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An analysis of the interaction between leverage and market value: Evidence from the Ho Chi Minh City Stock Exchange in Vietnam

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ABSTRACT

This paper analyzes the relationship between leverage and market value among all firms listed on the Ho Chi Minh City Stock Exchange in Vietnam. Leverage and firm value are crucial concepts in the business world, making this topic of great interest to many researchers. However, previous studies have mainly focused on the impact of leverage on individual firms, neglecting the potential influence of industry-level leverage on firm value. We analyze the impact of leverage on firm value at both the firm and industry levels. We use two econometric models: one-step linear regression and hierarchical regression. Hierarchical regression, also known as a multilevel model, allows us to examine how firm value determinants affect market value at three levels: observation, firm, and industry. If this is the case, single-level regression estimation may produce biased results. Our prediction holds: the research data show stratification. Both firm-level and industry-level leverage have significant negative effects on firm market value. Here, the multilevel model can provide more precise and unbiased results than single-level regression. We contribute to the literature on the relationship between leverage and firm value in the Vietnamese market, where managers consider not only firm-level leverage but also industry-level leverage when making capital structure decisions.

1. Introduction

The topic of capital structure, in general, and its relationship to firm value is not new, but it is never old because it is related to the survival of a business. Particularly in the context of the ever-changing environment of modern business, this topic will continue to be of interest to academics and businesses alike (Bui et al., 2023).

Debt can be said to be a double-edged sword for businesses. On the one hand, it helps companies reduce costs by providing a tax shield. However, with a very high proportion of short-term debt in the debt structure, debt repayment will put pressure on solvency, which will affect cash flow and thus negatively affect the value of companies. For example, according to data from Moody's Investors Service, more than 40 companies filed for bankruptcy in the U.S. in the first half of 2023, twice as many as in the same period last year. Some of the major bankruptcies so far this year include Silicon Valley Bank (SVB), the large retail chain Bed Bath and Beyond, and the sports chain Diamond Sports. Analysts believe that rising interest rates are the biggest culprit in putting these companies under financial stress. Companies that need more liquidity or are burdened with debt and need to roll over debt are all facing high-interest rates. Therefore, a reasonable level of debt that helps companies reduce costs and ensures payment security is what all companies strive for (Laghari et al., 2023; Brunnermeier and Krishnamurthy, 2020).

It is well established in both theoretical and empirical literature that the amount of debt used in a firm can have an impact on its value. Despite the large volume of theoretical and empirical studies on the connection between debt finance level and firm value, no consistent conclusion has been reached on this nexus. Most capital structure theories agree that borrowing is an effective method to minimize asymmetric information and agency conflicts and thus enhance firm market value. Empirical studies have shown very mixed results. A bunch of research conducted in different markets, from emerging to

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developed ones, reveals the opposite result to theories, showing evidence of the inverse influence of firms' financial leverage on their value (Fosu et al., 2016; Vo and Ellis, 2017). More interestingly, Cheng and Tzeng (2014) discovered that the level of debt used in a firm affects its market value in a U-shaped relationship. In this research, besides the inclusion of internal corporate governance indicators like in other studies, the authors also pay attention to the role of macroeconomic factors and include them in the model as moderators and mediators of the relationship.

Our study examines how a company's use of debt affects its market value, focusing on Vietnam, an emerging market. Previous research on Vietnamese companies has shown inconsistent results regarding this relationship. For example, Vo and Ellis (2017) found that debt negatively impacts a company's value. However, a later study by Dang and Do (2021) reported mixed outcomes. They looked at companies across different industries in Vietnam and found that while debt was linked to higher market value in the food and beverage industry, it had a negative effect in the wholesale trade and construction sectors. The varied conclusions in these studies, especially concerning Vietnam, inspire us to explore this topic further.

In our review of past research on how companies use debt and its effect on their market value, we noticed some trends that point to an important area not fully explored. The amount of debt a company decides to hold is influenced by its specific business characteristics. These characteristics, which can shape business decisions, include factors unique to the company as well as those common across the industry in which it operates. This observation led us to identify a gap in research that we find intriguing: how the particular nature of a company's business and industry-specific factors together impact its decision on debt levels and, subsequently, its market value (Moritz et al., 2016; Kenourgios et al., 2019). Therefore, besides common factors related to the firm-specific that are widely examined in the literature, such as firm size, profitability, and board composition, prior studies also suggest that industry-specific factors or industry type do matter in deciding a firm's leverage (Islam and Khandaker, 2015), and therefore, it may be relevant in determining the firm's market value. As a result, when studying the association between firm value and the level of debt used in the firm, some authors add dummy variables in their traditional (ordinary least squares OLS) regression models or fixed effects models to control for the effects of industry. This practice implies the researchers' recognition of the impact of industry characteristics on firm value. However, by including industry dummies in the model, we can only observe the impact of industry type in general but not the separate effect of each industry-level attribute. For example, we cannot distinguish between the effect of industry-level leverage and the effect of industry-level profitability. This is also considered one disadvantage of the traditional single-level regression. To overcome this weakness, we employ a hierarchical approach (also known as a multilevel or nested data model), which is seen as a generalization of the linear model that allows intercepts and coefficients to be random. Thanks to this method, we can now observe the impact of leverage at both the firm level and industry level on the market value.

