

Analysis of the Socioeconomic Structures of BRICS Countries and Türkiye Using Multi-Criteria Decision-Making Techniques

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Abstract

Türkiye pursues a multidimensional foreign policy in the diplomatic, military, and commercial domains owing to its geopolitical position. The dynamic restructuring of global power balances is steering Türkiye toward closer relations with alternative economic cooperation platforms such as BRICS. This study aims to provide a comprehensive and analytical assessment of the socioeconomic performance of BRICS countries and Türkiye, along with a theoretical analysis of resource allocation scenarios. A holistic evaluation model comprising 60 criteria under seven main dimensions encompassing economic, environmental, and structural indicators was constructed. Criterion weights were calculated using objective weighting methods such as Entropy, Centroid, CRITIC, and MEREC, while country performance rankings were determined using multi-criteria decision-making (MCDM) techniques including TOPSIS, MABAC, and COPRAS. A total of 105 scenarios were generated, and aggregation was applied through Borda, Copeland, and weighted average methods to derive final rankings. Beyond comparative performance analysis, a hypothetical goal programming model was developed to determine the distribution of a limited fund among countries under different scenarios. The study demonstrates that integrating MCDM methods with mathematical models offers a flexible and applicable decision system for international politics and strategic planning. The proposed method contributes to the literature by combining ranking-based analysis with a resource allocation model. Additionally, this study is one of the most comprehensive studies in the literature in terms of the number of countries, criteria, and criterion domains considered.

Keywords

BRICS, Türkiye, Ranking, Fund Allocation, Multi-Criteria Decision Making

1. Introduction

The global economic system has been rapidly evolving toward a multipolar structure since the beginning of the 21st century. In this transformation, emerging economies are redefining the boundaries of the traditional Western-centric economic system in areas such as production capacity, demographic dynamics, trade volume, and political influence (Süsler 2025). In particular, Brazil, Russia, India, China, and South Africa—the founding members of BRICS—have been regarded as a rising force among global actors since the 2010s in terms of their economic performance, foreign trade integration, and international institutional roles (Süsler 2025). This role of BRICS stems not only from the individual economic magnitudes of its member countries but also from their efforts to attain a more influential position in economic governance and international cooperation (BRICS Economic Integration 2024).

Türkiye occupies a strategic role in global economic processes by virtue of its geopolitical position, young population, production infrastructure, and extensive foreign trade network. However, conducting a comparative analysis between Türkiye's economic performance and global competitiveness and the BRICS countries is significant for revealing the structural similarities and differences among these countries through objective measures (Murat and Güzel 2022). Scientific performance evaluation processes necessitate addressing economic and social indicators within a multidimensional framework. Analyses relying on a single indicator are insufficient to capture countries' development levels and global competitiveness in a comprehensive manner. For this reason, MCDM methods are preferred due to their capacity to evaluate multiple performance indicators simultaneously (Birol 2025). These methods provide decision-makers with a systematic evaluation framework when comparing the performance of countries based on multiple criteria such as economic, social, and governance indicators (Çınar and Başar 2025). In this context, studies evaluating the multidimensional performance of Türkiye and BRICS countries have been increasing in the literature and are significant in terms of determining strategic orientations (Murat and Güzel 2022). In particular, research employing different weighting techniques and ranking algorithms has attracted attention in recent years (Aydemir 2025). In addition, integrating performance scores into optimization models after their determination enables their use not only for ranking purposes but also as an effective decision support tool for strategic resource allocation and policy prioritization (Murat and Güzel 2022). In this respect, the present study aims to combine two significant domains that are rarely addressed together in the literature, multicriteria decision making and optimization-based resource allocation- within a holistic framework, enabling a comprehensive evaluation. Additionally, the study is one of the most comprehensive studies in the literature in terms of the countries considered, the number of criteria, and the criterion domains.

