |y_{kj} < y_{lj}\}, za\ j = 1,2,3, \dots, N. \qquad (5)$$

Step 5 . Creating matrices of agreement (*C*) and disagreement (*D*).

The agreement set was used to generate the agreement matrix (*C*). Matrix *C* has no value for $k = 1$. The elements of this matrix are calculated by the formula:

$$C_{kl} = \sum_{j \in c_{kl}} W_j. \qquad (6)$$

Here, the agreement index C_{kl} shows how confident (confident), as a result, the comparison is in pairs. Thus, for example, if $C_{12} = \{1,4\}$, then the value of the element C_{12} the matrix C will be C_{12}= w1 + w4. Matrix *C* is

$$C = \begin{bmatrix} - & C_{12} & \cdots & C_{1n} \\ C_{21} & - & \cdots & C_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ C_{m1} & C_{m2} & \cdots & - \end{bmatrix}$$

The elements of the nonconformity matrix (*D*) are calculated using the following formula:

$$d_{kl} = \frac{\Sigma\left(\left|y_{kj_{j\in D_{kl}}} - y_{lj}\right|\right)}{\Sigma\left(\left|y_{kj_j} - y_{lj}\right|\right)}. \qquad (7)$$

Matrix *D* does not take into account the value for *k* = 1. Matrix *D* is

$$D = \begin{matrix} - & d_{12} & \cdots & d_{1n} \\ d_{21} & - & \cdots & d_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ d_{m1} & d_{m2} & \cdots & - \end{matrix}$$

Step 6 . Performing a comparison of excellence.

Once the matrices of agreement and disagreement are calculated, their elements are checked in a certain way, and inappropriate alternatives are eliminated. The dominance of A_k alternative over A_l alternative is determined on the basis of how large C_{kl} is in the agreement matrix, and small D_{kl} in the disagreement index. The average C and *D* values ($\bar{C}$ and $\bar{D}$) were calculated. If $C_{kl} \geq \bar{C}$ and $D_{kl} \leq \bar{D}$ then the alternative A_k is preferred over the alternative A_l. The alternatives selected by the ELECTRE method form the core (*K*). Core (*K*) is formed according to the following conditions (Milani, 2006):

- The decision point (alternative) in *K* is not more dominant than the second decision point in *K* (alternative).
- The decision point (alternative) outside *K* is behind at least one point in *K* in the order of preferences.

Step 7 . Calculation of the net index of agreement and disagreement.

If there is more than one alternative in the core, then the choice is determined by calculating the index of net agreement and disagreement. They make it possible to see which alternative is more dominant than the comparable other. If the value of the net index of agreement is the highest, and the index of disagreement is the lowest - an alternative set (with these features) is the solution. The net agreement index $C_p's$ is sorted from higher to lower, and the net index of disagreement $D_p's$ is sorted from lowest to highest. The net index of agreement and disagreement is calculated as follows:

$$C_p = \sum_{k=1_{k\neq p}}^{m} C_{pk} - \sum_{k=1_{k\neq p}}^{m} C_{kp} \qquad (8)$$

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$$D_p = \sum_{k=1_{k\neq p}}^{m} D_{pk} - \sum_{k=1_{k\neq p}}^{m} D_{kp} \quad (9)$$

The final rank was determined by choosing the highest " *C* " and the lowest " *D* " (Milani, 2006).

In this paper, for the purposes of applying the ELECTRE method in the evaluation of the efficiency of food retailers 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

$$A = [a_{ij}] = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ 1/a_{12} & 1 & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ 1/a_{1n} & 1/a_{2n} & \cdots & 1 \end{bmatrix} \quad (10)$$

Step2: Normalizing the pair-wise comparison matrix

$$a_{ij}^{*} = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}, i,j = 1, \ldots, n \quad (11)$$

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

$$w_i = \frac{\sum_{i=1}^{n} a_{ij}^{*}}{n}, i,j = 1, \ldots, n \quad (12)$$

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

$$CI = \frac{\lambda_{max} - n}{n} \quad (13)$$

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.

