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Capital structure as a determinant of firm value: A moderation analysis of firm size

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Abstract: This study examines the effect of capital structure on firm value, with firm size as a moderating variable. Using a quantitative approach, the research focuses on 29 food and beverage manufacturing companies listed on the Indonesia Stock Exchange (IDX) during 2020–2023, yielding 116 firm-year observations. Panel data regression alongside moderated regression analysis (MRA) was employed to test the hypotheses. The results show that capital structure positively affects firm value. However, firm size does not directly influence firm value. Notably, the interaction between capital structure and firm size exhibits a negative effect, indicating that higher leverage reduces firm value in larger firms. These findings suggest that while debt can enhance firm value through tax advantages and financial discipline, its benefits may be offset in larger firms due to market concerns over excessive leverage. The study concludes that optimal debt management must consider firm size to avoid diminishing investor confidence. Practically, this research offers insights for corporate managers and policymakers in structuring capital financing strategies aligned with firm-specific characteristics, particularly size, to enhance firm value sustainably.

Keywords: *Capital structure, Firm size, Firm value.*

1. Introduction

Firm value is a key indicator that illustrates a company's business performance, future outlook, and the extent of market trust in its long-term sustainability. An increase in firm value not only boosts shareholders' wealth but also signals positively to investors and creditors about the firm's financial soundness and growth opportunities [1]. As a result, exploring the internal and external factors influencing firm value remains a significant theme in corporate finance studies, with capital structure frequently highlighted as a major determinant.

The composition of debt and equity financing—known as capital structure—has long been central to financial theory, particularly following the seminal work of Modigliani and Miller [2] who argued that capital structure would not affect a firm's valuation in an ideal, frictionless market. However, subsequent theoretical developments, such as the trade-off, pecking order, and agency theories, challenged this view by highlighting how capital structure choices can substantially impact firm value. These effects stem from the way financing decisions alter financial risk exposure, cost of capital, tax efficiency, and the extent of agency conflicts within firms [3].

Despite extensive research, the empirical relationship between capital structure and firm value remains inconsistent. Some studies find that higher leverage enhances firm value [3-5] while others report negative [6, 7] or statistically insignificant effects [8]. These divergent findings imply that the impact of capital structure may vary depending on firm-specific attributes. Among these, firm size has emerged as a plausible moderating factor. Larger firms are generally perceived to enjoy greater access

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to external capital, more diversified operations, and lower cost of financing. As a result, the effect of leverage on firm value might differ based on a firm's scale. Prior studies have indicated that large firms may be able to manage debt more efficiently without incurring excessive financial risk [9]. However, despite its theoretical importance, empirical evidence on the moderating effect of firm size remains limited, particularly within emerging market contexts.

This study examines manufacturing firms within the food and beverage sub-sector that are listed on the Indonesia Stock Exchange (IDX). The manufacturing sector plays a vital role in the national economy and is characterized by high financing needs and a substantial fixed cost structure. These characteristics make capital structure decisions particularly crucial in this sector [10]. Moreover, the size of manufacturing firms in Indonesia varies widely, making it a suitable context to test the moderating effect of firm size on the relationship between capital structure and firm value.

In light of the aforementioned issues, this study seeks to fill several important gaps in the literature. First, the existing empirical evidence on the link between capital structure and firm value remains fragmented and inconclusive. Second, the potential moderating role of firm size in shaping this relationship has not received sufficient attention, particularly within the context of emerging economies such as Indonesia. Third, research focusing specifically on manufacturing firms—especially those with substantial financing needs and complex capital structures—remains limited. To address these gaps, this study investigates the influence of capital structure on firm value, while incorporating firm size as a moderating variable, using data from manufacturing companies listed on the Indonesia Stock Exchange (IDX). The findings aim to enrich empirical understanding in corporate finance and offer practical implications for financial decision-makers, investors, and regulators in crafting capital structure policies aligned with firm characteristics.

2. Literature Review and Hypothesis Development

2.1. Capital Structure and Firm Value

Capital structure refers to the proportionate mix of debt and equity that a company employs to fund its operations and long-term investments. While Modigliani and Miller [2] argued that under ideal market conditions a firm's capital structure has no bearing on its value, subsequent research highlights how real-world imperfections—such as taxation, default risk, and agency costs—can make financing decisions highly consequential. These market frictions imply that the choice of capital structure can substantially influence a firm's financial performance and valuation.