The primary objective of this research is to evaluate the multidimensional socioeconomic performance of BRICS countries and Türkiye within an objective and integrated methodological framework and to develop a decision support system model by integrating the resulting performance scores into optimization-based decision models. Measuring the multidimensional performance of BRICS countries and Türkiye through different methods within the framework of economic, environmental, educational, health, industrial, financial, and energy indicators constitutes one of the fundamental research objectives of this study. In particular, the determination of importance weights by objective weighting techniques, taking into account the intercriteria variation and information content, contributes to eliminating subjective effects from the analysis results. Accordingly, this study aims to perform a comparative analysis of results by jointly applying multiple weighting and ranking approaches rather than producing results based on a single method. The consolidation of obtained rankings through aggregation techniques aims to yield a more consistent and scientifically robust final performance score. Recent studies have demonstrated that the use of integrated and multiple methods enhances decision quality and produces more reliable results (Birol 2025).

The current literature indicates that integrating performance indices into strategic decision processes enhances decision effectiveness and produces more rational policy outcomes (BRICS Economic Integration 2024). One of the most original objectives of this study is the integration of calculated performance scores into a mathematical programming model. Most studies in the literature are limited to generating performance indices. In this research, the relative performance scores calculated for countries are incorporated as parameters into a goal programming model that determines the distribution of a limited fund amount according to scenarios. Thus, the performance measurement and resource allocation problems are combined within the same analytical framework.

This paper is divided into five sections following this introductory section. The second section presents a brief overview of relevant literature and the contribution of this study to the topic. The third section describes the methods used for the considered problem. In the fourth section, criteria; application and goal programming model are explained. The country rankings and detailed results are presented in section five. Finally, the sixth section presents the main conclusion and contributions of this study.

2. Literature Review

In recent years, the impact of BRICS countries on the global economy and international governance has become a significant research topic in the literature. Studies indicate that BRICS countries have become increasingly influential actors in global economic balances owing to their growing economic magnitudes and trade volumes (Kumar et al. 2024). Furthermore, it is emphasized that economic cooperation and financial integration within the group may create alternative mechanisms in global economic governance (Nach and Newadi, 2024). The expansion process of BRICS and the BRICS+ structure are regarded as developments that further strengthen the group's role in global trade and the distribution of economic power (Cochrane and Zaidan 2024). In this framework, BRICS is considered a significant international platform with the potential to enhance economic cooperation among developing countries, expand trade volumes, and establish a more inclusive structure in global economic balances (Wang et al, 2024; Müller 2025).

MCDM methods are widely used in the analysis of complex decision problems that require the simultaneous evaluation of multiple economic, social, and environmental indicators. These methods enable the evaluation of country performance within a multidimensional criteria framework and facilitate comparisons across different development indicators. In recent years, MCDM approaches have become important analytical tools in economic performance and national competitiveness analyses due to their ability to simultaneously evaluate numerous criteria and provide a systematic analytical framework for the decision-making process (Mardani et al. 2015; Kou et al. 2016).

A significant number of studies in the literature employ MCDM methods to evaluate the economic performance of countries. These studies generally rank countries according to their overall economic performance using macroeconomic criteria such as economic growth, trade performance, inflation, and development indicators. In this context, methods such as AHP, VIKOR, ELECTRE, and MOORA are frequently utilized (Mardani et al. 2015; Kou et al. 2016). Additionally, studies examining developing economies demonstrate that multi-criteria evaluation frameworks make significant contributions to understanding national competitiveness and economic development processes (Banga 2013; Sahu and Narayanan 2016; Ghosh 2017). These findings reveal that MCDM methods provide important tools for the comprehensive evaluation of economic performance.

Recent studies focus on hybrid MCDM approaches that combine different weighting and ranking techniques or the integration of these methods with analytical models. Hybrid models are regarded as approaches that provide more reliable results by reducing methodological biases that may arise from the use of a single method. In this context, studies employing objective weighting methods such as Entropy and CRITIC in conjunction with ranking methods such as TOPSIS, VIKOR, COPRAS, or MABAC are increasingly prevalent in the literature (Kumar and Singh 2021; Li et al. 2022; Wang et al. 2024). These integrated approaches enable more comprehensive analyses by bringing together different methodological perspectives. Furthermore, some studies employ MCDM methods in combination with decision support systems or analytical modeling frameworks to support policy analysis and decision-making processes (Rahman and Alam 2021; Kou et al. 2016). Such hybrid models offer particularly robust and reliable results in the evaluation of complex socioeconomic systems.