3.MEASURING THE PERFORMANCE OF FOOD RETAILERS IN SERBIA BASED ON THE ELECTRE METHOD

During the measurement of performance of retailers food in Serbia using ELECTRE method as well as the criteria have been taken: C1 - gross margin on inventories, C2 - gross margin on sales, C3 - inventory turnover ratio, C4 - company size and C5 - capital intensity. Alternatives are chosen food retailers in Serbia. Table 1 shows the initial data in the form of ratio numbers for measuring the performance of food retailers in Serbia based on the ELECTRE I method for 2019. The study included leading food retailers in Serbia.

TABLE 1. INITIAL DATA FOR MEASURING THE PERFORMANCE OF FOOD RETAILERS IN SERBIA

	Gross margin on inventories (Gross margin / Inventories (%)	Gross margin on sales (Gross margin / Sales) (%)	Inventory turnover ratio (Sales / Supplies)	Company size (Log10 sale)	Capital intensity (Fixed assets / Assets)
Delhaize Serbia	402.61	29.71	13.55	5.02	0.51
Mercator-S	214.31	23.38	9.16	4.89	0.69
Univerexport	224.93	23.37	9.62	4.3	0.69
DIS	102.32	10.22	10.01	4.3	0.72
Delta Agrar	13.94	5.16	2.7	4.31	0.58
Gomex	168.08	17.85	9.41	4.13	0.48
Lidl Serbia	219.88	21.59	10.18	4.57	0.76
Matijević DOO	15.2	9.54	1.59	3.71	0.68
Statistics					
Mean	170.1588	17.6025	8.2775	4.4038	.6388
Std. Error of Mean	45.21337	2.99856	1.42751	.14823	.03623
Median	191.1950	19.7200	9.5150	4.3050	.6850
Std. Deviation	127.88272	8.48122	4.03759	.41925	.10246
Skewness	.463	-.197	-.895	-.010	-.652
Std. Error of Skewness	.752	.752	.752	.752	.752
Kurtosis	.397	-1.247	-.039	-.034	-1.172
Std. Error of Kurtosis	1.481	1.481	1.481	1.481	1.481
Minimum	13.94	5.16	1.59	3.71	.48
Maximum	402.61	29.71	13.55	5.02	.76
Mean	170.1588	17.6025	8.2775	4.4038	.6388
Test statistics[a]					
N	8				
Chi-Square	30.800				
df	4				
Asymp. Sig.	.000				
a. Friedman Test					

Note: Author's calculation
Source: Agency for Business Registers of the Republic of Serbia

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There is a significant difference between the observed variables at the level of statistical significance (Asymp. Sig. .000 < .05), so that the null hypothesis that there are no differences between them is rejected. According to the ratio analysis, the food retailer Delhaize Serbia is the best in all performance indicators in relation to the observed food retailers in Serbia. This is, among other things, the result of a good knowledge of the specifics of doing business in the retail food market in Serbia.

TABLE 2. CORRELATIONS

Correlations						
		1	2	3	4	5
1 Gross margin on inventorie	Pearson Correlation	1	.958**	.891**	.792*	-.231
	Sig. (2-tailed)		.000	.003	.019	.581
	N	8	8	8	8	8
2 Gross margin on sales	Pearson Correlation	.958**	1	.814*	.715*	-.119
	Sig. (2-tailed)	.000		.014	.046	.779
	N	8	8	8	8	8
3 Inventory turnover ratio	Pearson Correlation	.891**	.814*	1	.720*	-.111
	Sig. (2-tailed)	.003	.014		.044	.794
	N	8	8	8	8	8
4 Company size	Pearson Correlation	.792*	.715*	.720*	1	-.092
	Sig. (2-tailed)	.019	.046	.044		.828
	N	8	8	8	8	8
5 Capital intensity C	Pearson Correlation	-.231	-.119	-.111	-.092	1
	Sig. (2-tailed)	.581	.779	.794	.828	
	N	8	8	8	8	8
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

Note: Author's calculation

There is a strong correlation between the observed variables at the level of statistical significance, except for capital intensity. The weighting coefficients of the selected criteria were determined using the AHP method. They are shown in Table 3 and Figure 1.

