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RESEARCH ARTICLE

Analysis Of Factors Affecting the Profitability of Small and Medium-Sized Enterprises in The Manufacturing Industry in Vietnam Amid the Economic Crisis

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ARTICLE INFO	ABSTRACT
	This paper analyzes the factors affecting the profitability of small and medium-sized enterprises (SMEs) in Vietnam, using data on SMEs in the manufacturing sector across northern provinces from 2007 to 2019. By applying a panel data model (Fixed Effects Model and Random Effects Model) to estimate the model, the empirical results confirm that factors such as the total value of a firm's physical assets, the total number of full-time employees, the type of machinery and equipment used, the proportion of skilled labour among full-time employees, the technical qualifications of the enterprise owner, the sector of the enterprise, the firm's size, enterprises with support from the Vietnamese government and its export activities all impact profitability. Additionally, the paper identifies that business performance, sector group, production process, ownership type, and years of economic crisis influence the likelihood of firms introducing new products. These empirical results provide policy insights for SMEs in Vietnam's manufacturing sector to foster sustainable business development.

INTRODUCTION

The manufacturing industry is a cornerstone of the economy, significantly contributing to GDP growth and creating substantial value. Its development not only directly impacts economic growth but also has spillover effects on other sectors and the broader economy. Between 2011 and 2020, the manufacturing industry demonstrated its role as a growth driver, accounting for an average of 14.9% of GDP and achieving an impressive average annual growth rate of 10.44%, higher than the overall economic growth rate. This highlights the increasing reliance of the economy on the sustainable development of the sector (Pham Viet Dung, 2022).

In the second quarter of 2024, the manufacturing sector's import-export activities exhibited a diverse trend. Exports of goods such as footwear, textiles, and electronics grew strongly, reflecting the recovery of these production sectors. However, imports of raw materials, such as crude oil, wood, and fabric, also rose significantly, underscoring the industry's reliance on foreign supply (General Statistics Office, 2024).

Although Vietnam's manufacturing industry plays a crucial role in economic growth, it still faces several limitations. In particular, SMEs, which make up a large portion of the sector, encounter many

challenges yet play an essential role in driving the industry's development. One of the biggest obstacles facing the manufacturing sector is the low rate of product localization. Heavy reliance on imported materials and components makes domestic manufacturing vulnerable to global market fluctuations. This not only reduces the competitiveness of products but also hinders the sustainable development of the sector. SMEs, with their flexibility and adaptability, play a vital role in diversifying products and meeting domestic market demands. However, these enterprises often struggle with access to capital, technology, and markets, limiting their ability to invest in research and development, improve product quality, and expand production scale (Pham Viet Dung, 2022).

Profit plays a vital role in every business operation. Under the independent accounting mechanism in a market economy, the ability to generate profit is a decisive factor in a firm's survival and growth. Thus, profitability is considered a key indicator of business performance. In the context of integration, as Vietnam increasingly aligns with the global economy, enhancing enterprise profitability becomes essential, not only affecting the firm's survival but also impacting the broader economic development prospects (Do Thi Van Trang, 2019). Furthermore, according to the second quarter 2024 manufacturing and construction industry business trend report and the forecast for the third quarter of 2024 (General Statistics Office, 2024), manufacturing enterprises have revenue growth potential. It indicates that the new order balance index in Q3/2024 compared to Q2/2024 is 21.8% (38.0% of enterprises forecast an increase, while 16.2% expect a decrease); the FDI sector has the highest balance index at 23.5%, followed by non-state enterprises at 21.2%, and state enterprises at 18.5%.

Given the importance of profitability to SMEs in the manufacturing sector in Vietnam, as well as to the economy as a whole, studying the factors affecting profitability for these enterprises to enhance competitiveness in this field is necessary.

The initial section of the paper introduces the importance of analyzing factors impacting the profitability of SMEs in Vietnam's manufacturing sector. The remaining parts of the paper are organized as follows: Section 2. Literature Review and Research Methodology, Section 3. Research Data and Model Estimation Results, Section 4. Conclusion and Policy Implications.

OVERVIEW OF RESEARCH AND RESEARCH METHODOLOGY

Overview of rresearch

Globally and domestically, there have been studies analyzing the impact of various factors on the profitability of small and medium-sized enterprises (SMEs) in general, and those in the manufacturing sector in particular.

International studies

Small and medium-sized enterprises (SMEs) play a vital role in the manufacturing sector as well as in the economy of each country. In the context of current global economic integration, countries are increasingly focusing on supporting SMEs to maximize resources for economic development. Consequently, in recent years, issues related to SMEs in the manufacturing sector have garnered significant attention from researchers and organizations.

