Araştırma Makalesi ● Research Article

Determinants of Turkish Firms' Sales Revenue: An Empirical Analysis in the Turkish Manufacturing Industry [*]

Türk Firmalarının Satış Gelirlerinin Belirleyicileri: Türk İmalat Sanayinde Ampirik Bir Analiz

Alper Sönmez [a, **] & Fazal Rahman Amirzai [b]

[a] Assoc. Prof. Dr., Selçuk University, Department of Economics, 42000, Selçuklu/Konya, Türkiye
ORCID: 0000-0001-5476-7627
[b] Ph.D. Candidate, Selçuk University, Department of Economics, 42000, Selçuklu/Konya, Türkiye
ORCID: 0000-0002-5389-2378

MAKALE BİLGİSİ

ÖZ

Bu çalışmanın amacı Türk imalat sanayinde faaliyet gösteren firmaların satış gelirlerini etkileyen belirleyici faktörleri araştırmaktır. Bu amaçla, firmaya özgü çeşitli özellikler ile satış geliri arasındaki ilişkiyi araştırmak için doğrusal bir regresyon analizi yapılmıştır. Çalışmada kullanılan veriler, Türkiye'de 1.063 imalat sanayi firmasını kapsayan 2019 Dünya Bankası İşletme Araştırması'ndan alınan mikro düzeydeki verilerdir. Bulgular, işgücü girdilerinin ve organizasyonel deneyimin önemini vurgulayarak, satış gelirini birincil etkileyen faktörler olarak işgücü büyüklüğünün ve firma yaşının öneminin altını çizmektedir. Yönetim deneyimi, yenilikçilik çabaları, eğitim yapısı ve cinsiyet çeşitliliği gibi değişkenler satış geliri ile sınırlı doğrudan ilişkiler gösterirken, Ar-Ge'ye yapılan stratejik yatırım kritik bir belirleyici olarak ortaya çıkmakta ve satış geliri üzerinde pozitif ve istatistiksel olarak anlamlı bir etki göstermektedir. Araştırma bulgularının, Türk imalat sanayinde firma performansını artırmak ve yenilik faaliyetlerini teşvik etmek isteyen hem firma karar alıcılarına hem de politika yapıcılara yol gösterici olması beklenmektedir.

ARTICLE INFO

ABSTRACT

The purpose of this study is to investigate the determinant factors impacting the sales revenue of firms in the Turkish manufacturing industry. For this purpose, a linear regression analysis is conducted to explore the relationship between various firm-specific characteristics and sales revenue. The data used in the study is micro-level data from the 2019 World Bank Enterprise Survey, encompassing 1,063 manufacturing firms in Turkey. The findings underscore the significance of workforce size and firm age as primary influencers of sales revenue, emphasizing the importance of labor inputs and organizational experience. While variables such as managerial experience, innovation efforts, educational composition, and gender diversity demonstrate limited direct associations with sales revenue, strategic investment in R&D emerges as a critical determinant, showing a positive and statistically significant impact on sales revenue. The findings of the study are expected to provide guidance for both firm decision-makers and policymakers seeking to enhance firm performance and foster innovation activities in the Turkish manufacturing industry.

1. Introduction

The success of firms depends significantly on their ability to generate sales revenue, which serves as a crucial indicator of firm's financial health, competitiveness, and growth potential within the economy. Financial health refers to the overall well-being of a firm's financial strength and operational soundness, encompassing its ability to generate profit, manage cash flow, meet financial obligations, and maintain stability over time. In the context of the Turkish

---

manufacturing industry, where understanding factors that drive sales revenue is pivotal, assessing financial health through metrics like profitability, liquidity, and efficiency becomes essential.

The motivation for this research stems from the dynamic and competitive nature of the manufacturing industry in Turkey, characterized by rapid technological advancements, evolving market dynamics, and increasing global competition. In such a landscape, identifying the key factors that influence sales revenue becomes imperative for firms seeking to enhance their performance and sustain growth in the long term.

Drawing on data from the World Bank Enterprise Survey (World Bank, 2019), this study employs linear regression, to explore the relationship between various firm-specific characteristics and sales revenue. By examining factors such as workforce composition, managerial expertise and investment in R&D, the study aims to uncover the underlying drivers of revenue generation in the Turkish manufacturing industry.