TABLE 3. AHP METHOD: PRIORITY RESULTS

Resulting Priorities

Priorities
These are the resulting weights for the criteria based on your pairwise comparisons:

Chat		Priority	Rank	(+)	(-)
1	Gross margin on inventories	50.1%	1	13.0%	13.0%
2	Gross margin on sales	21.6%	2	6.2%	6.2%
3	Inventory turnover ratio	16.4%	3	5.2%	5.2%
4	Company size	7.6%	4	1.7%	1.7%
5	Capital intensity	4.4%	5	1.0%	1.0%

Decision Matrix

The resulting weights are based on the principal eigenvector of the decision matrix:

	1	2	3	4	5
1	1	3.00	4.00	5.00	9.00
2	0.33	1	2.00	3.00	4.00
3	0.25	0.50	1	3.00	5.00
4	0.20	0.33	0.33	1	2.00
5	0.11	0.25	0.20	0.50	1
Number of comparisons = 10 **Consistency Ratio CR** = 3.2% Principal Eigen value = 5.143 Eigenvector solution: 4 iterations, delta = 6.4E -8					

Note: The author's calculating using the program AHP online calculator
Source: Author's calculation

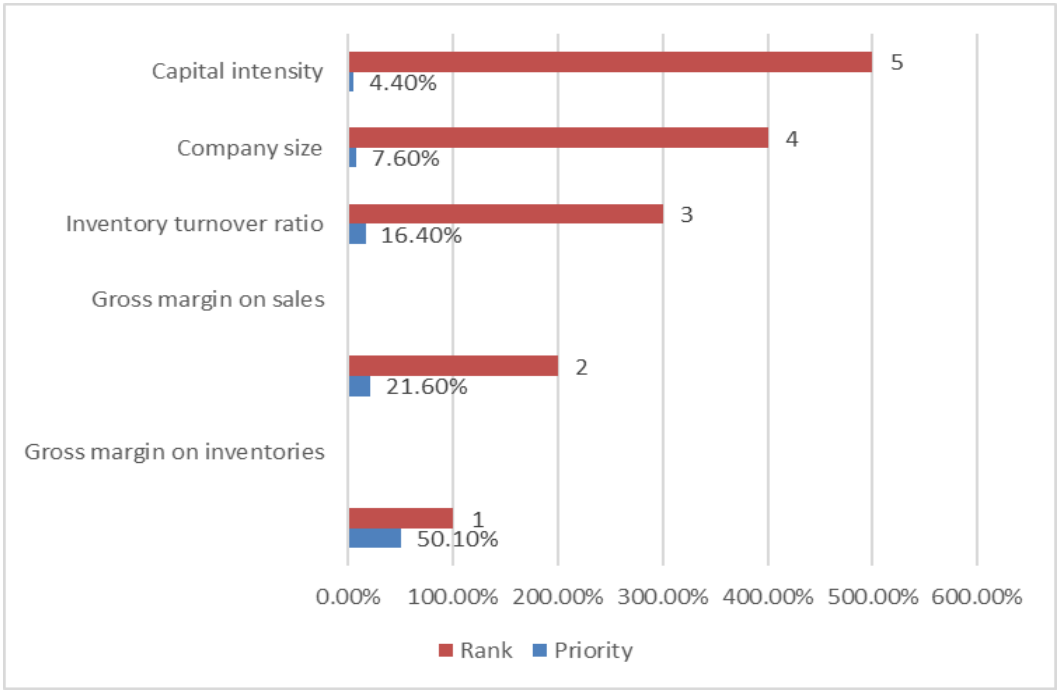

FIGURE 1. WEIGHT COEFFICIENTS OF CRITERIA
Source: Author's picture

The importance of individual criteria in the order is, therefore, according to AHP method as follows: gross margin on inventories, gross margins on sales, inventory turnover ratio, company size and capital intensity. Effective control of these factors can achieve the target performance of food retailers in Serbia.

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The obtained results of the research of the efficiency of the leading food retailers in Serbia using the ELECTRE method are presented in the tables below, as well as graphically. The order of the tables (4 – 13) follows the phases of calculation using the ELECTRE method. The calculation was performed using the software program ELECTRESoftware-Excel.

Table 4 shows the initial decision matrix.

