Application of the MARCOS Method in Analysis of the Positioning of Electronic Trade of the European Union and Serbia

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The issue of the development of digitization and electronic trade is very challenging, significant and complex. Bearing that in mind, this paper comparatively analyzes the position of electronic trade of the countries of the European Union and Serbia based on the MARCOS method. The obtained empirical results of the research show that the top five countries of the European Union in terms of the development of electronic business in trade are in order: Finland, Austria, Netherlands, Spain, and Sweden. Out of the twenty-eight countries included in the research of the problem treated in this work, Romania ranks last. As far as the electronic trade business of Serbia is concerned, it is in the twenty-fourth place. It is in a worse position compared to Slovenia and Croatia. By rank, Slovenia is in sixth place, and Croatia is in twenty-first place. Certainly, the differences in the development of electronic business are reflected in their own way on the performance of trade between the European Union and Serbia. As is well known, electronic trade has significantly mitigated the negative effect of the Covid-19 pandemic on trade performance. In the future, it is absolutely necessary to improve the digitization of the entire business of trade in all member countries of the European Union and Serbia. This will have a positive impact on their performance.

Keywords: *Electronic trade, European Union, MARCOS method, Positioning, Serbia*
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1 Introduction

As part of numerous innovations in modern trade (multichannel sales, private label, sale of organic products, etc.), digitization of the entire business is of particular importance [1-23]. Considering the actuality, importance and complexity of digitalization of modern trade, in this paper, as a subject of research, the ranking of the trade of the European Union and Serbia according to the degree of development of electronic business based on the MARCOS method is carried out. The goal and purpose of this is to take appropriate measures based on real knowledge of the positioning (ranking) of individual European Union – EU member states and Serbia in the function of improving electronic trade in the future, as a significant determinant of the achievement of the target profit. This is completely in line with the fact that electronic business is one of the critical factors of the business success of modern trade. In this context, the scientific and professional contribution of this work is manifested.

The issue of the development of digital (electronic) trade business is very challenging, significant and complex [10], [11], [6], [19], [20], [23], [3]. The effects of electronic trade come to the fore especially in times of crisis, as is the case with the COVID-19 corona virus pandemic [21], [4]. Considering that, there is a richer literature dedicated to electronic trade. In the literature, the electronic business of trade (application of information and communication technology, digitization of business) is investigated from different angles: the dynamics of the development of electronic business of trade; the importance of the development of electronic trade; impact of electronic business on trade performance; problems of applying electronic business in trade; and the impact of electronic business on trade performance in the conditions of the COVID-19 pandemic [5], [1], [2], [8], [14], [15], [22]. Recently, electronic trade has been especially investigated from the point of view of bibliometric analysis (research through literature) [11]. All the relevant literature in this paper serves as a theoretical,

methodological and empirical basis for research and ranking according to the degree of development of the electronic trade of the European Union and Serbia based on the MARCOS method.
The research hypothesis in this paper is based on the fact that electronic business is one of the critical factors of business success of modern trade. That is why it is important to find out as realistically as possible what is the positioning (ranking) of each country's trade in terms of the development of electronic business (application of modern information and communication technology, digitization of the entire business). It provides the basis for the improvement of electronic business in order to achieve the target performance of trade [13], [15]. In this, the application of integrated or individually different methods of multi-criteria decision-making, including the MARCOS method [11], and DEA (Data Envelopment Analysis) model.
For the purposes of researching the issues treated in this paper, the original empirical data were collected from Eurostat. They are "produced" according to the same methodology, so there are no restrictions on international comparability.

2 MARCOS method

The MARCOS method is based on defining the relationship between alternatives and reference values (ideal and anti-ideal alternatives). Based on the defined relationships, the utility functions of the alternatives are determined and a compromise ranking is made in relation to ideal and anti-ideal solutions. Decision preferences are defined based on a utility function. Utility functions represent the position of alternatives in relation to ideal and anti-ideal solutions. The best alternative is the one that is closest to the ideal and at the same time furthest from the anti-deal reference point. The MARCOS method proceeds through the following steps [17], [18]:
Step 1: Formation of the initial decision-making matrix. A multi-criteria model involves defining a set of *n* criteria and *m* alternatives. In the case of group decision-making, a set of *r* experts is formed who evaluate the alternatives in relation to the criteria. In that case, the expert evaluation matrices are aggregated into the initial group decision matrices.
Step 2: Forming the expanded initial matrix. In this step, the expansion initial matrix is defined with ideal (*AI*) and anti-ideal (*AAI*) solutions.