In a study examining the impact of economic crises in Indonesia on SMEs through field research in the metalworking sector in Java, Sato Yuri (2000) indicated that the operational performance of SMEs during crises varies significantly even within the same industrial sub-sector. The study presented new findings that the most influential factors on operational performance are market orientation and the connections established by SMEs with their product buyers. Well-performing SMEs capitalized on processing links with wholesalers, allowing them to transition to products with better market prospects. Conversely, SMEs linked to assemblers or under contract with using factories (excluding those with export-oriented links) faced severe difficulties during the crisis due to the specificity of

their products, which reduced their ability to pivot. The paper also concluded that exposure to investment debt is another factor influencing operational performance, yet the size of the enterprise does not exhibit a linear correlation with performance. However, the study did not consider long-term strategies, the role of government support policies, and the impacts of culture and corporate governance on adaptability and operational effectiveness.

Aleksander Jakimowicz and Daniel Rzeczkowski (2019) studied the innovation strategies of Polish industrial processing enterprises based on their size after the global financial crisis. A notable aspect of this research is the detailed analysis of the innovation strategies of Polish industrial processing firms in the context of the post-global financial crisis. The study examined factors such as enterprise size, market scope, forms of innovation, and barriers to innovation, and provided specific recommendations for ecological innovations aimed at mitigating the impact of external shocks. The research also employed chi-square testing to verify the relationships between these factors, creating a practical foundation for innovation policy formulation. However, the study did not clarify the impact of internal factors such as managerial capacity or innovation culture in responding to crises.

In 2019, while investigating the global crisis and subsidies for processing and manufacturing companies, Kaya Halil Dincer and Balas Ayse Nilgun (2019) examined the effects of the 2008-2009 global financial crisis on the subsidies provided to processing and manufacturing enterprises by their governments or the European Union (EU). The study's findings indicated that, overall, a significant proportion of enterprises received subsidies following the global crisis. When considering various sub-groups, the study found that factors such as enterprise size, the number and management of female employees, and quality certification had no impact (as many enterprises in all these sub-groups received subsidies). Conversely, the results indicated that the type of enterprise and the experience level of senior management created differences in the subsidies received post-crisis.

In researching the impact of economic crises and pathways forward for SMEs in Sri Lanka, G. T. W. Sriyani (2022) identified the main challenges faced by SMEs during the economic crisis and determined factors influencing their survival despite the numerous negative impacts of the crisis. This study was primarily based on an empirical model and utilized quantitative methods. The sample comprised 172 SMEs in the manufacturing sector located in the southern and western provinces of Sri Lanka. The main challenges faced by SMEs included high production costs and declining demand due to inflation, shortages of necessary raw materials, continuous power outages, working capital and liquidity issues, and supply chain disruptions caused by fuel problems. All these major issues affected the reduction in capacity utilization rates and diminished the business performance of many SMEs. The research revealed new results indicating that some enterprises managed to survive even during the economic crisis due to their dynamism and entrepreneurial orientation. Among the two factors considered specific to ownership in this study, the owner's managerial dynamism was found to be a more decisive factor for business survival than entrepreneurial orientation during the economic crisis.

Andrew Chan et al. (2023) conducted a study on the sustainable performance of SMEs in the manufacturing sector following the global financial crisis of 2008-2009. Utilizing a sample of 207 SMEs in the manufacturing sector in Hong Kong, the authors examined the simultaneous impact of positive orientation, financial reserves, and external networks on business performance post-crisis through strategic changes. The research results indicated that positive orientation and external networks play supportive roles in strategic shifts, leading to high performance. However, the supportive role of financial reserves was not demonstrated. The study also revealed a new point that positive orientation, financial reserves, and external networks function as cushioning factors, exerting direct and positive influences on performance. These findings provide researchers and practitioners with a fresh perspective on the underlying mechanisms that sustain the performance of SMEs in the context of financial crises.

An overview of international studies on SMEs in the manufacturing sector highlights the importance of market linkages, innovation, and policy support factors. However, there remain considerable research gaps concerning the impacts of internal factors such as equity capital and wage policies, as well as external environmental factors such as government support and international operations. These gaps need to be addressed through further research to promote sustainable development in the sector amidst economic integration and global shocks.

