Vietnam Journal of Agricultural Sciences

ISSN 2588-1299

VJAS 2023; 6(1): 1735-1744
https://doi.org/10.31817/vjas.2023.6.1.04

The Impact of Capital Investments on Firm Financial Performance – Empirical Evidence from the Listed Food and Agriculture Companies in Vietnam

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Abstract

Capital investment decisions are among the most important financial decisions of a firm, which effect a business's survival. This paper investigates the impact of capital investments on firm financial performance to provide insight for future capital investment decisions of companies. The study used the unbalanced panel data gathered from 62 companies, which covered 688 observations of listed companies in the food and agriculture sector in the Vietnam Stock Exchange during the period 2009-2020. To control for unobserved individual effects, the random effect estimator was employed. Profit margin (PM) was used as a proxy for firm financial performance, while the independent variables were the capital investment rate in both short-term and long-term effects, equity to total assets ratio, firm size, and tangible to fixed assets ratio. The results indicated that capital investments have a statistically significant positive impact on the long-term performance of the analyzed enterprises. Especially in the context of Vietnamese listed food and agriculture companies having a high level of capital investments, a portion increase in the capital investment rate will increase the company's profit margin. Other variables also had statistically significant relationships with the profit margin, in detail, the equity ratio and size had positive effects while the tangible assets ratio had a negative effect on firm performance. Therefore, the research suggests firm managers should choose the appropriate capital investment strategies in the long-term perspective, within the consideration of the equity ratio, economics of scale, and tangible assets investment ratio to get the most efficient performance.

Received: May 11, 2022
Accepted: March 16, 2023

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Keywords

Capital investment, Firm financial performance, Profit margin, CapEx, panel data

Introduction

Capital investment decisions are among the most important financial decisions of an enterprise because they affect the owner's wealth, long-term survival, competitive advantage, and social responsibilities of the business (Taipi & Ballkoci, 2017). Capital investments involve important capital budgeting decisions. They include the main aspects of capital expenditure management such as expansion, acquisition, modernization, and replacement of long-term assets. They should be positively associated with the future profits of companies (Jiang *et al.*, 2006), and all investment opportunities should be considered to select the most suitable ones within the framework of limited resources.

In fact, enterprises around the world have invested considerable amounts of money on capital investments to increase their financial performance and maximize their value. At the macroeconomic level, Vietnam capital investments have increased dramatically from the time of the reform policies launched in 1986 (known as Doi Moi) until now. According to **Figures 1 and 2**, Vietnam capital investments have increased from 0.81 billion USD in 1990 to 73.24 billion USD in 2020. The average value as a percentage of the GDP during that period was 27.13% with a minimum of 12.57% in 1990 and a maximum of 39.57% in 2007. The latest value from 2020 is 27.01%, while the world average based on 151 countries is 23.76%.

At the firm level, capital investments are considered one of the riskiest categories of assets

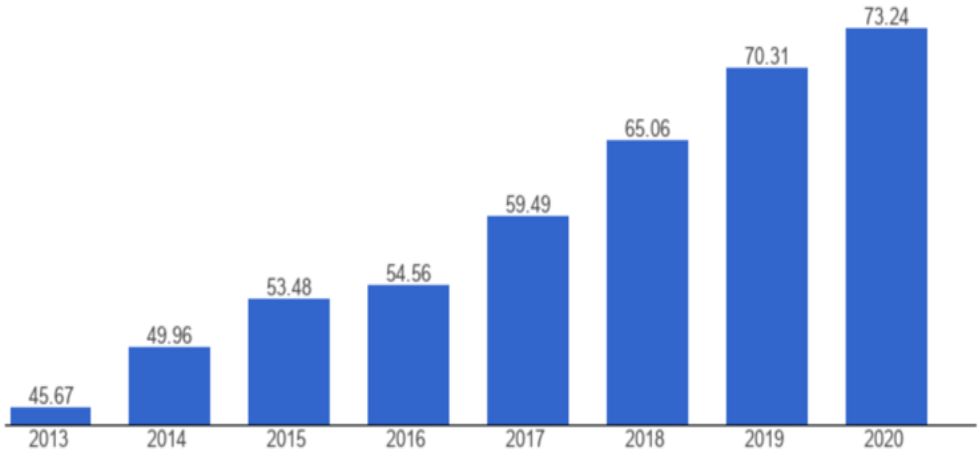

Figure 1. Vietnamese capital investments in billions of USD, 2013-2020

Source: World Bank (2022)

