

DEVELOPMENTS OF THE EUROPEAN UNION'S EXPORT DIRECTIONS IN THE CONTEXT OF THE US-EU TRADE WAR

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Abstract. The article assesses which countries in the world are most suitable for export such goods as aluminum, steel, cheese, and meat from the European Union in the context of the European Union – US trade wars. The theoretical study is designed to identify factors that promote the export and import of goods and to identify factors that can be used for further multicriteria research. An investigation using multi-criteria methods, EDAS, TOPSIS and SAW, revealed alternative export countries in the context of the EU-US trade war. The calculated RCA index showed the competitiveness of the analyzed products: aluminum, steel, cheese and meat in the selected countries. Another step was a forecast of exports of the analyzed goods and also was made conclusions to which countries are most suitable to export aluminum, steel, meat, and cheese in the context of the European Union-US trade war.

Keywords: export, EU, USA, MCDM, EDAS, TOPSIS, SAW, RCA, forecast, trade war.

JEL Classification: F13, F14, CO2, F17.

1. Introduction

Trade wars in the economy are not a new phenomenon. The trade wars concept is important for the economy, its origins and other aspects were analyzed by such authors as Horwell (1966), Rodriguez (1974), Kuga (1973), Bagwell and Staiger (1999), Grossman and Helpman (1995), Berthou, JarDET, Siena, and Szczerbowicz (2018), Hoekman (2020).

Conybeare (1987, p. 3) defines trade wars as “an intensive international conflict, when countries interact, negotiate and retaliate mainly for economic purposes, which are directly related to their economies by their sold goods or service sectors, which are limited by restrictions on the free flow”.

Jahnsen (1953) was one of the first researchers who tried to prove that trade wars can be beneficial for large countries, but small countries in trade wars most often lose than win. The same opinion also has Bouët and Laborde (2017) which emphasizes several types of trade wars. The first type is the global trade war, which brings damage to the global economy. The second type is a trade war between the two countries. In such a trade war two countries take damage, but usually, the larger country wins and the smaller country loses (Bouët & La-borde 2017).

The trade war between China and the USA started in the middle of 2018, and a bit later the trade war moved to the European Union. The trade

war between the USA and the EU was started in 2018 when the USA set 25 proc. import duty on steel and a 10 proc. import duty on aluminum. Also in 2019, the USA increased import duties for cheese and meat that are imported to the USA from the EU.

When the USA increased import duties for goods that were imported from the EU, the EU countries suffered a loss. Breuss and Christen (2019) has created a simulation model that shows how the import duties for steel and aluminum impacted the economy. The authors state that the best international trade result is in those countries, where import duties were not applied – Canada, Mexico, South Korea, Portugal, Brazil. Also, it is seen that when the USA increase the import duties for goods that were imported from the EU, EU steel export to the USA has fallen by 64 proc., and aluminum export has fallen by 49 proc.

The authors McCarthy (2019), Breuss and Christen (2019), Kilolo (2018) state that the trade war will force affected countries to change their export directions.

It can be concluded that trade wars hurt all countries that are involved in them. Therefore, we can state that trade wars have the worst impact on smaller countries. Although it is mentioned that large countries may benefit from a trade war, however, this does not always happen. (Berthou et al., 2018) point out that annual export volumes of all

countries involved in trade wars are decreasing; therefore the countries are forced to look for other, alternative export markets.

According to experts, the US-EU trade war is a continuation of the US-China trade war.

Liu and Woo (2018) emphasizes three main points that encouraged the USA to start a trade war with China: 1) a huge disbalance in China – USA trades have slowed down job creations in the USA; 2) China has used illegal methods to obtain technologies from the USA; 3) the USA was sure that China wanted to decrease USA national safety and their international influence.

This paper will analyze in which countries it is most appropriate to export EU goods for which the USA has increased import duties rates in the context of the European Union – United States trade war.

The objective of this paper: to determine alternative export directions of steel, aluminum, cheese and meat of the European Union in the context of the US-EU trade war.

