COMPARISON OF THE EXPORT PERFORMANCE OF EMERGING MARKETS WITH CRITIC-BASED TOPSIS AND COPRAS METHODS

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Abstract

The objective of this study is to assess the export performance of emerging markets over the period 2018-2022, utilising multi-criteria decision-making (MCDM) techniques. In this study, the CRITIC method was employed to assign weights to the criteria, and the TOPSIS and COPRAS methods were utilized to rank the emerging markets according to their export performance. The most significant criterion for the CRITIC method is the export growth rate. The world export share was identified as the export performance indicator with the lowest criterion weight. According to the TOPSIS and COPRAS methods, China demonstrated the highest export performance across all years. When considering the period average according to both methods, Türkiye was ranked 11th in the export performance ranking. Chile, Colombia, Peru, and India exhibited the lowest export performance according to the average of the period.

Keywords: Export, Export Performance, CRITIC, TOPSIS, COPRAS, Emerging Markets

Jel Clasiffication: F10, F14, F40.

GELİŞMEKTE OLAN PAZARLARIN İHRACAT PERFORMANSLARININ CRITIC TABANLI TOPSIS VE COPRAS YÖNTEMLERİ İLE KARŞILAŞTIRILMASI

Öz

Bu çalışmanın amacı, gelişmekte olan pazarların 2018-2022 dönemi ihracat performansını çok kriterli karar verme (ÇKKV) teknikleri ile değerlendirmektir. CRITIC yöntemi ile kriter ağırlıklandırılmasının yapıldığı çalışmada, TOPSIS ve COPRAS yöntemleri ile gelişmekte olan pazarlar, ihracat performanslarına göre sıralandırılmıştır. CRITIC yöntemine en önemli kriter, ihracat büyüme oranı olmuştur. Dünya ihracat payı ise kriter ağırlığı en düşük olan ihracat performansı göstergesi olmuştur. TOPSIS ve COPRAS yöntemlerine göre bütün yıllarda en yüksek ihracat performansı gösteren ülkenin Çin olduğu görülmüştür. İki yönteme göre dönem ortalaması dikkate alındığında Türkiye ihracat performansı sıralamasında 11.sırada yer almıştır. Dönem ortalamasına göre Şili, Kolombiya, Peru ve Hindistan ise en düşük ihracat performansı gösteren ülkeler olmuştur.

Anahtar kelimeler: İhracat, İhracat Performansı, CRITIC, TOPSIS, COPRAS, Gelişmekte Olan Pazarlar

Jel kodları: F10, F14, F40.

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1. Introduction

Exporting can be defined as the sending and selling of products that have been produced or grown in one country and subsequently exported to another country. Exports exert a considerable influence on economic growth, which plays a pivotal role in the economic development of countries (Uysal and Mohamoud, 2018: 168). As a country's exports increase, economic growth is driven by the creation of demand for that country's goods and services in international markets. Consequently, when businesses engage in greater export activity, they typically increase their production levels. This results in higher incomes and greater economic activity. The expansion of exports has been demonstrated to stimulate economic growth, enhance employment opportunities, augment foreign exchange earnings, improve the trade balance, and encourage innovation and productivity (Benli, 2020: 286-287; Ji et al., 2022: 1). Furthermore, increased exports yield additional benefits, including the emergence of more competitive businesses, an improvement in the living standards of the population, the attraction of greater foreign direct investment (FDI) to the country, and a reinforcement of the country's geopolitical position (Bierut and Kuziemska-Pawlak, 2017: 524). Moreover, more exports positively affect the purchasing power of the country and enable it to compete more strongly in the international arena (Ruzekova et al., 2020: 149). For these reasons, in order for countries to increase their exports, they need to show higher export performance due to the increasing competitive environment (Katsikeas et al., 1996: 6). The performance of exports is a crucial element in the growth of emerging markets, a phenomenon that is evident in all countries. Furthermore, the significance of these markets in global trade is also increasing. In this respect, China, which is among the emerging markets, alone realized 15% of the world's merchandise exports in 2022 (Trade Map, 2024). Other countries other than China, which are included in the Morgan Stanley Capital International (MSCI) list of emerging markets, represent approximately 25% of global exports. In this respect, the share of the countries on the list in world exports reached 40% in 2022. Moreover, the share of these countries in both world exports and global income is expected to continue to increase in the coming years.

The use of a single criterion for measuring a country's export performance may not provide an accurate representation of the actual export performance of that country. For this reason, a number of indicators of export performance have been developed. Nevertheless, there is still no consensus among scholars regarding these indicators. While some of these indicators have been identified as variables that affect export performance, others have been developed with the specific purpose of directly reflecting export performance. In this study, the focus is on indicators that directly reflect export performance. In this context, the value of net trade, per capita exports, the export share in the global market, the export growth rate, high-technology exports, the proportion of exports of goods to GDP, the concentration of

exports by product, and the concentration of exports by market are considered to be suitable indicators for measuring export performance.

Nevertheless, while the use of multiple indicators offers a more comprehensive understanding of export performance, it is equally crucial to ascertain their respective weights and to make comparisons in a manner that is consistent with this information. In this regard, the objective of this study is to assess the export performance of the countries included in the MSCI Emerging Markets Index by employing a range of export performance indicators. In order to achieve this, two significant research questions must be addressed. Firstly, this study seeks to ascertain which criteria are of greater importance in determining export performance for emerging market economies. Secondly, this study seeks to identify which emerging markets exhibit the highest and lowest export performance according to the aforementioned criteria.

In order to respond to these questions, it is first necessary to conduct a literature review. Subsequently, the export performance criteria identified as particularly relevant in the literature review will be specified within the data set section. In order to assign weights to the selected export performance criteria, the CRITIC method was employed. The export performance of emerging markets was then evaluated using the TOPSIS and COPRAS methods. The aforementioned methods have facilitated the attainment of research findings. The findings presented here are discussed in the context of previous research results in the discussion section. In the concluding section, the export performance criteria and the export performance of individual countries are evaluated.

2. Literature Review

A review of the literature reveals that there are only a limited number of studies that employ multi-criteria decision-making (MCDM) in the analysis of exports and international trade performance. Consequently, studies that employ foreign trade data and assess countries based on their macroeconomic performance are also included in the analysis. A synthesis of the findings from the aforementioned studies is presented in Table 1.

Table 1: Summary of Literature

Study	Results	Methods	Performance Types	Terms	Alternatives
Dinçer (2011)	The countries with the highest economic performance are Luxembourg, the Netherlands, and Denmark. The lowest-performing countries in the ranking are Macedonia, Latvia, and Bulgaria. Türkiye was ranked 27th.	TOPSIS and WSA	Economic performance	2008	EU (European Union) member states and candidate countries
Özden (2011)	Luxembourg exhibited the most optimal performance among all countries. Conversely, Greece exhibited the least favourable performance. In terms of overall economic performance, Türkiye was ranked 27th out of 29 countries.	TOPSIS	Economic performance	2009	EU member states and candidate countries
Urfalıoğlu and Genç (2013)	The initial three positions were assumed by the Netherlands, Sweden, and Romania. The final three positions were occupied by Bulgaria, Greece, and Romania. With regard to the economic ranking, Türkiye was placed 31st with the ELECTRE method, 13th with the TOPSIS method, and 32nd with the PROMETHEE method.	ELECTRE, TOPSIS and PROMETHEE	Economic performance	2010	EU countries and Türkiye
Göktolga et al. (2015)	In all years except 2006, 2009 and 2013, Kazakhstan was identified as having the most favourable macroeconomic performance.	TOPSIS	Economic performance	2003-2013	Five Asian counries

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Table 1: Summary of Literature (Continue)

Study	Results	Methods	Performance Types	Terms	Alternatives
Önder et al. (2015)	Türkiye experienced the most fragile economy during the global economic downturn of 2008-2009. However, following this period, the Turkish economy demonstrated a relatively high level of performance. India has a stable economy and typically ranks first or second in this regard.	ANP and TOPSIS	Economic performance	2001-2013	F5 (Fragile) countries
Altay Topçu and Oralhan (2017)	The highest-performing countries were Germany, the UK, Luxembourg, and Japan. Türkiye ranked 30th (29th) according to TOPSIS (ELECTRE).	ELECTRE and TOPSIS	Economic performance	2010-2015	OECD countries
Sevgin and Kundakcı (2017)	The first three positions were occupied by Luxembourg, Sweden and Denmark. The lowest rankings were achieved by Croatia, Bulgaria, Slovenia, Greece, Slovenia, Greece and Türkiye.	TOPSIS and MOORA	Economic performance	2013	EU countries and Türkiye
Işık et al. (2018)	It is asserted that the most crucial criterion in evaluating export performance is the export of high-technology products. Furthermore, Türkiye was ranked 17th among 22 developing countries.	Fuzzy AHP and TOPSIS	Export performance	2013	Developing countries
Karabıyık and Karabıyık (2018)	In the international trade performance assessment, Norway, Ireland and Germany were the countries that achieved the highest rankings. The lowest rankings were achieved by Türkiye, the USA and Greece.	TOPSIS and AHP	International trade performance	1999-2014	OECD countries