In reviewing research related to the Vietnamese market, we found no previous studies that look into how industry-wide debt levels influence company value. Our study is pioneering in evaluating the effect of how much debt industries carry on the value of companies within those industries, especially for those trading on the Ho Chi Minh City Stock Exchange. We employed a technique known as multilevel analysis to uncover patterns of debt usage across different industries. This technique allows us to analyze data that is organized at more than one level, such as both the company and industry levels, offering a nuanced view beyond what traditional single-level analysis can provide. Our findings are significant, showing that a company's market value is influenced not just by its own debt levels but also by the debt levels prevalent in its industry. This work expands the existing body of research by introducing a novel analytical method to explore the relationship between company value and debt, thereby deepening our understanding of these dynamics.

2. Literature review

2.1. Theoretical framework

There are multiple theories on capital structure regarding the level of debt used in firms. Most of them also mention and explain the link between firm value and its capital structure, as the two factors are inextricably linked with each other. According to McMillan and Camara (2012), "The relationship between capital structure and firm value may be broadly understood through the weighted average cost of capital (WACC)." The net income approach by Durand (1952) was one of the oldest hypotheses about capital structure. This theory measures the capital structure's cost in terms of the WACC and posits that a connection exists between the capital structure and the firm's market value. Based on certain assumptions, Durand (1952) Brought forth the relevance of the debt-to-equity ratio in determining the firm market value. In detail, it suggests that an increase in the market value brings about a decrease in the overall WACC. A firm can lower its cost of capital by using more debt, as it is an effective and cheap source of finance.

With a similar viewpoint to the net income approach, the trade-off theory adds some new notions in explaining the effect of the level of debt employed in a firm on its WACC and market value. Companies can take advantage of tax shields to reduce their cost to finance assets by gearing up and using more debt to finance their assets (Dommes et

al., 2019). However, the use of tax shield advantage should be considered with the threat of bankruptcy and financial distress as the company takes on more debt, the risk of bankruptcy increases. The firm's optimal capital structure is determined at the point of the lowest value of WACC and, therefore, the highest market value. After this optimal point, more debt will be counterproductive.

The pecking order theory was first initiated by Donaldson (2000) and then further developed by Myers (1984). The view ranks different types of capital, including new equity, retained earnings, and debt, in a pecking order when firms make their financing decision. The firm will prefer retained earnings over debts to finance its assets and projects, and new equity will be the last option to consider. Pecking order theory approaches the link between firm leverage and its value through the concept of "information asymmetry." The fact that firms choose to issue new equity, overtaking more debt might make outside investors interpret this behavior as the overestimation of the company value, causing the stock price to fall and, hence, undermining the company value and the net loss of existing shareholders. Pecking order theory supports the view that leverage is an effective way to reduce information asymmetry and, therefore, help improve the firm's value.

2.2. Empirical literature

In the empirical literature, the results yielded are varied. Based on a simple observation, Fama and French (1998) assumed that market value is "(i) the market value of an all-equity no-dividends firm with the same pretax expected net cash flows (cash earnings before interest, dividends, and taxes, less investment outlays), plus (ii) the value of the tax effects of the firm's expected dividend and interest payments." The paper investigates how the taxation of dividends and debt financing influence firm value by constructing the cross-sectional regression model. Interesting findings are revealed. Their model shows that financial leverage level and long-run changes in debt have valuable information about prices missed by other indexes (for example, earnings, investment, and dividends). Yet, instead of the positive correlation postulated in most of the theories discussed above, the marginal relation between leverage and value is typically negative in the regression. The authors interpreted this result as relevant to Miller's (1977) hypothesis that the level of debt used by the firm has no net tax benefits because "personal taxes on interest offset the corporate tax savings." Similarly, not only single research concludes on the negative relationship (Pandey and Sahu, 2017; Vo and Ellis, 2017; Akomeah et al., 2018). On the other hand, research by Kartikasari et al. (2019) using the traditional multiple regression model strongly supported the positive influence of firm leverage on its value. They postulated that the use of debts in Indonesian firms is viewed by the investors as an effective way to gain added value for the business. Cheng and Tzeng (2014) theoretically and empirically showed that leveraged firms have greater values than unleveraged firms if the probability of bankruptcy is not considered. Furthermore, they stated that enterprises having greater opportunities for growth and higher Z-scores tend to see a much stronger positive relationship between their debt and value. Even mixed outcomes are found in one research. The study of Iturriaga and Crisostomo (2010) examined the dual role of debt financing. They aim at 200 Brazilian companies listed on the stock exchange for the duration of 10 years (1995-2004). Through the regression estimation method, debt financing is found to harm the value of firms with growth opportunities. In contrast, in firms with low opportunities to grow, borrowings seem to be more beneficial and improve their values.