The trade-off hypothesis posits that enterprises seek to achieve an optimal capital structure by weighing the tax advantages of debt financing against the potential for financial distress it may induce [11]. The pecking order theory posits that, owing to information asymmetry, corporations prioritize internal financing, followed by debt, and consider equity as a final alternative [12]. Agency theory suggests that debt serves as a disciplinary tool, improving managerial accountability and mitigating agency conflicts between owners and managers [13].

Empirical studies examining how capital structure affects firm value yield inconsistent outcomes. Some findings indicate a positive link, emphasizing the tax shield and reduced agency costs associated with debt [3-5]. In contrast, others highlight a negative association, citing heightened financial risk and potential insolvency [6, 7]. Additionally, some research reports no significant correlation [8].

Unique firm attributes, market conditions, and regulatory environments across nations may influence these differing results. Hence, further investigation within the Indonesian manufacturing context, where companies often rely heavily on debt and face weaker investor protections, is warranted.

2.2. The Role of Company Size as a Moderator

Firm size, typically represented by total assets, reflects a company's operational scale, financial resources, and ability to navigate market complexities. Larger enterprises often enjoy easier access to capital, reduced financing costs, and greater diversification, enabling them to manage leverage more

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effectively [9]. Agency theory posits that larger firms are more exposed to public and regulatory scrutiny, which helps curb managerial opportunism [13].

Empirical support exists for this moderating role [9] observed that leverage contributes more significantly to firm performance in large firms. Similarly, Widyakto, et al. [14] highlights that firm size amplifies the relationship between debt structure and firm value in Indonesia's manufacturing sector. Nevertheless, empirical studies in emerging economies addressing this moderation effect remain relatively scarce.

2.3. The Relationship Between Capital Structure and Firm Value

Capital structure is a crucial strategic decision in corporate financial management, as it reflects the combination of internal funds and external financing used to support a company's operations and investments. Decisions related to capital structure significantly influence firm value because they affect financial risk and investor return expectations.

The trade-off theory [15] states that firms seek to establish an optimal capital structure by balancing the tax advantages of debt (tax shield) against the risk of financial distress from excessive debt burdens. Therefore, a well-balanced capital structure is believed to enhance firm value.

From the signaling theory perspective [16] financing decisions—particularly the use of debt—can convey signals to the market regarding a company's condition and prospects. An increase in debt is often interpreted as management's confidence in the firm's future, which may positively influence firm value.

Several empirical studies support a positive relationship between capital structure and firm value. Hirdinis [4] found that leverage has a positive effect on firm value in Indonesia. Similar findings were reported by Wijaya and Asyik [10] in their study of the manufacturing sector listed on the Indonesia Stock Exchange. Additional support comes from studies by Saeedi and Mahmoodi [3]; Alghifari [17] and Setioko, et al. [18] although contradictory evidence has also been presented by Majumdar and Chhibber [6]; Kodongo, et al. [19] and Vătavu [7].

Based on these theoretical frameworks and empirical findings, the first hypothesis proposed is:
H_1: Capital structure affects firm value.

2.4. The Moderating Role of Firm Size on the Effect of Capital Structure and Firm Value

Firm size is an important characteristic often used as an indicator of a company's ability to manage financial risk, access funding, and maintain its market reputation. According to the pecking order theory [12] large firms tend to rely more on internal financing due to their more stable financial reserves, whereas smaller firms are more dependent on external sources of funds.

Agency theory [13] suggests that debt usage in capital structure can serve as a control mechanism for mitigating agency conflicts between managers and shareholders. The obligation to pay interest and principal limits managerial discretion, thereby reducing the potential for opportunistic behavior. Additionally, signaling theory [16] explains that the decision to take on debt can be perceived as a positive signal of the company's prospects, especially when the company is financially strong.

However, the relationship between capital structure and firm value is not universal and may vary depending on firm-specific characteristics, one of which is firm size. Size reflects operational scale, access to capital, and market expectations. Larger firms generally face a lower risk of bankruptcy, possess stronger reputations, and can access cheaper financing compared to smaller firms [4]. As a result, the effect of capital structure on firm value may differ depending on the firm's size.

Several studies support the moderating role of firm size. For instance, Suriawinata and Nurmalita [20] found that firm size moderates the relationship between ownership structure and firm value in Indonesia. Meanwhile, Hirdinis [4] revealed that firm size can either strengthen or weaken the influence of capital structure on firm value.

Taking these considerations into account, the second hypothesis proposed is:

H_2: Firm size moderates the effect of capital structure on firm value.

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3. Research Method

3.1. Research Design

This research adopts a quantitative method utilizing a causal design to investigate the influence of capital structure on firm value, as well as the moderating role of firm size in manufacturing firms listed on the Indonesia Stock Exchange (IDX). The causal approach is selected to elucidate cause-and-effect linkages among variables, grounded in pertinent theoretical frameworks and empirical findings from prior research [21].

