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Article

The impact of firm leverage on investment decisions: The new approach of hierarchical method

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BANKING & FINANCE | RESEARCH ARTICLE

The impact of firm leverage on investment decisions: The new approach of hierarchical method

Mo Tran Thi^{1*}, Ha Hoang Thi Thu² and Diep Nguyen Thi Thanh³

Abstract: This paper investigates the impact of firm leverage on its investment activities. Especially, the research is conducted in the context of the Vietnamese emerging market, an incomplete market in South East Asia with the existence of inefficient market problems such as information asymmetry and agency conflicts which are the root cause of the relationship between corporate leverage and investment. Regarding methodology, we build the two main types of econometric models: traditional multiple regression and multilevel model (also called hierarchical, mixed, or nested data model). The purpose of employing the multilevel model is to observe the hierarchical structure of data and the effect of each data level in the hierarchy on firm investment that the traditional regression model may fail to achieve. We construct three-level predictors (three levels of leverage) for investment: observation unit, firm level, and industry level. We find that debt used in a firm can harm or reduce its investment activities. All three hierarchical levels of leverage show negative and significant effects on investment. Especially, the impact of leverage at the first level of data clustering on investment gets stronger under the moderation of industry leverage. In this case, the multilevel model is a more appropriate estimation method than the traditional regression.

Subjects: Corporate Governance; Finance

Keywords: Firm leverage; firm investment; emerging market; asymmetric information; multilevel model; clustering data

JEL classification: G14; G31; G32

1. Introduction

Capital structure and investment are both crucial corporate decisions in a firm as they can affect the survival of a firm. A firm always aims to achieve investment efficiency and wishes to locate its capital structure at the optimal point where the firm value reaches the highest. In the literature, the relationship between investment and leverage is still a matter of controversy. One side of this debate argues that it is a waste of time to look at leverage as it is essentially irrelevant in determining firm investment (Miller, 1991). Under Modigliani and Miller's (1958)'s hypothesis, investment policy in a firm should solely rely on the firm's cash flow, profitability, or some macroeconomic factors such as the market interest rate rather than leverage level.



Nevertheless, the capital structure literature, especially empirical studies, has challenged this proposition and they do find evidence to support the relation between the two elements. In general, there is higher consistency in the results of empirical papers as most of them assert on the reverse association between firm leverage level and investment. However, this relationship can get stronger or weaker under the impacts of other firm characteristic variables. For example, many research observe and insist on the effect of firm growth opportunities measured by Tobin's Q on leverage–investment relation.

In the perfect information environment, a firm should invest in a project with a positive NPV, and there is no correlation between leverage and investment (Modigliani & Miller, 1958). However, outside a Miller—Modigliani world, more aspects should be taken into account to study this relationship. Literature has explained the link between the level of debt used in a firm and its investment policy under the framework of asymmetric information and agency theory. In the reality of incomplete markets, the inevitable presence of transaction costs and information asymmetry gives rise to agency conflicts among shareholders, debt holders, and managers. These problems can deviate a firm position from investment inefficiency, resulting in under- or over-investment. Model hazard model of Jensen and Meckling (1976) and research of Jensen (1986) document that in a firm with excess debt capacity and high free cash flows, managers can be opportunistic, consuming the firm's resources, taking more perquisite, obtaining more power for self-aggrandizement, and especially they can cause the company to overinvest by undertaking projects with low or negative NPV. In this case, debt can be an effective solution to resolve the over-investment problem (Aivazian et al., 2005). However, a high level of debt can be counter-effective, causing hindrance and restraint to investment (Myers, 1977).

This paper engages in this streamlining, investigating the relationship between the firm leverage and its corporate investment decision in the context of the Vietnamese economy, an important transitional market. Our research is motivated by multiple reasons.

Firstly, as we mentioned above, the link between capital structure and investment policy is a crucial matter in finance (Lang et al., 1996; Mohammad & McMillan, 2021). Recently, although there is more research paying attention to this topic, the relation between the two factors remains controversial. Our study continues to find the answer and explore the insights of this relationship.

Secondly, the research is conducted in the Vietnamese emerging market—an incomplete market with the existence of market inefficiencies. The large proportion of literature examining the relationship between corporate leverage and investment focuses mainly on some developed markets such as the UK market, the Canadian market, and especially the US market as it is one of the major markets in the world economy (Aivazian et al., 2005; Guariglia, 2008; Lang et al., 1996; Servaes, 1994). Although the US stock market is not “perfectly efficient”, authors would suggest that it is likely “reasonably efficient”. However, according to Ahmad et al. (2023), the impact of firm leverage on the real investment decision is clearly manifested in incomplete markets under the effect of information asymmetry and agency problems which give rise to investment inefficiencies' incentives. Recently, there are some scholars interested in studying this issue in developing markets like China, and Pakistan (Ahmad et al., 2023; Ling & Wu, 2022; Siddiqua et al., 2019; Zeng et al., 2022). However, the number of studies in other emerging markets is still limited.

