EVALUATION OF TRANSPORT AND STORAGE PERFORMANCE OF THE EUROPEAN UNION AND SERBIA BASED ON SF-WASPAS AND WASPAS METHODS

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Abstract

Transport and storage performance research is in principle very challenging, current, significant and complex. Based on that, this paper makes a comparative evaluation of the performance of transport and storage in the European Union and Serbia. The obtained empirical results show that, according to the SF-WASPAS method, out of the five observed countries of the European Union (Germany, France, Italy, Croatia and Slovenia) and Serbia, Germany ranks first in terms of transport and storage performance. Followed by: Italy, Slovenia, Croatia, France and Serbia. Serbia has the worst performance of transport and storage. According to the classic WASPAS method, the top five countries of the European Union in terms of transport and storage performance are, in order: Germany, France, Spain, Italy and Poland. Luxembourg has the worst performance in transport and storage. The performance of transport and storage in Croatia is better than in Slovenia. In Serbia, the performance of transport and storage is poor. By comparison, they are worse than in Croatia and Slovenia. The performance factors of transport and storage are: economic and political climate, economic activity, company size, number of employees, turnover, added value, personal costs, the Covid-19 pandemic and the energy crisis. Effective control of critical factors can significantly influence the achievement of the target performance of transport and storage. Digitization of the entire transport and storage business plays a significant role in this.

Key words: performance, transport and storage, European Union, Serbia, SF-WASPAS method, WASPAS method

1. INTRODUCTION

The problem of evaluating the performance of transport and storage is very challenging, continuously current, important and complex (Kara, 2022; Zhang &Wei,

2023). Because the performance of transport and storage is maintained on the performance of all other sectors. Based on that, the subject of research in this paper is the analysis of the performance factors of transport and storage in the European Union and Serbia. The aim and purpose of this is to investigate the given problem as complex as possible in order to improve performance in the future by taking adequate measures. Recently, in order to evaluate the performance of all managers as accurately as possible, which means both transport and storage, different multi-criteria decision-making methods are increasingly being applied in the literature (Lukić & Hadrovic, 2021, 2022; Tadić *et al.* , 2021; Ulutas *et al.* , 2021; Osintsev, 2021; Saaty, 2008; Popović *et al*., 2022; Iao *et al*., 2022; Đalić *et al*., 2020; Kovač *et al*., 2021; Miškić *et al*., 2021; Puška *et al*. , 2021; Stević & Brković, 2020; Stević *et al*., 2020; Stanković *et al*., 2020; Trung, 2021; Lukić, 2022; Mešić *et al*., 2022). These include the SF-WASPAS and WASPAS methods. Because the multi-criteria analysis ensures, compared to the classical methodology, a more accurate assessment of the performance of transport and storage as a basis for improvement in the future of taking adequate measures (Thanh, 2022; Do Duc Trung, 2022). Continuous analysis of transport and storage performance factors, in the specific case of the European Union and Serbia, is a key assumption for improvement in the future by taking adequate measures (Lukic, 2022a,b,c,2023a,b,c,d,e,f). This manifests the primary research hypothesis in this paper. In the methodological sense of the word, following the given research hypothesis, the application of both SF-WASPAS and WASPAS methods plays a significant role in the evaluation of transport and storage performance (Jafarzadeh Ghoushchi *et al*., 2023). In this paper, they are applied to the case of a comparative analysis of the transport and storage performance of the European Union and Serbia. The necessary empirical data for the research of the treated problem in this paper were collected from Eurostat. They are "manufactured" in accordance with all relevant standards so that there are no restrictions regarding the international comparison of the empirical results obtained in this paper.

2. METHODOLOGY

The primary methodology for researching the transport and storage performance of the European Union and Serbia is the classic WASPAS method. At the same time, the weighting coefficients of the criteria were obtained using the SF-WASPAS method. The methodological process of researching the transport and storage performance of the European Union and Serbia using the classic WASPAS method takes place as follows:

Two methods are used in the research of the treated problem in this paper: the SF-WASPAS method and the classic WASPAS method. We will briefly point out their characteristics.

2.1. SF-WASPAS method

The extended WASPAS (Weighted Aggregated Sum Product Assessment) method with spherical fuzzy sets is a newer method of multi-criteria decision making. MCDM (multi-criteria decision-making) problem it can be expressed as a decision matrix whose elements indicate the evaluation values of all alternatives in relation to each criterion under spherical fuzzy circumstances (Kutlu Gundogdu & Kahraman, 2018, 2019). Suppose that is a $X = \{x_1, x_2, \dots, x_m\}$ $(x \geq 2)$discrete set of m feasible alternatives, $C = \{C_1, C_2, \dots, C_n\}$ is a finite set of criteria, and is a $w = \{w_1, w_2, \dots, w_n\}$weight vector of criteria satisfying the condition that $0 \leq w_j \leq 1$i $\sum_{j=1}^{n} w_j = 1$. SF-WASPAS (Spherical Fuzzy WASPAS) method proceeds through several steps.

Step 1: Decision makers (DMs) evaluate the criteria based on the linguistic terms shown in Table 1.

Table 1 Linguistic terms and their corresponding spherical fuzzy numbers

Linguistic terms	(μ, v, π)
Absolutely more Importance (AMI)	(0.9, 0.1, 0.1)
Very High Importance (VHI)	(0.8, 0.2, 0.2)
High Importance (HI)	(0.7, 0.3, 0.3)
Slightly More Importance (SMI)	(0.6, 0.4, 0.4)
Equal Importance (EI)	(0.5, 0.5, 0.5)
Slightly Low Importance (SLI)	(0.4, 0.6, 0.4)
Low Importance (LI)	(0.3, 0.7, 0.3)
Very Low Importance (VLI)	(0.2, 0.8, 0.2)
Absolutely Low Importance (ALI)	(0.1, 0.9, 0.1

Source: Kutlu Gundogdu, F., Cengiz Kahraman, C. (2019)

Step 2: Aggregating the assessment of each decision maker (DM) using the Spherical Weighted Arithmetic Mean (SWAM).

$$SWAM_w(\tilde{A}_{S1}, \dots, \tilde{A}_{Sn}) = w_1\tilde{A}_{S1} + w_2\tilde{A}_{S2} \dots\dots w_n\tilde{A}_{Sn}$$
$$= \left\{ \left[1 - \prod_{i=1}^{n} \left(\mu_{\tilde{A}_{Si}}^2 \right)^{w_i} \right]^{1/2}, \prod_{i=1}^{n} v_{\tilde{A}_{Si}}^{w_i}, \left[\prod_{i=1}^{n} \left(1 - \mu_{\tilde{A}_{Si}}^2 \right)^{w_i} - \prod_{i=1}^{n} \left(1 - \mu_{\tilde{A}_{Si}}^2 - \pi_{\tilde{A}_{Si}}^2 \right)^{w_i} \right]^{1/2} \right\} \quad (1)$$

Step 2.1: Aggregating criteria weights.

In any case, it cannot be assumed that all criteria are equally important. To obtain the weights, all the individual opinions of the decision maker regarding the importance of each criterion should be aggregated.

Step 2.2: Constructing an aggregated spherical fuzzy decision matrix based on the opinion of the decision maker.

