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Analysis of the Export Performance of Manufacturing Industry Sectors in Turkey Using the Entropy-Weighted TOPSIS Method

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ABSTRACT

Purpose – The aim of this study is to evaluate and rank the export performance of manufacturing industry sectors in Türkiye using the Entropy-weighted TOPSIS method. Within this framework, sectoral performance is measured based on export-related indicators and profitability ratios derived from the income statements published by the Central Bank of the Republic of Türkiye. The analysis covers 21 manufacturing industry sectors over the period 2009–2023 and provides a comparative assessment of sectoral performance using objective financial and trade-based criteria.

Design/methodology/approach – This study evaluates the export performance of manufacturing industry sectors. The data are based on the income statement derived from the sectoral data of the Central Bank of the Republic of Turkey. The data were compiled from sectoral reports published by the CBRT. These reports provide information for all sectors up to the second sub-level. In addition, the sector classification, sub-sectors and the related calculation methodology are explicitly presented. Within the scope of this study, 21 sectors classified under the main heading of C–Manufacturing Industry are analyzed. The data begin in "2009" in line with the publication framework of the CBRT. The most recent finalized data correspond to the year "2023." Therefore, to avoid the use of provisional data, the analysis is conducted using data covering the period up to 2023. The analysis utilizes indicators such as export data related to foreign trade, gross profit margin, net profit margin, operating profit margin, and the sector's share in total foreign trade volume. The TOPSIS method has been employed in the analysis of sector performance.

Findings – Based on the data from the 2009–2023 period, the analysis reveals that sectors such as food, basic metal industry, pharmaceuticals, chemicals, and electrical equipment manufacturing demonstrated high performance, whereas sectors such as manufacture of furniture products, printing and reproduction of recorded media, manufacture of leather and related products manufacturing exhibited relatively low performance.

Discussion – The analysis reveals notable differences in export performance across manufacturing industry sectors in Türkiye based on export ratios and profitability indicators. While the study does not directly test policy instruments, the observed performance disparities suggest that sectoral characteristics play an important role in shaping export outcomes. In this respect, the results may serve as a descriptive reference for future research that aims to examine the effectiveness of regulatory measures, incentives, and support mechanisms on sectoral export performance using extended variable sets.

1. Introduction

The export performance of manufacturing industry sectors is a key indicator that directly affects a country's foreign trade balance, production capacity, and competitiveness. In Türkiye, the manufacturing industry holds a significant position in terms of exports, and the degree of openness of different sectors to foreign markets is a factor that shapes overall economic performance. When evaluating the export performance of sectors, indicators such as foreign trade volume, export figures, profit margins, and sectoral shares are taken into account. High-performing sectors are generally more competitive in global markets and contribute added value to the economy, while low-performing sectors tend to have more limited foreign trade capacity. Therefore, improving the export performance of manufacturing sectors can enhance the overall competitiveness of the economy, support employment, and constitute an important step toward sustainable growth.

ETHICAL APPROVAL: This study used secondary data and therefore did not require ethics committee approval.

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In Türkiye, the manufacturing industry is the cornerstone of economic growth and development. Although its share in GDP varies from year to year, it generally ranges between 20% and 25% (TSI, 2025b). The manufacturing sector plays a vital role in foreign trade, accounting for approximately 95% of Türkiye's total real sector exports. Especially sectors such as automotive, textiles, food, machinery, and electronics lead in terms of both production and employment. In addition, organized industrial zones and incentive policies are important elements supporting the growth of the manufacturing industry. However, structural problems such as dependence on imports and high energy costs affect the sustainability of this sector within the Turkish economy.

The manufacturing industry is rapidly transforming alongside technological developments. Industry 4.0 and digitalization are making production processes more efficient and flexible by integrating innovations such as automation, artificial intelligence, and the Internet of Things (IoT). In Türkiye, strengthening the technological infrastructure in the industrial sector and increasing the production of high value-added goods are among the top priorities to enhance economic competitiveness. While the use of technology is becoming more widespread -particularly in sectors such as defense, automotive, and electronics- R&D investments and university-industry collaboration are also supporting innovation. However, to compete with global rivals in terms of technological adaptation, greater investment and a more qualified workforce are required.

There are numerous studies that measure the performance of manufacturing industry sectors using different variables. This study differs from other research in that the decision variables are calculated based on profitability and export data. In this respect, the study focuses exclusively on profitability and export indicators, deliberately excluding other financial variables such as indebtedness, R&D expenditures, and similar measures. In response to the second request, an additional revision has also been made. The main differences of this study compared to similar studies are that the dataset is constructed from the sectoral balance sheets and income statements obtained from the CBRT, that it covers the entire available period (2009–2023, 15 years), and that it includes only purpose-oriented variables. Based on the findings, a sectoral ranking was conducted, and the export performances of the sub-sectors were clearly revealed.

2.Manufacturing Industry and Foreign Trade in Türkiye

In Türkiye, the manufacturing industry plays a critical role in the national economy as the driving force behind exports. Although its share in total exports fluctuates, it continues to maintain a high proportion (RTSBP, 2025). Approximately 95% of total exports consist of manufactured products, with key sectors including automotive, textiles, food, electronics, chemicals, and machinery. The automotive sector, in particular, holds a leading position in Türkiye's exports, with a significant volume of sales directed toward European countries such as Germany, France, and Italy (TSI, 2025a).

As highlighted in TÜSİAD's (2023) manufacturing sector reports, the sector's contribution to GDP is noteworthy. The textile and ready-to-wear industry holds a large market share in both Europe and the Middle East. Food and agriculture-based industrial products are also among Türkiye's traditional export items. Meanwhile, the electronics and defense industries have significantly increased their exports in recent years through R&D investments and the production of high-tech goods. Thanks to its geographic location, Türkiye enjoys strategic export advantages with easy access to European, Asian, and Middle Eastern markets. However, structural problems such as high energy costs, import dependency, and the predominance of low value-added products remain key factors limiting the export performance of the manufacturing industry. To overcome these challenges, investments must be increased in the production of high value-added goods and in technological transformation.

In recent years, the manufacturing industry sectors in Türkiye have undergone a significant transformation process in terms of technology-intensive production. Sectors such as defense, automotive, electronics, machinery, and chemicals are among the key areas where technology-focused production is gaining prominence. In these sectors, the production of high value-added goods has increased thanks to R&D investments, university-industry collaborations, and technology development zones (TÜSİAD, 2014). The defense industry has become one of Türkiye's leading sectors in technology-intensive production, with developments in unmanned aerial vehicles (UAVs), radar systems, and software-based solutions. The automotive sector is also undergoing a transformation through investments in electric and autonomous vehicle technologies, aiming to enhance its international competitiveness with projects such as TOGG.

