

COMPARATIVE FINANCIAL PERFORMANCE ANALYSIS OF KEY SECTORS IN TURKEY

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Abstract

The financial performance of Turkey's major industries from 2017 to 2021 is examined in this study. It analyzes structural financial changes over time and compares sectoral performance using profitability, liquidity, leverage, and efficiency ratios. Focusing on businesses in key industries like finance, energy, automotive, technology, construction, food, and industry, the analysis evaluates how internal and external factors influence financial resilience. The results give academics, investors, and policymakers a strategic foundation for assessing economic trends and projecting future sectoral developments in Turkey by offering insightful information on the advantages and disadvantages of each area. The findings have policy ramifications for post-crisis recovery plans, investment assessment, and sectoral resilience.

Keywords: Financial Performance, Financial Indicators, Sectoral Analysis, Economic Insights.

Jel classification: G20, G21, G23.

TÜRKİYE’DE SEKTÖREL FİNANSAL PERFORMANSIN KIYASLAMALI ANALİZİ

Özet

Bu çalışmada, Türkiye’deki başlıca sektörlerin 2017–2021 yılları arasındaki finansal performansı incelenmektedir. Çalışma, zaman içinde yapısal finansal değişimleri analiz etmekte ve kârlılık, likidite, kaldıraç ve etkinlik oranları aracılığıyla sektörel performansı karşılaştırmaktadır. Finans, enerji, otomotiv, teknoloji, inşaat, gıda ve sanayi gibi kilit sektörlerde faaliyet gösteren işletmelere odaklanarak, iç ve dış faktörlerin finansal dayanıklılığı nasıl etkilediği değerlendirilmektedir. Elde edilen sonuçlar, her sektörün güçlü ve zayıf yönlerine ilişkin önemli bilgiler sunarak akademisyenler, yatırımcılar ve politika yapımcılar için Türkiye’deki ekonomik eğilimleri değerlendirme ve gelecekteki sektörel gelişmeleri öngörme konusunda stratejik bir temel sağlamaktadır. Bulgular ayrıca kriz sonrası toparlanma planları, yatırım değerlendirmeleri ve sektörel dayanıklılık açısından politika çıkarımları içermektedir.

Anahtar Kelimeler: Finansal Performans, Finansal Göstergeler, Sektörel Analiz, Ekonomik İçgörüler.

Jel sınıflaması: G20, G21, G23.

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Extended Abstract

The purpose of this study is to compare the financial performance of several important Turkish economic sectors from 2017 to 2021. To comprehend the economic structure and the ability of sectors to withstand crises, sectoral financial performance analysis is essential. Sectoral performance varies significantly in developing countries like Turkey because different sectors are impacted to differing degrees by both internal and external economic volatility. The Turkish economy has faced many difficulties during the research period, including fluctuating exchange rates, inflationary pressures, tensions in international commerce, and particularly the COVID-19 pandemic, all of which have had varying effects on the financial results of various sectors. While some industries saw significant declines during the epidemic, others took advantage of expansion prospects. This demonstrates how different sectors have varying levels of financial and economic resilience.

The study measures the financial performance of sectors using important financial variables like profitability, liquidity, leverage, and efficiency ratios. These parameters varied significantly amongst sectors, according to the research. The effect of financial structure on sectoral performance is particularly noteworthy. For example, short-term borrowing has been found to boost export intensity in some industries, although the relationship between financial structure and performance varies depending on sector-specific factors. Furthermore, the connection between financial performance and sustainability reporting is investigated. It was discovered that sustainability methods pertaining to social and environmental responsibility had a favorable impact on financial performance in industries including food, beverage, and textiles. This result emphasizes how crucial it is for businesses to show social, environmental, and economic performance in the current business climate.

The study's conclusions show that sectoral financial performance is complex and influenced by sector-specific factors. Therefore, regardless of overall economic conditions, policymakers, investors, and sector leaders should create plans specific to each sector. Furthermore, it is important to acknowledge that sustainable practices contribute to long-term financial success. This study seeks to be a useful resource for future research and adds to the sectoral financial analysis of the Turkish economy.

1. Introduction

An essential tool for comprehending a nation's economic structure and the resilience of its sectors is sectoral financial performance analysis. Sector-based financial studies are crucial in developing economies like Turkey because different sectors are impacted to differing degrees by both internal and external shocks. Exchange rate swings, inflationary pressures, conflicts in international commerce, and the COVID-19 pandemic all had varying effects on different sectors of the Turkish economy between 2017 and 2021. In particular, the pandemic created growth prospects in certain industries while causing severe contractions in others (Ataman, Gökçen, & Şimşek, 2022; Voyvoda & Yeldan, 2020).