Work tasks:

1. Using methods of multi-criteria evaluation (MCDM) (EDAS, TOPSIS, SAW) to find out in which countries it is best for the European Union to export their products.
2. Calculate the RCA index for exported steel, aluminum, cheese and meat and to determine whether the exported products are competitive in the selected countries.
3. Produce export forecasts of the analyzed products to the sampled countries.
4. Research methods: analysis and synthesis of scientific literature, calculation of RCA index, methods of multicriteria evaluation (EDAS, TOPSIS, SAW), prognosis.

2. Methodology for assessing export expansion opportunities in the context of US and EU trade

To find out countries where the European Union should export their products, it is important to know what are the most important factors influencing export development processes.

In order to determine which criteria are most suitable for research, it was chosen to prepare an analysis of the scientific literature. Literature analysis was performed using 25 scientific literature articles on export expansion opportunities. After analyzing the literature, those authors who talked about criteria that are important for the export extension opportunities were chosen. After analysis, only 4 main criteria were left, because the authors emphasized the importance of these criteria the most.

After analyzing the scientific literature on the subject of export development, summarized factors influencing the change of export indicators are presented in the table below.

Table 1. Export criteria (composed by authors)

Author	Amount of customs duty	Subsidy amount	GDP per capita	Demand
Beckman, Estrades, and Aguiar (2019)	+	+	+	+
Kilolo (2018)	+	-	-	+
McCarthy (2019)	+	-	+	-
Breuss and Christen (2019)	+	+	+	-
Qiu and Wei (2019)	+	+	+	+
Chen, Crespi, Hahn, Schulz, and Taha (2019)	-	-	-	+
Chang, McAleer, and Nguyen (2019)	-	+	-	+
Tolkachev and Teplyakov (2018)	+	+	-	+
Mizuno and Takauchi (2018)	+	+	-	+
Corbo (2019)	+	-	+	+
Araújo, Chalaux, and Haugh (2018)	-	-	+	+
Aldcroft (2019)	+	-	+	+
Pervaz, Petrovic, Pecujlija, and Cosic (2018)	+	+	-	+
Dergachova and Boiko (2018)	+	-	+	+
Costinot and Rodríguez-Clare (2018)	-	-	+	+

Note: Here + indicates that the author considers the indicator to have an impact on exports, and this indicator is important in the export valuation, - indicates that the author considers the indicator irrelevant to the export valuation, or the author has no opinion on the indicator.

In this study multi-criteria approaches (MCDM) such as the SAW, TOPSIS and EDAS will be used to find out in which countries it is best for the European Union to export their products in the context of the EU – USA trade war. These methods allow us to rank our investigation countries.

One of the most popular and easier multi-criteria methods is the SAW method. The main purpose of this method is to find a value for each criterion and in this way to give a rank for all criteria. The first step in the SAW method is to create a

normalized matrix and to calculate an S_j indicator – to set up a rank for criteria (Anggraeni et al., 2018).

$$S_j = \sum_{i=1}^m w_i \bar{r}_{ij}, \quad (1)$$

where: \bar{r}_{ij} – j alternatives i criterion value.

The normalization matrix is compiled by normalizing criteria. In this step, it is established whether the criterion is minimizing or maximizing. In this way, we establish normalization matrix values (Anggraeni et al., 2018).

$$\bar{r}_{ij} = \frac{\min_j r_{ij}}{r_{ij}}; \quad (2)$$

$$\bar{r}_{ij} = \frac{r_{ij}}{\max_j r_{ij}}, \quad (3)$$

where: \bar{r}_{ij} – j alternatives i criterion value.

One of the exceptions to the SAW method is that a criterion cannot be a negative one, it is why it is necessary to convert negative criterion to a positive criterion.

$$\hat{r}_{ij} = r_{ij} + |\min_j r_{ij}| + 1. \quad (4)$$

Another multi-criteria method is a TOPSIS method. With this method, we can establish criterion rank by the ideal positive and the ideal negative criterion. According to Karim and Karmaker (2016), a positive ideal solution consists of all the good values that a criterion can achieve, whereas a negative ideal solution consists of all the worst values of a criterion. With the TOPSIS method, when the alternatives that come from all the criteria help determine the exact rank, in this way a decision matrix is formed (Karim & Karmaker, 2016). Below is an overview of the TOPSIS solution process.