Domestic studies

In developing countries like Vietnam, SMEs in the manufacturing sector play a crucial role in economic development: they largely provide employment for the national labor force, exhibit high operational efficiency, particularly demonstrate flexibility in response to changes and economic shocks, and increasingly contribute to the country's GDP. These enterprises represent a potential pathway to becoming larger businesses in the nation. However, there currently exists no research in Vietnam addressing quantitative analysis using panel data models related to SMEs in the manufacturing sector to analyze the factors impacting their profitability. The work of Nguyễn Hoàng Hải (2004) presented qualitative analyses of the effects of economic globalization on SMEs in Vietnam. Phan Thị Minh Lý (2011) studied the impact of various factors on the business operations of SMEs in Thừa Thiên – Huế. The results indicated new findings that local policy factors and macroeconomic policies positively affect enterprise performance. Specifically, local policies pertain to local support measures, administrative procedures, infrastructure, land leasing processes, and support from business associations. Macroeconomic policies include support for SMEs, legal frameworks, and tax policies. Nguyễn Thị Hải Ninh (2012) clarified the theoretical framework and the current status of the impact of the global crisis on SMEs in Vietnam, subsequently proposing recommendations and solutions based on qualitative analyses to foster the development of SMEs in Vietnam in the post-global economic crisis period.

Research hypotheses

According to research by Bibiana Njogo et al. (2020), equity capital positively impacts earnings per share of manufacturing companies in Nigeria. This indicates that higher total equity capital may lead to profit growth for enterprises. Specifically, findings show that companies primarily investing in their operations through equity capital tend to achieve better financial performance compared to those that rely more heavily on debt. Thus, this paper formulates the following hypothesis:

Taufiqurrahman et al. (2023) conducted research focusing on the State Bank of India (SBI) and examined how tangible assets influence its financial performance, particularly through metrics like Return on Assets (ROA). The results indicated a positive relationship between the value of tangible assets and key financial metrics, such as ROA, highlighting that tangible resources are crucial for profitability. Thus, this paper formulates the following hypothesis:

H1: The total value of a company's tangible assets positively influences its gross profit.

Evgeny L. Pankratov (2021) conducted a study revealing that the total number of employees in an industrial enterprise significantly affects the company's gross profit. A model presented in the paper indicates that an appropriate number of employees is essential for achieving the desired profit level. Excessive staffing can lead to increased costs, such as salaries and other employee-related management expenses, which may negatively impact profit margins. Thus, this paper formulates the following hypothesis:

H2: The total number of full-time employees influences the gross profit of the enterprise.

Tahir Abdi (2008) indicated in his research that the type of machinery and equipment (M&E) used in production significantly affects output and productivity growth, which can directly impact gross profit. The study showed that investments in M&E exhibit a strong positive elasticity concerning

output, suggesting that better or more efficient machinery can lead to higher production levels and consequently increased profits. Thus, this paper formulates the following hypothesis:

H3: The type of machinery and equipment used by the enterprise in production affects its gross profit.

Ada Leiponen (2000) conducted research indicating that companies with a higher ratio of skilled technical employees tend to achieve better profits. The study suggested that educational capacity, especially in innovation-oriented companies, has a significant correlation with financial performance. Thus, the authors formulate the following hypothesis:

H4: The number of technical-skilled workers relative to the total number of full-time employees positively influences the enterprise's profit.

Richard Chinomona (2013), in his study, utilized data from 221 employees at small enterprises in Zimbabwe and concluded that the expertise of small business owners positively influences business performance, including profits. The owners' expertise enhances skill training for employees, ultimately improving business performance and supporting the view that expertise indirectly impacts profits through training. The research by Mesri Welhelmina Nisriani Manafe et al. (2024) showed that the technical expertise of business owners is a crucial factor affecting the performance of micro-enterprises in the technology sector. This expertise can enhance decision-making and operational efficiency, leading to improved profits. Thus, this paper formulates the following hypothesis:

H5: The technical expertise of the business owner is also expected to have an impact on the enterprise's profitability.

In the study by Ewa Majerowska et al. (2018), it was indicated that the field of business and production significantly impacts corporate profitability. The research pointed out that the industry environment plays a crucial role in shaping financial outcomes, exerting a deeper influence than the effects of specific internal factors within individual companies. Therefore, the paper formulates the following hypothesis:

H6: The manufacturing industry is an expected factor in the model, anticipated to affect corporate profitability.