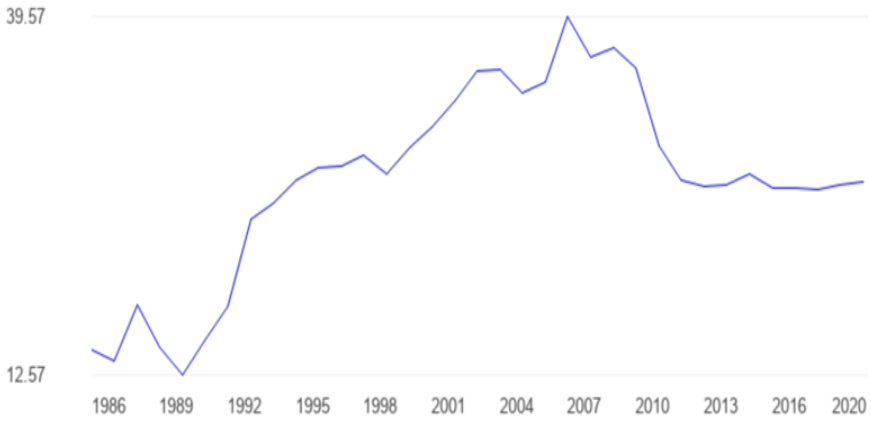

Figure 2. Vietnamese capital investments as a percentage of the GDP, 1986-2020

Source: World Bank (2022)

that indicate the most vital use of a firm's resources. Capital investments, along with land and labor, are basic inputs of a production process. They are material resources consciously used to create assets (tangible and intangible) to expand production through the procurement of property, plants, and equipment; and through researching, implementing, and absorbing new technologies to improve the competitiveness of enterprises. On one hand, capital investments have short-term characteristics because they are firm expenses, but on the other hand, they have a long-term nature because of their future benefits to the firm (Grozdić *et al.*, 2020).

Previous empirical results on the impacts of capital investments on firm performance are not conclusive. On a macro perspective, Fazzari & Athey (1987) demonstrated the effects of capital expenditures on a country's gross national product and economic growth. From a business perspective, the review of various literature papers about the relationships between capital investments and firms highlight three main contradictory conclusions. Chung *et al.* (1998) and Jiang *et al.* (2006) indicated that capital investments have a positive impact on the financial performance of a firm. In contrast, some studies have found a negative relationship between capital investments and financial performance such as the works of Titman *et al.* (2004), Cooper *et al.* (2008), and Yao *et al.* (2011). However, some authors such as Kapelko *et al.* (2015) and Grozdić *et al.* (2020) argued that capital investments generate a significant productivity loss in the first year but improve after that, resulting in a positive performance in the long run.

As mentioned above, there have been many research projects on this topic from around the world. However, the data haven't been updated with the current financial situation. In Vietnam, although there have been studies on the factors affecting a firm's capital investments, such as Anh & Hieu (2020), there is still a lack of formal research on the effects of capital investments on firm performance, hence creating a research gap that deserves attention.

Moreover, the food and agriculture industry in Vietnam has always been one of the most important pillars in the national economy. According to a report published by Oxford Economics, this sector contributed 84.6 billion USD to the GDP in 2019. The number of food and agriculture companies account for a large proportion of the securities market in Vietnam. Nowadays, they have great growth opportunities but also great challenges, requiring their managers to make effective financial decisions. In particular, due to the nature of the food and agriculture industry, capital investments are more important and necessary.

The objective of this paper was to analyze the impacts of capital investments on the financial performance of firms listed as food and agriculture companies in Vietnam, and to, therefore, provide insight for future capital investments of companies in the industry.