After shifting from a centrally planned to a market economy, Vietnamese has emerged to become one of the fastest-growing economies in the Indo-Pacific region (Nguyen et al., 2020) and is listed on the Emerging Market Index from Morgan Stanley Capital International (Pangboonyanon & Kalasin, 2018). The Vietnamese stock market is just more than 20 years old but has made rapid growth with nearly 1,000 firms listed on the two Stock Exchanges. But it is still a small frontier with low liquidity compared to others. Vietnamese listed firms are still characterized by high ownership concentration by family or government (Tran, 2020). The information environment including both firm-level and market-level environments is still considered inefficient

and intransparent, providing poor protection for public investors (Ha, 2016). Firms mainly rely on bank loans as their main external source of finance (Vo, 2019). This fact might lead us to think about the positive relationship between debt and investment. In addition, the new Vietnamese Law on corporate income tax which came into effect in 2016 has limited the interest expenses of enterprises (enterprises) that are deducted a certain percentage compared to equity before calculating corporate income tax. This regulation would certainly affect firms' decisions on the level of debt they are employing. Therefore, observing and exploring the insight and pattern of the leverage-investment link in the Vietnamese market will be no less interesting. This second motivation is also one contribution of our research to the literature.

Besides influential factors which belong to the nature of the firm such as profitability, asset tangibility, and firm size, prior literature suggests that industry type does matter for firms making decisions on leverage (Islam & Khandaker, 2015). Therefore, we conjecture that industry attributes may play some crucial role in determining the level of investment in firms. In the literature, there are few studies paying attention to the effect of industry leverage level on firm investment and these papers observe the impact by adding dummy variables for firm sectors when performing the tests. However, this method can only yield the result for the industry effects in general, but not the effects of industry-level of debt in particular. To overcome this weakness, our research employs the model of the hierarchy (also called the multilevel or nested data model). This is a statistical model of parameters that vary at more than one level, allowing the intercepts and coefficients to be random. The purpose of using this approach is to better handle clustered (or grouped) data and separate out the effects between observed and unobserved group attributes. This is a new contribution of our paper to the literature on the firm leverage-and-investment relationship regarding methodology. Our research results confirm the negative influence of leverage at both the firm level and industry level on firm investment. This is an interesting finding as it strengthens the point of view that besides firm-level characteristics, industry-level leverage also plays an essential role in determining firm investment. Using a multilevel approach, we can observe and analyze the impacts of different levels of corporate leverage determinants on its investment policy, giving a more in-depth understanding of the relationship between the two factors.

2. Literature review

A number of papers study the association between leverage and firm investment. The conventional wisdom is that besides NPV-related criteria, funding or debt capacity is an important consideration when an investment activity is appraised. This might lead us to infer a positive relationship between them as more debt means more investment. However, many find that leverage decreases investment activities in companies (Firth et al., 2008; Vo, 2019). The leverage-investment link has many nuances and can manifest differently under the impact of different factors in different contexts. As a result, prior researchers investigate and elucidate this relationship from different perspectives.

Myers (1977) explains that the use of debt has a negative influence on investment because investing in new projects will be more beneficial for debt providers than shareholders. Therefore, when there is more debt used in firms to finance their assets and projects, investment activities will be more constrained.

The root of the association between the two elements is the inefficient market with its attributes of asymmetric information and agency problems (Aivazian et al., 2005). According to Kalasin et al. (2020): "Agency relationships are subject to bounded rationality, imperfect and asymmetric information, diverging objectives, and imperfect contract design and protection mechanisms". The differences in objectives between principles and agents are the culprit of information asymmetry and agency conflicts that in turn, cause investment inefficiency. Aivazian et al. (2005) highlights that "These agency problems introduce a range in which investment may not be fully responsive, or maybe over-responsive to changes in economic fundamentals". Extant empirical literature

points out that leverage can be an effective mechanism to reduce over-investment or can trigger underinvestment.

To specify, on the one hand, the conflict between shareholders and managers gives rise to over-investment. When a profitable firm has surplus cash flow and external funds are easily available, managers can overconfidently or opportunistically expand the scale of the company by investing in really low or negative NPV projects even at the cost of the equity holders, leading to over-investment (Naheed et al., 2022). To constrain these harmful activities, shareholders can tighten the availability of the cash flow, and force managers to switch to debt finance. The commitment and burden of paying debt and interest make managers more cautious in allocating these funds to unprofitable projects (Dao & Ta, 2020). Debt is seen as a successful tool to reduce agency problems and control for the over-investment phenomenon. Also, the existing research has addressed another form of conflict that received a lot of attention from scholars called principal-principal conflict. This type of conflict often arises in concentrated-ownership companies controlled by controlling shareholders (Dharwadkar et al., 2000). A study by Jebran et al. (2019) carried out in China presents an outcome that controlling shareholders often expropriate minority shareholders by holding an excessive amount of cash, for example, to pursue private benefits. To maintain large cash reverses, the company may suffer under-investment and even projects with positive NVP may be rejected. And again, an agreement between shareholders to use debt finance can resolve the conflict.

On the other hand, under related underinvestment theory, companies with a high level of leverage will invest less. Myers (1977) contends that irrespective of the nature of a firm's growth opportunities, debt can create underinvestment incentives. A firm with large debt commitments is unlikely to exploit valuable growth opportunities compared to a firm with a lower leverage level. Similar to overinvestment, in this case, leverage also tends to harm a firm's investment strategies.