The significance of this study lies in its potential to provide actionable insights for firms, policymakers, and practitioners. By understanding the factors that contribute to sales revenue, manufacturing firms can develop informed strategies to optimize performance, allocate resources efficiently, and maintain competitiveness in the market. Additionally, policymakers can leverage these insights to formulate targeted policies and initiatives aimed at fostering a conducive environment for manufacturing firms to thrive and contribute to the broader economic growth agenda. In addition, this study also seeks to contribute to the existing body of knowledge by shedding light on the complicated factors that shape sales revenue of the firms in the industry. By providing empirical evidence and actionable insights, this study aims to inform decision-making processes and facilitate strategic planning for stakeholders across the industry.

The study comprises five sections, each with a specific role. The rest of the study is organized as follows. The first section serves as the introduction, setting the stage for the research topic. Second section summarizes the literature on innovation strategies and sales revenue in the Turkish manufacturing industry. Third section describes the data sources and research methodology. Section four presents the empirical analysis and findings on the determinants of sales revenue. The last section concludes and summarizes the study's key takeaways, and discusses the implications of these findings for the firms in the Turkish manufacturing industry.

2. Literature Review

The investigation of determinants influencing sales revenue in manufacturing firms has been a focal point of scholarly research, with studies employing various methodologies to explore the complex impact of factors shaping firm performance. This literature review provides a brief overview of key findings and theoretical frameworks regarding the variables and methodology employed in the study.

Studies in the literature suggest a positive relationship between firm size and sales revenue, with larger firms often enjoying economies of scale and greater market penetration capabilities (Pervan & Višić, 2012; Olawale et al., 2017; Ibhagui & Olokoyo, 2018). Additionally, firm age has been examined as a predictor of revenue generation, with studies indicating a nonlinear relationship, where younger firms may experience rapid revenue growth initially, followed by a stabilization or decline in growth rates over time (Loderer & Waelchli, 2010; Coad et al., 2013; 2018).

The role of managerial expertise, particularly top managers' experience, has received considerable attention in the literature. Empirical studies have consistently highlighted the impact of managerial experience on firm performance, including sales revenue (Bathula, 2008; Davis et al., 2010; Huang, 2014; Hamori & Koyuncu, 2015). Experienced managers are often better equipped to navigate market uncertainties, devise effective strategies, and capitalize on emerging opportunities, thereby contributing to revenue growth (Peni, 2014).

R&D is another crucial determinant of firm performance, including sales revenue. Prior researches suggest that firms investing in R&D activities tend to introduce innovative products or processes, thereby gaining a competitive edge and increasing their revenue potential (Bathula, 2008; Krasnikov & Jayachandran, 2008; Sönmez & Amirzai, 2023).

The educational composition of the workforce, measured by the percentage of workers with secondary education qualifications, has been explored as a potential determinant of firm performance. While a skilled workforce is often viewed as essential for innovation and productivity (Erden et al., 2014), empirical evidence on its direct impact on sales revenue remains mixed, with some studies highlighting significant effects while others find limited or no association (Jalbert et al., 2002; Thornhill, 2006; Magoutas et al., 2011).

Innovation strategies and gender diversity in top management have also received attention in the literature as potential drivers of sales revenue. Studies have suggested that firms embracing innovation and fostering gender diversity in leadership positions may experience enhanced performance outcomes, including revenue growth (Anandarajan et al., 2007; Magoutas et al., 2011; Perryman et al., 2016). The Table 1 provides a summary of the reviewed literature and gives information about the theoretical frameworks, the methods used, and key findings of the articles.