Another important research area in the literature focuses on the comparative analysis of developing economies. In particular, BRICS countries have become the focal point of numerous studies due to their increasing roles in the global economy. In this scope, various studies have examined the economic growth performance, financial development levels and competitiveness of BRICS economies using macroeconomic indicators (Sahu and Narayanan 2016; Ghosh 2017). Moreover, more recent studies analyze topics such as economic resilience, sustainable development, and innovation capacity using MCDM techniques (Zhang and Liu 2022). These studies reveal that economic diversity, technological advancement, and sustainable growth indicators play a critical role in determining long-term national economic performance (Kumar et al. 2024; Zhou et al. 2024).

In conclusion, a review of the literature within a general framework reveals that MCDM methods offer robust analytical tools for evaluating multidimensional country performance. However, a significant portion of existing studies focuses on specific dimensions such as economic indicators, sustainability criteria, or energy performance. Moreover, many studies employ a single decision-making method without comparing the results of different methods. This situation indicates the need for integrated analytical approaches that combine different weighting and ranking techniques to more comprehensively evaluate the socioeconomic performance of countries. The principal contributions of this study to the literature are presented below in itemized form:

- Compared to similar studies in the literature, this study presents a comprehensive analysis in terms of a much broader indicator set (60 indicators across 7 different domains) and the combined use of numerous MCDM methods (9 techniques).
- Unlike many studies in the literature that focus on ranking country performance, this research also develops a hypothetical goal programming model using the outputs obtained in addition to the country rankings. In this regard, the study constitutes a hybrid analysis.
- It is notable that the literature contains an extremely limited number of comprehensive analyses that include Türkiye and involve comparisons with either BRICS countries or other nations. This study contributes to filling this gap in the literature.
- While BRICS countries in the literature are mostly limited to Brazil, Russia, India, China, and South Africa, this study also considers Egypt, Ethiopia, Iran, the United Arab Emirates (UAE), and Indonesia in addition to the aforementioned countries. In this context, Saudi Arabia was not included in the country set due to the ambiguity surrounding its accession status. Although Saudi Arabia was invited to join BRICS during the 2023 Johannesburg Summit, its accession process remained unclear. While some BRICS-related sources listed Saudi Arabia among the expanded members (BRICS BRASIL 2025), Saudi official statements indicated that the invitation was still under consideration. Magid et al. 2024) Moreover, Saudi Arabia participated in subsequent BRICS meetings as an invited country rather than through a clearly confirmed full-membership status. (Saudi foreign minister 2024; Saudi FM Arrives 2025) Therefore, since full membership was not clearly established, Saudi Arabia was not included in the country set examined in this study in order to maintain a consistent and clearly defined sample.

3. Methods

In this study, a methodological framework based on the MCDM approach was employed to evaluate the socioeconomic performance of countries. Due to page constraints, the methods presented below are not explained in detail; detailed method descriptions can be found in the recommended sources (Hwang and Yoon 1981; Diakoulaki et al. 1995; Keshavarz Ghorabae et al. 2021; Barron 1992; Pamučar and Čirović 2015; Zavadskas et al. 1994; Charnes and Cooper 1957; Salabun et al. 2019). In the first stage of the analysis process, objective criterion weighting methods such as Entropy, CRITIC, Centroid, and MEREC—based on inter-criteria correlation, variance, the degree to which a criterion affects the outcome, and proximity/distance to mean values—were employed. In the second stage, objective ranking methods such as TOPSIS, MABAC, and COPRAS were utilized, which analyze criteria based on proximity/distance to the ideal solution, classification of criteria as benefit/cost, and the distances of criteria to boundary values. In the final stage of the study, aggregation techniques such as Borda, Copeland, and arithmetic mean were employed to evaluate the pairwise comparisons of criteria, the rankings in each scenario, and the average scores obtained. In addition to the methods used, a goal programming model was also incorporated into the analysis to evaluate the obtained performance results within a decision model. The objective is to minimize deviations from targeted values while simultaneously optimizing one or more goals. This model was used to analyze the resource allocation problem taking into account the performance results obtained for the countries.