Financial structure is one of the key elements influencing sectoral financial performance. For example, short-term borrowing was shown to boost export intensity in Turkey's industrial sectors, suggesting that different sectors have different relationships between financial structure and performance (Yıkılmaz Erkol & Coşkun, 2020). Furthermore, financial performance in the food, beverage, and textile industries has been favorably correlated with sustainability reporting, indicating that social and environmental considerations also have an impact on financial results (Lehenchuk, Zhyhlei, Ivashko & Gliszczyński, 2023). Comparative, sector-wide longitudinal evaluations that cover several industries within the same national setting are still rare, particularly in emerging countries, despite the fact that many studies have assessed financial performance at the business or industry level. In order to close this gap, this study uses profitability, liquidity, leverage, and efficiency metrics to examine the financial performance of Turkey's main industries from 2017 to 2021. A thorough understanding of sectoral movements and resilience under economic stress is provided by the analysis, which covers important industries like finance, energy, automotive, technology, construction, food, and manufacturing.

The period of 2017 to 2021 was chosen since the Turkish economy was subjected to major internal and external shocks that had differing effects on various sectors. Examples of events that led to significant disparities in sectors performance include the 2018 currency crisis, the COVID-19 pandemic's economic and sectoral repercussions, and interruptions in global supply chains. In this perspective, this highlights the sectors' financial resilience and vulnerabilities throughout this time and illuminates the dynamics of this unique period, which have not been sufficiently explored in the majority of earlier research. Furthermore, previous research has often examined longer time periods in an average fashion; however, the abrupt changes brought on by crisis years have not been fully examined at the sectoral level. This study fills this vacuum and gives investors and policymakers a chance to assess sectors performance during brief but severe shocks. Although the chosen period is somewhat brief, this

intense and exceptional time frame serves as the primary justification for the study, particularly in terms of comprehending the impacts of these shocks.

This study's comprehensive sectoral-level examination over a multi-year timeframe that encompasses significant macroeconomic disturbances like the COVID-19 epidemic and currency shocks. By using a comparative lens, this study makes it possible to identify resilience trends and fundamental financial transitions across industries.

Thus, by addressing a methodological and contextual vacuum in the literature, our work offers an addition. The results enhance the scholarly conversation on sector-based financial sustainability and macroeconomic adaptation while also providing useful information for investors and policymakers.

2. Literature Review

While prior research has employed multi-criteria decision-making (MCDM) techniques to examine Turkey's financial performance, integrated regression-based analyses that concurrently take into account sector-specific characteristics, environmental certification, and governance are scarce. Using financial metrics and MCDM methodologies, numerous research evaluated the financial performance of Turkish sectors between 2009 and 2021. Between 2009 and 2020, professional, scientific, and technological activities, as well as wholesale and retail trade, continuously showed the best overall performance (Yalçinkaya & Başaran, 2022). In a similar vein, the retail trade industry performed well for several years between 2017 and 2021 (Şenol et al., 2024). On the other hand, because of changes in interest rates and exchange rates, the construction industry reached its lowest performance in 2018 after peaking in 2012 (Öznur Doğan & Özlem Doğan, 2023). Most likely as a result of the COVID-19 pandemic, the health sector's performance peaked in 2020 but fell in 2021 (Erdoğan, 2023). The resilience of sectors against financial shocks is closely related not only to economic indicators but also to the quality of risk management and internal auditing within the organization. According to Mansyur and Saban (2023), the transportation and storage industry had its best performance in 2009 and its worst in 2021. These research used consolidated balance sheet data to assess sectoral performance using techniques like TOPSIS, Entropy, CCSD, COCOSO, SOWIA-ELECTRE III, and Grey Relational Analysis. The assessments heavily relied on important financial metrics including return on equity (Şenol et al., 2024; Erdoğan, 2023). Additionally, some research revealed partial correlations between stock returns and financial performance, highlighting the usefulness of these assessments for investors and decision-makers (Şenol et al., 2024; Çulhaoğlu & Yeşildağ, 2023).