Overall, there is no consistent pattern of the association between debt and business value. It manifests variously in different markets and economies. However, empirical studies on this topic share some common points regarding their research scope, design, and methodology. Accordingly, the majority of papers investigating the firm leverage-value connection pay attention only to the influences of firm leverage and ignore the impacts of industry and country leverage levels. This fact affects the authors' choice of research methodology. In most of the above research, the traditional single-level linear or non-linear regression models and some of their extensions (for example, pooled OLS, fixed effects, random effects, multivariate model, and generalized method of moments (GMM)) are employed to generate results however, if determinants at higher levels, such as industry or country level, matter, single-level regression is no longer appropriate.

Literature documents show that finance decisions in a business are influenced by many factors, which can be divided into three levels: firm-specific, industry-specific, and country-specific. A study by Joeveer (2013), which extensively investigates SMEs' capital structure determinants in eight European countries, reports that country-specific factors have stronger influences on small businesses, while factors at the industry level show greater impacts on larger companies. The author estimates that around 10% of variances in small firms' capital structure are explained by country-specific factors. Another study in the UK by Hall et al. (2000) revealed that the effect of firm-specific factors on leverage varied from one industry to another. Based on these arguments, we contend that not only debt at the firm level but also debt at the industry level can have effects on the firm value. When investigating the impact of leverage on business value, some authors recognize the importance of sector-level influential factors and try to estimate and control for these effects by including industry dummy variables in their models (Iturriaga and Crisostomo, 2010; Vo and Ellis, 2017). Yet, as discussed in the first section, under this technique, the impacts of industry-level predictors are confounded with the impacts of the industry

dummies. Our paper aims to address this issue. We first will revisit the topic of the relationship between firm debt and firm value and then find the answer to the question regarding the impact of industry leverage level on firm value: "Does industry-level leverage have an impact on the firm value?". Accordingly, we propose two hypotheses as follows:

H1: Firm leverage has a negative impact on firm value.
H2: Industry-level leverage has an impact on the firm value.

3. Test design

3.1. Measure for firm value

Different studies used different measures for firm value. Table 1 summarizes measures for firm value. Accordingly, we choose the market-to-book ratio (Tobin's Q) as the proxy for company value in this research.

$$FV = \frac{MV+DV}{TAV} \quad (1)$$

where, FV is the firm value. MV is the market value of equity (total outstanding share number multiplied with (x) closing price of firm share). DV represents the total value of debt in a firm, and TAV is the total book value of assets.

3.2. Model development and data collection

3.2.1. Single-level regression model

To test the first hypothesis, we build the single-level (or one-level) regression model, which employs firm value (FV) as a dependent variable and firm leverage (LEV) as the explanatory variable. Firm size (FS), profitability (ROA), managerial ownership (MO), and foreign ownership (FO) are added to the model as they are documented in previous research to have an impact on firm value (Sinha, 2017; Vo and Ellis, 2017; Kartikasari et al., 2019). Besides, we also control for industry and year effects by including industry dummies (coded as INDUSTRY) and year dummies (coded as YEAR) in the model. Codes and explanations for all variables are presented in Table 2.

Model 1

$$FV_{ijk} = \beta_{0jk} + \beta_{1jk} LEV_{ijk} + \beta_{2jk} FS_{ijk} + \beta_{3jk} ROA_{ijk} + \beta_{4jk} MO_{ijk} + \beta_{5jk} FO_{ijk} + \beta_{6jk} INDUSTRY + \beta_{7jk} YEAR + \varepsilon_{ijk} \quad (2)$$

Table 1: Measure for firm value in previous studies

No.	Measure for firm value	Research
1	Market-to-book ratio (Tobin's Q)	Iturriaga and Crisostomo (2010), Lin and Chang (2011), Fosu et al. (2016), Kartikasari et al. (2019), Huynh et al. (2020), Cooper et al. (2022), and Tang et al. (2022)
2	Market-to-equity ratio	Iturriaga and Crisostomo (2010)
3	Market value minus total assets' book value divided by total assets' book value	Fama and French (1998)
4	Abnormal announcement returns (calculated by the CAPM model)	Lundstrum (2009)
5	Cumulative abnormal stock returns	Vo and Ellis (2017)

Table 2: Explanations for variables in model 1

No.	Level	Code	Name	Measurement
1	1	FV	Firm value	Estimated by the value of Tobin's Q (Eq. 1)
2	1	LEV	Firm leverage	Total debt divided by the total book value of equity
3	1	FS	Firm size	Total assets' logarithm
4	1	ROA	Profitability	Net profit divided by total firm equity
5	1	MO	Managerial ownership	The rate of shares owned by managers
6	1	FO	Foreign ownership	The rate of shared owned by the foreign investor

3.2.2. Multilevel model

When studying how a company's value is determined, it's important to consider not just the specific characteristics of the company itself but also the broader industry context in which it operates. This idea suggests that factors influencing a company's market value can be organized into three levels: the individual observations (such as specific financial data points), the company level (including its own financial health, strategy, and performance), and the industry level (reflecting broader market and sector influences). According to research by Kayo and Kimura (2011), characteristics from a higher level can impact those at a lower level, indicating that an analysis focusing only on a single level might miss important influences and lead to inaccurate conclusions.