3.2. Population and Sample

This study's population comprises all food and beverage sub-sector manufacturing firms listed on the IDX from 2020 to 2023, amounting to 95 companies. The employed sampling technique is purposive sampling, adhering to the following criteria:

1. Manufacturing firms that were continuously listed on the IDX from 2020 to 2023.
2. Organizations possessing comprehensive data about the research variables, specifically firm value, capital structure, and firm size.

A sample of 29 companies was selected based on these parameters, observed over four years, yielding a total of 116 observations.

3.3. Data Analysis Method

The analysis in this study utilized a panel data regression approach combined with Moderated This study employed a panel data regression methodology alongside Moderated Regression Analysis (MRA) to investigate the moderating influence of firm size on the connection between capital structure and firm value. MRA was chosen as it assesses the interaction effect between the independent variable and the moderating variable on the dependent variable [22].

The utilization of panel data enabled the research to integrate both cross-sectional and time-series elements, resulting in more robust and comprehensive estimates. Three types of panel regression models were evaluated to determine the most appropriate estimation model: Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The best model was determined by various statistical tests, including the Chow Test (to differentiate between CEM and FEM), the Hausman Test (to choose between FEM and REM), and the Lagrange Multiplier Test (to compare CEM and REM, if necessary). After identifying the most suitable model, MRA was conducted by integrating an interaction term between capital structure and firm size (DER × SIZE) into the regression equation. This methodology evaluated the extent to which business size affects the robustness of the correlation between capital structure and firm value.

The regression model employed in this study is as:

$$FV = \alpha + \beta_1 DER + \beta_2 SIZE + \beta_3 (DER \times SIZE) + \varepsilon$$

Description:

- FV = Firm value
- DER = Debt-to-Equity Ratio
- SIZE = Firm size
- DER×SIZE = Interaction of Capital Structure and Firm Size
- α = Constant
- β = Regression Coefficient
- ε = Error Term

All regression estimations and statistical analyses were conducted using EViews version 13, which facilitated panel data processing and provided accurate estimation of interaction effects within the panel data framework.

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3.4. Types and Sources of Data

Quantitative data obtained from secondary sources is the primary type of data utilized in this investigation. The data were obtained from the Annual IDX Statistics publications of manufacturing companies, which are accessible on the Indonesia Stock Exchange's official website (www.idx.co.id).

3.5. Operational Definition of Variables

This study utilizes three key variables: firm value as the dependent variable, capital structure as the independent variable, and firm size as the moderating variable. Each variable is measured using quantitative indicators widely applied in previous empirical studies, with adaptations to suit the context of manufacturing firms in Indonesia. The operational definitions are as follows:

1. Firm Value
   Firm value serves as a crucial indicator reflecting investor expectations regarding a company's future potential and overall market success. It indicates the price investors are prepared to pay for each unit of net income produced by the organization. This study uses the Price Earnings Ratio (PER) as a proxy for corporate value, defined as the market price per share divided by earnings per share (EPS). This ratio is frequently employed in financial literature to summarize the market's anticipations concerning a company's earnings growth. This measurement methodology adheres to the frameworks established by Hirdinis [4] and Saeedi and Mahmoodi [3].
2. Capital Structure
   Capital structure denotes the ratio of a company's funding derived from debt relative to equity. It is essential in financial decision-making because of its impact on both financial risk and capital return. This research evaluates capital structure through the Debt-to-Equity Ratio (DER), calculated by dividing total liabilities by total shareholders' equity. This ratio signifies the degree to which the company depends on debt financing in comparison to its internal capital. The use of DER as a key indicator is supported by previous empirical studies such as [7].
3. Firm Size is an internal attribute that may affect or moderate the correlation between capital structure and firm value. Large corporations generally enjoy enhanced access to financial markets, reduced capital expenditures, and increased company diversity. This study quantifies business size by the natural logarithm of total assets (Ln Total Assets). This transformation is utilized to standardize the data distribution and mitigate potential heteroscedasticity. The measurement method corresponds with the research undertaken by Hirdinis [4].

Table 1.
Operational Definition of Variables.

