

# AN EMPIRICAL STUDY OF DETERMINANTS INFLUENCING ENVIRONMENTAL PROTECTION INVESTMENT BY SMALL AND MEDIUM ENTERPRISES IN VIETNAM

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**Abstract.** After implementing Doi Moi (Renovation) in 1986, Vietnam moved to a market economy and reached many achievements in socio-economic development. The Vietnamese business community has grown significantly and made great contributions to the country's development, including the great role of small and medium enterprises. This study investigates the determinants of environmental protection investment in small and medium companies in Vietnam by using the Vietnam Enterprise Dataset (2021) with multiple regression models. We find that loans borrowed from banks, value of fixed assets, profit and the number of employees significantly impacts the companies' environmental protection investment. The study also shows that ownership forms, education level and enterprise's years of operation have no impact on environmental investment decisions. Implications drawn from the study include increasing awareness of environmental protection for enterprises, along with providing market information and financial support for them to better capacity to invest in environmental protection, contributing to improving the competitiveness of Vietnamese enterprises.

**Keywords:** *small and medium enterprises, corporate environmental investment, environmental protection, social responsibility, Vietnam*

## Introduction

Investment is the main activity that determines each enterprise's establishment, existence, and development (Stojanovic et al., 2020). Any companies, when doing business, must invest in building new or repairing, replacing, or supplementing physical and technical facilities such as headquarters, factories, machinery, and equipment to serve the production and operation. Therefore, increasing capital and rational use of investment capital will improve production and business efficiency, helping businesses grow quickly and sustainably and thereby helping to develop the economy further (Testa et al., 2016; de Sousa Gabriel and Rodeiro-Pazos, 2017).

Regarding corporate environmental investment (CEI), this agenda comprises various environmental notions, such as health and safety, environmental concerns, community relations or resource management (Babalola, 2012). CEI is considered as a complex concept (Bokhari and Khan, 2013). The arguments explain the rationale of CEI has relation to corporate performance, governance, and stakeholders. First, corporate CEI can be attributable to firms' economic motivation (Chang and Deegan, 2010). In addition, the principal-agent theory shows that firms doing CEI activities can have private gains and control rent-seeking of shareholders (Mukonza and Swarts, 2019). Third, previous literature argues that corporate giving CEI activities help to legitimize companies as good corporates in the mind of stakeholders (Konar and Cohen, 2001; Wang et al., 2018). In

turn, CEI improves firm performance and thus increase values of shareholders (Testa et al., 2015).

In the context of world economic integration, Vietnam is making efforts to join international organizations and successfully negotiate a series of free trade agreements, bringing many effective opportunities for socio-economic development. Keeping pace with this trend, small and medium enterprises (SMEs) - the main driving force of the economy - have many opportunities to expand production and business (Le and Truong, 2019; Vo and Ho, 2021). Recent years, the state has been implementing many measures to improve the business environment for enterprises, especially SMEs. Since the government promulgated support policies, these enterprises have increased rapidly in number and have operated more dynamically and efficiently, significantly contributing to gross domestic product (GDP) and attracting many workers (Tran et al., 2020). However, in a new environment, SMEs have to face quite many challenges from the highly competitive and demanding markets (Tien and Ho, 2021). Therefore, SMEs need appropriate strategies to be compatible with the new competitive environment. Hence, the issue of the effectiveness of environmental investment of SMEs needs to be considered for suitable solutions to help them make better market adaptation (Le and Nguyen, 2019; Le and Truong, 2019).

Around the world, there have been many studies on CEI such as Lovely 's study in China (2011), Mishra and Sharma's study in India (2010) and Chamorro and Banegil's research in Spain (2019). In general, environmental investment needs investing in capital is likely to relate to significant committed costs and might result in the loss of scale economies (Orlova et al., 2018; Nga, 2019) argues that environmental investment can open to diseconomies if the management of a company cannot quickly respond to the changing needs of its stakeholders. Existing studies find that good corporate governance will bring about firm reputations, competitiveness of capital sourcing, and provides financial advantages (Lovic, 2019).

In Vietnam, the research and application of CEI are still new and are taking initial steps with market development (Dung, 2019). Not many researches have been done in this field, thus there is no overall picture of CEI of SMEs and few implications to promote CEI. This research hence is strongly motivated by the important roles corporate governance plays in environmental investment. It aims at estimating the factors affecting the decision to invest in the environment protection of SMEs in Vietnam.

This study contributes to the extant literature in several ways. First, we add to the debate concerning the factors influencing of investment in corporate green management practices, specifically investments in environmental protection initiatives. Second, our study identifies environmental industry affiliation as institutional factors that influence SMEs CEI in Vietnam. This is a link between institutional renovation and environmental management in firms. Finally, the study contributes to behavior theory by arguing that, apart from regulatory forces, internal and external pressures are also key factors motivating firms to be greener and more sustainable practices.