In a study conducted by Robert Kisavi Mule and colleagues (2015), it was shown that a company's size has a significantly positive relationship with profitability, specifically measured by return on equity (ROE). A unit change in company size led to an increase in ROE by 0.012, suggesting that larger companies tend to have higher profitability. M. Stevan Tomasevic et al. (2019) examined the impact of enterprise size on the profitability of agricultural businesses in Serbia. Using data from 121 enterprises during the 2014-2017 period, the authors concluded that larger enterprises tend to be more profitable than small and medium-sized enterprises. Therefore, the authors formulate the following hypothesis:

H7: Enterprise size is also expected to impact corporate profitability.

In 2024, Yicheng Fu (2024) in his study pointed out that expanding international activities, including exporting goods to other countries, significantly enhances business performance and positively affects corporate profitability. In addition, Joanna Wyrobek (2015) conducted a study on 50 manufacturing companies listed on the Warsaw Stock Exchange using a dynamic panel data model and Granger causality testing, confirming that exports have a positive impact on corporate profitability. Therefore, the authors formulate the following hypothesis:

H8: Exports are also expected to impact corporate profitability.

In the study of Vita Vynogradnya and Lyuda Burdonos (2023), it was shown that state support plays an important role in improving the profitability of enterprises. The article emphasizes that state participation helps enterprises overcome various obstacles, such as the lack of paying customers and volatile market conditions. Therefore, the authors build the following hypothesis:

H9: State participation in supporting the activities of enterprises has a positive impact on enterprise profitability.

RESEARCH DATA AND MODEL ESTIMATION RESULTS

Research Data

The data used in this study are drawn from surveys on small and medium-sized enterprises (SMEs) in the manufacturing and processing industry, conducted by the Institute of Labor Science and Social Affairs (ILSSA), the Central Institute for Economic Management (CIEM), and the Department of Economics of the University of Copenhagen (DoE) – Denmark, with technical support from the Danish International Development Agency (DANIDA). The survey was conducted in nine provinces and cities, including Hanoi, Hai Phong, Ho Chi Minh City, Phu Tho, Nghe An, Quang Nam, Khanh Hoa, Lam Dong, and Long An. This survey is carried out biennially and provides consistent information with sample sizes as follows: 2,635 enterprises in 2007, 2,659 in 2009, 2,552 in 2011, 2,575 in 2013, 2,756 in 2015, and 2,865 in 2017.

The dataset includes information on SMEs in the manufacturing and processing industry, such as: information about business owners; business indicators like revenue, profit, investment capital, labor, inventory, interest expenses, etc.; labor and employment indicators; and information about government support for SMEs.

Model and estimation results

Model of Factors Affecting Enterprise Profitability

Model and variable description

The panel data regression model assessing the impact of the global economic crisis on the resilience of SMEs in the manufacturing and processing industry in this study takes the following form:

$$Profit_{it} = \beta_0 + \beta_1 Capital_{it} + \beta_2 Labor_{it} + \beta_3 Profession_{rate_{it}} + \beta_4 Export_{it} +$$

$$\beta_5 Year_i + +\beta_6 Machinery_i + \beta_8 Size_{it} + \beta_9 Profession\_owne_{it} + \beta_{10} Dummy_{it} + c_i + u_{it} \ (1)$$

where i represents cross-sectional units (enterprises), t denotes time (year), c_i represents unobserved firm-specific characteristics, and u_{it} is the random error term.

Profit: The natural logarithm of gross profit. Profit is chosen as the indicator of business development effectiveness in the empirical model for several reasons. First, profit is the primary goal of most businesses. Second, higher profits allow firms to sustain and expand production, invest in research and development, and access advanced technology, thus increasing employees' income and motivation. Moreover, profit data is readily available in the dataset. Profit is measured in thousands of VND.

Capital: The natural logarithm of the total physical assets of the enterprise at year-end, is expected to positively influence the dependent variable. Physical assets are measured in thousands of VND.

Labor: The natural logarithm of the total regular full-time labor at year-end.

Machinery: The type of machinery and equipment used by the enterprise, representing technological adoption.

Profession_rate: The ratio of technically skilled workers to total regular labor at year-end, expected to positively impact profitability.

Profession_owner: The technical expertise of the business owner, expected to influence profitability.

Sector: Industry sector is included in the model, with three categories for the manufacturing industry: food processing, textiles and wood processing, and chemical, metal, non-metal, and assembly sectors.

Size: Enterprise size is also expected to affect profitability.

Export: Export is included in the model since global economic downturns affect Vietnam's export markets, and thus, exports are expected to impact profitability.

Year: The year factor is important for assessing profitability variations between years during and after the crisis, reflecting business fluctuations.