$$X = \quad C_1 \; C_2 \; \cdots \; C_n \;\; AAI \; A_1 \; A_2 \; \cdots \; A_m \; AI$$
$$\begin{bmatrix} x_{aa1} \; x_{aa2} \; \cdots \; x_{aan} \; x_{11} \; x_{12} \cdots x_{1n} \; x_{21} \cdots x_{m1} \; x_{ai1} \;\; x_{22} \cdots x_{m2} \; x_{ai2} \;\; \cdots \; x_{2n} \\ \cdots \; \cdots \; \cdots \; x_{mn} \; \cdots \; x_{ain} \end{bmatrix} \quad (1)$$

Anti-ideal solution (*AAI)* is the worst alternative. The ideal solution (AI*)* is, on the contrary, the alternative with the best characteristics. Depending on the nature of the criteria, *AAI* and *AI* are defined by applying the following equations:

$$AAI = x_{ij} \;\; if \; j \in B \; and \; x_{ij} \;\; if \; j \in C \qquad (2)$$

$$AI = x_{ij} \;\; if \; j \in B \; and \; x_{ij} \;\; if \; j \in C \qquad (3)$$

where *B* represents a benefit and *C* a cost group of criteria.
Step 3: Normalization of the expanded initial matrix (*X*). The elements of the normalized matrix $N = [n_{ij}]_{mxn}$ are obtained by applying the following equations:

$$n_{ij} = \frac{x_{ai}}{x_{ij}} \; if \; j \in C \qquad (4)$$

$$n_{ij} = \frac{x_{ij}}{x_{ai}} \ if \ j \in B \quad (5)$$

where the elements x_{ij} and x_{ai} represent the elements of the matrix *X*.
Step 4: Defining the weighting matrix $V = [v_{ij}]_{mxn}$.Weighting matrix *V* is obtained by multiplying the normalized matrix *N* with the weighting coefficients of the criteria w_j using the following equation:

$$v_{ij} = n_{ij} x v_j \quad (6)$$

Step 5: Determining the degree of utility of alternatives K_i. The degree of usefulness of alternatives in relation to anti-ideal and ideal solutions is determined using the following equations:

$$K_i^- = \frac{S_i}{S_{aai}} \quad (7)$$

$$K_i^+ = \frac{S_i}{S_{ai}} \quad (8)$$

where S_i ($i=1,2,..,m$) represents the sum of the elements of the weight matrix *V*, shown in the following equation:

$$S_i = \sum_{i=1}^{n} v_{ij} \quad (9)$$

Step 6: Determining the utility function of alternatives $f(K_i)$. The utility function is the compromise of the observed alternative in relation to ideal and anti-ideal solutions. The utility function of alternatives is defined by the following equation:

$$f(K_i) = \frac{K_i^+ + K_i^-}{1 + \frac{1 - f(K_i^+)}{f(K_i^+)} + \frac{1 - f(K_i^-)}{f(K_i^-)}}; \quad (10)$$

where $f(K_i^-)$represents the utility function in relation to the anti-ideal solution and $f(K_i^+)$represents the utility function in relation to the ideal solution.
Utility functions in relation to ideal and anti-ideal solutions are determined using the following equation:

$$f(K_i^-) = \frac{K_i^+}{K_i^+ + K_i^-} \quad (11)$$

$$f(K_i^+) = \frac{K_i^-}{K_i^+ + K_i^-} \quad (12)$$

Step 7: Ranking of alternatives. The ranking of alternatives is based on the final value of the utility function. The alternative that has the highest possible value of the utility function is preferred.

3 Analytical Hierarchy Process (AHP) method

Given that the weight coefficients of the criteria when applying the MARCOS method are determined using the AHP method, we will briefly refer to its theoretical and methodological characteristics.