Creates a vector matrix based on 5 formula:

$$n_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}}, \quad (5)$$

where: \bar{n}_{ij} – i indicator j object value; $i = 1, \dots, m$; $j = 1, \dots, n$.

After performing matrix normalization, we can calculate a weighted matrix using formula 6:

$$v_{ij} = w_i n_{ij}, \quad (6)$$

where: \bar{w}_i – j criterion weight.

In defining the ideal positive V^+ and ideal negative V^- solutions we use formulas 7 and 8:

$$V^+ = (v_1^+, v_2^+, \dots, v_n^+) = ((\max_i v_{ij} \mid j \in I), (\min_i v_{ij} \mid j \in J)); \quad (7)$$

$$V^- = (v_1^-, v_2^-, \dots, v_n^-) = ((\min_i v_{ij} \mid j \in I), (\max_i v_{ij} \mid j \in J)), \quad (8)$$

where: I – set of maximizing indices; J – a set of minimizing indices; $[(\max)]_i / [(\min)]_i$ – the weight of the indicator.

As discussed above, the authors Karim and Karmaker (2016) note the importance of calculating the ideal positive and the ideal negative distance to the criteria in the TOPSIS method. We calculate the distance using formulas 9 and 10.

$$S_i^+ = \sqrt{\sum_{j=1}^n (v_{ij} - v_i^+)^2}; \quad (9)$$

$$S_i^- = \sqrt{\sum_{j=1}^n (v_{ij} - v_i^-)^2}. \quad (10)$$

By calculating the positive and negative distances, we can calculate the relative proximity to the positive ideal solution according to formula 11:

$$P_i = \frac{s_i^-}{s_i^- + s_i^+}. \quad (11)$$

With the Gave P_i value, we can give each survey unit rank and determine where it ranks among all the survey units.

According to the authors Stanujkic, Zavadskas, Ghorabae, and Turski (2017), the EDAS method is one of the most recently introduced multi-criteria methods. The basic idea behind the EDAS approach is to use two distance measures: positive distance from the mean (PDA) and a negative distance from the mean (NDA). The first step in this approach is to identify the most important criteria describing the alternatives and construct the decision matrix.

The second step is to determine the average solution for all criteria:

$$AV_j = \frac{\sum_{i=1}^n x_{ij}}{n}. \quad (12)$$

The third step is to calculate the positive distance from the mean (PDA_{ij}):

If j criterion is maximizing:

$$PDA_{ij} = \frac{\max(0, (x_{ij} - AV_j))}{AV_i}. \quad (13)$$

If j criterion is minimizing:

$$PDA_{ij} = \frac{\max(0, (AV_j - x_{ij}))}{AV_i} \tag{14}$$

The fourth step is to reverse the negative distance from the mean:

If *j* criterion is maximizing:

$$NDA_{ij} = \frac{\max(0, (AV_j - x_{ij}))}{AV_i} \tag{15}$$

If *j* criterion is minimizing:

$$NDA_{ij} = \frac{\max(0, (x_{ij} - AV_j))}{AV_i} \tag{16}$$

The fifth step is to calculate the weighted *PDA_{ij}* amount:

$$SP_i = \sum_{j=1}^m w_j PDA_{ij} \tag{17}$$

The sixth step is to calculate the weighted *NDA_{ij}* amount:

$$SN_i = \sum_{i=1}^m w_j NDA_{ij} \tag{18}$$

The seventh step is to normalize the *SP_i* and *SN_i* values:

$$NSP_i = \frac{SP_i}{\max_i(SN_i)} \tag{19}$$

$$NSN_i = 1 - \frac{SP_i}{\max_i(SN_i)} \tag{20}$$

The eighth step is to calculate the *NSP_i* and *NSN_i* averages:

$$AS_i = \frac{1}{2} (NSP_i + NSN_i) \tag{21}$$

The last, ninth step is to rank the criteria according to the *AS_i* values obtained.

Multi-criteria evaluation by SAW TOPSIS and EDAS compares the results. The objects used in the study are potential importing countries, and the criteria by which the research is conducted show the results of potential importing countries. The study is conducted to evaluate which countries are most suitable for export from the European Union in the context of the US-EU trade war.

