








ISSN: 2617-6548

URL: www.ijirss.com



Impact of financial leverage and Big 4 audit quality on the performance of listed manufacturing companies in Vietnam

 Anh Phan¹,  Thi Thuy Huong Nguyen^{2*},  Minh Phuong Nguyen³,  Quoc Cuong Truong⁴,  Thi Huong Tra Le⁵

¹*Deputy Director of Banking Research Institute, Banking Academy of Vietnam.*

²*Faculty of Foreign Languages, Vietnam Academy of Finance Hanoi, Vietnam (10000–14000).*

^{3,4}*Faculty of Banking, Banking Academy of Vietnam.*

⁵*Banking Research Institute, Banking Academy of Vietnam.*

Corresponding author: Thi Thuy Huong Nguyen (Email: nguyenthuyhuong@hvtc.edu.vn)

Abstract

This study examines the impact of financial leverage and audit quality, specifically the use of Big 4 accounting firms, on the performance of listed companies in Vietnam. It also explores both internal and external factors that influence the performance of these companies. Data were gathered from the financial statements of 60 listed manufacturing companies, as well as from the General Statistics Office of Vietnam. To find out the relationship between the dependent variable and explanatory variables, this research uses the Pearson test, Hausman test, Breusch-Pagan test, Wald test, and both Fixed and Random Effects Models. The findings indicate that short-term debt, long-term debt, total debt, and audit quality have a significant effect on company performance. In contrast, dividend payout policies were found to have no effect on profitability, while foreign direct investment significantly impacted performance. To enhance their financial performance, listed companies in Vietnam should focus on optimizing their short-term and long-term debt ratios, consider the impact of dividend payouts on shareholder value, and engage the services of Big 4 audit firms for financial statement audits. This research contributes to the literature on how financial leverage and the use of large audit firms influence corporate performance.

Keywords: Audit quality, long-term debt, return on assets, return on equity, short-term debt.

DOI: 10.53894/ijirss.v8i3.6478

Funding: This study received no specific financial support.

History: Received: 14 March 2025 / Revised: 17 April 2025 / Accepted: 21 April 2025 / Published: 25 April 2025

Copyright: © 2025 by the authors. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Competing Interests: The authors declare that they have no competing interests.

Authors' Contributions: Conceptualization, AP and TTHL; methodology, AP; software, MNN; validation, LDN, NTML and AP; formal analysis, LDN; investigation, NTML; data curation, AP and MNN; writing—original draft preparation, AP; writing—review and editing, AP and TTHL; visualization, TTHL; supervision, AP; project administration, AP. All authors have read and agreed to the published version of the manuscript.

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.

Acknowledgment: The authors gratefully acknowledge the financial support from the Banking Academy of Vietnam.

Publisher: Innovative Research Publishing

1. Introduction

The concept of firm performance has been a central theme in business and finance research over the last two decades, as firms continually seek to enhance their efficiency and competitiveness. The role of financial leverage and audit quality as determinants of firm performance has attracted considerable scholarly attention. However, while the literature offers valuable insights, these studies differ significantly in their findings, methodologies, and conceptual frameworks. This critical review synthesizes and evaluates key contributions, highlighting both consistencies and contradictions in the existing body of work, with a particular focus on financial leverage and audit quality.

1.1. Financial Leverage and Firm Performance

Financial leverage plays a critical role in shaping firm performance, especially within emerging markets. [1] offered early empirical insights into this relationship through their examination of 21 cement manufacturers listed on the Karachi Stock Exchange. Their research revealed a significant negative correlation between financial leverage and profitability, using return on assets (ROA) as the key performance metric. They found that financial leverage explained 29.8% of the variance in ROA, with a negative coefficient (-0.348), implying that higher debt levels tend to reduce profitability, likely due to increased interest expenses and leverage-related risks. While the findings contribute valuable knowledge, they are limited by the small sample size and industry specificity, which may not extend to other sectors or broader economic contexts. Additionally, the analysis was restricted to the 2005-2010 period, raising questions about whether these patterns hold in more recent, possibly volatile, market conditions.

Building on this, Krishna and Kumar [2] broadened the discussion by incorporating multiple debt measures, including short-term, long-term, and total debt ratios. Their results reinforced the negative impact of leverage on ROA, consistent with Ahmad et al. [3], but also uncovered a more nuanced relationship. While the effect on ROA remained negative, they observed a positive correlation between certain types of debt and return on equity (ROE), complicating the assumption that debt universally harms firm performance. This highlights the importance of considering debt maturity and firm-specific characteristics when evaluating leverage's effects [4].

Pham [5] used data from 218 listed firms in Vietnam, doing the research on enhancing corporate bond issuing opportunities, with the explanation variables such as firm size, financial leverage, GDP and so on. The result show that, financial leverage positively impacted on ROA, therefore, this leads to have more chance to issue corporate bonds of the firms under the research.

Al-Slehat [6] extended this exploration by including firm size and asset structure as additional variables influencing firm value, measured through Tobin's Q. His research confirmed the detrimental impact of leverage on firm value but also emphasized that larger firms and those with a more robust asset structure may mitigate the negative effects of debt. However, the focus on Jordanian firms limits the applicability of these findings to other regions or sectors.

Manh and Huy [7] and Nguyen et al. [8] researched the Big 4 banks in Vietnam to find out the relationship between financial leverage and financial performance, measured by ROA. The result showed that ROA was negatively impacted by capital ratio and financial leverage. Similarly, Pham et al. [9] researched the role of R&D on firm performance in textile listed firms in Vietnam, and one of the explanatory variables is financial leverage, measured by total debt on total equity. They concluded that financial leverage also negatively impacted on firm's financial performance in the companies under the research.

1.2. Audit Quality and Firm Performance

Audit quality has also been extensively examined as a determinant of firm performance, though the findings here are similarly mixed. Rahman et al. [10] in their study of 503 firms listed on the Dhaka Stock Exchange, demonstrated that larger audit committees tend to be associated with better firm performance. The size of the audit committee, which reflects greater oversight and expertise, was positively linked to firm performance. However, the same study found that frequent audit committee meetings had a negative impact on firm performance, suggesting that excessive scrutiny might hinder operational efficiency. This study offers valuable insights but raises questions about the mechanisms through which audit committee characteristics influence performance. For instance, while committee size can provide diverse expertise, the negative effect of meeting frequency could indicate inefficient governance practices or excessive focus on compliance over strategic growth.