To address this, our study not only looks at company-specific debt levels (a single-level analysis) but also employs a multilevel model to examine how industry-wide factors contribute to a company's market value. This multilevel approach has several benefits over traditional regression techniques, which typically do not account for the nested nature of data and may underestimate or overestimate the importance of certain variables due to ignoring the grouping effect. By using a multilevel model, we can more accurately estimate the impact of both company-specific and industry-wide variables on market value, separating the effects of group-level predictors from those of individual companies. This

method allows for a more nuanced and accurate analysis, providing better insights into how various factors contribute to a firm's market value.

We develop three-level determinants of firm value according to studies by Kayo and Kimura (2011) and Mo et al. (2023). The first level is across the observation unit, level two is the between-firm level, and level three is the industry level. The multilevel models are extended gradually from the empty model (Eq. 3) to the model with the random intercepts (Eq. 4), the model with random coefficients (Eq. 5), and then the model with the inclusion of some control as determinants (Eq. 6). For firm-level determinant (level 2), we employ leverage mean for each firm during the studied period (from 2017 to 2021). For the industry-level determinant (level 3), the role of the grand mean of all firms' leverage in one industry is analyzed in the multilevel model. Codes and explanations for variables in all multilevel models are presented in Table 3.

The empty model: The empty model is performed in the first step to determine whether there is evidence of clustering in the data with respect to the dependent variable.

Level-one equation:

$$FVijk = \beta_{0jk} + \varepsilon_{ijk} \quad (a_0)$$

Level-two equation:

$$\beta_{0jk} = \gamma_{00k} + \mu_{0jk} \quad (a_1)$$

Level-three equation:

$$\gamma_{00k} = \delta_{000} + r_{00k} \quad (a_2)$$

Model 2: Combined empty model:

$$FV_{ijk} = \delta_{000} + r_{00k} + \mu_{0jk} + \varepsilon_{ijk} \quad (3)$$

Random-intercept models with covariates:

Level-one equation:

$$FV_{ijk} = \beta_{0jk} + \beta_{1jk} LEV_{ijk} + \varepsilon_{ijk} \quad (a_3)$$

Level-two equation:

$$\beta_{0jk} = \gamma_{00k} + \gamma_{1jk} FLEV_{0jk} + \mu_{0jk} \quad (a_4)$$

Level-three equation:

$$\gamma_{00k} = \delta_{000} + \delta_{01k} ILEV_{00k} + r_{00k} \quad (a_5)$$

where, FLEV and ILEV are the firm-level and industry-level leverage, respectively. The firm-level industry is the mean of firm leverage through the study period. Industry-level leverage is measured as the mean of industry leverage through the study period. FLEV is the level two variable, and ILEV is the level three variable.

Model 3 (Eq. 4) is obtained by consolidating equations (a_3), (a_4), and (a_5). This model is to estimate if the intercepts of the three levels are random.

Model 3

$$FV_{ijk} = \delta_{000} + \delta_{01k} ILEV_{00k} + \gamma_{1jk} FLEV_{0jk} + \beta_{1jk} LEV_{ijk} + \varepsilon_{ijk} + \mu_{0jk} + r_{00k} \quad (4)$$

Random-coefficient models with covariates: Model 4 (Eq. 5) is the combination of (a_6) to (a_9). It is a more consolidated mixed-effect model that assumes the intercepts and slopes of firm-level variables are random and affected by determinants at firm and industry levels. In other words, by using this type of model, we can analyze the indirect effects of sector characteristic levels on a company's value.

Level-one equation:

$$FV_{ijk} = \beta_{0jk} + \beta_{1jk} LEV_{ijk} + \varepsilon_{ijk} \quad (a_6)$$

Level-two equation:

$$\beta_{0jk} = \gamma_{00k} + \gamma_{1jk} FLEV_{0jk} + \mu_{0jk} \quad (a_7)$$

Level-three equation:

$$\gamma_{00k} = \delta_{000} + \delta_{01k} ILEV_{00k} + r_{00k} \quad (a_8)$$
$$\beta_{1jk} = \delta_{100} + \delta_{110} ILEV_{00k} + r_{1jk} \quad (a_9)$$

Model 4

$$FV_{ijk} = \delta_{000} + \delta_{01k} MLEV_{I00k} + \gamma_{1jk} MLEV_{F0jk} + \delta_{100} LEV_{ijk} + \delta_{110} ILEV_{00k} * LEV_{ijk} + + r_{1jk} LEV_{ijk} + \varepsilon_{ijk} + \mu_{0jk} + r_{00k} \quad (5)$$

Model 5 (Eq. 6) is extended from model 4 (Eq. 5) by adding some more explanatory variables as determinants, including firm size, profitability, managerial ownership, foreign ownership, and industry and year dummy variables.