According to data from the Presidency of Defense Industries (2024), global defense spending has reached a total of $2.24 trillion, with Türkiye accounting for $16 billion of this amount. The global arms trade totaled $592 billion, of which Türkiye held a 1.6% share, ranking 11th globally. Additionally, in 2023, Türkiye's defense and aerospace industry export revenues amounted to $5.54 billion.

According to Eurostat's classification of manufacturing technology, pharmaceuticals, computers and electronics, aircraft, and related fields are classified as high-technology manufacturing. Chemical products and pharmaceuticals, the arms industry, electrical appliances, machinery, and similar equipment are classified as medium-high technology. Sectors such as food, textiles, paper, and wood products are classified as low technology (Eurostat, 2025). The share of high-technology products in Türkiye's overall manufacturing industry remains limited. According to TSI data, the proportion of high-technology products in exports is around 3-4%, which is quite low compared to global competitors. The manufacturing output is dominated primarily by medium- to low-technology level products. This situation indicates that Türkiye needs to increase its capacity for technology-based production. However, R&D and technology intensity in the manufacturing industry are not included in the main focus of the study. Therefore, variables related to these concepts were not preferred. Likewise, in the interpretation of the findings, an evaluation based on technology and R&D concepts has been deliberately avoided.

In recent years, Industry 4.0 applications and digitalization initiatives have also become widespread in manufacturing. While the use of automation, artificial intelligence, robotics, and the Internet of Things (IoT) is increasing in factories, companies are striving to make production processes more efficient and flexible. However, accelerating this transformation critically depends on increasing the qualified workforce, more R&D investment, and the continuation of state incentives for technology. In summary, although the potential for technology-intensive production in Türkiye is steadily increasing, more structural reforms and strategic investments are necessary to raise the share of high-technology products in production and exports.

3. Literature Review

Lowinger (1975), in an early study on the U.S. economy, demonstrated that technology- and R&D-based developments increase firms' economic and export performance. Using 1970 data from the American National Science Foundation, the study investigated determinants of export performance in sectors such as airlines, electrical appliances, pharmaceuticals, scientific instruments, industrial chemicals, and machinery. The results showed that, thanks to economies of scale and capital accumulation, increases in R&D and innovation positively affected foreign trade.

Sterlacchini (2001), analyzing export performance of Italian manufacturing sectors, identified firms' scale as a key factor influencing export performance and its determinants. The most important factor determining firm export performance was innovation. Technology and innovation were significant variables affecting export performance across all firm sizes (small, medium, and large), though this effect was more pronounced in medium and large firms. Additionally, relatively higher average costs and profitability levels of foreign sales also played an important role in motivating firms.

Sousa (2004) conducted a content analysis based on 43 academic articles from 14 different countries focused on export performance analysis. Although the measurement variables used in these studies varied, they were similar in content. Some of the measurement variables used in the research consisted of subjective data derived from expert and manager opinions, while others were objective data obtained directly from nominal figures. When examining the variables used to measure export performance, 32 different headings fall under main categories related to sales, profitability levels, and market structure. Variables such as export value, export volume, export growth rates, and profitability are among the important factors.

Bozkurt (2008), in a study analyzing export performance of manufacturing industry sectors in Türkiye, conducted a panel data analysis using technology and patent data from firms in various sectors. Based on data from 1985 to 2001, the study found that technology-related efforts and patents have a positive and significant impact on the export performance of sectors.

Polat (2011), in a study examining the role of manufacturing industry sectors within Türkiye's overall economic structure, addressed aspects such as income levels, employment, and value added. When comparing the development and transformation structures of the sectors on a global scale, it was emphasized that

Türkiye's manufacturing industry structure is fragile, externally dependent, and has a competitive framework that needs improvement. Accordingly, taking measures to address these issues was highlighted as essential.

Uzay, Demir, and Yıldırım (2012), in their study investigating the impact of R&D expenditures on the export performance of manufacturing sectors in Türkiye, used data from 1995 to 2005. Their findings indicated that R&D plays a significant role in sector performance, with a positive and meaningful relationship between the variables. Additionally, technological advancements were found to have a positive effect on export performance in subsequent periods.

Karabıyık and Karabıyık (2018), in their study analyzing the foreign trade performance of OECD countries, conducted a performance analysis using the TOPSIS method with variables such as per capita export value, normalized trade balance, and terms of trade. Based on data from 1999 to 2014, the evaluation showed that Norway had the highest performance while Greece had the lowest. Germany, Ireland, and the Netherlands ranked among the high-performing countries, whereas Turkey, Portugal, the United Kingdom, and the United States showed relatively low performance.

Dineri and Işık (2021) conducted an analysis of dependency in the foreign trade performance of manufacturing industry sectors in Turkey. Using data from the 2007–2018 period, their findings aligned with the general trend. They emphasized inefficiencies in the production of real sectors in the Turkish economy, insufficient value creation, dependence on imported inputs for production, resulting trade imbalances, and the lack of progress in competitiveness in the long term. As a result, they concluded that significant transformations in performance in manufacturing industry.

Mo, Zhang, and Dong (2021), in their study, state that capital and intermediate goods imports have a significant impact on economic growth in the Chinese economy. It is demonstrated that the import of capital goods positively affects manufacturing industry production through technological innovation, R&D, and similar factors. Analyzing data from Chinese manufacturing sectors between 2000 and 2006, the study found that both capital and intermediate goods imports effectively explain economic growth. In particular, imported inputs that enhance productivity in manufacturing sectors have been shown to be influential.

Kutlar and Çabukoğlu (2022), in their study examining the production structure of Turkey's real sector through the perspectives of foreign trade, exchange rate fluctuations, foreign trade deficit, and export dependence on imports, employed a VAR model. Their findings parallel Turkey's longstanding real sector problems. It is highlighted that structural transformation is necessary for the manufacturing and export sectors. There is a long way to go regarding R&D, branding, service quality, and customer satisfaction. Consequently, it is observed that Turkey remains far from an ideal state in export and foreign trade indica.

Sancheza, Welshb, and Stein (2022), using data from 237 small and medium-sized enterprises in the Peruvian economy, tested the relationship between innovation and foreign trade. The analysis applied structural equation modeling with the least squares method. The findings revealed a positive interaction between innovation and export performance. Evaluations were made regarding the incentives and policies that should be implemented to increase firms' export performance.

Bedir (2023), in a study analyzing the structural transformation of manufacturing industry sectors in Türkiye, used data from 2010 to 2019. The analysis employed the Lawrence index and the beneficial structural change index. The results indicated that a limited structural transformation took place in Türkiye during this period, driven by global demand. However, it was also shown that both in major sector categories and subsectors, the real sector still does not fully align with global demands.