The Analytical Hierarchy Process (AHP) method proceeds through the following steps [16]:

Step 1 : Forming a matrix of comparison pairs:

$$A = \left[a_{ij}\right] = \ [1\ 1/a_{12}\ \cdots\ 1/a_{1n}\ \ a_{12}\ 1\ \cdots\ 1\ /a_{2n}\ \ \cdots\ a_{1n}\ \cdots\ a_{2n}\ \cdots\ \cdots\ \cdots\ 1\ ] \quad (13)$$

Step 2: Normalization of the matrix of comparison pairs.

$$a_{ij}^{*} = \frac{a_{ij}}{\sum_{i=1}^{n} \quad a_{ij}}, i, j = 1, \dots, n \quad (14)$$

Step 3: Determination of relative importance, i.e. vector weights.

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

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

$$CI = \frac{\lambda_{max} - n}{n} \quad (16)$$

If CI < 0.1 of the estimated value of coefficients a_{ij} are consistent, and the deviation of 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 the random index.

4 Results and discussion: Ranking of electronic trade of the European Union and Serbia

For the purposes of ranking the electronic trade of the European Union and Serbia, the relevant data (criteria and alternatives) are shown in Table 1 for 2021. The selected information indicators (resource planning system, electronic data exchange, radio frequency identification and customer relationship management) as criteria are, in our opinion, a good measure of the development of electronic business in trade. In the specific case, the alternatives are the member states of the European Union and Serbia.

Table 1. E-business: Wholesale and retail trade; repair of motor vehicles and motorcycles (10 or more employees and independent companies), 2021.

		Enterprises with a website - Percentage of enterprises	Enterprises who have an ERP software package to share information between different functional areas - Percentage of enterprises	Enterprises using software solutions like Customer Relationship Management (CRM) - Percentage of enterprises	Enterprises using Customer Relationship Management to analyze information about clients for marketing purposes - Percentage of enterprises	Enterprises using Customer Relationship Management to capture, store and make available client information to other business functions - Percentage of enterprises	Enterprises using RFID technologies as part of the production and service delivery process (as of 2014, 2017) - Percentage of enterprises	Enterprises with EDI-type sales - Percentage of enterprises	Enterprises with web sales - B2B and B2G - Percentage of enterprises
		C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
A1	Belgium	0	62	59	33	57	5	11	32
A2	Bulgaria	50	29	22	15	19	8	2	13
A3	Czech	85	50	28	19	25	1	9	34
A4	Denmark	0	60	51	36	46	1	15	36
A5	Germany [1]	88	47	51	30	50	2	6	21
A6	Estonia	0	32	30	20	29	4	6	30
A7	Ireland	69	24	33	22	26	5	12	18
A8	Greece	65	47	25	21	23	3	1	14
A9	Spain	78	63	51	42	48	8	6	20
A10	France	71	51	39	25	39	5	5	11
A11	Croatia	76	31	28	16	26	4	9	23
A12	Italy	75	36	34	26	34	5	3	14
A13	Cyprus	66	45	47	34	47	7	1	10
A14	Latvia	74	46	23	17	21	2	5	19
A15	Lithuania	82	51	38	27	38	3	4	34
A16	Luxembourg	77	51	39	26	37	5	3	8
A17	Hungary	62	25	19	12	19	2	5	20
A18	Malta	81	42	43	35	37	4	6	14
A19	Netherlands	94	52	59	34	58	5	7	31
A20	Austria	91	54	60	37	60	5	7	23
A21	Poland	68	36	38	27	38	2	3	21
A22	Portugal	68	58	33	25	32	11	6	8
A23	Romania	51	23	23	15	22	2	3	9
A24	Slovenia	93	54	43	29	43	4	6	33
A25	Slovakia	81	40	33	26	31	4	5	14

[1] until 1990 former territory of the FRG

A26	Finland	99	58	54	39	49	4	11	34
A27	Sweden	94	44	49	35	46	1	15	37
A28	Serbia	86	30	21	8	18	4	2	22
	Statistics								
	Mean	68.714 3	44.321 4	38.321 4	26.107 1	36.357 1	4.1429	6.2143	21.535 7
	Median	75.500 0	46.500 0	38.000 0	26.000 0	37.000 0	4.0000	6.0000	20.500 0
	Std. Deviati on	27.130 49	11.993 99	12.561 12	8.7827 2	12.623 36	2.3208 3	3.8137 9	9.4535 2
	Skewne ss	-1,749	-.298	.207	-.167	.231	1,020	.884	.218
	Std. Error of Skewne ss	.441	.441	.441	.441	.441	.441	.441	.441
	Kurtosi s	2,592	-1.003	-1.104	-.739	-1.009	1,620	.304	-1.302
	Std. Error of Kurtosi s	.858	.858	.858	.858	.858	.858	.858	.858
	The minimu m	.00	23.00	19.00	8.00	18.00	1.00 am	1.00 am	8.00
	Maxim um	99.00	63.00	60.00	42.00	60.00	11.00	15.00	37.00

Note: Author's statistics
Source: Eurostat

The weight coefficients of the criteria were calculated using the AHP method. They are shown in Table 2.