A number of empirical studies also support the above conclusion on the negative effect of leverage on investment. Firth et al. (2008) and Arif et al. (2019) follow Aivazian's et al. (2005) method to regress firm investment on firm leverage. They separate their data sample into two groups of state-owned enterprises and non-state-owned enterprises and find that corporate investment is negatively correlated to debt in state-owned firms but not in non-state-owned enterprises. Arif et al. (2019) also add that this negative impact of leverage can be decreased or increased due to the effect of uncertainties and firm-specific factors. Ahmad et al. (2023) hypothesize that leverage inversely influences firms' investment policy as it helps to reduce information asymmetry. They performed the fixed effect Model to analyze data from Pakistan Stock Exchange in the period of 9 years from 2000 to 2018. The research results confirm their hypothesis. In addition, the research finds that information asymmetry enhances the negative effect of debt finance on corporate investment. Research by McConnell and Servaes (1995) conducted in the US and Vo (2019) conducted in Vietnam, also using the fixed effect econometric analysis, obtains the same results. In both papers, they group firms in high and low growth opportunities categories (indicated by high and low Tobin's Q) and report that the negative relationship exhibits stronger in firms that have high growth opportunities than firms with low growth opportunities. Nevertheless, Lang et al. (1996), employing pooling regression, agree on the inverse relationship, but his test shows valid for only companies with weak growth opportunities. Aivazian et al. (2006) provide an explanation for the difference between the conclusions of these existing empirical papers. They postulate that the difference in the type of firms in which the relationship is found (in firms with low and high growth opportunities) is due to the proxy for a firm's growth opportunities. Growth opportunities are measured by Tobin's Q which can serve as a proxy for ease of access to the capital market. High Tobin's Q means high growth opportunities and vice versa. Firms with larger Tobin's Q have fewer constraints and limitation of finance sources. It is easier for them to refinance or recapitalize as compared to smaller Tobin's Q firms whose debt would be "a tighter constraint limiting investment".

Besides asymmetric information and growth opportunities, the literature identifies many factors that can impact the nexus between leverage and investment. Firm size and age are revealed to have an impact on the leverage–investment relationship in the research of Chang et al. (2020). In detail, the two factors can reduce the negative impact of debt on investment activities. Dang (2011) also supports the inverse link and adds that uncertainty of a firm future can have an influence on corporate investment. Guariglia (2008) analyzes the panel data of more than 20,000 firms in the UK in 10 years to learn about the sensitivity of investment to cash flow under the effect of internal and external financial constraints. The findings suggest that the higher degree of external financial constraints strengthens the sensitivity of investment to cash flow. Among firms facing externally financially constraints, the sensitivity is lowest for those with a relatively high level of internal funds (or lower leveraged firms).

When investigating the impact of leverage on firm investment, some authors recognize the importance of sector-level leverage and try to include this effect in their model. Lang et al. (1996) and Aivazian et al. (2005) use the industry median to adjust the variables (industry-adjusted variables) while research by Ding et al. (2019) employs industry dummies. Although these methods can help to control the effect of the industry group, they do not allow us to directly observe the effects of a predictor at the industry level. One more limitation of these techniques is that they cannot separate the effects of the industry from the effects of industry-level predictors. Therefore, in this paper, we strive to address the two questions at the same time. The first question is “How does firm leverage impact its investment activities?”, and the second is “Does industry-level leverage have an impact on the firm investment?”.

Based on the review of the literature on the relationship between the level of debt in a firm and its investment decision, we propose two hypotheses as follows:

H1: Firm leverage has a negative impact on its investment activities.

H2: Industry-level leverage has an impact on the firm investment.

3. Test design

3.1. Single-level regression model

For the first test to investigate the impact of firm leverage on investment, we follow Aivazian et al. (2005) and Vo (2019) to build a regression model with leverage as the independent variable and firm investment as the dependent variable. According to Fazzari et al. (1988), internal funds including sales and cash flow can have impacts on firm investment. Therefore, we control for the effect of the net sales and net cash flow in the model. Firm total assets and profitability (return on total assets) are also added to the equation as bigger firms with large values of assets and higher returns may need and can invest more (Ahmad et al., 2023). Similarly, newly established young businesses may require more investment. Firm age is included in our test. We also follow previous studies to control for the impact of firm growth opportunities (Aivazian et al., 2005; Vo, 2019). The lagged value of all control variables, including firm sales, profitability, firm growth (proxied by Tobin’s Q), cash flow, year dummies, and industry dummies are also included in the model to control for the reverse causality. Variables, including firm investment, net sales, and net cash flow are normalized using the firm’s total assets to transform them to the same scales so as to avoid biased estimations. We conduct Pooled OLS regression to estimate the first model. Besides, fixed effects and random effects regressions are also performed to facilitate comparison.

Model 1:

$$FIK_{i,t} = \beta_0 + \beta_1 LEV_{i,t-1} + \beta_2 SALEK_{i,t-1} + \beta_3 TQ_{i,t-1} + \beta_4 TA_{i,t-1} + \beta_5 CFK_{i,t-1} + \beta_6 ROA_{i,t-1} + \beta_7 AGE_{i,t-1} + \beta_8 INDUSTRY_i + \beta_9 YEAR_i + \varepsilon_{i,t} \quad (1)$$

where i stands for firm and t stands for year, and β is the constant.