Aktepe and Yumuş (2023), in their study examining the relationship between capacity utilization rates and export performance of manufacturing industry sectors in Türkiye, conducted a causality analysis using monthly data from 2013 to 2022. The findings indicate a unidirectional causality from exports to capacity utilization rates. Additionally, the results suggest that export values provide preliminary information about the potential direction of manufacturing sector capacity utilization. While exports of products from sectors such as computers, electronics, and chemicals continue to grow, labor-intensive sectors like food, clothing, and beverages show relatively slower development (TÜSİAD, 2014).

Karagöz and Şener (2023), analyzing the export performance of the Turkish economy, used data from 35 OECD countries covering the period 2008–2017. Their analysis results, consistent with many studies, reveal that manufacturing sectors fall short of demonstrating sufficient foreign trade performance. Based on data on manufacturing value-added and R&D expenditures, the analysis highlights the significant contribution of manufacturing sectors to economic growth, with R&D expenditures playing an important multiplier role in this process.

Külünk (2023), in a study analyzing the relationship between the manufacturing industry and economic growth, used data from 2013 to 2022. The findings from the causality analysis were consistent with the literature. Accordingly, a significant and positive long-term relationship was identified between the manufacturing industry and economic growth. Considering the share of manufacturing sectors within Turkey's total exports, it is understood that a certain structural transformation is necessary. From this inference, enhancing the economic performance of manufacturing sectors and increasing productivity are important for long-term economic growth.

Aktürk, Akan, and Gültekin (2023), based on data from Türkiye's manufacturing sectors between 2000 and 2014, concluded that increasing human capital (labor productivity), improving capital use in labor-intensive areas, reviewing the use of imported inputs and substitute domestic production, the importance of exchange rate stability, and policies to increase exports are key factors. Their findings reaffirm long-standing fundamental requirements for the Turkish economy, real sector, and export structure.

Koç (2023) conducted a performance analysis of firms operating in Türkiye's food sector using financial data from 2011 to 2021. The decision variables used in the analysis were compiled from liquidity, financial structure, profitability, and asset utilization data, covering 16 criteria. The results showed that 2019 represented the best performance year for firms in the sector, while 2013 was the worst period for the industry.

Michalikova (2023) states that the use of technology and the Internet of Things (IoT) in manufacturing sectors increases sector productivity. Based on analyses of data from 50 different sectors—including productivity, efficiency, profitability, and customer satisfaction—she demonstrated that technology input enhances performance in manufacturing. The TOPSIS analysis revealed that firms with higher performance also exhibit higher customer satisfaction. It is predicted that for products in sectors with stronger technology inputs, customer satisfaction and product loyalty will increase.

Özaydın (2024), in his study on import dependency of manufacturing industry subsectors in Türkiye, applied the ARDL bounds test using data from 2013 to 2024 for all sectors. The results aligned with the general trend, revealing that sectors have a significant level of import dependency and that fluctuations in exchange rates negatively affect the stable behavior of manufacturing sectors. This effect is particularly pronounced in high-technology-intensive sectors.

In the literature, different perspectives are observed in studies examining the performance of manufacturing industry sectors. While some studies conduct analyses based on technology and R&D variables, others focus on different variables affecting export performance. In this study, an analysis based on export and profitability data has been preferred in order to determine the export performance of manufacturing industry sectors and to rank sectoral performances accordingly. In its present form, the study systematically examines the export performance of manufacturing industry sectors in Türkiye and establishes a sectoral ranking for the specified period, based on the variables under consideration. By doing so, it seeks to provide a structured basis for future comparative analyses and to contribute to a deeper and more comprehensive body of research in the field.

4. Data, Methodology and Analysis

The data used in the study were compiled from the Income Statements within the Sectoral Data of the Central Bank of Türkiye. The decision variables consisted of sectors' foreign sales, gross sales, gross profit margin, net profit margin, operating profit margin, and total export data. For entropy weighting, the 2023 data of the sectors were used to calculate and determine the weightings (Ömürbek & Özcan, 2016; Demirhan, 2022). Based on these weightings, data from 2009 to 2023 were calculated to construct the decision matrix, and sector performances were listed for each year. As a result of the analyses conducted using the TOPSIS method, the performance rankings of each sector for each year were revealed.

It should be noted that the entropy weights are based solely on 2023 data; hence, the sectoral rankings may not fully capture temporal variations across the 2009–2023 period, which constitutes a limitation of the study. The weights for 2023 were taken as a reference as they reflect the most current economic structure and sectoral shares. The use of a single-year weighting was preferred for analyzing current performance rather than capturing long-term changes.

The CBRT has been publishing income statements and balance sheets related to the manufacturing industry as open-access data since 2009. According to the sector codes determined by the Ministry of Industry and Technology (ranging from 10 to 32), income statement and balance sheet data are published separately for each manufacturing sub-sector. However, sectors with a very small transaction volume within the overall economy (such as the tobacco sector, Code 12) or sectors that are highly concentrated and large in scale with multiple stakeholders (such as the coke and refined petroleum products sector, Code 19) are reported within aggregated sector groups rather than being presented individually. The Central Bank generally adopts the NACE Rev.2 classification system in line with international practices and conducts its sectoral classification mostly at the two-digit level. More detailed sub-classifications are not considered. This approach is regarded as more appropriate, particularly in cases where the number of firms is limited, sectoral transaction volumes are low, missing data are substantial, or confidentiality concerns exist.

There are multiple analysis methods available within multi-criteria decision-making techniques. The choice of analysis may vary depending on objective or subjective data. As stated by Dedenia et al. (2015), in analyses based on financial indicators, the use of objective criteria is considered more reliable. Based on this framework, the study adopts a set of criteria primarily focused on sales, profitability, and export variables. In addition, research and development (R&D) expenditures represent another concept closely related to export performance and profitability. However, since the main focus of the study is not R&D and innovation, this variable is not included in the analysis. When evaluating alternatives of the same type, it is more rational to compare them based on similar types of data and rely on objective information as much as possible. For this reason, the TOPSIS method weighted by entropy was preferred in the analyses. Entropy weighting is a method used in decision-making processes to measure value distribution and to reveal the effectiveness levels of decision variables (Zhu, Tian, and Yan, 2020).

Entropy and TOPSIS methods require non-negative data. Therefore, the dataset used in this study consists of aggregated sector-level values under the manufacturing industry classification. As a result, no negative or zero observations were encountered in any criterion. Therefore, no additional transformation to eliminate negative values was required, and the analysis was conducted using the standard normalization procedures inherent to the entropy and TOPSIS methods."

4.1. Entropy Weighted

There are four stages involved in conducting an analysis using the entropy method. The first of these is the construction of the decision matrix obtained from raw data. In the decision matrix, the columns represent the alternatives, while the rows contain the criteria. In the second stage, the normalized decision matrix is obtained. In the third stage, the entropy value for each criterion is calculated, and in the final stage, the weighting of each criterion is performed.