Denote the evaluation value of the alternative $x_i(1,2,\ldots,m)$with respect to the criteria $C_j(1,2,\ldots,n)$ with $C_j(\tilde{x}_i) = (\mu_{ij}, v_{ij}, \pi_{ij})$ and $\tilde{x}_{ij} = \left(C_j(\tilde{x}_i)\right)_{mxn}$ we arrive at a spherical fuzzy decision matrix. For an MCDM problem with SFS (Spherical Fuzzy Set), the decision matrix $\tilde{x}_{ij} = \left(C_j(\tilde{x}_i)\right)_{mxn}$ can be constructed as

$$\tilde{x}_{ij} = \left(C_j(\tilde{x}_i)\right)_{mxn} = \begin{pmatrix} (\mu_{11}, v_{11}, \pi_{11}) & (\mu_{12}, v_{12}, \pi_{12}) & \cdots & (\mu_{1n}, v_{1n}, \pi_{1n}) \\ (\mu_{21}, v_{21}, \pi_{21}) & (\mu_{22}, v_{22}, \pi_{22}) & & (\mu_{2n}, v_{2n}, \pi_{2n}) \\ \vdots & & \ddots & \vdots \\ (\mu_{m1}, v_{m1}, \pi_{m1}) & (\mu_{m2}, v_{m2}, \pi_{m2}) & \cdots & (\mu_{mn}, v_{mn}, \pi_{mn}) \end{pmatrix} \quad (2)$$

Also, decision makers evaluate the criteria as shown in Table 2. Decision makers evaluate alternatives in relation to the criteria by assigning higher linguistic terms to the benefit criteria and lower linguistic terms to the cost criteria.

Table 2 Evaluation of criteria by decision makers

Criteria	DM1	DM2	⋯	DMk
C1	$(\mu_{11}, v_{11}, \pi_{11})$	$(\mu_{12}, v_{12}, \pi_{12})$	⋯	$(\mu_{1k}, v_{1k}, \pi_{1k})$
C2	$(\mu_{21}, v_{21}, \pi_{21})$	$(\mu_{22}, v_{22}, \pi_{22})$	⋯	$(\mu_{2k}, v_{2k}, \pi_{2k})$
⋮	⋮	⋮	⋱	⋮
Cj	$(\mu_{j1}, v_{j1}, \pi_{j1})$	$(\mu_{j2}, v_{j2}, \pi_{j2})$	⋯	$(\mu_{jk}, v_{jk}, \pi_{jk})$

Source: Kutlu Gundogdu, F., Cengiz Kahraman, C. (2019)

Step 3: Calculating the value of the score function (score) for each criterion in Table 2 and normalizing their value.

Step 3.1: Defuzzify the aggregated criteria weights using the score function shown below.

$$\omega_j^S = (\mu_j - \pi_j)^2 - (v_j - \pi_j)^2 \quad (3)$$

Keep in mind the following: If less than 0, a small number is added to all criterion weights to provide a number slightly greater than zero.

Step 3.2: Normalize the aggregated criteria weights using the following equation.

$$\overline{\omega}_j^S = \frac{\omega_j^S}{\sum_{j=1}^{n} \omega_j^S} \quad (4)$$

Step 4: Calculating the result of the weighted sum of the WSM (Weighted Sum Model) as shown in the following equation.

$$\tilde{Q}_i^{(1)} = \sum_{j=1}^{n} \tilde{x}_{ij\omega} = \sum_{j=1}^{n} \tilde{x}_{ij}\overline{\omega}_j^S \quad (5)$$

The equation can be split into two parts for easier calculation.

4.1: Calculating the multiplier part of an equation using the following equation.

$$\tilde{x}_{ij\omega} = \tilde{x}_{ij}\overline{\omega}_j^S = \langle\left(1-\left(1-\mu_{\tilde{x}_{ij}}^2\right)^{\omega_j^S}\right)^{1/2}, \nu_{\tilde{x}_{ij}}^{\omega_j^S}, \left(\left(1-\mu_{\tilde{x}_{ij}}^2\right)^{\omega_j^S} - \left(1-\mu_{\tilde{x}_{ij}}^2-\pi_{\tilde{x}_{ij}}^2\right)^{\omega_j^S}\right)^{1/2}\rangle \quad (6)$$

4.2: Calculating the additional term in the equation using the following equation.

$$\tilde{x}_{i1\omega}\otimes\tilde{x}_{i2\omega} = \langle\left(\mu_{\tilde{x}_{i1\omega}}^2+\mu_{\tilde{x}_{i2\omega}}^2-\mu_{\tilde{x}_{i1\omega}}^2\mu_{\tilde{x}_{i2\omega}}^2\right)^{1/2}, \nu_{i1\omega}\nu_{i2\omega}, \left(\left(1-\mu_{\tilde{x}_{i2\omega}}^2\right)\pi_{\tilde{x}_{i1\omega}}^2 + \left(1-\mu_{\tilde{x}_{i1\omega}}^2\right)\pi_{\tilde{x}_{i2\omega}}^2 - \pi_{\tilde{x}_{i1\omega}}^2\pi_{\tilde{x}_{i2\omega}}^2\right)^{1/2}\rangle \quad (7)$$

Step 5: Calculating the results of the Weighted Product Model (WPM) as shown in the following equation.

$$\tilde{Q}_i^2 = \prod_{j=1}^{n} \tilde{x}_{ij}^{\overline{\omega}_j^S} \quad (8)$$

The equation can be divided into two parts for easier calculation.

Step 5.1: Calculating the exponential part of the equation using the following equation.

$$\tilde{x}_{ij}^{\omega_j^S} = \langle\mu_{\tilde{x}_{ij}}^{\overline{\omega}_j^S}, \left(1-\left(\nu_{\tilde{x}_{ij}}^2\right)^{\overline{\omega}_j^S}\right)^{1/2}, \left(\left(1-\nu_{\tilde{x}_{ij}}^2\right)^{\overline{\omega}_j^S} - \left(1-\nu_{\tilde{x}_{ij}}^2-\pi_{\tilde{x}_{ij}}^2\right)^{\overline{\omega}_j^S}\right)^{1/2}\rangle \quad (9)$$

Step 5.2: Calculating the multiplier term in the equation using the following equation.

$$\tilde{x}_{i1}^{\omega_1^S} \otimes \tilde{x}_{i2}^{\omega_2^S} = \langle \mu_{\tilde{x}_{i1}^{\omega_1^S}} \mu_{\tilde{x}_{i2}^{\omega_2^S}}, \left(\nu^2_{\tilde{x}_{i1}^{\omega_1^S}} + \nu^2_{\tilde{x}_{i2}^{\omega_2^S}} - \nu^2_{\tilde{x}_{i1}^{\omega_1^S}} \nu^2_{\tilde{x}_{i2}^{\omega_2^S}} \right)^{1/2}, \left(\left(1 - \nu^2_{\tilde{x}_{i2}^{\omega_2^S}}\right) \pi^2_{\tilde{x}_{i1}^{\omega_1^S}} + \left(1 - \nu^2_{\tilde{x}_{i1}^{\omega_1^S}}\right) \pi^2_{\tilde{x}_{i2}^{\omega_2^S}} - \pi^2_{\tilde{x}_{i1}^{\omega_1^S}} \pi^2_{\tilde{x}_{i2}^{\omega_2^S}} \right)^{1/2} \rangle \quad (10)$$

Step 6: Determining the threshold number λ and calculating as in the following equations.