The corporate governance structure is the cornerstone of financial sustainability. Especially during periods of crisis, the functioning of these structures is shaped by the psychosocial responses of decision-makers and their strategic flexibility (İslamoğlu & Tiring, 2026). Ataman, Gökçen, and Şimşek (2022) examined 250 enterprises in 22 BIST sub-sectors to determine how the COVID-19 pandemic affected sectoral financial performance in Turkey between 2016 and 2020. They looked at profitability statistics such return on equity, return on assets, and net profit margin. Karadeniz, Koşan, Günay and Beyazgül (2017) evaluated the financial performance of 21 subsectors in Turkey's manufacturing industry between 2012 and 2014 using the Grey Relational Analysis (GRA) approach. They conducted a thorough sectoral assessment using 32 financial parameters based on data released by the Central Bank of the Republic of Turkey (CBRT). Before and during the COVID-19 pandemic, Ersoy and Orçun (2022) looked at the financial performance of Turkish businesses in the Chemicals, Pharmaceuticals, Petroleum, Rubber, and Plastics sectors. For 32 businesses in the industry, financial ratios were computed for the years 2018 and 2019 (before to COVID) and 2020 (during COVID). The financial criteria's weights were established using the Entropy approach, and performance was assessed using the TOPSIS method. When studies on sectoral performance measurement are examined, Ersoy and Tehci (2020) analyzed the efficiency levels of logistics companies listed in the Fortune 500 for the years 2016–2017 using the Data Envelopment Analysis (DEA) method. The study revealed that, in order to maintain their competitiveness, firms need to integrate their marketing and logistics activities and conduct continuous performance evaluations, which is of critical importance. Financial performance studies conducted in the context of Turkey are not limited to industrial or service sectors; they also include performance evaluations of specialized organizational structures such as sports clubs (Zaman, Alakuş, & Bulut, 2015). Such studies demonstrate the applicability of financial ratios across different fields. Five major structural breakpoints have been identified in the Turkish economy between 2005 and 2020 (Demirdağ & Sağır, 2021). Between 2011 and 2015, 19 manufacturing companies included in the Borsa Istanbul Sustainability Index had their financial performance examined by Akyüz and Yeşil (2017). Ratio analysis was used to evaluate the companies' financial health, and rating agencies' corporate governance compliance scores were taken into account. The comparability of sectoral financial performance across the literature is limited by the methodological variations among these studies. This study fills a major need by providing a multi-sector, longitudinal financial analysis, whereas the majority of prior studies concentrated on single sectors or brief durations. This method improves knowledge of Turkey's financial structure changes over time and sectoral resilience.

2.1. Studies Employing Multi-Criteria Decision-Making (MCDM) Methods

Özari & Demirkale (2024) examined the financial performance of Turkey's transportation and storage industry from 2009 to 2021 using TOPSIS and entropy methodologies. The entropy approach was used to determine the criteria weights, and ratios from the period's consolidated financial statements were used to assess the financial performance. Şenol et al. (2024) used an integrated SOWIA-ELECTRE III approach to analyze the financial performance of ten real sectors in Turkey between 2016 and 2022. They employed ELECTRE III for sector ranking and SOWIA for establishing criteria weights. To evaluate the connection between sector index returns and financial rankings, they also used Spearman's rank correlation coefficient.

Işık (2019) used CRITIC-based TOPSIS and MULTIMOORA multi-criteria decision-making techniques to assess the non-life insurance industry's financial performance in Turkey between 2009 and 2017. Ten financial ratios unique to the insurance industry were used as criteria in the analysis, and the industry's performance was evaluated annually. According to the analysis, 2012 had the worst performance, while 2017 was the most successful year.

Kurt, İmren, and Karayılmazlar (2021) used the Entropy-based PROMETHEE approach to examine the financial performance of paper, wood, and furniture enterprises in Turkey's forest industry sector. For the years 2018, 2019, and 2020—including the COVID-19 period—the study assessed the performance of fifteen companies listed on the Borsa Istanbul (BIST) stock exchange. Eleven financial ratios pertaining to liquidity, profitability, activity, and financial structure were included in the analysis. The PROMETHEE approach was used to rank the companies based on pairwise comparisons of the alternatives for each criterion, while the Entropy method was utilized to determine the weights of the criteria. The results showed that the pandemic had no effect on the businesses' financial performance.

Erdoğan (2023) used MCDM methodologies to assess the Turkish health sector's financial performance from 2017 to 2021. The weights of performance criteria were determined using the Statistical Variance (SV) approach, and performance was evaluated using the EDAS method. The COVID-19 epidemic was blamed for a notable drop in performance in 2021, according to the results.

Doğan and Doğan (2023) used the entropy-based TOPSIS approach to examine the financial performance of Turkey's construction industry from 2011 to 2020. The financial ratio criteria's importance weights were determined using the entropy method, which provides an objective method independent of subjective assessments. The sector's financial performance was then assessed using the TOPSIS approach, which identified the ideal and negative ideal

solutions, computed the distances from these solutions, and ranked the options according to how close they were to the ideal answer. The Central Bank of the Republic of Turkey's financial ratios served as the analysis's input data. Çulhaoğlu and Yeşildağ (2023) examined the correlation between stock returns and financial performance in the retail trade, pharmaceutical, and food industries listed on Borsa Istanbul (BIST) between 2017 and 2021. Three MCDM techniques were used in the study: Entropy, Grey Relational Analysis (GRA), and TOPSIS. The findings showed a strong correlation between stock returns and financial performance.

Using a variety of financial research techniques, Kavas & Medetoğlu (2023) assessed the financial performance of companies in Turkey's BIST Forest Products and Furniture Sector between 2017 and 2021. The TOPSIS multi-criteria decision-making method is used to rank companies' financial performance; horizontal analysis is used to evaluate changes in financial statement data over time; vertical analysis is used to look at the proportionate size of financial statement items; and ratio analysis is used to assess the companies' financial condition and compare it to industry averages.