Stage 1: Construction of the Decision Matrix

$$\mathrm{F} = f(Xij)mxn = \begin{vmatrix} f_{11} & f_{12} & f_{1n} \\ f_{21} & f_{22} & f_{2n} \\ f_{m1} & f_{m2} & f_{mn} \end{vmatrix}$$

i= 1,2,…m (alternatives) (21 different manufacturing sectors)

j= 1,2,…n (criteria) (performance measurement criteria)

i= (*10- Manufacture of food products, 11- Manufacture of beverages, 13- Manufacture of textile products, 14- Manufacture of clothing, 15- Manufacture of leather and related products, 16- Manufacture of wood, wood products, and mushroom products, 17- Manufacture of Paper and Paper Products, 18- Printing and Reproduction of Recorded Media, 20- Manufacture of Chemicals and Chemical Products, 21- Manufacture of Basic Pharmaceutical Products and Pharmaceutical Materials, 22- Manufacture of Rubber and Plastic Products, 23- Manufacture of Other Non-Metallic*

Mineral Products, 24- Primary Metal Industry, 25- Manufacture of Fabricated Metal Products, 26- Manufacture of Computers, Electronic and Optical Products, 27- Manufacture of Electrical Equipment, 28- BYS Machinery and Equipment Manufacturing, 29- Motor Vehicle, Trailer, and Semi-Trailer Manufacturing, 30- Other Transportation Equipment Manufacturing, 31- Furniture Manufacturing, 32- Other Manufacturing)

j= (*Overseas Sales/Gross Sales, Gross Profit Margin, Net Profit Margin, Operating Profit Margin, Overseas Sales/Total Exports from Turkey*)

Table 1: Decision Matrix (2023 Year)

Sector	Overseas Sales/Gross Sales	Gross Profit Margin = Gross Profit / Gross Sales	Net Profit Margin = Net Profit for the Period / Net Sales	Operating Profit Margin = Operating Profit / Net Sales	Overseas Sales / Total Exports from Turkey
10	18,27	16,45	5,86	9,13	0,006
11	3,79	14,16	16,96	7,94	0,00010
13	18,90	15,76	5,40	9,82	0,0028
14	30,66	13,71	2,22	5,22	0,00355
15	14,24	13,72	3,42	5,78	0,00027
16	16,06	15,03	9,38	7,88	0,00062
17	19,23	19,54	8,94	10,04	0,00145
18	11,36	17,87	4,80	7,48	0,00016
20	25,81	24,39	9,38	14,94	0,00359
21	10,97	38,05	19,47	26,95	0,00040
22	25,47	18,24	6,54	10,68	0,00351
23	13,65	23,45	8,11	14,22	0,00192
24	24,66	14,35	5,23	10,28	0,00642
25	21,42	18,25	7,47	11,11	0,0037
26	30,07	19,71	7,95	11,75	0,00112
27	36,09	19,97	6,61	11,63	0,00550
28	28,60	21,66	11,13	13,80	0,00432
29	37,15	16,21	6,89	10,37	0,00627
30	60,27	33,94	20,80	27,94	0,00213
31	16,36	19,69	5,31	7,67	0,00070
32	40,69	15,14	3,35	6,34	0,00140

Stage 2: Normalization of the Decision Matrix

The normalization of the decision matrix is performed by dividing each cell in the matrix by the total of its corresponding column.

$$e\text{ij} = \frac{f\ ij}{\sum_{i=1}^{m} fij}$$

Table 2: Normalized Decision Matrix (eij value)

Sector	Overseas Sales/Gross Sales	Gross Profit Margin = Gross Profit / Gross Sales	Net Profit Margin = Net Profit for the Period / Net Sales	Operating Profit Margin = Operating Profit / Net Sales	Overseas Sales / Total Exports from Turkey
10	0,03627	0,04020	0,03348	0,03787	0,11628
11	0,00753	0,03459	0,09674	0,03296	0,00193
13	0,03752	0,03850	0,03082	0,04076	0,05075
14	0,06087	0,03349	0,01270	0,02168	0,06263
15	0,02828	0,03353	0,01952	0,02400	0,00489

16	0,03189	0,03671	0,05354	0,03272	0,01108
17	0,03819	0,04775	0,05100	0,04166	0,02564
18	0,02255	0,04367	0,02739	0,03104	0,00295
20	0,05124	0,05959	0,05354	0,06199	0,06340
21	0,02179	0,09294	0,11108	0,11182	0,00713
22	0,05057	0,04457	0,03734	0,04433	0,06190
23	0,02710	0,05729	0,04626	0,05900	0,03386
24	0,04896	0,03505	0,02987	0,04267	0,11326
25	0,04253	0,04460	0,04263	0,04609	0,06607
26	0,05969	0,04817	0,04538	0,04876	0,01981
27	0,07164	0,04878	0,03773	0,04827	0,09703
28	0,05677	0,05292	0,06351	0,05726	0,07614
29	0,07375	0,03962	0,03932	0,04305	0,11055
30	0,11963	0,08291	0,11868	0,11593	0,03759
31	0,03248	0,04811	0,03029	0,03182	0,01235
32	0,08078	0,03699	0,01916	0,02633	0,02476

Stage 3: Calculation of Entropy Values

In this stage, entropy values for each criterion are calculated. The process involves multiplying each cell value in the normalized decision matrix by the logarithm of that value. Then, the sum of these results for each column is divided by the logarithm of the number of alternatives.

$$Ej = -\frac{\sum_{i=1}^{m} eij \ \ln(eij)}{\ln(m)}$$

Table 3: Entropy Values (E_j)

Alternatives	Overseas Sales/Gross Sales	Gross Profit Margin = Gross Profit / Gross Sales	Net Profit Margin = Net Profit for the Period / Net Sales	Operating Profit Margin = Operating Profit / Net Sales	Overseas Sales / Total Exports from Turkey
Ej	0,4265	0,4254	0,3731	0,4342	0,3800

Stage 4: Obtaining the Importance Weights (Entropy Values) of Each Criterion

In the fourth stage, the importance weight of each criterion ($1\text{-}E_j$) is calculated by subtracting each previously obtained entropy value ($1\text{-}E_j$) from 1 and dividing this result by the sum of all values.

$$wj = \frac{1 - \mathrm{Ej}}{\sum_{j=1}^{n}(1 - Ej)}$$

Table 4: Criterion Weights of Entropy Values

Alternatives	Overseas Sales/Gross Sales	Gross Profit Margin = Gross Profit / Gross Sales	Net Profit Margin = Net Profit for the Period / Net Sales	Operating Profit Margin = Operating Profit / Net Sales	Overseas Sales / Total Exports from Turkey
Wj	0,187	0,195	0,206	0,203	0,209
Wj %	18,704	19,465	20,613	20,314	20,904
Ranking	5	4	2	3	1

4.2. Analysis Using the TOPSIS Method

The TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method was developed by Chin-Lai Hwang and Kwangsun Yoon in 1981 and has since been improved by various contributions. It is an analysis method that assists in ranking alternatives when multiple options are evaluated based on the same criteria. The distances of alternatives to the ideal and negative-ideal solutions are calculated using Euclidean distance. By comparing these proximities to the ideal, a preference ranking is created (Güler & Polatgil, 2023).