$$\lambda \tilde{Q}_i^{(1)} = \langle \left(1 - \left(1 - \mu^2_{\tilde{Q}_i^{(1)}} \right)^{\lambda} \right)^{1/2}, \nu^{\lambda}_{\tilde{Q}_i^{(1)}}, \left(\left(1 - \mu^2_{\tilde{Q}_i^{(1)}} \right)^{\lambda} - \left(1 - \mu^2_{\tilde{Q}_i^{(1)}} - \pi^2_{\tilde{Q}_i^{(1)}} \right) \right)^{\lambda} \rangle \quad (11)$$

$$1 - \lambda \tilde{Q}_i^{(2)} = \langle \left(1 - \left(1 - \mu^2_{\tilde{Q}_i^{(2)}} \right)^{1-\lambda} \right)^{1/2}, \nu^{\lambda}_{\tilde{Q}_i^{(2)}}, \left(\left(1 - \mu^2_{\tilde{Q}_i^{(2)}} \right)^{1-\lambda} - \left(1 - \mu^2_{\tilde{Q}_i^{(2)}} - \pi^2_{\tilde{Q}_i^{(2)}} \right) \right)^{1-\lambda} \rangle \quad (12)$$

Step 7: The sum of the previous equations gives the following equation.

$\tilde{Q}_i = \lambda \tilde{Q}_i^{(1)} + (1 - \lambda) \tilde{Q}_i^{(2)}$ (13).

Step 8: Defuzzify the score function (using the equation shown in step 3.1).

The alternatives are arranged according to the decreasing value of the score. If the score values for two alternatives are equal, the accuracy of their value function is considered as in the following equation.

$$Accuracy(\tilde{A}_s) = \mu^2_{A_s} + \nu^2_{A_s} + \pi^2_{A_s} \quad (14)$$

2.2. WASPAS method

WASPAS (Weighted Aggregates Sum Product Assessment) was proposed by Zavadskas *et al*. (2012). It respects the unique combination of two well-known approaches of multi-criteria decision making (MCDM - Multi-Criteria Decision Making) : the method of weighted sums (WS - Weighted Sum) and the method of weighted products (WP - Weighted Product). The WASPAS method is used to solve various complex problems in multi-criteria decision-making (for example, production decision-making) (Chakraborty & Zavadskas, 2014; Zavadskas et al., 2013). An advanced fuzzy WASPAS method was developed for solving complex problems under uncertainty. The procedure of the WASPAS method consists of the following steps (Urosevic et al., 2017):

Step 1: Determining the optimal performance rating for each criterion.

The optimal performance rating is calculated as follows:

$$x_{0j} = \begin{cases} \max\limits_{i} x_{ij}; & j \in \Omega_{max} \\ \min\limits_{i} x_{ij}; & j \in \Omega_{min} \end{cases}, \quad (15)$$

where: x_{0j} denotes the optimal performance rating of the *i*- th criterion, Ω_{max} indicates the benefit criterion (the higher the value, the better), Ω_{min} means a set of cost criteria (the lower the value, the better), *m* denotes the number of alternatives (*i*= 0,1,..., *m*), and *n* indicates the number of criteria (*j*= 0,1,..., *n*).

Step 2 **:** Determination of the normalized decision matrix.

The normalized performance rating is calculated as follows:

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{x_{0j}}; & j \in \Omega_{max} \\ \dfrac{x_{0j}}{x_{ij}}; & j \in \Omega_{min} \end{cases}, \quad (16)$$

where: r_{ij} denotes the normalized performance rating of the *i*- th alternative in relation to the *j* - th criterion.

Step 3: Calculation of the relative importance of the *i*- th alternative based on the WS method.

The relative importance of the *i*- th alternative, based on the WS method, is calculated as follows:

$$Q_i^{(1)} = \sum_{j=1}^{n} w_j r_{ij}, \quad (17)$$

where: $Q_i^{(1)}$ denotes the relative importance of the *i*- th alternative in relation to the *j* - th criterion, based on the WS method.

Step 4: Calculating the relative importance of the *i*- th alternative, using the based WP method.

The relative importance of the alternative, based on the WP method, is calculated as follows:

$$Q_i^{(2)} = \prod_{j=1}^{n} r_{ij}^{w_j}, \quad (18)$$

where: $Q_i^{(2)}$ denotes the relative importance of the *i*- th alternative in relation to the *j* - th criterion, based on the WP method.

***Step 5* :** Calculating the overall relative importance for each alternative.

The total relative importance (common generalized criterion of weight aggregations of additive and multiplicative methods) (Zavadskas, 2012) is calculated as follows:

$$Q_i = \lambda Q_i^{(1)} + (1-\lambda)Q_i^{(2)} = \lambda \sum_{j=1}^{n} w_j r_{ij} + (1-\lambda)\prod_{j=1}^{n} r_{ij}^{w_j} \quad (19)$$

wherein: λ coefficient and $\lambda \in [0, 1]$.

When decision-makers have no preference for the coefficient, the value is 0.5, and equation (5) is expressed as:

$$Q_i = 0.5Q_i^{(1)} + 0.5Q_i^{(2)} = 0.5\sum_{j=1}^{n} w_j r_{ij} + 0.5\prod_{j=1}^{n} r_{ij}^{w_j} \quad (20)$$

3. DISCUSSION AND RESULTS

The research of the treated problem in this paper will be carried out in two parts. In the first part, we will analyze the transport and storage performance of selective countries of the European Union (Germany, France, Italy, Croatia and Slovenia) and Serbia based on the SF-WASPAS method. The second part is dedicated to the evaluation of the transport and storage performance of the European Union and Serbia using the classical WASPAS method. Table 3 shows the relevant data for 2020. (The data for 2021 and 2022 are not available on the Eurostat website.)

Table 3 Key performance indicators of transport and storage in the European Union and Serbia

		Enterprises - number	Persons employed - number	Turnover or gross premiums written - million euros	Value added at factor cost - million euros	Personnel costs - million euros
		C1	**C2**	**C3**	**C4**	**C5**
A1	**Belgium**	18,830	218,830	45,853.9	15,969.6	10,858.1
A2	**Bulgaria**	22,422	168,136	8,046.2	2,617.8	1,364.3
A3	**Czechia**	42,430	286,554	22,425.1	7,431.7	4,816.4
A4	**Denmark**	11,353	137,619	57,370.2	15,492.9	7,518.3