Definition for each variable is provided in the [Appendix](#).

3.2. Multilevel model

Besides determinants related to firm characteristics, some variables at the industry level may also have several critical indirect influences on the firm's market value. For this reason, in addition to the linear regression model to study the impact of firm leverage on its investment level, we also perform the multilevel model to consider and analyze the degree of clustering in the data with respect to firm investment. We develop three levels of determinants of firm investment. The first level is each observation of the panel dataset (leverage of a firm at 1 year), the second is the between-firm level (firm leverage mean), and the third is the industry level. The multilevel model is extended gradually from the empty model (Eq. 2) to the model with the random intercepts (Eq. 3), the model with random coefficients (Eq. 4), and then the model with the inclusion of some more explanatory variables as determinants (Eq. 5). 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 industry leverage mean is analyzed in the multilevel model. Definition for each variable is provided in the [Appendix](#).

3.2.1. 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.

$$\text{Level 1 : } FIK_{lmn} = \beta_{mn} + \varepsilon_{lmn} \quad (2.1)$$

$$\text{Level 2 : } \beta_{0mn} = \gamma_{00n} + \mu_{0mn} \quad (2.2)$$

$$\text{Level 3 : } \gamma_{00n} = \delta_{000} + r_{00n} \quad (2.3)$$

where l, m, n represent each level of clustering data including individual observation, between-firm level, and the industry level, respectively.

Model 2:

$$\text{Combined empty model : } FIK_{lmn} = \delta_{000} + r_{00n} + \mu_{0mn} + \varepsilon_{lmn} \quad (2)$$

3.2.2. Random-intercept models with covariates

$$\text{Level 1 : } FIK_{lmn} = \beta_{0mn} + \beta_{1mn}LEV_{lmn} + \varepsilon_{lmn} \quad (3.1)$$

$$\text{Level 2 : } \beta_{0mn} = \gamma_{00n} + \gamma_{1mn}F.LEV_{0mn} + \mu_{0mn} \quad (3.2)$$

$$\text{Level 3 : } \gamma_{00n} = \delta_{000} + \delta_{01n}I.LEV_{00n} + r_{00n} \quad (3.3)$$

Equation (3) is obtained by consolidating (3.1), (3.2), and (3.3). This model is to estimate if the intercepts of the three levels are random.

Model 3:

$$FIK_{lmn} = \delta_{000} + \delta_{01n}I.LEV_{00n} + \gamma_{1mn}F.LEV_{0jn} + \beta_{1mn}LEV_{lmn} + \varepsilon_{lmn} + \mu_{0mn} + r_{00n} \quad (3)$$

3.2.3. Random-coefficient models with covariates

Model (4) is the combination of (4.1), (4.2), (4.3), and (4.4). It is a more consolidated mixed-effect model which assumes the intercepts and slopes of some firm-level variables are random and affected by the firm and industry variables. In other words, the study model helps to analyze the indirect influence of sector characteristics levels on firm value.

$$\text{Level 1 : } FIK_{lmn} = \beta_{0mn} + \beta_{1mn} LEV_{lmn} + \varepsilon_{lmn} \quad (4.1)$$

$$\text{Level 2 : } \beta_{0mn} = \gamma_{00n} + \gamma_{1mn} F.LEV_{0mn} + \mu_{0mn} \quad (4.2)$$

$$\text{Level 3 : } \gamma_{00n} = \delta_{000} + \delta_{01n} I.LEV_{00n} + r_{00n} \quad (4.3)$$

$$\beta_{1mn} = \delta_{100} + \delta_{110} I.LEV_{00n} + r_{1mn} \quad (4.4)$$

Combined model 4:

$$FIK_{lmn} = \delta_{000} + \delta_{01n} I.LEV_{00n} + \gamma_{1mn} F.LEV_{0mn} + \delta_{100} LEV_{lmn} + \delta_{110} I.LEV_{00n} * LEV_{lmn} + r_{1mn} LEV_{lmn} + \varepsilon_{lmn} + \mu_{0mn} + r_{00n} \quad (4)$$

Model 5 is extended from model 4 by adding some more explanatory variables as determinants, including dummy variables (coded as YEAR which represents each year studied in the research), firm size, firm age, profitability, and managerial ownership.

Model 5:

$$FIK_{lmn} = \delta_{000} + \delta_{01n} I.LEV_{00n} + \gamma_{1mn} F.LEV_{0mn} + \delta_{100} LEV_{lmn} + \delta_{110} I.LEV_{00n} * LEV_{lmn} + r_{2mn} LEV_{lmn} + \delta_{200} TA_{lmn} + \delta_{300} SALEK_{lmn} + \delta_{500} CFA_{lmn} + \delta_{600} ROA_{lmn} + \delta_{700} AGE_{lmn} + \delta_{800} YEAR_{lmn} + \varepsilon_{lmn} + \mu_{0mn} + r_{00n} \quad (5)$$

4. Descriptive statistic, result, and discussion

4.1. Data

The hierarchical or multilevel test is one of the primary modeling strategies in this paper. Three levels of investment determinant (firm leverage) are analyzed to detect the clustered structure of data and observe the effect of each level in the hierarchy on corporate investment. For the power of statistical tests and estimation algorithms, the success in fitting a multilevel model depends on the sample size and other design aspects, including the numbers of each level unit. The sample size for one level is defined as the total number of units observed for that level. Too large or small data may be both problematic. Memory problems and slow execution can be caused by too large data sample while too small a size of the data sample may affect the accuracy of the model estimation result. According to Maas and Hox (2005), for the maximum likelihood estimation for the multilevel method, the sample size must be sufficiently large. They conclude that an acceptable limit of sample size at level two is above 50, meaning that a sample of 50 or fewer can lead to biased estimates and second-level standard errors. In this paper, we will manage to avoid this sample size-related problem by extending our dataset.