The TOPSIS method consists of six stages. These are; Forming the decision matrix, Obtaining the normalized decision matrix, Multiplying the normalized matrix with entropy weights to get the weighted normalized decision matrix, Calculating the positive and negative ideal solution values, Calculating the distances to the ideal solutions based on the relationship between solution values and matrix cells, Determining the relative closeness to the ideal solution and ranking the alternatives accordingly. Below, the step-by-step analysis process and interpretations according to the TOPSIS method are provided.

Stage 1: Decision Matrix

$$\mathrm{F} = f(Xij)mxn = \begin{vmatrix} f_{11} & f_{12} & f_{1n} \\ f_{21} & f_{22} & f_{2n} \\ f_{m1} & f_{m2} & f_{mn} \end{vmatrix}$$

i= 1,2,…m (alternatives) (21 different manufacturing sectors)

j= 1,2,…n (criteria) (performance measurement criteria)

Table 5: Decision Matrix

Sector	Overseas Sales/Gross Sales	Gross Profit Margin = Gross Profit / Gross Sales	Net Profit Margin = Net Profit for the Period / Net Sales	Operating Profit Margin = Operating Profit / Net Sales	Overseas Sales / Total Exports from Turkey
10	18,27297	16,45931	5,86947	9,13000	0,00660
11	3,79188	14,16188	16,96128	7,94607	0,00011
13	18,90481	15,76358	5,40436	9,82561	0,00288
14	30,66694	13,71087	2,22619	5,22682	0,00355
15	14,24607	13,72774	3,42221	5,78544	0,00028
16	16,06681	15,03020	9,38753	7,88719	0,00063
17	19,23939	19,54941	8,94100	10,04189	0,00146
18	11,36024	17,87842	4,80227	7,48321	0,00017
20	25,81428	24,39844	9,38675	14,94386	0,00360
21	10,97708	38,05162	19,47447	26,95606	0,00040
22	25,47698	18,24886	6,54742	10,68705	0,00351
23	13,65539	23,45367	8,11118	14,22214	0,00192
24	24,66587	14,35020	5,23759	10,28619	0,00643
25	21,42676	18,25897	7,47385	11,11158	0,00375
26	30,07164	19,71990	7,95700	11,75538	0,00112
27	36,09434	19,97069	6,61524	11,63638	0,00551
28	28,60344	21,66622	11,13444	13,80363	0,00432
29	37,15949	16,21863	6,89325	10,37813	0,00627
30	60,27226	33,94441	20,80801	27,94733	0,00213
31	16,36657	19,69625	5,31093	7,67074	0,00070
32	40,69844	15,14503	3,35988	6,34796	0,00141

Stage 2: Normalized Decision Matrix

The normalized decision matrix (R matrix) is obtained by dividing each cell value by the square root of the sum of the squares of the cell values in the column.

$$rij = \frac{\text{Xij}}{\sqrt{\sum_{i=1}^{m}(x^2\text{ij})}}$$

Table 6: Normalized Decision Matrix (D value)

Sector	Overseas Sales/Gross Sales	Gross Profit Margin = Gross Profit / Gross Sales	Net Profit Margin = Net Profit for the Period / Net Sales	Operating Profit Margin = Operating Profit / Net Sales	Overseas Sales / Total Exports from Turkey
10	0,1479	0,1756	0,1322	0,1549	0,4188
11	0,0306	0,1511	0,3821	0,1348	0,0069
13	0,1530	0,1682	0,1217	0,1667	0,1827
14	0,2482	0,1463	0,0501	0,0887	0,2255
15	0,1153	0,1465	0,0771	0,0982	0,0176
16	0,1300	0,1604	0,2115	0,1338	0,0399
17	0,1557	0,2086	0,2014	0,1704	0,0923
18	0,0919	0,1908	0,1082	0,1270	0,0106
20	0,2089	0,2603	0,2115	0,2536	0,2283
21	0,0888	0,4061	0,4388	0,4575	0,0256
22	0,2062	0,1947	0,1475	0,1814	0,2229
23	0,1105	0,2503	0,1827	0,2414	0,1219
24	0,1996	0,1531	0,1180	0,1746	0,4079
25	0,1734	0,1948	0,1684	0,1886	0,2379
26	0,2434	0,2104	0,1792	0,1995	0,0713
27	0,2921	0,2131	0,1490	0,1975	0,3494
28	0,2315	0,2312	0,2508	0,2343	0,2742
29	0,3008	0,1730	0,1553	0,1761	0,3981
30	0,4879	0,3622	0,4688	0,4743	0,1353
31	0,1324	0,2102	0,1196	0,1302	0,0444
32	0,3294	0,1616	0,0757	0,1077	0,0891

Stage 3: Weighted Normalized Decision Matrix Using Entropy Values

In this stage, the decision matrix is obtained by applying the criterion weights calculated using the entropy method to the normalized decision matrix according to the relevant formula. The matrix obtained by multiplying each criterion weight by the cell values of the alternatives in each column is shown below;

$$v\,ij\ = wj\,.\ r\,ij$$

and wj total of criterion weights;

$$\sum_{j=1}^{n} w\,j = 1$$

Table 7: Entropy Weighted Normalized Decision Matrix (V Matrix)

Sector	Overseas Sales/Gross Sales	Gross Profit Margin = Gross Profit / Gross Sales	Net Profit Margin = Net Profit for the Period / Net Sales	Operating Profit Margin = Operating Profit / Net Sales	Overseas Sales / Total Exports from Turkey
10	0,0276	0,0341	0,0272	0,0314	0,0875
11	0,0057	0,0294	0,0787	0,0274	0,0014
13	0,0286	0,0327	0,0251	0,0338	0,0382
14	0,0464	0,0284	0,0103	0,0180	0,0471
15	0,0215	0,0285	0,0158	0,0199	0,0036
16	0,0243	0,0312	0,0436	0,0271	0,0083

17	0,0291	0,0406	0,0415	0,0346	0,0193
18	0,0172	0,0371	0,0223	0,0258	0,0022
20	0,0390	0,0506	0,0435	0,0515	0,0477
21	0,0166	0,0790	0,0904	0,0929	0,0053
22	0,0385	0,0379	0,0304	0,0368	0,0466
23	0,0206	0,0487	0,0376	0,0490	0,0254
24	0,0373	0,0298	0,0243	0,0354	0,0852
25	0,0324	0,0379	0,0347	0,0383	0,0497
26	0,0455	0,0409	0,0369	0,0405	0,0149
27	0,0546	0,0414	0,0307	0,0401	0,0730
28	0,0433	0,0450	0,0517	0,0475	0,0573
29	0,0562	0,0336	0,0320	0,0357	0,0832
30	0,0912	0,0705	0,0966	0,0963	0,0283
31	0,0247	0,0409	0,0246	0,0264	0,0093
32	0,0616	0,0314	0,0156	0,0218	0,0186

Stage 4: Calculation of the Positive Ideal Solution (A*) and the Negative Ideal Solution (A⁻)

Ideal solution values are calculated based on minimum and maximum values each criterion column. In this analysis; sales, profitability, and export variables are treated as benefit criteria, as higher values indicate better performance. All criteria included in the analysis are considered benefit criteria, as higher values indicate better performance.