A5	**Germany (until 1990 former territory of the FRG)**	98,486	2,217,268	311,077.3	106,327.2	77,499.6
A6	**Estonia**	5,905	39,599	4,743.8	1,318.9	781.5
A7	**Ireland**	24,127	104,443	14,736.8	3,226.3	3,485.0
A8	**Greece**	58,701	179,576	12,011.7	4,524.8	3,356.3
A9	**Spain**	218,298	927,491	100,798.9	39,493.8	26,583.5
A10	**France**	163,436	1,493,629	197,130.9	69,264.2	62,384.4
A11	**Croatia**	12,878	90,165	4,362.3	1,893.5	1,325.1
A12	**Italy**	115,293	1,123,402	139,235.1	51,623.3	38,553.6
A13	**Cyprus**	3,094	17,400	3,073.7	652.0	441.5
A14	**Latvia**	8,085	70,145	4,577.9	1,279.1	932.9
A15	**Lithuania**	24,240	157,937	11,839.4	3,670.1	2,072.7
A16	**Luxembourg**	1,028	50,644	6,743.0	2,705.5	1,401.9
A17	**Hungary**	36,266	252,736	16,163.5	4,083.7	3,759.6
A18	**Malta**	1,944	12,967	2,020.8	396.5	307.0
A19	**Netherlands**	55,622	426,141	87,875.0	29,982.9	20,349.2
A20	**Austria**	13,799	211,110	40,976.6	14,269.3	9,733.9
A21	**Poland**	170,508	946,314	65,548.7	20,023.7	10,676.7
A22	**Portugal**	34,237	186,628	17,485.8	5,339.5	4,416.7
A23	**Romania**	58,022	383,438	18,934.4	5,871.8	3,800.0
A24	**Slovenia**	8,674	53,831	6,028.4	2,239.6	1,208.4
A25	**Slovakia**	22,909	114,556	9,853.5	3,003.8	1,817.3
A26	**Finland**	19,719	136,164	19,097.0	6,541.4	5,060.7
A27	**Sweden**	29,134	264,172	43,185.5	14,671.8	11,025.9
A28	**Serbi**	6,315	105,622	4,389.0	1,455.4	1,090.2

Source: Eurostat

3.1. Measurement and analysis of transport and storage performance of selective countries of the European Union and Serbia based on the SF-WASPAS method

The selected criteria for the analysis of the transport and storage performance of the European Union and Serbia are C1 - Enterprises - number, C2 - Persons employed - number, C3 - Turnover or gross premiums written, C4 - Value added at factor cost and C5 – Personnel costs. According to Eurostat statistics, they are key indicators of transport and storage performance. The alternatives are selected countries of the European Union and Serbia: A1 - Germany, A2 - France, A3 - Italy, A4 - Croatia, A5 - Slovenia and A6 - Serbia. They were chosen according to the criteria of the leading countries of the European Union, countries in the region of Serbia and Serbia. Table 4 shows the evaluation of the criteria by the decision makers.

Table 4 Evaluation of criteria

Decision Makers	**Importance**	**Criteria**	**DM1**	**DM2**	**DM3**
DM1	**0.40**	**C1**	**WE**	**HI**	**EI**
DM2	**0.30**	**C2**	**HI**	**LI**	**LI**
DM3	**0.30**	**C3**	**VHI**	**VHI**	**HI**
		C4	**SMI**	**HI**	**HI**
		C5	**EI**	**HI**	**EI**

	DM1			**DM2**			**DM3**			**Weight of Criteria**			**Score Function**	**Normalized Weights**
	0.40	**0.40**	**0.40**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**					
	1-(μ*μ)	ν	1-(μ*μ)-(π*π)	1-(μ*μ)	ν	1-(μ*μ)-(π*π)	1-(μ*μ)	ν	1-(μ*μ)-(π*π)	1 st	2nd	3rd		
C1	0.19	0.10	0.18	0.51	0.30	0.42	0.75	0.50	0.50	**0.78**	**0.23**	**0.27**	**0.267**	**0.381**
C2	0.51	0.30	0.42	0.91	0.70	0.82	0.91	0.70	0.82	**0.53**	**0.50**	**0.31**	**0.012**	**0.017**
C3	0.36	0.20	0.32	0.36	0.20	0.32	0.51	0.30	0.42	**0.77**	**0.23**	**0.23**	**0.298**	**0.425**
C4	0.64	0.40	0.48	0.51	0.30	0.42	0.51	0.30	0.42	**0.66**	**0.34**	**0.34**	**0.105**	**0.150**
C5	0.75	0.50	0.50	0.51	0.30	0.42	0.75	0.50	0.50	**0.58**	**0.43**	**0.44**	**0.018**	**0.026**
												SUM	**0.701**	**1.000**

Source: Author's calculation

In the specific case, therefore, the most important criterion is C3 – Turnover or gross premiums written. This means, in other words, that the target profit of transport and storage can be realized by more efficient management of this criterion.

Table 5 shows the initial aggregated matrix.

Table 5 Initial Aggregated Matrix

Initial Aggregated Matrix	0.381	0.381	0.381	0.017	0.017	0.017	0.425	0.425	0.425	0.150	0.150	0.150	0.026	0.026	0.026
	C1			**C2**			**C3**			**C4**			**C5**		
A1	0.78	0.23	0.27	0.63	0.37	0.37	0.77	0.23	0.23	0.55	0.46	0.40	0.48	0.54	0.42
A2	0.40	0.60	0.40	0.71	0.30	0.32	0.65	0.35	0.36	0.58	0.43	0.44	0.57	0.43	0.43
A3	0.56	0.45	0.41	0.80	0.20	0.20	0.77	0.23	0.23	0.65	0.35	0.36	0.37	0.63	0.38
A4	0.64	0.36	0.36	0.66	0.34	0.34	0.53	0.50	0.31	0.40	0.61	0.41	0.53	0.50	0.32
A5	0.70	0.30	0.30	0.62	0.38	0.39	0.53	0.49	0.38	0.57	0.43	0.43	0.75	0.26	0.26
A6	0.55	0.45	0.40	0.56	0.45	0.41	0.48	0.53	0.38	0.60	0.40	0.36	0.61	0.43	0.29

Source: Author's calculation

Table 6 shows the weighted normalized matrix for WSM .

Table 6 Weighted Normalized Matrix for WSM

	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5
Weighted Normalized Matrix for WSM	**C1**			**C2**			**C3**			**C4**			**C5**		
A1	0.55	0.57	0.23	0.09	0.98	0.07	0.57	0.53	0.20	0.23	0.89	0.19	0.08	0.98	0.08
A2	0.25	0.82	0.27	0.11	0.98	0.06	0.46	0.64	0.29	0.24	0.88	0.22	0.10	0.98	0.09
A3	0.36	0.74	0.30	0.13	0.97	0.04	0.57	0.53	0.20	0.28	0.85	0.19	0.06	0.99	0.07
A4	0.43	0.67	0.27	0.10	0.98	0.06	0.36	0.74	0.22	0.16	0.93	0.18	0.09	0.98	0.06
A5	0.48	0.63	0.23	0.09	0.98	0.07	0.36	0.74	0.28	0.24	0.88	0.21	0.15	0.96	0.06
A6	0.36	0.74	0.29	0.08	0.99	0.07	0.32	0.77	0.28	0.26	0.87	0.18	0.11	0.98	0.06

Source: Author's calculation

Table 7 shows the calculation for WSM.