Conversely, May and Rasha [11] found that certain attributes of audit quality, such as auditor experience and independence, had no significant impact on firm performance, particularly on ROA and ROE, in a study of non-financial firms listed on the Egyptian Exchange. This finding is surprising, as the literature generally supports the notion that experienced and independent auditors enhance transparency and firm credibility. One explanation could be the unique characteristics of the Egyptian market, where regulatory oversight may not align with global standards, potentially diminishing the expected role of audit quality in enhancing performance. Alternatively, this result could reflect the limitations of measuring audit quality solely through experience and independence, neglecting other dimensions such as auditor specialization or client-auditor relationships.

1.3. Synthesis and Critical Analysis

The varying results across these studies emphasize several key issues that merit deeper investigation. First, the relationship between financial leverage and firm performance is intricate and influenced by context. While many studies highlight the negative impact of leverage on profitability [1, 2, 6], the potential advantages of leverage, such as tax benefits or managerial discipline, are often overlooked. Firm-specific factors, such as size, industry, and asset composition, also play a significant role in moderating the effects of leverage. Larger firms or those with substantial tangible assets may be better

equipped to mitigate leverage-related risks, an area future research should address more comprehensively.

In terms of audit quality, the conflicting results suggest a need for a more detailed analysis of how audit committee characteristics impact firm outcomes. Rahman et al. [10] argue that larger audit committees positively influence performance, while May and Rasha [11] contend that auditor independence and experience are not reliable predictors of success. These discrepancies could arise from varying institutional environments or different ways of measuring audit quality across studies. Additionally, Rahman et al. [10] identify a negative relationship between the frequency of audit committee meetings and firm performance, indicating that more frequent meetings do not necessarily lead to better governance. Future studies should focus on finding the optimal balance between audit committee size, meeting frequency, and governance effectiveness, perhaps through qualitative research to delve into the internal dynamics of audit committees.

In summary, both financial leverage and audit quality are significant but inconsistent determinants of firm performance. The widely observed negative correlation between leverage and performance is influenced by factors such as firm size, asset structure, and debt composition. Similarly, audit quality's effect on performance is contingent upon the audit committee's attributes and the governance structure in place. This research will explore the influence of short-term, long-term, and total debt on firm performance, as well as the role of Big 4 audit firms, using ROA and ROE as performance metrics.

2. Materials and Methods

While the general consensus supports a negative relationship between leverage (especially total and long-term debt) and profitability, significant differences across industries, countries, and firm characteristics underscore the need for more context-specific research. Similarly, the role of audit quality in improving firm performance is well documented, but its impact is not uniform across contexts, highlighting the importance of considering local market conditions and regulatory environments. Firm performance is a critical area of research in corporate finance, with numerous studies examining the impact of various financial metrics on profitability.

Among these, financial leverage, comprising total debt, long-term debt, and short-term debt, and audit quality are consistently emphasized as key factors that influence a firm's ROA and ROE. However, findings across different studies vary significantly due to methodological differences, industry contexts, and geographic factors. This review critically evaluates key studies on these topics, analyzing their contributions and limitations while identifying areas for further investigation.

2.1. Total Debt and Firm Performance

The relationship between total debt and firm performance, particularly its impact on ROA and ROE, remains an area of considerable debate due to inconsistent findings across various studies. Kebewar [12], who analyzed over 2,000 service sector firms in France, found that while total debt had a negative effect on ROA, the result was statistically insignificant. This suggests that, although debt can put pressure on profitability through increased interest obligations, its impact may not be pronounced in certain industries or economic conditions, such as those in the service sector of developed countries. Similarly, Enekwe et al. [13] in their study of Nigerian firms, also observed a negative but insignificant relationship between total debt and ROA, which could indicate that firms in these contexts are able to manage debt without it substantially harming profitability.

In contrast, Prempeh et al. [14] examining listed firms in Ghana, identified a significant negative relationship between total debt and ROA, supporting the traditional notion that higher leverage heightens financial risk and interest burdens, thereby reducing profitability. The difference in findings between studies like [14] and those such as Kebewar [12] points to the need to consider local economic contexts, financial market maturity, and sectoral differences. The more pronounced effect of debt on performance in Ghana may be attributed to higher borrowing costs or less developed financial markets, where firms may face greater challenges in managing debt.

When looking at ROE, the evidence is similarly mixed. Lenka [15] in a study of 14 Czech firms, found that total debt accounted for more than 30% of the variation in ROE, with a significant negative impact. This implies that high leverage can erode returns to equity holders due to increased interest payments and the potential for financial distress. On the other hand, Basit and Irwan [16] studying Malaysian firms, found a positive and significant relationship between total debt and ROE. This suggests that in some environments, debt may enhance returns to equity holders, particularly when borrowing costs are lower or when firms can efficiently use debt to generate higher returns.

Further complicating this relationship is the role of industry-specific factors. Uluyol et al. [17] demonstrated that total debt positively affected ROE in construction firms, while it had a negative impact in other industries. This sectoral variation underscores the importance of considering the unique dynamics within industries, as some may be better positioned to leverage debt for growth, while others may struggle with the financial risks associated with high leverage. Nguyen et al. [18] and Pham and Tran [19] did the research on listed banks as well as textile and garment firms in Vietnam to find out which factors impact firm performance. The results show that financial leverage, measured by total debt to equity, negatively impacts financial performance, measured by ROA.

In summary, these divergent findings indicate that the impact of total debt on firm performance is highly context-dependent, influenced by local economic conditions, sectoral characteristics, and the cost and availability of debt financing. Future research should focus on these contextual factors to better understand the conditions under which debt may either enhance or harm firm performance. Therefore, we are going to develop the first hypothesis as follows:

H1: Firm profitability is significantly impacted by TTD.

2.2. Long-Term Debt and Firm Performance

Long-term debt (LTD) has similarly produced divergent findings across different studies. Zelgalve and Berzkalne [20] examined 55 Baltic companies and found a negative and significant relationship between LTD and ROE, suggesting that long-term obligations may be a drag on profitability over time, particularly as firms must service these debts regardless of short-term financial performance. This finding was echoed by Tifow and Sayilir [21], who used Generalized Least Squares regression to study 130 listed manufacturing firms on the Borsa Istanbul. Their findings confirmed that long-term debt had a negative and significant impact on ROE, reinforcing the notion that long-term debt obligations can increase financial pressure on firms, particularly in capital-intensive industries. Regarding ROA, the negative influence of LTD is also well supported. Ikapel and Kajirwa [22] found that long-term debt significantly negatively impacted ROA in Kenyan firms, a result that aligns with the conventional view that long-term debt increases a firm's financial burden without necessarily enhancing its operational efficiency. Andersson and Minnema [23] arrived at similar conclusions, reinforcing the notion that long-term debt can be a drag on asset profitability. However, Kirimi [24], who studied energy and petroleum firms in Kenya, found that long-term debt did not significantly affect ROA. This exception suggests that certain industries, particularly capital-intensive ones like energy, may be better able to manage the financial costs associated with long-term debt, potentially due to stable cash flows or the ability to pass costs onto consumers. This raises important questions about the generalizability of findings across industries and calls for more industry-specific research to understand the conditions under which long-term debt impacts profitability. As a result, the second hypothesis in this research is:

H₂: Firm profitability is significantly influenced by LTD.