Positive ideal solution values (max);

$$A^+ = (v_1^+, v_2^+ , \dots \dots . v_n^+)$$

Negative ideal solution (min);

$$A^- = (v_1^-, v_2^- , \dots \dots . v_n^-)$$

Table 8: Calculation of Ideal Solution Value A* and Negative Ideal Solution Value A-

	Overseas Sales/Gross Sales	**Gross Profit Margin = Gross Profit / Gross Sales**	**Net Profit Margin = Net Profit for the Period / Net Sales**	**Operating Profit Margin = Operating Profit / Net Sales**	**Overseas Sales / Total Exports from Turkey**
A* (Max)	0,0912	0,0790	0,0966	0,0963	0,0875
A- (Min)	0,0057	0,0284	0,0103	0,0180	0,0014

Since all criteria are treated as benefit criteria in the TOPSIS analysis, the positive ideal solution (A*) is determined based on the maximum values of each criterion, while the negative ideal solution (A−) is determined based on the minimum values.

Stage 5: Calculation of the Distances to the Ideal Solutions

Distance of positive ideal solution value;

$$D_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^+)^2}$$

Distance of positive ideal solution value;

$$D_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2}$$

Table 9: Si* and Si- Values

Sector	D_i^+ (Si*)	D_i^- (Si-)
10	0,1228	0,0916
11	0,1492	0,0690
13	0,1323	0,0486
14	0,1406	0,0611
15	0,1637	0,0170
16	0,1436	0,0398
17	0,1297	0,0475
18	0,1582	0,0202
20	0,0996	0,0773
21	0,1112	0,1213
22	0,1186	0,0629
23	0,1243	0,0540
24	0,1194	0,0923
25	0,1174	0,0643
26	0,1244	0,0559
27	0,1023	0,0926
28	0,0936	0,0859
29	0,1055	0,1002
30	0,0598	0,1529
31	0,1485	0,0292
32	0,1414	0,0589

Stage 6: Calculation of the Relative Closeness to the Ideal Solution

The similarity value to the ideal solution for each alternative is calculated as follows

$$C_i = \frac{D_i^-}{D_i^+ + D_i^-}$$

Table 10: Closeness of Ideal Relative Solution Ci*

Sector	Ci*
10	0,427
11	0,316
13	0,268
14	0,303
15	0,094
16	0,217
17	0,268
18	0,113
20	0,436
21	0,521
22	0,346
23	0,302
24	0,435
25	0,354
26	0,310
27	0,475
28	0,478
29	0,487

30	0,718
31	0,164
32	0,294

The values given in Table 10 represent the export performance indicators of Turkey's manufacturing industry sectors based on 2023 data. Ci^* value close to 1 indicates that the sector has a high export performance within the framework of the relevant indicators, while a Ci^* value close to 0 indicates a low export performance for that sector. When looking at the export performance values of the sectors in Table 10, the sectors with values close to 1 are identified as follows: 10-Manufacture of Food Products, 20-Manufacture of Chemicals and Chemical Products, 21-Manufacture of Basic Pharmaceutical Products and Pharmaceutical Preparations, 24-Basic Metal Industry, 27-Manufacture of Electrical Equipment, 28-Manufacture of Machinery and Equipment n.e.c., 29-Manufacture of Motor Vehicles, Trailers and Semi-Trailers, 30-Manufacture of Other Transport Equipment. The sectors with values close to 0 and considered to have low export performance are 15-Manufacture of Leather and Related Products, 18-Printing and Reproduction of Recorded Media, 31-Manufacture of Furniture.

Stage 7: Ranking of Alternatives

Table 11 presents the sector rankings based on the decision matrix created with 2023 data. In the final stage of the analysis, the list formed by ranking the sectors according to their closeness value to 1 represents the performance ranking of the manufacturing industry sectors based on 2023 data.

Table 11: Performance Ranking of Manufacturing Industry Sectors According to TOPSIS Analysis (2023)

Sector no	Sector name	Ci*
30	Manufacture of Other Transportation Equipment	0,718
21	Manufacture of Basic Pharmaceutical Products and Pharmaceutical Materials	0,521
29	Manufacture of Motor Vehicles, Trailers, and Semi-Trailers	0,487
28	Other Manufacture of NCE Machinery and Equipment	0,478
27	Manufacture of Electrical Equipment	0,475
20	Manufacture of Chemicals and Chemical Products	0,436
24	Primary Metal Industry	0,435
10	Manufacture of Food Products	0,427
25	Manufacture of Fabricated Metal Products	0,354
22	Manufacture of Rubber and Plastic Products	0,346
11	Manufacture of Beverages	0,316
26	Manufacture of Computers, Electronic and Optical Products	0,310
14	Manufacture of Clothing	0,303
23	Manufacture of Other Non-Metallic Mineral Products	0,302
32	Other Manufacturing	0,294
13	Manufacture of Textile Products	0,268
17	Manufacture of Paper and Paper Products	0,268
16	Manufacture of Wood, Wood Products, and Cork Products	0,217
31	Manufacture of Furniture Products	0,164
18	Printing and Reproduction of Recorded Media	0,113
15	Manufacture of Leather and Related Products	0,094

4.3. Performance Rankings of Manufacturing Industry Sectors According to the TOPSIS Method (2009-2023)

Table 12 presents the export performance values of manufacturing industry sectors calculated for the period 2009-2023. According to the table, which is created based on values calculated separately for each year, some sectors within the manufacturing industry generally maintain their positions in the upper ranks, while the performance values of other sectors consistently remain behind.