This study uses regression-based analysis to provide a thorough and comparative assessment of sectoral financial performance across several industries in Turkey. This study offers a more comprehensive and multifaceted evaluation by combining environmental certification and governance criteria with financial metrics, in contrast to other research that frequently concentrates on specific industries or just employs ranking techniques. This integrated methodology unveils the structural factors that determine financial resilience over time in addition to revealing sectoral variances.

3. Methodology

3.1. Sample and Data Collection

140 businesses from seven different industries—finance, energy, construction, automotive, food, technology, and industry—make up the sample. Companies listed on Borsa Istanbul (BIST) that functioned continuously between 2017 and 2021 make up the study's sample. Based on their primary business activities, companies were divided into seven major sectors: finance, energy, automobile, technology, construction, food, and industrial. The analysis only included companies that had complete financial data over the whole study period. Although the total sample size ($n=140$) is adequate for sectoral comparison, the distribution of firms across sectors may not be fully homogeneous. Some sectors, such as technology and energy, may include relatively fewer firms compared to others. This uneven distribution may limit

the generalizability of sector-specific findings and should be considered when interpreting the results.

3.2. Study Design

In order to investigate how corporate traits and environmental certification affect financial performance metrics, this study used a quantitative, cross-sectional research approach. The main goal was to look into how CEO-Chairperson duality, ISO 14001 certification (Environmental Management System – EMS), and group affiliation (such as public vs. private ownership) affect businesses' financial performance, with a particular emphasis on Return on Assets (ROA) and Profitability of Sales. Data were collected from a sample of firms operating in various sectors. The analysis proceeded in two stages:

The combined effects of the independent factors (Group, Duality, ISO 14001, and their interactions) on the two dependent variables (ROA and Profitability of Sales) were evaluated using Multivariate Analysis of Variance (MANOVA). The CEO-Chairperson duality and the interaction between ISO 14001 certification and Group membership had statistically significant effects on profitability metrics, according to the MANOVA results. The individual effects on each dependent variable were then investigated using univariate analyses of variance (ANOVA). These analyses demonstrated that while both Group and ISO 14001 certification had an impact on the Profitability of Sales, CEO duality had a substantial impact on ROA. Additionally, the same profitability metric was significantly impacted by the interplay between Group and ISO 14001. The impact of sectoral variations on four important financial metrics—ROA, Leverage Ratio, Profitability of Sales, and LOGROE—was then examined using a General Linear Model (GLM) framework. With R^2 values ranging from 0.352 to 0.579, suggesting moderate to high explanatory power, the findings showed that sectoral affiliation had statistically significant effects on all four variables. Overall, the study design used univariate and multivariate statistical methods to offer a solid evaluation of the ways in which sectoral context, environmental certification, and governance structure all influence business financial performance. In a further step, a General Linear Model (GLM) framework was applied to analyze the influence of sectoral differences on four key financial indicators: ROA, Leverage Ratio, Profitability of Sales, and LOGROE. The results revealed that sectoral affiliation had statistically significant effects on all four variables, with R^2 values ranging from 0.352 to 0.579, indicating moderate to high explanatory power. Overall, the study design integrated multivariate and univariate statistical techniques to provide a robust assessment of how governance structure, environmental certification, and sectoral context collectively shape firm financial performance.

3.3. Statistical Methods

The comprehensive and comparative analysis of the financial performance of companies in Turkey's seven main industries over a number of years is what makes this study unique. Unlike previous studies, this one integrates financial ratios with management criteria such as corporate governance structure, environmental certifications, and sustainability strategies. Using advanced statistical methods like regression analysis and MANOVA, the study provides a comprehensive examination of how these factors collectively impact financial success. This thorough approach offers more insights into sectoral financial dynamics while methodologically and empirically contributing to the corpus of prior knowledge.

The Public Disclosure Platform (KAP), a trustworthy database, provided the financial information. Based on companies' yearly financial statements, key financial ratios were computed, including profitability (net profit margin, return on equity), liquidity (current ratio, quick ratio), leverage (debt/equity ratio, total debt ratio), and efficiency (asset turnover, inventory turnover). Only publicly traded companies that were active during the analysis period and independently reported their financials were included in the sample. To maintain the consistency and dependability of the comparative analysis, companies with missing data, those that merged or left the market, or those that drastically changed their line of business throughout the period were eliminated. Regression analysis and MANOVA (Multivariate Analysis of Variance) techniques were chosen for this study in order to fully investigate the connections between management variables and financial performance. The linear relationship between the dependent variable (such ROAA, a financial performance indicator) and one or more independent factors was measured using regression analysis. The benefit of this approach is that it can be used to determine which management and financial elements have a major impact on performance, as well as the direction and strength of these impacts. The Kolmogorov-Smirnov and Shapiro-Wilk tests were used to test the financial ratios' normalcy assumptions prior to the analysis. Non-parametric techniques were used when the data did not follow a normal distribution. Additionally, Variance Inflation Factor (VIF) values were computed in order to identify any multicollinearity among the independent variables. Multicollinearity is typically not a major concern when VIF values are less than 10. These initial tests guarantee the analytical model's robustness and statistical correctness. To concurrently determine if several dependent variables differ based on group variables, MANOVA was utilized. This approach produced more thorough and multifaceted results than univariate analyses by revealing how several financial performance metrics are collectively impacted by management structure.