TABLE 4. INITIAL DECISION MATRIX

Initial Decision Matrix					
Weights of Criteria	0.501	0.216	0.164	0.076	0.044
Kind of Criteria	1	1	1	1	1
	C1	**C2**	**C3**	**C4**	**C5**
A1	402.61	29.71	13.55	5.02	0.51
A2	214.31	23.38	9.16	4.89	0.69
A3	224.93	23.37	9.62	4.3	0.69
A4	102.32	10.22	10.01	4.3	0.72
A5	13.94	5.16	2.7	4.31	0.58
A6	168.08	17.85	9.41	4.13	0.48
A7	219.88	21.59	10.18	4.57	0.76
A8	15.2	9.54	1.59	3.71	0.68
SUM OF SQUARES	346109.9	2982.3	662.251	156.3745	3.3375
SQRT	588.3111	54.6105	25.7342	12.50498	1.826883

Source: Author's calculation

Table 5 shows the normalized decision matrix.

TABLE 5. NORMALIZED DECISION MATRIX

Normalized Decision Matrix					
Weights of Criteria	0.501	0.216	0.164	0.076	0.044
Kind of Criteria	1	1	1	1	1
	C1	**C2**	**C3**	**C4**	**C5**
A1	0.6843	0.5440	0.5265	0.4014	0.2792
A2	0.3643	0.4281	0.3559	0.3910	0.3777
A3	0.3823	0.4279	0.3738	0.3439	0.3777
A4	0.1739	0.1871	0.3890	0.3439	0.3941
A5	0.0237	0.0945	0.1049	0.3447	0.3175
A6	0.2857	0.3269	0.3657	0.3303	0.2627
A7	0.3737	0.3953	0.3956	0.3655	0.4160
A8	0.0258	0.1747	0.0618	0.2967	0.3722

Source: Author's calculation

Table 6 shows the weighted normalized decision matrix.

TABLE 6. WEIGHTED NORMALIZED DECISION MATRIX

Weighted Normalized Decision Matrix					
Weights of Criteria	0.501	0.216	0.164	0.076	0.044
Kind of Criteria	1	1	1	1	1
	C1	C2	C3	C4	C5
A1	0.3429	0.1175	0.0864	0.0305	0.0123
A2	0.1825	0.0925	0.0584	0.0297	0.0166
A3	0.1915	0.0924	0.0613	0.0261	0.0166
A4	0.0871	0.0404	0.0638	0.0261	0.0173
A5	0.0119	0.0204	0.0172	0.0262	0.0140
A6	0.1431	0.0706	0.0600	0.0251	0.0116
A7	0.1872	0.0854	0.0649	0.0278	0.0183
A8	0.0129	0.0377	0.0101	0.0225	0.0164

Source: Author's calculation

Table 7 shows the determine the concordance and discordance

TABLE 7. DETERMINE THE CONCORDANCE AND DISCORDANCE

Determine the concordance and discordance					
Weights of Criteria	0.501	0.216	0.164	0.076	0.044
Kind of Criteria	1	1	1	1	1
	C1	C2	C3	C4	C5
A1-A2					
A1-A3					
A1-A4					
A1-A5					
A1-A6					
A1-A7					
A1-A8					
A2-A1					
A2-A3					
A2-A4					
A2-A5					
A2-A6					
A2-A7					
A2-A8					
A3-A1					
A3-A2					
A3-A4					
A3-A5					
A3-A6					

A3-A7					
A3-A8					
A4-A1					
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A7-A4					
A7-A5					
A7-A6					
A7-A8					
A8-A1					
A8-A2					
A8-A3					
A8-A4					
A8-A5					
A8-A6					
A8-A7					
Notice that the green cells contain the concordance set and the red cells contain the discordance set.					

Source: Author's calculation

Table 8 shows the concordance matrix.

TABLE 8. CONCORDANCE MATRIX

Concordance Matrix								
	A1	A2	A3	A4	A5	A6	A7	A8
A1		0.9570	0.9570	0.9570	0.9570	1.0010	0.9570	0.9570

A2	0.0440		0.3360	0.7930	1.0010	0.8370	0.2920	1.0010
A3	0.0440	0.7090		0.7930	0.9250	1.0010	0.7170	1.0010
A4	0.0440	0.2080	0.2840		0.9250	0.2840	0.0000	1.0010
A5	0.0440	0.0000	0.0760	0.0760		0.1200	0.0000	0.2400
A6	0.0000	0.1640	0.0000	0.7170	0.8810		0.0000	0.9570
A7	0.0440	0.7090	0.2840	1.0010	1.0010	1.0010		1.0010
A8	0.0440	0.0000	0.0000	0.0000	0.7610	0.0440	0.0000	

TOTAL AMOUNT	**28.1480**
Threshold Value	**0.5026**

Source: Author's calculation

Table 9 shows the discordance matrix.