Methodology

Sampling and Research Methodology

The study sampled all the food and agriculture enterprises that were listed on the Vietnam Stock Exchanges over the period from 2009 to 2020. The classification of the food and agriculture industry in this study was based on the North American Industry Classification System (NAICS). In total, 62 companies, which covered 688 observations, were included in the unbalanced panel data.

The panel data were employed to take advantage of a large number of samples and degrees of freedom, and, therefore, enhance the estimator's efficiency. Multivariate regression analysis for the panel data was performed to evaluate the relationship between the variables in terms of sign and magnitude after controlling for the unobserved individual effects. Therefore, the main three analytical techniques applied were the pooled Ordinary Least Square (OLS) model (with an assumption of constant coefficients), the Fixed Effect Model (FEM) (which assumes that the firm-specific effects are correlated with regressors), and the Random Effect Model (REM) (which assumes that the individual specific effects are not correlated) (Hsiao, 2007)

In detail, the linear regression model was:

$y_{it} = \alpha + x_{it}*\beta + \mu_{it}$,

where, y_{it}: dependent variable of firm i in year t; x_{it}: explanatory variables; β: coefficients for x_{it}; and μ_{it}: error term.

The pooled OLS model assumes the coefficients of the linear equation are constant over time and between individuals. Therefore, if there are no unobserved individual effects and the residual μ_{it} is independent to x_{it}, the OLS model will be consistent and unbiased. However, if unobserved heterogeneity is present, it's better to use the FE or RE estimators than the OLS.

The fixed effect model (FEM) takes into account each firm's specific effects by allowing a varying slope for each firm, but assuming a constant slope among firms.

The random effects model REM assumes that the differences among individuals are random, drawn from a given distribution with constant parameters.

Therefore, to determine which model was better, it was necessary to perform an F-test (if Prob <0.05, FEM is better than OLS because the null hypothesis that μ_{it} is independent from x_{it} would be rejected) and a Breusch-Pagan Lagrange Multiplier (LM) test (if Prob < 0.05, REM is more suitable than OLS because the null hypothesis that the variance between individuals is zero would be rejected). In addition, a Hausman test was conducted to select a fixed or random model (if Prob < 0.05, FEM is better because the differences in coefficients would not be systematic). Furthermore, to increase the efficiency of the model, tests for multicollinearity, heteroskedasticity (Wald test), and autocorrelation (Wooldridge test) were conducted.

Model specification

There are many indicators to represent a firm's performance. According to Al-Matari *et al*. (2014) a firm's performance can be evaluated by accounting criteria such as the return on assets (ROA), return on equity (ROE), profit margin (PM), and earnings per share (EPS), etc. In this study, the firm performance was measured by the PM (the firms' profit margin).

As mentioned by Grozdić *et al.* (2020), capital investments not only represent a firm's expenses in the short-term, but also bring some benefits to a firm in the long-term. Thus, the purpose of this study was to analyze the impacts of capital investments on a firm's performance in both the short-term and long-term aspects. Therefore, the study's main research hypotheses were:

H1: Capital investments have a positive impact on the short-term financial performance of food and agriculture companies.

H2: Capital investments have a positive impact on the long-term financial performance of food and agriculture companies.

The study used the current year and one-year lag of the capital investment rate (CI and CI_lag) as the independent variables to measure the short-term and long-term effects of capital investments. The capital investment rate was calculated as CapEx (capital expenditures) divided by total assets. The other factors affecting a firm's performance were used as control variables, namely size, equity to asset ratio (Equity_ratio), and tangible-asset ratio (Tang_ratio).

Accordingly, the equation of the regression model was as follows:

$$PM = \alpha + \beta_1 *CI + \beta_2 *CI\_lag + \beta_3 *Equity\_ratio + \beta_4 *Tang\_ratio + \beta_5 *Size + \mu_{it.}$$

Table 1 gives explanatory descriptions of the variables used in the research.