Table 12: Export Performance of Manufacturing Industry 2009-2023

Years/No	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
10	0.413	0.343	0.420	0.406	0.499	0.441	0.429	0.425	0.382	0.292	0.329	0.399	0.373	0.396	0.427
11	0.532	0.450	0.355	0.386	0.300	0.207	0.093	0.063	0.154	0.013	0.169	0.056	0.296	0.000	0.316
13	0.414	0.387	0.490	0.404	0.537	0.395	0.395	0.388	0.344	0.300	0.272	0.362	0.376	0.312	0.269
14	0.453	0.432	0.397	0.440	0.578	0.453	0.463	0.387	0.372	0.321	0.296	0.362	0.332	0.307	0.303
15	0.289	0.225	0.297	0.191	0.439	0.148	0.182	0.125	0.107	0.099	0.117	0.131	0.129	0.165	0.094
16	0.312	0.299	0.339	0.372	0.313	0.253	0.172	0.217	0.149	0.157	0.128	0.212	0.332	0.231	0.217
17	0.306	0.215	0.338	0.305	0.491	0.259	0.222	0.203	0.212	0.284	0.224	0.282	0.352	0.320	0.268
18	0.263	0.151	0.124	0.230	0.386	0.137	0.155	0.145	0.113	0.097	0.117	0.128	0.124	0.154	0.114
20	0.449	0.458	0.659	0.492	0.662	0.524	0.508	0.523	0.470	0.439	0.370	0.436	0.499	0.460	0.437
21	0.453	0.391	0.175	0.323	0.314	0.353	0.421	0.457	0.388	0.343	0.450	0.446	0.435	0.493	0.522
22	0.444	0.337	0.452	0.384	0.527	0.379	0.365	0.375	0.302	0.287	0.286	0.350	0.356	0.336	0.347
23	0.432	0.418	0.507	0.386	0.587	0.431	0.408	0.386	0.223	0.180	0.190	0.254	0.312	0.371	0.303
24	0.407	0.504	0.562	0.534	0.554	0.538	0.437	0.513	0.556	0.561	0.432	0.527	0.720	0.552	0.436
25	0.414	0.351	0.449	0.392	0.578	0.357	0.414	0.396	0.305	0.309	0.309	0.378	0.409	0.389	0.354
26	0.552	0.453	0.451	0.494	0.508	0.480	0.485	0.463	0.389	0.491	0.477	0.471	0.420	0.417	0.310
27	0.617	0.525	0.574	0.522	0.718	0.525	0.540	0.512	0.440	0.402	0.367	0.489	0.488	0.420	0.475
28	0.466	0.445	0.586	0.498	0.683	0.495	0.499	0.472	0.413	0.390	0.381	0.429	0.437	0.453	0.479
29	0.560	0.594	0.757	0.629	0.732	0.612	0.614	0.632	0.644	0.573	0.567	0.633	0.625	0.564	0.487
30	0.497	0.391	0.411	0.404	0.293	0.566	0.555	0.558	0.508	0.582	0.568	0.513	0.559	0.662	0.719
31	0.361	0.272	0.371	0.270	0.494	0.222	0.246	0.183	0.144	0.123	0.163	0.193	0.178	0.227	0.164
32	0.313	0.182	0.268	0.208	0.462	0.293	0.318	0.301	0.273	0.240	0.262	0.353	0.315	0.307	0.294

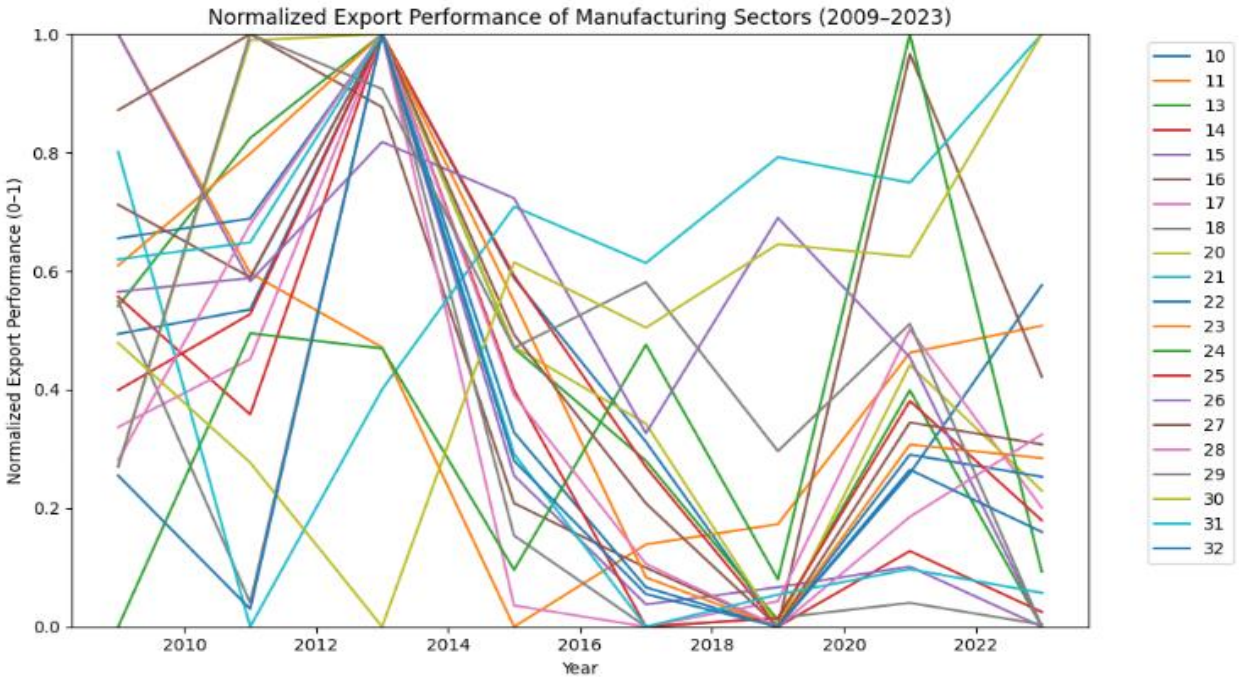

Figure 1: Normalized Export Performance of Manufacturing Sectors (2009-2023)

It is also possible to interpret the performance of manufacturing industry sectors over the period 2009–2023 within the framework of the selected criteria by using a graphical representation. First, the values obtained for each sector on a yearly basis are transformed into the 0–1 range through min–max normalization. In this context, the value of 0 represents the lowest performance period for each sector individually, while the value of 1 indicates the highest performance period. Accordingly, the year in which a sector achieves its best performance corresponds to the value of 1, whereas the period with the poorest performance is reflected at

the lowest point. Although the graph exhibits a generally dispersed pattern, two specific years stand out. The year 2013 reflects a positive export performance, which may be attributed to factors such as an increase in global demand, exchange rate advantages, incentive mechanisms, or broader cyclical effects. In contrast, the year 2019 can be evaluated negatively due to factors including the global economic slowdown, rising input costs, demand contraction, and the adverse effects of exchange rate volatility. Furthermore, as observed in the graph, the manufacturing industry exhibits a high degree of volatility, along with a general structural break characterized by a downward trend after 2015, followed by a dispersed recovery pattern in the post-2015 period. Overall, the findings suggest that manufacturing industry sectors constitute a relatively fragile area in general terms.