4. Data and Application

In this study, secondary data were used to evaluate the socioeconomic performance of BRICS countries and Türkiye. The data used in the analysis were obtained from the official database of the World Bank (World Bank 2025). The dataset covers a total of nine years from 2014 to 2022. The selected criteria were chosen based on economic growth, development potential, and strategic indicators. The collected data were analyzed by using MS Excel and LINGO software in accordance with the methodological framework detailed below. The flowchart of the application is presented in Figure 1 below.



Figure 1. Analysis flowchart

The study commenced with the collection of the requisite data from the World Bank, followed by weighting the raw data using the employed methods. With the aid of the obtained country weights, country rankings were analyzed across

105 different scenarios created using combinations of MCDM techniques, and final country rankings were obtained upon completion of the aggregation process. Finally, a goal programming model was formulated and solved using the obtained country scores and rankings (Table 1).

Table 1. Description of evaluation criteria

Abbr.	Category	Name	Definition	Type
C1	Health	Age dependency ratio, young	Youth dependents relative to working population	C
C2	Environment	Agricultural land	Share of land used for agriculture	B
C3	Economy	Agriculture, forestry, and fishing	Sectoral contribution to GDP of	B
C4	Infrastructure	Air transport, freight	Volume of goods transported by air (million ton-km)	B
C5	Infrastructure	Air transport, passengers carried	Total number of passengers using air travel	B
C6	Infrastructure	Air transport	Domestic and international takeoffs by air carriers	B
C7	Energy & Mining	Alternative and nuclear energy	Percentage of non-fossil fuel sources in total energy use	B
C8	Economy	Annual freshwater withdrawals	Total water removed from internal sources	B
C9	Education	Compulsory education, duration	Years legally required for schooling	B
C10	Health	Current health expenditure	Health spending share of GDP	B
C11	Infrastructure	Electric power consumption	Per capita usage of electricity	B
C12	Infrastructure	Electricity production from coal	Share of total electricity from coal sources	C
C13	Infrastructure	Electricity production from hydro	Share of total electricity from hydroelectric plants	B
C14	Infrastructure	Electricity production from natural gas	Share of total electricity from natural gas	B
C15	Infrastructure	Electricity production from oil	Share of total electricity from petroleum products	C
C16	Environment	Electricity production from renewables	Share of electricity from solar, wind, and biomass	B
C17	Energy & Mining	Energy use (kg of oil equivalent)	Total energy consumption per capita	B
C18	Economy	Exports of goods and services	Value of goods and services exported	B
C19	Health	Fertility rate, total	Average number of children born per woman	B
C20	Economy	Final consumption expenditure	Total spending by households and government	B
C21	Infrastructure	Fixed telephone subscriptions	Number of active landline connections per 100 people	B
C22	Economy	Foreign direct investment (FDI)	Net inflows of foreign investment capital	B
C23	Environment	Forest area	Land under of trees of at least 5 meters	B
C24	Energy & Mining	Fossil fuel energy consumption	Total share of coal, oil, and gas in the national energy mix	C
C25	Energy & Mining	Fuel exports	Total merchandise exports derived from fuel products	B
C26	Energy & Mining	Fuel imports	Share of fuel products in total imports	C
C27	Economy	GDP growth (annual %)	Yearly percentage growth rate of GDP at market prices	B