Table 1: Summary of Literature (Continue)

Study	Results	Methods	Performance Types	Terms	Alternatives
Korucuk et al. (2018)	It has been demonstrated that the most significant factors influencing a country's performance in international trade are unemployment and imports.	ENTROPY	Foreign trade performance	-	Countries of the Turkic World
Özbek and Demirkol (2019)	In terms of economic performance, Germany is the country with the best results, while Greece is the country with the worst results. Türkiye ranked last in this category.	AHP, ARAS COPRAS and GRA	Economic performance	2016	EU countries and Türkiye
Kandemir and Özarı (2019)	The highest economic performance was observed in Germany, with France and the United Kingdom also exhibiting high performance. In contrast, Türkiye demonstrated a relatively mediocre performance during the 2007-2013 period, and a notable decline during the subsequent 2013-2017 period.	TOPSIS ve EDAS	Economic performance	2007-2017	EU countries and Türkiye
Belke (2020)	Germany demonstrated the highest macroeconomic performance, whereas Italy exhibited the lowest performance.	CRITIC and MAIRCA	Economic performance	2010-2018	G7 (Group of 7) countries
Erdoğan and Özarı (2020)	The USA has demonstrated the strongest performance among OECD countries. Türkiye's ranking among OECD countries was notably high until 2014, but it has since experienced a decline in its position.	TOPSIS	Economic performance	2010-2017	OECD countries and Türkiye
Orhan (2020)	Among 35 countries, Luxembourg ranked highest in terms of performance, while Türkiye ranked 26th.	ARAS	Economic performance	2018	EU member states and candidate countries

Table 1: Summary of Literature (Continue)

Study	Results	Methods	Performance Types	Terms	Alternatives
Uludağ and Ümit (2020)	Türkiye and Turkmenistan had the best macroeconomic performance, while showing the worst in value-added production. Kazakhstan, Uzbekistan and Azerbaijan had better value-added production than Türkiye and Turkmenistan, but did less well in macroeconomics.	DEMATEL and COPRAS	Macro-economic and value-added production performances	2008-2016	Countries of the Turkic World
Kahreman et al. (2021)	Italy demonstrated the highest performance among selected countries from 2000 to 2018, ranking second in 2019. Despite sixth place in foreign trade in agriculture, Italy outperforms other countries. In 2019, the USA had the highest ranking.	Fuzzy AHP and TOPSIS	Agricultural Sector Foreign Trade Performance	2000-2019	Selected OECD countries
Koşaroğlu (2021)	The most crucial indicator of a country's macroeconomic performance is the current account deficit. In comparison to the other E7 countries, China has demonstrated the most robust economic performance. In contrast, Brazil exhibited the least favourable performance.	ENTROPY and ARAS	Economic performance	2010-2019	E7 (Emerging) countries

Table 1: Summary of Literature (Continue)

Study	Results	Methods	Performance Types	Terms	Alternatives
Maruf and Özdemir (2021)	The metropolitan cities of İstanbul, Kocaeli, İzmir, Bursa, and Ankara have demonstrated the highest export performance and are among the top five in the ranking. In contrast, the metropolitan cities of Muğla, Şanlıurfa, Diyarbakır, Erzurum, and Van have exhibited the lowest export performance.	CRITIC and MAUT	Export Performance of Cities	2020	Metropolitan cities in Türkiye
Coşkun (2022)	China was the highest performing country. Türkiye ranked 5th.	ENTROPY and WASPAS	Economic performance	2011-2020	BRICS-T countries
Yazgan (2022)	The highest export performance is observed in İstanbul, Kocaeli and İzmir, while the lowest export performance is observed in Ordu, Van and Erzurum.	CRITIC and EDAS	Export Performance of Cities	2021	Metropolitan cities in Türkiye
Apan and Tiyek (2023)	The export ratio criterion has been identified as the most important criterion. Türkiye achieved its lowest performance in 2008, while it achieved its highest performance in 2015.	CRITIC and MABAC	Economic performance	2008-2021	Years (Türkiye)
Kahreman (2023)	Luxembourg, Ireland, and Germany have demonstrated the most favourable economic performance. Conversely, Colombia, Türkiye and Greece have displayed the least favourable economic performance.	CRITIC and MABAC	Economic performance	2015-2021	OECD countries

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Table 1: Summary of Literature (Continue)

Study	Results	Methods	Performance Types	Terms	Alternatives
Özekenci (2023)	İstanbul, Kocaeli, İzmir, and Hatay exhibited the highest export performance. Conversely, Diyarbakır, Şanlıurfa, Ordu, Van and Erzurum demonstrated the lowest export performance.	CRITIC, MULTI-MOORA and WASPAS	Export Performance of Cities	2022	Metropolitan cities in Türkiye
Yalman et al. (2023)	The most important criterion for the performance of the Turkish economy is economic growth. The criterion with the least impact has been the labor force participation rate. The best performance for the Turkish economy was in 2004, while the worst performance was in 2001. On the other hand, the Turkish economy also performed poorly during the years of the global crisis.	MEREC, LOPCOW and MARCOS	Economic performance	2000-2020	Years (Türkiye)
Kahreman (2024)	China has consistently demonstrated the most robust economic performance, whereas India has exhibited the least favourable outcomes, as reflected in the overall average. While Türkiye was ranked second in 2011, it was ranked third when the data was averaged over all years.	ENTROPY and WEDBA	Economic performance	2000-2022	BRICS-T countries
Kaya et al. (2024)	The inflation rate was the most important factor affecting economic performance. Compared to other years, 2022 was the most successful year for the Turkish economy.	CRITIC, FUCOM and GRA	Economic performance	2013-2022	Years (Türkiye)

Table 1: Summary of Literature (Continue)

Study	Results	Methods	Performance Types	Terms	Alternatives
Oussama et al. (2024)	The countries with the highest macroeconomic performance were Oman, the UAE, Qatar, Morocco and Kuwait. In contrast, Iran exhibited the weakest performance.	TOPSIS	Economic performance	2000-2020	MENA (Middle East and North Africa) countries
Tekman and Ordu (2025)	The best performance over the four-year period was in the Istanbul region, while the Eastern Anatolia region experienced consistently declining performance and ranked last.	SWARA and CoCoSo	Economic performance	2019-2022	26 regions in Türkiye
Ulutaş et al. (2025)	The current account balance was the most significant factor in macroeconomic success. Japan exhibited the highest economic performance, while the USA demonstrated the lowest.	LOPCOW and RAWEC	Economic performance	-	G7 countries

Source: Author's compilation.

As evidenced in Table 1, the literature review yielded a limited number of studies examining various aspects of international trade performance. These include the export performance of countries (Işık et al., 2018), the international trade performance of countries (Karabıyık and Karabıyık, 2018), foreign trade performance in general (Korucuk et al., 2018), the foreign trade performance of the agricultural sector (Kahreman et al., 2021), and economic performance in relation to foreign trade data (Yaşar and Bolat, 2023). Moreover, studies have been conducted to evaluate the export performance of cities (Maruf and Özdemir, 2021; Yazgan, 2022; Özekenci, 2023). This study differs from previous studies in terms of both the export performance criteria used in terms of addressing the export performance of countries, the ranking of different alternative emerging markets and the MCDM methods used. In this way, the study is expected to contribute to the literature.

3. Material and methods

3.1. Material

The present study encompasses the period between 2018 and 2022. In the evaluation, both the average export performance for the period and the export performance by years are taken into account. The average export performance for the period is calculated using the mean of the export values for each year, whereas the export performance by years considers the export values for each individual year. The calculations for the period average are presented in detailed tables, while the weighting of criteria and performance results by year are evaluated through figures.

A variety of criteria have been employed in the assessment of export performance. The value of net trade (Mimouni et al., 2007), per capita exports (Mimouni et al., 2007; Karabıyık and Karabıyık, 2018), share in the global market (Mimouni et al., 2007; Chakrabartty and Sinha, 2022), export growth rate (UNCTAD, 2019), product diversification and concentration (Mimouni et al., 2007; Chakrabartty and Sinha, 2022), and market diversification and concentration (Mimouni et al., 2007). Additionally, the evaluation of export performance has considered the following criteria: high technology exports, imports of goods and services, exports of goods and services (Yaşar and Bolat, 2023), normalized balance of trade and terms of trade (Karabıyık and Karabıyık, 2018), and export value (Korucuk et al., 2018). Furthermore, Işık et al. (2018) examined export performance utilizing an export value index (2000=100), the cost to export (US$ per container deflated), high-technology exports (percent of manufactured exports), exports of goods and services (percent of GDP), merchandise exports to high-income economies (percent of total merchandise exports), and manufactured exports (percent of merchandise exports). The data on high-technology exports as a percentage of manufactured exports for these indicators were obtained and included in the study. As data on exports of goods and services (as a percentage of gross domestic product) for Kuwait and the United Arab Emirates were not available, exports of goods (as a percentage of gross domestic product) were calculated and included. The data for the remaining indicators for the years 2021 and 2022 are not available for a significant number of countries, and thus these indicators are not included in the analysis. Conversely, in the absence of data regarding export country and export product diversification, calculations are based on export country concentration and export product concentration data. The criteria utilized to assess export performance, along with the pertinent references, are presented in Table 2.