Table 7 Calculation for WSM

Calculation for WSM	1-(μ*μ)	ν	1-(μ*μ)-(π*π)	1-(μ*μ)	ν	1-(μ*μ)-(π*π)	1-(μ*μ)	ν	1-(μ*μ)-(π*π)	1-(μ*μ)	ν	1-(μ*μ)-(π*π)	1-(μ*μ)	ν	1-(μ*μ)-(π*π)
	C1			**C2**			**C3**			**C4**			**C5**		
A1	0.70	0.57	0.64	0.99	0.98	0.99	0.68	0.53	0.64	0.95	0.89	0.91	0.99	0.98	0.99
A2	0.94	0.82	0.86	0.99	0.98	0.98	0.79	0.64	0.71	0.94	0.88	0.89	0.99	0.98	0.98
A3	0.87	0.74	0.78	0.98	0.97	0.98	0.68	0.53	0.64	0.92	0.85	0.88	1.00	0.99	0.99
A4	0.81	0.67	0.74	0.99	0.98	0.99	0.87	0.74	0.82	0.97	0.93	0.94	0.99	0.98	0.99
A5	0.77	0.63	0.72	0.99	0.98	0.99	0.87	0.74	0.79	0.94	0.88	0.90	0.98	0.96	0.97
A6	0.87	0.74	0.79	0.99	0.99	0.99	0.90	0.77	0.82	0.93	0.87	0.90	0.99	0.98	0.98

			λ	0.5	
Q1i			**λQ1i**		
0.75	0.26	0.27	0.58	0.51	0.24
0.57	0.44	0.39	0.42	0.67	0.31
0.69	0.32	0.32	0.52	0.57	0.27
0.57	0.45	0.35	0.42	0.67	0.28
0.62	0.39	0.35	0.46	0.62	0.29
0.53	0.48	0.39	0.39	0.69	0.30

Source: Author's calculation

Table 8 shows the weighted normalized matrix for WPM.

Table 8 Weighted Normalized Matrix for WPM

	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5
Weighted Normalized Matrix for WPM	**C1**			**C2**			**C3**			**C4**			**C5**		
A1	0.91	0.14	0.17	0.99	0.05	0.05	0.90	0.15	0.15	0.91	0.19	0.18	0.98	0.09	0.09
A2	0.71	0.40	0.30	0.99	0.04	0.04	0.83	0.23	0.25	0.92	0.17	0.20	0.99	0.07	0.08
A3	0.80	0.29	0.28	1.00	0.03	0.03	0.90	0.15	0.15	0.94	0.14	0.15	0.97	0.11	0.08
A4	0.85	0.22	0.24	0.99	0.04	0.05	0.76	0.34	0.22	0.87	0.26	0.21	0.98	0.09	0.06
A5	0.87	0.19	0.19	0.99	0.05	0.06	0.76	0.33	0.28	0.92	0.17	0.19	0.99	0.04	0.04
A6	0.80	0.29	0.28	0.99	0.06	0.06	0.73	0.36	0.28	0.93	0.16	0.16	0.99	0.07	0.05

Source: Author's calculation

Table 9 shows the calculation for WPM.

Table 9 Calculation for WPM

	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5
Calculation for WPM	μ	1-(ν*ν)	1-(ν*ν)-(π*π)	μ	1-(ν*ν)	1-(ν*ν)-(π*π)	μ	1-(ν*ν)	1-(ν*ν)-(π*π)	μ	1-(ν*ν)	1-(ν*ν)-(π*π)	μ	1-(ν*ν)	1-(ν*ν)-(π*π)
	C1			**C2**			**C3**			**C4**			**C5**		
A1	0.91	0.98	0.95	0.99	1.00	0.99	0.90	0.98	0.95	0.91	0.96	0.93	0.98	0.99	0.98
A2	0.71	0.84	0.76	0.99	1.00	1.00	0.83	0.95	0.88	0.92	0.97	0.93	0.99	0.99	0.99
A3	0.80	0.92	0.84	1.00	1.00	1.00	0.90	0.98	0.95	0.94	0.98	0.96	0.97	0.99	0.98
A4	0.85	0.95	0.89	0.99	1.00	1.00	0.76	0.89	0.84	0.87	0.93	0.89	0.98	0.99	0.99
A5	0.87	0.96	0.93	0.99	1.00	0.99	0.76	0.89	0.81	0.92	0.97	0.93	0.99	1.00	1.00

A6	0.80	0.92	0.84	0.99	1.00	0.99	0.73	0.87	0.79	0.93	0.97	0.95	0.99	0.99	0.99

			(1-λ)	0.5	
Q2i			**(1-λ)Q2i**		
0.73	0.29	0.29	0.56	0.54	0.26
0.53	0.48	0.40	0.39	0.69	0.31
0.65	0.37	0.35	0.49	0.60	0.29
0.55	0.47	0.35	0.40	0.69	0.28
0.60	0.41	0.36	0.45	0.64	0.30
0.53	0.48	0.39	0.39	0.70	0.30

Source: Author's calculation

Table 10 and Figure 1 show the results of the SF-WASPAS method.

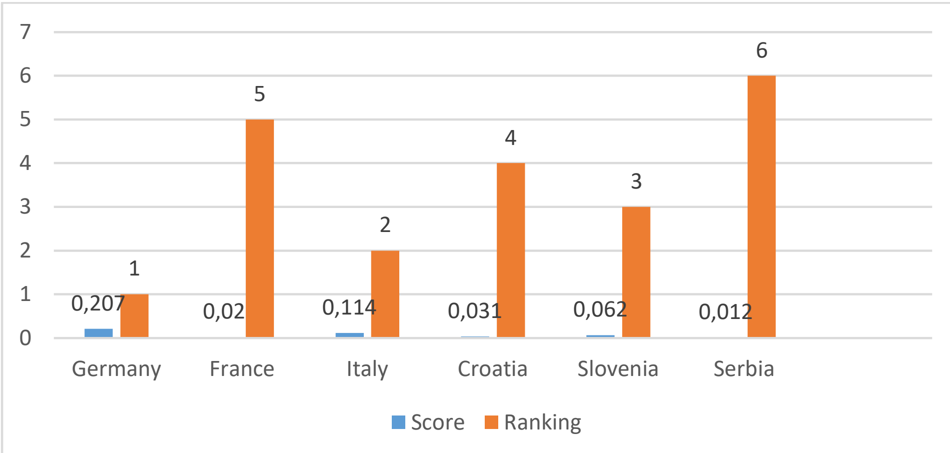
Table 10 Results of the SF-WASPAS

	Results of SF-WASPAS	**Q1i**			**λQ1i**			**Q2i**			**(1-λ)Q2i**			**Qi**			**Score Function**	**Score**	**Ranking**
Germany	**A1**	0.749	0.259	0.274	0.581	0.509	0.244	0.727	0.293	0.293	0.560	0.541	0.256	0.738	0.275	0.284	0.207	**0.207**	**1**
France	**A2**	0.566	0.444	0.390	0.419	0.666	0.313	0.531	0.481	0.395	0.390	0.694	0.313	0.549	0.462	0.393	0.020	**0.020**	**5**
Italy	**A3**	0.686	0.322	0.319	0.522	0.568	0.271	0.653	0.365	0.346	0.493	0.605	0.289	0.670	0.343	0.332	0.114	**0.114**	**2**
Croatia	**A4**	0.567	0.449	0.348	0.420	0.670	0.278	0.548	0.473	0.350	0.404	0.688	0.277	0.558	0.461	0.349	0.031	**0.031**	**4**

Slovenia	**A5**	0.620	0.390	0.353	0.464	0.624	0.290	0.602	0.414	0.363	0.449	0.643	0.295	0.611	0.402	0.358	0.062	**0.062**	**3**
Serbia	**A6**	0.534	0.476	0.385	0.393	0.690	0.305	0.528	0.483	0.386	0.388	0.695	0.304	0.531	0.480	0.385	0.012	**0.012**	**6**

Source: Author's calculation

Figure 1 Ranking of alternatives according to the SF-WASPAS method



Source: Author's picture

According to the empirical results obtained using the SF-WASPAS method, out of the five observed countries of the European Union (Germany, France, Italy, Croatia and Slovenia) and Serbia, Germany ranks first in terms of transport and storage performance. Followed by: Italy, Slovenia, Croatia, France and Serbia. Therefore, Serbia has the worst performance of transport and storage. In order to achieve the target profit of transport and storage, it is necessary, among other things, to manage the company, human resources (training, rewards, advancement, health and social insurance), turnover or gross premiums written, value added at factor cost and personnel costs as efficiently as possible.