To determine whether the exported goods are competitive in the countries in which the EU will be able to export goods in the context of the EU – US trade war it calculates the RCA index for each commodity in the countries:

$$RCA_{Ai} = \frac{\frac{x_{Aj}}{\sum_{j \in P} x_{Aj}}}{\frac{X_{wj}}{\sum_{j \in P} x_{wj}}} \geq 1, \tag{22}$$

where: *P* – number of products, *X_{Ai}* – country; *A* – export of product, *X_{wi}* – world export of product, $\sum_{i \in P} X_{Ai}$ – country A export value, $\sum_{i \in P} X_{wi}$ – world export value.

3. Study of European Union export expansion opportunities in the context of US-EU trade war

As mentioned earlier for this study will be used such methods as EDAS, TOPSIS, and SAW. Using multi-criteria methods, the goal was to determine which countries are best for exporting products for which the US has increased customs duties, ie meat, cheese, steel, and aluminum, from the European Union. The country was satisfactory in terms of imports of a particular product into the country. The results of each study are summarized below.

3.1. Expansion opportunities for steel exports

In Table 2 below is shown a list of selected countries for the study, as well as the criteria for those countries that were selected from the scientific literature analysis.

Table 2. The meanings of the criteria of the selected countries for steel export study

	Duties	Share of exports in GDP	Share of imports in GDP	Share of imports of a country's product in world imports (2018)
China	0	0.20440252	0.35722041	1
Turkey	0	0.31027254	0.33441911	0.8
Korea	0	0.46121593	0.42345277	0.8
Thailand	0	0.70020964	0.61346363	0.6
Vietnam	0	1	1	0.6
India	0	0.20649895	0.25407166	0.6
Mexico	0	0.41090147	0.44625407	0.6
Weight	0.25	0.25	0.25	0.25
min/max criterion	min	max	max	max

The first analyzed multi-criteria method in this study is the SAW method. It helps to evaluate selected countries and the criteria assigned to them,

and also in this way we can give the ranks for those countries. This rank shows us in which countries after the trade war between the US and the European Union, it makes sense to import products. The S_j indicator was used to rank the countries. The results of the SAW study are shown in Table 3 below.

Table 3. SAW methods results

	S_j	Rank
China	0.39	4
Turkey	0.361	6
Korea	0.421	3
Thailand	0.478	2
Vietnam	0.65	1
India	0.265	7
Mexico	0.364	5

In the SAW study, each country was assigned an appropriate rank. The higher the S_j score is – the higher the rank for the country becomes. These are the ranking results of countries: In the first place is Vietnam, in the second is Thailand and Korea is ranked third. It can, therefore, be concluded that, according to the recommendations of this method, steel is best exported to these countries. To make the study more accurate, the same country will be ranked in the survey by two other methods, TOPSIS and EDAS, the results of which are presented below. The results of the TOPSIS method are summarized in Table 4 below.

Table 4. TOPSIS method results

	S^+	S^-	P_i	Rank
China	0.270	0.055	0.169	7
Turkey	0.169	0.205	0.548	5
Korea	0.140	0.211	0.601	3
Thailand	0.100	0.229	0.696	2
Vietnam	0.092	0.228	0.713	1
India	0.234	0.076	0.245	6
Mexico	0.150	0.208	0.581	4

In the TOPSIS study, each country was assigned an appropriate rank. The higher the P_i score is – the higher the rank for the country becomes. These are the ranking results of countries: in the first place is Vietnam, Thailand is ranked second and Korea is ranked third. Therefore it can be concluded that, according to the recommendations of the TOPSIS method, steel is best exported to these countries. The summarized results of the EDAS method are presented in Table 5 below.

Table 5. EDAS method results

	SP_i	SN_i	NSP_i	NSN_i	AS_i	Rank
China	0.1	0.83	0.18	0	0.09	7
Turkey	0.28	0.16	0.51	0.80	0.66	5
Korea	0.28	0.038	0.51	0.95	0.73	3
Thailand	0.4	0.04	0.80	0.95	0.87	2
Vietnam	0.54	0.11	1	0.85	0.92	1
India	0	0.59	0	0.28	0.14	6
Mexico	0.25	0.09	0.46	0.88	0.67	4

In the EDAS study, each country was assigned an appropriate rank. The higher the AS_i score is – the higher the rank for the country becomes. These are the ranking results of countries: In the first place is Vietnam, Thailand is ranked second and Korea is ranked third. It can, therefore, be concluded that, according to the recommendations of this method, steel is best exported to these countries.