Table 1: Summary of Review of Literature

Author(s) & Year	Title	Journal	Methodology	Key Findings
Loderer & Waelchli (2010)	Firm age and performance	N/A	Empirical analysis, data documentation	Profitability declines with firm age. Increased costs, slowed growth, obsolete assets, decreased investment and R&D. Poorer governance, larger boards, higher CEO pay in older firms. Evidence of organizational rigidities and rent-seeking behavior over time.
Coad et al. (2018)	Firm age and performance	Journal of Evolutionary Economics	Exhaustive literature review, original empirical studies, econometric analysis	Firm age affects various performance metrics, including innovation performance, financial performance, exports, survival, and growth. Older firms may face challenges in maintaining high performance levels. The diversity of country contexts and analytical methods enriches the findings.
Olawale et al. (2017)	The effect of firm size on performance of firms in Nigeria	The IEB International Journal of Finance	Panel data analysis, pooled regression model, fixed effects model, random effects model	Firm size measured by total assets negatively affects performance, while firm size measured by total sales positively affects performance. Leverage and working capital positively affect performance.
Ibhagui & Olokoyo (2018)	Leverage and firm performance: New evidence on the role of firm size	The North American Journal of Economics and Finance	Hansen threshold regression model, panel data analysis	Leverage negatively affects firm performance more significantly for small-sized firms. This negative effect diminishes as firm size increases and disappears beyond a certain threshold. Positive relationship between leverage and Tobin's Q observed, stronger for small-sized firms.
Pervan & Višić (2012)	Influence of firm size on its business success	Croatian Operational Research Review	Financial analysis using profitability ratios, statistical analysis	Firm size has a significant positive (although weak) influence on firm profitability. Assets turnover and debt ratio also statistically significantly influence firm performance. Current ratio did not prove to be an important explanatory variable of firms' profitability.
Hamori & Koyuncu (2015)	Experience matters? The impact of prior CEO experience on firm performance	Human Resource Management	Analysis of CEOs in S&P 500 corporations, statistical analysis	CEO experience negatively correlates with firm performance post-succession. CEOs moving directly from previous CEO roles or with job-specific experience show lower performance.
Peni (2014)	CEO and chairperson characteristics and firm performance	Journal of Management & Governance	Analysis of S&P 500 firms, statistical analysis	CEO and Chairperson characteristics (demographic and experience-related) influence firm performance. Positive relationship found between female CEOs or Chairs and firm performance. Mixed results for age, positive for experience and quality. CEO holding multiple board seats negatively impacts firm performance.
Davis et al. (2010)	Entrepreneurial orientation and firm performance: The moderating role of managerial power	American Journal of Business	Utilizing Covin and Slevin's conceptual framework	Top managers with high risk tolerance, preference for innovation, and proactiveness positively impact firm performance. Influence of managerial power on EO and firm performance examined. Top managers' prestige, structural power, and expert power moderate the relationship between

				entrepreneurial orientation and firm performance.
Huang (2014)	Managerial expertise, corporate decisions and firm value: Evidence from corporate refocusing	Journal of Financial Intermediation	Analysis of CEOs' industry expertise and divestiture decisions	CEOs with industry expertise are more likely to divest divisions where they lack experience, aiming to improve CEO-firm match and focus. Such divestitures lead to improved operating performance and significant stock returns lasting three years. Greater CEO experience correlates with higher gains in firm value from divestitures. Divestitures enhancing focus without improving expertise-asset match do not enhance firm value long-term.
Bathula (2008)	Board characteristics and firm performance: Evidence from New Zealand	Doctoral Thesis, AUT	Longitudinal analysis (GLS)	Examines the relationship between board characteristics (e.g., size, CEO duality, gender diversity) and firm performance (measured by ROA) using a sample of 156 New Zealand firms. Finds positive/negative associations with various board attributes.
Krasnikov & Jayachandran (2008)	The relative impact of marketing, research and development, and operations capabilities on firm performance	Journal of Marketing	Meta-analysis using mixed-effects model	Marketing capability generally has a stronger impact on firm performance compared to research and development and operations capabilities. Results offer managerial guidelines and suggest areas for further research.
Sönmez & Amirzai (2023)	Factors impacting on product and process innovation capability: An empirical analysis on manufacturing firms in turkey	Journal of Emerging Economies and Policy	Analysis using 2019 World Bank Enterprise Survey (WEBS) database, binary logistic regression, bivariate probit regression	Internal R&D activities significantly influence both product and process innovation capabilities of manufacturing firms in Turkey. Use of foreign technology positively affects product innovation but has a weaker effect on process innovation. Foreign ownership positively impacts process innovation. Human capital development has positive impacts on both product and process innovation activities.
Shin et al. (2017)	R&D and firm performance in the semiconductor industry	Taylor & Francis Online	Empirical analysis	Examines the relationship between R&D investment and financial performance of fabless and vertically integrated firms in the semiconductor industry from 2000 to 2010. Finds that fabless firms, despite spending more on R&D relative to sales, achieve higher gross and net margins, higher return on assets (ROA), and greater intangible value (Tobin's q) compared to vertically integrated firms. Suggests that while the semiconductor industry as a whole may be overinvesting in R&D, fabless firms benefit from focusing on chip design and leveraging manufacturing partners' process innovations
Erden et al. (2014)	Knowledge-flows and firm performance	Journal of Business Research	Longitudinal research with data on global public biopharmaceutical firms, testing knowledge flow model	Knowledge-flows have a largely nonlinear impact on firm performance. Geographical location, traditionally a measure of knowledge-flows, shows no significant influence in the extended model. Implications discussed for practice and research.