3.2. Measurement and analysis of transport and storage performance of the European Union and Serbia based on the classic WASPAS method

When measuring and analyzing the transport and storage performance of the European Union and Serbia based on the classic WASPAS method, the same criteria are used (C1 - Enterprises - number, C2 - Persons employed - number, C3 - Turnover or gross premiums written, C4 - Value added at factor cost and C5 - Personnel costs) as for SF - WASPAS methods. Alternatives are all member states of the European Union and Serbia. Table 11 shows the initial matrix.

Table 11 Initial Matrix

Initial Matrix					
weights of criteria	0.381	0.017	0.425	0.15	0.026
kind of criteria	1	1	1	1	-1
	C1	**C2**	**C3**	**C4**	**C5**
A1	18,830	218,830	45,853.90	15,969.60	10,858.10
A2	22,422	168,136	8,046.20	2,617.80	1,364.30
A3	42,430	286,554	22,425.10	7,431.70	4,816.40
A4	11,353	137,619	57,370.20	15,492.90	7,518.30
A5	98,486	2,217,268	311,077.30	106,327.20	77,499.60
A6	5,905	39,599	4,743.80	1,318.90	781.5
A7	24,127	104,443	14,736.80	3,226.30	3,485.00
A8	58,701	179,576	12,011.70	4,524.80	3,356.30
A9	218,298	927,491	100,798.90	39,493.80	26,583.50
A10	163,436	1,493,629	197,130.90	69,264.20	62,384.40
A11	12,878	90,165	4,362.30	1,893.50	1,325.10
A12	115,293	1,123,402	139,235.10	51,623.30	38,553.60
A13	3,094	17,400	3,073.70	652	441.5
A14	8,085	70,145	4,577.90	1,279.10	932.9
A15	24,240	157,937	11,839.40	3,670.10	2,072.70
A16	1,028	50,644	6,743.00	2,705.50	1,401.90
A17	36,266	252,736	16,163.50	4,083.70	3,759.60
A18	1,944	12,967	2,020.80	396.5	307
A19	55,622	426,141	87,875.00	29,982.90	20,349.20
A20	13,799	211,110	40,976.60	14,269.30	9,733.90
A21	170,508	946,314	65,548.70	20,023.70	10,676.70
A22	34,237	186,628	17,485.80	5,339.50	4,416.70
A23	58,022	383,438	18,934.40	5,871.80	3,800.00
A24	8,674	53,831	6,028.40	2,239.60	1,208.40
A25	22,909	114,556	9,853.50	3,003.80	1,817.30
A26	19,719	136,164	19,097.00	6,541.40	5,060.70
A27	29,134	264,172	43,185.50	14,671.80	11,025.90
A28	6,315	105,622	4,389.00	1,455.40	1,090.20
MAX	218298	2217268	311077.3	106327.2	77499.6
MIN	1028	12967	2020.8	396.5	307

Source: Author's calculation

Table 12 shows the normalized matrix.

Table 12 Normalized Matrix

Normalized Matrix					
weights of criteria	0.381	0.017	0.425	0.15	0.026
kind of criteria	1	1	1	1	-1
	C1	**C2**	**C3**	**C4**	**C5**
A1	0.0863	0.0987	0.1474	0.1502	0.0283
A2	0.1027	0.0758	0.0259	0.0246	0.2250
A3	0.1944	0.1292	0.0721	0.0699	0.0637
A4	0.0520	0.0621	0.1844	0.1457	0.0408
A5	0.4512	1.0000	1.0000	1.0000	0.0040
A6	0.0271	0.0179	0.0152	0.0124	0.3928
A7	0.1105	0.0471	0.0474	0.0303	0.0881
A8	0.2689	0.0810	0.0386	0.0426	0.0915
A9	1.0000	0.4183	0.3240	0.3714	0.0115
A10	0.7487	0.6736	0.6337	0.6514	0.0049
A11	0.0590	0.0407	0.0140	0.0178	0.2317
A12	0.5281	0.5067	0.4476	0.4855	0.0080
A13	0.0142	0.0078	0.0099	0.0061	0.6954
A14	0.0370	0.0316	0.0147	0.0120	0.3291
A15	0.1110	0.0712	0.0381	0.0345	0.1481
A16	0.0047	0.0228	0.0217	0.0254	0.2190
A17	0.1661	0.1140	0.0520	0.0384	0.0817
A18	0.0089	0.0058	0.0065	0.0037	1.0000
A19	0.2548	0.1922	0.2825	0.2820	0.0151
A20	0.0632	0.0952	0.1317	0.1342	0.0315
A21	0.7811	0.4268	0.2107	0.1883	0.0288
A22	0.1568	0.0842	0.0562	0.0502	0.0695
A23	0.2658	0.1729	0.0609	0.0552	0.0808
A24	0.0397	0.0243	0.0194	0.0211	0.2541
A25	0.1049	0.0517	0.0317	0.0283	0.1689
A26	0.0903	0.0614	0.0614	0.0615	0.0607
A27	0.1335	0.1191	0.1388	0.1380	0.0278
A28	0.0289	0.0476	0.0141	0.0137	0.2816

Source: Author's calculation

Table 13 shows the weighted normalized matrix.

Table 13 Weighted Normalized Matrix

Weighted Normalized Matrix					
	C1	**C2**	**C3**	**C4**	**C5**
A1	0.0329	0.0017	0.0626	0.0225	0.0007
A2	0.0391	0.0013	0.0110	0.0037	0.0059
A3	0.0741	0.0022	0.0306	0.0105	0.0017
A4	0.0198	0.0011	0.0784	0.0219	0.0011
A5	0.1719	0.0170	0.4250	0.1500	0.0001
A6	0.0103	0.0003	0.0065	0.0019	0.0102
A7	0.0421	0.0008	0.0201	0.0046	0.0023
A8	0.1025	0.0014	0.0164	0.0064	0.0024
A9	0.3810	0.0071	0.1377	0.0557	0.0003
A10	0.2852	0.0115	0.2693	0.0977	0.0001
A11	0.0225	0.0007	0.0060	0.0027	0.0060
A12	0.2012	0.0086	0.1902	0.0728	0.0002
A13	0.0054	0.0001	0.0042	0.0009	0.0181
A14	0.0141	0.0005	0.0063	0.0018	0.0086
A15	0.0423	0.0012	0.0162	0.0052	0.0039
A16	0.0018	0.0004	0.0092	0.0038	0.0057
A17	0.0633	0.0019	0.0221	0.0058	0.0021
A18	0.0034	0.0001	0.0028	0.0006	0.0260
A19	0.0971	0.0033	0.1201	0.0423	0.0004
A20	0.0241	0.0016	0.0560	0.0201	0.0008
A21	0.2976	0.0073	0.0896	0.0282	0.0007
A22	0.0598	0.0014	0.0239	0.0075	0.0018
A23	0.1013	0.0029	0.0259	0.0083	0.0021
A24	0.0151	0.0004	0.0082	0.0032	0.0066
A25	0.0400	0.0009	0.0135	0.0042	0.0044
A26	0.0344	0.0010	0.0261	0.0092	0.0016
A27	0.0508	0.0020	0.0590	0.0207	0.0007
A28	0.0110	0.0008	0.0060	0.0021	0.0073

Source: Author's calculation

Table 14 shows the exponentially weight matrix.