The following conclusion is that in the context of US-EU trade, steel exports from the European Union are the most appropriate to countries like Vietnam, Thailand, and Korea, because the study of using multi-criteria methods such as the SAW, TOPSIS and EDAS give the same results.

3.2. Opportunities for aluminum export expansion

Table 6 below shows a list of selected countries for the study, as well as the criteria for those countries that were selected from the scientific literature analysis.

Table 6. Importance of criteria for countries selected for the aluminum export survey

	Duties	Share of exports in GDP	Share of imports in GDP	Share of imports of a country's product in world imports (2018)
Japan	0	27.44	6.83	5
Mexico	0	39.2	41.1	4
Korea	0	44	39	4
China	30	19.5	18.7	3
India	7.5	19.7	23.4	3
Canada	0	31.8	33.9	2
Turkey	0	29.6	30.8	2
Weight	0.25	0.25	0.25	0.25
min/max criterion	min	max	max	max

The first analyzed multi-criteria method in this study is the SAW method. It helps to evaluate selected countries and the criteria assigned to them, and also in this way we can give the ranks for those countries. This rank shows us to which countries after the trade war between the US and the European Union, it makes sense to import products. The S_j indicator was used to rank the countries. The results of the SAW study are shown in Table 7.

In the SAW study, each country was assigned an appropriate rank. The higher the S_j score is – the higher the rank for the country becomes. These are the ranking results of countries: in the first place it is Korea, Mexico is a second and Japan is ranked third. It can, therefore, be concluded that, according to the recommendations of this method, aluminum is best exported to these countries. To make the study more accurate, the same country will be ranked in the survey by two other methods, TOPSIS and EDAS, the results of which are presented below. The results of the TOPSIS method are summarized in Table 8 below.

Table 7. Results of the aluminum SAW method

	S_j	Rank
Japan	0.508	3
Mexico	0.673	2
Korea	0.687	1
China	0.375	7
India	0.404	6
Canada	0.487	4
Turkey	0.456	5

Table 8. Results of the aluminum TOPSIS method

	S_i^+	S_i^-	P_i	Rank
Japan	0.090	0.257	0.740	3
Mexico	0.031	0.267	0.896	2
Korea	0.028	0.268	0.905	1
China	0.269	0.028	0.095	7
India	0.123	0.185	0.601	6
Canada	0.093	0.251	0.730	4
Turkey	0.098	0.248	0.716	5

In the TOPSIS study, each country was assigned an appropriate rank. The higher the P_i score is – the higher the rank for the country becomes. These are the ranking results of countries: In the first place it is Korea, Mexico is a second and Japan is ranked third. Therefore it can be concluded that, according to the recommendations of the TOPSIS method, aluminum is best exported to

these countries. The summarized results of the EDAS method are presented in Table 9 below.

Table 9. Results of the aluminum EDAS method

	SP_i	SN_i	NSP_i	NSN_i	AS_i	Rank
Japan	0.380	0.128	0.755	0.905	0.830	3
Mexico	0.482	0	0.956	1	0.978	2
Korea	0.503	0	1	1	1	1
China	0	1.349	0	0	0	7
India	0	0.257	0	0.809	0.405	6
Canada	0.304	0.097	0.604	0.927	0.766	4
Turkey	0.264	0.102	0.525	0.923	0.725	5

In the EDAS study, each country was assigned an appropriate rank. The higher the AS_i score is – the higher the rank for the country becomes. These are the ranking results of countries: In the first place it is Korea, Mexico is a second and Japan is ranked third. It can, therefore, be concluded that, according to the recommendations of this method, aluminum is best exported to these countries.

The following conclusion is that in the context of US-EU trade, aluminum exports from the European Union are the most appropriate to countries like Korea, Mexico, and Japan, because the study of using multi-criteria methods such as the SAW, TOPSIS and EDAS give the same results.

3.3. Cheese export expansion opportunities

Table 10 below shows a list of selected countries for the study, as well as the criteria for those countries that were selected from the scientific literature analysis.