Table 2: Decision criteria and characterization

Criteria	Characterisation	Reference Data	Reference Study	Direction
Value of net trade (C1)	The value of net trade is defined as the value of exports minus the value of imports. As a reliable indicator of economic activity at the national level, it accounts for the globalization of production processes and the vertical specialization of countries at various stages of production (Mimouni et al., 2007). A negative value indicates a country with a trade deficit, whereas a positive value indicates a country with a trade surplus (Chakrabartty and Sinha, 2022; UNCTAD, 2024).	Trade Map (2024)	Mimouni et al. (2007); Chakrabartty and Sinha (2022)	Maximum
Per capita exports (C2)	Per capita exports represent the ratio of a country's total merchandise exports to its population. It is an indicator of a country's level of outward orientation and the extent to which its population contributes to the global market (Mimouni et al., 2007).	Trade Map (2024) and World Bank Group (2024a)	Mimouni et al. (2007); Karabıyık and Karabıyık (2018)	Maximum
(Export) Share in world market (C3)	It is a percentage share of the total value of global exports. The world market share of a specific country is the ratio of a country's total exports to the global total of exports worldwide (Mimouni et al., 2007).	Trade Map (2024)	Mimouni et al. (2007)	Maximum
Export growth rate (C4)	It is obtained by subtracting the export value of the countries in each year from the export value in the previous year and dividing it by the export value in the previous year.	Trade Map (2024)	Gonçalves and Richtering (1987); Mimouni et al. (2007); UNCTAD (2019)	Maximum

Table 2: Decision criteria and characterization (Continue)

Criteria	Characterisation	Reference Data	Reference Study	Direction
High-technology exports (C5)	It is the proportion of manufactured exports comprising high-technology exports (Işık et al.,2018).	World Bank Group (2024b)	Işık et al. (2018); Yaşar and Bolat (2023)	Maximum
Exports of goods (% of GDP) (C6)	A measure of the total value of merchandise exports expressed as a percentage of gross domestic product.	Trade Map (2024) and IMF (2024)	Gonçalves and Richtering (1987); Işık et al. (2018)	Maximum
(Export) Product concentration (C7)	The product concentration index is also called the Herfindahl-Hirschmann Index (Product HHI). It is a measure of the degree of product concentration (Chakrabartty and Sinha, 2022; UNCTADstad, 2024a). Values range from 0 to 1, with higher values indicating greater concentration. A value of 0 indicates that a country's exports are concentrated in a large number of products, while a value of 1 indicates that exports are concentrated in a small number of products (Aydemir, 2024).	UNCTADstad (2024b)	Chakrabartty and Sinha (2022)	Minimum
(Export) Market concentration (C8)	The HH Market Concentration Index is employed for the purpose of measuring the extent of concentration in export markets. This index assumes values between 0 and 1. Values proximate to 0 indicate that a country's exports are concentrated in a substantial number of countries. Conversely, values approaching 1 indicate that a country's exports are concentrated in a limited number of countries (WITS, 2010; Yaşar, 2019; Chakrabartty and Sinha, 2022).	WITS (2024)	Del Rosal, (2019); Chakrabartty and Sinha (2022)	Minimum

Source: Author's compilation.

As shown in Table 2, value of net trade, per capita exports, (export) share in world market, export growth rate, high-technology exports, exports of goods (% of GDP), (export) product concentration and (export) market concentration indicators are used as export performance criteria.

The study sample comprises emerging markets. There are numerous lists of emerging markets, including those published by the International Monetary Fund (IMF), the United Nations Conference on Trade and Development (UNCTAD), the BRICS (Brazil, Russia, India, China, and South Africa) and the Next Eleven countries, the Financial Times Stock Exchange (FTSE), Standard & Poor's (S&P), and the Dow Jones Industrial Average (DJIA), among others. This study considers emerging markets as delineated by the MSCI classification. As illustrated in Table 3, the MSCI (2024) classification identifies 24 countries as emerging markets.

Table 3: Emerging Markets according to MSCI

America	Europe, Middle East and Africa	Asia
Brazil	Czechia	China
Chile	Egypt	India
Colombia	Greece	Indonesia
Mexico	Hungary	Korea
Peru	Kuwait	Malaysia
	Poland	Philippines
	Qatar	Taiwan
	Saudi Arabia	Thailand
	South Africa	
	Türkiye	
	The United Arab Emirates (UAE)	

Source: MSCI (2024).

Due to the unavailability of data pertaining to high-tech exports and export country concentration for Taiwan and Saudi Arabia, as presented in Table 3, these countries are excluded from the study sample. Consequently, the export performance of 22 countries is evaluated.

3.2. Methods

3.2.1. The CRITIC Method

The CRITIC (Criteria Importance Through Intercriteria Correlation) method was developed by Diakoulaki et al. (1995) for the purpose of weighting the criteria. In this method, the weight values of the criteria are determined by normalising the decision matrix, taking into account the standard deviation values and the correlation relationship between the criteria (Apan and Tiyek, 2023: 51). In contrast to subjective approaches, the CRITIC method prioritises the inherent characteristics of the available data over the subjective evaluations of the decision-makers (Ayçin, 2020: 4; Bulduk and Ecer, 2023: 320). As a result, the determination of objective criteria weights eliminates the potential for evaluation results to be subject to criticism (Akbulut, 2020: 475). In this regard, the CRITIC method is regarded as one of the most objective criteria weighting methods and is frequently referenced in the literature (Belke, 2020; Akandere and Zerenler, 2022; Apan and Tiyek, 2023; Kahreman, 2023).

The CRITIC method is calculated in five steps, as outlined in Table 4 (Diakoulaki, 1995: 764-765; Akandere and Zerenler, 2022: 528; Bektaş and Baykuş, 2024: 38).

Table 4: Steps of the CRITIC Method

Step 1. Creation of the decision matrix	$X = \begin{array}{c} A_1 \\ A_2 \\ \vdots \\ A_m \end{array} \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix}$	(1)
Step 2. Normalization of the decision matrix	$r_{ij} = \dfrac{x_{ij} - x_j^{\min}}{x_j^{\max} - x_j^{\min}} \quad j = 1,2,...,n$	(2)
	$r_{ij} = \dfrac{x_j^{\max} - x_{ij}}{x_j^{\max} - x_j^{\min}} \quad j = 1,2,...,n$	(3)
Step 3. Creation of correlation coefficient matrix	$\rho_{jk} = \dfrac{\sum\limits_{i=1}^{m}(r_{ij} - \overline{r_j}).(r_{ik} - \overline{r_k})}{\sqrt{\sum\limits_{i=1}^{m}(r_{ij} - \overline{r_j})^2}.\sqrt{\sum\limits_{i=1}^{m}(r_{ik} - \overline{r_k})^2}} \quad j = 1,2,...,n$	(4)

Step 4. Calculation of C_j values	$$C_j = \sigma_j \cdot \sum_{k=1}^{n} (1 - \rho_{jk}) \qquad j = 1,2,...,n$$	(5)
	$$\sigma_j = \sqrt{\frac{\sum_{i=1}^{m} (r_{ij} - \overline{r_j})^2}{m-1}}$$	(6)
Step 5. Calculation of criteria weights	$$w_j = \frac{c_j}{\sum_{k=1}^{n} c_j} \qquad j = 1,2,...,n$$	(7)

3.2.2. The TOPSIS Method

The TOPSIS (Technique for Order Preference Similarity to Ideal Solution) was developed by Hwang and Yoon (1981) as a multicriteria decision-making method based on the distances from the ideal solution. This method enables the relative ordering of alternatives in accordance with specific criteria (Ela and Kurt, 2019, p. 551). The most preferable alternative should be situated in close proximity to the ideal solution and in contrast, at a considerable distance from the negative-ideal solution (Opricovic and Tzeng, 2004: 448).

The TOPSIS method comprises six sequential steps, as detailed in Table 5 (Opricovic and Tzeng, 2004: 448-449; Ashourian, 2012: 288; Ela and Kurt, 2019: 551-552; Akandere and Zerenler, 2022: 528-529).