C28	Economy	GDP per capita growth	Annual growth rate of GDP divided by the population	B
C29	Economy	GDP per capita (PPP)	Economic output per person	B
C30	Economy	Gov. final consumption expenditure	All government current expenditures	B
C31	Education	Gov. expenditure on education	Total public spending on education percentage rate GDP	B
C32	Industry	High-technology exports	Exported products with high R&D intensity	B
C33	Health	Hospital beds	Hospital beds per 1,000 people	B
C34	Economy	Imports of goods and services	Value of goods and services imported	C
C35	Infrastructure	Individuals using the Internet	Percentage of the population that has used the internet	B
C36	Economy	Inflation, consumer prices	Annual change in consumer prices	C
C37	Economy	Inflation, GDP deflator	Price change of domestically produced goods	C
C38	Health	Life expectancy at birth	Expected years of life at birth	B
C39	Economy	Manufacturing	Manufacturing value added as % of GDP	B
C40	Economy	Medium and high-tech manufacturing	Share of medium- and high-tech industries	B
C41	Health	Mortality rate, adult (Female)	Probability of dying between 15 and 60 per 1,000 females	C
C42	Health	Mortality rate, adult (Male)	Probability of dying between 15 and 60 per 1,000 males	C
C43	Health	Mortality rate, infant	Number of dying till the age of 1 per 1,000 live births	C
C44	Health	Mortality rate, under-5	Number of dying till the age of 5 per 1,000 live births	C
C45	Energy & Mining	Ores and metals exports	Share of minerals and metals in total merchandise exports	B
C46	Energy & Mining	Ores and metals imports	Share of minerals and metals in total merchandise imports	C
C47	Economy	Other manufacturing	Value added of traditional manufacturing sectors	B
C48	Industry	Patent applications	Number of patent applications filed	B
C49	Environment	PM2.5 air pollution	Exposure to fine particulate air pollution	C
C50	Environment	Renewable energy consumption	Percentage of renewable energy in total final energy use	B
C51	Infrastructure	Renewable internal freshwater	Total renewable freshwater resources	B
C52	Industry	R&D expenditure	Current and capital spending on research and development	B
C53	Industry	Researchers in R&D	Researchers engaged in R&D per million people	B
C54	Education	School enrollment, preprimary	Share of children enrolled in preschool	B
C55	Education	School enrollment, primary	Share of children enrolled in primary education	B
C56	Industry	Scientific and technical journal articles	Number of scientific papers published in journals	B

C57	Infrastructure	Secure Internet servers	Number of servers supporting encrypted connections	B
C58	Economy	Total natural resources rents	Sum of oil, gas, mineral, forest etc. rents as % of GDP	B
C59	Economy	Trade (% of GDP)	Exports and imports as % of GDP	B
C60	Economy	Unemployment, total	Share of labor force unemployed	C

Descriptions of the indicators used in the study are presented in Table 1. The indicators represent different dimensions such as economic performance, energy use, environmental sustainability, demographic structure, health, education, and technological development. These indicators were selected to evaluate the multidimensional development and performance levels of countries. Each indicator represents a quantitative measurement of the relevant concept and was used in the construction of decision matrices within the scope of MCDM methods. The benefit or cost direction of each criterion is explicitly given in the last column of Table 1, where B denotes a benefit criterion and C denotes a cost criterion.

The goal programming model established in the study addresses a theoretical budget allocation to the 11 countries in question. The model is presented below.

Parameters – Decision Variables

- $i \in N = \{1, 2, \dots, 11\}$: Set of countries
- B : Total budget to be allocated to countries
- α : Minimum fund distribution ratio
- γ : Maximum fund distribution ratio
- β : Distribution coefficient ($-1 \leq \beta \leq 1$)
- S_i : Normalized MCDM score of country i
- $\bar{S}$: Mean MCDM score
- $\bar{S} = \frac{1}{|N|} \sum_{i=1}^N S_i$
- x_i : Amount of funds allocated to country i
- d_i^-, d_i^+ : Negative and positive deviations from the target budget allocation of country i
- d_c^-, d_c^+ : Negative and positive deviations from the target allocation specified in the country-group constraint
- d_v^-, d_v^+ : Negative and positive deviations from the target allocation specified in the country-group constraint
- m : 0-1 Programming variable