Table 10. Criteria for the examination of cheese exports

	Duties	Share of exports in GDP	Share of imports in GDP	Share of imports of a country's product in world imports (2018)
Japan	29.46	17.77	16.83	4
Russia	15	30.74	20.8	3
Saudi Arabia	5	39.7	26.8	2
China	8	19.5	18.7	2
Mexico	45	39.2	41.1	2
Korea	15.7	44	39	2
Weight	0.25	0.25	0.25	0.25
min / max criterion	min	max	max	max

The first analyzed multi-criteria method in this study is the SAW method. It helps to evaluate selected countries and the criteria assigned to them, and also in this way we can give the ranks for those countries. This rank shows us in which countries after the trade war between the US and the European Union, it makes sense to import products. The S_j indicator was used to rank the countries. The results of the SAW study are shown in Table 11.

In the SAW study, each country was assigned an appropriate rank. The higher the S_j score is – the higher the rank for the country becomes. These are the ranking results of countries: In the first place is Saudi Arabia, Korea is a second and Mexico is ranked third. It can, therefore, be concluded that, according to the recommendations of this method, cheese is best exported to these countries. To make the study more accurate, the same country will be ranked in the survey by two other methods, TOPSIS and EDAS, the results of which are presented below. The results of the TOPSIS method are summarized in Table 12 below.

Table 11. Results of cheese SAW method

	S_j	Rank
Japan	0.496	6
Russia	0.572	4
Saudi Arabia	0.763	1
China	0.505	5
Mexico	0.626	3
Korea	0.691	2

Table 12. Cheese results of the TOPSIS method

	S_i^+	S_i^-	P_i	Rank
Japan	0.157	0.102	0.395	6
Russia	0.101	0.179	0.640	3
Saudi Arabia	0.094	0.174	0.649	2
China	0.135	0.123	0.478	5
Mexico	0.188	0.280	0.598	4
Korea	0.091	0.298	0.767	1

In the TOPSIS study, each country was assigned an appropriate rank. The higher the P_i score is – the higher the rank for the country becomes. These are the ranking results of countries: in the first place is Saudi Arabia, Korea is a second and Mexico is ranked third. Therefore it can be concluded that, according to the recommendations of the TOPSIS method, cheese is best exported to these countries. The summarized results of the EDAS method are presented in Table 13 below.

Table 13. Results of cheese EDAS method

	SP_i	SN_i	NSP_i	NSN_i	AS_i	Rank
Japan	0.150	0.330	0.589	0.112	0.350	6
Russia	0.110	0.067	0.430	0.819	0.624	3
Saudi Arabia	0.248	0.054	0.975	0.855	0.915	2
China	0.148	0.225	0.583	0.394	0.488	4
Mexico	0.186	0.371	0.729	0.000	0.364	5
Korea	0.255	0.050	1.000	0.865	0.933	1

In the EDAS study, each country was assigned an appropriate rank. The higher the AS_i score is – the higher the rank for the country becomes. These are the ranking results of countries: In the first place is Saudi Arabia, Korea is a second and Mexico is ranked third. It can, therefore, be concluded that, according to the recommendations of this method, cheese best exported to these countries.

The following conclusion is that in the context of US-EU trade, cheese exports from the European Union it is most appropriate to such countries as Saudi Arabia, Korea, and Mexico, because the study of using multi-criteria methods such as the SAW, TOPSIS and EDAS give the same results.

3.4. Meat export expansion opportunities

Table 14 below shows lists of the countries selected for the study, as well as the criteria for those countries selected through the literature analysis.

Table 14. Selection criteria for meat products

	Duties	Share of exports in GDP	Share of imports in GDP	Share of imports of a country's product in world imports (2018)
Japan	0	27.4	16.8	8
China	70	19.5	18.7	9
Russia	15	30.7	20.8	2
Mexico	15	39.2	41.1	3
Korea	0	44	39	4
Canada	0	31.8	33.9	2
Weight	0.25	0.25	0.25	0.25
min/max criterion	min	max	max	max

The first analyzed multi-criteria method in this study is the SAW method. It helps to evaluate selected countries and the criteria assigned to them, and also in this way we can give the ranks for those countries. This rank shows us in which coun-

tries after the trade war between the US and the European Union, it makes sense to import products. The S_j indicator was used to rank the countries. The results of the SAW study are shown in Table 15.