Table 5: Steps of the TOPSIS Method

Step 1. Creation of the decision matrix	$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix}$$	(8)
Step 2. Creation of a standard decision matrix	$$r_{ij} = \frac{w_{ij}}{\sqrt{\sum_{k=1}^{m} w_{kj}^2}} \qquad i = 1,2,...,m \text{ and } j = 1,2,...,n$$	(9)

Step 3. Calculation of the weighted normalized decision matrix	$v_{ij} = r_{ij}^{\ *} . w_j \qquad j = 1,2,...,n$	(10)
Step 4. Determination of positive ideal and negative ideal solution values	$A^* = \left\{ (\max_i v_{ij} \mid j \in J), (\min_i v_{ij} \mid j \in J^{'}) \right\}$	(11)
	$A^* = \left\{ v_1^*, v_2^*, ..., v_n^* \right\}$	
	$A^- = \left\{ (\min_i v_{ij} \mid j \in J), (\max_i v_{ij} \mid j \in J^{'}) \right\}$	(12)
	$A^- = \left\{ v_1^-, v_2^-, ..., v_n^- \right\}$	
Step 5. Calculation of the distance to the positive ideal and negative ideal points	$S_i^* = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^*)^2}$	(13)
	$S_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2}$	(14)
Step 6. Calculation of the relative closeness to the ideal solution	$C_i^* = \dfrac{S_i^-}{S_i^- + S_i^*} \qquad i = 1,2,...,m$	(15)

3.2.3. The COPRAS Method

The COPRAS (Complex Proportional Assessment) method was developed by Zavadskas and Kaklauskas (1996). The method enables the coordination and prioritization of disparate objectives (Zavadskas et al., 2009: 323). The method is utilized to identify the optimal decision alternative in terms of its importance and utility degrees, as well as to rank the decision alternatives (Ayçin and Çakın, 2019: 254; Uludağ and Ümit, 2020: 149). In comparison to other methods for the analysis of complex decision-making situations, this approach offers several notable advantages. Primarily, the application process is relatively straightforward and does not necessitate the use of specialized computer software for calculations (Ayçin, 2018: 53).

The calculation of the COPRAS method is comprised of six distinct stages, as illustrated in Table 6 (Zavadskas et al., 324-325; Ayçin, 2018: 53-54; Ayçin and Çakın, 2019: 254-255; Arsu, 2022: 8-9).

Table 6: Steps of the COPRAS Method

Step 1. Creation of the decision matrix	$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix}$ $\quad i = 1,2,...,m \ \ j = 1,2,...,n$	(16)
Step 2. Normalization of the decision matrix	$x_{ij}^{*} = \dfrac{x_{ij}}{\sum\limits_{i=1}^{m} x_{ij}} \qquad \forall_{j} = 1,2,...,n$	(17)
Step 3. Weighting of the normalised matrix	$d_{ij} = x_{ij}^{*}.w_{j} \qquad\qquad j = 1,2,...,n$	(18)
Step 4. Summation of weighted normalized indices	$s_{+i} = \sum\limits_{j=1}^{k} d_{+ij} \qquad j = 1,2,...,k$	(19)
	$s_{-i} = \sum\limits_{j=k+1}^{n} d_{-ij} \qquad j = k+1, k+2,...,n$	(20)
Step 5. Calculation of relative importance levels of decision alternatives	$Q_{i} = s_{+i} + \dfrac{s_{-\min}.\sum\limits_{i=1}^{m} s_{-i}}{s_{-i}.\sum\limits_{i=1}^{m} \dfrac{s_{-\min}}{s_{-i}}}$	(21)
Step 6. Calculation of performance indices of decision alternatives	$P_{i} = \dfrac{Q_{i}}{Q_{\max}}.100$	(22)

4. Results

This section of the study presents the results of the analysis in tabular form. The initial stage of the analysis entails the presentation of the results obtained through the application of the CRITIC method for the determination of the criteria weights. Subsequently, the ranking results obtained with the TOPSIS and COPRAS methods are presented. The calculations made according to the average of the 2018-2022 period are detailed in the tables. The export performance criteria weights and performance results by year are presented in figures.

4.1. Results of the CRITIC Method for the Average of the 2018-2022 Period

The CRITIC method was used to assign relative weights to the criteria. The decision matrix, which is based on the average data obtained for the 2018-2022 period, was calculated using Equation (1) and is presented in Table 7.

Table 7: Decision Matrix

	C1	C2	C3	C4	C5	C6	C7	C8
Brazil	55775475	1208.773	0.0125	0.1006	11.6415	0.1452	0.1816	0.1255
Chile	1242889	4300.4779	0.0040	0.0986	9.8501	0.2856	0.3344	0.1711
Colombia	-14717935	826.78855	0.0020	0.1112	8.5541	0.1310	0.3038	0.1238
Mexico	-2424957.8	3812.2637	0.0235	0.0764	20.3880	0.3710	0.1356	0.5452
Peru	3590955.4	1508.6156	0.0024	0.0930	4.5191	0.2196	0.2804	0.1354
Czechia	15743653	19997.884	0.0104	0.0611	20.8797	0.7855	0.1238	0.1087
Egypt	-45874350	342.61736	0.0018	0.1587	2.2362	0.0993	0.1544	0.0360
Greece	-28173929	4096.4207	0.0021	0.1358	15.4971	0.2082	0.2496	0.0348
Hungary	2121126.6	13514.998	0.0064	0.0599	17.1121	0.7796	0.1056	0.0875
Kuwait	34906204	15723.476	0.0033	0.1960	1.9796	0.4612	0.6440	0.1146
Poland	-6906452.4	7593.1879	0.0139	0.0967	10.0640	0.4509	0.0622	0.0901
Qatar	55867640	31271.819	0.0041	0.2036	2.6937	0.4548	0.4564	0.0921
South Africa	12439273	1764.1944	0.0050	0.0807	5.3626	0.2638	0.1584	0.0672
Türkiye	-58030606	2391.1316	0.0097	0.1082	3.1507	0.2489	0.0664	0.0320
The UAE	73719241	41106.766	0.0185	0.1100	5.9043	0.9033	0.2534	0.0580
China	577236398	2062.4238	0.1414	0.1007	29.4333	0.1838	0.0944	0.0504
India	-177774056	253.51763	0.0172	0.1050	10.5969	0.1193	0.1338	0.0540
Indonesia	20004171	760.65828	0.0100	0.1302	7.9749	0.1787	0.1392	0.0750
Korea	27188325	11555.642	0.0292	0.0428	31.5503	0.3294	0.1876	0.1149
Malaysia	45203132	8250.7175	0.0133	0.1082	47.6929	0.7402	0.2316	0.0910
Philippines	-46762398	633.29234	0.0035	0.0487	64.2947	0.1885	0.3240	0.0948
Thailand	192447.6	3572.2169	0.0125	0.0409	24.2947	0.5008	0.0784	0.0675

Source: Trade Map (2024), World Bank Group (2024a), World Bank Group (2024b), IMF (2024), UNCTADstad (2024b) and WITS (2024).

The normalized decision matrix created according to Equation (2) and Equation (3) is presented in Table 8.

Table 8: Normalized Decision Matrix

	C1	C2	C3	C4	C5	C6	C7	C8
Brazil	0.3093	0.0234	0.0768	0.3667	0.1550	0.0570	0.7948	0.8178
Chile	0.2371	0.0991	0.0161	0.3545	0.1263	0.2316	0.5321	0.7290
Colombia	0.2160	0.0140	0.0018	0.4319	0.1055	0.0394	0.5847	0.8212
Mexico	0.2322	0.0871	0.1554	0.2184	0.2954	0.3379	0.8738	0.0000
Peru	0.2402	0.0307	0.0047	0.3200	0.0408	0.1496	0.6250	0.7985
Czechia	0.2563	0.4833	0.0619	0.1242	0.3033	0.8535	0.8941	0.8506
Egypt	0.1747	0.0022	0.0000	0.7237	0.0041	0.0000	0.8415	0.9923
Greece	0.1981	0.0941	0.0023	0.5830	0.2169	0.1355	0.6779	0.9946
Hungary	0.2383	0.3246	0.0334	0.1169	0.2428	0.8461	0.9254	0.8919
Kuwait	0.2817	0.3787	0.0107	0.9535	0.0000	0.4500	0.0000	0.8391
Poland	0.2263	0.1797	0.0871	0.3427	0.1297	0.4373	1.0000	0.8868
Qatar	0.3095	0.7593	0.0166	1.0000	0.0115	0.4421	0.3224	0.8830
South Africa	0.2519	0.0370	0.0234	0.2446	0.0543	0.2045	0.8347	0.9315
Türkiye	0.1586	0.0523	0.0567	0.4134	0.0188	0.1860	0.9928	1.0000
The UAE	0.3331	1.0000	0.1199	0.4247	0.0630	1.0000	0.6714	0.9494
China	1.0000	0.0443	1.0000	0.3673	0.4406	0.1051	0.9447	0.9642
India	0.0000	0.0000	0.1102	0.3936	0.1383	0.0248	0.8769	0.9572
Indonesia	0.2620	0.0124	0.0587	0.5486	0.0962	0.0987	0.8677	0.9162
Korea	0.2715	0.2767	0.1967	0.0116	0.4745	0.2862	0.7845	0.8385
Malaysia	0.2953	0.1958	0.0827	0.4138	0.7336	0.7971	0.7088	0.8851
Philippines	0.1735	0.0093	0.0123	0.0480	1.0000	0.1109	0.5500	0.8777
Thailand	0.2357	0.0812	0.0770	0.0000	0.3581	0.4994	0.9722	0.9309

Source: Author's calculations.