Model 5

$$FV_{ijk} = \delta_{000} + \delta_{01k} ILEV_{00k} + \gamma_{1jk} FLEV_{0jk} + \delta_{100} LEV_{ijk} + \delta_{110} ILEV_{00k} * LEV_{ijk} + r_{2jk} LEV_{ijk} + \delta_{200} YEAR_{ijk} + \delta_{300} FS_{ijk} + \delta_{400} ROA_{ijk} ++ \delta_{500} FO_{ijk} + \delta_{600} YEAR + \varepsilon_{ijk} + \mu_{0jk} + r_{00k} \quad (6)$$

3.2.3. Data collection

As described above, one primary strategy of the test is to perform multilevel modeling in which three levels of firm value determinants are analyzed. For software packages and estimation algorithms, the success in fitting a multilevel model depends on the size of the data, including the numbers of each level unit. The major restriction is often the higher-level sample size. Too large data or models may lead to memory problems or slow execution. On the

contrary, too small a data sample may affect the accuracy of the model estimation result. Maas and Hox (2005) concluded that "only a small sample size at level two (meaning a sample of 50 or fewer) leads to biased estimates of the second-level standard errors." In our tests, we also managed to avoid this problem. Table 3 describes our data sample in terms of industry.

Table 3: Industry description

	No. of companies	No. of observations	I_LEV
Consumer discretionary	78	379	1.15
Energy	16	70	0.81
Utilities	31	139	1.01
Industrials	97	452	1.17
Consumer staples	52	238	1.12
Tech	15	47	0.95
Real estate	29	121	2.23
Communication service	17	66	0.93
Health care	14	58	1.04
Materials	9	40	1.22
Total	358	1,610	

Our data sample includes companies listed on the Ho Chi Minh City Stock Exchange in Vietnam for five years from 2017 to 2021. All companies are required to be listed and remain listed in at least the last two years. The research data is provided by Tai Viet Corporation, a leading supplier of financial data in Vietnam (https://vietstock.vn). Financial companies such as banks, securities, and insurance are not relevant and, hence, excluded because they have a unique nature of business and are associated with extremely high levels of leverage. In the end, the final sample has 358 companies with 1,610 observations coming from 10 sectors apart from financials (classified according to GISC – Global Industry Classification Standard).

4. Empirical results

4.1. Statistic description

The research employs the software SPSS statistics to perform the test. Table 4 presents the descriptive statistics for all variables in the test sample.

Table 4: Statistic description

	N	Range	Minimum	Maximum	Mean	Std. deviation
FV	1,610	9.03	0.09	9.12	1.44	0.89
LEV	1,610	4.96	0.00	4.96	1.18	1.05
MO	1,610	79.16	0.00	79.16	6.91	6.42
FO	1,610	77.52	0.00	77.52	17.82	15.37
ROA	1,610	1.72	-0.81	0.94	0.13	0.11
FS	1,610	4.13	9.83	13.96	11.09	0.74
FLEV	1,610	4.89	0.02	4.91	1.18	0.68
ILEV	1,610	11.68	0.05	3.86	1.18	0.43

At first glance, we can see the maximum and minimum values of Vietnamese firms in the sample are 0.09 and 9.03, respectively, which shows the significant differences in firm value among different Vietnamese listed firms. While some companies have a very low market price, some other companies seem to perform well and are highly evaluated by investors. However, looking further at the mean value of 1.44 with a standard deviation of only 0.87, we can infer that the majority of the sampled companies have Tobin's Q less than three.

Similarly, although the maximum leverage level is 4.96, the leverage mean and standard deviation of the non-financial sample are only 1.18 and 1.04, respectively. This level is higher than most Latin American companies (Munoz-Mendoza et al., 2022) but still lower than that in many emerging markets such as Pakistan-listed firms (2.42), Bangladesh firms (1.20) (Chow, 2019; Uddin et al., 2022). Current Vietnamese law, which came into effect in 2016, limits the debt-to-equity ratio of listed firms to five times. This explains why the maximum level of debt-to-equity ratio of Vietnamese companies stands at 4.96 for this period.

Table 5 presents the correlation result among variables of the research sample with 1,610 observations. Generally, the correlation coefficients between variables are below 0.5, and all the VIF indexes are smaller than five, showing no serious multi-collinearity issues between variables.