2.3. Short-Term Debt and Firm Performance

STD has also been shown to have variable effects on firm performance. Tailab [25] in a study of 30 listed energy companies in the U.S., reported a positive and significant relationship between STD and ROA, suggesting that firms may use short-term debt for working capital or other operational needs that directly contribute to profitability. Nadeem et al. [26] similarly found that STD positively and significantly impacted ROE in cement firms, indicating that short-term borrowing may offer flexibility and financial agility in certain industries. In contrast, other studies have found a negative relationship between STDs and profitability. Bokhari and Khan [27] examined 380 non-financial companies listed on the Karachi Stock Exchange, found that STD negatively influenced ROA. Aziz and Abbas [28] also reported a negative relationship between STD and ROA, with significance at the 10% level. Similarly, Vătavu [29] in a study of 196 Romanian firms, concluded that STD had a negative and significant effect on ROE, reinforcing the idea that short-term debt can increase financial risk and reduce returns. The divergence in findings may be due to differences in how firms manage short-term debt some may use it effectively for operational purposes, while others may face higher interest rates or struggle to repay loans, leading to negative outcomes. Therefore, we are going to develop the third hypothesis:

H₃: Firm profitability is significantly influenced by STD.

2.4. Audit Quality and Firm Performance

Audit quality (ADQ), often measured by whether firms use the services of large, reputable audit firms (e.g., the Big 4), has been shown to play an important role in firm performance. Khader [30] argues that high-quality financial reports, supported by large audit firms, provide crucial information for investors, helping them make informed decisions about which firms to invest in. Elewa and El-Haddad [31] using data from 30 non-financial firms in Egypt, found that firms employing Big 4 audit firms had a significant and positive impact on ROA. This finding suggests that large audit firms may enhance the credibility and transparency of financial reporting, which in turn positively influences firm performance by increasing investor confidence. Similarly, Hamza et al. [32] found a positive and significant relationship between the use of Big 4 audit services and ROA in non-financial Jordanian companies. However, Tanko and Polycarp [33] arrived at a different conclusion in Nigeria, where they found no significant effect of using Big 4 audit firms on ROA. This may reflect differences in the regulatory environment or the level of investor confidence in audit reports across countries. The findings suggest that the impact of audit quality on firm performance is highly contextual and may vary based on the strength of local institutions and investor perceptions. Regarding ROE, studies have generally found a positive relationship between audit quality and firm performance. Anissa [34] did the research in 200 listed French firms in 2007-2018 period to find out the role of audit quality on the relationship between corporate social responsibility (CSR) and firm financial performance. The result reported that the improvement effect of CSR on corporate financial performance is more pronounced for firms audited by Big 4 auditors. Kimeli [35] found a weak but significant positive correlation between audit services from Big 4 firms and ROE in Nairobi-listed firms, suggesting that audit quality can enhance shareholder returns, albeit with varying degrees of influence. The next hypothesis is developed as below:

H₄: ADQ has a significant effect on firm profitability.

3. Results and Discussion

3.1. Descriptive Statistics

This study examines data from 60 listed manufacturing companies in Vietnam, spanning from 2011 to 2021, using both firm-level financial statements and macroeconomic data from the General Statistics Office of Vietnam. The research employs quantitative methods with three regression models: Pooled OLS (POLS), Fixed Effect Regression (FEM), and Random Effect Regression (REM). After estimating the coefficients, several statistical tests are conducted to determine the most appropriate model. The F-test is used to compare POLS and FEM, while the Breusch-Pagan Lagrange Multiplier (LM) test is applied for choosing between POLS and REM. Hausman's test helps decide between FEM and REM, and diagnostics such as the

Wooldridge test for serial correlation, Breusch-Pagan/Cook-Weisberg, and Breusch-Pagan LM tests for heteroskedasticity, and Variance Inflation Factor (VIF) analysis will be performed to ensure model robustness. The research model has the following form:

$$FP_{i,t} = \beta_0 + \beta_1 TTD_{i,t-1} + \beta_2 STD_{i,t-1} + \beta_3 LTD_{i,t-1} + \beta_4 ADQ_{i,t-1} + \beta_5 DIV_{i,t-1} + \beta_6 FDI_{i,t-1} + \beta_7 GDP_{i,t-1} + \mu_{i,t}$$

Where: FP is firm performance (measured by ROA and ROE); Total debt: TTD; Short-term debt: STD; Long-term debt: LTD; Audit quality: ADQ; Dividend payout: DIV; Foreign direct investment: FDI; Gross domestic product: GDP.

As presented in Table 1, the maximum values of ROA and ROE are 0.5030 and 0.7273, respectively, while the minimum values are -0.1916 and -0.4111, and the mean values are 0.0724 and 0.1371, respectively. For the independent variables, total debt has a minimum value of 0.0069 and a maximum value of 861.2509. Short-term debt (STD) has a minimum value of 0 and a maximum of 861.2509. Long-term debt (LTD) has a mean value of 1.53133 with a standard deviation of 9.446419, and its minimum value is 0, with a maximum value of 193.4361. Interestingly, some firms do not have any short-term or long-term debt, which is reflected by the minimum values being 0 for both. Regarding audit quality, the mean value is 0.5265, with a standard deviation of 0.4997, based on a total of 566 observations. For dividend payouts, the minimum value is 0, and the maximum is 0.8889, indicating that some firms did not pay dividends during the period under study. As for the control variables, FDI has a mean value of 23.4113 and a standard deviation of 0.2357, while GDP has a mean of 36.2380 with a standard deviation of 0.3960.

Table 1.
Descriptive statistics.