Model

- $\text{Min } Z = \sum_{i=1}^N (d_i^- + d_i^+) + d_c^- + d_c^+ + d_v^- + d_v^+$,
(Objective function aiming to minimize deviations from the targeted budget allocation.)
- $\sum_{i=1}^N x_i = B$
(Budget constraint ensuring that the total budget allocated to countries equals the total budget amount.)
- $x_i = (B / |N|) + \beta (S_i - \bar{S}) B$
(Scenario constraint enabling the adjustment of budget allocation through the β parameter based on performance scores. As the β value approaches one, a positive correlation emerges between the country score and the budget allocated to that country. The value of β is determined according to the aim of the allocation. If the allocation model is designed to prioritize countries with higher socioeconomic performance scores by assigning them higher funding shares, then β takes higher values; however, if the aim is to provide greater support to countries with lower socioeconomic performance scores, then β takes lower values. The variable x_i represents the final budget allocation assigned to country i . The score-based equation provides a reference allocation level derived from MCDM performance scores. The final allocation is determined by the goal programming model while satisfying group constraints and minimizing deviation variables.)
- $x_i + d_i^- - d_i^+ = (B / |N|)$
(Constraint representing deviations from the targeted equal budget share for each country.)
- $\alpha B \leq x_i \leq \gamma B$

(Lower and upper bound constraint determining the minimum and maximum budget share each country can receive.)

- $x_1 + x_{11} + d_c^- - d_c^+ = 0.25*B$
(Constraint ensuring that the budget allocated to the designated country group equals 25% of the total budget.)
 $x_8 + x_9 + x_{10} + d_v^- - d_v^+ = 0.20*B$
(Constraint ensuring that the budget allocated to the designated country group equals 20% of the total budget.)
The country-group constraints were introduced solely to illustrate the applicability and flexibility of the proposed goal programming framework under alternative allocation scenarios. Both the selected country groups and the associated threshold values were adopted as benchmark assumptions and do not represent specific empirical findings or policy recommendations. Instead, they were included for illustrative purposes to demonstrate how alternative allocation priorities can be incorporated into the proposed framework.
- $m \in \{0,1\}$
 $x_5 \geq 0.15*B*m$
(Constraint ensuring that at least 15% of the total budget is allocated to the 5th country when $m = 1$.)
 $x_6 \geq 0.15*B*(1-m)$
(Constraint ensuring that at least 15% of the total budget is allocated to the 6th country when $m = 0$.)
- $x_i \geq 0; d_i^- \geq 0; d_i^+ \geq 0; \forall i \in N$
(Non-negativity constraint ensuring that parameters and variables are non-negative.)

The goal programming model in question aims to determine the distribution of the total budget among countries by taking into account the country performance scores obtained through MCDM methods. In the model, potential deviations from the targeted budget share for each country are represented through negative and positive deviation variables, and the minimization of these deviations is targeted. Furthermore, the model enables the analysis of different budget allocation scenarios through its embedded parameters and constraints.

5. Results and Discussion

In this study, the socioeconomic performance of BRICS countries and Türkiye was analyzed using MCDM methods. In the first stage, criterion weights were calculated using non-subjective methods such as Entropy, CRITIC, MEREC, and Centroid. Subsequently, the performance of countries was evaluated using TOPSIS, MABAC, and COPRAS methods with the obtained weights, and a total of 105 country rankings were generated through various combinations. Each ranking includes at least one weighting and one ranking method. To be more specific, case 87 consists of the following methods: Entropy, Centroid, CRITIC, COPRAS, and TOPSIS. In this case, each weighting method is assigned a weight of 1/3, while each ranking method is assigned a weight of 1/2. These rankings were aggregated separately using the Borda, Copeland, and arithmetic mean methods, yielding three final rankings. The obtained results are presented in Table 2.