Results and Discussion

Descriptive statistics

Table 2 presents the summary statistics of both the dependent and independent variables. In general, the profit margin of the listed food and agriculture companies in Vietnam was 6.72% during the period of 2009 - 2020, which was lower than those observed for US food and agriculture companies in 2018 (15%) and US firms in general in 2020 (7.81%) (CSI market). However, the PM indicator fluctuated widely between -134.99% and 167.72%. Therefore, although companies in this industry had development potential in their financial performance, there were significant gaps among them.

Table 1. Description of the variables used in the analysis

Variable	Type of variable	Description
PM	Dependent	Profit margin = Net income / Revenue
CI	Independent	Capital investment rate = CapEx (t) / Total assets (t)
CI_lag	Independent	One - year lag CI rate = CapEx (t-1) / Total assets (t-1)
Size	Control	Firm's size = Natural log of Total assets
Equity_ratio	Control	Equity ratio = Equity / Total assets
Tang_ratio	Control	Tangible assets / Fixed assets

Table 2. Descriptive statistics of the variables

No. of observations: 668

Variable	Mean	S.D	Min	Max
PM	0.0672	0.1452	-1.3499	1.6772
CI	0.0489	0.0874	-0.4386	0.6298
CI_lag	0.0473	0.082	-0.5058	0.4945
Size	27.6314	1.6309	24.5905	32.3823
Equity_ratio	0.5347	0.2093	-0.1678	0.9993
Tang_ratio	0.7717	0.2333	0	1.0516

In terms of capital investments, investment rates in the short-term (CI) and long-term effects (CI_lag) accounted for 4.89% and 4.73%, respectively. Specifically, they were higher than the non-financial listed firms in the Ho Chi Minh Stock Exchange (HOSE), which was 2.34%, as observed by Anh & Hieu (2020).

The equity ratio was 53.47%, revealing that firms in the food and agriculture industry used a high level of debt (equal to 46.53%). However, this financial leverage was lower in comparison with the average of all industries in the Vietnam Stock Exchange, which accounted for 51.92% during 2007 to 2012 (Vy & Nguyet, 2017). In contrast, it was higher than firms in developed countries: 22% for France (de La Bruslerie & Latrous, 2012), and 33.4% for Western European and East Asian countries (Lin & Chang, 2011).

In terms of size, the natural log of the total assets was 27.63, equivalent to 4,504.4 billion VND. The average size of the total assets of this industry was larger than that of non-financial enterprises on the HOSE (26.22) as reported by Anh & Hieu (2020).

The Tang_ratio was 77.17%, which indicated that food and agriculture firms in Vietnam have invested mostly in tangible assets in comparison with intangible assets.

Correlation Matrix

According to **Table 3**, the capital investment variables, equity to total assets, and firms' size variables were positively correlated with firm performance, while the relationship was negative with the level of investment in tangible assets. In addition, the capital investment variables and equity ratio variable had negative correlations. All the correlation coefficients were quite small (highest number was 0.371). The correlation results were consistent with most previous studies and in line with the author's expectations during this research period in Vietnam. Therefore, all the variables were suitable in the regression models.

Empirical results

Table 4 reports the results of examining the relationship between capital investments and firm performance, which were estimated by OLS, FEM, and REM. In general, all three models agreed on the statistically significant impact of capital investments in the long-term effects on firm performance. Although the capital investments in the short-term effects had a positive relationship with firm performance, the results weren't statistically significant.

The F-test and Breusch-Pagan LM were performed, both resulting P <0.01, which meant the OLS model was not suitable in this case. The Hausman test resulted in chi-square statistics that weren't statistically significant (P = 0.1384), favoring the RE model over the FE model. Also, other tests for multicollinearity, heteroskedasticity (Wald test), and autocorrelation (Wooldridge test) supported this result. The Wooldridge test showed that there was no autocorrelation (P = 0.0794 > 0.05). Moreover, it is commonly believed that the autocorrelation problem can be omitted in short panel data (Vy & Nguyet, 2017). For this reason, the random effect estimator was used to explore the impact of capital investments on firm performance.