Table 5: Correlations between variables

	FV	LEV	MO	ROA	FS	FO	VIF
FV	1						
LEV	-.192*	1					1.014
MO	-.061	-.027	1				1.107
ROA	.376**	-.026**	.026	1			1.183
FS	.073*	-.018**	-0.068	.063**	1		1.630
FO	.343**	.275*	-.240***	.419*	.228**	1	1.502

Note: *, **, and *** indicate the significance at the 10% level (1-tailed), 5% level (2-tailed), and 1% level (3-tailed), respectively

4.2. Results

4.2.1. Single-level regression results

For single-level regression, we perform pooled ordinary least squares (OLS), fixed effects (FE), and random effects (RE) tests to examine the impact of firm-level leverage on firm value. Table 6 presents the outcomes for all these above tests. In all three models, while the coefficient of determination (R-square) under the assumption of the pooled regression model is 0.2351, meaning that 23.51% of the variation in firm value can be explained by all the independent and control variables, 27.14% and 28.72% are shown under fixed effect and random effect model respectively.

Table 6: Results for pooled OLS, fixed effects (EF), and random effects (RE) models

	Pooled OLS		FE model		RE model		FE (Robust SE)	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
(Constant)	-0.472	0.167	0.141	0.038	0.168	0.0274	0.141	0.106
LEV	-0.065**	0.005	-0.047**	0.002	-0.061*	0.039	-0.047**	0.013
MO	-0.038	0.014	0.019*	0.001	0.060	0.025	0.019*	0.007
FO	0.016***	0.009	0.013***	0.007	0.048***	0.036	0.013***	0.011
ROA	1.972**	0.715	2.406*	1.003	1.765**	0.702	2.406*	1.183
FS	0.045***	0.039	0.036***	0.014	0.013***	0.005	0.036***	0.031
Industry dummies	Yes		Yes		Yes		Yes	
Year dummies	Yes		Yes		Yes		Yes	
R-Square	0.2351		0.2714		0.2872			
F-test			51.49***					
Hausman test			5.84***					
Heteroskedasticity			0.000***					
No. of Obs	1,610		1,610		1,610		1,610	

Note: *, **, *** indicate p <0.1, 0.05, and 0.01, respectively

An F-test is carried out to decide the suitable model between the pooled OLS and the fixed effects. The F-test is 51.49 with a significant level of less than 0.01 (1%), indicating the better fit of the fixed effects model compared to the pooled OLS. Following this, we perform the Hausman test to choose between the fixed effects and the random effects model. The probability of Wald yielded in the test is less than 0.01, which means that the null hypothesis H0 is rejected, and thus, the fixed effects model is better off for analysis purposes. Next, the additional score test (Lagrange Multiplier – LM) test shows that heteroscedasticity matters. Therefore, the fixed effects model with robust standard errors is conducted.

From Table 6, we can see that firm leverage has a significantly negative impact on firm value. The higher level of debt employed by a firm can harm its market value. Using more debt to finance assets seems counter-productive and reduces a firm's market value. Hypothesis H1 is accepted. Although the negative relationship between capital structure and shareholder value is not consistent with most of the theories in the literature mentioned above, our outcomes still support the results of various empirical studies in the past (Pandey and Sahu, 2017). Especially our analysis result is in line with a study by Vo and Ellis (2017) which showed that a higher level of debt in Vietnamese firms lowers their shareholder value, indicating a proportionately greater cost to debt financing than benefit for Vietnamese firms. Another experiment on the pecking order theory was conducted by Huynh et al. (2020) in the context of the Vietnamese emerging market. They explain that information asymmetry is a market failure and hypothesize that debt financing can be an effective tool to narrow the gap of information and help to improve the corporate market value.

Besides leverage, the regression result also shows that other variables, including firm profitability, firm size, and foreign ownership, are positively correlated to the firm's value. Managerial ownership is revealed to have a negative influence on firm value, but this relationship is insignificant.

4.2.2. Multilevel models

Table 7 shows the results of covariance parameter estimation in four models (models 2, 3, 4, and 5). The level one, level two, and level three variances are tested using the Wald Z test in SPSS.

Table 7: Variance decomposition

	Model 2	Model 3	Model 4	Model 5
Covariance parameters				
Time level	0.12263***	0.12286***	0.12232***	0.11148***
Firm level	0.51127***	0.51534***	0.46282***	0.30147***
Industry level	0.04107**	0.04315**	0.05302**	0.02906**
Covariance parameters (%)				
Time level	18.17	18.03	19.17	25.22
Firm level	75.75	75.62	72.52	68.20
Industry level	6.08	6.34	8.31	6.57

Note: ** and *** indicate significance at 1%, 5%, and 10%, respectively

Model 2 (the empty or null model) tests the null hypothesis, which proposes that the variation in the level one (observation unit) outcome or the intercepts at level two (firm level) and level three (industry level) is insignificant. Without the inclusion of covariates, we can observe the relative importance of each class on the variance of firm value. Heck et al. (2014) noted that "5% is often considered a "rough cut-off" of evidence of substantial clustering." We can see that the variation at the observation level and firm level are significantly greater than zero. This is considered evidence of non-trivial clustering of time-level units within firm-level clusters. In detail here, we have evidence of substantial clustering, where 18.17 percent of the firm value variation in firm value occurs across observation units, which means that the level-1 leverage can be considered a valid predictor for firm value. For instance, the important influence of macroeconomic shocks that each firm may feel in a given year. The intra-class correlation (ICC) at the firm level accounts for a large proportion of value variance, 75.8 percent, indicating that intrinsic corporate characteristics are responsible for a significant proportion of firm value. The impact of the determinant at the sector level shows the smallest proportion, at 6.08 percent, with an insignificance level of 5%. However, according to Heck et al. (2014), this level of clustering (above 5%) is still seen as substantial and can have an important role in inferences.