The study starts with building a model to estimate the influencing factors from inherited previous literature, then an overview of SMEs in Vietnam is presented, next the CEI influencing factors are estimated and discussed. Finally, from the research results, some policies are proposed to help Vietnamese SMEs to develop to protect the environment, better adapt to the market and move towards sustainable development.

## Material and Method

### *Model specification*

In economics, investment is defined as the act of spending or using resources to increase output, develop productive capacity, and expect a returning profit in the future. Jorgenson and Siebert (1968) argue that 'Investments and goods purchased by individuals or businesses to increase their capital'. Environmental investment can be understood as investments to prevent and treat environmental damage and protect the environment of enterprises. This investment includes expenditures to prevent, destroy, plan, control or change the course of action incurred to environmental protection for which businesses are legally responsible De Marchi and Grandinetti (2013).

In general, environmental investment of enterprises is affected by many factors (Rahman et al., 2012; Katrandjiev, 2016; Park, 2019). Tehreem et al. (2021) summarizes some external and internal factors as follow:

*Profit:* when credit is limited due to asymmetric information and cannot access many loans from commercial banks; enterprises will have to use accumulated profits to finance environmental investments. De Marchi and Grandinetti (2013) also said that when the enterprise's investment depends mainly on the internal financial source of the enterprise, most enterprises often have difficulty accessing bank loans. This also means that the profits earned by the business will affect the CEI behavior of the business (Testa et al., 2016). Then, the higher the profit, the more the environmental invests. This shows that a business that achieves much profit will increase its ability to expand environmental investment in the future.

*Loan:* is the loan amount from a commercial bank used by the enterprise to invest in fixed assets. This determinant can positively or negatively affect the environmental investment of enterprises (Soonthonsmai, 2007; Tien and Ho, 2021). However, Stojanovic et al. (2020) shows that borrowed capital greatly influences enterprises' increasing investment. Because SMEs are small, accessing loans from banks is difficult due to a lack of collateral. They have to rely on their minimal capital for initial investment. Therefore, loan capital is vital to help SMEs increase CEI.

*Fixed assets:* Typically, businesses with large asset values invest more in the environment than small businesses (Shane, 2003; Park, 2019). However, some studies have found the opposite results and suggested that small businesses make more significant environmental investments than large firms. It is because businesses with significant assets are often less flexible in converting products and services and has little opportunity for growth. In addition, due to their large size and to avoid significant changes in the firm, these firms are also limited in making additional investments because of the risk (Chang and Deegan, 2010; Wang et al., 2020). This also means that enterprises with significant fixed assets do not want to invest more because they may face risks, so this determinant is expected to influence the investment decision of enterprises negatively.

*Labor:* The number of employees, more or less, also shows the size of the business. The theory of Shane (2003) used the number of employees to measure the size of the enterprise. The analysis results show that the higher the total number of employees, the higher the probability of the enterprise's environmental investment. Because once businesses have many employees, they want to take advantage of their human resources to increase output, which creates the need for environmental investment in businesses will be more.

*Competitor*: is a determinant that shows the number of competitors in the business's industry. Competition is a determinant that affects the investment decisions of enterprises because if they are slow to invest, competitors will lose good opportunities (Lovely, 2011). Enterprises want to invest in more modern machinery to increase productivity and reduce costs to increase competitive advantage over competitors. In addition, businesses also promote investment to prevent other businesses from joining. Enterprises soon stepped-up investment to create more products and gain market share preventing new competitors from entering the industry (Lovic, 2019; Tehreem et al., 2021). Therefore, competition is also an expected determinant in promoting the environmental investment of enterprises.

*Experience*: is the number of years of operation of the enterprise from the year of establishment. Long-term business enterprises will gain much experience and accumulate capital. In addition, these firms can operate more efficiently than younger firms due to their cost and market advantages (Jorgenson and Siebert, 1968). In a stable and saturated market, businesses with a longer operating time may invest less because they are already large enough (Testa et al., 2015; Mukonza, 2018). Therefore, this determinant is expected to affect the increase in enterprises' environmental investment negatively.

*Education*: shows the cultural and professional (education in general) qualifications of the business owner or manager. According to economists, the higher the education level, the better the ability to acquire scientific and technical and scientific knowledge about modern economic management, creating more effective business opportunities, promoting businesses to improve profits, and encouraging businesses to want to invest more (Orlova et al., 2018; Tran et al., 2019). Thus, a business owner with a high level of education or expertise can understand and access science and technology more conveniently. This helps them decide to invest in science and technology to increase their productivity and the quality of their products.