The results from the REM were as follows:

First, the one-year lag capital investment rate (CI_lag) had a positive and statistically significant effect on the PM at 1%. The coefficient of 0.2152 implied that if the capital investment rate of the previous year increased by 1%, the profit margin of the current year would increase to 0.2152%. In contrast, the short-term effects of capital investment CI had a positive relationship on the PM but it was not statistically significant.

Second, the equity ratio was positively correlated with the PM at a significance level of 1%. The correlation coefficient of 0.2878 meant that if the equity to total asset ratio increased by 1%, the PM would increase by 0.2878%.

Third, at the statistical significance level of 1%, the firm size had a positive impact on the firm performance. If one unit of Ln(asset) increased, the profit margin would increase by 0.0137.

Fourth, the level of investment in tangible assets had a negative and statistically significant effect on financial performance at 1%. The profit margin would decrease by 0.0814% if this ratio increased 1%.

Last but not least, the R^2 values of the OLS, FEM, and REM regressions were 20.46%, 11.03%, and 10.81%, respectively; in other words, the variables included in the model could only explain the changes of the PM with the corresponding proportions. Numerically, the R^2 values were quite low, which didn't mean that the models were not good, but that the predictability of the variables in the models was low. This is a common occurrence, especially in cases where it is difficult to predict the behavior of some entities, such as in the social and economic aspects. Studies on the same topic also had similar R^2 results, such as the study of Grozdić *et al.* (2020), in which the R^2 ranged from 6.7% to 14.6%.

Discussion

In general, this study provided evidence of capital investments positively affecting firm

Table 3. Correlation coefficients between the variables

	PM	CI	CI_lag	Equity_ratio	Tang_ratio	Size
PM	1					
CI	0.092	1				
CI_lag	0.149	0.158	1			
Equity_ratio	0.371	-0.005	-0.01	1		
Tang_ratio	-0.125	-0.138	-0.05	-0.008	1	
Size	0.118	0.061	0.031	-0.183	-0.163	1

Table 4. The impact of capital investments on firm performance

668 Observations		Dependent variables: PM		
		OLS	FE	RE
Independent variable				
Capital investment rate	CI	0.0848	0.0463	0.0674
		(0.150)	(0.431)	(0.238)
	CI_lag	0.2394***	0.18897***	0.2152***
		(0.000)	(0.003)	(0.000)
Equity to total assets ratio	Equity_ratio	0.2799***	0.3183***	0.2878***
		(0.000)	(0.000)	(0.000)
Tangible assets ratio	Tang_ratio	-0.04995**	-0.1181***	-0.0814***
		(0.024)	(0.000)	(0.001)
Size	Size	0.0152***	0.0137	0.0137***
		(0.000)	0.207	(0.003)
Constant		-0.4797	-0.4016	-0.4175
R-squared		0.2046		
Adj R-square		0.1986		
F-test		34.06		
Prob>F		<0.001		
R-squared (within)			0.1103	0.1081
F-test (overall)			14.93	
Prob>F			<0.001	
Wald test				112.50
Prob>Chi2				<0.001
F-test that all u_i=0			2.60	
Prob>F			<0.001	
B&Pagan LM test				33.72
Prob>Chi2				<0.001
Hausman test				8.34
Prob>Chi2				0.1384
Breusch-Pagan test for heteroskedasticity		0.19		
Prob>Chi2		0.6654		
Wooldridge test for autocorrelation		3.185		
		0.0794		

*Note: Standard error in parentheses; ** and *** denote the significance levels of 5% and 1%, respectively.*

performance. Specifically, the results indicated that only capital investments in terms of long-term effects have a statistically significant impact on the firm's profit margin, which means that for a certain increase in capital investments, the PM of firms is expected to increase in a one-year lag after the investments instead of having an immediate effect.

First, regarding Yu *et al.* (2017), capital investments have a positive and statistically significant effect on firm performance as measured by revenue growth. Additionally, Taipi & Ballkoci (2017) argued that capital investments are positively related to the return on assets of the firm. Besides, Jiang *et al.* (2006) implied that capital investments represent a

signal of predicting future stock returns and firm profitability. In contrast, some authors believe that the level of capital investments has a negative relationship with profit growth, such as Titman *et al.* (2004), Cooper *et al.* (2008), and Yao *et al.* (2011). On the other hand, some researchers, such as Kapelko *et al.* (2015) and Grozdić *et al.* (2020), demonstrated that capital investments generate a short-term loss, but then productivity rapidly improves and they have a positive effect on long-term profitability.