We gather the panel dataset of all firms listed on the Hochiminh City and Hanoi stock exchange in Vietnam over the period from 2017 to 2021. These are the two main stock exchanges in the country. To be selected in the research sample, a firm must (1) be listed for a period of at least 3 years; (2) remain listed till now; and (3) be a non-financial company (banks, securities, and insurance firms are excluded). The data is retrieved from the Bloomberg Terminal. In the end, the final sample has 2,307 observations (the first level of the hierarchy analysis) of 569 listed firms

Table 1. Descriptive statistics

	Minimum	Maximum	Mean	Std. Deviation
FI	−2,078	16,792	209	935
LEV	0.006	4.958	1.191	0.967
SALE	−20	191,932	3,678	11,167
ROA	−0.778	0.918	0.104	0.100
TA	11.110	14.459	12.211	0.564
CF	−9,984	27,903	308	1,504
TQ	0.094	9.044	1.203	0.813
AGE	3	15	10.13	2.334

Note: Valid N (listwise): 2,307.
 FI, SALE, CF unit: One billion VND

(the second level) coming from 10 sectors (the third level) apart from financials (classified according to the Global Industry Classification Standard—GISC).

4.2. Statistic description

Table 1 presents statistically descriptive information for both dependent and independent variables in the research.

In general, we can see that from 2017 to 2021, Vietnamese firms invested more in current or new projects as the mean of firm investment (FI) is 209 billion Vietnamese money (VND). Some companies have high levels of investment, showing the maximum investment is 16,792 billion VND. Vietnamese law of corporate income tax, which came into effect in 2016, caps the debt-to-equity ratio of listed companies at 5. It is the reason for the maximum value of 4.958 of the firm leverage variable (LEV) in the dataset. However, most of the Vietnamese listed firms have LEV in the range of (1,3) as the average value of LEV stands at nearly 2 with a standard deviation of 0.967. Regarding the net operating cash flow (CF), the differences among listed firms are quite high with the min and max being −10,000 billion VND to nearly+28,000 billion VND.

Table 2 presents detailed information number of firms and observations according to each sampled sector. Overall, apart from the real estate sector with the highest level of debt-to-equity ratio of 2.03, the remaining sectors have leverage averages lower than 1.5. This explains why the mean of leverage of the whole sample stands at just nearly 1.2 (times).

Table 3 displays the correlation coefficients for all the research variables. The correlation of only one pair (ROA and TQ) shows the possibility of the collinearity issue. However, as all the values of the VIF index are generally smaller than two, we can conclude that there is no high or serious linear correlation between predictors in the paper.

4.3. Results

4.3.1. Single-Level Regression Model

The Pooled OLS estimations for the first model are presented in Table 4. As predicted, firm leverage (LEV) significantly and negatively affects its investment. The first research hypothesis H1 is accepted. This outcome is consistent with a number of empirical research in the past studying the relationship between the two elements. Literature often explains this inverse relationship in two ways. First, the increase in the use of debt in a firm may harm investment activities because more debt means more risk and is more beneficial for bondholders than shareholders when the company takes on new projects (Aivazian et al., 2005; Vo, 2019). Another way to look at the relationship is based on the theory of asymmetry information. Asymmetry of information and

Table 2. Industry description											
	Consumer discretionary	Energy	Utilities	Industrials	Consumer staples	Tech	Real estate	Communication service	Health care	Materials	Total
No. of companies	118	24	45	167	94	26	44	21	17	13	569
No. of observations	526	107	178	659	375	92	162	69	76	63	2,307
I_LEV	1.09	1.20	1.11	1.17	1.21	0.93	2.03	1.18	1.14	1.32	

Table 3. Matrix of correlations

	LEV	SALEK	CFK	TA	ROA	TQ	AGE	VIF
LEV	1							1.173
SALEK	−0.015	1						1.004
CFK	0.029	−0.054	1					1.007
TA	.259**	−0.041	0.039	1				1.109
ROA	−.290**	0.007	0.036	−0.057	1			1.735
TQ	−.174**	−0.008	0.038	.098**	.620**	1		1.674
AGE	−.086	0.010	0.055	0.034	0.076	0.023	1	1.032

Note: **Correlation is significant at the 0.01 level (2-tailed).