Based on the synthesis of previous studies, the estimated model proposed in this study is as follows (Eq. 1):

$$INVEST = \beta_0 + \beta_1.PROFIT + \beta_2.LOAN + \beta_3.FA + \beta_4.LABOR + \beta_5.COMPETITOR + \beta_6.EXP + \beta_7.EDU2 + \beta_8.EDU3 + \beta_9.EDU4 + \beta_{10}.PE + \beta_{11}.COOPERATIVE + \beta_{12}.LLC + \beta_{13}.JSC + \varepsilon \quad (\text{Eq.1})$$

In which:

**INVEST**: The dependent variable represents the level of environmental investment of the enterprise. This variable measures the value of investment or the amount of money the business uses in waste treatment and control; pollution prevention and management; environmental research and development.

Independent variables are:

**PROFIT**: The ratio between profits after tax divided by the value of fixed assets of the enterprise;

**LOAN**: The ratio between the loan borrowed by the enterprise and the total value of the fixed assets of the enterprise;

**FA**: Fixed asset value of the enterprise;

**LABOR**: Total number of employees of the enterprise;

**COMPETITOR**: Number of competitors in the industry;

**EXP**: Number of years operating in the business of the enterprise;

EDU: Dummy variable to represent the educational level of the business owner or manager, specifically

EDU1: Elementary education and below (reference group); EDU2: Junior education = 1, others = 0; EDU3: high school education = 1, others = 0;

EDU4: higher education = 1, others = 0;

TYPE: company type including PE (Private Enterprise), COOPERATIVE (cooperative enterprises), LLC (limited liability company), and JSC (joint stock company): are dummy variables included to test the difference in environmental investment decisions of enterprises of different types of private enterprises.

$\varepsilon$ : error term

Details about the proposed model and variables are presented in *Figure 1* and *Table 1* below:



**Figure 1.** Proposed model of CEI impacted variables

**Table 1.** Variables in the estimation model

Symbol of determinants	Description	Expectation sign
INVEST	Dependent variable - enterprise investment	+
PROFIT	The ratio between the enterprise's after-tax profit and the value of the enterprise's fixed assets	+
LOAN	The ratio of loan to the value of fixed assets	+
FA	The business's fixed asset value	-
LABOR	Total number of employees of the enterprise as of the time of the survey (2021)	+
COMPETITOR	Total number of competitors in the industry/sector	+
EXP	Number of years of operation of the enterprises since its establishment	-
EDU	Education level of the business owner or manager (including dummy variables EDU2, EDU3, and EDU4 explained above)	+
COOPERATIVE	Dummy variable of business type: Cooperative Enterprise= 1; Others = 0	+
PE	Dummy variable of business type: Private Enterprise= 1; Others = 0	+
LLC	Dummy variable of business type: Limited Liability Company = 1; Others = 0	+
JSC	Dummy variable of business type: Joint Stock Company = 1; Others = 0	+

Source: Synthesized from literature (2022)

## Data collection

This study uses secondary data on investment and business environment characteristics of micro, small and medium enterprises in Vietnam. The secondary data are taken from the "Economic Census 2021" survey conducted in 2021 by Ministry of Planning and Investment (MPI). This survey focuses on the business, operational and management aspects of enterprises including SMEs. In which environmental costs of enterprises include investment costs for pollution treatment machinery and equipment, costs of operating pollution control systems and costs for the company's human resources in environmental protection. We focus on SMEs in 9 provinces and cities with high industrial density representing 3 geographical regions in Vietnam, including Hanoi, Phu Tho, Hai Phong (North region), Nghe An, Da Nang, Khanh Hoa (Central region), Ho Chi Minh City, Binh Duong, Dong Nai (South region).

## Results

### Overview of SME in Vietnam

Viet Nam's legal definition of SME follows the classification of the Law on SME (Law 04/2017/QH14, dated 12 June 2017), which includes two criteria – the number of employees and total revenues or total capital of the business enterprise – and applies different thresholds for different sectors (*Table 2*).

**Table 2.** Classification of small and medium enterprises in Vietnam

	Agriculture, forestry, fisheries, industry, construction		Trade and services	
Micro enterprise	The average number of employees participating in social insurance per year does not exceed 10 people	Total annual revenue is not more than 3 billion VND or total capital is not more than 3 billion VND	The average number of employees participating in social insurance per year does not exceed 10 people	Total annual revenue is not more than 10 billion VND or total capital is not more than 1 billion VND
Small enterprise	The average number of employees participating in social insurance per year does not exceed 100 people	Total annual revenue is not more than 50 billion VND or total capital is not more than 20 billion VND	The average number of employees participating in social insurance per year does not exceed 50 people	Total annual revenue is not more than 100 billion VND or total capital is not more than 1 billion VND
Medium enterprise	The average number of employees participating in social insurance per year does not exceed 200 people	Total annual revenue is not more than 200 billion VND or total capital is not more than 100 billion VND	The average number of employees participating in social insurance per year does not exceed 100 people	Total annual revenue is not more than 300 billion VND or total capital is not more than 100 billion VND

Source: Vietnamese Law on SME (2017)

SMEs have become an important part of Vietnam's economy. The results of the Vietnamese enterprise survey in 2021 show that SMEs account for 97.6% of the total number of enterprises across the country. SMEs contribute significantly to the Gross National Income, create jobs, and mobilize capital sources domestically and abroad for production and business activities, solving social problems. In addition, SMEs have

created a team of entrepreneurs and workers with increasingly improved and perfected knowledge and skills.