The correlation coefficient matrix, calculated in accordance with Equation (4), is presented in Table 9.

Table 9: Correlation Coefficients Matrix

	C1	C2	C3	C4	C5	C6	C7	C8
C1	1.000	0.095	0.897	0.036	0.165	0.039	0.059	0.066
C2	0.095	1.000	-0.073	0.259	-0.166	0.755	-0.341	0.074
C3	0.897	-0.073	1.000	-0.122	0.238	-0.096	0.288	0.025
C4	0.036	0.259	-0.122	1.000	-0.542	-0.146	-0.602	0.174
C5	0.165	-0.166	0.238	-0.542	1.000	0.119	0.100	-0.074
C6	0.039	0.755	-0.096	-0.146	0.119	1.000	-0.018	-0.023
C7	0.059	-0.341	0.288	-0.602	0.100	-0.018	1.000	0.034
C8	0.066	0.074	0.025	0.174	-0.074	-0.023	0.034	1.000

Source: Author's calculations.

The values of c_j and w_j, as calculated in accordance with the specifications outlined in Equations (5), (6) and (7), are presented in Table 10.

Table 10: The values of c_j and w_j

	C1	C2	C3	C4	C5	C6	C7	C8
c_j	1.0009	1.6810	1.2148	2.1111	1.8057	1.9192	1.7959	1.3636
w_j	0.0776	0.1304	0.0942	0.1638	0.1401	0.1489	0.1393	0.1058

Source: Author's calculations.

As evidenced in Table 10, the most significant criterion was the export growth rate (C4) with 0.1638, which was calculated as the average of the period in question. Other significant criteria include export per capita (C2) with 0.1304, high-tech export rate (C5) with 0.1401, and product concentration (C7) with 0.1393. In terms of the assigned importance ranking, net trade (C1) is identified as the least significant criterion with 0.0776. The world export share is another indicator of export performance, the weight of which is relatively low.

4.2. Results of the TOPSIS Method for the Average of the 2018-2022 Period

The TOPSIS method was initially employed to evaluate the export performance of countries based on the criteria weights obtained from the CRITIC method. The weighted normalized decision matrix generated by applying Equations (8), (9), and (10) based on these weightings is presented in Table 11.

Table 11: Weighted Normalized Decision Matrix

	C1	C2	C3	C4	C5	C6	C7	C8
Brazil	0.0069	0.0025	0.0077	0.0315	0.0156	0.0106	0.0213	0.0191
Chile	0.0002	0.0091	0.0025	0.0309	0.0132	0.0208	0.0392	0.0260
Colombia	-0.0018	0.0017	0.0013	0.0349	0.0115	0.0095	0.0356	0.0188
Mexico	-0.0003	0.0080	0.0145	0.0240	0.0273	0.0270	0.0159	0.0830
Peru	0.0004	0.0032	0.0015	0.0291	0.0061	0.0160	0.0329	0.0206
Czechia	0.0020	0.0421	0.0065	0.0192	0.0280	0.0572	0.0145	0.0166
Egypt	-0.0057	0.0007	0.0011	0.0497	0.0030	0.0072	0.0181	0.0055
Greece	-0.0035	0.0086	0.0013	0.0426	0.0208	0.0152	0.0292	0.0053
Hungary	0.0003	0.0284	0.0040	0.0188	0.0229	0.0568	0.0124	0.0133
Kuwait	0.0043	0.0331	0.0020	0.0615	0.0027	0.0336	0.0755	0.0174
Poland	-0.0009	0.0160	0.0086	0.0303	0.0135	0.0328	0.0073	0.0137
Qatar	0.0069	0.0658	0.0025	0.0638	0.0036	0.0331	0.0535	0.0140
South Africa	0.0015	0.0037	0.0031	0.0253	0.0072	0.0192	0.0186	0.0102

Table 11: Weighted Normalized Decision Matrix (Continue)

	C1	C2	C3	C4	C5	C6	C7	C8
Türkiye	-0.0072	0.0050	0.0060	0.0339	0.0042	0.0181	0.0078	0.0049
The UAE	0.0092	0.0865	0.0115	0.0345	0.0079	0.0658	0.0297	0.0088
China	0.0718	0.0043	0.0875	0.0316	0.0394	0.0134	0.0111	0.0077
India	-0.0221	0.0005	0.0106	0.0329	0.0142	0.0087	0.0157	0.0082
Indonesia	0.0025	0.0016	0.0062	0.0408	0.0107	0.0130	0.0163	0.0114
Korea	0.0034	0.0243	0.0181	0.0134	0.0423	0.0240	0.0220	0.0175
Malaysia	0.0056	0.0174	0.0082	0.0339	0.0639	0.0539	0.0271	0.0139
Philippines	-0.0058	0.0013	0.0022	0.0153	0.0861	0.0137	0.0380	0.0144
Thailand	0.0000	0.0075	0.0078	0.0128	0.0325	0.0365	0.0092	0.0103

Source: Author's calculations.

Table 12 illustrates the negative and positive ideal solutions, as derived from Equations (11) and (12).

Table 12: Negative and Positive Ideal Solutions

	C1	C2	C3	C4	C5	C6	C7	C8
A^*	0.0718	0.0865	0.0875	0.0638	0.0861	0.0658	0.0073	0.0049
A^-	-0.0221	0.0005	0.0011	0.0128	0.0027	0.0072	0.0755	0.0830

Source: Author's calculations.

Table 13 presents the performance results and rankings calculated in accordance with the formulas specified in Equations (13), (14), and (15).

Table 13: TOPSIS Performance Results and Rankings

	S_i^*	S_i^-	C_i^*	Rank
Brazil	0.1646	0.0919	0.3582	17
Chile	0.1681	0.0758	0.3109	21
Colombia	0.1750	0.0818	0.3185	19
Mexico	0.1715	0.0734	0.2996	22
Peru	0.1744	0.0811	0.3174	20
Czechia	0.1381	0.1168	0.4583	4
Egypt	0.1774	0.1046	0.3708	14
Greece	0.1641	0.0993	0.3769	12
Hungary	0.1472	0.1141	0.4367	6
Kuwait	0.1659	0.0955	0.3653	15

Table 13: TOPSIS Performance Results and Rankings (Continue)

	S_i^*	S_i^-	C_i^*	Rank
Poland	0.1550	0.1062	0.4065	10
Qatar	0.1481	0.1167	0.4407	5
South Africa	0.1702	0.0971	0.3633	16
Türkiye	0.1715	0.1073	0.3849	11
The UAE	0.1311	0.1414	0.5189	2
China	0.1129	0.1669	0.5965	1
India	0.1777	0.0990	0.3577	18
Indonesia	0.1666	0.1007	0.3766	13
Korea	0.1413	0.1025	0.4205	7
Malaysia	0.1321	0.1208	0.4777	3
Philippines	0.1633	0.1157	0.4147	8
Thailand	0.1553	0.1096	0.4138	9

Source: Author's calculations.

As demonstrated in Table 13, China exhibits the highest export performance according to the TOPSIS method with 0.5965. The UAE with 0.5189 and Malaysia with 0.4777 were the second and third highest-performing countries, respectively. Mexico with 0.2996 exhibited the least favorable export performance. Peru and Chile exhibited the lowest performance, with values of 0.3174 and 0.3109, respectively. Türkiye was ranked 11th with 0.3849.

4.3. Results of the COPRAS Method for the Average of the 2018-2022 Period

The COPRAS method was used as an additional ranking technique to evaluate countries' export performance based on the criteria weights obtained from the CRITIC method. The normalized decision matrix, which was generated by applying Equations (16) and (17) based on these weightings, is presented in Table 14.