Jalbert et al. (2002)	Does school matter? An empirical analysis of CEO education, compensation, and firm performance	International Business and Economics Research Journal	Empirical analysis	Examines CEO educational backgrounds from Forbes 800 list. Finds most CEOs have undergraduate degrees, about half have graduate degrees. No significant impact of school attended on CEO compensation. Association found between possession of a degree and firm's Return on Assets (ROA) and Tobin's Q.
Magoutas et al. (2011)	Education and firm performance: Empirical evidence from Greece	International Journal of Economic Research	Panel data techniques	Examines education's role in Greek manufacturing firms' financial performance using panel data from 287 firms over 2004-2006. Finds significant influence of education on economic performance.
Thornhill (2006)	Knowledge, innovation and firm performance in high- and low-technology regimes	Journal of Business Venturing,	Survey data from 845 Canadian manufacturing firms	Industries with higher R&D intensity have higher firm-level innovation rates. Innovation correlates with revenue growth, regardless of industry dynamism. Skilled workforce benefits firm performance most in dynamic environments; stable industries benefit from training investments.
Anandarajan et al. (2007)	The effect of innovative activity on firm performance: The experience of Taiwan	Advances in Accounting	Analysis of patents granted and firm performance	Innovative activity measured by patents significantly influences firm performance, particularly as measured by Tobin's q. Greater impact observed when patents are granted in the United States. Market values innovation more when patents are granted by the U.S. Patenting Office to foreign firms. Impact of patenting activity varies with the stage of the product in the industry chain, strongest when patents are granted in the design stage.
Robb & Watson (2012)	Gender differences in firm performance: Evidence from new ventures in the United States	Journal of Business Venturing	Longitudinal study using a database of 4000+ new ventures in the US, 2004-2009	Examines firm performance between female- and male-owned new ventures using size-adjusted and risk-adjusted measures. Finds no significant performance differences when controlling for demographics.
Perryman et al. (2016)	Do gender differences persist? An examination of gender diversity on firm performance, risk, and executive compensation	Journal of Business Research	Empirical investigation using data on gender diversity in top management teams (TMTs), firm performance, risk, and executive compensation	Greater gender diversity in TMTs correlates with lower firm risk and better performance. Female executives tend to receive lower compensation compared to males, but this disparity decreases as gender diversity in TMTs increases.

Note: Constructed by the authors.

The present study adopts a quantitative approach, specifically linear regression analysis, to examine the relationship between the aforementioned variables and sales revenue of the firms in the Turkish manufacturing industry. This methodological choice aligns with prior research employing regression techniques to investigate the firm performance determinants, offering robust statistical inference and facilitating hypothesis testing (Kuncová et al., 2016).

The literature review highlights the complex nature of factors impacting sales revenue of the firms and underscores the importance of empirical research to explain these relationships. By building on existing knowledge and employing logical methodology, the study aims to

contribute to a deeper understanding of revenue generation dynamics in the Turkish manufacturing industry.

3. Data and Methodology

Data

The dataset used in the study is based on the firm-level data drawn from the 2019 World Bank Enterprise Survey (World Bank, 2019). This dataset encompasses valuable information from 1,063 firms operating in the Turkish manufacturing industry. The survey is known for its protracted data collection methods, ensuring comprehensive coverage of various business aspects, including innovation strategies and financial metrics, all denominated in Turkish Lira (TRY). The choice of the 2019 dataset was driven by its status as the most recent and comprehensive source available at the time of our study. This ensured that we had access to up-to-date and reliable data to analyze the factors influencing firm sales revenue in the context of Turkish manufacturing industry. Table 2 tabulates a list of the variables constructed and utilized in the study.