Regression study revealed that while board diversity has a beneficial impact on ROAA, other variables, notably financial leverage, have a significant negative impact. This suggests that while diversification and good management boost performance, the company's debt structure lowers returns. Several performance metrics (such as ROAA, ROE, and profit margin) exhibit notable variations based on the management structure, according to MANOVA studies. This demonstrates how the management structure affects the company's financial performance in a variety of ways. In conclusion, factors influencing financial performance were thoroughly assessed both at the individual and multivariate levels by combining regression and MANOVA analyses, producing significant results.

In this study, multiple linear regression analysis was applied to analyze the impact of key determinants on firm profitability. The basic regression model used in the analysis is defined as follows:

$$Y = \beta_0 + \beta_1(\text{Leverage}) + \beta_2(\text{Duality}) + \beta_3(\text{BOARDDIVERSITY}) + \beta_4(\text{BOARD}) + \beta_5(\text{INDBM}) + \beta_6(\text{KEA}) + \varepsilon$$

Y represents the dependent variable (firm profitability, such as ROA or operating profit margin),

Leverage refers to the financial leverage ratio of the firm,

Duality is a dummy variable indicating whether the CEO and the board chair positions are held by the same person,

BOARDDIVERSITY indicates the level of diversity within the board of directors,

BOARD refers to the size of the board of directors,

INDBM denotes the proportion of independent members on the board,

KEA represents the proportion of female executives,

ε is the error term.

4. Results

4.1. Regression Analysis Results

This model aims to evaluate the impact of corporate governance structure and board characteristics on firm profitability.

Table 1: Results of Regression Analysis

Regression Statistics	Value
Multiple R	0.6469
R Square	0.4185
Adjusted R Square	0.3923
Standard Error	0.0430
Observations	140

The regression model shows a Multiple R of 0.6469, indicating a moderate positive correlation between the independent variables and the dependent variable. The R Square value of 0.4185 means that approximately 41.85% of the variance in the dependent variable is explained by the model's predictors, which suggests a moderate level of explanatory power. The Adjusted R Square of 0.3923 adjusts for the number of predictors, indicating that about 39.23% of the variance is accounted for when considering model complexity. The Standard Error of 0.0430 reflects the average distance that the observed values fall from the regression line, with lower values indicating better model fit. Lastly, the analysis is based on 140 observations, providing a reasonable sample size for the regression. The joint effect of ISO 14001 and group affiliation indicates that sustainability practices yield different profitability benefits depending on ownership structure.

4.2. ANOVA Analysis Results

Table 2: ANOVA Summary for Regression Model

Source	df	SS	MS	F	Significance F
Regression	6	0.177007429	0.029501238	15.95524922	9.25224E-14
Residual	133	0.245916853	0.001848999		
Total	139	0.422924283			

The ANOVA table tests the overall significance of the regression model. With 6 degrees of freedom for regression and 133 for residuals, the model explains a sum of squares (SS) of 0.1770 compared to the residual SS of 0.2459. The mean square (MS) for regression is

0.0295, which is much higher than the residual mean square of 0.0018, resulting in an F-value of 15.96. This high F-value indicates that the model's predictors significantly explain the variation in the dependent variable. The Significance F (p-value) is 9.25×10^{-14} , which is far below the conventional 0.05 threshold, confirming that the regression model is statistically significant. In other words, there is strong evidence that at least one of the independent variables reliably predicts the dependent variable.

Table 3: Coefficients for Independent Variables Predicting ROAA

Variable	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.2219	0.0377	5.8939	0.0000	0.1474	0.2964
Leverage	-0.1357	0.0199	-6.8144	0.0000	-0.1750	-0.0963
Duality	0.0493	0.0149	3.3102	0.0012	0.0199	0.0788
BOARDDIVERSITY	0.0100	0.0041	2.4405	0.0160	0.0019	0.0181
BOARD	0.0055	0.0024	2.2710	0.0248	0.0007	0.0103
INDBM	-0.0193	0.0069	-2.8009	0.0059	-0.0329	-0.0057
KEA	-0.0056	0.0022	-2.4963	0.0138	-0.0099	-0.0012

$R^2 = 0.419$: The independent variables in the model explain 41.9% of the total variance in ROAA. This represents a moderate level of success in explaining financial performance. F-test ($p < 0.001$): The model is statistically significant overall, indicating that the variables used collectively have a meaningful impact on ROAA.