TABLE 9. DISCORDANCE MATRIX

Discordance Matrix								
	A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**
A1		0.0270	0.0287	0.0198	0.0051	0.0000	0.0387	0.0124
A2	1.0000		1.0000	0.0568	0.0000	0.0405	0.9181	0.0000
A3	1.0000	0.3965		0.0238	0.0003	0.0000	0.5069	0.0000
A4	1.0000	1.0000	1.0000		0.0008	1.0000	1.0000	0.0000
A5	1.0000	1.0000	1.0000	1.0000		1.0000	1.0000	1.0000
A6	1.0000	1.0000	1.0000	0.1032	0.0183		1.0000	0.0370
A7	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000		0.0000
A8	1.0000	1.0000	1.0000	1.0000	0.4083	1.0000	1.0000	

TOTAL AMOUNT	**30.6423**

Threshold Value	0.5472

Source: Author's calculation

Table 10 shows the concordance dominance matrix.

TABLE 10. CONCORDANCE DOMINANCE MATRIX

Concordance Dominance Matrix								
	A1	A2	A3	A4	A5	A6	A7	A8
A1		1	1	1	1	1	1	1
A2	0		0	1	1	1	0	1
A3	0	1		1	1	1	1	1
A4	0	0	0		1	0	0	1
A5	0	0	0	0		0	0	0
A6	0	0	0	1	1		0	1
A7	0	1	0	1	1	1		1
A8	0	0	0	0	1	0	0	

Source: Author's calculation

Table 11 shows the matrix of disagreement dominance.

TABLE 11. DISAGREEMENT DOMINANCE MATRIX

Discordance Dominance Matrix								
	A1	A2	A3	A4	A5	A6	A7	A8
A1		1	1	1	1	1	1	1
A2	0		0	1	1	1	0	1
A3	0	1		1	1	1	1	1
A4	0	0	0		1	0	0	1
A5	0	0	0	0		0	0	0
A6	0	0	0	1	1		0	1
A7	0	0	0	1	1	1		1
A8	0	0	0	0	1	0	0	

Source: Author's calculation

Table 12 shows the dominance aggregation matrix.

TABLE 12. AGGREGATE DOMINANCE MATRIX

Aggregate Dominance Matrix									
	A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**SUM**
A1		1	1	1	1	1	1	1	7
A2	0		0	1	1	1	0	1	4
A3	0	1		1	1	1	1	1	6
A4	0	0	0		1	0	0	1	2
A5	0	0	0	0		0	0	0	0
A6	0	0	0	1	1		0	1	3
A7	0	0	0	1	1	1		1	4
A8	0	0	0	0	1	0	0		1
SUM	0	2	1	5	7	4	2	6	

Source: Author's calculation

Table 13 and Figure 2 show the ranking of alternatives.

TABLE 13. RANKING OF ALTERNATIVES

	Ranking			
	Alternatives	**Sum of Rows**	**Sum of Columns**	**Final Solution**
Delhaize Serbia	**A1**	7	0	**7**
Mercator-S	**A2**	4	2	2
Univerexport	**A3**	6	1	5
DIS	**A4**	2	5	-3
Delta Agrar	**A5**	0	7	-7
Gomex	**A6**	3	4	-1
Lidl Serbia	**A7**	4	2	2
Matijević DOO	**A8**	1	6	-5
Higher Values in Final Solution have Higher Rankings.				