By economic sector, the number of enterprises operating in the service sector accounts for the highest proportion with 220,095 enterprises (accounting for 67.8% of enterprises in the whole economy). Also in this region, the number of large enterprises accounted for 48.6%, SME accounted for 68.3% and the proportion of micro enterprises in this area also accounted for the highest proportion with 77.5%. While the proportion of micro enterprises in the agriculture, forestry and fishery sector is 0.68% and the industry and construction sector is 21.8% of the total number of micro enterprises in 2021 (Figure 2).

By capital size, as of December 2021, the number of SMEs is 309,322, accounting for 95.3% (of which 39,421 medium enterprises account for 12.1 % of total enterprises; small enterprises are 26,991 enterprises, accounting for 83.1% of total enterprises).

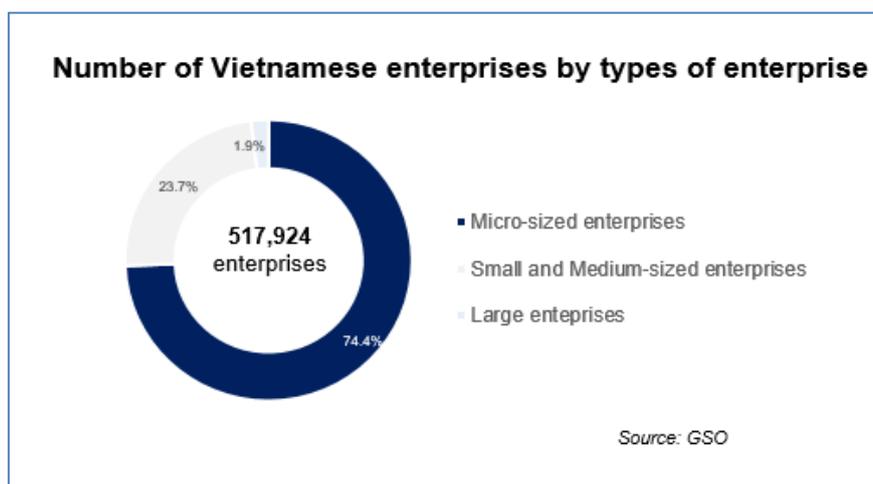


Figure 2. Structure of SME from 2016 to 2021 (%). Source: MPI (2021)

Employee efficiency (measured by average revenue/average income per employee) in 2021 of SMEs reached 21 times and this index is much higher than level 16.6 times of the whole enterprise. By type of enterprise, the non-state SME sector in 2021 achieved the highest efficiency in employing 14 employees in the three regions with 21.6 times, followed by the state sector SME sector with 21 times and FDI sector with 17.3 times. The service sector has the highest labor utilization ratio with 31.8 times, while the industry and construction sector has 13.2 times and the lowest is the agriculture, forestry and fishery sector with only 8 times (Figure 3).

The capital turnover ratio (calculated by total revenue/total capital) in 2021 of SME reached 0.92 times, which means that every 1 VND of capital investment will generate 0.92 VND of revenue (higher than the average capital turnover ratio) and 0.85 times of the entire enterprise sector). By economic sector, the non-state SME sector has the highest capital turnover index in 2021 with 1 time, followed by the state sector SME sector 0.74 times and the lowest is the non-home SME sector with 0.66 times. The service sector is the sector with the highest capital turnover index in 2011 with 0.98 times, followed by the industry - construction sector 0.86 times, the last is the agriculture, forestry and fishing sector was only 0.51 times.

Profitability on revenue (calculated by total profit before tax/ total revenue, reflecting how much profit is generated when generating 1 VND of revenue) of the entire SME in

2021 reached 1% (lower than the rate of 3.4% in 2016), while the overall profitability of the enterprise is 2.3%. By type of enterprise, the state sector had the highest return on assets in 2011 with 5.3%, followed by the FDI sector with 3.9% and the lowest was non-state enterprises with only 3.9%. 0.3%. By economic sector, the agriculture, forestry and fishery sector has a high return on revenue, outperforming the other two sectors with 4.6%, followed by industry and construction 2.1% and the lowest is the service sector with 0.3% (MPI, 2021).