Variable	Definition	Indicator/Measurement	Source
Firm Value	Represents the extent to which investors value a firm's profitability in determining its share price.	Price Earnings Ratio (PER) = Stock Price per Share / Net Earnings per Share (EPS)	Hirdinis [4] and Saeedi and Mahmoodi [3]
Capital Structure	Composition of company debt to equity	Debt to Equity Ratio (DER) = Total Debt / Total Equity	Vătavu [7]
Firm Size	The firm's size is determined by its total assets.	Ln Total Assets	Hirdinis [4]

4. Analysis Results and Discussion

4.1. Overview of Regression Analysis Results

This study utilizes panel data regression analysis using EViews 13 to assess the effect of capital structure on firm value, incorporating firm size as a moderating variable. The analysis covers 29 manufacturing companies listed on the Indonesia Stock Exchange (IDX) over the 2020–2023 period, yielding a total of 116 firm-year observations.

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Three estimating models were evaluated: Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The Chow test demonstrates a preference for the FEM over the CEM model, evidenced by a significance level (Prob. F) below 0.05. Additionally, the Hausman test results endorse the preference for the Fixed Effects Model (FEM) over the Random Effects Model (REM), as indicated by a p-value below 0.05. Thus, the Fixed Effect Model is selected as the definitive model for analysis.
The results of the FEM regression are summarized as follows:

Table 2.
Panel Data Regression Test Results with Fixed Effect Model.

Variable	**Coefficient**	**t-Statistic**	**Prob.**
C (Constant)	-80,447	-0,064	0,948
DER (Capital Structure)	2054,552	3,220	0,0018
SIZE (Firm Size)	67,729	0,392	0,695
DERxSIZE (Capital Structure × Firm Size Interaction)	-309,838	-3,186	0,0020
Statistic	**Value**		
R-squared	0.425105		
Adjusted R-squared	0.212941		
F-statistic	2.003663		
Prob (F-statistic)	0.006536		

The regression coefficient for capital structure (DER) is 2054.552 and is statistically significant at the 0.0018 level, which is much below the 0.05 criterion. This outcome indicates that a one-unit increase in the capital structure ratio results in a 2054.552-point increase in company value, provided all other factors remain constant. Consequently, capital structure exerts a substantial and favorable influence on business value.

The firm size variable exhibits a positive coefficient of 67.729; nevertheless, its p-value of 0.695 suggests it lacks statistical significance. This indicates that firm size, when evaluated independently, lacks a significant direct impact on the value of manufacturing enterprises throughout the examined time.

The interaction term (DER × SIZE) displays a negative coefficient of -309.838 and is statistically significant at the 0.0020 level. This indicates that firm size diminishes the beneficial impact of capital structure on firm value. Essentially, as business size escalates, the advantageous impacts of leverage on firm value tend to wane, perhaps because larger organizations adopt a more conservative approach to debt use to prevent undermining investor confidence due to elevated financial commitments.

The R-squared value of 0.4251 signifies that the independent and moderating variables together account for 42.51% of the variation in company value. The Adjusted R-squared of 0.2129 indicates a moderate model fit, implying that while the model accounts for some variance, significant variables absent from this study may also influence company value.

4.2. The Effect of Capital Structure on Firm Value

The test results indicate that capital structure possesses a positive coefficient of 2054.552 with a significance level of 0.0018, suggesting that increasing the debt proportion of a company's funding structure may augment firm value. This discovery corroborates the trade-off theory, which asserts that leveraging debt can enhance firm value through tax shield advantages, provided that bankruptcy risk stays within the company's acceptable limits [15].

Furthermore, agency theory [13] explains this relationship in terms of potential conflicts of interest between managers (agents) and shareholders (principals). Managers may pursue personal interests such as higher compensation, expanding control, or engaging in unprofitable investments (overinvestment), which can harm shareholders. In this context, debt serves as a financial discipline mechanism that encourages management to be more prudent and efficient in utilizing company funds,

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thereby reducing agency costs [13]. Thus, an increase in leverage can enhance firm value through internal efficiency.

Moreover, signaling theory [16] is pertinent in elucidating the impact of capital structure on business value. The market may perceive an increase in debt use as a favorable indication of management's confidence in the company's prospects. The company's dedication to meeting its debt obligations conveys an image of financial stability, which can subsequently elevate market perception and increase business value.

In the context of Indonesia's manufacturing sector, companies typically require substantial funding for operations, such as procuring raw materials and investing in production machinery. Therefore, debt financing becomes a strategic alternative to drive growth and maintain competitiveness. As long as debt funds are managed productively and lead to higher profits, leverage can positively contribute to firm value. Moreover, investors in the Indonesian capital market tend to respond positively to firms engaged in expansion, which is often supported by debt financing.