Dummy: The dummy variable Dummy represents whether the state participates in supporting the business activities or not (through capital contribution, shares, etc.). The dummy variable takes the value of 1 if the state supports and 0 if the state does not support.

Table 1: Descriptive Statistics of Variables

Variable	N	Mean	Dtd.dev.	Min	Max
Profit	10904	14.43715	1.913472	6.738153	21.66418
Capital	10904	14.6526	1.819652	2.995732	19.55858
Labor	10904	1.878643	1.1380651	0	6.214608
Machinery	10904	3.580815	0.36512	1	4
Profession_rate	10904	0.0295027	0.0764484	0	1
Profession_owner	10904	2.913177	1.318633	1	5
Sector	10904	2.336246	0.823053	1	3
Size	10904	1.394172	0.4252953	1	3
Export	10904	0.0730747	0.2231196	0	1
Dummy	10904	0.34616	0.4758	0	1

Source: Author's calculations using EViews software.

Table 2: Correlation Matrix of Variables

	Profit	Capital	Labor	Machinery	Profession rate	Export	Dummy
Profit	1.0000						
Capital	0.6466	1.000					
Labor	0.5576	0.6640	1.000				
Machinery	0.1072	0.0714	0.1084	1.000			
Profession rate	0.3386	0.3811	0.4065	0.0338	1.000		
Export	0.2935	0.2665	0.3820	0.0373	0.1812	1.000	
Dummy	0.3821	0.3012	0.0185	0.0256	0.1516	0.1658	1.000

Source: Author's calculations using EViews software.

Estimation Results

Hausman test indicates that the fixed-effects model is appropriate, and the model shows heteroskedasticity, leading the study to apply a fixed-effects model with robust standard errors, as proposed by White (1980). The estimation results (see Table 3) reveal that variables such as Capital,

Labor, and Year are statistically significant at the 1% level, while Machinery, Export, Profession_rate, and Profession_owner are significant at the 5% level, all positively affecting firm profitability.

Table 3: Regression Results for Factors Affecting Firm Profitability

Independent Variables	Coef.	Std.Err (Robust)	T	P>|t|
Capital	.1326687	.0153187	8.66	0.000
Labor	.515496	.0308582	16.71	0.000
Machinery (Handheld machinery)				
2(operated by hand)	.0145968	.0843620	0.17	0.814
3(operated by machine)	.1325810	.0674889	1.96	0.025
4(Combination operation)	.0699711	.0628953	1.11	0.314
Export	.2617013	.1084724	2.41	0.015
Profession_owner				
2 (Vocational certificate, basic level)	.1136945	.0360439	3.15	0.002
3 (Technician without formal certificate)	.0642186	.0312232	2.06	0.038
4 Certified technician	.1163485	.0436695	2.66	0.009
5 College or university degree or highe	.1841034	.0578403	3.18	0.005
Year				
2009	1.618091	.0273841	59.09	0.000
2011	2.567034	.0355683	72.17	0.000
2013	3.125522	.0348503	89.68	0.000
2015	3.427675	.0467810	73.27	0.000
2017	3.526788	.0436120	80.87	0.000
Profession_rate	.5416772	.2263464	2.41	0.016
Dummy	.0617012	.0108412	3.69	0.002

 Source: Author's calculations using EViews software.

The regression results in Table 3 suggest that increasing the number of employees or fixed assets leads to higher average profitability. The coefficient for Export indicates that firms engaged in exporting have higher average profits than non-exporting firms.

The Profession_rate coefficient implies that workforce skill level positively impacts firm profitability, suggesting that firms should either recruit skilled labor or invest in training programs to boost productivity.

For enterprises with support from the Vietnamese government, the coefficient of the Dummy variable shows that enterprises with state support have higher average profits than enterprises without support from the Vietnamese government. From here, we see that the state needs to continue to have an investment strategy for enterprises.

The Profession_owner coefficient shows that the technical expertise of business owners impacts profitability, with variations across levels, though the differences are not substantial.

The Machinery coefficient suggests that enterprises using electrically operated machinery have higher profits than those relying on manual or hand-operated equipment, underscoring the role of technology in enhancing productivity.

The Year coefficient indicates that, compared to 2007, firms experienced an average profit increase of about 1.62% in 2009, 2.57% in 2011, 3.12% in 2013, 3.43% in 2015, and 3.53% in 2017. This trend

suggests that despite the global economic crisis, SMEs remained relatively stable, demonstrating their resilience and adaptability to external shocks. However, post-crisis recovery led to a stronger profit increase, highlighting SMEs' ability to bounce back swiftly.