Table 2. Final rankings of the countries

Borda Ranking Results			Copeland Ranking Results			Arithmetic Mean Ranking Results		
Rank	Country	Score	Rank	Country	Score	Rank	Country	Score
1	China	1147	1	China	10	1	China	702.250
2	United Arab Emirates	979	2	United Arab Emirates	8	2	United Arab Emirates	598.250
3	Brazil	909	3	Brazil	6	3	Brazil	567.500
4	Russian Federation	882	4	Russian Federation	4	4	Russian Federation	531.750
5	Egypt, Arab Rep.	650	5	Egypt, Arab Rep.	2	5	Egypt, Arab Rep.	403.750
6	Türkiye	568	6	Türkiye	0	6	Türkiye	354.250
7	Ethiopia	504	7	Ethiopia	-2	7	Ethiopia	326.750
8	Iran, Islamic Rep.	501	8	Iran, Islamic Rep.	-4	8	Iran, Islamic Rep.	294.250
9	Indonesia	289	9	Indonesia	-6	9	South Africa	160.500
10	South Africa	252	10	India	-8	10	Indonesia	155.750
11	India	249	11	South Africa	-10	11	India	145.500

Despite the differences among the MCDM methods considered, it is observed that the country rankings are largely similar across the three aggregation results. To examine the consistency among the three aggregation results, Spearman's rho and Kendall's tau coefficients were calculated. The results indicate very high agreement among all aggregation methods (Spearman's $\rho = 0.973\text{--}0.991$; Kendall's $\tau = 0.927\text{--}0.964$), confirming the robustness of the final rankings. This situation serves as evidence that the results obtained from different methods support each other and that the analyses possess a consistent structure. Upon examination of the tables, it is observed that countries such as China, UAE, Brazil, and Russia consistently rank in the upper positions across most methods. It can be stated that these countries possess a stronger structure compared to other countries in terms of economic magnitude, production capacity, trade volume, infrastructure development, and overall macroeconomic performance. Conversely, countries such as South Africa, Indonesia, and India are observed to rank in the middle or lower positions in most methods, indicating lower performance in the aforementioned areas compared to other countries. The changes observed in the last three positions can be explained by the relatively close performance levels of these countries. Since the differences among the higher-ranked countries are more pronounced, all three aggregation methods produce the same ordering for the top eight countries. In contrast, the final scores of South Africa, Indonesia, and India are relatively close to each other and this closeness makes their exact positions more sensitive to the aggregation logic of each method. While the Borda and arithmetic mean approaches primarily reflect the magnitude of accumulated scores, the Copeland method is based on pairwise dominance relationships. Therefore, countries with similar overall performance levels may change positions in the lower part of the ranking depending on whether the aggregation procedure emphasizes score magnitude or pairwise superiority. The reason India ranks in the lower positions despite its advanced economy and high GDP is that it possesses a low-scoring/low-performing structure that significantly diverges from BRICS countries when indicators outside the economic domain (education, health, infrastructure, environment, etc.) are considered. Certain variations emerging in the rankings are attributable to the structure and characteristics of the aggregation technique. The results indicate that each country possesses different levels of development. In this context, the findings of the study enable a comparative evaluation of the positions of BRICS countries and Türkiye within the global economic system. Based on the indicators considered, it can be stated that Türkiye's potential accession to BRICS would not substantially alter the average development level of BRICS countries.

Another method incorporated into the analysis in this study is the goal programming model. The results of the budget distribution model in question were obtained through the LINGO software. Below, the parameters required for the solution, the explanation of country scores, and the screenshots of the obtained results are presented, respectively.

Table 3. Goal programming parameters and country scores

Parameter / Country	Value
B	1000.000
α (Alpha)	0.020
γ (Gamma)	0.200
β (Beta)	1.000
$\bar{S}$ (Mean MCDM Score)	0.091
China	0.166
United Arab Emirates	0.141
Brazil	0.134
Russia	0.125
Egypt	0.095
Türkiye	0.084
Ethiopia	0.077
Iran	0.069
South Africa	0.038
Indonesia	0.037
India	0.034

As shown in Table 3, the total fund amount allocated and planned for distribution to countries is 1000 units. The minimum (alpha) and maximum (gamma) budget shares a country can receive were set at 2% and 20% of the total budget, respectively. The countries whose normalized scores are provided are, in order, China, UAE, Brazil, Russia, Egypt, Türkiye, Ethiopia, Iran, Indonesia, South Africa, and India. The Beta value was set to '1' to ensure that the budget allocation is distributed directly proportional to the country scores.