Table 14: Normalized Decision Matrix

	C1	C2	C3	C4	C5	C6	C7	C8
Brazil	0.1024	0.0068	0.0360	0.0444	0.0327	0.0180	0.0386	0.0530
Chile	0.0023	0.0244	0.0116	0.0435	0.0277	0.0355	0.0712	0.0722
Colombia	-0.0270	0.0047	0.0059	0.0490	0.0241	0.0163	0.0647	0.0522
Mexico	-0.0045	0.0216	0.0677	0.0337	0.0573	0.0461	0.0289	0.2301
Peru	0.0066	0.0085	0.0070	0.0410	0.0127	0.0273	0.0597	0.0572
Czechia	0.0289	0.1133	0.0300	0.0270	0.0587	0.0976	0.0263	0.0459

Table 14: Normalized Decision Matrix (Continue)

	C1	C2	C3	C4	C5	C6	C7	C8
Egypt	-0.0842	0.0019	0.0051	0.0700	0.0063	0.0123	0.0329	0.0152
Greece	-0.0517	0.0232	0.0061	0.0599	0.0436	0.0259	0.0531	0.0147
Hungary	0.0039	0.0766	0.0186	0.0264	0.0481	0.0969	0.0225	0.0369
Kuwait	0.0641	0.0891	0.0094	0.0865	0.0056	0.0573	0.1371	0.0484
Poland	-0.0127	0.0430	0.0402	0.0426	0.0283	0.0560	0.0132	0.0380
Qatar	0.1026	0.1771	0.0118	0.0898	0.0076	0.0565	0.0971	0.0389
South Africa	0.0228	0.0100	0.0145	0.0356	0.0151	0.0328	0.0337	0.0284
Türkiye	-0.1066	0.0135	0.0279	0.0477	0.0089	0.0309	0.0141	0.0135
The UAE	0.1354	0.2328	0.0534	0.0485	0.0166	0.1122	0.0539	0.0245
China	1.0600	0.0117	0.4076	0.0444	0.0828	0.0228	0.0201	0.0213
India	-0.3265	0.0014	0.0495	0.0463	0.0298	0.0148	0.0285	0.0228
Indonesia	0.0367	0.0043	0.0287	0.0574	0.0224	0.0222	0.0296	0.0317
Korea	0.0499	0.0655	0.0843	0.0189	0.0887	0.0409	0.0399	0.0485
Malaysia	0.0830	0.0467	0.0384	0.0477	0.1341	0.0920	0.0493	0.0384
Philippines	-0.0859	0.0036	0.0101	0.0215	0.1808	0.0234	0.0690	0.0400
Thailand	0.0004	0.0202	0.0361	0.0180	0.0683	0.0622	0.0167	0.0285

Source: Author's calculations.

The weighted normalized decision matrix obtained by applying Equation (18) to the criterion weights obtained from the CRITIC method is presented in Table 15.

Table 15: Weighted Normalized Decision Matrix

	C1	C2	C3	C4	C5	C6	C7	C8
Brazil	0.0080	0.0009	0.0034	0.0073	0.0046	0.0027	0.0054	0.0056
Chile	0.0002	0.0032	0.0011	0.0071	0.0039	0.0053	0.0099	0.0076
Colombia	-0.0021	0.0006	0.0006	0.0080	0.0034	0.0024	0.0090	0.0055
Mexico	-0.0003	0.0028	0.0064	0.0055	0.0080	0.0069	0.0040	0.0243
Peru	0.0005	0.0011	0.0007	0.0067	0.0018	0.0041	0.0083	0.0060
Czechia	0.0022	0.0148	0.0028	0.0044	0.0082	0.0145	0.0037	0.0049
Egypt	-0.0065	0.0003	0.0005	0.0115	0.0009	0.0018	0.0046	0.0016
Greece	-0.0040	0.0030	0.0006	0.0098	0.0061	0.0039	0.0074	0.0016
Hungary	0.0003	0.0100	0.0017	0.0043	0.0067	0.0144	0.0031	0.0039
Kuwait	0.0050	0.0116	0.0009	0.0142	0.0008	0.0085	0.0191	0.0051
Poland	-0.0010	0.0056	0.0038	0.0070	0.0040	0.0083	0.0018	0.0040
Qatar	0.0080	0.0231	0.0011	0.0147	0.0011	0.0084	0.0135	0.0041

Table 15: Weighted Normalized Decision Matrix (Continue)

	C1	C2	C3	C4	C5	C6	C7	C8
South Africa	0.0018	0.0013	0.0014	0.0058	0.0021	0.0049	0.0047	0.0030
Türkiye	-0.0083	0.0018	0.0026	0.0078	0.0012	0.0046	0.0020	0.0014
The UAE	0.0105	0.0304	0.0050	0.0079	0.0023	0.0167	0.0075	0.0026
China	0.0823	0.0015	0.0384	0.0073	0.0116	0.0034	0.0028	0.0023
India	-0.0253	0.0002	0.0047	0.0076	0.0042	0.0022	0.0040	0.0024
Indonesia	0.0029	0.0006	0.0027	0.0094	0.0031	0.0033	0.0041	0.0033
Korea	0.0039	0.0085	0.0079	0.0031	0.0124	0.0061	0.0056	0.0051
Malaysia	0.0064	0.0061	0.0036	0.0078	0.0188	0.0137	0.0069	0.0041
Philippines	-0.0067	0.0005	0.0009	0.0035	0.0253	0.0035	0.0096	0.0042
Thailand	0.0000	0.0026	0.0034	0.0030	0.0096	0.0093	0.0023	0.0030

Source: Author's calculations.

The results and rankings for COPRAS performance, as calculated by the equations presented in this study (Equations 19, 20, 21, and 22), are presented in Table 16.

Table 16: COPRAS Performance Results and Rankings

	S_{+i}	S_{-i}	s_{-min}	$\sum s_{-i}$	s_{-min} / s_{-i}	$\sum s_{-min} / s_{-i}$	Q_i	P_i	Rank
Brazil	0.0241	0.0110	0.0034	0.2451	0.3093	8.7656	0.0327	20.4712	12
Chile	0.0154	0.0175			0.1936		0.0209	13.0463	19
Colombia	0.0105	0.0145			0.2338		0.0170	10.6331	21
Mexico	0.0224	0.0284			0.1198		0.0257	16.1008	16
Peru	0.0108	0.0144			0.2367		0.0174	10.8816	20
Czechia	0.0325	0.0085			0.3987		0.0436	27.2840	6
Egypt	0.0065	0.0062			0.5495		0.0219	13.6964	18
Greece	0.0155	0.0090			0.3795		0.0261	16.3230	15
Hungary	0.0231	0.0070			0.4829		0.0366	22.8890	7
Kuwait	0.0324	0.0242			0.1404		0.0363	22.7270	9
Poland	0.0194	0.0059			0.5793		0.0356	22.2323	10
Qatar	0.0479	0.0176			0.1926		0.0533	33.3484	3
South Africa	0.0124	0.0077			0.4416		0.0247	15.4680	17
Türkiye	0.0052	0.0034			1.0000		0.0331	20.7234	11
The UAE	0.0562	0.0101			0.3364		0.0656	41.0107	2
China	0.1411	0.0050			0.6730		0.1599	100.0000	1
India	-0.0087	0.0064			0.5330		0.0062	3.8530	22

Table 16: COPRAS Performance Results and Rankings (Continue)

	S_{+i}	S_{-i}	$s_{-\min}$	$\sum s_{-i}$	$\dfrac{s_{-\min}}{s_{-i}}$	$\dfrac{\sum s_{-\min}}{s_{-i}}$	Q_i	P_i	Rank
Indonesia	0.0187	0.0075			0.4545		0.0314	19.6185	13
Korea	0.0359	0.0107			0.3178		0.0448	27.9889	5
Malaysia	0.0428	0.0109			0.3110		0.0515	32.1753	4
Philippines	0.0236	0.0138			0.2456		0.0305	19.0439	14
Thailand	0.0186	0.0053			0.6367		0.0364	22.7587	8

Source: Author's calculations.

As shown in Table 16, China had the highest export performance according to the COPRAS method with a score of 100.0000. The UAE and Qatar were the second and third highest-performing countries, with 41.0107 and 33.3484, respectively. India exhibited the lowest export performance, at 3.8530. Peru and Colombia demonstrated similarly low performance, at 10.8816 and 10.6331, respectively. Türkiye was ranked 11th with 20.7234.

Figure 1. Comparison of ranking results between TOPSIS and COPRAS
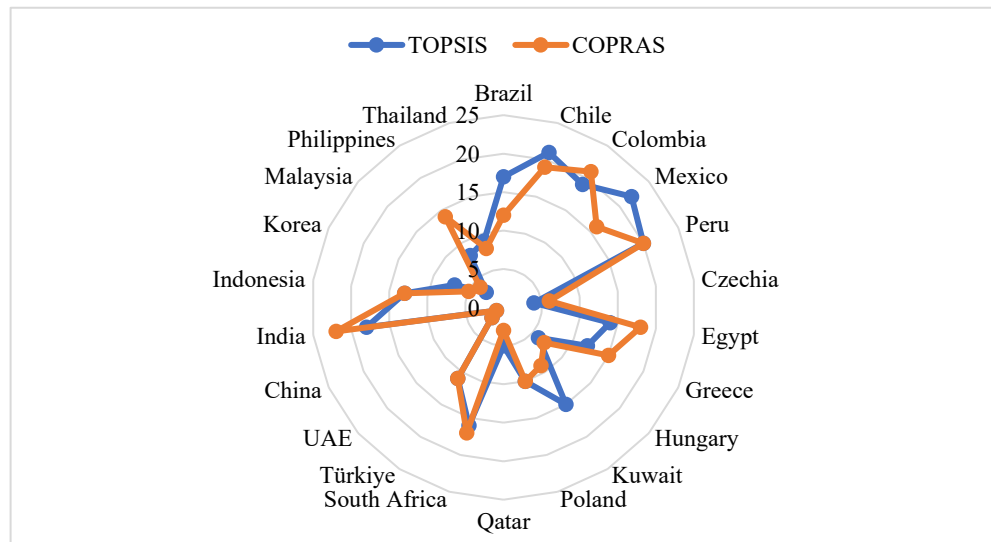
As illustrated in Figure 1, the CRITIC-based TOPSIS and COPRAS methods reveal that the top-ranked countries exhibit a high degree of consistency in their performance. Notable discrepancies were observed in the rankings of countries situated in the middle and last positions, including Kuwait, Egypt, Greece, Mexico, and Brazil.