Table 14 Exponentially Weight Matrix

Exponentially Weighted Matrix					
	C1	**C2**	**C3**	**C4**	**C5**
A1	0.3931	0.9614	0.4432	0.7525	0.9115
A2	0.4202	0.9571	0.2115	0.5737	0.9620

A3	0.5358	0.9658	0.3270	0.6709	0.9309
A4	0.3242	0.9538	0.4875	0.7491	0.9202
A5	0.7384	1.0000	1.0000	1.0000	0.8661
A6	0.2527	0.9339	0.1690	0.5176	0.9760
A7	0.4321	0.9494	0.2736	0.5920	0.9388
A8	0.6063	0.9582	0.2508	0.6228	0.9397
A9	1.0000	0.9853	0.6194	0.8620	0.8905
A10	0.8956	0.9933	0.8238	0.9377	0.8710
A11	0.3402	0.9470	0.1631	0.5465	0.9627
A12	0.7841	0.9885	0.7106	0.8973	0.8819
A13	0.1976	0.9209	0.1405	0.4657	0.9906
A14	0.2849	0.9430	0.1665	0.5153	0.9715
A15	0.4328	0.9561	0.2493	0.6035	0.9516
A16	0.1298	0.9378	0.1962	0.5766	0.9613
A17	0.5047	0.9638	0.2845	0.6133	0.9369
A18	0.1655	0.9163	0.1176	0.4323	1.0000
A19	0.5940	0.9724	0.5844	0.8271	0.8967
A20	0.3492	0.9608	0.4225	0.7399	0.9141
A21	0.9102	0.9856	0.5159	0.7785	0.9119
A22	0.4937	0.9588	0.2942	0.6385	0.9330
A23	0.6036	0.9706	0.3043	0.6476	0.9367
A24	0.2926	0.9387	0.1871	0.5604	0.9650
A25	0.4236	0.9509	0.2306	0.5857	0.9548
A26	0.4001	0.9537	0.3055	0.6582	0.9297
A27	0.4643	0.9645	0.4321	0.7430	0.9111
A28	0.2593	0.9496	0.1635	0.5254	0.9676

Source: Author's calculation

Table 15 and Figure 2 show the ranking of alternatives.

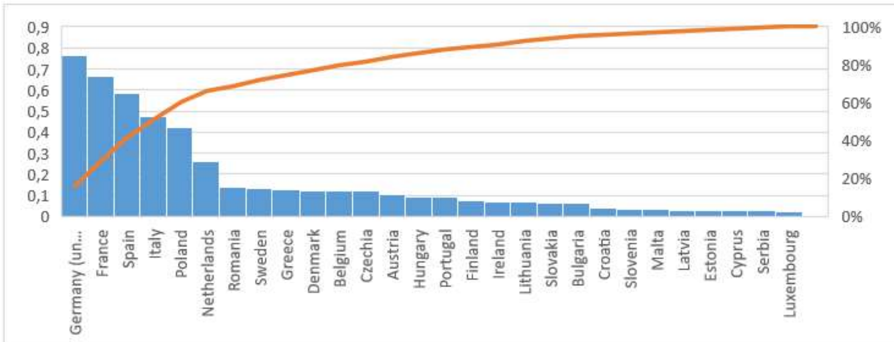
Table 15 Ranking

	Ranking					
					λ **0.5**	
	Alternatives	**Qi1**	**Qi2**	**Qi**	**Qi**	**Ranking**
Belgium	**A1**	0.1205	0.1205	0.1205	0.1205	**11**
Bulgaria	**A2**	0.0610	0.0610	0.0610	0.0610	**20**
Czechia	**A3**	0.1190	0.1190	0.1190	0.1190	**12**
Denmark	**A4**	0.1222	0.1222	0.1222	0.1222	**10**
Germany (until 1990 former	**A5**	0.7640	0.7640	0.7640	0.7640	**1**

territory of the FRG)						
Estonia	**A6**	0.0292	0.0292	0.0292	0.0292	**25**
Ireland	**A7**	0.0699	0.0699	0.0699	0.0699	**17**
Greece	**A8**	0.1290	0.1290	0.1290	0.1290	**9**
Spain	**A9**	0.5818	0.5818	0.5818	0.5818	**3**
France	**A10**	0.6639	0.6639	0.6639	0.6639	**2**
Croatia	**A11**	0.0378	0.0378	0.0378	0.0378	**21**
Italy	**A12**	0.4731	0.4731	0.4731	0.4731	**4**
Cyprus	**A13**	0.0287	0.0287	0.0287	0.0287	**26**
Latvia	**A14**	0.0313	0.0313	0.0313	0.0313	**24**
Lithuania	**A15**	0.0687	0.0687	0.0687	0.0687	**18**
Luxembourg	**A16**	0.0209	0.0209	0.0209	0.0209	**28**
Hungary	**A17**	0.0952	0.0952	0.0952	0.0952	**14**
Malta	**A18**	0.0328	0.0328	0.0328	0.0328	**23**
Netherlands	**A19**	0.2631	0.2631	0.2631	0.2631	**6**
Austria	**A20**	0.1026	0.1026	0.1026	0.1026	**13**
Poland	**A21**	0.4234	0.4234	0.4234	0.4234	**5**
Portugal	**A22**	0.0944	0.0944	0.0944	0.0944	**15**
Romania	**A23**	0.1405	0.1405	0.1405	0.1405	**7**
Slovenia	**A24**	0.0336	0.0336	0.0336	0.0336	**22**
Slovakia	**A25**	0.0630	0.0630	0.0630	0.0630	**19**
Finland	**A26**	0.0724	0.0724	0.0724	0.0724	**16**
Sweden	**A27**	0.1333	0.1333	0.1333	0.1333	**8**
Serbia	**A28**	0.0272	0.0272	0.0272	0.0272	**27**

Source: Author's calculation

Figure 2 Ranking of alternatives according to the WASPAS method



Source: Author's picture

The top five countries of the European Union in terms of transport and storage performance according to empirical results obtained using the classic WASPAS method are, in order: Germany, France, Spain, Italy and Poland. Luxembourg has the worst performance in transport and storage. The performance of transport and storage in Croatia is better than in Slovenia. As far as Serbia's transport and storage performance is concerned, they are bad. They are worse than in Croatia and Slovenia.

Transport and storage performance was influenced by a number of factors. In addition to the economic and political climate, economic activities, the Covid-19 pandemic and the energy crisis stand out among them recently. Significant factors also include the number and size of companies, number of employees, turnover, added value by factor costs and personnel costs. Effective control of critical factors, among them especially today's energy crisis, can significantly influence the achievement of the target performance of transport and storage. Digitalization of the entire transport and storage business certainly plays a significant role in this.

For the sake of the treated issue, we will present a sectoral analysis of the key indicators of transport and storage in the European Union for 2020. Table 16 and figure 3 shows the given indicators.