Source: Author's calculation

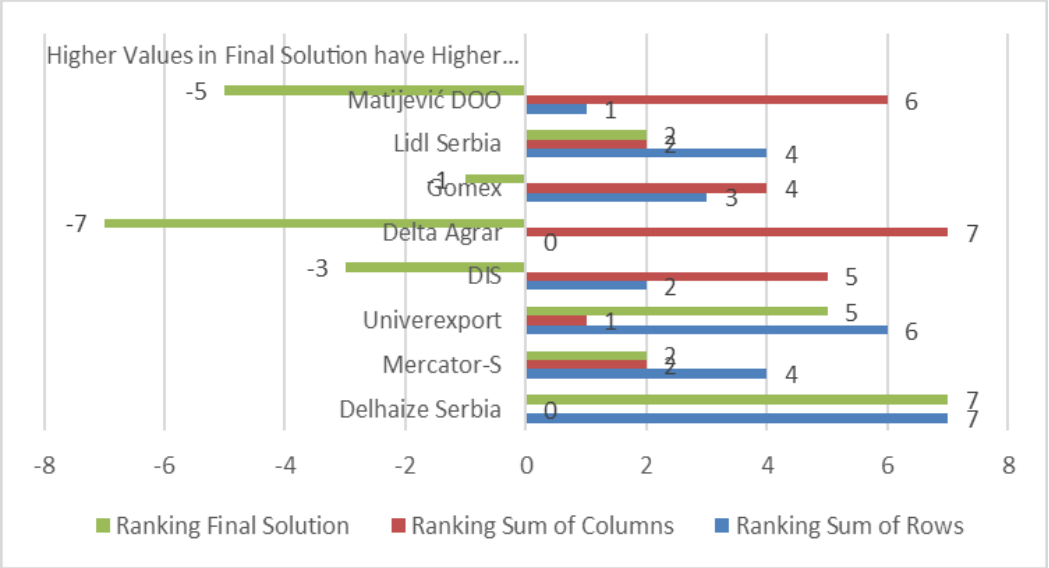

FIGURE 1. RANKING OF ALTERNATIVES
Source: Author's picture

Based on the obtained results of the research on the efficiency of food retailers in Serbia using the ELECTRE I method, it can be stated that Delhaize Serbia is in the first place in terms of performance. They follow in order: Univerexport, Mercator-S, LIDL Serbia (shares the same place with Mercator-S), Gomex, DIS, Matijević DOO and Delta Agrar.Delhaize Serbia has been operating in Serbia for a long time , and is well acquainted with consumer requirements and the business environment. This had a positive effect on its good positioning on the food retail market in Serbia. Thanks to its specific business strategy, Univerexport is well positioned on the retail market in Serbia. In order to improve the performance of food retailers in Serbia, it is necessary to manage revenues, costs and stocks as efficiently as possible. Likewise, firm size and capital intensity need to be optimized.

In order to see the most realistic efficiency of food retailers in Serbia, it is necessary, in addition to the ratio analysis, statistical analysis, to use the ELECTRE method. And especially in combination with other methods of multicriteria analysis (TOPSIS, AHP, VASPAS and others), as well as DEA models.

4.CONCLUSION

Based on the conducted empirical research in this paper, we can conclude the following:

(1) According to the ratio analysis, according to all analyzed performance indicators, the retailer Delhaize Serbia is better than the observed food retailers in Serbia. This is a consequence, among other things, of a good knowledge of the specifics of the retail food market in Serbia in terms of customer requirements.

(2) According to the obtained analysis results of the efficiency of food retailers in Serbia using the ELECTRE I method, it can be concluded that Delhaize Serbia is in the first place in terms of performance. They follow in order: Univerexport, Mercator-S, LIDL Serbia (shares the same place with Mercator-S), Gomex, DIS, Matijević DOO and Delta Agrar. Delhaize Serbia has been operating in Serbia for a long time, and is well acquainted with consumer requirements and the business environment. This had a positive effect on its good positioning on the food retail market in Serbia. Thanks to its specific business strategy, Univerexport is positioned in the retail food market in Serbia.

(3) In order to improve the performance of food retailers in Serbia, it is necessary to manage revenues, costs and stocks as efficiently as possible. Likewise, firm size and capital intensity need to be optimized.

(4) Research on the example of food retailers in Serbia shows that the application of the Elektra method provides a realistic evaluation of the efficiency of food retailers as a starting point for improvement in the future by more efficient control of critical factors and application of relevant measures. For these reasons, generally speaking, its application in the analysis of the efficiency of food retailers is recommended. In addition, other methods of multi-criteria analysis should be used, such as VASPAS, ARAS, SAW and others.

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