Variables	Observation	Mean	Std. Dev.	Min.	Max.
ROA	568	0.0724	0.0834	-0.1916	0.5030
ROE	568	0.1371	0.1411	-0.4111	0.7273
TTD	567	10.2733	46.8433	0.0069	861.2509
STD	567	8.7132	43.5669	0.0000	861.2509
LTD	567	1.5313	9.4464	0.0000	193.4361
ADQ	566	0.5265	0.4997	0.0000	1.0000
DIV	567	0.0891	0.1075	0.0000	0.8889
FDI	600	23.4113	0.2357	23.0708	23.7378
GDP	600	36.2380	0.3960	35.6002	36.6798

3.2. Results of the Multinomial Logistic Regression

According to Table 2, the correlation analysis reveals several significant relationships between the variables. ROA shows a low but significant positive correlation with dividend (Pearson's correlation = 0.3243) and a significant negative correlation with GDP (Pearson's correlation = -0.2072) and audit quality (Pearson's correlation = -0.1333). Similarly, ROE has a positive and low correlation with dividend (Pearson's correlation = 0.3389) and a negative but low correlation with audit quality (Pearson's correlation = -0.1246).

Table 2.
Correlation analysis.

	ROA	ROE	STD	LTD	TTD	DIV	FDI	GDP	ADQ
ROA	1								
ROE	0.8501*	1							
STD	-0.049	-0.0382	1						
LTD	-0.040	-0.0104	0.2521**	1					
TTD	-0.0538	-0.0379	0.9808**	0.4360**	1				
DIV	0.3243**	0.3389**	-0.0183	0.0748	-0.0017	1			
FDI	-0.0769	-0.0732	0.0685	0.0679	0.0773	-0.0100	1		
GDP	-0.2072**	-0.2035**	0.0703	0.0788	0.0809	-0.0836**	0.5085**	1	
ADQ	-0.1333*	-0.1246*	0.0748	0.0954*	0.0882*	-0.0953*	0.0725	0.0551	1

Note: (***) statistically significant at 1%, (**) statistically significant at 5%;
(*) statistically significant at 10%

Regarding the debt variables, STD exhibits significant positive correlations with LTD and TTD, with a very high correlation of 0.9808 between STD and TTD. LTD has a low but significant correlation with audit quality (Pearson's correlation = 0.0954). There is also a positive and significant correlation between the use of Big 4 audit services and total debt (Pearson's correlation = 0.0882). Furthermore, FDI shows a significant positive correlation with GDP (Pearson's correlation = 0.5085), while dividend payout negatively influences GDP.

Table 3.

POLS regression with ROA, ROE as dependent variable.

	POLS regression with ROA as dependent variable		POLS regression with ROE as dependent variable	
Variable	Coefficient	T-test	Coefficient	T-test
$STD_{i,t-1}$	0.0279	2.14**	0.0505	2.29**
$LTD_{i,t-1}$	0.0271	2.08**	0.0504	2.29**
$TTD_{i,t-1}$	-0.0279	-2.15**	-0.0504	-2.29**
$DIV_{i,t-1}$	0.1872	5.77***	0.3172	5.79***
FDI_{t-1}	0.0406	2.29**	0.0426	1.42
GDP_{t-1}	-0.0371	-3.62***	-0.0471	-2.72**
$ADQ_{i,t-1}$	-0.0155	-2.18**	-0.0294	-2.45**
Constant	0.4545	1.09	0.8279	1.18
	R-square = 0.1115; F-test = 8.95; P-value = 0.0000		R-square = 0.1025; F-test = 8.15; P-value = 0.0000	

Note: (***) statistically significant at 1%, (**) statistically significant at 5%; (*) statistically significant at 10%

Table 3 reports that the R-squared value for the model is 0.1115, indicating that 11.15% of the variance in ROA is explained by the selected independent and control variables. The F-test statistic is significant at the 5% confidence level, with a p-value of 0.0000, demonstrating that the independent and control variables collectively have a substantial impact on ROA. Specifically, short-term debt and long-term debt have positive coefficients of 0.02791 and 0.0271, respectively, with their T-tests showing statistical significance at the 5% level (p-values of 0.032 and 0.038). In contrast, total debt has a negative and significant effect on ROA. Regarding the control variables, dividends exhibit a strong positive effect on ROA, with a coefficient of 0.1872, statistically significant at the 5% level. FDI also shows a positive influence, with a coefficient of 0.0406 and a p-value of 0.023. On the other hand, both GDP and audit quality have negative coefficients, with statistically significant effects on ROA at the 5% level. In the case of ROE, the model explains 10.25% of its variance using the POLS regression. Short-term debt, long-term debt, and total debt have coefficients of 0.0505, 0.0504, and -0.0505, respectively, and the p-values of their T-tests are below 0.05, confirming their statistical significance. This suggests that both short-term and long-term debt positively affect ROE, while total debt has a negative effect. These results are consistent with the findings for ROA. Moreover, the effect of dividends on ROE is positive, with a coefficient of 0.3172, and is statistically significant at the 5% level. FDI also has a significant and positive impact on ROE, while GDP and audit quality continue to have negative and significant effects. These findings indicate that the control variables exhibit similar influences on both ROA and ROE, reinforcing the importance of debt structure, economic conditions, and external factors in determining firm performance.

Table 4.

FEM regression with ROA, ROE as dependent variable

	FEM regression with ROE as dependent variable		FEM regression with ROA as dependent variable	
Variable	Coefficient	T-test	Coefficient	Z-test
$STD_{i,t-1}$	0.0277	0.99	0.0184	1.23
$LTD_{i,t-1}$	0.0292	1.05	0.0189	1.25
$TTD_{i,t-1}$	-0.0277	-0.99	-0.0184	-1.23
$DIV_{i,t-1}$	0.0211	0.35	0.0441	1.33
FDI_{t-1}	0.0465	1.91*	0.0403	3.07**
GDP_{t-1}	-0.0570	-4.02***	-0.0416	-5.44***
$ADQ_{i,t-1}$	0.0264	1.47	0.0178	1.83*
Constant	1.0902	1.89*	0.6192	1.99**
R-square overall = 0.0078; F-test = 2.83; P-value = 0.0067			R-square overall = 0.0270; F-test = 5.49; P-value = 0.0000	

Note: (***) statistically significant at 1%, (**) statistically significant at 5%; (*) statistically significant at 10%.