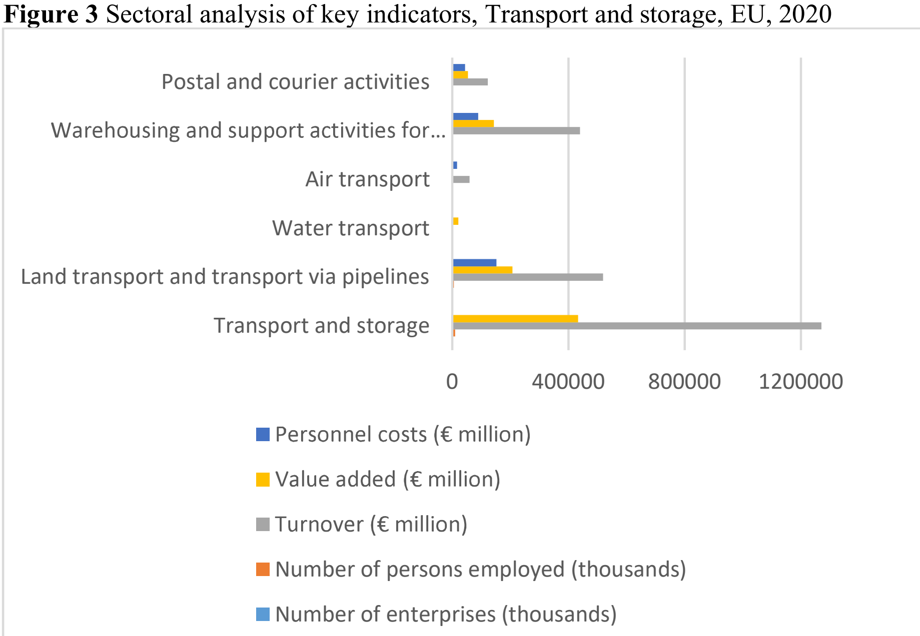
Table 16 Sectoral analysis of key indicators, Transport and storage, EU, 2020

	Number of enterprises (thousands)	Number of persons employed (thousands)	Turnover (€ million)	Value added (€ million)	Personal l costs (€ million)
Transport and storage	1279.4	10270.9	1271195.2	433914.8	315.530.4
Land transport and	966.4	5682.2	519836.0	207372.7	152584.6

transport via pipelines					
Water transport	:	:	:	21607.1	:
Air transport	:	300.0	59854.1	:	16954.0
Warehousing and support activities for transportation	144.0	2440.0	440000.0	144000.0	90000.0
Postal and courier activities	145.1	1629.2	123188.3	54600.4	44738.2

Note: Not avallable
Source: Eurostat

Figure 3 Sectoral analysis of key indicators, Transport and storage, EU, 2020



Source: Author's picture

The data in the given table show that land transport and pipeline transport is the most significant in the framework of the sectoral findings of the key indicators of transport and storage in the European Union. Thus, for example, land transport and pipeline transport participate in the total additional value of transport and storage of the European Union with 47.79%. This means, in other words, that effective management of the number and size of companies, human resources, traffic, added value and personnel costs in the sector of land transport and pipeline transport can significantly influence the achievement of the target performance of transport and storage in the European Union.

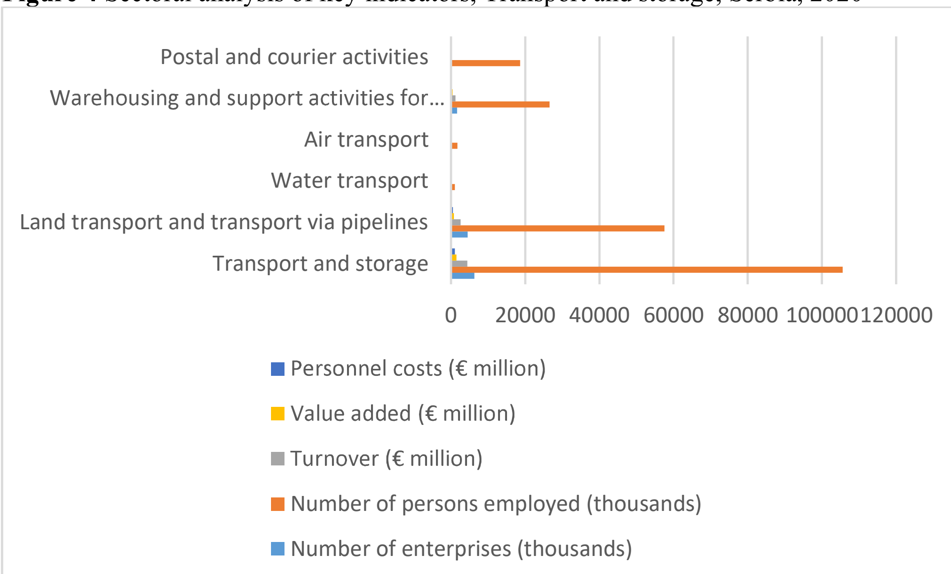
The situation is similar with regard to the sectoral analysis of the key indicators of transport and storage in Serbia (Table 17 and Figure 4). For example, land transport and pipeline transport participate in the total added value of transport and storage in Serbia with 53.77%.

Table 17 Sectoral analysis of key indicators, Transport and storage, Sebia, 2020

	Number of enterprises (thousands)	Number of persons employed (thousands)	Turnover (€ million)	Value added (€ million)	Personal costs (€ million)
Transport and storage	6315	105622	4388.9	1455.3	1090.2
Land transport and transport via pipelines	4496	57548	2578.2	782.6	541.7
Water transport	68	1043	132.4	24.1	12.7
Air transport	33	1787	184.2	36.2	54.0
Warehousing and support activities for transportation	1665	26587	1208.5	414.4	319.3
Postal and courier activities	53	18657	285.4	197.9	162.3

Note: Author's conversion in euros. The conversion was made according to the middle exchange rate for 2020, 1 EUR = 117.5777 dinars.
Source: Statistical Yearbook of the Republic of Serbia 2022

Figure 4 Sectoral analysis of key indicators, Transport and storage, Serbia, 2020



Source: Author's picture

4. CONCLUSION

Based on the obtained empirical results of the research of the problem treated in this paper, the following can be concluded:

(1) According to the SF-WASPAS method, out of the five observed countries of the European Union (Germany, France, Italy, Croatia and Slovenia) and Serbia, Germany ranks first in terms of transport and storage performance. Followed by: Italy, Slovenia, Croatia, France and Serbia. Serbia has the worst performance of transport and storage.

(2) The top five countries of the European Union in terms of transport and storage performance according to the classic WASPAS method are, in order: Germany, France, Spain, Italy and Poland. Luxembourg recorded the worst performance in transport and storage. The performance of transport and storage in Croatia is better than in Slovenia. The performance of transport and storage in Serbia is unsatisfactory. They are worse than in Croatia and Slovenia.

There are numerous determinants of transport and storage performance. These are: the economic and political climate, economic activity, the Covid-19 pandemic and the energy crisis. Significant factors also include the number and size of companies, number of employees, turnover, added value by factor costs and personnel costs. Effective control of critical factors can significantly influence the achievement of the target performance of transport and storage. Digitalization of the entire transport and storage business certainly plays a significant role in this.

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