In the SAW study, each country was assigned an appropriate rank. The higher the S_j score is – the higher the rank for the country becomes. These are the ranking results of countries: in the first place is Korea, Mexico is a second and Japan is ranked third. It can, therefore, be concluded that, according to the recommendations of this method, meat is best exported to these countries. To make the study more accurate, the same country will be ranked in the survey by two other methods, TOPSIS and EDAS, the results of which are presented below. The results of the TOPSIS method are summarized in Table 16 below.

Table 15. Results of SAW export method for meat products

	S_j	Rank
Japan	0.48	3
China	0.475	4
Russia	0.357	6
Mexico	0.556	2
Korea	0.598	1
Canada	0.442	5

Table 16. Results of TOPSIS survey on meat products export

	S_i^+	S_i^-	P_i	Rank
Japan	0.099	0.265	0.729	2
China	0.262	0.131	0.334	6
Russia	0.162	0.192	0.542	5
Mexico	0.124	0.215	0.633	4
Korea	0.094	0.265	0.738	1
Canada	0.139	0.249	0.642	3

In the TOPSIS study, each country was assigned an appropriate rank. The higher the P_i score is – the higher the rank for the country becomes. These are the ranking results of countries In the first place is Korea, Mexico is a second and Japan is ranked third. Therefore it can be concluded that, according to the recommendations of the TOPSIS method, meat is best exported to these countries. The summarized results of the EDAS method are presented in Table 17.

Table 17. Results of EDAS export method for meat products

	SP_i	SN_i	NSP_i	NSN_i	AS_i	Rank
Japan	0.429	0.139	0.983	0.859	0.921	2
China	0.232	0.983	0.532	0.000	0.266	6
Russia	0.025	0.221	0.057	0.776	0.417	5
Mexico	0.192	0.089	0.441	0.909	0.675	4
Korea	0.436	0.036	1.000	0.964	0.982	1
Canada	0.299	0.145	0.685	0.852	0.768	3

In the EDAS study, each country was assigned an appropriate rank. The higher the AS_i score is – the higher the rank for the country becomes. These are the ranking results of countries: In the first place is Korea, Mexico is a second and Japan is ranked third. It can, therefore, be concluded that, according to the recommendations of this method, meat best exported to these countries.

The following conclusion is that in the context of US-EU trade, meat exports from the European Union it is most appropriate to such countries as Saudi Arabia, Korea, and Mexico, because the study of using multi-criteria methods such as the SAW, TOPSIS and EDAS give the same results.

4. Product competitiveness

Following country rankings, the next step was to calculate the RCA index to determine product competitiveness in certain countries. The results obtained are shown in Table 18 below.

Table 18. Competitiveness of aluminum and steel

Product	Country	RCA
Aluminum	Korea	0.61
	Mexico	0.378
	Japan	0.332
Steel	Vietnam	0.869
	Thailand	0.283
	Korea	1.877

Tables 18 and 19 show us product RCA indexes by country. The RCA index calculations showed that the aluminum RCA index is less than 1 in any of the selected countries, but Korea is the closest to 1. Therefore, Korea will be used for further analysis of aluminum exports. According to calculations of the steel RCA index, the highest RCA index was found in Korea, in this case, it is 1.87, which shows that steel is a competitive