Table 4 shows that the overall R-squared value for the FEM with ROA as the dependent variable is 0.0270, indicating that only 2.70% of the variance in ROA is explained by the selected independent and control variables. The F-test is statistically significant at the 5% level, confirming that the effect of the independent and control variables on ROA is statistically significant. When exploring the individual effects of each variable, the coefficients for short-term debt and long-term debt are 0.01843 and 0.0189, respectively, suggesting positive effects on ROA. However, neither of these effects is statistically significant at the 5% level (p-value > 0.05). Total debt has a coefficient of -0.0184, indicating a negative effect on ROA, but this effect is also not statistically significant (p-value > 0.05). Among the control variables, the coefficients for dividend, FDI, GDP, and audit quality are 0.0441, 0.0403, -0.0416, and 0.0178, respectively. Only GDP has a negative effect on ROA in the FEM. The effects of FDI and GDP are statistically significant at the 5% level. The effect of dividends on ROA is not statistically significant, and audit quality has a positive effect on ROA, significant only at the 10% level. The overall R-squared value is 0.0078, meaning that only 0.78% of the variance in ROE is statistically explained by the selected

independent and control variables. The coefficients for short-term debt, long-term debt, and total debt are 0.0277, 0.0292, and -0.0277, respectively, but none of these effects are statistically significant at the 5% level. Among the control variables, only GDP has a statistically significant effect on ROE at the 5% level. The coefficient of GDP is estimated at -0.0570, indicating a negative effect on ROE. FDI shows a positive coefficient with a p-value of 0.057, meaning the effect of FDI on ROE is only statistically significant at the 10% level. Finally, audit quality has a positive but statistically insignificant effect on ROE.

Table 5.

REM regression with ROA, ROE as dependent variable

Variable	REM regression with ROA as dependent variable		REM regression with ROE as dependent variable	
	Coefficient	Z-test	Coefficient	Z-test
$STD_{i,t-1}$	0.0195	1.40	0.0337	1.35
$LTD_{i,t-1}$	0.0196	1.40	0.0346	1.39
$TTD_{i,t-1}$	-0.0195	-1.40	-0.0336	-1.35
$DIV_{i,t-1}$	0.0754	2.40**	0.1188	2.09**
$FDI_{i,t-1}$	0.0405	3.07**	0.0455	1.84*
$GDP_{i,t-1}$	-0.0404	-5.25***	-0.0534	-3.73***
$ADQ_{i,t-1}$	0.007	0.77	0.0001	0.01
Constant	0.5735	1.83	0.9883	1.70*
R-square overall = 0.0684; Wald-test = 39.64; P-value = 0.0000			R-square overall = 0.0701; Wald-test = 22.09; P-value = 0.0000	

Note: (***) statistically significant at 1%, (**) statistically significant at 5%;
(*) statistically significant at 10%.

Table 5 presents the results of the REM applied to the first research model, showing that 6.84% of the variance in ROA is explained by the selected independent and control variables. The coefficients for short-term debt, long-term debt, and total debt are 0.0195, 0.0196, and -0.0195, respectively, but their high p-values (greater than 0.05) indicate no statistically significant impact on ROA. When examining the control variables, dividends show a positive and statistically significant effect on ROA, with a coefficient of 0.0754, significant at the 5% level. FDI also positively influences ROA, with a coefficient of 0.0405 and a p-value of 0.002. Conversely, GDP has a negative impact, with a coefficient of -0.0404, significant at the 5% level. Audit quality, despite a positive coefficient of 0.007, has a p-value of 0.444, indicating no statistically significant effect on ROA. For ROE, the REM regression explains 7.01% of the variance, with short-term debt, long-term debt, and total debt having coefficients of 0.0337, 0.0346, and -0.0336, respectively, but none are statistically significant, as their p-values exceed 0.05. Of the control variables, dividend and FDI show significant effects on ROE, with coefficients of 0.1188 and 0.0455, respectively, with FDI significant at the 10% level and dividends at the 5% level. GDP, with a coefficient of -0.0534, has a negative and significant impact on ROE, while audit quality shows no significant influence. Finally, model selection between POLS, FEM, and REM is confirmed through F-tests, which validate the choice of FEM over POLS.

Table 6 presents the results of the F-test for Model 1 and Model 2, where the statistics (8.34 and 5.66) and p-values (both smaller than 0.05) lead to the rejection of the null hypothesis, indicating significant variance in the data. This outcome justifies the use of the Fixed Effects Model (FEM) over the Pooled OLS model. To compare POLS and REM, the Breusch and Pagan Lagrangian Multiplier test is employed, which tests the null hypothesis of equal error variance. The test results, shown in Table 6, demonstrate that REM is preferred over POLS, as indicated by the high LM-test statistics (361.06 and 186.79) and low p-values. Lastly, Hausman's test compares FEM and REM, with statistics of 16.72 for Model 1 and 26.60 for Model 2, both yielding p-values below 0.05. This confirms the rejection of the null hypothesis and supports the selection of REM over FEM for both models.

Table 6.

Model Comparison - F-test, Breusch-Pagan Lagrangian Multiplier Test, and Hausman's Test for POLS, FE, FEM.

Indicators	Model 1	Model 2
F-test result to compare between POLS and FEM		
Result	8.34***	5.66***
Conclusion	FEM is better than POLS	
Breusch and Pagan Lagrangian multiplier test result to compare between POLS and REM		
Result	361.06***	186.79***
Conclusion	REM is better than POLS	
Hausman's test result to compare between FEM and REM		
Result	16.72**	26.60***
Conclusion	REM is better than POLS	

Note: (***) statistically significant at 1%; (**) statistically significant at 5%; (*) statistically significant at 10%.

3.3. Heteroskedasticity Diagnostic

Heteroskedasticity is examined using relevant tests based on the regression techniques employed. For POLS regression,

the Breusch-Pagan/Cook-Weisberg test is conducted, which tests the null hypothesis of constant variance. For FEM regression, the Modified Wald test is used to check for heteroskedasticity. In the case of REM regression, the Breusch and Pagan Lagrangian Multiplier test is applied. Each test is tailored to its respective regression technique to detect heteroskedasticity and assess whether the assumption of constant variance holds.

Table 7.

REM regression with ROE as dependent variable.

Regression technique	Test	Model 1	Model 2
POLS	Breusch-Pagan / Cook-Weisberg test	132.08***	11.49***
FEM	Modified Wald test	4632.22***	7643.30***
REM	Breusch and Pagan Lagrangian multiplier test	361.06***	186.79***

Note: (***) statistically significant at 1%, (**) statistically significant at 5%;
(*) statistically significant at 10%

Table 7 shows that the Breusch-Pagan / Cook-Weisberg test statistics for Model 1 and Model 2 in the POLS regression are 132.08 and 11.49, respectively, with p-values less than 0.05. This indicates that both models suffer from heteroskedasticity. Additionally, the Modified Wald test for FEM regression confirms the presence of heteroskedasticity for both Model 1 and Model 2, as the test statistics are statistically significant at the 5% level. A similar result is observed when testing for heteroskedasticity in Model 1 and Model 2 under REM regression. Therefore, it can be concluded that all regression models face the issue of heteroskedasticity, requiring appropriate adjustments such as the use of robust standard errors.