Table 2. Weight coefficients of criteria

AHP With Arithmetic Mean Method								
Initial Comparisons Matrix								
	C1	**C1**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
C1	1	2.5	4	2	1	2	2	2
C2	0.4	1	6	1.25	2	2	1	2
C3	0.25	0.166667	1	0.5	2	2	1	2
C4	0.5	0.8	2	1	1	2	1	2
C5	1	0.5	0.5	1	1	2	1	2
C6	0.5	0.5	0.5	0.5	0.5	1	1	2
C7	0.5	1	1	1	1	1	1	2
C8	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1
SUM	4.65	6.96667	15.5	7.75	9	12.5	8.5	15

Normalized Matrix									
	C1	**C1**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**Weights of Criteria**
C1	0.2151	0.3589	0.2581	0.2581	0.1111	0.1600	0.2353	0.1333	0.2162
C2	0.0860	0.1435	0.3871	0.1613	0.2222	0.1600	0.1176	0.1333	0.1764
C3	0.0538	0.0239	0.0645	0.0645	0.2222	0.1600	0.1176	0.1333	0.1050
C4	0.1075	0.1148	0.1290	0.1290	0.1111	0.1600	0.1176	0.1333	0.1253
C5	0.2151	0.0718	0.0323	0.1290	0.1111	0.1600	0.1176	0.1333	0.1213
C6	0.1075	0.0718	0.0323	0.0645	0.0556	0.0800	0.1176	0.1333	0.0828
C7	0.1075	0.1435	0.0645	0.1290	0.1111	0.0800	0.1176	0.1333	0.1108
C8	0.1075	0.0718	0.0323	0.0645	0.0556	0.0400	0.0588	0.0667	0.0621
								SUM	**1**
Consistency Ratio	**0.0732**	**COMPARE WITH 0.1; IT SHOULD BE LESS THAN 0.1.**							

Note: Author's calculation

Table 3 shows the initial matrix.

Table 3. Initial Matrix

Initial Matrix								
weights of criteria	0.2162	0.1764	0.105	0.1253	0.1213	0.0828	0.1108	0.0621
kind of criteria	1	1	1	1	1	1	1	1
	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
A1	0	62	59	33	57	5	11	32
A2	50	29	22	15	19	8	2	13
A3	85	50	28	19	25	1	9	34
A4	0	60	51	36	46	1	15	36
A5	88	47	51	30	50	2	6	21
A6	0	32	30	20	29	4	6	30
A7	69	24	33	22	26	5	12	18
A8	65	47	25	21	23	3	1	14
A9	78	63	51	42	48	8	6	20
A10	71	51	39	25	39	5	5	11
A11	76	31	28	16	26	4	9	23
A12	75	36	34	26	34	5	3	14
A13	66	45	47	34	47	7	1	10
A14	74	46	23	17	21	2	5	19
A15	82	51	38	27	38	3	4	34
A16	77	51	39	26	37	5	3	8
A17	62	25	19	12	19	2	5	20
A18	81	42	43	35	37	4	6	14
A19	94	52	59	34	58	5	7	31
A20	91	54	60	37	60	5	7	23
A21	68	36	38	27	38	2	3	21
A22	68	58	33	25	32	11	6	8

A23	51	23	23	15	22	2	3	9
A24	93	54	43	29	43	4	6	33
A25	81	40	33	26	31	4	5	14
A26	99	58	54	39	49	4	11	34
A27	94	44	49	35	46	1	15	37
A28	86	30	21	8	18	4	2	22
MAX	99	63	60	42	60	11	15	37
MIN	0	23	19	8	18	1	1	8

Note: Author's calculation

The expanded initial matrix is shown in Table 4.