4.3. MANOVA and Interaction Effects

Table 4: Effect of Independent Variables on ROAA

Variable	Coefficient	Significance (p)	Interpretation
Leverage	-0.136	< 0.001	As leverage increases, ROAA significantly decreases. A higher debt ratio negatively affects the firm's asset returns.
Duality	0.049	0.0012	CEO duality (when the board chair is also the CEO) positively affects ROAA. This may enhance decision-making efficiency.
Board Diversity	0.010	0.016	Greater board diversity positively increases ROAA. Different perspectives contribute to financial performance.
Board	0.006	0.025	Larger or more structured boards positively impact ROAA. Broader or more effective boards may provide benefits.
INDBM	-0.019	0.006	An increase in the number of independent board members decreases ROAA. Independence does not always have a positive effect.
KEA	-0.006	0.014	The KEA variable (likely a managerial or financial ratio) negatively impacts ROAA.

A Multivariate Analysis of Variance (MANOVA) was conducted to evaluate the combined effects of Group affiliation, CEO-Chairperson Duality, and ISO 14001 certification on two key profitability indicators: Return on Assets (ROA) and Profitability of Sales (Bulut, 2023). Duality has a statistically significant joint effect on ROA and Profitability of Sales (*Wilks' Lambda* = 0.889, $F(2,134) = 8.383$, $p < 0.001$). Indicates that firms with and without CEO-Chairperson duality show significantly different profitability levels. The interaction between Group and ISO 14001 is also significant (*Wilks' Lambda* = 0.923, $F(2,134) = 5.567$, $p = 0.005$). Suggests that ISO 14001's impact on profitability varies by group affiliation. The individual effects of Group and ISO 14001 were not statistically significant on their own (*Group*: $p = 0.111$; *ISO 14001*: $p = 0.067$). Firm profitability is influenced not just by isolated governance or certification factors, but by their interactions. CEO-Chairperson duality and the combined presence of ISO certification and group membership play an important role in shaping financial performance. A comprehensive, integrated assessment is essential.

Table 5. MANOVA Test Results by Sector

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	ROA	0.051	4	0.013	4.640	0.002
	Profitability of Sales	0.282	4	0.071	3.098	0.018
Intercept	ROA	0.274	1	0.274	99.545	0.000
	Profitability of Sales	2.487	1	2.487	109.164	0.000
Group	ROA	0.000	1	0.000	0.109	0.742
	Profitability of Sales	0.102	1	0.102	4.499	0.036
Duality	ROA	0.045	1	0.045	16.238	0.000
	Profitability of Sales	0.044	1	0.044	1.921	0.168
ISO14001	ROA	0.001	1	0.001	0.511	0.476
	Profitability of Sales	0.102	1	0.102	4.476	0.036
Group * Duality	ROA	0.000	0	–	–	–
	Profitability of Sales	0.000	0	–	–	–
Group * ISO14001	ROA	0.006	1	0.006	2.190	0.141
	Profitability of Sales	0.173	1	0.173	7.602	0.007
Duality * ISO14001	ROA	0.000	0	–	–	–
	Profitability of Sales	0.000	0	–	–	–
Group * Duality * ISO14001	ROA	0.000	0	–	–	–
	Profitability of Sales	0.000	0	–	–	–
Error	ROA	0.372	135	0.003		
	Profitability of Sales	3.075	135	0.023		
Total	ROA	0.809	140			
	Profitability of Sales	6.990	140			
Corrected Total	ROA	0.423	139			
	Profitability of Sales	3.357	139			

Effect Analysis – Group Type, CEO Duality, and ISO 14001 Certification

In the study, the effects of group type (public vs. private), CEO duality (whether the CEO and board chairperson are the same person), and ISO 14001 certification status on companies' financial performance indicators—namely Return on Assets (ROA) and Profitability of Sales—were tested using two-way ANOVA. For the ROA variable, the overall model was found to be statistically significant ($F = 4.640$; $p = 0.002$), with an explanatory power of 12.1% ($R^2 = 0.121$). Among the independent variables, only CEO duality had a statistically significant effect on ROA ($F = 16.238$; $p < 0.001$). This result indicates that the consolidation of CEO and board chairperson roles in a single individual has a significant impact on companies' return on assets.

Direct Effect: The individual impact of ISO 14001 on ROA ($p = 0.476$) and on Profit Margin ($p = 0.036$; however, $p = 0.067$ in the overall MANOVA) should be interpreted as weak.

Interaction Effect: The interaction term “Group * ISO 14001” is statistically significant for Profit Margin ($p = 0.007$), and the Wilks' Lambda value (0.923) supports this combined effect.

the certification yields a financial impact only when it is considered in conjunction with the firm's ownership structure (public vs. private).

4.4. Sectoral Comparative Analysis (GLM) Analysis Results

The Effect of Sectoral Differences on Financial Performance Indicators

Through the "Tests of Between-Subjects Effects," the General Linear Model (GLM) was used in the second stage of the study to determine whether the dependent variables (ROA, leverage ratio, profitability of sales, and LOGROE) differed significantly between sectors. Sectors were considered the independent variable in this research.