Estimated Results by Enterprise Size

This article also implements a business performance assessment model within the economic framework, evaluating the recovery capacity of small and medium enterprises post-crisis according to scale, as shown in Table 4 below.

Table 4: Profit Regression Results by Enterprise Scale

	Micro-enterprises		Small Enterprises		Medium Enterprises	
	Coef.	P>|t|	Coef.	P>|t|	Coef.	P>|t|
Capital	.0681803	0.000	.2197541	0.000	.3190623	0.000
Labor	.4189008	0.000	.4290175	0.000	-.2488202	0.000
Year						
2009	1.639342	0.000	1.758804	0.000	1.429115	0.000
2011	2.657982	0.000	2.481111	0.000	2.198152	0.000
2013	3.155736	0.000	3.120232	0.000	4.185912	0.000
2015	3.324674	0.000	3.321862	0.000	4.321614	
2017	3.645124	0.000	3.642741	0.000	4.651232	
Profession_rate	.7887396	0.012	.6882377	0.089	16.79764	0.000
R(sq)	0.8687		0.78		0.982	
Number of obs.	7720		3102		48	

Source: Author's calculations using EViews software.

Table 4: shows that the regression results indicate statistically significant coefficients below the 1% level, with positive signs except for the Labor variable in the medium-sized business group, which shows a negative sign. This suggests that for medium-sized businesses, the labor variable negatively affects average profitability, while for micro and small businesses, it has a positive impact. This result can be explained by the fact that medium-sized businesses are likely utilizing their workforce efficiently to maximize the capacity of their machinery and equipment, and thus, they should not hire additional labor unless other factors remain unchanged. In contrast, micro and small businesses can continue to recruit additional labor, assuming no changes in machinery, equipment, and other factors.

Moreover, the results show that small and medium-sized businesses increased average profitability during and after the economic crisis. Comparing the coefficients indicates that micro-enterprises have a higher likelihood of increasing average profitability during a crisis than small and medium-sized enterprises. This can be attributed to the greater agility and flexibility of micro-enterprises in crisis situations compared to small and medium-sized firms. However, in the post-crisis period, medium-sized businesses tend to recover more strongly than micro and small businesses. This could be because, although their adaptation may be slower due to their larger scale, once they adapt, their greater financial capacity allows them to invest more, secure contracts, and expand market reach more effectively.

Estimated Results by Sector Group

Additionally, this study includes a regression estimation model to evaluate the production and business performance of small and medium-sized enterprises (SMEs) in the manufacturing sector during and after the economic crisis, presented in Table 5 below.

Table 5: Regression Results of Business Profitability by Sector Group

	Food Processing (Group 1)		Textile, Wood Processing, Printing (Group 2)		Petrochemicals, Metals, Non-metals, Assembly (Group 3)	
	Coef.	P>|t|	Coef.	P>|t|	Coef.	P>|t|
Capital	.0614082	0.001	.1454072	0.000	.1495702	0.000
Labor	.5216203	0.000	.4147393	0.000	.5488478	0.000
Year 2009	1.852862	0.000	1.841071	0.000	1.602274	0.000
2011	2.902734	0.000	2.808398	0.000	2.532978	0.000
2013	3.563114	0.000	3.410176	0.000	3.268104	0.000
2015	3.681246	0.000	3.621346	0.000	3.432618	0.000
2017	3.786124	0.000	3.701256	0.000	3.621446	0.000
Profession_rate	.1598124	0.780	.3487515	0.462	.8964412	0.003
R(sq)	0.8517		0.8162		0.8015	
Number of obs.	3306		2752		4784	

Source: Author's calculations using EViews software.

The average profitability regression results by industry group indicate that the Capital, Labor, and Year variables all have statistically significant coefficients below 1%, showing a positive impact on average profitability. Non-significant variables were excluded from the model. The results demonstrate that the average profitability of firms in all three industry groups - food processing; textiles, wood processing, and printing; petrochemicals, metals, non-metals, and assembly - increased during and after the crisis of 2008, reaffirming that SMEs in the manufacturing sector are competitive during crises and resilient in recovery periods. However, the food processing industry exhibited the highest competitiveness and recovery potential among the three groups. This aligns with Vietnam's economic structure and development context, where agriculture holds a substantial share, with abundant labor resources, low labor costs, and readily available raw materials contributing to lower production costs in food processing. Additionally, Vietnam is a major exporter of these goods, while it imports very few raw materials and machinery for this sector.