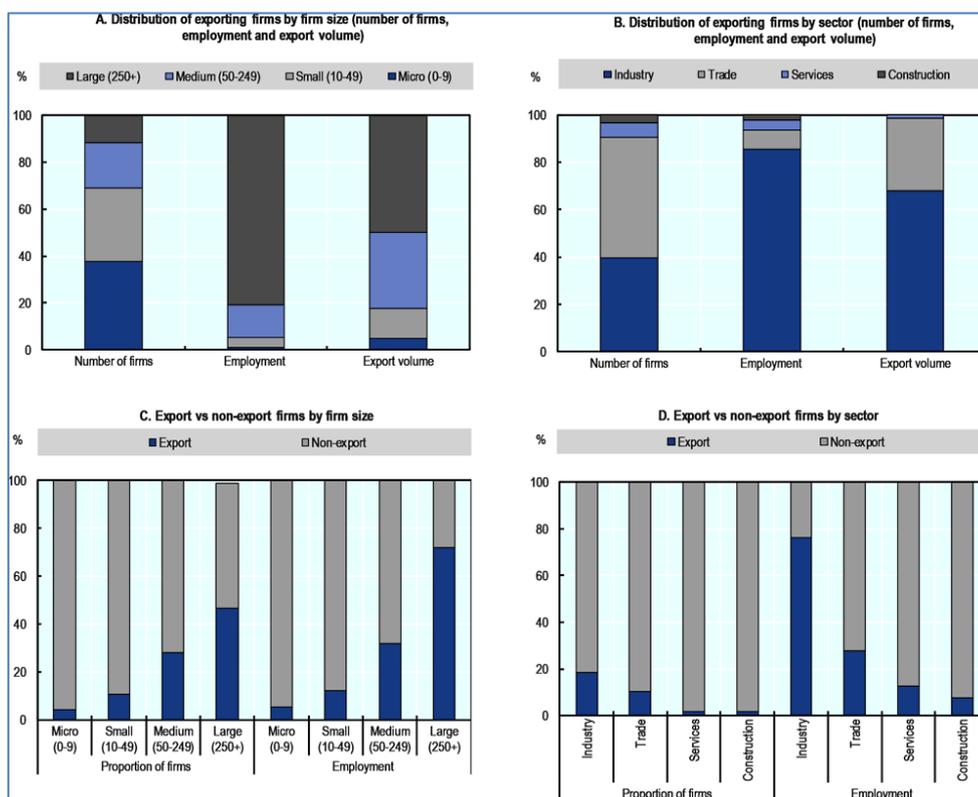


Figure 3. Some characteristics of SMEs in Vietnam. Source: MPI (2021)

### Characteristics of SMEs in the sample

In this study, we use a sample of survey results of 3,584 SMEs in 9 provinces and cities in Vietnam for analysis. In our sample, 2,249 (63%) businesses registered as household enterprises; next are enterprises in the form of limited liability companies, with 797 accounting for 22%. Private enterprises have 289 enterprises and account for 8%. The type of cooperatives has the smallest number with 80 companies (Table 3).

As to the data surveyed, the technology that SMEs use is not too outdated. If calculating the age of the leading machinery and equipment used by enterprises, up to 60.44% are from 3 to 10 years old. The age of machinery and equipment is calculated in years because most of the machinery and equipment of these enterprises are depreciated on a straight-line basis from year to year. Table 4 describes some characteristics of technology used in enterprises in terms of the level, age, and status of technology at the time of purchase.

**Table 3.** Number of enterprises by types and province/city in the sample

Province/city	Types					Total
	Household business	Private enterprise	Cooperatives	Limited Liability Company	Joint Stock Company	
Hanoi	556	41	20	207	61	887
Phu Tho	314	5	5	27	11	365
Hai Phong	124	29	23	66	36	280
Nghe An	351	33	6	61	36	489
Da Nang	174	15	2	37	2	232
Khanh Hoa	76	18	1	26	2	125
Binh Duong	98	16	0	16	0	132
Ho Chi Minh city	408	104	18	334	16	882
Dong Nai	144	25	1	18	0	189
Total	2,249	289	80	797	167	3,584

Source: Analyzed from survey data (2023)

**Table 4.** Technological features of SMEs (%)

Technological features		Proportion
Level	Manual tools	6.63
	Manually operated machinery	2.86
	Electrical operated machinery	37.96
	Both types 2 and 3	52.55
Age	Less than 3 years	23.32
	3-5 years	24.8
	6-10 years	35.64
	11-20 years	13.2
	More than 20 years	3.04
Status	New	69.7
	Used	26.5
	Produced (Designed)	3.8