Table 2: List of the Variables

Variables	Definitions
Dependent Variable	
Sales Revenue (in TRY)	***This variable signifies the total sales revenue generated by each firm during the fiscal year (TRY). It serves as a crucial performance metric, reflecting a firm's financial health and competitiveness within the industry.***
Independent Variables	
Size	This variable represents the size of the firm, quantified by the total count of full-time employees. It is treated as a continuous variable, meaning it takes on numerical values and can vary over a range. It serves as a measure of the firm's workforce capacity.
Age (year)	**Age signifies the maturity or longevity of the firm, measured by the number of years since its establishment. It is also treated as a continuous variable, providing a numeric representation of the firm's temporal existence. Age serves as an indicator of the firm's experience within its respective industry.**
Experience: Experience of Top Managers (year)	This variable captures the cumulative experience of top-level managers within the firm. It is treated as a continuous variable, denoting the total duration of managerial experience aggregated across key leadership roles. This variable reflects the human capital and expertise leveraged at the executive level to influence firm performance.
R&D	**The variable representing R&D activities is binary, with a value of 1 indicating that the firm allocates resources to R&D activities and a value of 0 indicating that the firm does not allocate resources to R&D activities. This binary representation simplifies the understanding of whether a firm engages in R&D endeavors or not.**
Education: % of Workers with Secondary Education	This variable denotes the proportion of the firm's workforce possessing secondary education qualifications. It is treated as a continuous variable, quantifying the educational attainment level of the labor force. It provides insight into the skill composition and human capital profile of the firm's employees
Innovation	**It is a binary variable that dichotomously indicates whether the firm engages in innovative practices. It assumes a value of 1 if the firm pursues innovation, and 0 otherwise. This binary indicator serves to differentiate firms based on their innovative behavior, facilitating the analysis of its impact on performance outcomes.**
Gender: Gender of Top Manager	This binary variable specifies the gender of top manager, taking a value of 1 if the top ı female and 0 if male. This variable enables the examination of gender diversity within leadership and its potential influence on firm performance and dynamics.

Source: Extracted from the World Bank Enterprise Survey (World Bank, 2019).

Table 3 presents a detailed overview of the descriptive statistics for the variables analyzed. Sales revenue, the dependent variable, is analyzed alongside several independent variables, including firm size, age, managerial experience, R&D expenditure, workforce education levels, innovation adoption, and gender diversity in top management. Through comprehensive descriptive statistics, such as means, standard deviations, minimum and maximum values, as well as frequency counts for categorical variables, Table 3 provides a comprehensive picture of the characteristics and distributions of these key variables. This analysis lays the groundwork for further exploration into the relationships and dynamics impacting sales revenues of the firms.

Table 3: Descriptive Statistics

Variables	n	Mean	SD	Min.	Max.
Sales Revenue (TRY)	1,063	4.41e+07	2.47e+08	50000	8.00E+09
Size	**1,056**	**103.29**	**249.29**	**3**	**3000**
Age (year)	1,047	20.51	14.37	2	99
Experience (year)	**1,051**	**25.92**	**12.08**	**2**	**70**
R&D					
Yes	1,051	0.17	0.37	0	1
Education (%)	**336**	**49.85**	**23.78**	**0**	**100**
Innovation (1 if the firm pursues innovation and 0, otherwise)	1,055	0.096	0.29	0	1
Gender (1 if the top manager is female, and 0 if male)	**1,063**	**0.069**	**0.25**	**0**	**1**

The descriptive statistics provided in Table 3, offer valuable insights into the characteristics of the variables under consideration within the dataset. Firstly, regarding sales revenue (TRY), the mean value of approximately 44,1M Turkish Lira (TRY) and a standard deviation of 247M TRY indicates a considerable variation in revenue among the manufacturing firms surveyed. The minimum value of 50K TRY suggests that even smaller firms are included in the dataset, while the maximum value of 8B TRY highlights the presence of outliers with exceptionally high revenue figures. Similarly, when examining the size variable, the mean of 103.29 and standard deviation of 249.29 underscore the diversity in the workforce size among these firms. The range from a minimum of 3 to a maximum of 3,000 employees further demonstrates the wide spectrum of firm sizes represented in the dataset. For age and experience, the mean values of approximately 20.51 years and 25.92 years provide insights into the average age of firms and average experience level of top managers. Innovation with nearly 0.10 mean value shows the prevalence of firm's innovation pursuits in the industry. The standard deviations indicate the degree of variability around these mean values. The R&D expenditure variable, categorized into "*Yes*" and "*No*" groups, reveals that approximately 17.32% of the firms surveyed invest in R&D activities. This suggests a moderate level of commitment to innovation-driven growth strategies within the industry. Moreover, the education variable demonstrates a mean percentage of 49.85, indicating that, on average, around half of the workforce possesses some level of education beyond the primary level. The range from 0 to 100 signifies the diverse educational backgrounds among employees in these manufacturing firms. Lastly, the gender variable shows that approximately 6.96% of the top managers are female. While this percentage may seem relatively low, it reflects the current gender composition within leadership positions in the Turkish manufacturing industry.