Table 4. Expanded initial matrix

Extended Initial Matrix								
weights of criteria	0.2162	0.1764	0.105	0.1253	0.1213	0.0828	0.1108	0.0621
kind of criteria	1	1	1	1	1	1	1	1
	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
AAA	0	23	19	8	18	1	1	8
A1	0	62	59	33	57	5	11	32
A2	50	29	22	15	19	8	2	13
A3	85	50	28	19	25	1	9	34
A4	0	60	51	36	46	1	15	36
A5	88	47	51	30	50	2	6	21
A6	0	32	30	20	29	4	6	30
A7	69	24	33	22	26	5	12	18
A8	65	47	25	21	23	3	1	14
A9	78	63	51	42	48	8	6	20
A10	71	51	39	25	39	5	5	11
A11	76	31	28	16	26	4	9	23
A12	75	36	34	26	34	5	3	14
A13	66	45	47	34	47	7	1	10
A14	74	46	23	17	21	2	5	19
A15	82	51	38	27	38	3	4	34
A16	77	51	39	26	37	5	3	8
A17	62	25	19	12	19	2	5	20
A18	81	42	43	35	37	4	6	14
A19	94	52	59	34	58	5	7	31
A20	91	54	60	37	60	5	7	23
A21	68	36	38	27	38	2	3	21
A22	68	58	33	25	32	11	6	8
A23	51	23	23	15	22	2	3	9
A24	93	54	43	29	43	4	6	33
A25	81	40	33	26	31	4	5	14
A26	99	58	54	39	49	4	11	34
A27	94	44	49	35	46	1	15	37
A28	86	30	21	8	18	4	2	22
AI	99	63	60	42	60	11	15	37

Note: Author's calculation

Table 5 shows the normalized matrix.

Table 5. Normalized Matrix

Normalized Matrix								
weights of criteria	0.2162	0.1764	0.105	0.1253	0.1213	0.0828	0.1108	0.0621
kind of criteria	1	1	1	1	1	1	1	1
	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
AAA	0	0.365079	0.316667	0.190476	0.3	0.090909	0.066667	0.216216
A1	0.0000	0.9841	0.9833	0.7857	0.9500	0.4545	0.7333	0.8649
A2	0.5051	0.4603	0.3667	0.3571	0.3167	0.7273	0.1333	0.3514
A3	0.8586	0.7937	0.4667	0.4524	0.4167	0.0909	0.6000	0.9189
A4	0.0000	0.9524	0.8500	0.8571	0.7667	0.0909	1.0000	0.9730
A5	0.8889	0.7460	0.8500	0.7143	0.8333	0.1818	0.4000	0.5676
A6	0.0000	0.5079	0.5000	0.4762	0.4833	0.3636	0.4000	0.8108
A7	0.6970	0.3810	0.5500	0.5238	0.4333	0.4545	0.8000	0.4865
A8	0.6566	0.7460	0.4167	0.5000	0.3833	0.2727	0.0667	0.3784
A9	0.7879	1.0000	0.8500	1.0000	0.8000	0.7273	0.4000	0.5405
A10	0.7172	0.8095	0.6500	0.5952	0.6500	0.4545	0.3333	0.2973
A11	0.7677	0.4921	0.4667	0.3810	0.4333	0.3636	0.6000	0.6216
A12	0.7576	0.5714	0.5667	0.6190	0.5667	0.4545	0.2000	0.3784
A13	0.6667	0.7143	0.7833	0.8095	0.7833	0.6364	0.0667	0.2703
A14	0.7475	0.7302	0.3833	0.4048	0.3500	0.1818	0.3333	0.5135
A15	0.8283	0.8095	0.6333	0.6429	0.6333	0.2727	0.2667	0.9189
A16	0.7778	0.8095	0.6500	0.6190	0.6167	0.4545	0.2000	0.2162
A17	0.6263	0.3968	0.3167	0.2857	0.3167	0.1818	0.3333	0.5405
A18	0.8182	0.6667	0.7167	0.8333	0.6167	0.3636	0.4000	0.3784
A19	0.9495	0.8254	0.9833	0.8095	0.9667	0.4545	0.4667	0.8378
A20	0.9192	0.8571	1.0000	0.8810	1.0000	0.4545	0.4667	0.6216
A21	0.6869	0.5714	0.6333	0.6429	0.6333	0.1818	0.2000	0.5676
A22	0.6869	0.9206	0.5500	0.5952	0.5333	1.0000	0.4000	0.2162
A23	0.5152	0.3651	0.3833	0.3571	0.3667	0.1818	0.2000	0.2432
A24	0.9394	0.8571	0.7167	0.6905	0.7167	0.3636	0.4000	0.8919
A25	0.8182	0.6349	0.5500	0.6190	0.5167	0.3636	0.3333	0.3784
A26	1.0000	0.9206	0.9000	0.9286	0.8167	0.3636	0.7333	0.9189
A27	0.9495	0.6984	0.8167	0.8333	0.7667	0.0909	1.0000	1.0000
A28	0.8687	0.4762	0.3500	0.1905	0.3000	0.3636	0.1333	0.5946
AI	1	1	1	1	1	1	1	1