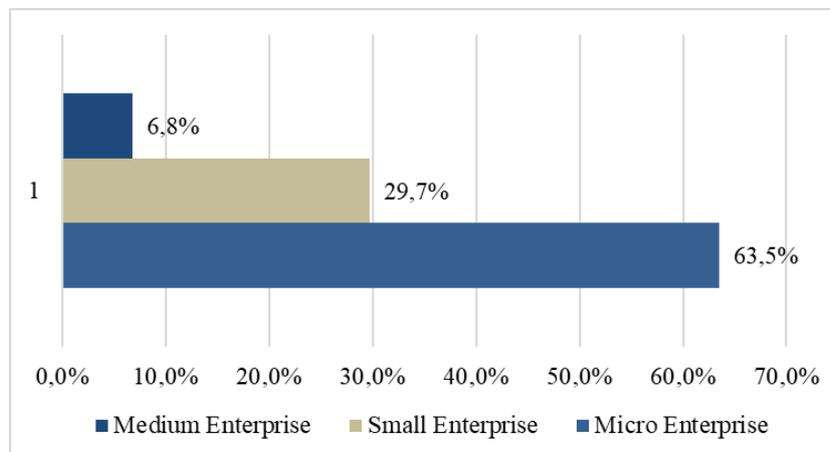
Source: Analyzed from survey data (2023)

In terms of size, 63.5% of enterprises in the sample are micro enterprises, 29.7% are small-scale enterprises and 6.8% are medium-sized enterprises. This ratio is quite similar to the ratio of all types of enterprise sizes in the total number of enterprises in Vietnam (Figure 4).

### Results of estimation model

Below is the table describing the mean, minimum, maximum, and standard deviation of the baseline variables in the model (Table 5). Accordingly, the average investment of each enterprise for environmental protection is 41.94 million VND with the highest investment at more than 1 billion VND. The average ratio between the enterprise's after-tax profit and the value of the enterprise's fixed assets is 0.033, which means that for every 1 VND of assets put into the business process, it will increase by VND 0.033 in profit after tax. Average value of fixed assets of enterprises in the sample is 266 millions VND; in which the enterprise has the largest fixed asset of 3.88 billion VND. In addition, the

average labor size of an enterprise is only about 14 people. The average level of education of business owners in the sample is 52% in high school and only 6% in primary school, and 28% at a higher professional education.



**Figure 4.** Size of the enterprise by number of employees. Source: Analyzed from survey data (2023)

**Table 5.** Descriptive statistics of the variables in the model

Variable	Unit	Mean	Minimum value	Maximum value	Standard deviation
INVEST	Million VND	41.94	25.14	1,121.51	19.85
PROFIT	Million VND	0.033	0.011	0.057	0.008
LOAN	Million VND	123.46	0.00	610.50	45.31
FA	Million VND	266.18	55.60	3,880.04	72.64
LABOR	People	14.46	5	42	7.16
COMPETITOR	Enterprise	39.07	1	138	47
EDU2	Junior Education	0.33	0	1	1
EDU3	High Education	0.72	0	1	1
EDU4	Higher Education	0.25	0	1	0
PE	Private enterprise	0.25	0	1	0
COOPERATIVE	Cooperative company	0.17	0	1	0
LLC	Limited Liability Company	0.31	0	1	0
JSC	Joint Stock Company	0.21	0	1	0

Source: Analyzed from survey data (2023)

We also checked for violations of the necessary assumptions before analyzing the multiple regressions by the ordinary least squares (OLS) method. The tests for a linear relationship, constant error variance, autocorrelation, and multicollinearity indicated that the regression assumptions were not violated.

The estimated results are shown in *Table 6*. Regarding the overall fit, the coefficient of determination R square is 0.582, which means that 58.2% of the enterprise's investment volatility (INVEST) is explained by the independent variables included in the model, the

rest is due to errors or other determinants not studied such as business type, level of risk, market information, credit restrictions, etc. At the same time, ANOVA analysis showed that the  $F = 2.778$  value corresponds to  $\text{Sig.} = 0.000$  (significant level of 1%), this concludes that the model fits the data or that there is a linear relationship between the dependent variable (INVEST) and at least one independent variable, which can be generalized to the whole overall.

**Table 6. Multivariable regression model parameters**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Dubin - Watson
1	0.7622a	0.582	0.693	0.2123	1.742
a. Dependent Variable: INVEST b. Predictor: (Constant)					
Model		Sum of Squares	Mean Square	F	Sig.
1	Regression	107.789	19.345	2.778	0.00b
	Residual	23.785	0.117		
	Total	130.114			
a. Dependent Variable: INVEST b. Predictor: (Constant)					
Variables	Coefficient ( $\beta$ )	Significance level (Sig.)	VIF value		
Constant	0.684	0.844			
PROFIT	0.002	0.025**	1.964		
LOAN	0.059	0.029**	1.478		
FA	-0.035	0.015**	1.749		
LABOR	0.12	0.047**	1.825		
COMPETITOR	-0.009	0.037**	1.588		
EXP	0.010	0.621	1.510		
EDU2	-0.502	0.518	1.901		
EDU3	-0.232	0.877	1.919		
EDU4	0.280	0.894	1.825		
PE	-0.485	0.557	1.164		
LLC	0.466	0.501	1.033		
JSC	1.107	0.064*	1.376		
COOPERATIVE	1.029	0.697	1.322		
Number of observations (N)				3,584	
Coefficient of determination $R^2$ (%)				24.2	
F value				2.788	
Significance level (Sig.)				0.000	

As expected, two determinants that positively affect the investment decisions of enterprises are LOAN and LABOR. The estimated coefficients of these variables are positive and statistically significant. This result shows that the amount of enterprises' investment is affected by the amount of money that enterprises borrow and the number of employees. Specifically:

The variable LOAN also has a positive coefficient at the 5% significance level ( $\beta = 0.059$ ). If the loan increases by 1 million VND, the investment will increase by 0.059 million VND. The loan determinant is the same as expectations and, like some

previous studies, has a positive impact on investment decisions of micro, small and medium enterprises.