Estimations for models 3, 4, and 5 show similar results for all levels of the hierarchical data apart from results for industry class. The lower levels (observation and firm level) are mainly responsible for most of the firm value variance. This might be justifiable as variables at these levels are more likely to change than at the industry level. Moreover, we see that the ICC at the firm level decreased from the null/intercept model 2 to model 5 after controlling for the level one and level two predictors (LEV and FLEV) with randomly varying intercepts and slopes (Kayo and Kimura, 2011). This is generally interpreted to mean that the inclusion of these determinants (LEV and FLEV) managed to account for some of the market value variations between firms. The sector level shows significant proportions of 5, 8, and 6 percent for models 3, 4, and 5, respectively. These are the evidence for substantial clustering in research data and significant contribution of industry leverage to firm value's variances. We can say that the industry level of leverage does matter and is relevant in determining the value of a firm.

Table 8 shows the hierarchical linear estimation for the fixed effects of the year, firm, and industry levels. The intercept estimated for empty model 2 is 1.18, which can be interpreted as the grand mean of the sample's firm value. Models 3 to 5 gradually add covariates. In model 3 of random intercept, at the 0.05 level of significance, leverage (LEV) and the firm leverage mean (FLEV) positively affect the firm's market value. These results still hold significance even after considering the random coefficient (Model 4) and adding more firm-level value determinants (Model 5). A higher level of debt used in a firm can help to improve its market value. This is consistent with the result from our single-level regression model and supports extant literature in the past that supports the inverse association between the level of debt used in a firm and the market value (Akani and Kenn-Ndubuisi, 2017; Akomeah et al., 2018). Our hypothesis H1 is also confirmed by the outcome of the multilevel model.

Table 8: Fixed effects result

Fixed effects parameters	Model 2	Model 3	Model 4	Model 5
Intercept	1.185187	1.18916	1.19053	1.19830
Year fixed effect		No	No	Yes
LEV		-0.075** (0.028)	-0.077* (0.063)	-0.069** (0.065)
FLEV		-0.016** (0.018)	-0.021** (0.014)	-0.028** (0.013)
ILEV		-0.211 (0.156)	-0.305* (0.227)	-0.156* (0.081)
LEV*ILEV			-0.383 (0.146)	-0.418* (0.363)
ROA				3.270* (3.040)
FS				0.090*** (0.005)
MO				-0.037 (0.019)
FO				0.020** (0.005)

Note: Standard errors are in parentheses; *, **, and *** indicate significance at 1%, 5%, and 10%, respectively

Additionally, models 3, 4, and 5 also reveal consistent shreds of evidence for the negative and significant influence (at level 0.1) of the level-3 predictor (ILEV) on the value of the firm. These outcomes once again confirm the inferences we made above based on the results of variance decomposition on the essential contribution of industry leverage in explaining the change of firm value. The interaction variable (LEV*ILEV) representing the indirect influences of industry-related attributes on firm value in model 5 shows negative and significant results, indicating that industry leverage level has a moderating role in the impact of firm leverage on its market value. This outcome confirms our hypothesis H2 and provides stronger evidence for the view of previous scholars who suggested that industry-level determinants are relevant in considering factors related to the topics of capital structure. In more detail, Simerly and Li (2000) contend that environmental characteristics and similarities affect all organizations of a given industry. Their findings suggest that "firms the interaction variable between dynamism and industry leverage show a negative and significant influence on firm return on assets." Mo et al. (2023) also employed the hierarchy method and came to the

conclusion that debt at the industry level can harm a firm's investment activity.

Besides, estimation for model 5 also supports the model 1 (linear regression) result as firm value is revealed to be positively correlated to other firm variables – profitability (ROA), foreign ownership (FO), and firm size (FS). Managerial holdings (MO) have no significant impact on firm value.

4.3. Robust check for multilevel results

We are aware that the time of the COVID-19 outbreak (the years 2020 and 2021) is included in our research period. The pandemic has had wide-ranging and severe impacts on the global economies, and financial markets are no exception. As a result of massive drops in stock prices, the market values of listed companies also decreased. This fact can affect the accuracy and generalization of our research outcomes. Therefore, we perform an additional test for non-COVID time (the remaining three years from 2017 to 2019) to see if the results still hold for this normal period.