3.4. Fixing Heteroskedasticity Issue

To fix heteroskedasticity issue, robust standard error is a common method. Using robust option in STATA, we obtain stimulation result for each research model as in Table 8.

Table 8.

Robust Standard Error for POLS for Model 1 and Model 2.

Variables	Model 1 – Robust		Model 2 – Robust	
	Coef.	T-test	Coef.	T-test
$STD_{i,t-1}$	0.0279	4.22***	0.0504	4.32***
$LTD_{i,t-1}$	0.0271	4.12***	0.0504	4.32***
$TTD_{i,t-1}$	-0.0279	-4.22***	-0.0504	-4.32***
$DIV_{i,t-1}$	0.1872	3.70***	0.3172	4.30***
FDI_{t-1}	0.0406	1.79*	0.0426	1.32
GDP_{t-1}	-0.0371	-2.64**	-0.0471	-2.40**
$ADQ_{i,t-1}$	-0.0155	-2.13**	-0.0294	-2.43**
Constant	0.4545	1.20	0.8279	1.29
R-square	0.1115		0.1025	
F-test	4.79 (0.000)		6.07 (0.000)	

Note: (***) statistically significant at 1%, (**) statistically significant at 5%; (*) statistically significant at 10%

With robust standard errors applied, the results indicate that 11.15% of the variance in ROA and 10.25% of the variance in ROE are statistically explained by the independent and control variables. The effects are similar across both models. Short-term debt, long-term debt, dividends, and FDI positively impact ROA and ROE, though FDI's effect on both is not statistically significant at the 5% level. In contrast, total debt, GDP, and audit quality have a negative and significant effect on ROA and ROE, highlighting the importance of managing debt and external economic factors to improve firm profitability.

Table 9 presents the findings after applying robust standard errors, revealing that 2.70% of the variance in ROA and 0.78% in ROE are statistically explained by the chosen independent and control variables. The effects differ across the models. Notably, short-term debt, long-term debt, and total debt exert a significant influence on both ROA and ROE, while dividends, although positively correlated, show no statistical significance. FDI significantly affects ROA at the 5% level but only influences ROE at the 10% level. Additionally, GDP demonstrates a negative and significant impact on both ROA and ROE, while audit quality shows no significant effect. Moreover, another set of results, also using robust standard errors, indicates that 6.84% of the variance in ROA and 7.01% in ROE can be attributed to the model's variables. Here, short-term debt, long-term debt, total debt, and audit quality significantly influence both metrics, whereas dividends again show no significant impact. FDI continues to affect ROA at the 5% level and ROE at the 10% level, while GDP maintains its significant negative effect on both measures. These results highlight the key role of debt management and external macroeconomic factors in shaping firm profitability.

Table 9.

Robust Standard Error for FEM and REM.

Variables	FEM				REM			
	Model 1 – Robust		Model 2 – Robust		Model 1 – Robust		Model 2 – Robust	
	Coef.	T-test	Coef.	T-test	Coef.	T-test	Coef.	T-test
STD_{it-1}	0.0184	3.15**	0.0184	3.15**	0.0195	3.89***	0.0337	4.45***
LTD_{it-1}	0.0189	3.24**	0.0189	3.24**	0.0196	3.94***	0.0346	4.59***
TTD_{it-1}	-0.0184	-3.15**	-0.0184	-3.15**	-0.0195	-3.89***	-0.0336	-4.45***
DIV_{it-1}	0.0441	0.74	0.0441	0.74	0.0754	1.26	0.1187	1.42
FDI_{t-1}	0.0403	2.81**	0.0403	2.81**	0.0405	2.78**	0.0454	1.84*
GDP_{t-1}	-0.0416	-2.56**	-0.0416	-2.56**	-0.0404	-2.49	-0.0534	-2.28**
ADQ_{it-1}	0.0178	1.26**	0.0178	1.26**	0.0065	0.54**	0.0001	0.01**
Constant	0.6192	1.57	0.6192	1.57	0.5735	1.48	0.9883	1.45
R-square	0.0270		0.0078		0.0684		0.0701	
F-test	2.55 (0.0229)		2.26 (0.0416)					
Wald-test					20.05 (0.0055)		25.09 (0.0007)	

Note: (***) statistically significant at 1%, (**) statistically significant at 5%;
(*) statistically significant at 10%

4. Discussion

4.1. Debt Levels and Profitability

The findings of this research align with established literature indicating that high debt levels negatively impact firm profitability. This observation is consistent with the trade-off theory, which posits that excessive debt can lead to increased financial distress costs, thereby diminishing profitability [7, 9]. In addition, this research also has the similar results with Pham and Tran [19] which showing that financial leverage negatively impact on profitability, measuring by ROA. However, a significant deviation from previous studies is the positive correlation identified between both short-term and long-term debt and profitability (measuring by ROE) in this study. While earlier research suggests that short-term debt can pressure firms due to the necessity for frequent refinancing [3] this study posits that, if managed effectively, short-term debt could enhance profitability by ensuring liquidity for daily operations. This divergence may be attributed to the unique characteristics of the Vietnamese manufacturing sector during the study period, where firms potentially utilized debt more strategically to boost operational efficiency. Similarly, Pham [5] concluded that financial leverage positively influenced on profitability (measured by ROA).

4.2. Dividend Policies and Profitability

The research further extends existing literature regarding dividend payouts by demonstrating their positive effect on profitability. This finding resonates with Arnott and Asness [36] who argue that firms maintaining regular dividends tend to exhibit stronger profitability due to signaling effects. The implication here is clear: Vietnamese manufacturing firms could benefit from enhancing their dividend policies. However, this study introduces an innovative angle by emphasizing the importance of communication strategies—such as public announcements and direct correspondence—related to dividend policies. This aspect is often overlooked in existing literature but is particularly relevant in emerging markets where information asymmetry tends to be more pronounced.

4.3. Audit Quality and Firm Performance

Another critical finding relates to audit quality, specifically the use of Big 4 auditors, which was shown to positively influence profitability. This aligns with prior studies such as Khader [30] and Anissa [34] asserting that high-quality auditors enhance the credibility of financial reporting, thus improving investor confidence and firm valuation. In addition, Hamza et al. [32] and Tanko and Polycarp [33] also find out the positive and significant relationship between the use of Big 4 audit services and ROA. This supports the research result of this research. While endorsing the use of Big 4 firms is consistent with Vietnam's regulatory framework, this study adds a practical recommendation for periodic external auditor rotations—an aspect less frequently discussed in prior research. This distinction emphasizes the paper's contribution to operationalizing audit quality within Vietnam's specific regulatory context.