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4.4. Results of the CRITIC, TOPSIS and COPRAS Methods by Years

The figures illustrate the criteria weights and performance rankings for each year. Figure 2 illustrates the criteria weights and rankings for each respective year.

Figure 2. Criteria weights and rankings within years according to CRITIC method
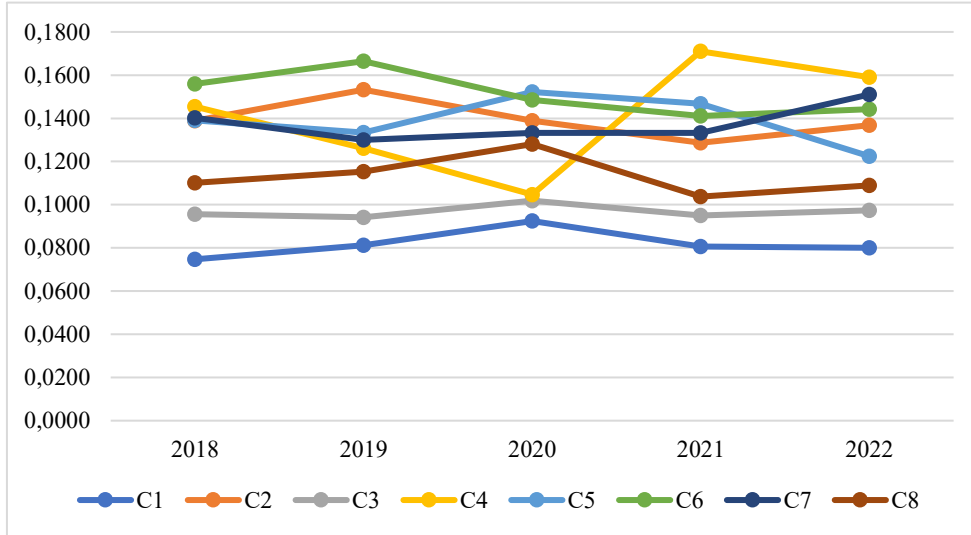
Figure 2, which employs the CRITIC method, indicates that the primary criterion was exports of goods as a percentage of gross domestic product (GDP) during 2018 and 2019. In 2020, high-tech exports were identified as the most significant criterion, whereas export growth rates were the most influential factor during both 2021 and 2022. The lowest criterion weight throughout the period was net, which aligns with the period average. With regard to the relative importance of the criteria, market concentration was assigned a weight of 6th place, while world export share was assigned a weight of 7th place in all years.

Figure 3. Country performance results and rankings within years according to TOPSIS method
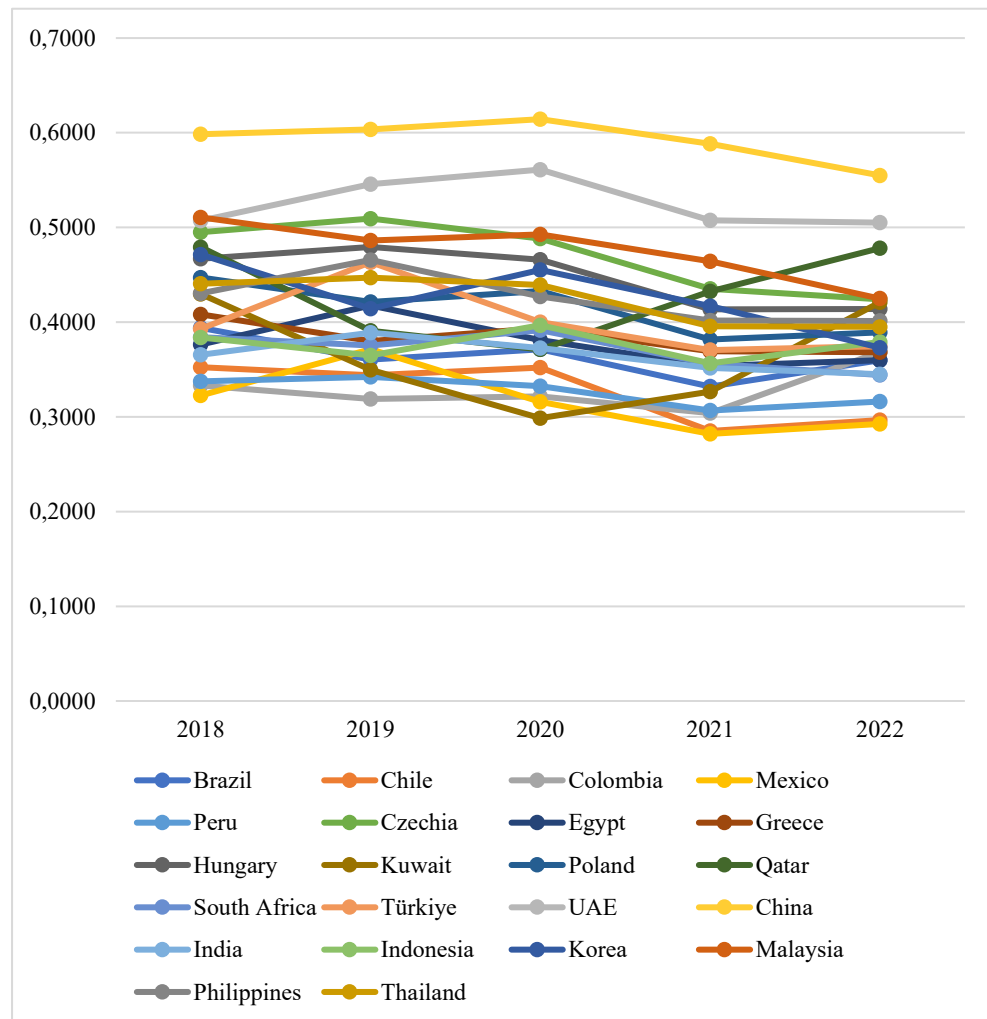
As illustrated in Figure 3, China consistently demonstrated the highest export performance according to the TOPSIS method across all years. The ranking of performance of other countries exhibited variability across years. In accordance with the TOPSIS method, the UAE was positioned third in 2018 and second in all subsequent years. In accordance with the aforementioned methodology, Malaysia was positioned second in 2018, fourth in 2019 and 2022, and third in 2020 and 2022. In the 2018-2022 period, Türkiye exhibited a fluctuating export performance ranking between 7th and 14th. Mexico had the poorest performance according to TOPSIS, ranking 22nd in 2018, 2021, and 2022.

Figure 4. Country performance results and rankings within years according to COPRAS method
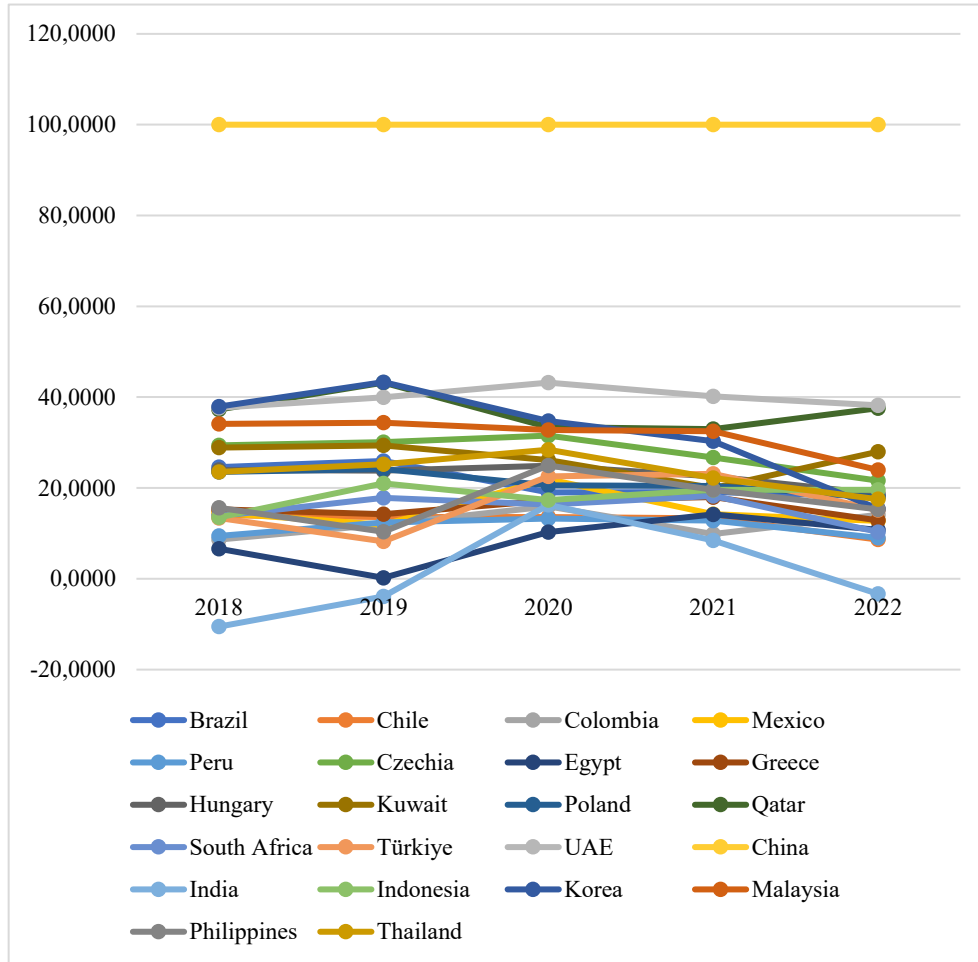
As illustrated in Figure 4, China consistently demonstrated the highest export performance according to the COPRAS method across all years. In accordance with this method, the UAE was ranked third in 2018, fourth in 2019, and second in 2020, 2021, and 2022. Türkiye's ranking exhibited fluctuations between 7th and 20th place across all years. India exhibited the poorest performance among the countries under consideration.