Table 9 and Table 10 present results for the decomposition of covariance parameters and estimates for fixed effects, respectively. At the industry level, only the ICC of the null model (Model) 2 is below 5%. Although this is a trivial figure of clustering, we cannot conclude on the insignificant impact as it may still have substantial effects on inferences when performing single–level regression (Pituch and Steven, 2016). The outcome of the other multilevel models 3, 4, and 5 recognize the substantial clusters at the firm level for the subsampled data in the non-COVID time.

Table 9: Variance decomposition

	Model 2	Model 3	Model 4	Model 5
Covariance parameters				
Time level	0.13385***	0.13429***	0.16347***	0.16221***
Firm level	0.74580***	0.76523***	0.79412***	0.45091***
Industry level	0.04341*	0.05026*	0.07863*	0.04036*
Covariance parameters (%)				
Time level	14.50	14.14	15.78	24.82
Firm level	80.80	80.57	76.64	69.00
Industry level	4.70	5.29	7.59	6.18

Note: * and *** indicate significance at 1%, 5%, and 10%, respectively

Table 10: Fixed effects result

Fixed effects parameters	Model 2	Model 3	Model 4	Model 5
Intercept	0.12641	1.30837	1.35362	1.39189
Year fixed effect		No	No	Yes
LEV		-0.010** (0.007)	-0.014** (0.011)	-0.009*** (0.006)
FLEV		-0.008* (0.003)	-0.013** (0.008)	-0.017** (0.036)
ILEV		-0.184 (0.046)	-0.226* (0.196)	-0.138* (0.051)
LEV*ILEV			-1.044** (0.753)	-0.972* (0.064)
ROA				2.757* (1.010)
FS				0.068** (0.025)
MO				-0.340 (0.128)
FO				0.926** (0.571)

Note: standard errors are in parentheses; *, **, and *** indicate significance at 1%, 5%, and 10%, respectively

Estimates for Fixed Effects in Table 10 show negative and significant influences of variables leverage (LEV), firm-level leverage, and industry-level leverage (ILEV) on firm value in Models 4 and 5. Leverage at the industry level also exhibits a negative impact on the firm value in Model 3. This coefficient, however, is statistically insignificant. The coefficients for the combined effects of the first and the third level of leverage are also negative at the significances of 5% and 10% in Models 4 and 5, respectively. Overall, we can conclude that the results of our robust checks also confirm the two hypotheses.

5. Conclusion

This test is an empirical and quantitative research, employing the deductive approach by developing the econometric models (linear regression and hierarchical regression models) to investigate the impact of leverage on firm value. We propose two hypotheses on the relationship between debt and firm value. The first one regards the impact of firm-level leverage on firm value, and the second concerns the impact of industry-level leverage on firm value. We found evidence supporting both the above hypotheses by performing linear regression and multilevel regression tests. The value of a firm is not only negatively affected by the amount of debt used in that firm but also by its industry level of debt. In brief, the hierarchical linear estimation shows a better fit compared to the single-level regression as our results yield evidence for the data clusters at both firm and industry levels.

In real business, most companies operating in a variety of industries are taking on debt to finance their operations and growth. Many companies are either having a fairly high debt-to-equity ratio or even rely heavily on debt to operate. This is an understandable fact as debts are cheap alternative sources of finance thanks to the advantage of the tax shield. The most difficult question of all time is determining the appropriate financial structure or level of leverage, as with a high level of debt used,

the company faces a high degree of financial distress and bankruptcy, which can harm the firm's market value. Our research results provide support for this viewpoint. In addition, our findings also suggest that the sector level of debt does matter in determining the firm value. Therefore, when making decisions about firm value, managers should act with discretion regarding company-specific characteristics as well as the nature of the enterprise. Firm value can be highly sensitive to changes in leverage. An unreasonable amount of debt employed by a firm can deteriorate its market value. A company should only continue to raise more debt when the risk is still at an acceptable level. With a judicious mixture of debt and equity finance, a firm can arrive at the optimal structure of capital where its market value is maximized, and its capital's overall cost is minimized (Ferriswara et al., 2022) as the costs associated with cases of financial emergencies (such as bankruptcy and financial distress) will increase, leading to an increase in the firm's weighted average cost of capital and a decrease in the value of the company.

As a quantitative study, this paper also has some inherent limitations. The first is the problem of measuring variables. Although the author's careful selection of variables is made based on past studies, there is a risk that these variables are not representative of the quantity under study. For example, Tobin's Q may not reflect the full enterprise value or the average of leverage may not be the best representation of leverage at the firm or industry level. This will lead to inaccurate estimates. In addition, another shortcoming of the research may have been related to the size of the data sample. The study is based on more than 300 companies listed on the Ho Chi Minh City Stock Exchange. Therefore, the generalization of the results should be considered. In order to generalize the results to the entire Vietnamese market or to other countries, studies with bigger data sample sizes are essential.

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