Note: Author's calculation

Table 6 shows the weight-normalized matrix.

Table 6. Weighted Normalized Matrix

Weighted Normalized Matrix								
	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
AAA	0	0.0644	0.03325	0.023867	0.03639	0.007527	0.007387	0.013427
A1	0.0000	0.1736	0.1033	0.0985	0.1152	0.0376	0.0813	0.0537
A2	0.1092	0.0812	0.0385	0.0448	0.0384	0.0602	0.0148	0.0218
A3	0.1856	0.1400	0.0490	0.0567	0.0505	0.0075	0.0665	0.0571

A4	0.0000	0.1680	0.0893	0.1074	0.0930	0.0075	0.1108	0.0604
A5	0.1922	0.1316	0.0893	0.0895	0.1011	0.0151	0.0443	0.0352
A6	0.0000	0.0896	0.0525	0.0597	0.0586	0.0301	0.0443	0.0504
A7	0.1507	0.0672	0.0578	0.0656	0.0526	0.0376	0.0886	0.0302
A8	0.1419	0.1316	0.0438	0.0627	0.0465	0.0226	0.0074	0.0235
A9	0.1703	0.1764	0.0893	0.1253	0.0970	0.0602	0.0443	0.0336
A10	0.1551	0.1428	0.0683	0.0746	0.0788	0.0376	0.0369	0.0185
A11	0.1660	0.0868	0.0490	0.0477	0.0526	0.0301	0.0665	0.0386
A12	0.1638	0.1008	0.0595	0.0776	0.0687	0.0376	0.0222	0.0235
A13	0.1441	0.1260	0.0823	0.1014	0.0950	0.0527	0.0074	0.0168
A14	0.1616	0.1288	0.0403	0.0507	0.0425	0.0151	0.0369	0.0319
A15	0.1791	0.1428	0.0665	0.0806	0.0768	0.0226	0.0295	0.0571
A16	0.1682	0.1428	0.0683	0.0776	0.0748	0.0376	0.0222	0.0134
A17	0.1354	0.0700	0.0333	0.0358	0.0384	0.0151	0.0369	0.0336
A18	0.1769	0.1176	0.0753	0.1044	0.0748	0.0301	0.0443	0.0235
A19	0.2053	0.1456	0.1033	0.1014	0.1173	0.0376	0.0517	0.0520
A20	0.1987	0.1512	0.1050	0.1104	0.1213	0.0376	0.0517	0.0386
A21	0.1485	0.1008	0.0665	0.0806	0.0768	0.0151	0.0222	0.0352
A22	0.1485	0.1624	0.0578	0.0746	0.0647	0.0828	0.0443	0.0134
A23	0.1114	0.0644	0.0403	0.0448	0.0445	0.0151	0.0222	0.0151
A24	0.2031	0.1512	0.0753	0.0865	0.0869	0.0301	0.0443	0.0554
A25	0.1769	0.1120	0.0578	0.0776	0.0627	0.0301	0.0369	0.0235
A26	0.2162	0.1624	0.0945	0.1164	0.0991	0.0301	0.0813	0.0571
A27	0.2053	0.1232	0.0858	0.1044	0.0930	0.0075	0.1108	0.0621
A28	0.1878	0.0840	0.0368	0.0239	0.0364	0.0301	0.0148	0.0369
AI	0.2162	0.1764	0.105	0.1253	0.1213	0.0828	0.1108	0.0621

Note: Author's calculation

The result and the MARCOS method are shown in Table 7 and Figure 1.