Empirically, these results are consistent with the findings of Setioko, et al. [18]; Nurdin, et al. [5]; Alghifari [17]; Hirdinis [4] and Saeedi and Mahmoodi [3] which state that increasing the proportion of debt can boost firm value if managed wisely. The study by Wijaya and Asyik [10] also supports this view by showing that capital structure is a crucial determinant in shaping firm value in Indonesia's manufacturing sector.

4.3. Firm Size as a Moderator of the Relationship Between Capital Structure and Firm Value

The analysis indicates that business size does not directly influence firm value, but it significantly affects firm value when interacting with capital structure. The interaction variable (DER × SIZE) exhibits a negative coefficient of -309.8381, with a significance level of 0.0020. This conclusion suggests that business size negatively influences the link between capital structure and firm value, a phenomenon known in moderation literature as pure moderation.

Pure moderation denotes a condition in which the moderator variable exerts no direct influence on the dependent variable, yet affects the direction and intensity of the link between the independent and dependent variables. The impact of capital structure on business value is contingent upon the firm's size.

These results suggest that large firms tend to experience a decline in firm value when the proportion of debt increases. This phenomenon is in line with the pecking order theory [12] which states that larger firms are more likely to rely on internal financing due to their stable cash reserves, while smaller firms tend to depend more on external funding. An increase in leverage in large firms may be interpreted by the market as a sign of potential financial distress or imbalance in the capital structure, thus lowering investor confidence.

Moreover, from the agency theory perspective, large and complex firms with long managerial hierarchies are more difficult for shareholders to monitor. Although debt can function as a control mechanism, its effectiveness may diminish in large and complex organizations. This increases the potential for agency conflicts between management and shareholders, making debt usage less beneficial for large firms' value.

Large firms also typically have strong internal financial capacity, reducing their reliance on external debt. When large firms significantly increase their debt, the market may interpret this as a negative signal, for instance, inefficiency in managing internal funds or facing liquidity pressures. As a result, investor risk perception increases, and firm value may decline.

From a signaling theory perspective, although debt can signal management's confidence in the company's prospects, excessive debt usage in large firms, where market expectations are high, may instead be perceived as a negative signal. Investors might interpret it as the firm's inability to optimize internal resources or as a sign of underlying operational risks.

This finding aligns with the research by Hirdinis [4] which showed that firm size can act as a moderator influencing the direction and intensity of the relationship between capital structure and firm

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value. Similar findings were reported by Saeedi and Mahmoodi [3] who noted that the sensitivity of firm value to leverage depends on firm-specific characteristics, including size.

Practically, large firms are generally subject to high market expectations regarding financial stability and sustainable earnings. Therefore, a significant increase in debt may trigger investor concerns and negatively impact firm value.

5. Conclusion and Implications

This research investigates how capital structure affects firm value, considering firm size as a moderating factor, specifically focusing on manufacturing firms listed on the Indonesia Stock Exchange between 2020 and 2023. Based on the panel data regression analysis, the Fixed Effect Model (FEM) emerged as the most appropriate estimation technique. The key empirical result reveals a significant positive relationship between capital structure and firm value, which aligns with the trade-off theory that supports the strategic use of debt to enhance firm value through tax-related benefits.

Nonetheless, firm size does not exert a direct effect on firm value. This suggests that, within the realm of manufacturing enterprises in Indonesia, the magnitude of assets or firm size is not a principal factor influencing market views of firm value. The relationship between capital structure and firm size exhibits a negative correlation, indicating that larger organizations are more susceptible to the hazards linked to leverage, and that excessive debt accumulation may diminish firm value.

Practically, these findings imply that corporate management should tailor capital structure policies by taking firm size into consideration. Large firms need to be more cautious when increasing debt, as market expectations regarding financial stability tend to be higher. On the other hand, small to medium-sized firms still have room to utilize debt as a strategy to enhance firm value.

Although this study contributes both theoretically and practically, several limitations should be noted. First, firm value in this study is measured solely using the Price Earnings Ratio (PER), while other alternatives such as Tobin's Q or Price to Book Value (PBV) may offer a more comprehensive view. Second, the research scope is limited to manufacturing firms listed on the IDX, which means the findings may not be generalizable to other industry sectors. Third, the relatively short observation period (2020–2023) may limit insights into long-term market dynamics, especially in the post-COVID-19 pandemic era.

For future research development, it is recommended that: 1. the research model be expanded by including additional control variables such as profitability, liquidity, and corporate governance; 2. the observation period be extended to capture broader and more representative market dynamics; and 3. the research scope be expanded to other industry sectors such as finance, mining, or property, to provide a more comprehensive understanding of the impact of capital structure on firm value in Indonesia.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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