Second, the equity to total assets ratio has a positive and statistically significant effect on the profit margin. In other words, businesses with low financial leverage tend to have a higher rate of return. The authors Zeitun & Tian (2007) and Vy & Nguyet (2017) argued that financial leverage will cause firms to overuse debt beyond their ability to pay, thus they will have a high risk of bankruptcy, reducing the business efficiency. Especially, in the Vietnam context with a transitional and emerging market, debt monitoring has been inefficient. An increase in debt incurs more cash to undertake discretionary investments, which negatively impacts enterprise performance.

Third, the size of the company, as measured by the natural logarithm of total assets, has a positive influence on the financial performance of companies listed in the food and agriculture sector. Large companies often have greater profitability because they can take advantage of economies of scale. The results correlate with the research of Prasetyantoko & Parmono (2008). In contrast, Kartikasari & Merianti (2016) found a negative relationship between these two variables. They explained that managers of large firms may put their own benefits ahead of company goals due to conflicts of interest.

Fourth, the tangible assets ratio has a negative and statistically significant impact on the financial performance of a firm. That is to say, food and agriculture companies are currently paying much attention to tangible assets. They often invest with a large proportion of tangible assets and neglect intangible assets, which are also important for the firm development. Consequently, it is difficult to effectively achieve profitability.

In summary, the listed food and agriculture companies on the Vietnam Stock Market have a relatively high capital investment rate compared to others, and therefore, an increase of the capital investment rate will contribute to increasing their profit margin in the long-run. However, in the short run, this effect is not obvious and may bring unexpected results. As a result, from the perspective of managers, it is necessary to pay attention to the firm's long-term benefits and to make strategic capital investment decisions that are vital to the sustainable development of the business.

Moreover, managers need to consider the equity ratio. Choosing an optimal capital structure will maximize the firm's profits, ensuring that assets financed by loans provide sufficient return to cover the costs and a return on the investment. Excessive use of debt in capital investment projects will not bring benefits to a business but may bring financial risks. Especially, for large-scale enterprises, capital investments are more and more necessary because they bring higher efficiency. However, it should be noted that the level of investment needs to be balanced between tangible assets and intangible assets.

The implications of this study also can be used by state governments. Policymakers should encourage and support investment activities, especially for the food and agriculture sector. Firms in this sector should be encouraged to invest in sustainable production projects with a long-term vision. Fiscal policies should consider the role of capital investments in bracing business growth and better performance.

Conclusions

This study has presented the significant relationship between capital investments and firm performance of food and agriculture companies in the Vietnam Stock Exchange. It is proposed that the capital investment rate of the previous year (one-year lag), the equity to total assets ratio, and firm size can positively and significantly affect profit margin while the level of investments in tangible assets negatively and significantly affects the PM. Listed companies in the food and agriculture industry in Vietnam

have used a high level of capital investments in comparison with other industries. The findings suggest that firms that invest more in capital investments are likely to experience a better performance measured by the PM in the long-term. If the firm employs a 1% higher capital investment rate over the previous year, the PM will raise 6.74% in the current year.

To control for unobserved individual effects, the study employed fixed effect and random effect estimators. The results illustrated that the random effect model was more suitable than the pool OLS and fixed effect models.

Based on these findings, the following are proposed recommendations for managers and policymakers. The board of management in companies should choose appropriate capital investment strategies to improve their firm's performance. They need to consider the long-term effects of capital investments instead of immediate results. In addition, managers should choose the optimal capital structure, as well as taking the advantage of big scale and choosing a reasonable investment structure in tangible assets. Moreover, policymakers should consider the central role of capital investments in encouraging economic growth and business efficiency. Finally, the results of this study can contribute to the theoretical and practical basis of capital investments in enterprises in general as well as in the context of Vietnamese food and agriculture companies in particular.

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