Table 4. Single-level regression results

	Pooled OLS		Fixed effects		Random effects	
	Coef.	SE	Coef.	SE	Coef.	SE
LEV	−0.032**	0.218	−0.0260**	0.208	−0.037**	0.305
SALEK	0.005***	0.001	0.028***	0.015	0.007***	0.001
CFK	0.013**	0.006	0.017***	0.003	0.016**	0.009
TA	−0.174	0.138	0.109*	0.069	0.007*	0.076
ROA	−0.452	0.808	0.033	0.141	−0.027	0.114
TQ	0.090**	0.110	0.115**	0.225	0.138**	0.082
AGE	−0.324**	0.076	−0.248**	0.074	−0.302**	0.062
_Cons	2.006**	0.305	3.117***	0.057	1.825***	0.338
Year dummies	Yes		Yes		Yes	
Industry dummies	Yes		Yes		Yes	
R-Square	0.2082		0.2165		0.2087	
F-Ttest	7.36***		21.53***		35.04***	
Hausman test			6.95			
Observations	2,307		2,307		2,307	

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

agency conflicts are attributes of the inefficient market which can cause investment inefficiencies. While a too high level of debt can reduce firm investment (also called under-investment), over-investment can be controlled by switching from equity finance to debt finance.

Regression results also exhibit that firm investment is positively correlated to firm sales (SALEK), cash flow (CFK), and Tobin's Q (TQ). All these associations are significant. Sales, cash flow, and Tobin's Q can represent the firm size, investment capacity, and also the firm ability to access the capital market. The bigger sales, larger cash flow, and higher Tobin's Q mean more advantageous conditions to enhance investment. Firm total assets (TA) and profitability (ROA) show a negative impact on firm investment. However, these results are insignificant.

Besides, Table 4 also reports our results for fixed effects and random effects regressions. The Hausman test shows that the probability of Wald yielded is more than 10%, indicating that the random effects model is more appropriate for analysis purposes. Different from pooled OLS, we can see that in fixed effects and random effect estimations, total assets (TA) exhibit a positive

Table 5. Estimates of covariance parameters

	Model 2	Model 3	Model 4	Model 5
<i>Parameter Estimation</i>				
Individual Obs.	2.087***	2.083***	2.081***	2.001***
Firm level	5.350***	5.351***	5.249***	5.063***
Industry level	0.413*	0.481*	0.676*	0.518*
<i>Parameter Estimation (%)</i>				
Individual Obs.	26.59%	26.32%	25.99%	26.40%
Firm level	68.15%	67.61%	65.57%	66.77%
Industry level	5.26%	6.08%	8.44%	6.83%

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

Table 6. Estimates of fixed effects

Parameter	Model 2	Model 3	Model 4	Model 5
Intercept	0.016*** (0.072)	0.026*** (0.268)	0.280*** (0.391)	0.978*** (0.628)
Year fixed effect		No	No	Yes
LEV		−0.085** (0.202)	−0.294** (0.368)	−0.236** (0.379)
F_LEV		−0.131** (0.218)	−0.129** (0.218)	−0.101** (0.217)
I_LEV		−0.104** (0.229)	−0.259* (0.323)	−0.216* (0.340)
I_LEV*LEV			−0.158* (0.232)	−0.144* (0.238)
SALEK				0.005** (0.001)
CFK				0.010* (0.011)
TA				−0.149 (0.139)
ROA				−0.673 (0.973)
TQ				0.089* (0.111)
AGE				−0.227** (0.185)

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

association with firm investment at the significance level of 10%, implying that larger Vietnamese listed firms tend to invest more compared to firms with smaller sizes.

4.3.2. Multilevel Model

Tables 5 and 6 describe the results for the estimations of the covariance parameters and the fixed effects, respectively, for hierarchical tests (Model 2,3,4,5). Three-level tests are designed, including each individual observation, firm level, and industry level. At the observation level (level 1),

investment predictors are firm leverage (LEV), sales (SALEK), operating cash flow (CFK), total firm assets (TA), profitability (ROA), and Tobin's Q (TQ). The level-2 and level-3 predictor is the mean of firm leverage in 5 years and the grand mean of all firms' year leverages in each industry for the whole period, respectively. The multilevel models are extended from model 2 to model 5.

It can be seen from Table 5 that all estimated parameters for the three levels are significant. This means we can reject the null hypothesis of the Wald Z test, inferring that the variation in the level 1 outcome and the intercepts at the firm level and industry level is significantly greater than 0. This is considered evidence of non-trivial clustering of observation units within firm-level clusters within industry-level clusters.

The intraclass correlation coefficients (ICC) are also computed in Table 4. ICC (%) is also considered an indicator of whether there is evidence of clustered observations within level 2 and 3 units. Overall, in all the models from 2 to 5, ICCs for the firm-level account for around 65–68% of all three levels, meaning that more than 60% of the variation in investment activity occurs between firms. In other words, intrinsic firm characteristics are responsible for the largest proportion of firm investment variation. The following is the observation-unit level with around 26% of investment variance, and industry-related attributes have a 5–8% effect. Heck et al. (2014) noted that “5% is often considered a ‘rough cut-off’ of evidence of substantial clustering”. As the result, we can conclude that substantial clustering is found at both between-firm and industry levels. Multilevel models show a better fit than the traditional multiple regression model.

Table 6 is the hierarchical linear results for fixed effects. The estimated intercept for the null model is 0.016, which is interpreted as the grand mean of the industry means (intercept) on investment activities. In effect, this is the expected industry mean for investment, and by extension to expected investment level for any random observation or firm sampled from Level 1 and Level 2.