Table 7. Results of the MARCOS method

	Results of the MARCOS Method								
		Si	**Ki-**	**Ki+**	**f(K-)**	**f(K+)**	**f(K)**		**Ranking**
	AAA	0.1862							
Belgium	**A1**	0.6631	3.5605	0.6632	0.1570	0.8430	0.6444	0.6444	**8**
Bulgaria	**A2**	0.4089	2.1953	0.4089	0.1570	0.8430	0.3973	0.3973	**25**
Czech	**A3**	0.6129	3.2909	0.6130	0.1570	0.8430	0.5956	0.5956	**14**
Denmark	**A4**	0.6364	3.4169	0.6365	0.1570	0.8430	0.6184	0.6184	**12**
Germany (until 1990 former territory of the FRG)	**A5**	0.6982	3.7489	0.6983	0.1570	0.8430	0.6785	0.6785	**7**
Estonia	**A6**	0.3852	2.0681	0.3852	0.1570	0.8430	0.3743	0.3743	**27**
Ireland	**A7**	0.5503	2.9548	0.5504	0.1570	0.8430	0.5347	0.5347	**19**
Greece	**A8**	0.4799	2.5768	0.4800	0.1570	0.8430	0.4663	0.4663	**23**
Spain	**A9**	0.7964	4.2762	0.7965	0.1570	0.8430	0.7739	0.7739	**4**
France	**A10**	0.6126	3.2890	0.6126	0.1570	0.8430	0.5952	0.5952	**15**
Croatia	**A11**	0.5373	2.8847	0.5373	0.1570	0.8430	0.5220	0.5220	**21**

Italy	**A12**	0.5537	2.9728	0.5537	0.1570	0.8430	0.5380	0.5380	**18**
Cyprus	**A13**	0.6257	3.3595	0.6258	0.1570	0.8430	0.6080	0.6080	**13**
Latvia	**A14**	0.5077	2.7260	0.5078	0.1570	0.8430	0.4933	0.4933	**22**
Lithuania	**A15**	0.6549	3.5165	0.6550	0.1570	0.8430	0.6364	0.6364	**9**
Luxembourg	**A16**	0.6048	3.2473	0.6049	0.1570	0.8430	0.5877	0.5877	**16**
Hungary	**A17**	0.3984	2.1392	0.3985	0.1570	0.8430	0.3871	0.3871	**26**
Malta	**A18**	0.6469	3.4733	0.6470	0.1570	0.8430	0.6286	0.6286	**11**
Netherlands	**A19**	0.8142	4.3716	0.8143	0.1570	0.8430	0.7911	0.7911	**3**
Austria	**A20**	0.8146	4.3735	0.8146	0.1570	0.8430	0.7915	0.7915	**2**
Poland	**A21**	0.5456	2.9296	0.5457	0.1570	0.8430	0.5302	0.5302	**20**
Portugal	**A22**	0.6485	3.4818	0.6485	0.1570	0.8430	0.6301	0.6301	**10**
Romania	**A23**	0.3576	1.9199	0.3576	0.1570	0.8430	0.3474	0.3474	**28**
Slovenia	**A24**	0.7328	3.9346	0.7329	0.1570	0.8430	0.7121	0.7121	**6**
Slovakia	**A25**	0.5774	3.1003	0.5775	0.1570	0.8430	0.5611	0.5611	**17**
Finland	**A26**	0.8569	4.6011	0.8570	0.1570	0.8430	0.8327	0.8327	**1**
Sweden	**A27**	0.7921	4.2528	0.7922	0.1570	0.8430	0.7696	0.7696	**5**
Serbia	**A28**	0.4506	2.4195	0.4507	0.1570	0.8430	0.4379	0.4379	**24**
	AI	0.9999							