5. Conclusion and Discussion

Manufacturing industry sectors hold a significant place within a country's total production volume. Although their average share in total GDP is around 20%, they account for nearly 90% in terms of foreign trade. Therefore, improving the export performance of manufacturing industry sectors is important for the national economy across a broad spectrum—from gross national income to foreign trade, employment, and tax revenues. These sectors need to be supported and motivated to transform into technology-intensive activities through R&D and innovation, tax incentives, subsidies, and similar methods to ensure sustainable economic growth. Manufacturing industry sectors should be regarded not only as matters concerning the sectors themselves and their stakeholders but as actors that affect the overall national economy, and policies should be developed accordingly.

In this study, a performance analysis was conducted based on foreign trade data of 21 manufacturing industry sectors for the period 2009-2023. Several points need to be emphasized as a result of the analyses. The sector represented by number 30, Manufacture of Other Transport Equipment, shows above-average performance. Subcategories within this sector include ship and boat building, manufacture of railway locomotives and wagons, manufacture of aircraft and spacecraft along with related machinery, manufacture of military combat vehicles, and manufacture of transport equipment not classified elsewhere.

The top three sectors in terms of performance are the **Manufacture of Other Transportation Equipment**, **Manufacture of Basic Pharmaceutical Products and Pharmaceutical Materials**, and **Manufacture of Motor Vehicles, Trailers, and Semi-Trailers**. Structurally, these sectors encompass specialized production equipment, high value-added products with low demand elasticity, and industrial products with widespread applications. These sectors are also conventionally more exposed to international trade. Therefore, it is reasonable that they rank highly in a study evaluating the export performance of manufacturing industry sectors. On the other hand, sectors such as **Manufacture of Furniture Products**, **Printing and Reproduction of Recorded Media**, and **Manufacture of Leather and Related Products**, which are more labor-intensive, have high substitutability, and primarily cater to domestic consumption, are expected to exhibit relatively lower performance. Finally, sectors like **Manufacture of Rubber and Plastic Products**, **Manufacture of Beverages**, and **Manufacture of Computers, Electronic and Optical Products** are influenced by industrial production intensity and, to some extent, higher technology intensity in terms of export performance. These sectors do not produce highly labor-intensive or easily substitutable products, nor do they require substantial R&D expenditures.

The sector represented by number 21 includes Basic Pharmaceutical Products Manufacture and Manufacture of Pharmaceutical Preparations. This sector’s production process also heavily involves technology and R&D. The sector represented by number 29 covers Manufacture of Motor Vehicles, Trailers, and Semi-Trailers, including the manufacture of motor vehicles, motor vehicle bodies (coachwork), trailers and semi-trailers, as well as parts and accessories for motor vehicles.

The sub-sectors under sector number 28 include Manufacture of General-Purpose Machinery, Manufacture of Other General-Purpose Machinery, Manufacture of Agricultural and Forestry Machinery, Manufacture of Metalworking Machinery and Machine Tools, and Manufacture of Other Special-Purpose Machinery. Sector number 27 is the Manufacture of Electrical Equipment. Its sub-sectors include the manufacture of electric motors, generators, transformers, and electrical distribution and control apparatus; manufacture of accumulators and batteries; manufacture of wires, cables, and related articles for electrical wiring;

manufacture of electric lighting equipment; manufacture of household appliances; and manufacture of other electrical equipment.

Sector number 20 covers the Manufacture of Chemicals and Chemical Products. Subcategories under this include manufacture of basic chemicals, chemical fertilizers and nitrogen compounds, primary form plastics and synthetic rubber, manufacture of pesticides and other agrochemical products, manufacture of paints, varnishes and similar coatings, printing ink and mastics, manufacture of soap and detergents, cleaning and polishing preparations, perfumes, cosmetics and toiletries, manufacture of other chemical products, and manufacture of artificial or synthetic fibers.

Sector number 24 is the Basic Metal Industry. Its sub-sectors consist of manufacture of basic iron and steel products and ferroalloys, manufacture of tubes, pipes, hollow profiles, and related fittings of steel, manufacture of other products obtained during the first processing of steel, manufacture of precious basic metals and other non-ferrous metals, and metal casting industry sub-sectors. When examining the sectors and sub-sectors below the average, the sector represented by number 15, Manufacture of Leather and Related Products, stands out. This sector includes tanning and processing of leather; manufacture of luggage, handbags, saddlery, and harnesses; processing and dyeing of fur; and manufacture of footwear such as shoes, boots, and slippers. The export performance of this sector is quite low. Sector number 18 is Printing and Reproduction of Recorded Media. Its sub-sectors include printing and related service activities, and reproduction of recorded media. Sector number 31 is the Furniture sector.

Based on the variables used in the study, the results obtained can be interpreted from several different perspectives. As shown in Tables 10 and 11, manufacturing industry sectors are ranked according to their profitability and export performance indicators. These rankings indicate that the sectors predominantly exhibit a medium level of performance. As a policy recommendation, solutions aimed at improving the variables used in the analysis at the firm level should be proposed. It is necessary to identify the factors that negatively affect profitability and exports and to support firms accordingly. These sectors with low export performance tend to be more labor-intensive and have lower technology intensity. Their competitiveness in international trade and production techniques need to be reconsidered and revised. Policy recommendations regarding manufacturing industry sectors cover a broad scope. In generalized terms, there is a need for substantial measures such as reducing the use of imported intermediate inputs, expanding and supporting priority sectors, calculating sectoral multiplier effects and implementing support programs accordingly, adopting confidence-enhancing measures against exchange rate volatility, and developing practices that mitigate the adverse effects of trade barriers.

The export performance of the Turkish economy is largely dependent on the production capacity and efficiency of the manufacturing sectors. The primary reason for this is that the share of manufacturing sectors in total product exports is approximately 93%. Consequently, the stronger the manufacturing sectors, the higher the country's performance in foreign trade. As evidenced by performance analyses, sectors within manufacturing that exhibit higher performance are also those that rank at the top of Turkey's total exports. Another finding of the analysis is that a significant portion of sectors demonstrate medium-level performance values, which indicates the necessity of further enhancing performance in the manufacturing industries. At this point, an additional remark can be made based on the general structural issues observed in Turkey's foreign trade. Although the issue of import dependency in manufacturing sectors is not directly within the scope of this study, foreign trade statistics indicate that these sectors generally exhibit a high level of import dependency. Since export growth achieved through the importation of intermediate and raw materials has only a limited effect on overall economic performance, this reflects one of the structural problems of the Turkish economy. Therefore, policies aimed at reducing import dependency should be developed for sectors ranked according to their export performance. In addition, it is essential to identify the challenges faced by sectors with below-average export performance and to remove the barriers that hinder their growth. Policies that promote the domestic production of substitute intermediate goods, provide tax exemptions, offer employment incentives, and strengthen protectionism should be accelerated to enhance competitiveness.

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