ROA (Return on Assets):

There are statistically significant differences in ROA across sectors ($F(6,122) = 14.139$, $p < 0.001$). The explanatory power of the model is $R^2 = 0.410$, indicating that 41% of the variance in ROA is explained by the sector variable. This demonstrates that sector has a strong effect on firms' return on assets.

Leverage Ratio:

The leverage ratio also shows statistically significant variation across sectors ($F(6,122) = 27.913$, $p < 0.001$). The R^2 value of 0.579 reveals that approximately 57.9% of the variance

in leverage is attributable to sectoral differences. This high explanatory power suggests that capital structure and debt levels vary substantially by sector.

Profitability of Sales:

Firms' profitability of sales differs significantly among sectors ($F(6,122) = 17.816$, $p < 0.001$). The R^2 value of 0.467 indicates that 46.7% of the variance in this variable is explained by sectoral differences. This finding underscores the role of sector-specific conditions in determining firms' profit margins from sales.

LOGROE (Log of Return on Equity)

The LOGROE variable also exhibits statistically significant variation across sectors ($F(6,122) = 11.038$, $p < 0.001$). With an R^2 of 0.352, the model explains 35.2% of the variance in LOGROE. While this explanatory power is lower than that of the other variables, it still indicates a moderate effect, highlighting the influence of sectoral context on equity profitability.

Overall Evaluation

The analyses clearly demonstrate that all key financial performance indicators—ROA, leverage ratio, profitability of sales, and LOGROE—differ significantly by sector ($p < 0.001$). The sector variable explains between 35% and nearly 58% of the variance in these indicators. These findings emphasize that sectoral differences are a critical determinant of corporate financial performance and underline the importance of incorporating sectoral context into financial analyses and evaluations. This suggests that sectoral affiliation is a strong predictor of financial leverage.

5. Results

This study examined the effects of group type (public vs. private), CEO duality, and ISO 14001 environmental certification on firms' financial performance, using return on assets (ROA) and profitability of sales as key indicators, through two-way ANOVA analyses. Additionally, sectoral variations in financial performance were analyzed via the General Linear Model (GLM), considering ROA, leverage ratio, profitability of sales, and logarithm of return on equity (LOGROE).

The contribution of this study lies in integrating governance variables (such as CEO duality) and environmental certification status with traditional financial indicators, enabling a comprehensive and multidimensional understanding of the drivers behind sectoral financial performance. This approach provides fresh insights for both academics and practitioners,

highlighting the strategic importance of internal governance and sustainability practices in shaping firm-level financial outcomes.

Two-Way ANOVA Results: The two-way ANOVA for ROA showed a statistically significant model ($F = 4.640$; $p = 0.002$) with an explanatory power of $R^2 = 0.121$. Among the factors examined, only CEO duality had a significant impact on ROA ($F = 16.238$; $p < 0.001$). This supports the agency theory perspective that CEO duality, by concentrating decision-making power, may enhance firm performance under certain governance conditions. Contrary to expectations, neither group type (public vs. private) nor ISO 14001 certification showed significant effects on ROA or profitability of sales. These findings align with previous literature suggesting that environmental certifications may have delayed or indirect financial benefits.

GLM Sectoral Analysis: Sectoral differences were significant across all financial indicators:

ROA ($F(6,122) = 14.139$, $p < 0.001$, $R^2 = 0.410$)

Leverage Ratio ($F(6,122) = 27.913$, $p < 0.001$, $R^2 = 0.579$)

Profitability of Sales ($F(6,122) = 17.816$, $p < 0.001$, $R^2 = 0.467$)

LOGROE ($F(6,122) = 11.038$, $p < 0.001$, $R^2 = 0.352$)

These results confirm that economic and managerial factors affect financial outcomes differently across sectors, emphasizing the need for sector-specific analyses when evaluating firm performance. Overall, the study's findings reveal that internal governance mechanisms (especially CEO duality) and sectoral characteristics significantly influence financial performance. The sector variable alone explains a substantial proportion (35–58%) of variance in financial metrics, underscoring its critical role. By combining governance, environmental certification, and traditional financial metrics, this study offers integrative perspective that deepens understanding of sectoral financial dynamics in Turkey.

6. Theoretical Implications

The study's results show that ROAA is negatively impacted by the INDBM variable, which represents the percentage of independent board members (Coefficient: -0.019 , $p=0.0059$). The "information asymmetry" that independent members encountered about the company's intricate internal operational procedures, especially during Turkey's severe macroeconomic crisis periods between 2017 and 2021, which were marked by exchange rate shocks, inflationary pressures, and the pandemic, can theoretically account for this situation. According

to Agency Theory, these members' over-monitoring behaviors—whose main responsibility is oversight—may have slowed down the quick and adaptable decision-making processes that are crucial in emergency situations, which would have reduced operational effectiveness and, ultimately, profitability. This conclusion shows that corporate independence may not always immediately improve financial performance; rather, the detrimental effects of independent members on strategic agility during times of severe shock may manifest as unfavorable financial outcomes. With a coefficient of -0.006 ($p=0.0138$), the study shows a statistically significant negative influence on ROAA with respect to the KEA variable (percentage of female executives). The "Glass Cliff" theory, which contends that women are more likely to be promoted to leadership roles at times of crisis or when financial performance is already unstable, can be used to interpret this finding.