Covariates are gradually added to models 3–5. In the random intercept model (model 3), all three leverage indexes (observation unit, between-firm, and industry level) appear to have an inverse effect on investment with the significance at 0.1 level of P-value. These outcomes still significantly hold after considering the random coefficient (model 4) and adding more first-level determinants of firm investment (model 5). A higher amount of debt employed by a firm can harm its investment activities. In addition, the debt-to-equity ratio of the industry in which a company operates also plays a crucial role in determining that company's investment policy. The hypothesis H2 is confirmed.

Included in both models 4 and 5, the cross-level variable $LEV \times I_LEV$ which is the interaction term between firm leverage at a time (LEV) and its industry leverage (I_LEV) indicates the impact of leverage on firm investment under the effect (the moderation) of industry-level leverage. The coefficients show a negative and stronger impact on investment than the impact of firm leverage itself. In other words, leverage at the industry level strengthens the negative effect of firm-level leverage on firm investment.

Regarding other control variables at the firm level, net sales (SALEK), operating cash flow (CFK), and firm growth (TQ) are also demonstrated to have positive and significant influences on firm investment. On the contrary, firm age (AGE) is revealed to be inversely correlated to investment activity. These findings are consistent with the outcomes of one-level regressions (Pooled OLS, fixed effects, and random effects) represented in Table 4. However, unlike fixed effects, and random effects' results, our hierarchical model reveals that total assets (TA) manifest no significant effect on investment. Overall, we can see that single-level regressions

Table 7. Results of pooled OLS tests for the period of 2017–2019 and small sectors

	2017–2019		Small sectors	
	Coef.	Std. Error	Coef.	Std. Error
LEV	−0.068**	0.254	−0.031**	0.617
SALEK	0.025**	0.001	0.001***	0.004
CFK	0.150**	0.011	0.022***	0.029
TA	0.250*	0.091	−0.013	0.214
ROA	−1.978	0.605	0.554	1.644
TQ	0.161*	0.084	0.039	0.158
AGE	0.506**	0.562	0.216*	0.377
_Cons	2.593**	1.062	1.964*	2.509
R_square	0.225		0.189	
F-test	8.70***		3.99***	
No. of Obs.	1,560		747	

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

show higher significant levels for most of these above variables compared to the multilevel test. Traditional regression techniques treat each unit of data as an independent observation. One of the consequences of failing to recognize hierarchical structure is that the statistical significance of regression coefficients will be overstated (Snijders, 1999). Especially, estimation of parameters for higher-level predictor variables will be the most affected by ignoring grouping (Snijders, 1999). Therefore, it is insignificant to include the industry level of leverage on single-level regressions when we have evidence of data clustering as it will lead to incorrect inferences.

4.4. Robust Tests

We conduct some robust tests to verify the results of the main models. The time period of our research includes the year of the Covid pandemic (from 2020 to 2021). As a result of this pandemic, investment by companies may be decreased or even stopped. So the first robust checks are for the remaining 3 years from 2017 to 2019 to see if the outcomes still hold for this normal time.

As described above, the data sample has 569 listed enterprises with 2,307 observations. These companies come from 10 industries. It is noticeable from Table 2 that there is an uneven distribution of firms in sectors. The three biggest industries are industrials, consumer discretionary, and consumer staples which account for 68% of the total number of observations. To check if the results are not driven by a few main industries, we run the robust checks for the subsample including the other seven sectors (called small sectors).

Table 7 shows the results for pooled OLS checks for the period 2017–2019 and the small sectors. We can see that the conclusion still holds for both subsamples.

Tables 8 and 9 are the estimates for parameters and fixed effects of the multilevel test for the two subsamples. Similar to the outcome of main multilevel models, the data cluster is recognized substantially at the firm level for the two subsampled data. At the industry level, only the ICC of model 2 for a sample of small sectors is below 5%. However, according to Pituch and Stevens (2016), even a trivial level of clustering (below 5%) may still have substantial effects on inferences. Table 9 presents our robust results for fixed effect parameters. Firm investment is robustly confirmed to be negatively associated with debt ratio at all three levels of the hierarchy.

Table 8. Estimation for parameters for the period of 2017–2019 and small sectors									
2017–2019					Small sectors				
	Model 2	Model 3	Model 4	Model 5	Model 2	Model 3	Model 4	Model 5	
<i>Parameter Estimation</i>									
Individual Obs.	6.253***	5.089***	5.070***	4.963***	3.899***	4.253***	4.342***	4.001***	
Firm level	12.820***	12.950***	12.292***	11.988***	7.206***	7.071***	7.268***	6.630***	
Industry level	2.110**	2.851**	2.763**	2.225**	0.580*	0.639*	0.684*	0.575*	
<i>Parameter Estimation (%)</i>									
Individual Obs.	29.52%	24.36%	25.19%	25.88%	33.37%	35.55%	35.32%	35.70%	
Firm level	60.52%	61.99%	61.08%	62.52%	61.67%	59.11%	59.12%	59.16%	
Industry level	9.96%	13.65%	13.73%	11.60%	4.96%	5.34%	5.56%	5.13%	