Methodology

The question addressed in the study revolves around identifying the key determinants of sales revenue of the firms in the Turkish manufacturing industry. To explore this inquiry, a linear regression model was formulated to examine the relationship between various independent variables and the dependent variable, sales revenue. Therefore, the following empirical model is estimated:

$$Log(Sales\ revenue)_i = \beta_0 + \beta_1 Size_i + \beta_2 Age_i + \beta_3 Experience_i + \beta_4 R\&D_i + \beta_5 Education_i + \beta_6 Innovation_i + \beta_7 Gender_i + \epsilon \dots 1 \qquad (1)$$

In the equation 1, the dependent variable denotes firm i's log of sales revenue. Where, β's are coefficients representing the effect of each independent variable. The dependent variable, sales revenue, is hypothesized to be influenced by a combination of firm-specific characteristics and external factors. The independent variables include the number of full-time employees (size), the age of the firm (age), the cumulative experience of top managers (experience), R&D activities performed (R&D), the percentage of workers with secondary education qualifications (education), innovation adoption (innovation), and the gender diversity of top management (gender). The coefficients (β) associated with each independent variable provide insights into the magnitude and direction of their impact on sales revenue, while the error term (ϵ) accounts for unexplained variability in sales revenue not captured by the independent variables.

By examining these relationships, the study aims to uncover the underlying drivers of sales revenue generation of the firms in the Turkish manufacturing industry, contributing to a deeper understanding of the factors shaping firm performance.

4. Empirical Analysis and Findings

Results of the regression analysis is presented in Table 4. The results yield insightful findings regarding the impact of independent variables on sales revenue and unveil different insights into the factors influencing sales revenue. Through linear regression test of key predictor variables, the study sheds light on the dynamics shaping revenue generation in the industry.

Table 4: Result of the Linear Regression

Variables	Coef.	SE	t-value	p-value
Size	0.002***	0.00038	5.26	0.000
Age (year)	**0.015****	**0.00684**	**2.20**	**0.029**
Experience (year)	0.005	0.00807	0.73	0.466
R&D				
Yes	**0.724****	**0.234**	**3.09**	**0.002**
Education (%)	-0.004	0.0035	-1.37	0.172
Innovation				
Yes	**-0.048**	**0.281**	**-0.17**	**0.862**
Gender				
Female	0.302	0.397	0.76	0.447
Constant	**15.859**	**0.244**	**64.94**	**0.000**
R-squared	0.1889			
Adj R-squared	0.1708			
Prob > F	0.0000			
n	320			

*** $p<0.01$, ** $p<0.05$, * $p<0.10$

One of the notable findings refers to the pivotal role of workforce size in driving sales revenue. The positive coefficient associated with the number of full-time employees underscores the significance of labor inputs in facilitating production and revenue generation of the firms. Importantly, this relationship is highly statistically significant ($p<0.01$), indicating a robust association between workforce size and sales revenue. This finding aligns with the broader literature, highlighting the importance of human capital in driving economic output and organizational performance.

Furthermore, the age of manufacturing firms emerges as a significant determinant of sales revenue. The positive coefficient associated with firm age suggests that longevity and experience result in competitive advantages, such as brand reputation, market knowledge, and operational efficiency, which results into higher sales revenues over time. This relationship is statistically significant ($p<0.05$), underscoring the empirical validity of the association between firm age and sales revenue in the industry.

In contrast, certain factors such as the top manager's experience, pursuit of innovation, educational composition of the workforce, and gender diversity in leadership positions do not exhibit statistically significant associations with sales revenue. While these variables may influence other dimensions of firm performance or organizational dynamics, their direct impact on revenue generation appears to be limited.

A particularly noteworthy finding of the analysis relates to the role of R&D in driving sales revenue among firms. The positive coefficient associated with R&D investment underscores the strategic importance of innovation-driven growth strategies in enhancing competitiveness and market positioning within the industry. Importantly, this relationship is highly statistically significant ($p<0.05$), highlighting the imperative for manufacturing firms in Turkey to prioritize R&D initiatives as a means of fostering product innovation, technological advancement, and market differentiation to sustain revenue growth in an increasingly competitive global market.