During the analyzed period of 2017–2021, the Turkish economy faced severe challenges, including exchange rate volatility, inflationary pressures, and the COVID-19 pandemic. Specifically, sectors like construction reached their lowest performance in 2018 due to currency fluctuations, while others saw significant declines in 2020 and 2021 due to the pandemic. Therefore, the negative coefficient for KEA likely indicates that female executives in Turkey were often brought into leadership roles when companies were already operating under high-risk conditions and structural stress, rather than reflecting a deficiency in their management effectiveness. This suggests that the financial outcomes were largely shaped by the turbulent macroeconomic environment into which these executives were appointed,

7. Conclusion

While the vast majority of studies in the literature focus solely on Multi-Criteria Decision-Making (MCDM) and ranking methods, this study empirically demonstrates the direct and interactive roles of corporate governance variables such as CEO duality, independent board members (INDBM), and the ratio of female executives (KEA) on financial outcomes by integrating regression analysis and MANOVA methods. Specifically, the fact that the sector variable alone explains 35% to 58% of the variance in financial performance provides strong evidence that "sectoral belonging" plays a much more decisive and dominant role in financial performance compared to individual corporate policies in emerging markets like Turkey. These findings reveal that the financial resilience and profitability of companies are shaped not only by internal governance mechanisms but primarily by the structural dynamics and macroeconomic sensitivities of the sectors in which they operate.

This study examined the effects of group type (public vs. private), CEO duality, ISO 14001 certification, and sectoral differences on firms' financial performance. The key finding

is that CEO duality significantly enhances return on assets (ROA), supporting agency theory's assertion that consolidating CEO and board chair roles can improve decision-making efficiency, particularly with effective oversight (Meckling & Jensen, 1976; Finkelstein & D'Aveni, 1994). This finding contrasts with some prior research reporting negative effects of CEO duality (Rechner & Dalton, 1991).

ISO 14001 certification and ownership type showed no significant short-term impact on financial performance. The study findings reveal that ISO 14001 certification does not exert a direct effect on financial performance ($p > 0.05$). However, the interaction between Group Type and ISO 14001 has a statistically significant impact on Profitability of Sales ($p = 0.005$). This indicates that the financial success of environmental management systems is in a conditional relationship with the company's ownership structure and corporate ecosystem. Consequently, the effect of ISO 14001 does not manifest directly but rather emerges through interactions with organizational variables. This aligns with previous studies suggesting environmental certifications primarily enhance legitimacy and reputation rather than immediate financial gains, especially in developing markets or less environmentally sensitive sectors (King & Lenox, 2002; López-Gamero et al., 2009). Similarly, governance mechanisms and sectoral context often outweigh ownership structure in influencing profitability (Xu & Wang, 1999; Boubakri et al., 2005).

Sectoral differences emerged as the most powerful determinant, explaining 35–58% of variance across financial metrics including ROA, leverage, sales profitability, and ROE. This underscores the critical influence of industry-specific factors on firm performance (Schmalensee, 1985; Rumelt, 1991). The strong explanatory power for leverage ($R^2=0.579$) reflects sector-specific capital and risk profiles (Rajan & Zingales, 1995), while profitability variations conform to Porter's competitive dynamics framework (1980).

This study integrates governance, environmental certification, and sectoral factors in a comprehensive analysis of financial performance drivers, providing fresh insights for academics and practitioners. The findings advise tailored governance and evaluation frameworks sensitive to sectoral contexts rather than uniform policies. Furthermore, the long-term financial benefits of environmental certifications warrant further longitudinal research.

Limitations include reliance on secondary data, which may not fully capture firm-level managerial dynamics. Future studies should incorporate ESG metrics, export data, and extended timelines beyond 2021 to validate these insights. This study is limited by its cross-sectional design, which does not allow for the analysis of year-by-year changes or dynamic effects of macroeconomic shocks such as the 2018 currency crisis or the COVID-19

pandemic. Future research should employ panel data analysis to better capture temporal dynamics and structural break effects. Despite these limitations, the study provides robust empirical evidence by integrating governance, environmental, and sectoral variables within a unified analytical framework. The findings offer important implications for both academic research and policy-making in emerging economies.

Suggestions for Future Research

Future research should examine how institutional quality, environmental regulations, and board characteristics mediate governance-financial performance links. Longitudinal designs are also needed to capture the delayed financial returns of sustainability initiatives like ISO 14001.

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The author declares that I have no competing interests.

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