Model of Factors Influencing the Ability to Innovate Products

Model and Variable Description

In this model, the dependent variable, New_Product, is binary. Therefore, a logistic regression model (Logit) is used.

The Logit model applies where the dependent variable Y is binary, taking values of 0 and 1. If we denote the independent variables (influential factors) as X_j (for j = 2,...,k), the probability that the dependent variable Y equals 1 is given by the formula below:

$$p_i = \frac{e^{\beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + ... + \beta_k X_{ki}}}{1 + e^{\beta_1 + \beta_2 X_{2i} + \beta_3 X_{2i} + ... + \beta_k X_{ki}}} (2)$$

Notation:

$$\beta = \begin{pmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_k \end{pmatrix} \quad \text{và} \quad X=(1,X_2,X_3,...,X_k); \quad X_i =(1,X_{2i},X_{3i},...,X_{ki}); \quad i=0,..,n$$

The logit model can be written as: $p_i = \dfrac{e^{X_i\beta}}{1+e^{X_i\beta}} = \dfrac{\exp(X_i\beta)}{1+\exp(X_i\beta)}$ (3)

With $\beta_1, \beta_2, ..., \beta_k$ the unknown coefficients that need to be estimated.

Equation (3) is referred to as the logistic distribution function. In this function, $X\beta$ ranges from $-\infty$ to $+\infty$, so p takes values from 0 to 1, and p_i is nonlinear with both X_j and the parameters β

The panel data regression model that evaluates the impact of various factors on the likelihood of product creation by small and medium-sized enterprises (SMEs) in the manufacturing and processing industries in this study is structured as follows:

$$New\_product_{it} = \beta_0 + \beta_1 Profit_{it} + \beta_2 Sector_{it} + \beta_3 Ownership_{it} + \beta_4 Export_{it}$$

$$+\beta_5 Year_i + \beta_6 Process_{it} + c_i + u_{it} \ (4)$$

New_product: The new product variable takes the value "yes" or "no," encoded as:

$$New\_product = \begin{cases} 1 \ if \ the \ enterprise \ have \ a \ new \ product \\ 0 \ if \ the \ enterprise \ does \ not \ have \ a \ new \ product \end{cases}$$

Profit: Theoretically, a company's business performance may impact its ability to generate new products. If a company operates inefficiently with low profits due to a limited consumer base or low selling prices, it may need to improve or replace products to create better ones with higher competitiveness. Therefore, the author includes Profit as an independent variable in the model.

Export: In practice, companies that export are often affected by economic crises. Hence, the author incorporates the Export variable into the model to assess its impact on the likelihood of introducing new products.

Process: When a company enhances its technology or production processes, it contributes to the creation of new products. Thus, the author includes the production process variable (Process) in the model, expecting it to have a positive impact on the likelihood of introducing new products.

Ownership: The ownership form of the enterprise is also expected to affect its ability to create new products. In this study, the Ownership variable takes the value "0" if the ownership form is a household enterprise or a sole proprietorship, and "1" if the ownership form is a partnership, cooperative, limited liability company, joint-stock company, joint venture, or state-owned enterprise.

Year: The year factor is also included in the model to assess the impact of crises on the likelihood of introducing new products.

Table 6: Descriptive Statistics of Variables

Variable	N	Mean	Dtd.dev.	Min	Max
New_product	10904	.0348264	.1781962	0	1
Profif	10904	15.43716	1.923452	6.738143	25.66428
Sector	10904	3.13659	.8529164	1	3
Ownership	10904	.2285953	.4133332	0	1
Export	10904	.0730631	.2430967	0	1
Process	10904	.1304841	.3255587	0	1

Source: Author's calculations using EViews software.

The Hausman test indicates that the random effects model is more appropriate. The estimation results (see Table 7) show that the variables Export, Process, and Sector are statistically significant at the 1% level, Ownership and Year at the 5% level, with positive coefficients for these variables. Profit is statistically significant at the 10% level, with a positive coefficient.

Table 7: Regression Results of Factors Affecting New Product Creation

Independent Variable	Coef.	OR	Std.Err(Robust)	T	P>|t|
Profit	-.1181168	.888592259	.0612418	-1.92	0.056
Sector					
2	.2180373	1.243633454	.2667929	0.82	0.349
3	.7487891	2.114438093	.2198573	3.41	0.000
Ownership	.4612092	1.585990606	.2393282	1.93	0.034
Process	1.459334	4.303092714	.1922904	7.59	0.000
Export	.8615748	2.366885131	.2857295	3.01	0.000
Year					
2009	-.5542728	0.574489878	.2264268	-2.45	0.020
2011	.2652849	1.303802376	.2241137	1.18	0.354
2013	-1.949412	.142357753	.4275084	-4.56	0.000
2015	-2.161462	.115156639	.4624512	-4.67	0.000
2017	-2.486712	.083183023	.5421286	-4.77	.0000

Source: Author's calculations using EViews software.