4.4. Policy Implications

The implications of these findings extend beyond theoretical discussions; they provide actionable recommendations tailored to the Vietnamese market. The negative correlation between total debt and profitability suggests that firms must carefully manage their capital structures—a sentiment echoed in the literature [37]. However, this study uniquely emphasizes assigning clear responsibilities to financial managers for monitoring debt levels relative to capital structures. Such a recommendation transcends mere theory and offers practical guidance for improving financial management practices. In summary, this research not only reinforces existing knowledge about debt management and its implications for profitability but also introduces novel insights into how Vietnamese firms can leverage short-term debt and enhance their dividend communication strategies. Furthermore, it highlights the importance of audit quality in fostering investor confidence while providing practical recommendations for aligning with regulatory frameworks. These contributions are particularly significant for practitioners and policymakers aiming to optimize financial performance in Vietnam's evolving economic

landscape.

To improve operational efficiency in financial management, Vietnamese companies should focus on strategic recommendations related to debt management, dividend policy and audit quality.

Debt management: Companies must adopt a proactive approach to debt management by strategically balancing short-term and long-term obligations. This includes assessing the cost of capital and optimizing the capital structure to minimize interest expenses while ensuring adequate liquidity for operations. Effective communication of debt strategies to stakeholders is important as it promotes transparency and builds trust, which can lead to favorable financing conditions in the future.

Dividend policy: The decision on dividend payments should be consistent with the financial health and growth objectives of the company. Organizations should consider implementing a flexible dividend policy that allows for adjustments based on earnings performance and cash flow capacity. Clearly communicating these policies to investors will help manage expectations and improve shareholder satisfaction, ultimately supporting a company's reputation in the marketplace.

Audit quality: Ensuring high-quality audits is critical to maintaining investor confidence and regulatory compliance. Companies should invest in auditor training and adopt best practices in the audit process. Regular reviews of audit quality can identify areas for improvement, ensuring that financial statements accurately reflect the company's performance. Furthermore, establishing a strong feedback loop between auditors and management can enhance accountability and transparency.

In practice, these recommendations should be communicated through comprehensive training programs, regular updates during stakeholder meetings, and transparent reporting activities. By embedding these strategies into organizational culture, Vietnamese companies can effectively navigate financial complexities while fostering trust and stability among stakeholders.

References

- [1] N. Ahmad, A. Salman, and A. Shamsi, "Impact of financial leverage on firms' profitability: An investigation from cement sector of Pakistan," *Research Journal of Finance and Accounting*, vol. 6, no. 7, pp. 2222-1697, 2015.
- [2] P. Krishna and S. Kumar, "The dual relationship between financial leverage and firm performance: Evidence from Indian firms," *Journal of Business Research*, vol. 92, pp. 143-152, 2018.
- [3] Z. Ahmad, A. Ali, and M. Hussain, "Financial leverage and profitability: Evidence from cement manufacturing firms listed on the Karachi Stock Exchange," *International Journal of Accounting and Financial Reporting*, vol. 5, no. 1, pp. 1-15, 2015.
- [4] A. Phan, C. H. Lu, L. X. Hoang, and M. P. Nguyen, "The effect of investing into distribution information and communication technologies on banking performance the empirical evidence from an emerging country," *The Journal of Distribution Science*, vol. 20, no. 6, pp. 43-56, 2022. <https://doi.org/10.15722/JDS.20.06.202206.43>
- [5] T. M. Pham, "Enhancing corporate bond issuing opportunities - empirical research in listed firms on Vietnam's stock market," *Vietnam Journal of Science and Technology*, vol. 62, no. 10, pp. 7-11, 2020.
- [6] Z. A. F. Al-Slehat, "Impact of financial leverage, size and assets structure on firm value: Evidence from industrial sector, Jordan," *International Business Research*, vol. 13, no. 1, pp. 109-120, 2020. <https://doi.org/10.5539/ibr.v13n1p109>
- [7] P. T. Manh and Q. L. Huy, "Factors impact on financial performance in big 4 Banks in Vietnam: The role of corporate social responsibility disclosure," *Accounting & Finance*, vol. 104, no. 2, pp. 58-69, 2024. [https://doi.org/10.33146/2307-9878-20242\(104\)-58-69](https://doi.org/10.33146/2307-9878-20242(104)-58-69)
- [8] M. P. Nguyen, T. T. H. Hoang, and A. Phan, "Determinants influencing intention to apply multi-dimensional profitability analysis at commercial banks' strategy," *Business Strategy Review*, vol. 5, no. 3, pp. 137-147, 2024. <https://doi.org/10.22495/cbsrv5i3art13>
- [9] M. T. Pham, H. D. Nguyen, and Q. T. Hoang, "Role of research and development on profitability: An empirical research on textile listed firms in Vietnam," *Economic Insights-Trends & Challenges*, vol. 10, no. 4, pp. 1-9, 2021. <https://doi.org/10.51865/EITC.2021.04.01>
- [10] M. M. Rahman, M. R. Meah, and N. U. Chaudhory, "The impact of audit characteristics on firm performance: An empirical study from an emerging economy," *The Journal of Asian Finance, Economics and Business*, vol. 6, no. 1, pp. 59-69, 2019.
- [11] A. May and A. Rasha, "Audit quality and firm performance: Evidence from non-financial firms in Egypt," *Journal of Accounting and Finance*, vol. 19, no. 2, pp. 45-56, 2019.
- [12] M. Kebewar, "The effect of debt on corporate profitability: Evidence from the service sector in France," *International Journal of Economics and Finance*, vol. 4, no. 2, pp. 5-15, 2012.
- [13] C. I. Enekwe, C. I. Agu, and K. N. Eziedo, "The effect of financial leverage on financial performance: Evidence of quoted pharmaceutical companies in Nigeria," *IOSR Journal of Economics and Finance*, vol. 5, no. 3, pp. 17-25, 2014. <https://doi.org/10.9790/5933-0531725>
- [14] C. Prempeh, K. Osei, and A. Asare, "Total debt and profitability: Evidence from listed firms in Ghana," *International Journal of Business and Management*, vol. 11, no. 11, pp. 123-134, 2016.
- [15] S. Lenka, "The relationship between total debt and return on equity in Czech firms," *European Journal of Business and Management*, vol. 9, no. 11, pp. 1-10, 2017.
- [16] A. Basit and N. F. Irwan, "The impact of capital structure on firm's performance: Evidence from Malaysian industrial sector-a case based approach," *International Journal of Accounting & Business Management*, vol. 5, no. 2, pp. 131-148, 2017.
- [17] O. Uluyol, E. Kocak, and A. Yilmaz, "The impact of total debt on return on equity in the construction industry," *Journal of Construction Engineering and Management*, vol. 140, no. 10, p. 04014055, 2014.
- [18] M. P. Nguyen, T. H. H. Nguyen, P. D. Hoang, M. D. Tran, and Q. T. Pham, "Determinants influencing information transparency in Vietnamese commercial banks," *The Journal of Asian Finance, Economics and Business*, vol. 7, no. 12, pp. 895-907, 2020. <https://doi.org/10.13106/jafeb.2020.vol7.no12.895>
- [19] T. M. Pham and T. T. H. Tran, "Enhancing operational efficiency of Vietnamese textile and garment enterprises in the context of the EVFTA," *Vietnam Journal of Science and Technology*, vol. 63, no. 4, pp. 8-12, 2021.
- [20] E. Zelgalve and I. Berzkalne, "Long-term debt and profitability: Evidence from Baltic companies," *Journal of Business Management*, vol. 6, no. 2, pp. 12-20, 2015.