In addition to the above analysis and findings, the regression model's performance indicators further enhance our understanding of the dynamics governing sales revenue among firms. The R-squared value of 0.1889 signifies that approximately 18.89% of the variability in sales revenue can be explained by the variables integrated into the model. This implies that while the included predictors offer valuable insights into revenue generation, there are still unaccounted factors contributing to the remaining variability. Moreover, the adjusted R-squared value, standing at 0.1708, provides a more conservative estimate of the model's explanatory power, adjusting for the number of predictors and the sample size. This adjusted value reaffirms that approximately 17.08% of the variance in sales revenue is explicable by the independent variables, considering the model's complexity and the data's scale. It suggests that while the model captures a notable portion of the variability, there may be limitations in fully explaining the details of revenue generation within the industry. The statistical significance of the overall regression model, indicated by the probability associated with the F-statistic (Prob>F=0.0000), underscores the model's robustness in outlining the determinants of sales revenue. This implies that the collective influence of the independent variables contributes significantly to explaining variations in sales revenue among firms. Thus, despite the modest proportion of variability explained, the model remains statistically sound and offers meaningful insights into the factors shaping revenue outcomes in the industry.

This regression analysis offers valuable insights into the determinants of sales revenue among manufacturing firms operating in Turkey. By describing the differential impacts of various factors on revenue generation and clarifying their statistical significance, the findings provide actionable

insights for firms and policymakers seeking to enhance firm performance, foster innovation, and drive economic growth in the industry.

5. Conclusion and Discussion

Regarding the findings of the study conducted on Turkish manufacturing firms, it's evident that several key understandings emerge regarding the factors influencing sales revenue of the firms. The analysis reveals a significant positive association between workforce size and sales revenue, underscoring the critical role of labor inputs in driving production and revenue generation. This finding suggests that manufacturing firms in Turkey should strategically consider expanding their workforce to enhance revenue streams, thereby leveraging the potential of human capital to fuel economic growth and organizational success.

Moreover, the study highlights the importance of organizational longevity and experience, as reflected in the positive relationship between firm age and sales revenue. Firms with a longer operational history tend to exhibit higher sales revenues, indicating the accumulation of expertise, market knowledge, and brand reputation over time. This underscores the value of implementing strategies that foster organizational continuity and continuous improvement, as well as recognizing the importance of established market presence in driving revenue growth of the firms.

However, certain variables, such as top manager's experience, pursuit of innovation, educational composition of the workforce, and gender diversity in leadership positions, do not show statistically significant associations with sales revenue. While these factors may impact other aspects of firm performance, their direct impact on revenue generation appears to be limited. Nonetheless, policymakers and firms should remain attentive to these factors as they may still contribute to overall organizational resilience and sustainability.

A notable finding of the analysis relates to the positive relationship between R&D and sales revenue. This underscores the strategic imperative for the firms to prioritize innovation-driven growth strategies. By investing in R&D initiatives, firms can foster innovation, technological advancement, and market differentiation, thereby enhancing competitiveness and sustainable economic growth in the industry.

Furthermore, while the regression model explains a significant portion of the variability in sales revenue, there remain unexplained factors influencing revenue dynamics of the firms. This highlights the need for further research to explore additional variables and methodologies, thereby refining our understanding and informing evidence-based decision-making. In conclusion, the findings of this research offer valuable insights for policymakers and Turkish manufacturing firms, providing a foundation for enhancing firm performance, fostering innovation, and driving sustainable economic growth in the industry.

In exploring the determinants of sales revenue among manufacturing firms in Turkey, this study aligns with traditional literature while uncovering unique insights into the factors driving firm performance. The findings confirm the significant influence of workforce size on revenue generation, echoing broader research that underscores the pivotal role of human capital in enhancing operational efficiency and production output. Similarly, the positive relationship between firm age and sales revenue highlights the competitive advantages associated with longevity, market experience, and brand reputation within the industry. Moreover, the study contributes valuable empirical evidence supporting the strategic importance of R&D investment in fostering innovation-led growth strategies, essential for maintaining competitiveness in a globalized market environment. These findings are supported by robust statistical significance ($p<0.01$ for workforce size, $p<0.05$ for firm age and R&D), reinforcing their reliability and applicability to the Turkish manufacturing context.

Interestingly, the study separates from some existing literature by not finding statistically significant associations between CEO characteristics and sales revenue, suggesting contextual factors at play in the leadership-performance dynamics specific to Turkey's manufacturing industry. This perspective adds depth to current understanding, emphasizing the need for tailored strategies that capitalize on workforce, firm age advantages, and strategic R&D investments to optimize revenue outcomes in the manufacturing sector.

References

Anandarajan, A., Chin, C. L., Chi, H. Y., & Lee, P. (2007). The Effect of Innovative Activity on Firm Performance: The Experience of Taiwan. *Advances in Accounting, 23*, 1-30.