5. Discussion

In this study, the most significant criterion for assessing the export performance of emerging markets is the growth rate of exports. In this regard, it is established that high-tech exports are not the most significant criterion in the export performance reported by Işık et al. (2018), nor have they undergone a notable change over time. Concurrently, the export of goods as a percentage of gross domestic product (GDP), high-tech exports, and product concentration represent additional pivotal criteria for evaluating export performance. Conversely, net trade and world export share were identified as the least important criteria. Consequently, in order to enhance their export performance, Türkiye and other emerging markets must endeavor to increase their exports on an annual basis, while ensuring sustainability. Given the significance of the merchandise exports-to-GDP ratio as a variable, it is crucial for emerging markets to prioritize increasing their exports relative to their total income. Another significant factor is the export of high-tech goods, which provides insight into how emerging markets can enhance their export performance by prioritizing the promotion of high-tech exports. Despite an increase in high-tech exports from emerging markets over time, these exports have not yet reached a sufficient level. Furthermore, it has been established that countries can enhance their export performance by prioritizing the diversification of their export products. In other words, a country's export profile can be strengthened by focusing on the export of a range of products. Furthermore, it has been observed that exports per capita is a factor that warrants attention in order to enhance export performance.

Furthermore, the findings of Işık et al. (2018) indicate that Türkiye occupies a position in the middle-lower ranks of emerging markets in terms of export performance. This is in contrast to the results of the present study, which suggest that Türkiye is currently ranked in the middle ranks. In this regard, it can be posited that Türkiye's export performance has exhibited an upward trajectory over time. Conversely, while the Philippines was ranked first in the aforementioned study, China was ranked first in this study. It is evident that the criteria used to evaluate export performance and the resulting country rankings have undergone significant changes.

6. Conclusion

This study assesses the export performance of emerging markets, a crucial aspect of their economic development. It analyzes the period between 2018 and 2022. The study is based on the MSCI list of emerging markets and incorporates data from 22 countries. In order to assign relative weights to the criteria used to evaluate export performance, the CRITIC method was employed. The export performance rankings of the countries were determined through the application of the TOPSIS and COPRAS methods.

In consideration of the 2018-2022 average, the export performance indicator with the highest criterion weight in export performance according to the CRITIC method was export growth rate. Subsequently, the export performance indicator with the second highest criterion weight was exports of goods (% of GDP), followed by high-tech exports, product concentration, export per capita, market concentration, and world export share. The export performance indicator with the lowest criterion weight is net trade. In accordance with the TOPSIS and COPRAS methodologies, China was identified as the foremost performer in terms of export performance. In accordance with the results yielded by both methods, the United Arab Emirates and Malaysia were identified as the countries exhibiting the highest export performance subsequent to China. Türkiye was determined to be in 11th position. Conversely, Chile, Colombia, Peru, and India exhibited the lowest export performance according to the period average.

Furthermore, when the weights of the criteria were set to an equal average for the entire period, there was no significant change in the countries that were initially and ultimately ranked first and last. Consequently, the ranking of the countries situated in the middle of the list underwent a transformation. In this regard, Türkiye was ranked 12th according to the TOPSIS method and 13th according to the COPRAS method based on the period average.

In accordance with the CRITIC method, the most significant criterion was the volume of exports of goods as a percentage of gross domestic product (GDP) in both 2018 and 2019. This was followed by high-tech exports in 2020 and the export growth rate in both 2021 and 2022. The lowest criterion weight throughout the period was net, which aligns with the period average. With regard to the relative importance assigned to each criterion, market concentration was accorded the sixth-highest weight, while world export share was assigned the seventh-highest weight in all years. In accordance with the TOPSIS and COPRAS methodologies, China was identified as the foremost performer in export performance across all years.

The performance ranking of other countries exhibited variability across years. In accordance with the TOPSIS method, the UAE was positioned third in 2018 and second in the subsequent years. In accordance with the aforementioned methodology, Malaysia was positioned second in 2018, fourth in 2019 and 2022, and third in 2020 and 2022. Türkiye's ranking in terms of export performance exhibited fluctuations between the 7th and 14th positions. Mexico exhibited the poorest performance among the countries under consideration, according to the TOPSIS method. In 2018, 2021, and 2022, it was ranked 22nd. In accordance with the COPRAS method, the UAE achieved a ranking of third in 2018, fourth in 2019, and second in 2020, 2021, and 2022. In accordance with this methodology, Qatar was identified as the third-best performing country. Türkiye's ranking exhibited considerable variability, ranging between 7th and 20th. India exhibited the poorest performance among all countries. Furthermore, it was determined that there was no notable shift in the export performance rankings between the average of the period and the years. It is therefore evident that the average of the period should be taken into account in the evaluations of this study.

China was the highest-ranking country in the export performance ranking due to its considerable foreign trade surplus and its substantial share of global exports. Similarly, other countries with high export performance, such as the UAE and Qatar, exhibit elevated export per capita and net trade values. Conversely, it has been observed that Qatar exhibits a high degree of product concentration in its exports, which can be attributed to the considerable volume of oil and gas exports. It is therefore anticipated that Qatar's export performance will reach a higher level with the increase in exports of non-oil and gas products. Malaysia's high export performance is largely attributable to its exports of high-tech products, exports of goods as a percentage of gross domestic product, and net trade values.

Conversely, Chile, Colombia, Peru, and India are notable emerging markets with relatively low export performance. The primary factors contributing to Chile's suboptimal export performance are its low net trade and world export share values, coupled with a high degree of product market concentration in exports. Furthermore, Colombia and Peru exhibit particularly low net trade, export per capita, and world export share values. It is imperative that decisive action be taken with regard to these indicators in order to achieve a higher level of export performance. Conversely, India would be well advised to accord greater attention to the net trade and export per capita indicators.

In regional terms, emerging markets in Asia have demonstrated a higher level of export performance. Emerging markets in Eastern Europe, the Middle East, and Africa exhibited relatively mediocre performance, while emerging markets in South America demonstrated the lowest rankings. In this regard, the region with the most unfavourable export performance relative to emerging markets was South America.

Türkiye has been engaged in a persistent trade deficit for an extended period. Concurrently, Türkiye has exhibited the most unfavorable net trade performance among the selected advanced economies. However, as the weight assigned to the net trade indicator for the export performance criterion is relatively low, its impact on the ranking was limited. Conversely, given the relatively high export growth rates observed during the 2018-2022 period and the pivotal role of the export growth rate as a criterion, Türkiye has secured a position within the central portion of the export performance rankings. However, the relatively high value of exports of goods as a percentage of GDP has had a beneficial impact on Türkiye's ranking. Furthermore, the comparatively low concentration of exports by country and product in Türkiye is a positive factor. In order for Türkiye to achieve a higher ranking in export performance, it is necessary to give greater emphasis to export per capita, particularly in the case of high-tech exports, which currently have very low values. In order to achieve this, it is recommended that Türkiye should place greater emphasis on production based on R&D activities and focus more on exports of these products. Concurrently, the formulation of policies should be prioritized to facilitate the preferential selection of Türkiye by companies that prioritize high-tech production in foreign direct investment (FDI) flows, which have a beneficial impact on high-tech exports.

This study is distinct from previous studies, particularly in terms of the export performance criteria employed and the utilization of the most recent data on these criteria. It is therefore anticipated that this study will make a valuable contribution to the existing literature and serve as a source of reference for future research in this field. It is similarly conceivable that future studies may yield disparate results with disparate data sets, disparate time periods, and disparate integrated models. This research provides policy makers and regulatory agencies of selected countries, especially Türkiye, with information on the importance of relevant export performance variables and potential improvements to export policies based on these variables.

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