- [21] A. A. Tifow and O. Sayilir, "Capital structure and firm performance: An analysis of manufacturing firms in Turkey," *Eurasian Journal of Business and Management*, vol. 3, no. 4, pp. 13-22, 2015.
- [22] O. F. Ikapel and I. Kajirwa, "Analysis of long term debt and financial performance of state owned sugar firms in Kenya," *International Journal of Commerce and Management Research*, vol. 3, no. 2, pp. 108-111, 2017.
- [23] A. Andersson and J. Minnema, "The relationship between leverage and profitability: A quantitative study of consulting firms in Sweden," Bachelor's Thesis, Umeå University, DiVA Portal, 2018.
- [24] E. Kirmi, "The impact of long-term debt on profitability in the energy sector: Evidence from Kenya," *Journal of Finance and Accounting*, vol. 6, no. 2, pp. 45-52, 2018.
- [25] M. M. K. Tailab, "The effect of capital structure on profitability of energy American firms," *International Journal of Business and Management Invention*, vol. 3, no. 12, pp. 54-61, 2014.
- [26] M. Nadeem, M. Ali, and A. Khan, "Short-term debt and profitability: Evidence from cement sector in Pakistan," *Journal of Business Studies Quarterly*, vol. 6, no. 4, pp. 20-30, 2015.
- [27] S. A. R. Bokhari and M. Khan, "Impact of short-term debt on profitability: Evidence from non-financial companies in Pakistan," *Journal of Business and Management*, vol. 12, no. 3, pp. 1-10, 2013.
- [28] S. Aziz and U. Abbas, "Effect of debt financing on firm performance: A study on non-financial sector of Pakistan," *Open Journal of Economics and Commerce*, vol. 2, no. 1, pp. 8-15, 2019.
- [29] S. Vătavu, "The impact of capital structure on financial performance in Romanian listed companies," *Procedia Economics and Finance*, vol. 32, pp. 1314-1322, 2015.
- [30] A. Khader, "Audit quality and firm performance: Evidence from the Jordanian market," *Journal of Accounting and Finance*, vol. 21, no. 2, pp. 45-60, 2021.
- [31] M. M. Elewa and R. El-Haddad, "The effect of audit quality on firm performance: A panel data approach," *International Journal of Accounting and Financial Reporting*, vol. 9, no. 1, pp. 229-244, 2019. <https://doi.org/10.5296/ijaf.v9i1.14163>
- [32] I. H. Hamza, M. H. Norhayati, and A. G. J. Rawan, "The impact of audit quality in firm performance: The moderating role of ownership concentration," *International Journal of Professional Business Review*, vol. 8, no. 4, pp. 17-21, 2023.
- [33] M. Tanko and O. Polycarp, "Audit quality and firm performance in Nigeria: An empirical analysis," *Journal of Accounting Research*, vol. 57, no. 1, pp. 23-38, 2019.
- [34] D. Anissa, "The impact of corporate social responsibility on firm financial performance: Does audit quality matter?," *Journal of Applied Accounting Research*, vol. 23, no. 5, pp. 950-976, 2022. <https://doi.org/10.1108/jaar-06-2021-0150>
- [35] E. K. Kimeli, "Determinants of audit fees pricing: Evidence from Nairobi Securities Exchange," *International Journal of Research in Business Studies and Management*, vol. 3, no. 1, pp. 23-35, 2016.
- [36] R. D. Arnott and C. S. Asness, "Surprise! Higher dividends= higher earnings growth," *Financial Analysts Journal*, vol. 59, no. 1, pp. 70-87, 2003.
- [37] F. Modigliani and M. H. Miller, "The cost of capital, corporation finance and the theory of investment," *The American Economic Review*, vol. 48, no. 3, pp. 261-297, 1958.

Appendix 1.

F-test result to compare between POLS and FEM.

Indicators	Model	
	Model 1	Model 2
Result	8.34***	5.66***

Note: (***) statistically significant at 1%, (**) statistically significant at 5%; (*) statistically significant at 10%

F-test statistics of Model 1 and Model 2 are 8.34 and 5.66, and p-values are smaller than 0.05.

The null hypothesis is rejected, or there is a variant in the data: FEM is better than POLS.

Appendix 2.

Breusch and Pagan Lagrangian multiplier test result.

Indicators	Model	
	Model 1	Model 2
Result	361.06***	186.79***

Note: (***) statistically significant at 1%, (**) statistically significant at 5%; (*) statistically significant at 10%

LM test statistics of Model 1 and Model 2 are 361.06 and 186.79, and p-values are smaller than 0.05.

The null hypothesis is rejected, or there is a variant in the data: REM is better than POLS.

Appendix 3.

Hausman's test result to compare between FEM and REM.

Indicators	Model	
	Model 1	Model 2
Result	16.72**	26.60***

Note: (***) statistically significant at 1%, (**) statistically significant at 5%; (*) statistically significant at 10%

Hausman's test for Model 1 and Model 2 are 16.72 and 26.60, respectively. The p-values of Hausman's test for Model 1 is 0.0193, and the p-value of Hausman's test for Model 2 is 0.0004. Both are smaller than 0.05, indicating that the Random Effects Model (REM) is better than the Fixed Effects Model (FEM).