Bathula, H. (2008). *Board Characteristics and Firm Performance: Evidence from New Zealand.* Doctoral thesis, Faculty of Business, Auckland University of Technology, New Zealand.

Coad, A., Segarra, A., & Teruel, M. (2013). Like Milk or Wine: Does Firm Performance Improve with Age?. *Structural Change and Economic Dynamics*, 24, 173-189.

Coad, A., Holm, J. R., Krafft, J., & Quatraro, F. (2018). Firm Age and Performance. *Journal of Evolutionary Economics,* 28(1), 1-11. https://doi.org/10.1007/s00191-017-0532-6.

Davis, J. L., Greg Bell, R., Tyge Payne, G. & Kreiser, P. M. (2010), Entrepreneurial Orientation and Firm Performance: The Moderating Role of Managerial Power, *American Journal of Business*, 25(2), 41-54.

Erden, Z., Klang, D., Sydler, R., & von Krogh, G. (2014). Knowledge-Flows and Firm Performance. *Journal of Business Research, 67*(1), 2777-2785.

Hamori, M., & Koyuncu, B. (2015). Experience Matters? The Impact of Prior CEO Experience on Firm Performance. *Human Resource Management, 54*(1), 23-44.

Huang, S. (2014). Managerial Expertise, Corporate Decisions and Firm Value: Evidence from Corporate Refocusing. *Journal of Financial Intermediation, 23*(3), 348-375.

Ibhagui, O. W., & Olokoyo, F. O. (2018). Leverage and Firm Performance: New Evidence on the Role of Firm Size. *The North American Journal of Economics and Finance, 45*, 57-82.

Jalbert, T., Rao, R. P., & Jalbert, M. (2002). Does School Matter? An Empirical Analysis of CEO Education, Compensation, and Firm Performance. *International Business and Economics Research Journal,* 1(1), 83-98.

Krasnikov, A. V., & Jayachandran, S. (2008). The Relative Impact of Marketing, Research-and-Development, and Operations Capabilities on Firm Performance. *Journal of Marketing, 72*(4), 1-11.

Kuncová, M., Hedija, V., & Fiala, R. (2016). Firm Size as a Determinant of Firm Performance: The Case of Swine Raising. *Agris on-line Papers in Economics and Informatics,* 8(3), 77-89.

Loderer, C. F. & Waelchli, U. (2010). Firm Age and Performance. Available at SSRN, http://dx.doi.org/10.213 9/ ssrn.1342248.

Magoutas, A. I., Agiomirgianakis, G. M., & Papadogonas, T. A. (2011). Education and Firm Performance. Empirical Evidence from Greece. *International Journal of Economic Research,* 8(2), 141-152.

Olawale, L. S., Ilo, B. M. & Lawal, F. K. (2017). The Effect of Firm Size on Performance of Firms in Nigeria, Aestimatio, *The IEB International Journal of Finance*, 15, 68-87.

Peni, E. (2014). CEO and Chairperson Characteristics and Firm Performance. *Journal of Management & Governance, 18(1)*, 185-205.

Perryman, A. A., Fernando, G. D., & Tripathy, A. (2016). Do Gender Differences Persist? An Examination of Gender Diversity on Firm Performance, Risk, and Executive Compensation. *Journal of Business Research,* 69(2), 579-586.

Pervan, M., & Višić, J. (2012). Influence of Firm Size on its Business Success. *Croatian Operational Research Review, 3*(1), 213-223.

Robb, A., & Watson, J. G. (2012). Gender Differences in Firm Performance: Evidence from New Ventures in the United States. *Journal of Business Venturing,* 27, 544-558.

Shin, N., Kraemer, K. L., & Dedrick, J. (2017). R&D and Firm Performance in the Semiconductor Industry. *Industry and Innovation,* 24(3), 280-297.

Sönmez, A., & Amirzai, F. R. (2023) Factors Impacting on Product and Process Innovation Capability: An Empirical Analysis on Manufacturing Firms in Turkey. *JOEEP: Journal of Emerging Economies and Policy,* 8(2), 348-357.

Thornhill, S. (2006). Knowledge, Innovation and Firm Performance in High-and Low-Technology Regimes. *Journal of Business Venturing, 21*(5), 687-703.

World Bank. (2019). World Bank Enterprise Surveys, http://www.enterprisesurveys.org, Turkey 2019 Database.