Labor determinant (LABOR) also has a positive coefficient and is statistically significant at 5% ( $\beta = 0.12$ ). This means that when the enterprise increases one employee in a year, the investment capital needs to increase by about 0.12 million VND.

The PROFIT variable in the estimated result is also as expected and it is positively significant at 5% significant level. SMEs have a microscopic scale, however having profit leads to more investment in environmental protection.

From the estimation results, two determinants harm investment: the value of fixed assets of the enterprise and the competition (COMPETITOR) of enterprises in the industry. Specifically, the variable, FA has a negative coefficient and is significant at the 1% level. When FA increased by 1 million VND, CEI decreased by 0.035 million VND. When the number of competing companies increases by 1 unit, the investment for the environment will decrease by 0.009 million VND.

Notably, the variable EXP and the variables EDU2, EDU3, and EDU4 are not statistically significant in the model. Thus, we can determine that the experience of the business and the education level of the owner or manager of the business do not influence the amount of investment.

The regression results also show that the type of business has almost no influence on the investment decision because the variables PE, LLC, and COOPERATIVE are not statistically significant in the research model. This is different from the expectations and research of the United Nations conference on trade and development (2022). Notably, only variable JSC has a positive coefficient (1.107) at the significance level of 10%. Among the types of enterprises in the study, only JSC has an enormous scale, so they are interested in investing in expanding production and business and enhancing competitiveness.

## Discussions

This study shows the factors affecting environmental protection investment by small and medium enterprises in Vietnam. The most important result is CEI is impacted by LOAN, PROFIT and LABOR.

Specifically, when businesses have more loans, they will invest more in environmental protection. This result is consistent with previous studies of Soonthonsmai (2007), Chang and Deegan (2010), Tien and Ho (2021). At the same time, the study also shows that there is a time lag between firm environmental investment and loan received, as shown in Park (2019). It seems to be true that it takes time for SMEs to identify investment opportunities. Although our result that a significant positive effect holds only for short period, this is even shorter than the result of Testa et al. (2016) that the effect of CEI holds for at least 2 years, the relationship obtained from our analysis is consistent with their conclusion in that the positive effect of LOAN on CEI is insignificant at first year and then becomes significant for following years. However, it is worth noting that, to obtain the effect of environmental investment in a truly effective manner, a large amount of investment is required. Even though environmental investment has been increasingly recognized as an important corporate strategy, such a large investment into environmental protection can be a large burden on a firm. This result is consistent with findings of Testa et al. (2015) and Tran et al. (2020).

This study also has the same results as research by De Marchi and Grandinetti (2013) and Testa et al. (2016) that PROFIT has a positive influence on CEI. This relationship has been mentioned in the theory of corporate social responsibility (Shane, 2003). As businesses increase profits, they will invest more in building a social image to improve interactions with stakeholders. In particular, investing in the environment is a smart and popular way that many businesses have applied. CEI not only improves the social image of businesses but also directly brings tangible benefits to them. CEI makes businesses operate more efficiently and sustainably. The research contributes to experimentally proving that Shane's theory can be applied to SMEs in Vietnam.

In the study, LABOR is also found to be positively associated with CEI. Research results show no trade-off between investment capital and labor, which is consistent with the theory and the studies of Tien and Ho (2021), that is, the higher the total number of employees, the higher the investment requirements of enterprises. Although previous studies such as Konar and Cohen (2001) show that CEI is related positively to LABOR, their conclusion is not tested with the data including small and medium firms. This study investigates with a larger data set and come up with conclusions that company scale does not change the relation.

In our estimation results, CEI is negatively impacted by FA and COMPETITOR. The results were as expected and in agreement with the results of Lovely (2011) and Testa et al. (2015). This determinant shows that enterprises with more considerable fixed asset value tend to invest less because the management ability of micro, small and medium enterprises in Vietnam is still poor, so they do not want to invest too much because it can be risky. The regression coefficient of the competitive variable (COMPETITOR) is also negative at the 5% significance level. Thus, this determinant differs from the expectations and research results of Lovic (2019). This proves that in an industry with many competing businesses, they do not want to invest more. Because the management capacity and market understanding of micro, small and medium-sized enterprises in Vietnam are still minimal, they are afraid to invest more in enterprises for fear of risks and failure in competition.