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

Table 9. Fixed effects estimates for the period of 2017–2019 and small sectors										
Parameter	2017–2019					Small sectors				
	Model 2	Model 3	Model 4	Model 5		Model 2	Model 3	Model 4	Model 5	
Intercept	0.757*** (0.256)	0.912*** (0.181)	1.218*** (1.115)	1.627*** (1.430)		0.399** (0.184)	0.399** (0.197)	0.411** (0.275)	0.333** (0.592)	
Year fixed effect		No	No	Yes			No	No	Yes	
LEV		−0.348** (0.797)	−0.367** (1.027)	−0.460*** (0.686)			−0.233* (0.485)	−0.233** (0.807)	−0.361** (0.869)	
F_LEV		−0.168** (0.510)	−0.169** (0.576)	−0.141** (0.450)			−0.142* (0.115)	−0.197* (0.148)	−0.126* (0.147)	
I_LEV		−0.244* (0.384)	−0.356** (0.259)	−0.237** (0.283)			−0.226* (0.168)	−0.227* (0.279)	−0.222** (0.284)	
I_LEV*LEV			−0.477** (0.507)	−0.526* (0.764)				−0.388 (0.734)	−0.394* (0.764)	
SALEK				0.010*** (0.812)					0.001*** (0.001)	
CFK				0.231*** (0.057)					0.026*** (0.010)	
TA				0.488* (0.444)					0.002 (0.111)	
ROA				−0.106 (0.856)					0.305 (0.584)	
TQ				0.237 (0.503)					−0.019 (0.080)	
AGE				−0.406** (0.757)					0.341* (0.407)	

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

5. Conclusion

This paper studies the link between the level of debt used in a business and its investment decision in the context of the Vietnamese developing market, an emerging market that received growing attention from scholars. Our strategy is performing both a traditional multiple regression model and multilevel tests in case the data structure is hierarchical. The leverage variable is measured at three different levels of the multilevel data structure, including the observation unit, firm level, and industry level. In the research, we find evidence for the nested data of the research sample. Our outcomes reveal that investment activities are negatively and significantly correlated to firm leverage at all three levels. Especially, the impact of firm leverage at level 1 of data clustering on investment gets stronger under the interaction of the level-3 (industry) leverage. We confirm that industry level does matter in determining firm investment decisions and in this case, therefore, the multilevel approach is the better choice than the traditional regression method as well as fixed effects as it can provide more precise and unbiased estimates (coefficients, standard errors, and statistical significance).

The firm investment can be restrained and influenced by leverage at both the firm level and the industry level. Our findings have an important significance to business managers, company shareholders, as well as investors. Since investment inefficiencies are related to agency conflicts, debt can be used as an effective tool to protect shareholders. Leverage at both the firm level and industry level can be a constraint for a firm's managers in developing firm over-investment policies. An increasing level of debt will possibly lead to a lower level of cash available for other projects. Hence, debt can be employed as a corporate governance mechanism to prohibit this issue of overinvestment. Therefore, when making decisions about business investments, managers should act with discretion regarding company-specific characteristics as well as the nature of the enterprise. Investment can be highly sensitive to changes in the level of leverage. An unreasonable amount of debt employed by a firm can exacerbate the status of under or over-investment and therefore, aggravate agency conflicts.

Our research also has some drawbacks. The conclusion is drawn from the tests for the data sample of 569 listed companies. So it might be a problem if we generalize this outcome for the bigger population. Moreover, the association between leverage and investment can exhibit different in different natures of business as well as in different environments (such as in different countries). In some industries, such as hi-tech businesses, investments are continuously needed. However, other companies, for example, consumer goods manufacturing companies, may need to invest one time and harvest their profit in a long run. In addition, developing countries including Vietnam tend to focus on an efficiency-driven economy, rather than an innovation-driven economy. Therefore, the proportion of the tech sector in the economy is relatively small in comparison to other developed markets. These differences can be further explored and examined in future research. With an appropriate method, it would be interesting to investigate the relationship between leverage and investment in one or a few groups of firms that have similarities in their nature of investment activities.

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Appendix

Variable Definitions (Models 1–5)

FIK is the ratio between firm investment at time t (FI_t) and the net fixed assets at time $t-1$ (K_{t-1}). Firm investment is firm capital expenditure measured as a change in fixed assets (book value of the fixed asset at time t minus book value of the fixed asset at time $t-1$) plus depreciation at time t (Aivazian et al., 2005; Vo, 2019). LEV is firm leverage measured by the ratio of the total book value of debt over equity. Control variables include 1) $SALEK_{t-1}$ is calculated as firm-lagged net sales ($SALE_{t-1}$) divided by the lagged net fixed (K_{t-1}); 2) TQ_{t-1} is the lagged Tobin's Q; 3) TA is firm size proxied by the natural logarithm of total assets; 4) CFK_{t-1} is the ratio between the lag of the net operating cash flow (CF_{t-1}) and the lagged net fixed (K_{t-1}); 5) ROA_{t-1} is firm lagged profitability measured by the ratio of the lagged net profit over lagged total firm assets; AGE_{t-1} is the period of time (years) since the company started to operate. F_LEV is the mean of the firm's lagged leverage through the 5 years and I_LEV is the lagged leverage grand mean of all the firms in one industry. YEAR and INDUSTRY are the dummy variables, representing each year studied in the research and the firm industry (based on the SIC Code), respectively.