Table 4. Goal programming fund allocation and deviation results

Variable / Country	Value
DCMIN	50.082
DCPLUS	0.000
DVMIN	56.031
DVPLUS	0.000
M	1.000
China	165.605
United Arab Emirates (UAE)	86.293
Brazil	133.829
Russia	125.398
Egypt	150.000
Türkiye	83.540
Ethiopia	77.055
Iran	69.390
South Africa	37.849
Indonesia	36.729
India	34.312

The solution of the goal programming model is presented in Table 4. Considering only the value of the Beta parameter, the budget should decrease from top to bottom. However, upon examining the outputs, this condition is not met on two occasions in total. Although the UAE has a high performance score, the total budget balance has been reshaped due to alliance constraints, minimum allocation requirements, and priority budget-sharing conditions defined for certain countries in the model. This situation has led to the allocation of resources below target values for high-scoring countries. In this context, Russia was relatively reduced to minimize total deviation, and the model was aimed at achieving an optimal balance across the system. Looking at the 6th constraint of the model, the budget to be assigned Egypt or Türkiye through 0-1 programming must be at least 150 units. In the solution, only Egypt having a value of

150 units confirms this situation. Additionally, Table 4 also contains the deviations pertaining to the 5th constraint. The constraint includes two separate allocation targets for China-India and Iran-South Africa-Indonesia separately. As a result of the optimization, the deviations were obtained as 50 and 56 units, respectively.

The goal programming model included in the study was established hypothetically. The model can be readily extended by adding different parameters, constraints, and variables according to the decisions and objectives expected to contribute. When the analysis outputs are evaluated overall, they reveal that the socioeconomic performance of BRICS countries and Türkiye varies significantly across different indicators. This situation can be interpreted as a reflection of the differences among the countries in terms of economic structure, production capacity, and development levels. The resulting rankings can be enriched through a theory-based optimization model to produce a more consistent and comprehensive analysis.

6. Conclusion

This study aimed to comprehensively and holistically evaluate the socioeconomic performance of BRICS countries and Türkiye within the framework of the MCDM approach. Accordingly, an extensive dataset was systematically analyzed, and 4 weighting, 3 ranking, and 3 aggregation methods were employed in combination to enhance the reliability of the study. Thereby, biases that may arise from reliance on a single method were reduced, and more consistent, mutually supportive final rankings were obtained. The study was not limited to country rankings alone; an optimization-based analytical approach was also incorporated into the process. The goal programming model developed in this scope enables the analysis of potential deviations based on the distribution of a theoretical budget/fund by taking country performance scores into account. In this respect, the study not only offers a theoretical evaluation but also presents an applicable analytical tool for decision-makers. Unlike many studies in the literature, the study includes a total of 10 countries that have attained 'full member' status instead of 5 founding members of BRICS. Considering that Türkiye is also included in the study and that the study was concluded with 60 different indicators across 7 different domains, it can be stated that the study is one of the pioneers in its field.

In conclusion, the study occupies a unique position in the literature in terms of its comprehensive indicator set, the number of countries considered, the socioeconomic performance evaluations specifically based on Türkiye, the combined use of different MCDM methods, and the support provided by the optimization model. This holistic approach provides both theoretical contributions and significant implications for strategic decision-making processes. For future studies, it is recommended that the model be expanded with dynamic datasets in terms of both domains and the number of indicators, that different normalization and analysis techniques be tested, or that a new model be developed by considering the amounts and conditions of aid funds/grants previously allocated by various international organizations, rather than a theoretical budget allocation to countries.

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