On the contrary, it seems to be strange that environmental investment has no effect in the observed micro firms, while it has a significant effect in medium firms. We can interpret this result as meaning that society considers that, because larger firms have more resources than small firms, environmental efforts are common practice for large ones. That is, dealing with green issues for large firms may lead to additional appreciation by stakeholders. Thus, the room for improvement in corporate image by environmental investment is bigger for medium firms. This result is consistent with the results of previous studies of De Marchi and Grandinetti (2013), Lovic (2019). In fact, in Vietnam, micro and small sized enterprises often do business in simple industries based on mostly domestic customers, so they do not require these businesses to pay much attention to management the environment in a deep way. The result that experience not having a significant effect on CEI is not in line with previous studies. We can interpret this result by referring to Mishra and Sharma (2010) and Nga (2019). According to their studies, experience can have a quadratic effect on CEI. This means that an adequate level of year experience increases CEI, while too much years of operation decreases the level of CEI. It is assumed that our empirical model cannot capture this nonlinear relationship.

The TYPE dummy is also not significant in regression model, which suggests the economic nature of firms does not impact CEI. This is consistent with Chang (2010), Gabriel et al. (2017), who show that industry characteristics influence the environmental

investment, not their ownership nature. Hence, society evaluates a firm depending on the pollution level of the industry that the firm belongs to. Moreover, most of these dummies are not statistically significant. Thus, our results are considered to be free from bias arising from ignoring the more detailed classification of industries.

## Conclusions

The estimated results show that the model variables are statistically significant in explaining the change in environmental investment decisions of SMEs in Vietnam. These determinants include the loan amount, the value of fixed assets, the number of employees, and competitors that affect the environmental investment of the business.

Research has shown that the environmental investment of Vietnamese SMEs depends greatly on bank loans. Besides, environmental investment affects the same direction as the number of employees employed by the enterprise. On the other hand, firms with more considerable fixed assets tend to invest less, which has the opposite effect. The results also show that the effect of competition on the environmental investment of enterprises is negative. In addition, the study shows that business types such as household enterprises, private enterprises, cooperative enterprises, and limited liability companies have almost no influence on environmental investment decisions. Only joint stock companies are larger businesses that are interested in environmental investment. Finally, in addition to the variables that are meaningful and impact environmental investment, there are other determinants, such as the seniority of the business and the education level of the owner or manager, not statistically significant, so there is no apparent impact on the environmental investment of enterprises.

From the results discussed above, the study proposes the following policy implications:

Firstly, the state, as well as the competent agencies, need to create an open and transparent investment and production and business environment, reduce unofficial costs to create equal competition among enterprises, continue to perform well the support services for micro, small and medium enterprises, further strengthen administrative reform in business registration, tax, reduce inspection, inspection and investment procedures; Support enterprises to apply new technologies in production and business to increase productivity; Completing and consistent mechanisms and policies for preferential land rental, land auction and income tax for micro, small and medium enterprises.

Secondly, loans have a positive effect on the environmental investment of enterprises. Therefore, to increase access to bank loans, businesses should join organizations and associations to expand opportunities for cooperation or support when borrowing. In addition to enterprises actively creating their funds (own capital) for investment, enterprises must prepare all necessary conditions to take advantage of preferential credit programs from the government or other financial institutions. Enterprises must also build a credit reputation by implementing a standard bookkeeping system, a clear business plan, transparent asset information, solvency, and the company's business prospects to make bank loans more convenient. On the contrary, banks also need to strengthen information exchange with businesses to simplify the approval process and provide specific support for loans to micro, small and medium enterprises in Vietnam.

Thirdly, it is crucial to identify and build competitive advantages to adapt well to competition and encourage businesses to invest in the development environment. Each

enterprise needs to consider implementing a strategy or coordinating the implementation of basic competitive strategies, such as the need to control and save costs, focus strategies and differentiate products and markets. In addition, applying new technology in production, business, and management and developing high-quality resources creates its competitive advantage in the context of integration.

Lastly, the study shows that the type of small-scale enterprises, such as cooperatives, household enterprises, and private enterprises, does not make sense in the model because the types of enterprises are micro-sized, so they do not affect environmental investment decisions. Therefore, to increase society's total production and business scale, the Government and agencies at all levels need policies to create conditions for these two types to develop into a larger-scale joint stock company.

The study has some limitations, such as not including business lines, policies for micro, small and medium enterprises, premises, and some other determinants in the estimation model. In addition, this data set has not been continuous over many years, so the results may not reflect the change in the environmental investment of enterprises over the years. However, this study has pointed out the primary determinants affecting the decision to expand environmental investment of micro, small and medium enterprises in Vietnam, thereby helping the management agency and the government. The country has policies and solutions to support the development of micro, small and medium enterprises in Vietnam in the future.

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