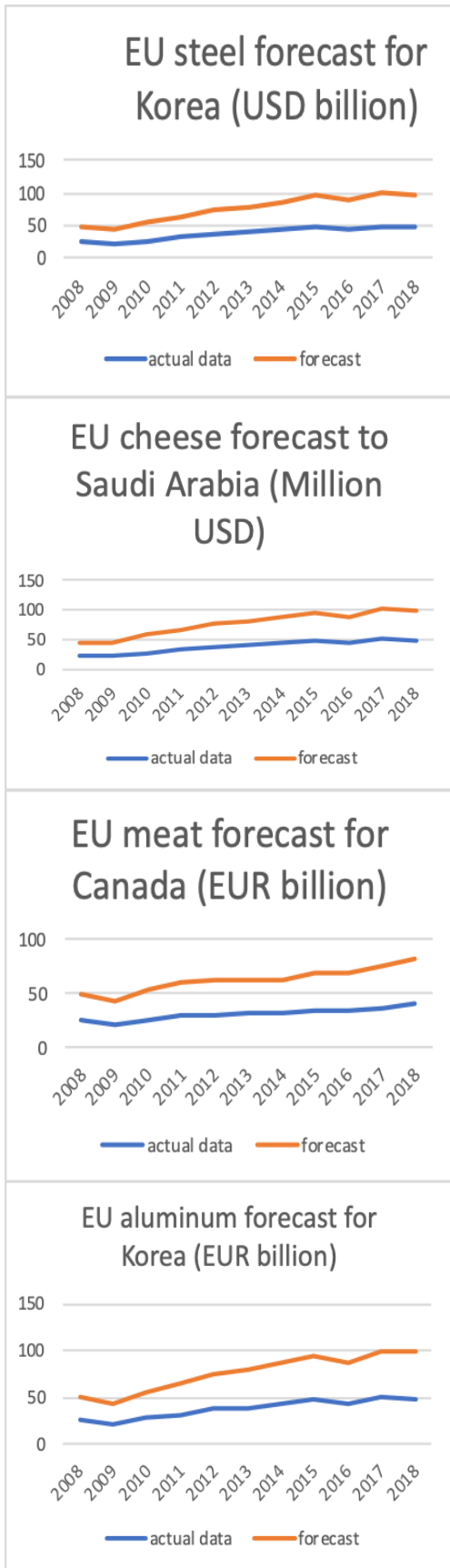


Figure 1. EU export forecast for selected goods to selected countries

Table 19. Competitiveness of cheese and meat

Product	Country	RCA
Cheese	Korea	0.002
	Russia	0.091
	Saudi Arabia	0.632
Meat	Korea	0.01
	Japan	0.051
	Canada	1.709

product on the market in Korea, which is why Korea will be used for further investigation of steel. The cheese RCA index estimates are less than 1 in any of the selected countries, but Saudi Arabia is closest to 1. Therefore, Saudi Arabia with an RCA index of 0.63 will be used for further analysis of aluminum exports. The RCA Meat Index estimates that Canada has the highest RCA index at 1.7, indicating that meat is a competitive commodity in the Canadian market, which is why Canada will be chosen for further meat analysis.

With the help of the RCA index for each product was selected a country in which this product is competitive. The next step illustrates the export forecasts for the goods concerned in the context of the EU – EU trade war.

Figure 1 above shows the export forecasts of the analyzed products to the sampled countries. The graphs depict the actual export data of the European Union to the sampled countries (the actual data curve) and assume that the quantities analyzed, taking into account the EU-US trade war, will be exported to the countries sampled during the investigation (forecast curve). The predictions in Table 19 show that exports of goods subject to customs duties in the context of the EU-US trade war to the alternative countries we selected in the study will increase European exports to selected countries. Such export growth will also promote the competitiveness of goods in the markets of these countries. Therefore, such export alternatives are useful not only for the European Union but also are useful for the partner countries to which the products may be exported.

6. Conclusions

1. The study, using MCDM methods (SAW, TOPSIS, and EDAS), identified new directions for EU exports in the context of the EU-US Trade War. The study showed that meat products are best exported to Korea, Japan, Canada, and Mexico. Cheese products are best exported to Korea, Russia, Saudi Arabia, and Mexico and Japan. Aluminum products are best exported to Korea, Mexico,

and Japan. And steel products are best exported to Vietnam, Thailand, and Korea.

2. According to the RCA index, aluminum and steel were found to be a competitive commodity in Korea, cheese was a competitive commodity in Saudi Arabia and meat was a competitive commodity in Canada.

3. The analysis of exports of the product concerned made by the European Union showed that exports to the alternative countries identified in the investigation, ie aluminum and steel to Korea, cheese to Saudi Arabia and meat to Canada, would increase the European Union's exports to those countries, and such an increase in exports will also promote the competitiveness of goods on the markets of those countries. Therefore, such export alternatives not only benefit the European Union but also the partner countries to which the products may be exported.

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