Note: Author's calculation

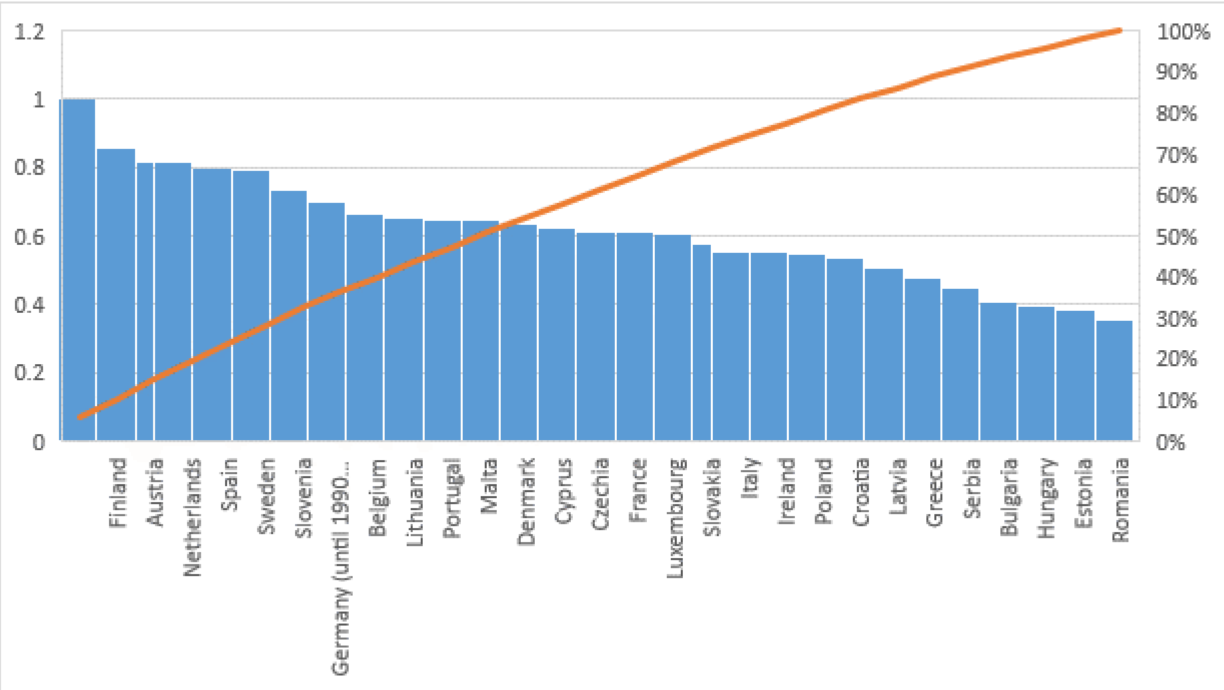

Fig. 1. Ranking of alternatives
Source: Author's picture

The obtained empirical results of the ranking of electronic trade of the European Union and Serbia based on the MARCOS method show that the top five countries in terms of the development of electronic business in trade are in order: Finland, Austria, the Netherlands, Spain, and Sweden. Germany is ranked seventh. France took fifteenth place. Eighteenth place went to Italy. In the last place is Romania.

As far as the electronic trade business of Serbia is concerned, it is positioned in the twenty-fourth place. It is in a worse position compared to Slovenia and Croatia. In terms of rank, Slovenia is in sixth place and Croatia is in twenty-first place.
Innovation (including electronic trade) is a critical factor in the business success of modern trade. Bearing that in mind, the differences in the development of electronic business are reflected in their own way in the performance of trade between the European Union and Serbia. The resource planning system, electronic data exchange, radio frequency identification and customer relationship management affect the reduction of operating costs and increase sales, which has a positive effect on the size of trade profits.
Electronic trade significantly mitigated the impact of the Covid-19 pandemic on trade performance [1], [7].
In the future, it is absolutely necessary to improve the digitization of the entire business of trade in all member countries of the European Union and Serbia. This will have a positive impact on their performance.

5 Conclusion

Based on the conducted empirical research of the position of electronic trade of the European Union and Serbia, the following can be concluded:

1. The top five countries in terms of the development of electronic business in trade are in order: Finland, Austria, Netherlands, Spain, and Sweden. In the last place is Romania.
2. As far as the electronic trade of Serbia is concerned, it is in the twenty-fourth place. It is in a worse position compared to Slovenia and Croatia. In terms of rank, Slovenia is in sixth place and Croatia is in twenty-first place.

Observed differences in the development of electronic business are reflected in their own way on the trade performance of the European Union and Serbia.
Considering that electronic trade is one of the critical factors of the business success of modern trade, in the future it is absolutely necessary to improve the digitization of the entire business of trade in all member countries of the European Union and Serbia. This will have a positive impact on their performance.

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