Companies that innovate their production processes are 3.5 times more likely to introduce new products than those that do not (holding other factors constant and evaluated at the average value). This aligns with the reality that when companies change production processes to enhance productivity, they can also introduce new products that better fit the market and consumer preferences.

Exporting companies are 2.37 times more likely to introduce new products than non-exporting ones (holding other factors constant and evaluated at the average value). This can be explained by the flexibility of exporting firms in production activities, as they serve both domestic and foreign markets, where consumers tend to be more demanding. This creates opportunities for these companies to adjust their products or introduce new ones that are more suitable for foreign markets. Additionally, the international market is often volatile, and export policies change frequently, pushing firms to innovate and adapt.

The regression results also indicate that the industry sector affects the likelihood of new product creation. Enterprises in the petrochemical, metals, and assembly sectors are more likely to introduce new products compared to those in the food processing sector. This is consistent with the fact that the food processing industry typically has stable input sources, low production costs, and a mostly domestic market with less need for product innovation to remain competitive. In contrast, industries reliant on finite resources such as oil and coal are often driven to innovate processes and products to enhance efficiency and meet market demand.

Ownership form also affects product innovation. Partnerships, cooperatives, limited liability companies, joint-stock companies, joint ventures, and state-owned enterprises are more likely to create new products compared to household or privately-owned businesses. This aligns with the reality that household and private businesses often face financial and technical limitations, reducing their capacity for innovation compared to firms with more resources and specialized expertise.

On average, a 1% increase in profit raises the likelihood of introducing new products to 89% of the initial level (holding other factors constant and evaluated at the average value).

The regression results further show that compared to 2007, the likelihood of introducing new products in 2009 (post-crisis) dropped by approximately 43%, and by 2013, it fell by about 86% compared to 2007. In 2015, this probability decreased by 89%, and by 2017, it fell by 92% compared to 2007. This can be attributed to the 2008 economic crisis, which posed challenges for SMEs, compelling them to research and develop new products to recover and grow.

CONCLUSION AND POLICY IMPLICATIONS

Based on the estimated model results, the authors propose the following policy implications:

First, this paper provides empirical evidence confirming that, despite being negatively affected by global economic crises, small and medium-sized enterprises (SMEs) in the manufacturing and processing industries still demonstrate relatively strong resilience, competitiveness, and recovery capacity. This finding suggests that Vietnam should focus more on supporting this sector with policies aimed at fostering its growth, especially considering the significant and increasing contribution of SMEs to the country's economic growth in recent years.

Second, the paper also identifies factors that have a positive impact on the competitiveness and sustainable development of enterprises, such as fixed assets, workforce size, export activities, types of machinery and equipment used, the number of skilled workers, and the expertise level of the business owner. This affirmation suggests that Vietnam needs policies to support SMEs in general, and particularly in the manufacturing and processing sectors, to promote sustainable growth. Specifically, the Vietnamese government should prioritize support for export-oriented businesses, as these companies, although initially affected by global economic crises, tend to perform better than non-exporting firms. The government should consider policies such as continuing investment credit policies (providing investment loans and post-investment support) and export credit policies (providing loans to exporters and foreign importers) for investment projects. Additionally, this finding suggests that businesses should recruit employees with relevant skills and technical expertise, encourage managers to engage in research and development, and invest in modern machinery and high technology to improve labor productivity and drive business growth.

Finally, this research highlights that among SMEs in the manufacturing and processing industries, those that adopt new technologies and implement modern production processes are more likely to create new products and improve existing ones. This enhances their ability to meet market demands and strengthens their competitiveness. The study also confirms that private or family-owned businesses are less likely to innovate or create new products compared to businesses with other ownership structures. This finding suggests that the Vietnamese government should implement timely and targeted support policies for various sectors, helping SMEs improve their technology and production processes. On the business side, owners should regularly enhance their expertise, learn from more developed companies, or form partnerships and joint ventures with other firms. This will enable them to develop training strategies for their workforce, adopt advanced technology, and modify production processes, thereby promoting sustainable growth for the enterprise.

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